Amargosa River
Area of Critical Environmental Concern
Implementation Plan

BLM

Barstow Field Office

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Our Mission

To sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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To serve with honesty, integrity, accountability, respect, courage, and commitment to make a difference.

Our Priorities

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To cultivate community-based conservation, citizen-centered stewardship, and partnership through consultation, cooperation, and communication.

To respect, value, and support our employees, giving them resources and opportunities to succeed.

To pursue excellence in business practices, improve accountability to our stakeholders, and deliver better service to our customers.











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Area of Critical Environmental Concern
Implementation Plan

Bureau of Land Management
Barstow Field Office

October, 2006

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Barstow Field Office
2601 Barstow Road
Barstow, CA 92311
http://www.blm.gov/ca/barstow/

TAKE PRIDE IN AMERICA

In Reply Refer To:
1792 (P)
CA-680.01

October 2, 2006

Dear Reader:

Enclosed, for your review, is the draft Amargosa River Area of Critical Environmental Concern (ACEC) Implementation Plan and associated Environmental Assessment (EA). The draft ACEC Plan will guide the implementation of management goals established in the Northern and Eastern Mojave (NEMO) 2002 amendment to the California Desert Conservation Area (CDCA) Plan. The Bureau of Land Management (BLM) prepared these documents in fulfillment of its responsibilities under the Federal Land Management Policy Act of 1976, the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, and BLM ACEC management regulations (43 CFR 1610.7-2).

The Amargosa River ACEC planning area includes about twenty-one-thousand acres of public land located in southeastern Inyo County and northeastern San Bernardino County near the communities of Tecopa, Shoshone, and Death Valley Junction. The purpose of the draft ACEC Implementation Plan is to guide BLM's on-the-ground management activities of public land within the ACEC over the next twenty years. The EA assesses the impacts of the draft Plan and its alternatives.
Thirty-five days are being provided for public review. Comments should be addressed to:

Amargosa River ACEC Plan
Bureau of Land Management
2601 Barstow Road
Barstow, CA 92311

Final approval of the Amargosa River ACEC Implementation Plan will be documented in a Decision Record. The Record Decision will reflect any changes made as a result of public review and will be made available to the public and mailed to interested parties.

Sincerely,

Roxie C. Trost

Roxie C. Trost
Field Manager

Enclosure
Draft ACEC Implementation Plan and Environmental Assessment (EA).

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Amargosa River
Area of Critical Environmental Concern
Implementation Plan

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I. Introduction

A. Location and Setting of Planning Area

The Amargosa River Area of Critical Environmental Concern (ACEC) is located in northeastern San Bernardino and southeastern Inyo Counties, California, near the communities of Tecopa and Death Valley Junction, California (Map 1). Ninety-two percent of the lands composing the ACEC are public lands administered by the Bureau of Land Management (BLM). BLM has no authority to implement any part of this plan on private lands without the willing agreement of the private landowner.

The ACEC encompasses 21,552 acres in three distinct geographic units (Maps 2a through 2c). The 15,964 acre Central Amargosa Unit includes the previous Amargosa Canyon and Grimshaw Lake Natural Areas plus additional lands in China Ranch Wash and the Tecopa area. Eighty-nine percent of the Central Amargosa Unit[1] is public lands administered by BLM. The Lower Carson Slough Unit[2] is located about two miles northeast of Death Valley Junction along State Route 190 and contains 4,340 acres of public land administered by the BLM. The Upper Amargosa Mesquite Bosque Unit[3] is located west of State Route 127 and south of the Nevada state line and contains 2,720 areas of public land administered by the BLM.

The Amargosa River originates in the mountains surrounding Beatty, Nevada, flows through the Amargosa Desert region, and terminates at Bad Water in Death Valley National Park. Most of the river course to Bad Water is underground, but about seventeen miles of surface flow exist in the areas of Shoshone, Tecopa, and the Amargosa Canyon. This perennial surface flow has created lush riparian and wetland habitats that support endemic and sensitive species such as the endangered Amargosa vole (*Microtus californicus scirpensis*). The Amargosa Canyon contains some of the lusher cottonwood-willow gallery forest in the Mojave Desert. Portions of the Amargosa River are eligible for inclusion in the National Wild and Scenic River System (NWSRS).

The alkali flats in the Carson Slough Unit are downstream from Ash Meadows in Nevada. Carson Slough is a tributary to the main Amargosa River and provides designed critical habitat for two regionally endemic plants listed under the Endangered Species Act.

The Upper Amargosa Unit includes upstream flow and source waters for the Central Unit, mesquite bosque, and ephemeral wetlands. One-hundred and five acres of public land administered by BLM within the Upper Unit may be patented as private land within the life of this plan.

[1] Referred to as the Central Unit
[2] Referred to as the Carson Slough Unit
[3] Referred to as the Upper Amargosa Unit

B. Relevance and Importance Criteria of the Amargosa River ACEC

To qualify as an Area of Critical Environmental Concern (ACEC), an area must meet the relevance and importance criteria defined in the Federal Land Policy and Management Act of 1976 (FLPMA) and codified in 43 Code of Federal Regulations (CFR) 1610.7-2. An environmental resource can be found *relevant* if there is a significant historic, cultural, or scenic value; a fish or wildlife resource; or other natural system or process. An environmental resource can be found *important* if the significant value, resource, or system have substantial significance and value. This generally requires that qualities exceed mere local significance and special worth.

The resources present in the Amargosa River ACEC are both relevant and important because of three resource values:

A. Fish and wildlife resources and natural systems and processes

The importance of the Amargosa River ACEC lies in its unique and dramatic contrast from the vast surrounding desert area and its isolation from other similar landscapes and habitats. Perennial free-flowing water and associated wetland and riparian habitats provide food, cover, and water to diverse bird, fish, mammal, mollusk, and insect species that would otherwise not be found in this part of the Mojave Desert. Extensive riparian, wetland, and alkali mudflat habitats are found in other isolated spots of the Mojave Desert, but those found along this section of the Amargosa River have been isolated for so long that they have begun to take on special significance. Plant and animal species, found nowhere else in the world, such as the Amargosa vole, Amargosa pupfish (*Cyprinodon nevadensis amargosae*), Amargosa dace (*Rhinichthys osculus spp.*), and many others depend on these distinct habitats for survival. These endemic species are perfectly adapted to the special environmental conditions and forces that these habitats have placed on them, but they are not adapted to pressures placed on them by current land use practices. Legal protection for many of these species and critical habitat designation for the Amargosa vole provide special importance to this area and the need for ACEC designation. The Carson Slough Unit contains alkali mudflats and saltgrass meadows containing designated critical habitat for the federally endangered Amargosa niterwort (*Nitrophila mohavensis*) and federally threatened Ash Meadows Gum Plant (*Grindelia fraxino-pratensis*).

B. Historical and cultural values

The Amargosa River Area of Critical Environmental Concern (ACEC) encompasses diverse, unique, and significant cultural and paleontological resources. Because the Amargosa River is a significant water source in the Mojave Desert, human use extends over the last 8,000 years (BLM 1983b:9). Rogers (1939) identified four distinct cultural complexes, which have since been renamed Paleo-Indian, Lake Mohave/Pinto, Amargosa, and Shoshonean. In addition to its prehistoric value, historic landmarks include the Old Spanish Trail and the Tonopah and Tidewater Railroad, which traversed the canyon. The Lake Tecopa bed is fossil-rich and the canyon area is scientifically valuable for paleontological study (Sulley 1972:1).

C. Scenic values

The presence of important scenic values is part of the agency record in the California Desert Conservation Area (CDCA) Plan (1980). Applying the Visual Resources Management (VRM) inventory program of the time, the BLM rated CDCA polygons as to land form, color, water, vegetation, uniqueness, intrusions, and adjacent scenery. Using a points system, each "rating area" was assigned an overall rating of A, B or C. Seventeen rating area polygons exist within the viewshed of the Amargosa River ACEC; eight were rated A, seven were rated B, and one was rated C. In the A, B, and C rating system, A areas combine the most outstanding characteristics of each rating factor. The ACEC's viewshed includes natural scenery entirely or partly within the boundaries of eight wilderness areas and two wilderness study areas managed by BLM, as well as substantial wilderness acreage within Death Valley National Park.

C. Purpose and Need of the Plan

The Amargosa River Area of Critical Environmental Concern (ACEC) Implementation Plan is a site-specific, interdisciplinary plan that strategically implements management goals for the Amargosa River ACEC. The area is a popular recreation destination due to its location and special values, and is an integral component for local community services and economic life. A real threat to the water resources within the ACEC comes from potential future development in Nevada and California. Development could cause an overdraft of the aquifers that feed the spring sources providing water to the Amargosa River. Because of the high sensitivity, popularity, and importance of the ACEC's resources and values, special management actions are necessary to monitor and evaluate resources and values and to control and repair damage from recreation, resource use, invasive species, and other pressures that are not part of the native, natural environment.

This site-specific implementation plan integrates the vision for this area from various previous planning documents and designations, and defines a long-term action plan for the ACEC through implementation goals and actions to meet those goals. The plan will also identify the cost and priority associated with each action.

D. Management Background

The California Desert Conservation Area (CDCA) Plan of 1980 established the Grimshaw Lake and Amargosa Canyon Natural Areas of Critical Environmental Concern (ACECs). The CDCA Plan recognized the Amargosa River's importance as a natural system containing important resources and values. BLM adopted activity plans for these ACECs in 1983. Management objectives of the 1983 plans were to:

1. Improve the condition, and maintain the current extent of wetland habitats in order to perpetuate certain sensitive wildlife species, including least Bell's vireo (*Vireo bellii pusillus*), California yellow-billed cuckoo (*Coccyzus americanus occidentalis*), Amargosa speckled dace, Amargosa River pupfish, and the Amargosa vole.

2. Minimize man-caused intrusions to protect high-value scenery (geologic features and vegetative patterns).
3. Provide for passive recreation opportunities (non-motorized, day-use) in a manner compatible with the protection of sensitive wildlife species and scenic values.

Because of events that created changes in circumstances on public lands administered by BLM in the Northern and Eastern Mojave (NEMO) Planning Area, the NEMO plan amendment to the CDCA plan was completed in 2002. These changes of circumstance include:

1. Almost twenty miles of the Amargosa River, from Shoshone to State Highway 178, are eligible for the inclusion in the National Wild and Scenic River System (NWSRS). Consideration of a river for suitability puts a certain constraints on development. These constraints prohibit activities and uses that may adversely affect the potential suitability of the river segment at the recommended level of protection (wild, scenic or recreational), until suitability determination is made.
2. The Old Spanish Trail, which follows the Amargosa River, was included in the National Historic Trails System (NHTS) in 2002. The National Park Service (NPS) and BLM are jointly developing a management plan that guides the protection and interpretation of the trail.
3. The listing of the Amargosa vole as endangered under the Endangered Species Act (ESA) in 1984, the designation of critical habitat, and in 1997 the publication of a recovery plan for the species.
4. The California Desert Protection Act of 1994 (CDPA) created the Kingston Range Wilderness, portions of which are in the Central Unit. Wilderness constraints on uses and activities need to be integrated into the plan's overall management and interpretation strategies.
5. The 1985 listing of the Amargosa niterwort as endangered and the Ash Meadows gumplant and spring-loving centaury (*Centaurium namophilum*) as threatened under ESA, and the designation of critical habitat for the two former plant species. Recovery of these plants is addressed in the *Recovery Plan for the Endangered and Threatened Species of Ash Meadows, Nevada* (FWS 1990).
6. The southwestern willow flycatcher (*Empidonax traillii extimus*) and least Bell's vireo were listed as endangered under ESA and recent surveys conducted in 2005 and 2006 have confirmed that least Bell's vireo is nesting in the Amargosa River ACEC.
7. Inyo County adopted a Recreational Trails Strategy for eastern Inyo County. The Strategy needs to be integrated into the ACEC's overall management and interpretation strategies.

The NEMO Amendment to the CDCA Plan established the new Amargosa River ACEC with modified boundaries, adopted additional management strategies, designated routes of travel, and identified the need for an updated ACEC Plan to implement these strategies and integrate them with existing ACEC Plan strategies.

II. Resource Summary

The Amargosa River Area of Critical Environmental Concern (ACEC) includes perennial surface flows that support major riparian and wetland systems in the Death Valley region of the Mojave Desert. As a result, the ACEC contains an important and complex array of resources. Within the ACEC's Central Unit, the Amargosa River, and its cottonwood-willow gallery forest are the most notable of these resources. The Amargosa River and its riparian forest support two federally listed birds, a state listed bird, and two BLM sensitive fish. Because of its perennial water, the Amargosa River has a long history of human use and occupation.

Grimshaw Lake, also in the Central Unit, provides important wetlands for migrating waterfowl. The meadows, marshes, and pastures surrounding Grimshaw Lake provide habitat for the federally endangered Amargosa vole, which is endemic to the ACEC. Critical habitat for the vole is designated within the ACEC. The Central Unit provides a variety of compatible recreation opportunities and continues to be increasingly popular with recreationalists.

The Carson Slough Unit provides designed critical habitat for two federally listed plants and suitable habitat for a third. These rare plants are endemic to the Ash Meadows region.

The continued presence of these sensitive resource values is dependent upon the continued adequate flow of ground and surface water and the proper functioning of riparian and wetland systems.

The environmental assessment for the implementation plan (Appendix A) and Appendices B through E outline in detail ACEC features, resources, and uses.

III. Management Goals

To meet the vision for the Amargosa River ACEC set forth in current resource management plans and incorporate recent strategies, the following management goals were identified for implementation:

1. Protect, enhance, and restore natural riparian and wetland systems;
2. Protect and prevent irreparable damage to threatened and endangered species and their habitat;
3. Take prudent, proactive steps towards recovery of threatened and endangered species and their habitat;
4. Conserve and protect water resources essential to the maintenance of valued resources and habitat;
5. Implement an inventory and monitoring strategy;
6. Provide recreation opportunities that are consistent with resource protection;
7. Protect sensitive historical, cultural, and scenic values;
8. Provide for consistent management of public lands within ACEC boundaries.

IV. Implementation Actions

Implementation actions were developed for the Amargosa River ACEC based upon eight management goals that were derived from the CDCA Plan and its NEMO amendment. The actions were placed into one of three categories: those specific actions specially analyzed by the accompanying Environmental Assessment (Appendix A) (*), administrative policies and procedures that do not require analysis (#), and actions that will require analysis on a case-by-case basis once specific implementation has been determined (+). The accompanying Environmental Assessment analyzed all actions for cumulative effects. Actions were then prioritized as high (I), medium (II), and low (III) based upon regulatory requirement, management policy, and expected funding scenarios.

A. Protect, enhance, and restore natural riparian and wetland systems

Priority I

1. Control tamarisk (*Tamarix spp.*) through implementation of the Barstow Field Office's ten-year weed control plan. Control or contain, as appropriate, other species of weeds. Efforts will include infestations that are both upstream and within the ACEC. If feasible, BLM will establish partnerships to treat state and private lands where there is nexus to the ACEC.*

2. Implement, as needed, a controlled burn program to further supplement weed control projects and/or to eliminate refuse from mechanical removal.*

3. Conduct active riparian restoration, as needed, by introducing native riparian plant species into areas of weed control and other priority damaged areas.*

4. Use the results of bird surveys and literature review of microhabitat requirements to design projects that encourage the nesting of listed and candidate bird species.*

5. Prohibit ground fires on public lands within the ACEC.*

Priority II

6. Initiate additional active riparian and upland restoration in priority degraded areas within the ACEC.+

Priority III

7. Take steps to restore and maintain the natural sinuosity of the Amargosa River in order to minimize unnatural down cutting.+

B. Protect and prevent irreparable damage to threatened and endangered species and their habitat

Priority I

8. Reduce direct and indirect impacts to listed and special status plants by maintaining existing protective fences. Fence, restore closed routes, and/or sign known listed or special status plant population centers that have determined to be impacted by human or other disturbances.*

9. Construct a vehicle barrier at the mouth of Cowboy Canyon to protect riparian listed species habitat.*

10. Maintain the existing off-highway vehicle (OHV) barriers at the southern end of the Amargosa River ACEC adjacent to Sperry wash. These barriers protect wilderness values and support the existing OHV vehicle closure in Amargosa Canyon to protect listed species and their habitat.*

11. Survey the location of current and proposed land use authorizations for potential adverse effects to listed species[4] or their habitat and develop and/or implement specific protection or avoidance measures, dependent on location, threats, and other relevant factors.#

12. Motorized vehicles will be limited to designated routes of travel by the 2004 NEMO Route of Travel process.#

13. Enter into cooperative agreements with State and private landowners to limit vehicle access in the ACEC to the 2004 NEMO Route of Travel designations.#

14. Eliminate bathing at native hot springs[5] located in suitable habitat for the Amargosa vole in order to protect habitat.*

Priority II

15. Reduce the numbers of exotic fauna within listed species habitat consistent with protocols in appendix I. This may include, but is not limited to:
    - the house mouse (*Mus musculus*);
    - free-roaming and/or feral domestic cats (*Felis silvestris*);
    - brown-headed cowbirds (*Molothrus ater*).*

16. Periodically review the fire management plan for the region and modify it if necessary to assure that it continues to provide appropriate protection and mitigation for listed and sensitive species and their habitat during wildfire suppression and managed fire operations.#

C. Take prudent, proactive steps towards recovery of threatened and endangered species and their habitat

[4] For the purpose of this document listed species are those listed as threatened or endangered (T&E) under the Federal or State ESA, species that are T&E candidates under ESA, or species that are BLM sensitive.
[5] For clarification, this action does not apply to the Inyo County or privately operated facilities in Tecopa Hot Springs.

Priority I

17. Develop a formalized agreement between BLM, California Department of Fish and Game (CDFG), U.S. Geological Survey (GS), and U.S. Fish and Wildlife Service (FWS) for the implementation of actions in the *Amargosa Vole Recovery Plan*. BLM will encourage the establishment an interagency Amargosa Vole Recovery Team that meets regularly to coordinate, evaluate, and prioritize Amargosa vole research and recovery actions. Amargosa vole recovery actions considered for evaluation and prioritization should include:
    - Identification of any additional threats to the vole;
    - Enhancement of habitat in current wetlands that could support populations of Amargosa vole;
    - Expansion of wetland habitat into selected saltgrass meadows that may support populations of Amargosa vole;
    - Increasing the level of gene flow between existing, isolated populations of Amargosa vole, this may include establishment and restoration of wetland corridors and/or an expanded Amargosa vole translocation program;
    - Carrying out a focused Amargosa vole research and survey program that will provide information to enhance populations. This program may include, but is not limited to:
        - changes to abundance, distribution, natality, mortality, recruitment, age class distribution dispersal and temporal and spatial distribution patterns;
        - rate of population change;
        - genetic diversity studies;
        - assessments of changes to suitable habitat for the Amargosa vole;
        - micro and macro-habitat surveys and assessments in order to quantify habitat characteristics;
        - determination of temporal and spatial patterns of habitat use.

    Specific recovery implementation actions will require separate additional NEPA analysis and for the lead party or parties to acquire a section 10(a)(1)(A) recovery permit under the Endangered Species Act and a State of California incidental take permit. BLM will cooperate and support, to the maximum extent possible, the party implementing each recovery action.+

18. Prioritize and evaluate, in consultation and coordination with Ash Meadows National Wildlife Refuge, the issues related to the recovery and research of the Ash Meadows gumplant and Amargosa niterwort such as:
    - Establishment of new Ash Meadows gumplant and Amargosa niterwort populations in unoccupied, suitable habitat, based on monitoring results and literature review;
    - Monitoring to better determine specific habitat requirements for Ash Meadows gumplant and Amargosa niterwort.

    Specific implementation of these recovery actions will require NEPA analysis and a section 10(a)(1)(A) recovery permit under the Endangered Species Act and a State of California incidental take permit. BLM will take the lead of these recovery actions occurring on public lands in the Amargosa River ACEC.+

D. Conserve and Protect water resources essential to maintenance of valued resources and habitat

Priority I

19. Prohibit new non-administrative, discretionary stream diversions and groundwater disturbing activities on public lands within the ACEC.*

20. Prohibit discretionary geothermal development and exploration in the ACEC.*

21. Do not authorize land uses within the Amargosa watershed that would result in the deterioration of water quality or quantity within the ACEC or that may adversely affect listed species through their direct or cumulative effects. Develop protective measures as appropriate and notify responsible state water control agencies as appropriate. Coordinate efforts with Death Valley National Park, Las Vegas Field Office, and Ash Meadows National Wildlife Refuge.+

22. Assert Federal Reserve water rights for Kingston Range Wilderness, Wild and Scenic River[6], and Public Water Reserves and file for appropriated water rights to conserve existing water sources that support the ACEC's resources and values.*

Priority II

23. Utilize the U.S. Geological Survey (GS) Death Valley Regional Flow System (DVRFS) Model (Belcher, W.R., ed., 2004) or other best available technology to model the aquifers that feed the within the ACEC. Key questions include:
    - Sources of recharge;
    - Hydrologic connectivity with neighboring basins and hydrologic systems;
    - Effects of local and regional groundwater withdrawals.#

E. Implement an inventory and monitoring strategy

Priority I

24. Install and maintain stream monitoring equipment to quantify Amargosa River flows in the Amargosa Canyon.*

25. Identify, map, and/or monitor groundwater sources and springs within the ACEC.*

26. Monitor and evaluate habitat trends and conditions specific to listed species on public lands throughout the ACEC and work with private landowners, the State, and other federal agencies to identify listed species habitat and habitat trends throughout the ACEC.*

27. Conduct multi-year surveys to establish vegetation baseline in the ACEC, including additional populations of listed and sensitive plant species. Monitor suitable listed and sensitive plant habitat, track population trends, and identify additional recovery needs.

[6] If determined suitable

Monitor changes in vegetation characteristics over time, once a baseline is established. Identify thresholds for substantial change that would trigger the reevaluation of strategies.*

28. Monitor levels of visitor use of the ACEC trail system and watchable wildlife areas with visitor registers, periodic visitor counts, traffic counters, and other methods.*

29. Monitor water uses from new BLM land use authorizations within the California portion of the Amargosa watershed.*

30. Identify sensitive resources that have been or are subject to being degraded by improper use, ongoing erosion, or are potential health and safety hazards.+

31. Monitor for effectiveness of restoration efforts.+

32. Monitor any newly established populations of Ash Meadows gumplant and Amargosa niterwort to determine the success of these new populations.+

33. Monitor recreational activities to identify adverse effects to habitat, sensitive resources, and facilities using appropriate on-the-ground and remote methodologies.+

34. Conduct regular focused research and surveys for listed, sensitive, and other riparian birds to determine variety, abundance, nesting locations, and information to maintain and enhance nesting populations. Determine changes to nesting status.+

Priority II

35. Monitor surface water quality at pre-selected locations to gauge condition and trend.*

36. Document cultural resources within the ACEC through an archaeological inventory of culturally significant portions of the ACEC. This inventory will fulfill Section 110 of the National Historic Preservation Act (NHPA) and use any of the methods or techniques suitable for Section 110 surveys. Monitor locations exhibiting intense use and areas with fragile cultural resources.*

Priority III

37. Survey for populations of Amargosa River pupfish and the Amargosa Canyon speckled dace.*

38. Conduct an Order III soil survey for the ACEC that will include a series or association level vegetation map for the ACEC.*

39. Inventory invertebrate populations and assemblages in the ACEC, and monitor sensitive fish and invertebrate microhabitats to identify trends and threats.*

40. Conduct an in-stream flow study to document flows required to sustain resources and values within the ACEC. Model historic flows. Attempt to identify causes for non-seasonal changes.+

41. Monitor species diversity, richness, and abundance for mammalian, avian, reptilian, amphibian, and vascular plant taxa within the ACEC. Identify thresholds for substantial change that would trigger reevaluation of strategies.+

F. Provide recreation opportunities that are consistent with resource protection

Priority I

42. Determine the need and if necessary, build an OHV exclusion barrier at the trailhead of the rerouted northern end of the Tecopa Trail, and restore the previous trailhead.*

43. Prohibit the discharge firearms on public lands within the ACEC except shotguns when engaged in legal hunting.*

44. Prohibit overnight camping on public lands within the Central Unit of the ACEC.*

45. Implement Trail Plan Alternative A (Appendix B).*

46. Maintain a pack it in pack it out policy on public lands within the ACEC.#

Priority II

47. Implement Interpretive Plan Alternative A (Appendix C).*

G. Protect sensitive historical, cultural, and scenic values

Priority I

48. Protect cultural resources that display adverse effects by signing or fencing.+

H. Provide consistent management of public ands within ACEC Boundaries

Priority I

49. Cooperate with other agencies and partners to establish a public education program that Includes:
    - Information on the listed and sensitive species within the ACEC and ways to assist in conservation efforts;
    - Harmful effects of releasing non-native fish into the Amargosa River;
    - Information for private landowners about invasive species and federal, state, and non-governmental organization (NGO) invasive species assistance programs.#

50. Work with other federal, state, county and local governments, as appropriate, to implement management activities within the ACEC. Participate in regional forums and coordination processes to the extent possible. Seek a formalized agreement between BLM, GS, FWS, CDFG, and private parties for the implementation of actions in the ACEC Plan. Cooperate with non-governmental groups (NGOs) and individuals that wish to cooperate to implement the ACEC Plan.#

51. Actively engage in the existing interagency forums concerned with Devil's Hole and the Death Valley Regional Flow System. Notify appropriate state water control agencies, land managers, and the DOI Solicitor's Office of the importance of the Amargosa River and its sensitive biological resources present within the ACEC.#

Priority II

52. Work with mosquito and vector control districts to promote alternative methods to mosquito fish for mosquito control in the Amargosa River region.#

Priority III

53. Work with other federal, state, county and local governments and partners, as appropriate, to develop an informational database of the Amargosa watershed.#

54. Acquire State and private lands within the Amargosa River ACEC through exchange or purchase from interested, willing landowners to consolidate public lands. Priority areas would be lands that were identified in the 1983 ACEC Plans and lands in the expanded ACEC that contain significant resource values or designated critical habitat.*

V. Consultation and Coordination

A. Public Outreach

BLM informed the public in June of 2003 that an update of the Amargosa River ACEC activity plan was being initiated with the following notices:

1. A letter to the BLM CDCA wilderness mailing list dated June 17, 2003.
2. California BLM press release number CA-CDD-03-58 dated June 23, 2003: In addition to regular distribution, the press release was mailed to the NEMO routes of travel mailing list.
3. A notice posted on the BLM California and Barstow Field Office Internet web pages on June 24, 2003.
4. A notice in the BLM California's email newsletter News.bytes, issue 114 released June 24, 2003.

These notices opened a thirty-day public scoping period to identify issues and alternatives within the Amargosa River ACEC that were consistent with the NEMO Plan goals and framework. Five commenters identified twenty-nine potential issues (Table 5.1). Each issue was considered. The table discusses the reason for not incorporating those issues that were not incorporated into the range of alternatives considered.

After the June 2003 scoping period, BLM created a mailing list based on current commenters, area cooperators and landowners, and previous requests to be involved in this planning effort.

A letter updating the public on plan status and a final request for input went to the ACEC mailing list for the ACEC Plan on April 18, 2005.

BLM will make this proposed plan and environmental assessment available for a thirty-day public-review and comment period prior to its approval. During that period, BLM will host one public meeting in Tecopa to brief the public on the proposed activity plan and solicit additional feedback. BLM will announce the document's availability and the public meeting via a press release, which BLM will mail to the ACEC Plan mailing list.

At the end of the public review period for the environmental analysis, BLM will analyze the comments and make appropriate changes to the activity plan or analysis. If there are no substantial changes as a result of public comment, BLM will then prepare and issue a Decision Record for the implementation of the Amargosa River ACEC Activity Plan. If substantial changes are made, BLM will recirculate the plan and environmental assessment for another review period. Upon issuance of the decision record, the activity plan will be subject to a thirty-day appeal period in accordance with Title 43 of the Code of Federal Regulations, Part 4.

Table 5.1: SCOPING COMMENTS

Item	*Comment*	*Category*	*Response/Where Incorporated*
1	Inventory and monitor spring snails.	Bio	E 39 and E 41
2	Manage vegetation at Bore Hole Spring to allow more water to flow into Grimshaw Lake.	Bio	B 14, Vegetation at Bore Hole Springs provides suitable Amargosa vole habitat.
3	Inventory and monitor fish.	Bio- Fish	E 38, E 39, and E 41
4	Monitor T&E plants.	Bio- Plants	C 18, E 27, E 28, E 33, and E 41
5	Create a series-level vegetation map of the ACEC.	Bio- Plants	E 27
6	Inventory and monitor for Spring loving centaury, Tecopa bird's beak, Hall's meadow hawkbeard, Desert popcorn flower, & Bee-hive cactus.	Bio- Plants	E 27, E 28, and E 41
7	Designate critical habitat for vole.	Bio- Vole	Beyond scope of an activity plan to modify critical habitat boundaries: FWS may do so in the future based on the data collected in implementing this plan.
8	Develop a cooperative agreement to control camel thorn in Tecopa.	Bio-Plants	A 1 and H 49 (does not specify all invasive species that may be controlled)
9	Remove protective fence at Carson Slough due to blow sand problem it creates.	Bio-Plants	Construction techniques were used to minimize such problems (3-strand smooth-wire). Any problems would be mitigated but there are no plans to remove the fence, which has eliminated off-route incursions into occupied T&E plant critical habitat.
10	Protect cultural sites.	Cultural	E 37, G 48
11	Acquire in-holdings within the ACEC boundary	General	H 54
12	Coordinate management activities with other agencies.	General	A 1, B 13, C 17, C 18, E 34, E 40, E 41, and H 49-53

13	Develop contingency plan for hazardous materials transported on SR 127.	General	There are existing California Desert District (CDD)-wide and Barstow Field Office (BAFO) contingency plan for hazardous materials releases to public lands that adequately covers sensitive resources that may be affected, including those in the ACEC. If a SR 127 specific plan is needed for specific transport activities, it would be addressed in the context of those activities, and BLM would provide appropriate input at that time.
14	Build a solid, scientific database to use as a baseline.	Monitoring	E 26-28, E 36, E 40, E 41, and H 53
15	Build a cultural and geologic database to serve as a baseline.	Monitoring	E 26 and E 37
16	Inventory and monitor for cuckoos and plovers.	Monitoring-Birds	E 35 and E 41. Includes cuckoo but not specifically plovers. Several other avian species are included, and the specific indicator species may be modified based on inventory results and which species provide the most complete dataset for various habitat niches, in consultation with other agencies.
17	Inventory and monitor for vole populations, locations, and habitat.	Monitoring-Vole	C 17
18	Eliminate bathing at Bore Hole Spring.	Bio-Vole	B 14
19	Eliminate all wheeled vehicle use of ACEC except on routes of travel (ROT).	Recreation	B 9, B 10, B 12, B 13 and E 45
20	Develop bicycle and motorized map of ACEC to control use.	Recreation	E 47. All bicycles would be limited to designated ROT.
21	Protect Old Spanish Trail and the Mormon Trail.	Recreation	G 48 and H 50. Additional OST measures may be identified during the concurrent, multi-state OSNHT planning process. Mormon Trail not addressed.
22	Manage Central Unit in accordance with the National Wild and Scenic River System (NWSRS).	Recreation	This policy was established in NEMO upon eligibility determination, pending suitability findings. Protection measures and data gathering to provide suitability data include D 19-23, E 24, E 29, E 35, E 36, E 39, and E 40.
23	Resolve access issues.	Recreation	B 9, B 10, B 12, and B 13
24	Only improve the hiking trail between China Ranch Wash and Sperry Siding, no others.	Recreation	This is addressed in the range of alternatives. Trail Plan alternatives include a no new trails/trail upgrades alternative, a larger network designed for hiking only, and a larger network for both equestrian and hiking use.
25	Control salt cedar	Restoration	A 1, A 2, and A 3
26	Institute control burn program in the Central Unit	Restoration	A 2

27	Control Athel	Restoration	A 1 and A 6 if necessary. Currently, no athel infestations have been identified as invasive threats. BLM is currently focusing priority on invasive species that are known to displace native plants (e.g. saltcedar).
28	Protect ground water, springs, and in-stream flows.	Water	D 19-23, E 24, E 36, and E 40
29	Promote water conservation in Tecopa.	Water	May occur in conjunction with local agencies, based on information collected under H 50.

B. Interagency Coordination

BLM submitted a biological evaluation to FWS with a request to initiate informal consultation in January 2004. At the same time, the biological evaluation was also sent to CDFG for their review and comment. Subsequent discussions with wildlife agencies resulted in several clarifications and modifications to the proposed action, and submission of additional information. In addition, interested agencies and partners were consulted to provide input to the monitoring plan for the ACEC, including Death Valley National Park, California Native Plant Society, CDFG, Point Reyes Bird Observatory, and FWS. Death Valley National Park was briefed on the plan and provided an opportunity to comment on the entirety of the proposed action in January 2005. The County of Inyo was briefed of the proposed plan in February 2005 and through follow-up letters and discussions, several issues were clarified to address County concerns.

C. Agency Consultation

In January 16, 2004, the proposed action was submitted for formal consultation with the U.S. Fish and Wildlife Service (FWS) under Section 7 of the Endangered Species Act for proposed actions that may affect listed species. The biological opinion for the proposed plan was received from the Fish and Wildlife Service on March 13, 2006, and is attached as Appendix F.

May 8, 2006, informal, programmatic consultation with the State Historic Preservation Office (SHPO) was conducted. SHPO concurred that pursuant to the California State Protocol Agreement, a qualified archeologist will review each ground disturbance resulting from the implementation of this plan.

D. Intergovernmental Coordination

Requests for consultation with twelve tribal entities were initiated on September 9, 2003. To date, no comments have been received and no additional Native American issues have been identified through the scoping and consultation process.

E. List of Consultants

Bob Boyd	BLM Nevada Sate Hydrologist
Brian Croft	U.S. Fish and Wildlife Service (FWS)
Chris Kennedy	Inyo County Planning Division
Denyse Racine	California Department of Fish and Game
Linda Greene	Death Valley National Park
Val Page	Mojave Weed Management Area

F. List of Preparers

Amy Lawrence	Archaeologist - now employed by Bureau of Reclamation
Anthony Chavez	Rangeland Management Specialist
Brad Mastin	Outdoor Recreation Planner
Brian Croft	Natural Resource Specialist - now employed by FWS
Charles Sullivan	Natural Resources Specialist
Chris Roholt	CDD Wilderness Specialist
David Frink	Outdoor Recreation Planner
Edythe Seehafer	Environmental Coordinator
Jim Shearer	Archaeologist
Ken Schulte	Geologist - Retired
Rebecca Gonzalez	Resources Branch Chief
Roxie Trost	Field Manager
Russell Scofield	Project Lead
Shelly Jackson	Geographic Information System Specialist
Tim Read	Field Manager – Retired

VI. References

Belcher, W.R., ed., 2004, Death Valley regional ground-water flow system, Nevada and California—Hydrogeologic framework and transient ground water flow model: U.S. Geological Survey Scientific Investigations Report 2004-5205, 408 p.

Bureau of Land Management, 1983b. *Management Plan for Grimshaw Lake Natural Area: An Area of Critical Environmental Concern*. Barstow Resource Area. Barstow, California.

Bureau of Land Management, 1980. *The California Desert Conservation Area Plan 1980 as amended*. California Desert District. Riverside, California.

Bureau of Land Management, 2002. *Proposed Northern and Eastern Mojave Desert Management Plan: Amendment to The California Desert Conservation Area Plan*. A Final Environmental Impact Statement. California Desert District. Riverside, California.

Rogers, Malcolm J., 1939. Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas. *San Diego Museum of Man Archaeological Papers* 3. San Diego, California.

Sully, John M., Miriam A. Romero, and Robert D. Smith, 1972. *Amargosa Canyon-Dumont Dunes Proposed Natural Area*. A Report Submitted to the Bureau of Land Management by The Pupfish Habitat Preservation Committee, Montrose, California.

U.S. Fish and Wildlife Service, 1990. *Recovery Plan for the Endangered and Threatened Species of Ash Meadows, Nevada*. Portland, Oregon. 43pp.

Appendix A
Environmental Assessment
for the
Amargosa River
Area of Critical Environmental Concern
Implementation Plan
EA Number CA-680-03-53

1. Introduction
    A. Purpose and Need
    B. Land Use Plan Conformance
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    A. Proposed Action High Intensity Management (Alternative A)
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3. Affected Environment
    A. Vegetation Communities
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    Q. Socioeconomic Values
4. Environmental Consequences
    A. Proposed Action
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    D. Cumulative Impacts of the Proposed Action and Alternatives
    E. Residual Impacts and Irreversible and Irretrievable Commitments of Resources
5. References

Introduction

This environmental assessment (EA) of the Amargosa River Area of Critical Environmental Concern (ACEC) Implementation Plan examines the impacts of implementation of the proposed management actions and alternatives, incorporates mitigation measures, and determines where there is need for further site-specific analysis prior to implementation of actions.

Prior programmatic environmental documents written for the Amargosa River ACEC include the two activity plans and accompanying environmental assessments (1983) for the Grimshaw Lake Natural Area and Amargosa Canyon Natural Area ACECs and the 2002 Northern and Eastern Mojave (NEMO) bioregional amendment to the California Desert Conservation Area (CDCA) Plan. The NEMO plan and accompanying environmental impact statement (EIS) expanded the boundaries of the previously established ACECs, established broad management objectives for the new Amargosa River ACEC, and addressed regional impacts of adoption of these objectives. This EA and the accompanying proposed Implementation Plan address the activities to strategically implement the management objectives set forth in the CDCA and NEMO plans.

The planning area is defined by the Amargosa River ACEC boundaries (Maps 1 and 2). The study area is defined by the watershed boundary (Map A-1). This Implementation Plan does not constitute a CDCA plan amendment.

A. Purpose and Need

Because of the high sensitivity, popularity, and importance of the Amargosa River ACEC's resources and values, special management actions are necessary to monitor and evaluate resources and values and to control and repair damage from recreation, resource use, invasive species, and other pressures that are not part of the native, natural environment.

The purpose of this site-specific implementation plan is to integrate the vision for this area from various previous planning documents and designations, and define a long-term action plan for the ACEC through the identification of implementation goals and the development of implementation actions to meet those goals.

B. Land Use Plan Conformance

The activity level management of the Amargosa River ACEC conforms to the CDCA Plan, as amended, as required by 43 CFR 1610.5-3, and implements the goals identified for management of the Amargosa River ACEC in the CDCA Plan, as amended.

C. Planning Goals

The following planning goals were derived from the 1983 ACEC management plans for the area and NEMO:

1. Protect, enhance, and restore natural riparian and wetland systems
2. Protect and prevent irreparable damage to threatened and endangered species and their habitat
3. Take prudent, proactive steps towards recovery of threatened and endangered species and their habitat
4. Conserve and protect water resources essential to the maintenance of valued resources and habitat
5. Implement an inventory and monitoring strategy
6. Provide recreation opportunities that are consistent with resource protection
7. Protect sensitive historical, cultural, and scenic values
8. Provide for consistent management of public lands within ACEC boundaries

2. Proposed Action and Alternatives

Based on the eight management goals identified for the planning effort, three implementation strategy alternatives were developed for the Amargosa River ACEC. The three alternatives are the proposed action or high-intensity management alternative, the low-intensity management alternative, and the no action or current management alternative. Actions in each alternative were placed in one of three categories: those actions with adequate site-specific analysis in this environmental assessment (EA) and/or other environmental documents (*), administrative policies and procedures that do not require site-specific analysis (#), and actions that will require additional analysis, interagency coordination, and/or review on a case-by-case basis prior to implementation, (+). All actions were analyzed for cumulative effects. Actions were then prioritized as high (I), medium (II), and low (III) based upon regulatory requirement, management policy, and expected funding scenarios.

A. Proposed Action- High Intensity Management (Alternative A)

Protect, enhance, and restore natural riparian and wetland systems

Priority I

1. Control tamarisk (*Tamarix spp.*) through implementation of the Barstow Field Office's ten-year weed control plan. Control or contain, as appropriate, other species of weeds. Efforts will include infestations that are both upstream and within the ACEC. If feasible, BLM will establish partnerships to treat state and private lands where there is nexus to the ACEC.*

2. Implement, as needed, a controlled burn program to further supplement weed control projects and/or to eliminate refuse from mechanical removal.*

3. Conduct active riparian restoration, as needed, by introducing native riparian plant species into areas of weed control and other priority damaged areas.*

4. Use the results of bird surveys and literature review of microhabitat requirements to design projects that encourage the nesting of listed and candidate bird species.*

5. Prohibit ground fires on public lands within the ACEC.*

Priority II

6. Initiate additional active riparian and upland restoration in priority degraded areas within the ACEC.+

Priority III

7. Take steps to restore and maintain the natural sinuosity of the Amargosa River in order to minimize unnatural down cutting.+

A. Protect and prevent irreparable damage to threatened and endangered species and their habitat

Priority I

8. Reduce direct and indirect impacts to listed and special status plants by maintaining existing protective fences. Fence, restore closed routes, and/or sign known listed or special status plant population centers that have determined to be impacted by human or other disturbances.*

9. Construct a vehicle barrier at the mouth of Cowboy Canyon to protect riparian listed species habitat.*

10. Maintain the existing off-highway vehicle (OHV) barriers at the southern end of the Amargosa River ACEC adjacent to Sperry wash. These barriers protect wilderness values and support the existing OHV vehicle closure in Amargosa Canyon to protect listed species and their habitat.*

11. Survey the location of current and proposed land use authorizations for potential adverse effects to listed species[1] or their habitat and develop and/or implement specific protection or avoidance measures, dependent on location, threats, and other relevant factors.#

12. Motorized vehicles will be limited to designated routes of travel by the 2004 NEMO Route of Travel process.#

13. Enter into cooperative agreements with State and private landowners to limit vehicle access in the ACEC to the 2004 NEMO Route of Travel designations.#

14. Eliminate bathing at native hot springs[2] located in suitable habitat for the Amargosa vole in order to protect habitat.*

Priority II

15. Reduce the numbers of exotic fauna within listed species habitat consistent with protocols in appendix I. This may include, but is not limited to:
    - the house mouse (*Mus musculus*);
    - free-roaming and/or feral domestic cats (*Felis silvestris*);
    - brown-headed cowbirds (*Molothrus ater*).*

16. Periodically review the fire management plan for the region and modify it if necessary to assure that it continues to provide appropriate protection and mitigation for listed and sensitive species and their habitat during wildfire suppression and managed fire operations.#

[1] For the purpose of this document listed species are those listed as threatened or endangered (T&E) under the Federal or State ESA, species that are T&E candidates under ESA, or species that are BLM sensitive.
[2] For clarification, this action does not apply to the Inyo County or privately operated facilities in Tecopa Hot Springs.

B. Take prudent, proactive steps towards recovery of threatened and endangered species and their habitat

Priority I

17. Develop a formalized agreement between BLM, California Department of Fish and Game (CDFG), U.S. Geological Survey (GS), and U.S. Fish and Wildlife Service (FWS) for the implementation of actions in the *Amargosa Vole Recovery Plan*. BLM will encourage the establishment an interagency Amargosa Vole Recovery Team that meets regularly to coordinate, evaluate, and prioritize Amargosa vole research and recovery actions. Amargosa vole recovery actions considered for evaluation and prioritization should include:
    - Identification of any additional threats to the vole;
    - Enhancement of habitat in current wetlands that could support populations of Amargosa vole;
    - Expansion of wetland habitat into selected saltgrass meadows that may support populations of Amargosa vole;
    - Increasing the level of gene flow between existing, isolated populations of Amargosa vole, this may include establishment and restoration of wetland corridors and/or an expanded Amargosa vole translocation program;
    - Carrying out a focused Amargosa vole research and survey program that will provide information to enhance populations. This program may include, but is not limited to:
        - changes to abundance, distribution, natality, mortality, recruitment, age class distribution dispersal and temporal and spatial distribution patterns;
        - rate of population change;
        - genetic diversity studies;
        - assessments of changes to suitable habitat for the Amargosa vole;
        - micro and macro-habitat surveys and assessments in order to quantify habitat characteristics;
        - determination of temporal and spatial patterns of habitat use.

    Specific recovery implementation actions will require separate additional NEPA analysis and for the lead party or parties to acquire a section 10(a)(1)(A) recovery permit under the Endangered Species Act and a State of California incidental take permit. BLM will cooperate and support, to the maximum extent possible, the party implementing each recovery action.+

18. Prioritize and evaluate, in consultation and coordination with Ash Meadows National Wildlife Refuge, the issues related to the recovery and research of the Ash Meadows gumplant and Amargosa niterwort such as:
    - Establishment of new Ash Meadows gumplant and Amargosa niterwort populations in unoccupied, suitable habitat, based on monitoring results and literature review;
    - Monitoring to better determine specific habitat requirements for Ash Meadows gumplant and Amargosa niterwort.

    Specific implementation of these recovery actions will require NEPA analysis and a section 10(a)(1)(A) recovery permit under the Endangered Species Act and a State of California

incidental take permit. BLM will take the lead of these recovery actions occurring on public lands in the Amargosa River ACEC.+

C. Conserve and Protect water resources essential to maintenance of valued resources and habitat

Priority I

19. Prohibit new non-administrative, discretionary stream diversions and groundwater disturbing activities on public lands within the ACEC.*

20. Prohibit discretionary geothermal development and exploration in the ACEC.*

21. Do not authorize land uses within the Amargosa watershed that would result in the deterioration of water quality or quantity within the ACEC or that may adversely affect listed species through their direct or cumulative effects. Develop protective measures as appropriate and notify responsible state water control agencies as appropriate. Coordinate efforts with Death Valley National Park, Las Vegas Field Office, and Ash Meadows National Wildlife Refuge.+

22. Assert Federal Reserve water rights for Kingston Range Wilderness, Wild and Scenic River[3], and Public Water Reserves and file for appropriated water rights to conserve existing water sources that support the ACEC's resources and values.*

Priority II

23. Utilize the U.S. Geological Survey (GS) Death Valley Regional Flow System (DVRFS) Model (Belcher, W.R., ed., 2004) or other best available technology to model the aquifers that feed the within the ACEC. Key questions include:
    - Sources of recharge;
    - Hydrologic connectivity with neighboring basins and hydrologic systems;
    - Effects of local and regional groundwater withdrawals.#

D. Implement an inventory and monitoring strategy

Priority I

24. Install and maintain stream monitoring equipment to quantify Amargosa River flows in the Amargosa Canyon.*

25. Identify, map, and/or monitor groundwater sources and springs within the ACEC.*

[3] If determined suitable

26. Monitor and evaluate habitat trends and conditions specific to listed species on public lands throughout the ACEC and work with private landowners, the State, and other federal agencies to identify listed species habitat and habitat trends throughout the ACEC.*

27. Conduct multi-year surveys to establish vegetation baseline in the ACEC, including additional populations of listed and sensitive plant species. Monitor suitable listed and sensitive plant habitat, track population trends, and identify additional recovery needs. Monitor changes in vegetation characteristics over time, once a baseline is established. Identify thresholds for substantial change that would trigger the reevaluation of strategies.*

28. Monitor levels of visitor use of the ACEC trail system and watchable wildlife areas with visitor registers, periodic visitor counts, traffic counters, and other methods.*

29. Monitor water uses from new BLM land use authorizations within the California portion of the Amargosa watershed.*

30. Identify sensitive resources that have been or are subject to being degraded by improper use, ongoing erosion, or are potential health and safety hazards.+

31. Monitor for effectiveness of restoration efforts.+

32. Monitor any newly established populations of Ash Meadows gumplant and Amargosa niterwort to determine the success of these new populations.+

33. Monitor recreational activities to identify adverse effects to habitat, sensitive resources, and facilities using appropriate on-the-ground and remote methodologies.+

34. Conduct regular focused research and surveys for listed, sensitive, and other riparian birds to determine variety, abundance, nesting locations, and information to maintain and enhance nesting populations. Determine changes to nesting status.+

Priority II

35. Monitor surface water quality at pre-selected locations to gauge condition and trend.*

36. Document cultural resources within the ACEC through an archaeological inventory of culturally significant portions of the ACEC. This inventory will fulfill Section 110 of the National Historic Preservation Act (NHPA) and use any of the methods or techniques suitable for Section 110 surveys. Monitor locations exhibiting intense use and areas with fragile cultural resources.*

Priority III

37. Survey for populations of Amargosa River pupfish and the Amargosa Canyon speckled dace.*

38. Conduct an Order III soil survey for the ACEC that will include a series or association level vegetation map for the ACEC.*

39. Inventory invertebrate populations and assemblages in the ACEC, and monitor sensitive fish and invertebrate microhabitats to identify trends and threats.*

40. Conduct an in-stream flow study to document flows required to sustain resources and values within the ACEC. Model historic flows. Attempt to identify causes for non-seasonal changes.+

41. Monitor species diversity, richness, and abundance for mammalian, avian, reptilian, amphibian, and vascular plant taxa within the ACEC. Identify thresholds for substantial change that would trigger reevaluation of strategies.+

E. Provide recreation opportunities that are consistent with resource protection

Priority I

42. Determine the need and if necessary, build an OHV exclusion barrier at the trailhead of the rerouted northern end of the Tecopa Trail, and restore the previous trailhead.*

43. Prohibit the discharge firearms on public lands within the ACEC except shotguns when engaged in legal hunting.*

44. Prohibit overnight camping on public lands within the Central Unit of the ACEC.*

45. Implement Trail Plan Alternative A (Appendix B).*

46. Maintain a pack it in pack it out policy on public lands within the ACEC.#

Priority II

47. Implement Interpretive Plan Alternative A (Appendix C).*

F. Protect sensitive historical, cultural, and scenic values

Priority I

48. Protect cultural resources that display adverse effects by signing or fencing.+

G. Provide consistent management of public ands within ACEC Boundaries

Priority I

49. Cooperate with other agencies and partners to establish a public education program that Includes:
    - Information on the listed and sensitive species within the ACEC and ways to assist in conservation efforts;
    - Harmful effects of releasing non-native fish into the Amargosa River;
    - Information for private landowners about invasive species and federal, state, and non-governmental organization (NGO) invasive species assistance programs.#

50. Work with other federal, state, county and local governments, as appropriate, to implement management activities within the ACEC. Participate in regional forums and coordination processes to the extent possible. Seek a formalized agreement between BLM, GS, FWS, CDFG, and private parties for the implementation of actions in the ACEC Plan. Cooperate with non-governmental groups (NGOs) and individuals that wish to cooperate to implement the ACEC Plan.#

51. Actively engage in the existing interagency forums concerned with Devil's Hole and the Death Valley Regional Flow System. Notify appropriate state water control agencies, land managers, and the DOI Solicitor's Office of the importance of the Amargosa River and its sensitive biological resources present within the ACEC.#

Priority II

52. Work with mosquito and vector control districts to promote alternative methods to mosquito fish for mosquito control in the Amargosa River region.#

Priority III

53. Work with other federal, state, county and local governments and partners, as appropriate, to develop an informational database of the Amargosa watershed.#

54. Acquire State and private lands within the Amargosa River ACEC through exchange or purchase from interested, willing landowners to consolidate public lands. Priority areas would be lands that were identified in the 1983 ACEC Plans and lands in the expanded ACEC that contain significant resource values or designated critical habitat.*

B. Low Intensity Management Alternative (Alternative B)

A. **Protect, Enhance, and Restore Natural Riparian and Wetland Systems**
Implementation actions for this goal are the same as the proposed action the difference being in the pace of implementation.

Priority I

1. Control tamarisk (*Tamarix spp.*) through implementation of the Barstow Field Office's ten-year weed control plan. Control or contain, as appropriate, other species of weeds. Efforts

will include infestations that are both upstream and within the ACEC. If feasible, BLM will establish partnerships to treat state and private lands where there is nexus to the ACEC.*

2. Implement, as needed, a controlled burn program to further supplement weed control projects and/or to eliminate refuse from mechanical removal.*

3. Conduct active riparian restoration, as needed, by introducing native riparian plant species into areas of weed control and other priority damaged areas.*

4. Use the results of bird surveys and literature review of microhabitat requirements to design projects that encourage the nesting of listed and candidate bird species.*

5. Prohibit ground fires on public lands within the ACEC.*

Priority II

6. Initiate additional active riparian and upland restoration in priority degraded areas within the ACEC.+

Priority III

7. Take steps to restore and maintain the natural sinuosity of the Amargosa River in order to minimize unnatural down cutting.+

B. Protect and Prevent Irreparable Damage to Threatened and Endangered (listed) Species and Their Habitat

In this alternative, new fencing would not be used as a standard strategy to protect listed plant species, non-listed sensitive plant species would not be a focus of protection strategies, signing rather than a vehicle barrier would be used to discourage OHV use of Cowboy Canyon, and protection measures for Amargosa vole would focus on future authorizations.

Priority I

8. Reduce direct and indirect impacts to listed plants by maintaining existing protective fences. Restore closed routes and/or sign known population centers that have been determined to be impacted by human or other disturbances.*

9. Place a "no motor vehicle" sign at the mouth of Cowboy Canyon to protect riparian listed species habitat.*

10. Maintain the existing off-highway vehicle (OHV) barriers at the southern end of the Amargosa River ACEC adjacent to Sperry wash. These barriers protect wilderness values and support the existing OHV vehicle closure in Amargosa Canyon to protect listed species and their habitat.*

11. Survey the location of current and proposed land use authorizations for potential adverse effects to listed species[4] or their habitat and develop and/or implement specific protection or avoidance measures, dependent on location, threats, and other relevant factors.#

12. Motorized vehicles will be limited to designated routes of travel by the 2004 NEMO Route of Travel process.#

13. Enter into cooperative agreements with State and private landowners to limit vehicle access in the ACEC to the 2004 NEMO Routes of Travel Designations.#

Priority II

14. Reduce the numbers of exotic fauna within listed species habitat consistent with protocols in appendix I. This may include, but is not limited to:
    - the house mouse;
    - free-roaming and/or feral domestic cats;
    - brown-headed cowbirds.∗

15. Periodically review the fire management plan for the region and modify if necessary to assure that it continues to provide appropriate protection and mitigation for listed and sensitive species and their habitat during wildfire suppression and managed fire operations.#

C. Take Prudent, Proactive Steps towards Recovery of Threatened And Endangered Species and Their Habitat

This alternative would not include an aggressive habitat expansion strategy, vole research would be limited to population and habitat monitoring and assessments, and a proactive program to establish listed plant populations would not be undertaken. Focus for all listed species would be on coordination with and support of other agencies' efforts.

Priority I

16. Develop a formalized agreement between BLM, California Department of Fish and Game (CDFG), U.S. Geological Survey (GS), and U.S. Fish and Wildlife Service (FWS) for the implementation of actions in the *Amargosa Vole Recovery Plan*. BLM will encourage the establishment an interagency Amargosa Vole Recovery Team that meets regularly to coordinate, evaluate, and prioritize Amargosa vole research and recovery actions. Amargosa vole recovery actions considered for evaluation and prioritization should include:
    - Identification of any additional threats to the vole;
    - Increasing the level of gene flow between existing, isolated populations of Amargosa vole, this may include establishment and restoration of wetland corridors and/or an expanded Amargosa vole translocation program;

[4] For the purpose of this document listed species are those listed as threatened or endangered (T&E) under the Federal or State ESA, species that are T&E candidates for under ESA, or species that are BLM sensitive.

- Identification of priorities and protocols for implementation of Amargosa vole population monitoring, habitat surveys, and assessments.

Specific recovery implementation actions will require separate additional NEPA analysis and for the lead party or parties to acquire a section 10(a)(1)(A) recovery permit under the Endangered Species Act and a State of California incidental take permit. BLM will cooperate and support, to the maximum extent possible, the party implementing each recovery action.+

17. Prioritize and evaluate, in consultation and coordination with Ash Meadows National Wildlife Refuge, the issues related to the recovery and research of the Ash Meadows gumplant and Amargosa niterwort. Specific implementation of these recovery actions will require NEPA analysis and a section 10(a)(1)(A) recovery permit under the Endangered Species Act and a State of California incidental take permit. BLM will take the lead of these recovery actions occurring on public lands in the Amargosa River ACEC.+

D. Conserve and Protect Water Resources Essential to Maintenance of Valued Resources & Habitat

Under this alternative, watershed protection measures would be focused in the ACEC and existing knowledge and modeling of the watershed and flows would be utilized to determine management needs.

Priority I

18. Prohibit new non-administrative, discretionary stream diversions and groundwater disturbing activities on public lands within the ACEC.*

19. Prohibit discretionary geothermal development and exploration in the ACEC*

20. Do not authorize land uses within the ACEC that would result in long-term deterioration of water quality or quantity. Develop protective measures as appropriate and notify responsible State water control agencies as appropriate.#

21. Assert Federal Reserve water rights for Kingston Range Wilderness, Wild and Scenic River[5], and Public Water Reserves and file for appropriated water rights to conserve existing water sources that support the ACEC's resources and values.*

E. Implement an Inventory and Monitoring Strategy

Under this alternative, water monitoring would continue but not be expanded to include additional stream reaches, an in-stream flow study, or modeling. Identification of habitat trends would be focused on listed species on public and State lands. A systematic baseline of soils and vegetation, and tracking system of changes in the vegetation of the ACEC would not be pursued. Monitoring of visitor use of the ACEC would consist of visitor registers only. Monitoring and survey of listed bird species would be focused on inventory activities and prevention of adverse impacts, and other sensitive species would be monitored for

[5] If determined suitable

changes but comprehensive inventories and monitoring of overall species diversity and richness in the ACEC would not be pursued.

Priority I

22. Install and maintain stream monitoring equipment to quantify Amargosa River flows in the Amargosa Canyon, consistent with the existing Stream Gage EA (CA-680-05-46).*

23. Monitor and evaluate habitat trends and conditions specific to listed species on public and State lands throughout the ACEC.*

24. Monitor listed plant habitat, track population trends, and identify additional recovery needs.*

25. Monitor levels of visitor use of the ACEC trail system and watchable wildlife areas by placing visitor registers at all trailheads.*

26. Include monitoring of water usage in future BLM land use authorizations within the California portion of the Amargosa watershed.+

27. Identify sensitive resources that have been or are being degraded by improper use, ongoing erosion, or are potential health and safety hazards.*

28. Monitor for effectiveness of restoration efforts consistent with existing restoration EAs (CA-680-03-47)* or with other appropriate strategies.+

29. Monitor recreational activities to identify adverse effects to habitat, sensitive resources, and facilities using appropriate on-the-ground and remote methodologies. This monitoring will require additional analysis if it exceeds casual use.+

Priority II

30. Identify groundwater sources and springs that contribute to the maintenance of Amargosa vole habitat and monitor those water sources that are essential to maintain quality Amargosa vole habitat within the ACEC.*

31. Monitor surface water quality at pre-selected locations to gauge condition and trend using standard water quality testing protocols.*

32. Document cultural resources within the ACEC through an archaeological inventory of culturally significant portions of the ACEC. This inventory will fulfill Section 110 of the National Historic Preservation Act (NHPA) and use any of the methods or techniques identified as suitable for Section 110 surveys. Monitor ACEC locations exhibiting intense use and areas with fragile cultural resources.*

33. Continue to conduct regular surveys for listed riparian birds to determine variety, abundance, and listed species nesting locations.*

Priority III

34. Survey for populations of Amargosa River pupfish and the Amargosa Canyon speckled dace.*

F. Provide recreation opportunities that are consistent with resource protection
A less ambitious Trail Plan and Interpretation Plan are proposed for this alternative.

Priority I

35. Determine the need and if necessary, build an OHV exclusion barrier at the trailhead of the rerouted northern end of the Tecopa Trail, and restore the previous trailhead.*

36. Prohibit the discharge firearms on public lands within the ACEC except shotguns when engaged in legal hunting.*

37. Prohibit overnight camping on public lands within the Central Unit of the ACEC.*

38. Implement Trail Plan Alternative B (Appendix B).*

39. Maintain a pack it in pack it out policy on public lands within the ACEC.#

Priority II

40. Implement Interpretive Plan Alternative B (Appendix C).*

G. **Protect sensitive historical, cultural, and scenic values**
Implementation actions are similar as the proposed action. The differences would be in not providing the opportunity for interpretation through signing of sites not suitable for fencing, and the scope and pace of implementation.

Priority I

41. Protect cultural resources that display adverse effects by fencing.+

H. Provide For Consistent Management of Lands within ACEC Boundaries
Implementation actions are similar as the proposed action. The differences would be in a more focused, less comprehensive public education program, a more focused cooperative program with other agencies, a more site-specific and less proactive cooperation effort with NGOs and private landowners, and the pace of implementation.

Priority I

42. Cooperate with other agencies and partners to establish a public education program that includes:
    - Information on the listed and sensitive species within the ACEC and ways to assist in conservation efforts;
    - Information for private landowners about invasive weeds and federal, state, and non-governmental organization (NGO) assistance programs.#

43. Work with other federal, state, county and local governments, as appropriate, to implement management activities within the ACEC. Participate in regional forums and coordination processes to the extent possible. Seek a formalized agreement between BLM, GS, FWS, CDFG, and private parties for the implementation of actions in the ACEC Plan. Cooperate with non-governmental groups (NGOs) and individuals that wish to cooperate to implement the ACEC Plan.#

44. Actively engage in the existing interagency forums concerned with Devil's Hole and the Death Valley Regional Flow System. Notify appropriate state water control agencies, land managers, and the DOI Solicitor's Office of the importance of the upper Amargosa drainage in the maintenance of sensitive biological resources present within the ACEC.#

Priority II

45. Work with mosquito and vector control districts to promote alternative methods to mosquito fish for mosquito control in the Amargosa River region.#

Priority III

46. Work with other federal, state, county and local governments and partners, as appropriate, to develop an informational database of the Amargosa watershed.#

47. Acquire State and private lands within the Amargosa River ACEC through exchange or purchase from interested, willing landowners to consolidate public lands. Priority areas would be lands that were identified in the 1983 ACEC Plans and lands in the expanded ACEC that contain significant resource values or designated critical habitat.*

C. No Action Alterative (Alternative C)

A. **Protect, Enhance, and Restore Natural Riparian and Wetland Systems**
Implementation actions for this goal are the same as the proposed action, except that weed management efforts are currently focused on federal and State lands, restoration activities would be focused on existing known degraded areas, and bird surveys would only be used to prevent impacts from ongoing activities and projects, rather than also in a proactive manner to encourage nesting.

Priority I

1. Control saltcedar through implementation of the Barstow Field Office's ten-year weed control plan, focusing efforts both upstream and within the ACEC's riparian areas. Focus active weed management efforts on public and State lands within the Amargosa River ACEC. Enter into individual agreements with interspersed private landowners to control weeds on their lands.*

2. Implement, as needed, a controlled burn program to further supplement weed control projects and/or to eliminate refuse from mechanical removal.*

3. Conduct active riparian restoration as needed by introducing native riparian species in areas of weed control and other priority damaged areas.*

4. Continue to conduct bird surveys in areas of tamarisk control.*

5. Prohibit ground fires on public lands within the ACEC*

B. Protect and Prevent Irreparable Damage to Threatened and Endangered (listed) Species and Their Habitat

In the No Action alternative, new fencing is not used as a standard strategy to protect listed plant species, OHV use of Cowboy Canyon is being monitored but no actions to curtail it are identified at this time, protection measures for Amargosa vole and its habitat focus on future authorizations, and reduction of exotic fauna is limited to cowbirds.

Priority I

6. Reduce direct and indirect impacts to listed plants by maintaining existing protective fences and restoring closed routes within the Carson Slough Unit.*

7. Maintain existing off-road vehicle barriers at the southern end of the Amargosa River ACEC adjacent to Sperry wash that protects wilderness values and also supports the existing OHV vehicle closure in Amargosa Canyon to protect listed species and their habitat.*

8. Survey the location of proposed land use authorizations for potential adverse effects to the Amargosa vole or its critical habitat and develop and implement appropriate protection and/or avoidance measures.#

9. Motorized vehicles will be limited to designated routes of travel by the 2004 NEMO Route of Travel process.#

10. Enter into cooperative agreements with State and private landowners to limit vehicle access in the ACEC to the 2004 NEMO Routes of Travel Designations.#

Priority II

11. Reduce the numbers of exotic fauna within listed species habitat consistent with the protocols in Appendix I. This may include, but is not limited to, brown-headed cowbirds.*

12. Review the fire management plan for the region and modify if necessary to assure that it provides appropriate protection and mitigation for listed and sensitive species and their habitat during wildfire suppression and managed fire operations.#

C. **Take Prudent, Proactive Steps towards Recovery of Threatened And Endangered Species and Their Habitat**

In the No Action alternative, enhancement of vole populations is done using existing invasive species management plans and new fencing is not used as a standard strategy to protect listed plant species.

Priority I

13. Consistent with the Amargosa Vole Recovery Plan, cooperate with other agencies to identify priorities and protocols for implementation of Amargosa vole population monitoring and habitat surveys and assessments. This may include:
    - Cooperation with CDFG to identify additional threats to the vole;
    - Increasing the level of gene flow between existing, isolated populations of Amargosa vole within the ACEC through establishment and restoration of wetland corridors.

    If specific implementation is beyond the scope of Barstow's ten-year weed control plan (CA-680-03-47), this action may require separate additional analysis and for the lead party or parties to acquire a section 10(a)(1)(A) recovery permit under the Endangered Species Act and a State of California incidental take permit.+

D. Conserve and Protect Water Resources Essential to Maintenance of Valued Resources & Habitat

Under the No Action alternative, prohibition of discretionary stream diversions and groundwater disturbing activities are not in place, prohibitions on new geothermal activities are limited to the Central Unit of the ACEC, parameters on activities that may jeopardize long-term water quality or quantity in the ACEC are limited to activities proposed within the ACEC boundaries, and aquifer system data is based on existing models and currently available information.

Priority I

14. Prohibit discretionary geothermal development and exploration within the Central Unit of the ACEC.*

15. Do not authorize land uses within the ACEC that would result in long-term deterioration of water quality or quantity. Develop protective measures and notify responsible State water control agencies as appropriate. Coordinate efforts with Death Valley National Park and Ash Meadows National Wildlife Refuge.+

Priority III

16. Assert Federal Reserve water rights, where they exist, to the State Water Resources Control Board. File for appropriate water rights to conserve existing water sources that support the ACEC's resources and values. Identify lands in the SW ½ SW ¼ of Section 28 of T. 21 N., R. 7 E., as a public water reserve for the protection of a hot spring and associated wetland habitat.#

E. Implement an Inventory and Monitoring Strategy

Under the No Action alternative, water monitoring would continue but not be expanded to include additional stream reaches, an in-stream flow study, or modeling. Identification of habitat trends would be focused on listed species on public and State lands. A systematic baseline of soils and vegetation, and tracking system of changes in the vegetation of the ACEC would not be pursued. Monitoring of visitor use of the ACEC would consist of two visitor registers only. Monitoring and survey of listed bird species would be focused on inventory activities and prevention of adverse impacts, and other sensitive species would be monitored for changes but comprehensive inventories and monitoring of overall species diversity and richness in the ACEC would not be pursued.

Priority I

17. Install and maintain stream monitoring equipment to quantify Amargosa River flows in the Amargosa Canyon, consistent with the existing Stream Gage EA (CA-680-05-46).*

18. Monitor and evaluate population and habitat condition and trends specific to the Amargosa vole, Ash Meadows gumplant, and Amargosa Niterwort on public lands to identify habitat and habitat trends for these species throughout the ACEC.*

19. Monitor listed plant habitat, track population trends, and identify additional recovery needs.*

20. Monitor levels of visitor use of the Amargosa Canyon trail system with two visitor registers at the Tecopa end and just north of the Sperry Wash end of the canyon.*

21. Include monitoring of water usage in future BLM land use authorizations within the California portion of the Amargosa watershed.+

22. Identify sensitive resources that have been or are being degraded by improper use, ongoing erosion, or are potential health and safety hazards.*

23. Monitor for effectiveness of restoration efforts consistent with existing restoration EAs (CA-680-03-47)* or with other appropriate strategies.+

24. Monitor recreational activities for adverse effects and to gauge trends using aerial photography, remote sensing, repeat photography, and/or on the ground assessment*

Priority II

25. Monitor surface water quality at pre-selected locations to gauge condition and trend*

26. Document cultural resources within the ACEC through an archaeological inventory of culturally significant portions of the ACEC. This inventory will fulfill Section 110 of the National Historic Preservation Act (NHPA) and use any of the methods or techniques identified as suitable for Section 110 surveys. Monitor locations exhibiting intense use and areas with fragile cultural resources*

27. Continue to conduct regular surveys for listed riparian birds to determine variety, abundance, and listed species nesting locations.*

Priority III

28. Inventory and monitor key fish populations at five-year intervals, and upon collection of adequate general population information, sample selective microhabitats to gauge trends.*

F. Provide recreation opportunities that are consistent with resource protection

A smaller area where camping is not allowed and more limited Trail and Interpretive Plans represent the No Action alternative.

Priority I

29. Build an OHV exclusion barrier at the trailhead of the rerouted northern end of the Tecopa Trail, and restore the previous trailhead as needed.*

30. Prohibit overnight camping within the ACEC from one mile north of Sperry Wash to one mile south of the town of Tecopa. Designate a primitive camping area in the vicinity of the town of Tecopa.*

31. Maintain a pack it in pack it out policy on public lands within the ACEC.#

32. Use ranger patrols to enforce compliance and to monitor use levels at least once per weekend between February and April, again in October, and at least once per month during the remainder of the year.#

33. Implement Trail Plan Alternative C (Appendix B).*

Priority II

34. Implement Interpretive Plan Alternative C (Appendix C).*

G. Protect sensitive historical, cultural, and scenic values

Implementation actions are similar as the proposed action. The differences are in not providing the opportunity for interpretation through signing of sites not suitable for fencing, and the scope and pace of implementation.

Priority I

35. Protect cultural resources that display adverse effects by fencing.+

H. **Provide For Consistent Management of Lands within ACEC Boundaries** Implementation actions are similar as the proposed action. The differences would be in a more focused, less comprehensive public education program, a more focused cooperative program with other agencies, a more site-specific and less proactive cooperation effort with NGOs and private landowners, and the pace of implementation.

Priority I

36. Cooperate with other agencies and partners to establish a public education program that includes information on the listed and sensitive species within the ACEC and ways to assist in conservation efforts.#

Priority II

37. Participate in regional forums and coordination processes to the extent possible.

38. Actively engage in the existing interagency forums concerned with Devil's Hole and the Death Valley Regional Flow System. Notify appropriate state water control agencies, land managers, and the DOI Solicitor's Office of the importance of the Amargosa River and its sensitive biological resources present within the ACEC.#

Priority III

39. Acquire State and private lands within the Amargosa River ACEC through exchange or purchase from interested, willing landowners to consolidate public lands. Priority areas would be lands that were identified in the 1983 ACEC Plans and lands in the expanded ACEC that contain significant resource values.*

3. Affected Environment

A. Vegetation Communities

Many factors influence the wide range of vegetation types that are found within the Amargosa River ACEC. Hydrology, soil properties, and geographic range all have an effect on the type and location of vegetation within the ACEC. The vegetation can be described in general terms as has been done in the California Wildlife Habitat Relationship (CWHR) System, which classifies vegetation based upon value as habitat for wildlife. These classifications are general in nature, and many times one classification can mean many different things in terms of the vegetation and flora present at a site. For example, a Desert Riparian classification can mean anything from a willow-dominated stretch of stream to a cottonwood gallery forest or mesquite bosque woodland. This makes it difficult to use this system to talk about vegetation in specific terms. For the purposes of this environmental assessment and plan, a combination of the (CWHR) system and another system based on vegetation series, put forth by John O. Sawyer and Todd Keeler-Wolf in *A Manual of California Vegetation*, will be used. The Sawyer/Keeler-Wolf classification bases the description of a specific vegetation series on dominant plant species that occur in a given location.

Upland CWHR vegetation types for the Upper Amargosa Unit of the ACEC include Alkali Desert Scrub and Desert Scrub. By using the Sawyer/Keeler-Wolf method, we can use the series level of classification to further break down these two groups.

The Alkali Desert Scrub vegetation type is made up of the Allscale, Desert Holly, Shadscale, and Mixed Saltbush Series depending on the dominant plant at a given upland location within the ACEC. The Allscale Series is dominated by *Atriplex polycarpa*, and is found on dissected alluvial fans and rolling hills within the ACEC. Other species that may be present within this series include bush buckwheat (*Eriogonum fasciculatum*), California jointfir (*Ephedra californica*), cheesebush (*Hymenoclea salsola*), and other species of *Atriplex*. There may also be scattered mesquite within this series in places near the river course (Sawyer 1995). The Desert Holly Series is also found within the Upper Amargosa Unit of the ACEC. It occupies areas along dry washes that dissect alluvial fans and feed the main river course or along dry sections of the river course itself in areas where other plants do not dominate. This series is generally found in carbonate-rich soils, and is characterized by the presence of a desert holly (*Atriplex hymenelytra*) as the sole or dominant plant. Other species that may be present would include brittlebush (*Encelia farinosa*), creosote bush (*Larrea tridentata*), and white bursage (*Ambrosia dumosa*) (Sawyer 1995). The Shadscale Series is found in carbonate rich soils on bajadas, washes, and open flats within the Upper Amargosa Unit, and is dominated by shadscale (*Atriplex confertifolia*). Other species present may include creosote, spiny hopsage (*Grayia spinosa*), Nevada ephedra (*Ephedra nevadensis*), spinescale (*Atriplex spinifera*), and winterfat (*Krascheninnikovia lanata*) (Sawyer 1995). Other carbonate-rich upland areas where a dominant Atriplex species cannot be determined are defined as a Mixed Saltbush Series. This series is a

combination of the previously described series and could include any of the species present in those classifications (Sawyer 1995).

The Desert Scrub CWHR vegetation type could be made up of the Hopsage Series, Creosote Bush Series, White Bursage Series, and Creosote-White Bursage Series. The Hopsage Series is found on alluvial derived soils within the ACEC that are dominated by hopsage. Other species that may be present include: boxthorn (*Lycium spp.*), creosote, shadscale, spinescale, white bursage, and winterfat (Sawyer 1995). The Creosote Bush Series is found on many geologic surfaces within this unit of the ACEC. This series is dominated by creosote, but could be accompanied by brittlebush, desert holly, ephedra, hopsage, mesquite, white bursage, and any of the saltbushes mentioned above (Sawyer 1995). The White Bursage Series is found on a variety of soil surfaces, and would be dominated by white bursage. Other plants present include brittlebush, creosote, and various saltbush species (Sawyer 1995). Areas of the Upper Amargosa Unit that are classified in the Creosote-White Bursage Series have creosote and white bursage as codominant species. The vegetation would be two tiered in nature and many of the same secondary species would be present as are found in the individual Creosote Series and White Bursage Series (Sawyer 1995).

Lowland areas of the Upper Amargosa Unit of the ACEC are not as diverse as in the other units of the ACEC because of a lack of perennial water. Groundwater, however, does support an extensive Desert Riparian CWHR vegetation type. Desert Wash CWHR vegetation types are also found in sections of the ACEC where washes feed the main river course or along dry sections of the main channel, where riparian vegetation has not become extensively established. The Desert Riparian CWHR areas of the Upper Amargosa Unit are made up of the Mesquite Series. This series is found along the stream course in areas that are intermittently flooded. This series is made up of varying levels of honey mesquite (*Prosopis glandulosa*) and screw bean mesquite (*Prosopis pubescens*) as the sole canopy. Various saltbush and grass species may also be present in a sparse understory (Sawyer 1995). A considerable drop in the water table would heavily impact this vegetation series.

The Carson Slough Unit of the ACEC is very similar to the upland areas of the Upper Amargosa Unit. CWHR vegetation types include Alkali Desert Scrub, Desert Scrub, and Desert Wash. The Alkali Desert Scrub vegetation type consists of the Mixed Saltbush Series, Desert Holly Series, Shadscale Series, and Allscale Series. The Desert Scrub Series consists of the Hopsage Series, Creosote Bush Series, White Bursage Series, and Creosote-White Bursage Series. The Desert Wash CWHR vegetation types consist of the same vegetation series as found in the upland areas.

While the vegetation types are not very diverse, the Carson Slough Unit is extremely interesting in terms of its rare and sensitive plant species. In addition to the vegetation series listed above, the lower Carson Slough is also composed of extensive salt-encrusted mudflats. These areas provide excellent habitat for the federally endangered Amargosa niterwort (*Nitrophila mohavensis*). Mozingo described this plant in 1977 as an extremely hardy (perennial) species that is tolerant of high soil salinity and alkalinity (FWS 1990). Mozingo and Williams (1980) noted that saltgrass (*Distichilis spicata*) was found either on the periphery or intermixed with niterwort populations (FWS 1990). Portions of the existing California niterwort populations

have been destroyed by road construction, while Nevada populations have been impacted through trampling by wild horses and soil compaction by off-road vehicles (FWS 1990). There may also be a connection between niterwort populations and subsurface groundwater but more research is needed to establish this connection.

Other sensitive plants species that may be found in the Lower Carson Slough Region include the federally threatened: Ash Meadows gumplant (*Grindelia fraxino-pratensis*) and the spring-loving centaury (*Centaurium namophilum*). Some have suggested that the spring-loving centaury at one time was more widespread than it is today, and is not endemic to the Carson Slough area as is the Ash Meadows gumplant. The centaury is an annual species that blooms in the summer and autumn. It is typically found on moist soils within riparian areas or near seeps (FWS 1990). If this habitat description is accurate, it would be difficult to believe that the spring-loving centaury would be present in this region of the ACEC. This plant was observed, however, in 1986 in an alkaline meadow of saltgrass northeast of Death Valley Junction (CNDDB). While this observation would cast doubt on its habitat description, it would introduce the possibility of this plant being located within the Carson Sough Unit of the ACEC. It is possible that it occupies these types of habitats in areas where the water table is very close to the surface.

The Ash Meadows gumplant is found only in the Ash Meadows area of southwestern Nye County Nevada and Eastern Inyo County California. Its range encompasses about fifty square miles (Cochrane 1981). This plant is often associated with the spring-loving centaury on moist soils that are influenced by seeps (Reveal and Beatley 1971). Cochrane (1981) described its habitat as saltgrass meadows along streams and surrounding pools near ash-screwbean mesquite woodlands and desert shadscale scrub vegetation. She also indicated that it would occasionally occur on open alkali clay soils in drier shadscale habitats. Cochrane (1981) also indicates that when the plant is found in drier areas, it is associated with areas of shadscale dominance (Shadscale Series), with alkali sacaton, *Haplopappus acradenius*, *Chrysothamnus albidus*, *Sueda spp.*, and other saltbushes as secondary plants. She did not indicate that it had an association with the spring-loving centaury within these drier habitats.

Desert popcorn flower (*Plagiobothrys salsus*), a CNPS List 2.2[1] species, may also be present in the Carson Slough Unit.

In contrast to the Upper Amargosa Unit and the Carson Slough Unit, the Central Amargosa Unit is extremely diverse in its vegetation types. It is a mosaic of wetland, riparian, meadow, and upland vegetation. CWHR vegetation types for this region include Desert Riparian, Freshwater Emergent Wetland, Wet Meadow, Alkali Desert Scrub, Desert Scrub, and Desert Wash.

The Desert Riparian system is made up of the Black Willow Series, Arrow Weed Series, Mesquite Series, and Tamarisk Series. The Black Willow Series occupies areas of the Amargosa Canyon and Grimshaw Basin that are occasionally flooded during high water events. This series is dominated by an overstory of black willow (*Salix goodingii*) with little or no ground cover beneath (Sawyer 1995). The Arrow Weed Series is found in similar areas to the Black Willow

[1] California Native Plant Society (CNPS) List 2.2 means, "Rare, threatened, or endangered in California, but more common elsewhere. Fairly endangered in California"

Series, but is dominated by arrow-weed (*Pluchea sericea*), with tamarisk as a secondary species. This series involves an almost continuous canopy of arrow-weed with little or no ground cover (Sawyer 1995). The Mesquite Series is found for the most part in the Willow Creek portion of the ACEC and is similar to the series described above in the Upper Amargosa Unit. The Tamarisk Series is found in many portions of the Central Amargosa Unit that were formally populated by black willow. This series is slowly displacing the native black willow stands. The Tamarisk Series is dominated by different species of tamarisk, but may also contain other species such as catclaw acacia (*Acacia gregii*), cheesebush (*Hymenoclea salsola*), black willow (*Salix goodingii*), and various species of saltbush (Sawyer 1995).

The Freshwater Emergent Wetland CWHR vegetation types in the Central Amargosa Unit are composed of the Bulrush Series, Cattail Series, and Bulrush-Cattail Series. These spring-fed emergent wetland areas are found in the Grimshaw Basin area and in some areas along the watercourse in the Amargosa Canyon. Drops in the water table and invasion by tamarisk pose serious threats to the continued existence of these vegetation types within the ACEC. The Bulrush Series is found in areas that are either permanently or frequently flooded, and is dominated by Olney bulrush (*Scirpus olneyi*). Other species that are found in areas classified in the Bulrush Series include broadleaf cattail (*Typha latifolia*), spikerush (*Eleocharis parishii*), saltgrass (*Distichilis spicata*), and yerba mansa (*Anemopsis californica*) (Sawyer 1995). The Cattail Series is found in similar areas to the Bulrush Series, but is dominated by broad-leafed cattail. Other species that might occur in these areas include bulrush, saltgrass, and yerba mansa (Sawyer 1995).

The Wet Meadow CWHR vegetation type is found in areas of saturated soils on the margins of emergent wetlands or in other areas where the water table is just below the surface. This vegetation type is found in the Grimshaw Basin area, and consists of the Saltgrass Series and the Common Reed Series. The Saltgrass Series is found in areas with soils that are moist or saturated that have a moderate to high salinity. This series is dominated by saltgrass, but may contain secondary species that include alkali sacaton (*Sporobolus airoides*), Cooper rush (*Juncus cooperi*), iodine bush (*Allenrolfea occidentalis*), and yerba mansa (Sawyer 1995). The Common Reed Series is found in similar areas, and is completely dominated by common reed (*Phragmites australis*). No other species are found in these monocultures.

Upland vegetation types for the Central Amargosa Unit include Alkali Desert Scrub and Desert Scrub. The series classifications for these vegetation types are the same as for the ones in the Carson Slough and Upper Amargosa Units.

The series classifications for the Desert Wash CWHR vegetation type are, likewise, similar to the ones for Carson Slough and the Upper Amargosa Units. Like the Carson Slough Unit, this area is populated by many rare and sensitive plant species. Many of the wet meadow areas in the Grimshaw Basin have areas of open clay mud flats that contain populations of Amargosa niterwort. Some of these populations are located near the Inyo County operated park at Tecopa Hot Springs and are therefore impacted by human disturbance. Ground water use in this area might also affect these plants. The spring-loving centaury may also be present within the Central Amargosa Unit of the ACEC near springs and other seeps. While some have suggested that this species was once more widespread, more recent taxonomic analysis has disputed this claim.

Some botanists today contend that spring-loving centaury plants found outside of the lower Carson Slough are in fact *Centaurium exaltatum* (Baldwin 2002). If this is true, then the spring-loving centaury may not be found in this region of the ACEC. Reveal et al. (1973) collected the species in the Tecopa area. The species, however, has not been rediscovered in this region putting forth the possibility that it has been extirpated.

The Tecopa bird's beak (*Cordylanthus tecopensis*), a BLM sensitive species, is also found in the Central Amargosa Unit. This rare annual plant is found in moist, alkaline, clay soils near wetland areas (FWS 1990). It is subject to many of the same impacts as the Amargosa niterwort, since it shares similar habitat requirements. Some areas of this Central Amargosa Unit may also contain the white bear poppy (*Arctomecon merriamii*). This plant grows on ridges with upland arid alkaline soils (FWS 1990).

B. Wildlife

Within the boundary of the Amargosa River ACEC is an extremely diverse and unique fauna of native wildlife. These wildlife species are associated with many different habitat types that are limited in their extent due to the availability of surface and/or subsurface water and are isolated from other similar habitats by vast expanses of the arid Mojave Desert. Wildlife habitat types for the ACEC can be broken down into lowland and upland groups based on their vicinity to water. Lowland habitats support the greatest number of sensitive species in the ACEC, and unfortunately could be the most imperiled by improper land use practices in the area. The upland habitat types are found at varying distances from the river and contain more common desert species that do not require association with surface water or a high water table.

The Central Amargosa Unit can be broken down into seven or eight main wildlife habitat types as described by the California Wildlife Habitat Relationships (CWHR) system. The lowland habitat types are closely associated with the Amargosa River itself or Grimshaw Lake, and include desert riparian, desert wash, freshwater or saline emergent wetland (depending on the salinity of the water), wet meadow, and riverine. The upland CWHR systems include alkali desert scrub, desert scrub, and barren.

The lower Carson Slough region, near Death Valley Junction, is comprised mostly of upland habitat types, which include alkali desert scrub, desert wash, and desert scrub. The lower Carson Slough region does not have perennial surface flow, and therefore has not developed any riparian vegetation that would support diverse faunal species.

The Upper Amargosa region is made up of alkali desert scrub, desert scrub, desert wash, and desert riparian (mesquite bosque) habitat types, which potentially contain diverse wildlife resources. This area, however, has not yet been surveyed.

Upland mammalian diversity is probably relatively high in all three areas of the ACEC owing to a high diversity of rodent species. This high diversity is the result the ACEC's range overlap between Great Basin and Mojave Desert species. Genera represented include: three species of pocket mice (*Perognathus parvus, P. longimembris,* and *P. formosus mohavensis*), three species

of kangaroo rat (*Dipodomys microps, D. merriamii,* and *D. deserti*), two species of deer mice (*Peromyscus eremicus* and *P. maniculatus*), the western harvest mouse (*Reithrodontomys megalotis*), the southern grasshopper mouse (*Onychomys torridus*), and the desert woodrat (*Neotoma lepida*). All of these rodents lead a fossorial life and are nocturnal. These rodents do not require the intake of free water and are generally able to obtain all of the water they need from the food that they eat. They all have the ability to form concentrated urine and feces, which reduces the amount of water that they loose when eliminating waste products. The *Dipodomys* species do not even have to eat plant materials that are high in water content and, for the most part, subsist on dried seeds. All of these rodents benefit from their nocturnal lifestyle because it provides them with added protection from predators, and makes it easier to thermoregulate since they are not dealing with extreme daytime temperatures.

Two common sciurid rodent species are likely to occur: the white-tailed antelope ground squirrel (*Ammospermophilus leucurus*) and the round-tailed ground squirrel (*Citellus tereticaudus*). Both of these species are also fossorial, but tend to lead more of a diurnal existence. The Central Amargosa Unit also contains the Amargosa pocket gopher (*Thomomys umbrinus amargosae*) and the botta pocket gopher (*Thomomys bottae*). Lagomorphs in the area include the desert cottontail (*Sylvilagus audubonii*) and the black-tailed jackrabbit (*Lepus californicus*).

Other, larger mammals that may prey on the rodent and lagomorph species include the coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), and badger (*Taxidea taxus*). A small herd of wild horses (*Equus caballus*) is also found in the Lower Carson Slough area, and intermittently utilizes that portion of the ACEC.

Bats, such as the western pipistrelle (*Pipistrellus hesperus*), big brown bat (*Eptesicus fuscus*), Brazilian free-tailed (*Tadarida brasiliensis*), spotted bat (*Euderma maculatum*) and possibly three species of myotis (*Myotis californicus, M. lucifugus, and M. ciliolabrum*), may be seen feeding in all areas of the ACEC, but may only roost in the Amargosa Canyon area due to a lack of adequate crevices, cliffs, or mine shafts in the other sections of the ACEC. The pallid bat (*Antrozous pallidus*), which is a California Species of Concern and a BLM sensitive species, is found throughout California, including the Amargosa region. It roosts in caves, rock crevices, mines, and hollow trees, and tends to forage over open ground. The many cliffs and crevices of the Amargosa Canyon as well as numerous abandoned mines in the surrounding area provide ample roosting sites for this species. Threats to this bat include destruction of roosting and foraging habitats.

Many of the upland rodents are also found in lowland areas but are not restricted to these habitats. Two rodent species, the exotic house mouse (*Mus musculus*) and Amargosa vole (*Microtus californicus scirpensis*), are be restricted to lowland areas with access to water. This endemic subspecies is restricted to exceedingly small habitat types due to its reliance on ample surface water. The Amargosa vole is restricted to tulle marsh habitats associated with permanent water in the Amargosa River and tributary springs above its floodplain. The vegetation of these marshes is dominated by bulrush (*Scirpus olneyi*), rush (*Juncus cooperi*), and saltgrass (*Distichilis spicata*) (Rado and Rowlands 1984). The historical distribution of the Amargosa vole appears to be from Shoshone to the Amargosa Canyon, but the Shoshone population, where the type specimen was collected in 1891, may be completely extirpated due to burning of the

marsh in the area and its subsequent use as a hog pasture (Kellog 1918). Threats to the vole and its habitat include the burning and conversion of marshes, water diversions, and ground water withdrawals (McClenaghan and Montgomery 1998). Other threats may include introduction of non-native species, such as tamarisk (*Tamarix spp.*) and the house mouse (*Mus musculus*), predation by feral or free-roaming house cats, pesticides, flooding, and inbreeding (FWS 1997). Critical habitat for the vole, which lies entirely within the Amargosa River ACEC, was designed in 1997.

Another BLM sensitive species, the Nelson's bighorn sheep (*Ovis canadensis nelsoni*), is known to occur in the area, but no records exist for it within the ACEC. It has been found in other riparian canyons of the Mojave Desert, including Afton Canyon along the Mojave River. It is possible, but improbable, that populations living in the Nopah or Resting Spring ranges may use the Amargosa Canyon occasionally; this has not been documented through direct observations.

Reptilian diversity over the ACEC consists of common desert lizard species, such as the desert spiny lizard (*Sceloporus magister*), long-tailed brush lizard (*Urosaurus graciosus*), desert night lizard (*Xantusia vigilis*), desert iguana (*Dipsosaurus dorsalis*), zebra-tailed lizard (*Callisaurus draconoides*), desert banded gecko (*Coleonyx variegates variegates*), leopard lizard (*Gambelia wislizenii*), desert side-blotched lizard (*Uta stansburiana*), southern desert horned lizard (*Phrynosoma platyrhinos calidiarum*), great-basin whiptail (*Cnemidophorus tigris tigris*), chuckwalla (*Sauromalus obesus*), and Gilbert's skink (*Eumeces gilberti*). Based on diversity of habitats available, wide snake species diversity is suspected, consisting of species like the coachwhip (*Masticophis flagellum piceus*), western patch-nosed (*Salvadora hexalepis hexalepis*), desert glossy snake (*Arizona elegans eburnata*), Great Basin gopher snake (*Pituophis melanoleucus deserticola*), western shovel-nosed snake (*Chionactis occipitalis occipitalis*), desert night snake (*Hypsiglena torquata*), Mojave sidewinder (*Crotalus cerastes cerastes*), long-nosed snake (*Rhinocheilus lecontei*), common kingsnake (*Lampropeltis getulus*), western blind snake (*Leptotyphlops humilis*), rosy boa (*Lichanura trivirgata*), spotted leaf-nosed snake (*Phllorhynchus decurtatus*), striped whipsnake (*Masticophis taeniatus*), wandering garter (*Thamnophis elegans*), western ground snake (*Sonora semiannulata*), western black headed snake (*Tantilla planiceps*), Sonora lyre snake (*Trimorphodon lambda*), Mojave rattlesnake (*Crotalus scutulatus*), and speckled rattlesnake (*Crotalus mitchelli*) (Romero 1972). The desert tortoise (*Gopherus agassizi*) is also a rare visitor to the ACEC.

Because of its wide diversity of habitats, avian diversity in the ACEC is very high for the Mojave Desert. The Central Amargosa and Upper Amargosa Units of the ACEC support the most bird species because of the availability of surface water and riparian vegetation. The Lower Carson Slough region contains little diversity of avian fauna. A comprehensive list of avian species within the ACEC is too lengthy for this resource summary, but there are several interesting sensitive species found in the Central Amargosa Unit. Avian sensitive species that have been seen within or near the Central Amargosa Unit include the federally endangered southwestern willow flycatcher (*Empidonax traillii extimus*) and least Bell's vireo (*Vireo bellii pusillus*), as well as the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), a federal candidate for listing.

The southwestern willow flycatcher's breeding habitat consists of patchy to dense riparian habitat along streams or other wetlands, near or adjacent to surface water or underlain by saturated soil. Common tree or shrub species include willows (*Salix spp.*), seep willow (*Baccharis spp.*), cottonwood (*Populus spp.*), arrowweed (*Tessaria sericea*), and tamarisk (*Tamarisk ramosissima*) (FWS 2001). The last species is a non-native invasive that is displacing the native trees and shrubs that the flycatcher uses for breeding habitat. The flycatcher has begun to use tamarisk for breeding, which can make restoration of riparian areas difficult within the range of the flycatcher. The Amargosa ACEC has many of the elements that are present in flycatcher breeding habitat. In 2001, a single willow flycatcher was detected during a BLM sponsored survey of the Amargosa Canyon. In 2002, another survey yielded additional flycatcher sightings, but in both surveys, evidence of breeding was not detected. Point Reyes Bird Observatory (PRBO) conducted surveys for BLM in 2005 and 2006 as part of BLM's tamarisk control project. While no nesting activity was observed, twenty observations were made in 2005 and fourteen were made in 2006.

The least Bells vireo has similar habitat requirements to the willow flycatcher, and was found in the canyon on both the 2001 and 2002 surveys. Surveys by PRBO in 2005 located least Bell's vireo nesting in the northern portion of the Amargosa Canyon. The same pair returned to the nest in 2006 and made two nesting attempts, both of which cowbirds parasitized. PRBO made eighteen least Bell's vireo observations in 2006.

There are records of the yellow-billed cuckoo in the Amargosa Canyon from the California Natural Diversity Database. The yellow-billed cuckoo has even more restrictive habitat requirements than the flycatcher or vireo. During the breeding season, cuckoos are confined to cottonwood-willow riparian areas, with enough continuous habitat to support their fifty to one-hundred acre home ranges (Laymon and Halterman 1985). Microhabitat characteristics are also very important for nesting of this species. Cuckoos choose to nest in areas with between forty and sixty-five percent canopy closure with a mean canopy height of twenty-three to thirty-three feet and the presence of at least one willow (Laymon et al., 1997). These extremely specific requirements may make it a rare occurrence for cuckoos to be found in the Amargosa, but points out the importance of native wildlife habitat in this riparian area.

Threats to all of these species in the Amargosa region include removal or alteration of riparian vegetation, invasive species, ground water withdrawal, stream diversions, interruption of flooding cycles, illegal off-highway vehicle (OHV) use in the canyon, and fire.

Other species of concern listed as California Species of Concern, BLM Sensitive, or FWS Sensitive that have been found within the Central Amargosa Unit or in the general vicinity include the long-eared owl (*Asio otus*), yellow warbler (*Dendroica petechia brewsteri*), prairie falcon (*Falco mexicanus*), yellow-breasted chat (*Icteria virens*), brown-crested flycatcher (*Myiarchus tyrannulus*), summer tanager (*Piranga rubra*), vermillion flycatcher (*Pyrocephalus rubinus*), Virginia's warbler (*vermivora virginiae*), northern harrier (*Circus cyaneus*), loggerhead shrike (*Lanius ludovicianus*), and crissale thrasher (*Toxostoma crissale*). The prairie falcon, northern harrier, and loggerhead shrike are California Species of Concern (CSC) year round, while the others are only CSCs when nesting. It is quite possible that many of the species could

nest during the spring and summer in the riparian areas of the Amargosa River ACEC. All of these species are threatened by the destruction of riparian habitats. Yellow warblers and yellow-breasted chats prefer willows for nesting and cover, and both are potentially susceptible to nest parasitism by the brown-headed cowbird. Vermillion flycatchers are subject to many of the same threats as the yellow warbler and yellow-breasted chat (CWHR).

Brown-crested flycatchers are transient and rare in the Amargosa, since the region is north of their generally accepted range along the Colorado River. This species is threatened by destruction of riparian thickets that contain trees with cavities for nesting. The brown-crested flycatcher may also be threatened by competition for nest cavities from the non-native European starling (CWHR). Summer tanagers are rare in the Amargosa region because the species prefers dense stands of old mature cottonwoods for nesting. It is possible that long-eared owls are found in the Amargosa ACEC year-round. This owl prefers to roost in small densely canopied trees, and is therefore threatened by destruction of riparian habitat. Crissale thrashers could likewise be found year-round in the Amargosa region in dense mesquite thickets (CWHR). It is threatened by destruction of these thickets and by the use of washes for OHV routes. Prairie falcons are listed as a California Species of Concern, but populations in inland deserts are regarded as stable and healthy.

Other species that are considered sensitive by BLM, Fish and Wildlife Service (FWS), or the State of California that have not been seen in the ACEC, but that have the appropriate range and habitat selection to occur in the area include the burrowing owl (*Athene cunicularia hypugea*), furruginous hawk (*Buteo regalis*), Bendire's thrasher (*Toxostoma bendirei*), western least bittern (*Ixobrychus exilis hesperis*), LeConte's thrasher (*Toxostoma lecontei*), and hepatic tanager (*Piranga flava*).

Two fish species occurring in the Central Amargosa Unit: the Amargosa River pupfish (*Cyprinodon nevadensis amargosae*) and the Amargosa River speckled dace (*Rhinichthys osculus spp.*), are listed by the BLM as sensitive species. Both of these species have probably been isolated in the Amargosa River for thousands of years, following a drying time when many of the large, ancient, Pleistocene lakes of the Mojave Desert, which were connected by watercourses, were cut off from each other. Many of the lakes in the Amargosa region continued to dry leaving water and fish in only a few isolated spots such as the Amargosa River and various springs. As these new environments placed different environmental pressures on fish, they began to undergo speciation. As a result, the Amargosa pupfish and Amargosa speckled dace have evolved into unique organisms that are found nowhere else. These fish prefer similar riverine habitats in the Amargosa Canyon. The pupfish is much more common in the river than the speckled dace, but the speckled dace dominate the Willow Creek drainage, a tributary of the Amargosa (Williams 1982). Both fish prefer transparent water runs, and to a lesser extent two-meter deep pools for habitat. Gravel riffles of the Amargosa River are usually not preferred habitat (Williams 1982). Threats to this fish could include water diversions, ground water extraction, and competition with the exotic mosquito fish (*Gambusia affinis*). Non-native tamarisk may also affect these riverine habitats by changing the quantity and salinity of the water.

C. Soils

A formal Order III soil survey was conducted in the late 1970s that encompasses a portion of the Central Amargosa Unit. However, many of the soils in the Amargosa River ACEC have not been formally surveyed. Most soils in the Amargosa region are poorly developed, and are generally well drained and coarse textured. Portions of the region are internally drained, resulting in small playas with surface clays, surface physical soil crusts, and increased salinity. Soils in the Carson Slough Unit are sub-irrigated with high clay content. In general, soil depths range from deeper alluvial materials to very shallow or non-existent depth over the rocky substrate.

The soils in the ACEC are susceptible to accelerated erosion from wind and water, especially when the surface has been disturbed. Portions of the region have been subject to periodic disturbances by grazing, mining, agriculture, off-highway vehicle (OHV) activity, and other resource uses.

The CDCA plan separated desert soils into various sensitivity classes. These classes are based on surface texture, slope, rock topography and other factors, all of which affect soil sensitivity to surface disturbance. The CDCA Plan classified a majority of the soils in the Amargosa River ACEC in the high sensitivity class, with most of the remaining soils in the medium sensitivity class.

D. Air Quality

The Amargosa River ACEC is located in two different air basins: the Great Basin Valley and the Mojave Desert Air Basins. As a result, air quality standards in the study area are managed and enforced by two Air Quality Management Districts (AQMD). The portions of the ACEC in San Bernardino County are within the Mojave Desert AQMD, and the portions in Inyo County are within the Great Basin Unified Air Pollution Control District.

Air quality throughout the Amargosa River ACEC study area is generally good, however a small portion of the area (about 20%) is in non-attainment of Clean Air Act (CAA) health standards for one or two air pollutants, and unclassified for a third pollutant. The non-attainment areas do not meet air quality standards because of local generation of and/or long distance transportation of pollution to the area[2]. Due to transportation from sources outside of the ACEC, some portions are occasionally in non-attainment for ozone and PM_{10} under the state and/or national standards. There is concern for visibility-reducing particles and PM_{10} precursor emissions, including oxides of nitrogen (NO_x), oxides of sulfur (SO_x) and reactive organic gases in most of Southern California.

[2] Definitions used to determine whether an area meets air quality standards for health are found in the Federal Clean Air Act (CAA), as Amended (1990), and associated national ambient air quality standards. State standards, which are generally stricter, are associated with the California Clean Air Act (1988) and consider aesthetic and visual factors as well. National and/or state ambient air quality standards have been established for ten different pollutants. These standards are used to classify all areas of the state of California as to whether they are in attainment, in non-attainment, or are unclassified for any of the ten standards.

EPA has also identified certain wilderness areas and National Parks as Class I airsheds[3]. There are currently no Class I airsheds in or adjacent to the Amargosa River ACEC study area, but the National Park Service has petitioned EPA for reclassification of airsheds in Death Valley National Park, west of the ACEC, to a Class I airshed.

E. Water Resources

The Amargosa River is the focal hydrological system of the ACEC. It is one of only two large rivers in the Mojave Desert and includes perennial and ephemeral surface flows as well as subterranean flow. The Amargosa River's major tributaries include the Carson Slough in the northern reach of the river, China Ranch Wash in the central reach, and Salt Creek in the south. Approximately ninety-four percent of the lands along the Amargosa River in California are in Federal ownership[4].

Surface Water

The unified watershed assessment conducted in preparation of the Clean Water Action Plan (EPA 1998) classified the Upper Amargosa River in Category I, and the Central and Lower Amargosa River in Category III[5]. Until recently, the entire Amargosa River was listed on the U.S. Environmental Protection Agency's (EPA) 303(d) list of impaired water bodies. In 2000, the Lahontan Regional Water Quality Control Board (RWQCB) conducted a Use Attainability Analysis, which determined that the Amargosa River is considered naturally impaired with high levels of salinity and as a result, the RWQCB removed the Amargosa River from the 303(d) Impaired Waters list.

June 2003, BLM conducted a Proper Functioning Condition (PFC) assessment of seven reaches of the Amargosa River. PFC is a qualitative method for assessing the condition of riparian-wetland areas. The PFC assessment refers to a consistent approach for considering hydrology, vegetation, and erosion/deposition attributes and processes. Table A-3.1 summarizes the 2003 PFC assessment by reach.

Ground Water

The Amargosa River is within the Death Valley Regional Flow System (DVRFS), an area encompassing about 70,000 km^2 in Nevada and California. Ground water flow in the DVRFS is extremely complex because of extensive past tectonic and volcanic activity. Ground-water flow generally occurs within sediment-filled valleys in hydraulic connection with an underlying extensive regional carbonate bedrock aquifer. Large springs discharge from the carbonate bedrock aquifer or overlying sediments in areas such as Ash Meadows and the Amargosa River

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[3] These areas also have stricter non-deterioration standards and mitigation requirements.

[4] BLM and National Park Service

[5] Category I- Watersheds that are candidates for increased restoration activities due to impaired water quality
Category II- Watersheds with good water quality that, through regular program activities can be sustained and improved
Category III- Watersheds with pristine or sensitive areas on federal, state, or tribal lands that need protection
Category IV- Watersheds where more information is needed

where faults or other geologic structures act as barriers to ground-water flow. Recharge rates are low and occur at higher elevations in isolated mountain ranges such as the Spring Mountains; rainfall at lower elevations results in little if any recharge as it either evaporates or is transpired by plants. Intensive ground water pumping from sediment-filled valleys can cause water-level declines and often delayed but noticeable decreases in spring discharge. An example is the drying of springs near Pahrump (D'Agnese, F.A., et. al. 2002).

Presently, intensive ground water pumping occurs in nearby Amargosa Farms near Ash Meadows, and in the Pahrump Valley in Nevada. The Nevada State Engineer has designated both the Pahrump Valley and the Amargosa Desert hydrographic basins as basins where permitted ground water rights approach or exceed the estimated average annual recharge and the water resources are being depleted or require additional administration (Office of the Nevada Engineer). Less intensive ground water pumping occurs in the Tecopa and Shoshone areas of California. Ground water exploration for a residential development is currently occurring in Charleston View located in California in the southwest end of the Pahrump Valley.

Table A-3.1: Evaluation of Amargosa River Proper Functioning Condition

Reach	*Site*	*Condition*[6]	*Trend*[7]	*Rational*
Upper Amargosa	Upper Amargosa	FAR	NA	Dying mesquite and uncertain upstream conditions
Shoshone 1	Shoshone	PFC	---	Despite tamarisk, the river appears to be functioning properly.
Grimshaw 1	Grimshaw	PFC	---	Wide and well vegetated Stable and shallow
Grimshaw 2	Grimshaw	FAR	NA	Close to PFC, but may be incised more than natural conditions would dictate. Bank stability is low and lacks adequate vegetation.
Amargosa Canyon 1	Amargosa Canyon	FAR	Up	Recovery from recent fire is better than expected. Percent vegetation cover is down; everything except mesquite has resprouted. Plant composition has changed.
Amargosa Canyon 2	Amargosa Canyon	FAR	NA	Heavy densities of tamarisk and uncertain upstream condition are a concern.
Sperry	Sperry	FAR	NA	Site potential unknown; no vegetation. Heavy use by OHV

The U.S. Geological Survey, in cooperation with the Department of Energy, recently completed a regional ground-water flow model (Belcher, W.R., ed., 2004) to improve understanding of ground-water flow within the DVRFS. The GS model indicates ground water pumping as far away as the Pahrump Valley, Amargosa Farms, or Charleston View may eventually reduce discharge in the lower Amargosa River. Land management agencies are currently working with the USGS and other stakeholders to improve the resolution of the DVRFS model and develop a tool that can be used to better understand potential impacts at a local scale.

[6] PFC- Proper Functioning Condition; FAR – Functioning At Risk; NF – Not Functioning
[7] NA – Not Apparent; Up – Upward Trend; Down – Downward Trend

Water Rights

Within the study area, there are established Federal public water reserves on seven springs. The BLM has no State appropriated water rights within the study or planning areas, however BLM has filed a Statement of Water Diversion and Use on four springs within the study area for the purpose of wildlife protection. Three of these water sources are within the Central Amargosa Unit of the ACEC. The California Desert Protection Act of 1994 reserved a Federal Water Right for the purposes of the Act for the Kingston Range Wilderness. If the Amargosa River is determined to be suitable for inclusion in the National Wild and Scenic River System, additional Federal Water Rights will likely be granted.

The California State Water Resources Control Board has no regulatory authority over ground water. The Amargosa watershed is unadjudicated and Inyo County has no ground water management ordnances. The Nevada State Engineer has regulatory authority for ground water within Nevada but no interstate compact exist for the Amargosa River or DVRFS.

F. Cultural Resources

The Amargosa River study area encompasses a variety of unique and significant cultural resources. Human use of the Amargosa River is known to extend over the last 8,000 years (BLM 1983 b:9). This river is a significant water source in the Mojave Desert and while it flows underground in most places, the Amargosa River flows above ground all year long between Tecopa and the northwest area of Dumont Dunes near the Salt Creek Hills. The result is an oasis in the desert that was utilized by prehistoric and historic people. Rogers (1939) identified four distinct cultural complexes, which have since been renamed Paleo-Indian, Lake Mohave/Pinto, Amargosa, and Shoshonean. Remains identified by Broadbent (1972) include sleeping rings, chopping tools, worked flakes, diagnostic projectile points (Pinto, Gypsum, Elko, and Rose Springs), metates, mortars, pottery, and pendants (BLM 1983b:9). In addition to its archaeological value, historic landmarks include the Old Spanish Trail and Tonopah and Tidewater Railroad, which traverse the canyon. Evidence of mining for nitre and talc are also present. A complete prehistory and history of the Amargosa River region is in Appendix E.

G. Paleontological Resources

The Tecopa lakebeds are composed of a series of lacustrine, and marginally fluvial, deposits composed dominantly of gypsiferous mudstones in a succession that is about fifty to sixty meters thick. Geologic deposits in the Tecopa Basin were formed during the Middle Pleistocene by an elongated lake formed when a barrier of coarse alluvial sediments in the China Ranch area impounded the Amargosa River. The lake deposits consist predominately of soft mudstones and interbedded rhyolitic vitric tuffs (Sully *et al*. 1972:32). Twelve volcanic tuffs, ranging from two inches to three feet thick, are recognizable in exposed sections. The ashes appear to yield dates ranging from a little over two million to a little younger than 600,000 years before present. Several of the Tecopa volcanic ashes have been correlated with the Bishop Ash bed (Izett *et al*.

1970), which is a well-established marker bed for the middle Pleistocene in North America that dates to approximately 700,000 years ago (Sully *et al*. 1972:33).

Fossil vertebrates within the Tecopa Lake Basin have been recovered from stratified layers below a distinct tuff layer correlated to the approximately two million years old Huckleberry Ridge tuff. This places the fossils at the boundary between the Pliocene and Pleistocene (Whistler and Webb 2000:63). Fossils were first reported from the Tecopa Basin in 1902. For the most part, only sporadic vertebrate paleontology work has occurred in the area. Amateurs made a small collection in 1954 and turned it over to the Los Angeles County Natural History Museum. Another group of amateurs discovered well-preserved vertebrate remains in 1971, which instigated a cooperative effort by the San Bernardino County Museum, the University of California Riverside, and the Natural History Museum to carry out paleontological investigation and excavation.

Multiple vertebrate fossils have been recovered from exposures east of Tecopa Hot Springs, though numerous finds occur west and north. Blancan and Irvingtonian land mammal assemblages as well as Rancholabrean age camels and mammoths have been reported from this area. This area is one of only two places that provide good examples of small Irvingtonian-age mammals (Sully *et al*. 1972:33; Wilkerson 1995:17; Woodburne 1978:37).

Fieldwork in 1971 yielded fourteen new fossil localities concentrated in a two square mile area two and one half miles northeast of Tecopa Hot Springs (Sully *et al*. 1972:32). The fossils represent the first well-documented Middle Pleistocene record from the Mojave Desert. Most fossil discoveries have occurred in the basal ten feet of exposed deposits. Many specimens were relatively well articulated.

The larger animals are dominated by a diversity of four different extinct camels ranging from a new short-footed form the size of a large goat to a long necked, long legged form the size of a modern giraffe. Two horses are present (*Plesippus*), one burro-sized, the other quarter horse sized, mammoth and mastodons (*Mammut*), and a small species of North American prong buck antelope were present. Birds are represented by a flamingo and the only carnivore in the fossil assemblage is a moderate sized fox (*Mustellidae*). The small vertebrates included two shrews, a rabbit, ground squirrel, kangaroo rat, white footed mouse, cotton rat, and pack rat. The most unusual among the fossil animals recovered from the lakebeds is a camel with mountain goat-like adaptations. Camels are typically long-legged (and long-footed) animals. This is the only known camel to have developed short, goat-like proportions in the legs and feet (Whistler and Webb 2000:63).

The most common large vertebrate bones recovered were feet and lower legs. Other body skeletal parts were rare. Study of the surrounding geology and springs suggests that the various animals may have become trapped in “quick mud” near water sources. Thus, the legs and feet were preserved, while the upper portion may have been removed by weathering or predators. One fossil bed contained seventeen partially articulated individuals of the same species (Sully *et al*. 1972:33; Whistler and Webb 2000:63).

H. Wild Horses

The Chicago Valley Herd Management Area (HMA)[8] overlaps the Carson Slough and Upper Amargosa Units of the ACEC. This HMA is managed for a population of wild horses that can generally be found near Death Valley Junction. Although the Appropriate Management Level (AML) for horses within the Chicago Valley HMA is twelve, the current population is estimated at six. The AML for burros is zero and the Chicago Valley HMA currently has a population estimate of zero burros.

I. Wilderness

In 1994, Congress established federal wilderness in the lower Amargosa Canyon as part of the National Wilderness Preservation System (Kingston Range Wilderness). The primary purpose of wilderness is to secure, for the public, the benefits of areas "where the earth and its community of life are untrammeled …" [Wilderness Act, 1964, Sec. 2. (c)]. While sustaining an "untrammeled" course of events in wilderness, BLM, to the extent compatible with that course of events, is to allow recreational, scenic, scientific, educational, conservation, and historical use and seek to minimize conflicts between these secondary purposes.

As a practical matter, BLM is to allow no permanent road and no commercial enterprise in wilderness except when the Wilderness Act specifically provides for these, or when existing private rights are recognizable and exercised. Furthermore, BLM is to allow the following uses only as necessary to meet minimum requirements for administering wilderness: structures or installations, operation of motorized vehicles or equipment, operation of mechanical transport devices, landing of aircraft, or temporary roads.

Given this direction, BLM expects to manage the wilderness portion of the Amargosa River ACEC to secure enduring opportunities for land uses that genuinely require wilderness-level qualities of scenic, scientific, educational, recreational, conservation and historical value.

Based on field observations and visitor contacts, between two and three-hundred visitors are projected to use the Catskull Scramble through wilderness in the Central Amargosa Unit each year. This use could double over the next ten years. Scramble routes follow difficult terrain and require the use of hands. Public awareness and participation in the use of scramble routes is increasing with the sport spreading throughout the west. Climbing and guiding schools offer lessons, routes are shared on the internet, retailers are making new products like scramble boots, and there is a steady stream of new books, CDs, and scramble map guides. The Catskull Canyon scramble been identified on the China Ranch Trail Guide for many years. This scramble was identified on a Death Valley CD guide in 2002. If left unmanaged, this activity could result in a network of scramble trails that are harmful to visitors and wilderness values.

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[8] Herd Areas become Herd Management Areas (HMAs) when the decision has been made that wild horses and/or burros can be managed long-term within the ecological balance of the habitat. Upon designation as a HMA, wild horses and burros shall be managed as an integral component of the public lands in a manner that maintains an ecological balance.

J. Recreation Resources and Use

Visitor Use Patterns

Public recreation in the three ACEC units is generally oriented to the enjoyment of the region's cultural and natural resources. The regional setting is characterized by expanses of wilderness, vast mountain ranges, unobstructed views, solitude, extreme weather, few roads, few settlements, little water outside the Central Amargosa Unit, and a rich history. Popular recreation activities in the ACEC include scenic touring, desert exploration and photography, rock hounding, bird watching, painting, nature study, horseback riding, hiking, mountain climbing, rock climbing, and off-road vehicle (OHV) touring on designated routes.

About 1.2 million people visit the region each year. The majority of these visitors come to see Death Valley National Park (DEVA) and many travel through one of the ACEC Units during their trip. In 1996, DEVA prepared a report on visitor patterns. At the time, sixty-nine percent of park visitors were from other countries. Eight-two percent were visiting for the first time. The same percentages of visitors stopped in Las Vegas. A similar number, eight-nine percent, visited the park as one of several destinations on their trip. Common park activities identified in the 1996 visitor use report include sightseeing (96%), photography (92%), and hiking less than two hours (42%).

When compared to DEVA, recreation use in the Amargosa River ACEC is light because of limited vehicular accessibility. In the 1983 Amargosa Natural Area ACEC Plan, visitor use for the Amargosa Canyon was estimated at three-thousand visits per year. Use at nearby Dumont Dunes OHV Area was estimated at sixty-thousand visits a year. No visitor use numbers were provided in the Grimshaw Lake Natural Area ACEC Plan. The same relative use in these two adjacent areas continues, although both areas see substantially more use now than twenty years ago. Visitor use data in the BLM Recreation Management Information System shows that Amargosa Canyon averaged 1,883 visits a year between October 1, 1998 and September 30, 2002. Dispersed use in the Central Unit averaged 5,135 visits a year. Grimshaw Lake averaged 2,784 visits a year. Visitation averaged 81,691 a year at Dumont Dunes OHV Area. Use at Dumont Dunes is rapidly increasing; there were 112,393 visits in the first ten months of 2003. Detailed visitor use data is not collected for the ACEC units.

Historically, regional visitation was highest from October to May, and it lowest in summer. This pattern, however, has now changed and August is now the second busiest month of the year. According to recent DEVA studies, about 85% of summer visitation is by international tourists. The northern part of the Central Unit receives a particularly large increase in use during winter. There, the communities of Tecopa, Tecopa Hot Springs, and Shoshone receive a seasonal influx of between fourteen and eighteen-hundred long-term winter visitors.

The majority of public land in the Amargosa River ACEC is managed as Multiple Use Classification L, Limited Use[9]. This class is suitable for recreation that generally involves low to moderate user densities. Recreation opportunities also include those allowed in Class C (wilderness) managed lands, plus non-competitive vehicle touring and events only on approved routes of travel. All organized vehicle events, competitive or not, require a permit specifying the conditions of use. Trails are open for non-vehicle use and new trails for non-motorized access may be allowed. The demand is low for organized and permitted recreational events within the ACEC.

Recreation Management

Recreation opportunities and management actions are further guided by classifying the setting according to the Recreation Opportunity Spectrum (ROS). The classification tiers the remote nature of an area with the level and type of use thus constraining the level of development. Table A-3.2 provides a description of the characteristics of various ROS classes.

Because of significant differences in access and development, the Central Unit of the ACEC is divided into two different ROS settings. The south half of the Central Unit contains the Amargosa Canyon from just south of Tecopa to Sperry Wash is classified as Semi-primitive Non-motorized. The north half of the Central Unit contains the Amargosa River drainage and surrounding area from just south of Shoshone down to, and including the town of Tecopa. The ROS for this area is Roaded Natural.

The Central Unit's south half has been managed for semi-primitive non-motorized opportunities for some time. The Amargosa Canyon was closed to motorized use in 1973 to protect sensitive riparian resources. Fences and signs were installed on public land at both ends of the Amargosa Canyon and the China Ranch landowner closed a road that entered the Canyon at the southern end of his property. The north end of the Amargosa Canyon is accessed by motor vehicles from Tecopa, mid-canyon from China Ranch Wash, and the south end from the Sperry Wash Route. Because the Tonopah and Tidewater Railroad (T&T) grade and China Ranch wash ran into and through the canyon, visitors began parking at the erected fences and hiking into the canyon using these well-worn paths through relatively dense riparian vegetation. Accessible washes also have provided less frequently used hiking opportunities.

Table A-3.2: Recreation Opportunity Spectrum (ROS) Setting Description

ROS Class	*Physical Setting*	*Social Setting*	*Managerial Setting*
Primitive	Area is characterized by essentially unmodified natural environment of fairly large size	Concentration of users is very low and evidence of other users is minimal.	Only facilities essential for resource protection are used. No facilities for comfort or convenience of the user are provided. Spacing of groups is informal and dispersed to minimize

[9] Multiple-Use Class L (Limited Use) protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

			contacts between groups. Motorized use within the area is not permitted.
Semi-Primitive Non-Motorized	A predominantly unmodified natural environment of moderate to large size characterizes area.	Concentration of users is low, but often other area users are evident.	Facilities are provided for the protection of resource values and the safety of users. On-site controls and restrictions may be present but are subtle. Spacing of groups may be formalized to disperse use and limit contacts between groups. Motorized use is not generally permitted.
Semi-Primitive Motorized	Same as Semi-Primitive Non-Motorized	Same as Semi-Primitive Non-Motorized	Same as Semi-primitive Non-Motorized except that motorized us is permitted.
Roaded Natural	Area is generally characterized by a generally natural environment. Resource modification and utilization practices are evident, but harmonize with the natural environment.	Concentration of users is low to moderate. Moderate evidence of the sights and sounds of humans	On-site controls and restrictions offer a sense of security. Rustic facilities are provided for user convenience as well as for safety and resource protection. Facilities are sometimes provided for group activity. Conventional motorized use is provided for in construction standards and design of facilities.
Rural	Area is characterized by a substantially modified natural environment. Resource modification and utilization practices are evident.	Concentration of users is often moderate to high. The sights and sound of humans are readily evident.	A considerable number of facilities are designed for use by large numbers of people. Facilities are often provided for specific activities. Developed sites, roads, and trails are designed for moderate to high use. Moderate densities are provided far away from developed sites. Facilities for intensive motorized use are available.

Because of the higher level of human development, the north half of the ACEC's Central Unit is managed for roaded natural area recreation opportunities. This designation includes public lands within part of the local communities of Tecopa and Tecopa Hot Springs. There are several opportunities for passive recreation in this area. A short loop road provides access and parking at a watchable wildlife site just north of Tecopa. A short dirt road directly across the highway east of the wildlife viewing site leads to a trailhead at Thom's Spring. A rock lined trail leads up the ridge to the peaks of the Tecopa Hills.

Developments in the northern half of the Central Unit include developed hot springs and long-term visitor campground in the town of Tecopa Hot Springs that Inyo County manages. This recreational development is on public land and operated under a lease agreement, first approved June 1, 1981. There are also a private campgrounds and hot springs operated on private lands in the community.

Borehole Hot Spring, located north of Tecopa Hot Springs is located on public lands and is used for bathing. This spring was accidentally created in 1967 when a test well struck a pressurized cauldron of 118 degree hot water. Due to the artesian flow and the erosion it created, the well could never be capped. In 2001, the BLM built a post & cable barrier along the road to block motorized access to the spring. There is light use of the spring, which is estimated at about twenty-five people a week. Borehole Hot Spring receives no environmental health oversight or

testing. While use at Borehole Hot Spring may be considered casual use, access to the hot spring impacts Amargosa vole suitable habitat and bathers have placed unauthorized improvements within the spring itself.

The ROS setting for the Upper Amargosa River ACEC Unit is managed for semi-primitive motorized recreation opportunities. Motorized access into and through this ACEC unit is permitted on designated unimproved dirt routes. The historic T&T Railroad grade parallels the west side of the river and provides non-motorized access through the unit. There are no facilities in this unit of the ACEC and there is no visitor use data available. Recreation use is estimated to be light because of the remote location and limited recreational opportunities. The natural setting provides opportunities for activities such as sightseeing, bird and wildlife viewing, photography, and solitude. The most common activity is casual use vehicle touring.

The ROS setting for the Carson Slough Unit is managed for semi-primitive non-motorized recreation opportunities. There are few landscape features in this unit with only an occasional mesquite tree providing visual relief in this alkaline marsh and meadow. Ash Meadows Road bisects the unit a few miles east of Death Valley Junction. A tee-post fence runs down each side of this road through the ACEC. There is no other access into this unit and there are no developments or trails. There is no reliable visitor use data for this unit but the overwhelming majority of people visiting the region do not stop here.

K. Old Spanish Trail National Historic Trail

The Old Spanish Trail was added to the National Historic Trail System in 2002, creating the Old Spanish National Historic Trail (OSNHT). The Armijo Route and the North Branch are designated as the primary routes of the OSNHT. Shorter variations of these routes were also designated totaling approximately thirty-five hundred miles. The trail begins in Santa Fe, New Mexico and runs through the states of Colorado, Utah, Arizona, and Nevada before terminating in Los Angeles. The BLM and National Park Service (NPS) are to coordinate on OSNHT issues and share management responsibilities. The steps in implementing the OSNHT designation are the formation of an advisory council and the development of a comprehensive management plan.

The OSNHT management plan will outline the acquisition, use, management, and developments along the Trail. Within the Amargosa River ACEC, the OSNHT parallels the Amargosa River from the ACEC boundary at Dumont Dunes, north up the Amargosa River. The trail leaves the Amargosa River at Fremont Spring and goes east, up Cowboy Canyon, exiting the ACEC and continuing to Resting Springs Ranch. There is a steady, gentle grade free of obstacles through Cowboy Canyon climbing out of the Amargosa drainage. This site offers the greatest potential for providing an OSNHT visitor experience.

L. Amargosa Wild and Scenic River Eligibility

The NEMO Plan Amendment determined that three segments of the Amargosa River are eligible for inclusion in the National Wild and Scenic River System. Two of these segments flow

through the Amargosa River ACEC. The southern portion of the Central Amargosa Unit of the ACEC, from Sperry Site to just south of Tecopa, is eligible with the tentative classification as a wild segment. In the north half of the Central Unit, from Shoshone to Tecopa, the river is eligible with the tentative classification as a scenic segment. Management guidelines prescribed by these classifications parallel the River's recreation opportunity spectrum (ROS) classifications. A third eligible river segment is outside and downstream of the Amargosa River ACEC. This segment flows from the Sperry Site south through Dumont Dunes OHV Area almost to Highway 127 and is tentatively classified as a recreation segment

When a river segment is determined eligible and given a tentative classification, its identified outstandingly remarkable values shall be afforded adequate protection, subject to valid existing rights, and until the eligibility determination is superseded, management activities and authorized uses shall not be allowed to adversely affect either eligibility or the tentative classification. Specific management prescriptions for eligible river segments should provide protection in the following ways:

1. Free-flowing Values: The free-flowing characteristics of eligible river segments cannot be modified to allow stream impoundments, diversions, channelization, and/or riprapping to the extent the BLM is authorized under law.
2. River-Related Values: Each segment shall be managed to protect identified outstandingly remarkable values (subject to valid existing rights) and, to the extent practicable, such values shall be enhanced.
3. Classification Impacts: Management and development of the eligible river and its corridor cannot be modified (subject to valid existing rights) to the degree that its eligibility or tentative classification would be affected.

M. Motorized Access

The Amargosa and Grimshaw Lake ACEC Plans provided one of the earliest designated route networks implementing the CDCA Plan. These ACEC Plans designated the majority of routes within the Central ACEC Unit in 1983 and had a focus on protecting sensitive resources while providing recreational access to non-motorized trailheads and major destinations. In 2004, the NEMO Route of Travel (ROT) process reviewed existing designations and designated additional routes within the eastern expansion of the ACEC. Some major open routes currently used by the public include China Ranch Road, Furnace Creek Road, the access road to Bon Mesa Overlook, the road along the north rim of China Ranch Wash, from China Ranch Road down to the canyon bottom, and the north-south route through the Upper Amargosa Unit west of the T&T.

The Sperry Wash route traverses the southern tip of the Central Amargosa Unit and was designated as an open route in the 1983 Amargosa Canyon Natural Area Plan, and again in the NEMO ROT process. The original route was constructed in the 1950s as a paved road to replace the T&T Railroad and link the mines east of Tecopa with State Route 127 at Dumont Dunes. Road maintenance ceased as the mines began closing in the 1970s. Today, most of the original road is washed away, and the route requires a four-wheel-drive vehicle. In 1994, Congress

designated the surrounding land wilderness, but excluded the route by creating a non-wilderness corridor.

N. Geologic Resources

Regional Geology

The Amargosa River ACEC is in the Basin Ranges geomorphic province, characterized by long narrow mountain ranges separated by large valleys or basins and overall great topographic relief. This province is characterized by internal drainage since surface water does not flow out of the region. The high mountain blocks of this province have a north-northwest trend and complex internal structure. Tight folds and faults occur, with flat thrusts, high-angle normal, and some strike-slip faults (Norris & Webb, p. 100). The Basin Ranges are bounded by the Garlock fault (and Mojave Desert) on the south, the Sierra Nevada Mountains on the west (Sharp, p. 52), the Columbia Plateaus to the north, and the Colorado Plateaus to the east (Raisz, 1957). Typically, the ranges rise abruptly above the floors of intervening valleys with steep, prominent faces. Most valleys are filled with thick deposits of alluvium (bajada) with fans rising gradually from central dry-lakes (playas) to a sharp contact with the mountain front (piedmont). Remnants of partly buried, older hills and sand dunes are common features within this province.

The mountain ranges are represented by nearly all the main subdivisions of geologic time from Precambrian to Recent. Aridity increased during Tertiary time, and by early Pliocene time, rainfall was probably about fifteen inches per year. Although the age of the Tertiary-Quaternary boundary is still unsettled, the boundary has been arbitrarily placed by Norris & Webb (p. 108) at the earliest recorded glaciation in the Sierra Nevada, about three-million years ago. The presence of Plio-Pleistocene saline beds and fanglomerates in the Basin Ranges implies that basins resembling modern topography were taking shape during these epochs (Norris & Webb, p. 99). The glacial period profoundly affected Basin Ranges climates, making them cooler, wetter, and with less evaporation than in modern times. The most recent flooding of today's valleys probably occurred about two to five-thousand years ago, when small shallow lakes briefly occupied many basins (Norris & Webb, p. 113).

The Basin Ranges province hosts a variety of metallic and nonmetallic minerals. Although mineralization is widespread and the area has been extensively prospected, truly large mining operations have not been developed in the California portion (Sharp, p. 56). Aside from saline minerals, recent mining has been predominantly for talc, zeolites, and specialty clay. The talc formed as a contact metamorphic deposit, particularly in magnesium limestones near intrusive igneous bodies. Zeolites, which are part of the Lake Tecopa sequence, formed by the reaction of volcanic ash and alkaline lake waters. The specialty clay, hectorite is formed by the reaction of volcanic ash (largely glass) and hot spring activity. For additional information, the reader is referred to the Geologic Map of California, Trona Sheet (Jennings, et. al., 1963), and the Death Valley Sheet (Streitz & Stinson, 1974).

Local Geology

The oldest rocks in the Central Amargosa Unit of the ACEC are the Later Precambrian (Proterozoic) sedimentary and metamorphic rocks exposed in the gorge about a mile south of

China Ranch. These formations and the contrasting younger rocks above them along the walls of the gorge form a spectacular visual display, particularly on sunny days either shortly after sunrise or shortly before sunset.

Cambrian marine rocks and Cambrian to Precambrian non-marine rocks form the bulk of the Tecopa Hills on the north side of Grimshaw Lake. North of Tecopa the ACEC is comprised of about fifty percent Quaternary-age stream alluvium, with the balance being mostly Pliocene to Pleistocene-age volcanic tuff and sedimentary rocks (Lake Tecopa sediments). South of Tecopa, because of the confines of the gorge, stream alluvium is ten percent or less of the study area, with the balance being mostly Tertiary-age China Ranch beds (non-marine) overlain by Pliocene to Pleistocene-age conglomerate with local tuff beds.

The Carson Slough Unit of the ACEC, from east to west, is comprised of Pleistocene non-marine sediments, Quaternary lake beds (Franklin Playa), and Quaternary alluvium (surfical sediments).

The Upper Amargosa Unit of the ACEC is covered with Quaternary alluvium in an area sometimes referred to as the Amargosa Desert (Taylor, 1986, Plate 1). Roughly the west half is covered by Pleistocene non-marine sediments, whereas the east half is comprised of lake deposits. The Quaternary sediments are probably underlain by Pliocene-age sediments. Franklin Well is located within this area and is a part of a spring-fed hydrologic basin. Pliocene sediments include clay, hectorite (a magnesium, lithium clay) caliche breccia, and limestone overlain by gravel (Wilkerson, 2001, p. 4 & 5).

Mineral Deposits and Production

Gypsum was mined from 1914 to 1918 near China Ranch in the Central Amargosa Unit. The gypsum beds are six inches to three feet thick in brown clay shale (Norman and Stewart, 1951, p. 222). The only current interest U.S. Borax has in the area is the Gerstley mine, located five miles north of the Central Amargosa Unit. There are still reserves under a state lease and two patented mining claims. The mine has been in intermittent operation since 1945 with yearly production typically ranging from 500 to 2,000 tons of borates (Taylor, 1986, p. 30).

Minor geothermal resources exist in the Tecopa area. However, based on the limited commercial potential of these resources, further development is not anticipated within the ACEC.

An existing sand and gravel pit along Tecopa Hot Springs Road, just north of the ACEC boundary, continues to provide material to Inyo County for maintenance of its roads and highways in the area between Shoshone and the southern boundary of Inyo County. The Inyo County Roads Department extracts about twenty-five-hundred cubic yards per year from the pit, which has dimensions of five-hundred by one-thousand feet and is twenty-five feet deep.

A large zeolite deposit east of the Carson Sough Unit, is part of a Tertiary-age altered volcanic tuff deposit largely concealed beneath younger formations. This deposit is being mined under a plan of operations on mining claims owned by Ash Meadows, LLC of Nevada. When visited in 2004, the pit was about five-hundred feet long, four-hundred feet wide, and thirty-five to forty feet deep, for a total disturbance of twenty-seven acres. The zeolite is used for fire retardants, swimming pool filtration, animal feed additives, and other agricultural applications.

There has been historic prospecting for sodium in the Carson Slough Unit, with the last permit expiring in 1961. Most, if not all, of the activity was concentrated on the playa known as Alkali Flat. Commercial deposits of sodium minerals have not been found in this area.

Hectorite, a light brown, lithium bearing clay, has been mined from open pits near Franklin Well (Upper Amargosa) since 1974 (Hay, 1985, p. 57). The current owner is Southern Clay Products, which produces about one-thousand tons per year from an open pit. The deposit and mining claims extend into the western half of the Upper Amargosa Unit. The clay unit averages fifteen feet thick and is covered by up to fifteen feet of gravel. This is one of four hectorite mines in the United States. The world's largest hectorite mine is north of the Cady Mountains in the West Mojave Desert Planning area. The clay is used to make "organoclays" for specific products that are proprietary. Of the total mining claims, which are under a mineral patent application, (two-hundred and thirty acres), one-hundred and twenty acres are within the ACEC boundary.

The Upper Amargosa Unit also contains the twenty-foot wide access road to the Sidehill bentonite mine, encompassing four patented claim holdings of R. T. Vanderbilt Company. The white clay is intermittently mined underground from two beds, as much as twenty feet thick and is used for cosmetic and pharmaceutical purposes.

Mineral Potential

The reader is referred to the mineral potential map, Map 3a of the NEMO Final EIS (BLM 2002). The Central Unit lies within both the Resting Spring Range Geology-Energy-Minerals Resource Area (GRA)[10] and the Dumont GRA. Although the Cambrian or Precambrian rocks have hosted lead-silver-zinc mineralization farther to the east, the overall potential for occurrence of metallic resources is low within the ACEC as indicated by the lack of prospects, mining claims, or other indication that the metals occur there.

The southern part of the Central Amargosa Unit is within an area classified as "present or likely" for the occurrence of gypsum. The potential for future production of gypsum within the ACEC is low, as none has been mined in the area in over eighty years and better deposits occur elsewhere.

The portion of the ACEC in Inyo County is within an area classified as prospectively valuable for sodium by the BLM (Wayland et al., 1985). Borates have not been extracted from this area since 1890, and there has been no commercial production of nitrate deposits from the area (Norman & Stewart, 1951, p. 129). The potential for future production of borate or leasable sodium minerals from the area is low because there is an abundant supply of borates from the Boron mine in Kern County and other deposits in the Death Valley region and foreign countries.

[10] A GRA, as explained on page 15, Volume G, Appendix IX for the 1980 CDCA Plan, is an area similar to a planning unit but related to geologic environment and mineral or administrative units instead of non-mineral uses and resources. The CDCA contains 75 GRAs. Each GRA file contains mineral potential overlays and other geology and minerals information for that particular area. Most GRA files also contain a draft report summarizing what is know about the geology, mining history, and mineral potential for that area. The information was gathered by the Desert Planning Staff in response to Section 601(d) of the Federal Land Policy and Management Act.

Most of the ACEC is within an area classified by BLM as "Lands Valuable Prospectively for Geothermal Resources", State of California - South Half. Most of the Central Amargosa Unit within Inyo County is in a zone classified as a Potential Geothermal Resource Area. This rating is given to areas that are prospectively valuable and favorable for plant siting (flat lying or gently sloping terrain). This classification is considered as being high in potential for the occurrence of geothermal resources. Hot springs in the general area have water temperatures ranging from eighty to one-hundred-nine degrees Fahrenheit. This does not mean thermal water, if discovered within the ACEC, would be practical to use for the sparse dwellings and businesses in this area. The potential for development of geothermal resources within the ACEC are regarded as low because it is unlikely that exploration would be cost-effective in finding sufficient hot water for heating structures.

The narrow band of sand and gravel within the Amargosa River drainage is considered to have moderate potential for the occurrence of the resource. The potential for development is low because of the lack of a market in the immediate vicinity and because of the environmental consequences that would discourage extraction in riparian and Amargosa vole habitat. An active gravel pit west of Tecopa, and within designated critical habitat for the Amargosa vole, was permitted prior to FWS critical habitat designation. The gravel pit, however, does not contain suitable Amargosa vole habitat and has been excluded from the designated ACEC.

The prospectively valuable classification for geothermal resources in the Carson Slough Unit is a few miles from hot springs having temperatures ranging from eighty to one-hundred-three degrees Fahrenheit. If geothermal resources are present, they would be limited to such things as heating bathhouses or buildings.

Although the Carson Slough Unit is within an area classified as prospectively valuable for sodium resources, there has been no sodium prospecting interest in this area in the last forty-five years.

BLM mineral potential overlays for the Carson Slough area do not show any sand and gravel deposits within designated critical habitat for the Amargosa niterwort or Ash Meadows gumplant. The nearest zone having sand and gravel potential lies nearly two miles to the west. The nearest sand and gravel deposits that have been developed in the past are five miles west of Death Valley Junction, and from the Amargosa River drainage on the southwest side of Eagle Mountain.

The Upper Amargosa Unit has high potential for occurrence of specialty clay such as hectorite, especially on the west side of the Amargosa River drainage.

Although the Upper Amargosa Unit is within an area classified as prospectively valuable for sodium resources, the potential for discovery and development of commercial sodium deposits is low based on a lack of salt crusts or sodium occurrences in the area. The nearest area of discovery and development of sodium minerals is Searles Lake, which is sixty miles to the southwest.

The portion of the Upper Amargosa Unit classified as prospectively valuable for geothermal resources contains Pliocene-age clay deposits in which the magnesium and lithium content probably precipitated by evaporation of spring water in playas, ponds, and related environments. There is extensive evidence of hydrothermal activity along the surface expression of the Franklin Wells fault passing through this area, including massive sinter deposits (hard deposits such as silica deposited by mineral waters of springs, etc.) in the vicinity of the hectorite mine (Wilkerson, G., 2000). The absence of modern hot springs in the area, however, coupled with sparse population that could use hot water, makes discovery and development unlikely.

O. Scenic Resources

The presence and significance of the Amargosa River region's scenic resources are documented in the Visual Resources Management (VRM) materials prepared during BLM's CDCA Plan (1980) inventory work. The planning staff identified and rated visual resources polygons[11] as to landform, color, water, vegetation, uniqueness, intrusions, and adjacent scenery[12].

Of ninety-six B Series polygons[13] inventoried in what is now the Barstow Field Office area, three relate to the Amargosa River ACEC. Polygon B-27 (Central Amargosa Unit, South Half) was rated *A*, and Polygons B-31 and B-41, which contain the other portions of the ACEC, were rated *B*.

As early as 1983, BLM expressly recognized that, in part, the "picturesque natural environment" of the Amargosa River region is responsible for attracting tourists. Since 1983, there has been a marked increase in the number of seasonal visitors. Still photography has been popular in the area for many years and recently, the motion picture industry has begun to appreciate the area's natural appearances, which show few traces of human activity.

Polygon B-27 (Central Amargosa Unit, South Half): "The presence of running water, the abundant vegetation, and the massive cliffs along the gorge make this area scenically unique in the California Desert[14]." The full narrative describes the canyon as "picturesque", with "High, erosion-fluted cliffs … on each side of the river", their "delicate, abstract beauty" most evident during the low light angles of morning and evening.

Polygon *B-31*(Upper Amargosa Unit and Carson Slough Unit): Scenic Narrative text recognizes the mesquite stands of the Upper Amargosa Unit as a visual resource east of the Funeral Mountains.

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[11] Rating areas

[12] "Visual Polygon Descriptions *B* Series", Barstow Field Office, BLM.

[13] Using a points system, the BLM planning staff assigned each polygon an overall rating of *A, B,* or *C*. *A*: Areas that combine the most outstanding characteristics of each rating factor; *B*: Areas in which there is a combination of some outstanding features and some that are fairly common to the physiographic region; *C*: Areas in which the features are common to the physiographic region. (*Visual Resource Management Program*, BLM, 1980, 0-302-993, p.18)

[14] Excerpted from "Scenic Narrative" for Amargosa Canyon Polygon *B27*

Polygon *B-41* (Central Amargosa Unit, North Half): "Where the Amargosa River flows on the surface, patches of riparian vegetation including cattails, giant reeds, and mesquite can be found[15]"

P. Non-native Invasive Weeds

Several species of invasive weeds are present within the Amargosa River ACEC. Mustards and thistles are present and take advantage of favorable weather conditions. Camel thorn (*Alhagi pseudalhagi*), and African rue (*Peganum harmala*), both State *A* rated noxious weeds[16], as wells as Tree-of-heaven (*Ailanthus altissima*) are known to occur in a limited number of sites. Filaree (*Erodium cicutarium*), red brome (*Bromus rubens*), and Mediterranean split grass (*Schismus barbatus*) are found throughout the ACEC at varying densities depending on weather conditions. Black locust (*Robinia pseudoacacia*) and honey locust (*Gleditsia triacanthos*) infest spring-fed riparian areas and greatly impact important riparian habitat by replacing native vegetation.

Tamarisk or salt cedar (*Tamarix ramosissima*) is the invasive weed of greatest concern within the ACEC. Salt cedar effectively out-competes native flora, provides little wildlife forage, uses massive amounts of water, and is often so dense that many animals cannot reach the associated water sources. If not controlled, salt cedar will replace all native vegetation becoming monotypic. Athel tree (*Tamarix aphylla*) is not considered an invasive species, but causes problems at spring sites due to its extreme water use. There is also evidence that it can hybridize with salt cedar.

The BLM currently has an active salt cedar control program within the ACEC. Control efforts for other weed species have been limited.

Q. Socioeconomic Values

Local Area

The harsh and isolated conditions of the Amargosa region have resulted in primarily a rural settlement pattern, with two small permanent towns emerging in the area. These towns, Tecopa and Shoshone, depend both on visitors whose destination is the greater Death Valley region as well as well as those passing through on business or pleasure.

Immediately north of the Central Unit of the ACEC is the unincorporated community of Shoshone, which offers limited public and emergency services. Just southeast of Shoshone and mostly with the Central Amargosa Unit is another unincorporated community, Tecopa. Tecopa is the primary gateway to the Central Amargosa Unit of the ACEC. Inyo County manages a campground and hot springs on public lands in Tecopa Hot Springs, which is a community within Tecopa.

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[15] Scenic Narrative" for Tecopa Badlands Polygon *B-41*

[16] California Department of Food and Agriculture (CDFA) rates *A* noxious weeds as an organism of known economic importance subject to state enforced action involving: eradication, quarantine, containment, rejection, or other holding action.

Small towns are typically close-knit, and Tecopa and Shoshone are no exception. One unique characteristic of the area is the number of long-term transient visitors that occupy the County-operated campground or are dispersed in nearby areas. These long-term visitors also are close-knit, and many return to the area year after year. The social activities of area's residents and visitors are intimately intertwined with the ACEC's resources, whether bathing in the hot springs, enjoying the scenic resources of the ACEC, or making their living catering to the needs of others enjoying these assets. Local residents thus have a unique stewardship interest in the ACEC's resources, as indicated by the general activism of these communities, and the values promoted in that activism. Short-term visitors that come to the area to vacation or tour may be less attached to the specific landscape of the ACEC and more interested in the specific activities that bring them to or through the area.

The U.S. Census Bureau indicates that during the 2000 census Tecopa had ninety-nine residents while Shoshone had fifty-two residents. Previous census data were not recorded for communities of this size, but these population numbers indicate that there has not been a great deal of population change in these two communities in recent years. The area includes pockets of higher than average minority populations, up to forty percent in some areas, and a generally older population typical of rural communities in the region.

Income levels vary widely and range from the community of Shoshone that exceeds state and county averages by approximately one-third, to other rural areas and the town of Tecopa where incomes are two-thirds below those same state and county averages. Generally, the rural nature of the area limits the diversity of local job opportunities.

In Tecopa, one-third of the population is employed, with eighty-five percent of employed persons living in Tecopa and average commutes to work taking only eight minutes. Although the area has a higher than average 15.2% unemployment rate, based on age-data and local residency patterns it is likely that many unemployed residents are retired, living on fixed incomes and/or are long-term transient visitors[17]. Poverty rates exceed other rural areas of eastern Inyo County[18] by two-hundred and thirty percent.

Eighty-three percent of Shoshone's population is employed, with eighty-eight percent of employed persons living in Shoshone and commutes to work averaging seventeen minutes. Although the area has a higher than average 11.6% unemployment rate, actual labor force participation is similar to other rural portions of eastern Inyo County. Median incomes of all age groups with the exception of those sixty-five to seventy-four exceed California and United States median incomes. Poverty rates are fifty-nine percent lower than other rural areas of eastern Inyo County. With the small samples involved in each of these communities, individual circumstances have a greater effect on overall averages.

Travel, dining, and recreation services contribute a significant portion of the economies to small towns in eastern Inyo and San Bernardino Counties (Dean Runyan and Associates, 1998). Inyo County has recognized this and tourism has been identified as the primary economic development

[17] HUD, 1999 Employment and Unemployment Data & Income and Poverty Data for Tecopa and Shoshone CDP
[18] That is, rural areas within the Bishop, CA Metropolitan Statistical Area.

activity based on its abundance of historic, natural, and recreational assets[19]. Census statistics on the current employment sectors of local residents confirm this focus. Inyo County's tourism assets are primarily located in the central and western portion of the County, and the Amargosa River ACEC and its surrounding features stand out as one of the best tourism assets in eastern Inyo County, east of Death Valley National Park. Besides their wealth of history, culture, and emerging artist communities, these eastern Inyo County destinations and unincorporated towns offer recreation and leisure-based activities surrounded by spectacular natural geology and attractions such as the Amargosa Valley, Tecopa Hot Springs, China Ranch Oasis, and the Old Spanish Trail[20].

In an effort to carve out a niche for its unique tourism assets and to attract more visitors from the Las Vegas and Pahrump areas, Tecopa businesses have embarked on significant capital improvements by enhancing lodging properties, hot springs resorts, historic sites, and artisan shops. The ACEC's opportunities and values enhance several small businesses and likewise they may enhance the ACEC's recreational and natural values. These businesses make up the majority of commercial enterprises in the study area. A list of some of the primary tourism-related businesses in the study area is provided in Table A-3.3.

[19] *Coalition of County Chambers of Commerce of Inyo County, Tourism Assessment,* p. 17, Compiled by Strategic Marketing Group, 2004.
[20] Ibid, p. 39.

Table A-3.3: Shoshone and Tecopa Tourism-Related Businesses

Name and Type of Business	*Benefits To/From ACEC*
China Ranch Date Farm & Gift Shop	Tourism destination surrounded by the ACEC; source of services for ACEC users, including: food, trailhead for hikers and groups, local and historical information; uniqueness enhances appeal of ACEC and ACEC enhances appeal of business as a destination
Ranch House Inn Bed & Breakfast (on China Ranch property)	Tourism destination surrounded by the ACEC that provides overnight accommodations adjacent to the area closed to camping within the ACEC, ACEC enhances appeal of business as a destination
Inyo County Hot Springs (with concessionaire)	Tourism and local resident destination surrounded by the ACEC; trailhead for hikers; local and historical informational source; ACEC enhances appeal of hot springs as a destination
Local Independent Artists/Retail Studios	Uniqueness enhances appeal of ACEC and ACEC enhances artistic opportunities
Petersen's Tecopa Palms RV Park	Tourism destination and low-cost housing surrounded by the ACEC; ACEC and hot springs are two primary appeals of this housing location
Miners Diner Restaurant (new)	Business surrounded by the ACEC; provide food services for ACEC users
Shoshone Museum	Source of local, natural, and historical information for ACEC users; enhances values of ACEC and ACEC enhances interest in museum
Charles Brown General Store	Business adjacent to the ACEC; provide food services and gasoline for ACEC users, other commuters, and local residents
Shoshone Inn	Provides overnight accommodations; serves overnight ACEC visitors and ACEC enhances appeal of business as a destination
J and R's Crowbar Cafe and Saloon	Business adjacent to the ACEC; provides food services for ACEC users, other travelers, and local residents
Cafec'est. Si Bon Restaurant and Fine Arts	Business adjacent to the ACEC; provides food services for ACEC users, other travelers, and local residents; ACEC values portrayed by artists

Regional

The Amargosa region is bounded on the south by the community of Baker, the east and north by populations along the Nevada/California border from Mesquite Valley north to Ash Meadows National Wildlife Refuge and the Upper Amargosa Valley, and the west by other federal boundaries (Death Valley National Park and the Fort Irwin Military Installation. Visitation is focused on the Central Amargosa Canyon area, and therefore the Amargosa region is defined using this area as the focal point.

In general, the entire Amargosa region is rural in character, and sparsely populated with a few small rural communities. It is similar to the local ACEC area with two notable exceptions: The town of Pahrump is located in southern Nye County, Nevada adjacent to the California-Nevada border, and is within a convenient thirty-mile drive to the Central Amargosa Unit and within one hour of most of the ACEC. The city of Las Vegas is located in central Clark County, Nevada and the city is within ninety miles of the Central Amargosa Unit. According to the Death Valley Chamber of Commerce, about fifty percent of the visitors to the eastern towns located outside of

Death Valley National Park are from Nevada, and the majority are coming from Las Vegas[21]. In addition, the smaller community of Baker, California in San Bernardino County is located at the southern end of the Amargosa region along Interstate 15. Baker services travelers along Interstate 15. The major urban centers or population clusters in the Amargosa region, their populations, and growth rates in the most recent decade (1990-2000) include the following:

Table A-3.4: Amargosa Region Cities, Towns, & Population Centers

Name	*Population (1990)*	*Population[22] (2000)*	*Percent Change*
Las Vegas, NV*	697,348	1,314,357	+88.5
Pahrump, NV CDP**	7,424	24,631	+231.8
Sandy Valley, NV CDP**	n/a	1,804	n/a
Baker, CA CDP **	n/a	464	n/a
Tecopa, CA CDP **	n/a	99	n/a
Shoshone, CA CDP**	n/a	52	n/a
Furnace Creek, CA CDP**	n/a	31	n/a

* Urban area, which includes immediately adjacent cities and unincorporated areas outside of incorporated city limits.

**And immediate vicinity. CDP- Census Designated Place and denotes a density settled area that is not an incorporated place. As of the 2000 census, no minimum size exists for CDPs; in 1990, all incorporated towns and CDPs of approximately 2,500 and above were included.

As Table A-3.4 indicates, the towns and cities in western Nevada are undergoing substantial population growth. This is not just a recent trend. While there was essentially no net growth over the past century in eastern Inyo County, the regional population trends illustrate that towns in adjacent counties, and in particular, those in western Nevada (over 80%) and in southwestern and central San Bernardino County California (over 20%) have shown a long-term growth trend since 1950. A similar growth trend is occurring elsewhere in urban and suburban areas of Southern California.

As is noted in the latest (2003) census figures showing population changes for the last three years, these growth trends are continuing. Nevada is currently growing faster than any other state in the nation and most of that growth in the southwestern portion of the state. California shows the highest absolute population totals and the ninth fastest population growth in the nation. Population growth in both states is primarily focused in certain fast growing middle- and large-sized urban centers and associated bedroom communities. These fast growing areas include the two Nevada counties closest to the ACEC and San Bernardino County, California. This indicates that recreational demands of nearby urban and suburban residents and potential opportunities for tourism dollars in nearby communities with tourism assets can be expected to increase in the reasonably foreseeable future. It is yet unknown what effects this unprecedented growth could have on regional hydrology[23] and air quality.

[21] Ibid, p. 39.
[22] Ibid, by City, 100% Data, Data Sets with Detailed Tables.
[23] See ground water section of this document

Another factor that has had and will continue to have an economic effect upon Shoshone and Tecopa and the associated recreation areas close to them is the California Desert Protection Act's designation of wilderness and Death Valley National Park in 1994. The result of the more limited compatible range of recreation opportunities in wilderness has resulted in increased recreation at other locations outside of wilderness. This displaced activity usually gravitates towards areas that provide similar opportunities. In addition, more visitation is occurring in Death Valley National Park since it has become a higher-profile destination for tourists. These two factors have increased tourism opportunities for small towns adjacent to the National Park that offer accessible natural attractions.

Changes in visitor use have not been well documented in the area as nearby populations have increased, but one indication is the economic revenue to local communities. After a brief downturn associated with the September 11, 2001 terrorist attacks, revenues associated with these communities are now growing at a healthy pace. The majority of visitors are spending their dollars in towns on major artery routes, on freeways, and at gateways to major destinations. Some tourists are engaging in recreational pursuits within and adjacent to the ACEC and visiting businesses secondarily to their touring. Increased marketing is essential to continued growth of this economic sector.

4. Environmental Consequences

Fifteen critical elements of the human environment are subject to requirements specified in statute, regulation, and/or executive order and must be considered in. If the resource or value is not present or is not affected by the Proposed Action or alternatives, this may be documented in the EA without further consideration in the analysis. The Table A-4.1 lists these fifteen critical elements and their determination of need for further consideration. A brief discussion of rationale is provided after the table for elements that are present or applicable, but were not considered further.

In addition to critical elements of the environment, this analysis discusses impacts to the following resource values and uses that may be affected by the Proposed Action or alternatives: vegetation, wildlife, soils, wild horses and burros, recreation, motorized access, mineral deposits and production, scenic resources, and socioeconomic values.

Table A-4.1: Affects To Critical Elements

Critical Elements	*Not Applicable N/A or Not Present*	*Present or Applicable, No Impact*	*Discussed In Analysis*
Air Quality		X	No
Areas of Critical Environmental Concern/Special Areas			Yes
Cultural Resources			Yes
Environmental Justice (E.O. 12898)		X	No
Farm Lands (prime or unique)		X	No
Floodplains		X	No
Invasive, Nonnative Species			Yes
Migratory Birds			Yes
Native American Religious Concerns		X	No
Threatened or Endangered Species			Yes
Wastes, Hazardous Substances, or Solid Wastes		X	No
Water Quality			Yes
Wetlands/Riparian Zones			Yes
Wild and Scenic Rivers (Eligible)			Yes
Wilderness			Yes

Present or Applicable, No Impact

Air Quality
A portion of the ACEC is located in northeastern San Bernardino County (SBCO), a county that is in non-attainment of the Clean Air Act for infrequent exceedances of the twenty-four hour State and federal standards for particulate matter that is ten microns or smaller in size. However, the area of the ACEC located in SBCO, excepting about one-hundred-sixty acres, is within designated wilderness and is at the opposite end of the county from areas that are responsible for the vast majority of these emissions. Given the limitations on uses within wilderness, and the limited changes to emissions-generating activities proposed outside of wilderness in SBCO, no appreciable change in emissions to the non-attainment area are anticipated and activities under all alternatives will continue to be below de minimus levels. Therefore, no further analysis is necessary.

Environmental Justice
Environmental justice is not an issue that needs further analysis because, although certain minorities occur in the vicinity of the planning area in concentration, the ACEC Plan will not have adverse effect on those populations.

Unique Farm Land
Unique farmlands exist in the Amargosa ACEC boundaries on private lands. These farmlands are not constrained by this activity plan.

Floodplains
Floodplains exist along the Amargosa River of varying width. These floodplains will not be affected by any of the alternatives, as no permanent structures are proposed for the floodplains. Structures under development and proposed in the ACEC are limited to small water monitoring devices or interpretive signs.

Native American Religious Concerns
This area has a long history of Aboriginal use, and nearby Native American populations. Native American Religious Concerns would not be adversely affected as nothing in this plan prevents use of the area by Native Americans or promotes use of the area to the detriment of Native American resource values. Consultation with tribes using this area has been conducted and no input or issues of concern have been provided.

Wastes, Hazardous Substances, or Solid Wastes
Potentially hazardous wastes may continue to be generated by the herbicide applications required for the control of exotic species. Standard operating procedures and regulations to prevent adverse impacts to riparian and other resource values are always followed. The ongoing effects for this herbicide use have been previously adequately analyzed in the Barstow Field Office area-wide tamarisk management plan and environmental assessment (CA-680-03-47).

No additional hazards will occur due to the Proposed Action or alternatives. No solid wastes will be generated as a result of the proposed plan or alternatives. Generation of solid wastes by casual users will continue to be monitored and if determined needed through monitoring, trailhead trash receptacles may be provided.

Residual Impacts

Mitigation measures and standard operating procedures have been identified for impacts that are exceed a minimal level, including those identified by FWS for conservation or enhancement of federally threatened and endangered species. The Proposed Action and alternatives incorporates these measures and procedures, therefore, residual impacts are not different from the direct and indirect impacts that this analysis identifies.

Proposed Action- High Intensity Management (Alternative A)

Impacts to Biotic Communities

The Proposed Action would have a positive impact on native riparian and upland vegetation communities, and would adversely affect non-native invasive weeds that are currently, or may in the future, infesting the ACEC. The Proposed Action reiterates the need to control and manage non-native invasive weeds infesting portions of this unique, biologically rich habitat.

The control of non-native invasive weeds implements the Barstow Field Office weed control plan and incorporates by reference the environmental assessments to approve and evaluate that weed control plan (CA-068-94-23, CA-680-99-48) as well as the associated pesticide use permit (PUP) (CA-068-03-47) which is already in-place for the ACEC planning area. Continued implementation of the weed control plan will result in a more diverse mosaic of native plants occupying the ACEC. The bulk of invasive weed control and management is scheduled for the Central Amargosa Unit and Shoshone along the Amargosa River riparian-wetland corridor, occupying a narrow, linear strip on the landscape of the Mojave Desert. Water currently utilized by tamarisk would become available to native vegetation, which in turn, would provide more productive habitat for native wildlife, especially nesting birds.

The successful control of invasive weeds on public land is partially dependent on successful control of invasive weeds on adjacent and upstream private land in Shoshone, Modine Meadows, and China Ranch. The Proposed Action establishes a management strategy aimed at education and control actions on a watershed basis, including adjacent private lands, through agreements made with third parties.

The Proposed Action includes both active restoration and natural regeneration of native plants after invasive weed control. Restoration will capitalize on the ability of natives in this type of productive habitat to regenerate naturally in the absence of non-native invasive species. Active re-planting of native trees and shrubs will further enhance the re-vegetation process and augment natural regeneration.

Monocultures of tamarisk, like the stands near Modine Meadows in the Central Amargosa Unit, provide minimal value as wildlife habitat and provide long-term adverse impacts to the biological potential of the area by increasing soil salinity and lowering aquifers, such that a less diverse ecological community can survive. Wildlife would benefit directly by replacing tamarisk with native trees and shrubs, which provide much better habitat for all wildlife, especially nesting migratory birds, and do not adversely affect the biological potential of sites. The diversity of riparian habitat for wildlife in general would increase over leaving tamarisk in-place and untreated. On the other hand, while native vegetation is regenerating, nesting birds that need trees and canopy would not have as much tree foliage available to them over the short and mid-term.

Tamarisk is not devoid as habitat for listed birds, as evidenced by surveys during the spring and summer of 2005 indicating that least Bell's vireos are nesting in tamarisk on private land in the Central Amargosa Unit. However, native wildlife, especially nesting migratory birds, would benefit from more diverse stands of native vegetation than from monocultures of tamarisk. Under the Proposed Action, several measures are included to maximize benefits to listed birds and minimize the short-term adverse effects from loss of tree cover:

- No disturbance of trees bearing nest of threatened or endangered bird species would occur during the March-September period when the birds may occupy the Amargosa River drainage.
- Only tamarisk is to be removed, while native trees and shrubs would be left intact to serve as alternative nesting sites.
- Tamarisk treatment would be limited to one-hundred acres per year, or approximately one-tenth of tamarisk acres targeted for removal to date.

These measures would allow listed birds to become acclimated to the reversion, over time, of tamarisk-dominated habitat to a more diverse, native-dominated habitat. This action would contribute to the recovery of the southwestern willow flycatcher and least Bell's vireo over the long-term by providing better nesting trees, attracting more insects, and providing better structure for nesting, breeding, and foraging.

Leaving some tamarisk slash piles in place after tamarisk removal is a measure included in the Proposed Action to enhance habitat for ground-nesting birds and provide cover for all sorts of wildlife during tamarisk removal. All slash piles would be placed outside wet areas, where the cuttings cannot take root. The amount of additional native plants that are anticipated to occur due to the loss of competition for water from removed tamarisk is partially offset by the riparian ground that would be made unavailable for plant growth because it is covered by slash piles. Slash piles within the marshy habitat that sustains the federally listed Amargosa vole would not affect the total amount of suitable habitat available to the species, but would enhance overall wetland habitat potential by removing competition for water from tamarisk.

Even within the more swamp-like areas of the drainage, such as Grimshaw Lake, continued aggressive treatment and removal of tamarisk will allow native wetland vegetation to remain and thrive, which would benefit the federally endangered Amargosa vole by helping to assure that water is plentiful enough to sustain the marsh vegetation essential to the species.

A wildfire near the north end of Amargosa Canyon in March 2002 is an example of how unplanned fires can devastate the riparian vegetation in the Central Amargosa Unit. Fortunately, willows have now become re-established on the fire site without assistance. In other areas, pole plantings are needed to re-establish native trees in areas that were previously occupied by tamarisk. Nearby sources of willows that could be used for pole plantings are available within the ACEC. By prohibiting the use of ground fires (such as campfires) in this vegetation community, the possibility of further unintended vegetation and associated listed bird habitat loss can be largely avoided (lightning fires in the canyon are unlikely and arson is an uncontrollable factor).

Protective measures to prevent cutting of trees occupied by nesting pairs of the federally endangered southwestern willow flycatcher or least Bell's vireo and seasonal prohibitions on pole gathering should prevent impacts to these species. Nonetheless, incidental take of listed birds may occur with the tamarisk management, restoration, and monitoring activities that are identified in the Proposed Action. Take of up to one least Bell's vireo and one southwestern willow flycatcher in the form of death or injury would be authorized without additional consultation, consistent with other parameters and biological conditions adopted in the Proposed Action. Designing projects that encourage the nesting of listed and candidate bird species and prohibition of ground fires would minimize potential for further loss of nesting bird habitat, and increase the possibility of these birds continuing to establish nesting sites in the Central Amargosa Unit.

House mice and cats are a major threat to the Amargosa vole, while brown-headed cowbirds parasitize the nests of the least Bell's vireo and southwestern willow flycatcher and pose one of the greatest threats to the birds' recovery. An obvious benefit to reduce the numbers of these exotic faunal species is prevention of direct losses of the listed species. In addition, reducing cowbird populations will enhance reproductive success of the vireo and flycatcher. Trapping to remove exotic species could result in minimal disturbance to marsh habitat (in the case of the Amargosa vole) or trees in nesting bird habitat. Protective measures listed in Appendix F would keep such disturbance to a minimum and reduce the possibility of inadvertent take of listed species.

Wildlife, especially listed birds, would also substantially benefit from enhancing the ability to maintain the vehicle use closures within the Amargosa Canyon and its secondary drainages. It is particularly critical for vehicle barriers to be constructed and maintained and for closed routes to be restored to protect the ACEC from the nearby heavy use of OHVs at the Dumont Dunes OHV Open Area just south of the ACEC. Although route restoration, barrier, and fence construction and repairs may be needed at any time of the year, most activities would be scheduled for the time of the year (September to March) when listed birds would not be frequenting the area. This would minimize disturbance of the very species that have benefited the most from these vehicle exclusion strategies in the first place. To date, barriers have been effective in keeping vehicles out of the sensitive areas. Likewise, expanding the camping closure beyond the Amargosa Canyon to other portions of the Central Unit would also benefit these bird species by increasing their potential for reproductive success.

Riparian habitat in general and listed plant population centers would benefit from the exclusion of vehicles. Although the occasional errant vehicle may do little harm to the riparian-wetland habitat, the reality is that one intrusion generally leads to another. Therefore, barriers at any major point of actual or potential vehicular access to Amargosa Canyon and China Ranch Wash would greatly benefit riparian habitat by protecting it from the damage that OHVs can cause as they repeatedly traverse moist or saturated soils and/or adjacent drier habitat. This action best addresses potential damage from vehicular intrusions by preventing them in the first place.

No additional sensitive wildlife or habitat disturbance would occur from restoration and constructing or maintaining barriers as currently identified barrier locations are well outside of sensitive wildlife habitats. Any sites identified for additional fencing or barriers would be inventoried, and structures would be designed so as not to impact sensitive wildlife species or nests of listed birds.

Signing may be effective in conjunction with restoration, fencing, and barriers to keep multiple users and their vehicles away from listed plant populations, but signing alone would not place a physical barrier between the plants' populations and access from outside of the habitat.

The most obvious way to enhance the riparian vegetation communities is to assure an on-going and unobstructed flow of water into the ACEC (primarily from the Amargosa River and the effluent springs that feed it). To accomplish this, the proposed plan would prohibit water diversions and groundwater disturbing activities, and make assertion of Federal Water Rights a priority. It is imperative that the marshy listed plant habitats, the swamp-like Amargosa vole habitat, and the riparian habitats in Amargosa Canyon and China Ranch Wash be provided with a steady, plentiful supply of water in order to continue to thrive. Geothermal exploration and development in and of itself would have relatively little immediate impact on vegetation communities. However, future withdrawals of water from an already at-risk source, and the potential for intrusions by large numbers of people to subsequently developed sites could result in direct loss of vegetation, as well as the potentially significant adverse indirect effect of loss of the water needed to support sensitive vegetation and wildlife habitat. Consequently, the prohibition of this type of exploration and development complements other strategies to protect in-stream flow.

All of the listed species that inhabit this region are dependent on a stable water supply, particularly the endangered Amargosa vole and Amargosa niterwort. The Amargosa vole would cease to exist, except in captivity, if its primary habitat in and adjacent to Grimshaw Basin were to go dry. Therefore, the water quality and quantity protection measures of the Proposed Action will result in beneficial impacts on Amargosa vole. Prohibiting bathing at native hot springs located in suitable Amargosa vole habitat (Borehole Hot Springs is located in suitable, occupied, Amargosa vole designated critical habitat (BLM 2003)), will reduce indirect take of the Amargosa vole by eliminating pedestrian trampling of vole habitat as bathers access hot springs. The probability of indirect take would also be reduced by eliminating disturbances and harassment caused by bathers accessing the spring or unrestrained pets at the spring. Unrestrained pets could also cause direct take of the vole. These measures were first identified in the NEMO Plan Amendment and the FWS Amargosa vole recovery plan.

There would be no substantive impacts to vegetation communities from fish and wildlife surveys. There may be minor disturbance of vegetation communities to carry out vegetation baseline, listed plant, surface and groundwater, spring, invertebrate, other habitat investigations, cultural surveys, monitoring, and trend studies, primarily from researchers inadvertently and unavoidably disturbing (trampling) some listed plants as investigators run transects or walk through or between study sites. Trained botanists should be able to minimize this effect simply by identifying listed species. Protective measures are identified in Appendix F protocols to avoid trees that are being used by listed birds for nesting.

Impacts to Soils

As discussed in the Affected Environment chapter of this EA, most of the soils within the planning area are susceptible to accelerated erosion from wind and water, especially when the surface has been disturbed. Under the Proposed Action, BLM would conduct an Order III soil survey. This type of survey would result in more detailed soil information, resulting in better route and trail design and more location-specific monitoring capability within the ACEC.

No changes are proposed in this implementation plan to the approved NEMO routes of travel network. There are thirty-one miles of existing non-motorized trails, three existing trailheads and five new trailheads, all of which are located in the Central Amargosa Unit. Some of these routes and trails are well marked and well known while others are not marked and are less frequently or even rarely used. The designated route and trail networks represent sources of continuing run-off and soil erosion due to soil compaction. Active canyon drainages are subject to minimal erosion from trail use, but side-hill and ridge-top trail erosion can be a localized problem on maintained trails, depending on soils, grade, and trail angle and construction.

The continually eroding T&T Railroad grade, which forms the backbone of the trail network and is adjacent to the main Amargosa River channel, contributes to the overall sediment load that makes it way to the Amargosa River. The natural forces of erosion during flood events is also impacting the integrity of the T&T Railroad grade itself and there is no reasonable way to prevent this natural degradation while also avoiding substantial riparian damage. The sedimentation resulting from the entire route network and trail system that is eventually deposited into the Amargosa River represents only a fraction of the annual deposition in the River, with the vast majority of the deposition resulting from precipitation events that can wash substantial amounts of sediments into the river.

Impacts to Water Resources

Under the Proposed Action, several management actions directly relate to the conservation and protection of water resources that support ACEC habitats. These management actions include prohibiting discretionary use and development of water resources within the ACEC, prohibiting land uses within the California portion of the Amargosa River watershed that would result in deterioration of water quality or quantity within the ACEC, and actively protesting applications for development of water resources that could have a detrimental affect to natural resources within the ACEC. Under the Proposed Action BLM's Federal Reserve Water Right associated

with the Amargosa River[1],public water reserves, and the Kingston Range Wilderness Area would be asserted. These management actions would maintain or improve water quality and quantity within the planning area by prohibiting actions that negatively impact water quality or extract water from the regional hydrologic system. The Proposed Action also contains five additional management actions aimed at characterizing and quantifying both ground water and surface water on a regional basis within the study area and individual water bodies within the ACEC. Together, these actions would result in a beneficial impact to water and watershed resources.

Under this alternative, bathing at natural hot springs within the ACEC would be a prohibited act. Water quality at natural hot springs currently used for bathing would not be degraded due to the lack of facilities for users or improvements to minimize sedimentation. Currently, substantial use is limited to Borehole Hot Spring, which has trail access to it from a nearby county maintained road.

Impacts to Cultural and Paleontological Values

As discussed in the Affected Environment chapter of this EA and Appendix E, there is a variety of significant prehistoric and historic resources in the Amargosa Canyon portion of the ACEC. Under the Proposed Action, tamarisk control and active riparian restoration have a low to moderate potential to affect sensitive cultural resources. The riverbed and banks have been previously disturbed by annual flash flooding, but the there is a potential to impact cultural or paleontological resources because natural flood events may uncover or move buried resources. The more ground disturbance created; the higher the potential to adversely affect cultural remains. Because this is a known area of cultural resource sensitivity, and specific locations are not comprehensively mapped, Section 106 compliance has occurred and the Proposed Action includes pre-disturbance surveys, and, based on the results of those surveys, would include monitoring of new ground disturbance by a qualified archaeologist.

Administrative actions have no direct affect on cultural or paleontological resources; however, the contents and implementation of interpretive and educational strategies for the ACEC should include cultural resources and practical measures to protect cultural remains and minimize potential inadvertent destruction or vandalism. Proposed interpretive and educational information includes explanations of the laws protecting cultural and paleontological resources coupled directly to real, logical reasons why these resources are important and fragile and how they contribute to the study of the past.

Inventory of cultural and paleontological resources both in the context of other activities and as part of the identification of areas with sensitive cultural or paleontological resources that might be or are being damaged by unauthorized or improper uses, and the documentation, recovery, stabilization, and protection thereof, will have positive affects on these resources and the ACEC's cultural knowledgebase.

[1] If determined suitable to inclusion within the National Wild and Scenic River System.

Trail utilization and maintenance has the potential to adversely impact cultural resources with the degree of potential effect depending primarily upon the trail's location in the landscape. Because of their size and the increased level of maintenance required, trails maintained for universal access have the potential for greater impact to cultural resources. For the most part, designated trails in this alternative reflect the design of current on-going uses. To provide additional opportunities or minimize riparian impacts, moderate improvements or relocation is proposed for a few trails. Pack and saddle use is the most common design use for trails.

Identifying hiking and equestrian trails as part of the designated trail network is also likely to increase use, which would indirectly increase adverse impacts to nearby, sensitive cultural resources. Trails through culturally sensitive areas may be rerouted or closed depending on their potential for adverse affects. Any new proposed trail construction will require prior cultural inventory and evaluation to avoid substantial adverse cultural impacts. While an effective protection method in many cases, route restoration could also result in substantial impacts to cultural resources during implementation and will be considered on a case-by-case basis.

The potential impacts for trailhead, information portal, and overlook development and maintenance are the same as for trail development. In particular, identification of historic and prehistoric points of interest, though general in nature, has the potential to increase looting, thus, increasing adverse impacts to cultural resources.

Continued use of the **Amargosa River Trail** by hikers and equestrians will have moderate impact to sensitive cultural resources in the Amargosa Canyon. The majority of this trail is located on top of the historic Tonopah and Tidewater (T&T) Railroad grade (SBR2340H), which is a National Historic Landmark. With a few exceptions, this portion of the T&T grade has moderate to high cultural and structural integrity that may be impacted. Maintenance of this trail on the historic railroad grade will continue to impact the structural integrity in some places.

A variety of historic and prehistoric resources, including the Old Spanish National Historic Trail and a national register eligible structure and mining district, are documented in the central canyon of the Amargosa River. Amargosa River Trail use and maintenance will continue to result in moderate impact to some of these resources, while also providing access for the public to learn about these cultural values. The popularity of this trail focuses most use and impacts away from other nearby sensitive sites. The northern (Tecopa) trailhead for this trail has been previously disturbed and construction of a trailhead sign is not likely to impact cultural or paleontological resources.

The **Badlands Trail,** the **Mesa Trail**, and the **Tecopa Hill Trail** are located in areas of low potential for cultural resources and therefore have low potential to impact cultural resources. However, the trailheads for the former two of these trails are at China Ranch, a historic farming and ranching site located on private lands. Increased visitation from trail users on these two designated routes may enhance China Ranch business operations, and is not likely to further increase impacts to the ranch's historic facilities. All three of the trailheads for these trails are located in areas that have been previously substantially disturbed and construction of trailhead signs has a minimal potential to impact cultural or paleontological resources.

The **Willow Creek Trail** follows Willow Creek from China Ranch to the west Noonday Mine area. Use of this trail has a moderate potential to impact cultural resources, as there has been historic activity associated with homesteads and the historic Noonday Mine. Impacts to China Ranch and its historic facilities would be the same as those outlined in the previous paragraph.

The **Catskull Loop Trail** is adjacent to the Amargosa River and Willow Creek confluence and serves as a connector to other trails proposed for designation that contain a partially restored national register eligible structure and the historic China Ranch. Designation and use of this trail may indirectly impact area historic mine workings through increased exploration by the public and may increase use of other adjacent trails with sensitive resources. It will have a moderate to low potential to directly impact cultural resources along the trail itself. Impacts to China Ranch would be the same as those outlined above.

Designation, use, and maintenance of the **Cowboy Canyon Trail** will have a low potential impact to cultural resources because the majority of the route has been scoured by recurring flooding. It serves as a connector between several other trails and may result in increased use of adjacent trails that impact a national register eligible structure, the T&T railroad, and lead to the historic China Ranch. The trailhead is located on the west side of China Ranch Road where there is an existing turnout. This area has been previously disturbed and construction of a trailhead sign has minimal potential to impact cultural or paleontological resources.

The **DD Crossover Trail** from China Ranch to the T&T grade next to the Amargosa River has moderate to high potential to impact cultural resources. Designation and maintenance of this trail may impact a variety of historic and prehistoric resources. It also may result in increased use of adjacent trails that impact a national register eligible structure, the T&T railroad, and leads to the historic China Ranch and the other trails that branch out from the ranch.

The majority of the **Grimshaw Trail** would be located on top of the historic Tonopah and Tidewater Railroad grade (SBR2340H), which is a National Historic Landmark. This portion of the T&T grade has moderate cultural sensitivity and generally poor structural integrity and will continue to be impacted by upgrade and maintenance of a universal access trail. The trailhead is located off an existing single lane loop road and parking area. The loop does not cross or otherwise impact the T&T grade. This trailhead area has been previously disturbed and construction of a trailhead sign is not likely to impact cultural or paleontological resources.

The **Slot Canyon** trailhead is located at the confluence of the Amargosa River and Willow Creek where a variety of documented historic and prehistoric resources, as discussed above. Trail designation, use, and maintenance will have moderate potential to adversely impact these resources and other sensitive cultural resources on the west side of the Amargosa River, particularly through inadvertent destruction or vandalism.

The **Sperry Wash Route** was a haul route for the historic Western Talc Mine. Because the routes is no longer maintained and is located in the Amargosa River and Sperry Wash drainages, it is now washed out. The old road's paving from the inactive mine to the intersection of Furnace Creek Road is still partially in tact. The route south of the Sperry Wash/Amargosa River confluence passes the old Sperry Site and T&T Railroad grade, both of which have been

heavily weathered and subject to flash-flood erosion. The route itself parallels the river course and has been washed out repeatedly by flash flood events. With the exception of indirect effects of continued visitation of the historic Western Talc Mine, use of this route for all-purpose access will have low to moderate impacts on cultural resources because the route has been scoured by flooding and partially paved over.

Interpretive display/information sign sites located in Tecopa Basin, in Shoshone at the Bon Mesa Overlook, and at the Badlands Overlook are on previously disturbed sites and therefore are unlikely to impact known cultural resources. One of these signs is located in an area where there is some potential for unknown resources to be uncovered. One other site, in California Valley is located on undisturbed ground surrounded by a disturbed area, and the likelihood of cultural resource impacts is low. The site at Emigrant Pass is in a known cultural area and based on preliminary site surveys and an evaluation of cultural records, inventory will occur prior to development; additional protection or avoidance measures may be identified at that time.

Impacts to Wild Horses and Burros

No impacts are anticipated to wild horses and burros, and in particular to the Chicago Valley Herd Management Area (CVHMA). Wild horses are present in the Carson Slough Unit of the ACEC. Two federally listed plants, the Amargosa niterwort and the Ash Meadows gumplant occupy this unit. To prevent potential future conflicts with listed plant populations, previous actions were to limit the CVHMA horse population to a maximum of twelve animals and eliminate all burro populations from the CVHMA. Presently there are six horses within the CVHMA. Based on the historical lack of adverse impacts to listed plant populations or habitat by the wild horses, it is anticipated that the Proposed Action would not conflict with the maintenance of this small herd. This ACEC plan establishes a monitoring program for the listed plant species and would track their progress towards recovery. Based on historic trends, monitoring is unlikely to reveal impacts from the wild horse population. If future monitoring reveals adverse impacts from wild horses to either plant species or their habitats subsequent management actions directed would be taken.

Impacts to Wilderness

Wilderness impacts from weed control, controlled burning, and restoration would be minimal, with the adoption of procedures from the Wilderness Rehabilitation Environmental Assessment (CA-068-97-26). Wilderness impacts include loss of naturalness and adverse scenic impacts over the short-term, primarily in the Amargosa River riparian corridor. Some restoration activities may be associated with management of OHV use in conjunction with new barrier needs and/or maintenance of barriers already in place to protect wilderness values (see Wilderness Barrier Installation and Maintenance EA CA-680-96-55). All activities within wilderness necessitate a field survey to map specific work sites, determine whether activities fall within the parameters of the above-cited programmatic EAs, and satisfy the minimum requirement provision of Section 4(c) of the Wilderness Act.

Exotic fauna (cowbird) control could occur within wilderness to protect nesting listed migratory birds, and thus wilderness lands may be affected. Additional consultation will be required with FWS in order to determine cowbird control needs and protocols. Therefore, direct impacts to wilderness and appropriate parameters or mitigation will be evaluated at that time.

Placement and maintenance of vehicle barriers would have a positive impact on wilderness values, as it would tend to reduce vehicle intrusions into wilderness. All current barrier locations are outside of wilderness boundaries. Restoration of damaged lands would also have a positive impact, as it would restore natural wilderness values. Elimination of exotic species and restoration native plants would enhance wilderness values over the long-term, and minimize the potential for the further degradation of natural wilderness values by invasive weeds.

Protection of water sources that feed the Amargosa River within the Kingston Range Wilderness enhances long-term presence of the water resources, which is necessary for habitats. The presence of water is a wilderness value. Inventory, survey, monitoring, tracking, and identification actions performed consistent with wilderness provisions would not be expected to affect wilderness adversely.

Adoption of a designated trail network and better interpretation and education of the values of the ACEC through the proposed ACEC Trail and Interpretive Plans will have both positive and negative effects on wilderness values. To the extent that wilderness users better understand the sensitive ACEC values, wilderness regulations, and confine activities to designated routes would have beneficial impacts on wilderness by decreasing inadvertent degradation. To the extent that interpretation and education leads to increased overall use of the ACEC within wilderness could result in adverse impacts to wilderness values. This overall impact is not anticipated to be substantial, and will be monitored for substantial changes.

Impacts to ACEC Values

Relevance and importance criteria for the Amargosa River ACEC include sufficient permanent flowing water to support sensitive values, associated wetland habitats, endemic fish species, listed and other migratory bird species, listed and other sensitive plant species, the endemic, endangered Amargosa vole, superb scenic and cultural values, and wild and scenic river values. These values will either be enhanced or not be affected by most of the activities of the proposed activity plan.

Certain implementation activities will have some short-term adverse affects that are more than offset by their long-term beneficial affects. Beneficial activities include invasive species management, restoration activities, development of protection devices, inventories, and monitoring activities for sensitive species. The loss of overstory and associated slash piles that may be produced from tamarisk control may seem unsightly to the public who hike in the area over the short-term. The Proposed Action will not substantially affect the naturally occurring unique scenic and wild and scenic river values of this area.

Restoration activities could adversely affect some cultural values but standard avoidance and protection measures are in place to minimize adverse effects. Trail designation, maintenance, and interpretation will lead to increased use, and thus may adversely affect all of the sensitive values of the ACEC. Trail designation and interpretation also will result in beneficial impacts by providing more users an increased access to the area and its unique resource values. The Proposed Action will also spread the impacts of trial use over a larger area, rather than concentrating it in the Amargosa Canyon by providing a focal point of use that is not on public lands (China Ranch). Ongoing monitoring of trail use (trail registers) and of resource values (inventory activities and patrol) is part of the Proposed Action and is designed to detect adverse impacts to relevance and importance criteria for the ACEC designation. Mechanisms such as trail closure or reroute may be used to correct any undue adverse impacts when they are detected.

Impacts to the Old Spanish National Historic Trail

The Proposed Action would overall have moderately positive impacts on the designated Old Spanish National Historic Trail (OSNHT) where it transects the ACEC. The Proposed Action would protect sensitive desert resources associated with the trail. This increases the visitor's opportunity to view the landscape as it might have been during the period of significance, 1829 to 1848. This is particularly true in the Amargosa Canyon where use of the trail is well documented. Of particular significance is the trail segment located in wilderness. This is the only remaining place in California where the trail location is known to have existed along a free-flowing river that is still without other human developments. Amargosa Canyon is one place where a visitor can experience the natural setting as it might have looked in 1829 along the early Old Spanish Trail (OST). Demand for this type of experience is low today, but by protecting it, the experience will not be lost.

The development of interpretive signs in the Proposed Action would provide positive benefits to the OSNHT. Interpretive facilities at locations along the Amargosa River Trail, California Valley, Bon Mesa Overlook, and at the China Ranch and Tecopa trailheads would benefit the public by explaining when and where the OST was located, and how it was used both historically and prehistorically by Aboriginal peoples. Development of the wayside OSNHT exhibit at Emigrant Pass would redirect trail users outside of wilderness and provide interpretation of one of the best remaining traces of the entire trail. It would also decrease degradation of historic trail segments within wilderness. The national comprehensive management plan for the trail will further inventory, protection, and interpretation strategies for the OSNHT.

Impacts to Wild and Scenic River Eligibility

The Proposed Action would have positive impacts on resource values associated with the eligible Wild and Scenic River (WSR) segments of the Amargosa River. Under the eligibility status, a wild and scenic river is to be managed to protect free flowing values, and associated outstanding remarkable values (ORV). The Amargosa River has been documented to possess all six ORVs. The Proposed Action identifies actions to protect all of the six ORV values for the Amargosa River. Some actions will not impact WSR values while others will have some beneficial affects.

The actions protection of water resources would have substantial positive impacts for long-term WSR protection.

Impacts to Recreation Resources and Use

The Proposed Action would have substantial positive impacts on long-term public recreation opportunities in the ACEC. The ACEC natural and cultural resources are best enjoyed by passive recreation experiences. Protection of ACEC resources improves their value for recreation and tourism because these resources provide the primary attractions for recreation users coming to the ACEC, and there are limited opportunities for similar desert experiences at other locations in the Mojave Desert. The affects of the Proposed Action would therefore be positive because the plan provides for additional protection of resource values while allowing access for users to facilitate passive public enjoyment those resources.

The ACEC plan continues to provide recreation opportunities in the Central Amargosa Unit. Because of their remoteness and the sensitivity of listed plant habitat, there are no proposed designated trails or interpretation activities affecting the Carson Slough or Upper Amargosa Units. Public use of the ACEC's Central Unit is anticipated to grow during the twenty-year life expectancy of this plan, and could possibly result in overuse of some sensitive areas. The Proposed Action will disperse the impacts of that increased use over a larger area and provide an increased public knowledge of the entire trail network.

The construction and maintenance of trailheads and trails would have a positive affect because it would better manage human travel for enjoyment, while avoiding or limiting impacts. Current use focuses on the sensitive Amargosa Canyon. The expanded trail network will include a focal point of use that is not on public lands (China Ranch). Ongoing monitoring of trail use (trail registers) and of resource values (inventory activities and patrol) is part of the Proposed Action and is designed to detect adverse impacts to relevance and importance criteria for the ACEC designation. Mechanisms such as trail closure or reroute may be used to correct any undue adverse impacts when they are detected.

The signing and interpretive strategies would provide visitor information about the area's sensitive nature. Wayside exhibits and interpretive signs provide site-specific information about sensitive resources. This information helps visitors adjust their behavior to fit the landscape. The construction and maintenance of signs and protective barriers would help stop motorized intrusions that result in adverse impacts on sensitive riparian, cultural, and listed bird species. Stopping such intrusions would have a positive affect on these sensitive resource values and the public's continued enjoyment of them.

Inyo County manages the largest natural hot spring within the ACEC planning for public use. Other commercial hot springs that are privately managed are located in the area and available to the public. There are also numerous hot springs at area private residences. At this time, the current and anticipated demand for hot spring bathing opportunities has been met in this area.
Currently, one unimproved (native) hot spring exist within the ACEC. This spring (Borehole Hot Spring) is located in suitable, occupied, Amargosa vole designated critical habitat. The

spring has also been subject to various trespass structures and unauthorized improvements over the years. Continued use of Borehole Hot Springs for bathing could result in unauthorized indirect take of the Amargosa vole, exceeds casual use, is inconsistent with BLM authorized use regulations (43 CFR 2920 et. seq.), and is not compatible with management goals for the ACEC. Additionally, Borehole Hot Spring does not comply with State and County health and safety codes or receive environmental health oversight.

Other proposed actions would have both adverse and positive impacts on public recreation. This includes the action to prohibit camping on public lands in the Central Amargosa Unit, which is an expansion of the existing closure that covered only the main Amargosa Canyon. The main portion of the Amargosa Canyon, which was were most overnight use occurred at the time, was closed to overnight camping by Federal Register notice on November 26, 1982. Camping on public land in the Central Amargosa Unit could lead to adverse impacts to sensitive resources that cannot be mitigated, particularly to cultural resources and nesting migratory birds. Additional impacts could include an accumulation of food, trash, and human waste resulting in an overall poorer recreation experience and deterioration of water quality. This expanded closure limits camping opportunities and overnight facilities within the Central Amargosa Unit to the Inyo County Park and the bed and breakfast facilities on private property at China Ranch. Nearby camping opportunities and overnight facilities, include Dumont Dunes OHV Area just south of the ACEC, undeveloped public lands outside of the ACEC, and a motel at Shoshone.

In conjunction with Inyo County, trash receptacles have been installed at key access points to the Central Amargosa Unit. With this activity plan, the designated trail network has been expanded, and more wastes would be generated in more areas. Monitoring of trailheads will indicate if additional trash receptacles and removal services are needed in the future.

Another action would prohibit discharging firearms on public land in the ACEC. This is not a historical use and shooting guns is not compatible with other managed uses. One final restriction is the prohibition of ground fires within the Central Amargosa Unit, excluding the Inyo County Park in Tecopa Hot Springs. This action would have little adverse impact on the public because under the Proposed Action overnight camping is prohibited in this unit of the ACEC, and any fires not associated with camping or casual use would require permit in any case.

Impacts to Motorized Access

Motorized routes were initially designated for most of the Central Amargosa Unit in the two original, 1983 ACEC plans. This network was reviewed in 2004 by the NEMO route of travel (ROT) process and routes were designated in the remainder of the Amargosa Valley, which includes the areas in and around all three ACEC units. To prevent further erosion, listed plant, and watershed impacts, NEMO ROT closed three additional routes in the Central Amargosa Unit and one route each in the Carson Slough and Upper Amargosa Units. Minimal impacts are expected to motorized access from this Proposed Action because this implementation plan makes no further changes to the 2004 NEMO route network.

Moderately increased use of the designated route network in the Central Unit will likely occur over the course of the twenty-year life of this activity plan. The tourism industry in the area appears capable of accommodating increased visitor use that may result from the Proposed Action. The private industry currently provides housing, food services, sanitary facilities, hot spring bathing, and parking. Increased growth, and associated traffic issues will occur in some measure regardless of which alternative is implemented. Some trailheads will receive increased use due to additional visibility in flyers and interpretive signs. At this time, the existing and proposed facilities will accommodate anticipated growth. Non-ACEC plan factors currently limiting the amount of motorized access through the area include relatively few visitor services and amenities and high fuel costs compared to surrounding communities on major highways.

Impacts to Mineral Deposits and Production

Impacts to mineral development are anticipated to be minimal because the potential for the occurrence of mineral resources is low with the exception of geothermal resources. Development of geothermal resources within the ACEC or Amargosa watershed is not feasible for commercial energy production because of relatively low water temperatures. Such temperatures limit uses to such things as heating small buildings and bathhouses. It is doubtful that the energy cost savings from these uses would offset exploration and development costs. Geothermal exploration would have adverse impacts on the resource values for which the ACEC has been designated to protect.

Prospecting opportunities for locatable minerals would not be diminished by the Proposed Action because no new motorized vehicular route closures or withdrawals are being proposed.

Impacts to Scenic Resources

In areas of weed control, restoration activities would temporarily reduce the abundance of vegetation. Based on the use of these techniques in other riparian systems, these adverse impacts would be temporary, and in the long-term, some increase in the presence of running water can be anticipated.

In general, the Proposed Action would not result in adverse impacts to scenic resources. In particular, inventory, survey, monitoring, tracking, and identification actions, construction and maintenance of fencing and vehicle barriers, restoring closed routes, and installing signs would not be expected to adversely affect the presence of running water in the Amargosa River, abundance of vegetation, or natural appearances of the cliffs. Likewise, the trail plan would not be expected to substantially affect the presence of running water in the Amargosa River, the abundance of vegetation, or the natural appearances of the cliffs. A larger designated network could lead to increased litter along designated trails. Proposed monitoring of the trail network would provide needed information to maintain the network in a scenic condition.

Some proposed actions are anticipated to benefit scenic resources. Better interpretation and education of ACEC values through the proposed ACEC Interpretive Plan will have positive

effects on scenic values as recreation users better understand the sensitive values of the area and inadvertent degradation decreases. Protection of water sources that feed the Amargosa River and Grimshaw Lake ensures long-term presence of the water that is necessary for habitats. Since the presence of water is a scenic value, actions identified to protect water sources are a beneficial effect of the Proposed Action. The effects of land acquisition would also be beneficial by providing additional acres within areas identified for enhancement of natural and cultural values.

Impacts to Socioeconomic Values

Most ACEC Plan implementation items of the Proposed Action would have little or minimal direct or indirect socioeconomic impacts to the adjacent communities or region or minority populations. The control of exotic species could have some impact on local pet populations. Behavior modification would be required of pet-owners and loosely controlled pets may nonetheless be lost. This would be a higher risk for people living in the area that own cats that are used to scavenging outside. The impacts to pets and pet-owners would be mitigated by the protocols outlined in Appendix I; including phased implementation of control strategies, the use of alternative mechanisms prior to consideration of removals, opportunities for reclaiming captured pets, and an assertive outreach program to inform the public of upcoming activities.

Various prohibitions of activities within the ACEC may have minor impacts on development. These include prohibitions of discretionary stream diversions and groundwater disturbing activities, geothermal development, camping, ground fires, and non-hunting shooting of firearms. However, most of these activities have not generally been authorized in the recent past, and implementation of the prohibitions would provide law enforcement an additional tool to enforce existing strategies for visitor safety and protection of sensitive resources. In the long-term, they are anticipated to result in maintenance and enhancement of the natural values on the public lands that draw visitors and residents to the region, and complement the efforts of other landowners and land managers to provide most of these services elsewhere.

Acquisition of private lands within the Amargosa ACEC has been a long-term goal since the signing of the original ACEC Plans in 1983 and has previously been adopted as a plan action[2]. The majority of these lands have already been identified in the original plan and exchanges are the preferred mechanism for acquisition when feasible, thus providing Inyo County with more developable lands elsewhere. All acquisitions are done only upon willing, mutual agreement of both parties.

The greatest potential long-term impacts to this predominantly rural area will be from the adoption of the proposed trail plan that designates just over thirty-three miles of trails. This trail plan increases the currently designated trail network approximately one-hundred-thirty-seven percent and would provide more trail options to the public and thus more frequent visits to the area. Just as the existing network, the proposed new trail network will cater to hiking and equestrian use and would not substantially change the spectrum of recreational use available in the ACEC.

[2] Northern and Eastern Mojave Plan, December 2002.

The adoption of the route network and adoption of an Interpretation Plan that brings more tourists to the area has the potential to benefit existing local businesses to varying degrees. The major benefits will come from the increased visibility of the area and its many values, as interpreted in the Appendix C. Businesses located within or immediately adjacent to the ACEC are likely to benefit moderately to substantially from the Proposed Action, since trailheads and trail crossings provide additional traffic to those businesses. Other area businesses that cater to tourism or are in the service industry will benefit somewhat.

These benefits would indirectly accrue to residents of all income levels and backgrounds, from business owners to increased employment opportunities for other residents. Lesser benefits that nonetheless complement existing tourism assets of the region would also result from the proposed trail network. This includes Native American populations that have an interest in attracting visitors in the area. There would also be benefits to homeowners in the area, from the value added to their property by the increased recreational opportunities available. Minor adverse effects include small increases in the cost of doing business in some more remote areas, and decreases in other areas, moderate increased resource protection costs and moderate increases in recreation management costs.

Low Intensity Management Alternative (Alternative B)

Impacts to Biotic Communities

Alternative B would have similar positive impacts on native riparian vegetation communities, wildlife habitat, and water availability in riparian areas as the Proposed Action and No Action but to a lesser degree. This alternative focuses on tamarisk exclusively rather than tamarisk *and* other non-native invasives, does not include a soil survey which would provide additional associated vegetation information, does not include a program for treatment of upstream private lands, and does not include substantial monitoring to detect changes in the water regime that may affect vegetation communities. Some invasives may persist in riparian areas and positive effects will occur more slowly.

These funding and scope limitations would eliminate focused upland invasives control and therefore would be less likely to result in a positive impact on upland ecological communities. A small population of the invasive camel-thorn (*Albagi pseudalbagi*) was identified by BLM and treated by Inyo County in the Tecopa area approximately four years ago, and potential retreatment needs would not be addressed under this alternative. The control of tamarisk would be consistent with the Barstow Field Office ten-year weed control plan, EA, and pesticide use permit (CA-680-03-47) that is already in-place.

The positive effects to riparian-wetland habitat and associated vegetation communities would be much the same as discussed in the analysis of the Proposed Action so long as water flow or other sensitive resource values are not adversely affected by resource uses over the long-term. Upland wildlife habitat and associated vegetation communities would receive less focus, and therefore fewer benefits. Some differences in strategies for invertebrates and listed species under this

alternative would result in a minimal reduction of anticipated direct impacts to vegetative communities from fewer disturbances.

Impacts to suitable, occupied, Amargosa vole designated critical habitat would continue absent a ban on bathing and the removal of unpermitted improvements illegally placed at undeveloped hot springs.

Impacts to Soils

Impacts to soils from Alternative B would be the same as the Proposed Action, except BLM would not seek an Order III soil survey for the ACEC, thereby eliminating the potential beneficial effects of better predictive information for analysis of soils' susceptibility to erosion and other soil factors, and incorporation of appropriate design features based on that additional information. Given the diversity of landscapes and soil types in the ACEC, this loss of information may result in localized adverse affects to soils in the form of accelerated erosion from some activities. Since approximately two-thirds of the designated trail network under this alternative would be maintained for hiking only, there would be a decrease in soil compaction and erosion from trail use as compared to the Proposed Action. Due to the low intensity of current and future uses anticipated under this alternative and the short-term nature of most of these activities, adverse impacts would not be significant.

Impacts to Water Resources

Impacts to water resources from Alternative B would be similar to the Proposed Action, except that indirect impacts to water quantity and quality are less assured under this alternative due to its focus on ACEC uses and changes rather than regional changes to the riverine and aquifer system. The extent of these effects are anticipated to be minimal over the short-term, but based on increasing development pressures and the importance of affluent springs and ground water sources to the maintenance of this system, could likely become substantial over the long-term.

Under this alternative, bathing at natural hot springs within the ACEC would not be a prohibited act. Water quality at natural hot springs currently used for bathing could be degraded due to the lack of facilities for users or improvements to minimize sedimentation. Currently, substantial use is limited to Borehole Hot Spring, which has trail access to it from a nearby county maintained road.

Impacts to Cultural and Paleontological Values

Impacts to cultural resources from Alternative B would be the same as the Proposed Action, except: The hiking and equestrian trail system is intended to provide a minimum level of improvements, resulting in hiking as the predominant use of the designated system. Overall, this use type requires fewer tread improvements and lower clearances, and therefore lower potential impacts to cultural resources immediately on or adjacent to trails. There would be no differences

in development, and therefore no differences in potential cultural resource impacts from the Amargosa River Trail, Catskull Loop Trail, Cowboy Canyon Trail, Mesa Trail, Slot Canyon Trail, Tecopa Hills Trail, and Willow Creek Trail.

Equestrian use may continue off-trail, and no substantial differences in overall impacts under this alternative are anticipated as compared to the Proposed Action.

Impacts Wild Horses and Burros

As with the Proposed Action, no impacts are anticipated to wild horses and burros from Alternative B.

Impacts to Wilderness

Impacts to wilderness resources from Alternative B are not anticipated to be substantially different from the Proposed Action. There might be an overall lower use of the ACEC over the long-term and therefore decreased potential for impacts from that use. There will also be a lower level of protection for wilderness water resources and related values under this Alternative.

Impacts to ACEC Values

Impacts from Alternative B to ACEC values that have contributed to its designation are not anticipated to be substantially different from the Proposed Action in the short-term. Over the long-term, additional impacts to the relevance and importance factors that are dependent on water resources can be anticipated under Alternative B, but the extent of these impacts is unknown at this time.

Impacts to the National Historic Old Spanish Trail

Impacts to the Old Spanish National Historic Trail (OSNHT) under Alternative B are the same as those from the Proposed Action. Activities under both alternatives that may affect the OSNHT are consistent with the National Historic Trails Act.

Impacts to Wild and Scenic River Eligibility

Impacts to the Amargosa Wild and Scenic River eligibility from Alternative B are not anticipated to be substantially different from the Proposed Action. Potential long-term benefits to the Wild and Scenic River resource under Alternative B would be lower due to the elimination of watershed monitoring. The potential to the Wild and Scenic River resource could likely be substantial, long-term, absent the Proposed Action's protective measures and monitoring of the aquifers supplying water to the Amargosa River.

Impacts to Recreation Resources and Use

The impacts of Alternative B would be similar to those in the Proposed Action, with three exceptions. First, the trail system would primarily be designed to accommodate hikers instead of hikers *and* equestrian users. Second, there would be fewer interpretive opportunities and less information about hiking opportunities. As a result, visitors may be more likely to engage in activities that cause unintended impacts to sensitive resources in the ACEC. Although there would be no change in the amount or type of other recreation opportunities in this alternative, less knowledgeable recreationists may not be aware of all of the opportunities that the area offers. The existing trail system would remain in place, including undesignated trails, unless specific resource impacts, such as identification of nesting birds adjacent to a trail, provide a basis for closure and restoration.

Lastly, continued bathing in native hot springs (Borehole Hot Spring) located in suitable, occupied, Amargosa vole designated critical habitat could result unauthorized take of the vole or adverse modification of critical habitat. Various trespass structures and unauthorized improvements would continue in the spring. Recreationalists could become sick or injured because Borehole Hot Spring does not comply with State and County health and safety codes or receive environmental health oversight.

Impacts to Motorized Access

The impacts to motorized access from Alternative B would be similar to the Proposed Action.

Impacts to Mineral Deposits and Production

The impacts to mineral deposits and production from Alternative B would be the same as from the Proposed Action.

Impacts to Scenic Resources

The impacts to Scenic Resources from Alternative B would not be substantially different from the Proposed Action. The lower level of interpretation under this alternative may provide both beneficial impacts (providing a more natural experience) and adverse impacts (visitors will have less information available to interpret some of the scenic resources). However, the potential impact to the scenic nature of the Amargosa River's perennial water supply could likely be substantial, long-term, absent the Proposed Action's protective measures and monitoring.

Impacts to Socioeconomic Values

The impacts to Socioeconomic Values from Alternative B would not be substantially different from the Proposed Action. There may be lower beneficial effects from tourism due to lower levels of public outreach and general knowledge of the recreational opportunities under this alternative.

No Action Alterative (Alternative C)

Impacts to Biotic Resources

The No Action Alternative would have substantial positive impacts on native riparian vegetation communities, wildlife habitat, and water availability in riparian areas, but the impacts would be to a lesser degree than the Proposed Action. This alternative would have fewer beneficial effects than the Proposed Action primarily because:

1. It focuses on tamarisk rather than tamarisk *and* other non-native invasives;
2. It does not include a soil survey which would provide additional associated vegetation information;
3. It does not include a barrier to prevent motorized access into Amargosa Canyon from Cowboy Canyon;
4. It does not preclude discretionary stream diversions and groundwater disturbing activities that may affect riparian resources;
5. It includes less monitoring to detect changes in riparian habitat and water regime and monitoring is limited to wetland habitat that supports the Amargosa vole and/or the two listed plants;
6. It does not place a ban on bathing or call for the removal of unpermitted improvements illegally placed at undeveloped hot springs in suitable, occupied, Amargosa vole designated critical habitat.

Otherwise, the positive effects to vegetation communities and riparian-wetland habitat would be much the same as discussed in the analysis of the Proposed Action so long as water flow or other sensitive resource values are not adversely affected by resource uses over the long-term.

The No Action Alternative would also have positive impacts on listed species, as does the Proposed Action, but they would be to a lesser extent. Under the No Action Alternative, listed bird surveys are limited to tamarisk control areas, sensitive invertebrate monitoring would not occur, and additional protection strategies for listed plants would not occur.

Listed species would benefit substantially from brown-headed cowbird control under the No Action Alternative. However, the more limited scope of bird surveys would result in less information available for management of listed birds and of other activities to avoid potential conflicts with listed birds, and fewer opportunities to promote recovery based on changes identified through surveys in the status of birds in other areas of the ACEC. Failure to control house mouse and feral cat populations could result in adverse effects to the Amargosa vole. Some differences in strategies for invertebrates and listed species under this alternative would

result in a minimal reduction of anticipated direct impacts to vegetative communities from fewer disturbances.

The No Action Alternative continues the existing protection of listed plants in the Carson Slough Unit. While the Proposed Action would use a combination of new fencing, restoration of closed routes, and signing to protect known populations of listed plants and Alternative B would do similarly except for new fencing, the No Action Alternative is dependent entirely on fences already in place. Existing fences are an important first step; however, additional steps provided by the Proposed Action or Alternative B would do a more complete job of protecting these plant populations. Although the possibility of destroying some listed plants would be avoided during new fence construction; if new populations are discovered, existing fencing may not be adequate to protect them.

Under the No Action Alternative, monitoring activities would have similar beneficial effects on vegetation communities to those anticipated under the Proposed Action, but on a smaller scale and more limited range. The early warning of potentially harmful losses of water by identification, mapping, and/or monitoring groundwater sources and springs within the ACEC would not occur. The ability to determine a cause-and-effect relationship about what may cause future diminishing quality and quantity of vegetation communities/riparian-wetland habitat, including Amargosa vole habitat, and take appropriate, timely action would be diminished.

Impacts to suitable, occupied, Amargosa vole designated critical habitat would continue absent a ban on bathing and the removal of unpermitted improvements illegally placed at undeveloped hot springs.

Impacts to Soils

The impacts to soils from the No Action Alternative would be similar to those for Alternative B. The loss of information due to elimination of the soils survey under the No Action Alternative may result in localized adverse affects to soils in the form of accelerated erosion from some activities. Since approximately two-thirds of the existing trail network under this alternative would no longer be maintained or would be restored, there would be a decrease in soil compaction and erosion from trail use as compared to the Proposed Action and Alternative B. However, given the low intensity of current and future uses anticipated in the area and the short-term nature of most of these activities, adverse impacts would not be significantly different under this alternative.

Impacts to Water Resources

Impacts to water resources from the No Action Alternative would be the same as the Proposed Action, except: Over the long-term protection of to water quantity and quality are less assured under this alternative due to its focus on ACEC uses and changes rather than watershed or regional changes to the aquifer system, discretionary water uses or groundwater disturbing activities would not be prohibited, and groundwater source and spring monitoring would not

occur. BLM would retain its ability to protest water use applications. Although other agencies would continue to monitor groundwater in the Death Valley Regional Flow System (DVRFS), BLM would not compile groundwater data specific to the ACEC and its water resources nor would BLM participate in regional monitoring networks or modeling efforts.

Under this alternative, bathing at natural hot springs within the ACEC would not be a prohibited act. Water quality at natural hot springs currently used for bathing could be degraded due to the lack of facilities for users or improvements to minimize sedimentation. Currently, substantial use is limited to Borehole Hot Spring, which has trail access to it from a nearby county maintained road.

Impacts to Cultural and Paleontological Values

Impacts to cultural resources from the No Action Alternative would be approximately the same as impacts for Alternative B and lower than those from the Proposed Action. The No Action hiking and equestrian trail system is intended to provide a minimum level of improvements and limited increased usage, resulting in hiking as the predominant use of a smaller designated trail system. There would be some increase in the potential for impacts to previously unknown cultural resources during trail restoration activities over the short-term, as there would with the Proposed Action due to trail improvements. Over the long-term, there would be a decrease in potential impacts to cultural resources previously accessed by restored routes as compared to the other alternatives. Equestrian and hiking use may continue off-trail, and therefore no substantial difference in overall impacts under this alternative is anticipated as compared to other alternatives.

Impacts Wild Horses and Burros

As with the other alternatives, no impacts are anticipated to wild horses and burros from the No Action Alternative.

Impacts to Wilderness

Impacts to wilderness resources from the No Action Alternative are not anticipated to be substantially different from the Proposed Action or Alternative B. Overall, lower use of trails is anticipated over the long-term as compared with other alternatives and therefore a decreased potential for impacts from that trail use would occur under the No Action alternative. There would also be a lower level of protection for wilderness water resources and related values under this Alternative as compared with the Proposed Action.

Impacts to ACEC Values

Impacts to ACEC values under the No Action Alternative are the same as those from Alternative B. Over the long-term, additional impacts to relevance and importance factors dependent on water resources can be anticipated as compared with the Proposed Action, but the extent of the difference is unknown at this time.

Impacts to the National Historic Old Spanish Trail

Impacts to the Old Spanish National Historic Old Spanish Trail (OSNHT) under the No Action Alternative are similar to those from other alternatives. Activities under all alternatives that may affect the OSNHT are consistent with the National Historic Trails Act. Under the No Action Alternative, the ACEC Implementation Plan does not recognize the newly designated OSNHT and contains no specific protection and interpretation actions for the OSNHT resources in the ACEC.

Impacts to Wild and Scenic River Eligibility

Impacts to Wild and Scenic River values under the No Action Alternative are the same as those from Alternative B, and are not substantially different from the Proposed Action. The river flow and related outstanding remarkable values would continue to be protected under the eligibility status afforded a component of the National Wild and Scenic River System pending suitability determination. Potential long-term benefits to the wild and scenic river resource under the No Action Alternative would be lower than the Proposed Action due to the elimination of watershed monitoring and protection.

Impacts to Recreation Resources and Use

The impacts of the No Action Alternative would be similar to those in the Proposed Action, with three exceptions: First, the trail system would primarily be designed to accommodate hikers instead of hikers *and* equestrian users. Second, there would be fewer interpretive opportunities and less information about hiking opportunities. Third, the designated trail system would be limited to the Amargosa River Trail and the Grimshaw Lake Watchable Wildlife Trail. Other existing trails would not be designated or maintained and they could be restored to a natural condition. About three miles of existing trails would be restored and about four additional miles of decreased equestrian trail opportunities would exist. Because hiking and equestrian access would still be available cross-country throughout the ACEC, there would be no change in the amount of potential hiking opportunities under the No Action Alternative. However, less knowledgeable or less physically fit recreationists may either not be aware of or not be capable of taking advantage of many of the off-trail hiking opportunities that the area offers.

Lastly, continued bathing in native hot springs (Borehole Hot Spring) located in suitable, occupied, Amargosa vole designated critical habitat could result unauthorized take of the vole or adverse modification of critical habitat. Various trespass structures and unauthorized improvements would continue in the spring. Recreationalists could become sick or injured

because Borehole Hot Spring does not comply with State and County health and safety codes or receive environmental health oversight.

Impacts to Motorized Access

The impacts to motorized access from the No Action Alternative would be similar to those from other alternatives. Some routes may receive less use under this alternative, as the trail network is focused on existing opportunities. In particular, the route to China Ranch may receive somewhat less use by recreationists under this alternative.

Impacts to Mineral Deposits and Production

The impacts to mineral deposits and production from the No Action Alternative would be the same as for other alternatives.

Impacts to Scenic Resources

The impacts to scenic resources from the No Action Alternative would not be substantially different from other Alternative B. The lower number of developed trails, signage, and interpretation under this alternative may provide both beneficial impacts (providing a more natural experience) and adverse impacts (visitors will have less information available to interpret some of the scenic resources or may not be able to access or find them). Water resources would not be protected to the same level as in the Proposed Action.

Impacts to Socioeconomic Values

The impacts to socioeconomic values from the No Action Alternative would not be substantially different from other alternatives. There may be lower beneficial effects from tourism than the Proposed Action due to lower levels of interpretation and limitations to recreational opportunities under this alternative.

Cumulative Impacts of the Proposed Action and Alternatives

The BLM regulations that implement the National Environmental Policy Act (NEPA) require assessment of the cumulative impacts of a proposed action. The Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA define cumulative effects as: “The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1507). Cumulative impacts result when the effects of an action (in this case, the Proposed Plan) are added to or interact with other effects in a particular place and within a particular time. It is the

combination of these effects, and any resulting environmental degradation, that will be the focus of cumulative impact analysis.

This cumulative analysis tiers off of the Cumulative Analysis found in the Northern and Eastern Mojave (NEMO) Proposed Plan/Final Environmental Impact Statement (BLM, 2002). The cumulative analysis in this document therefore does the following:

1. Briefly summarizes the previous NEMO cumulative analysis as it relates to Amargosa River ACEC issues;
2. Focuses on the relationship of the overall cumulative effects already discussed in the 2002 document and the specific analysis in this document for the Amargosa River ACEC planning area;
3. Clarifies and/or modifies, as appropriate, the previous cumulative analysis with new information from this analysis.

Cumulative Issues addressed in the NEMO Analysis

The cumulative analysis within the NEMO Proposed Plan/Final Environmental Impact Statement (EIS) addresses the following resources and activities/uses which may be affected by or may affect the planning area: vegetation and wildlife; air quality; cultural resources and Native American values; recreation resources and activities; minerals and mining; vehicle access; and socioeconomic resources. Major findings of the 2002 analysis included:

1. Overall in the relatively remote lands (such as those of the Amargosa River watershed), county governments project little to no growth due to lack of water and infrastructure. The exception in this area would be along the Nevada border in faster growing, urbanizing areas.
2. Off-highway Vehicle (OHV) use will continue to be focused in designated OHV open areas, such as the Dumont Dunes OHV Area immediately south of the Amargosa River ACEC. Because of route designations and the numbers of available routes, the opportunities for competitive events have been reduced by moderate amounts.
3. Opportunities for mining and future rights-of-ways are not anticipated to be substantially affected by the implementation of the NEMO Plan. There should be no negative effects on energy projects.
4. The NEMO Plan did not change current usage of the Chicago Valley Herd Management Area (CVHMA) within the Amargosa River watershed. The CVHMA does not have burro usage, but NEMO did limit wild horse numbers to closer match current populations found within the CVHMA. Along with other limitations in NEMO and the CDCA, opportunities to provide burro management areas have been moderately adversely affected in Southern California.
5. The Pahrump Allotment, which is only livestock operation in the Amargosa Valley, was not substantively affected by NEMO's changes to ephemeral forage allocations. The total economic effect of reduced livestock grazing in the CDCA is slight, given the sparse and infrequent nature of available desert forage.
6. Land acquisition and disposal strategies would continue in order to increase habitat manageability and investment in conservation management areas, including the Amargosa River watershed. Disposal of federal lands, including areas along the Nevada

border in the Amargosa watershed would help mitigate, or offset issues of tax base loss to local governments and encourage growth adjacent to existing areas of development.

7. Implementation costs would be relatively high for listed species protection and monitoring strategies, including within the Amargosa River ACEC.
8. Cultural Resources will be better protected, especially where they are co-located with special status species or located in designated conservation areas, including within the Amargosa River ACEC. Cultural resources will also be protected by the commitment to end unauthorized proliferation of new routes.

Overall, the NEMO plan, including measures within the Amargosa watershed, is anticipated to have a positive impact on the CDCA by protecting federally and State listed plants and animals and their habitats, as well as conserving riparian and upland communities and species, including various special status plants and animals. Many public comments on the draft plan/Draft EIS indicated that NEMO plan decisions would contribute to significant adverse cumulative effects, particularly to access and use of desert resources. However, in light of past actions and the potential for cumulative change from all current plans, BLM analysis shows that NEMO decisions would be cumulatively small and spread across several programs. NEMO proposes no additional withdrawals from mineral and land entry beyond Congressional designations and emphasizes addressing impacts through location, design, and mitigation. Mitigation and compensation costs would be higher in more sensitive conservation areas and lower in less-sensitive areas.

Relationship of NEMO Analysis and the Proposed Plan and Alternatives

This analysis focuses on specific management actions that implement the goals and objectives of NEMO (2002) within the Amargosa River ACEC and whether the Proposed Action or its Alternatives incrementally result in a substantial change in the previous NEMO analysis or result in substantial differences between the three alternatives. NEMO's cumulative analysis adequately addressed most issues and would not be substantially modified by the Proposed Action or its Alternatives. This is because either the majority of implementation actions were either identified or implied by the goals and objectives in the NEMO Plan and its Alternatives, or else they are unaffected by it. This includes all of the items identified in the summary of the NEMO analysis of the previous section.

One issue, however, that was not addressed with any specificity in the NEMO Plan was how recreation resources and activities would be managed and interpreted to the public. Recreation resources and uses may affect various aspects of the NEMO analysis. Based on the previous NEMO analysis, this supplemental cumulative analysis will focus on whether and how the adoption of the Proposed Plan would modify NEMO's cumulative effects with respect to:

- Enhancement or elimination of similar recreational opportunities to those occurring or proposed within the Amargosa River ACEC, in particular the Central Amargosa Unit, and associated socioeconomic effects
- Changes to cumulative resource protection or degradation, in particular to sensitive species, habitat, and water and cultural resources, based on the recreational and interpretation strategies of the Proposed Plan and Alternatives

Other Projects and Activities Considered in this Analysis

Generally, the same projects and activities were identified as the primary cumulative concerns for these issues as those projects and activities identified in the NEMO analysis. These include:

- Route Designation Efforts in Southern California: As stated in the NEMO Proposed Plan/EIS (2002), one of the CDCA Plan (1980) decisions included designations of routes of travel in limited use management areas. Updates to designations made in the mid-1980s were accomplished in the NEMO planning area in December 2002 and in June 2004. Updated designations have also been completed throughout Southern California, with a final set of updates in the West Mojave planning area in 2006.
- Fort Irwin Military Expansion Act of 2001: Legislation approved in 2001 expanded the U.S. Army's Fort Irwin boundary south, east, and west by about 130,000 acres, including approximately fifty-thousand acres that were within the 1987 NEMO Routes of Travel designation area. BLM administered, State, and private lands were transferred to the U.S. Army. Impacts of the action are subject to mitigation, as preliminarily identified in the Supplemental Draft Congressional EIS completed in April 2004.
- Other bioregional planning efforts in Southern California and western Nevada: These efforts address protection of sensitive and listed species and habitats, some of which are also addressed in this ACEC Plan, and may augment the overall beneficial cumulative effects to those species, as well as potentially affecting recreational opportunities within sensitive areas.
- California Desert Protection Act of 1994 (CDPA): Legislation that established sixty-nine wilderness areas, including nearly 3.8 million acres of BLM managed lands, the Mojave National Preserve (MOJA), and expanded Joshua Tree and Death Valley National Monuments and designated them as National Parks. With this act, half of the CDCA was included in military reservations, national parks, or wilderness areas. The remaining lands are equally split between private and BLM-managed public lands.
- Urban expansion and population growth: Populations and developments within and adjacent to the Amargosa River ACEC, or within easy driving distance are expanding. The most notable areas are the Las Vegas and Pahrump Valleys and the adjacent areas of southwestern Nevada. A secondary urban expansion phenomenon is occurring in areas of Southern California, including parts of San Bernardino and Riverside County that provide visitors to the area.

In addition, a few additional projects recently identified or currently underway deserve mention, because of their potential to affect the ACEC and its resource values. These include:

- Wind energy commercial development proposals: Currently several proposals are under consideration throughout Southern California, including one permitted testing right-of-way site in the Mountain Pass area and one proposed area north of Mountain Pass. Subsequent development of these sites has the potential to affect listed birds, including those identified within the Amargosa ACEC.
- Tecopa sewage treatment facilities: Strategies are currently under development by Inyo County to address existing leakage issues and the upgrade of facilities that may affect

recreational opportunities and the quality and quantity of wetland habitat in the Grimshaw Lake area of the Amargosa River ACEC.

Whether or not these projects are individually mentioned in the sections they have, or at least have the potential, for substantial effects based on the amount of land base they may affect, the change in land use they could produce, or the resources they may affect, not only within their boundaries, but within the ACEC (at least indirectly).

Resource Values and Uses That May Be Impacted By the Proposed Action or Alternatives

Located just south of the ACEC, Dumont Dunes OHV Open Area is the highest recreational visitor use area in the eastern half of San Bernardino County, with most of this use on holiday weekends in the cooler months. This OHV open area receives approximately 100,000 visitors per year. Most visitors come from the urban centers of southern California and Nevada such as Las Vegas, Pahrump, and Los Angeles. Sperry Wash Road, along the southern boundary of the ACEC, is an important secondary access to this OHV open area, and divides a very high use area from portions of the Kingston Range Wilderness located within the ACEC boundaries. It is anticipated that permitted and casual use activity associated within the Dumont OHV Dunes Open Area will moderately increase in the reasonably foreseeable future. A growth in OHV use is consistent with the continued population growth that the region anticipates.

The additional recreational opportunities, trail designations, interpretation, and maintenance within the ACEC under the Proposed Action supplements regional recreational opportunities available in the OHV open area. By providing different recreational opportunities, a broad spectrum of uses is provided. There is not a substantial difference in the types of recreational opportunities provided under the alternatives. However, providing information as to the availability of these opportunities and maintaining their quality as identified in the Proposed Action is likely to increase their use somewhat and assure a range of trail opportunities designed to meet current and future demand, as well as directing visitor use to areas that may sustain visitor use.

Alternative hiking and equestrian trail opportunities are available throughout public lands in the eastern Mojave Desert, but regionally, only the Amargosa River ACEC provides such a well-developed and accessible trail system within a riverine environment. Therefore, the minimum funding alternative would modestly adversely affect recreational opportunities in the ACEC over the long-term, through trail closure and rehabilitation.

There would be a minor negative impact to the perceived feeling of remoteness and first time discovery within wilderness under all alternatives. This happens on the River Trail because it is obvious to tell by the presence of the historic, National Register eligible T&T Railroad grade that humans were here before. This could also happen under the Proposed Action on the Catskull Canyon scramble trail if a single defined path wore into the landscape. After ten to twenty years, a noticeable wear pattern may become visible on the rocks, mud hills, and across the ridge. The visual impact of these traces would be nominal and would appear natural because there are

similar historic and prehistoric traces made by Aboriginal peoples, explorers, miners, and cattle throughout the ACEC.

Associated Socioeconomic Effects

The small towns of Tecopa and Shoshone depend in a large part on tourism related to the region's natural values to survive. These towns form the gateways to the ACEC's Central Amargosa Unit and to the eastern entrances of Death Valley National Park. The Pahrump Valley, located east of the ACEC in Nevada and California, contains the fast-growing small city of Pahrump. It is anticipated that the population in the Pahrump Valley will moderately increase in the reasonably foreseeable future and infrastructure and development will substantially increase in the Pahrump Valley to accommodate past, present, and future growth. This includes water systems and other water-intensive uses needed to support community infrastructure.

Over the next twenty years, growth will continue, whether or not the Proposed Action or its Alternatives are implemented. The particular strategy adopted will have a minimal impact on the cumulative effects of these changes or the area, except for a few individuals within the planning area.

Major past, present, and future socioeconomic changes in the area within and around the Amargosa River ACEC (the planning area and surrounding High Mojave Desert) include population changes, changes in the overall amount and relative types of economic activity, a growing diversity of job opportunities, and a need to meet increasing and diverse recreational needs. A more proactive ACEC plan provides the opportunity for a more coordinated response to ongoing socioeconomic changes, and therefore fewer unplanned stresses that may impact either the economies or infrastructure of the small, local communities near the ACEC or the important resource values that were the basis for ACEC designation. However, the overall cumulative effect from the implementation of any of the alternative ACEC Plan strategies on local communities, economies, and recreational needs is unchanged. These needs will continue to grow, and be met by this area as well as others nearby.

Resource Values and Uses That May Result In Cumulative Impacts to the ACEC

As stated earlier in this analysis, the 2002 NEMO amendment to the CDCA Plan adopted the goals and objectives, as well as many of the specific actions identified in this Proposed Action as part of its Amargosa vole and listed plant recovery strategies. Thus, the overall cumulative effect of the Proposed Action, and to a lesser degree the other Alternatives, is to sustain and enhance existing the riparian and wetland habitats, the vegetation communities they support, and the wildlife that uses this habitat. Increased use of the Amargosa ACEC and surrounding area is also anticipated to occur regardless of which ACEC implementation strategy is adopted. Therefore, a focused strategy that recognizes this increasing use and directs it to compatible use is what both the Trail and Interpretive Plans for the ACEC propose.

Throughout the California deserts there has been a long history of degradation and loss to riparian and wetland habitats resulting from human development and use. Recent efforts aimed

at conserving remaining riparian and wetland habitats, including those along the Amargosa River, cannot significantly reverse the overall cumulative trend, but do slow that trend and provide assurance that such habitats will not be completely lost.

The Proposed Action would restore the riverine system to something akin to its previous ability to sustain galleries of native trees in riparian habitat; moist or swampy conditions essential to the survival of the Amargosa vole and listed and sensitive plants; and flowing water that would sustain a stunning variety (considering the surrounding upland aridity) of fish, birds, amphibians, invertebrates, and mammals. The Proposed Action would do the best to protect water resources that sustain the ACEC's riverine system. With the addition of the Trail and Interpretive Plans, this alternative would also do the best to accommodate and inform the area's many visitors and direct them to the most appropriate locations to engage in their particular form of recreation. A well-accommodated and well-informed visitor will do the least harm to sensitive resources while enjoying their unique grandeur.

The lower-intensity management alternative (Alternative B) would accomplish the same overall goals as the Proposed Action but over a longer amount of time and with a different approach to recreational users. Law enforcement and compliance would become larger components of the strategy, and recreational and interpretation components would be focused on hiking users and major accessible locations. This alternative would target a narrower spectrum of users, but would also protect water resources thereby maintaining the ACEC values that attract visitors. The cumulative impacts from these changes are not substantial because equestrians would still have off-trail access throughout the ACEC.

The current management (No Action Alternative) achieves the objective of reversing degradation to the riverine system and would give listed species the ability to survive. This alternative would target the narrowest spectrum of recreational users, but water resources at protected. The loss of recreational opportunities does contribute to adverse cumulative effects discussed in NEMO (2002), but not to a substantial degree when compared to recreational access losses from large-scale changes such as the expansion of Fort Irwin or the passage of the California Desert Protection Act. Hikers and equestrians would still have off-trail access throughout the ACEC.

Cumulative effects of non-native, invasive weeds such as tamarisk were discussed in the NEMO analysis. Additional actions identified in all of the alternatives would not result in a contribution to the adverse cumulative effects of these weeds, and would to a greater or lesser degree, beneficially address the management of these weeds in the Amargosa watershed, as well as the associated degradation of habitat from weed infestations. The proposed Trail and Interpretive Plans or Alternatives do not substantively change these impacts.

Without water, the ACEC riparian and wetland ecosystems would cease to function and the Amargosa vole would become extinct except in captivity. The Proposed Action and its Alternatives will not substantially affect actions identified to protect water resources. However, other factors that are beyond the scope of this plan may substantially and even significantly affect water flow in the Amargosa River.

For example, within the next ten to twenty years development and agriculture on private land (including privatized lands resulting from public land disposals) within the Amargosa watershed will increase the demand for water for commercial, agricultural, and residential uses. Future, full-scale operations at Yucca Mountain may also tax this finite resource. Other water uses will pale in comparison to these two factors. The vast majority of increased water use will be from the pumping of ground water. The regional effects of increased ground water pumping on the Amargosa River can be modeled using the best available technology. The United States Geological Survey's (USGS) Death Valley Regional Flow System (DVRFS) model (Belcher, W.R., ed., 2004) is the current best available technology. The USGS model predicts potential negative impacts to ACEC water resources from ground water pumping as far away as the Pahrump Valley, Amargosa Farms, or Charleston View. Because the negative resource impacts from regional ground water extraction might not be obvious for years or even decades, it is critical that BLM better understand these predicted impacts. Additional data collection and modeling, however, will be required to more fully understand these predicted impacts. The USGS model can guide managers in siting monitoring wells for an effective early detection network and data collection for an embedded localized model of the lower Amargosa River. The Proposed Action does include monitoring of surface flows in the Amargosa Canyon.

With the absence of a State Adjudication or an Interstate Compact for the Amargosa River and no allocations provided for wild and scenic river or wilderness values, the cumulative effects of protection of water sources are uncertain. State and County governments will primarily be responsible for regulating the use of water resources. Interior agencies (USGS, NPS, BLM and FWS) have engaged in a cooperative effort aimed at facilitation of conservation planning and management actions using an ecosystem perspective; development of consistent protocols and methods for scientific research and resource monitoring; sharing of scientific information and data; and coordination of actions on regional water-resources issues (see Appendix H). The success of any future mitigation will depend on cooperative efforts with local citizens and these other governmental entities.

Cumulative impacts to cultural resources are anticipated and will be similar to direct and indirect impacts described under all of the alternatives. Loss or destruction of cultural resources within and adjacent to the Amargosa River ACEC has occurred because of increased use of these areas over time and is unavoidable. In addition, mitigation of impacts to cultural resources for actions approved in the plan by data recovery instead of avoidance would also result in cumulative impacts. Although avoidance is the preferred strategy, it is not always reasonably feasible. While overall, the Proposed Action and Alternatives result in a net benefit to cultural resources through resource protection and enhancement actions, specific actions may have deleterious effects on cultural resources.

Invasive weed management and other restoration activities may result in a loss of cultural resources and the context in which they were found. Consequential removal of cultural resources from the area during data collection constitutes an irreversible, cumulative, and residual impact to the site. Sites would rarely, if ever be completely excavated. Mitigation by data recovery results in a steady loss of archaeological sites, and reduces opportunities for interpretation in their natural context. Taken in conjunction with other reasonably foreseeable

past, present, and future actions, the overall effects of the proposed action or alternatives do not significantly contribute to this loss.

Residual Impacts and Irreversible and Irretrievable Commitments of Resources

As mentioned at the beginning of this chapter, residual impacts are not different from direct and indirect impacts, as mitigation has been incorporated into the alternatives. However, a brief discussion of some of the impacts that cannot be readily mitigated follows.

Biotic Resources

Some short-term loss of vegetation and habitat would occur in the interest of long-term ecological enhancements such as weed control and restoration. These short-term adverse effects would not result in significant losses relative to the overall presence of sensitive communities in the Amargosa River ACEC. No irretrievable or irreversible commitment of vegetation or wildlife resources is made.

Soil, Water, and Air Resources

Some short-term erosion and air quality impacts would occur during trail development and restoration activities. Continuing erosion would occur on steeper slopes along existing trails. These residual effects would not be substantial. Overall, residual effects to soils and water quality would be beneficial, from reduced salinity in riparian areas where tamarisk is replaced with native vegetation. No irretrievable or irreversible commitment of water and air resources is made. The slow, continual erosion process that occurs on steep slopes is not readily reversible because of the loss of native soil material; however, this is a natural geologic process and would not be substantially accelerated by the proposed action or alternatives.

Cultural Resources

All undertakings that involve ground-disturbing activities would require site-specific cultural analysis, which may include surveys, recording of historic and prehistoric sites, and determinations of eligibility of sites to the National Register of Historic Places. Potential impacts to Native American values would be analyzed. Mitigation measures would be identified and implemented if necessary. Avoidance of impacts to cultural resources is the preferred mitigation measure and avoids residual impacts, but is not always possible or feasible. To the extent feasible, sites determined eligible for the National Register of Historic Places that could be impacted by activities within the Proposed Action or Alternatives would be avoided.

A decision to mitigate impacts to cultural resources by data recovery, instead of avoidance and the consequential removal of cultural resources from the area constitutes a residual impact to the

site. Mitigation by data recovery results in a steady loss of archaeological sites and reduces opportunities for interpretation in their natural context.

Residual impacts to cultural resources include additional damage to and destruction of cultural resources because of the implementation of the Trail and Interpretive Plans or their alternatives. These impacts will be substantially offset by avoidance and interpretive activities identified in these plans to protect known significant cultural sites. Two exceptions to avoidance as the major strategy to protect cultural resources are the OSNHT and the T&T Railroad grade, both of which have continued to receive substantial use since their historic use that provided their cultural value. These many years of continued use has diminished and in cases substantially altered or lost the cultural integrity of these historic resources. However, evidence of earlier times remains in areas, and continues to be at risk until survey and recovery for potentially eligible properties is complete.

Long Term Productivity versus Short Term Use

This section addresses short-term use and long-term productivity for each alternative. Under the No Action Alternative, no short-term uses of the environment above existing conditions are identified, and it can be expected to result in minor benefits to long-term resource and economic productivity. The Alternative B involves minor short-term uses in support of threatened and endangered species protection and restoration, and can be expected to result in modest benefits to long-term resource and economic productivity. The Proposed Action involves minor short-term uses in support of threatened and endangered species protection, restoration, trail development, and maintenance, and is anticipated to result in modest benefits to long-term resource and economic productivity.

References

Belcher, W.R., ed., 2004. Death Valley regional ground-water flow system, Nevada and California—Hydrogeologic framework and transient ground-water flow model, U.S. Geological Survey Scientific Investigations Report 2004-5205, 408 p.

Broadbent, S., 1972. Archaeology Report In the *Amargosa Canyon-Dumont Dunes Proposed Natural Area* submitted to the Bureau of Land Management by The Pupfish Habitat Preservation Committee.

Bureau of Land Management, 1980. The California Desert Conservation Area Plan 1980 as amended. California Desert District. Riverside, California.

Bureau of Land Management, Desert Planning Staff, 1980b, Final environmental impact statement and proposed plan, Appendix XIV, Vol. G, CDCA, 208 p.

Bureau of Land Management, 1983a. Management Plan for Amargosa Canyon Natural Area: An Area of Critical Environmental Concern. Barstow Resource Area. Barstow, California.

Bureau of Land Management, 1983b. Management Plan for Grimshaw Lake Natural Area: An Area of Critical Environmental Concern. Barstow Resource Area. Barstow, California.

Bureau of Land Management, 2002. Proposed Northern and Eastern Mojave Desert Management Plan: Amendment to The California Desert Conservation Area Plan. A Final Environmental Impact Statement. California Desert District. Riverside, California

Bureau of Land Management, 2003. Biological Evaluation of Barstow Field Office's Proposed Salt Cedar Removal and Habitat Restoration Project at Grimshaw Basin, Amargosa Canyon, And Willow Creek Inyo and San Bernardino Counties, California. Barstow Field Office. Barstow, California.

California Wildlife Habitat Relationship System (CWHR). California Department of Fish and Game.

Cochrane, S.A. 1981. Status report for the Ash Meadows gumplant (*Grindelia fraxino-pratensis* Reveal and Beatley). Unpublished report to the U.S. Fish and Wildlife Service, Portland, Oregon.

D'Agnese, F.A., O'Brien, G.M., Faunt, C.C., Belcher, W.R., and San Juan, C., 2002, A three-dimensional numerical model of predevelopment conditions in the Death Valley regional ground-water flow system, Nevada and California: U.S. Geological Survey Water-Resources Investigations Report 02-4102, 114 p.

Dean Runyan and Associates, 1998. Economic Impact Analysis: Northern and Eastern Mojave Planning Area prepared for the National Park Service. Denver, Colorado.

Environmental Protection Agency, 1998. Clean Water Action Plan. Washington, DC

Fish and Wildlife Service. 1990. Recovery plan for the endangered and threatened species of Ash Meadows, Nevada. U.S. Fish and Wildlife Service, Portland, Oregon. 123pp.

Fish and Wildlife Service, 1997. Amargosa Vole (*Microtus californicus scirpensis*) Recovery Plan. Portland, Oregon. 43pp.

Fish and Wildlife Service, 2001. Southwestern Willow Flycatcher Recovery Plan. Albuquerque, New Mexico.

Godwin, L.H., Stephens, E.V., and Brock, C, 1976, Lands valuable for geothermal resources, southern California, map scale 1:500,000

Hay, R.L., 1985, Clays of the Amargosa Desert: International Clay Conference fieldtrip guidebook (Clays, and zeolites, Los Angeles, California, to Las Vegas, Nevada, p. 57-59.

Hillhouse, J.W., 1987, Late Tertiary and Quaternary geology of the Tecopa Basin, U.S. Geological Survey, Map I-1728.

Izett, G. A., R. E. Wilcox, H. A. Powers, and G. A. Desborough, 1970. The Bishop Ash Bed, a Pleistocene Marker Bed in the Western United States. *Quaternary Research* 1:121-132.

Jennings, C.W., Burnett, J.L. and Troxel, B.W., 1962, Geologic map of California, Trona sheet: Calif. Div. of Mines, map scale 1:250,000.

Kellogg, R. 1918. A revision of the *Microtus californicus* group of meadow mice. Univ. of California. Publ. Zool. 21:1-42.

Laymon, S.A. and M.D. Halterman. 1985. Yellow-billed Cuckoos in the Kern River Valley: 1985 population, habitat use, and management recommendations. California Department of Fish and Game, Nongame Bird and Mammal Section Rept. 85.06.

Laymon, S.A., P.L. Williams, and M.D. Halterman, 1997. Breeding status of the Yellow-billed Cuckoo in the South Fork Kern River Valley, Kern County, California: summary report 1985-1996. Admin. Rept. USDA Forest Service, Cannell Meadow Ranger District, Sequoia National Forest.

McClenaghan, L.R. and S.J. Montgomery. 1998. Draft Report: Distribution and abundance of the Amargosa vole (*Microtus californicus scirpensis*). California Department of Fish and Game.

Mozingo and Williams, 1980. Threatened and Endangered Plants of Nevada: an Illustrated Manual. Fish and Wildlife Service and Bureau of Land Management, Reno.

Norman, L.A., Jr. and Stewart, R.M., 1951, Mines and mineral resources of Inyo County, Calif. Div. of Mines, v. 47., No. 1, 223 pages.

Noris, R.M. and Webb, R.W., 1976, Geology of California, John Wiley & Sons, Santa Barbara, 365 p.

Rado, T.A., and P.G. Rowlands. 1984. A small mammal survey and plant inventory of wetland habitats in Amargosa Canyon and Grimshaw Lake Areas of Critical Environmental Concern. U.S. Dept. of Interior, Bureau of Land Management, Barstow Resource Area Office, Barstow.

Raisz, E., 1957, Landforms of the United States (to accompany *Atwood's Physiographic Provinces of North America*), map scale 1.4 inches = 100 miles.

Reveal, J.L. and J.C. Beatley. 1971. A new *Penstemon* (Scrophulariaceae) and *Grindelia* (Asteraceae) from southern Nye County, Nevada. Bull. Torrey Bot. Club. 98(6):332-5.

Reveal, J.L., C.R. Broome, and J.C. Beatley. 1973. A new *Centaurium* (Gentianaceae) from Death Valley Region of Nevada and California. Bull. Torrey Bot. Club. 100(6):353-6.

Rogers, Malcolm J., 1939. Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas. *San Diego Museum of Man Archaeological Papers* 3. San Diego, California.

Romero, M.A. (ed.) et al. 1972. Amargosa Canyon-Dumont Dunes Proposed Natural Area. Report submitted to the U.S. Dept. of Interior, Bureau of Land Management, by The Pupfish Habitat Preservation Committee.

Sawyer, J.O. and T. Keeler-Wolf. 1995. *A Manual of California Vegetation*. California Native Plant Society, Sacramento, California. 471pp.

Sharp, R.P., 1975, Southern California field guide, K/H Geology Field Guide Series, Kendall/Hunt Publishing Co., Dubuque, Iowa, 208 p.

Streitz, R. and Stinson, M.C., 1974, Geologic Map of California: Death Valley Sheet, California Division of Mines and Geology.

Sully, John M., Miriam A. Romero, and Robert D. Smith, 1972. *Amargosa Canyon-Dumont Dunes Proposed Natural Area*. A Report Submitted to the Bureau of Land Management by The Pupfish Habitat Preservation Committee, Montrose, California.

Taylor, G.C., 1986, Mineral classification of the Ash Meadows, Big Dune, Ryan, Pahrump, and Stewart Valley 15-Minute Quadrangles and High Peak 7.5-Minute Quadrangle, Inyo County, California, Calif. Div. of Mines and Geology, Open-File Report 86-10, 63 p.

Wayland, R.B., Calzia, J.A., and Docktor, R., 1963, Lands valuable for sodium and potassium, California, southern half, U.S. Geological Survey map (1:500,000) revised by BLM in 1985.

Wilkerson, G., Vredenburgh, L., Serenko, T.J. and Eyde, T.H., 2001, The Franklin Wells Hectorite deposits, Inyo County, California, unpublished BLM paper, 9 p.

Williams, C.D., T.P. Hardy, J.E. Deacon. 1982. Distribution and status of fishes of the Amargosa River Canyon, California. U.S. Fish and Wildlife Service, Sacramento Office.

Appendix B
Amargosa River Area of Critical Environmental Concern
Trail Plan

Trail System Overview

Trail plan prescriptions describe the desired management for each trail. Prescriptions take into account user preferences, setting, protection of sensitive resources, and other management activities. The first step in planning for trails involves determining the designed and managed uses for each trail.

The trail's designed use is the intended use that controls its design. This is determined by applying the standard agency trail specifications (Table B-1) which determines the subsequent maintenance parameters and the "footprint" of the trail. The trail's "footprint" includes the width of the tread, plus the horizontal and vertical clearances. Changing the designed use therefore prescribes changes to the tread width and clearances. There is only one designed use per trail or trail segment.

The managed use is the mode of travel that is actively managed and appropriate, considering the design and management of the trail. For example, a trail designed for pack and saddle will usually accommodate the managed use of hiking. The trail will have a wide tread with good horizontal and vertical clearance. Conversely, a trail designed for hiking may be too narrow or steep for other uses.

The next step in planning for trails involves assigning each trail to an appropriate trail class (Table B-3). These general classes identify applicable trail design characteristics. Five trail classes reflect the Recreation Opportunity Spectrum (Table B-4). The class designation determines the level of development and frequency of maintenance. The higher the class the more developed and maintained the trail would be. Trail classes also help determine the cost needed to meet quality standards.

During the planning process, three alternatives were developed for each proposed trail (Maps B-1 through B-3). Not all trials are constructed and maintained in each alternative. The class designation and alignment for each constructed and maintained trail, however, does remain the same in each alternative. Under some alternatives, trials that are either not built or are restored and have no class designation and alignment. While the class designation may remain constant for each trail in each alternative, the design use may change for individual trails in each alternative. Hence, the alternatives reflect the general size of the trail network and the trails' various design features and managed uses.

All proposed trails are located in the Central Amargosa Unit of the Amargosa River ACEC. Trails and uses will be periodically reevaluated based on anticipated or observed impacts to the ACEC and its resources.

Trail Plan Alternatives

Alternative 1: Under this alternative, the trail system is intended to provide the most complete network of designated trails in order to minimize off-trail use, damage to sensitive resources, and maintain the optimum mix of trail use. All trails in this alternative reflect the designed use of current on-going trail uses, but not all trails in this alternative are currently designated. With the exception of reroutes to protect sensitive resources, there is no proposed new trail building under this alternative. For some trails, there will be no or few improvements and these trails will only be signed. For several trails, there will be moderate to major improvements. Pack and saddle use is the most common design use in this alternative. The range of managed uses is kept low to minimize trail conflicts.

Alternative 2: Under this alternative, the trail system is intended to provide a complete network of designated trails, a minimum level of improvements, and subsequently fewer intrusions or environmental impacts. In this alternative, the type of designed use is constrained by the type of access and cost. This is reflected in the preference for designed use types that require the minimum amount of development. Hiking is the predominant designed use in this alternative resulting in possible off-trail equestrian use. This alternative's designed use requires fewer tread improvements and lower clearances. This alternative has the fewest managed trail uses and no proposed new trail building under this alternative.

Alternative 3: This no action alternative provides for a continuation of trail opportunities under existing plans. Trails currently exist to primary points of interest but a comprehensive trail network does not exist. In this alternative, trails built by the public without National Environmental Policy Act (NEPA) review and BLM authorization are trespass structures. Existing laws and policy require the removal of unauthorized improvements from public land. Trails in this alternative have a greater range of managed uses over the fewest number of managed trail miles. Under this alternative, much of the equestrian use will likely occur off-trail. There is no proposed new trail building under this alternative and some trespass trails will be restored.

Incompatible Trail Uses

Mountain bike use is prohibited in wilderness by 43 CFR 6302.20 and 43 CFR 6301.5. The designed and managed use for mountain bikes on the ACEC trail system is excluded from all alternatives to prevent conflicts with other users and to minimize the potential for harmful environmental impacts. This activity is not considered passive recreation and is inappropriate within the ACEC. Furthermore, the use of mountain bikes in the ACEC has the potential to accelerate impacts to sensitive natural resources. Potential impacts include increased erosion and disturbances to endangered species.

Proposed Trail Descriptions

Two ACEC trails have segments in wilderness. These are the Amargosa River Trail and the Catskull Canyon Scramble. Both provide recreation opportunities in the Kingston Range

Wilderness. These trail opportunities are managed in accordance with BLM *Management of Designated Wilderness Areas* (43 CFR 6300) and wilderness policy in BLM Manual sections 8560.06(A), .31B1 and, .31B3a(2). The policy states wilderness areas may be devoted to the public purpose of recreation.

Eight other trails provide recreational opportunities in non-wilderness portions of the Central Amargosa Unit and connect to each other at various points providing a variety of options for difficulty, length, and experience.

An initial condition assessment will be performed for all trails to document existing conditions and will include baseline photography for long-term monitoring. Trail segments will be reassessed on a periodic basis during routine trail system maintenance. A tiered response of increasing use restrictions would be applied when trends are identified that could result in adverse impacts to resources. These actions may include carrying capacity limits, creating new opportunities elsewhere, modifying interpretive information, or various types of use closures.

Amargosa River Trail: A hiking trail was designated on the Tonopah and Tidewater Railroad (T&T) grade in the 1983 Amargosa Canyon Natural Area Management Plan. This designation represented a compromise between allowing motorized access and closing the canyon to human use. The trail runs about six miles between Tecopa and China Ranch. In 1994, the California Desert Protection Act included about a half mile of the trail the Kingston Range Wilderness. The trail blends nicely into the wilderness character because the railroad grade, upon which it is situated, is one-hundred years old. Rain has weathered the banks of the grade, rounding the edges and creating riles in the same pattern found on the mud hills. At the current rate of erosion, the grade may last several hundred more years.

Overall, the railroad grade through wilderness is in fair condition and retains its original shape. Minor trail maintenance, however, would still need to be periodically performed. Maintenance would consist of trimming vegetation and clearing the tread to a maximum width of twenty-four inches. Non-mechanized hand tools will be used to complete all trail maintenance work. Trail maintenance will help to prevent visitors from becoming lost in a remote and inhospitable environment, prevent unauthorized trail maintenance[1], and protect wilderness values by keeping people on the trail and out of the sensitive riparian zones, cultural resources, or endangered species habitat.

Badlands Trail: This is more of a hiking opportunity than a trail. Visitors start from the China Ranch and go east up a canyon into the China Ranch Mud Hills, which are also known as the Badlands. The slope up the wash is gentle and free of obstructions with rock cairns marking the path. No other work has been done or is necessary to maintain this hiking opportunity. The visitor experience begins at an oasis in a green riparian zone. Visitors pass through a date grove, then transition into strangely configured mud hills devoid of vegetation. Traveling up the wash, the canyon narrows and cliffs in the mud hills loom high above. The canyon ends after about 1.5 miles at a sheer vertical cliff over one-hundred feet high.

[1] Unauthorized trail maintenance of this segment of trail has been previously documented by BLM.

Catskull Canyon Scramble: Catskull Canyon is a rugged canyon that has been used as a scramble trail for years. The path goes up a steep, windy, boulder-strewn canyon with spectacular scenic vistas. The narrow canyon fosters a sense of adventure in a very remote setting. There is no developed or maintained trail tread. A visitor register is proposed at the trailhead of this trail to document use levels. The route would be identified on trailhead signs and minimally marked at key turns. Hand constructed rock cairns would be made to mark the route. Limited marking of the route will help prevent visitors from becoming lost in a remote and inhospitable environment and to protect wilderness values by keeping people on the route and out of the sensitive riparian zones, cultural resources, or endangered species habitat.

Cowboy Canyon: This canyon is well suited for hiking and improvements are not needed. The canyon currently appears in a natural state and undisturbed. If designated, trailhead improvements would be required to prevent motorized access into the canyon. Suitable barriers include a five-strand tee-post fence or a post and cable barricade. The slope down this canyon trail is very gentle with a wide clear path on sand and gravel. At one point, the canyon narrows to twenty-five feet between the fifty-foot vertical cliffs. Closer to the Amargosa Canyon there are seeps with mesquite bosque and a few springs that support lush native riparian vegetation communities.

DD Crossover: This is an old short-cut trail about one and one-half miles long between the China Ranch and the Amargosa Canyon. The trail runs up the hill from the gift shop at the ranch. The trail twice doglegs to the north into different drainages as it works its way west. In some places, the trail is well worn and visible as it runs down the side of smaller drainages. There are some very steep, short sections where the trail crosses saddles between drainages. The trail becomes lost in the larger drainages and minor tread improvements would be needed through these sections. The entire trail would be identified with markers.

Grimshaw Lake Watchable Wildlife Trail: This is an existing, lightly used footpath on the T&T Railroad grade from Grimshaw Lake to Tecopa Hot Springs. It includes a spur to a wildlife viewing area. The viewing area is on a rock outcrop jutting into the playa. This trail was designated a hiking trail in the 1983 Grimshaw Lake ACEC Plan. That plan included an action to construct a wildlife viewing area east of the county park in Tecopa Hot Springs, upon acquisition of lands or an easement. The land recently came into the public domain and the trail and viewing area can now be improved to provide access for disabled trail users.

Mesa Trail: This trail is a three-mile loop on the mesa north of China Ranch. The trail starts out narrow, heading up a slope from the gift shop. The trail then heads north on the ridge top and merges with an old utility road that continues up to the desert pavement on the mesa top. On the mesa, the trail splits away from the old, unused service road and in another mile forks. The main fork continues east along the edge of the mesa and connects with China Ranch Road. Trail users can loop back on the road or re-trace their steps back down the trail. Meanwhile, back at the fork, those seeking a longer trip can

turn west and take a connector trail north into Cowboy Canyon. The Mesa trail includes good views of the China Ranch and the lower Amargosa Canyon. Large rocks painted white mark the trail.

Slot Canyon Trail: This short, one-mile roundtrip side-trail runs from the Amargosa River Trail south into a small side canyon west of the Amargosa Canyon. A small footbridge is tethered to the east bank of the river, providing access across the river to the side canyon. The trail, from the side canyon's mouth to its terminus, is not maintained because the force of ephemeral storm run-off periodically scours the narrow canyon.

Tecopa Hill Trail: This is an existing trail across the spine of the Tecopa Hills. Access to the south end of the trail is from Thom's Spring. The trail runs up the ridge to the nearest peak, and then crosses a saddle to the next peak. There is very little vegetation and the area feels open. The peaks are not very high and have easy slopes to ascend. Someone put forth great effort to line both sides of the trail with rocks, almost its entire length. A side trail, which is also rock-lined, connects the main trail to the first peak. The top of the peak is marked with a rock feature about fifteen feet across.

Willow Creek Trail: This scenic loop trail is about ten miles in length. The first four miles travel up China Ranch Wash from China Ranch. This trail segment is within the wash and provided vehicular access to an old home in the canyon that was below the Bon Mesa Overlook. The ruins of the residence, which was abandoned in the 1970s, still exist. There has been no vehicle traffic over this route in years and the route is now closed. The trail leaves the canyon just east of the Bon Mesa Overlook and climbs up the Trailhead Road (AR0413). The trail then follows a lightly used open route (AR0416) west along the north rim of the China Ranch Wash to China Ranch Road. The final leg of this route runs south along the China Ranch access road back to China Ranch.

Table B-1: Trail Designation and Standards

Trail Name	*Design Use, Managed Use*			*Trail Class*	*Trail Length*
	Alt 1	*Alt 2*	*Alt 3*		
Amargosa River Trail	HK, EQ	HK	HK	3	8.09
Badlands Trail	HK, EQ	HK	NO	1	2.04
Catskull Loop	SC	SC	NO	1	2.43
Cowboy Canyon Trail	HK, EQ	HK, EQ	NO	2	2.25
DD Crossover Trail	HK, EQ	HK	NO	2	1.17
Grimshaw Trail	HK, UA	HK, EQ	HK	4	1.76
Mesa Trail	HK, EQ	HK, EQ	RE	2	2.32
Slot Canyon Trail	HK, EQ	HK	NO	1	0.34
Tecopa Hill Trail	HK, EQ	HK	RE	2	1.01
Willow Creek Trail	HK, EQ	EQ	NO	2	9.89

Abbreviation	**Trail Use**	**Minimum Tread**	**Minimum Vertical Height**
HK	Hiking	30 inches	6 feet 6 inches
EQ	Equestrian	30 inches	10 feet
SC	Scramble	None	None
UA	Universal Access	36 inches	6 feet 6 inches
NO	None	None	None
RE	Restore	None	None

HK Hiking and foot travel. Typical minimum tread width is thirty inches, preferred is forty-eight inches, minimum acceptable is eighteen inches.

EQ Equestrian travel. Typical vertical clearance is ten feet, variations are allowed for special considerations.

SC Scramble trail, undeveloped trail travel. No tread improvements are made and signs or structures only where needed.

UA Universal access, handicap travel. Special parking, grading, trail access, and hardening to accommodate visitors with disabilities. Clearance variations not allowed.

NO No trail improvements. This refers to trails that do not exist or are unimproved. These trails would not be developed (there are none in the preferred alternative).

RE Restore trails created in trespass. These trails would be restored to pre-development condition (there are none in the preferred alternative).

Table B-2: Trail Mileage by Use

Plan Alternative	*Hiking*	*Equestrian*	*Scramble*	*Universal Access*	*Total Trail Miles*	*Miles to Restore*
One	0.00	27.11	2.43	1.76	31.30	0.00
Two	18.98	9.89	2.43	1.76	31.3	0.00
Three	09.85	0.00	0.00	0.00	09.85	3.33

Table B-4: Recreation Opportunity Spectrum (ROS) Setting Description

ROS Class	*Physical Setting*	*Social Setting*	*Managerial Setting*
Primitive	Area is characterized by essentially unmodified natural environment of fairly large size.	Concentration of users is very low and evidence of other users is minimal.	Only facilities essential for resource protection are used. No facilities for comfort or convenience of the user are provided. Spacing of groups is informal and dispersed to minimize contacts between groups. Motorized use within the area is not permitted.
Semi-Primitive Non-Motorized	A predominantly unmodified natural environment of moderate to large size characterizes area.	Concentration of users is low, but often other area users are evident.	Facilities are provided for the protection of resource values and the safety of users. On-site controls and restrictions may be present but are subtle. Spacing of groups may be formalized to disperse use and limit contacts between groups. Motorized use is not generally permitted.
Semi-Primitive Motorized	Same as Semi-Primitive Non-Motorized	Same as Semi-Primitive Non-Motorized	Same as Semi-primitive Non-Motorized except that motorized use is permitted.
Roaded Natural	A generally natural environment generally characterizes area. Resource modification and utilization practices are evident, but harmonize with the natural environment.	Concentration of users is low to moderate with a moderate evidence of the sights and sounds of humans.	On-site controls and restrictions offer a sense of security. Rustic facilities are provided for user convenience as well as for safety and resource protection. Facilities are sometimes provided for group activity. Conventional motorized use is provided for in construction standards and design of facilities.
Rural	A substantially modified natural environment characterizes area. Resource modification and utilization practices are evident.	Concentration of users is often moderate to high with the sights and sound of humans readily evident.	A considerable number of facilities are designed for use by large numbers of people. Facilities are often provided for specific activities. Developed sites, roads, and trails are designed for moderate to high use. Moderate densities are provided far away from developed sites. Facilities for intensive motorized use are available.

Table B-3: National Trail Management Classes

Trail Attributes [1]	***Trail Class 1*** *Primitive/Undeveloped*	***Trail Class 2*** *Simple/Minor Development*	***Trail Class 3*** *Developed/Improved*	***Trail Class 4*** *Highly Developed*	***Trail Class 5*** *Fully Developed*
Tread & Traffic Flow	• Tread intermittent and indistinct • May require route finding • Native materials only	• Tread discernible and continuous, but narrow and rough • Few or no allowances constructed for passing	• Tread obvious and continuous • Width accommodates unhindered one-lane travel (occasional allowances constructed for passing) • Typically native materials	• Tread wide and relatively smooth with few irregularities • Width may consistently accommodate two-lane travel • Native or imported materials • May be hardened	• Width generally accommodates two-lane and two-directional travel, or provides frequent passing turnouts • Commonly hardened with asphalt or other imported material
Obstacles	• Obstacles common • Narrow passages; brush, steep grades, rocks, and logs present	• Obstacles occasionally present • Blockages cleared to define route and protect resources • Vegetation may encroach into trailway	• Obstacles infrequent • Vegetation cleared outside of trailway	• Few or no obstacles exist • Grades typically less than 12% • Vegetation cleared outside of trailway	• No obstacles • Grades typically less than 8%

[1] Descriptions define typical attributes, and exceptions may occur for some attributes. Apply the Trail Class that most closely matches the managed use of the trail.

Constructed Features & Trail Elements	• Minimal to non-existent • Drainage is functional • No constructed bridges or foot crossings	• Structures are of limited size, scale, and number • Drainage is functional • Structures adequate to protect trail infrastructure and resources • Primitive foot crossings and fords	• Trail structures (walls, steps, drainage, raised trail may be common and substantial • Trail bridges as needed for resource protection and appropriate access • Generally native materials used in wilderness	• Structures frequent and substantial • Substantial trail bridges are appropriate at water crossings • Trailside amenities may be present	• Structures frequent or continuous; may include curbs, handrails, trailside amenities, and boardwalks • Drainage structures frequent; may include culverts and road-like designs
Signs	• Minimum required • Generally limited to regulation and resource protection • No destination signs present	• Minimum required for basic direction • Generally limited to regulation and resource protection • Typically very few or no destination signs present	• Regulation, resource protection, user reassurance • Directional signs at junctions, or when confusion is likely • Destination signs typically present • Informational and interpretive signs may be present outside of wilderness	• Wide variety of signs likely present • Informational signs likely outside of wilderness • Interpretive signs possible outside of wilderness • Trail Universal Access information likely displayed at trailhead	• Wide variety of signage is present • Information and interpretive signs likely • Trail Universal Access information is typically displayed at trailhead
Recreation Environs & Experience	• Natural, unmodified • ROS[1]: Typically Primitive setting • WROS[2]: Primitive	• Natural, essentially unmodified • ROS: Typically Semi-Primitive setting • WROS: Primitive to Semi-Primitive	• Natural, primarily unmodified • ROS: Typically Semi-Primitive to Roaded Natural setting • WROS: Semi-Primitive to Transition	• May be modified • ROS: Typically Roaded Natural to Rural setting • WROS: Transition (rarely present in wilderness)	• Can be highly modified • ROS: Typically Rural to Urban setting • Commonly associated with Visitor Centers or high-use recreation sites • Not present in wilderness

[1] Recreation Opportunity Spectrum
[2] Wilderness Recreation Opportunity Spectrum

Appendix C
Amargosa River Area of Critical Environmental Concern
Sign and Interpretive Strategy

This interpretive strategy guides the use of signs and interpretive tools to accomplish Amargosa River ACEC management goals and objectives. This strategy is limited in scope to site and message content because the primary methods for delivery are signs and personal messages. Additional, comprehensive regional interpretive strategies, as identified in other plans such as the Old Spanish National Historic Trail (OSNHT) General Management Plan, will likely involve additional messages and delivery methods such as visitor's centers, interpretive trails, etc. The opportunity may exist to include additional interpretive themes related to other Amargosa River resources in any future OSNHT interpretive strategies. Future interpretive strategies would be included in the environmental analysis of future management documents and would be subject to full public scoping at that time.

Sign Strategy

Existing identification signs for the Amargosa Canyon and Grimshaw Lake Natural Areas will be replaced with new Amargosa River ACEC signs. Existing mounting post will be re-used. New direction signs would guide travelers to the ACEC from Baker, Death Valley Junction, Shoshone, and Nevada State Highway 160. New site direction and identification signs would be installed for each trailhead, wayside exhibit, and overlook. A byline on the site identification signs would identify the name of the location. International recreation symbols would identify available types of activity. Direction signs would go on the adjoining paved road and direct traffic to the site while identification signs would be located along site entry roads and where visitors park their vehicles.

The OSNHT would be identified through the ACEC using symbols adopted in the OSNHT Comprehensive Management Plan. The Grimshaw Lake and Amargosa Canyon Watchable Wildlife Sites would continue using the same names. Regulatory signs would be installed where needed within the ACEC and on a case-by-case basis as determined by site-specific needs, use trends, and monitoring data. A *pack it in – pack it out* sign strategy would be used throughout the ACEC to encourage visitors to take their trash home with them. Wilderness and travel (route) management signs would conform to agency and California Desert District signing practices. This consists of posting relevant message decals on color-coded fiberglass markers. Only open routes of travel will be signed.

Open Routes and trails may be marked with unique identifiers. This would include the existing white rocks that mark the Mesa Trail and rock cairns marking the Sperry Wash Route, the Badland Trail, and the Willow Creek Loop Trail. Trail art would be incorporated, where appropriate, in related site specific plans for trails, kiosks, trailheads and overlooks. Destination and mileage signs would be located at key points along trails and at trail junctions. This includes

trailheads, junctions, and key geographical positions. Kiosks, wayside exhibits, interpretive sign panels, signs, mounting posts, and hardware will be maintained on an as needed basis.

Interpretation Strategy

This interpretive strategy covers the lower Amargosa River valley, from the Upper ACEC Unit near the Nevada border, to the south end of the ACEC. This greater planning boundary was adopted for the presentation of a consistent public message. Concern about the ecological health of the watershed, with special emphasis on riparian zones, was a primary factor driving the NEMO 2002 amendments to the CDCA Plan. Therefore, this strategy addresses interpretation on a landscape scale. There are several other special management areas to the south of the Amargosa River ACEC and they have their own management plans addressing additional sign and interpretive needs. These include Sperry Wash Route, Dumont Dunes Off-highway Vehicle (OHV) Area, and Salt Creek ACEC. Death Valley National Park, located just west of the Amargosa River ACEC addresses management and interpretation in its April 2002 General Management Plan (GMP) and accompanying EIS.

The ACEC plan includes two alternatives for interpretation. These are: the proposed action (alternative one) which is the implementation of this strategy and the no action alternative (alternative three) where implementation of existing plans will continue. Alternative two, the low intensity management alternative, is the same as the no action alternative.

In the proposed action, interpretation would occur at the sites on Map C-1 showing kiosk, trailheads, and overlooks. These sites were selected with two criteria: First, kiosks were located along primary routes visitors use to access the ACEC. At these locations, priority is given to a consistent message regarding sensitive ACEC resources. Second, sites were selected where there is good access to interesting or unique recreational opportunities. At these sites, the priority is to interpret the unique features of each location. Table C-1 identifies and prioritizes interpretive themes by site.

A consistent message about the ACEC resource values will be delivered using a multi-media approach. The proposed action accomplishes this through the development of kiosks on major roads leading into the ACEC. Each kiosk would have similar information about sensitive ACEC resources, and the appropriate human behavior necessary to avoid negative impacts. Concurrently, the same message would be delivered on a Barstow Field Office web page for the ACEC. Additional web pages will be prepared for the OSNHT and watchable wildlife sites. New content will be added about the area's cultural and historic points of interest to the existing Barstow Field Office cultural resources web page. The message content from these sources will be condensed into a site-specific brochure.

Additional interpretive material will be developed on a site-specific basis to explain unique resource values in the ACEC. This includes, but is not limited to, the 1903 Building along Willow Creek and the Borehole Hot Spring north of Tecopa. Interpretive signs would be installed along three trails. Along the Amargosa River Trail, signs will cover a range of cultural and natural resource topics while signs along Grimshaw Lake Watchable Wildlife Trail will

focus on endangered species and wetland habitat. Additionally, signs along the Tecopa Hill Trail will focus on history and hot springs. Signs would be small and site specific. Preferred mounting will consist of a single steel post.

Table C-1: Amargosa River ACEC Interpretive Themes for Trailheads, Wayside Exhibits, and Overlooks

	First Level Interpretive Themes	*Second Level Interpretive Themes*	*Third Level Interpretive Themes*
Basic Visitor Info Common to all Wayside Exhibits	• Site identification sign • Desert travel warnings and tips • Area map panel • Roads/type of condition/use • ACEC/wilderness boundaries	• Visitor services/amenities • Sites to see and things to do • WSR, OSNHT, T&T • Trailheads, exhibits, overlooks	• Interpretive topics • ACEC purpose & need • Amargosa riparian area/sensitive resources • Area rules and regulations/dos and don'ts • Wilderness dos and don'ts
1 Tecopa Trailhead	Amargosa River ACEC • Sensitive/riparian habitat • T&E species • Geologic background • Amargosa River pupfish and dace	OSNHT • National significance and history • Initial 1829 Armijo canyon route • Freemont/Carson 1844 trip • Nearby trail sites • 1848 Mormon trip/Mormon Road	Amargosa Wild and Scenic River • National system • Unique/rare desert river and ecology • Known river flow regime/history • Purpose and meaning of designation
2 China Ranch Trailhead	Large area map panel, including: • Roads, places, sites to see • Local services • Wilderness boundaries/corridors • OSNHT • Amargosa Wild and Scenic River • T&T, twenty mule team route	Amargosa River ACEC • Sensitive riparian habitat • T&E species • Geologic background • Desert spring ecology	Prehistoric Culture • Native Americans and their lifestyle • Four previous civilizations • Native food sources and resources
3 Cowboy Canyon Trailhead	• Small area map panel • Overview of main canyon • Overview of ACEC, purpose and need	Travel Management • Purpose for restrictions • Access opportunities and regulations • Route signing strategy	None

4 *Grimshaw* *Watchable Wildlife* *Trailhead*	Amargosa River ACEC • Sensitive/riparian habitat • T&E species • Geologic background • Amargosa vole and habitat • Marsh habitats and associated birds	History of Mr. Grimshaw/Tecopa • Early business owner • Namesake lake • History of Tecopa	Trailside Interpretive Signs • T&E species and their habitats
5 *Tecopa Hills* *Trailhead*	Small Interpretive Panel • Outline topographic map with trail • Desert hiking/protocol • Leave No Trace/Tread Lightly	Trailside Interpretive Signs • Native American local history • Early village named Yaga • Sites of historic hot springs	Overlook Panorama Signs • Common geographical features within visible range
6 *Hot Springs* *Trailhead*	Amargosa River ACEC • Sensitive/riparian habitat • T&E species • Geologic background • Amargosa vole and habitat • Marsh habitats and associated birds	Hot Springs • Subsurface water flow • Causes of hot springs • Associated sensitive habitat • Local spring history	Prehistoric and Historic • Local Native American history • Transportation along the river; then and now
7 *Tecopa Basin* *Wayside Exhibit*	Large Area Map Panel, including: • Roads, places, sites to see • Local services • Wilderness boundaries and corridors • OSNHT • Amargosa Wild and Scenic River • T&T, twenty mule team route	Historic Mining • Amargosa Borax Works and relation to Death Valley • Twenty mule team, springs, and feed • Regional mining history	Amargosa River ACEC • Free flowing WSR • Sensitive/riparian habitat • T&E species • Geologic background • American Indian trails, OSNHT, T&T
8 *Shoshone* *Wayside Exhibit*	Large Area Map Panel, including: • Roads, places, sites to see • Local services • Wilderness boundaries/corridors • OSNHT • Amargosa Wild & Scenic River • T&T, twenty mule team route	Travel Management • Purpose for restrictions • Access opportunities and regulations • Route signing strategy	None

9 *California Valley* *Wayside Exhibit*	Wilderness • Local wilderness areas: Kingston, Resting Spring Ranges, and Ibex • Philosophy and benefits • Wilderness dos and don'ts • Kingston Mountains and Needles Field Office opportunities	OSNHT • Initial 1829 Antonio Armijo route • Comparison to Mojave Road route • Mule travel/equipment/navigation	Amargosa River ACEC • Free flowing WSR • Sensitive/riparian habitat • T&E species • Geologic background
10 *Emigrant Pass* *Wayside Exhibit*	OSNHT • 1844 Freemont Trip • 1847 Mormon Battalion • 1848 first wagon Emigrants • San Bernardino-Salt Lake Road, Mormon Road	Wilderness • Purpose and meaning of designation • Philosophy and benefits • Wilderness dos and don'ts	Amargosa River ACEC • Free flowing WSR • Sensitive/riparian habitat • T&E species • Geologic background
11 *Bon Mesa* *Overlook*	Brief description of China Ranch Canyon morphology, age, and creation	Brief overview of local geography, and its relevance and importance to mining history	Possible route of initial 1829 Antonio Armijo travels on OSNHT
12 *Badlands* *Overlook*	Brief description of tertiary China Ranch beds; the badlands morphology, age, and creation	Panorama sign describing regional landmarks in viewshed	None
13 *Death Valley* *Junction* *Wayside Exhibit*	BLM Wild horse program • Purpose and meaning of designation • Philosophy and benefits • Wilderness dos and don'ts	Amargosa River ACEC • Free flowing WSR • Sensitive/riparian habitat • T&E species • Geologic background • American Indian trails, OSNHT, and T&T	Travel Management • Access opportunities and regulations • Purpose for restrictions • Route signing strategy

Maintenance Note: Selection of any of the alternatives includes the follow-up action to complete routine maintenance. This includes work on all related existing and new structures, access roads and trail improvements.

Appendix D
Species Accounts for Threatened and Endangered Species

The following are species accounts for the Amargosa vole, southwestern willow flycatcher, least Bell's vireo, Amargosa niterwort, Ash Meadows gumplant, and spring-loving centaury.

Amargosa Vole (*Microtus californicus scirpensis*)

The State of California listed the Amargosa vole as an endangered species on September 2, 1980 (Title 14 California Administrative Code, Section 670.5). The species was federally listed as endangered with designated critical habitat on November 15, 1984 (49 Federal Register: 45160). The species has an approved recovery plan (FWS 1997).

General Distribution

The Amargosa vole, also referred to as the Amargosa meadow mouse, is one of seventeen named subspecies of the California vole, *Microtus californicus* (Hall 1981). The entire range of the species encompasses the Coast Ranges, the Cascade Range, the Sierra Nevada Range (with the exception of high elevations), the Central Valley, the Peninsular Ranges, and the Transverse Ranges of California. The species also has been recorded in portions of Baja California. The subspecies *scirpensis* occupies bulrush marshes near Tecopa Hot Springs and Shoshone in southeastern Inyo County, California. Originally described as a distinct species, (i.e., *Microtus scirpensis* (Bailey 1900)), the scientific name *M. c. scirpensis* was re-assigned by Kellogg (1918).

The range of *M. c. scirpensis* is entirely within the Northern and Eastern Mojave Desert (NEMO) Planning Area. This endemic subspecies is restricted to marsh habitats along the Shoshone-Tecopa reach of the Amargosa River. Appropriate habitat also exists along several "feeder" springs and wet meadows located upslope from the river between the towns of Shoshone and Tecopa. The distribution of this subspecies appears to coincide principally with isolated bulrush (*Scirpus* spp.) and southern cattail (*Typha domingensis*) pockets that are not subjected to regular inundation during high precipitation events.

Natural History

The Amargosa Vole is a large microtine, averaging eight inches (20.3 cm) in total length (Kellogg 1918). The fur is bright brown, ranging from cinnamon buff to "buckthorn" brown. Tail length averages 2.5 inches (6.3 cm). The eyes are small and the ears are inconspicuous and fur-covered. Distinguishing characteristics include the "bright" fur and a small skull with a comparatively large zygomatic width. *M. californicus* can be distinguished from all other members of the genus by the shape of the incisive foramen (Ingles 1965). However, no other microtines are sympatric with the Amargosa vole.

Amargosa voles construct runways in grassy wetland habitats by clipping vegetation. These runways often lead to shallow burrows in friable soil. Little specific information regarding the natural history of *M. c. scirpensis* is available, and much of the following text is taken from accounts of other subspecies. California voles are active year-round and during both night and day. The size of their home range is typically small, with at least one study (Krebs 1966) indicating a dispersal distance of less than four-hundred feet. They forage primarily on the stems and leaves of grasses and forbs, with green emergent vegetation comprising the bulk of the diet. Due to an inability to concentrate urine, California voles require regular intake of large amounts of water, meeting or exceeding ten percent of body weight per day (Batzli and Pitelka 1971). Most voles will switch to eating grass seeds during the drier parts of the year. Peaks in reproductive activity correspond to times when food and cover are abundant.

The gestation period for California Voles averages twenty-one days, and litter size ranges between one and eleven (Gill 1979). The species undergoes two- to four-year cyclic irruptions (Batzli and Pitelka 1971), and cyclic vole population explosions may result in intensive interspecific competition for available resources (Heske *et al.* 1984). California voles are a prey species for a variety of predators including diurnal and nocturnal raptors, mammalian carnivores, and snakes. The Amargosa vole is suspected to contribute to the diet of great horned owls (*Bubo virginianus*) in the Grimshaw Lake Basin. Life expectancy of this vole subspecies is very short, with average adult longevity estimated at eight to twelve weeks (Pearson 1985).

Habitat Requirements

The Amargosa vole is found in moist habitats (meadows, freshwater marshes, and pastures) in the vicinity of the Shoshone-Tecopa reach of the Amargosa River (Murphy and Freas 1989). Suitable habitat for the subspecies begins at Shoshone, California and extends downstream to the northern end of the Amargosa Canyon. Ponds, meadows, and hot spring outflows occurring in proximity but upslope from the Amargosa River, also provide habitat.

Associated wetland vegetation is dominated by reeds (*Juncus* spp.), bulrush (*Scirpus olneyi*) and cattails (*Typha* spp.), with southern reed (*Phragmites australis*), arrow weed (*Pluchea sericea*), iodine weed (*Suaeda torreyana*), and quail bush (*Atriplex lentiformis*) forming the overstory plant component (Murphy and Freas 1989). Understory plants generally include yerba mansa (*Anemopsis californica*) and saltgrass (*Distichilis spicata*).

Elevations of known *M. c. scirpensis* localities range between 1329-1569 feet. Areas that are not subjected to flooding by the Amargosa River, such as upslope "feeder" springs and creeks may provide refuge for the species during flooding. Upland habitat adjoining occupied wetland habitat is used by the species during unusually high water levels (Thelander 1994).

Threats Analysis

The primary threat to the Amargosa vole is the destruction and fragmentation of the limited habitat available to this subspecies. Past development of "hot spring" spa facilities and associated campgrounds, as well as road construction and residential development, have all contributed to reduced and fragmented suitable habitat for Amargosa vole. Any additional streambed alteration, such as local groundwater depletion, road construction activity, or geothermal mining, which tends to reduce the extent of wetlands/meadows along the Shoshone-

Tecopa segment of the Amargosa River, is considered a primary threat to this subspecies.

Secondary threats to the subspecies include agricultural development, channelization of surface water, and spread of salt cedar (*Tamarix ramosissima*). The latter exotic plant displaces native plants, alters the composition and structure of native plant communities, and generally "dries" up wetland and meadow habitats. Competition from introduced house mice (*Mus musculus*) and predation by domestic cats (*Felis silvestris*) has also been identified as a threat to the Amargosa vole (CDFG 1992). The restricted range of this vole subspecies makes it susceptible to natural catastrophic events such as flooding and drought, and to genetic inbreeding depression and demographic bottlenecks typical of small populations. A majority of all suitable habitat for this subspecies is in Federal ownership as BLM managed public lands.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

The southwestern willow flycatcher was federally listed as endangered on February 27, 1995. Critical habitat was designated in July 22, 1997, but no critical habitat exists in or near the ACEC. A recovery plan for the species has yet to be prepared.

General Distribution

The willow flycatcher is a nearly transcontinental species, breeding across temperate North America. All subspecies of the willow flycatcher are completely migratory. The species as a whole winters from southern Mexico south through Central America to Panama and western Venezuela. It consists of four subspecies (*contra* Browning 1993).

1. Nominate *traillii* (including *campestris*) breeds in the Great Plains region and has extended its range into the northeastern U.S.
2. *E. t. adastus* breeds in the Great Basin and central Rocky Mountain region, south to Utah and Colorado.
3. *E. t. brewsteri* breeds in the Pacific Northwest and south in the Sierra Nevada in central California.
4. *E. t. extimus* breeds in southern California (north to the Santa Ynez River, Kern River, and Independence on the Owens River), southern Nevada, southern Utah, Arizona, New Mexico, and extreme western Texas. A few records suggest rare or sporadic breeding in northwestern Baja California and northeastern Sonora. Subspecies *extimus* differs from the other two western races by its paler upper parts and lack of contrast between crown and back. Dark centers to the crown feathers often contrast with the paler olive tips, generating a dappled effect.

Subspecies *extimus* has been collected in winter in Guatemala, El Salvador, Honduras, and Costa Rica (Unitt 1997). Otherwise, the winter distribution and ecology of the subspecies remain unknown.

Because the species is strongly migratory, migrants of the more northern subspecies occur commonly in the breeding range of *extimus*. Southern California lies across the main migration route of *brewsteri*, and specimens of *brewsteri* outnumber specimens of *extimus* in collections from the range of the latter. Since the population crash of *extimus*, almost all willow flycatchers

seen in southern California are *brewsteri*. *Extimus* is usually encountered only at the few sites where it breeds.

Subspecies *extimus* arrives in spring, usually in early May, rarely as early as the last two or three days of April. Occasionally, arrival of birds is delayed until the third week of May. In fall, the adults depart mainly during the last half of August, remaining rarely as late as early September. Juveniles remain later in September but all have departed by October.

Distribution in the California Desert Conservation Area (CDCA)

Confirmation of the occurrence of the southwestern willow flycatcher (*E. t. extimus*) is based on a single specimen, a male with "testes large" collected at Oro Grande on May 26, 1920 (Museum of Vertebrate Zoology 40543). However, the occurrence of this subspecies just to the west at Weldon on the South Fork Kern River, to the north at Independence, and to the east along the Colorado River imply that any population of willow flycatchers nesting in the CDCA in Kern, San Bernardino, Riverside, or Imperial counties would likely be *extimus*. Any population occurring in Inyo County could be either *extimus* or *brewsteri*. The subspecies *brewsteri* also occurs as a regular spring and fall migrant throughout the CDCA.

Recent surveys in 2005 and 2006 by Point Reyes Bird Observatory (PRBO) have indicated *extimus* presence along the Amargosa River. While no breeding behavior was detected, two males attempted to establish territories but were unsuccessful in attracting mates.

Natural History

The southwestern willow flycatcher has grayish olive upper parts, a whitish throat, a pale gray tinge on the breast, and a pale yellow-tinged belly. The dark gray wing feathers are edged paler, olive on the coverts (forming wing bars), and pale grayish on the secondaries, especially the tertials. The bird weighs about twelve to thirteen grams, has a wingspread of around 8.1-8.7 in., and is around 5.5-5.9 in. long.

The southwestern willow flycatcher closely resembles several other small flycatchers of the genus *Empidonax* as well as the western wood pewee (*Contopus sordidulus*). It differs from the other species of *Empidonax* by its near lack of a pale eye ring and from the western wood pewee by its smaller size, paler, more olive upper parts, and habit of wagging the tail. The song of the southwestern willow flycatcher is characteristic: "witcha-pew," commonly rendered "fitz-bew" in the literature. The species is not easily identified by the inexperienced; intensive study in both the field and museum is essential for reliable identifications, in the field or in the hand. Studies of non-singing birds that are not supported by such experience (e.g., Yong and Finch 1997) lead to inaccurate data. The subspecies can be identified reliably only through comparison of museum specimens.

Like most other flycatchers, the southwestern willow flycatcher is a diurnal insectivore, catching its prey on the wing usually in the midstory of riparian woodland. Males maintain and advertise a territory by singing. Territorial defense begins immediately after spring arrival. Females occasionally sing, apparently when stimulated by territorial disputes (Seutin 1987, Sogge *et. al.* 1997). Most birds are monogamous within one breeding season, but ten to twenty percent of

males have two mates, and one instance of trigyny is known from the South Fork Kern River. Not all territorial males mated.

Territory sizes of *extimus* along coastal southern California range from 0.097-0.18 acres (Haas pers. comm.), and in the Grand Canyon from 0.036-0.2 acres (Sogge *et al*. 1997). A study in Wisconsin found that territory size is apparently independent of population density. Population density in suitable habitat can range up to six females and five males in 1.78 acres (0.75 females per acre), as observed along the South Fork Kern River (Whitfield pers. comm.). The birds use a home range larger than the defended territory.

Nests are initiated usually within one week of pair formation, ten to fourteen days after spring arrival. Building nests takes three to eight days. The nests are open cups, attached by the sides to slender stems and twigs, which may be vertical, horizontal, or slanting. Nests may be in an upright crotch or without support from below. Nest material often trails from the bottom of the cup. Only the female builds the nest. The nest substrate varies greatly by site. In historic egg collections from southern California, eight-six percent of nests were in willows (*Salix* spp.), four percent in stinging nettles (*Urtica dioica*), and ten percent in other plants (Unitt 1987). On the South Fork Kern River, seventy percent were in willows, ten percent in stinging nettles, and fifteen percent in both (Whitfield pers. comm.). On the San Luis Rey River, however, a canyon rather than floodplain site, nests have been in coast live oak (*Quercus agrifolia*). Materials used in the nest include bark, plant fibers, stems, and grass in the cup, grass, animal hair, plant down, feathers, and spider cocoons in the lining. The height of the nest above the ground is highly variable. In historic egg collections from southern California, the range is two to eighteen feet, mean 7.5 feet (Unitt 1987). Data that are more recent also show much variability: range two to thirty-three feet on the South Fork Kern River (Whitfield pers. comm.), two to twenty-eight feet on the San Luis Rey River (Haas pers. comm.).

Egg clutches may begin as early as May 24 (historic egg collections); recent studies found the earliest clutches initiated on May 25 on the South Fork Kern River (Whitfield pers. comm.) and June 5 on the San Luis Rey River (Haas pers. comm.). The median date for ninety-two first nest attempts on the South Fork Kern River from 1989 to 1995 was June 12 (Whitfield pers. comm.). The clutch consists normally of three or four eggs; two-egg clutches are rare, five-egg clutches very rare. In historic egg collections, the average clutch size in coastal southern California is 3.4 eggs, along the Colorado River, 2.8 eggs. Along the South Fork Kern River, Mary Whitfield has found a mean size of 3.78 eggs in first nest attempts, 2.78 in second nest attempts, and 2.29 in third or fourth nest attempts. The incubation period is twelve to thirteen days from the laying of the last egg. Only the female incubates. The young fledge at an age of twelve to fifteen days. They may disperse from their natal territory fourteen or fifteen days after fledging, but they remain longer when, as usually occurs, no second clutch follows.

Viable clutches may be laid as late in the summer as July 16. The latest recorded dates for eggs are July 30 (historic southern California egg collections) and July 31 (Whitfield pers. comm.; South Fork Kern River). Singing decreases through July, ending in the last week of July or first week of August.

Habitat Requirements

The southwestern willow flycatcher breeds only in riparian woodland, typically adjacent to or even over water. Surface water or saturated soil is usually present in or adjacent to nesting sites during at least the initial portion of the nesting period (Muiznieks *et al.* 1994, Tibbits *et al.* 1994). Riparian woodland used by willow flycatchers typically has a tree canopy and an understory of shrubs or saplings. The vegetative composition of the habitat varies greatly from site to site. Native willows dominate the habitat commonly represented in historical records, and in areas is still occupied as breeding sites on the South Fork Kern, Santa Margarita, and Santa Ynez rivers in California. Along the San Luis Rey River, the plant species are more varied, with ash (*Fraxinus spp.*), alder (*Alnus spp.*), and coast live oak being major components of the overall plant community. At some sites in Arizona, as at Roosevelt Lake and in the Grand Canyon, the southwestern willow flycatcher currently occupies nearly pure stands of mature nonnative tamarisk (e.g., Spencer *et al*. 1996, Sogge *et al.* 1997), though the species undoubtedly used native willow thickets in the area prior to tamarisk invasion. In very low deserts, however, as along the Colorado River south of Lake Havasu, this flycatcher currently makes little if any use of tamarisk woodland. Young tamarisk thickets are not occupied anywhere. Near the Gila River in New Mexico, *extimus* occupies floodplain forest dominated by cottonwoods and boxelders (*Acer negundo*) and narrow strips of riparian vegetation, including the nonnative Russian olive and tamarisk, along networks of water-diversion ditches (D. Zimmerman in press). Because this flycatcher frequently nests adjacent to water, aquatic plants such as cattail, bulrush, and (along the San Luis Rey River) broadfruit bur-reed (*Sparganium eurycarpum*) are a conspicuous element of the habitat. Clearly, water and vegetation structure are important to this flycatcher; but plant-species composition apparently is not as important. Studies in Arizona find the birds selecting the densest riparian vegetation available (e.g., Spencer *et al*. 1996). Other ongoing studies indicate that reproductive success is highest at breeding locales comprised of native vegetation rather than tamarisk. In many desert riparian areas, the general drying effects of tamarisk over time usually outweigh any potential short-term benefit of suitable nesting structure.

Threats Analysis

Synergy between loss and degradation of riparian habitat and brood-parasitism by the brown-headed cowbird (*Molothrus ater*) seems responsible for the southwestern willow flycatcher's decline (Unitt 1987). Loss of riparian wetlands has been especially severe in California, estimated at ninety-one percent. In coastal southern California, these losses have been due largely to conversion of floodplains to agriculture (and then commonly to cities) and flood-control projects. In Arizona and New Mexico, overgrazing by cattle has been an important factor. Overgrazing can degrade southwestern willow flycatcher habitat both directly and indirectly. Cattle eat and trample the vegetation on which the flycatcher depends, removing the understory. On a broader scale, overgrazing removes vegetative cover that assists rain in permeating the ground water tables decline and wetlands dry out, eliminating flycatcher habitat. Other processes that disrupt water tables, such as over-pumping of ground water, urban use, or compaction of the soil, which accelerates water runoff, also adversely affect the southwestern willow flycatcher's habitat.

Brood-parasitism by the brown-headed cowbird is also a major negative factor on the southwestern willow flycatcher. For example, Harris (1991) found that cowbirds parasitized at

least sixty-eight percent of southwestern willow flycatcher nests on the South Fork Kern River and that cowbird parasitism was the leading cause of nest failure. The flycatchers may accept the cowbird eggs, in which case they invariably raise cowbird young if the cowbird lays shortly after the flycatcher. Even if the cowbird lays eggs too late in the flycatcher's incubation period to be assured sufficient incubation, it typically removes one of the host's eggs, reducing the number of young the flycatcher can raise. More frequently, the flycatchers abandon the parasitized nest and start their nesting cycle over. Repeated cases of parasitism may lead to repeated nesting attempts, reducing the birds' efficiency, often to zero. Because the birds arrive so late in the spring, the southwestern willow flycatcher's breeding season is among the shortest of North American songbirds, heightening the species' sensitivity to disruptions to its breeding cycle of any sort.

Significance of Desert Populations

The minimum requirements necessary for a self-sustaining population of the southwestern willow flycatcher can only be guessed under the current state of knowledge. Nesting birds defend only a small territory of less than 0.2 acre (Sogge *et al*. 1997, Haas pers. comm.). Several pairs may pack themselves into suitable habitat at close to this density. Along the San Luis Rey River, where the birds are arranged in a narrow linear strip, the population consists of about thirty-five pairs in three miles (Haas pers. comm.). In Arizona, sites of stands of riparian woodland occupied by southwestern willow flycatchers ranged from 0.12 (in montane willows) to twenty (in low-elevation tamarisk) acres (Spencer *et al*. 1996).

Although the southwestern willow flycatcher maintains some degree of fidelity to its nesting sites, this fidelity is not absolute. Birds shift from site to site from year to year, complicating the question of the size of a viable population. Good information on how this vagility affects the bird's population dynamics is possible only with multiple populations intensively banded over several years. Such a banding effort only began in 1996; because the effort depends heavily on volunteers and the vagaries of the permitting procedures, the future of the banding effort is uncertain.

The southwestern willow flycatcher's remaining population is distributed among both larger populations or colonies and isolated scattered pairs and individuals. Fluctuations of flycatchers in the Grand Canyon show that the isolated pairs are *not* self-sustaining (Sogge *et al*. 1997). Data currently available are not sufficient to reveal whether any population or colony is self-sustaining. Alleviation of parasitism pressure through cowbird trapping has not resulted in immediate population increases, at least on the Kern River (Whitfield pers. comm.). Evidently, all the negative influences on the species have not been identified and mitigated effectively.

Because the viability of the current population is open to question, the species cannot be considered recovered until its numbers are substantially greater than they are currently. Because of the questionable contribution of isolated pairs, the estimate should take into account substantial colonies only. Multiyear experience along the San Luis Rey River suggests that a population of thirty-five to thirty-eight pairs may be self-sustaining, at least in the short term, if high nesting success can be maintained by eliminating cowbirds. Twenty-five colonies of forty pairs each, in combination with intensive cowbird trapping at each, yields a total population of one-thousand pairs, which may have a chance of sustaining itself.

The Desert has never been reported as an important region for the southwestern willow flycatcher. Currently, the birds appear to use the area only sporadically. Apparently, at present, the habitat is only marginally suitable. However, it is quite possible that the Mojave River once supported a significant population that was extirpated before it was reported by biologists. The Kern River offers an intriguing parallel. On both the Kern and Mojave Rivers, *Empidonax traillii extimus* is known from a single historic specimen. The birds of neither area were thoroughly inventoried and reported on in earlier literature. Yet, now the Kern River is the site of one of the subspecies' key populations, presumably as a relict. The Mojave River may once have had an equally important role, suggesting it as a focal site for restoration attempts.

Least Bell's Vireo (*Vireo bellii pusillus*)

The least Bell's vireo was federally listed as endangered on May 2, 1986, and critical habitat was designated in 1994. A recovery plan for the species has not been completed.

General Distribution

The least Bell's vireo is a subspecies of the Bell's vireo. The Bell's vireo breeds in the southwestern United States and northwestern Mexico, northward through the Great Plains of the central United States to the southwestern fringe of the Great Lakes (Brown 1993). This species winters in southern Baja California; on the Pacific slope of mainland Mexico from Sonora south through northern Nicaragua (Brown 1993); and on the Atlantic slope from Vera Cruz south to Honduras (AOU 1998).

Distribution in the California Desert Conservation Area

The least Bell's vireo historically bred in California and adjacent northwestern Baja California (Wilbur 1980, Garrett and Dunn 1981). It now largely occurs in cismontane southern California, but it does extend into transmontane areas along the western flank of the Anza-Borrego Desert (San Diego County; Unitt 1984), in the vicinity of Palm Springs (Riverside County; McGaugh pers. comm.); at Leona Valley (Los Angeles County; summering, breeding not proven; K.L. Garrett in press); and in San Bernardino County: at Morongo Valley; along the Mojave River (Patten 1995, S. J. Myers in press); and along the Amargosa River near Tecopa and Willow Creek (Garrett and Dunn 1981). It has also been recorded as a migrant at Smith Spring, on the western flank of the Kingston Mountains just upslope from Amargosa Canyon (Stone and Sumida 1983). The species is suspected to use Cushenbury and Old Woman Springs at the base of the San Bernardino Mountains. Appropriate riparian areas occurring along the north slope of the San Bernardino Mountains that connect desert and montane habitats (including Cushenbury Springs) provide migratory use areas for the species and may provide breeding habitat. Recent surveys by Point Reyes Bird Observatory (PRBO) in 2005 located least Bell's vireo nesting in the northern portion of the Amargosa Canyon. The same pair returned to the nest in 2006 and made two nesting attempts, both of which were parasitized by brown-headed cowbirds. Eighteen observations were made in 2006. Additionally, there are breeding records for this subspecies just north of the CDCA in the southern Owens Valley of Inyo County, and it regularly breeds just northwest of the CDCA at the South Fork of the Kern River Preserve (Kern County; Heindel pers. comm.). Elsewhere within the CDCA, the Bell's Vireo is an occasional migrant.

The eastern limit of the range of the least Bell's vireo in California is poorly defined, in that the ranges of the state and federally listed least Bell's vireo and the state listed Arizona Bell's vireo (*V. b. arizonae*) in California are based more on supposition than on direct evidence. It is generally believed that the Arizona Bell's vireo is confined to the Lower Colorado River Valley, whereas the least Bell's vireo occurs in cismontane southern California and on the western edge of the California deserts extending north up the Mojave River into the Owens Valley and eastward into Death Valley National Park, along the Amargosa River and at Fort Piute in the East Mojave Desert (Goldwasser 1978, Goldwasser *et al*. 1980, Garrett and Dunn 1981, Regional Environmental Consultants 1986, Franzreb 1987a, Franzreb 1987b, Franzreb 1989, Brown 1993, Small 1994).

Natural History

Because of its lively, complex song, Bell's vireo is a conspicuous member of riparian habitats. However, given its penchant for dense vegetation, it is far more often heard than seen. Its song belies its rather subtle, drab plumage: this small passerine is basically olive-gray (with emphasis on the latter in *V. b. pusillus*) above with a single faint wingbar, a thick bill, thin but distinct "spectacles," and a long tail that is flipped expressively from side-to-side. In overall plumage and behavior, this species most closely resembles a gray vireo (*V. vicinor*), a species with a very different song that occurs in pinyon-juniper and redshank-chaparral associations.

The least Bell's vireo and the Arizona Bell's vireo differ slightly in size and subtlety of color, with the latter being slightly smaller and more brightly colored (Ridgway 1904, Phillips 1991). Specimens of Bell's vireo from eastern California (e.g., Death Valley) have been identified as least Bell's vireo (Ridgway 1904, Grinnell 1923). However, these specimens were taken in spring (Fisher 1893, Grinnell 1923), when the plumage of a Bell's vireo can be quite worn (Unitt 1985), thus confounding subspecific identification. An examination of specimens at the Natural History Museum of Los Angeles County, the Museum of Vertebrate Zoology, University of California, Berkeley, and elsewhere indicates that evidence for defining the eastern extent of the range of least Bell's vireo is weak (Patten unpubl. data, A.R. Phillips in press, N.K. Johnson in press). Seven external characters have proven useful in distinguishing these subspecies (Ridgway 1904, Phillips 1991): exposed culmen length, wing chord, tail length, rump color, flank color, mantle color, and undertail covert color. These subspecies may also have slight differences in song (Hays pers. comm.), and they apparently differ in habitat choice (see below).

The least Bell's vireo arrives on its breeding grounds in mid-March (Brown 1993), with males arriving slightly before females (Nolan 1960, Barlow 1962). This vireo shows a high degree of nest site fidelity (Greaves 1987). Most individuals depart by September (Brown 1993), although some individuals remain on their breeding grounds into late November (Rosenberg *et al*. 1991). The winter range of this subspecies is not well known, however, it winters in Baja California and southern Sonora along the west coast of Mexico, with occasional individuals remaining through the winter in cismontane southern California (there is also a record for the Sonoran Desert at this season, although the subspecies is not known).

Nesting takes place from early April through the end of July, with two broods usually attempted. Nests are suspended from forks in dense bushes or small trees. Over sixty species of plants have

been used by Bell's vireos for nest sites (Brown 1993), but the least Bell's vireo predominantly uses willows (*Salix* spp.). The Bell's vireo feeds almost exclusively on arthropods, with insects and spiders comprising over ninety-nine percent of their diet (Brown 1993).

Habitat Requirements

The Bell's vireo occurs in riparian habitats. The least Bell's vireo typically breeds in willow riparian forest supporting a dense, shrubby understory of mule fat (*Baccharis salicifolia*) and other mesic species (Goldwasser 1981, Gray and Greaves 1984, Franzreb 1989). Oak woodland with a willow riparian understory is also used in some areas (Gray and Greaves 1984), and individuals sometimes enter adjacent chaparral, coastal sage scrub, or desert scrub habitats to forage (Brown 1993, Hays pers. comm.). The least Bell's vireo and the Arizona Bell's vireo probably have different habitat requirements. Least Bell's vireos in cismontane California occur in riparian forest dominated by willows (Goldwasser 1981, Gray and Greaves 1984), whereas Arizona Bell's vireos tend to occur in riparian woodland (Rosenberg *et al*. 1991, Brown 1993, Hays pers. comm., Patten pers. obs.) dominated by mesquite (*Prosopis* spp.). Similar habitats are used by the species during winter months. Although the Arizona Bell's vireo will use non-native salt cedar (*Tamarix* spp.) in parts of its range (Brown 1993), the least Bell's vireo avoids riparian areas dominated by these plants.

Threats Analysis

Loss and degradation of habitat, combined with increased brood parasite pressure from brown-headed cowbirds (Goldwasser 1978, Beezley and Rieger 1987), has led to the two breeding subspecies in California, least Bell's vireo and Arizona Bell's vireo, being listed as Endangered by the State of California and, for *V. b. pusillus*, by the Federal government (Franzreb 1989, Franzreb *et al*. 1992, Salata 1992, FWS 1992). Losses of habitat similarly have affected the Bell's vireo throughout its range (Brown 1993). Habitat degradation has resulted from tamarisk type-conversion and groundwater reductions along both the Amargosa and Mojave Rivers. Habitat loss has also occurred along both rivers, largely resulting from agricultural development and flood control efforts (e.g., dam construction on the Mojave, stream channelization, and native vegetation clearing for agricultural development).

Although brown-headed cowbirds are perhaps less prevalent in transmontane sites occupied by this vireo, cowbirds nevertheless can have a huge negative impact on the breeding success of the least Bell's vireo (Goldwasser 1978, Beezley and Rieger 1987, Clark 1988), and they have increased dramatically in California in the past century (Laymon 1987, Rothstein 1994). Populations of the least Bell's vireo have responded dramatically to efforts to remove cowbirds from breeding areas (see above) underscoring the severe impact of brood parasitism. The recent, albeit slow, northwesterly range expansion of the bronzed cowbird (*Molothrus aeneus*) could present this vireo with yet another brood parasite (Patten unpubl. data). Efforts to improve degraded riparian habitat, i.e., control non-native plants and eliminate livestock grazing in vireo use areas, as well as increasing riparian habitat patch width in some riverine areas and reducing alfalfa/livestock production in others, could potentially assist in recovering the species.

Amargosa Niterwort (*Nitrophila mohavensis*)

The Amargosa niterwort *(Nitrophila mohavensis)* was listed as an endangered species by the State of California in 1970, under the California Endangered Species Act. The species was first proposed for Federal listing as an endangered species in 1976, but this petition was withdrawn in 1979. On October 13, 1983, the U.S. Fish and Wildlife Service (FWS) again proposed *N. mohavensis*, along with seven other Ash Meadows endemic species, as endangered species with designated critical habitat. *N. mohavensis* was then listed by final rule as an endangered species, with designated critical habitat, on June 19, 1985 (FWS 1985). A Federal recovery plan addressing species occurrences in Ash Meadows Wildlife Refuge has been developed, but this plan does not address the species range-wide.

General Distribution

N. mohavensis is confined to a specific habitat type found only in a few small depressions, or "sinks", of the Carson Slough in Nevada and California. This habitat is composed of highly saline and alkaline soils that are hydrated to varying degrees and are formed by seepage from freshwater springs that lie many miles to the north and east in Ash Meadows, Nevada (Beatley 1977). One of these sinks is located at Franklin Playa, California, near where the Lower Carson Slough meets the Amargosa River. *N. mohavensis* grows on open, highly alkaline mudflats and low sand deposits in this and other sinks, around alkali sink vegetation. The species is found at an elevation of two-thousand to twenty-five hundred feet and is known from nowhere else in the world. Associated plants include spiny saltbush (*Atriplex confertifolia*), Parry's saltbush (*A. parryi*), iva (*Iva acerosa*), Tecopa bird's-beak *(Cordylanthus tecopensis*), short-pedicelled cleomella (*Cleomella brevipes*), pickleweed (*Allenrolfea occidentalis*), and salt grass (*Distichlis spicata* var. *stricta).*

Only two species of *Nitrophila* occur in the western United States. The Western Niterwort (*N. occidentalis*) is widespread in appropriate alkali sink areas of the west. The Amargosa Niterwort (*N. mohavensis*) on the other hand, is believed limited to the Carson Slough in Nevada and California, and portions of Grimshaw Lake Basin (Amargosa River) in California. Both plant species can occur in the same general area, though typically not at the same site, and both species do look similar. However, *N. occidentalis* stems are much larger (three to twelve inches); its leaves (.4 to .8 inches) longer; and very linear. *N. mohavensis* stems are relatively small (two to four inches); its leaves shorter; and considered rounded to oval.

Distribution in the Northern and Eastern Mojave Planning Area

Amargosa Niterwort is known only from Carson Slough in Nevada and California, from Ash Meadows Wildlife Refuge in Nevada downstream to Franklin Playa, California; and from at least one locale on the eastern shore of the Amargosa River at Grimshaw Basin, California. The California population of the species occurs entirely on public lands within the Northern and Eastern Mojave Desert (NEMO) Planning Area of the California Desert Conservation Area (CDCA). The Franklin Playa population, the majority of the known distribution, is within a public land area designated as the Brackish Water Marsh Unusual Plant Assemblage (UPA) by the BLM in 1980. This same area has also been designated as the only Amargosa niterwort critical habitat area (FWS 1985). The Grimshaw Basin population (five-hundred to fifteen-hundred plus plants) is located on private and public lands near the sewer pond and below Ali

Baba's Motel, in Tecopa Hot Springs. Plants observed in proximity to *Nitrophila mohavensis* include *Scirpus olneyi*, *Nitrophila occidentalis*, *Triglochin concinna*, and *Distichlis spicata* var. *stricta* (Rowlands 1986).

Natural History

The genus *Nitrophila* is not well studied, and the number of species in the genus is not accurately determined. *N. mohavensis*, and its associate (but probably not its close relative), *N. occidentalis*, are the best known of the genus. The genus *Nitrophila* itself is in the Goosefoot Family (Chenopodiaceae).

N. mohavensis is a small, erect perennial from an extensive, heavy, underground rootstock. The critical habitat population of *N. mohavensis* is thought to consist of several thousand individuals (Reveal 1978), many of which are interconnected via under-ground rootstocks. Plants can over-winter as under-ground rootstocks, with new plants starting to be formed in March. Flowering is from late April to October. The stems are glabrous, pinkish, compactly branched, and two to four inches tall. The leaves clasp the stem in opposite pairs, are rounded-ovate, somewhat succulent, concave in the upper portion, two to three mm long, and pointed at the ends. Perfect flowers are mostly single in the axils of the upper leaves and are composed of sepals only, no petals. The calyx is about two mm long and rose-colored when fresh. Stamens are five. There is one solitary, shiny black seed per flower, which is approximately 1.2 mm long and 1 mm wide. Seed viability, longevity, dormancy and germinations requirements are unknown (Reveal 1978).

Habitat Requirements

All populations are known from wet alkaline flats lacking appreciable standing water and which support very little vegetation, with extensive salt crust development. *N. mohavensis* occurs in the open and is generally not found with, or under, any type of cover. Natural and unaltered hydrology within Lower Carson Slough appears critical for *N. mohavensis* survival (CDFG 1990).

Threats Analysis

The restricted range of this species makes it susceptible to natural catastrophic events such as flooding and drought, as well as the genetic and demographic consequences of small populations. A majority of all suitable habitat in California for this species is in Federal ownership (BLM managed public lands). Potential threats to the species include ground water depletion; streambed alteration; highway maintenance; mining, including exploratory drilling and claim marker placement; cross country vehicle travel; and trampling by wild horses or humans.

Lands supporting the species at Franklin Playa have been damaged previously by unauthorized mineral exploration and claim marker installation activities. Due to nearby artesian water source, a small herd (less than ten animals) of wild horses (Chicago Valley Herd Management Area) can inhabit the same public lands. This wild horse herd is managed under objectives outlined in the Chicago Valley Herd Area Management Plan. No trampling impacts to the species have been noted to date, though this possibility exists.

An additional threat (FWS 1985) includes the potential introduction and spread of the exotic tamarisk (*Tamarix ramosissima*). This weed often replaces native riparian and wetland plants, alters the composition and structure of native plant communities, and generally "dries" up wetland and meadow habitats. No tamarisk has been observed near Franklin Playa to date, though it does occur downstream on the Amargosa River in the vicinity of Grimshaw Basin.

Ash Meadows Gumplant (*Grindelia fraxino-pratensis*)

On October 13, 1983, the U.S. Fish & Wildlife Service proposed the Ash Meadows gumplant, along with seven other Ash Meadows endemic species, as endangered species with designated critical habitat. *Grindelia fraxino-pratensis* was then listed by final rule as a threatened species, with designated critical habitat (California/Nevada), on June 19, 1985 (FWS 1985). A Federal recovery plan addressing species occurrences in Ash Meadows Wildlife Refuge has been developed, but this plan does not address the species range-wide.

General Distribution

Ash Meadows gumplant is known only from moist, meadow habitats along Carson Slough in Nevada and California, from Ash Meadows Wildlife Refuge in Nevada downstream to Franklin Playa, California. Beatley (1965) first located the species at Ash Meadows, Nevada (FWS 1985). James L. Reveal (1968) also obtained the type collection in Ash Meadows. Other populations were located throughout Ash Meadows since the original sighting. It was later reported from California in only two Lower Carson Slough locations.

Distribution in the Northern and Eastern Mojave Planning Area

In California, Ash Meadows Gumplant is located entirely on public lands within the Northern and Eastern Mojave Desert (NEMO) Planning Area of the California Desert Conservation Area (CDCA). A portion of the public land potentially providing habitat for this species at Franklin Playa was designated as the Brackish Water Marsh Unusual Plant Assemblage (UPA) by the BLM in 1980. This same area has also been designated as one of approximately a dozen Ash Meadows gumplant and Amargosa niterwort critical habitat areas (FWS 1985).

Natural History

The Ash Meadows gumplant is an erect, biennial or more often perennial, herb of the sunflower (Asteraceae) family. Both the common name and the specific epithet were taken from *fraxinus*, meaning ash, and *pratensis*, meaning of the meadow (Mozingo & Williams 1980). It is one of six species in the genus and hybridization is common with all but *G. fraxino-pratensis.* Ash Meadows gumplant does not appear to hybridize with any other species within the genus (Lane 1992). This species is twenty-seven to forty inches in length and the leaves and stem are glabrous-resinous. The gumplant has one to three smooth, leafy, tan-reddish stems arising from a woody rootstock. The dark green leaves are leathery, generally oblanceolate-oblong, acute, and entire-serrate toward the top. The inflorescence is openly branched with several heads on the terminal branchlets. The yellow flowers consist of heads measuring eight to ten mm, with approximately fifteen disk flowers and thirteen ray flowers. In bud the disk flowers are covered with a white gum-like substance; hence, the name gumplant (Cochrane 1981). The phyllaries are resinous dotted and the fruit is a three to four mm. long achene with two stout awns. Flowering

occurs from June through October (Beatley 1976).

Seed dispersal could occur by means of wind/water transportation and possibly by mammals or birds. The pollinators for this species are unknown (Cochrane 1981).

Habitat Requirements

The Ash Meadows gumplant occurs in primarily saltgrass meadows along streams and surrounding pools near ash-screwbean-mesquite woodlands and desert shadscale scrub vegetation. It occasionally occurs sparsely on open alkali clay soils in drier shadscale habitats or in the unique clay barrens where ground water is at or near the surface, and where other Ash Meadow endemics are supported. *G. fraxino-pratensis* is quite robust in marshy areas along some dirt roads where runoff accumulates and saturates soils throughout a longer portion of the year. The Carson Slough populations occur in full sunlight and in the lowest topographic areas associated with water (Cochrane 1981).

The dominant plant species that occurs with the gumplant is saltgrass (*Distichlis spicata* var. *stricta*) and the common associates within this saltgrass meadow type community include Spring-loving centaury (*Centaurium namophilum* var. *namophilum*), baccharis (*Baccharis emoryi*), yerba mansa (*Anemopsis californica*), western niterwort (*Nitrophila occidentalis*), loosestrife (*Lythrum californicum*), and iva (*Iva acerosa*). In the wooded areas, and on the drier sites, the common associates include velvet ash (*Fraxinus velutina* var. *coriacea*), screwbean mesquite (*Prosopis pubescens*), shadscale (*Atriplex confertifolia*), alkali sacaton (*Sporobolus airoides*), alkali goldenbush (*Isocoma acradenia*), rabbitbush (*Chrysothamnus albidus*), seepweed (*Sueda* sp.), and other saltbush (*Atriplex* sp.) species.

This species also appears to colonize recently disturbed areas, almost appearing weed-like, along roadsides adjacent to meadows. The quick colonization may be due to the removal of the usual associated plant competitors (adapted from Cochrane 1981, Reveal & Beatley 1971, Mozingo and Williams 1980).

Threats Analysis

Threats to the Ash Meadows gumplant include reduced and/or rechannelled spring outflow caused by adjacent land development and/or water diversion; the destruction and/or modification of the limited habitat available to this species from camping, staging areas, road maintenance and/or mining activities; and degradation of habitat resulting from wild horse grazing/trampling and from cross-country vehicle use.

A potential also exists for the establishment and spread of the exotic weed tamarisk (*Tamarix ramosissima*), which replaces native plants, alters the composition and structure of native plant communities, and generally dries up wetland and meadow habitats. If this weed were to become well established in the vicinity of gumplant populations, the surface water necessary for this species to survive, hence associated habitat could be affected.

Spring-loving Centaury (*Centaurium namophilum namophilum*)

Spring-loving centaury was first proposed for federal listing as an endangered species in 1976, but this petition was withdrawn in 1979. On October 13, 1983, the U.S. Fish and Wildlife Service (FWS) proposed listing the Spring-loving Centaury, along with seven other Ash Meadows endemic species, as endangered species with designated critical habitat. Spring-loving centaury (*Centaurium namophilum namophilum)* was then listed by final rule as a threatened species, with designated critical habitat in Nye County Nevada, on June 19, 1985 (FWS 1985). A Federal recovery plan addressing species occurrences in Ash Meadows Wildlife Refuge within Nevada has been developed, but this plan does not address species protection throughout the entirety of designated critical habitat.

General Distribution

Broome (1981) first recognized *C. namophilum namophilum* as a separate plant variety, although the plant had been collected as early as 1891(Colville 1893) and was first described in 1973 (FWS 1983). It is found on moist to wet clay soils along the banks of streams or in seepage areas (Mozingo and Williams 1980) in the Carson Slough, Ash Meadows, Death Valley, and Amargosa River vicinities. The type collection comes from the "Collins Ranch" (Devils Hole vicinity, Death Valley National Park) at Ash Meadows, in Nye County, Nevada (FWS 1983). California collections have included spring influenced sites along the Amargosa River at Tecopa-Grimshaw Basin (Roos and Roos 1950; per CDFG 1992); Texas Spring on the west base of the Funeral Mountains near the Amargosa River (Gilman 1935, per CDFG 1992); Furnace Creek in Death Valley (Parish 1915, per CDFG 1992); an alkaline meadow located somewhere between Laws (in Inyo County) and Mono County line in 1952 (Reveal, Broome, and Beatley 1973); a spring site located one-quarter mile north of Shoshone in 1934 (Reveal, Broome, and Beatley 1973); and Resting Spring near Tecopa in 1891 (Colville 1893, CDFG 1992).

No observations or species collections in these latter California sites have been made since they were first recorded. Many, if not all, were revisited in 1978 by Cochrane (CDFG 1992). The species has also been recorded from alkali flats in Lower Carson Slough within California (Rowlands 1986, per CDFG 1992) and at Travertine Springs (Schramm 1977, per CDFG 1992) within Death Valley National Park. Recorded elevations range from near sea level to six-thousand feet. In general, the species is recognized from alkaline springs and marshy areas occurring in the vicinity of Ash Meadows, Death Valley, and the Amargosa River. Associated plants include spiny saltbush (*Atriplex confertifolia*), Parry's saltbush (*A. parryi*), iva (*Iva acerosa*), Tecopa bird's-beak *(Cordylanthus tecopensis*), short-pedicelled cleomella (*Cleomella brevipes*), pickleweed (*Allenrolfea occidentalis*), and saltgrass (*Distichlis spicata* var. *stricta),* as well as the federally listed threatened Ash Meadows gumplant (*Grindelia fraxino-pratensis*).

Some authors maintain that centauries occurring in the downstream portions of the Amargosa River and Death Valley in California are actually Great Basin centauries, or *Centaurium exaltatum* (The Jepson Manual 1993), and that only those plants occurring in upstream Ash Meadows, Nevada, are properly classified as the threatened variety *namophilum namophilum*. Others maintain that although *C. namophilum namophilum* looks like *C. exaltatum,* a larger, denser inflorescence on *C. Namophilum namophilum* distinguishes it from *C. exaltatum*.

Distribution in the Northern and Eastern Mojave Planning Area
Spring-loving centauries have been recorded from the Lower Carson Slough area and reported from the Grimshaw Lake vicinity, California. Both the recorded and the reported sites occur entirely on public lands within the Northern and Eastern Mojave Desert (NEMO) Planning Area of the California Desert Conservation Area (CDCA). A portion of the public land potentially providing habitat for this species in Lower Carson Slough and Franklin Playa was designated (BLM 1980) as the Brackish Water Marsh Unusual Plant Assemblage (UPA) and a monitoring plan was subsequently prepared (BLM 1988). No critical habitat has been designated for this species in California.

Natural History
The spring-loving centaury is an erect annual of the Gentianaeae Family that reaches eighteen inches in height, and has a wide range of variability in appearance due to environmental factors. The species is usually found on moist to wet clay soils along the banks of streams or in seepage areas. Opposite paired leaves range from ten to thirty mm in length and are linear to linear lance like or oblong, as well as acute. Flowering stems from many lateral side branches beginning at stem base and occurs between July and September. The tri-forked paniculate-cymose flower of this species is open and is considered denser than other species of the genus. Pedicells range between ten and fifty mm in length and the rolling, linear, and non-overlapping corolla tube lengths average three to seven mm. Flower color is usually white-rose to pink and the one mm length anthers are dehised. The extremely small, narrowly linear seeds are more or less rounded with surface netting.

Habitat Requirements
Alkaline springs and marshy areas containing moist clays in the Ash Meadows-Death Valley-Amargosa River area characterize this species' habitat. Such areas often support low density Parry's/spiny saltbush, patchy saltgrass meadows, lizardtail (*Anemopsis californica*) thickets, pickleweed clumps, and occasionally support scattered mesquite (*Prosopis glandulosa* var. *torreyana, P. pubescens*). The endemic Tecopa birdsbeak (*Cordylanthus tecopensis*) and Ash Meadows gumplant often share a similar habitat.

Threats Analysis
The restricted range of this species makes it susceptible to natural catastrophic events such as flooding and drought, as well as the genetic and demographic consequences of small populations. No surveys for the species have been undertaken in California recently, though a majority of all potentially suitable habitat within California is in Federal ownership (BLM and NPS). Potential threats to the species include local groundwater depletion; streambed or spring alteration; highway maintenance; mining, including exploratory drilling and claim marker placement; cross country vehicle travel; and trampling by wild horses and/or livestock.

Potential habitat for the species at Franklin Playa has been damaged previously by unauthorized mineral exploration and claim-marker installation. A small herd (less than ten animals) of wild horses (Chicago Valley Herd Management Area) is known to inhabit these same public lands and utilize springs located nearby. This wild horse herd is managed under objectives outlined in the Chicago Valley Herd Area Management Plan, and horse impacts to native plant communities at local springs have been documented. However, no trampling impacts to this species have been

documented to date.

An additional threat (FWS 1985) includes the potential introduction and spread of the exotic weed tamarisk (*Tamarix ramosissima*). This weed often replaces native riparian and wetland plants, alters the composition and structure of native plant communities, and generally "dries" up wetland and meadow habitats. No tamarisk has been observed near Franklin Playa to date, though it does occur downstream on the Amargosa River in the vicinity of Grimshaw Basin.

References

American Ornithologists' Union. 1957. Checklist of North American Birds. 5th ed. Amer. Ornithol. Union, Washington, D.C.

American Ornithologists' Union. 1983. Checklist of North American Birds. 6th ed. Amer. Ornithol. Union, Washington, D.C.

American Ornithologists' Union. 1998. Checklist of North American Birds, 7th ed. Amer. Ornithol. Union, Washington, D.C.

Bailey, V. 1900. Revision of American voles of the genus *Microtus*. N. American Fauna 17:1-88.

Barlow, J.C. 1962. Natural history of the Bell vireo, *Vireo bellii* Audubon. Univ. Kansas Publ. Mus. Nat. Hist. 12:241-296.

Batzli, G.O. and F.A. Pitelka. 1971. Condition and diet of cycling populations of the California vole, *Microtus californicus.* J. Mamm. 52:141-163.

Beatley, J.C. and Reveal, J. 1971. Bull. Torr. Bot. Club 98(6):332-335.

Beatley, J.C. 1977. Endangered plant species of the Nevada Test Site, Ash Meadows, and central-southern Nevada. Contract E (11-1)-2307, U.S. Energy Research and Development Administration.

Beezley, J.A., and J.P. Rieger. 1987. Least Bell's vireo management by cowbird trapping. West. Birds 18:55-61.

Broome, C.R. 1981. A new variety of *Centaurium namophilum* (Gentianaceae) from the Great Basin. Great Basin Naturalist 41:192-197.

Brown, B.T. 1993. Bell's Vireo (*Vireo bellii*). No. 35, *In:* A.F. Poole and F. B. Gill, (eds.), Birds of North America. Acad. Nat. Sci. Philadelphia and Am. Ornithol. Union, Washington, D.C.

Browning, M.R. 1993. Comments on the taxonomy of *Empidonax traillii* (Willow Flycatcher). West. Birds 24:241-257.

Bureau of Land Management. 1984. The Chicago Valley Herd Management Area Plan. Barstow Field Office, Barstow California.

Bureau of Land Management. 1988. The Brackish Water Marsh Unusual Plant Assemblage Monitoring Plan. Barstow Field Office, Barstow California.

Bureau of Land Management. 1997. California Desert District Resource Area files.

Bureau of Land Management, 2002. *Proposed Northern and Eastern Mojave Desert Management Plan: Amendment to The California Desert Conservation Area Plan*. A Final Environmental Impact Statement. California Desert District. Riverside, California

California Department of Fish and Game. 1990. Natural Heritage Division, June 1990. Draft Recommendations to the California Fish and Game Commission.

California Department of Fish and Game. 1992a. Annual Report on the Status of California State Listed Threatened and Endangered Animals and Plants. Sacramento, California.

California Department of Fish and Game. 1992b. Natural Diversity Data Base Program Report for *Centaurium namophilum namophilum*. Natural Heritage Division. Sacramento, CA.

California Department of Fish and Game. 1998. Natural Diversity Data Base: Special Animals. Biannual publication. 44 pp.

California Department of Fish and Game. 2000. Element reports for *Grindelia fraxino-pratensis*. California natural diversity database, California Department of Fish and Game, Sacramento, California.

Cardiff, E.A., Kniffen, J., and Kniffen, R. 1982. Breeding birds survey 197. Desert riparian-freshwater marsh and ponds. Amer. Birds 36-102-103.

Clark, C.F. 1988. Observations on the nesting success of Bell's vireo in southern Arizona. West. Birds 19:117-120.

Cochrane, S. 1981. Field Survey Report for *Grindelia fraxino-pratensis* 20 Oct. 1981, Calif. Nat. Div. Data Base, Sacramento, 95814.

Dunning, J.B. 1984. Body weights of 686 species of North American birds. Western Bird Banding Association. Monograph No. 1.

Ehrlich, P.R., D.S. Dobkins, and D. Wheye. 1988. The Birder's Handbook. Simon and Schuster, Fireside Books, New York.

England, A. S., and Horton, S. 1978 Bird surveys at selected springs in the California Desert Conservation Area", on file at BLM, California Desert District Office, Riverside, CA.

Fish and Wildlife Service. 1985. Final rule for seven plants and one insect in Ash Meadows, NV. Vol. 50, No. 97, 20777-20794.

Fish and Wildlife Service. 1992. Least Bell's vireo survey guidelines. FWS. Laguna Niguel, California.

Fish and Wildlife Service, 1997. Amargosa Vole (*Microtus californicus scirpensis*) Recovery Plan. Portland, Oregon. 43pp.

Fish and Wildlife Service. 2000. "Southwestern Willow Flycatcher Protocol Revision 2000". Fish and Wildlife Service, Albuquerque, NM.

Fisher, A.K. 1893. Report on the ornithology of the Death Valley expedition of 1891, comprising notes on the birds observed in southern California, southern Nevada, and parts of Arizona and Utah. N. Am. Fauna 7.

Franzreb, K.E. 1987a. Least Bell's vireo recovery plan. FWS, Portland. Franzreb, K. E. 1987b. Endangered status and strategies for conservation of the least Bell's vireo (*Vireo bellii pusillus*) in California. West. Birds 18:43-49.

Franzreb, K.E. 1989. Ecology and conservation of the endangered Least Bell's Vireo. FWS Biol. Rep. 89.

Franzreb, K.E., L. Salata, L. Hays, K. Kramer, and B. Ruesink. 1992. Revised proposed determination of critical habitat for the least Bell's vireo (*Vireo bellii pusillus*). Fed. Register 57:34892-34908.

Gaines, D.A. and S.A. Laymon. 1984. Decline, status and preservation of the Yellow-billed Cuckoo in California. West. Birds 15:49-80.

Garrett, K., and J. Dunn. 1981. Birds of Southern California: Status and Distribution. Los Angeles Audubon Soc., Los Angeles, California

Gill, A.E. 1979. Partial reproductive isolation in subspecies of the California vole, *Microtus californicus*. Genetica 52:105-117.

Goldwasser, S. 1978. Distribution, reproductive success and impact of nest parasitism by Brown-headed Cowbirds on Least Bell's Vireo. Proj. rep. W-54-R-10, Calif. Dept. Fish Game, Sacramento, California.

Goldwasser, S., D. Gaines, and S. Wilbur. 1980. The least Bell's vireo in California: A de facto endangered race. Amer. Birds 34:742-745.

Goldwasser, S. 1981. Habitat requirements of the least Bell's Vireo. Proj. rep. E-W-4, Calif. Dept. Fish Game, Sacramento, California.

Gray, M.V., and J.M. Greaves. 1984. Riparian forest as habitat for the Least Bell's Vireo. pp. 605-611, *In:* R.E. Warner and K. M. Hendrix, (eds.), California riparian systems: Ecology, conservation, and productive management. Univ. California Press, Berkeley, California.

Greaves, J.M. 1987. Nest-site tenacity of Least Bell's Vireos. West. Birds 18:50-54.

Grinnell, J. 1923. Observation upon the bird life of Death Valley. Proc. Calif. Acad. Sci. 8:43-109.

Grinnell, J., and A.H. Miller. 1944. The distribution of the birds of California. Pac. Coast Avifauna 27.

Hall, E.R. 1981. Mammals of North America. John Wiley & Sons. New York, New York.

Halterman, M.D. 1991. Distribution and habitat use of the Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) on the Sacramento River, California, 1987-1990. M.S. Thesis, California State University, Chico.

Harris, J.H. 1991. Effects of brood parasitism by brown-headed cowbirds on willow flycatcher nesting success along the Kern River, California. West. Birds 22:13-26.

Heske, E.J., R.S. Ostfield, and W.Z. Lidicker, Jr. 1984. Competitive interactions between *Microtus californicus* and *Reithrodontomys megalotis* during two peaks of Microtus abundance. J. Mamm. 65(2):271-280.

Hickman, J.C. (ed.). 1993. The Jepson Manual: Higher Plants of California. University of California Press, Berkeley, California.

Hughes, J.M. 1999. Yellow-billed Cuckoo (*Coccyzus americanus*). *In:* A. Poole and F. Gill (eds.), Birds of North America, No. 418. The Birds of North America, Inc., Philadelphia, Pennsylvania.

Ingles, L.G. 1965. Mammals of the Pacific States. Stanford University Press. Stanford, California.

Kellogg, R. 1918. A revision of the *Microtus californicus* group of meadow mice. Univ. California Publ. Zool., 21:1-42.

Krebs, C.J. 1966. Demographic changes in fluctuating populations of *Microtus californicus*. Ecol. Monogr. 36(3): 239-273.

Knight, T.A. 1990. A survey for *Nitrophila mohavensis* [Munz & Roos] on the Naxos Trespass Area, Inyo County, California. A report submitted to the U.S. Department of the Interior, Bureau of Land Management. Barstow Field Office. Barstow, California.

Lane, Meredith A. 1992. Novon 2: 215-217

Laymon, S.A. and M.D. Halterman. 1985. Yellow-billed Cuckoos in the Kern River Valley: 1985 population, habitat use, and management recommendations. California Department of Fish and Game, Nongame Bird and Mammal Section Rept. 85.06.

Laymon, S.A. 1987. Brown-headed cowbirds in California: Historical perspectives and management opportunities in riparian habitats. West. Birds 18:63-70.

Laymon, S.A. and M.D. Halterman. 1989. A proposed habitat management plan for Yellow-billed Cuckoos in California. USDA Forest Service Gen. Tech. Rep. PSW-110 p 272-277.

Laymon, S.A., P.L. Williams, and M.D. Halterman. 1993. Monitoring of riparian habitat restoration sites: Breeding birds and habitat characteristics, 1992, and Yellow-billed Cuckoo study, 1992. Admin. Rept. The Nature Conservancy, Kern River Preserve, #CARO 060894. and California Dept. of Fish and Game #FG1496.

Laymon, S.A., P.L. Williams, and M.D. Halterman. 1997. Breeding status of the Yellow-billed Cuckoo in the South Fork Kern River Valley, Kern County, California: summary report 1985 -1996. Admin. Rept. USDA Forest Service, Cannell Meadow Ranger District, Sequoia National Forest.

Laymon, S.A. 1998. Yellow-billed Cuckoo survey and monitoring protocol for California. Available from the author, P.O. Box 1236, Weldon, California 93283. E-mail: slaymon@lightspeed.net

Mitchell, D.R., K.E. Buescher, J.R. Eckert, D.M. Laabs, M.A. Allaback, S.J. Montgomery and R. C. Arnold. 1993. Biological Resources Environmental Planning Technical Report. Air Force Flight Test Center Environmental Management Office, Edwards Air Force Base.

Mozingo, H.N., and M. Williams. 1980. Threatened and endangered plants of Nevada, U.S. Fish and Wildlife Service and Bureau of Land Management.

Muiznieks, B.M., T.E. Corman, S.J. Sferra, M.K. Sogge, and T J. Tibbits. 1994. Arizona partners in flight 1993 southwestern willow flycatcher survey. Nongame and Endangered Wildlife Program Technical Report 52. Arizona Game and Fish Dept., Phoenix, Arizona.

Murphy, D.D. and K.E. Freas. 1989. Recommendations for the conservation of the Amargosa River pupfish, *Cyprinodon nevadensis amargosae* and the Amargosa vole, *Microtus californicus scirpensis.* Report submitted to the Nature Conservancy by the Center for Conservation Biology, Department of Biological Sciences, Stanford University. 27 pages. On file at the Barstow Field Office, Bureau of Land Management, Barstow California.

Nolan, V. 1960. Breeding behavior of the Bell Vireo in southern Indiana. Condor 62:225-240.

Oberholser, H.C. 1974. The Bird Life of Texas. Univ. of Texas Press, Austin, Texas.

Patten, M.A. 1995. Checklist of the birds of Morongo Valley. BLM. Morongo Valley, California.

Pearson, O.P. 1985. in R.H. Tamarin (ed.). Biology of New World *Microtus*. Pp. 535-566. Spec. Publ. No. 8, Amer. Soc. Of Mamm., Boston.

Phillips, A.R. 1991. The known birds of North and Middle America, pt. II. Allan R. Phillips, Denver, Colorado.

Regional Environmental Consultants. 1986. Draft Comprehensive Species Management Plan for Least Bell's Vireo. Unpubl. rep., San Diego Assoc. Govern., San Diego, California.

Reveal, J. L., C.R. Broome, and J.C. Beatley. 1973. A new *Centaurium* (Gentianaceae) from Death Valley region of Nevada and California. Bull. Torrey Bot. Club 100:353-356.

Reveal, J.L. 1978. Status report on *Nitrophila mohavensis* Munz & Roos (Amargosa niterwort) 14 March 1978. Dept. of Botany, Univ. of Maryland, College Park 20742.

Ridgway, R. 1904. The birds of North and Middle America, pt. 3. U.S. Natl. Mus. Bull. 50.

Roberson, D. 1980. Rare birds of the west coast. Woodcock Publications, Pacific Grove, California.

Rosenberg, K.V., R.D. Ohmart, W.C. Hunter, and B.W. Anderson. 1991. Birds of the Lower Colorado River Valley. Univ. Ariz. Press, Tucson, Arizona.

Rothstein, S.I. 1994. The cowbird's invasion of the far west: History, causes and consequences experienced by host species. pp. 301-315 *In:* J.R. Jehl, Jr., and N.K. Johnson, (eds.), A century of avifaunal change in western North America. Stud. Avian Biol. 15.

Rowlands, P. 1986. California Natural Diversity Database (Rarefind) Entry. California Department of Fish and Game. Sacramento, California.

Salata, L. 1992. Notice of public hearings on revised proposal to designate critical habitat for the Least Bell's Vireo. Fed. Register 57:43685-43686.

Seutin, G. 1987. Female song in willow flycatchers (*Empidonax traillii*). Auk 104:329-330.

Sogge, M.K., T.J. Tibbitts, and J.R. Peterson. 1997. Status and breeding ecology of the southwestern willow flycatcher in the Grand Canyon. West. Birds 28:142-157.

Sogge, M. K., Marshall, R. M., Sferra, S. J. and Tibbits, T. J. 1997. "A Southwestern Willow Flycatcher Natural History Summary and Survey Protocol", National Park Service, Tech, Rep NPS/NAUCPRS/NRTR-97/12.

Spencer, J.A., S.J. Sferra, T.E. Corman, J.W. Rourke, and M.W. Sumner. 1996. Arizona partners in flight 1995 southwestern willow flycatcher survey. Nongame and Endangered Wildlife Program Technical Report 97. Arizona Game and Fish Dept., Phoenix, Arizona.

Small, A. 1994. California Birds: Their Status and Distribution. Ibis Publ., Vista, California.

Stein, B. A. and Warrick, S. F. 1979, Granite Mountains Resource Survey. Pub. No. 1, Environmental Field Program, Univ. of Calif., Santa Cruz.

Stone, R. D. and V. A. Sumida, eds. 1983 The Kingston Range of California: A Resource Survey. Pub. No. 10, Environmental Field Program, Univ. Of Calif., Santa Cruz.

Thelander, C.G. (Ed.). 1994. Life on the Edge: A Guide to California's Endangered Natural Resources. BioSystems Books, Santa Cruz, California.

Tibbits, T.J., M.K. Sogge, and S.J. Sferra. 1994. A survey protocol for the Southwestern Willow Flycatcher (*Empidonax traillii extimus*). Technical Report NPS/NAUCPRS/NRTR-94/04. Colorado Plateau Research Station, Northern Arizona Univ., Flagstaff, Arizona.

Unitt, P. 1984. The birds of San Diego County. San Diego Soc. Nat. Hist. Memoir 13.

Unitt, P. 1985. Plumage wear in *Vireo bellii*. West. Birds 16:189-190.

Unitt, P. 1987. *Empidonax traillii extimus*: An endangered subspecies. West. Birds 18:137-162.

Unitt, P. 1997. Winter range of the southwestern willow flycatcher (*Empidonax traillii extimus*). Report to Bureau of Reclamation, P.O. Box 9980, Phoenix, Arizona 85068-0980.

Warner, R.E. and K.M. Hendrix. 1985. Riparian Resources of the Central Valley and the California Desert. Final Draft Admin. Report. Calif. Dept. of Fish and Game.

Wilbur, S.R. 1980. The Least Bell's Vireo in Baja California, Mexico. West. Birds 11:129-133.

Williams, D.F. 1986. Mammalian Species of Special Concern in California. Wildlife Management Division Administrative Report 86-1.

Yong, W., and Finch, D.M. 1997. Migration of the willow flycatcher along the middle Rio Grande. Wilson Bull. 109:253-268.

Zeiner, D., W. Laudenslayer, Jr., K. Mayer, and M. White. 1990. California's Wildlife, Volume III: Mammals. California Department of Fish and Game, Sacramento, California.

Appendix E
Amargosa River Regional History

The Amargosa River study area encompasses a variety of unique and significant cultural and paleontological resources. Human use of the Amargosa River is known to extend over the last eight thousand years (BLM 1983b:9). This river is a significant water source in the Mojave Desert. While it flows under ground most of the year, the Amargosa River flows above ground all year long between Tecopa and the northwest area of Dumont Dunes near the Salt Creek Hills. The result is an oasis in the desert utilized by prehistoric and historic people.

Rogers (1939) identified four distinct cultural complexes, which have since been renamed Paleo-Indian, Lake Mohave/Pinto, Amargosa, and Shoshonean. Remains identified by Broadbent (1972) include sleeping rings, chopping tools, worked flakes, diagnostic projectile points (Pinto, Gypsum, Elko, and Rose Springs), metates, mortars, pottery, and pendants (BLM 1983b:9). In addition to its archaeological value, historic landmarks include the Old Spanish Trail and the Tonopah and Tidewater (T&T) Railroad, which traversed the canyon. Evidence of historic mining for nitre and talc are also present.

Peripheral to the Amargosa River are the Kingston Range and Salt Creek Hills. The Kingston Range is a culturally significant location in the Mojave Desert because it contains one of the few large Piñon-Juniper woodlands in the region. Site records indicate a major concentration of habitation sites, including midden and food processing sites, with ground stone artifacts related to piñon exploitation dating to about 3,000 to 1,500 BC. The riparian vegetation along a desert stream in the Salt Creek Hills is also a rare and unique habitat in the Mojave Desert and, like the Amargosa River, an important source of water, food, and shelter for birds and other animals. The presence of standing water and game attracted aboriginal peoples to the vicinity, which resulted in a relative abundance of artifacts and sites. Historic cultural resources for both areas consist of the remains of various mining activities, such as gold in the Salt Creek Hills, beginning in the mid-nineteenth century and continuing until World War II (BLM 1982:1; BLM 1989:8, 10).

Prehistoric Archaeological Overview

Some assemblages may be cautiously considered cultural remains that date from the Pleistocene, prior to 12,000 before present (BP). Warren et al. (1980:25-27) make a reasonable argument for the tentative recognition of the Manix Lake Lithic Industry represented at the Baker Site CA-SBR-541 (Glennan 1974), the assemblages at the Calico Early Man Site (Leakey, Simpson, and Clements 1968), and the core tool tradition at China Lake (Davis 1978). The age and/or the cultural nature of the artifacts at these sites have not been demonstrated with the rigor necessary to convince the scientific community (Warren et al. (1980:27). Warren *et al*. (1980:27) suggest that the Pleistocene becomes a catchall time period for a number of different assemblages of alleged antiquity and/or artifacts.

Lake Mojave Period (12,000-7,000 BP)

The Lake Mojave complex is a Paleo-Indian assemblage that has become a comparative unit for early man in the Mojave Desert. There are some similarities to sites in the western Great Basin and to the San Dieguito complex of southern California. The assemblage consists of various projectile point types, including leaf-shaped forms, long stemmed points with narrow shoulders (Lake Mojave and Parman points), short bladed, stemmed points with pronounced shoulders (Silver Lake point), and the rarer fluted point. Other tools include crescents in simple lunate and more excentric forms, small flake graving tools, specialized scrapers, leaf-shaped knives, drilling tools, and a few heavy core tools possibly used as choppers or hammer stones. Milling stones are rare or absent (Warren et al. 1980:19-20; Warren and Crabtree 1986:184).

Pinto Period (7,000-4,000 BP)

Increasing warmth and dryness during this period, often called the "altithermal," is thought to have cause Pleistocene lakes to dry up, thus altering the distribution and nature of the vegetation. This period may be characterized by Pinto Basin type points (Wallace 1962:175), Lake Mojave and Silver Lake points (Bettinger and Taylor 1974:130), leaf-shaped points, knife blades, drills, scrapers, hammers, choppers, and a few manos and flat metates (Stickel and Weinman-Roberts 1980:68).

There are several different interpretations of cultural development in the Mojave Desert during the Pinto Period. This stems from problems of inadequate documentation as well as other factors. One major problem is the definition and identification of Pinto Points, the diagnostic artifact for this period. There has been some confusion with projectile point types since Pinto points are very similar (or identical) to Humboldt Concave Based A and Elko Eared points. Radiocarbon dates appear to support a short chronology with Pinto points beginning around 5,000 BP and continuing until about 2,700 BP; however, these dates derive from sties outside of the Mojave Desert and the identification of Pinto points my be inaccurate in some cases. The association of Pinto points with Lake Mojave points, Silver Lake points, small beaked gravers, and certain concave scrapers in a deep midden at the Stahl Site suggests a long period with relatively little change (Warren et al. 1980:44). Researchers generally hold that human populations were greatly reduced in the Mojave Desert region in response to this environmental shift (Wallace 1962; Stickel and Weinman-Roberts 1980:68). During the later part of this period when the Mojave Desert was most arid, much of the desert may have been essentially uninhabited (Warren and Crabtree 1986:187).

Gypsum Period (4,000-1,500 BP)

Around 4,000 years ago, the Little Pluvial period began and corresponding flora and fauna essentially assumed its present form and distribution. This period is initially characterized by intense occupation of the desert, broadening economic activities, and increased contact with the California coast and Southwest. Petroglyphs and split twig figurines at Etna Cave (Wheeler 1973) and Newberry Cave (Smith *et al*. 1957; Davis and Smith 1981; Davis, Taylor, and Smith 1981) suggest ritual activities were in existence, especially concerning big horn sheep hunting. It

is presumed that a flexible "band" organization was still operative as people exploited food resources across the landscape (Warren and Crabtree 1986:189; Warren *et al*. 1980:46).

Hunting technology consisted of medium to large stemmed and notched points; the most common forms include Elko Eared, Elko Corner-notched, Gypsum Cave, and Humboldt Concave Base points. Found at a number of sites, these points seem to represent Great Basin influence (Warren and Crabtree 1986:187). Other defining features of the material culture include blades, drills, flake scrapers, slate pendants, introduction of mortars and pestles, and an increase in manos and metates (Stickel and Weinman-Roberts 1980:70). Transition from atlatl to bow and arrow technology is also apparent during this time. Pottery and split twig figurines reminiscent of Southwest cultures suggest additional relations with Mojave Desert inhabitants (Warren and Crabtree 1986:189).

During the latter part of this period, cultural development of the eastern and western Mojave diverges. In the east, pit houses and some agriculture are apparent in the Moapa and Virgin Valleys. This represents the beginnings of Anasazi influence and is equated with Basketmaker II, which leads to the Basketmaker II-Pueblo sequence in the extreme eastern Mojave. The western Mojave appears to have maintained a less sedentary way of life based on a foraging economy (Warren *et al*. 1980:46-47).

Saratoga Springs Period (1,500-1,200 BP)

There does not appear to be any major climatic changes correlated to the Saratoga Spring Period. The defining feature of this period is the appearance of true arrowheads, as opposed to spear/dart points, indicating adoption of the bow and arrow (Stickel and Weinman-Roberts 1980:80). Knives, drills, scrapers, and slate pendants are still present. Manos and metates are slightly more prominent and pottery is more frequent, suggesting greater interaction with Southwest cultures. The hunting-gathering economy persisted, but settlement patterns may be characterized as having "camp sites" on sandy terrain near waterholes or on the edges of playas (Stickel and Weinman-Roberts 1980:79; Wallace 1962:176). Sites in the period include Bickel (McGuire, Garfinkel, Basgall 1981), Saratoga Springs (Wallace Taylor 1959), Oro Grande (Rector, Swenson, Wilke 1979), Rustler Rockshelter (J. T. Davis 1962), and possibly China Ranch (McKinney *et al*. 1971) (Warren and Crabtree 1986:191).

Shoshonean Period (1,200 BP to Contact)

Increased numbers of habitation sites suggest a general population increase in the Mojave Desert. Small groups of people more than likely continued to hunt and forage along a seasonal route, but village sites become more frequent (Stickel and Weinman-Roberts 1980:85-86). Numerous marine shell beads and steatite ornaments suggest continued, if not intensified, interaction with other regional populations (Stickel and Weinman-Roberts 1980:88). The diagnostic artifacts for this period are Desert Side-notched points and various poorly defined types of brown ware pottery, including Owens Valley Brown ware. This period is also characterized by a wet climatic regime between about 800 and 900 BP. This moist episode is suggested by the shell middens surrounding the Cronise Lakes (Rogers 1933). Most of the material culture at Cronise

Lakes seems best compared with prehistoric "Yuman" (Patayan) occupations (Davis 1962; Donnan 1962, 1964; True, Davis, and Sterud 1966; Kroeber 1959) (Warren *et al*. 1980:54).

Prehistoric Resources

Prehistoric cultures in the Mojave Desert have been described within a series of periods distinguished by environmental, technological, and/or ethnographic variations. There seems to be a consistent lack of agreement on taxonomic systems and terminology for Mojave Desert archaeology. Therefore, the overview presented here is derived from Warren and Crabtree (1986), who provide one of the most current syntheses for the Mojave Desert region. It is a modified version of Warren and Crabtree's (1986) chronology, organized on the basis of temporal units, or periods, that are marked by changes in distinctive artifact types, such as projectile points and pottery (Warren and Crabtree 1986:184).

Periods were originally determined by the occurrence of time sensitive artifact types and attributes (Rowe1962). Later, temporal control was maintained through radiocarbon and other dating techniques (Warren et al. 1980:16). Time sensitive artifacts are cultural items that generally create chronologies dependent on the cultural changes they reflect. However, these "period markers" are only a small part of the total assemblage and many changes (i.e. settlement patterns, social organization) will not significantly affect artifact types; therefore, period markers identify units of time, not cultural content.

The basic function of period markers is to construct a chronology by which the whole, preserved cultural assemblage of sites may be dated. "Cultural units" are independent of time in that they may not be confined within a period, but extend across two or more chronological periods (Warren et al. 1980:17). The cultural unit usually consists of taxonomic divisions and units traditionally used by archaeologists (i.e. complex, phase, stage, culture, etc). The basis for definition in this case, however, is the similarity of cultural content (Warren et al. 1980:18).

Major site concentrations can be found along valley floors in the salt bush-sand dune zone, especially near past and/or present water sources. A second area of site concentration occurs at higher elevations in the black bush, Joshua tree pinyon-juniper zone not necessarily near existing water. These two areas of concentration have different resources and differing site types. High elevation sites appear smaller, more scattered, and contain fewer artifacts than lower elevation sites. Sites on the valley bottom are concentrated along lake margins and springs and may cover several acres. A wide range of artifacts are found here, suggesting many different activities. The same or different groups of people may have used these same sites repeatedly (Warren et al. 1980:68). The site distribution suggests small bands dispersed across the countryside to exploit scattered resources. The pattern of sites suggests seasonal movement from valley bottoms to higher elevations in search of pine nuts, agave, deer, mountain sheep, etc. The pattern is one in which bands gathered in the valley bottoms and dispersed in small task groups at higher elevations (Warren et al. 1980:70).

Twelve sites and nine isolates with tools on both sides of the Amargosa River occur at Ash Meadows and Franklin Wells, possibly distributed by sheet flooding. Ash Meadows is an area of springs and sand dunes with mesquite groves and rice grass. The remains of small camps are

located in areas of sand dunes and mesquite trees (Hunt and Hunt 1964) (Warren *et al*. 1980:71-72)**.** The Barnett site is a Gypsum period site radiocarbon dated between 2660 BP and 1790 BP. The artifact assemblage contains many knives, milling stones, and manos as well as Elko-Eared, Humboldt Basal Notched, Concave Based, and Gypsum Cave points. Saratoga Springs period sites have, among characteristics artifacts, olivine tempered Moapa Gray Ware (Hunt and Hunt 1964:10). Shoshonean Period site are found on sand dunes near springs with Paiute brown ware and small triangular & desert side-notched points among other characteristic artifacts (Warren *et al*. 1980:72).

The China Ranch area has a number of late sites clearly showing use of spring-related resources as well as mesquite and game animals. Data seem to represent migratory hunting and foraging people who utilized the spring in the China Ranch area. Sites include China Ranch (McKinney *et al*. 1971) Shoshone Cave #2 (Gearheart 1974), and Robinson Cave. Robinson Cave (Saratoga Springs and Shoshonean Period) contained Anasazi gray ware & Paiute brown ware pottery, Desert side-notched, Rose Springs series, & possible Gypsum Cave points, mesquite seeds and pods, and pieces of fur. Shoshone Cave #2 (Shoshonean & Historic Period) had a few shards of Paiute brown ware, small triangular and Desert side-notched points, egg shells, small pieces of rabbit skin blanket, and sea shell fragments (as ornaments). Both caves contained manos, metates, scrapers, and knives (Warren et al. 1980:73).

The Salt Springs area consists of approximately eighteen small, dispersed campsites dispersed over about four square miles along Salt Creek (Rogers 1939). The fossil dunes have been considerably eroded, exposing the sites (Warren et al. 1980:73-74). Most sites exhibit Pinto and/or Gypsum Period projectile points, the most characteristic of which are the Pinto series, Gypsum Cave points, Elko series, and a few Humboldt types. In addition to the projectile points, knives and scrapers are numerous. Hammer stones, cores, manos, and metates are frequent, indicating diverse activities. The fossil dunes cluster around an old water source (Salt Creek) where a number of groups returned seasonally (Warren et al. 1980:74). Salt Springs is significant because the sites concern the numerous problems related to the Pinto and Gypsum Periods and the sites located here are associated with a spring that has no potable water at present. This suggests that the sites were occupied during different climatic conditions (Warren et al. 1980:88).

Ethnographic Overview

The major groups occupying the western Mojave Desert include the Serrano, Kitanemuk, Kawaiisu, Vanyume, and possibly the Tataviam. Some Mohave, Chemehuevi, and desert Cahuilla may have traveled through the area for trade or other purposes, though whether they settled is controversial (Stickel and Weinman-Roberts 1980:93-94). Ethnographic and ethnohistoric accounts indicate that the original inhabitants had efficient foraging processes, some of which were semi-agricultural. For instance, burning was applied to enhance plant growth and animal resources (Lewis 1972; Bean and Blackburn 1976:45) and quasi-agricultural patterns are apparent for harvesting acorn, yucca, mesquite, and piñon nuts (Stickel and Weinman-Roberts 1980:94). Group settlement and exploitation patterns were within well-defined territories, though inter-group marriage and friendship no doubt existed (Heizer 1978:649; Kroeber 1925:145, 213, 395; Powers 1877:109-110; Stickel and Weinman-Roberts

1980:93-94). Ethnographically, Southern Paiute people occupied the Amargosa River region. Serrano (Vanyume), Kawaiisu, and Chemehuevi groups were immediate neighbors and probably utilized the area as well (Warren *et al*. 1980:141).

The Serrano are generally located in the San Bernardino Mountains east of Cajon Pass, at the base and north of these mountains near Victorville, east as far as Twentynine Palms, and south to and in the Yucaipa Valley. The area has considerable topographic variation and associated plant and animal communities (Bean and Smith 1978:570). Like their neighbors, a settlement location was determined by the availability and accessibility of water. Most Serrano lived in small villages situated near water sources. Family dwellings were usually circular, domed structures built of willow frames covered with tule thatching. An adjacent shade ramada was often constructed where daily household activities took place (Bean and Smith 1978:571).

Vegetable staples varied by locality. Generally, staple foods were piñon nuts (*Pinus monophylla*), Indian rice grass (*Oryzopis hymenoides*), mesquite (*Prosopis juliflora glandulosa*), and screwbean (*Prosopis pubescens*). Other food plants available included Mojave yucca (*Yucca schidigera*), Joshua trees (*Yucca brevifolia*) and agave (*Agave deserti*) (Warren *et al*. 1980:147-148). Various roots, bulbs, shoots, and seeds, particularly chia (*Salvia columbariae*) supplemented the main vegetable resources (Bean and Smith 1978:571). In riparian areas, specialized resources such as reeds (*Phragmites vulgaris*), tule (*Scirpus* sp.), and cattail (*Typha latifolia*) were also available (Warren *et al*. 1980:150).

Animals provided only a small part of the overall diet. While many groups highly valued mountain sheep (*Ovis canadensis*), deer (*Odocoileus hemionus*), and antelope (*Antilocapra americana*), such big game was rare (Laird 1976:112; Warren *et al*. 1980:153). Smaller species were more important. The most commonly used animals were cottontails (*Sylvilagus audubonii*) and jack rabbits (*Lepus californicus*), followed by chuckwalla (*Sauromalus obesus*), desert tortoise (*Gopherus agassizi*), rattle snake (*Crotalus* sp.), and birds, such as quail (*Lophortyx gambelii*) (Warren *et al*. 1980:153).

Shells, wood, bone, stone, and plant fibers were used to make a variety of implements, such as decorated baskets (Smith and Simpson 1964), pottery, awls, arrow straighteners, sinew-backed bows, arrows, fire drills, stone pipes, mats, cordage, nets, rabbit skin blankets, musical instruments (rattles of turtle, tortoise, or deer-hoof, wood rasps, bone whistles, bull-roarers, flutes), and feathered costumes. Bows and arrows, curved throwing sticks, traps, snares, and deadfalls were all employed in hunting. Manos, metates, stone knives, scrapers, pottery trays and bowls, baskets, and horn and bone spoons and stirrers were used to process animal and plant foods (Strong 1929; Bean 1962-1972; Bean and Smith 1978:571; Drucker 1937; Benedict 1924).

Other aboriginal populations living in the Mojave Desert are thought to have had similar subsistence patterns and cultural organization to the Serrano. The greatest differences are in location. Very little is known about the Vanyume, who lived along the Mojave River north and east of Victorville. It is thought that subsistence and social structure resembled that of the Serrano (Bean and Smith 1978:570).

The Kawaiisu culture overlaps between the Mojave Desert and Great Basin regions. The core area is located in the Sierra Nevada and Piute and Tehachapi mountains. Their habitat consisted of low mountainous ridges between the Mojave Desert and San Joaquin Valley (Zigmond 1986:398). Social and political organization was minimal and band territory was flexible in response to resource availability (Zigmond 1986:405).

Except for cultivating tobacco plants through pruning and burning, agriculture was not practiced. Acorns were a primary food source followed by piñon nuts, among other edible plants. Gathering and preparation involved a number of basket types, such as seed-beaters, burden baskets, winnowers, trays, hoppers, and containers of various sizes for collection acorns, seeds, nuts, berries, and roots (Zigmond 1986:399, 408). Baskets were made with two basic weaves, twined and coiled. The Kawaiisu had a unique variant of the coiled method that has no analog in the Great Basin or California areas (Zigmond 1986:401).

Other items in the Kawaiisu tool kit included bedrock and portable metates, pestles, manos, and obsidian knives were the primary stone implements for preparing food. Mammals (deer, rabbit) and birds (eagle, crow) were usually hunted with bow and arrows and sometimes hunters used decoys and blinds (Zigmond 1986:400). A three-piece composite arrow was utilized to hunt big game. Smaller game and birds were sought with one and two-piece composite arrows. Some undecorated brownware pottery is also associated with Kawaiisu sites, but it is unclear if it was made or traded in from neighboring areas (Zigmond 1986:401).

The Southern Paiute, also thought to include Chemehuevi culture, are generally located across southern Utah and Nevada and southward into California west of the Colorado River (Kelly *et al*. 1986:368). These people subsisted on a great variety of plant foods, small game, and the less common large game animals. Piñon nuts, agave, and various seeds were staple foods. Small animals included wood rats, mice, gophers, squirrels, chipmunks, birds, chuckwalla, and tortoise. Deer and antelope were usually available while bear and elk were more scarce (Kelly *et al*. 1986:370).

Historic Resources

In few other regions of the American west has the topography, climate, and geography played such a direct role in its development. Settlement in the Amargosa River region was slow to be established. Between 1776 and 1880, only precious metals or agriculture attracted Mexican, Spanish, and American settlers. The region was mainly used as a corridor for aboriginal traders and couriers, Mexican caravans, and later railroads, telegraph, telephone lines, and power lines. Ephemeral towns and mining camps were linked to these routes of travel and stimulated by their development. Railroad lines and other roads often died when the towns died (Warren *et al*. 1980:195). Historic sites associated with American settlement and commerce across the Mojave desert relate to ranches/homesteads, trails and landmarks, military presence, and mining (Stickel and Weinman-Roberts 1980:177). Other early activity in the area consisted of exploration and scientific expeditions.

Expeditions

Many early exploratory, scientific, military, and railroad expeditions passed near or through the Amargosa River region. In 1844, John C. Fremont's second and third western expeditions followed the Old Spanish Trail from the southern Mojave River to Las Vegas (Von Till Warren *et al*. 1981:II-2). In the spring of 1855, Lieutenant Sylvester Mowry and a military detachment marched from Salt Lake City to Fort Tejon by way of Resting Springs. They traveled through Cedar City, Santa Clara, Las Vegas, and the Mojave River (Von Till Warren *et al*. 1981:II-63). Coming from the east, Edward F. Beales' first trans-continental expedition explored a central route for a proposed railroad from May 10, 1853 to August 22, 1853. While passing through Utah, he intersected the Old Spanish Trail before reaching the Green River. His survey passed by Stump Spring, Resting Springs, the Amargosa Desert, and Bitter Spring to the Mojave River (Von Till Warren *et al*. 1981:II-72).

J. R. N. Owen and his Nevada-California Border Survey Party of 1861 traversed the Old Spanish Trail on their way from Mount Potosi in Nevada to the Amargosa River and finally the Owens Valley (Von Till Warren *et al*. 1981:II-25). During the summer of 1867, William M. Gabb of the California State Geologic Survey and the army-scientist Lieutenant Charles Emil Bendire left Camp Independence and rode across Death Valley to Resting Springs and Oasis Valley. Since the army was short of funds that fiscal year, it sent Bendire and an escort to accompany this California State Geologic Survey expedition (Von Till Warren *et al*. 1981:II-30).

In 1871, George M. Wheeler and Lieutenant Daniel Alfred Lyle led seventy-five men (two divisions) on an expedition to correct vague maps, provide geological data, study the flora and fauna, study potential agricultural possibilities, and record meteorological conditions. In the course of their survey, Wheeler and Lyle traveled through Ash Meadows, Cottonwood Springs, and Ivanpah, among other areas (Von Till Warren *et al*. 1981:II-40).

Mining

The earliest white European settlement was a small gold mining camp at the mouth of Salt Creek on the Amargosa River. Addison Pratt and other members of the 1849 Jefferson Hunt wagon train to California discovered gold in December 1849. A small mill was brought to the site in 1851, but after an Indian attack, the place was abandoned. The Amargosa Mining Company attempted to mine gold and silver in 1863. This operation was even shorter lived; however, the mine was operated sporadically until the 1930s (Heap 1957; Rousseau 1958; Warren *et al*. 1980:214).

The Resting Springs Mining District included the Gunsight and Noonday Mines. The earliest town established here was Tecopa in about 1875 along Willow Creek about eight miles from present day Tecopa (Warren *et al*. 1980:218). Mormons opened the Confidence Mine nearby as early as the 1860s. Ores from the mines were processed at Ivanpah in 1876. Development at Tecopa continued as three water jacket furnaces and a ten stamp mill were installed in 1880 to supplement the existing smelter. The boom subsided some time after 1882 (Myrick 1963; Warren *et al*. 1980:219).

In 1908, the camp was reactivated, but called "Tecopa Well," perhaps because the new Tecopa station on the Tonopah and Tidewater (T&T) railroad had usurped the name (Warren *et al*.

1980:219). The station along the railroad was located next to present day Tecopa Hot Springs, with the intent to use it for a water stop. Between 1913 and 1918, one or two cars of ore per day were sent to a concentration mill at the Tecopa T&T station. After 1918, production again decreased (Warren *et al*. 1980:220).

Aaron and Rose Winters made the first discovery of borax in 1880 in Death Valley. The claim was sold to William T. Coleman of San Francisco and developed into the Harmony Borax Works. Coleman later bought the claims for the Amargosa Borax works. This plant operated in the Amargosa Valley where temperatures were cool enough to operate year round. Elsewhere, summer temperatures were so high, borax would not crystallize. Finally, Coleman bought the Monte Blanco deposit, later named the Lila C. mine after his daughter (Glasscock 1940:145; Warren *et al*. 1980:222). Borax production would decline as the Calico District Borax mines would become the major supplier between 1888 and 1893 (Warren *et al*. 1980:222).

Railroads

The California gold rush, in conjunction with extensive settlement of the Oregon Territory, created more pressure to establish railroad routes across the continent. Four railroad surveys were begun in 1853, though Congress had been studying the "Railroad West Project" since 1849 (Stickel and Weinman-Roberts 1980:130). To determine a practical route to the Pacific Ocean, Secretary of War Jefferson Davis defined four routes to be examined: north between the 46th and 49th parallels, central between the 38th and 39th parallels, at the 35th parallel (Senator Gwin Route), and at the 32nd parallel (Gila route). Relevant to the Mojave Desert is the survey of the 35th parallel by Lt. Amiel Weeks Whipple. Lt. Robert Stockton Williamson conducted a second independent survey that included the western Mojave Desert (Stickel and Weinman-Roberts 1980:130).

Many other spur lines were established in the course of various mining activities in order to market the raw ore. Francis Marion "Borax" Smith instigated the Tonopah and Tidewater (T&T) Railroad in 1904 to ship ore out of Death Valley (Myrick 1991:545-546). Later, the Death Valley Railroad Company was formed by the Pacific Coast Borax Company in order to construct short rail lines between the Lila C., Biddy McCarty, and Widow Mines (Myrick 1991:608). The company acquired the Calico mines, where they also established the Borate and Daggett Railroad to haul ore to Daggett and replacing the twenty-mule teams (Myrick 1991:823). Likewise, The Tecopa Consolidated Mining Company completed the Tecopa Railroad in 1910 to connect the Noonday and Gunsight Mines to the Tonopah and Tidewater Railroad (Myrick 1991:593-594).

Although the Atlantic and Pacific Line (Santa Fe railroad) had been operational since 1883, train travel did not pass through the northeast Mojave Desert until eighteen years later. The San Pedro, Los Angeles, and Salt Lake line opened in 1905. Within two years, the T&T line bisected the region north to south, running between Ludlow on the Santa Fe railroad and extending north through the Death Valley-Amargosa regions into southern Nevada. This stimulated new mining developments and the beginning of tourist traffic (Warren *et al*. 1980:232). During its thirty-one years of use, the T&T Railroad was subject to flash floods and slides that caused tracks and stations to be relocated (Warren *et al*. 1980:236). All traffic finally ceased on June 14, 1940. Tracks were torn up by the War Department between 1942 and 1942 to be used for World War II

(Myrick 1963; Warren *et al*. 1980:236). Myrick (1963), Belden (1953b, 1960b) and Art Rader provide further detail regarding history and construction of the T&T.

Trails and Wagon Roads

At the same time the railroad surveys of the early 1850s were being carried out, traffic on the Spanish Trail (also called the Mormon Road) flourished. Sheep, pack trains, and wagons used it and in 1855, Jules Remey and Julius Brenchley led a scientific expedition for the French government across the western Mojave along that trail (Stickel and Weinman-Roberts 1980:135). One of the most important figures for trail development was Edward F. Beale. In the Navy, he fought with John Fremont and Kit Carson during the California takeover and was later appointed Superintendent of Indian Affairs for California in 1852. In 1857, he was appointed superintendent of a wagon road survey from Fort Defiance to the Colorado River along the 35th parallel. Shortly after Beales appointment, Secretary of War Jefferson Davis and Major George H. Crasman supported the idea of using camels for military service and Beale was put in charge of this experiment. Beale became well known for commanding the Camel Corps and was partially responsible for its existence (Stickle and Wienman-Roberts 1980:135).

Like other major east-west trails across the Mojave Desert, the North Fork route of the Old Spanish Trail and Salt Lake (Mormon) Road was first developed by aboriginal traders. Between 1829 and 1830, a trail was established from Santa Fe and Los Angeles following this route. This allowed New Mexicans to immigrate to California. After 1848, Mormon converts used the trail, later followed by Mormon freighting companies carrying goods between Salt Lake City and San Pedro Harbor (Von Till Warren *et al*. 1981:21). Two notable locations along the Old Spanish/Mormon Trail include Salt Creek and Resting Springs (Von Till Warren *et al*. 1981:28).

Colonel Reese discovered the Kingston Cut-Off in 1854. This shortened the Salt Lake route by about 40 miles by cutting off at Kingston Wash and traveling via Kingston Springs to Mountain Springs, Nevada (Von Till Warren *et al*. 1981:28). Ivanpah was also a stop on the Salt Lake trail by way of Coyote Holes (Springs). Two stages served Potosi in 1860-1861 (Von Till Warren *et al*. 1981:29). From the Ivanpah route, lesser wagon roads connected ranches to the north and the silver mines at Potosi, Nevada to California (Von Till Warren *et al*. 1981:40).

The Amargosa Mines route developed from the Ivanpah Road in the 1860's. The Amargosa Mines were established as early as the 1850's with the establishment of a camp and mill at Salt Creek on the Amargosa River (Von Till Warren *et al*. 1981:39). The route probably followed the Amargosa River south to Salt Creek where it connected with the Salt Lake Road. Major stops along this road include Burnt-Book Springs and Leach's Point (Von Till Warren *et al*. 1981:40).

Another cut-off from the Salt Lake trail was developed in the 1860's. Known as the Cox-Cut-Off, this route left the trail and looped through Mesquite Wells to the Potosi town site and back to the Salt Lake Trail at Cottonwood Springs. Silas C. Cox was an active freighter between San Bernardino and Salt Lake City and is the likely namesake for this road (Beattie 1925). Two stages served Potosi in 1860-1861 (Von Till Warren *et al*. 1981:29).

Amargosa Valley Ranches

The Spanish in the mid-1700s began exploration and early settlement of the Mojave Desert region. Francisco Garces, a Spanish Franciscan priest, was one of the first people to go looking for a practical route from Arizona to northern California. He was a consummate explorer and maintained good relations with the Mohave people, among other groups (Keeling 1976:2). Subsequent Spanish contact with aboriginal people became increasingly hostile, involving reciprocating massacres (Stickel and Weinman-Roberts 1980:119). Mexican control of the western Mojave Desert and the Spanish missions and ranches resulted in secularizing ownership by 1836. Settlement by white colonists, mostly trappers like Jedediah Strong Smith, soon followed (Stickel and Weinman-Roberts 1980:122).

During this period, the western Mojave Desert served first as a point of entry for westward bound American fur trappers. By the 1840s, these trappers had joined forces with aboriginal tribes to attack cattle ranches, which were the economic mainstay of California under Mexican rule. Some of the biggest and best-known raids were led by American Thomas L. "Peg-Leg" Smith (Stickel and Weinman-Roberts 1980:125, 126). Historic sites of this time mostly relate to missions, ranches, and trails.

Ash Meadows, located on the upper reaches of the Amargosa River, was the site of historic Indian rancherias. Aaron and Rose Winters were one of the earliest European residents before 1880 (Warren *et al*. 1980:225). In 1904, R. J. "Dad" Fairbanks established the first tent city at Ash Meadows, which functioned as a passenger stopover for the Las Vegas to Beatty stretch of the Las Vegas and Tonopah Railroad (Myrick 1963:588; Warren *et al*. 1980:226). Grain and provisions were obtained at the ranch, which was irrigated from springs (Warren *et al*. 1980:226).

Philander "Phi" Lee and his Paiute wife settled Resting Springs, south of Ash Meadows at the southern tip of the Resting Springs Range, in 1882 (Waring 1915:319; Warren *et al*. 1980:226). It is thought he began his ranch with the money from selling the Monte Blanco borax works to Coleman is about 1880 or 1881. Differing accounts (Mendenhall 1909; Waring 1915) place the size of the ranch between twenty-five and two hundred acres on which alfalfa, corn, and garden vegetables were raised (Warren *et al*. 1980:227). Yeoman Hot Spring and the Alec C. Yeoman ranch (Thompson 1929:574-575) are thought to have been located about five miles southeast of Shoshone. It is not certain when this ranch began (Warren *et al*. 1980:227).

China Ranch, also known as the Morrison Ranch and Willow Creek Ranch (Mendenhall 1909:40) was established just north of the Amargosa River and Willow Creek confluence. The ranch is located on an old road leading from Manse in Pahrump Valley to Death Valley (Warren *et al*. 1980:227). Early development of the site may have begun with the first activity at Tecopa in the 1870s. Mining entrepreneur J. B. Osborne was involved in Tacoma's development since 1876 and is credited with settling his personal cook on the ranch (Vincent 1973; McKinney *et al*. 1971). Quon Sing had come from China to work as a cook for the Harmony Borax works, the Gunsight mine, and later as personal cook for Osborne. He possibly ran a small farming operation and sold crops to the local mining camp (Warren *et al*. 1980:227-228). Quon Sing disappeared one day and was never seen again. Morrison took over (or chased Quon Sing away)

and his name appeared on the records during construction of the T&T Railroad. A siding to this railroad was also called Morrison and later renamed Acme (Warren *et al*. 1980:228).

Another account (Belden 1957) states that the ranch founder was Ah Foo, a Tibetan. He raised vegetables in the 1880s for the local "borax crews" and later planted fig trees. Belden (1957) says Ah Foo returned to Tibet to visit relatives and was unable to return (Warren *et al*. 1980:228). These two accounts may be versions of the same story, but more research is necessary to clarify events. China Ranch was purchased by Ben Robinson and his wife in 1955, and later by Bernice Brown-Sorrell and her brother Charles Brown in 1969 Warren *et al*. 1980:228). Brian Brown is the current owner and operator of the China Ranch date farm.

References

Bean, Lowell John, 1962-1972. Serrano Field Notes. Cited In The *Handbook of North American Indians, Volume 8: California* edited by Robert F. Heizer. Smithsonian Institute. Washington D.C.

Bean, Lowell J. and Thomas C. Blackburn, 1976. *Native Californians – A Theoretical Retrospective*. Ballena Press, Socorro, New Mexico.

Bean, Lowell J. and Charles R. Smith, 1978. Serrano. In The *Handbook of North American Indians, Volume 8: California* edited by Robert F. Heizer. Smithsonian Institute. Washington D.C.

Beattie, George William, 1925. Development of Travel between Southern Arizona and Los Angeles As It Relates to the San Bernardino Valley. *Historical Society of Southern California Annual Publications* 13(2).

Belden, L. Burr, 1953. T&T Built To Top Death Valley Borate Deposits. *San Bernardino Sun-Telegram*. February 1, 1957, Page 16.

Belden, L. Burr, 1957. Hanging Rocks of Armargosa's Canyon Visited. *San Bernardino Sun-Telegram*. March 10, 1957, Page 46.

Belden, L. Burr, 1960. Mine, Railroads Bring Boom to Town of Ludlow. *San Bernardino Sun-Telegram*. April 10, 1960, Section D, Page 8.

Benedict, Ruth Fulton, 1924. A Brief Sketch of Serrano Culture. *American Anthropologist* 26(3):366-392.

Bettinger, R. L. and R. E. Taylor, 1974. Suggested Revisions in Archaeological Sequences of the Great Basin in Interior Southern California. *Nevada Archaeological Research Papers* 5:1-26.

Blackburn, Thomas C. and Lowell J. Bean, 1978. Kitanemuk. In The *Handbook of North American Indians, Volume 8: California* edited by Robert F. Heizer. Smithsonian Institute. Washington D.C.

Brooks, Richard H., Richard Wilson, and Sheilagh Brooks, 1981. *An Archaeological Inventory Report of the Owlshead/Amargosa-Mojave Basin Planning Units of the Southern California Desert Area*. Cultural Resource Publications in Anthropology-History. Bureau of Land Management, California.

Broadbent, S., 1972. Archaeology Report in The *Amargosa Canyon-Dumont Dunes Proposed Natural Area* submitted to the Bureau of Land Management by The Pupfish Habitat Preservation Committee.

Bureau of Land Management, 2002. *Proposed Northern and Eastern Mojave Desert Management Plan: Amendment to The California Desert Conservation Area Plan*. A Final Environmental Impact Statement. California Desert District.

Bureau of Land Management, 1990. *Management Plan for Dumont Dunes Off-Highway Vehicle Area*. Barstow Resource Area. Barstow, CA.

Bureau of Land Management , 1989. M*anagement Plan for Kingston Range Natural Area: An Area of Critical Environmental Concern*. Barstow Resource Area. Barstow, California.

Bureau of Land Management , 1983a. *Management Plan for Amargosa Canyon Natural Area: An Area of Critical Environmental Concern*. Barstow Resource Area. Barstow, California.

Bureau of Land Management, 1983b. *Management Plan for Grimshaw Lake Natural Area: An Area of Critical Environmental Concern*. Barstow Resource Area. Barstow, California.

Bureau of Land Management, 1982. *Management Plan for Salt Creek Hills: An Area of Critical Environmental Concern*. Barstow Resource Area. Barstow, California.

Campbell, Elizabeth W. Crozer and William H. Campbell, 1935. The Pinto Basin Site: An Ancient Aboriginal Camping Ground in the California Desert. *Southwest Museum Papers* 9. Los Angeles.

Clewlow, C. William Jr., Robert F. Heizer, and Rainer Berger, 1970. An Assessment of Radiocarbon Dates for the Rose Spring Site (CA-INY-372), Inyo County, California. In *Papers on Anthropology of the Great Basin*, pp. 19-27. University of California Archaeological Research Facility Contributions 7. Berkeley.

Coombs, Gary B., Robert H. Crabtree, and Elizabeth Warren, 1979. *The Archaeology of the Northeast Mojave Desert*. Cultural Resource Publications in Archaeology. Bureau of Land Management, California.

Dalrymple, G. B., A. Cox, and R. R. Doell, 1965. Potassium-Argon Age and Paleomagnetism of the bishop Tuft, California. *Geological Society of America Bulletin* 76:665-673.

Davis, James T., 1962. The Rustler Rockshelter Site (SBr-288): A Culturally Stratified Site in the Mohave Desert, California. *University of California Archaeological Survey Reports* 57(2):25-56. Berkeley.

Davis Emma Lou, 1975. The “Exposed Archaeology” of China Lake, California. *American Antiquity* 40(1):39-53.

Davis Emma Lou, 1978. *The Ancient Californians: Rancholabrean Hunters of the Mojave Lakes Country*. Natural History Museum of Los Angeles County, California.

Davis, C. Alan and Gerald A. Smith, 1981. *Newberry Cave*. San Bernardino County Museum Association. Redlands, California.

Davis, C. Alan, R. E. Taylor, and Gerald A. Smith, 1981. New Radiocarbon Determinations From Newberry Cave. *Journal of California and Great Basin Anthropology* 3(1):144-147.

D'Azevedo, Warren L., 1986. *Handbook of North American Indians, Volume 11: Great Basin*. Edited by William C. Sturtevant. Smithsonian Institute. Washington D.C.

Donnan, Christopher B., 1964. A Suggested Cultural Sequence For The Providence Mountains (Eastern Mojave Desert). *Annual Reports of the University of California Archaeological Survey for 1964-1964*:1-23. Los Angeles, CA.

Drucker, Philip, 1937. Culture Element Distribution, Volume 5: Southern California. *University of California Anthropological Records* 1(1):1-52. Berkeley.

Gerhardt, Patricia L., 1974. Shoshone Shelter Cave Number Two: A Preliminary Report. *Pacific Coast Archaeological Society Quarterly* 10(2):35-50. Santa Ana, California.

Glasscock, Carl Burgess, 1940. *Here's Death Valley*. Grosset and Dunlap, New York.

Glennan, William S., 1974. The Baker Site (SBR541). *Pacific Coast Archaeological Society Quarterly* 10(2):17-34.

Harrington, John P., 1957. A Pinto Site at Little Lake, California. *Southwest Museum Papers* 17. Los Angeles.

Heap, Gwin Harris, 1957. *Central Route to the Pacific*. Arthur H. Glendale, Clark Company.

Heizer, Robert F., 1978. *Handbook of North American Indians, Volume 8: California*. Edited by William C. Sturtevant. Smithsonian Institute. Washington D.C.

Hunt, Alice P. and Charles B. Hunt, 1964. *Archaeology of the Ash Meadows Quadrangle, California and Nevada*. Manuscript on file at Death Valley National Monument.

Izett, G. A., R. E. Wilcox, H. A. Powers, and G. A. Desborough, 1970. The Bishop Ash Bed, a Pleistocene Marker Bed in the Western United States. *Quaternary Research* 1:121-132.

Jenkins, Dennis L. and Claude N. Warren, 1983. *Obsidian Hydration and the age of Pinto Points*. Paper Presented at the Southwest Anthropological Conference. San Diego, California.

King, Chester and Thomas C. Blackburn, 1978. Tataviam. In The *Handbook of North American Indians, Volume 8: California* edited by Robert F. Heizer. Smithsonian Institute. Washington D.C.

Kroeber, Alfred L., 1925. Handbook of the Indians of California. *Bureau of American Ethnology Bulletin* 78.

Kroeber, Alfred L., 1959 Ethnographic Interpretations 7-11. *University of California Publications in American Archaeology and Ethnology* 47(3):235-310. Berkeley.

Lanning, Edward P, 1963. Archaeology of the Rose Spring Site INY-372. *University of California Publications in American Archaeology and Ethnology* 49(3):237-336. Berkeley.

Leakey, Lewis S. B., Ruth D. Simpson, and T. Clements, 1968. Archaeological Excavations in the Calico Mountains, California: Preliminary Report. *Science* 160:1022-1023.

Lewis, H. T., 1972. The Role of Fire in the Domestication of Plants and Animals in Southwest Asia: A Hypothesis. *Man* 7:195-222.

Mason, J. F., 1948. Geology of the Tecopa Area, Southeastern California. *Geological Society of America Bulletin* 59:333-352.

McGuire, Kelly R, Alan P. Garfinkel, and Mark E. Basgall, 1981. *Archaeological Investigations in the El Paso Mountains of the Western Mojave Desert: The Bickel and Last Chance Sites (CA-Ker-250 and 261).* Report prepared by the Far West Anthropological Research Group, Inc. for the U.S. Bureau of Land Management, Riverside, California.

McKinney, Aileen, Duane Hafner, and Jane Gothold, 1971. A Report on the China Ranch Area. *Pacific Coast Archaeological Society Quarterly* 7(2):1-48.

Mehringer, Peter J., 1977. Great Basin Late Quaternary Environments and Chronology. In Models and Great Basin Prehistory: A Symposium edited by Don D. Fowler, pp. 113-167. *University of Nevada Desert Research Institute Publications in the Social Sciences* 12. Reno.

Mendenhall, W. C., 1909 Some Desert Watering Places in Southern California and Southwestern Nevada. *USGS Water Supply Paper* 224. U.S. Government Printing Office, Washington, D.C.

McKinney, Aileen, Duane Hafner, and Jane Gothold, 1971. A Report on the China Ranch Area. *Pacific Coast Archaeological Society Quarterly* 7(2):1-48. Costa Mesa, California.

Myrick, David F., 1963. *Railroads of Nevada and Eastern California: Volume II*. Howell-Norton Books, Berkeley, California.

Myrick, David F., 1991. *Railroads of Nevada and Eastern California, Volume II: The Southern Railroads*. University of Nevada Press, Las Vegas.

Powers, S., 1877. Tribes of California. U.S. Geographical and Geological Survey of the Rocky Mountain Region. *Contributions to North American Ethnology* 3. Washington D.C.

Rader, Art, 1974. *Tonopah and Tidewater Railroad: An Outline On Its Construction History: A Preliminary Historical Archaeological Survey*. Masters Thesis in Anthropology, University of California. Las Vegas, Nevada.

Rector, Carol H. James D. Swenson, and Philip I. Wilke, 1979. *Archaeological Studies at Oro Grande, Mojave Desert, California*. Final report Submitted to Victor Valley Wastewater Reclamation Authority, Victorville, California.

Rogers, Malcolm J., 1929. Report on an Archaeological Reconnaissance in the Mojave Sink in *Diego Museum of Man Archaeological Papers* 1(1). San Diego, California.

Rogers, Malcolm J., 1939. Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas. *San Diego Museum of Man Archaeological Papers* 3. San Diego.

Rogers, Malcolm J., 1945. An Outline of Yuman Prehistory. *Southwestern Journal of Anthropology* 1:167-198.

Rousseau, J. A., 1958. Rousseau Diary: Across the Desert to California from Salt Lake City to San Bernardino in 1864. *San Bernardino Museum Quarterly* 6(2).

Rowe, John H., 1962. Stages and Periods in Archaeological Interpretation. *Southwest Journal of Anthropology* 18(1).

Sheppard, R. A., and A. J. Gude, 1968. Distribution and Genesis of Anthigenic silicate Minerals in Tufts of Pleistocene Lake Tecopa, Inyo County, California. *U.S. Geologic Survey Paper* 597.

Smith, Gerald A., W. C. Schuiling, L. Martin, R. J. Sayles, and P. Jillson, 1957. Newberry Cave, California. *San Bernardino County Museum Association Quarterly Scientific Series* 1(4):3.

Smith, Gerald A., 1963a. *Archaeological Survey of the Mojave River Area and Adjacent Regions*. San Bernardino County Museum Association.

Smith, Gerald A., 1963b. Split-Twig Figurines from San Bernardino County, California. *Masterkey* 37:86-90.

Stickel, E. Gary and Lois J. Weinman-Roberts, 1980. *An Overview of the Cultural Resources of the Western Mojave Desert*. California Bureau of Land Management Cultural Resources Publications: Anthropology-History.

Strong, William D., 1929. Aboriginal Society in Southern California. *University of California Publications in American Archaeology and Ethnology* 26(1):1-358. Berkeley.

Sully, John M., Miriam A. Romero, and Robert D. Smith, 1972. *Amargosa Canyon-Dumont Dunes Proposed Natural Area*. A Report Submitted to the Bureau of Land Management by the Pupfish Habitat Preservation Committee, Montrose, California.

Sutton, Mark Q., 1980. Some Aspects of Kitanemuk Prehistory. *Journal of California and Great Basin Anthropology* 2(2):214-225.

Sutton, Mark Q., 1981. Archaeology of the Antelope Valley, Western Mojave Desert, California. Manuscript cited by Warren and Crabtree in the *Handbook of North American Indians, Volume 11: Great Basin* edited by Warren L. D'Azevedo, pp183-193. Smithsonian Institute. Washington D.C.

Thompson, David G., 1929. The Mohave Desert Region. *Water Supply Paper* 578. Government Printing Office, Washington D.C.

True, D. L., E. L. Davis, and E. L. Sterud, 1966. Archaeological Surveys in the New York Mountains Region, and Bernardino County, California. *Annual Reports of the University of California Archaeological Survey* 8:243-278. Los Angeles, California.

Vincent. Bill, 1973. China Ranch and Amargosa Gorge. *The Nevadan, Las Vegas Review-Journal*. December 9, 1973:3-5.

Von Till Warren, Elizabeth, Ralph J. Roske, and Elizabeth Nelson Patrick, 1981. *Cultural resources of the California Desert, 1776-1880: Historic Trails and Wagon Roads*. Cultural Resource Publications in Anthropology-History. Bureau of Land Management, California.

Wallace, William J. and Edith S. Taylor, 1959. A Pre-ceramic Site at Saratoga Springs, Death Valley National Monument, California. *Contributions to California Archaeology* 3(2):1-13. Los Angeles.

Wallace, William J., 1962. Prehistoric Cultural Developments in the Southern California Deserts. *American Antiquity* 28:172-180.

Wallace, William J., 1978. Post Pleistocene Archaeology, 9,000-2,000 B.C. In The *Handbook of North American Indians, Volume 8: California* edited by Robert F. Heizer. Smithsonian Institute. Washington D.C.

Waring, Gerald A., 1915. *Springs of California*. Government Printing Office, Washington D.C.

Warren, Claude N. and Robert H. Crabtree, 1986. Prehistory of the Southwestern Area. In The *Handbook of North American Indians Volume 11: Great Basin* edited by Warren L. D'Azevedo. Smithsonian Institute. Washington D.C.

Warren, Claude N., Martha Knack, Elizabeth von Till Warren, and Richard L. McCarty, 1980. *A Cultural Resource Overview for the Amargosa-Mojave Basin Planning Units*. Cultural Resource Publications in Anthropology-History. Bureau of Land Management, California.

Warren, Claude N. and Anthony J. Ranere, 1968. Outside Danger Cave: A View of Early Man in the Great Basin. In Early Man In Western North America Edited by C. Irwin-Williams. *Eastern New Mexico University Contributions in Anthropology* 1(4):6-18.

Wheeler, S. M., 1973. The Archaeology of Etna Cave, Lincoln County, Nevada. Edited by Don .D Fowler. *Desert Research Institute Publications in the Social Sciences* 7.

Zigmond, Maurice L., 1986. Kawaiisu. In The *Handbook of North American Indians Volume 11: Great Basin* edited by Warren L. D'Azevedo. Smithsonian Institute. Washington D.C.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
PAS 2623.4016.5186

March 13, 2006

Memorandum

To: District Manager, California Desert District, Bureau of Land Management, Moreno Valley, California
/s/ Carl T. Benz
From: Acting Assistant Field Supervisor, Great Basin and Mojave Deserts, Ventura Fish and Wildlife Office, Ventura, California

Subject: Biological Opinion for the Amargosa River Area of Critical Environmental Concern Management Plan (CA610 1510(P)) (1-8-04-F-61)

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed management plan for the Amargosa River Area of Critical Environmental Concern (ACEC) located in Inyo and San Bernardino Counties, California. At issue are the effects of the implementation, by the Bureau of Land Management (Bureau), of the ACEC plan on the federally endangered Amargosa vole (*Microtus californicus scirpensis*), southwestern willow flycatcher (*Empidonax traillii extimus*), least Bell's vireo (*Vireo bellii pusillus*), and Amargosa niterwort (*Nitrophila mohavensis*) and the threatened Ash Meadows gumplant (*Grindelia fraxino-pratensis*), and the designated critical habitat for the Amargosa vole, Amargosa niterwort, and Ash Meadows gumplant, in accordance with section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act). We received your January 16, 2004 request for formal consultation on January 20, 2004.

You also requested formal consultation on the effects of plan implementation on the threatened spring-loving centaury (*Centaurium namophilum* var. *namophilum*). All known populations and critical habitat for this plant are within or in the immediate vicinity of the Ash Meadows National Wildlife Refuge, Nye County, Nevada; we have no records of the spring-loving centaury within the planning area. We, therefore, have not included the spring-loving centaury in this consultation.

Through informal consultation with our office, you also requested concurrence that some management actions within the Amargosa River ACEC Plan are not likely to adversely affect listed species and their critical habitat. We have described these actions and provided our reasons for concurrence in the Description of the Proposed Action section of this biological opinion.

We based this biological opinion on information provided in the January 16, 2004 biological evaluation and project description (Bureau 2003a), draft sections of the environmental assessment for the ACEC (Bureau 2005a), the monitoring plan (Bureau 2003b), and electronic mail and telephone communications with Charles Sullivan of the Bureau. A complete administrative record of this consultation is on file at the Service's Ventura Fish and Wildlife Office.

We provided a draft biological opinion for your review on March 8, 2006. Your staff provided verbal comments to us in response to the draft document; we incorporated these comments into this final biological opinion.

BIOLOGICAL OPINION

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification of critical habitat" at 50 *Code of Federal Regulations* 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the analysis with respect to critical habitat that is contained in this biological opinion.

DESCRIPTION OF THE PROPOSED ACTION

Background

Signing of the record of decision for the final environmental impact statement for the Bureau's Northern and Eastern Mojave (NEMO) Plan on December 20, 2002, mandated the creation of a new management plan for the areas of critical environmental concern along the Amargosa River (Bureau 2002). In addition, the Bureau created a new Amargosa River ACEC, which combined the previous Grimshaw Lake and Amargosa Canyon ACECs into one unit and added additional area (see Figure 2 in Bureau 2003a). The Bureau also created the Lower Carson Slough ACEC near Death Valley Junction, California and established a new wildlife habitat management area (WHMA) near Stateline, Nevada (see Figure 2 in Bureau 2003a). The Amargosa River ACEC Plan provides direction for the management of these lands. This plan will function for 20 years, at which point the Bureau will review and revise the plan per its regulations. We will refer to all of these lands collectively as the "Amargosa ACEC" or the "ACEC" within this biological opinion.

Organization of the Description of the Proposed Action

The Bureau has established several management goals within the Amargosa River ACEC Plan. They are: 1) protect, enhance, and restore riparian and wetland systems; 2) protect and prevent irreparable damage to threatened, endangered, and sensitive species and their habitat; 3) take prudent, proactive steps towards recovery of threatened and endangered species and their habitat; 4) conserve and protect water resources essential to the maintenance of valued resources and habitat; 5) implement an inventory and monitoring strategy; 6) provide recreation opportunities consistent with resource protection; 7) protect sensitive historical, cultural, and scenic values; and 8) provide consistent management of lands within the ACEC boundaries.

The Bureau has defined management actions to accomplish these management goals and determined that some of these management actions or portions of management actions will not affect listed species. Consequently, we will not discuss these management actions in the biological opinion. For other management actions, the Bureau has requested our concurrence that the management actions or portions of the actions are not likely to adversely affect listed species or their critical habitat because they have beneficial or insignificant effects. We have included these management actions in the project description and indicated whether we concurred with the Bureau's determination and the reasoning for our conclusion. In addition, we have already consulted on some plan actions. We have listed these management actions in the project description and have indicated the consultation in which these actions were evaluated. We will not carry these management actions forward for analysis through the remainder of the biological opinion because we have already analyzed them in previous biological opinions. The remaining management actions proposed in the ACEC Plan are likely to adversely affect listed species and their critical habitats. We will analyze these management actions in this biological opinion. Unless otherwise noted, the protective measures proposed by the Bureau and described in the Minimization Measures section of this biological opinion (following the description of the proposed management actions) apply to all relevant actions.

Management Actions That Are Not Likely to Adversely Affect Listed Species

Actions with Insignificant Effects

1. The Bureau will reduce the numbers of brown-headed cowbirds (*Molothrus ater*) within the ACEC.

The Bureau will monitor for brown-headed cowbirds during regular avian point count surveys. It proposes to use trapping as the only authorized method of removal. The Bureau may construct and place brown-headed cowbird traps at anytime of the year, but will only open traps between March 1 and May 31. The Bureau does not anticipate loss of habitat for listed species while installing and using the traps. It will access trapping sites on foot or by all-terrain vehicles (ATV) using the Tonopah and Tidewater (T & T) railroad grade (see Figure 2 in Bureau 2003a), the Willow Creek Drainage Trail, or Cowboy Canyon.

The southwestern willow flycatcher and least Bell's vireo may be affected by implementation of this action. The Bureau will not destroy or degrade their habitat because placement and use of traps do not require the removal of riparian vegetation to result in effective control. Traps are unlikely to catch southwestern willow flycatchers and least Bell's vireos because they are baited for grainivorous birds. Because both southwestern willow flycatchers and least Bell's vireos are insectivorous, the traps are unlikely to attract them. In 2003, no southwestern willow flycatchers or least Bell's vireos were captured in 252 cowbird traps in 45 locations throughout Kern, Ventura, Los Angeles, Riverside, Orange, Imperial, San Bernardino, and San Diego counties; no individuals of these listed species were captured in 180 traps in 2004 (Kus pers. comm.). Based on this information, we do not anticipate adverse effects to the southwestern willow flycatcher or least Bell's vireo from implementation of this management action. None of the other listed

species occur in areas where the Bureau would place traps; consequently, this management action would not affect other listed species.

This action would not take place within or affect designated critical habitat of any listed species. Because this action is not likely to adversely affect listed species or their critical habitat, we will not discuss it again in this biological opinion.

2. The Bureau will conduct multi-year surveys to establish vegetation baseline and trend in the ACEC; it will also collect information on new populations of listed and sensitive plant species. In addition, it will monitor suitable listed and sensitive plant habitat, track population trends, and identify additional recovery needs. It will also monitor changes in vegetation characteristics over time and identify thresholds for substantial change that will trigger the reevaluation of strategies.

Survey crews will measure perennial vascular plant species richness using permanent vegetation plots placed along nine 3,500-meter permanent transects located in the Upper Amargosa WHMA (1 transect), Lower Carson Slough Unit (1 transect), and Lower Amargosa Unit (7 transects). The Bureau will also note the location of any new populations of Amargosa niterwort, Ash Meadows gumplant, white bear poppy (*Arctomecon merriami*), or Tecopa bird's beak (*Cordylanthus tecopensis*). The Bureau has listed white bear poppy and Tecopa bird's beak on its sensitive species list. The Bureau will survey the vegetation plots every year, between April and June, for the first 3 years of plan implementation, and then every 5 years thereafter.

Survey crews will mark and intensively survey areas where they locate new populations of Amargosa niterwort, Ash Meadows gumplant, white bear poppy, or Tecopa bird's beak. The Bureau will delineate and identify locations with a high number of individuals as populations it will monitor further. Survey crews, composed of 3 to 15 biologists, will revisit Amargosa niterwort, Ash Meadows gumpant, Tecopa bird's beak, and white bear poppy populations each year for the first 2 years and then every 3 years thereafter. The Bureau does not anticipate any surface disturbance during this activity.

Implementation of this action may affect the southwestern willow flycatcher, least Bell's vireo, Amargosa vole, Amargosa niterwort and Ash meadows gumplant. While survey crews perform walking surveys to identify populations of listed plants, they will actively look for Amargosa niterwort and Ash Meadows gumplant on survey transects. This will make identification and avoidance of adverse effects to listed plants possible.

The Bureau will establish seven transects in areas potentially occupied by Amargosa voles; workers will walk through areas and look for plants. Surveys will occur only 6 times over the next 20 years. The transects would be distributed across areas that may provide suitable habitat for these plant species. Amargosa voles may occupy a small portion of this area to be surveyed; therefore, the transects are likely to cross only a small portion of occupied habitat. Consequently, only a small portion of occupied habitat of the Amargosa vole may be affected. The activity associated with the surveys consists only of walking through an area, and the surveys would be conducted on a very infrequent basis. For these reasons, we anticipate that

Amargosa voles are unlikely to be killed or injured and that damage to their habitat could not be meaningfully measured. In conclusion, we consider any adverse effects of this activity to be insignificant and discountable.

Walking of transects within southwestern willow flycatcher and least Bell's vireo habitat may disturb a bird for a short time while the surveyors are walking through the riparian area. We do not anticipate this level of disturbance would result in adverse effects to the birds, however, because the action would occur infrequently (6 times over a 20-year period) and surveyors walking through riparian areas would disturb birds for an extremely short time. We anticipate disturbed birds would return to their previous location and continue forming territories, feeding, or nesting activities following these disturbances. Therefore, we do not anticipate that this disturbance is likely to adversely affect breeding, feeding, or sheltering activities to a degree that we could meaningfully measure.

None of the survey or monitoring work associated with plants will disturb habitat, including critical habitat, of listed species in any manner. For these reasons, we will not discuss this action further in the biological opinion.

3. The Bureau will monitor any newly established populations of Ash Meadows gumplant and Amargosa niterwort to determine their success.

The Bureau will begin monitoring at sites where it has planted Amargosa niterwort and Ash Meadows gumplant when the restoration work occurs. It will use the number of plants placed in the ground as the baseline. The Bureau will visit sites every year, between May and September, for the first 3 years following planting to determine success. It will count all individuals of Amargosa niterwort and Ash Meadows gumplant between May and September. Surveyors will monitor these species, on foot, at all transplant sites once every 3 years to determine if they are persisting following establishment.

During implementation of this management action, surveyors could crush plants while walking in habitats occupied by these newly established populations. We conclude, however, that individuals of these species are unlikely to be crushed because surveys will be conducted on foot and surveyors will be specifically searching for these species.

Because surveyors will perform all work associated with this action on foot, adverse effects to designated critical habitat will not be measurable. For these reasons, we will not discuss this action further in the biological opinion.

4. The Bureau will monitor for effectiveness of restoration efforts.

The Bureau will monitor some restoration sites in upland and riparian habitats to determine the effectiveness of its efforts and if it needs to take additional steps. This monitoring will involve plant survival counts within planted restoration sites and tracking of trends in germination and seedling survival at seeded restoration sites. Monitoring will occur every year for the first 3 years following planting or seeding and then every 3 years thereafter.

We do not anticipate this management action is likely to adversely affect southwestern willow flycatchers or least Bell's vireos within the ACEC for several reasons. The Bureau will conduct the initial monitoring efforts in disturbed upland or riparian areas that it has recently planted or seeded. Due to the disturbed nature of these sites, they will generally be devoid of vegetation or contain vegetation that is substantially degraded. Consequently, these areas will not support the appropriate structure of riparian vegetation to support nesting of these species.

The Bureau has proposed to cease monitoring efforts once it has determined that restoration efforts have been successful (C. Sullivan pers. comm.). Therefore, monitors are unlikely to work in areas of dense vegetation that may provide suitable habitat for listed species. Because the Bureau would not perform monitoring in these areas following successful restoration, listed species that return to these areas following the improvement of habitat are not likely to be adversely affected.

This management action may briefly disturb southwestern willow flycatchers or least Bell's vireos that are foraging in or migrating through these areas. Such disturbances are unlikely to cause any meaningful adverse effect to the individual's ability to breed, feed, shelter, or undertake any other behavior.

The Bureau will also conduct surveys for Ash Meadows gumplant in newly restored areas. We anticipate that individuals of Ash Meadows gumplant are unlikely to be trampled because surveyors will be specifically searching for them and ground cover is likely to be sufficiently sparse that workers will be able to avoid trampling plants.

For the Amargosa vole, this action is unlikely to result in adverse effects for reasons similar to those described for the southwestern willow flycatcher. Restored salt grass (*Distichlis spicata* var. *stricta*) meadows and bulrush marshes will not initially contain the appropriate attributes of Amargosa vole habitat. Therefore, Amargosa voles are extremely unlikely to be present in these areas.

Amargosa niterwort is unlikely to be affected by this action because the Bureau will not seed or plant native vegetation in areas that are naturally salt-encrusted mudflats. Because the Bureau would not perform restoration of this type in these areas, it will not monitor for effectiveness; therefore, Amargosa niterwort will not be adversely affected.

Surveyors would be traveling on foot when monitoring restoration sites and would not disturb any vegetation or soils. Based on this information, we do not anticipate this action will adversely affect critical habitat for any listed species.

For the reasons we have discussed in the preceding paragraphs, monitoring of restoration sites is not likely to adversely affect individuals or habitat, including critical habitat, of listed species in any manner. Consequently, we will not discuss this action further in this biological opinion.

5. The Bureau will identify, map, and/or monitor groundwater sources and springs within the ACEC to determine trends in available water quantity.

The Bureau will continuously monitor water quantity on the main course of the Amargosa River with gauging stations that are maintained by the U.S. Geological Survey. We do not anticipate that the Bureau's use of existing gauging stations will affect listed species because these structures and their access routes are already in place and the Bureau can monitor them remotely.

The Bureau will also monitor water quantity at all spring outflows every 5 years for the life of the plan. It will use notched weirs or other related devices in the channels flowing from these springs. We do not anticipate periodic monitoring of water quantity at spring outflows would result in adverse effects to listed species. This action could disturb southwestern willow flycatchers and least Bell's vireos for a short time during access to and work at springs; however, due to the short duration of the disturbance, this action is unlikely to cause any meaningful adverse effect to the individual's ability to breed, feed, shelter, or undertake any other behavior. We anticipate the birds will return to normal behavior within these areas when surveyors leave.

This action is unlikely to adversely affect Amargosa niterwort because spring outflows that can be measured do not generally occur on salt-encrusted mud flats. This action may affect Ash Meadows gumplant if monitors accidentally step on plants when accessing or working at survey sites. Because this work would occur only 4 times over 20 years, the potential disturbance of Ash Meadows gumplant is not likely to result in a meaningful effect to individuals of the species or its growth, reproduction, and distribution in the action area.

This action is unlikely to adversely affect the Amargosa vole because monitors will be accessing a small number of sites within suitable habitat by foot. They will do so infrequently (4 times over 20 years) and will need to stay for only the length of time required to place a weir and take measurements. We anticipate this amount of human access to Amargosa vole habitat will result in an extremely low likelihood of an Amargosa vole being crushed.

Because access to all sites and monitoring at springs will result in no surface or vegetation disturbance, we anticipate this action is not likely to adversely affect critical habitat. For these reasons, we will not discuss activities related to identifying, mapping, and monitoring groundwater sources and springs again in this biological opinion.

6. The Bureau will conduct regular focused research and surveys for listed, sensitive, and other riparian birds to determine variety, abundance, nesting locations, and information to maintain and enhance nesting populations.

The following description and reasoning for concurrence does not apply to presence/absence surveys or spot mapping for the southwestern willow flycatcher. We have addressed these actions for the southwestern willow flycatcher and all nest surveys in Action 29. The following description and reasoning for concurrence only applies to presence/absence surveys and spot mapping for the least Bell's vireo and non-listed bird species.

Survey crews will monitor migratory and non-migratory avian species richness, diversity, and relative abundance using point counts along the same 3,500-meter permanent transects described previously for vegetation surveys. They will make special note of any cowbird species found

during the census. The Bureau will perform these surveys every year, between April and July, for the first 3 years of plan implementation and then every 5 years thereafter. Survey crews will run transects twice during each season.

The Bureau will also perform presence/absence surveys for the least Bell's vireo using Service-approved biologists. It will follow the Service's (2001) protocols for the least Bell's vireo and conduct four surveys of the riparian areas of the ACEC between April 1 and July 31. Survey crews will perform these surveys every other year for the life of the plan. The Bureau's efforts to gain more information about the status of this subspecies in the action area should contribute to its conservation. Because the Service's protocol does not involve the use of tapes to elicit calls from least Bell's vireos, surveyors are not required to possess a permit from the Service, pursuant to section 10(a)(1)(A) of the Act, to conduct this work.

The Bureau will also perform spot mapping to establish the boundaries of breeding territories for least Bell's vireos. Surveyors will visit sites where they detect individuals during presence/absence surveys at least eight times during the course of the breeding season and note the location of the male or mated pair to determine approximate territorial boundaries. The Bureau may make some of these visits concurrent with presence/absence surveys, but it will make them early enough to allow for performance of subsequent nest surveys (nest surveys are described below in the section covering likely to adversely affect actions –Action 29).

Although presence/absence surveys and spot mapping for least Bell's vireos and other avian species would occur more frequently than vegetation transects, we conclude its implementation is not likely to adversely affect the least Bell's vireo for the same reasons as those discussed in Action 2. We base this conclusion on the fact that surveyors will not use taped playbacks.

Because the Bureau will not perform these surveys within habitat for the other listed species, we do not anticipate adverse effects to the Amargosa vole, Amargosa niterwort, or Ash Meadows gumplant or their critical habitat. Because no critical habitat for the southwestern willow flycatcher or least Bell's vireo occurs within areas the Bureau will survey, implementation of this action will not affect designated critical habitat for these species. For these reasons, we will not discuss this action further in this biological opinion.

7. The Bureau will survey for populations of Amargosa River pupfish (*Cyprinodon nevadensis amargosae*) and the Amargosa Canyon speckled dace (*Rhinichthys osculus* ssp.).

The Bureau will perform fish surveys of Amargosa Canyon and Grimshaw Basin in May and July every 3 years for the life of the plan. The Bureau will also measure stream depth, stream width, water velocity, substrate type, dissolved oxygen, pH, total dissolved solids, turbidity, air temperature, water temperature, and percent cover at each location, to characterize the condition of the riverine habitat. It could conduct these surveys anytime of the year. The Bureau does not anticipate the need to disturb any riparian habitat.

We anticipate this action is not likely to adversely affect listed species within the ACEC. We base this conclusion on similar reasoning to that discussed for Action 5. The southwestern willow flycatcher, least Bell's vireo, and Amargosa vole are the only species this action may affect. Access to and work at survey locations will not result in habitat disturbance, will be short in duration, and will occur infrequently. We anticipate this level of disturbance is not likely to disturb southwestern willow flycatchers or least Bell's vireos to such an extent that it affects breeding, feeding, sheltering, or other behaviors in a meaningful way. In addition, we anticipate this level of human access into Amargosa vole habitat is extremely unlikely to result in the crushing of Amargosa voles.

Because access to all survey locations will be on foot and will result in no surface disturbance, we anticipate this action is not likely to adversely affect critical habitat for any listed species. For these reasons, we will not discuss fish surveys and habitat assessments within Amargosa Canyon and Grimshaw Basin again in this biological opinion.

8. The Bureau will inventory invertebrate populations and assemblages in the ACEC and monitor sensitive fish and invertebrate microhabitats to identify trends and threats.

The Bureau will evaluate all springs within the ACEC during April and May for the presence of endemic spring snails every other year for the life of the plan. It will also note the presence of any non-native spring snails.

The Bureau will also perform general macroinvertebrate studies every other year for the life of the plan. A three- to four-person survey crew will collect macroinvertebrates from riverine gravel, soil, and cobbles at sampling points along the course of the Amargosa River and at other sampling locations within the Grimshaw Basin. The Bureau does not anticipate the need to disturb any riparian habitat.

We anticipate this action is not likely to adversely affect listed species or designated critical habitat within the ACEC. We base this conclusion on similar reasoning to that discussed for Action 5. For these reasons, we will not discuss inventories for macroinvertebrates within Amargosa Canyon and Grimshaw Basin again in this biological opinion.

Actions with Solely Beneficial Effects

The following actions, proposed by the Bureau in the ACEC Plan, are not likely to adversely affect listed species because they have solely beneficial effects:

9. The Bureau will prohibit ground fires on public lands within the ACEC.

10. The Bureau will construct a vehicle barrier at the mouth of Cowboy Canyon.

11. The Bureau will maintain existing off-road vehicle barriers at the southern end of the Amargosa River ACEC adjacent to Sperry Wash.

12. The Bureau will prohibit new non-administrative, discretionary stream diversions and groundwater disturbing activities on public lands within the ACEC and will prohibit discretionary geothermal development and exploration in the ACEC.

13. The Bureau will assert Federal Reserve water rights for the Kingston Range Wilderness, Wild and Scenic River and Public Water Reserves and file for appropriated water rights to conserve existing water sources that support the ACEC's resources and values.

14. Build a barrier at the trailhead of the rerouted northern end of the Tecopa Trail to exclude off-highway vehicles (OHV) and restore the previous trailhead, as needed.

15. Eliminate bathing at hot springs in the ACEC.

16. Prohibit the discharge firearms on public lands within the ACEC except shotguns when engaged in legal hunting.

17. Prohibit overnight camping on public lands within the Central Unit of the ACEC.

18. Acquire State and private lands within the Amargosa River ACEC through exchange or purchase from interested, willing landowners to consolidate public lands.

Management Actions Analyzed in Previous Biological Opinions

We have already consulted with the Bureau on the following three management actions (Service 2005). The Bureau's proposed action with regard to this ACEC Plan will not change their nature or scope. Consequently, we will not discuss these actions further in this biological opinion.

19. The Bureau will control salt cedar (*Tamarix* spp.) and other weedy species through implementation of the Barstow Field Office's 10-year weed control plan.

20. The Bureau will implement, as needed, a controlled burn program to further supplement weed control projects and/or to eliminate slash-piles from mechanical removal.

21. The Bureau will conduct active riparian restoration as needed. It will introduce native riparian species in areas of weed control and other priority areas that have been damaged.

Management Actions That Are Likely to Adversely Affect Listed Species

22. The Bureau will initiate additional active riparian and upland restoration in priority-degraded areas within the ACEC, as needed.

The Bureau will identify, through continual assessment and monitoring, areas within all sections of the ACEC that are degraded due to human-caused disturbances. These areas may include trail short cuts, prohibited OHV routes, unauthorized campsites, and human-caused rill and gully erosion. With the exception of erosion control sites, the Bureau will reseed these areas with

locally obtained native seed of common perennial species, plant them with containerized native plants grown from locally collected seed or with cuttings from native riparian vegetation, or vertically mulch (plant) them with dead portions of shrubs and trees from the immediate project vicinity. The Bureau will use augers, hydroplanting drills, chainsaws, and hand tools at these sites, and may include drip irrigation systems to increase plant survival rates at some sites. The Bureau will repair rill and gully erosion with water bars, gabions, and other erosion control structures. It will install structures by hand in most instances but, in areas where a small "bobcat" or backhoe can access the site without creating habitat damage, it will use mechanized equipment.

The Bureau may employ as many as 15 people on an erosion control crew at a given site and may implement this action at any time of the year, except within habitat of the southwestern willow flycatcher and least Bell's vireo. Work crews will implement restoration activities between October 31 and March 1 in these areas.

The Bureau may need to implement erosion-control projects at almost any location within the ACEC to respond to different areas of habitat degradation. It is unable to predict precise access points for the entire ACEC but when working within Amargosa Canyon or in the Willow Creek drainage, the Bureau will use the T & T railroad grade, the Willow Creek drainage trail, or Cowboy Canyon to access the work sites using small ATVs. The Bureau will perform pre-project surveys of the access routes if it uses ATVs for cross-country travel. Bureau biologists will clearly delineate access routes to prevent vehicle straying if they traverse or are immediately adjacent to listed species or their habitat. The Bureau will perform pre-project surveys for Ash Meadows gumplant and Amargosa niterwort when implementing this action within confirmed or potential habitats. A Service-authorized biologist will survey for runway systems and rodent feces if the project is within or adjacent to Amargosa vole habitat. The authorized biologist will choose routes crossing areas with the fewest runway systems. He/she will clearly mark the boundaries of restoration sites and access routes and all restoration activities will remain within those boundaries. The Bureau cannot predict how many restoration or erosion-control projects it may need or how much surface disturbance will occur over the 20-year life of the ACEC plan.

23. The Bureau will take steps to restore and maintain the natural sinuosity of the Amargosa River to minimize unnatural down cutting.

The Bureau does not have a specific project description for this action or know, at this time, what steps it will need to take to implement this action. This action will likely require several separate projects over the course of plan implementation.

24. The Bureau will reduce direct and indirect impacts to listed and special status plants by maintaining existing protective fences. It will fence and/or sign known population centers and restore closed routes that human or other disturbances have adversely affected. It will maintain existing protective fences, fence and/or sign population centers of listed and special status plants, and restore closed routes where human use or other disturbances are adversely affecting sensitive plant resources.

The Bureau will fence population centers (sites with high numbers of plants relative to the surrounding area) of Amargosa niterwort, Ash meadows gumplant, Tecopa bird's beak, and white bear poppy, affected by surface disturbance. The Bureau will assess population centers of these species to determine the amount of risk they face from human-caused disturbances and will determine whether to fence these areas. Three- to five-person work crews will use hand tools to install four-strand smooth-wire fencing, strung between t-posts, around each population center identified for protection. They will fence the boundary of the identified population center, 6 meters outside of the delineated boundary. If possible, the Bureau will fence the entire habitat area containing the population center. The Bureau will identify access routes, using the same methods described for restoration and erosion control sites.

The Bureau may need to fence listed and sensitive plant populations anytime of the year and will most likely implement this action within areas of the Lower Carson Slough portion of the ACEC or in appropriate habitats near Tecopa Hot Springs. The Bureau is unable to predict how many populations it will need to fence or what the associated area of disturbance will be for fence installation. The Bureau does not anticipate the need to perform this action within bulrush marshes occupied by the Amargosa vole.

25. The Bureau will reduce the numbers of exotic animals within listed species habitat. These species may include, but are not limited to, the house mouse (*Mus musculus*) and free-roaming domestic cats.

***House Mouse Control*:**

The recovery plan for the Amargosa vole (Service 1997) identifies monitoring and control of populations of house mice within Amargosa vole habitat as a priority two action (task no. 53). The Nature Conservancy (TNC), Bureau, California Department of Fish and Game (CDFG), and Service will implement this recovery action through this ACEC Plan to minimize the potential effects of interspecific competition between the Amargosa vole and the house mouse by controlling house mouse populations at a low and manageable level. The Bureau will likely use live trapping within Amargosa vole habitat to monitor house mouse numbers and for control programs, but does not know the trapping intensity, schedule, and location at this time. The Bureau will determine the details of this program through planning with CDFG, TNC, and the Service.

***Free-Roaming Domestic Cat Control*:**
The Bureau will monitor free-roaming domestic cats within and adjacent to suitable habitat to determine the extent of this threat to the Amargosa vole. The Bureau will develop and implement a public education program in the area if cats are present. The Bureau will institute a control program if subsequent surveys show continued free-roaming cat presence within Amargosa vole habitat.

Surveyors will trap free-roaming cats in Amargosa vole habitat using live traps placed within and immediately adjacent to occupied bulrush marshes. Surveyors may need to remove a small amount of bulrush to place the live-traps. This action will require four to five traps per

Amargosa vole marsh patch and one person to implement for every 20 traps placed. All trapping will occur between November and March. The Bureau will perform monitoring of the Amargosa vole sites every 3 years to determine if they need focused trapping.

26. The Bureau will develop a formalized agreement between the Bureau, CDFG, U.S. Geological Survey, and the Service for the implementation of actions in the recovery plan for the Amargosa vole. The Bureau will encourage the establishment of an interagency Amargosa vole team that meets regularly to coordinate and prioritize Amargosa vole research and restoration actions.

Establishing an Amargosa vole team will not affect the Amargosa vole. However, actions the team plans will likely aid in recovering the Amargosa vole by implementing restoration and research actions. The entity or entities responsible for implementing individual actions planned by the team will need to contact the Service to determine the most appropriate mechanism for compliance under the Act. Because the Bureau has no direct control over implementing these future actions, we will not discuss this action further in this biological opinion.

27. The Bureau will coordinate with staff at the Ash Meadows National Wildlife Refuge regarding recovery actions and research on Ash Meadows gumplant and Amargosa niterwort. These potential actions include the establishment of new Ash Meadows gumplant and Amargosa niterwort populations in unoccupied, suitable habitat, based on monitoring results and literature review and monitoring to better determine specific habitat requirements for Ash Meadows gumplant and Amargosa niterwort.

The Bureau will take the lead on these recovery actions occurring in the Amargosa River ACEC. It will perform monitoring studies to determine the specific hydrologic, soil, and other microhabitat characteristics needed for establishment of Amargosa niterwort and Ash Meadows gumplant populations in unoccupied habitats. The Bureau will also take steps to determine the feasibility of establishing new populations of Amargosa niterwort and Ash Meadows gumplant in unoccupied habitat. The Bureau has not developed a detailed description of activities associated with monitoring and establishment of new populations at this time.

The Bureau's efforts to establish new populations of Amargosa niterwort and Ash Meadows gumplant could substantially improve the rangewide status of these species. We also acknowledge that some aspects of the program may adversely affect these species to a limited degree. Because the work associated with such efforts would likely require the issuance of a section 10(a)(1)(A) permit by the Service and subsequent review of a more refined proposal under section 7(a)(2) of the Act, we will not review this portion of the proposed action further in this biological opinion.

28. The Bureau will identify, map, and/or monitor groundwater sources and springs within the ACEC to determine trends in available water quantity.

The Bureau will monitor ground water in the Lower Carson Slough using a combination of methods. The Bureau will identify and cooperate with the owners of current groundwater

monitoring wells in the region to keep track of the status of groundwater levels in the Lower Carson Slough Region. It may also add additional monitoring wells at strategic locations to monitor site-specific groundwater levels near occurrences of Amargosa niterwort and Ash Meadows gumplant.

The Bureau's use of existing groundwater monitoring wells is not likely to adversely affect listed species because these structures are already in place. Access to these wells would be along existing routes. No new surface disturbance would occur. Consequently, we will not discuss this portion of the proposed action further in this biological opinion.

Installing new groundwater monitoring wells in the Lower Carson Slough may affect listed species. The Bureau does not know where it will need to install groundwater-monitoring wells.

29. The Bureau will conduct regular focused research and surveys for listed, sensitive, and other riparian birds to determine variety, abundance, nesting locations, and changes to nesting status; it will also gather information to maintain and enhance nesting populations.

The Bureau will perform presence/absence surveys for the southwestern willow flycatcher using Service-approved biologists. They will follow the Service's (revised 2000) protocol for the southwestern willow flycatcher, involving three surveys between May 15 and May 31, three surveys between June 1 and June 21, and two surveys between June 22 and July 17. The Bureau will perform these surveys every other year for the life of the plan.

The Bureau will also perform spot mapping to establish the boundaries of breeding territories for the southwestern willow flycatcher. Surveyors will visit sites where they detect individuals during presence/absence surveys at least eight times during the course of the breeding season and note the location of the male or mated pair to determine approximate territorial boundaries. The Bureau may make some of these visits concurrent with presence/absence surveys, but it will make them early enough to allow for performance of subsequent nest surveys.

Finally, the Bureau will perform nest surveys for the southwestern willow flycatcher and least Bell's vireo from mid-May to the end of July. Surveyors will search territories identified during spot mapping to find nests. The Bureau may resurvey the breeding territory in late June or early July to try to detect any re-nesting activity if it finds nests during the early part of the season. The Bureau will check nests once a week to monitor nest success, predation, and nest parasitism. The Bureau does not anticipate the need to disturb any riparian habitat during the implementation of these surveys. Because the work associated with such efforts would likely require the issuance of a section 10(a)(1)(A) permit by the Service and subsequent review of a more refined proposal under section 7(a)(2) of the Act, we will not review this portion of the proposed action further in this biological opinion.

30. The Bureau will conduct an Order III soil survey for the ACEC and develop a series- or association-level vegetation map.

The Bureau does not have a specific project description for this action, but Order III surveys generally involve soil scientists accessing sites to dig soil pits and perform vegetation analysis. The Natural Resource Conservation Service (NRCS) would scatter these sites throughout the ACEC in an effort to obtain a representative sample of the different soil map units. At each site, a soil survey crew would dig a soil pit by hand or with a backhoe. For an area of approximately 4,045 hectares, the NRCS would likely require 12 backhoe pits and 38 hand pits (Fahnestock pers. comm. 2005). If the Bureau does not allow backhoe pits, the NRCS can dig all pits by hand (Fahnestock pers.comm. 2005).

31. The Bureau will monitor species diversity, richness, and abundance for mammalian, avian, reptilian, and vascular plant taxa within the ACEC. It will identify thresholds for substantial change that will trigger reevaluation of strategies.

We have discussed the monitoring of vascular plant and avian diversity, richness, and relative abundance under Actions 2 and 6 respectively. We have addressed monitoring for mammalian and reptilian taxa in the discussion below.

The Bureau will measure small mammal species diversity, richness, and relative abundance using Sherman live traps in arrays along the same transects described in Actions 2 and 6. Each transect will contain five trapping arrays. Each array will contain 8 spokes with 10 traps per spoke for a total of 80 traps per array. The Bureau will perform trapping for 3 consecutive nights at each array for a total of 240 trap nights of effort per array. Surveyors will set traps at dusk and check them immediately prior to sunrise. The Bureau will perform surveys every year, between April and August, for the first 3 years of plan implementation, and then every 5 years thereafter. Service-authorized biologists will perform all trapping within or immediately adjacent to Amargosa vole habitat.

The Bureau will measure reptile species diversity, richness, and relative abundance using pitfall-trapping arrays along the same transects described in Actions 2 and 6 for vegetation and avian surveys. Each transect will contain five pitfall arrays. Each array will contain a center pitfall trap and eight spokes. Removable barriers will connect pitfall traps to help lead reptiles into the traps. Surveyors will perform trapping for 3 consecutive days at each array. They will open pitfalls in the morning, and check them every hour for 4 hours in the morning and for an additional 4-hour session in the afternoon. They will close the pitfalls and remove the barriers from the site at the end of trapping. The Bureau will perform surveys every year, between April and August, for the first 3 years of plan implementation, and then every 5 years thereafter. The Bureau does not anticipate the establishment of pitfall arrays within bulrush marshes potentially occupied by the Amargosa vole. Trapping arrays for both small mammal and reptilian surveys do not overlap. The Bureau will locate these arrays at separate locations along the previously mentioned transects.

32. The Bureau will implement the Amargosa River ACEC Trail Plan.

The Bureau has proposed the construction of numerous trails throughout Amargosa Canyon, Willow Creek, and Grimshaw Basin to provide hiking, equestrian, and handicap access. We

have described only the portions of the trail plan that the Bureau has determined may affect listed species.

Amargosa River Trail

The proposed Amargosa River Trail will be approximately 12 kilometers long, starting immediately west of the town of Tecopa. The trail will proceed south from the trailhead, enter Amargosa Canyon, and cross the Amargosa River. It will join an existing trail after crossing the river, which visitors have used for many years. The majority of the existing portions of the trail are located on the top of the T & T railroad grade. The trail will proceed up the west side of the Willow Creek drainage and terminate at China Ranch after it reaches the confluence of the Amargosa River and Willow Creek. Visitors also use this portion of the trail but the Bureau has not maintained it. A second trail will also loop around the east side of Willow Creek and connect to the Amargosa River Trail at China Ranch.

The Amargosa River trail will accommodate equestrians and hikers. The Bureau will maintain it accordingly and will not authorize other modes of travel. The Bureau will modify the existing trail sections and construct new trail sections to make the entire trail 76 to 122 centimeters wide with 3 meters of vertical clearance along its entire length to accommodate equestrian use.

To construct and maintain the Amargosa River Trail, the Bureau would survey and mark the trail route, clear and grub tree limbs, roots, downed logs, brush, and other debris, install water bars and other drainage devices, and install signs. Two to three recreation specialists will survey the trail corridor and flag the proposed route. They will also mark limbs, stumps, logs, and other obstructions for removal. Trail crews of up to 20 workers will clear and grub tree limbs and other obstructions using hand tools and chainsaws to remove limbs, logs, rocks, and other obstructions from various sections of the trail. Trail crews may use the T & T railroad grade, Willow Creek Drainage Trail, or Cowboy Canyon to allow ATVs to bring tools to and from work sites.

Trail crews will install water bars and other drainage structures immediately following removal of obstructions from the trail route. They will use hand tools to dig trenches and construct berms to direct runoff from the trail. The Bureau will install two-paneled kiosks and trail intersection signs at major trail intersections and at the trailhead following completion of construction.

The Bureau will perform routine trail maintenance as funding allows. All trail sections are unlikely to require maintenance in a given year. Trail crews will use similar techniques for trail maintenance as those performed during trail construction. The Bureau will confine trail construction and maintenance each year to the period between October 31 and March 1.

Watchable Wildlife Trail

The Watchable Wildlife Trail will be approximately 2 kilometers long, beginning at the Tecopa Hot Spring Campground. It will accommodate hiking and handicap access, and will be approximately 92 centimeters wide. The trail will go west from Tecopa Hot Springs to the T & T railroad grade, where it will turn south and follow the T & T railroad grade for approximately 1.5 kilometers to its terminus. The Bureau will construct the trail surface with asphalt, crusher

fines and soil cement, or a similar material. The Bureau will align the hardened surface on the existing railroad grade.

Work crews will not disturb bulrush marshes when constructing trails within the Amargosa ACEC. They will use silt fences or other temporary erosion control structures to prevent sediment runoff into bulrush marshes or other sensitive wetland areas.

33. The Bureau will protect cultural resources displaying adverse effects by signing or fencing.

The Bureau does not know, at this time, where signing and fencing may occur; consequently, it cannot predict the associated area of disturbance. It will follow the same fence installation methodology and minimization measures used in fencing listed plant populations.

Minimization Measures

In addition to the measures below, the Bureau has included numerous measures in the project description to avoid or reduce adverse effects to listed species.

1. The Bureau will apply the following measures when conducting live trapping within or near bulrush marshes:
    a. Only biologists authorized by the Service will conduct Amargosa vole presence/absence surveys or rodent live trapping within or adjacent to bulrush marshes.
    b. Biologists will only use live traps for rodent trapping within Amargosa vole habitat.
    c. Surveyors will open traps at dusk, check, and close or remove them before sunrise the following morning to prevent mortality of captured Amargosa voles.
    d. Surveyors will only remove the minimum amount of bulrush vegetation to place live traps when live trapping within Amargosa vole habitat.
    e. Surveyors will release Amargosa voles captured during implementation of these actions shortly before dawn into the nearest bulrush marsh to the trapping location.
    f. Biologists will use clean latex gloves to handle Amargosa voles during live trapping. They will change these gloves prior to handling each animal.
    g. Biologists will use non-invasive techniques when marking individuals during mark-recapture surveys.
    h. The Bureau will only consider Amargosa vole habitat unoccupied if 7 consecutive days of live trapping and surveys yield no evidence of vole occupation.
2. The Bureau will apply the following measures when conducting presence/absence surveys for Amargosa niterwort and Ash Meadows gumplant to minimize the effects of management actions:
    a. Biologists will prominently mark the location of plants so work crews can easily see and avoid them.
    b. The Bureau will conduct 100 percent surveys on project sites prior to project initiation.
    c. The Bureau will perform surveys for Amargosa niterwort when rametes of these plants are above ground.

3. Unless specifically indicated in the preceding description of the proposed action, the Bureau will access all sites on county-maintained roads, Bureau-designated open routes, or on foot, when traveling cross-country.
4. When cross-country vehicle access is necessary for project work, the Bureau will only use access routes when they are dry.
5. The Bureau will give all personnel, working within listed species habitat, an education program prior to work. This education program will inform the worker of the presence of listed species within the area, provide information on their legal protections, and inform the workers about avoidance and minimization measures.

Action Area

The Service defines the action area as the area the Federal action will affect directly or indirectly and not merely the immediate area involved in the action (50 *Code of Federal Regulations* 402.02). We have determined the action area for this consultation consists of all areas within the boundaries of the Amargosa River ACEC, including the Upper Amargosa WHMA, the Lower Carson Slough Unit, and the Central Amargosa Unit.

Format of the Biological Opinion

Because of the complexity of the proposed action and the number of species involved with this consultation, we have elected to present the Status of the Species (and Critical Habitat, where appropriate), Environmental Baseline, Effects of the Action, Cumulative Effects, and Conclusion sections for each species separately.

BIOLOGICAL OPINION FOR THE AMARGOSA VOLE AND ITS CRITICAL HABITAT

STATUS OF THE AMARGOSA VOLE AND ITS CRITICAL HABITAT

Ecology of the Amargosa Vole

The Amargosa vole is one of 17 named subspecies of the California vole, *Microtus californicus* (Hall 1981 *in* Service 1997). Although the California vole has a broad range, the Amargosa vole subspecies occurs only along the Amargosa River between the town of Shoshone, California and the northern end of the Amargosa Canyon (Murphy and Freas 1989).

Amargosa voles construct runways in grassy wetland habitats by clipping vegetation. Wetland vegetation associated with Amargosa vole habitat is dominated by reeds (*Juncus* spp.), bulrush (*Scirpus olneyi*) and cattails (*Typha* spp.), with southern reed (*Phragmites australis*), arrow weed (*Pluchea* spp.), iodine weed (*Suaeda torreyanna*), and quail bush (*Atriplex lentiformis*) forming the upland overstory plant component (Murphy and Freas 1989). Habitat for the Amargosa vole occurs at the north end of the Amargosa Canyon and in the vicinity of Tecopa Hot Springs. McClenaghan and Montgomery (1998) found Amargosa voles primarily in wet or lightly flooded (e.g., 2.5 to 5 centimeters deep) substrates. Dry areas away from permanent water appeared to

lack individuals of the species as did areas of deeper water. Murphy and Freas (1989) found Amargosa vole burrows exclusively within the interface between bulrush and salt grass habitats.

Little information is available regarding the life history of the Amargosa vole; we have taken much of the following from accounts of other subspecies of the California vole. California voles are active year-round and during both night and day. Their home range size is typically small. Krebs (1966) indicated dispersal distance was less than 122 meters. They forage primarily on the stems and leaves of grasses and forbs, with green emergent vegetation comprising the bulk of the diet. California voles require regular intake of large amounts of water, meeting or exceeding 10 percent of body weight per day (Batzli and Pitelka 1971).

We have little data concerning the longevity of the Amargosa vole, but at least one marked individual has survived for at least a year (McClenaghan pers. comm. 2005). McClenaghan and Montgomery (1998) recaptured 19 marked Amargosa voles 5 months after they were originally marked and released.

Age structure for the Amargosa vole appears to fluctuate temporally through the year. McClenaghan and Montgomery (1998) found the number of adults increased and the number of juvenile and subadults decreased between their June and November trapping periods. They also found a significantly larger number of adult males and females in reproductive conditions during June than in November. McClenaghan and Montgomery (1998) calculated that 82 percent of the Amargosa voles alive in any given month would survive until the next month.

California voles reach sexual maturity when females attain a weight of 25.5 to 31.1 grams and males a weight of 34 to 39.6 grams (Hoffman 1958). California voles reproduce at all times of the year, but the availability of food and water primarily influences their reproduction (Hoffman 1958, Seabloom 1985 *in* Service 1997). Female California voles will have litters averaging 4.7 individuals after a gestation period of approximately 21 days (Nadeau 1985 *in* Service 1997).

Neuwald (2002) concluded that the Amargosa vole had low genetic diversity due to its limited habitat and small population size. These attributes of population and habitat promote inbreeding, founder effects, bottlenecks, and genetic drift. She noted, however, that the Amargosa vole did not show signs of excessive inbreeding, which is likely the result of mate selection behaviors that researchers have noted in other *Microtus* species (Neuwald 2002). She postulated that the low genetic diversity is likely a result of small population size, exacerbated by genetic bottlenecks brought on by population cycling or stochastic events like flooding (Neuwald 2002). She also noted that lack of gene flow between isolated patches of marsh likely augments this low genetic diversity.

California voles undergo both seasonal population fluctuations (Krebs 1966) and 2- to 4-year cyclic irruptions (Batzli and Pitelka 1971). We do not thoroughly understand the causes of subsequent crashes following these irruptions, but food quality and availability could be factors (Batzli and Pitelka 1971) and/or intensive interspecific competition (Heske et al. 1984). Diurnal and nocturnal raptors, mammalian carnivores, and snakes likely prey on the Amargosa vole.

Status of the Amargosa Vole and its Critical Habitat

The Service listed the Amargosa vole as an endangered species and designated critical habitat on November 15, 1984 (49 *Federal Register* 45160). We also completed a recovery plan for the species (Service 1997).

We have addressed the status of the Amargosa vole and its critical habitat within the Environmental Baseline for the Amargosa Vole and its Critical Habitat section of this biological opinion because the entire range of the Amargosa vole lies within the action area for this consultation.

ENVIRONMENTAL BASELINE FOR THE AMARGOSA VOLE AND ITS CRITICAL HABITAT

Previous Consultations

We have completed two previous biological opinions involving the Amargosa vole within the action area for this consultation. We completed a biological opinion for the Bureau on the effects of the California Desert Conservation Area Plan (1-8-01-F-69) on the Amargosa vole and its critical habitat (Service 2002c). To date, we have not received any reports of mortality or injury of Amargosa voles that may have resulted from activities associated with implementation of the California Desert Conservation Area Plan.
In addition, we have completed a biological opinion for the Bureau on the effects on the Amargosa vole and its critical habitat of the removal of salt cedar along the Amargosa River (Service 2005). To date, project implementation has not resulted in any reports of mortality or injury of Amargosa voles.

Status of the Amargosa Vole in the Action Area

We listed the Amargosa vole as an endangered species because of the reduction and modification of the Amargosa vole's marsh habitats by human encroachment; channelization, diversion, and development of spring sources; the inadequacy of existing regulatory mechanisms; and competition from introduced species such as the house mouse (49 *Federal Register* 45160). We know little regarding the current status of the Amargosa vole; however, the overall distribution of the Amargosa vole has decreased since Bailey originally described it in 1900. Kellog (1918 *in* Service 1997) noted the type locality for the subspecies near Shoshone was burned and used for pasture. Researchers have never relocated the Amargosa vole at this northern extent of the range and no habitat currently exists at that location that resembles occupied habitats near Tecopa Hot Springs (Murphy and Freas 1989, Bleich 1979a, Bleich 1979b, Gould and Bleich 1977). Murphy and Freas (1989) estimated the extent of suitable habitat for the Amargosa vole in 1989 to be one square kilometer.

Amargosa voles are likely extirpated from the southern portion of their range within Amargosa Canyon. Rado and Rowlands (1984) trapped a single specimen within Amargosa Canyon, but McClenaghan and Montgomery (1998) did not detect presence of the subspecies during

subsequent investigations. They concluded little evidence existed to suggest viable Amargosa vole populations are present within Amargosa Canyon. They also indicated that Amargosa Canyon generally lacked suitable habitat. They concluded that flooding, livestock grazing, and salt cedar invasion have likely degraded or destroyed suitable habitat.

We know little about the populations in the vicinity of Tecopa Hot Springs; the trapping that has occurred in this location did not focus on determining population size or relative abundance to the extent necessary to provide this information. McClenaghan and Montgomery (1998), who performed an extensive distribution and abundance survey, observed that, although some occupied sites had small numbers of individuals, other sites supported high densities. Although they noted that some sites no longer supported Amargosa voles, they found a number of new sites and previously unoccupied sites containing Amargosa voles. The relative abundance varied widely from location to location across the subspecies' range in this study; the relative abundance was 4.8 Amargosa voles per 100 trap nights when McClenaghan and Montgomery pooled the data. McClenaghan and Montgomery (1998) concluded the Amargosa vole was in a relatively stable state with respect to distribution and abundance in this area.

Threats facing the Amargosa vole have changed since its listing. The Bureau, the California State Lands Commission, and TNC now manage most of the marsh habitat the Amargosa vole occupies (Service 1997). This change in land status has greatly improved the adequacy of regulatory mechanisms to protect and recover the Amargosa vole and has eliminated burning of marshlands and grazing of private lands as a threat (Service 1997).

The diversions and channelizations of spring outflows mentioned in the listing rule are still present. Bathhouses run by private individuals and the County of Inyo have diverted many hot springs supplying water for Amargosa vole habitat. Outflow from these bathhouses continues to support marsh vegetation for the Amargosa vole, we do not understand if or how diversions have altered the historic extent of Amargosa vole habitat.

Non-native house mice continue to occupy Amargosa vole habitat and continue to pose a competitive threat. McClenaghan and Montgomery (1998) noted that, in areas where house mouse abundance was high, Amargosa vole abundance was low.

Predation by feral and free-roaming domestic cats is also a potential threat to the Amargosa vole not identified in the original listing. McClenaghan and Montgomery (1998) noted the presence of cats in the vicinity of Amargosa vole habitat and discussed them as a potential source of predation.

The recovery plan for the Amargosa vole (Service 1997) did not set specific delisting criteria for this species due to a lack of adequate information on the biology and management requirements of the subspecies. Most of the recovery actions involve the collection of information to fill these data gaps. The recovery plan sets tasks that involve securing water sources for maintaining wetland habitat and minimizing threats from introduced species as an interim goal.

Status of Critical Habitat for the Amargosa Vole in the Action Area

Critical habitat for the Amargosa vole consists of one 829-hectare unit stretching along the Amargosa River from approximately 5 kilometers northwest of Tecopa Hot Springs south to a point approximately 5 kilometers south of the town of Tecopa. This unit contains all of the currently known occurrences for the Amargosa vole.

Primary constituent elements known to require special management considerations or protection are marsh vegetation (primarily bulrushes), springs, and some open water along the Amargosa River, which provides escape cover and an adequate food supply (49 *Federal Register* 45160). Activities that may alter these primary constituent elements include burning or otherwise removing marsh vegetation, overgrazing of marsh or adjacent vegetation, pumping of ground water supplies, diverting or channelizing springs along the Amargosa River, road repair work, OHV use in or adjacent to marsh areas, use of herbicides or rodenticides, introduction of exotic plant or animal species, and exploration for and exploitation of geothermal resources (49 *Federal Register* 45160).

Critical habitat for the Amargosa vole is important to the conservation of the species because it contains all of the bulrush marshes, spring sources, and open water within the known range of the species. The number of marshes occupied by the Amargosa vole fluctuates annually; the amount of suitable habitat also varies over time in response to varying environmental conditions. Consequently, the conservation role of critical habitat of the Amargosa vole is to provide for the maintenance of suitable conditions over time and space in a highly variable environment. It also functions to identify intermediary habitats that may be important for population connectivity and maintenance of a diverse gene pool. This critical habitat unit may also be particularly important to the conservation needs of the subspecies because of its tendency to undergone periodic irruptions of populations.

The current extent of bulrush habitats within Amargosa vole critical habitat has likely changed from historic marshes. Non-native salt cedar invasion has eliminated historic habitats within Amargosa Canyon. Amargosa voles do not likely use areas infested with salt cedar because this type of vegetation does not provide the appropriate attributes of cover that they require. The T & T railroad grade, constructed in the early part of the last century, created a barrier running north to south through Amargosa vole habitat. This barrier has likely changed the distribution of the bulrush marshes in the Amargosa Canyon and the Grimshaw Basin by altering the pattern in which water ponds and decreased the extent of Amargosa vole habitat in the area. Exploratory drilling in the 1970s in the vicinity of Tecopa Hot Springs created marsh habitat. This drilling opened an artesian well, which created an extensive bulrush marsh within critical habitat supporting a high relative abundance of Amargosa voles (McClenaghan and Montgomery 1998).

Threats to critical habitat have changed from those listed during its designation. Public or TNC-owned lands contain most of Amargosa vole critical habitat and virtually all areas currently supporting the primary constituent elements are on public or TNC lands. These entities have eliminated burning of wetlands and livestock grazing within critical habitat, thereby removing these threats. Geothermal exploration continues to be a potential threat to critical habitat because

the practice is not explicitly banned; however, the final environmental impact statement for the northern and eastern Mojave Desert planning area notes that "further development of geothermal resources is not anticipated within the planning area" (Bureau 2002).

County-maintained roads bisect two portions of the critical habitat unit and contribute to habitat fragmentation. Periodic road repair continues to remove small amounts of bulrush.

OHV use, in and adjacent to Amargosa vole habitat, is no longer a major concern. Habitat for the Amargosa vole is within a designated ACEC, where the Bureau has limited vehicle use to existing routes. The Bureau has eliminated routes within Amargosa Canyon.

Use of herbicides continues to be a minor threat to bulrush marshes. The Service recently issued a biological opinion to the Bureau on its salt cedar removal and riparian restoration activities within Amargosa vole habitat (Service 2005). The Bureau will use small amounts of herbicide on this project to prevent resprouting of salt cedar stumps. Herbicide drift during application or herbicide spills could result in impacts to bulrush marshes by killing vegetation in the localized area of the spill or spray site. Minimization measures and terms and conditions outlined in that biological opinion should reduce the likelihood of this occurring. We are unaware of any other uses of herbicides or rodenticides that may affect the Amargosa vole or its critical habitat. Construction of hot spring bathing facilities for private enterprises and public bathhouses has modified springs supporting marsh habitats within Amargosa vole critical habitat. Development of these facilities and related infrastructure has likely resulted in loss of habitat for the Amargosa vole near the springheads. Bathhouses have diverted most of the springs in the Tecopa Hot Springs area. These bathhouses channel outflows from Tecopa Hot Springs to bulrush marshes within Grimshaw Basin.

Non-native salt cedar invasion serves as a new source of critical habitat degradation. The recovery plan (Service 1997) notes it as a specific threat to Amargosa vole habitat. Invasion by salt cedar may affect the extent and succession of bulrush marshes within the action area by out-competing the marsh vegetation; it may also change the salinity of the soil to an extent that it is no long able to support marsh vegetation. In addition, salt cedar may reduce the amount of surface water available to support bulrush marshes in certain areas and may affect the amount of open water present along the Amargosa River. All of these factors would affect the primary constituent elements of critical habitat of the Amargosa vole. The Bureau's program to control salt cedar may ameliorate this threat to some degree.

In summary, human activities have altered the primary constituent elements of critical habitat, but it continues to provide for the conservation of the Amargosa vole.

EFFECTS OF THE ACTION ON THE AMARGOSA VOLE AND ITS CRITICAL HABITAT

Methodology

To the extent possible, we have grouped the analysis of various portion of the ACEC Plan for which the effects of implementation on the Amargosa vole and its critical habitat would be

similar. We will not discuss actions that we have already concluded are not likely to adversely affect listed species or their critical habitat.

We have indicated, in the following sections that discuss the potential effects of various action on the Amargosa vole and its critical habitat, whether the specific action can proceed with the Bureau's signing of the Amargosa River ACEC Plan or whether future approvals and analysis pursuant to the National Environmental Policy Act by the Bureau are required. In the former case, the action will become effective with the signing of the decision record for the Amargosa River ACEC Plan (e.g., routine maintenance of trails). Additional consultation, pursuant to section 7(a)(2) of the Act, will not occur on these activities, unless the re-initiation criteria, described at 50 *Code of Federal Regulations* 402.16 and reiterated at the end of this biological opinion are met. In the latter case, the Bureau has discretionary authority over the implementation of future actions (e.g., specific larger restoration activities, such as restoring sinuosity to the Amargosa River). In such cases, the Bureau will consider whether the action may affect listed species or critical habitat and conduct additional consultation, pursuant to section 7(a)(2) of the Act, if appropriate.

Active Riparian and Upland Restoration of Degraded Areas, Fencing and Signing Listed and Sensitive Plant Populations, and Signing and Fencing of Cultural Resource Sites

Effects on the Amargosa Vole

Direct effects to Amargosa voles could occur, due to these actions, near Tecopa Hot Springs and in the northern portion of the Amargosa Canyon. Because Amargosa vole burrows occur at the interface of bulrush and salt grass vegetation types, workers or equipment traveling along access routes or working on the periphery of degraded restoration sites, located near bulrush marshes, could destroy runways and burrows, or injure or kill individuals. Because Amargosa voles require deep vegetative cover to facilitate protected movement, loss or disturbance of runways and burrows may temporarily reduce their ability to move within their habitat. We anticipate, however, that Amargosa voles will quickly establish new runway systems to facilitate their movement. The Bureau has proposed to use pre-project surveys to delineate access routes, fencing alignments, and work site boundaries that will avoid areas containing many burrows and runway systems.

We cannot predict the precise number of burrows or runway systems the implementation of these actions may crush or how many individuals they may kill or injure. We lack data on population size, population density, and burrow and runway density; additionally, information on the ecology of this species indicates population attributes can change over a matter of months. In addition, the Bureau does not know the area or extent of project work sites or how much of that area will be in the immediate vicinity of bulrush marshes.

<u>Active Riparian and Upland Restoration of Degraded Areas</u>
The Bureau will only restore degraded sites, and the interface with Amargosa voles, burrows, and runway systems will only occur on the periphery of these sites. Only access routes and restoration sites the Bureau establishes at the interface of salt grass and bulrush vegetation will

adversely affect Amargosa voles. Based on the Bureau's alignment of access routes and worksite boundaries away from areas with greater amounts of Amargosa vole sign, we anticipate the number of sites meeting these criteria will be small. Based on the nature of this action, the proposed minimization measures, and the ecology of the species, we anticipate that the restoration of degraded areas will crush few Amargosa voles, runway systems, or burrows.

In addition to the effects described in the previous paragraph, work crews may use arrow weed, iodine weed, and quail bush for vertical mulching in some areas. These plants form the majority of the overstory of upland plants in Amargosa vole habitat; therefore, the removal of portions of these shrubs could adversely affect the quality of habitat. We do not know the precise role these species play in Amargosa vole habitat; however, because cover is important to the subspecies, any substantial reduction in the amount of cover may reduce their ability to forage or render them more vulnerable to avian predators.

Fencing and Signing Listed and Sensitive Plant Populations

Disturbance related to this action will affect the Amargosa vole in similar locations to those described in the previous section for restoration of degraded sites. However, the Bureau will fence some undisturbed sites in these locations and create new temporary disturbances. Therefore, work at these sites may affect more runways, burrows, and Amargosa voles than was described in the previous subsection.

Based on the range and habitat characteristics of the species the Bureau will fence, we anticipate that only fencing of Tecopa bird's beak populations could adversely affect Amargosa voles because these taxa occur in the same type of habitat, alkaline meadows, near Tecopa Hot Springs. Given the use of pre-project surveys, the habitat preferences of the Amargosa vole, the habitat of the plant species the Bureau wants to fence, and the likelihood of fence alignments occurring in areas of salt grass and bulrush interface, we anticipate the number of burrows, runways, and Amargosa voles adversely affected by this action will be small.

Signing and Fencing Cultural Resource Sites

The only cultural resource within an area that may be occupied by the Amargosa vole is the T & T railroad grade. Although the grade is threatened by flows in the Amargosa River, the Bureau has no plans to fence it (Seehafer pers. comm.). Consequently, the signing and fencing of cultural resource sites will not affect the Amargosa vole.

Effects on Critical Habitat of the Amargosa Vole

Active Riparian and Upland Restoration of Degraded Areas

The Bureau does not know how much restoration may be required within Amargosa vole critical habitat. Restoration work at these sites is not likely to affect the primary constituent elements in a substantial manner because the Bureau will perform minimal to no work within bulrush marshes, spring sources, or open water along the Amargosa River. Additionally, the Bureau would only conduct restoration activities in areas where disturbance has already decreased the value of the natural physical and biological attributes of the habitat.

Fencing and Signing Listed and Sensitive Plant Populations
Fencing and signing populations of listed and sensitive plant species and the access routes needed for this activity could adversely affect a small amount of bulrush in areas where the populations are immediately adjacent to marshes. We anticipate this circumstance will occur infrequently because, as we noted in the previous section, only the Tecopa bird's beak is located within habitat of the Amargosa vole. Work associated with the installation of fences may cause a minimal loss of bulrush and will not disrupt the outflow of springs.

Signing and Fencing Cultural Resource Sites
As we noted in the previous section of this biological opinion, the Bureau has no plans to fence the only cultural resource within critical habitat of the Amargosa vole (Seehafer pers. comm.). Consequently, the signing and fencing of cultural resource sites will not affect critical habitat of the Amargosa vole.

The Bureau will conduct additional environmental review of active restoration work. The other actions evaluated in this section are likely to occur without subsequent environmental analysis by the Bureau.

Free-Roaming and Domestic Cat Control, Monitoring Small Mammals and Reptiles, and Monitoring and Control of House Mouse Populations

Effects on the Amargosa Vole

During implementation of these actions, surveyors could disturb or destroy some runway systems and burrows while accessing bulrush marshes or areas immediately adjacent to them to place or check traps. Personnel may need to remove small amounts of vegetation to place traps and some amount of disturbance will occur while accessing traps on foot. This disturbance will not likely be aggregative with subsequent trapping disturbances because these actions will occur infrequently, allowing time for natural regeneration of disturbed trapping locations. In addition, some Amargosa voles could be inadvertently captured in small mammal traps or pitfall traps during small mammal surveys, house mouse control, or reptile surveys. These individuals could be injured or killed due to exposure in the traps or stress related to being trapped.

Free-Roaming and Domestic Cat Control
The placement of traps for cats may temporarily disturb a small amount of vegetation during any year trapping occurs. A minimal amount of additional temporary disturbance could also occur due to surveyors traveling by foot within bulrush marshes. We anticipate that few, in any, individuals will be killed or injured during trapping because the activities will occur in such a limited area and the vast majority of Amargosa voles will be able to avoid the traps as they are being placed or workers moving on foot; immature Amargosa voles may be at the greatest risk because they may move more slowly or be inexperienced in avoiding disturbance. Amargosa voles are unlikely to be caught in the live traps because they will not be attracted to the bait used for cats. For these reasons, we anticipate this action will adversely affect few runways, burrows, or Amargosa voles, although we cannot predict the precise number of burrows or runway

systems the implementation of this action may crush or how many individuals it may kill or injure.

Trapping of cats will likely reduce predatory pressure on Amargosa voles. Consequently, the implementation of this action will likely promote the recovery of this subspecies.

Monitoring Small Mammals

The Bureau has proposed to survey for a total of 8,400 trap nights per survey in areas potentially within or adjacent to Amargosa vole habitat. In a survey of 51 sites, encompassing all potential habitat of the Amargosa vole across its range, McClenaghan and Montgomery (1998) captured 146 Amargosa voles during 3,039 trap nights of survey effort. Although the Bureau will perform more trap nights during a given survey, the trapping arrays will not focus on Amargosa vole habitat, as McClenaghan and Montgomery's did. Only a fraction of the 8,400 trap nights per survey would be within Amargosa vole habitat because the purpose of the surveys is to obtain a representative sample of the small mammal diversity throughout all habitat types of the ACEC. We cannot provide any estimate of the numbers of Amargosa voles that may be trapped because of the great degree of variability involved factors such as the location of traps, the response of individual Amargosa voles to traps, the availability of food in the wild, and population cycling. We anticipate this trapping will kill or injure few Amargosa voles due to exposure or stress because the Bureau will use a Service-authorized biologist and implement measures aimed at reducing the amount of time animals are in traps.

We cannot determine how many burrows or runway systems this action could damage. Because biologists using live traps attempt to place traps along habitat features in a manner that is likely to increase the likelihood of capturing small mammals, they will be examining vegetation fairly closely. Consequently, they will likely avoid placing traps on burrows or runways. Additionally, as we noted previously, Amargosa voles are likely able to reconstruct runways quickly. We anticipate that damage to burrows and runways caused by small mammal trapping is unlikely to affect Amargosa voles in a substantial manner.

Monitoring Reptiles

We do not know how many Amargosa voles may be captured during surveys for reptiles using pitfall traps. Because the Bureau will not install pitfall traps within bulrush marshes, we anticipate reptile-trapping arrays will capture few Amargosa voles. However, some individuals may be captured in arrays in salt grass meadows immediately adjacent to bulrush marshes. Injury or death of individuals due to stress or exposure during trapping is likely to be low because surveyors will check traps and release captured animals once an hour when they are open.

We cannot determine how many burrows or runway systems this action could damage. The barriers used to guide reptiles into the pitfall traps may be placed over runways and could block or damage runways. The placement of barriers may damage burrows to a minor degree when they are fastened to the ground. Because the trapping arrays would be established for only 3 days per year, we do not anticipate that blocking portions of the runways or this temporary

damage to burrows for this length of time will substantially alter the behavior patterns of Amargosa voles or expose them to a substantially greater threat of predation.

Monitoring and Control of House Mice

Implementation of this action will result in similar effects to those described for other trapping types, but the effects will be of a greater magnitude because the monitoring and trapping of house mice will focus on Amargosa vole habitat. Because the Bureau does not know what trapping schedule, location, or intensity it will use, we cannot estimate the number of Amargosa voles this action may kill or injure or the number of burrows or runways it may crush. Other trapping efforts, however, focused on determining the distribution and relative abundance of the Amargosa vole have not resulted in injury or mortality of Amargosa voles (McClenaghan and Montgomery 1998). This action will likely benefit the Amargosa vole by reducing competition from the non-native house mouse and allowing expansion of some populations.

Effects on Critical Habitat of the Amargosa Vole

Activities associated with the control of free-roaming and domestic cats, monitoring of small mammals and reptiles, and monitoring and control of house mouse populations will likely cause minimal adverse effects to the primary constituent elements of Amargosa vole critical habitat. We anticipate small amounts of bulrush may be disturbed by placement of traps and foot access to trapping locations; these disturbances will be temporary and the value provided by the habitat would be fully restored over a relatively short period of time. Spring outflows or open water within critical habitat will not be affected by these activities. Consequently, implementation of these actions will not compromise the conservation role or function of critical habitat of the Amargosa vole.

Controlling cats and house mice is likely to occur without subsequent environmental analysis by the Bureau. The Bureau will conduct additional environmental review regarding activities associated with inventories of small mammals and reptiles.

Amargosa ACEC Trail Plan

Effects on the Amargosa Vole

The Bureau will implement the Amargosa River ACEC Trail Plan, which involves construction and maintenance of trails throughout Amargosa Canyon, Willow Creek, and Grimshaw Basin. Only the Watchable Wildlife Trail, proposed for the Grimshaw Basin, is likely to adversely affect the Amargosa vole.

Direct effects to the Amargosa vole could occur during trail construction and maintenance. Workers and equipment could crush Amargosa voles while building and maintaining the trail. Amargosa voles are more likely to be crushed during the initial construction because they would be more difficult to see and may take cover in saltgrass; Amargosa voles are unlikely to remain for any length of time in fairly open areas and are thus unlikely to be killed or injured during maintenance activities on or casual use of the trail. Furthermore, Amargosa voles seem to spend

little time in saltgrass habitat; therefore, few are likely to be killed by activities associated with the construction, use, or maintenance of the trail.

The trail would cover approximately 1,840 square meters of habitat that Amargosa voles may use to some degree for dispersal; Amargosa voles may cross such areas while dispersing but do not seem to spend extensive time in these areas foraging or engaging in other essential behavior. The Bureau will not construct the trail through bulrush marsh where Amargosa voles spend most of their time. Consequently, the loss of habitat associated with construction and maintenance would be minimal in relation to the amount of area available for dispersal.

The construction, use, and maintenance of trails through saltgrass habitat are not likely to affect, in a substantial manner, the ability of Amargosa voles to disperse. The meter-wide bare areas within the footprint of the trail will not constitute a barrier to the movement of individuals. Additionally, use of the trail, both by hikers and Amargosa voles, is likely to be sporadic; therefore, we expect that few, if any, Amargosa voles would be trampled by hikers.

Effects on Critical Habitat of the Amargosa Vole

The trail Watchable Wildlife Trail would not be constructed within spring outflows, open water, or bulrush marshes, which are the primary constituent elements of critical habitat of the Amargosa vole. Therefore, its construction and maintenance will not affect critical habitat of the Amargosa vole.

Implementation of the trail plan is likely to occur without subsequent environmental analysis by the Bureau.

Restoring and Maintaining the Natural Sinuosity of the Amargosa River

Effects on the Amargosa Vole

Researchers have hypothesized that populations of Amargosa voles along the Amargosa River are generally already unstable due to their exposure to regular flooding in the constrained channel (Rado and Rowlands 1984, Murphy and Freas 1989). Changes to the natural sinuosity of the Amargosa River will likely change the number and distribution of Amargosa voles along the main course of the Amargosa River. In some cases, populations will be lost or reduced in size. More frequently, restoring the natural sinuosity of the river will likely increase the number of Amargosa vole along the river and distribute their population centers in a more natural pattern. These effects on Amargosa voles would result from habitat alterations, which we will discuss in detail in the following section.

This action will not affect Amargosa voles east of the T & T railroad grade because they do not rely on waters from the river and the T & T railroad grade protects them from flooding. Marshes in this area contain the core populations of Amargosa voles and the highest number of individuals.

In summary, some short-term losses of Amargosa voles are likely to occur along the main course of the river, but this action will not affect the majority of Amargosa vole populations, which occur east of the T & T railroad grade. This action will likely benefit the Amargosa vole in the long-term by providing areas for expansion of populations by natural means or translocation.

Effects on Critical Habitat of the Amargosa Vole

Changes to the natural sinuosity of the Amargosa River will likely change the extent and distribution of primary constituent elements along the main course of the Amargosa River. In some cases, areas of open water and bulrush marsh will be lost or reduced in size. On most areas, restoring the natural sinuosity of the river will likely reduce down cutting within the river channel. As the water finds it own way, the extent of backwaters, pools, and oxbows will likely increase; bulrush marshes are likely to expand in these areas of more slowly moving water. The net result of the proposed action is likely to be an increase in the amount and distribution of the primary constituent elements of critical habitat of the Amargosa vole.

This action will not affect spring sources and bulrush marshes east of the T& T railroad grade. These areas do not rely on waters from the river and the T & T railroad grade protects them from flooding.

In summary, some short-term losses of areas supporting the primary constituent elements of critical habitat are likely to occur along the main course of the river. In the long term, we expect that the proposed action will likely increase the ability of the critical habitat to serve its conservation role.

The Bureau will conduct additional environmental review regarding activities associated with restoring the natural sinuosity of the Amargosa River.

Order III Soil Survey

Effects on the Amargosa Vole

Amargosa voles could be affected when workers are accessing sites and during activities associated with digging soil pits. Many of these effects will be similar to those described previously for active riparian and upland restoration of degraded areas, fencing and signing of listed and sensitive plant populations, and signing and fencing of cultural resource sites. We anticipate the digging of soil pits and access to sites is likely to adversely affect the Amargosa vole only in areas adjacent to bulrush marshes; the NRCS is not likely to dig soil pits within bulrush marshes because of the difficulty of working in extremely wet areas (Fahnestock pers. comm. 2006). We anticipate the number of soil pits or access routes required adjacent to bulrush marshes will be minimal because the NRCS estimated that approximately 50 pits would be required to sample lands within the ACEC. Consequently, the distribution of a fairly limited number of pits across such a large area would substantially reduce the abundance of pits adjacent to bulrush marshes. Consequently, only a minor amount of work is likely to occur in areas

inhabited by the Amargosa vole. This work is likely to kill or injure few, if any, Amargosa voles and result in the destruction of few runway systems or burrows.

Effects on Critical Habitat of the Amargosa Vole

The NRCS is not likely to dig soil pits within bulrush marshes, open water, or spring sources because of the difficulty of working in extremely wet areas (Fahnestock pers. comm. 2006). Therefore, this action is not likely to adversely affect critical habitat of the Amargosa vole.

Conducting soil surveys is likely to occur without subsequent environmental analysis by the Bureau.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. We are unaware of any non-federal actions that are reasonably certain to affect the Amargosa vole within the action area.

CONCLUSION

Amargosa Vole

After reviewing its status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the Amargosa River ACEC Plan is not likely to jeopardize the continued existence of the Amargosa vole. We reached this conclusion because:

1) the Bureau is not proposing any specific actions that will result in disturbance of bulrush marshes where most Amargosa voles live;

2) the Bureau will disturb a minimal amount of habitat immediately adjacent to bulrush marshes;

3) the Bureau has proposed to implement numerous measures to avoid or reduce the number of Amargosa voles that may be killed or injured during project activities;

4) we are not aware of any cumulative effects that will alter the status of the Amargosa vole; and

5) the Bureau's goal in implementing this plan is to aid in the conservation and recovery of listed species within the ACEC.

Critical Habitat for the Amargosa Vole

It is also the Service's biological opinion that implementation of the Amargosa River ACEC Plan is not likely to adversely modify critical habitat for the Amargosa vole. We reached this conclusion because:

1) the Bureau has not proposed any actions that will result in substantial loss or degradation of the primary constituent elements of critical habitat;

2) we did not detect any cumulative effects that will alter the status of critical habitat of the Amargosa vole; and

3) a component of the Bureau's goal in implementing this plan is to restore habitat, including the primary constituent elements of critical habitat, within the ACEC.

Although this biological opinion has concluded that the proposed Amargosa River ACEC Plan is not likely to jeopardize the continued existence of the Amargosa vole or adversely modify its critical habitat, the Bureau may propose a specific action in the future that could result in a finding of jeopardy or adverse modification of critical habitat. Such a circumstance could occur if proposals for future actions contain project-specific details that cannot be evaluated at this programmatic level.

BIOLOGICAL OPINION FOR THE SOUTHWESTERN WILLOW FLYCATCHER AND LEAST BELL'S VIREO

STATUS OF THE SOUTHWESTERN WILLOW FLYCATCHER AND LEAST BELL'S VIREO

Ecology of the Southwestern Willow Flycatcher

The southwestern willow flycatcher breeds in southern California, southern Nevada, southern Utah, Arizona, New Mexico, southwestern Colorado, and western Texas (Hubbard 1987, Unitt 1987, and Browning 1993 *in* Service 2002a). It winters in Guatemala, El Salvador, Honduras, and Costa Rica (Unitt 1998).

Southwestern willow flycatchers breed in native and non-native riparian woodland, typically adjacent to or over water. Surface water or saturated soil is usually present in or adjacent to nesting sites at least during the initial portion of the nesting period (Muiznieks et al. 1994 and Tibbits et al. 1994 *in* Unitt 1998). Occupied riparian patches usually have dense vegetation in the interior or an aggregate of dense patches interspersed with openings, open water, or shorter/sparser vegetation, creating a mosaic that is not uniformly dense (Service 2002a).

In some areas, southwestern willow flycatchers nest in some riparian habitats containing and even dominated by salt cedar (McKernan and Braden 1999 and Paradzick et al. 2000 *in* Finch et al. 2000). Southwestern willow flycatcher productivity in some sites dominated by non-native

vegetation is lower than in some native-dominated habitats (Sferra et al. 1997 and Sogge et al. 1997 *in* Finch et al. 2000). However, southwestern willow flycatcher productivity is similar or higher within some salt cedar-dominated habitats than nearby native-dominated sites (McKernan and Braden 1999 and Paradzick et al. 1999 *in* Finch et al. 2000).

Southwestern willow flycatchers are diurnal insectivores. They forage within and above the canopy, along the patch edge, in openings within the territory, above water; they also glean from tall trees as well as herbaceous ground cover (Bent 1960, McCabe 1991, B. Valentine pers. comm., and M. Whitfield pers. comm. *in* Service 2002a).

Males maintain and advertise a territory by singing to attract females. We have little information regarding factors that females use in mate selection, though habitat quality or quality of the male may affect it (Service 2002a). Territorial defense begins immediately after spring arrival. Females occasionally sing when stimulated by territorial disputes (Seutin 1987 and Sogge et al. 1997 *in* Finch et al. 2000). Males sing persistently early in the breeding season, but song rate declines as the season progresses, particularly once the male finds a mate and nesting efforts begin (Finch et al. 2000). Response to taped playback of songs during surveys decreases as the nesting season progresses. Mapped breeding territory sizes are 0.06 to 0.2 hectare on the Colorado River (Sogge et al. 1997 *in* Finch et al. 2000), 0.2 to 0.51 hectare along the Verde River, Arizona (Sogge 1995 *in* Finch et al. 2000), and 0.14 to 2.31 hectares along the Kern River, California (Whitfield and Enos 1996 *in* Finch et al. 2000).

Southwestern willow flycatchers usually initiate nests within one week of pair formation (Finch et al. 2000). Females build the nest over a period of 4 to 7 days (Service 2002a). In southern California, 86 percent of nests are in willows, 4 percent are in stinging nettles (*Urtica dioica*), and 10 percent are in other plants (Unitt 1987 *in* Unitt 1998).

Females typically lay one egg per day, until the nest contains three to four eggs. Incubation begins after the female lays the last egg and lasts 12 to 13 days (Service 2002a). Females spend approximately 50 percent of the day attending (incubating or shading) the eggs and incubate throughout the night. Incubation and shading bouts can last from less than one to more than 60 minutes (Finch et al. 2000).

Young usually leave the nest 12 to 15 days after hatching. During the brooding period, both the male and female care for the young. Feeding trips during the peak of this period can reach 30 trips per hour during days 5 to 10 (Finch et al. 2000). Fledglings stay close to the nest and each other for 3 to 5 days and may repeatedly return to and leave the nest during this period (Spencer et al. 1996 *in* Finch et al. 2000). The fledglings will typically stay in the general area for an additional 14 to 15 days following this initial period (Service 2002a).

Southwestern willow flycatchers typically arrive on breeding grounds from late April to early June (Ligon 1961, Maynard 1995, Skaggs 1996, and Sferra et al. 1997 *in* Service 2002a). From 1997 to 2000, 66 percent to 78 percent of southwestern willow flycatchers returned to the same breeding site (Luff et al. 2000 *in* Service 2002a).

In some cases, situations forcing movement face willow flycatchers, such as catastrophic habitat loss from fire or flood. Some resident willow flycatchers will move to remaining habitat within the breeding site, some move to other sites 1.9 to 27.0 kilometers away (Paxton et al. 1996 and Owen and Sogge 1997 *in* Service 2002a), and others will disappear without being seen again.

Status of the Southwestern Willow Flycatcher

The Service listed the southwestern willow flycatcher as endangered on February 27, 1995 (60 *Federal Register* 10694). We listed the southwestern willow flycatcher as endangered for the following reasons: 1) habitat loss and modification from urban and agricultural development, water diversions and impoundments, channelization, livestock grazing, off-road vehicle and other recreational uses, and hydrological changes resulting from various land uses; 2) predation; 3) the inadequacy of existing regulatory mechanisms; and 4) brood parasitism by the brown-headed cowbird (60 *Federal Register* 10694).

In the late 1980s, the estimated rangewide population of the southwestern willow flycatcher was between 500 and 1,000 pairs/territories (Unitt 1987 *in* Service 2002a). The Service knew of approximately 350 pairs/territories rangewide when it listed the southwestern willow flycatcher in 1995 (60 *Federal Register* 10694). The minimum number in 2001 was 986 pairs/territories (Service 2002a). This number, however, did not include southwestern willow flycatchers suspected to occur on some tribal and private lands. An additional 200 to 300 nesting pairs may remain undiscovered, yielding an estimate of 1,200 to 1,300 pairs/territories rangewide (Service 2002a).

Threats to the southwestern willow flycatcher have not changed considerably since its listing, although the Act has aided in the protection of its riparian habitats. Increases in recovery efforts related to brown-headed cowbird trapping and habitat restoration have reduced nest parasitism in many areas. We do not fully understand the threat of habitat modification and degradation posed by the invasion of non-native salt cedar.

The Service (2002a) has approved a final recovery plan for the southwestern willow flycatcher. The recovery plan divides the subspecies' range into six recovery units that are further subdivided into management units. The Amargosa Management Unit, which includes the Amargosa River drainage, comprises a portion of the Basin and Mojave Recovery Unit. The recovery plan indicates that this management unit does not support any location with more than five pairs/territories of southwestern willow flycatchers (Service 2002a).

Status of Critical Habitat of the Southwestern Willow Flycatcher

The Service designated critical habitat for the southwestern willow flycatcher on October 19, 2005 (70 *Federal Register* 60935). Because no designated critical habitat for this species occurs within the action area for this consultation, we have not addressed its status in this biological opinion.

Ecology of the Least Bell's Vireo

Least Bell's vireos typically breed in willow riparian forests supporting a dense, shrubby understory of mulefat (*Baccharis salicifolius*) and other mesic species (Goldwasser 1981, Gray and Greaves 1984, and Franzreb 1989 *in* Bureau 2005b). They also use oak woodlands with a willow riparian understory in some areas (Gray and Greaves 1984 *in* Bureau 2005b). The presence of dense cover within 0.99 to 1.98 meters of the ground and a dense stratified canopy for foraging characterizes least Bell's vireo habitat (Goldwaser 1981, Gray and Greaves 1981, and Salata 1981 *in* Service 1998). Although least Bell's vireos typically nest in willow-dominated areas, habitat structure seems to be more of a factor than plant species composition (Service 1998).

Least bell's vireos are insectivorous, preying on a wide variety of insects, including bugs, beetles, grasshoppers, moths, and particularly caterpillars (Chaplin 1925 and Bent 1950 *in* Service 1998). Prey is obtained primarily by foliage gleaning and hovering (Service 1998). Foraging occurs at all levels of the canopy, but seems to be concentrated in the lower to mid-strata (Grinnell and Miller 1944, Goldwasser 1981, Gray and Greaves 1981, Salata 1983, and Miner 1989 *in* Service 1998). Foraging occurs most frequently in willows (Salata 1983 and Miner 1989 *in* Service 1998).

Least Bell's vireos are subtropical migrants. The earliest studies of color-banded least Bell's vireos suggested they are strongly site tenacious; once birds selected a breeding site, they returned to it year after year (Salata 1983 and Greaves 1989 *in* Service 1998). Not only do least Bell's vireos return to the same drainage, they return to the same territory and even the same tree or shrub (Service 1998). Recent studies have found, however, that least Bell's vireos may change locations during their first few breeding seasons.

Least Bell's vireos arrive on breeding grounds in California from mid-March to early April, with males arriving in advance of females (Service 1998). They are generally present until late September, although some may depart by late July (Garrett and Dunn 1981 and Salata 1983 *in* Service 1998).

Males establish and defend territories by counter-singing, chasing, and sometimes physically confronting neighboring males. In general, least Bell's vireo territories are between 0.2 and 3.04 hectares (Service 1998).

Nest building commences a few days after pair formation. Least Bell's vireos typically construct nests in the fork of a tree or shrub branch within one meter of the ground. Plant species used for nesting include willows, mule fat, California wild rose (*Rosa californica*), poison oak (*Toxicodendron diversilobum*), grape (*Vitus californica*), elderberry (*Sambucus mexicana*), Fremont's cottonwood (*Populus fremontii*), California sycamore (*Platanus racemosa*), coast live oak (*Quercus agrifolia*), and several herbaceous species (Service 1998). Egg laying begins 1 to 2 days after nest completion. Typically, they lay four eggs, occasionally two, and rarely five. Both parents share in incubation, which takes approximately 14 days. Upon hatching, both

parents feed nestlings for 10 to 12 days until fledging, and then care for fledglings for an additional 2 weeks (Service 1998).

Status of the Least Bell's Vireo

The Service listed the least Bell's vireo as endangered on June 2, 1986 (51 *Federal Register* 16474) and completed a draft recovery plan for the species in 1998. Reasons for listing of the least Bell's vireo as endangered included: 1) habitat loss and modification due to flood control and water development projects, agricultural and urban development, livestock grazing, invasive exotic plants, and off-road vehicles; 2) predation by house pets, feral cats, and other animals; 3) the inadequacy of existing regulatory mechanisms; and 4) brood parasitism by the brown-headed cowbird (51 *Federal Register* 16474).

Least Bell's vireos historically ranged from interior northern California, south through the Sacramento and San Joaquin Valleys and Sierra Nevada foothills, and in the coast range from Santa Clara County south to approximately San Fernando, Baja, Mexico. Surveyors also found populations in the Owens Valley, Death Valley, and at scattered oases in the Mojave Desert (Service 1998). Extensive habitat loss and brown-headed cowbird parasitism after the 1940s decimated populations. By the early 1980s, least Bell's vireos had been extirpated from the Sacramento and San Joaquin Valleys (D. Roberson, pers. comm. *in* Service 1998), and were restricted primarily to southern California and northern Baja California, Mexico (Gaines 1977, Goldwasser 1978, Goldwasser et al. 1980, Wilbur 1987, and Unitt 1984 *in* Service 1998).

Currently, most breeding pairs inhabit Santa Barbara, Ventura, Los Angeles, Orange, San Diego, western Riverside, and southwestern San Bernardino Counties. Recent occurrences have also been located along the Amargosa Rivers of Inyo County, California (Lynn, et al. 2001; Wilamowski and Whitfield 2002). The subspecies has also been located in Morongo Valley and along the Mojave River (Patten 1995 *in* Bureau 2005b). In addition, a recent location of a breeding pair on the San Joaquin River National Wildlife Refuge indicates the subspecies may be moving into historic northern breeding territories.

The taxonomy of the subspecies along the Amargosa River has come into question by some ornithologists, who believe the Bell's vireos found along the Amargosa River and other locations in the eastern Mojave Desert are actually Arizona Bell's vireos (*V. b. arizonae*). This species is not federally listed. In the absence of firm data to the contrary, however, we will treat the occurrences mentioned in the eastern Mojave Desert as the least Bell's vireo for the purpose of this consultation.

Prior to 1978, the population estimate for least Bell's vireos in California was as low as 30 pairs (Gaines 1977 and Remsen 1978 *in* Goldwasser 1978). Although this estimate is based on little survey information, an extensive 1978 survey found less than 90 pairs (Goldwasser 1978). This report also indicated the number found probably did not reflect actual population numbers due to an inadequacy of survey data for all potential breeding locations across the range. Despite continued survey effort, by the time the Service listed the least Bell's vireo, the statewide population was only 300 pairs (RECON 1989 *in* Service 1998).

Since listing, the subspecies has undergone increases in population size. Available census data indicate the least Bell's vireo population in southern California increased from an estimated 300 pairs in 1986 to an estimated 1346 pairs in 1996, with the highest increases (more than 80 pairs difference) occurring on Las Flores Creek and the San Luis Rey, Santa Margarita, Tijuana, and Santa Ana Rivers (Service 1998).

Threats facing the least Bell's vireo today are similar to those noted at the time of listing. Extensive control efforts, however, have greatly reduced brown-headed cowbird parasitism at many breeding locations. Habitat loss from a variety of factors continues to threaten the least Bell's vireo in many portions of the range. Since least Bell's vireos build their nests close to the ground, predation of nests will probably continue to be a problem. The threat of habitat modification posed by the invasion of non-native salt cedar is also a potential threat to some habitats.

Status of Critical Habitat of the Least Bell's Vireo

The Service designated critical habitat for the least Bell's vireo on February 2, 1994 (59 *Federal Register* 4845). Because no designated critical habitat for this species occurs within the action area for this consultation, we have not addressed its status in this biological opinion.

ENVIRONMENTAL BASELINE FOR THE SOUTHWESTERN WILLOW FLYCATCHER AND LEAST BELL'S VIREO

The action area for these species consists of all areas within the ACEC boundaries from the northern end of Grimshaw Basin to the southern end of Amargosa Canyon and all areas along Willow Creek within the ACEC boundaries. We have chosen these areas because they are the only locations within the ACEC containing habitat for these species.

Previous Consultations

We have completed biological opinions on two activities involving the southwestern willow flycatcher and least Bell's vireo that overlap the action area for this consultation. We completed a biological opinion for the Bureau regarding the effects of the California Desert Conservation Area Plan on the southwestern willow flycatcher and least Bell's vireo (Service 2002d). We determined that the overall guidance provided by the California Desert Conservation Area Plan was not likely to jeopardize the continued existence of these subspecies.

In addition, we have completed a biological opinion for these species regarding the Bureau's proposal to remove salt cedar on the Amargosa River (Service 2005). We determined that the proposed action may increase habitat value for southwestern willow flycatchers in the region and concluded that it was not likely to jeopardize the continued existence of these taxa.

Status of the Southwestern Willow Flycatcher in the Action Area

Within the action area, southwestern willow flycatchers have been located within Amargosa Canyon (Lynn et al. 2001, Wilamowski and Whitfield 2002). Suitable habitat is also present along Willow Creek and near Shoshone.

Surveyors found only one southwestern willow flycatcher in upper Amargosa Canyon in 2001. Surveyors were only able to perform two surveys during the last week of May (Lynn et al. 2001). The paucity of surveys may have contributed to the low number of detections; an inability of surveyors to look for southwestern willow flycatchers later in the breeding season likely also affected the results.

A second survey of the entire Amargosa Canyon and Willow Creek resulted in 17 southwestern willow flycatcher detections between May 20 and June 12, 2002. No individuals were detected on Willow Creek (Wilamowski and Whitfield 2002). Some individuals may have been counted twice; consequently, we do not know how many birds these detections represent. Surveyors made these detections during four distinct survey periods (May 20-21, May 30-31, June 11-12, and June 24-25). Based on when and where birds were sighted, the surveyors estimated that between one and six singing males and an unknown number of females were likely present within the Amargosa Canyon during the 2002 breeding season at any given time (Wilamowski and Whitfield 2002).

Wilamowski and Whitfield (2002) could not conclude whether any of these individuals were breeding. Inability to detect southwestern willow flycatchers on a July 24, 2002 suggests either the singing males were unable to find mates and moved on or they had successfully nested and were no longer defending territories through singing.

In 2005, surveyors detected a “handful” of southwestern willow flycatchers in the Amargosa Canyon. They did not find any nesting and concluded they were all probably migrating through and not using the ACEC for nesting (McCreedy pers. comm. 2005).

No one has performed surveys of suitable habitat in other portions of the action area, such as Shoshone and Tecopa Hot Springs. We have no information on the status of the subspecies in these areas.

Threats faced by known populations within the action area have changed since the species’ listing. Although agricultural development, urbanization, water diversions and impoundments, and channelization have never been major threats within the action area, off-road vehicle and grazing disturbances once affected habitat within the Amargosa Canyon. Placement of vehicle barriers by the Bureau and elimination of the grazing allotments have removed these threats from the action area. Brood parasitism by the brown-headed cowbird continues to be a problem. Surveyors have directly observed parasitism of migratory songbirds within the action area and have documented brown-headed cowbirds within the Amargosa Canyon and Willow Creek (Lynn et al. 2001, Wilamowski and Whitfield 2002, McCreedy pers. comm. 2005).

Additional threats within the action area include habitat modification from non-native salt cedar invasion and wildfires that destroy both native and non-native habitats. A wildfire in 2002 destroyed the riparian habitat in Section 16 within the Amargosa Canyon. The Bureau has been using spot herbicide applications to kill salt cedar resprouts in this burn area to try to prevent reinvasion. Although native willow stands still exist within the action area, many areas are dominated by monoculture stands of non-native salt cedar. The salt cedar has the potential to adversely affect southwestern willow flycatcher productivity within the action area by modifying native riparian habitats; however, as we discussed previously in this biological opinion, in some portions of its range, southwestern willow flycatchers occur in greater densities in salt cedar than in native plant communities.

Status of the Least Bell's Vireo in the Action Area

Within the action area, least Bell's vireos have been located within Amargosa Canyon and Willow Creek (Lynn et al. 2001, Wilamowski and Whitfield 2002). A single least Bell's vireo was also observed on one occasion at a spring source in Shoshone in the early 1990s (Bransfield pers. comm.).

Four least Bell's vireos were detected in upper Amargosa Canyon and one along Willow Creek during three survey visits (May 25, June 12, July 15) in 2001 (Lynn et al. 2001). Surveyors, however, were unable to conduct intensive surveys of Amargosa Canyon.

In 2002, surveyors detected five least Bell's vireos between April 22 and June 18 in the Amargosa Canyon and along Willow Creek (Wilamowski and Whitfield 2002). Most of these individuals were detected along Willow Creek, near China Ranch, although one least Bell's vireo was detected on the Amargosa River (Wilamowski and Whitfield 2002). Least Bell's vireos were not detected in the upper portion of Amargosa Canyon during these surveys. This absence may be the result of a loss of habitat from a wildfire that destroyed most of the riparian vegetation within Section 16 in 2002.

Surveyors located "several territories" and one nesting pair within Amargosa Canyon during surveys performed in the spring and summer of 2005 along the Amargosa River and Willow Creek. This pair produced four fledglings and attempted to re-nest at the same spot following this initial success. Brown-headed cowbirds initially parasitized the second nest and the young were subsequently killed by predators before fledging. On Willow Creek, approximately 19 to 21 least Bell's vireo territories and 15 nests were located. Of these, brown-headed cowbirds parasitized eight. We have no information regarding the success of the remaining nests (McCreedy pers. comm. 2005).

Threats faced by populations within the action area have changed since listing. Although habitat loss due to agricultural development, urbanization, and flood control and water development projects has never been a major threat within the action area, off-road vehicle and grazing disturbances once affected habitat occupied by the least Bell's vireo within the Amargosa Canyon. Placement of vehicle barriers by the Bureau and elimination of grazing allotments have removed these threats from the action area. Habitat modification due to invasion of non-native

salt cedar is still a persistent threat that management has not removed completely from the action area.

No one has observed predation by house pets, feral cats, and other predators within the action area, but the presence of stray cats in the town of Tecopa poses a potential threat. Brood parasitism by the brown-headed cowbird continues to be a problem. Surveyors have directly observed parasitism of least Bell's vireo nests within the action area, and have documented brown-headed cowbirds within the Amargosa Canyon and Willow Creek.

With the conversion of native riparian habitats by non-native salt cedar, a change in the fire regime poses a threat to least Bell's vireos and their habitat within the action area. As noted in the discussion of the environmental baseline for the southwestern willow flycatcher, a wildfire in 2002 destroyed the riparian habitat in Section 16 within the Amargosa Canyon.

EFFECTS OF THE ACTION ON THE SOUTHWESTERN WILLOW FLYCATCHER AND LEAST BELL'S VIREO

Methodology

We used the same methodology to analyze the effects of the proposed action on the southwestern willow flycatcher and least Bell's vireo that we used for the Amargosa vole. We will not repeat it here.

Active Riparian and Upland Restoration of Degraded Areas, the Amargosa ACEC Trail Plan, and Signing and Fencing Cultural Resource Sites

The collection or clearing of small amounts of riparian vegetation during the installation of erosion control devices, collection of plant materials for restoration sites, installation of fencing, and trail maintenance may affect the southwestern willow flycatcher and least Bell's vireo. Collection and clearing of riparian vegetation could change the vegetative structure of habitat in localized areas of Amargosa Canyon or Willow Creek by thinning it to the extent that it is less attractive to southwestern willow flycatchers and least Bell's vireos. Based on the project description, however, the Bureau is unlikely to collect or disturb enough riparian vegetation, in any given year, to change the structure of a large portion of the available habitat within the action area to the extent that individuals of these species would be affected in a measurable manner. Because both subspecies nest in riparian areas, they have adapted to occasional changes in the structure of the plant communities as these communities mature and are damaged by flooding. Consequently, we do not expect that the amount of work that the Bureau is likely to conduct with regard to these activities will interfere with nesting of least Bell's vireos or southwest willow flycatchers.

The Bureau will implement most restoration activities outside of the nesting season and during a time of year when these subspecies are on their wintering grounds in Central America. Therefore, we do not anticipate that southwestern willow flycatchers or least Bell's vireos will be killed or injured as a result of this work.

The Bureau proposes to construct and maintain trails throughout Amargosa Canyon, Willow Creek, and Grimshaw Basin. Only work on the Amargosa River Trail is likely to adversely affect the southwestern willow flycatcher or least Bell's vireo. The Bureau will conduct activities related to trail work outside of the nesting season and during a time of year when these subspecies are on their wintering grounds in Central America. Therefore, we do not anticipate that southwestern willow flycatchers or least Bell's vireos will be killed or injured as a result of this work.

Use of the trail by hikers and equestrians during the spring and summer will likely disturb least Bell's vireos near breeding locations. Most species of birds are most susceptible to disturbance when they are attempting to establish a nest; once eggs are laid or young birds are present, parents are not as easily disturbed. The presence of humans near breeding locations could disturb some nesting birds to the extent that they abandon nesting or scold hikers sufficiently to attract predators; therefore, some nests may be lost as a result of the use of trails. We anticipate that few least Bell's vireos will be affected to the extent that nests or young are lost because we do not expect a substantial level of continued use by hikers and equestrians. At the present time, southwestern willow flycatchers do not nest within the action area; however, they are likely to be affected in the same manner as least Bell's vireos.

The Bureau will not install fencing and signing at cultural resource sites within Amargosa Canyon and Willow Creek because no such sites occur in these areas (Seehafer pers. comm.). Therefore, this activity is not likely to adversely affect the least Bell's vireo or southwestern willow flycatcher.

The Bureau will conduct additional environmental review of active restoration work. The other actions evaluated in this section are likely to occur without subsequent environmental analysis by the Bureau.

Restoring and Maintaining the Natural Sinuosity of the Amargosa River

Changes to the natural sinuosity of the Amargosa River will likely change the location and amount of water along the main course of the Amargosa River in certain locations. Such changes could dry out or shrink some riparian areas along the Amargosa River, in which case least Bell's vireos (and southwest willow flycatchers, if they breed in the action area at some later time) using these habitats would be forced to seek other breeding areas. However, the new course of the river within Amargosa Canyon will likely create new riparian vegetation the birds could use as habitat. The transition of river course, from an incised channel to a meandering creek bed, is likely to be slow, which will allow for a slow transition of riparian vegetation and allow individuals of these subspecies birds to adjust their habitat usage.

We anticipate restoration of the natural sinuosity of the Amargosa River will greatly improve the quality and quantity of riparian habitat along the Amargosa River by providing several braided channels able to produce more riparian vegetation than a single incised channel. The increase in habitat quality and quantity will have long-term benefits for both subspecies within the Amargosa ACEC.

The Bureau will conduct additional environmental review regarding activities associated with restoration of the natural sinuosity of the Amargosa River.

Order III Soil Survey

The use of access routes and digging of soil pits within riparian habitats could disturb breeding southwestern willow flycatchers and least Bell's vireos and cause them to abandon nests. We anticipate disturbance associated with this action will be minor and localized in nature, because relatively few pits may be dug in relation to the size of the action area. For this reason, we anticipate this action will disturb few if any nests or breeding pairs.

Conducting soil surveys is likely to occur without subsequent environmental analysis by the Bureau.

CUMULATIVE EFFECTS ON THE SOUTHWESTERN WILLOW FLYCATCHER AND LEAST BELL'S VIREO

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The Nature Conservancy is planning a riparian restoration effort on private lands within the Willow Creek drainage. Most of this would occur on lands encompassing China Ranch. Least Bell's vireos have been located on this property and these efforts may affect them. The removal effort will likely consist of removing salt cedar from localized areas using chainsaws and then spraying the stumps with spot applications of herbicide. The Nature Conservancy is planning to do work during the non-breeding season (Christian pers. comm.).

Implementation of this action during the non-breeding season will eliminate the potential that any least Bell's vireos may be killed or injured. Salt cedar infestations in this area are minor and consist of scattered trees within a riparian area dominated by native vegetation. Because the majority of the riparian area on this property is dominated by native vegetation that would not be removed, ample habitat for nesting least Bell's vireos would remain. Based on this information, the actions The Nature Conservancy may undertake at China Ranch are not likely to adversely affect the least Bell's vireo and will contribute to its conservation. Although southwest willow flycatchers have not been observed on China Ranch, The Nature Conservancy's planned action would affect this subspecies in the same manner, if it occupies China Ranch at some point in the future.

CONCLUSION

After reviewing their current status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the Amargosa River ACEC Plan is not likely to jeopardize the continued

existence of the southwestern willow flycatcher or least Bell's vireo. We reached these conclusions because:

1) the Bureau is proposing to accomplish many of the proposed actions outside of the nesting season for both species;

2) due to the nature of most of the projects, the Bureau will disturb a minimal amount of riparian habitat in a small portion of ranges of these subspecies;

3) populations of both species along the Amargosa River represent a minimal portion of the range and population size for both subspecies;

4) restoration of the natural sinuosity of the Amargosa River is likely to occur slowly and allow for replacement of riparian habitat as the river shifts its course;

5) actions proposed in this plan are likely to improve the quality of southwestern willow flycatcher and least Bell's vireo habitat through control of human access and restoration of disturbed areas within riparian habitats;

6) we anticipate that cumulative effects associated with riparian restoration at China Ranch will not likely affect the least Bell's vireo or southwest willow flycatcher; and

7) the Bureau's goal in implementing this plan is to aid in the preservation and recovery of listed species within the ACEC.

Although this biological opinion has concluded that the proposed Amargosa River ACEC Plan is not likely to jeopardize the continued existence of the least Bell's vireo or southwest willow flycatcher, the Bureau may propose a specific action in the future that could result in a finding of jeopardy. Such a circumstance could occur if proposals for future actions contain project-specific details that cannot be evaluated at this programmatic level.

BIOLOGICAL OPINION FOR AMARGOSA NITERWORT AND ITS CRITICAL HABITAT

STATUS OF AMARGOSA NITERWORT AND ITS CRITICAL HABITAT

Ecology of Amargosa niterwort

Amargosa niterwort can over-winter as under-ground rootstocks, with new plants starting to form in March. Large rhizomatous roots connect many seemingly individual plants shoots, called rametes within a colony (Service 1990). Flowering is from late April to October. Seed viability, longevity, dormancy and germination requirements are unknown (Reveal 1978).

Amargosa niterwort only occurs in highly saline and alkaline soils hydrated to varying degrees and formed by seepage from freshwater springs (Beatley 1977). Amargosa niterwort occurs at

an elevation of 600 to 750 meters. Associated plants include spiny saltbush (*Atriplex confertifolia*), short-pedicelled cleomella (*Cleomella brevipes*), salt grass, bush seepweed (*Suaeda moquinii*), common niterwort (*Nitrophila occidentalis*), and Tecopa bird's beak (Johnston and Zink 2004, Reveal 1978).

Amargosa niterwort occurs in the open and is not associated with or under any type of cover (Reveal 1978). Salt grass may compete with Amargosa niterwort in more marginal habitats, where soil moisture is low (Johnston and Zink 2004).

Status of Amargosa niterwort

The Service listed Amargosa niterwort as an endangered species on June 19, 1985 (50 *Federal Register* 20777). The Service developed a recovery plan for listed species at the Ash Meadows National Wildlife Refuge that addressed the recovery of Amargosa niterwort within the Lower Carson Slough, California, and the Ash Meadows National Wildlife Refuge, Nevada, but it does not address the rangewide recovery of the species. Reasons for listing of Amargosa niterwort as endangered included: 1) habitat loss and modification due to interruption of water flow to its habitat by peat mining operations in the Lower Carson Slough during the 1960s, ground water depletion, off-road vehicle activity, and mining activities; 2) direct loss of individuals due to trampling by cattle and/or feral horses; and 3) inadequacy of existing regulatory mechanisms (50 *Federal Register 20777*).

At the time of listing, we knew of Amargosa niterwort only from the Lower Carson Slough (50 *Federal Register 20777*). In 1978, this population consisted of several thousand individuals (Reveal 1978). Today, we know of Amargosa niterwort populations in the Lower Carson Slough, below Crystal Reservoir on the Ash Meadows National Wildlife Refuge, and near Tecopa Hot Springs (Johnston and Zink 2004). These three occurrences represent approximately 310,500 to 311,500 above ground rametes (Johnston and Zink 2004). In recent years, some of the subpopulations making up the occurrence at Tecopa Hot Springs have not been relocated (Threloff pers. comm. *in* Service 2002b).

Threats facing Amargosa niterwort have changed to some extent since its listing. Fences installed by the Bureau have curtailed OHV activity. Mining activities and ground water depletion continue to threaten Amargosa niterwort. Direct loss of individuals due to trampling by cattle and feral horses is not an acute threat to the species. No cattle grazing occurs in or near Amargosa niterwort habitat. A herd of approximately 10 wild horses continues to inhabit areas around Death Valley Junction and may pose a threat to this occurrence. Past construction of private campground facilities in the Tecopa Hot Springs area may have destroyed some individuals of Amargosa niterwort.

Status of Critical Habitat of Amargosa Niterwort

Critical habitat for Amargosa niterwort was designated on June 19, 1985 (50 *Federal Register* 20777) and consists of one 486-hectare unit. This unit is within the Lower Carson Slough, approximately 8 kilometers northeast of Death Valley Junction, on both sides of State Line Road.

The primary constituent element of critical habitat known to require special management considerations or protection is salt-encrusted mud flats (50 *Federal Register 20777*). Activities that may alter this primary constituent element include mining, overgrazing, land development for agriculture, road construction, ground water depletion, and/or off-road vehicle use (50 *Federal Register* 20777).

Critical habitat for this species is important to its conservation because it protects large continuous salt-encrusted mudflats containing the largest known occurrence of the species. Because these plants are not above ground year-round and could be damaged unknowingly by various activities, the designation of critical habitat serves as an indicator of their potential presence in areas that support the primary constituent element.

The current extent of suitable habitat within Amargosa niterwort critical habitat has likely changed from the historic condition, but the extent of such change is uncertain. Agricultural and land development activities in Ash Meadows in the 1960s and 1970s modified many spring outflows in the region that provided water to salt-encrusted mudflats in the Lower Carson Slough. We do not know the extent to which these alterations have affected critical habitat. Johnston and Zink (2004) noted that, in areas where mud flats were less saturated, Amargosa niterwort plants were out-competed by salt grass. Drying of salt encrusted mud flats due to these spring alterations may have resulted in a loss of this primary constituent element and a subsequent loss of plants in some portions of the Lower Carson Slough. Establishment of the Ash Meadows National Wildlife Refuge in the late 1980s and the elimination of many of the diversions and ground water wells have likely improved the condition to some degree. However, past activities substantially altered flow paths for many of the springs in Ash Meadows and we are uncertain whether many of them have reverted to their historic paths.

Threats to critical habitat have changed from those listed during the critical habitat designation. Fencing of critical habitat along State Line Road has reduced the effects associated with off-road vehicle use and road construction. The fencing, however, has not eliminated all of these effects. Johnston and Zink (2004), for example, noted some Amargosa niterwort individuals growing out of the edge of gravel deposited by road grading activities, indicating road construction may still adversely affect some habitat. Mining disturbances and adverse effects associated with ground water depletion continue to be potential disturbances to critical habitat for Amargosa niterwort. Overgrazing, although mentioned as a potential threat in all of the Ash Meadows plant critical habitat designations in the 1985 *Federal Register* final rule, has never been a major concern within Amargosa niterwort critical habitat.

ENVIRONMENTAL BASELINE FOR AMARGOSA NITERWORT AND ITS CRITICAL HABITAT

Previous Consultations

We have completed one biological opinion involving Amargosa niterwort that overlaps the action area for this consultation. We completed a biological opinion for the Bureau regarding the effects of the California Desert Conservation Area Plan on Amargosa niterwort, Ash meadows

gumplant, and Lane Mountain milk-vetch (Service 2002b). We determined that the overall guidance provided by the California Desert Conservation Area Plan was not likely to jeopardize the continued existence of Amargosa niterwort or adversely modify its critical habitat.

Status of Amargosa Niterwort in the Action Area

Within the action area, Amargosa niterwort has been located in the Lower Carson Slough and near Tecopa Hot Springs. The occurrence within the Lower Carson Slough is approximately 170 hectares in size and is located within alkaline mudflats formed by the surface and subsurface flow from springs in Ash Meadows (Johnston and Zink 2004). This population contains approximately 280,000 aboveground rametes with an average density of 0 to 6 aboveground rametes per square meter (Johnston and Zink 2004). The occurrence north of the Tecopa Hot Springs Community Center contained approximately 500 to 1,500 rametes as late as 1994 (California Natural Diversity Database 2000). Searches, in recent years have not relocated this second occurrence (Threloff pers. comm. *in* Service 2002b). Other, smaller populations have been discovered in a different location within Tecopa Hot Springs as recently as last spring, indicating the species persists at this location.

Status of Critical Habitat of Amargosa Niterwort in the Action Area

The 486-hectare critical habitat unit for Amargosa niterwort, near Death Valley Junction, contains the majority of the area and plants encompassing the Lower Carson Slough occurrence. In 1989, unauthorized mineral exploration on the Naxos Mining Claim resulted in vehicle travel within critical habitat near Death Valley Junction (Knight 1990). Additional unauthorized off-road vehicle activity has also adversely affected critical habitat. In addition, road grading of State Line Road crossing Amargosa niterwort critical habitat near Death Valley Junction has resulted in some habitat disturbance when equipment has strayed off the roads shoulder. Installation of fencing along State Line Road by the Bureau has helped to alleviate many of these adverse effects.

Ground water pumping described in the previous section of this biological opinion is also likely to affect critical habitat within the action area. We do not know the historic extent of the primary constituent element in this area or how ground water withdrawals may have affected it.

EFFECTS OF THE ACTION ON AMARGOSA NITERWORT AND ITS CRITICAL HABITAT

Methodology

We used the same methodology to analyze the effects of the proposed action on Amargosa niterwort that we used for the Amargosa vole and its critical habitat. We will not repeat it here.

Active Riparian and Upland Restoration of Degraded Areas, Fencing and Signing Listed and Sensitive Plant Populations, Signing and Fencing Cultural Resource Sites

Effects on Amargosa Niterwort

Work crews within Amargosa niterwort habitat could crush aboveground rametes. During times of year when plants are below ground, loss of underground rootstocks could occur while installing erosion control structures, planting shrubs, accessing project sites, or performing other restoration-related activities. The likelihood of overlap between revegetation sites and Amargosa niterwort habitat will be low because this species usually occupies barren mudflats, where the Bureau is unlikely to implement numerous restoration activities. Where revegetation sites are located adjacent to these habitats, however, they could adversely affect some outlying individuals or small subpopulations. We cannot predict how many plants restoration work may affect; however, because this work is likely to only affect plants at the fringes of suitable habitat, we expect that the number of Amargosa niterwort plants lost because of restoration will be minor.

Fencing and signing populations of listed and sensitive plants will affect an unknown number of individuals of Amargosa niterwort. ATVs and workers may crush plants as they access the fencing sites. The potential exists that ATVs could compact substrates and impede the growth of plants; however, because wet, sandy substrate may not compact to a great degree, this impact may be minimal. Finally, inserting posts into the ground may damage some plants; damaged plants may be killed, be more susceptible to invasion by microbes or invertebrates, or continue growing with little adverse effect. We do not know the extent of fencing or signing that may be installed. However, because the effects of fencing or signing would occur either along a linear path or essentially at a point within aggregations of Amargosa niterwort, respectively, very few individuals are likely to be affected. Additionally, as we noted previously in this paragraph, the intensity of the effect may be minimal and almost certainly would be temporary. Finally, the protection afforded to Amargosa niterwort by the fencing and signing is likely to further the recovery of this species.

Signing and fencing cultural resource sites would affect Amargosa niterwort in the same manner as we discussed in the previous paragraph for protection of sensitive plants. Consequently, we expect the intensity of any adverse effects on Amargosa niterwort to be minor; additionally, because cultural sites will generally be more restricted in area than aggregations of sensitive plants, the overall effect of this action should have negligible effects on Amargosa niterwort.

Effects on Critical Habitat of Amargosa Niterwort

We expect that active restoration of degraded areas in riparian and upland habitats will have minimal effects on the primary constituent element of critical habitat because the Bureau is unlikely to seed, plant, or vertically mulch on salt-encrusted mudflats. The restoration of other sites within critical habitat not containing salt-encrusted mudflats will enhance the conservation role of critical habitat by reducing human incursions. This action will not reduce the ability of critical habitat to function and may result in overall improvement of the condition of the unit.

We anticipate that fencing and signing listed and sensitive plant populations and cultural resource sites would result in temporary and minor effects to the primary constituent element of

critical habitat of Amargosa niterwort. The relatively low level of activity expected with installing fences and signs is unlikely to alter the biological and physical attributes of salt-encrusted mudflats that are important to Amargosa niterwort. Additionally, the protection of sites supporting the primary constituent element of critical habitat of Amargosa niterwort is likely to improve the ability of the critical habitat unit to serve its conservation role.

The Bureau will conduct additional environmental review of active restoration work. The other actions evaluated in this section are likely to occur without subsequent environmental analysis by the Bureau.

Order III Soil Survey

Effects on Amargosa Niterwort

Use of access routes and digging of soil pits could result in the damage or loss of plants and underground rootstocks. These effects will likely occur in small, localized areas, if at all. Consequently, we anticipate this action will destroy few, if any, plants or underground rootstocks. The loss of these plants is unlikely to substantially alter Amargosa niterwort's population size within the ACEC.

Effects on Critical Habitat of Amargosa Niterwort

The use of access roads and the digging of soil pits will disturb small, localized patches of salt-encrusted mudflats. However, we anticipate these actions will result in disturbance of only a small fraction of the area of salt-encrusted mudflats available to Amargosa niterwort. This action will not compromise the function of the critical habitat.

Conducting soil surveys is likely to occur without subsequent environmental analysis by the Bureau.

Installing New Ground Water Monitoring Wells

Effects on Amargosa Niterwort

The placement of monitoring wells near occurrences of Amargosa niterwort could result in the loss of some outlier individuals from a localized area. Vehicular access the site would further increase the disturbance. Given the location of the core occurrences and the range of the species within Lower Carson Slough, the Bureau will not likely require more than a few wells to accomplish its goal. Because the wells will be placed near, but not within, the occurrences, we anticipate the loss of only outlier individuals. We expect this loss will be minimal because the construction footprint will be in a localized area and will likely be small. The remaining construction footprint will be localized around that point or along an access route. We anticipate this amount of disturbance to areas outside of the core occurrences will result in the loss of few individuals; this level of loss will not affect the distribution, numbers, or reproduction of the species in a substantial manner.

Effects on Critical Habitat of Amargosa Niterwort

Access to well sites and construction of wells will likely result in impacts to a few localized areas of salt-encrusted mudflats within critical habitat. Relative to the extent of the primary constituent element within the critical habitat unit, a small area would be disturbed. We do not anticipate this action will compromise the function of critical habitat. Monitoring of water levels within Lower Carson Slough will provide for better management of critical habitat by allowing the Bureau to be more aware of habitat conditions that are not directly observable.

The activities discussed in this section are likely to occur without subsequent environmental analysis by the Bureau.

Monitoring Small Mammals and Reptiles

Effects on Amargosa Niterwort

Workers who are placing and checking traps may trample plants; the movement of vegetation to set a mammal trap and digging to install a pitfall trap may damage or destroy individuals of Amargosa niterwort within the Lower Carson Slough portion of the ACEC. We anticipate this action will few damage or destroy individuals of Amargosa niterwort because these arrays will affect a small amount of habitat within this part of the ACEC; additionally, only portions of the arrays are likely be within Amargosa niterwort habitat. This level of loss will not affect the distribution, numbers, or reproduction of the species in a substantial manner.

Effects on Critical Habitat of Amargosa Niterwort

Workers accessing arrays and placing traps could disturb a small amount of critical habitat. We anticipate that this disturbance would affect a very small area that supports the primary constituent element of critical habitat because the overall area that would be affected by the arrays would be a minor component of critical habitat and only a minor portion of the array would likely occur on salt-encrusted mudflats. Additionally, this disturbance will be temporary. This level of disturbance will not result in any substantial changes to the function of critical habitat.

The Bureau will conduct additional environmental review regarding activities associated with inventories of small mammals and reptiles.

CUMULATIVE EFFECTS ON AMARGOSA NITERWORT AND ITS CRITICAL HABITAT

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.
We are unaware of any non-federal actions reasonably certain to occur that will affect Amargosa niterwort or its critical habitat within the action area.

CONCLUSION

Amargosa Niterwort

After reviewing its status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the Amargosa River ACEC Plan is not likely to jeopardize the continued existence of Amargosa niterwort. We reached this conclusion because:

1) upland restoration activities, installation of groundwater monitoring wells, and fencing of plant populations will only adversely affect outlier individuals on the periphery of core populations;

2) all activities will occur in localized areas and will not affect substantial portions of the species' range;

3) we did not detect any cumulative effects that will alter the status of Amargosa niterwort; and

4) the Bureau's goal in implementing this plan is to aid in the conservation and recovery of listed species within the ACEC.

Critical Habitat of the Amargosa Niterwort

After reviewing its status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the Amargosa River ACEC Plan is not likely to adversely modify critical habitat for Amargosa niterwort. We reached this conclusion because:

1) most activities proposed by the Bureau will have only minor and temporary effects to the primary constituent element of critical habitat;

2) all activities will occur in localized areas and will not affect substantial portions of the critical habitat unit;

3) we did not detect any cumulative effects that will alter the status of critical habitat of Amargosa niterwort; and

4) the Bureau's goal in implementing this plan is to aid in the conservation and recovery of listed species within the ACEC.

Although this biological opinion has concluded that the proposed Amargosa River ACEC Plan is not likely to jeopardize the continued existence of the Amargosa niterwort or adversely modify its critical habitat, the Bureau may propose a specific action in the future that could result in a finding of jeopardy or adverse modification of critical habitat. Such a circumstance could occur

if proposals for future actions contain project-specific details that cannot be evaluated at this programmatic level.

BIOLOGICAL OPINION FOR ASH MEADOWS GUMPLANT AND ITS CRITICAL HABITAT

STATUS OF ASH MEADOWS GUMPLANT AND ITS CRITICAL HABITAT

Ecology of Ash Meadows gumplant

Flowering occurs from June through October (Beatley 1976). Seeds could be dispersed by wind, water, and possibly mammals or birds. We do not know the pollinators for this species at this time (Cochrane 1981).

Ash Meadows gumplant occurs in primarily salt grass meadows along streams and surrounding pools near ash-screwbean-mesquite woodlands and desert shadscale scrub vegetation. It occasionally occurs sparsely on open alkali clay soils in drier shadscale habitats or in the unique clay barrens where ground water is at or near the surface (Cochrane 1981). The dominant plant species occurring with the gumplant is salt grass. One common associate within this salt grass meadow community is the spring-loving centaury (Cochrane 1981).

Status of Ash Meadows Gumplant

The Service listed Ash Meadows gumplant as a threatened species on June 19, 1985 (50 *Federal Register* 20777). The Service developed a recovery plan for listed species at the Ash Meadows National Wildlife Refuge that addresses this species' recovery. Reasons for listing of Ash Meadows gumplant as threatened included: 1) habitat loss and modification due to peat mining activities in the 1960s, agricultural development, ground water depletion and surface water diversions, and threats related to clay mining claims and proposed road construction within its habitat; 2) direct loss of individuals due to trampling and grazing by cattle and/or feral horses; and 3) inadequacy of existing regulatory mechanisms (50 *Federal Register 20777*).

In 1981, we knew of approximately 10,000 to 13,000 plants from 4 major and 9 minor occurrences within the Ash Meadows area of southwestern Nye County and eastern Inyo County, an area of approximately 130 square kilometers (Cochrane 1981). Recent surveys of a single population within the Lower Carson Slough have likely increased this population estimate by at least 100,000 plants (Johnston and Zink 2004).

Threats facing Ash Meadows gumplant have changed since listing. Creation of the Ash Meadows National Wildlife Refuge has reduced agricultural developments, peat mining, and surface water diversion that once adversely affected Ash Meadows gumplant habitat. Ground water depletion in areas outside of the national wildlife refuge continues to pose a threat to spring discharges supporting Ash Meadows gumplant habitat. The largest known occurrence is located on Bureau-managed land outside of the national wildlife refuge and is still exposed to potential clay mining and road construction activities. Listing has likely reduced direct loss of

individuals due to grazing. Cattle no longer graze in this area, but wild horses near the Death Valley Junction area continue to pose some degree of threat. A new threat to Ash Meadows gumplant is the potential invasion of habitats by non-native salt cedar and other exotic species.

Status of Critical Habitat of Ash Meadows Gumplant

Critical habitat for Ash Meadows gumplant was designated on June 19, 1985 (50 *Federal Register* 20777) and consists of 14 units, totaling 797 hectares. These units are within the Lower Carson Slough and Ash Meadows regions.

Primary constituent elements of its critical habitat known to require special management considerations or protection are salt grass meadows along streams and pools or drier areas with alkali clay soils (50 *Federal Register* 20777). Activities that may alter these primary constituent elements include mining, overgrazing, land development for agriculture, road construction, ground water depletion, and/or off-road vehicle use (50 *Federal Register* 20777).

We are uncertain to what extent suitable habitat within Ash Meadows gumplant critical habitat has changed from the historic condition. Diversion of spring discharges and impoundment of water during the 1960s and 1970s likely reduced the amount of water supporting Ash Meadows gumplant habitats. Establishment of the Ash Meadows National Wildlife Refuge in the late 1980s and the elimination of many of the diversions and ground water wells have likely improved the condition to some degree. However, land use practices have substantially altered flow paths for many of the springs in Ash Meadows and we are uncertain whether many of them have reverted to their historic paths.

A 33-hectare wildfire on the Ash Meadows National Wildlife Refuge in 2004 burned some critical habitat for Ash Meadows gumplant. The report indicated natural regeneration of the habitat was likely given the low intensity of the fire.

Threats to critical habitat have changed, from those listed during the critical habitat designation. Creation of the Ash Meadows National Wildlife Refuge reduced or eliminated mining, overgrazing, land development, agriculture, road construction, and off-road vehicle disturbances within the majority of critical habitat units. Ground water depletion caused by pumping at locations in California and Nevada continues to be a potential source of critical habitat disturbances.

ENVIRONMENTAL BASELINE FOR ASH MEADOWS GUMPLANT AND ITS CRITICAL HABITAT

Previous Consultations

We have completed one biological opinion involving Ash Meadows gumplant that overlaps the action area for this consultation. We issued a biological opinion to the Bureau regarding the effects of the California Desert Conservation Area Plan on Amargosa niterwort, Ash meadows gumplant, and Lane Mountain milk-vetch (Service 2002c). In that opinion, we determined the

implementation of that plan was not likely to jeopardize the continued existence of Ash Meadows gumplant or adversely modify its critical habitat.

Status of Ash Meadows Gumplant in the Action Area

Within the action area, Ash Meadows gumplant has been located in the Lower Carson Slough. This occurrence, near the Nevada-California state line, is approximately 36 hectares in size (Johnston and Zink 2004) and is the largest known occurrence of the plant. This population contains approximately 241,514 plants with an average density of approximately 0.78 plants per square meter (Johnston and Zink 2004). In a 1981 status review for Ash Meadows gumplant, Cochrane (1981) identified this occurrence as the largest known population, with fewer than 10,000 plants. We do not know whether this increase in plants since 1981 is the result of an actual increase in numbers or an artifact of survey intensity or other factors.

Since the listing of Ash Meadows gumplant, the threats facing the occurrence within the action area have changed. Peat mining in the 1960s within the Lower Carson Slough that destroyed a significant portion of the known habitat no longer occurs. Agricultural development and water diversions have been reduced and in some cases eliminated upstream from the occurrence within the action area. Some impoundments from the 1960s and 1970s remain, however, and we are unable to quantify the number of individuals or the amount of habitat lost within the action area due to past diversions and modifications of springs upstream from the action area.

Potential threats to Ash Meadows gumplant within the action area still include potential road construction, and clay mining, although we are unaware of any recent case of these activities near the occurrence within the action area. Trampling or grazing of individuals by wild horses in the area may also result in some loss of individuals, although we have no documented evidence of this occurring.

Status of Critical Habitat of Ash Meadows Gumplant in the Action Area

Approximately 113 hectares are located within in the Lower Carson Slough and the action area for this consultation. This critical habitat unit is important to the conservation of the species because it encompasses the largest known population of Ash Meadows gumplant.

The effects associated with past and current activities within the action area have likely affected critical habitat for Ash Meadows gumplant. We do not know the amount of critical habitat permanently or temporarily disturbed as a result of these activities.

EFFECTS OF THE ACTION ON ASH MEADOWS GUMPLANT AND ITS CRITICAL HABITAT

Methodology

We used the same methodology to analyze the effects of the proposed action on Ash Meadows gumplant and its critical habitat that we used for the Amargosa vole and its critical habitat. We will not repeat it here.

Active Riparian and Upland Restoration of Degraded Areas, Fencing and Signing Listed and Sensitive Plant Populations, and Signing and Fencing Cultural Resource Sites

Effects on Ash Meadows Gumplant

Crews working on restoration actions in the Lower Carson Slough could crush or disturb individual Ash Meadows gumplant plants while walking or moving equipment within or near work sites. Ash Meadows gumplant populations predominately occur within salt grass and mesquite woodland vegetation types, making it difficult to see plants. In areas where they occur in shadscale or clay barren habitats, they will be easier to recognize and avoid. We anticipate the number of plants that will be killed or damaged is small because the Bureau will only implement this action only on disturbed sites, which likely contain few plants. In addition, the Bureau will perform pre-project surveys of access routes and project sites to delineate boundaries that result in minimal impacts to this species; this minimization measure will reduce the chance of crushing individual plants further. This action will likely benefit Ash Meadows gumplant by repairing erosion damage and restoring salt grass, mesquite woodland, and shadscale vegetation types this species occupies in Lower Carson Slough.

Fencing and signing populations of listed and sensitive plants will affect an unknown number of individuals of Ash Meadows gumplant. ATVs and workers may crush plants as they access the fencing sites. The potential exists that ATVs could compact substrates and impede the growth of plants. Finally, inserting posts into the ground may damage some plants; damaged plants may be killed, be more susceptible to invasion by microbes or invertebrates, or continue growing with little adverse effect. We do not know the extent of fencing or signing that may be installed. However, because the effects of fencing or signing would occur either along a linear path or essentially at a point within aggregations of Ash Meadows gumplant, respectively, very few individuals are likely to be affected. Additionally, as we noted previously in this paragraph, the intensity of the effect may be minimal and almost certainly would be temporary. Finally, the protection afforded to Ash Meadows gumplant by the fencing and signing is likely to further the recovery of this species.

Signing and fencing cultural resource sites would affect Ash Meadows gumplant in the same manner as we discussed in the previous paragraph for protection of sensitive plants. Consequently, we expect the intensity of any adverse effects on Ash Meadows gumplant to be minor; additionally, because cultural sites will generally be more restricted in area than aggregations of sensitive plants, the overall effect of this action should have negligible effects on Ash Meadows gumplant.

Effects on Critical Habitat of Ash Meadows Gumplant

The restoration of degraded riparian and upland areas likely temporarily disturb a limited amount of critical habitat as workers conduct work at or access sites. The use of clearly delineated access routes and work areas will reduce the chance of inadvertent damage to the primary constituent elements. Because the Bureau will implement this action to restore disturbed salt grass meadows and other drier upland vegetation types that support the primary constituent elements, we anticipate its implementation will increase the extent and quality of the primary constituent element of Ash Meadows gumplant critical habitat.

We anticipate that fencing and signing listed and sensitive plant populations and cultural resource sites would result in temporary and minor effects to the primary constituent element of critical habitat of Ash Meadows gumplant. The relatively low level of activity expected with installing fences and signs is unlikely to alter the biological and physical attributes of critical habitat that are important to Ash Meadows gumplant. Additionally, the protection of sites supporting the primary constituent element of critical habitat of Ash Meadows gumplant is likely to improve the ability of the critical habitat unit to serve its conservation role.

Order III Soil Survey

Effects on Ash Meadows Gumplant

Use of access routes and digging of soil pits could result in the damage or loss of Ash Meadows gumplant plants. These effects will likely occur in small, localized areas, if at all. Consequently, we anticipate this action will destroy few, if any, plants. The loss of these plants is unlikely to substantially alter the population size of Ash Meadows gumplant within the ACEC.

Effects on Critical Habitat of Ash Meadows Gumplant

The use of access roads and the digging of soil pits will disturb small areas of primary constituent elements. However, we anticipate these actions will result in disturbance of only a small fraction of the areas of salt grass meadows along streams and pools or drier areas with alkali clay soils available to Ash Meadows gumplant; as we noted previously in this biological opinion, the NRCS is unlikely to place soil pits in areas along streams and pools because the wet soils in these areas make digging the pits very difficult. This action will not compromise the function of the critical habitat.

Installing New Ground Water Monitoring Wells

Effects on Ash Meadows Gumplant

We anticipate implementation of this action will have similar effects to Ash Meadows gumplant as those described for Amargosa niterwort. Because the wells would be placed near, and not within, the occurrences, we anticipate the loss of only outlier individuals. We expect this loss will be minimal because the work area will be in a localized area and will likely be small. We

anticipate this amount of disturbance to areas outside of the core occurrences will result loss of few individuals.

Effects on Critical Habitat of Ash Meadows Gumplant

Access to work sites and installation of ground water wells will likely result in impacts to salt grass meadows and drier alkaline habitats within critical habitat in only a few localized areas that are small relative to the size of the critical habitat unit. This level of disturbance will not compromise the function of the critical habitat unit.

Monitoring Small Mammals and Reptiles

Effects on Ash Meadows Gumplant

Workers who are placing and checking traps may trample plants; the movement of vegetation to set a mammal trap and digging to install a pitfall trap may damage or destroy individuals of Ash Meadows gumplant within the Lower Carson Slough portion of the ACEC. We anticipate this action will few damage or destroy individuals of Ash Meadows gumplant because these arrays will affect a small amount of habitat within this part of the ACEC; additionally, only portions of the arrays are likely be within habitat of the species. This level of loss will not affect the distribution, numbers, or reproduction of Ash Meadows gumplant in a substantial manner.

Effects on Critical Habitat of Ash Meadows Gumplant

Workers accessing arrays and placing traps could disturb small areas of salt grass meadows along streams and pools or drier areas with alkali clay soils within critical habitat. We anticipate that only a small area that supports the primary constituent elements would be disturbed because the arrays in total would not affect a large area and only a minor portion of the array would likely occur within salt grass meadows along streams and pools or drier areas with alkali clay soils. Additionally, this disturbance will be temporary. This level of disturbance will not result in any substantial changes to the function of critical habitat.

CUMULATIVE EFFECTS ON ASH MEADOWS GUMPLANT AND ITS CRITICAL HABITAT

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. We are unaware of any non-federal actions reasonably certain to occur that will affect Ash Meadows gumplant or its critical habitat within the action area.

CONCLUSION

Ash Meadows Gumplant

After reviewing its status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the Amargosa River ACEC Plan is not likely to jeopardize the continued existence of Ash Meadows gumplant. We reached this conclusion because:

1) upland restoration activities, installation of groundwater monitoring wells, and fencing of plant populations will only adversely affect outlier individuals on the periphery of core populations;

2) all activities will occur in localized areas and will not affect substantial portions of the species' range;

3) we did not detect any cumulative effects that will alter the status of Amargosa niterwort;

4) the Bureau will conduct pre-project surveys for the plant and delineate access routes and project boundaries during fencing and upland restoration activities that will minimize adverse effects to plants; and

5) the Bureau's goal in implementing this plan is to aid in the preservation and recovery of listed species within the ACEC.

Critical Habitat of the Ash Meadows Gumplant

After reviewing its status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the Amargosa River ACEC Plan is not likely to adversely modify critical habitat for Ash Meadows gumplant. We reached this conclusion because:

1) most activities proposed by the Bureau will have only minor and temporary effects to the primary constituent elements of critical habitat;

2) all activities will occur in localized areas and will not affect substantial portions of the critical habitat unit;

3) we did not detect any cumulative effects that will alter the status of critical habitat of Ash Meadows gumplant; and

4) the Bureau's goal in implementing this plan is to aid in the conservation and recovery of listed species within the ACEC.

Although this biological opinion has concluded that the proposed Amargosa River ACEC Plan is not likely to jeopardize the continued existence of the Ash Meadows gumplant or adversely modify its critical habitat, the Bureau may propose a specific action in the future that could result in a finding of jeopardy or adverse modification of critical habitat. Such a circumstance could occur if proposals for future actions contain project-specific details that cannot be evaluated at this programmatic level.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and must be undertaken by the Bureau or made binding conditions of any authorization provided to permittees. The Bureau has a continuing duty to regulate the activities covered by this incidental take statement. If the Bureau fails to assume and implement the terms and conditions of the incidental take statement or to make them enforceable terms of permit or grant documents, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Bureau must report the progress of its action and its impact on the species to the Service as specified in the incidental take statement (50 *Code of Federal Regulations* 402.14(i)(3)).

The Amargosa River ACEC Plan describes numerous programs under which the Bureau will need to conduct additional environmental analyses with regard to future actions. We cannot provide an exemption from the prohibitions against take, as described in section 9 of the Act, for the incidental take that may result from these future actions that require separate review and authorization by the Bureau. We will review the effects of those actions and, through the section 7(a)(2) consultation process, issue incidental take statements in the future, if appropriate, when the Bureau requests formal consultation on specific discretionary actions.

Given this limitation, this biological opinion provides an exemption from the prohibitions against take only for the incidental take of Amargosa voles, southwestern willow flycatchers, and least Bell's vireos that is likely to result from actions that the Bureau will undertake without additional environmental analysis.

These activities include:

Controlling house mice and feral domestic cats**;**

Maintaining existing fences, fencing and restoring disturbed areas, and signing known occurrances of sensitive plant species;

Conducting soil surveys within the ACEC; and

Construction, maintenance, and use of the Watchable Wildlife and Amargosa River Trails.

Amargosa Vole

All of the activities listed in the preceding section may kill or injure Amargosa voles; Amargosa voles would most likely be taken through the accidental crushing of individuals. We cannot quantify the precise numbers of Amargosa voles that will be taken during implementation of this plan because we have no information on population size or density of individuals within the action area. If data did exist for these attributes, any estimate made from it will not likely be valid at the time of project implementation because of population cycling. In addition, the Bureau has proposed many measures that are likely to reduce the amount of take that could occur during the implementation of specific actions.

We anticipate that few Amargosa voles will be killed or injured during these activities. We base this statement on the facts that the Bureau will implement measures that are likely to reduce the amount of take during the conduct of specific actions, that most projects will not be located in areas where Amargosa voles are most common (i.e., the interface between bulrush marshes and salt grass meadows), and that most activities will occur in a manner that would allow Amargosa voles to flee areas of disturbance.

Southwestern Willow Flycatcher and Least Bell's Vireo

We anticipate that, of the activities that the Bureau can implement without further environmental analysis, only use of hiking trails and digging soil pits may kill least Bell's vireos or southwestern willow flycatchers; individuals of these subspecies would most likely be taken through harassment that leads to abandonment of nests and young. We cannot quantify the precise numbers of least Bell's vireos or southwestern willow flycatchers that will be taken during implementation of this plan because the number of nesting birds and the level of activity will vary over the life of the plan, individual birds respond differently to disturbance (i.e., the amount of disturbance that may cause one pair to abandon a nest may not affect another pair), and the sensitivity of nesting birds varies, depending on the timing of the disturbance in relation to the breeding activity. In addition, the Bureau has proposed many measures that are likely to reduce the amount of take that could occur during the implementation of specific actions.

We anticipate that few least Bell's vireos and southwestern willow flycatchers will be killed or injured during these activities. We base this statement on the facts that the Bureau will

implement measures that are likely to reduce the amount of take during the digging of soil pits, that most soil pits will not be located in areas where least Bell's vireos or southwestern willow flycatchers nest (i.e., dense riparian vegetation), and that the level of disturbance associated with hikers in riparian habitat will be relatively minor.

Amargosa Niterwort and Ash Meadows Gumplant

Section 9 of the Act does not address the incidental take of listed plant species. Because the Act does not address the take of listed plant species, this biological opinion does not contain an incidental take statement, reasonable and prudent measures, or terms and conditions for these species.

The Bureau should be aware that the Act prohibits the removal of endangered plants from Federal lands and their reduction to possession, the malicious damaging, or destruction on such lands; by regulation, the Service extended this prohibition to threatened species. Section 9(a)(2)(B) prohibits any person from removing, cutting, digging up, or damaging or destroying individuals of an endangered listed plant species in knowing violation of any law or regulation of any State or in the course of any violation of a State criminal trespass law.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the Amargosa vole, southwestern willow flycatcher, and least Bell's vireo during activities that may result in incidental take through implementation of the Amargosa River ACEC Plan:

1. The Bureau must ensure the level of incidental take anticipated for the Amargosa vole, southwestern willow flycatcher, and least Bell's vireo in this biological opinion is commensurate with the analysis contained herein.

2. The Bureau must ensure that soil surveys within Amargosa Canyon or along Willow Creek result do not unduly disturb breeding pairs or territorial males of southwestern willow flycatchers and least Bell's vireos.

The Service's evaluation of the effects of the proposed action includes consideration of the measures developed by the Bureau and repeated in the Description of the Proposed Action portion of this biological opinion to reduce the adverse effects that plan implementation may have on the Amargosa vole, southwestern willow flycatcher, and least Bell's vireo. Any subsequent changes in the minimization measures proposed by the Bureau or in the project description may constitute a modification of the proposed action and may warrant re-initiation of formal consultation, as specified at 50 *Code of Federal Regulations* 402.16. These reasonable and prudent measures are intended to clarify or supplement the protective measures that were proposed by the Bureau as part of the proposed action.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions, which implement the reasonable and prudent measures described in the previous section and outline reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. The following term and condition implements reasonable and prudent measure 1:

   To ensure the measures proposed by the Bureau are effective and being properly implemented, the Bureau must contact the Service immediately if it becomes aware that an Amargosa vole, least Bell's vireo, or southwestern willow flycatcher has been killed or injured within the vicinity of any project site or along access routes. At that time, the Service and the Bureau must review the circumstances surrounding the incident to determine whether additional protective measures are required. Restoration, fencing, trapping, and trail construction activities can continue provided the Bureau's proposed protective measures and any appropriate terms and conditions of this biological opinion have been and continue to be fully implemented.

2. The following term and condition implements reasonable and prudent measure 2:

   If soil surveys are to be conducted within suitable habitat between March 15 and September 15, the Bureau must survey the area within 100 meters of the work site and access routes that contain appropriate nesting habitat to determine whether least Bell's vireos or southwestern willow flycatchers are present. If surveys detect southwestern willow flycatchers or least Bell's vireos, the Bureau must use spot mapping to determine the approximate territorial boundary. The Bureau must flag the boundary to ensure that new access routes and soil pits are not developed within the territory.

REPORTING REQUIREMENTS

By January 31 of each year this biological opinion is in effect, the Bureau must provide a report to the Service that describes the circumstances surrounding the take of any Amargosa voles, least Bell's vireos, or southwestern willow flycatchers. We request that the Bureau note whether the protective measures and terms and conditions are functioning as intended and provide recommendations regarding how these measures may be changed to provide additional protection to listed species while facilitating the implementation of its actions.

We also request that the Bureau provide us information on restoration, fencing, or other actions that are undertaken to promote the recovery of listed species. This information includes but is not limited to the results of trapping of free-roaming cat and brown-headed cowbirds and of surveys for small mammals, reptiles, and listed species.

DISPOSITION OF DEAD OR INJURED DESERT TORTOISES

Within 3 days of locating an Amargosa vole, least Bell's vireo, or southwestern willow flycatcher that may have been killed or injured as a result of activities undertaken as part of the Amargosa River ACEC Plan, you must notify the Service's Division of Law Enforcement (370 Amapola Avenue, Suite 114, Torrance, California 90501) and the Ventura Fish and Wildlife Office by telephone (805 644-1766) and by facsimile (805 644-3958). The report must include the date, time, and location of the carcass, a photograph, cause of death, if known, and any other pertinent information.

If an individual of a listed species is injured, the Service must be contacted regarding its disposition. Care must be taken in handling dead specimens to preserve biological material in the best possible state for later analysis. The remains of Amargosa voles, southwestern willow flycatcher or least Bell's vireo that have scientific value must be provided to an appropriate institution; if the damage is too extensive, the carcass must be disposed of in an appropriate manner. We recommend that the Bureau contain appropriate research facilities as soon as possible to determine their interest in receiving this biological material and the proper method of preserving it.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We offer the following conservation recommendations for your consideration:

1. We recommend the Bureau perform all activities associated with this plan between September 15 and March 15 when in riparian habitats.

2. We recommend the Bureau work with Ash Meadows National Wildlife Refuge to restore natural spring flow patterns in the Carson Slough that support Amargosa niterwort and Ash Meadows gumplant habitats.

3. We recommend the Bureau support the embedded groundwater flow model for the Ash Meadows Region currently proposed by the U.S. Geological Survey.

4. We recommend the Bureau investigate ways of expanding wetland habitats on the west side of the T & T railroad grade.

5. We recommend the Bureau investigate if the T & T railroad grade is adversely affecting the extent and location of riparian habitat within the Amargosa Canyon and determine if these effects can be remedied.

Please notify us if you implement any conservation recommendations so we may be kept informed of actions that minimize or avoid adverse effects to listed species or their habitats and promote their recovery.

REINITIATION NOTICE

This concludes formal consultation on Bureau's proposed plan for the Amargosa River ACEC. Reinitiation of formal consultation is required where discretionary federal involvement or control over the action has been retained or is authorized by law and: (a) if the amount or extent of taking specified in the incidental take statement is exceeded; (b) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (d) if a new species is listed or critical habitat designated that may be affected by the identified action.

If you have any questions regarding this biological opinion, please contact Brian Croft of my staff at (805) 644-1766, extension 302.

LITERATURE CITED

Batzli, G.O., and F.A. Pitelka. 1971. Condition and diet of cycling populations of the California vole, *Microtus californicus*. Journal of Mammalogy 52(1):141-163.

Bleich, V.C. 1979a. *Microtus californicus scirpensis* not extinct. Journal of Mammalogy 60(4):851-852.

Bleich, V.C. 1979b. Amargosa vole study – final report. Non-game wildlife investigation. Project No. W-54-R-10. California Department of Fish and Game. Sacramento, California.

Bransfield, R. 2006. Personal communication regarding observation of a least Bell's vireo at Shoshone Springs. Fish and wildlife biologist, Ventura Fish and Wildlife Office, U.S. Fish and Wildlife Service. Ventura, California.

Bureau of Land Management. 2002. Final environmental impact statement: proposed Northern and Eastern Mojave Desert Management Plan- Amendment to the California Desert Conservation Area Plan. Moreno Valley, California.

Bureau of Land Management. 2003a. Biological Evaluation for the BLM Barstow Resource Area's Amargosa ACEC Management Plan. Barstow, California.

Bureau of Land Management. 2003b. Draft Amargosa River ACEC Inventory and Monitoring Plan. Barstow Resource Area. Barstow, California.

Bureau of Land Management. 2005a. Draft Environmental Assessment for the Amargosa River ACEC Plan; Chapter 2- Implementation actions (August 17, 2005); Trail Summary (February 28, 2005). Barstow Field Office. Barstow, California.

Bureau of Land Management. 2005b. Least Bell's vireo (*Vireo bellii pusillus*) - species account for the West Mojave Plan final environmental impact statement. Adapted from a species account prepared by Michael A. Patten, Department of Biology, University of California, Riverside, California. Moreno Valley, California.

California Natural Diversity Database. 2000. Field survey forms and other unpublished reports for *Nitrophila mohavensis*. California Department of Fish and Game. Sacramento, California.

Christian, B. 2006. Personal communication regarding the timing of salt cedar removal efforts at China Ranch and along Willow Creek. March 10. Amargosa River Project Lead, The Nature Conservancy.

Cochrane, S.A. 1981. Status report for the Ash Meadows gumplant (*Grindelia fraxino-pratensis* Reveal and Beatley). Unpublished report to the U.S. Fish and Wildlife Service, Portland, Oregon.

Fahnestock, P. 2005. Personal communication regarding the methods used in performing an order III soil survey. October 12, 2005. Resource Soil Scientist, Natural Resource Conservation Service. Victorville, California.

Fahnestock, P. 2006. Personal communication regarding the methods used in performing an order III soil survey. February 28, 2006. Resource Soil Scientist, Natural Resource Conservation Service. Victorville, California.

Finch, D.M., and S.H. Stoleson, eds. 2000. Status, ecology, and conservation of the southwestern willow flycatcher. General Technical Report RMRS-GTR-60. Rocky Mountain Research Station, Forest Service, U.S. Department of Agriculture. Ogden, Utah

Goldwasser, S. 1978. Distribution, reproductive success and impact of nest parasitism by brown-headed cowbirds on least Bell's vireos. Federal Aid Wildlife Report, W-54-R-10, Nongame Wildlife Program, Job W 1.5.1, Final Report. California Department of Fish and Game. Sacramento, California.

Gould, G.I., Jr., and V.C. Bleich. 1977. Amargosa vole study – progress report. Nongame Wildlife Investigation Progress Report W-54-R-9. California Department of Fish and Game. Sacramento, California.

Heske, E.J., R.S. Ostfeld, and W.Z. Lidicker, Jr. 1984. Competitive interactions between *Microtus californicus* and *Reithrodontomys megalotis* during two peaks of *Microtus* abundance. Journal of Mammalogy 65(2):271-280.

Hoffman, R.S. 1958. The role of reproduction and mortality in population fluctuations of voles (*Microtus*). Ecological Monographs 28(1):79-107.

Johnston, S.C. and T.A. Zink. 2003. Demographics and ecology of the Amargosa niterwort (*Nitrophila mohavensis*) and Ash Meadows gumplant (*Grindelia fraxino-pratensis*) of the Carson Slough Area. Report to the Bureau of Land Management.

Knight, T.A. 1990. A survey for *Nitrophila mohavensis* [Munz & Roos] on the Naxos Trespass Area, Inyo County, California. A report submitted to the U.S. Department of the Interior, Bureau of Land Management. Barstow Field Office. Barstow, California.

Krebs, C.J. 1966. Demographic changes in fluctuating populations of *Microtus californicus*. Ecological Monographs 36(3):239-273.

Kus, B. 2005. Personal communication regarding data on inadvertent trapping of non-target species during brown-headed cowbird trapping efforts in southern California. September 22, 2005. Research Ecologist, US Geological Survey, Western Ecological Research Center. San Diego, California.

Lynn, J.C., L.A. Quattrini, M.J. Whitfield, and T. Benson. 2001. Southwestern willow flycatcher and least Bell's vireo surveys for Amargosa Canyon and Willow Creek, Inyo County, California. Report submitted to the Bureau of Land Management.

McClenaghan, L.R., and S.J. Montgomery. 1998. Draft Report: Distribution and abundance of the Amargosa vole (*Microtus californicus scirpensis*). Submitted to the California Department of Fish and Game. Sacramento, California.

McClenaghan, L.R. 2005. Personal communication regarding longevity of the Amargosa vole. March 17. Professor of Mammalogy, San Diego State University. San Diego, California.

McCreedy, C. 2005. Personal communications regarding the bird surveys done in the Amargosa Canyon during the spring of 2005. August 28. Biologist, Point Reyes Bird Observatory, Mono Basin Willow Flycatcher Project. Lee Vining, California.

Murphy, D.D, and K.E. Freas. 1989. Recommendations for the conservation of the Amargosa River pupfish, *Cyprinodon nevadensis amargosae* and the Amargosa vole, *Microtus californicus scirpensis*. Report to The Nature Conservancy.

Neuwald, J.L. 2002. Genetic variation and gene flow in fragmented populations of the endangered Amargosa vole, *Microtus californicus scirpensis*. Unpublished Masters Thesis. San Diego State University. California.

Rado, T., and P. Rowlands. 1984. A small mammal survey and plant inventory of wetland habitats in Amargosa Canyon and Grimshaw Lake Areas of Critical Environmental Concern. U.S. Bureau of Land Management. Barstow, California.

Reveal, J.L. 1978. Status report on *Nitrophila mohavensis* [Munz and Roos] (Amargosa niterwort). Unpublished report submitted to the Department of the Interior.

Seehafer, E. Personal communication regarding the extent of cultural resources within habitat of the Amargosa vole. Barstow Field Office, Bureau of Land Management. Barstow, California.

Sullivan, C. 2006. Personal communication regarding monitoring of riparian restoration sites within the ACEC. March 10. Project Lead, Bureau of Land Management. Barstow, California.

Unitt, P. 1998. Southwestern willow flycatcher (*Emidonax traillii extimus*) – species account for the Final West Mojave Plan Final Environmental Impact Statement. San Diego Natural History Museum. San Diego, California.

U.S. Fish and Wildlife Service. 1990. Recovery plan for the endangered and threatened species of Ash Meadows, Nevada. Portland, Oregon.

U.S. Fish and Wildlife Service. 1997. Amargosa vole (*Microtus californicus scirpensis*) recovery plan. Portland, Oregon.

U.S. Fish and Wildlife Service. 1998. Draft recovery plan for the least Bell's vireo. Portland, Oregon.

U.S. Fish and Wildlife Service. 2000. Southwestern willow flycatcher protocol revision. California/Nevada Operations Office. Sacramento, California.

U.S. Fish and Wildlife Service 2001 Least Bell's vireo survey guidelines. Carlsbad Fish and Wildlife Office. Carlsbad, California.

U.S. Fish and Wildlife Service. 2002a. Southwestern willow flycatcher recovery plan. Albuquerque, New Mexico.

U.S. Fish and Wildlife Service. 2002b. Biological opinion for the California Desert Conservation Area Plan [Lane-Mountain milk-vetch, Ash Meadows gumplant, and Amargosa niterwort] (6840(P) CA-063.50) (1-8-01-F-18). Memorandum to State Director, Bureau of Land Management, Sacramento, California. Dated February 27. From Field Supervisor, Ventura Fish and Wildlife Office. Ventura, California.

U.S. Fish and Wildlife Service. 2002c. Biological opinion for the California Desert Conservation Area Plan [Amargosa vole] (6840(P) CA-063.50) (1-8-01-F-69). Memorandum to State Director, Bureau of Land Management, Sacramento, California. Dated September 23. From Field Supervisor, Ventura Fish and Wildlife Office. Ventura, California.

U.S. Fish and Wildlife Service. 2002d. Endangered species consultation on the effects of the California Desert Conservation Area Plan on the southwestern willow flycatcher, least Bell's vireo, and arroyo toad. FWS-ERIV-2600.02. Memorandum to State Director, Bureau of Land Management, Sacramento, California. Dated December 17. From Assistant Field Supervisor, Carlsbad Fish and Wildlife Office. Carlsbad, California.

U.S. Fish and Wildlife Service. 2005. biological opinion for the salt cedar removal and riparian restoration project within the Amargosa River drainage (1-8-03-F-42). Memorandum to the California Desert District Manager, Bureau of Land Management, Moreno Valley, California. Dated February 24. From Field Supervisor, Ventura Fish and Wildlife Office. Ventura, California.

Wilamowski, D. and M.J. Whitfield. 2002. Southwestern willow flycatcher and Bell's vireo surveys at Amargosa Canyon ACEC, Inyo and San Bernardino Counties, California, 2002. Report submitted to the Bureau of Land Management.

Appendix G
Amargosa River Area of Critical Environmental Concern
Cost and Implementation Schedule

Implementation actions identified in the Amargosa River Area of Critical Environmental Concern (ACEC) Implementation Plan are prioritized as high, medium, and low. Cost estimates for many implementation actions, over the twenty-year life expectancy of this plan, are identified in Table G-1. Priorities and implementation schedules are based on current budget expectations and trends. Decreases or increases in the budget available for Plan implementation and monitoring will, obviously, decelerate or accelerate implementation schedules. Many implementation and monitoring actions will, no doubt, need to be funded through non-traditional methods such as grants.

Table G-1 and the priorities within the Plan are meant only as guidelines, and should only be regarded as strict, if full funding is received. In the event that significantly deficient budgets are encountered, implementation and monitoring activities could be reprioritized and rescheduled. A more appropriate use of Table G-1 is as a guide for funding requests. If sufficient funding to implement and monitor the Plan is not received, lower priority items may be temporally dropped. This is not to say that they will not occur but rather that schedules will not be met. All costing in Table G-1 is based upon 2006 dollars and should be adjusted for inflation in the out-years.

Table G-1 Cost and Implementation Schedule

Action	*FY 07*	*FY 08*	*FY 09*	*FY 10*	*FY 11*	*FY 12*	*FY 13*	*FY 14*	*FY 15*	*FY 16*	*FY 17*	*FY 18*	*FY 20*	*FY 21*	*FY 22*	*FY 23*	*FY 24*	*FY 25*	*FY 26*	*FY 27*	*Total*
Control tamarisk (Tamarix spp.) through implementation of the Barstow Field Office's ten-year weed control plan. Control or contain, as appropriate, other species of weeds. Efforts will include infestations that are both upstream and within the ACEC. If feasible, BLM will establish partnerships to treat state and private lands where there is nexus to the ACEC.	$200k	$200k	$200k	$200k	$200k	$200k	$200k	$200k	$200k	$200k	$100k	$50k	$100k	$50k	$50k	$30k	$30k	$30k	$30k	$30k	$2,500k
Implement, as needed, a controlled burn program to further supplement weed control projects and/or to eliminate refuse from mechanical removal.	$20k	$20k	$20k		$20k		$20k		$20k		$20k		$20k								$160k
Conduct active riparian restoration, as needed, by introducing native riparian plant species into areas of weed control and other priority damaged areas.	$42k	$42k	$42k	$42k	$42k	$42k	$42k	$42k	$42k	$42k	$42k		$42k								$504k
Use the results of bird surveys and literature review of microhabitat requirements to design projects that encourage the nesting of listed and candidate bird species.	$50k	$30k																			$80k
Initiate additional active riparian and upland restoration in priority degraded areas within the ACEC.				$20k	$10k	$10k	$25k										$20k	$10k	$10k	$25k	$130k
Reduce direct and indirect impacts to listed and special status plants by maintaining existing protective fences. Fence, restore closed routes, and/or sign known listed or special status plant population centers that have determined to be impacted by human or other disturbances.		$30k	$30k	$30k	$30k	$5k	$5k	$5k	$5k	$5k	$30k	$5k	$5k	$5k	$5k	$5k	$5k	$5k	$5k	$5k	$220k
Construct a vehicle barrier at the mouth of Cowboy Canyon to protect riparian listed species habitat.	$4k	$1k		$1k		$1k		$2k		$2k		$4k		$4k		$4k		$6k		$6k	$35k
Maintain the existing off-highway vehicle (OHV) barriers at the southern end of the Amargosa River ACEC adjacent to Sperry wash. These barriers protect wilderness values and support the existing OHV vehicle closure in Amargosa Canyon to protect listed species and their habitat.	$1k		$1k		$1k		$2k		$2k		$2k		$4k		$4k		$6k		$6k		$29k
Enter into cooperative agreements with State and private landowners to limit vehicle access in the ACEC to the 2004 NEMO Route of Travel designations.	$8k																				$8k
Reduce the numbers of exotic fauna within listed species habitat consistent with protocols in appendix I. This may include, but is not limited to: • the house mouse (Mus musculus) • free-roaming and/or feral domestic cats (Felis domesticus) • brown-headed cowbirds (Molothrus ater)				$75k	$75k	$75k	$75k	$75k	$75k	$75k	$75k	$75k	$75k	$75k	$75k	$75k	$75k	$75k	$75k	$75k	$1,275k

Action	*FY 07*	*FY 08*	*FY 09*	*FY 10*	*FY 11*	*FY 12*	*FY 13*	*FY 14*	*FY 15*	*FY 16*	*FY 17*	*FY 18*	*FY 20*	*FY 21*	*FY 22*	*FY 23*	*FY 24*	*FY 25*	*FY 26*	*FY 27*	*Total*
Periodically review the fire management plan for the region and modify it if necessary to assure that it continues to provide appropriate protection and mitigation for listed and sensitive species and their habitat during wildfire suppression and managed fire operations.					$3k					$3k					$3k					$3k	$12k
Assert Federal Reserve water rights for Kingston Range Wilderness, Wild and Scenic River, and Public Water Reserves and file for appropriated water rights to conserve existing water sources that support the ACEC's resources and values.								$4k													$4k
Utilize the U.S. Geological Survey (GS) Death Valley Regional Flow System (DVRFS) Model (Belcher, W.R., ed., 2004) or the best available technology to model the aquifers that feed the within the ACEC. Key questions include: • Source of recharge • Hydrologic connectivity with neighboring basins and hydrologic systems • Effects of local and regional groundwater withdrawals	$175k	$150k	$155k	These costs will be shared with BLM Nevada. Additional model costs will occur but are yet determined based upon future modeling activities.																	$480k
Install and maintain stream monitoring equipment to quantify river flows in the Amargosa Canyon.	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$20k	$400k
Identify, map, and/or monitor groundwater sources and springs within the ACEC.	$5k	$45k	$85k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$100k	$1,835k
Monitor and evaluate habitat trends and conditions specific to listed species on public lands throughout the ACEC and work with private landowners, the State, and other federal agencies to identify listed species habitat and habitat trends throughout the ACEC.	$17k	$12k			$12k			$12k			$12k			$17k			$12k			$12k	$106k
Conduct multi-year surveys to establish vegetation baseline in the ACEC, including additional populations of listed and sensitive plant species. Monitor suitable listed and sensitive plant habitat, track population trends, and identify additional recovery needs. Monitor changes in vegetation characteristics over time, once a baseline is established. Identify thresholds for substantial change that would trigger the reevaluation of strategies.	$17k	$12k			$12k			$12k			$12k			$17k			$12k			$12k	$106k
Monitor levels of visitor use of the ACEC trail system and watchable wildlife areas with visitor registers, periodic visitor counts, traffic counters, and other methods.	$1k	$1k	$10k	$1k	$1k	$2k	$2k	$2k	$2k	$2k	$4k	$4k	$4k	$4k	$4k	$6k	$6k	$6k	$6k	$6k	$74k
Monitor water uses from new BLM land use authorizations within the California portion of the Amargosa watershed.	$2k	$2k			$2k			$2k			$2k			$2k			$2k			$2k	$16k
Identify sensitive resources that have been or are subject to being degraded by improper use, ongoing erosion, or are potential health and safety hazards.	This will monitored through routine employee and volunteer patrols																				
Monitor for effectiveness of restoration efforts.	$5k	$3k	$3k	$3k	$3k	$3k	$3k	$3k	$3k	$5k	$3k	$3k	$3k	$3k	$3k	$3k	$3k	$3k	$3k	$3k	$64k

Action	*FY 07*	*FY 08*	*FY 09*	*FY 10*	*FY 11*	*FY 12*	*FY 13*	*FY 14*	*FY 15*	*FY 16*	*FY 17*	*FY 18*	*FY 20*	*FY 21*	*FY 22*	*FY 23*	*FY 24*	*FY 25*	*FY 26*	*FY 27*	*Total*
Monitor any newly established populations of Ash Meadows gumplant (Grindelia fraxino-pratensis) and Amargosa niterwort (Nitrophila mohavensis) to determine the success of these new populations.	Cost will be about $6k per year after establishment of any new populations.																				
Monitor recreational activities to identify adverse effects to habitat, sensitive resources, and facilities using appropriate on-the-ground and remote methodologies.	$4k				$6k				$8k				$10k				$12k				$40k
Conduct regular focused research and surveys for listed, sensitive, and other riparian birds to determine variety, abundance, nesting locations, and information to maintain and enhance nesting populations. Determine changes to nesting status.	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k	$40k		$760k
Monitor surface water quality at pre-selected locations to gauge condition and trend.				$30k				$30k				$30k				$30k				$30k	$150k
Document cultural resources within the ACEC through an archaeological inventory of culturally significant portions of the ACEC. This inventory will fulfill Section 110 of the National Historic Preservation Act (NHPA) and use any of the methods or techniques suitable for Section 110 surveys. Monitor locations exhibiting intense use and areas with fragile cultural resources.	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$25k	$500k
Survey for populations of Amargosa River pupfish and the Amargosa Canyon speckled dace.	$40k	$40k			$40k			$40k			$40k			$40k			$40k			$40k	$320k
Conduct an Order III soil survey for the ACEC that will include a series or association level vegetation map for the ACEC.				$250k	$250k	$50k															$550k
Inventory invertebrate populations and assemblages in the ACEC, and monitor sensitive fish and invertebrate microhabitats to identify trends and threats.	$40k	$40k					$40k					$40k					$40k				$200k
Conduct an in-stream flow study to document flows required to sustain resources and values within the ACEC. Model historic flows. Attempt to identify causes for non-seasonal changes.				$75k	$75k	$75k															$225k
Monitor species diversity, richness, and abundance for mammalian, avian, reptilian, amphibian, and vascular plant taxa within the ACEC. Identify thresholds for substantial change that would trigger reevaluation of strategies.	$17k	$12k					$12k					$17k					$12k				$70k
Build an OHV exclusion barrier at the trailhead of the rerouted northern end of the Tecopa Trail, and restore the previous trailhead, as needed.	$10k			$1k			$2k			$2k			$3k			$3k			$4k		$25k
Implement Trail Plan Alternative A (Appendix B).	$10k	$24k	$18k	$18k	$40k	$12k	$12k	$14k	$14k	$14k	$16k	$16k	$16k	$18k	$18k	$18k	$20k	$20k	$20k	$22k	$360k
Implement Interpretive Plan Alternative A (Appendix C).	$k	$53k	$61k	$42k	$62k	$73k	$45k	$300k	$400k	$4k	$4k	$4k	$6k	$6k	$6k	$8k	$8k	$8k	$10k	$10k	$1,110k
Protect cultural resources that display adverse effects by signing or fencing		$10k		$10k			$1k					$10k					$2k				$33k

Action	*FY 07*	*FY 08*	*FY 09*	*FY 10*	*FY 11*	*FY 12*	*FY 13*	*FY 14*	*FY 15*	*FY 16*	*FY 17*	*FY 18*	*FY 20*	*FY 21*	*FY 22*	*FY 23*	*FY 24*	*FY 25*	*FY 26*	*FY 27*	*Total*
Actively engage in the existing interagency forums concerned with Devil's Hole and the Death Valley Regional Flow System. Notify appropriate state water control agencies, land managers, and the DOI Solicitor's Office of the importance of the Amargosa drainage in the maintenance of sensitive biological resources present within the ACEC.	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$6k	$120k
Acquire State and private lands within the Amargosa River ACEC through exchange or purchase from interested, willing landowners to consolidate public lands. Priority areas would be lands that were identified in the 1983 ACEC Plans and lands in the expanded ACEC that contain significant resource values or designated critical habitat.			$5k	$5k	$11k		$11k		$11k				$13k								$56k
Supplemental rule making	$10k																				$10k
LE Support	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$23k	$460k
Total	*$592k*	*$641k*	*$544k*	*$817k*	*$909k*	*$562k*	*$511k*	*$757k*	*$796k*	*$368k*	*$476k*	*$422k*	*$415k*	*$405k*	*$332k*	*$366k*	*$489k*	*$347k*	*$353k*	*$425k*	*$10,527k*

MEMORANDUM OF UNDERSTANDING AMONG THE BUREAU OF LAND MANAGEMENT, FISH AND WILDLIFE SERVICE, NATIONAL PARK SERVICE, AND GEOLOGICAL SURVEY FOR MANAGING NATURAL RESOURCES IN THE AMARGOSA RIVER BASIN AND ADJACENT AREAS, CALIFORNIA AND NEVADA

I. BACKGROUND AND PURPOSE:

This Memorandum of Understanding (MOU) is among the following United States Department of the Interior bureaus: Bureau of Land Management (hereinafter referred to as BLM), Fish and Wildlife Service (hereinafter referred to as FWS), National Park Service (hereinafter referred to as NPS), and United States Geological Survey (hereinafter referred to as USGS).

BLM, FWS, and NPS have responsibilities for managing land and natural resources in the Amargosa River Basin and adjacent areas within the Death Valley Regional Ground Water Flow System (hereafter referred to as the Area of Concern) of California and Nevada. BLM administers large tracts of public land within this area. FWS manages the Ash Meadows National Wildlife Refuge and protects a number of plant and animal species endemic to the area. NPS provides stewardship over Death Valley National Park, including the Devils Hole detached unit. USGS conducts research and collects data to provide scientific information used by the other bureaus to make informed resource-management decisions.

Ground-water discharge at a number of localized areas within the Area of Concern sustains unique phreatophytic, riparian, and aquatic ecosystems. Although relatively small in areal extent, these ecosystems are the only habitats within the surrounding arid desert region for endemic plants and animals, many of which have been listed as endangered, threatened, or sensitive species. These ecosystems also provide recreational opportunities for residents and visitors to the region. Several reaches of the Amargosa River are eligible for inclusion within the National Wild and Scenic River System. Nine BLM and NPS wilderness units are within the Area of Concern. The newly designated Old Spanish Trail National Historic Trail also traverses the region. BLM, FWS, and NPS are concerned about the impacts regional population growth, land and ground-water development, and recreational use will have on these ecosystems. A coordinated, comprehensive science program is needed to determine the effects these impacts will have on the natural resources managed by the bureaus within the Area of Concern.

The purpose of this MOU is to improve coordination, cooperation, and communication between bureaus on efforts to conserve and manage water resources and water-dependent resources within the Area of Concern. Interagency cooperation will enhance natural resource management and planning efforts by addressing issues on a consistent regional scale and increasing the efficiency in which Bureaus utilize manpower and resources.

II. GEOGRAPHIC SCOPE

The geographic scope of this MOU corresponds to an area of the Death Valley Regional Ground-Water Flow System generally bounded on the west by Death Valley National Park, on the east by the Spring Mountains and Nevada Test Site, on the north by Sarcobatus Flat and Oasis Valley, and on the south by Interstate 15.

III. MANAGEMENT OBJECTIVES:

Signatory bureaus want to achieve greater cooperation and coordination on natural resource issues within the Area of Concern. It is envisioned that the bureaus can work with each other and external agencies, organizations, entities, and stakeholders to manage natural resources using a proactive regional approach. The overall goal is to protect the health and vigor of sensitive local ecosystems while allowing for sustainable economic development of desert communities and recreational use of the area.

IV. AUTHORITIES AND MANAGEMENT TOOLS:

Applicable Authorities

Federal Land Policy and Management Act of 1976
Endangered Species Act of 1973, as amended
National Park Service Organic Act (*39 Stat. 535, 16 U.S.C. 1*)
Proclamation of January 17, 1952 (*Proc 2961, 66 Stat. C. 18. 17 Fed. Reg. 691*) making Devils Hole a detached component of Death Valley National Monument
California Desert Protection Act of 1994
National Wildlife Refuge System Administrative Act of 1966
National Wildlife Refuge System Improvement Act of 1997

Applicable Bureau Plans

California Desert Conservation Area Plan of 1980, as amended
Amargosa Vole Recovery Plan of 1990
Recovery Plan of 1990 for Endangered and Threatened Species in Ash Meadows
Southwestern Willow Flycatcher Recovery Plan of 2002
Bureau of Land Management Las Vegas Resource Management Plan
Southern Nevada Mesquite Woodland Habitat Management Plan

Future management plans for the area will be incorporated as each is approved and implemented.

V. INTER-BUREAU COORDINATION AND COOPERATION:

Each bureau will make efforts to:

- Facilitate conservation planning and management actions using an ecosystem perspective and adopt policies tailored to protect Federally-administered resources within the Area of Concern.

- Develop consistent protocols and methods for scientific research and resource monitoring.

- Share scientific information and data and adopt standardized models and analytical methods.

- Identify and develop proposals and work plans for joint projects.

- Share resources, to the extent possible and practical, to implement projects and work plans developed under this MOU.

- Cooperate in developing budget requests and pursuing funding opportunities to implement projects and work plans developed under this MOU.

- Participate on a standing management oversight committee, which will meet at least once annually to coordinate activities and facilitate actions prescribed under this MOU.

- Conduct periodic meetings among staff specialists, as necessary, to coordinate actions on regional water-resources issues and facilitate actions prescribed under this MOU.

VI. EXTERNAL COORDINATION AND COOPERATION:

Natural-resource management, conservation planning, and related scientific research conducted with an ecosystem perspective requires significant coordination and cooperation with other agencies, entities, and stakeholders having interests within the Area of Concern and adjacent areas within the Death Valley Regional Ground-Water Flow System. Signatory bureaus will work with these external groups to identify solutions that allow sustainable economic development to coexist with the protection of sensitive ecosystems. Signatory bureaus also will work to develop unified positions on issues of concern to facilitate consistent negotiations with external groups.

VII. PRINCIPAL CONTACTS:

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Ph: (760)786-3240

VIII. FUNDING

Bureaus shall use their best efforts to secure funding to implement projects approved under this MOU. Project funding and implementation will be described under separate project-specific agreements between bureaus. Performance under this MOU depends upon the lawful appropriation, authorization, and allocation of funds. All bureaus agree to develop efficient means for transferring funds among said parties to implement projects conducted under this MOU.

IX. AGREEMENT PERIOD:

This MOU is effective as of the last date of signature by the agency representatives listed under Section XII. This MOU will be in effect for a period of five years from the

execution date. The agreement period may be extended by mutual consent of all participating bureaus by attaching a written amendment to this document.

X. TERMINATION:

Any bureau may terminate its participation in this MOU by issuing a written notice to the other agencies not less than thirty (30) days prior to the effective date of termination.

XI. MODIFICATIONS:

The terms of this MOU may be modified upon mutual consent of all bureaus by attaching a written amendment to this document.

XII. SIGNATORIES:

Robert V. Abbey
Bureau of Land Management
Nevada State Director

2.2.04
Date

Michael Pool
Bureau of Land Management
California State Director

12/19/03
Date

Steve Thompson
United States Fish and Wildlife Service
Nevada/California Operations Manager

1/14/2004
Date

Jonathan Jarvis
National Park Service
Pacific West Regional Director

1/20/2004
Date

A. Wes Ward
United States Geological Survey
Western Regional Geologist

23 Ja 04
Date

Appendix I
Amargosa River Area of Critical Environmental Concern
Inventory and Monitoring Plan

Introduction

The purpose of this inventory and monitoring plan is to gauge the success of the management actions within the Amargosa River Area of Critical Environmental Concern (ACEC) Implementation Plan in terms of their ability to meet the eight management goals and objectives for the ACEC. Many different management actions combine to achieve each goal, since these eight objectives are broad in scope. In order to better determine the level of success of the plan, this monitoring plan defines specific monitoring objectives to evaluate each management action that can be measured using field surveys and data analysis techniques to provide evidence for changes in management direction, as needed. Many of the management actions in the ACEC Plan are already written in the form of monitoring objectives and this monitoring plan provides additional definition for others. Some monitoring activities will not require further permitting. Other activities will require additional coordination, 10(a)1(A) recovery permits from FWS, and/or State Scientific Collecting permits. These requirements have been adequately discussed in the plan, and will not be further discussed here.

Much of the monitoring and sampling design has been developed using BLM Technical Reference 1730-1, *"Measuring and Monitoring Plant Populations"* by Elzinga, Salzer, and Willoughby (1998).

For example, a broad management goal may be: "Maintain threatened and endangered species populations". More specific management objectives may include: "Maintain 100% of the populations of endangered plant X within the ACEC over the life of this plan." Monitoring objectives give us thresholds to measure success to determine if management direction needs to be modified in order to meet our overall management goal of maintaining threatened and endangered species populations. Monitoring objectives may be adequately captured by management actions, such as the example above, or they could require further definition, such as "Maintain the population of endangered animal X at N individuals."

Certain monitoring objectives may require statistical sampling in order to measure success. In this case, a specific sampling objective is identified in order to define a confidence interval, and as appropriate, an associated minimum detectable change (MDC)[1] threshold for the sampling program. A second monitoring objective example would require sampling of the population to determine a statistically viable estimate of population size because it would be difficult to count every individual in the population. An example of a sampling objective for this monitoring objective could be as follows: "Be 90% confident that the estimated population size of

[1] Minimum Detectable Change (MDC) specifies the smallest change that you are hoping to detect with your sampling effort, and should represent a biologically meaningful quantity given the likely degree of natural variation in the attribute being measured. MDC is used in change/trend sampling but not in target/threshold sampling.

endangered animal X is within +/-20% of the actual population size". This sampling objective gives us thresholds from which we can calculate a minimum sample size and other sampling design parameters to assess our monitoring objective. Sampling objectives and monitoring objective thresholds are adaptive by nature and will be modified or refined over time. Statistical analysis of collected data will provide us with a better idea of what level of confidence we can place in our sampling design, and what amount of precision and MDC we can expect from the sampling that has been prescribed.

Monitoring for the Amargosa River ACEC Implementation Plan is complex due to its broad planning goals that address a diverse array of resource issues and the resulting number of variables that affect the plan's success. This monitoring plan assigns thresholds that are specific to different variables that indicate the level of success in implementing these planning goals. It also includes additional data collection that needs to occur in order to provide justification prior to certain management actions occurring. The action to remove brown-headed cowbirds from Amargosa Canyon, for example, requires initial inventory to determine if they are present and to what extent they are parasitizing nests. Through monitoring, BLM has determined the presence of cowbirds in the ACEC and that cowbirds are parasitizing the nest of least Bell's vireo (Chris McCreedy, pers. comm. and see Appendix A, Chapter 3 of this document).

This plan also establishes specific protocols to be used in collection of the data so that surveys will be performed in a consistent manner from year to year, and lists the permits that will be necessary from state and federal agencies in order to perform the field data collection. In the future, additional monitoring or sampling objectives may be added, or existing monitoring objectives may be modified or eliminated, based on their power to indicate change in the variables we are seeking to measure.

The organization for this monitoring plan is based on the eight management goals identified in the ACEC Implementation Plan. These goals are:

1. Protect, enhance, and restore natural riparian and wetland systems
2. Protect and prevent irreparable damage to threatened and endangered species and their habitat
3. Take prudent, proactive steps towards recovery of threatened and endangered species and their habitat
4. Conserve and protect water resources essential to the maintenance of valued resources and habitat
5. Implement an inventory and monitoring strategy
6. Provide recreation opportunities that are consistent with resource protection
7. Protect sensitive historical, cultural, and scenic values
8. Provide for consistent management of public lands within ACEC boundaries

For each management goal, the monitoring objective (if different) and type of protocol to be used is listed. If a monitoring objective will require sampling in order to determine success, an associated sampling objective is defined. In a separate section, specific protocols are spelled out in detail. *A section entitled Statistical Analysis* is included to address methods for determining

minimum sample size. The last section provides a summary timeline for implementation that prioritizes the monitoring actions.

The management goals that do not require specific inventory and monitoring will only be addressed in a cursory nature. The heart of this plan will center on the planning goals that include specific monitoring objectives and require field survey protocols.

Monitoring Objectives and Survey Protocols

A. Protect, enhance, and restore natural riparian and wetland systems

This management goal addresses the protection and enhancement of the water-dependent vegetation communities that lie within the ACEC. Riparian areas are found in the Upper Amargosa and the Central Amargosa Units. Wetland communities are found in the Grimshaw Basin portion of the Central Amargosa Unit near Tecopa. Management actions from the ACEC Plan focus on tamarisk (*Tamarix* spp.) removal and active native plant restoration on public lands and on upstream and interspersed private lands. Monitoring will look at the success at implementing the specific management actions and to what extent implementing these actions benefits ecosystem health in terms of increasing the ACEC's biodiversity. The following monitoring objectives and survey protocols will be used in order to determine the success of our management actions in meeting this planning goal:

1. Control tamarisk (*Tamarix* spp.) through implementation of the Barstow Field Office's ten-year weed control plan. Control or contain, as appropriate, other species of weeds. Efforts will include infestations that are both upstream and within the ACEC. If feasible, BLM will establish partnerships to treat state and private lands where there is nexus to the ACEC.*
    a. Decrease the acreage infested with tamarisk on public land in the ACEC to 75% of the initial infestation by the end of the third year of tamarisk removal.
        i. **Protocol type:** Remote sensing and ground transects.
    b. Decrease the acreage infested with tamarisk on public land in the ACEC to 57% of the initial infestation by the end of the fifth year of tamarisk removal.
        i. **Protocol type:** Remote sensing and ground transects.
    c. Decrease the acreage infested with tamarisk on public land in the ACEC to 32% of the initial infestation by the end of the tenth year of tamarisk removal.
        i. **Protocol type:** Remote sensing and ground transects.
    d. Decrease the acreage infested with tamarisk on public land in the ACEC to 10% of the initial infestation by the end of the twentieth year of plan implementation.
        i. **Protocol type:** Remote sensing and ground transects.
    e. Eliminate 90% of resprouts that occur each year following treatments.
        i. **Protocol type:** Remote sensing and ground transects.
    f. Decrease the acreage infested with tamarisk on private and State land in and adjacent to the ACEC to 40% of the initial infestation by the end of the tenth year of tamarisk removal.
        i. **Protocol type:** Remote sensing and ground transects.

g. Decrease the acreage infested with tamarisk on private and state land in the ACEC to 10% of the initial infestation by the end of the twentieth year of plan implementation.
    i. **Protocol type:** Remote sensing and ground transects.

2. Implement, as needed, a controlled burn program to further supplement weed control projects and/or to eliminate refuse from mechanical removal.
    a. See action number 1 above.
3. Conduct active riparian restoration, as needed, by introducing native riparian plant species into areas of weed control and other priority damaged areas.
    a. Establish, through natural regeneration and/or active planting, native riparian vegetation at 100% of the tamarisk removal sites that are suitable to support native riparian species.
        i. **Protocol type:** Remote sensing and ground transects.
    b. Maintain a 50% survival rate of planted native species at riparian restoration sites over the life of the restoration program.
        i. **Protocol type:** Remote sensing and ground transects or plant survival counts.
        ii. **Sampling objective:** Be 90% certain that estimates of the number of seedlings at a given seeded restoration site are within 10% of the true value.
    c. Maintain species richness of native perennial vascular plants within 20% of the values observed during initial inventory at permanent sampling locations (i.e. strata in which plot is located).
        i. **Protocol type:** Combined transect- plant diversity permanent plots.
        ii. **Sampling objective:** Be 85% certain of detecting a 20% change in perennial vascular plant species richness with a 15% chance of a false change error.
4. Use the results of bird surveys and literature review of microhabitat requirements to design projects that encourage the nesting of listed and candidate bird species. (See under Goal E below).
    a. Maintain richness of migratory birds so that values do not drop more than 20% below the values observed during the inventory of a similar climatic year[2] over the life of the plan at permanent point count locations (i.e. strata in which plot is located).
        i. **Protocol type:** Combined transect- point counts.
        ii. **Sampling objective:** Be 85% certain of detecting a 20% change in migratory bird species richness with a 10% chance of a false change error.
    b. Maintain richness of non-migratory birds so that values do not drop more than 20% below the values observed during the inventory of a similar climatic year over the life of the plan at permanent point count locations (i.e. strata in which plot is located).
        i. **Protocol type:** Combined transect- point counts.
        ii. **Sampling objective:** Be 85% certain of detecting a 20% change in non-migratory bird species richness with a 10% chance of a false change error.
5. Prohibit ground fires on public lands within the ACEC.
    a. No monitoring objectives established.

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[2] Similar climatic year means for the two years being compared means that (1) total winter precipitation (December, January, February) should be similar (+/- 1 inches total for the three months), (2) total spring and summer precipitation (March, April, May, June, July, August) should be similar (+/- 0.5 inches total for the three months), (3) mean winter months' high and low temperatures should be similar (+/- 10 degrees Fahrenheit), and (4) mean summer months' high and low temperatures should be similar (+/- 5 degrees Fahrenheit).

6. Initiate additional active riparian and upland restoration in priority degraded areas within the ACEC.
    a. See action number 3 above.
7. Take steps to restore and maintain the natural sinuosity of the Amargosa River in order to minimize unnatural down cutting.
    a. No monitoring objectives established.

B. Protect and prevent irreparable damage to threatened and endangered species and their habitat

This management goal addresses the protection and maintenance of populations and habitat of threatened and endangered species, including BLM-sensitive species, found in the ACEC. Monitoring to be done under this planning goal will be performed in the Carson Slough and the Central Amargosa Units. Management actions from the ACEC plan focus on public education, control of visitor use, control of non-native competitive fauna, and reducing non-native predators. Monitoring will look at the success of implementing these efforts and to what extent implementing these actions reverse the loss of or stabilize populations and habitat of sensitive and listed species.

Many of the actions listed in the management plan for this planning goal are part of the recovery plans for listed species, and are meant to be collaborative, interagency efforts that BLM may or may not lead. In cases, where BLM is not the lead agency, BLM will cooperate with the lead agency. Success in implementing some of these management actions is dependent on funding and availability of the resources of other agencies. For this reason, the monitoring objectives and survey protocols listed here may be modified once interagency implementation begins.

The following monitoring objectives and survey protocols will be used in order to determine the success of BLM management actions, including collaborative implementation of recovery plans, in meeting this planning goal:

8. Reduce direct and indirect impacts to listed and special status plants by maintaining existing protective fences. Fence, restore closed routes, and/or sign known listed or special status plant population centers that have determined to be impacted by human or other disturbances.
    a. Maintain 100% of the occurrences of Amargosa niterwort discovered during initial inventory in Grimshaw Basin and the Lower Carson Slough regions of the ACEC. Maintain the number of rametes at each occurrence site within 30% of the number of rametes observed during initial inventory.
        i. **Protocol type:** Walking transects in suitable habitat; permanent plots within population boundaries.
        ii. **Sampling objective:** Be 85% certain of detecting a 30% change in Amargosa niterwort occurrence size with a 10% chance of a false change error.
    b. Maintain 100% of the occurrences of Ash Meadows gumplant discovered during initial inventory of the Lower Carson Slough. Maintain the number of individuals at each occurrence site within 30% of the number of individuals estimated during initial inventory.

i. **Protocol type:** Walking transects in suitable habitat.
ii. **Sampling objective:** Be 85% certain of detecting a 30% change in Ash Meadow's gumplant occurrence size with a 10% chance of a false change error.

c. Maintain 100% of the populations of spring-loving centaury discovered during initial inventory of the Lower Carson Slough.
    i. **Protocol type:** Walking transects in suitable habitat.
d. Maintain 100% of the populations of Tecopa Bird's Beak discovered during initial inventory at Tecopa Hot Springs, Grimshaw Basin, and the Lower Carson Slough.
    i. **Protocol type:** Walking transects in suitable habitat.
e. Maintain 100% of the populations of White Bear Poppy discovered during initial inventory at Tecopa Hot Springs, Grimshaw Basin, and the Lower Carson Slough.
    i. **Protocol type:** Walking transects in suitable habitat.

9. Construct a vehicle barrier at the mouth of Cowboy Canyon to protect riparian listed species habitat.
    a. Detect 100% of vehicle incursions.
        i. **Protocol type:** BLM employee and volunteer patrol.
10. Maintain the existing off-highway vehicle (OHV) barriers at the southern end of the Amargosa River ACEC adjacent to Sperry wash. These barriers protect wilderness values and support the existing OHV vehicle closure in Amargosa Canyon to protect listed species and their habitat.
    a. Detect 100% of vehicle incursions.
        i. **Protocol type:** BLM employee and volunteer patrol of trails and other well-used areas.
11. Survey the location of current and proposed land use authorizations for potential adverse effects to the listed species or their habitat and develop and/or implement specific protection or avoidance measures, dependent on location, threats, and other relevant factors.
    a. Maintain listed species occupation in 100% of the currently occupied habitat over the life of this plan.
        i. **Protocol Type:**
            - Amargosa vole: Small mammal live trapping. Will require other agencies' cooperation and input.
            - Listed birds: Combined transects: habitat assessment at point count location.
            - Listed plants: ground transects.
12. Motorized vehicles will be limited to designated routes of travel by the 2004 NEMO Route of Travel process.
    a. Detect 100% of vehicle incursions.
        i. **Protocol type:** BLM employee and volunteer patrol of trails and other well-used areas.
13. Enter into cooperative agreements with State and private landowners to limit vehicle access in the ACEC to the 2004 NEMO Route of Travel designations.
    a. Detect 100% of vehicle incursions.
        i. **Protocol type:** BLM employee and volunteer patrol of trails and other well-used areas.
14. Eliminate bathing at native hot springs in the ACEC.

a. Maintain 100% of the bulrush habitat adjoining native hot springs as suitable Amargosa vole habitat.
    i. **Protocol type:** Ground transects and small mammal live trapping. Trapping will require other agencies' cooperation and input.
b. Native hot springs will remain trespass, litter, and improvement-free.
    i. **Protocol type:** BLM employee or volunteer patrols.

15. Reduce the numbers of exotic fauna within listed species habitat consistent with protocols in appendix I. This may include, but is not limited to:
- the house mouse
- free-roaming and/or feral domestic cats
- brown-headed cowbirds

a. Should control measures be documented as necessary, decrease the abundance of house mice in the Grimshaw Basin by 70% over the life of this plan.
    i. **Protocol type:** Small mammal live trapping in suitable vole habitat. Will require other agencies' cooperation and input.
b. Should control measures be documented as necessary, decrease the number of stray domestic cats in the Tecopa Hot Springs and Grimshaw Basin area by 80% over the number observed during initial inventory over the life of the plan.
    i. **Protocol type:** Medium-sized mammal live trapping for felids within and near suitable vole habitat. Will require other agencies' cooperation and input.
c. Decrease the number of brown-headed cowbirds observed on combined avian point count transects in the Amargosa Canyon by 90% over the number observed during initial inventory. Cowbirds will be controlled by trapping using standard protocols.
    i. **Protocol type:** Point count transects; look for nest parasitism during southwestern willow flycatcher and least Bell's vireo nest surveys.

16. Periodically review the fire management plan for the region and modify it if necessary to assure that it continues to provide appropriate protection and mitigation for listed and sensitive species and their habitat during wildfire suppression and managed fire operations.
    a. Document review in case file every ten years and after any unanticipated fire events in the ACEC.

C. Take prudent, proactive steps towards recovery of threatened and endangered species and their habitat

This management goal addresses the protection and enhancement of listed and sensitive species populations and their habitat within the ACEC. These actions are concentrated in the Carson Slough and Central Amargosa Units of the ACEC. Management actions from the ACEC plan focus on enhancing existing habitat and its ability to support listed and sensitive species, expansion of populations into unoccupied habitats, and maintaining established or enhanced populations. Monitoring will examine the success of implementing these efforts and their efficacy.

Many of the actions listed in the management plan for this planning goal are part of the recovery plans for listed species, and are meant to be collaborative, interagency efforts that BLM may or may not lead. In cases where BLM is not the lead agency, BLM will cooperate with the lead

agency. Success in implementing some of these management actions is dependent on funding and availability of the resources of other agencies. For this reason, the monitoring objectives and survey protocols listed here may be modified once interagency implementation begins.

The following monitoring objectives and survey protocols will be used in order to determine the success of BLM management actions, including collaborative implementation of recovery plans, in meeting this planning goal:

17. Develop a formalized agreement between BLM, CDFG, GS, and FWS for the implementation of actions in the Amargosa Vole Recovery Plan. BLM will encourage the establishment an interagency Amargosa Vole Recovery Team (VRT) that meets regularly to coordinate and evaluate and prioritize Amargosa vole research and recovery actions. Amargosa vole recovery actions considered for evaluation and prioritization should include:
    - Identify any additional threats to the vole.
        a. No monitoring objectives established.
    - Enhancement of habitat in current wetlands that could support populations of Amargosa vole.
        b. Increase the occupation of suitable vole habitat above 1370 feet, so that 100% of the suitable habitats are occupied with stable populations at the end of this twenty-year plan.
            i. **Protocol type:** Small mammal live trapping for Amargosa vole. Will require other agencies' cooperation and input.
    - Expansion of wetland habitat into selected saltgrass meadows that may support populations of Amargosa vole
        c. Increase the amount of suitable vole habitat by 10% over the life of this plan.
            i. **Protocol type:** Ground transects.
    - Increasing the level of gene flow between existing, isolated populations of Amargosa vole, this may include establishment and restoration of wetland corridors and/or an expanded Amargosa vole translocation program.
        d. Increase the level of gene flow between isolated vole subpopulations over the life of this plan.
            i. **Protocol type:** Small mammal live trapping for Amargosa vole. Will require other agencies' cooperation, input, and development of genetic protocols.
        e. Increase the level of genetic diversity in all isolated subpopulations of the Amargosa vole over the life of this plan.
            i. **Protocol type:** Small mammal live trapping for Amargosa vole. Will require other agencies' cooperation, input, and development of genetic protocols.
    - Carrying out a focused Amargosa vole research and survey program that will provide information to enhance populations
        f. No monitoring objectives established.
18. Prioritize and evaluate, in consultation and coordination with Ash Meadows National Wildlife Refuge, the issues related to the recovery and research of the Ash Meadows gumplant and Amargosa niterwort such as:
    - Establishment of new Ash Meadows gumplant and Amargosa niterwort populations in unoccupied, suitable habitat, based on monitoring results and literature review

a. Protect niterwort and gumplant populations so that that 85% of the suitable habitat identified within the ACEC is occupied.
    i. **Protocol type:** Permanent plots within population boundaries; collection of microhabitat data; survival counts and plant measurements at newly established populations.

- Monitoring to better determine specific habitat requirements for Ash Meadows gumplant (*Grindelia fraxino-pratensis*) and Amargosa niterwort (*Nitrophila mohavensis*)
    b. No monitoring objectives established.

D. Conserve and Protect water resources essential to maintenance of valued resources and habitat

This management goal addresses the protection of water resources within the ACEC. These actions are being implemented throughout the entire Amargosa River Watershed. They focus on the maintenance of in-stream flows, spring outflows, and groundwater levels to support species and vegetation community diversity, scenic and wilderness values, and habitat for listed and sensitive species in the ACEC. Management actions from the ACEC plan include protection of water sources from human disturbance, prohibiting stream diversions and geothermal development, assertion of federal water rights, protesting water rights applications, and cooperation with other agencies and entities in the watershed. Monitoring will look at the efficacy of implementing these actions to conserve water resources within the ACEC. Monitoring will also serve as an early warning for drops in water levels. The following monitoring objectives and survey protocols will be used in order to determine the success of our management actions in meeting this planning goal.

19. Prohibit new non-administrative, discretionary stream diversions and groundwater disturbing activities on public lands within the ACEC.
    a. Absent seasonal and yearly climatic differences, maintain 100% of the water flowing downstream in the Amargosa River needed for the purposes of the Kingston Range Wilderness and Wild and Scenic River. Maintain ground water levels sufficient to maintain 100 % of the current suitable habitat for the vole and listed plants.
        i. **Protocol type:** Automated stream/spring flow gauges, monitoring wells and/or weirs.
20. Prohibit discretionary geothermal development and exploration in the ACEC.
    a. Absent seasonal and yearly climatic differences, maintain 100% of the water flowing downstream in the Amargosa River needed for the purposes of the Kingston Range Wilderness and Wild and Scenic River. Maintain ground water levels sufficient to maintain 100% of the current suitable habitat for the vole and listed plants.
        i. **Protocol type:** Automated stream/spring flow gauges, monitoring wells and/or weirs.
21. Do not authorize land uses within the Amargosa watershed that would result in the deterioration of water quality or quantity within the ACEC or that may adversely affect listed species through their direct or cumulative effects. Develop protective measures as appropriate and notify responsible state water control agencies as appropriate. Coordinate

efforts with Death Valley National Park, Las Vegas Field Office, and Ash Meadows National Wildlife Refuge.

a. Absent seasonal and yearly climatic differences, maintain 100% of the water flowing downstream in the Amargosa River needed for the purposes of the Kingston Range Wilderness and Wild and Scenic River. Maintain ground water levels sufficient to maintain 100% of the current suitable habitat for the vole and listed plants.
    i. **Protocol type:** Automated stream/spring flow gauges, monitoring wells and/or weirs.

22. Assert Federal Reserve water rights for Kingston Range Wilderness, Wild and Scenic River, and Public Water Reserves and file for appropriated water rights to conserve existing water sources that support the ACEC's resources and values.
    a. Absent seasonal and yearly climatic differences, maintain 100% of the water flowing downstream in the Amargosa River needed for the purposes of the Kingston Range Wilderness and Wild and Scenic River. Maintain ground water levels sufficient to maintain 100% of the current suitable habitat for the vole and listed plants.
        i. **Protocol type:** Automated stream/spring flow gauges, monitoring wells and/or weirs.
23. Utilize the U.S. Geological Survey (GS) Death Valley Regional Flow System (DVRFS) Model (Belcher, W.R., ed., 2004) or the best available technology to model the aquifers that feed the within the ACEC. Key questions include:
    - Source of recharge
    - Hydrologic connectivity with neighboring basins and hydrologic systems
    - Effects of local and regional groundwater withdrawals
    a. Absent seasonal and yearly climatic differences, maintain 100% of the water flowing downstream in the Amargosa River needed for the purposes of the Kingston Range Wilderness and Wild and Scenic River. Maintain ground water levels sufficient to maintain 100% of the current suitable habitat for the vole and listed plants.
        i. **Protocol type**: Best available technology, currently USGS Numerical Three-dimensional Transient Ground Water Flow Model of DVRFS (Belcher, W.R., ed., 2004).

E. Implement an inventory and monitoring strategy

This is goal measures success in the implementation of this monitoring plan and provides information for managers to make informed decisions. Success for most Management Actions has been addressed under the other seven goals through the monitoring and sampling objectives. However, additional management actions provide broad baseline inventory information that may be used across multiple goals, and may or may not require a specific monitoring strategy. Success may measured by the collection and compilation of data, and its integration into existing mapping layers for the ACEC, or may be measured by specific monitoring objectives.

24. Install and maintain stream monitoring equipment to quantify river flows in the Amargosa Canyon.
    a. Establish baseline of seasonal in-stream flow volumes as determined by ongoing data collection at gauging stations. Determine flows required to sustain ACEC resources and the sources of non-seasonal flow changes.

i. **Protocol type:** Automated gauging stations and monitoring with notched weirs at spring outflows.

25. Identify, map, and/or monitor groundwater sources and springs within the ACEC.
    a. Maintain water quality and quantity at all springs within the ACEC over the life of this plan.
        i. **Protocol type:** Desert Managers Group Level I spring survey protocols and BLM Proper Functioning Conditions assessment.
26. Monitor and evaluate habitat trends and conditions specific to listed species on public lands throughout the ACEC and work with private landowners, the State, and other federal agencies to identify listed species habitat and habitat trends throughout the ACEC.
    a. Maintain the condition of 100% of suitable listed species habitat as stable or improving/expanding.
        i. **Protocol type:** Walking ground transects and permanent study plots.
27. Conduct multi-year surveys to establish vegetation baseline in the ACEC, including additional populations of listed and sensitive plant species. Monitor suitable listed and sensitive plant habitat, track population trends, and identify additional recovery needs. Monitor changes in vegetation characteristics over time, once a baseline is established. Identify thresholds for substantial change that would trigger the reevaluation of strategies.
    a. Obtain a series or association level vegetation map for the ACEC (no monitoring objectives).
    b. Establish baseline of wetland vegetation and permanent plots for species and vegetation richness throughout the ACEC.
        i. **Protocol type:** Walking ground transects and permanent study plots.
28. Monitor levels of visitor use of the ACEC trail system and watchable wildlife areas with visitor registers, periodic visitor counts, traffic counters, and other methods.
    a. Maintain visitor use levels at or below established recreational carrying capacities.
        i. **Protocol types:** visitor registers, visitor counts, traffic counters.
29. Monitor water uses from new BLM land use authorizations within the California portion of the Amargosa watershed.
    a. No monitoring objectives established.
30. Identify sensitive resources that have been or are subject to being degraded by improper use, ongoing erosion, or are potential health and safety hazards.
        i. **Protocol types:** remote sensing and/or regular on-the-ground patrol by BLM employees and volunteers of ACEC roads, trails, and use areas.
31. Monitor for effectiveness of restoration efforts.
    a. See above under management goal A.
32. Monitor any newly established populations of Ash Meadows gumplant and Amargosa niterwort to determine the success of these new populations.
    a. See action number 18 above.
33. Monitor recreational activities to identify adverse effects to habitat, sensitive resources, and facilities using appropriate on-the-ground and remote methodologies.
        i. **Protocol types:** remote sensing and/or regular on-the-ground patrol by BLM employees and volunteers of ACEC roads, trails, and use areas.
34. Conduct regular focused research and surveys for listed, sensitive, and other riparian birds to determine variety, abundance, nesting locations, and information to maintain and enhance nesting populations. Determine changes to nesting status.

a. Increase the amount of native southwestern flycatcher (SWWFC) and least Bell's vireo (LBV) habitat by 80% over initial inventory in the Amargosa Canyon over the life of this plan.
    i. **Protocol type:** Combined transects: habitat assessment at point count location.
    ii. **Sampling objective:** Be 80% certain that estimates of southwestern willow flycatcher and least Bell's vireo habitat area is within 10% of the true value for the Amargosa Canyon and Willow Creek drainages.
b. Increase the spring breeding population sizes of LBV and SWWFC in the Amargosa Canyon by 50% over initial inventory over the life of this plan.
    i. **Protocol type**:
        - LBV: FWS 2001 Revised
        - SWWFC: Sogge et al 1997(Revised 2000) for presence absence.
c. Increase the number of successful SWWFC and LBV nests by 25% over the number discovered during initial inventory.
    i. **Protocol type:** Spot mapping and nest surveys within territories.
d. If Cuckoo nests are found during bird surveys, increase the amount of nesting and foraging habitat in the Amargosa Canyon by 50%.
    i. **Protocol type:** Combined transects- habitat assessment at point counts.
    ii. **Sampling objective:** Be 80% certain that estimates of yellow-billed cuckoo habitat area is within 10% of the true value for the Amargosa Canyon and Willow Creek drainages.
e. Maintain the number of successful Cuckoo nests in the Amargosa Canyon no less than 90% of the number observed during initial inventory.
    i. **Protocol type:** Spot mapping and nest surveys within territories.
f. Increase the amount of suitable nesting and foraging habitat within the Amargosa Canyon by 80% for yellow warblers, yellow-breasted chats, vermillion flycatchers, Virginia's warblers, and crissal thrashers.
    i. **Protocol type:** Combined transects: habitat assessment at point count location.
    ii. **Sampling objective:** Be 80% certain that estimates of yellow warbler, yellow-breasted chat, vermillion flycatcher, Virginia's warbler, and crissal thrasher habitat area is within 10% of the true value for the Amargosa Canyon and Willow Creek drainages.

35. Monitor surface water quality at pre-selected locations to gauge condition and trend.
    a. Maintain water quality within Environmental Protection Agency standards
        i. **Protocol type:** Standard water quality test kits and protocols combined with California Streamside Biodiversity Survey.
36. Document cultural resources within the ACEC through an archaeological inventory of culturally significant portions of the ACEC. This inventory will fulfill Section 110 of the National Historic Preservation Act (NHPA) and use any of the methods or techniques suitable for Section 110 surveys. Monitor locations exhibiting intense use and areas with fragile cultural resources.
        i. **Protocol type:** Current Section 110 protocols to be used.
37. Survey for populations of Amargosa River pupfish and the Amargosa Canyon speckled dace.

a. Maintain the abundance of Amargosa pupfish and Amargosa River speckled dace within 30% of the abundance determined through initial inventory.
    i. **Protocol type:** Seining.
    ii. **Sampling objective:** Be 90% certain of detecting a 30% change in Amargosa pupfish and Amargosa speckled dace with a 10% chance of making a false change error.
b. Maintain 100% of the current amount of riverine habitat preferred by the Amargosa speckled dace and the Amargosa river pupfish.
    i. **Protocol type:** Riverine fish habitat assessment.
    ii. **Sampling objective:** Be 80% certain that estimates of Amargosa speckled dace and Amargosa pupfish habitat area is within 10% of the true value for the Amargosa ACEC.

38. Conduct an Order III soil survey for the ACEC that will include a series or association level vegetation map for the ACEC.
    i. **Protocol type:** USGS current protocols.
39. Inventory invertebrate populations and assemblages in the ACEC, and monitor sensitive fish and invertebrate microhabitats to identify trends and threats.
    a. See action numbers 35 and 37 above and action number 41 below.
40. Conduct an in-stream flow study to document flows required to sustain resources and values within the ACEC. Model historic flows. Attempt to identify causes for non-seasonal changes.
    a. Document in-stream flows required to maintain sensitive riparian, wetland, and riverine habitats and wilderness, wild and scenic river, cultural, scenic, and recreational values.
        i. **Protocol type:** Yet to be determined.
41. Monitor species diversity, richness, and abundance for mammalian, avian, reptilian, amphibian, and vascular plant taxa within the ACEC. Identify thresholds for substantial change that would trigger reevaluation of strategies.
    a. Maintain richness of small mammal species so that values do not drop more than 20% below the values observed during the inventory of a similar climatic year over the life of the plan at permanent trapping arrays (i.e. strata in which plot is located).
        i. **Protocol type:** Combined transect- small mammal live trapping arrays.
        ii. **Sampling objective:** Be 85% certain of detecting a 20% change in small mammal species richness with a 10% chance of a false change error.
    b. Maintain relative abundance of small mammal species so that values do not drop more than 20% below the values observed during the inventory of a similar climatic year over the life of the plan at permanent trapping arrays (i.e. strata in which plot is located).
        i. **Protocol type:** Combined transect- small mammal live trapping arrays.
        ii. **Sampling objective:** Be 85% certain of detecting a 20% change in small mammal relative abundance with a 10% chance of a false change error.
    c. Maintain richness of reptilian species so that values do not drop more than 20% below the values observed during the inventory of a similar climatic year[3] over the life of the plan (i.e. strata in which plot is located).

[3] Similar climatic year means for the two years being compared means that (1) total winter precipitation (December, January, February) should be similar (+/- 1 inches total for the three months), (2) total spring and summer

i. **Protocol type:** Combined transect- pitfall arrays.
ii. **Sampling objective:** Be 85% certain of detecting a 20% change in reptile species richness with a 10% chance of a false change error.

d. Maintain relative abundance of reptilian species so that values do not drop more than 20% below the values observed during the inventory of a similar climatic year over the life of the plan (i.e. strata in which plot is located).
   i. **Protocol type:** Combined transect- pitfall arrays.
   ii. **Sampling objective:** Be 85% certain of detecting a 20% change in relative abundance with a 10% chance of a false change error.
e. Maintain in-stream invertebrate species richness and abundance within 10% of the value determined by initial inventory as a measure of water quality.
   i. **Protocol type:** California Streamside Biodiversity Survey.
f. Maintain populations of springsnails in 100% of the springs they are seen in upon initial inventory.
   i. **Protocol type:** Presence/absence for springsnails.
g. Maintain richness of migratory birds so that values do not drop more than 20% below the values observed during the inventory of a similar climatic year[4] over the life of the plan at permanent point count locations (i.e. strata in which plot is located).
   i. **Protocol type:** Combined transect- point counts.
   ii. **Sampling objective:** Be 85% certain of detecting a 20% change in migratory bird species richness with a 10% chance of a false change error.
h. Maintain relative abundance of migratory birds so that values do not drop more than 20% below the values observed during the inventory of a similar climatic year over the life of the plan at permanent point count locations (i.e. strata in which plot is located).
   i. **Protocol type:** Combined transect- point counts.
   ii. **Sampling objective:** Be 85% certain of detecting a 20% change in migratory bird relative abundance with a 10% chance of a false change error.
i. Maintain richness of non-migratory birds so that values do not drop more than 20% below the values observed during the inventory of a similar climatic year over the life of the plan at permanent point count locations (i.e. strata in which plot is located).
   i. **Protocol type:** Combined transect- point counts.
   ii. **Sampling objective:** Be 85% certain of detecting a 20% change in non-migratory bird species richness with a 10% chance of a false change error.
j. Maintain relative abundance of non-migratory birds so that values do not drop more than 20% below the values observed during the inventory of a similar climatic year over the life of the plan at permanent point count locations (i.e. strata in which plot is located).
   i. **Protocol type:** Combined transect- point counts.

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precipitation (March, April, May, June, July, August) should be similar (+/- 0.5 inches total for the three months), (3) mean winter months' high and low temperatures should be similar (+/- 10 degrees Fahrenheit), and (4) mean summer months' high and low temperatures should be similar (+/- 5 degrees Fahrenheit).

ii. **Sampling objective:** Be 85% certain of detecting a 20% change in non-migratory bird relative abundance with a 10% chance of a false change error.

F. Provide recreation opportunities that are consistent with resource protection

This planning goal addresses the maintenance and monitoring of recreational opportunities within the ACEC. These actions are primarily being implemented in the Central Unit of the ACEC, which is the major recreational destination within the ACEC. They focus on the maintenance of trail opportunities, prevention of adverse effects to resources, and providing adequate information and facilities to the visiting public. Monitoring will look at the maintenance and effectiveness of mechanisms to direct visitor uses appropriately, visitor experiences, and changing visitor use levels in the Central Amargosa Unit. The following monitoring objectives and survey protocols will be used in order to determine the success of our management actions in meeting this planning goal:

42. Build an OHV exclusion barrier at the trailhead of the rerouted northern end of the Tecopa Trail, and restore the previous trailhead, as needed.
    a. See action numbers 3 and 12 above.
43. Prohibit the discharge firearms on public lands within the ACEC except shotguns when engaged in legal hunting.
        i. **Protocol type:** ranger patrol of roads, trails, and other well-used areas.
44. Prohibit overnight camping on public lands within the Central Unit of the ACEC**.**
        i. **Protocol type:** ranger patrol of roads, trails, and other well-used areas.
45. Implement Trail Plan Alternative A
    a. See Appendix B.
46. Maintain a pack it in pack it out policy on public lands within the ACEC.
    a. No detection of litter or illegal dumping on ACEC roads, trails, or other well-used areas.
        i. **Protocol type:** BLM employee and volunteer patrol of trails and other well-used areas.
47. Implement Interpretive Plan Alternative A
    a. See Appendix C

G. Protect sensitive historical, cultural, and scenic values

This planning goal addresses the maintenance and monitoring of cultural, historic, and scenic important and relevant values within the ACEC. These actions are primarily being implemented in the Central Amargosa Unit. Because of its water, the Central Amargosa Unit has been the major focus of prehistoric and historic use. It currently receives the most use within the ACEC therefore creating the potential for damage to these values. Monitoring will meet inventory and survey needs and the maintenance and effectiveness of mechanisms to prevent or reverse adverse affects in the Central Amargosa Unit. The following monitoring objectives and survey protocols will be used in order to determine the success of our management actions in meeting this planning goal:

48. Protect cultural resources that display adverse effects by signing or fencing.
    a. Identify sensitive resources that have been or are subject to being degraded by improper use, ongoing erosion, or are potential health and safety hazards.
        i. **Protocol type:** BLM employee and volunteer patrol of trails and other use areas combined with pedestrian surveys by a qualified archaeologist.
    b. Protect cultural and scenic resources that display adverse effects by signing or fencing.
        i. **Protocol type:** BLM employee and volunteer patrol of trails and other use areas combined with pedestrian surveys by a qualified archaeologist.

H. Provide consistent management of public ands within ACEC Boundaries

No monitoring objectives will be developed for this planning goal, and associated management actions 49 through 54. Monitoring of this planning goal will be accomplished in the context of overall plan implementation tracking and monitoring.

Monitoring Protocol Parameters[5]

Ground Transects

Ground transects will be used in the monitoring of tamarisk infestations and the extent of wetland vegetation and Amargosa vole habitat within the ACEC.

Ground transects to monitor tamarisk infestations - These transects will be performed to track the progress of tamarisk removal when implementing the BLM Barstow's ten-year weed control plan. Transects will be walked in the Amargosa Canyon, Grimshaw Basin, Willow Creek, and Upper Amargosa Unit portions of the Amargosa River ACEC. Transects may also be run on segments of the Amargosa River between Shoshone and the Central Amargosa Unit north boundary. On-the-ground scouting will determine the general locations of tamarisk infestations within the ACEC. Aerial photography may also be used to identify and quantify these locations.

Once an infestation is located, a walking transect will be performed in the area until the edge of an infestation is reached. The surveyor will walk the perimeter of the infestation or use some other method to map the boundary of the infestation. The polygons of infestation will be entered into GIS[6] and acreages for each polygon will be recorded and compared to remote sensing data. Initial inventory will be performed prior to year-one of removal efforts. Monitoring surveys at each treatment site will be performed immediately after removal efforts for the first two years. There will be another monitoring survey at treatment sites in year six after initial removal efforts. Following year six, monitoring will be performed every four years for the life of the management plan.

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[5] Methodologies may be changed to reflect updated protocols or technologies as appropriate. Monitoring that requires an accumulation of data over time may not utilize updated protocols, in order to assure comparability of data sets.

[6] A Geographic Information System is a computer-based program that allows the user to show, print, modify, combine, and analyze information on various data layers for the same geographic location. Data may be based on points, lines (one-dimensional), or polygons (two-dimensional).

Ground transects to monitor the extent of wetland vegetation and Amargosa vole habitat - These transects will be performed to monitor the extent of wetland vegetation communities and Amargosa vole habitat within the ACEC. Transects will be walked in Amargosa Canyon, Grimshaw Basin, and Willow Creek. On-the-ground scouting will be done to determine the general locations of wetland vegetation within the Central Unit of the ACEC. Aerial photography may also be used to identify these locations.

Once a wetland vegetation site is located, a walking transect will be performed in the area until the edge of a wetland vegetation patch is reached. The surveyor will walk the boundary of the wetland or use some other method to map the boundary. The polygons of wetland vegetation will be entered into GIS and acreages for each polygon will be recorded. Areas within wetland vegetation patches that are dominated by *Scirpus olneyi* (Olney's Three-Square) will be considered prime vole habitat. Modification of the definition of prime vole habitat will be made as additional requirements for the Amargosa vole are understood. Initial inventory will be performed in year one to obtain a baseline of wetland vegetation and vole habitat acreage within the ACEC. Following any wetland expansion, inventory of the extent of wetland vegetation and vole habitat will be performed every year for three years. Monitoring of stable wetland patches will occur once every five years. Monitoring should occur in the spring between March and May.

Plant Survival Counts

Plant survival counts will be used at restoration sites to gauge the success of the restoration effort. Plant counts will also be performed at sites where Amargosa niterwort and Ash Meadows gumplant are established in unoccupied suitable habitats.

Plant counts to monitor survival at riparian and upland restoration sites - When seeding or natural regeneration is used, a baseline will be established after three years of monitoring to allow for low germination rates and low recruitment success of restoration sites in the desert. The spring following restoration, the site will be monitored to determine germination success. On small sites, it may be possible to do an absolute count, but on larger sites, it will be necessary to sample. Belt transects will be the sampling methodology used in order to determine germination. Belt transects will be 100m long and 4m wide. Twelve square plots (4m x 4m) will be placed along the length of the belt transect at random locations. After these locations are determined in year-one, they will remain the same throughout the first three years of monitoring following active restoration using seeding.

The minimum sample size of square plots, and thus the number of belt transects needed per site, will be determined in year-one following collection of pilot data on each site. Statistical analysis to determine the minimum sample size can be done following the steps described in the *Combined Transects* section of this monitoring plan using the Formula I-2 shown in that section. The three years of data from the square plots will be used to estimate the number of individuals for the site as a whole and thus serve as a baseline for success. Depending on the plant species and the size of the site, the size of the belt transects may need to be increased. Larger plot frames may also be necessary due to the growth of the plants. The method for sampling and the need for pilot data and minimum sample size calculations will remain the same. Upon

establishment of a reasonable survival rate, these sites will be monitored consistent with other riparian restoration sites.

Monitoring at sites where container planting or pole planting has occurred will begin when the restoration work occurs. The number of plants or poles place in the ground will serve as the initial inventory. The site will be visited every year for the first three years following planting to determine success. The number of individuals surviving will be compared to the initial inventory to determine the survival rate. All plant counts, regardless of the method of site restoration, should be performed between April and June. Upon establishment of a reasonable survival rate, these sites will be monitored consistent with other riparian restoration sites.

Plant counts at Amargosa niterwort and Ash Meadows gumplant restoration sites - Monitoring at sites where niterwort and gumplant plantings have occurred will begin when the restoration work occurs. The number of plants placed in the ground will serve as the initial inventory. The site will be visited every year for the first three years following planting to determine success. The number of individuals surviving will be compared to the initial inventory to determine the survival rate. All plant counts for niterwort and gumplant should be performed between May and September. Upon establishment of a reasonable survival rate, these sites will be monitored consistent with other niterwort and gumplant sites, using the combined-transects methodology, as discussed below.

Combined Transects

Permanent combined transects will be used to measure changes in the biodiversity of the ACEC. Biodiversity data will be collected on reptiles, small mammals, birds, and perennial vascular plants. In addition, a habitat assessment will be performed at point-count sites to determine the amount of least Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo habitat is present in the ACEC. There will be nine transects spread throughout the three ACEC Units. Each transect will be 3500m long to allow for fifteen points along each transect, with 250m between each point. Transects will be distributed within the ACEC based on the following allocation:

1. Upper Amargosa Unit – 1 transect
2. Carson Slough Unit- 1 transect
3. Central Amargosa Unit
    a. Grimshaw Basin- 2 transects
    b. Amargosa Canyon- 3 transects
    c. Willow Creek- 2 transects

Within each unit, transect starting points will be randomly selected using GIS. Transect bearings will be randomly selected, but constrained based on topography and so that they remain within the ACEC boundaries. Transect direction will also be constrained to assure sampling points along each transect are proportionally allocated among the different ecological communities throughout the ACEC. These strata can be defined from soil survey polygons, vegetation maps, and/or landforms delineated from aerial photography.

In the Upper Amargosa and Lower Carson Slough Units, the starting points will be randomly allocated along the ACEC boundary. Within the Amargosa Canyon and Willow Creek portions

of the Central Unit, the starting points will be randomly allocated in a stratified manner. Within Grimshaw Basin, the starting points will be randomly located within an area that is bound by the ACEC boundaries, on east and west, the Tecopa Hot Springs Road to the north, and the Old Spanish Trail Highway to the south. So that data is comparable over time, there will be no changes in location of starting point or bearing once transects are established. Statistical analysis of data collected on the various taxa may warrant the addition or deletion of transects based on power analysis of the first few years of data.

Combined transects- point counts for avian taxa - Migratory and non-migratory avian species diversity, richness, and relative abundance will be measured using point-count censuses along each permanent combined transect. Each transect will contain fifteen point-count stations that are separated by 250m. The variable circular plot (VCP) point-count method (Rosenstock et al. 2002) will be employed at each station to record diversity, richness, and relative abundance data. Bird species will be identified and recorded by sight and song. Special note will be made of any cowbird species found during each census. Distance to the bird from transects will be estimated to the nearest 10m for each record. These transects will be performed in the morning within four hours after sunrise. Censuses will be performed every year, between April and July, for the first three years of data collection, and then every five years thereafter. Transects will be run two times during each season.

The first three years will provide a dynamic baseline of species relative to climatic conditions. Census data and standard deviation values from the first two years will be statistically analyzed (discussed below) to determine the minimum number of transects necessary to test sampling objectives. The number of permanent transects may be modified based on this information. If a significant increase is needed in the number of transects to adequately test sampling objectives, then an additional two years of surveying will be performed to obtain the dynamic baseline.

At each point-count location, the area within a circle that is 25m in radius will be assessed for its potential to serve as habitat for the southwestern willow flycatcher, least Bell's vireo, yellow-billed cuckoo, yellow warblers, yellow-breasted chats, vermillion flycatchers, Virginia's warblers, crissal thrashers, and other appropriate migratory bird species. The habitat will also be rated as to its quality and it will be noted if tamarisk is present. The estimated, total area of suitable habitat for all point-count locations will be divided by the total area of the habitat assessed (total area within all 25m circles at all point-count locations combined) to arrive at an estimate of the percentage of the riparian zone that is suitable habitat. This assessment will be performed in combination with the avian point-count transects. Statistical analysis of year-one data for suitable habitat will be used to determine the minimum sample size necessary to test the sampling objectives.

Combined transects- small mammal trapping arrays - Small mammal species diversity, richness, and relative abundance will be measured using Sherman Live Traps in small mammal trapping arrays along each permanent combined transect. Each transect will contain five trapping arrays located at every third avian point-count transect station, beginning at the transect's starting point. The arrays will be laid out in a wagon wheel configuration with the point-count station as the center of the wheel. Each wheel array will contain eight spokes with ten traps per spoke for a total of eighty traps per array. Traps will be located at 5m intervals along each spoke with no

trap set at the center of the wheel. Trapping will be performed for three consecutive nights at each array for a total of 240 trap-nights of effort per array. Configuration of the array may be modified based on terrain restrictions. Traps will be set at dusk and checked immediately prior to sunrise. Traps will be collected and individuals will be identified to species. Censuses will be performed every year, between April and August, for the first three years of data collection, and then every five years thereafter.

The first three years of data will provide a dynamic baseline of small mammal species relative to climatic conditions. Trapping data and standard deviation values from the first two years will statistically determine the minimum number of transects and arrays necessary to meet sampling objectives and the number of transects will be modified based on this information. If a significant increase in the number of transects is necessary to meet sampling objectives, then an additional two years of surveying will be performed to obtain the dynamic baseline. A State of California Scientific Collecting Permit will be necessary for this monitoring.

Combined transects- reptile pitfall arrays - Reptile species diversity, richness, and relative abundance will be measured using pitfall trapping arrays along each permanent combined transect. Each transect will contain five pitfall arrays located at every third point-count transect station, beginning at the transect's second station point. The arrays will be laid out in a wagon wheel configuration with the point-count station as the center of the wheel. Each wheel array will contain a center pitfall trap and eight spokes with four pitfall traps per spoke for a total of thirty-three pitfall traps per array. Pitfall traps will be located at 10m intervals along each spoke. Configuration of the array may be modified based on terrain restrictions. Pitfall traps will be connected by removable barriers that will lead reptiles into the traps. Trapping will be performed for three consecutive days at each array. Pitfalls will be opened in the morning and checked every hour for four hours in the morning, and again for a four-hour session in the afternoon. At the end of trapping, pitfalls will be closed and barriers will be removed from the site.

Censuses will be performed every year, between April and August, for the first three years pf data collection, and then every five years thereafter. The first three years will provide a dynamic baseline of species relative to climatic conditions. Trapping data and standard deviation values from the first two years will statistically determine the minimum number of transects and arrays necessary to test the sampling objective. The number of transects will be modified based on this information. If a significant increase in the number of transects is necessary to adequately test sampling objectives, then an additional two years of surveying will be performed to obtain the dynamic baseline. A State of California Scientific Collecting Permit will be necessary for this monitoring.

Combined transect- perennial, vascular plant diversity plots - Perennial vascular plant species richness will be measured using permanent vegetation plots along each combined transect. Each transect will contain five permanent vegetation plots located at every third point-count transect station, beginning at the transect's first station. The permanent plots will be 5m x 100m strip plots that follow the line of the combined transect towards its endpoint. Each permanent plot will be located so that the point-count transect station that it represents will lie in the center of the plot (this may be modified based on terrain features). Corners of the plot will be staked with

rebar that is driven to ground level. These corners will be mapped so that they can be relocated with a Global Positioning System and a metal detector.

Plots will be surveyed every year, between April and June, for the first three years of data collection, and then every five years thereafter. The first three years will provide a dynamic baseline of species relative to climatic conditions. Vegetation data and standard deviation values from the first two years of survey will statistically determine the minimum number of transects and arrays necessary to meet the sampling objective. The number of transects and permanent plots will be modified based on this information. If a significant increase in the number of transects is necessary to meet the objective, then an additional two years of surveying will be performed, after study design changes, in order to obtain the dynamic baseline.

Information collected on the plots will include percent canopy closure by species, percent perennial shrub cover by species and percent perennial ground cover by species (grasses and forbs). Percent canopy cover data will be collected along three 100m transects that run the length of the plots (one on each edge, and one in the center). The point intercept method will be utilized to collect canopy closure data by species every 1m along the transects using a canopy closure scope or densitometer. Percent shrub and ground cover by species will be also be collected using the point intercept method on the transects. The plot will then be broken down into twenty-five 5m x 4m quadrants to facilitate easier counting. Within each quadrant, every perennial plant will be identified and recorded to obtain an absolute measure of species richness on the plot.

Statistical analysis to determine minimum sample size for combined transect surveys: For the combined transect surveys, analysis of pilot data will determine if additional plots need to be added to individual strata to determine baseline conditions and detect any changes. Confidence intervals for the statistical analysis are defined in the sampling objectives. Good pilot data consists of at least two years of information collected under similar climatic conditions at the plots. Analysis of this data will determine whether additional sampling point locations are needed along transects in order to detect statistically significant changes within the given strata. Some strata may require more sampling locations per area in order to detect change due to the amount of variation in the data. Formula I-1 will be used in order to calculate minimum sample size for a given strata for those sampling objectives involving change detection.

Formula I-1

$$N = \frac{(s)^2 (Z\alpha + Z\beta)^2}{(MDC)^2}$$

s = standard deviation of the differences between paired samples.

Zα = Z-coefficient for the false change (Type I) error rate from page 354 of *Measuring and Monitoring Plant Populations*.

Zβ = Z-coefficient for the missed-change error (Type II) error rate from the table on page 354 of *Measuring and Monitoring Plant Populations*.

MDC = Minimum detectable change size. This needs to be defined in specific terms, not as a percentage as shown in the sampling objective. For example, if you want to detect a 20% change in population size from one year to the next, and your first years population size is 10 then the MDC = (0.20x10) = 2. You should use the higher of the two mean values from the two years of sampling.

Example: A vegetation map is used to stratify the survey by vegetation type. The minimum number of plots (arrays) required within the saltgrass meadow vegetation type (strata) to detect a specified level of change in species richness of small mammals would be computed as follows: There are three trapping arrays within the saltgrass meadow for the first two years (similar climate). The sampling objective is as follows: Be 80% certain of detecting a 30% change in small mammal species richness with a 10% chance of a false change error. The trapping results are as follows:

	Trapping Array 1	*Trapping Array 2*	*Trapping Array 3*	*Mean*	*SD*[7]
Year 1	4 species	3 species	4 species	3.67	0.578
Year 2	4 species	5 species	3 species	4	1
Difference	0 species	-2 species	1 species	-0.33	**1.528**

The minimum sample size for small mammal species richness in the saltgrass meadow vegetation community would be computed as follows:

Example I-1

$$N = \frac{(s)^2 (Z\alpha + Z\beta)^2}{(MDC)^2} = \frac{(1.528)^2 (1.64 + 0.84)^2}{(4*0.30)^2} = \frac{14.36}{1.44} = 9.97 \quad = 10 \text{ arrays}$$

[7] A standard spreadsheet program such as MS-Excel can be used to calculate standard deviation without the need for extensive calculations.

The example pilot data from these surveys show that seven arrays need to be added along the combined transects in saltgrass meadow vegetation communities in order to detect the specified level of change in species richness, given the requirements of the sampling objective. It would also be necessary to do this statistical analysis for the other vegetation strata within the ACEC to determine if they require additional trapping arrays.

In addition to statistical analysis to determine minimum sample sizes for change detection, it is also necessary to determine minimum sample sizes for distinct estimates of population size and percent of riparian zones that are suitable habitat for certain species. These estimates do not require change detection objectives and multiple years of pilot data. Instead, target/threshold sampling objectives monitor progress towards reaching the end goal using distinct snapshots in time. Therefore, statistically viable estimates in these situations only require pilot data from the year of the snapshot. Pilot data could be collected in the field, analyzed using a hand calculator or laptop computer, and additional sampling units sampled to meet the sampling objective. The following formula will be used in order to determine the unadjusted minimum sample size for these types of sampling objectives:

Formula I-2

$$N = \frac{(Z\alpha)^2(s)^2}{(B)^2}$$

s = standard deviation of the differences between paired samples.

$Z\alpha$ = Z-coefficient for the false change (Type I) error rate from page 354 of *Measuring and Monitoring Plant Populations*.

N = The uncorrected sample size estimate.

B = The desired precision level expressed in half of the maximum acceptable confidence interval width. This needs to be defined in specific terms, not as a percentage as shown in the sampling objective. For example, if you have a 20% confidence interval width, and your sample mean from pilot data is 10 then B = (0.20 x 10) = 2.

Example: The percentage of riparian zone that is suitable habitat for southwestern willow flycatcher is computed using habitat assessment of circular plots along transects in the Amargosa Canyon. In this example, our circular plots are 1962 square meters, and the pilot data is:

	Plot 1	*Plot 2*	*Plot 3*	*Plot 4*	*Plot 5*	*Plot 6*	*Plot 7*	*Plot 8*	***Mean***	***SD***
Percentage of circular plot that is suitable habitat	25	50	100	50	50	25	50	75	**53.1**	**24.8**

Our sampling objective is as follows: Be 80% confident that the estimate of southwestern willow flycatcher habitat is within 15% of the true value.

Solving for the minimum sample size for southwestern willow flycatcher suitable habitat should proceed as follows:

Example I-2

$$N = \frac{(Z\alpha)^2(s)^2}{(B)^2} = \frac{(1.28)^2(24.8)^2}{(53.1 \times 0.15)^2} = \frac{1008.7}{63.44} = 15.9 = 16 \text{ plots}$$

The unadjusted sample size would then be adjusted by consulting Appendix 7, Table 1 on page 349-350 of *Measuring and Monitoring Plant Populations* to arrive at an adjusted sample size of twenty-four plots.

This statistical method will also be used with pilot data to arrive at minimum sample sizes for population estimates and other similar distinct attributes.

Small Mammal Trapping Within Vole Habitat

Monitoring of vole populations within the ACEC will be an interagency cooperative effort, so specific protocols for trapping, tissue sampling, and other aspects are not addressed within this plan.

Medium-sized Mammal Trapping Within Vole Habitat

Medium-sized mammal live trapping adjacent to vole habitat will be used to determine presence/absence and abundance of stray domestic and feral cats near vole habitat in the Grimshaw Basin. Each bulrush marsh in the Grimshaw Basin will be ringed with medium-sized mammal live-traps. The number of traps per marsh will be determined by the size of the marsh itself. Traps will be set at dusk and checked immediately prior to sunrise. One trapping session will consist of three consecutive nights of trapping at each marsh. Trapping will be performed from November to March. Any trapped domestic cats will be turned over to animal control agencies or private adoption groups for return to potential owners, adoption, or humane disposal. Initial trapping will determine the need for additional public outreach and/or potential felid population control measures in the Grimshaw Basin. Trapping will be performed every three years for the life of the plan in order to determine if new management action needs to be taken or modified.

Walking Transects For Sensitive Plant Species, Permanent Plots to Determine Population Trends, Collection of Niterwort and Gumplant Microhabitat Data, and Monitoring of Experimental Niterwort and Gumplant Populations

Walking transects in suitable habitat - Walking transects will be performed within the ACEC to determine the boundaries of sensitive plant species populations and where population centers

occur. The monitoring protocols described below are separated based on the species being monitored. All transects for plant surveys will be 10m wide belt transects that are run in the configurations described under each plant's survey design.

Tecopa Bird's Beak, White Bear Poppy, and Spring-loving Centaury - Locations of suitable habitat will be determined by plotting all known occurrences of these species onto a map. These locations will be correlated with soil survey information in order to determine which ecosites within the ACEC are most likely to contain populations of the given species, and strata to be sampled determined accordingly.

If soil survey data is not available, aerial photography will be analyzed in order to delineate boundaries of distinct landforms within the ACEC. These landforms will be ground-truthed and categorized based on their similarity to one another. Landform categorization will be based on vegetation type, aspect, slope, and other abiotic factors; and will serve as a stratification of the landscape to correlate known species occurrence locations. If a correlation can be made between these strata and known occurrences, surveys will be concentrated in the strata that contain known occurrences.

Since the chosen strata may not be contiguous, all polygons of the strata will be identified. The number of transects per polygon will be proportional based on the acreage of the polygon as compared to the acreage of all of the chosen strata as a whole. For example: If one polygon makes up 40% of the acreage of the strata, it will receive 40% of the transects.

Within areas selected to sample for occurrences of a particular species, a line will be drawn along the long axis of each polygon. This line will serve as the starting point of all belt transects to look for individual occurrences. Belt transects will be placed at systematic locations along that line. The line and the starting points along it will be navigated using GPS. Once at the starting point, the bearing of the belt transect will be at a ninety-degree angle to the "long axis line" (see Diagram I-1). The belt transect will be 10m wide, and its length will be dependent on the distance to the edge of the given polygon. Any individuals of the species being surveyed will be recorded using a nested point. Surveyors may leave the transect line in order to record individuals away from the line, as long as they return to the point they left in order to resume their transect.

Once concentrated surveying is completed within each strata selected as suitable habitat, transects will be performed in other soil or landform/vegetation strata to determine if plants may be found in these other areas. Surveying of these areas will not be as intense in terms of the number of transects. If another stratum is found to contain individuals, a concentrated surveying effort will be performed within all polygons of that stratum based on the procedures outlined above.

Data from initial survey will be statistically analyzed to determine if additional transects need added. Once surveying is complete, point-location data will be input into a GIS framework in order to map population centers. Locations with a high number of individuals will be delineated and identified as an occurrence cluster that needs to be monitored (see Diagram I-1). These occurrence clusters will be revisited every year for the first two years, and then every three years

thereafter. The monitoring season for Tecopa bird's beak will be May through September. The monitoring season for White bear poppy will be April through July. The monitoring season for spring-loving centaury will be May through September.

Amargosa niterwort and Ash Meadow's gumplant - Locations of potential suitable habitat for Amargosa niterwort and Ash Meadow's gumplant will be identified using the methods described above for Tecopa bird's beak, white bear poppy, and spring-loving centaury. The chosen strata will also be identified using the same methods described for these plants, and will be the focus of the majority of surveying effort. Belt transect locations and bearings within selected strata and in unsuitable strata will also be determined in the same manner listed above (see Diagram I-1).

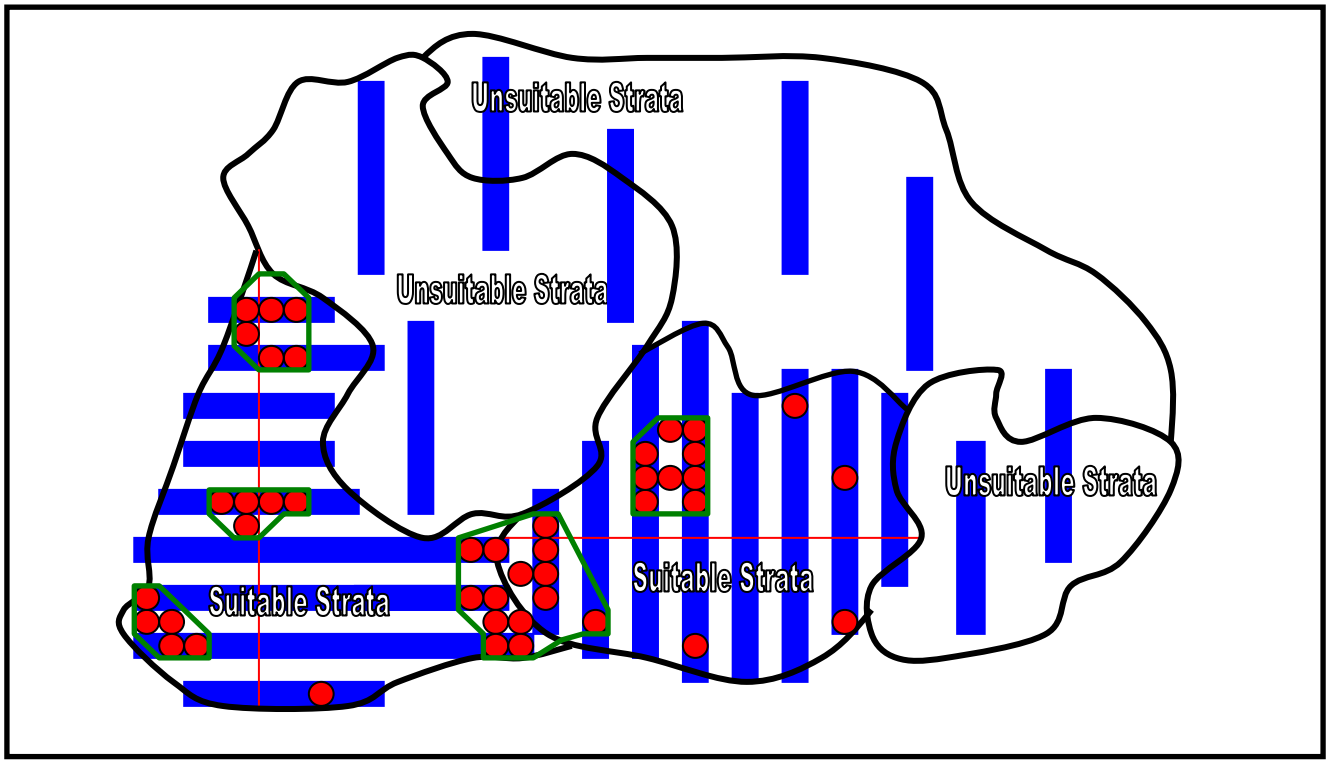

Diagram I-1
Blue- Belt Transects, Red- Plant Occurrences, Green- Clusters of Plants

Belt transect boundaries and the plants located in suitable strata will be mapped using GIS. Occurrence boundaries will be delineated based on concentrations of individuals, as with other species. If individuals are found within unsuitable strata, the strata will be intensively surveyed using the survey design employed in the suitable strata. Occurrence clusters will then be monitored every year for the first two years, and then every three years thereafter.

In addition, permanent plots will be randomly allocated within occurrence cluster boundaries. The size and shape (square plots will be avoided) of the plots will depend upon the plant being sampled (gumplant plots will likely be larger than niterwort plots) and the nature of the

occurrence. A minimum sample size will be determined for each occurrence cluster using pilot data collected prior to actual surveying. See *Statistical Analysis* under the *Combined Transects* section. Formula I-2 will be used to determine the minimum sample size. Once the sample size is determined for each cluster, the plants within each permanent plot will be counted. The data from each permanent plot will be used as an index of the population status as a whole. Once sample sizes, and plot dimensions are determined, they will be used consistently for the life of this plan, in order to gauge trends in the number of individuals. The monitoring season for Amargosa niterwort will be July through September. The monitoring season for Ash Meadow's gumplant will be June through September.

During the first year of survey at these permanent plots, microhabitat data will be collected in order to serve as data input in the search for other suitable habitats for experimental transplant populations. Microhabitat data that should be collected at each site includes: slope, aspect, perennial and annual plant species present, soil texture, soil pH, soil moisture, soil bulk density, soil infiltration rate, percent shrub cover, annual and perennial species density, annual and perennial species frequencies, and any other pertinent data.

If experimental populations of niterwort and gumplant are established, each plant placed in the ground will be flagged. Monitoring of these experimental plots will consist of survival counts, and measurement of above ground biomass. This monitoring will take place every year for the first three years after population establishment, and then every three years thereafter. The monitoring season will be the same as mentioned above for Amargosa niterwort and Ash Meadow's gumplant.

Southwestern Willow Flycatcher, Least Bell's Vireo, and Yellow-billed Cuckoo Presence/Absence, Spot Mapping, Nest Surveys, and Nest Monitoring

Presence/Absence Surveys - Presence/absence surveys for the least Bell's vireo will follow the US Fish and Wildlife Protocols established in 2001. This involves four surveys of the riparian areas of the ACEC May through July. These surveys will be performed every other year for the life of the plan. Presence/absence surveys for the southwestern willow flycatcher will follow the Sogge et al 1997 (revised 2000) protocol. This involves three surveys between during the month of May, three surveys in the month between June 1 and June 21, and two surveys between June 22 and July 17. These surveys will be performed every other year for the life of the plan. More frequent surveys will be required during the tamarisk control project. Yellow-billed cuckoo presence/absence will be assessed during point-count census transects previously discussed in the combined transects monitoring of permanent plots throughout the ACEC.

Spot Mapping - Spot mapping to establish the boundary of breeding territories will follow the standard guidelines established by Robbins (1970). Sites where individuals are detected during presence/absence surveys will be revisited at least eight times during the course of the breeding season. Some of these visits can be concurrent with the visits performed for presence/absence surveys, but they should be done early enough to allow subsequent nest surveys to be performed. This may require more visits to the site than what is required during the presence/absence surveys. Since only four visits are required for least Bell's vireo presence/absence surveys, extra

trips will be made to allow for spot mapping. Locations of the individual birds will be mapped in detail, and then the boundaries of breeding territories will be delineated. If yellow-billed cuckoos are discovered during point-count surveys, the sites will be identified. The area of the discovery will be returned to and surveyed eight separate times from April to August to determine the extent of the breeding territory.

Nest Surveys - Nest surveys will be performed for each species from mid-May to the end of July. These surveys will use the spot-mapping data as the guide for establishing survey boundaries, so these boundaries may be modified through the season as more spot-mapping data is accumulated. Breeding territories will be thoroughly searched to find nests. Taped calls may be used with the southwestern willow flycatcher in order to find individuals. If nests are found during the early part of the season, the breeding territory will be resurveyed in late June or early July to detect any re-nesting activity. Re-nesting surveys for any yellow-billed cuckoo nests will not be necessary, since they do not generally have more than one clutch in a season. If nests are found, they will be checked once a week in order to monitor nest success, predation, and nest parasitism. These surveys will be performed every other year for the life of the plan. More frequent surveys will be required during the tamarisk control project.

Riverine Fish Habitat Assessment and Population Monitoring for Amargosa River pupfish and Amargosa speckled dace

Habitat Assessment and Population Monitoring - The fifty-nine sites surveyed in the Williams et al. 1982 fish survey will be resurveyed in May and July using similar methods to those employed in that study. Methodology used at a survey site may be modified if the habitat at that site has changed, so that a twenty-foot seine cannot be used. Minnow traps, electrofishing, or other alternative methods could be used. All fish at each survey site will be identified and recorded in order to obtain species diversity and relative abundance for that site. A representative sub-sample of fish collected at each site will be sexed and measured for length.

Riverine habitat at each site will be analyzed using the parameters detailed in the 1982 study (stream depth, stream width, velocity, substrate type, dissolved oxygen, pH, total dissolved solids, turbidity, air temperature, water temperature, and percent cover). A detailed survey of the waters of the Grimshaw Basin will also be performed at selected sites that will be mapped, so that they can be resurveyed. Additional sites will be chosen in Grimshaw Basin, Amargosa Canyon, and the Willow Creek Drainage for riverine habitat analysis as described above. This data will be used in combination with habitat data gathered during the fish survey. Habitat analysis sites should be distributed so that a representative sample of the area's riverine habitat is obtained. Surveys will be conducted every three years for the life of the plan. The number of sampling locations may be modified based on the sampling objective and statistical analysis of the pilot data collected in year one.

Presence/Absence Monitoring for Endemic Springsnails

All springs within the ACEC will be evaluated during April and May for the presence of endemic springsnails every other year for the life of the plan. The presence of any invasions by non-native snails will also be evaluated.

Water Quantity and Quality Monitoring

Water-Quantity Monitoring - Water quantity on the main course of the Amargosa River will be monitored continuously with current and planned USGS gauging stations. Additional monitoring will be performed at spring outflows. This monitoring will be performed in the spring every five years for the life of the plan. This monitoring should correspond to monitoring of wetland vegetation extent. Notched weirs can be used in the channels that flow from these springs in order to determine water volume per second that is coming from the spring. Hydrographs will be created for the Amargosa River at several strategic locations to include the following: 1) Shoshone, 2) Tecopa, 3) below the confluence of Willow Creek and the Amargosa River, and 4) on the major stream channels of the Lower Carson Slough. Ash Meadows will also be contacted in order to monitor spring outflows from water sources that provide water to the Lower Carson Slough.

Groundwater in the Lower Carson Slough will also be monitored using a combination of methods. The BLM will cooperate with land managers of current ground water monitoring wells in the region to track the status of ground water levels in the Lower Carson Slough Region. Additional monitoring wells may also be added at strategic locations in the future to monitor site-specific groundwater levels near occurrence clusters of Amargosa niterwort and Ash Meadow's gumplant.

The USGS Death Valley Regional Flow System model (Belcher, W.R., ed., 2004) should be used in the siting of new monitoring wells. Additionally, agreements BLM could enter into agreements with USGS to install piezometers on monitoring wells or spring outflows.

Water-Quality Monitoring - Water-quality monitoring will be performed every other year for the life of the plan, and will consist of chemical analysis and analysis of macroinvertebrate biodiversity. Methods and parameters for chemical analysis would be determined with guidance from USGS. Some attributes include salinity, temperature, dissolved oxygen, total dissolved solids, turbidity, pH, and the presence of other important elements (nitrogen, phosphorus, lead, arsenic, boron, chloride, fluoride, sulfates). Macroinvertebrate studies will be done using the *California Streamside Biosurvey* protocols (Herbst et al 2001). The number of sampling plots needed for this survey will be determined using pilot data from year-one of surveying. Additional sampling locations will be added based on the sampling objective and statistical analysis of the pilot data. See "Statistical Analysis" under the "Combined Transects" section of this plan.

References

Belcher, W.R., ed., 2004, Death Valley regional ground-water flow system, Nevada and California—Hydrogeologic framework and transient ground water flow model: U.S. Geological Survey Scientific Investigations Report 2004-5205, 408 p.

Herbst, D.B., A.Y. Feng, and D.E. Gregorio. 2001. The California Streamside Biosurvey.

Robbins, C.S. (ed.). 1970. An international standard for a mapping method in bird census work recommended by the International Bird Census Committee. Audubon Field Notes 24:723-726.

Rosenstock, S. S., D. R. Anderson, K.M. Giesen, T. Leukering, and M. F. Carter. 2002. Landbird counting techniques: Current practices and an alternative. Auk 119:46–53.

Sogge, M.K., R.M. Marshall, S.J. Sferra and T.J. Tibbitts. 1997. A Southwestern Willow Flycatcher natural history summary and survey protocol. National Park Service Technical Report NPS/NAUCPRS/NRTR-97/12.

Williams, C.D., T.P. Hardy, and J.E. Deacon. 1982. Distribution and status of fishes of the Amargosa River Canyon, California. Unpubl. Rep. submitted to FWS, Endangered Species Off., Sacramento, California. 115 pp.