Nevada Partners in Flight

Bird Conservation Plan

Edited by Larry A. Neel

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EXECUTIVE SUMMARY

On April 1 1993, The Nevada Working Group of Partners In Flight held its inaugural meeting with the intent to create a cooperative, multi-entity planning process to address management concerns for the birds of Nevada, particularly those species not traditionally subject to other long-term management processes (species other than hunted waterfowl and game birds). Over the next six years, The Nevada Working Group diligently pressed forward to the task. A priority list of 46 species was developed, and descriptions for 15 major habitat type classifications in the state were written. Although long-term population data specific to Nevada were lacking for most of the priority species, population objectives were set for all species, with the level of accountability in each objective determined by the nature and amount of data available for the species. Species objectives were nested within the major habitat types, with some species receiving multiple objectives in multiple habitat types. Appurtenant to each objective, strategies outlining how the objective could be achieved were developed. These strategies most often addressed habitat management activities, but sometimes monitoring strategies were outlined where data collection processes were historically inadequate, and public awareness strategies were outlined when public awareness was deemed to be a critical element of a species' conservation. Strategies incorporated a list of "Actions", or discrete activities which, if implemented, could reasonably be expected to contribute positively toward the attainment of the objective.

A total of 63 objectives were set by the Nevada Working Group. These objectives ranged in complexity from "maintain present occurrence and distribution" to "stabilize a decreasing population trend" to "maintain 1,200 nesting pairs", depending on the nature of data available for each species. Most objectives set the year 2004 as their target date. During that year, review of the group's performance toward achieving its objectives will occur and objectives will be adjusted according to new information. Three objectives were set for a 2010 target date because that more realistically reflected the expectation of the work at hand.

Because so little long-term population data exist for most species in Nevada, much of the next five years will be spent devising, funding, and implementing adequate monitoring programs for the bulk of this document's priority species. Monitoring alone, however, contributes little toward the achievement of population objectives. Monitoring will only measure progress. In order to achieve most of its population objectives, the Nevada Working Group has focused on public land planning processes and cooperative projects with private landowners as the main vehicles of implementation. Where opportunities exist to create new habitats, such as the restoration of Argenta Marsh, the Nevada Working Group plans to coordinate its efforts with other national and regional entities to effect positive change on a larger scale than would be possible were each entity striving independent of one another. Where habitat models exist, these will be incorporated into land use plans and their performance will be monitored. Where models are needed but do not exist, efforts to construct models with Nevada-specific information will ensue. Where projects change the face of the land, the Nevada Working Group plans to devise and implement reasonable, achievable mitigation strategies to minimize the loss of a particular resource, with a strong intent to enhance rather than reduce the resource whenever possible. Where a lack of public awareness is hindering the conservation of a resource, efforts to enhance public understanding and support for Nevada's avian treasures will become a major priority.

The Nevada Working Group is pleased to present its Bird Conservation Plan for the next five years of work. We invite you to join us in making it happen.

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ACKNOWLEDGEMENTS

A work of this magnitude is nearly always the result of the collaboration of many persons with a wide range of skills and expertise. In addition to the authors listed on pages 8 and 9, the editor relied on the knowledge and expertise of the persons listed below, either to review portions of the document, to provide historical background, to provide specific knowledge about birds and/or habitats, or to work through any number of knotty problems that arose during the compilation and presentation of what follows. For their cheerful assistance and support, the editor wishes to take this opportunity to express his deepest heartfelt thanks to:

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INTRODUCTION

Continental and local declines in numerous bird populations have led to concern for the future of migratory and resident bird species. The reasons for declines are complex. Habitat loss, modification and fragmentation, loss of wintering and migratory habitat, and brood parasitism have all been implicated. Scientists and the concerned public agree that a coordinated, cooperative conservation initiative focusing on nongame landbirds is needed. In late 1990, the National Fish and Wildlife Foundation brought together federal, state, and local government agencies, foundations, conservation groups, industry and the academic community to form a program to address the problem. Thus, Partners in Flight was conceived.

The primary goal of Partners in Flight is to focus resources on the improvement of monitoring, research, management and education programs involving native, nongame landbirds and their habitats. PIF complements the successful North American Waterfowl Management Plan and the recently initiated Shorebird Conservation Plan.

Not far into the process, it became evident that geographically based conservation plans were needed for nongame landbirds, much as the North American Waterfowl Management Plan directs efforts and prioritizes funding for waterfowl. The planning phase began in 1995 when "The Flight Plan" was introduced to participants at a conference in Cape May, New Jersey. The Flight Plan forms the strategy for coordinating, developing, and writing Bird Conservation Plans. The plans put the best and most current scientific information into a format that land managers and landowners can use to translate ideas into action.

The Nevada Working Group, initiated in 1993, operates under the umbrella of the U.S. Partners in Flight program, with similar objectives and approaches. Planning meetings have always remained open to any one with an interest in bird conservation. Significant participation in the Nevada Working Group has come from Nevada Division of Wildlife, U.S. Fish and Wildlife Service, Bureau of Land Management, Bureau of Reclamation, U.S. Forest Service, National Park Service, the University of Nevada system, Lahontan Audubon Society, Red Rock Audubon Society, Great Basin Bird Observatory, The Nature Conservancy, Resource Concepts, Inc., and various interested persons without affiliation. The Nevada Bird Conservation Plan was conceived in 1996, and progress on the plan ensued through periodic meetings and correspondence through March 15, 1999, when a final draft was submitted to the Western Regional Coordinator. Planning meetings were designed to solicit information from participants that would form the core of the plan. An especially important result of planning meetings was the capture of scientific data and personal observations that were not available in the scientific literature. This information is important because local variations can dictate different needs and approaches. When necessary Nevada also borrowed information from adjacent states.

The Writers

The Nevada BCP is the result of collaboration of a dedicated group of biologists and bird conservationists from the wide array of agencies and organizations listed above. Persons volunteered to write individual species profiles, habitat descriptions, and conservation objectives based on their individual strengths and areas of expertise. No element of the plan is the sole product of any one person, and the editor takes full responsibility for any errors of omission or commission that survive into the present document, but it seemed

prudent to recognize each contributor's primary areas of participation. Most if not all contributed to the species profiles. While it may well be impossible to list everyone who worked in some capacity on the construction and publication of the plan, the following list is an attempt to do exactly that:

Elisabeth Ammon	Univ. Nevada, Reno	montane parkland, lowland riparian
Steve Anderson	Forest Service, Elko	montane riparian, coniferous forest
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John Brack	Forest Service, Tonopah	species profiles
Peter V. Bradley	NDOW, Elko	sagebrush, montane shrub, mt. mahogany, prioritization
Graham Chisholm	GBBO, TNC	lowland riparian, wetlands
Marti Collins	FWS, Desert NWR	Mojave shrub, mesquite
Jim Eidel	Lahontan Audubon	cliffs and talus
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Gary Herron	NDOW, Reno	agricultural lands
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Jeri Kreuger	BLM, Las Vegas	mesquite, Mojave shrub
Larry Neel	NDOW, Fallon	editor, salt desert scrub, coniferous forest
Al Pfister	FWS, Reno	pinyon-juniper
James Ramakka	BLM, Carson City	introduction, species profiles
Pat Shanley	Forest Service, Carson	species profiles
Beth St. George	FWS, Ash Meadows NWR	Mojave shrub, mesquite
David St. George	FWS, Ash Meadows NWR	Mojave shrub, mesquite
John Swett	BOR, Boulder City	lowland riparian
Jeanne Tinsmann	FWS, Ruby Lakes NWR	species profiles
Cris Tomlinson	NDOW, Las Vegas	mesquite, Mojave shrub
Ken Voget	FWS, Desert NWR	pinyon-juniper, mesquite, Mojave Shrub

PLANNING UNIT DESCRIPTION

Physical Features

Nevada is the driest state in the nation. The three largest natural lakes in the state are Pyramid Lake, Walker Lake, and a portion of Lake Tahoe. Major river systems include the Humboldt, Truckee, Carson, Walker and Colorado Rivers. Major wetland areas occur in the Lahontan Valley and Ruby Marshes.

Nevada contains 314 mountain ranges. Most of these ranges have a north-south orientation and are separated by relatively flat valleys. Twenty-five ranges have summits with elevations over 10,000 feet Valleys adjacent to the mountains can range in elevation from below 2,500 feet to over 6,000 feet (Grayson 1993) The highest point in Nevada is Boundary Peak with an elevation of 13,140 feet, the lowest point (479 ft) occurs on the Colorado River below Davis Dam. Variations in topographic relief combined with climate

variations between the north and south result in diverse habitats and avian communities.

Physiographic Regions

Kuchler (1964) maps four physiographic regions covering Nevada: Columbia Plateau to the north, Upper Basin and Range occupying the central part of the state, Lower Basin and Range in the southern part, and Sierra Mountains on the extreme western border. In the Partners in Flight mapping of physiographic regions, most of Nevada lies in the Basin and Range physiographic region (also called "provinces" in the plan; see Map 1). The southern tip of the state is classified as Mojave Desert while the northeastern corner of Elko County drained by the Owyhee, Bruneau, and Jarbidge Rivers is considered part of the Columbian Plateau. A small sliver of the Sierra Nevada Mountain physiographic region occurs on the extreme western border with California. The Great Basin (or Basin and Range) has been defined in a variety of ways (Grayson 1993). However, no matter which definition is used -- physiographic, hydrographic, or floristic -- Nevada occupies the heart of the Great Basin. The state provides at least 50% of the habitats within the region.

Vegetation

Vegetation in Nevada is strongly influenced by topography and latitude. Plant communities can be roughly categorized into different zones in each of the four PIF physiographic regions in the state. In the Great Basin the lowest valley bottoms are often dominated by Salt Desert Scrub vegetation. This type is usually dominated by shadscale (*Atriplex convertifolia*) and Bailey's greasewood (*Sarcobatus baileyi*). On sites with deeper, moister soils in this zone, such as seasonally flooded swales and edges of playas, large stands of black greasewood (*Sacrobatus vermiculatus*) occur.

On less saline soils at the edges of valleys (usually above 5,000 ft elevation) and lower slopes of the mountains, salt tolerant shrubs are replaced by a Sagebrush zone. This vegetation type is the most common in Nevada. Dominant shrub species are big sagebrush (*Artemisia tridentata*), black sagebrush (*Artemisia nova*), low sagebrush (*Artemisia arbuscula*), and bud sage (*Artemisia spinescens*). Grasses usually makes up less than 25% of the total vegetative cover. Common species which can be present in this zone include cheat grass (*Bromus tectorum*), blue grasses (*Poa spp.*), needlegrasses (*Stipa spp.*) fescues (*Festuca spp.*), and galleta grass (*Hilaria jamesii*).

Above the Sagebrush zone, in eastern and central Nevada there frequently occurs a zone of Pinyon Juniper woodland. This woodland zone most often occurs in inversion induced thermal belts between 5,000 to 8,000 feet elevation where precipitation ranges between 30 and 47 cm (Grayson 1993). Dominant species in this zone are Singleleaf Pinyon (*Pinus monophylla*) and Utah Juniper (*Juniperus osteosperma*). North of the Humboldt River, pinyon disappears and juniper dominates. Depending on geography and geology, common associated species can include sagebrush (*Artemisia spp.*), rabbitbrush (*Chrysothamnus spp.*), alderleaf mountain mahogany (*Cercocarpus montanus*), littleleaf mountain mahogany (*Cercocarpus intricatus*), bitterbrush (*Purshia tridentata*), and cliffrose *(Cowania mexicana*).

In central and northern Nevada at elevations between 6,500 and 10,000 feet, a Mountain Sagebrush Zone occurs above the Pinyon Juniper Zone. Communities in this zone are

dominated by mountain big sage (*Artemisia tridentata vaseyana*), subalpine sage (*Artemisia tridentata spiciformis*), low sage (*Artemisia arbuscula*), silver sage *(Artemisia cana*), littleleaf mountain mahogany, and snowberry (*Symphoricarpos spp.*).
On the higher mountain ranges east of the Sierra, Montane Forest types can occur. Primary tree species can include limber pine (*Pinus flexilis*), bristlecone pine (*Pinus longaeva*), whitebark pine (*Pinus albicaulis*), Englemann spruce (*Picea englemannii*), and subalpine fir (*Abies lasiocarpa*).

Montane Forest also occurs in the other physiographic regions in the state. In the Sierra Nevada, a greater variety of conifers occur including the primary species lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa),* Jeffrey pine (*Pinus jeffreyi*), red fir (*Abies magnifica*), and white fir (*Abies concolor*). Various shrubs can occupy the understory including manzanita (*Arctostaphylos spp.*), snowbrush (*Ceanothus spp.*), oaks (*Quercus spp.*), and bitterbrush.

On the highest peaks throughout Nevada, small areas of Alpine Tundra occur. This type usually occurs at elevations above 10,000 feet and contains communities dominated by a variety of forbs, sedges, grasses, and shrubs.

In the Mojave Desert physiographic region, Montane Forest occurs only on the highest mountain ranges and is characterized by the presence of ponderosa pine, limber pine, and bristlecone pine communities. The lower elevations (below 4,000 feet) of the Mojave Desert are dominated by the presence of creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). At elevations between 4,000 to 5,000 feet, blackbrush (*Coleogyne ramosissima*) becomes a dominate shrub. Certain localities within this type also support populations of Joshua trees (*Yucca brevifolia*).

Within all four physiographic regions are small habitats which may be disproportionately important as bird habitat. In the Mojave Desert, tall shrublands containing mesquite (*Prosopsis glandulosa*) and patches of velvet ash (*Fraxinus velutina*) appear to fall in this category. In all three regions riparian habitats are key areas for bird use. Chaney (1990) suggested that although riparian areas may comprise less than one percent of the area in the western United States, they were decidedly the most productive and valuable of all lands. In the Great Basin portion of southeastern Oregon, for instance, 75 percent of all wild species were known to use riparian habitats for at least part of their life cycle.

The Nevada GAP project defined 65 vegetation classes for the state (Table 1). For the purposes of the Bird Conservation Plan, these classes have been consolidated into the following broad categories. Total areas of the individual GAP vegetation classes are contained in Appendix A.

TABLE 1. Nevada Habitat Types (community types)

Agricultural Lands
1. ag #56

Aspen
1. aspen #2, 3

Barren

1. rock, cliffs, talus #57
2. sand dunes #61

Coniferous Forest
1. Engelmann spruce #4, 5
2. Great basin subalpin pine #6, 7
3. Mojave bristlecone pine #10, 11, 12
4. ponderosa pine/shrub #20
5. ponderosa pine #21
6 Sierran Conifers
    - Sierran lodgepole pine #22, 23, 24
    - Sierran red fir #25, 26
    - Sierran whitebark pine #27, 28
    - Sierran white fir #29
    - Sierran yellow pine #30, 31, 32
    - Sierran yellow pine/mountain shrub #33
7. subalpine fir #34, 35
8. white fir #36, 37, 38

Lowland riparian #58

Mesquite/Catclaw #44

Mojave Shrub
1. blackbrush #40
2. creosote/bursage #41
3. hopsage #43
4. Mojave mixed scrub #45

Montane Parkland
1. dry meadow #53
2. wet meadow #55

Montane riparian
1. mountain riparian #59

Montane Shrub
1. mountain shrub #47
2. Sierra mountain shrub #51

Mountain mahogany #13, 14, 15

Pinyon-Juniper
1. pinyon #16, 17
2. pinyon-juniper #18, 19
3. Utah juniper #8, 9
4. western juniper (no number)

Sagebrush
1. bitterbrush #39

2. mountain sagebrush #46
3. sagebrush/perennial grass #49
4. sagebrush #48

Salt Desert Scrub
1. greasewood #42
2. salt desert scrub #50

Wetlands
1. wet meadow #55
2. playas #60
3. open water #64
4. wetland #65

Historic Land Use

Virtually all of the accessible habitats in Nevada have been grazed by livestock for at least 100 years or more. Overgrazing by cattle beginning in the mid-1800's resulted in large scale changes in vegetation communities in Nevada, particularly in the sage steppe habitats of northern Nevada (Young and Sparks 1985). Native bunch grasses were reduced or eliminated from communities and shrub densities, particularly that of sagebrush, increased. The introduction of exotic plant species, particularly cheat grass (*Bromus tectorum*), further altered historic plant communities by outcompeting native species and, just as significantly, by changing historic fire regimes.

Forest communities in the Sierra Nevada were also severely impacted by humans beginning in the middle of the last century. Virtually all of Nevada's Sierran forests were cut down to supply the demand for lumber, mine timbers, and fuel wood during the Comstock mining boom of the 1860's. Only isolated remnants of old growth timber exist in the Nevada portion of the Sierra Nevada Mountain physiographic region.

Current Land Use

Present land use in Nevada mirrors that of the past but with many more controls in place. Livestock grazing still occurs on virtually all accessible land, except for the Mojave Desert, where significant reductions in grazing have occurred as a result of the federal listing of the Desert Tortoise. In addition, changes in range science and livestock management have improved vastly in the last 30 years, resulting in an overall improvement in range stewardship. Mining for precious metals, sand and gravel, and other mineral products continues throughout the state. Today, large scale open pit mines are the norm rather than small underground mines. Timber cutting, primarily salvage logging, occurs on a limited basis in the Sierra Nevada. Agriculture is primarily associated with the floodplains of Nevada's major river systems. The bulk of dam-building associated with agriculture and power generation in Nevada occurred prior to 1940, but all of the state's major dams are still maintained for their original uses today. Other land uses that gain more importance with time are outdoor recreation and use of the land for military training purposes. In the areas around the two population centers in the state, Reno and Las Vegas, urban/suburban development results in a steady conversion of natural habitats as well as those traditionally used for agriculture.

Land Ownership

The majority of Nevada is public land managed by the United States Government (Table 2). While private lands are only a small portion of the state, these areas contain

TABLE 2. Land Ownership in the State of Nevada

Land Ownership[1]	Hectares	Percent
Bureau of Land Management	19,638,200	69.4
Department of Defense	2,059,200	4.4
Department of Energy	366,000	1.3
U. S. Forest Service	2,059,200	7.3
U. S. Fish and Wildlife Service	579,200	2.0
Native American Lands	411,200	1.5
National Park Service	264,100	0.9
State Lands	1,400	0.0
State Parks	24,700	0.1
State Wildlife Areas	59,800	0.2
Private	3,757,200	13.3
Total[2]	28,298,240	

[1] Source: Nevada GAP Analysis Project 1995.
[2] Source: Nevada Statistical Abstract 1996.

much of the riparian habitat in Nevada.

Importance of Nevada in Western Region

Nevada contains only small portions of the Mojave, Columbia Plateau, and Sierra Nevada physiographic regions. The largest portion of the state is in the Basin and Range physiographic Region, with approximately one half of that province's total area lying in Nevada. The rest is located in Idaho, Oregon, Utah and a small portion of California. The state provides a large measure of the sagebrush, salt desert scrub and pinyon/juniper habitats in the region. Little long-term data presently exists to indicate how much Nevada directly contributes to the avifauna of the region. However, based on the extent of the Basin and Range habitats in the state, it likely provides significant habitat for those species dependent on the habitats listed above.

Conservation Opportunities

Several areas of major importance to migratory birds occur in areas under special management designations in Nevada. Many of the vitally significant wetlands of the Lahontan Valley are contained in the Stillwater National Wildlife Refuge and Carson Lake, a major site cooperatively managed by the State of Nevada and the Truckee-Carson Irrigation District. These wetlands were designated as a Hemispheric Site in the Western Hemisphere Shorebird Reserve Network and can provide foraging habitat for up to 250,000 migrating and breeding shorebirds (Neel and Henry 1997). Common nesting species include American Avocets, Black-necked Stilts, Wilson's Phalaropes, and Western Snowy

Plovers.

The large nesting colony of American White Pelicans at Anaho Island in Pyramid Lake is designated as a National Wildlife Refuge administered by Stillwater NWR. Ruby Lake National Wildlife Refuge also protects a large wetland area in the eastern part of the state. The Sheldon National Wildlife Refuge on the northwest border of the state contains the only large (230,000 hectares) expanse of sage steppe habitat without cattle grazing in the state. The Goshute Mountains Hawk management area serves as major raptor migration corridor and is managed under Wilderness Study Area guidelines by the Bureau of Land Management. The Spring Mountains National Conservation Area, also managed by the BLM, preserves forests unique in the state with regards to species composition and habitat character. This area serves as home to several bird species which would otherwise be absent from Nevada (i.e. Grace's Warbler), and also encompasses part of another important raptor migration route.

Other areas which present conservation opportunities in the state include Walker Lake which serves as a major migration stopover for Common Loons and other fish-eating birds and the Mary's River Conservation Area. In southern Nevada, riparian restoration efforts are under way for portions of the Muddy and Virgin Rivers, and a Habitat Management Plan for mesquite woodlands is being developed by the Bureau of Land Management.

BIRD CONSERVATION IN NEVADA - A BRIEF OVERVIEW

Nevada's location is such that both its flora and fauna could be influenced by the Sierra Nevada to the west, Rocky Mountains to the east, and Mojave Desert to the south. For the Great Basin portion of the state, habitats seem to have been more influenced by the Rocky Mountains than the Sierra Nevada (Harper 1978). The same has been suggested for bird species (Behle 1978). Although 456 species of birds have been listed as occurring, or potentially occurring, in the state (Alcorn 1988), Nevada has no endemic bird species (Ryser 1985).

Little information is available on historic population trends or distributions of nongame birds in Nevada. In the southern portion (Mojave Physiographic Region) of the state, there is evidence that the total number of bird species in certain mountain ranges increased substantially between the late 1930's and early 1970's (Johnson 1974). Species that expanded their ranges or increased breeding populations included Dusky Flycatcher, Solitary (Plumbeous) Vireo, and Cassin's Finch. During recent times (since 1963) colonization by Grace's Warbler also occurred (Johnson 1978).

A caveat crucial to this plan is that much of the information needed to reliably manage nongame birds in Nevada is lacking or presently in the process of being gathered. Nevada's rugged topography, small population, and lack of roads have done much to limit the amount of information available on its bird life. While Breeding Bird Survey (BBS) data are commonly used to measure trends in bird populations in other states, Nevada's BBS data are incomplete and not reflective of the habitats present in the state. The BBS program has suffered from a lack of survey personnel away from the two population centers. Since survey routes follow roads and most readily passable roads in Nevada are in valley bottoms, little sampling in foothill, mountain, and riparian habitats occurs.

Not that bird management has been nonexistent in Nevada. Much of the earliest

management efforts in Nevada centered around game birds, particularly Sage Grouse and waterfowl. To exploit Nevada's rapidly changing landscape, exotic game birds were introduced – Ring-necked Pheasant into the cultivated floodplains, Chukar into the cheatgrass-infested mountain ranges, Wild Turkey into floodplain and forest. In addition, Nevada boasts the only established population of Himalayan Snowcock in North America (in the Ruby Mountains). With regard to nongame bird monitoring, Nevada's oldest active Christmas Bird Counts date back only to 1972, although several efforts to establish CBC's occurred prior to that date.

In 1973, the Nevada Department of Wildlife initiated a nongame wildlife program. Starting with one biologist statewide, the program has to date grown to employ five full-time biologists. Initial efforts of this program centered on establishing population status, trend, and distribution of raptors statewide. Extensive hours of aerial survey were expended cataloguing Nevada's raptor nest sites, culminating in the 1985 publication "Nevada's Raptors". Federal agencies expanded their wildlife habitat management planning processes to include raptors as the new information was compiled. Nevada biologists participated in the recovery efforts for two endangered species – the Peregrine Falcon and the Bald Eagle. The Bald Eagle has since been re-classified from Endangered to Threatened federal status, while the Peregrine Falcon is presently being evaluated for re-classification as Threatened.
Subsequent nongame bird investigations and management emphasized Species of Concern, largely identified through the subsidiary listing processes of the Endangered Species Act of 1973. Considerable attention was given to the monitoring of nesting White-faced Ibis, the documentation of a unique Sandhill Crane migration through the state, documenting the distribution of the Western Snowy Plover, and documenting the importance of rapidly disappearing bosque habitats to Phainopepla in southern Nevada. Areas of significant shorebird use, both migratory and nesting, were identified and established as primary wetland management concerns. The remaining old growth forest pockets on the Sierra Nevada were identified and actions were taken to preserve them primarily for wildlife habitat. An exhaustive study of the wildlife of the Humboldt River was completed in 1994, resulting in individual communication with every major landowner on the system regarding the value of the their lands as wildlife habitat. Since 1994, considerable effort has been expended in a cooperative effort to establish songbird point counts on Forest Service and BLM lands, especially focusing on riparian areas. These point counts are expected to provide the information upon which the next layer of wildlife management emphasis on public lands will be built.

In 1995, the Southwestern Willow Flycatcher was officially listed as "Endangered" under the federal Endangered Species Act. This galvanized a major effort to survey potential habitat, delineate population parameters, and devise recovery strategies. As a result, more is now known specifically about the Southwestern Willow Flycatcher than all but a handful of Nevada nongame birds.

In 1997, largely as a result of the PIF planning effort, the Great Basin Bird Observatory was formed with the expressed purpose of mustering a reliable, well-trained volunteer bird monitoring corps to implement many of the monitoring strategies of this plan. As its first major project, GBBO proposed to fund and conduct the Nevada Breeding Bird Atlas. This landmark project hopes to once and for all establish the baseline knowledge of the distribution of all of Nevada's breeding birds. The Atlas will almost undoubtedly become Nevada's premier bird reference upon which the success of this plan will heavily rely.

PRIORITIZING NEVADA'S BIRD SPECIES FOR ACTION

The prioritization process for bird conservation in Nevada is necessarily a complex one. With well over 400 species of birds using Nevada for at least part of their life cycle, and a diversity of bird habitats ranging from Mojave Desert Scrub at 400 feet above sea level to Alpine Tundra at over 13,000 feet, the collective needs of bird populations are overwhelming compared to the human resources currently available to process and integrate information. Put simply, some species that deserve attention risk "falling through the cracks" any time a Conservation Plan of this magnitude is attempted.

The process of triage by consensus as ultimately implemented by the Nevada Working Group (NWG) followed a long, convoluted, and largely untraceable trail. Faced with the task of trying to sift a manageable subset of species out of over 450 with practically no baseline monitoring data to consult, the Working Group's first reaction was expressed through the conclusions of Reed et.al. (1996), who went to great pains to register a distrust of numeric ranking systems. The NWG ultimately fell back to traditional Species of Concern lists developed in-state over the last two decades, and supplemented it with species primarily nominated for concerns over threats to their habitats. Over time, the Group's initial resistance to the PIF priority ranking system wore down. With gentle persistence, the Western States Coordinator urged the NWG to take the ranking criteria used by the Colorado Bird Observatory more into consideration in subsequent exercises. Species were added to the list, subtracted, added again, and considerable debate ensued until at last the present group of species solidified. Following are the criteria the NWG ultimately used to arrive at the priority list proposed in this plan. These criteria are quite varied, are not mutually exclusive, and are discussed in no particular order of priority.

CBO Total Score– The CBO Total Score was a numeric index formulated by the Colorado Bird Observatory using ranking factors similar but not identical to those typically used by numerous state Natural Heritage programs. For a detailed description and discussion of that ranking process, please consult Carter et.al. (1998). High scores in this category were taken into consideration by the NWG, but were not blindly followed. Some species that ranked moderately high on this list were later discounted by the NWG based on extenuating circumstances perceived within the state.

ESA - Species in this category are either listed in the Federal Register as Endangered or Threatened or a petition is pending regarding listing. Examples include the Southwestern Willow Flycatcher and Western Yellow-billed Cuckoo. Because Nevada plays such a small role in the overall world population health of its long-time listed raptors – the Bald Eagle and the Peregrine Falcon – these species were not considered automatic candidates for priority and ultimately failed to make the list.

Habitat Threat - There is demonstrable evidence of historic, ongoing and/or future threats to the nesting, migratory or wintering habitat for species in this category. Examples include winter roost losses for Black Rosy Finches, nest-cavity losses for Western Bluebirds, and migration corridor losses for Wilson's Warblers.

Importance of Area - Nevada provides a large percentage of the total nesting habitat available in the world for species in this category (as estimated in Carter et. al.1998). Examples include the Gray Flycatcher, Juniper Titmouse, Pinyon Jay, Prairie Falcon, Sage

Thrasher, and White-faced Ibis.

Low Numbers and/or Isolated Population - Geographical isolation of Nevada's nesting population and/or a low nesting population in the state gave reason to place birds in this category. Examples include the Bobolink, Greater Sandhill Crane, and Phainopepla.

Population Decline - There is evidence of population declines for species in this category. Examples include the Vesper Sparrow, Gray Vireo, and Snowy Plover. For documented evidence, the NWG relied heavily on BBS trend data generated for each of its four physiographic areas, even though BBS data specific to Nevada contributed little to the understanding of those trends. Reliable anecdotal observations were also considered when appropriate.

Uniquely Representative of a Habitat Type - Species in this category may have been selected simply because their habitat type was otherwise unrepresented. Some have demonstrated their ability to respond positively to well-defined habitat improvements in other states. One example is the Grace's Warbler, which effectively represents the coniferous forests of the Spring Mountains and Sheep Range in southern Nevada.

Umbrella Species – Management for a species in this category would also address the needs of a larger community of species. For instance, manage an aspen stand for Northern Goshawk nesting, and habitat elements for Mountain Bluebird, Northern Flicker, and a whole host of species which rely on old, large-diameter tree trunks for cavity formation are provided. Another term in common use for this concept is "indicator species", which has fallen out of favor among biologists in recent years. Regardless of the constantly shifting fads in term definition, the concept persists and is valid in certain circumstances. Rarely, such a species might qualify as a true "keystone species" – that is, a species upon which others in the community actually rely upon to provide key elements of their habitat needs. Examples include the Lewis's Woodpecker, Red-naped Sapsucker, and White-headed Woodpecker.

Unknown - The ecological needs, population densities, and/or distributions of species in this category are so intractable, that their mere obscurity raises a red flag. Examples include Bell's Vireo, Three-toed woodpecker, and Virginia's Warbler.

HABITAT TYPE: AGRICULTURAL LAND

General Description

The majority of Nevada's agricultural lands are located in valley bottoms and on river systems. Water is taken from streams and rivers or large, high volume wells. Crops are watered by either flood irrigation or sprinkler systems. Approximately 222,469 hectares (less than one percent) of Nevada is classified as irrigated land and an additional 2,481,624 hectares (less than nine percent) are recorded as irrigated pastureland.

Physical Characteristics

Agricultural crops are grown throughout Nevada, from 600 feet above sea level on the Fort Mohave Indian Reservation to over 7,500 feet in the northern latitudes. Precipitation

ranges from less than seven centimeters in the south to close to 38 cm at higher elevations in the north. Temperatures vary from -25 degrees Fahrenheit in the north, to over 110 degrees F in the south. Most agriculture crops are found in valley bottoms and on alluvial deposits.

Dominant Plant Species

Hay is the primary harvested crop, with over 196,000 hectares in production. Wheat is grown on 8,400 hectares, barley is identified as the major crop on 2,400 hectares, and potatoes are produced on over 3,200 hectares. Approximately 1,480 hectares are used for onion and garlic production. Associated vegetation varies with elevation and latitude. In the north, sagebrush communities and greasewood flats are often adjacent to agricultural lands. In the south, salt desert shrub, tamarisk, mesquite, and creosote are the most common matrix habitats in which agriculture is found.

Historic and Current Condition

The majority of Nevada's agricultural lands occur on bottom lands associated with Nevada's larger river floodplains. A wide variety of habitat types have been converted – from greasewood flats to cattail marshes. Sometimes the conversion resulted in an overall increase in wildlife productivity, such as when greasewood flats or Great Basin wildrye sites were converted. Other habitat conversions have not been beneficial overall to wildlife, such as when willows and buffaloberry thickets were removed, or when wetlands were dredged or filled during land planing to facilitate irrigation (prior to the Clean Water Act and its Section 404 requirements).
Active agricultural lands are relatively stable in the wildlife habitat values they provide, although those values may vary cyclically with the season. Irrigated alfalfa in the Lahontan Valley around Fallon provides the primary feeding site for a regional colony of White-faced Ibis that varies between 3,000 and 9,000 pairs. Their primary prey item on irrigated alfalfa is earthworms that come to the surface during inundation. Waste corn and wheat left on the ground after harvest is welcome sustenance to a wide array of waterfowl and Sandhill Cranes. In certain areas, alfalfa fields that lay fallow through the winter tend to build up with resident rodent populations, particularly voles and mice. These rodent concentrations attract a wide variety of wintering raptors, including Prairie Falcons, Ferruginous Hawks, Rough-legged Hawks, and Short-eared Owls. In agricultural areas around Mesquite in southern Nevada, runoff from agricultural fields support stands of cottonwood and willow suitable as nesting habitat for Southwestern Willow Flycatchers, Yellow-breasted Chats, and Bell's Vireos.

Farming practices that tolerate isolated cottonwood trees and weedy turnrows and fencerows are beneficial to the Swainson's Hawk, which nests in the isolated cottonwood trees and feeds on rodents along the weedy margins of active fields. "Clean-farming" practices that do not tolerate unproductive margins and tree thickets tend to reduce a property's value as wildlife habitat.

The greatest threat to the long-term productivity of Nevada's agricultural lands may turn out to be the increased pressure upon prime lands from residential and commercial development. As Nevada's population continues to grow, land prices will continue to grow as well. Simple economics will make it more difficult for a farmer to stay on his land in the face of increasingly lucrative offers to sell and subdivide. When prime farm land goes

under asphalt, it is likely out of production for decades. Most potential that land may have had as wildlife habitat has been effectively precluded for the duration. While efforts to make housing developments more "wildlife friendly" are commendable and worth continuing, the overall loss of land potential can never be completely mitigated. Societal trends will continue to pose difficult challenges with respect to the maintenance of Nevada's most productive parcels of land in the foreseeable future.

Opportunities

Stemming the tide of residential development on Nevada's agricultural lands would require aggressive local planning with concomitant stiff ordinances designed to preserve the productivity options of crop and pasture lands in the various counties. Because such an aggressive program might be construed to infringe unconstitutionally on a private property owner's rights, county governments have been reluctant to act, although many county governments claim to be sympathetic to the farmer's dilemma. Societal values will have to shift significantly before it will become palatable to take such drastic action, which is not likely in the near future, barring a national food crisis. In the meantime, there has been a significant shift in the approaches of agricultural extension services with regard to the maintenance of wildlife values on farm lands. Land consultation agencies such as the U.S. Natural Resources Conservation Service (NRCS, formerly known as the Soil Conservation Service), have taken a much more holistic tact in their assistance services in the last decade. Funds are much more readily available to assist landowners in wildlife habitat improvement projects through programs such as the Wildlife Habitat Incentives Program (WHIP) administered by NRCS, State of Nevada's Stewardship program administered by the Nevada Division of Forestry and the Partnerships In Wildlife program administered by the U.S. Fish and Wildlife Service. Projects designed to increase agricultural productivity are now evaluated with respect to their secondary benefits to wildlife or to their possible impacts with a serious measure of scrutiny. Agricultural productivity is now more likely to be achieved through measures aimed at the long-term maintenance of overall land health, rather than through measures designed to reap short-term gain in favor of long-term degradation. In addition, the whole methodology of negotiating conservation easements with landowners in Nevada has hardly been scratched to date, and should be more fully developed through this planning process.

As the Partners In Flight effort grows from species prioritization through initial planning into implementation, agencies such as the NRCS and university extension offices will become key elements in any successes which may be gained in the implementation of habitat conservation strategies on private lands. These are the professionals that landowners have historically trusted, they are knowledgeable of the economic and environmental challenges facing landowners, and it will become paramount for PIF state working groups all around the country to actively cultivate strong working relationships with these personnel to achieve the desired objectives.

Priority Bird Species

The following species have been prioritized for management attention by the Nevada Working Group. "Obligates" are species that are found only in the habitat type described in this section. "Others" are Priority Species that can be found in this habitat type, but use other habitat types as well.

Obligates

Agricultural lands are habitats that our native wildlife did not evolve with; therefore The Nevada Working Group chose not to designate any species as obligates because they may now prefer agricultural vegetation.

Other

Long-billed Curlew
Swainson's Hawk
Burrowing Owl
Greater Sandhill Crane
Short-eared Owl
Ferruginous Hawk
Bobolink

SPECIES PROFILE 1. AGRICULTURAL LANDS

BOBOLINK

Dolichonyx oryzivorus

Distribution

The Bobolink breeds from southeastern British Columbia and central Alberta east to Nova Scotia, south to northern California northern Utah, and northern Kansas east to New Jersey. In Nevada, the Bobolink's highest nesting densities have been observed in Elko County along the upper Humboldt River, the Snake River System (Goose Creek) and northern Ruby Valley. Smaller, isolated populations have been documented in Lander and Humboldt Counties on the main stem of the Humboldt River and the South Fork of the Little Humboldt River (Nevada Division of Wildlife 1989). Nevada's Bobolink nesting populations appear to be low wherever they occur. Bobolink winter in South America.

Habitat

In Nevada, the Bobolink prefers to nest on the ground in mesic hay meadow vegetation (grasses, forbs, *Carex spp.*, *Juncus spp.*; 100% understory and ground cover, no canopy). Birds are also seen roosting on sandbar willow (*Salix exigua),* hardstem bulrush (*Scirpus spp*) and cattail (*Typha spp.)* at edges (ecotones) of hay meadow habitats.

Physical Factors

Broad, mesic river valleys, with no or low gradient and with elevations of 5,200 to 6,500 feet are the preferred nesting habitat for the Bobolink in Nevada. The species is found nesting in flood-irrigated and naturally flooded meadows.

Landscape Factors

In Nevada, Bobolinks are found nesting in mesic grasslands inside a matrix of early and late successional wetland/riparian communities. Nesting densities appear to be highest in the more mesic river valleys and those valleys with an established mosaic pattern of native hay meadow, willow and bulrush/cattail oxbow marshes. Flooding is a natural yearly disturbance factor and one that maintains the productivity of nesting habitat.

Special Considerations

Most Bobolink populations (95%) in Nevada have been found on private land. River valleys, where wetland mosaics have been replaced by upland shrub and xeric grass communities, do not appear to support Bobolink populations. Early harvest of meadow hay may result in nest failure. Bobolinks arrive on their summer range in late May and early June. Incubation lasts 10-11 days and young fledge in 10-14 days. Females incubate. Both sexes assist in brooding and feeding young. Bobolink young eat insects primarily for the first few weeks. One brood per season is the norm. Most broods are off the nest by the end of June (Bent 1965). Bobolinks feed primarily on insects (57%) and seeds (43%).

Recent bird surveys on the Humboldt River in northeastern Nevada indicate an upward trend in Brown-headed Cowbird densities since 1982. Brood parasitism may therefore need to be studied further with regard to its potential impact to Bobolink populations (Nevada Division of Wildlife 1997).

Associated Species

Savannah Sparrow
Song Sparrow
Yellow Warbler
Sora
Marsh Wren

Priority Considerations

Nevada's isolated pockets of breeding Bobolinks represent the western extreme of the species' breeding range. Its preferred habitat, seasonally flooded natural meadow interspersed with willow, is a highly desirable habitat type for a diverse bird community. These habitats occur almost exclusively on private lands, and their long-term maintenance depend on landowners who recognize their overall productivity and are content to reap the benefits of grass hay production and late-season forage. These lands are perennially threatened by the attractiveness to convert to crop lands or by economic pressures that lead to improper grazing practices. Because of these threats, the Nevada Working Group has identified the Bobolink as one of its priority species.

OBJECTIVE: Maintain stable or increasing populations of Bobolinks in Nevada through 2004, with particular emphasis on the following sites: the Mary's River from Mary's River Ranch to Cabin Field; The Humboldt River from Deeth to Halleck; the Humboldt River through Battle Mountain; and the Little Humboldt from the Elko-Humboldt County line to Paradise Valley.

Strategy: Coordinate conservation efforts with private landowners in the targeted areas.

Action Inform landowners of Bobolink habitat requirements. Encourage the maintenance of natural hay meadows with an interspersion of mature willows and saturated soils well into June.

Action: Inform landowners of Bobolink natural history and breeding phenology. Request a voluntary delay in hay-cutting until July 1

whenever possible.

Action: Seek conservation easements with landowners involving management practices favorable to Bobolink population maintenance.

Action: In cooperation with NRCS, develop an informational document or brochure (or update an existing one) identifying the wildlife management strategies necessary for maintaining valuable wildlife habitats on private lands.

Assumptions - Research and Monitoring Needs

The Bobolink objective assumes that the present distribution of breeding Bobolinks is sufficient to ensure long-term survival of the species in Nevada. Monitoring by point count is already established for all priority sites. If long-term monitoring detects a downward trend at any of the sites, a population viability analysis should be initiated. Incidence of Brown-headed Cowbird parasitism on Bobolink nests should be documented.

Opportunities

In 1994, the Nevada Division of Wildlife completed a comprehensive study of the wildlife habitats on the Humboldt River and several of its major tributaries. Resultant from that study were a series of reports written as friendly communiques between NDOW and each major landowner on the study area. The objective of the study was to create a two-way line of communication that would heighten the awareness of the Humboldt's wildlife habitat values among its chief stewards while at the same time educating NDOW biologists about the unique challenges of managing floodplain lands for agricultural production. This exchange of ideas and information has at least introduced landowners and biologists to one another and has set the stage for the construction of long-term cooperative working relationships between them regarding wildlife habitat management on their private lands. Further strengthening of that partnership seems evident through the inclusion of the NRCS, the private landowner's chief land consultant.

The Mary's River site has recently been the subject of an enormous cooperative riparian restoration project that consolidated public holdings on the floodplain and initiated some rest from grazing. It is anticipated that restoration of the Mary's River to a productive condition will bode well for both Bobolinks and traditional land users. It is hoped that the recent cooperative discussion regarding the restoration of the Humboldt River floodplain habitats through Battle Mountain, including the Argenta Marsh project, will also produce habitat enhancement for the species.

Threats do not seem imminent on either the Deeth to Halleck site or the Little Humboldt site, but land values, economic conditions, and technological opportunities are always shifting. New uses for the lands could become too attractive to resist. A long-term monitoring project is in place for the Little Humboldt up and down stream from Chimney Reservoir to determine the impacts, if any, of the aquifer depletion potential of the Twin Creeks Mine. Personnel from Twin Creeks Mine have been enthusiastic partners in this effort, and will provide the watch for these valuable bird habitats in the near future.

Further Reading

NDOW 1989-94.

SPECIES PROFILE 2. AGRICULTURAL LANDS

SWAINSON'S HAWK
Buteo swainsoni

Distribution

Nests from central Alaska, northwest Mackenzie, Saskatchewan, Manitoba, western Minnesota south to Baja California, northcentral Mexico and southcentral Texas, rarely in Missouri and Illinois. Winters in South America to Argentina. Nevada: reported nester at Sheldon NWR, confirmed nester at Buffalo Creek Ranch near Gerlach, Washoe County; confirmed nester for all the following: Paradise Valley, Humboldt County; Dunphy Ranch, Reese River Valley, Lander County; Humboldt River, Elko County; Lovelock, Pershing County; Lahontan Valley, Churchill County; unspecified sites in Eureka County; Carson Valley, Douglas County; Smith Valley, Mason Valley, Lyon County; Ash Meadows and Big Smoky Valley, Nye County; common spring and fall migrant in Clark County.

Habitat

In Nevada, Swainson's Hawks reside in agricultural valleys interspersed with cottonwood trees or on river floodplains (Truckee, Humboldt, Little Humboldt) with cottonwood or buffaloberry overstory. An occasional pair is rarely found in high elevation aspen, cottonwood, or juniper stands, usually adjacent to meadow systems. Nests are often in isolated cottonwood trees, and can be situated anywhere from the primary crotch to the very outer limbs in the top of the canopy.

Physical Factors

Most pairs nest on valley floors between 3,000 and 4,500 feet elevation, but individual pairs range as high as 6,000 feet (Santa Rosa Range). Territories are typically flat and heavily developed toward agriculture.

Landscape Factors

In Nevada, the species persists where agriculture has improved site productivity through irrigation. Swainson's Hawks have demonstrated a tolerance to moderate suburban development, but will not persist when housing densities reach a point that distance traveled between nest tree and hunting areas is too great and too perilous (Larry Neel unpubl.). Being highly migratory, Swainson's Hawks arrive on their breeding grounds to encounter serious competition from year-round residents for nest sites and territories. Swainson's Hawks must establish themselves among resident Red-tailed Hawks, Common Ravens, Great Horned Owls, and in extreme conditions, even Canada Geese! Densities are less than 0.4 pair per square kilometer.

Special Considerations

Swainson's Hawks arrive at breeding territories around the first week of April. They build

their nest most often in a deciduous tree, and will use the same nest year after year. Typically, two eggs are laid in mid-April and are incubated for 28-35 days mostly by the female. Young leave the nest in about 30 days and may chase insects on the ground until able to fly at 42-44 days. Young stay with parents until fall migration. Huge migratory flocks build as birds move southward. Swainson's Hawks winter on the pampas of Argentina, relying heavily on grasshoppers and crickets for food.

Serious concerns were recently raised on the Swainson's Hawk's wintering grounds in Argentina where massive pesticide applications had induced catastrophic die-offs. International negotiations and education involving pesticide manufacturers seem to have had a positive effect. Shooting and live capture for pets are also serious in some parts of winter range. Conversion of agricultural lands to residential use has been cited as the cause of a local decline in nesting density in Carson Valley, Nevada.

Associated Species

Red-tailed Hawk
American Kestrel
Western Kingbird

Priority Considerations

Ridgway (1877) observed that the Swainson's Hawk was one of the most numerous hawks in Nevada. One would certainly not get that impression today. There was a significant decline in Swainson's Hawks in the Basin and Range physiographic region between 1966 and 1979 (18.5 percent; Sauer 1998) as monitored by the Breeding Bird Survey. An 8.5 percent increase was documented in the same region between 1980 and 1996. Populations are apparently static in the Columbian Plateau region. Local declines in northwestern Nevada were documented in the early 1980's (NDOW), but regular monitoring has not occurred since. Because declines have been documented in the recent past, and because there are many pressures upon its preferred habitat from suburban development, the Swainson's Hawk has been selected as a Priority Species by the Nevada Working Group.

OBJECTIVE: Maintain 150 breeding pairs of Swainson's Hawks in suitable habitats throughout its range in Nevada through 2004.

Strategy: Develop a private lands partnership program that highlights the habitat needs of Swainson's Hawks and implements cooperative conservation measures aimed at preserving and enhancing habitat.

Action: Maintain an interspersion of solitary mature cottonwood trees in agricultural valleys and along the Humboldt River floodplain. Provide enough alternate sites to allow for competition with resident tree nesters.

Action: Maintain mature buffaloberry component on broad floodplains such as the Little Humboldt, Humboldt, Walker, and Quinn River.

Action: Maintain open spaces and irrigated agricultural lands wherever

possible. Negotiate conservation easements when opportunities exist.

Action: Utilize habitat assistance programs such as the Nevada Stewardship Program to plant replacement cottonwood trees and buffaloberry thickets, ensuring viable nesting habitat for future generations of Swainson's Hawks.

Strategy: Monitor the primary and secondary effects of pesticide use on Swainson's Hawk health and productivity. Reduce impacts through partnerships with private landowners and government pest control agencies.

Action: Monitor productivity in areas where pesticide application is chronic.

Action: Continue to collect more information regarding the physiological effects of pesticides on birds, as well as monitor the effects of prey population reduction in areas of chronic ground squirrel control.

Action: Continue to review government pest control agency annual work plans to mitigate spraying proposals in the vicinity of known raptor nesting areas. Request no-spray buffer zones around active raptor nests, both documented and discovered during project activity.

Action: Support international negotiations aimed at preventing further catastrophic losses of Swainson's Hawks to pesticides on their wintering grounds.

Assumptions - Research and Monitoring Needs

The Swainson's Hawk objective assumes that the 150 breeding pair estimate reported in Herron (1985) is reasonable and achievable. Periodic monitoring of Swainson's Hawk nesting activity is needed, and an estimate based on new data derived. Regardless of the 1972 ban of the use of DDT in the United States, many questions pertaining to the impacts of chronic pesticide application on nesting raptors remain unanswered. The effects of rodent control in certain agricultural areas on raptor productivity should be documented and better understood.

Opportunities

The maintenance of Swainson's Hawk nest tree availability gives conservationists a unique opportunity to involve volunteers, agencies, and private landowners in a shared stakeholdership where recruitment trees can be provided through the Nevada Stewardship Program and planted by volunteers on lands volunteered by their owners. Local volunteer monitoring of Swainson's Hawk territory occupation can be encouraged through media distribution of Swainson's Hawk facts and management objectives.

Further Reading

Herron 1985
Schmutz 1987
Sharp 1986

SPECIES PROFILE 3. AGRICULTURAL LANDS

GREATER SANDHILL CRANE
Grus canadensis tabida

Distribution

Several sub-populations of Greater Sandhill Cranes breed from extreme southeastern British Columbia south through eastern Washington, Idaho, eastern Oregon and eastern Nevada, east through northern Utah to southwestern Wyoming. In Nevada, the Greater Sandhill Crane breeds in the lower river valleys and interior basins of the northeastern and east-central regions of the state. Approximately 90% of nesting crane pairs are found in Elko County (Rawlings 1990) with additional nesting pairs in White Pine, Eureka, Lander, northern Lincoln and Nye, and eastern Humboldt counties (NDOW 1993). Nesting pairs of greater sandhill cranes in southern Idaho and northwestern Utah are also thought to be part of this breeding population (USFWS 1995).

This population of Sandhill Cranes winters in the lower Colorado River valley (LCRV) of southern California, western Arizona and northern Sonora and Baja, Mexico. The LCRV population of Greater Sandhill Cranes is the least numerous of the five identified populations of the subspecies *G.c.tabida* in North America (Drewien 1995).

Habitat

In Nevada, the Greater Sandhill Crane prefers to nest in hay meadow complexes generally where there is a mosaic of native hay [Timothy (*Phleum alpinum*) etc], emergent hardstem bulrush (*Scurpus spp.*), and willow (*Salix spp.*) vegetation of various age classes and structures. Cranes have also been documented nesting in flooded greasewood (*Sarcobatus spp.*) and Great Basin wildrye (*Elymus cinerius*).

Physical Factors

Greater Sandhill Cranes prefer to nest and roost in large relatively flat river valley floodplains (i.e. Humboldt River, Owyhee River), and closed interior basins (i.e., Ruby Valley, Newark Valley) from 4,400 to 7,000 feet elevation. They prefer to nest on islands or peninsulas adjacent to marsh vegetation but will also nest on river islands, river banks, and in large expanses of flooded meadow and alkali playa (NDOW 1989). Cranes prefer freshwater marshes and streams to alkaline or saline sites (Ryser 1985).

Landscape Factors

Floodplains and basins suitable for crane nesting are distributed throughout northeastern and central Nevada but are often separated by six to 60 km of unsuitable shrub steppe foothills, large mountain ranges, and/or riparian areas in poor condition. In Idaho, Drewien (1974) reported average size of five territories as 16.8 hectares.

Special Considerations

Cranes become reproductively active at 3 to 4 years old (Ryser 1985). Pair bonds are for life and wild birds can live for approximately 27 years. Birds arrive on breeding grounds

in March. Average clutch size is 2, but often 1 egg is laid. Incubation time is 30 days and fledging time is 60 days (Johnsgard 1983).

Greater Sandhill Cranes are omnivorous. During the nesting season, cranes consume roots, grain, small mammals, small birds, frogs, toads, snakes, crayfish, fish, worms and numerous species of insects including grasshoppers, crickets and beetles (Ryser 1985; Bent 1963). During spring and fall migrations cranes congregate in large flocks and generally shift to a diet of primarily waste grain and insects.

In 1988, there were approximately 1,800 to 2,000 cranes in the LCRV population segment that passes through Nevada (Rawlings 1990). Breeding range surveys in 1993 found total crane numbers down 33% from 1983. However, breeding pair numbers were up 40% for those areas where numbers were available for both 1983 and 1993 (NDOW 1993). The total crane population probably declined from 1983 to 1993 and then began a slow rebound in the mid 1990's. An 8.8% recruitment on wintering grounds was reported in Arizona in 1996/97 (Smith 1996).

The majority of crane nesting habitat is on private land. Loss or conversion of wet meadow/marsh/willow habitat complexes could lead to nesting population declines. Loss of migration/staging area foraging sites could result in increased over-winter mortality. Loss of quantity and/or quality of wintering grounds could be a significant population limiting factor. Nest predation could be a population limiting factor in select sites where residual ground cover has been removed by overgrazing and/or predator populations are at high levels. Recruitment censusing of cranes can give distorted results due to the varying cohorts of non-reproductive sub-adults in any population.

Associated Species

Sora	Common Snipe
Savannah Sparrow	Wilson's Phalarope

OBJECTIVE: Increase the number of Sandhill Crane breeding pairs in Nevada from 85 to 100 by 2010.

Strategy: Incorporate Sandhill Crane management strategies into existing or new private lands consultation programs for the purpose of maintaining or increasing the numbers of Sandhill Crane breeding pairs on private lands in the five priority areas: Ruby Valley; Humboldt, Starr, and Secret Valleys; Independence Valley; South Fork of the Owyhee River; Huntington Valley; and Spring Valley (White Pine County).

Action: Encourage the maintenance of residual vegetative cover into nesting areas through the breeding season. Encourage landowners, through incentives and conservation easements if necessary, to keep meadows wet through July, closely control, limit or restrict livestock grazing on nesting areas through the nesting period, and postpone mowing until August.

Action: Create a Sandhill Crane Nest Register that identifies lands, both public and private, that harbor nesting pairs. Organize affected landowners into a task force to investigate cooperative strategies to maximize Sandhill Crane production – i.e., nest protection from predation, livestock grazing deferrals during the nesting season, irrigation strategies, etc.

Strategy: Create nesting habitat for ten nesting pairs of Sandhill Cranes in the Humboldt River floodplain from Beowawe to Valmy.

Action: Provide the same incentives and services to landowners listed above.

Action: Participate in the cooperative efforts to restore the Argenta Marsh and other associated projects in the Battle Mountain area.

OBJECTIVE: Maintain or increase the total summering Sandhill Crane populations in five priority areas through 2004: Ruby Valley, Independence Valley, Humboldt, Starr, and Secret Valleys, Huntington Valley, and Spring Valley.

Strategy: Maintain or improve migratory staging areas such as White River Valley (Lund) as well as feeding and loafing habitats on the breeding grounds.

Action: Through incentives or conservation easements, encourage conservation plantings of grain crops for staging and breeding Sandhill Cranes, on private lands, state wildlife management areas, and National Wildlife Refuges.

Action: Encourage late plowing of harvested fields with significant residual grain on the ground until after Sandhill Cranes have moved through.

Strategy: Increase the economic value of Sandhill Cranes to rural communities and businesses by encouraging more nonconsumptive interest in Sandhill Crane staging and summering sites.

Action: Through a variety of media, including television, newspapers, and magazines, promote staging areas such as White River Valley as “adventure destinations” that combine Sandhill Crane viewing with other birding opportunities as well as other local sightseeing and historical study opportunities. Promote weekend trips that patronize local restaurants and motels.

Assumptions - Research and Monitoring Needs

The Sandhill Crane objectives assume that the potential exists to increase breeding pair and summering population numbers. Research may be necessary to document the rate of nest failure to predation. Monitoring should continue on a five-year interval in all priority areas. Helicopter survey has proven the most successful and time-effective method of nesting pair survey.

Opportunities

Several creative approaches to engendering public interest in Nevada's Sandhill Crane resource have been suggested in the strategies and actions above. The key to succeeding in any of these efforts will rest in the positive belief of biologists and conservationists that landowners and birdwatchers can be galvanized into action to implement specific management strategies to benefit Sandhill Cranes. By its sheer size, presence, and vocal resonance, the Sandhill Crane maintains a high charismatic attraction to itself among everyone but the hardest-bitten anti-naturalists. Just being around cranes evokes in most people a thrumming deep inside of yearnings and signals from an epoch long past – a living link to a time of simplicity and purity now repressed and relegated only to our genetic memories. This "hard wire to the soul" is the key to success in effecting creative Sandhill Crane management strategies in Nevada, and advocates should not be bashful or ashamed to put its power to good use. Midwestern states such as Kansas and Nebraska have been successful developing the charismatic power of Sandhill Cranes into effective conservation action, albeit with a resource several magnitudes greater than Nevada's; but Nevadans need not travel all the way to Nebraska to enjoy tapping into the same regenerative, primeval energy. Cranes are cranes wherever they may be found – each local population lends its grace to its landscape in its own unique way.

Further Reading

Drewein 1974
Rawlings 1990
USFWS 1995

SPECIES PROFILE 4. AGRICULTURAL LANDS

LONG-BILLED CURLEW
Numenius americanus

WHITE-FACED IBIS
Plegadis chihi

The Long-billed Curlew and the White-faced Ibis utilize irrigated agricultural lands extensively for foraging during the breeding season as well as during migration. Inundated earthworm beds and displaced terrestrial insects are the chief prey, and may account for up to 100 percent of the diet White-faced Ibis parents feed to their nestlings (Bray 1988). Both species nest in Nevada, but mostly in habitats other than agricultural lands. Objectives and strategies for the maintenance of breeding habitat for these species are outlined under the appropriate habitats elsewhere in the document. In the interest of economy and avoidance of repetition, the complete species profiles are located with their breeding habitat objectives and will not be repeated here. For a species profile for both species, please refer to the Wetlands habitat section.

Associated Species

Killdeer	Snowy Egret
Ring-billed Gull	Great Egret
California Gull	Cattle Egret

Priority Considerations

The Long-billed Curlew continues to be a species of elevated national concern, although trends seem to be static in the Basin and Range and Columbian Plateau provinces. The Basin and Range and Columbia Plateau regions combined account for over 73 percent of the world's White-faced Ibis population. Nevada harbors one of the major Great Basin White-faced Ibis nesting complexes, which attaches a high responsibility for the population viability of the species on our state. For these reasons, the Nevada Working Group has chosen to focus priority efforts on the summer foraging habitats for these two species.

OBJECTIVE: Maintain irrigated crop and pasture areas sufficient to supplement natural foraging habitats in supporting 5,000 nesting pairs of White-faced Ibis in northern Nevada through 2004.

Strategy: Maintain foraging habitat for 4,000 nesting pairs of White-faced Ibis in Lahontan Valley, Nevada; maintain foraging habitat for an additional 1,000 nesting pairs at the sites of various satellite colonies distributed through Washoe, Douglas, Lyon, Humboldt, Lander, and Elko Counties.

Action: Monitor the consequences of the transfer of water rights from agricultural lands of willing sellers to wetland use. Monitor White-faced Ibis feeding strategies in both agricultural and wetland foraging areas.

Action: Ensure that water being transferred from agricultural lands to wetlands is being deployed in a manner sufficient to compensate for the loss of agricultural foraging areas.

Action: Encourage the maintenance of irrigated crop and pasture lands in preference to residential or commercial development on lands not specifically purchased for the transfer of water rights to wetlands.

Action: Participate in the cooperative efforts to restore the Argenta Marsh and other associated projects in the Battle Mountain area.

Objective: Maintain current breeding distribution and densities for Long-billed Curlews in northern and central Nevada through 2004.

Strategy: Foraging areas provided by irrigated crop and pasture lands as identified for White-faced Ibis will be presumed sufficient to the needs of the bulk of Nevada's breeding Long-billed Curlew population. Actions pertinent to the implementation of this strategy are the same as above.

Strategy: Encourage the management of irrigated pasture lands with a sensitivity toward the needs of breeding Long-billed Curlews.

Action: In appropriate areas, graze pastures down to stubble heights less than 20 cm (eight inches), with scattered patches of residual

vegetation greater than for the duration of nesting and brooding (May 1 to July 15). This allows for general freedom of movement of adults with their extremely long bills, while also providing escape cover for broods.

Assumptions - Research and Monitoring Needs

The White-faced Ibis and Long-billed Curlew objectives assume that the maintenance of irrigated crop and pasture lands sufficient to maintain 5,000 nesting pairs of White-faced Ibis will also be sufficient to meet the foraging needs of the bulk of Nevada's Long-billed Curlew breeding population. Further study on the incidence of significant Long-billed Curlew breeding sites that are not also significant White-faced Ibis foraging sites may be required.

The figure of "5,000 nesting pairs" is derived primarily from U. S. Fish and Wildlife Service population objectives outlined in the Management Guidelines for the Great Basin Population (Sharp 1985) which targets 3,000 nesting pairs for Carson Lake and 1,000 nesting pairs for Stillwater NWR in Lahontan Valley. It is assumed that an additional 1,000 nesting pairs can be maintained at other sites with historic White-faced Ibis colonies over the long-term. These alternative sites include Ruby Lakes NWR, Humboldt Wildlife Management Area (Humboldt Sink), and Quinn Lakes in northern Humboldt County. The Humboldt WMA colony alone has been as high as 1,400 nesting pairs since 1995. The other two sites have a long-term potential of 300-400 nesting pairs.

The White-faced Ibis objective assumes that irrigated crop and pasture lands retired from production through the sale of water rights by willing sellers to the State of Nevada or the federal government for the purposes of transferring the water to wetlands will have their foraging values compensated for in the creation of new wetland habitats on state and federal wildlife management refuges. This assumption needs validation. Some water rights transfers for wildlife purposes might be considered detrimental overall to White-faced Ibis population maintenance; specifically, those transfers from irrigated crop and pasture lands to deep-water habitats in reservoirs or terminal lakes rather than shallow-water wetlands. These tradeoffs should be closely monitored, quantified, and mitigated if necessary.

Opportunities

Unfortunately, the maintenance of irrigated crop and pasture lands in the immediate future will be largely controlled by the vagaries of agricultural product prices and land values. The pressures of an expanding suburban population upon land values have already been duly identified and marked for further monitoring. The purchase of water rights from willing sellers has always been viewed by wildlife managers and advocates as favorable to wildlife and should continue to be so viewed; however, the foraging needs of White-faced Ibis, Long-billed Curlews, and other species which frequent the flooded fields must not be ignored. Care must be taken that alternative uses of water for wildlife are providing acceptable alternatives to the foraging habitat being lost.

Further Reading

Bray 1987

Jenni 1982
USDI 1996

SPECIES PROFILE 5. AGRICULTURAL LANDS

FERRUGINOUS HAWK
Buteo regalis

PRAIRIE FALCON
Falco mexicanus

SHORT-EARED OWL
Asio flammeus

The Ferruginous Hawk, Prairie Falcon, and Short-eared Owl all utilize agricultural lands in Nevada as wintering habitats. All three species also breed in Nevada, primarily in other habitats. Objectives and strategies for the maintenance of breeding habitat for these species are outlined under the appropriate habitats elsewhere in the document. In the interest of economy and avoidance of repetition, the complete species profiles are located with their breeding habitat objectives and will not be repeated here. For a species profile of Ferruginous Hawk refer to the Sagebrush habitat section. For Prairie Falcon, refer to Cliffs and Talus. For Short-eared Owl, refer to Montane Parkland.

Associated Species

Red-tailed Hawk
Rough-legged Hawk (winter)
Great Horned Owl
Long-eared Owl

Priority Considerations

The Ferruginous Hawk has experienced documented declines in many portions of the Midwest and maintains a high national priority ranking (Carter 1998), although populations in the Basin and Range and Columbian Plateau provinces seems to be static. Prairie Falcons have exhibited a significant decline in the Basin and Range province between 1980 and 1996 as reported by Breeding Bird Survey data analysis
(-13.2 percent; $p = 0.01$). The Basin and Range province is estimated to harbor 28 percent of the world population of Prairie Falcons; therefore the responsibility of Nevada to maintain Prairie Falcon population viability is high. Short-eared Owls exhibit widely fluctuating population trends that are influenced heavily by local microtine rodent abundance. Their presence in Nevada is highly local, but it reflects habitat health that is also beneficial for a diverse community of associate species. For these reasons, the Nevada Working Group has chosen to focus priority efforts on the winter populations of these three raptor species.

OBJECTIVE: Maintain present distribution and abundance of wintering Ferruginous Hawks, Prairie Falcons, and Short-eared Owls throughout the agricultural areas of Nevada through 2004.

Strategy: Develop a set of guidelines with specific recommendations regarding viable "raptor-friendly" alternatives to "clean-farming" practices, while respecting a landowner's need to integrate wildlife objectives with other agricultural objectives, i.e., noxious weed control, fire hazard, water transport, etc.

Action: Encourage landowners to leave live trees, snags, defunct power poles, fence posts, etc. for raptor perches whenever possible.

Action: Encourage landowners to leave property corners, fence rows, and drain ditches in native habitats conducive to harboring prey populations for raptors.

Action: Develop a species list of native plants that could be planted to combat the proliferation of noxious weeds on fallow or non-cultivated fields and patches.

Strategy: Periodically monitor winter raptor populations and pertinent losses of wintering agricultural habitat.

Action: Continue triennial midwinter raptor counts in northeastern Nevada.

Action: Recruit volunteers to conduct periodic winter raptor surveys, both on established and new routes wherever needed.

Action: Incorporate winter raptor surveys into Audubon Society winter field trips.

Action: Support and participate in Christmas Bird Counts and regularly analyze CBC data for trends.

Strategy: Promote the nonconsumptive recreational values of Nevada's winter raptor populations, particularly in areas with underdeveloped tourist economies.

Action: Promote significant raptor wintering areas like Lovelock Valley and Diamond Valley near Eureka as "wildlife adventure destinations". Assist local Chambers of Commerce in promotional activities.

Action: Promote weekend trips to Nevada's rural communities, combining winter raptor watching with other local sightseeing interests, patronizing local restaurants, motels, and service stations.

Assumptions - Research and Monitoring Needs

The objective for Ferruginous Hawk, Prairie Falcon, and Short-eared Owl assumes that present distribution and abundance are reflective of healthy, self-sustaining hemispheric populations, and that significant losses will not occur due to conversion of agricultural

habitats to suburban development. Periodic monitoring of wintering raptors performs the double duty of indirectly monitoring habitat change.

Opportunities

The presence of several wildlife habitat assistance programs like WHIP, Stewardship, and Partnerships In Wildlife should make the maintenance of raptor perches and foraging patches on wintering grounds a relatively simple matter. The long-term maintenance of agricultural lands in the face of rapid suburban development will be a great challenge that will require societal changes mostly beyond any entity's control, but the issue must be identified and its seriousness evaluated in the immediate future.

The Great Basin Bird Observatory is actively recruiting a volunteer monitoring corps capable of filling a wide array of survey needs, including winter raptor monitoring. The Lahontan and Red Rock Audubon Societies have the opportunity to combine fun with "science" by combining one or more winter field trips with a winter raptor survey route. Potential exists to facilitate with one or more rural communities the promotion of local winter raptor concentrations for nonconsumptive recreational purposes. A weekend "festival" in the dead of January dedicated to observing and learning about raptors might even be a possibility.

SPECIES PROFILE 6. AGRICULTURAL LANDS

BURROWING OWL
Athene cunicularia

The Burrowing Owl often breeds around the fringes of agricultural lands and use crop and pasture lands for foraging through the breeding season. Burrowing Owls winter over irregularly depending on the severity of the winter. For management objectives and strategies for wintering raptors, see above. While the Burrowing Owl is profiled in the Salt Desert Scrub habitat section, specific objectives and strategies were deemed necessary for agricultural lands.

OBJECTIVE: Stabilize or increase Burrowing Owl breeding populations in Nevada by 2004.

Strategy: Encourage farmers to leave undisturbed wildlife habitats around the margins of their lands in production. Leave drain ditches unburned, and ditch banks and turnrows undisturbed.

Action: Inform farmers and ranchers through NRCS and University Extension programs of the ancillary benefits of undisturbed margins as wildlife habitat.

Action: Investigate the feasibility of securing crop margin habitat through incentives and conservation easements.

Action: Initiate a Burrowing Owl artificial burrow program on agricultural lands as a 4-H Club or Scouting activity.

Action: Discourage the indiscriminate use of insecticides and rodenticides around agricultural zones. Promote the advantages of pest control through maintenance of high raptor populations around crop and pasture lands.

Assumptions - Research and Monitoring Needs

The Burrowing Owl objective assumes that populations can be stabilized or increased by combining actions on agricultural lands with management actions to benefit the species in other habitats where they are found. The extent to which Burrowing Owls depend on agricultural lands for population viability should be quantified. Surveys for Burrowing Owls should be initiated to supplement BBS data, particularly in the Mojave Desert region.

Opportunities

The key to developing good working relationships with farmers and ranchers lies in the integration of wildlife objectives and strategies into NRCS and University Extension consultation programs. As farm lands come under increasing pressure from suburban development, incentives and easements may become necessary to keep Nevada's prime lands open and undeveloped.

Burrowing Owls lend themselves quite well to population manipulation through artificial nest construction. Scout troops and 4-H clubs are the natural programs through which to implement such activities.

Further Reading

Coloumbe 1971
Thomsen 1971
Zarn 1974

HABITAT MANAGEMENT SUMMARY - AGRICULTURAL LANDS

The primary strategy for implementing this plan's objectives and strategies on agricultural lands will be to maintain an honest, progressive dialogue with farmers and ranchers. Management of private lands for wildlife must be compatible with the agricultural goals of the property owner. Cooperative efforts with landowners should be the primary method for maintaining or increasing wildlife species and numbers. Through accordant management approaches, the fundamental goal should be to maintain or create as much vegetative diversity as possible, especially in areas that are difficult to produce crops (e.g., sharp angle field corners, deep swales, ditch banks and fence lines). Existing midstory vegetation such as willows, rose, buffaloberry and big sagebrush should be maintained, and landowners should be encouraged to allow this vegetative component to increase, especially when it is compatible with agricultural goals. Although much of the upper story vegetation consists of native plants, many species (e.g., elm, Russian olive and locust trees) are not endemic to Nevada's agricultural lands, and often help support a greater

diversity of wildlife than was present prior to agricultural development. Landowners will be encouraged to maintain existing trees, and plant trees, on field borders and property lines. Both midstory and upperstory vegetation supports nesting populations of raptors and passerines. Bobolinks, Norther Harriers, Short-eared Owls, and Sandhill Cranes are included in the long list of birds that depend on understory vegetation for nesting and feeding.

To protect and improve habitat for birds that prefer meadows for nesting (e.g., Sandhill Cranes and Bobolinks) agricultural managers will be encouraged to keep meadows wet through July, delay mowing into August, limit or remove growing-season livestock grazing, remove unnecessary fencing, and discourage riparian habitat conversion. The use of insecticides and herbicides on or adjacent to flood plains where Sandhill Crane, Short-eared Owl, Northern Harrier, and Bobolink nesting occurs should be discouraged. Innovative approaches, including conservation easements and landowner conservation cooperatives, will be pursued to involve landowners in wildlife conservation and habitat landscape planning and design as much as possible.

HABITAT TYPE: ASPEN

General Description

Aspen (*Populus tremuloides*) is one of the most widely distributed tree species in North America (Perala 1990). In the western United States, aspen may form extensive stands which occupy a considerable area within a drainage or its distribution may be more limited and is expressed as riparian stringers or disjunct patches. As a general rule, the latter is more characteristic in Nevada – exceptions include extensive aspen stands in the Snake, Schell Creek, White Pine, Jarbidge, Independence, and Monitor Ranges, as well as the Santa Rosa and Ruby Mountains. Scattered stands occur as far south as the Spring Mountains near Las Vegas and in the adjacent Sheep Range (Lanner 1984). The Nevada GAP reports 122,070 hectares of aspen in Nevada, likely a serious underestimation.

Physical Characteristics

Within the Great Basin, aspen generally occupies elevations between 6.000 and 8,000 feet (Lanner 1984). Aspen stands are found on all aspects and grow where soil moisture is not a limiting factor. The variety of sites aspen will occupy include moist stream bottoms, ridgelines, talus slopes, and shallow to deep soils of varied origin (Mueggler 1984). Soils which are most conducive to aspen are well drained, loamy, and high in organic matter, calcium, magnesium, potassium, and nitrogen. Stands are found on soils derived from a wide range of parent materials including basalt, calcareous shale and limestone. The poorest sites are those of granitic origin (Perala 1990).

Climatic conditions vary greatly over the range which aspen occupies in the western United States. Most aspen areas receive at least 38 cm of precipitation per year (Jones and Debyle 1985). Within the semiarid climate of the interior West, aspen distribution appears to be limited by water availability to satisfy the heavy evapotranspirational demands of the species rather than any discernible temperature extreme or average.

Aspen is clonal, growing not as random individual trees, but rather sprouting from a common parent root system. While they are prolific seed producers, reproduction by seed is rare in the Intermountain Region. Some botanists believe the aspen clones alive today were established from seed during the last Ice Age about ten thousand years ago when climatic conditions were consistently wet and suitable for seedling establishment (Perala 1990). The above-ground expression of the tree has a relatively short lifespan – 50 to 200 years – but the clonal root system may be among the oldest organisms on earth, possibly surpassing even the oldest giant sequoia. Disturbance events such as fire or clearcutting of aspen groves stimulate the root system to produce suckers, effectively perpetuating aspen on the site. Stand decline has been attributed to the lack of disturbance, especially where aspen is seral to coniferous forest.

Aspen is typically shade intolerant and as such commonly grows in even-aged stands; however, all-aged stands do occur and are more common than expected (Jones and Debyle 1985). When found in association with coniferous species, aspen frequently represents a seral stage that progresses toward coniferous dominance without disturbance. Climax aspen communities which persist at a site for several centuries without appreciable change also occur throughout the West (Mueggler 1984). At upper

elevations, aspen often assumes a short, shrubby growth form in snowpockets or avalanche chutes, where it may form extensive stands.

Aspen communities can be multi-layered. Where present, tall shrubs form an open and intermittent layer from six to twelve feet. Shorter shrubs and tall herbs frequently form a more continuous layer at about three feet. A lower layer of herbs is a typical part of the understory.

Dominant Plant Species

Some aspen communities consist of only a tree layer and a low herbaceous layer of forbs and grasses. More commonly, a medium shrub or tall forb layer is also present (Mueggler 1984). Upland stands in Nevada frequently contain snowberry (*Symphoricarpos spp.*) and currant (*Ribes spp.*). Common forbs in aspen stands include meadow-rue (*Thalictrum spp.*), yarrow (*Achillea spp.*), *Hackelia*, *Aster*, *Angelica*, columbine (*Aquilegia spp.*), lupine (*Lupinus spp.*), and larkspur (*Delphinium spp.*).

Historic and Current Conditions

Aspen has persisted as a permanent type over much of its Nevada range (Perala 1990), particularly where shade-tolerant conifers are absent. In forested range such as is found on the east slope of the Sierra Nevada, the Jarbidge Mountains, and the Snake Range, aspen is often seral to coniferous forests, which eventually take over an aspen site, sometimes as quickly as in a single generation. Historically, fire acted as an agent of change, releasing sites from conifer and large-tree dominance, opening up the site to clone regeneration. Where beaver were present, their activities could have severely altered local landscapes. They cut mature trees, releasing the regenerative capacities of the clone. Their dams kept water tables high and provided site protection from hot fires. Wild ungulate grazing was mostly light and widely distributed, with winter yarding usually occurring at lower elevations outside the aspen belt. With its thin bark offering less than the best protection, aspen was naturally susceptible to the periodic ravages of insects, rusts, and diseases, all of which contributed to a rather dynamic system of turnover and change.

With the advent of European settlers, all these processes changed. Beaver were trapped out of their historical range. Many sites were subjected to severe livestock grazing which changed the understory composition and stand structure of aspen habitat. After 1920, fire suppression allowed conifers to invade and dominate aspen sites where the two coexisted, resulting in an overall decline in aspen area. Summer recreation was naturally drawn toward the cool, inviting aspen groves, and in places, camping and recreational vehicle activity compacted soils, removed the dead wood component, introduced and facilitated the growth of exotic weeds and grasses, and initiated erosional events that changed the hydrology and character of the site. In localized areas, mining activities, particularly ore removal on a landscape scale, removed aspen stands altogether with little chance of reclamation to original site conditions.

Opportunities For Conservation

Although localized grazing impacts are still evident in many aspen sites, significant strides toward the sustainable management of grazing within the capability of the landscape have

been taken in the last thirty years. Land managers have better understanding of the role of fire in the maintenance of aspen on a landscape, and are less and less squeamish about deploying it where improvements can be projected and achieved. Although there is increasing understanding about the natural dynamics of aspen ecosystems, there also persists a certain reluctance on the part of land managers to reintroduce the perturbations of beaver back into historical range. Understanding that a system's historical rhythms operated on a much wider amplitude does not necessarily negate our predilection for order, stability, and change within narrower waves of perturbation. Still, there is discussion in some management circles of the merits and liabilities of the reintroduction of beaver into historic range.

Because the attentions of so many user groups are focused on aspen stands, the land manager's job is complicated and often thankless. All these issues are relevant to the land use planning processes deployed by the various land management agencies. The bird conservationist still has no better forum in which to advocate habitat improvement for migratory birds. Getting involved, staying engaged, and following through will continue to challenge the bird advocate's stamina, resources, and wits; yet there seems little alternative to truly affect long-term change.

Priority Bird Species

The following species have been prioritized for management attention by the Nevada Working Group. "Obligates" are species that are found only in the habitat type described in this section. "Others" are Priority Species that can be found in this habitat type, but use other habitat types as well.

Obligates

Since the distinction has been made in this document between aspen habitats and montane riparian habitats which may include aspen, it is not possible to consider any of the Nevada Working Group's priority species as obligates of aspen, since many or all can also be found in montane riparian habitats.

Other

Northern Goshawk
Calliope Hummingbird
Flammulated Owl
Lewis's Woodpecker
Red-naped Sapsucker
Mountain Bluebird
Orange-crowned Warbler
Yellow Warbler
MacGillivray's Warbler
Wilson's Warbler

SPECIES PROFILE 1. ASPEN

NORTHERN GOSHAWK
Accipiter gentilis

Distribution

The Northern Goshawk is holarctic in distribution. In North America, it occurs from the tree line in northern Alaska and Canada south through the Cascades, Sierra Nevada, and the

Rocky Mountains to northern Mexico; east to the Black Hills of South Dakota, the Great Lakes states, and the northern Appalachians.

In Nevada, the Northern Goshawk nests in the Spring Mountains of Clark County, north through the mountain ranges of central Nevada, west to the Carson Range in Douglas, Carson City, and Washoe Counties, northeast to the Santa Rosa Mountains of Humboldt County, east to the Snake Range in White Pine County, and north through the Ruby Mountains and East Humboldt Range to the Jarbidge Mountains. Although the species is distributed throughout the state, it is confined to the higher elevations during the nesting season where environmental conditions allow trees to grow. After the nesting season (mid-March to late August) the goshawk may remain in the nesting habitat, wander to lower elevations, or migrate away from Nevada as indicated by band recoveries during the Boise State University population study and at Hawkwatch International's migration monitoring site on the Goshute Mountains.

Habitat

Typical goshawk habitat in Nevada is aspen for nesting and foraging and adjacent vegetation for foraging. Aspen occurs in naturally fragmented stands surrounded by a shrubsteppe or mountain brush community. Aspen is typically limited to riparian areas and adjacent slopes retaining sufficient soil moisture. All goshawks in the Boise State University study nested in aspen between 6,070 and 8,530 feet elevation. Nests were found in stands ranging in size from less than 0.8 hectare to more than 200 hectares. Nests occurred in stands consisting of mature trees averaging 60 years of age with a closed canopy and little understory cover. Nests were usually located within 100 meters of water and most were in north or east-facing stands with slopes ranging from 4 to 39 percent. Nests were usually 35 to 50 feet off the ground and located in the tree crotch below the upper canopy. Several alternate nests may occur within the same stand. Usually, occupancy was limited to one pair per drainage. In the Sierra Nevada, nests also regularly occur in mixed conifer habitats. One nest in the White Pine range in eastern Nevada was located in a pinyon pine in a narrow pinyon/cottonwood stand.

Physical Factors

In Nevada, Northern Goshawks are generally found between 6,000 and 10,000 feet elevation. Sites must be capable of producing trees, either aspen or montane conifers. Effects of slope, aspect, and topography are otherwise unknown.

Landscape Factors

Statewide surveys documented 152 occupied goshawk sites between 1974 and 1983. Biologists conservatively estimate 300 nest sites statewide. Population density was estimated at three pairs per 100 square km for the Independence and Bull Run Mountains during the Boise State University study, and population trend was deemed to be stable. Home range information is limited and variable by individuals, habitat, and year. For instance, one adult male in 1993 had a home range of 1,140 hectares. The same male in 1995 at a different territory had a home range of just 216 hectares. One adult female occupied a home range of 412 hectares.

Special Considerations

The BSU study reported an average of 2.0 young/pair which is comparable to the 2.2 figure reported by NDOW. Breeding adults occupied nest areas an average of 3.5 out of six years. Those nest areas occupied over several consecutive years generally had the highest productivity. Eight territories were occupied six out of six years and 40 percent were occupied for either five or six years. Reoccupancy rates for historical nest sites was 80 percent. Mate fidelity was 62 percent for males and 59 percent for females when paired with the same mate two years or more.

Courtship begins in mid-March. Breeding begins in April. Egg-laying is completed by May 1. Young are fledged around July 1. Fledglings remain relatively close to the nest tree for the first few weeks and 100 percent of fledgling sightings were within 0.8 km of the nest. Fledglings disperse between 48 and 54 days after fledging.

In Nevada, ground squirrels are the main prey item during the nesting season. Males do most of the hunting with the female staying close to the nest or to the fledglings.

Aspen is mostly found in riparian areas which provide many commercial and recreational uses in Nevada. Livestock use aspen for forage and shading. Roads often follow riparian aspen up drainages, and the habitat is subject to recreation, fuelwood harvest, and many other activities. Actual effects of these activities on goshawks are unknown. Livestock use of riparian areas is being administered more stringently by land management agencies with the advent of forage utilization standards and guidelines.

Loss of habitat has been documented as a result of mining, although the Boise State University study did not document the loss of any territories due to mining. Goshawks have demonstrated a tolerance to disturbance after the adult pair has put some investment into the reproductive cycle. Obviously, as aspen loss increases, prey is reduced and habitat for all species including the goshawk is impacted.

Aspen habitat is limited in Nevada and may be declining in vigor in some areas, where planned stand rejuvenation may be warranted. In other sites, the absence of fire has allowed aspen habitats to be overtaken by conifers. In Great Basin National Park, over 2,000 hectares of aspen habitat has converted to more shade-tolerant species. Increased emphasis in protection and rehabilitation of aspen, including the retardation of conifer invasion may be warranted. Seventy-one percent of all aspen habitat in Nevada occurs on National Forest lands.

Associated Species

Cooper's Hawk
Northern Flicker
Hermit Thrush
Yellow-rumped Warbler
Swainson's Thrush
Long-eared Owl

Priority Considerations

It is generally regarded that montane riparian sites are at risk throughout Nevada from a wide range of commercial and recreational uses. In the case of the Northern Goshawk, its mature aspen nesting sites may be aging with little prospect of replacement either on-

site or on nearby sites. Although a recent petition for listing the Northern Goshawk as "endangered" under the Endangered Species Act was recently denied, the conservation focus on this species throughout the West is still quite intense. For these reasons, the Nevada Working Group has selected the Northern Goshawk as one of its priority species.

OBJECTIVE: Maintain at least 300 nesting pairs of Northern Goshawks in suitable habitat throughout Nevada through 2004.

Strategy: Manage for mature stands of aspen with prospects for regeneration and replacement within breeding territories.

Action: Manage Northern Goshawk territories at the landscape level, providing within territories suitable nesting sites as well as replacement stands where aspen regeneration has been initiated through prescribed fire and other methods.

Strategy: Minimize disturbances in Northern Goshawk territories during the most sensitive periods of their nesting cycle.

Action: Occupancy surveys should be conducted prior to any land use projects designed to significantly alter the habitat or capable of producing significant levels of disturbance to a nesting pair within known or potential territories.

Action: Recommend the observance of "no disturbance" buffer zones around and including active nesting territories during the nesting season.

Strategy: Recommend the continued inclusion of Northern Goshawk on the U.S. Forest Service Region 4 Sensitive Species List.

Assumptions - Research and Monitoring Needs

The Northern Goshawk objective assumes that a target of 300 nesting pairs is a sustainable figure for Nevada. Periodic monitoring of territory occupancy and reproductive success should be maintained to both validate the target and to stay apprised of population trends.

Opportunities

The U.S. Fish and Wildlife Service has recently completed an intensive review of the status of the Northern Goshawk in the western United States as a result of a petition for listing under the Endangered Species Act. Although the Service declared that listing was not warranted at this time, the degree of national attention still focused on the species is substantial enough to warrant a continuance of special management attention by both state and federal agencies. The species continues to receive priority management attention by both Region 5 of the U.S. Forest Service and the Tahoe Regional Planning Agency. Mining companies have funded in-depth productivity studies of Northern Goshawks in northeastern Nevada appurtenant to the impacts of landscape-scale mining of goshawk nesting habitat. While these studies are nearing completion, mining

companies may continue to have a vested interest in the implementation of sound management strategies for the conservation of Northern Goshawks in the state, and should continue to be considered as potential partners as Partners in Flight seeks to implement the strategies outlined in this plan.

Further Reading

Shipman and Bechard 1998
Younk and Bechard 1994

SPECIES PROFILE 2. ASPEN

ORANGE-CROWNED WARBLER

Vermivora celata

Distribution

The Orange-crowned Warbler breeds from central Alaska east to northern Manitoba and southern Labrador, south to northern Baja California, western Texas, northern Manitoba, and east-central Quebec. Two subspecies of Orange-crowned Warbler are found in Nevada. Subspecies *orestera* is found throughout the Great Basin north of the Mojave Desert, while subspecies *lutescens* crosses the crest of the Sierra Nevada to molt in western Nevada after nesting at western slope sites.

Habitat

The Orange-crowned Warbler prefers streamside thickets and woodland groves with moderately dense foliage and partly shaded ground; riparian woodlands; pine forests; undergrowth of forests and woodlands; chaparral, low bushes and vines (Sogge, et.al. 1994); shrubby post-fire communities, aspen groves, forest edge (Dobkin 1992). Nesting habitat occurs mainly in deciduous vegetation along streams, in canyons, and in aspen groves (Ryser 1985).

In Morrison's (1981) study in the clearcuts of Oregon, Orange-crowned Warblers were associated with shrub and deciduous tree cover while MacGillivray's Warbler utilized shrub cover exclusively. In the Carson Range, habitat consists of mature willows in thick streamside clusters interspersed with sedges, clover and grasses, adjacent to meadows and lodgepole pine.

Structure of breeding site vegetation is little known in Nevada. In northern Nevada, Orange-crowned Warblers are known to summer in snowbank aspen, which is relatively shrubby and low-growing. In migration, Orange-crowned Warblers utilize low, dense riparian vegetation.

Physical Factors

Subspecies *lutescens* breeds below 3500 feet elevation on the west slope of the Sierra Nevada. Fledglings are known to disperse to higher elevations after breeding (Steele pers. comm.). No nest data seem to exist for Nevada. Subspecies *orestera* breeds between 6,000 and 9,000 feet elevation in the upper riparian basins of the higher mountain ranges. The importance of slope, aspect , and topography are unknown, but snowmelt aspen thickets usually occur on north and east-facing slopes protected from the afternoon sun.

Landscape Factors

Patch size requirements for Orange-crowned Warblers have not been studied in Nevada, but the species has been found using snowmelt aspen thickets and patchy, mature riparian willow. Foliage density may be more important than patch size. Breeding densities of 42 per 40 hectares and 16 per 40 hectares have been observed in California (Stewart 1974). In California coastal chaparral, a male had a territory of 2 hectares (Mans 1961).

Special Considerations

The Breeding Bird Survey 1966-1996 trend data indicate slight declines in breeding bird populations in northeastern Nevada. Knowledge of nesting habitat in Nevada requires study. The Nevada side of the Sierra Nevada could be critically important to subspecies *lutescens* for post-breeding dispersal and molt. Habitat loss from a variety of factors affecting riparian vegetation is likely. Orange-crowned Warblers are generally rare cowbird hosts, but again, little is known in Nevada.

Associated Species

Warbling Vireo	Dark-eyed Junco
Lincoln's Sparrow	Hermit Thrush
Song Sparrow	Swainson's Thrush

Priority Considerations

The Nevada Working Group selected the Orange-crowned Warbler for priority focus in this plan largely because its status as a breeding species away from the Sierra Nevada is unknown. As a summer resident in montane riparian and aspen sites, it was considered to be at risk from threats to habitat, since riparian habitats are the subject of such intensive use and debate.

OBJECTIVE: Maintain a stable or increasing population trend of Orange-crowned Warblers throughout their range in Nevada through 2004.

Strategy: Maintain snowbank aspen stands and encourage aspen regeneration in or around mature stands.

Action: Inventory snowbank aspen stands, delineate possible threats, and develop Best Management Practices.

Action: Without compromising objectives for bird species requiring mature aspen, seek opportunities to enhance aspen regeneration through fire, woodcutting, or other removal of dominant stems.

Action: Protect regenerating aspen stands from detrimental grazing until the new contingent has reached a height of 10 feet.

Strategy: Determine status, trend, and habitat use of Orange-crowned Warblers

throughout the state.

Action: Inventory potential habitat for breeding and post-fledging dispersal.

Action: Delineate distribution of different subspecies and document differential habitat needs, etc. if applicable.

Assumptions - Research and Monitoring Needs

The Orange-crowned Warbler objective for aspen habitats assumes that Orange-crowned Warbler populations are mostly stable or increasing in Nevada. Status, trend, and habitat use and preferences still need to be documented for this species throughout much of its Nevada range. One strategy assumes that an understory height of ten feet is somewhat resistant to depletion through grazing.

Opportunities

The Nevada Working Group recognizes that, to date, the snowbank aspen groves of the upper reaches of Nevada's mountain ranges have escaped serious threats over the years. Unattractive to commercial users and repellant of casual movement through them by both man and beast, these stands have enjoyed a certain immunity to human exploitation. Change is constant, however, and the Nevada Working Group recognizes the value of remaining vigilant to new technologies and needs that may suddenly put a historically uninteresting habitat type at risk from overutilization. A general re-thinking of the role of fire in maintaining landscapes and ecosystems within the management community is likely to create more opportunity for carefully controlled prescription burns to be implemented for the purposes of rejuvenating decadent, non-productive aspen sites.

Further Reading

Dobkin and Wilcox 1984
Sogge et. al. 1994

OTHER PRIORITY SPECIES: ASPEN

FLAMMULATED OWL
Otus flammeolus

LEWIS'S WOODPECKER
Melanerpes lewis

These species all nest in cavities in mature aspen in selected ranges across the state. The Nevada Working Group believes that objectives and strategies for the maintenance of these species in aspen habitats can basically met by achieving those set forth for Northern Goshawk. For a species profile of Flammulated Owl, please refer to the Coniferous Forest habitat section; for Lewis's Woodpecker, please refer to the Montane Riparian section.

CALLIOPE HUMMINGBIRD
Stellula calliope

RED-NAPED SAPSUCKER
Sphyrapicus nuchalis

MACGILLIVRAY'S WARBLER
Oporornis tolmei

WILSON'S WARBLER
Wilsonia pusilla

These species all utilize aspen habitats for important phases of their life histories, but since the distinction between montane riparian and aspen habitats in this document is not particularly clear, the Nevada Working Group recognizes that objectives and strategies set forth for these species in the Montane Riparian habitat section basically apply to non-riparian aspen habitats as well. For species profiles, objectives, and strategies of any of these species, please refer to the Montane Riparian habitat section.

HABITAT MANAGEMENT SUMMARY: ASPEN

A high priority will be placed on managing aspen stands in a healthy, naturally-regenerating condition with vigorous, multi-storied vertical habitat structure. Considering the aspen type at a statewide scale, recommendations will be focused on the maintenance of 300 Northern Goshawk territories in the type across the state. Stand regeneration may at times need to be assisted by the introduction of controlled fire or other appropriate habitat manipulation techniques, but stand improvements will be recommended in the context of landscape planning to ensure that improvement targets do not result in either a short- or long-term reduction in active goshawk territories. Stand improvements should be assessed on a stand-by-stand basis.

To date, snowbank aspen has remained a little-studied and underappreciated habitat type. A new commitment will be made to better understand the processes affecting snowbank aspen as well as to better quantify its value to Nevada's avian resources.

HABITAT TYPE: CLIFFS AND TALUS

General Distribution

Cliffs form in various erosion-resistant, often silica or carbonate-rich rock types. They commonly occur in uplifted areas and are often associated with uplift on normal faults. Cliffs may also occur in steep-sided, deeply eroded valleys and as the edges of eroded remnants of volcanic flows and sedimentary rock outliers at low to high elevations.

Cliffs erode primarily by mass wasting, i.e., the uncommon fall of blocks of rock that collect as talus at the base of cliffs. Talus resides at the angle of repose and forms rock slopes. The instability of loose rock or talus retards plant growth.

Being the result of uplift and erosion and erosion-resistant rock types, cliffs are not the norm; they are scattered widely throughout the mountain ranges of the Great Basin. The total area of cliffs is minimal and would be similar to the area of alpine habitat in Nevada, which is small compared to most other Nevada habitats.

Physical Characteristics

Cliffs range in elevation from the Colorado River canyons (starting at 480 feet in Clark County) to alpine habitats above 13,000 feet. Precipitation and temperature vary with the statewide extremes. Soils are absent for the most part on cliffs. Soils that develop below talus can be acidic or alkaline, depending upon rock-type forming the talus.

Dominant Plant Species

In general, plants are absent on cliff faces. Plants on talus slopes are pioneers related to the adjacent habitats. Since cliffs and talus form at variable elevations, temperatures and climate the dominant plant species will vary greatly. Lichens can be present in heavy densities on rock faces.

Historic and Current Conditions

The inaccessability of cliffs and the instability and ruggedness of talus slopes have historically protected them from incursion by livestock and, of course, cultivation; however, other uses by humans occur. Gold mining activities in recent decades have focused on ancient hot springs and seeps that flowed from many of Nevada's cliff faces, resulting in the removal of some cliffs with high microscopic ore content. Springs at the base of cliffs may be developed for agricultural or urban purposes. The recent advent of rock climbing has attracted climbers to cliffs, especially those nearest population centers. Talus is uncomfortable to climb and has not attracted the same attention.

Historically, cliffs and talus have been relatively devoid of threats, although an occasional natural cliff face has been destroyed by mining, an activity that will continue sporadically in the future. Mining activities usually leave cliff faces of varying integrity after the cessation of ore removal. Climbers occasionally abandon climbing equipment and otherwise briefly disturb cliffs and their denizens, but their activities for the most part have not significantly altered the habitat. In southern Nevada, concern is growing that recreational climbing associated with a burgeoning urban population is reaching levels

sufficient to affect nesting raptors. Areas of concern include the extremely popular Spring Mountains and the Sheep Range, where climbing frequency is approaching continual use.

Opportunities For Conservation

Mining companies are acutely aware that ore removal activities generally alter the landscape in drastic manner. Most companies have been willing and capable partners in efforts to mitigate these changes by preserving or sometimes even creating new alternative habitats. Biologists have established a productive history of cooperatively planning mitigation strategies for the loss of these habitats, usually before the project is undertaken. These cooperative mitigation strategies should continue, and more opportunities to involve mining companies in migratory bird conservation should be explored and employed.

Priority Bird Species

Obligates

Prairie Falcon
Black Rosy Finch

Other

Ferruginous Hawk

SPECIES PROFILE 1. CLIFFS AND TALUS

PRAIRIE FALCON
Falco mexicanus

Distribution

Next to the Aplomado Falcon, the Prairie Falcon has the most restricted distribution among the North American falcons, but is relatively common where it does occur. Distribution is restricted to western North America. Its breeding range covers approximately 3.9 million sq km, from central British Columbia, Alberta and western North Dakota south to Baja California, New Mexico and northern Texas. In Nevada, the Prairie Falcon breeds in all counties wherever cliffs occur with sufficient structure to support nesting. The highest nesting densities in Nevada occur in the northern part of the state with a general decline in numbers to the south. Nevada's Prairie Falcon population appears to be relatively stable. Over 450 nesting territories have been documented and it is estimated that there are over 1,200 nesting pairs in the state.

Habitat

The Prairie Falcon prefers geographic areas containing cliffs and escarpments adjacent to broad, arid, or semi-arid valleys with short, usually sparse vegetation. In Nevada this falcon also nests near agricultural areas, riparian, and wetland habitats when suitable cliffs are available. One such area supports seven nesting pairs in less than 2.5 sq km and

another has thirteen pairs in approximately 10.4 sq km of cliff-lined canyon. Prairie Falcons can also be found nesting at higher elevations where mountain brush and conifers are predominant. Nest site preference appears to depend primarily on the proximity and abundance of prey species.

Physical Factors

Prairie Falcon nest sites have been documented at elevations over 9,000 feet and under 500 feet in Nevada. However, the vast majority of eyries are located on or within a few hundred feet of valley floors. Wintering birds prefer open valleys and agricultural areas that support a suitable prey base. Prairie Falcons drink and bathe when surface water is available but water does not appear to be a limiting factor for nest site location.

Prairie Falcons prefer cliffs overlooking valleys for nesting. Wintering birds can be found throughout the state if prey species and perch sites are available. For nesting, they prefer a hole or well-sheltered ledge positioned anywhere from less than 20 to more than 300 feet above the cliff base. Prairie Falcons do not construct a stick nest. A depression or scrape is created in the rocky detritus generally present in holes or on ledges. Old stick nests constructed on cliffs by other raptors or Common Ravens are also used by Prairie Falcons. In Nevada, 36 percent of the known Prairie Falcon eyries are located on cliffs that are less than 23 meters high. Twenty-six percent of the cliffs are between 23 and 30 meters high, 22 percent are between 30 and 90 meters high, and 16 percent are over 90 meters in height. If a suitable food source is available, Prairie Falcons will nest on small, otherwise unsuitable cliffs and earthen banks.

Landscape Factors

Prairie Falcons appear to be able to adapt to habitat fragmentation, especially when small agricultural developments are the source of fragmentation. Otherwise, vast areas of sagebrush and other low, sparse vegetation appear to be preferred habitat for both nesting and wintering birds. Although agricultural lands have the potential to enhance prey abundance, ground squirrel control that often accompanies farming can significantly reduce prey biomass. Wide scale reduction of sagebrush habitats has proven to be detrimental to ground squirrel populations adjacent to the Snake River Canyon in southern Idaho. Conversion of native range to cropland reduced a nesting population of Prairie Falcons in the Central Valley of California from 33 historical eyries to one active eyrie. Nesting and foraging areas are loosely connected and may include over 104 sq km. Hunting territories for numerous eyries may overlap broadly. The size of the required foraging area is dictated by prey densities and availability. In Utah, Smith and Murphy (1973) reported home ranges of 5.7 and 6.5 sq km. In Wyoming and Colorado, Enderson (1964) reported linear winter home ranges along power lines of 6.1 km by four males, and 11.6 km by six females. Craighead and Craighead (1956) reported a breeding home range of one pair in Wyoming at 25.9 sq km.

Special Considerations

The principal prey species in much of northern Nevada is the Townsend's ground squirrel. Depending on the year, this animal may make up over 50 percent of the total biomass consumed by nesting Prairie Falcons and their young. Nesting phenology is closely tied to the life cycle of these diurnally active rodents. Other prey that inhabit open valleys

include small mammals, lizards and snakes, passerine birds and upland game birds. In the hot deserts of southern Nevada, where diurnally active rodents and birds may be scarce, reptiles appear to constitute a significant part of the falcon's diet. Rodent control programs, especially for ground squirrels, can have a detrimental effect on productivity and survival. Data gathered in the Snake River Canyon of Idaho noted that nestling survival averaged 89 percent when ground squirrel populations were high compared to 66 percent survival during years of low ground squirrel populations. Prolonged human disturbance can result in nest site abandonment. Prairie Falcons will readily nest in holes created with explosives on mine high walls.

Associated Species

Golden Eagle	Cliff Swallow
White-throated Swift	Violet-green Swallow
Say's Phoebe	Canyon Wren
Common Raven	Rock Wren

Priority Considerations

The Basin and Range physiographic region is reported to contain 28 percent of the world's population of Prairie Falcons (Carter et. al. 1998). Nevada encompasses 70 to 80 percent of the Basin and Range region; therefore, Nevada carries a high degree of responsibility for the maintenance of the world's Prairie Falcon population. A significant population decline has been reported for the Basin and Range region based on Breeding Bird Survey data (Sauer et. al. 1998), both over the thirty-year period 1966 to 1996 (-11 percent; $p = 0.01$) and the latest sixteen-year period 1980 to 1996 (-13 percent; $p = 0.01$). For these reasons, the Nevada Working Group has selected the Prairie Falcon for priority focus during this planning period.

OBJECTIVE: Maintain 1,200 nesting pairs of Prairie Falcons in Nevada with emphasis on 33 "high density" areas (identified in Herron et al. 1985) through 2004.

Strategy: Secure protection for high density sites at risk through the federal land use planning process and conservation designation processes.

Action: Conduct risk analyses on all 33 high density areas. Identify important sites at risk.

Action: Pursue special land designation for top priority sites i.e. "Areas of Critical Environmental Concern", "Research Natural Area", etc.

Action: Minimize human disturbances around nest sites during the nesting period where impacts on productivity have been identified.

Action: Conduct landscape analysis that delineates and classifies key foraging areas associated with the top priority sites. Promote the maintenance of Prairie Falcon habitat at a landscape scale.

Action: Where nest sites are likely to be significantly disturbed by project activities, mitigate for seasonal work restrictions after surveys have determined the site to be active.

Strategy: Mitigate unavoidable losses of nest sites through creation of new suitable habitat on a one-to-one or better ratio.

Action: Coordinate Prairie Falcon mitigation objectives with federal land agency reclamation policies. Work to create acceptable conditions under which nesting potholes can be blasted in abandoned mine high walls of suitable rock integrity that pose low threat to human safety.

Action: When constructed high walls are not available or feasible to maintain, identify alternate natural cliffs for pothole construction.

Action: Develop a partnership between conservationists, mining companies, and federal land management agencies to solve the conflicts of alternate nesting habitat creation and establish nest site mitigation as standard operating procedure for mining proposals and activities.

Strategy: Integrate periodic nest monitoring with regular analysis of Breeding Bird Atlas and Breeding Bird Survey data.

Action: Conduct nest occupancy checks every five years, prioritizing nest sites at risk, and noting changes in human activity in the area.

Action: Analyze Breeding Bird Atlas data for changes in Prairie Falcon breeding densities. Note new high density areas if discovered.

Strategy: Build public support for the maintenance of cliffs for Prairie Falcon nesting.

Action: Highlight the uniqueness of Nevada's Prairie Falcon resource through media profiles, bulletins, etc. Promote the importance of Nevada to the maintenance of the world's Prairie Falcon population, its ecology, habitat needs, and its value as a predator of agricultural pests.

Assumptions - Research and Monitoring Needs

The Prairie Falcon objective assumes that there is indeed potential to maintain 1,200 breeding pairs in the state and that the statewide population estimate made in Herron et al. (1985) is reasonably accurate. Intensive cliff-nesting raptor surveys have not occurred with any systematic regularity since 1985. The baseline established by Nevada Division of Wildlife biologists between 1975 and 1985 should be revisited and updated. Declines reported in the Breeding Bird Survey analyses should be validated and appropriate corrective conservation action taken if the declines are supported by parallel survey. State and federal mining reclamation laws make the leaving of high walls as habitat mitigation for Prairie Falcons very difficult. Further investigation should commence toward a better understanding of the comparative risks of high walls of various rock composition. Development of a sound, safe habitat mitigation strategy based on site-by-site merits should be striven for.

Opportunities

Mining companies have exhibited a willingness to cooperatively solve habitat loss problems

as much as physically and fiscally feasible, often proposing solutions and dedicating funding up front during the project proposal stage. Continued partnership among agencies, conservationists, and corporations should be cultivated toward that end. Until more substantial wildlife funding sources become available, it may be increasingly difficult to duplicate the intensive helicopter surveys of the 1975-85 decade. Volunteer bird survey corps may be particularly valuable in implementing systematic surveys for cliff-nesting raptors. Public interest in wildlife ecology has never been higher; every opportunity must be taken to promote the unique quality of Nevada's cliff-nesting raptor resource, the adventure potential of participating in raptor viewing activities in the state, and the citizen science potential for monitoring one of Nevada's most fascinating birds.

Further Reading

Herron et. al. 1985
Smith and Murphy 1973

SPECIES PROFILE 2. CLIFFS AND TALUS

BLACK ROSY FINCH

Leucosticte atrata

Distribution

The Black Rosy Finch breeds from southwestern Montana, Idaho, and western Wyoming south to southeastern Oregon, eastern Nevada, and southern Utah. In Nevada, the Black Rosy Finch breeds on the highest mountains of Elko and White Pine counties (NDOW 1993). There are reports of small nesting colonies in central Nevada although none has been confirmed to date (J. Brack pers comm). With the possible exceptions of Clark, southern Nye and southern Lincoln counties, mixed flocks of Black, Gray-crowned and Hepburn's Rosy Finches are found at lower elevations throughout Nevada in winter. These flocks can range from small groups of 10-20 birds to flocks of over 1,500 birds (Alcorn 1988).

Habitat

In Nevada, Black Rosy Finches prefer to breed and nest in alpine tundra habitat.

Physical Factors

Rosy finches nest on high ridges and peaks (9,000 to 13,000 feet elevation) near and on rock cover, usually in crevices and holes in cliff sides (Bent 1968). Communal night roosts in winter consist mainly of abandoned mine shafts and adits, natural caves, cliff swallow nests, and abandoned buildings (Ryser 1985). Up to 400 birds have been documented using one abandoned mine shaft in the Granite Range on Elko County (NDOW 1994).

Landscape Factors

In Nevada, alpine tundra habitats are extremely isolated. These small habitat islands are often separated by over 160 km of lower elevation habitats, unsuitable for rosy finch nesting. Breeding territories for Gray-crowned Rosy Finches were reported to have a 100-foot radius around the female only by Johnson (1965) in Montana and Twining (1938) in California. Winter roost sites are also isolated and in relatively short supply. There are vast areas with no roost sites available. Daily winter commuting distances for rosy finches from night roosts to day foraging sites are not known.

Special Factors

Wide variations in alpine snow depths and weather conditions determine phenology of rosy finch nesting from one year to the next. Nest building has been observed from 11 June to 14 July. Incubation is 12-14 days. Most young are fledged by mid-August (Bent 1968). An increased emphasis on closure of abandoned mine sites across Nevada has resulted in the loss of some historic winter night roosts. Prior survey and inventory work coupled with alternative mine closure methods (fencing) could eliminate this loss of critical habitat. Black Rosy Finches forage in tundra vegetation on seeds (97.2 percent) of rock-cress (*Arabis*), (*Smelowskia*), and catchfly (*Silene*) and search snow banks for windblown insects (2.8 percent). They're also known to glean insects from vegetation and flycatch as the summer progresses. In winter, mixed flocks of rosy finches feed exclusively on seeds (100 percent) at mid to lower elevations in winter. The consumption of brome grass (*Bromus*), Russian thistle (*Salsola*), and sunflower (*Helianthus*)seeds have been documented.

Associated Species

American Pipit
Cassin's Finch
Violet-green Swallow
White-throated Swift

Priority Considerations

Very little is known about the status and trend of Black Rosy Finch populations anywhere they occur. Their breeding habitats are largely inaccessible and virtually untapped by Breeding Bird Survey routes; therefore, very little data occur regarding distribution, density, or trend. The black variant has been "lumped" with all rosy finches in a single species, then split again into a separate species all in the last fifteen years. It is assumed that Nevada carries a high degree of responsibility for the maintenance of the world's Black Rosy Finch population, but specific percentage estimates have not been made (Carter et al.1998). Concern has been expressed about the systematic loss of rosy finch wintering habitats through the closure and destruction of abandoned mine shafts across the state. Investigations into the magnitude of the threat to Black Rosy Finch population maintenance have not been made. For these reasons, the Nevada Working Group has chosen to focus priority efforts on the Black Rosy Finch in Nevada through the planning period.

OBJECTIVE: Maintain a stable or increasing population trend for Black Rosy Finches in suitable habitat throughout their Nevada range through 2004.

Strategy: Mitigate the impacts of the state-mandated abandoned mine shaft closure program on wildlife, emphasizing wintering Black Rosy Finches.

Action: Gather baseline data regarding the extent of rosy finch utilization of abandoned mine shafts and open pit high walls. Develop population estimates, distribution, and current and projected population trend.

Action: Develop feasible mitigation strategies to preserve current habitat or provide alternative habitat whenever possible. Integrate rosy finch conservation strategies into a comprehensive wildlife mitigation program, including "Best Management Practices", to be presented to Nevada Bureau of Mines and Geology and mining industry representatives for development into policy.

Strategy: Determine the status and trend of Black Rosy Finch breeding populations in Nevada.

Action: Plot high altitude cliff and talus habitat to target areas for Black Rosy Finch surveys. Compile pertinent Black Rosy Finch information from the Nevada Breeding Bird Atlas.

Action: Conduct "Rosy Finch-Buster" surveys in likely habitat, utilizing agency biologists, trained volunteers, and other interested public using citizen science adventure methodology to promote interest in the activity. Sponsor guided backpacking expeditions into rosy finch breeding habitat. Promote wildlife population monitoring as a viable destination objective to interested backpackers and other high-altitude enthusiasts.

Assumptions - Research and Monitoring Needs

The Black Rosy Finch objective assumes that stable or increasing populations are achievable in Nevada. Baseline population information should be gathered and analyzed. The conservation strategies assume that feasible mitigation recommendations can be devised with regard to the closure of abandoned mine shafts. More problem-solving research should be directed toward this subject.

Opportunities

In the case of the Black Rosy Finch, this section should probably be more appropriately titled "Challenges". While mining companies have exhibited considerable desire to cooperate in the mitigation of mining impacts on wildlife habitats over a broad range of issues, the overriding concerns over public safety make abandoned mine shaft closure a particularly sticky dilemma. Regulatory officials have basically affected a "Get it done" attitude toward mine shaft closure that puts its biggest premium on rapidity of action rather than on a coordinated approach to impacts mitigation. Probably the most encouraging activity so far has been the development of engineering advances made by mining companies toward the installation of "bat gates" to preserve significant bat colony resources. Every abandoned mine shaft that has been "bat-gated" is a shaft now made available to a wide array of wildlife species, including Black Rosy Finches. Partnering between bird conservation advocates and bat conservation advocates to promote "bat-gating" is most definitely warranted, and at this time represents the most effective conservation strategy available to either group. In addition, the Nevada Attorney General's Office has accepted "fencing" as a liability-free alternative to backfilling of abandoned

mines, a development encouraging for both birds and bats.

Building a monitoring program for Black Rosy Finches in their breeding habitat presents its own set of challenges. While there are those who relish and maximize their time in Nevada's alpine zones, their interests are not always specifically citizen-science-oriented. On the other hand, dedicated bird count volunteers are not always in suitable physical condition to weather the rigors of high-altitude bird survey. Some specialized subset of the two constituent groups will have to be mustered to take on the daunting task of establishing the population baseline for Black Rosy Finches. With a little imagination, biologists and advocates can present the task as a challenge worthy of the most indefatigable "gonzo" outdoor enthusiast, complete with its own unique set of perks and rewards.

Further Reading

Johnson 1965

SPECIES PROFILE 3. CLIFFS AND TALUS

FERRUGINOUS HAWK

Buteo regalis

The Ferruginous Hawk occasionally nests on cliff ledges and promontories in Nevada, although such sites are by no means a primary nest site preference for the species. At this time, the needs of the handful of Ferruginous Hawk breeding pairs that do keep house on cliffs seem to be met through the objectives and strategies devised for Prairie Falcons. For a species profile of Ferruginous Hawk, please refer to the Pinyon-Juniper or Sagebrush habitat sections.

HABITAT MANAGEMENT SUMMARY: CLIFFS AND TALUS

A high priority will be placed on the preservation of existing cliff and talus habitat. Following the risk analysis of the 33 high density Prairie Falcon nesting areas and the identification of important sites at risk, management of areas of critical environmental concern can be integrated with mining operations and human disturbances can be minimized around nest sites during the nesting season.

When opportunities exist and safety concerns can be adequately addressed, mitigation strategies which preserve abandoned mine high walls will be pursued. Nesting potholes can be blasted in either natural or man-made habitats to create Prairie Falcon nest sites. Partnerships can then be formed to monitor cliffs and abandoned mining high walls for active Prairie Falcons during the breeding season and Black Rosy Finches during fall and winter. Once collected, baseline distribution and density data will be used to determine mitigation strategies to preserve current habitat or provide alternative habitat and design

an on-going monitoring program of Black Rosy Finch habitat.

HABITAT TYPE: CONIFEROUS FOREST

General Descripton

The term “coniferous forest” in this document refers to a variety of habitat types all dominated by one or more species of evergreen, cone-bearing trees other than pinyon or scrub juniper. These forests are mostly concentrated on the western and eastern margins of the state. Coniferous forests comprise the major vegetative expressions for the Sierra Nevada, and are distributed in widely scattered tracts of varying size along Nevada’s eastern border from Jarbidge in the northeast corner to Great Basin National Park in the Snake Range along the central Utah border. Small, isolated tracts of limber pine and bristlecone pine are scattered across several of the highest mountain ranges in the center of the state, usually restricted to elevations above 9500 feet. Considered “islands” isolated from the southern Sierra Nevada, the Spring Mountains and Sheep Range of Clark County support significant stands of ponderosa pine, representing the coniferous forest type’s southernmost reach within the state. Total area of these types combined has been estimated at 428,283 hectares by the Nevada GAP.

Physical Characteristics

Coniferous forests in Nevada take on two major growth forms. The forests of the Sierra Nevada and the eastern border attain well-developed timber stand structures typified by tall stems reaching diameters at breast height (dbh) up to 190 cm, but usually ranging between 38 and 76 cm. The limber pine - bristlecone pine forests of the central mountain ranges rarely attain sawtimber characteristics; rather, they typically assume stunted, tortured growth forms highly influenced by wind and the harsh conditions of their high-elevation sites. This growth form is known as *Krummholz* by plant ecologists. The timber stands of the eastern and western borders can vary in density and canopy coverage from quite open, large-stemmed stands of yellow (Jeffrey and ponderosa) pine on drier, exposed sites, to extremely closed mixed-species stands with high densities of small-diameter stems on moister, protected sites. Stem diameters, canopy coverages, and understory components all influence greatly the particular community of bird species found in each forest type. Coniferous forests grow on a variety of soil types, ranging from the deep mollisols of montane meadows (lodgepole pine) to the poorly developed granitic soils of Nevada’s ridgelines that produce the *Krummholz* forests of limber and bristlecone pine. As the amount of bare ground, gravel, and surface rock increase, there is usually a corresponding decrease in soil depth, available water-holding capacity, and productivity (Potter 1994). This in turn influences growth form, stand density, and canopy closure. Temperatures range from -30 to 90 degrees Fahrenheit, and annual precipitation varies from 45 to 76 cm, most of which is received as snow.

Dominant Plant Species

Nevada’s coniferous forests exist as several major types defined by the combination of dominant tree species. Eastern Sierra Nevada forests are the most diverse, starting at the foothills with the yellow pines, which include Jeffrey (*Pinus jeffreyi*), ponderosa (*P. ponderosa*), and Washoe (*P. washoensis*), transitioning through a mix of pines and white fir (*Abies concolor*), finally reaching the red fir (*A. magnifica*), western white pine (*P. monticola*), lodgepole pine (*P. contorta*), and mountain hemlock (*Tsuga mertensiana*) types. Whitebark pine *(P. albicaulis*) and limber pine (*P. flexilis*) are found at the highest elevations in the subalpine life zone. The White fir mixed type may also include incense

cedar (*Calocedrus decurrens*), sugar pine (*P. lambertiana*) and Sierra juniper (*Juniperus occidentalis*).

Shrub species which commonly form the understory in Sierra Nevada forests include snowberry (*Symphoricarpus albus*) manzanita (*Arctostaphylos patula*), several species of *Ceanothus*, and chinquapin *(Castanopsis chrysolepsis*). Open stands of Jeffrey pine on drier sites often have understories of bitterbrush (*Pershia tridentata*), mountain mahogany (*Cercocarpus ledifolius*), and several species of sagebrush. Grasses and forbs on these communities are diverse, and reflect moisture availability of the site.

The coniferous forests of eastern Nevada are different from the Sierra Nevada forests in that they reflect a strong Rocky Mountain influence. The Rocky Mountain form of ponderosa pine occurs on dry rocky slopes with sagebrush and grass in the understory. The Rocky Mountain form of Douglas fir (*Pseudotsuga menziesii*) forms pure stands on moister slopes or occurs with Englemann spruce (*Picea englemannii*), and subalpine fir (*A. lasiocarpa*) in its upper reaches (Lanner 1984). Englemann spruce is typically found along cool drainages or where snowpack lingers well into the summer. Subalpine fir attains its northernmost extension into the Jarbidge and Independence Ranges, inhabiting cool moist sites along streams and canyon bottoms or shaded, north-facing slopes. This species is often associated with aspen both on streams and slopes. Common shrubs associated with these communities include mountain mahogany, Oregon grape (*Berberis repens*), snowberry, and others. Forb and grass species vary with elevation, site moisture and canopy closure.

The forests of the Spring Mountains are predominantly open stands of ponderosa pine (Rocky Mountain form) and white fir, with understories of currant, mountain mahogany, and snowberry. Some limber pine and bristlecone pine exist at the highest elevations. Bristlecone pine (*P. longaeva*) stands are distributed from the Snake Range on the eastern border, across the central ranges to the Spring Mountains in southern Nevada and extend north as far as the White Mountains in northern Esmeralda County. Limber pine, actually the “white pine” of White Pine County, is found in scattered, isolated groves from the Jarbidge Mountains south along the eastern ranges to the Quinn Canyon Range and the Spring Mountains, across the central ranges to the Sierra Nevada as far north as Mount Rose. Isolated stands of whitebark pine exist in the Ruby, Independence, East Humboldt, Santa Rosa, and Pine Forest Ranges.

Understories in these communities are sparse, including low sage (*Artemisia arbuscula*), buckwheats (*Eriogonum spp.*), *Haplopappus spp.*, and other plants adapted to short growing seasons and severe site conditions.

Historic and Current Conditions

Historically, much of Nevada’s coniferous forest habitat was quite different than it is today. In the Sierra Nevada, European settlers arriving in the 1840’s found open stands of large-girth trees with an understory tended by periodic fire. At the larger girths and advanced age, the living trees we armored by thick bark which enhanced their ability to withstand normal fire events. Periodic fire probably also served to reduce the accumulation of down woody material on the forest floor.

Starting with the gold and silver mining booms of the 1860’s, a tremendous appetite for

timber and wood fuels was generated, resulting in the near complete harvest of the standing forest of the Carson Range by 1920. Only a few pockets of the historical old growth forest were spared, existing as they did in relatively inaccessible drainages on prohibitively steep slopes, often with wet, seepy soils not conducive to the harvest techniques of the day. The forest that returned to the Carson Range was relatively similar in age and contained a component of white fir much greater than did that of the pre-settlement forest. Starting in the 1920's, fire suppression served to maintain the forest with the unnatural percentage of white fir since fire was no longer allowed to take the white fir out of the stand after insect infestations had set back its growth. Dead woody material, once tended and consumed by low-intensity ground fires, now accumulated to dangerously high levels on the more productive sites. Drought and insect infestation threatened second-growth stands of relatively uniform age. A cycle of rapid stand collapse and regrowth replaced one of gradual change. All the while, the risk of catastrophic fire increased, placing life and ecosystem at risk.

The epidemic infestation of fir engraver beetle and pine borer beetle that coincided with the drought of the early 1990's drew considerable interest and concern from resource professionals and the general public alike. While attempts were made on a site-by-site basis to reduce the increasing threat of stand collapse through salvage and treatment harvest, the infestation spread much faster than land managers could ever have kept pace with. By 1997, most of the white fir component under 120 years old stood dead, as did much of the Jeffrey pine component of the same age. Galvanized to action, a consensus group of resource professionals and concerned citizens formed to plot a future for an endangered resource. Calling itself the Forest Health Consensus Group, it tackled the daunting task of understanding both historical conditions and the proper interpretations of the effects of current management practices. From this knowledge, it formulated a set of recommendations designed to interrupt the current cycle of total stand collapse and move the forest toward sustainability through enlightened stand treatment and harvest. The efforts of the Forest Health Consensus Group culminated in June 1997 with a visit to the Lake Tahoe Basin by President Clinton and Vice-President Gore. During this "summit", a series of marching orders and funding initiatives intended to improve the environmental sustainability of the region were set forth with considerable fanfare. Presently, operational plans are being drawn to follow through on the management initiatives first set forth by the Forest Health Consensus Group. It is hope that the lessons learned in the last decade have set resource professionals and the concerned public down the road of sustained forest management on a landscape scale, away from the old paradigms based on lumber yield and opportunity.

The same rush for gold and silver in the late 1800's that drastically modified the Sierra Nevada also heavily impacted the isolated forests of central and eastern Nevada. Called "white pine" by the local settlers, limber pine was practically eradicated from many of its native mountain ranges to provide structural timbers for mine shafts and charcoal for the gold extraction process. These isolated forests were greatly reduced by harvest and have yet to recover fully.

The Rocky Mountain forests of the eastern border were also cut during the settlement era from 1850 to 1920. The replacement forests have not generated much economic interest since 1920, and as such have been pretty much left alone to reclaim some of their stand characteristics of 100 years ago. Today, the coniferous forests of the Jarbidge are protected by wilderness designation, and the forests of the Snake Range south of Highway

50 are protected within the boundaries of Great Basin National Park. Many of the processes and concerns associated with fire suppression already discussed do indeed apply to these protected forests. An interesting corollary exists in that fire suppression has allowed the expansion of coniferous forest into traditional aspen stands. As a result, coniferous forest area in eastern Nevada may actually be slowly expanding, and that expansion may not always be viewed by land managers as a positive process. Innovative management may be necessary to avoid catastrophic fires which could conceivably destroy these forests' ability to sustain themselves, as well as to discourage coniferous encroachment into other important habitat types.

Opportunities for Conservation

As stated above, much of the forest area along Nevada's eastern border exists under administrative protection as either wilderness or national park. The remaining isolated tracts of coniferous forest across the state's central ranges have not presented any degree of economic attraction since the end of the gold and silver boom of the last century. Many, but not all of them, now exist under administrative protection as wilderness.

As suggested above, the broad directives of the Lake Tahoe Environmental Improvement Plan embrace the concepts of forest health within the sweep of its scope. The last significant stands of old growth on the Carson Range have been protected by mutual agreement between the state of Nevada and the U.S. Forest Service. Steps are being taken to ensure the maintenance of the wildlife values within old growth forest. Opportunities are also being explored to expand Nevada's old growth areas through innovative treatment of second growth stands designed to move them from even-aged to uneven-aged management. The Toiyabe-Humboldt Forest Plan is currently as of this writing in a revision process. Care is being taken to receive input from a broad range of interest groups to ensure that the new version of this planning document will accurately reflect the Forest's mandates as well as the collective desires and priorities of its public.

Priority Bird Species

Northern Goshawk
Cooper's Hawk
Flammulated Owl
Lewis's Woodpecker
Red-naped Sapsucker
Three-toed Woodpecker
White-headed Woodpecker
Olive-sided Flycatcher
Western Bluebird
Grace's Warbler

SPECIES PROFILE 1. CONIFEROUS FOREST
NORTHERN GOSHAWK
Accipiter gentilis

(*For a species profile, please refer to the Montane Riparian habitat section.)*

In addition to being one of the highest profile nesting species in Nevada's aspen and montane riparian habitats, Northern Goshawks are also found nesting in Nevada's coniferous forests on its western and eastern borders. U.S. Forest Service internal guidelines for the maintenance of Northern Goshawk territories are strict, and considerable emphasis has been placed on the management of this species over the last twenty years. The Nevada Working Group proposes conservation objectives and strategies which reflect the specific research and management emphasis that has been placed on this species up to the present time.

OBJECTIVE: Maintain thirty active Northern Goshawk nesting territories in coniferous forest habitat in Nevada through 2004, with particular management emphasis on the Sierra Nevada, the forests of the Jarbidge River drainage, and the forests of the Snake Range, including Great Basin National Park.

Strategy: Maintain timber stand characteristics within known Northern Goshawk territories consistent with U.S. Forest Service habitat models and management guidelines (USDA-FS, Gen. Tech. Rep. RM-217; *also* Fowler 1988).

Action: Review habitat models and management guidelines. Update as necessary, using most recent data and findings.

Action: Review action plan proposals in coniferous forest habitat and provide recommendations for the avoidance and/or mitigation of impacts to Northern Goshawk nesting and productivity.

Strategy: Monitor known Northern Goshawk nest territories and search for new territories on a periodic basis.

Action: Initiate interagency survey efforts on a three-year interval.

Action: Enlist the help of volunteer survey corps such as organized by the Great Basin Bird Observatory.

Action: Maintain positive liaison with practicing falconers regarding annual nest site information.

Assumptions - Research and Monitoring Needs

The Northern Goshawk objective for coniferous forest assumes that a target of 30 active nest territories in all of Nevada's coniferous forest habitats is realistically attainable. The number was derived from Herron (1985), who estimated 300 territories statewide, over 85 percent of which were observed in aspen habitat. A conservative ratio of ten percent of remaining territories was assumed to occur in coniferous forest – hence 30 territories. Coordinated survey effort should test this number and the objective should be adjusted based on the results. The objective assumes that existing habitat models and management recommendations are effective at conserving Northern Goshawk population viability in coniferous forests in Nevada. Post-treatment monitoring where goshawk recommendations have been invoked within or near a project should be a regular component of the overall monitoring effort to ensure positive performance of the

recommendations. Considerable study has been directed toward understanding suitable Northern Goshawk habitat parameters in the last two decades. The Nevada Working Group recognizes that, when compared to many of the other species prioritized in this plan, our knowledge of Northern Goshawk status, distribution, and habitat needs is somewhat more advanced, putting biologists and conservationists in a much stronger position of action.

Opportunities

The Humboldt/Toiyabe Forest Plan revision process presently under way will give conservationists the opportunity to reiterate the importance of maintaining goshawk population viability within Nevada's limited coniferous forest habitats. In the Lake Tahoe Basin, the Tahoe Regional Planning Agency (TRPA) actively maintains a database of Northern Goshawk nest sites, and requires a "no significant impact" finding for any projects that occur within buffer zones around known Northern Goshawk nests. The organization of a reliable volunteer work corps by the Great Basin Bird Observatory could prove especially valuable in the initiation of periodic surveys. More survey work should be directed toward the coniferous forests of the Jarbidge and Great Basin National Park to obtain a more complete knowledge of the status of the species in these habitats.

Further Reading

USDA-FS, Gen. Tech. Rep. RM-217
Fowler 1988

SPECIES PROFILE 2. CONIFEROUS FORESTS

FLAMMULATED OWL

Otus flammeolus

Distribution

The Flammulated Owl has a western breeding distribution in North America, extending from western Mexico to southern British Columbia and east to the western edge of the Great Plains. They winter from western Mexico to Guatemala. In Nevada, this species is both a migrant and a breeder. Breeding is confirmed from only the Carson Range in the west and a series of ranges along eastern Nevada from the Spring Mountains and Sheep Range in the south up to the Schell Creek and Snake Ranges. In addition, this species occurs as a breeder in the Santa Rosa Range in north-central Nevada and the Jarbidge Mountains in northeastern Nevada. There is additional appropriate habitat that needs to be surveyed (Dunham et al. 1996).

Habitat

In the Great Basin, Flammulated Owls breed in mature stands of white fir, subalpine fir and limber pine, open stands of large Jeffrey pine (Dunham et al. 1996), and ponderosa pine mixed with aspen (Voget pers. comm.). Recent surveys indicate that this species will nest in conifer patches less than 50 hectares in size. Tree cavities, usually excavated by Northern Flickers, are required for nesting. Distribution of breeding pairs is patchy in apparently suitable habitat.

Physical Factors

In Nevada, Flammulated Owls generally range between 7,200 and 8,200 feet elevation. Other abiotic factors do not seem to be particularly important.

Landscape Factors

Flammulated Owls prefer old growth conifer forests for nesting and foraging. Jeffrey pine stands of advanced age tend to open in stem density and canopy coverage. White fir and red fir stands can mature while maintaining both a greater stocking rate and heavier canopy coverage. In Nevada, Flammulated Owls are found in both types.

In a New Mexico study, Johnson and Zwank (1990) reported average densities in potential habitat ranging from 0.03 territorial males per 40 hectares to over 4.0 per 40 hectares. Group territory size was estimated between 80 and 640 hectares.

Special Considerations

Flammulated Owls are a migratory species and arrive on breeding grounds in Nevada by the middle of May. Migrants have been detected from late April into the second week of May in low elevation sites. Fall migration begins in late July. Migrants have been recorded from August through early October. Flammulated Owls are insectivorous, feeding on moths and other insects. Flammulated Owls are cavity nesters, requiring a snag component in suitable habitat. Territorial males tend to group toward one another, creating a patchy distribution of active territories through otherwise suitable habitat. Timber harvest in old growth habitats should be selective and should not severely compromise a stand's old growth character. The Flammulated Owl is listed as a sensitive species in the USFS Intermountain Region. The basic biology and status of this species in Nevada are largely unknown, particularly in central and eastern ranges due to the lack of regular survey efforts (Dunham et al. 1996).

Associated Species

Hermit Warbler
Hammond's Flycatcher
Blue Grouse
Band-tailed Pigeon
White-breasted Nuthatch

Priority Considerations

Despite the recent study by Dunham et al. (1996) which expanded our knowledge somewhat of the range and distribution of Flammulated Owls in Nevada, almost nothing is known about the status and trend of the species. The Nevada Working Group considers the species to possibly be at risk due to its preference for mature stands of coniferous trees of large girth with a standing snag component sufficient to provide adequate nest cavity sites. These habitats exist in extremely limited, scattered patches throughout Nevada's forest belts, and are constantly threatened by insects, disease, drought, and commercial harvest. For these reasons, the Nevada Working Group has selected the Flammulated Owl for priority focus in this plan.

OBJECTIVE: Maintain a stable or increasing population of nesting Flammulated Owls throughout their range in Nevada through 2004.

Strategy: Develop habitat models and management recommendations for Flammulated Owls in suitable habitat in Nevada.

Action: Determine the range of suitable habitat parameters, and within that range, identify preferred habitat of nesting pairs by region, i.e., Sierra Nevada, Jarbidge, Snake Range, central ranges.

Action: Derive a map of suitable habitat in Nevada from habitat models.

Action: Incorporate Flammulated Owl management recommendations into pertinent land management plans.

Strategy: Investigate Flammulated Owl response to nest box deployment. Implement a nest box program in suitable areas where snag densities are limiting Flammulated Owl breeding range.

Action: Encourage Scout groups, conservation organizations, and civic clubs to build nest boxes and monitor breeding success.

Strategy: Determine status and trend for Flammulated Owl populations where populations are of surveyable proportions.

Action: Assume a minimum of one pair per 50 hectares of contiguous suitable habitat throughout the state until specific survey proves otherwise.

Action: Evaluate Breeding Bird Atlas data for distribution and occurrence.

Action: Initiate interagency/volunteer surveys in suitable habitat not known to harbor nesting pairs.

Assumptions - Research and Monitoring Needs

The Flammulated Owl objective for coniferous forests assumes that stable or increasing populations are achievable in Nevada. Further survey effort is needed to quantify the range and number of nesting pairs across Nevada. The objective also assumes that a practical suitable habitat model can be derived from what may turn out to be a rather eclectic pattern of habitat use. The objective does not assume that Flammulated Owls will utilize nest boxes, but does suggest it as a possibility which may give conservationists a positive management tool in maintenance and enhancement of the statewide population once the species' preferences are identified.

Opportunities

The Flammulated Owl continues to be listed as a Sensitive Species by the U.S. Forest Service in the Intermountain Region. Opportunities to secure work program priorities for Flammulated Owl work within the Forest Service should be explored and exploited when possible. Interagency coordination of Flammulated Owl surveys, with the aid of the Great

Basin Bird Observatory, should result in the deployment of a sizable survey corps capable of answering the basic questions of Flammulated Owl distribution and trend. The University of Nevada has recently demonstrated a research interest in the species, and should be prepared to extend research into the construction of suitable habitat models using coordinated funding sources. The Nevada Division of Wildlife should consider special status listing of the Flammulated Owl in Nevada to raise its profile in project activities across the state. Geographic Information System (GIS) capabilities existing within the Forest Service, NDOW, and UNR could be coordinated to generate maps of suitable habitat from which survey effort can be focused and directed.

Further Reading

Dunham et al. 1996
Johnson and Zwank 1990
Linkhart, Reynolds and Ryder 1998

SPECIES PROFILE 3. CONIFEROUS FOREST

THREE-TOED WOODPECKER
Picoides tridactylus

Distribution

The Three-toed Woodpecker is a circumboreal species. One of its southern range extensions reaches east-central Nevada in the Snake Range (Ryser 1985), and possibly other ranges including the Schell Creek Range, the Cherry Creek Range and Spruce Mountain. No sightings have yet been documented in the latter three mountain ranges (Alcorn 1988, NDOW 1997), although habitat conditions in these ranges appear suitable for the species. The breeding population of Three-toed Woodpeckers is thought to be very low in the State. It is presumed to be a year round resident. Sight records include the months of January, May, July, August and September (Alcorn 1988, NDOW 1997).

Habitat

The Three-toed Woodpecker is a spruce forest obligate. In Nevada, this species is found in Englemann spruce (*Picea engelmannii*) forest in association with white fir (*Abies concolor*), limber pine (*Pinus flexilis*), bristlecone pine (*P. longaeva*) and aspen (*Populus tremuloides*). Preferred habitat within the forest canopy is often in decadent, diseased or burned portions of the canopy.

Physical Factors

In Nevada, Three-toed Woodpeckers prefer to nest in mixed conifer forests from 8,800 to

11,800 feet elevation. These forests generally have a northern aspect and are found on steep mountain slopes. In winter, birds can be found as low as 5900 feet.

Landscape Factors

The geographically isolated population of Three-toed Woodpeckers in the Snake Range is approximately 240 km from the nearest documented population (Wasatch Range, Utah). There may also be closer undocumented populations in the state of Utah (Deep Creek Mountains, etc.). Suitable nesting habitat in the Great Basin is generally found on high elevation mountain islands separated by large relatively flat basins.

Special Considerations

The Three-toed Woodpecker is a primary cavity nester that lays from 2-5 eggs from May to July in aspen, pine, fir and spruce cavities (Bent 1939). Three-toed Woodpeckers eat primarily (75%) bark insect larvae including caterpillars and beetles (Bent 1939; Ryser 1985). Three-toed woodpeckers are attracted to and prosper in areas where spruce forests have been naturally disturbed (Ryser 1985).

Forest practices that lead to even-age class monotypic forest canopies in the high-elevation mixed coniferous forest type may contribute to the decline of this species in Nevada.

Associated Species

Brown Creeper
Red-breasted Nuthatch
Hermit Thrush
Ruby-crowned Kinglet.

Priority Considerations

Only one nesting population of Three-toed Woodpeckers is known to presently exist in Nevada. Its preferred habitat is extremely limited and fragmented in Nevada. Because of the high uncertainty of the status of this species in Nevada, the Nevada Working Group selected it for priority focus in this document.

OBJECTIVE: Maintain a stable or increasing population trend of Three-toed Woodpeckers throughout their range in Nevada through 2004, with particular emphasis on the known population in the Snake Range in and near Great Basin National Park.

Strategy: Maintain Englemann spruce stands with a diversity of age classes and active decadence progressing toward an increase in snag density.

Action: Inventory stand characteristics of occupied and potential habitat on the eastern border of the state.

Action: Develop a suitable habitat model for Three-toed Woodpecker.

Action: Implement Three-toed Woodpecker habitat management recommendation into land use plans, including National Park Resource Management Plans, the Humboldt-Toiyabe Forest Plan, etc.

Action: Allow small insect infestations and lightning-ignited fires to run their course in high elevation mixed coniferous forest in east-central Nevada.

Strategy: Determine range, status, and trend of Three-toed Woodpecker in Nevada.

Action: Evaluate Breeding Bird Atlas data for Three-toed Woodpecker sightings outside the known occupied range.

Action: Initiate interagency/volunteer comprehensive discovery surveys in potential habitat.

Action: Ensure that sufficient point count or comparable trend surveys are established in known occupied habitat.

Assumptions - Research and Monitoring Needs

The Three-toed Woodpecker objective for coniferous forests assumes that stable or increasing populations are achievable in the species' restricted range in Nevada. Further study regarding minimum population size, minimum patch size, source populations, etc. would be helpful in developing a management model for this species.

Opportunities

The Great Basin National Park presently encompasses most if not all of the known occupied Three-toed Woodpecker habitat in the state. Land management policies within Park boundaries are likely very conducive to the implementations of this plan's objectives and strategies for the species, particularly with regards to low-intensity management involving stand decadence, insect infestation, and naturally-ignited fire. The species is also recognized as a Sensitive Species in Region 4 of the U.S. Forest Service, the region that administers Forest Service lands encompassing the Three-toed Woodpecker's potential range in eastern Nevada. The citizen-scientist corps presently being recruited by the Great Basin Bird Observatory will prove valuable in the search for new Three-toed Woodpecker sites as well as in the monitoring of known populations.

Further Reading

NDOW 1997

SPECIES PROFILE 4. CONIFEROUS FOREST

WHITE-HEADED WOODPECKER

Picoides albolarvatus

Distribution

The White-headed Woodpecker occupies a restricted range from southern interior British Columbia, north-central Washington, and northern Idaho south through Oregon, east through the Cascades to southern California. It is a fairly common resident of the Yosemite Valley and the west slope while less frequent on the east slope of the Sierra. Within Nevada, the White-headed Woodpecker is essentially restricted to the Carson Range.

Habitat

The White-headed Woodpecker primarily inhabits open ponderosa or Jeffrey pine forests, but also occurs in sugar pine, red fir, and white fir forests. Preferred habitat consists of open forests with large trees and 40 to 70 percent cover (USDA Forest Service 1991). Milne and Hejl (1989) found 89 percent of the nests observed were in pine or fir, which demonstrated a species selectivity considering the diversity of tree species found in the woodpecker's habitat. On the east slope of the Sierra, Gaines (1988) observed several nest sites within cottonwood and aspen. Raphael and White (1984) noted that the White-headed Woodpeckers of the Sagehen Creek study area north of Truckee, California selected for larger diameter snags, usually greater than 58 cm DBH, within the older-aged stands. Cavities are placed fairly close to the ground, averaging 2.5 meters. Often a shorter snag or a stump will be used for excavation (Raphael and White 1984; Gaines 1988; Milne and Hejl 1989).

Physical Factors

In Nevada, the White-headed Woodpecker ranges between 4,700 and 9,000 feet. Species responses to presence of water, topography, slope, and aspect are not known.

Landscape Factors

The White-headed Woodpecker prefers older-aged, large-stem pine forest with open canopy and a low to moderate stocking rate, but is also found in old growth stands of greater density and canopy closure. Maintenance of large-stem trees with a liberal component of large-stem soft snags would seem to take priority over canopy coverage concerns. Bird densities were summarized from American Birds by Raphael and White (1978) as ranging from one to five per 40 hectares.

Special Considerations

Large diameter snags allow for larger cavity excavation which facilitates larger clutch size and provides better insulation for eggs and young (USDA Forest Service 1991). White-headed Woodpeckers are bark gleaners (Raphael and White 1984) and may not drill as much as other woodpeckers because their skull is softer and less dense (Ehrlich et al.1988). They have been observed foraging on spiders (Beedy and Granholm 1985), bark beetles (Dudley 1981), and scale insects (Morrison 1987). Older aged Jeffrey pine exhibits a bark morphology known to foresters as "puzzle bark" which offers increased microhabitats for insects which White-headed Woodpeckers prefer as food (Airola 1980). Puzzle bark facilitates the woodpecker's gleaner foraging technique and to some extent explains its preference for large-stem stands. To maintain White-headed Woodpecker populations, forest managers should maintain old growth stands beyond harvest rotation ages with some stocking of overmature trees and large soft snags. Selective tree harvest

is preferable to clearcutting (Raphael and White 1984). White-headed Woodpeckers also utilize pine seeds as food, with pine seeds sometimes comprising as much as 70 percent of their winter diet.

Associated Species

White-breasted Nuthatch
Red-breasted Nuthatch
Steller's Jay
Brown Creeper
Clark's Nutcracker

Priority Considerations

While limited BBS data indicate a static trend for White-headed Woodpecker populations in the Sierra Nevada province, the Nevada Working Group recognizes that the older-aged pine stands which this species prefers are among the most limited habitats in the state. Threats from insects and commercial harvest require priority focus be directed toward this species to ensure its long-term viability in Nevada.

OBJECTIVE: Maintain stable or increasing populations of White-headed Woodpeckers throughout their range in Nevada.

Strategy: Support the preservation and long-term connectivity of remaining fragments of old growth in the Carson Range and Tahoe Basin.

Action: Monitor the activities within the current Spooner Summit Cooperative Old Growth Forest Management Area, an area created through agreement between the Humboldt-Toiyabe National Forest, the Lake Tahoe Basin Management Unit and the Nevada Department of Natural Resources. Call for regular review of the agreement and an update of individual and collective goals, objectives and strategies within the designated landscape.

Action: Devise innovative stand treatment strategies within heavy-density, even-aged second growth stands to track the stands toward old growth and away from self-perpetuating second growth, both within and without the Spooner Summit Old Growth Area.

Action: Establish regular inventory of snag densities in both occupied and potential habitat. Create snags where deficiencies occur; leave sufficient snags when extracting timber, firewood, or other forest products.

Action: Incorporate specific management guidelines into the Humboldt-Toiyabe Forest Plan presently under revision.

Action: Facilitate regular coordination between Nevada state agencies regarding management actions, particularly timber harvest projects, on state lands. Review such projects for mitigable impacts to wildlife, particularly upon species prioritized in this plan.

Strategy: Determine specific range, status and trend of White-headed Woodpeckers in the Carson Range and Lake Tahoe Basin.

Action: Compile Breeding Bird Atlas, Breeding Bird Survey, banding station, and incidental records into a specific White-headed Woodpecker database.

Action: Using GIS capabilities, generate a map of occupied habitat for the Carson Range and Lake Tahoe Basin.

Action: Ensure that sufficient point count or comparable trend surveys are established in known occupied habitat.

Assumptions - Research and Monitoring Needs

The White-headed Woodpecker objective for coniferous forest habitats assumes that stable or increasing populations are achievable in its restricted Nevada habitat. Further study regarding minimum population size, minimum patch size, source populations, etc. would be helpful in developing a management model for this species.

Opportunities

The White-headed Woodpecker is currently recognized as a Sensitive Species in Region 4 of the U.S. Forest Service. The Humboldt-Toiyabe Forest Plan is presently under revision, which presents a timely opportunity for the incorporation of Partners In Flight objectives and strategies for all Nevada's Priority Species. Portions of the species' occupied habitat also occurs on Nevada State Parks lands which are currently managed primarily for outdoor recreation. Occasional timber harvest activities occur in State Park lands, and should be regularly evaluated regarding their impacts to wildlife, particularly the species prioritized in this plan. Interestingly, while federal land agencies are required to consult with state wildlife agencies regarding possible impacts of their proposed activities, state agencies that exist within the same Department are not required by state law or interagency agreement to consult with one another regarding activities on their own lands. The citizen-scientist corps presently being recruited by the Great Basin Bird Observatory will prove valuable in the delineation of occupied and potential White-headed Woodpecker habitat along the western margin of the state.

Further Reading

Beedy and Granholm 1985
Gaines 1988
Milne and Hejl 1989
Morrison 1987
Raphael and White 1978, 1984

SPECIES PROFILE 5. CONIFEROUS FOREST

OLIVE-SIDED FLYCATCHER

Contopus borealis

Distribution

The Olive-sided Flycatcher breeds from central Alaska across north-central Canada to

Newfoundland, south as far as Baja California, central Nevada, northeastern Arizona, New Mexico and western Texas in the West; from central Saskatchewan, central Manitoba, northern portions of the Great Lakes states to northern New York, northern New England, New Brunswick, and Nova Scotia. It winters in South America.

In Nevada, the Olive-sided Flycatcher is a summer resident along the Carson Range on the western border south to the Spring Mountains of Clark County. On the eastern border, its range follows spruce-fir forest from Jarbidge to the Snake Range near Baker. Johnson (1973) reported isolated singing males in the Clover Mountains and the Quinn Canyon Range of Lincoln County.

Habitat

The Olive-sided Flycatcher breeds in open montane, boreal conifers and coniferous-deciduous forests. Tall trees are required for nesting and roosting sites (Zeiner 1990). Olive-sided Flycatchers are more common in open forests since they perch on prominent trees and flycatch. These hunting areas often occur adjacent to meadows and clearings (Zeiner 1990). Beedy (1981) found that they tend to be "more common in the open forests as their forging behavior required exposed perches and unobstructed air space to scan for flying insects". He found that forests that were dense and closed-canopy forests provided relatively few suitable perches. Typically the dead tips or uppermost branches of the tallest trees in an area are used for singing posts and hunting perches (Zeiner 1990). Martin et al. (1961) found the Olive-sided Flycatcher inhabited tree tops regardless of the height of the stand. Tall trees, dead tops and open stem densities are characteristic of old growth conifer stands over much of its range in Nevada.

Physical Features

Although direct requirements for water are unknown, Olive-sided Flycatchers usually nest close to a water source (Zeiner 1990). As with other insectivorous birds, this may be indirectly due to higher insect numbers near water. Olive-sided Flycatchers are generally found between 7,000 and 9,000 feet elevation in their Nevada range.

Landscape Features

Tall trees and snags are best maintained by uneven-aged silviculture practices due to greater height diversity (Airola 1980). Territory and breeding density information is lacking.

Special Considerations

The Olive-sided Flycatcher is an insectivore, and although little is known about the species it forages on, Bent (1942) did report a preference for honey bees. Information is lacking with regard to effects of disturbance. Its propensity for dwelling on tree tops could make ground disturbance negligible. Predation from accipiters is likely and Weitzel (1988) found that nesting attempts are occasionally disrupted by European Starlings.

Associated Species

Hermit Warbler
Yellow-rumped Warbler
Black-backed Woodpecker
Hammond's Flycatcher

Red Crossbill

Priority Considerations

Limited Breeding Bird Survey data indicate a slight but statistically significant decline in population for the Olive-sided Flycatcher in the Sierra Nevada province (-4.0 percent between 1966 and 1996; p = 0.00). The Olive-sided Flycatcher was selected for priority focus in this plan because of concern over a general lack of open-canopy, old growth timber habitat in Nevada coupled with the constant threat to that habitat which does persist.

OBJECTIVE: Stabilize or reverse a declining population trend of Olive-sided Flycatchers throughout their range in Nevada by 2004.

Strategy: Provide open-canopy old growth timber stands with an emphasis on tree height (tall) and significant decadence reflected in dead tops and snags.

Action: Preserve existing old growth forest remnants. Connect existing old growth tracts by treating second growth corridors to break self-perpetuating even-aged stand characteristics.

Action: Promote timber harvest strategies that leave larger, older trees in an open-canopied array. Leave snags and some dead-topped trees.

Strategy: Determine status and trend of Olive-sided Flycatcher populations specific to Nevada.

Action: Evaluate the present occurrence of point count, Breeding Bird Survey, or other appropriate survey methodologies in Olive-sided Flycatcher habitats. Supplement where necessary.

Assumptions - Research and Monitoring Needs

The Olive-sided Flycatcher objective for coniferous forest habitats assumes that population declines documented in the Sierra Nevada are paralleled in Nevada. Population status and trend for Nevada's populations need to be determined and the objective adjusted accordingly. The objective also assumes that Olive-sided Flycatchers prefer mature forest to young or second-growth forest. More specific habitat preference information would be helpful in creating a responsive objective that will present measurable results.

Opportunities

The Humboldt-Toiyabe Forest Plan is presently in revision, and as such presents a prime opportunity for bird conservationists to see that habitat maintenance strategies favorable to Olive-sided Flycatchers are positively addressed in the plan. The Spooner Summit Cooperative Old Growth Forest Management Area has focused emphasis on the preservation of old growth forest remnants in the Carson Range and Lake Tahoe Basin. The goals and objectives of the cooperative agreement pertaining to that area should be followed, with priority given to the linking of old growth remnants through innovative stand treatment. The Great Basin Bird Observatory will continue to be a valuable source of survey volunteers to achieve the population status and trend strategy.

Further Reading

Beedy 1981
Bock and Lynch 1970
Johnson 1973
Weitzel 1988

SPECIES PROFILE 6. CONIFEROUS FOREST

WESTERN BLUEBIRD

Sialia mexicana

Distribution

The Western Bluebird is found throughout western North America from southern British Columbia and central Montana south to northern Baja California. It is generally confined to the western mountain ranges (Pacific and Rocky Mountain States). In Nevada, the Western Bluebird is a resident species in western and southern mountain ranges. From the east slope of the Sierra Nevada, small breeding populations follow the cottonwood riparian zones down the Truckee, Carson, and Walker Rivers almost to their respective termini.

Habitat

Within their breeding range, Western Bluebirds are found in open woodlands with mature trees in proximity to open foraging space. In the Sierra Nevada, Western Bluebirds are closely associated with Jeffrey pine of sufficient age and size to support cavities for nesting.

Western Bluebirds are found in most forests except closed-canopy boreal forests. They utilize open stands with an understory of montane meadow or brush. They are readily drawn to burned areas where fire has left snags for perching and nest cavities and early successional regrowth is present.

Physical Factors

In Nevada, Western Bluebirds occur primarily throughout the transition zone (6,000 to 9,000) feet elevation, with stringer populations ranging down as low as 3900 feet. In contrast to the Mountain Bluebird, it appears to favor more mesic sites, although presence of water is not an absolute requirement. Slope, aspect and topography do not appear to be significant factors.

Landscape Factors

Open park-like woodlands are required, and open brush or meadows bordered by woodlands are preferred. Western Bluebirds readily occupy disturbed habitat often following fire as long as nest cavities can be found within or immediately adjacent to the site for foraging. In Arizona ponderosa pine, Balda (1975) reported “utilized areas” ranging from 0.3 to 0.8 hectares, averaging 0.6 hectares. Haldeman et al. (1973) reported a

density of 15 pairs per 40 hectares.

Special Considerations

Western Bluebirds require cavities for nesting – most often found in used woodpecker cavities. They readily occupy nest boxes, other natural openings in dead trees, or the occasional opening in a building. Insectivorous for much of the year, Western Bluebirds will eat a variety of fruits, berries, and seeds in late fall or winter. Nesting birds are susceptible to predation or parasitism by starlings and wrens. Competition for nest sites can be keen with Tree Swallows, nuthatches, chickadees, wrens, or European Starlings. Western Bluebirds are not particularly intolerant of human activity.

Associated Species

Band-tailed Pigeon
Blue Grouse
White-breasted Nuthatch
Fox Sparrow

Priority Considerations

Limited Breeding Bird Survey data report a slight but significant decline of Western Bluebird populations in the Sierra Nevada province between 1966 and 1996 (-2.2 percent; $p = 0.04$). The general lack of open-canopy, old growth timber habitat in Nevada, and constant threat to that which does persist, concerned the Nevada Working Group enough to select the Western Bluebird for priority focus in this plan.

OBJECTIVE: Stabilize or reverse a declining population trend for Western Bluebirds throughout their range in Nevada's coniferous forest habitats by 2004.

Strategy: Provide open-canopy old growth timber stands with an emphasis on open understory and juxtaposition with montane meadows or old burns.

Action: Preserve existing old growth forest remnants. Connect existing old-growth tracts by treating second-growth corridors to break self-perpetuating even-aged stand characteristics.

Action: Promote timber harvest strategies that leave larger, older trees in an open-canopied array. Leave snags for cavity provision.

Action: Thin second-growth stands with high stem densities "from the bottom up" where they occur adjacent to meadows; that is, thin smaller-diameter trees and leave well-spaced, larger-diameter trees, opening up a park-like interface with meadows.

Strategy: Encourage installation of nest boxes in suitable habitat.

Action: Encourage citizen-scientist participation in establishing and

maintaining Western Bluebird nest box routes.

Strategy: Determine status and trend of Western Bluebird populations specific to Nevada.

Action: Evaluate the present occurrence of point count, Breeding Bird Survey, or other appropriate survey methodologies in Western Bluebird habitats. Supplement where necessary.

Assumptions - Research and Monitoring Needs

The Western Bluebird objective for coniferous forest habitats assumes that population declines documented in the Sierra Nevada are paralleled in Nevada. Population status and trend for Nevada's populations need to be determined and the objective adjusted accordingly. The objective also assumes that Western Bluebirds prefer mature tree stands significantly over young or second-growth stands. More specific habitat preference information would be helpful in creating a responsive objective that will present measurable results.

Opportunities

The Humboldt-Toiyabe Forest Plan is presently in revision, and as such presents a prime opportunity for bird conservationists to see that habitat maintenance strategies favorable to Western Bluebirds are positively addressed in the plan. The Spooner Summit Cooperative Old Growth Forest Management Area has focused emphasis on the preservation of old growth forest remnants in the Carson Range and Lake Tahoe Basin. The goals and objectives of the cooperative agreement pertaining to that area should be followed, with priority given to the linking of old growth remnants through innovative stand treatment. Opportunities may exist to enhance habitats in the Little Valley and Tahoe Meadows areas of the Carson Range where heavily-stocked second-growth stands threaten to infringe on meadow margins. By taking down stem densities and opening up a forest margin that extends away from meadow margins, not only may Western Bluebird habitat be enhanced, but its ability to maintain itself more or less statically may also be enhanced. The Great Basin Bird Observatory will continue to be a valuable source of survey volunteers to achieve the population status and trend strategy.

Further Reading

Balda 1975
Haldeman et. al.,1973

SPECIES PROFILE 7. CONIFEROUS FOREST

GRACE'S WARBLER

Dendroica graciae

Distribution

The Grace's Warbler frequents the high mountain ranges from southern Nevada, southern Utah, and southwestern Colorado south to Nicaragua. In Nevada, it is found exclusively

in Clark County, where records exist for the Spring Mountains, Quinn Canyon Mountains, Potosi Mountains, and the Sheep Range.

Habitat

In Nevada, Grace's Warblers nest in montane forest (tall ponderosa pine) in the southern mountain ranges (Johnson 1978). Information is lacking on canopy closure or stand density needed to provide optimal habitat. Johnson (1978) notes this species is rarely found in ponderosa communities consisting primarily of stunted or scattered trees. Griscom and Sprunt (1957) state that Grace's Warblers usually nest 20 to 60 ft above ground in tall pines and Ehrlich, (1988) note the species is usually found high in the canopy. This indicates that mature stands would be preferred.

Physical Factors

Information appears to be lacking. Elevation would appear to be an influence only in the sense that it would determine the limits of ponderosa pine stands on mountain ranges (6,000 - 9,000 feet elevation).

Landscape Factors

Suitable late succession ponderosa pine stands are naturally fragmented and limited in Nevada. Grace's Warbler appears to have only recently (within the last 3 decades) expanded its range into Nevada (Johnson 1978). Unoccupied habitats exist in the state but only time will tell if this species will further expand its range in the state. Reported in ponderosa pine in Hidden Forest Canyon in the Sheep Range between 7,500 - 8,000 feet (Johnson 1965). An adult Grace's Warbler was seen at Wiregrass Spring in the Sheep Range in August 1995. Habitat was ponderosa pine/ white fir community at 8,000 feet

Special Considerations

Information is lacking regarding effects of human disturbance, brood parasitism, or other special relationships. Grace's warbler feeds on insects of the pine community; thus drought could play a role in affecting food supplies (Johnson 1978). Otherwise, little is known about the biology of this species.

Associated Species

Yellow-rumped Warbler
Western Tanager
Cassin's Finch
Black-throated Gray Warbler

Priority Considerations

Almost nothing is known about the status and trend of Grace's Warbler in Nevada. Because it occurs uniquely in the state in the yellow pine forests of the Spring Range and other Clark County mountain ranges, it was considered by the Nevada Working Group as an appropriate representative of those unique forests which are otherwise underrepresented in this plan. In order to learn more about this species and its habitats

in Nevada, the Working Group has selected the Grace's Warbler for priority focus in this plan.

OBJECTIVE: Maintain present occurrence and distribution of Grace's Warbler in coniferous forests throughout its limited range in Nevada through 2004.

Strategy: Conserve the yellow pine forests of southern Nevada, including the Spring Range, Quinn Canyon Range, the Potosi Mountains, and the Sheep Range.

Strategy: Determine status and trend for Grace's Warbler populations in Nevada.

Action: Supplement existing status and trend surveys with point counts or other appropriate survey methodologies to ensure that Grace's Warbler populations are being monitored.

Action: Coordinate population monitoring efforts with adjacent States.

Assumptions - Research and Monitoring Needs

The Grace's Warbler objective for coniferous forest habitats of southern Nevada assumes that its present occurrence and distribution in Nevada is sufficient to maintain healthy, self-sustaining populations in the state. Further information about the species' status in Nevada will validate the objective or prove a need for adjustment. Since it has only expanded into the state in the last three decades, it could conceivably be argued that this species is expanding from healthy source populations from somewhere, which might indicate relatively secure world status.

Opportunities

A recent Humboldt-Toiyabe Forest Plan Amendment combined with the designation of the Spring Mountains National Recreation Area bode well for the long-term conservation of the Spring Mountain forests. The Great Basin Bird Observatory will continue to be a valuable source of survey volunteers to achieve the population monitoring strategy for Grace's Warbler.

Further Reading

Johnson 1965, 1978

OTHER PRIORITY SPECIES: CONIFEROUS FOREST

COOPER'S HAWK
Accipiter cooperii

The Cooper's Hawk has been selected for priority focus by the Nevada Working Group because of multiple threats to its habitat and because limited Breeding Bird Survey data have documented a significant decline in its population in the Sierra Nevada province (-17.5 percent between 1966 and 1996; $p = 0.04$). It is believed that the basic objective and strategies for Northern Goshawk apply also for Cooper's Hawk.

LEWIS'S WOODPECKER
Melanerpes lewis

For a species profile for Lewis's Woodpecker, please refer to the Montane Riparian habitat section of this plan. The Nevada Working Group recognizes that the basic objective and strategies for Western Bluebird outlined above also apply for Lewis's Woodpecker.

RED-NAPED SAPSUCKER
Sphyrapicus nuchalis

The western sapsucker group, including Red-breasted and Williamson's Sapsucker, uses a variety of habitats within the mixes of coniferous, riparian, and aspen habitats found in Nevada's montane forests. Although the Red-naped Sapsucker does indeed make signficant use of coniferous forests, the Nevada Working Group believes that the key to conserving the species in Nevada lies primarily in preserving its riparian and aspen habitat components. For a species profile, objectives and strategies for Red-naped Sapsucker, please refer to the Montane Riparian habitat section.

HABITAT MANAGEMENT SUMMARY: CONIFEROUS FOREST

Conservation strategies for coniferous forest birds will focus on the continued development and improvement of species habitat models. Habitat modeling for forest species, notably California Spotted Owl, Northern Goshawk, and mustelid mammals has been a primary conservation tool for nearly two decades, and continues to be a relevant and useful approach to forest planning. Other than the Northern Goshawk, which has been the focus of considerable attention in recent years, knowledge of the status, distribution, and habitat needs of the priority species in this plan are generally not well known. Developing and improving habitat models will require compiling additional information about the full extent of the range of each species and identifying the range of variability within their respective ranges. Based upon what is currently known for these species, other conservation strategies identified include: determine status and trend; manage for habitat diversity by maintaining a mix of species and stand characteristics; maintain and perpetuate old growth conditions well distributed across the landscape; manage dead and down material to provide sufficient numbers, size, and distribution over time; allow for recruitment of habitat components through natural events such as insect infestations and fire without increasing the risk of catastrophic loss of habitat.

Old growth conditions and large snags are commonly identified as those habitat components most limiting to the distribution and abundance of several priority species. Both of these important habitat components have been severely depleted since the onset of logging in the late 1800's. Today, second growth conditions predominate. Age class distributions are depleted, species compositions are different, and the role of natural perturbations such as insects and fire have changed significantly. Managing to enhance the diversity of habitat conditions across a broad landscape would allow natural processes such as insects and fire to play a more functional role in maintaining a dynamic balance between habitat types and seral stages. To achieve such a balance, land managers need to understand and acknowledge the changes that have occurred and learn how to enhance diversity and balance without increasing the risk of catastrophic loss of habitat. Better understanding of the relationship between priority species and their habitats will be necessary in order that managers can better anticipate how changes in habitat condition might affect future population distributions and abundance.

HABITAT TYPE: LOWLAND RIPARIAN

General Description

Lowland riparian habitats are those associated with the floodplains of Nevada's major river systems occurring below 5,000 feet elevation in the northern half of the state and below 4,000 feet in the southern half. Those river systems are the Humboldt, the Truckee, the Carson and the Walker Rivers in the north, and the Colorado River and its tributaries in the south. Habitat conditions supported by these lowland floodplains are lush in stark contrast to the arid landscapes through which they course. Total lowland riparian habitat area in Nevada is estimated at 57,344 hectares (Nevada GAP).

Physical Characteristics

Nevada's major river systems drain vast landscapes and typically course for over 160 km across otherwise barren landscapes. Floodplains vary in width from a few hundred feet in the instance of the restricted canyons of the Truckee and the Virgin to over six kilometers in width as in the Carson Valley near Minden, or on the Humboldt River near Battle Mountain.

The Humboldt River drains most of northeastern Nevada from the southwestern foot of the Jarbidge Mountains and the western foot of the Ruby Mountains over 467 km to the Humboldt Sink south of Lovelock. Major tributaries include the Mary's River from its source to Deeth (truly the northern headwaters of the Humboldt), the Reese River draining from Toiyabe Dome north to where it enters the Humboldt at Battle Mountain, and the Little Humboldt which drains the watersheds near the Humboldt-Elko county line northeast of Paradise Valley, through Paradise Valley to the Humboldt at Winnemucca.

The Truckee, Carson, and Walker Rivers drain the east slope of the Sierra Nevada from Reno to well south of Topaz Lake. These rivers drain into terminal basins left by Pleistocene Lake Lahontan – the Truckee into Pyramid Lake north of Fernley; the Carson into the Carson Sink north of Fallon; the Walker into Walker Lake just north of Hawthorne.

In southern Nevada, the Virgin River enters Nevada from Arizona at Mesquite and courses approximately 402 km to where it enters Lake Mead east of Overton. The Colorado River constitutes the southern border for the state of Nevada from the northern tip of Iceberg Ridge to where the states of Nevada, Arizona, and California converge at the Fort Mohave Indian Reservation. From Iceberg Ridge to Davis Dam at Laughlin, the Colorado has cut an awesome major canyon that is completely flooded by the lakes behind Hoover and Davis Dams – Lake Mead behind Hoover Dam and Lake Mohave behind Davis Dam. The narrow canyons between Hoover Dam and the upper end of Lake Mohave proper – Black Canyon and Windy Canyon – are not wild, free-flowing stretches, but rather are highly affected by the backflow of Davis Dam and the outflow of Hoover Dam.

Another of the Colorado's tributaries that warrants mention is the Muddy River drainage through Moapa Valley. Although much of the Muddy's flow is supplied by a complex of thermal springs in northeastern Clark County known as Warm Springs, the drainage is also connected to two extremely long, intermittent wash systems that reach far into the hinterlands of Nevada. Meadow Valley Wash drains a watershed from some 48 km north

of Panaca through Caliente to the confluence at Glendale. The White River runs from Preston, some 40 km southeast of Ely through Lund and Sunnyside to Pahranagat Valley, where its name is changed to Pahranagat Wash before it joins Meadow Valley Wash at Glendale to become the Muddy. Flows of this system are predominantly subsurface, with surface inundations occurring naturally at Sunnyside (now mostly part of the Kirch Wildlife Management Area) and in Pahranagat Valley, where extensive wetland habitat is divided between Nevada's Key Pittman Wildlife Management Area and the Pahranagat National Wildlife Refuge. A stretch of riparian habitat survives on this system between Crystal Springs and Pahranagat NWR, and significant riparian habitat exists along the Muddy River from Moapa to Overton.

Annual precipitation and temperature ranges for Nevada's lowland riparian habitats reflect Nevada's extremes – from less than 12 to more than 76 cm of precipitation per year and from -30 to over 120 degrees Farenheit in temperature. Riparian vegetation is distributed according to different plant species' affinity for water and the extent to which the river's flow is distributed across its floodplain. Flood flows introduce periodic change into floodplain communities by removing overstory and scouring and exposing seed beds where new generations of shade-intolerant trees and other plants establish, catch sediments, and build new floodplain. Mature plant heights can range from less than five feet for greasewood to 90-100 feet tall for Fremont cottonwoods. Left to their own natural disturbance regimes, deciduous riparian habitats can attain a complex, multi-layered vertical structure with an intermittent to continuous overstory, a midstory that is often dense and impenetrable, and an understory rich in grasses and forbs. Another expression of cottonwood overstory is called *gallery forest*, where the canopy has become enough impenetrable to light it effectively shades out the midstory, creating a tall-stemmed, high-canopied forest that can stretch across the floodplain for hundreds of meters.

Dominant Plant Species

Lowland riparian habitats in Nevada, with the exception of the Humboldt River, are typically dominated by Fremont cottonwood (*Populus fremontii*). This fast-growing deciduous poplar attains huge sizes at maturity – up to 29 meters in height, with trunks often greater than 183 cm diameter at breast height (dbh), and crowns that can spread over 37 square meters in area. Under favorable conditions, cottonwood forests are capable of presenting a crown overstory more or less solid for 200 meters or more across a floodplain. Cottonwoods are soft-wooded and subject to heart rot fungus which make it a prime provider of cavities for bird nesting.

Several species of willow are found on Nevada's major river floodplains, including sandbar willow (*Salix exigua*), arroyo willow (*S. lasiolepis*), red willow (*S. laevigata*), and shining willow (*S. lucida,* which includes *lasiandra*, also known as whiplash willow). Sandbar willow, also known locally as "coyote" willow, forms thick stands of limber, multi-stemmed plants, while the other types more often form individual trees with single trunks and stiff, weight-bearing twigs. Gooding's willow (*S. gooddingii*), a large tree mostly prevalent in southern Nevada, extends its range as far north as Churchill County, where it is found on the lower Carson River.

Buffaloberry (*Shepherdia argentea*) is present on all the northern Nevada river systems, with particularly robust stands still extant on the Walker River north of Yerington and the Little Humboldt in Paradise Valley. Buffaloberry grows in thick-stemmed, inpenetrable thickets up to ten to twelve feet high and as much as five to ten yards thick. In southern

Nevada, the lowland riparian community includes velvet ash (*Fraxinus velutina*), desert willow (*Chilopsis linearis*), seep willow (*Baccharis salicifolia* and others), mesquite (both *Prosopis glandulosa* and *P. pubescens*), quailbush (*Atriplex lentiformis*), and wolfberry (*Lycium spp.*).

Tamarisk (*Tamarix ramosissima*), also known as saltcedar, is an exotic riparian tree that has invaded all of Nevada's river systems to varying degrees. Another aggressive exotic invader present on Nevada's rivers is Russian olive (*Elaeagnus angustifolia*), a small tree that grows up to 20 feet high. These exotics have replaced the native midstory on many stretches of Nevada's rivers. Tamarisk now dominates much of the Virgin River, Muddy River, and lower Meadow Valley Wash floodplains. In the north, tamarisk has made considerable inroads up the Humboldt. Russian olive is particularly prevalent on the Carson River below Dayton.

Meadows of grasses, sedges (*Carex spp.*) and rushes (*Juncus spp.*) are predominant on much of the floodplain of the Humboldt River and its tributaries, while occurring on shorter, more disjunct stretches of the other northern Nevada river floodplains. Creeping wildrye (*Elymus triticoides*) is one of the most important meadow grasses. Other types that may occur on a lowland floodplain include saltgrass (*Distichlis spicata*), greasewood (*Sarcobatus vermiculatus*), sagebrush (*Artemisia tridentata*), wildrye (*Elymus cinereus*), and in southern Nevada, arrowweed (*Pluchea sericea*) and saltgrass.

Historic and Current Conditions

Nevada's lowland riparian habitats are its most productive and among its most drastically altered. Historically, lowland floodplains were living components of the river itself – transporting water, dissipating energy and sediments, and cycling nutrients through many concurrent food chains. Rivers periodically flooded, streambanks and floodplains were scoured, and sediment deposits were rearranged. These periodic scourings prepared seedbeds for cottonwood seedlings to replenish the overstory. Willows regenerated on new point bars and linear sediment bars. Where floodplains were flat, channels wound tortuously across them, dissipating erosive energy and sustaining lush wet meadows and mature riparian shrub and tree layers through subbing of the slowed current into the surrounding soils.

At the coming of Europeans in the 1820's, the Humboldt River was not a cottonwood ecosystem. It was full of beaver, and willow and buffaloberry provided its dominant overstory layer while vast, marshy meadows coursed much of its length. The Truckee River did support stretches of gallery cottonwood forest, and ornithologist Robert Ridgway found it teeming with bird life, including Yellow-billed Cuckoos, when he surveyed it in 1868. The Carson River was likely very similar to the Truckee. Anecdotal accounts of the early settlers of Mason Valley describe a river floodplain too wet for cottonwoods – the Walker likely was similar in appearance to the Humboldt where it traversed Smith Valley and Mason Valley. According to the journals of the early trappers, beaver were scarce to nonexistent in the Truckee, Carson, and Walker systems (Cline 1963; Leonard 1978).

The Colorado River cut through hundreds of feet of rock as it passed by Nevada, and historically supported very little floodplain. Sandbars formed in the wider passages of the canyons where cottonwood and willow established in restricted thickets. These isolated communities likely shifted over time, and the woody debris produced by them played a

dynamic role in the establishment of point bars by jamming portions of the canyon and backing flows. Sediments dropped behind the logjams, and given enough time, new groves appeared on the new point bars. Before the invasion of tamarisk, the Virgin River riparian corridor likely supported coyote willow interspersed with patches of riparian forest comprised of Fremont cottonwood, Gooding's willow, green ash (*Fraxinus pennsylvanica*), Arizona sycamore (*Platanus wrightii*), and box elder (*Acer negundo*) (BIO/WEST, Inc. 1997). Upper terraces of the floodplain likely expressed a mosaic of screwbean mesquite and honey mesquite, arrowweed, and big saltbush along with meadows of salt-tolerant grasses such as Alkali sacaton and saltgrass.

With the settling of the West, beginning around 1850, Nevada's lowland riparian rivers underwent serious changes. Domestic livestock were brought in and from the beginning were often concentrated on the lowland floodplains, which were the most productive habitats Nevada had to offer. Permanent settlement began on the Carson River at Genoa, and soon the "backflow" from the California Gold Rush was filling the eastern Sierra river floodplains and later the Humboldt's with immigrant farmers who knew what to do with good soil and running water. Much of the Walker River floodplain was plowed for crops and extensive irrigation networks were established to divvy up and redistribute the water. The Humboldt, Truckee, Carson, and Virgin Rivers were initially groomed for irrigated pasture, but except for the extensive irrigation networks dug into the floodplain, change was negligible.

The gold strikes in western Nevada in the 1860's spelled the first grievous changes for any of Nevada's lowland rivers. Using mercury to separate the precious gold from its ore, a veritable battery of mills sprung up on the Carson River over the next twenty years and spilled thousands of tons of contaminated wastes into the river. These wastes were incorporated into the sediments and migrated downstream toward the unbelievably productive marshes in Lahontan Valley. Timber harvest from the eastern Sierra was sent down the Truckee to the sawmills above present-day Reno. These sawmills filled the Truckee with a deluge of sawdust and other mill waste that, while mostly organic and lacking the long-term contamination potential of mercury, began to change the productivity and nature of the Truckee from that time on.

In 1902, a Nevada U.S. Senator, Francis G. Newlands, was instrumental in getting the Reclamation Act passed, which authorized the newly formed U.S. Reclamation Service to divert and impound water on the major river systems in the West for the purposes of increasing arable lands through irrigation. Not surprisingly, Nevada found itself in line for the very first federal reclamation project, named after Senator Newlands, to be constructed in the Carson River system. Because the Carson watershed could not be counted upon to deliver reliable annual water volume to support the size of project that was envisioned, a massive ditch was cut across watersheds to empty diverted Truckee River water into the Carson River, and Derby Dam was constructed in the Truckee above its Big Bend at Wadsworth. In 1911, construction began on Lahontan Dam on the Carson at the end of the Truckee Canal spillway. When Lahontan Dam was completed in 1915, the era of the Federal Water Project had begun. Within 20 years, Rye Patch Dam had plugged the Humboldt north of Lovelock and water was being delivered to the Lovelock Project. Walker River farmers enhanced their water delivery options with the construction of Topaz Dam on the west fork in 1921 and Bridgeport Dam on the river's east fork in 1924. Downstream, the Paiute tribe at Schurz installed Weber Dam in 1935 to sustain their own agricultural venture, and the deed was complete. The relationship of every major river in

northern Nevada with its terminus – each of which supported vital migratory bird resources -- was profoundly changed, likely for the duration of mankind.

As with most all major changes of landscape, the modifications of Nevada's major rivers did not produce solely negative impacts on Nevada's bird life. For an account of species that thrive today in Nevada's agricultural centers as well as suggested strategies for their conservation, please refer to the "Agricultural Lands" section.

In the south, a different yoke was planned for the mighty Colorado. Concerns raised by the flooding of the Salton Sea in southern California during the years 1905 to 1907 and a thriving public works initiative conceived to keep America's workers employed and out of the bread lines facilitated the construction of Hoover Dam at the river's entrance into Black Canyon. One of mankind's greatest technological achievements, Hoover Dam – 726 feet high and 1,244 feet across – was completed in 1936, and the entire Boulder Basin was flooded from the top of Black Canyon upstream clear to Iceberg Canyon. A significant stretch of Virgin Canyon where it enters the Colorado at Overton was also inundated. Downstream, Davis Dam, near the present city of Laughlin was completed in 1953 and inundated the canyon as far upstream as the Chalk Cliffs. Today, no stretch of the Colorado as it passes Nevada functions under its natural hydrological regime. Downstream from Davis Dam to the southern tip of Nevada, the Colorado flows at the bidding of federal watermasters through a highly modified channel to service extensive agricultural lands converted from the natural floodplain vegetation types.

The Virgin River from Mesquite to its inundation by Lake Mead has been subjected to much less drastic structural modification, but much of its floodplain around Mesquite has at one time or another been converted to crop production. The Virgin's natural riparian vegetation has been significantly compromised by the invasion of tamarisk, although much of the river south of Riverside maintains a wide floodplain with braided channels and supports a large diversity of native species, particularly willows. The remaining natural habitats near Mesquite may soon be vulnerable to real estate development.

Plugging and inundating significant stretches of Nevada's major rivers was hardly enough to satisfy man's progress through the twentieth century. The remaining wild stretches of river were found to often misbehave and otherwise afflict or impede progress. After the completion of Rye Patch Dam in 1935, the U.S. Government began purchasing irrigation rights to the waters of the Humboldt from long-established users upstream for the purpose of transferring the use of that water downstream to the Lovelock Project. In order to "prove" to the State Watermaster that purchased waters had indeed been removed from their traditional delivery points on the floodplain between Battle Mountain and Valmy, a series of "channel improvement" projects were initiated that resulted in the Argenta Ditch, effectively draining Nevada's most productive riverine marsh complex around 1936, and an aggressive string of meander cuts that straightened the river channel as far downstream as the White House Ranch below Valmy. The downcutting that ensued as a result of these activities induced the river to abandon regular contact with much of its floodplain through this stretch, resulting in habitat degradation and loss of productivity.

On the Truckee, periodic flooding threatened the road bed of the Southern Pacific Railroad in the canyon between Sparks and Wadsworth. A significant channel-straightening project was initiated in the 1960's, meanders were cut by both the rail bed and the new Interstate Highway, and levees to deflect flow away from these structures were installed. The gravels

deposited in the canyon over centuries were coveted in Reno for construction, and several massive gravel extractions took place on its floodplain up and downstream from the Tracy Power Plant. A couple of active pits were catastrophically acquired and flooded by the river channel during the floods of 1996-97 when extraction activities did not reserve due respect for the river's destructive energies. Now, where productive floodplain once provided riparian habitat for migratory songbirds, there lies a string of open in-channel lakes of questionable productivity. Gravel operations have also impacted stretches of the Humboldt River's floodplain around Elko.

A boom of residential development on the floodplains of the Carson and Walker Rivers in the north and the Colorado below Davis Dam in the south has put increased pressure on water engineers to take action to prevent these rivers from exercising the natural processes necessary to maintain productive riparian habitats. Channel dredging, streambank armoring, levees, and other channel "improvements" are only going to be required with increasing frequency as land prices continue to rise and the population of northern Nevada continues to increase.

The general result of all this mucking about in Nevada's major floodplains has been disrupted stream flow, drowning and elimination of riparian habitat upstream of dams, interdicted vegetation responses to the scouring and subbing influences of water moving in natural rhythms down the system, invasion of undesirable exotic plants, and an ultimate degeneration of riparian habitat quality. As the urban thirst for water grows, the challenge of the next century could very well be that of preserving the integrity of Nevada's major river systems for the resource values they produce on their very own floodplains.

Opportunities For Conservation

While modification to Nevada's lowland river habitats has been extensive, the prospect for the future is quite encouraging. The general hydrological knowledge of the average long-time land user along Nevada's river floodplains is higher – there is more respect for a river's natural processes and more desire (at least among agriculturalists that have fought rivers all their lives) to allow a river to behave naturally than there was fifty years ago. Government assistance programs such as administered by the U.S. Natural Resource Conservation Service have shifted their emphasis in the last twenty years away from structural modification of river channels toward maintenance of natural habitats and processes. The State of Nevada Stewardship Program administered by the Division of Forestry provides monetary and technical assistance to private landowners interested in restoring quality habitats on their lands.

The public at large is also generally more knowledgeable about rivers and their needs. Water and power needs are now more likely to be weighed against the impacts of impoundment and controlled release on a river's natural productivity. Considerable public interest has been focused recently on the restoration of Nevada's damaged floodplains. Of particular interest at this time among a growing consortium of conservation and sportsmen's groups is the restoration of Argenta Marsh on the Humboldt near Battle Mountain. Regional cooperative planning efforts such as the Intermountain Waterfowl Venture are gaining momentum through the pooling of the technical expertise of government agencies and a gathering of many funding sources, federal, state, and private, to focus on regional priorities and bring bigger projects to fruition than each single entity would be capable of realizing itself with its own limited resources. As more of these types

of regional planning efforts (and Partners In Flight is certainly one) sharpen their focus and link together more and more to address matters of common concern, the power of the interested public to effect positive change on the ground will grow to unprecedented proportions.

Conservation bonds such as were approved and initiated in 1988 have resulted in the purchase and preservation of critical lowland riparian habitats such as the Carson River Ranches between Fort Churchill and Lahontan Dam. Both the Nevada Division of Wildlife and the U.S. Fish and Wildlife Service will have opportunities through their water purchase programs in the Lahontan Valley to acquire riparian lands along the lower Carson River. These lands are prime for riparian restoration even considering that much of the property's irrigation potential will be removed.

The Nature Conservancy has invested considerable time and resources into building consensus for the restoration of the lower Truckee River. This has resulted in riparian restoration projects being initiated downstream from Wadsworth, and more floodplain restoration in the watershed is planned.

In 1995, a group of concerned citizens of Moapa Valley formed the Muddy River Regional Environmental Impact Alleviation Committee. The purpose of the group is to adopt a pro-active approach to the improvement of the riparian habitat along the Muddy River. With the assistance of numerous partnerships from local, county, state, and federal entities, this group has initiated the Muddy River Habitat Restoration Project, an ambitious attempt to remove tamarisk along a portion of the Muddy River and revegetate with native species. To date, at least 1,000 native trees have been planted along the river, and avian abundance and species richness have already shown signs of improvement (Cris Tomlinson pers. comm.). This is an outstanding example of community involvement in riparian habitat restoration efforts.

It is the probable fate of this era to watch Nevada's arable lands become more valuable as residential and commercial property than they are for agricultural purposes. As population pressures continue to mount on the state's premium lands, the ability of biologists and bird advocates to work with county and local governments with respect to floodplain development issues will become critical to the long-term preservation and maintenance of lowland riparian habitats. Residential and commercial development within floodplains create situations which are intolerant of a river's need to exercise its natural processes. With development comes war with the river, waged with bulldozers, concrete and fill. Over time, the river may lose a few battles, but in the end it always wins the war at great expense and loss of property, dignity, and sometimes life. Vibrant, healthy migratory bird habitats are products of vibrant, healthy river systems. Anything less should be unacceptable.

Priority Bird Species

The following species have been prioritized for management attention by the Nevada Working Group. "Obligates" are species that are found only in the habitat type described in this section. "Others" are Priority Species that can be found in this habitat type, but use other habitat types as well.

Obligates

Yellow-billed Cuckoo
Southwestern Willow Flycatcher
Bank Swallow
Bell's Vireo
Blue Grosbeak

Other

Lewis's Woodpecker
Ash-throated Flycatcher
Phainopepla
Western Bluebird
Virginia's Warbler
Lucy's Warbler
Yellow-breasted Chat

PRIORITY SPECIES 1. LOWLAND RIPARIAN

SOUTHWESTERN WILLOW FLYCATCHER

Empidonax traillii extimus

Distribution

The Willow Flycatcher is one of eleven species of the genus *Empidonax* found in North America. Empidonax flycatchers are renowned for their physical similarities and, thus, for the difficulty in identifying individuals in the field (Phillips et al. 1964; Peterson 1990; Tibbitts et al. 1994). *Empidonax traillii* is further divided taxonomically into five subspecies (AOU 1997). Breeding territory for the Southwestern Willow Flycatcher extends from extreme southern Utah and Nevada, south through Arizona, New Mexico, southern California, and west Texas to extreme northern Baja California and Sonora, Mexico (Unitt 1987). The Southwestern Willow Flycatcher is a neotropical migrant, wintering in Mexico, Central America, and possibly in northern South America (Peterson 1990; Tibbitts et al. 1994). In Nevada, the Southwestern Willow Flycatcher is found in isolated pockets of the Colorado River drainage, including Las Vegas Wash, the Virgin River above Lake Mead, the Muddy River, Pahranagat Valley, and Meadow Valley Wash.

Habitat

Southwestern Willow Flycatchers nest in riparian habitat characterized by a dense stand of intermediate-sized shrubs or trees such as willows (*Salix* sp.), *Baccharis*, buttonbush (*Cephalanthus* sp.), box elder (*Acer negundo*), or tamarisk (*Tamarix* sp.), often with an overstory of scattered larger trees such as cottonwood or willows.

The Southwestern Willow Flycatcher is a riparian obligate occurring in habitats characterized by dense stands of intermediate-sized vegetation, usually with water or moist soil present beneath the canopy. A compact cup nest is constructed in a fork or horizontal branch approximately one to 7.5 meters above ground, typically within dense vegetation. The U.S. Fish and Wildlife Service (1997) has identified five general habitat types utilized by nesting Southwestern Willow Flycatchers, including:

1. Monotypic, dense stands of willow (often *S. exigua* or *S. geyeriana* above 7,000 feet elevation in Arizona) 2.7 to 6 meters in height with no distinct overstory; difficult to penetrate; vertical foliage density uniformly high (>60 percent) from ground to canopy.

2. Monotypic, dense stands of saltcedar (tamarisk) 3.6 to 10.6 meters in height forming a nearly continuous, closed canopy (i.e., no distinct overstory); vertical foliage density increases with height; canopy density uniformly high (approx. 90 percent); difficult to penetrate.

3. Dense stands of mostly Goodding's willow 3.6 to 12.2 meters in height characterized by trees of different size classes, a distinct overstory, subcanopy strata, fallen but living trees creating dense tangles difficult to penetrate.

4. Dense mixtures of native broadleaf trees and shrubs including cottonwood, willows, box elder, ash, buttonbush, and stinging nettle, characterized by a distinct overstory of cottonwood or willow with subcanopies and a dense understory of mixed species also difficult to penetrate.

5. Dense mixtures of native broadleaf trees and shrubs as in Number 4 above mixed with exotics such as saltcedar or Russian olive in the understory; dense ground-level tangles difficult to penetrate sometimes interspersed with small openings.

Physical Factors

The Southwestern Willow Flycatcher inhabits lowland riparian habitats below 4,000 feet elevation; other than that, effect of slope, aspect, and topography are unknown. Presence of water or moist soil is a necessary component of suitable nesting habitat; in fact, it seems to be the single most influential criterion among known nest sites. Temperature and humidity may influence pair distribution, but specific data are lacking.

Landscape Factors

Other site characteristics may be important; however, most are poorly understood. Occupied habitat patch size and shape can vary significantly, with areas as small as 0.6 hectares being utilized (Sogge et al. 1995). It appears, however, that linear habitats only one or two trees wide do not provide suitable nesting habitat for Southwestern Willow Flycatchers (U.S. Fish and Wildlife Service 1997).

Special Considerations

Southwestern Willow Flycatchers may begin arriving on breeding territory as early as late April and may continue to be present until August (R. McKernan pers. comm.). Migration routes are not completely known but do include drainages where breeding populations have not been documented in Arizona (U.S. Fish and Wildlife Service 1997). Other subspecies, including *E. t. brewsteri* and *E. t. adastus* probably utilize identical migration corridors.

They may begin nesting in late May and continue through July (Tibbitts et al. 1994; R. McKernan pers. comm.). Typically, Southwestern Willow Flycatchers raise one brood per year but have been documented to produce more than one brood during a season (Whitfield 1990; R. McKernan pers. comm.). Brood parasitism by Brown-headed Cowbirds has been documented throughout the range of the Southwestern Willow Flycatcher and

has been blamed for reducing flycatcher breeding success (Unitt 1987; Brown 1988; Rosenberg et.al. 1991; Sogge et al. 1993; Muiznieks et al. 1994; U.S. Fish and Wildlife Service 1997).

Other factors, including parasitism, predation, prey preferences and abundance, and population dynamics (e.g., site fidelity, distribution of breeding populations, dispersal, demography) are not fully understood and may affect breeding success. Studies are ongoing in an effort to further quantify habitat quality.

Associated Species

Vermilion Flycatcher	Yellow Warbler
Western Kingbird	Bullock's Oriole
Bewick's Wren	Lesser Goldfinch

Priority Considerations

The Southwestern Willow Flycatcher was listed as "Endangered" under the Endangered Species Act on February 27, 1995. Rangewide, the total population of Southwestern Willow Flycatchers has probably declined to approximately 300-500 pairs (USFWS 1993). The species is not abundant enough to register on Breeding Bird Survey data for the Mojave Desert region; however, considerable effort to survey new populations has transpired since the 1995 listing. These efforts are ongoing and new data may affect the previous population estimate. Historical potential breeding habitat for the Southwestern Willow Flycatcher has declined by as much as 97 percent in Arizona (Latta et al. 1999). For these reasons, the Nevada Working Group has selected the Southwestern Willow Flycatcher as a priority species in Nevada's conservation planning efforts.

OBJECTIVE: Establish between 40 and 50 successful breeding pairs in suitable habitat in the state of Nevada by 2010.

Strategy: Restore, enhance, and protect suitable Willow Flycatcher habitat on the Colorado River and its tributaries, on federal and state lands as well as through partnerships with private landowners.

Action: Work through public land planning processes to establish standards and guidelines that call for Willow Flycatcher detection surveys prior to any tamarisk or willow removal on federal or state lands.

Action: Encourage the voluntary standard protocol of detection surveys before tamarisk or willow removal on private lands. Work through federal assistance and stewardship programs to address Willow Flycatcher habitat needs in agency-assisted habitat improvement projects.

Action: Working through consensus with state and federal agencies and private landowners, target unoccupied tamarisk stands for rehabilitation into native plant communities more typical of historic Willow Flycatcher habitat.

Action: When opportunities exist, acquire breeding habitat from willing sellers via land exchange, purchase, or conservation easement.

Strategy: Increase survey efforts in known and potential habitat.

Action: Provide protocols, training, and survey tapes to all affected agency biologists and interested biological consultants.

Action: Train volunteers and coordinate survey efforts as part of a single-purpose activity.

Action: Coordinate survey efforts between agencies and maintain survey data in a central database accessible to local biologists.

Strategy: Monitor Brown-headed Cowbird brood parasitism in existing Southwestern Willow Flycatcher territories. Be ready to take serious action if brood parasitism reaches unsustainable levels.

Action: Initiate selective Brown-headed Cowbird trapping programs in areas with occupied Southwestern Willow Flycatcher territories.

Action: If selective trapping on breeding territories is inadequate, initiate Brown-headed Cowbird control around centers of concentration, i.e., dairies near Mesquite, feedlots, winter pastures.

Assumptions - Research and Monitoring Needs

The Southwestern Willow Flycatcher objective assumes that a total population goal of 40 to 50 pairs is achievable in Nevada. Current habitat analyses should continue toward a goal of comprehensive habitat assessment and survey. Unoccupied potential habitats should be targeted for population expansion. Current species surveys should continue to sharpen their focus on the production of a population estimate, an estimate of annual reproduction, recruitment, and prospects for expansion.

Opportunities

The Bureau of Reclamation has invested considerable resources into Southwestern Willow Flycatcher ecology and population assessment. The knowledge amassed by biologists as a result of this investment is the most comprehensive, concentrated resource regarding the species to date. Critical to the success of the effort to maintain and expand Nevada's current Southwestern Willow Flycatcher population will be the establishment of cooperative conservation strategies with the private landowners that control significant portions of the species' habitat. Partnerships must include attractive incentives to create "win-win" collaborations between agencies and landowners. The State of Nevada Stewardship Program administered by Nevada Division of Forestry is a successful model and source of funding and expertise toward achieving that end.

The Clark County Multiple Species Habitat Conservation Plan represents a bold effort by county government to take shared responsibility of the sustained conservation of wildlife within its borders. Acting as a central clearing house for the prioritization of needs and the

distribution of available mitigation funds, The Clark County Habitat Conservation Committee will continue to operate on the front line of habitat conservation in a heavily challenged region. Keeping the needs of the Southwestern Willow Flycatcher at the top of the priority list for mitigation funds in the short term should be a primary focus of Nevada Partners In Flight.

Management strategies designed to benefit the Southwestern Willow Flycatcher will also benefit Blue Grosbeak, Yellow Warbler, Yellow-breasted Chat, and Bell's Vireo – all species considered for prioritization by Nevada Partners In Flight.

Further Reading

Brown 1988
Sogge, Tibbitts, and Sferra 1993
Sogge, Van Riper, and May 1995

SPECIES PROFILE 2. LOWLAND RIPARIAN

WESTERN YELLOW-BILLED CUCKOO

Coccyzus americanus occidentalis

Distribution

Western Yellow-billed Cuckoos historically bred throughout the western United States, north to southern British Columbia. Currently, they are confirmed breeders in disjunct riparian habitats in California, Arizona, New Mexico southward into northern Mexico. They winter in tropical deciduous and evergreen forests of northern South America south to northern Argentina (Ehrlich, et al. 1988). In 1987, an estimate placed the number at 475-675 breeding pairs remaining in the western U.S. (Laymon and Halterman 1987). The number in Mexico was unknown, but is not assumed to exceed the number in the western U.S.

In Nevada, the historic status of the Western Yellow-billed Cuckoo is poorly documented although there is evidence it was a breeder along the Truckee and Carson River and in southern Nevada along the Colorado and Virgin Rivers. In the past decade there have primarily been sporadic sightings of single birds from a number of sites in the state. These birds are presumed to represent migrants. The only consistent set of recent sightings in Nevada is on a stretch of the Carson River. There have been almost annual reports of individual birds seen and heard from between 1986 and 1997 (Larry Neel pers. comm.). The most recent documentation of Yellow-billed Cuckoos breeding in Nevada was a pair at Beaver Dam Wash (Lincoln County) in 1979 (Kingery 1979).

Habitat

The Yellow-billed Cuckoo is a riparian obligate species which requires dense cottonwood-willow forested tracts of at least 16.8 hectares including a minimum of 3.0 hectares of closed-canopy broadleaf forest (Laymon and Halterman 1987). Gaines (1974) indicated that the riparian habitat needs to be at least 100 meters wide. Optimal habitat is greater than 80 hectares and wider than 580 meters (Laymon and Halterman 1989). Foraging occurs mostly in the cottonwood canopy, but nests are situated almost entirely in willows;

therefore, and multistoried vegetation structure is required (Laymon and Halterman 1987).

Physical Factors

Presently, the only potential Yellow billed Cuckoo habitats in Nevada occur in lowland riverine cottonwood forests below 4,500 feet elevation. Water is required to maintain viable habitat. Flood scouring regenerates cottonwood forest.

Landscape Factors

Gaines (1974) reported average home ranges of 10 hectares per pair in a riparian woodland in the Sacramento Valley. A wide band of cottonwood canopy closure is required, as is a healthy midstory of willow, where nesting occurs.

Special Considerations

Western Yellow-billed Cuckoos are one of the latest arriving summer breeding migrants. They arrive during the first week of June in Arizona, by late June in Northern Nevada, and depart by late August. Cuckoos feed on a variety of large invertebrates and on occasion amphibians and small reptiles (Ehrlich 1988; Nolan and Thompson 1975). They forage primarily in cottonwoods. Yellow-billed Cuckoos are asynchronous hatchers laying an average of three eggs per nest (Fleury 1994) and may have the ability to vary clutch size in conjunction with food availability. They can produce two and occasionally three clutches during years of high prey abundance (Fleury 1994).

There has been a drastic reduction in breeding range within the past 70 years due to riparian habitat alteration or destruction (Laymon and Halterman 1987). Western Yellow-billed Cuckoos are listed as endangered on several state wildlife lists and as of this writing, had been petitioned for protection under the U.S. Fish and Wildlife Service Endangered Species Act. Habitat loss of both migratory and breeding habitat is thought to be the primary reason for the decline of this species. Alteration of water flows has had a negative impact on riparian systems. Fleury (1994) lists the possible secondary causes of decline to habitat fragmentation, pesticide bioaccumulation, pesticide impacts on prey, and invasion of non-native species. Large contiguous blocks of cottonwood-willow riparian forest are more valuable than smaller fragmented patches of habitat.

Associated Species

Yellow Warbler
Summer Tanager

Priority Considerations

As of this writing, the Western Yellow-billed Cuckoo has been petitioned for protection under the Endangered Species Act. A “ninety-day finding” is still pending. The Yellow-billed Cuckoo has disappeared as a breeding species from all sites in Nevada where it was ever known to breed. Suitable habitat for Yellow-billed Cuckoos scarcely persists in Nevada. One site on the Carson River is deemed suitable and has supported single individuals several summers since 1988. Other stretches of Nevada’s cottonwood riparian forests are depleted of both canopy coverage and midstory. Despite seemingly impossible

challenges, the Nevada Working Group has selected the Yellow-billed Cuckoo for priority focus in the conservation plan.

OBJECTIVE: Establish two breeding pairs of Yellow-billed Cuckoos in Nevada by 2010.

Strategy: Maintain and increase large contiguous blocks of multi-storied cottonwood-willow forest wherever opportunities exist.

Action: Target the following sites for evaluation of habitat restoration potential: the Virgin River from Mesquite to Lake Mead; Meadow Valley Wash south of Caliente; the Colorado River below Davis Dam; the Carson River from Dayton to Lahontan Reservoir; the Truckee River below Wadsworth.

Action: Initiate cottonwood overstory restoration on Carson River Ranches State Park from Lahontan Reservoir to Fort Churchill.

Action: Continue cottonwood recruitment flows on the Truckee River and initiate other measures (adjustment to grazing treatments, etc.) to support restoration efforts.

Action: Utilize existing private lands habitat consultation/assistance programs to restore cottonwood/willow habitat on targeted sites through partnerships with willing landowners.

Strategy: Evaluate the extent and potential impacts of pesticide use in or adjacent to lowland riparian habitats.

Action: Monitor pesticide residues in common songbird species closely associated with Yellow-billed Cuckoos. Determine if effect levels exist which might be impeding reproductive potential.

Action: Determine if pesticide use is achieving an effect level in the reduction of preferred insect prey of Yellow-billed Cuckoo and other associated species.

Strategy: Survey all remaining suitable habitat for nesting Yellow-billed Cuckoos.

Action: Coordinate survey efforts among agency biologists, research biologists, and bird clubs to effectively survey all remaining suitable habitat.

Action: Focus Endangered Species Act funding (Section 6) toward additional Yellow-billed Cuckoo surveys in potential habitat.

Strategy: Investigate the feasibility of assisted recolonization of Yellow-billed Cuckoo pairs into suitable habitat.

Action: Evaluate the challenges posed by the prospect of capturing, relocating, and establishing breeding pairs of migratory songbirds.

Action: Evaluate the feasibility of augmentation of existing populations through captive breeding techniques.

Assumptions - Research and Monitoring Needs

The Yellow-billed Cuckoo objective assumes that there is the potential in Nevada to establish two breeding pairs into suitable habitat in the next ten years. Barring the discovery of any existing breeding pairs, the obstacles to achieving the establishment of even one breeding pair are intimidating. In the United States, there has not yet been an opportunity to resort to such severe recovery techniques as trap-and-transplant and captive breeding for migratory songbirds. In the instance of waterfowl species recovery, techniques have been fairly straightforward in their approach and strongly supported by the long history of husbandry techniques in the poultry industry. For raptor species recovery, an intense interest and participation from the falconry community proved vital to the advancement of successful captive propagation technology. Songbirds (including non-passerines such as the Yellow-billed Cuckoo) seem to pose a myriad of new problems for a recovery strategy that has been so successful as to have become taken for granted. Such an approach could be justified only if the western population of Yellow-billed Cuckoos as a whole were suddenly found to be in "emergency-room" crisis. That does not yet seem to be the case; yet laying the groundwork now to achieve success with artificial population augmentation techniques for songbirds does seem to make sense. By working out the many problems before the emergency recovery of any songbird species becomes necessary, conservationists would put themselves in a position of great advantage once a catastrophe occurs.

Opportunities

In the meantime, there is much to be gained in Nevada by building new suitable habitat to receive projected population expansion sometime in the future. By re-establishing multi-storied cottonwood/willow forests on Nevada's lowland river floodplains, conservationists can be assured that they are benefitting a host of species with habitat preferences similar to the cuckoo's. These habitats have the potential to support bird communities among the most diverse and most exciting in the state. All the necessary elements seem to be in place to assist Nevada State Parks in expanding what appears to be suitable Yellow-billed Cuckoo habitat on the Carson River Ranches property while impacting only a minimum of special interests. This project should be moved forward immediately. Habitat restoration efforts on the lower Truckee River have produced encouraging results, but time must now be allowed to work its magic on areas that have been adjusted. Mature habitats are still fifty years away. In the meantime, initiation of vegetative recovery should continue up and down the river. Restoration efforts on southern Nevada floodplains will be starting much from the same deteriorated condition as the Truckee. Landowner partnerships will need to be crafted and a regional vision must ensue if restoration efforts are to succeed. Considerable potential habitat for the Yellow-billed Cuckoo exists south of Caliente in Meadow Valley Wash. Surveys are needed to assess the habitat values of this stretch. Opportunities to restore habitat via the development of Clark County Wetlands Park may also exist in the Las Vegas Wash area where a Yellow-billed Cuckoo was sighted in the summer of 1998.

Further Reading

Fleury 1994
Laymon and Halterman 1989

SPECIES PROFILE 3. LOWLAND RIPARIAN

ASH-THROATED FLYCATCHER

Myiarchus cinerascens

Distribution

The Ash-throated Flycatcher ranges from northern Oregon, east to western Colorado and northern Texas, and south to El Salvador. In Nevada it is a summer resident from Clark County northwest to Pyramid Lake and northeast to the Ruby Mountains.

Habitat

The Ash-throated Flycatcher uses a wide range of habitats in Nevada, from yucca to riparian woodlands to pinyon-juniper. They require natural or created cavities for nesting. Ash-throated Flycatchers nest in open sparse Joshua trees to moderately dense mesquite-ash-cottonwood-willow riparian to moderately dense pinyon-juniper. Understory includes yucca, creosote bush, saltbush, riparian shrubs, sagebrush and desert almond. Occupied nests in cavities ranging from 3 to 20 feet off the ground have been reported.

Physical Factors

Ash-throated Flycatchers range in elevation from 2,000 to about 6,000 feet. Water is present in some riparian areas, but is not required. Topography varies with habitat type, from flat valleys to moderately steep slopes.

Landscape Factors

Ash-throated Flycatchers use large, contiguous habitats of Joshua tree and pinyon-juniper, as well as smaller linear riparian habitats. They require openings in the habitat or edges for flycatching. In Arizona, Hensley (1954) reported territory size as 2.9 hectares in desert washes and 9.9 hectares in open desert. In riparian habitat in the Sacramento Valley, Gaines (1977) reported a breeding density of 22 to 57 breeding males per square kilometer. This seemingly huge number is misleading due to the linear nature of suitable riparian habitat.

Special Considerations

Ash-throated Flycatchers feed mostly on insects caught in the air or gleaned, occasionally some small fruits. They would be affected by human disturbance that removes trees with cavities. These flycatchers are rarely parasitized by Brown-headed Cowbirds.

Associated Bird Species

Northern Flicker
Vermilion Flycatcher
Northern Mockingbird
Yellow Warbler
Yellow-breasted Chat
Bullock's Oriole
Summer Tanager

Priority Considerations

Limited Breeding Bird Survey data indicate a stable or increasing trend for the Ash-throated Flycatcher in all the physiographic regions found in Nevada (Sauer et. al. 1998). The Ash-throated Flycatcher is actually a species capable of exploiting a broad range of habitat types as long as nest cavities are available. It does, however, serve the purposes of the Nevada PIF planning effort for lowland riparian habitats by representing the needs of cavity-nesting birds in these habitats in both the northern and southern regions of the state. The species has been selected as a Priority Species by the Nevada Working Group because it effectively represents lowland riparian habitats which have been in decline in Nevada over the past century. New and severe challenges to these habitats in the future generate serious concern among conservationists.

OBJECTIVE: Maintain stable or increasing populations of Ash-throated Flycatcher breeding pairs throughout the lowland riparian habitats of Nevada through 2004.

Strategy: Maintain and enhance mature stands of mesquite, ash, cottonwood, willow, and buffaloberry to provide nesting cavities and an adequate prey base.

Action: Implement tamarisk control and native plant community re-establishment on suitable sites.

Action: Discourage the propagation of Russian olive on Nevada's lowland floodplains in favor of native willow species.

Action: Avoid large-scale removal of buffaloberry except on a scheduled rotation designed to maintain stand vigor at a scale that does not impact present habitat suitability.

Action: Utilize existing private lands habitat consultation/assistance programs to restore natural habitats on lowland riparian sites through partnerships with willing landowners.

Action: Utilize the Clark County Multiple Species Habitat Conservation Planning process to prioritize and fund lowland riparian habitat restoration projects.

Strategy: Monitor Ash-throated Flycatcher population trends through established monitoring protocols.

Action: Continue Breeding Bird Surveys and expand coverage.

Assumptions - Research and Monitoring Needs

The Ash-throated Flycatcher objective assumes that stable or increasing populations are achievable for the species in Nevada. Standard monitoring protocols should be continued to verify this assumption. This objective also assumes that Ash-throated Flycatchers adequately represent a cohort of lowland riparian bird species and their habitat requirements. Further research should be conducted to determine if other cavity-nesting, lowland riparian species with more restricted ranges such as Western Bluebird or Lucy's Warbler have more restrictive habitat requirements that would warrant a separate set of objectives and strategies for them.

Opportunities

It is likely that the opportunities for habitat improvement listed under the Yellow-billed Cuckoo objective will also benefit Ash-throated Flycatchers. One particular project warrants specific mention. Plans to restore sections of the lower Carson River presently being discussed by Stillwater National Wildlife Refuge personnel would greatly benefit Ash-throated Flycatcher and Western Bluebird – both of which occur in limited numbers along the river below Fallon. It is hoped that tamarisk control will release fertile floodplain lands toward the re-establishment of native willow and cottonwoods. Russian olive control may be necessary in a secondary treatment if response to tamarisk removal is not adequate.

Further Reading

Hensley 1954.

SPECIES PROFILE 4. LOWLAND RIPARIAN

BANK SWALLOW
Riparia riparia

Distribution

The Bank Swallow is distributed around the world. In North America, it breeds from Alaska east to southern Labrador, south to northern California, northern Nevada, Utah, northern New Mexico, southeast to northern Alabama and northeast to New Jersey. In Nevada, the Bank Swallow breeds from Washoe County east to Ruby Lakes NWR, south to Mason Valley in Lyon County. Breeding further south is poorly documented.

Habitat

Occurrence and distribution appears to be less dependent upon vegetation than suitable soil substrates for nest excavation. Bank Swallows are usually found near water where insect prey is abundant and they are generally regarded as a riparian species, although a dependence on riparian vegetation has not been demonstrated. Bank Swallows have been found over a wide range of habitat types and conditions, with preference for abundant insect concentrations. Suitable foraging habitat includes cropland and pasture, herbaceous range lands, forests, open water, and wetlands.

Physical Factors

Bank Swallows are most common in lowland habitats throughout their range but are known to nest up to about 7,500 feet elevation. Nest colonies are typically found in close association with water which may be due in part to a greater abundance of insects and bank soil moisture conditions for nest digging. Nesting colonies most often occur in banks, vertical cliffs, or bluffs with fine textured or sandy soil. Sand and gravel pits have also been used. Nesting colonies tend to occur most often on north and east aspects, west aspects to a lesser extent, and least frequently on south aspects. Soil moisture and/or suitable banks may be factors in colony orientation. Although Bank Swallows can utilize a variety of edge habitats, aspect is probably the most important factor in determining nesting suitability. Floods and erosion can serve both to destroy suitable habitat and/or existing

nests or create additional habitat by exposing bare soils.

Landscape Factors

Bank Swallows have a patchy distribution in suitable habitat. Because they are colonial, territory size is mostly irrelevant. Nest densities in colonies may exceed several hundred in suitable habitat. During the breeding season, most foraging occurs within about 1.6 km of the nest colony.

Special Considerations

Bank Swallows are completely insectivorous, ingesting large quantities of flies, beetles, and mayflies. They tend to be solitary feeders. Males form a monogamous pair bond but also mate promiscuously within the colony. Young are tended by both adults and typically return to the same colony or a nearby colony to breed. Previous success seems to be important, since few birds return to colonies that had many nest failures the previous year. Site fidelity increases with age and past breeding success.

Bank Swallows appear to be sensitive to human disturbance. Bank stabilization efforts for flood and erosion control work against Bank Swallows by destroying existing habitat and reducing potential for new habitat. Pesticide use and other management practices that reduce insect availability negatively impact Bank Swallows. Brood parasitism does not appear to be a problem, although nests are sometimes commandeered by House Sparrows. Nests are considered relatively inaccessible and safe from predators, but some eggs and adults are preyed upon by rats, skunks, house cats, snakes and some raptors. American Kestrels have been observed picking off young swallows at their burrow entrances.

Associated Species

Northern Rough-winged Swallow
Spotted Sandpiper
Belted Kingfisher
American Dipper

Priority Considerations

The Bank Swallow was identified by the Nevada Working Group as a species that may warrant concern in the Group's first efforts to prioritize species (Reed et al. 1996). The reasons given were "population declines in other states" and "uncertainty in Nevada". Since 1996, more data have become available. Some analyses showing a general increase in Bank Swallow numbers in Nevada based on limited Breeding Bird Survey data. A 24.2 percent decrease in the Columbia Plateau region was reported for the thirteen-year period between 1966 and 1979, but trends of the last decade were up slightly for that same region.

It seems as if Bank Swallow populations in Nevada are not in serious decline at this time; however, their colonial nesting ecology may make them vulnerable to local catastrophes and perturbations. The placement of Bank Swallow colonies in sandy banks of highly variable structural integrity makes the long-term maintenance of any single colony always

tenuous. Bank Swallow colonies may be vulnerable to indiscriminate recreational activities, sand and gravel mining, land development, and blatant acts of vandalism by the uneducated. Because the Nevada Working Group believes this vulnerability may be of a significant nature, objectives and strategies for Bank Swallow management are presented here.

OBJECTIVE: Maintain stable or increasing populations of Bank Swallows throughout Nevada through 2004.

Strategy: Protect known Bank Swallow colony sites.

Action: Survey and map all known Bank Swallow colony sites. Categorize each colony site with regard to size, persistence over time, and imminent and potential threats.

Action: Inform land management agencies, private landowners, and the general public about Bank Swallow distribution, ecology, and issues.

Action: Increase recognition of Bank Swallow colonies in areas of high recreational use. Exploit "Watchable Wildlife" potential of highly visible colonies.

Strategy: Monitor contaminant residue loading in Bank Swallow colonies which occur on contaminated soils - i.e., the mercury residues in the Carson River system.

Assumptions - Research and Monitoring Needs

The Bank Swallow objective assumes that present Bank Swallow populations are at least stable in Nevada. A relatively simple effort to atlas known Bank Swallow colonies will provide an important first step toward verifying that assumption. Bank Swallows are somewhat unique among their North American cousins – their colonies can be large with much swirling about much like Cliff Swallow colonies, but since they occur in sandy banks and not on man-made structures, there is much less potential for negative human concerns over waste excretion, etc. In Nevada, colonies occur on the banks of rivers or reservoirs where boating recreation is prominent. By getting the public excited about Bank Swallow colonies, the potential for long-range, volunteer population monitoring is excellent.

Although some baseline contaminant monitoring in Bank Swallow blood and tissue has been initiated along the Carson River below Dayton, not much is known about whether or not the mercury-contaminated sediments are transferring significant loads to either parent or young Bank Swallows that reside in them. Periodic monitoring is probably warranted to determine if Carson River populations are being exposed to undue risk.

Opportunities

The development of a Bank Swallow colony atlas and concurrent educational campaign presents an enjoyable opportunity for bird advocates, land management agencies, private

landowners, and the general public to build positive partnerships which engender trust, shared responsibility, and increased effectiveness that can be expected to grow into more effective bird conservation on an ever-broadening scale.

Further Reading

Petersen 1955.

SPECIES PROFILE 5. LOWLAND RIPARIAN

BLUE GROSBEAK

Guiraca caerulea

Distribution

The Blue Grosbeak ranges from southern California north to North Dakota east to the Atlantic coast and south to Panama. In Nevada, it is a summer resident from the Colorado River north to Mason Valley in Lyon County, with isolated pairs summering as far north as the lower Truckee River in Washoe County and the Humboldt River below Winnemucca.

Habitat

Dominant riparian species in southern Nevada habitats include screwbean mesquite, willow, cottonwood, ash, and tamarisk with an understory of saltbush, baccharis, and other riparian shrubs. In northern Nevada, the Blue Grosbeak tends to follow the distribution of buffaloberry (*Shepherdia argentea*) in the broader river floodplains.

Blue Grosbeaks prefer dense to moderately dense riparian tree canopy and midstory cover with sparse to dense shrub layer understory. They nest in a twig fork or among stems from 15 cm to 4.5 meters off the ground.

Physical Factors

Blue Grosbeaks are most common in low elevation, flat valley bottom riparian areas below 4,000 feet elevation. Water is usually present in the riparian habitats of Nevada, but it is not a major factor for the species in most of its breeding range.

Landscape Factors

Blue Grosbeaks use riparian areas from about 0.8 hectares to hundreds of hectares in size. They use both large contiguous areas and linear riparian areas. They will use riparian habitats with young to old-growth trees if vegetation is dense to moderately dense. Foraging habitat includes weedy fields and brushy areas after breeding, and before migration. Territory size and breeding density data are lacking for the western U. S., but one breeding territory in South Carolina occupied 6.1 hectares (Odum and Kuenzler 1955).

Special Factors

The Blue Grosbeak's diet consists of insects, seeds, and occasionally fruit. The potential for human disturbance is high due to limited riparian habitat in Nevada that is highly valued

for agricultural, livestock grazing, and recreational uses. Blue Grosbeaks are frequent Brown-headed Cowbird hosts. Males have individual territories during the breeding season. These birds may form flocks after the breeding season, feeding in grain fields and grasslands. Blue Grosbeaks are fairly common in low elevation riparian habitats but in low numbers due to limited riparian habitats in southern Nevada.

Associated Species

Western Kingbird
Bewick's Wren
Bullock's Oriole
Blue-gray Gnatcatcher
Brown-headed Cowbird
Northern Mockingbird
Verdin
Crissal Thrasher
Yellow Warbler

Priority Considerations

It was stated above that management strategies for Southwestern Willow Flycatcher would be sufficient to benefit and maintain Blue Grosbeak populations. This is true in southern Nevada where the two species occur together, but the range of the Blue Grosbeak extends much farther north than that of the Southwestern Willow Flycatcher, reaching as far north as the Humboldt River at Winnemucca. In addition, Breeding Bird Survey data analyses report a slight decline in Blue Grosbeak occurrence in the Basin and Range region over the thirty-year period between 1966 and 1996, with a marked increase in downward trend over the most recent decade. A population decline has also been reported for the Mojave region over the thirty-year period. Because of reported declines, differentiated distribution, and because habitat management issues do persist with regard to the Blue Grosbeak's northern haunts, it seemed prudent to create a separate set of objectives and strategies for the species.

OBJECTIVE: Maintain stable or increasing populations of Blue Grosbeaks throughout their range in Nevada through 2004.

In addition to the strategies and actions listed under Southwestern Willow Flycatcher, add:

Strategy: Maintain thriving buffaloberry stands mixed with cottonwood and/or willow stands on lowland river floodplains.

Action: Avoid large-scale removal of buffaloberry except on a scheduled rotation designed to maintain stand vigor at a scale that does not impact present habitat suitability.

Action: Determine the environmental requirements and life history of buffaloberry, as well as the species' recovery potential from fire and other perturbations.

Strategy: Initiate monitoring protocols sufficient to document status and trend of the Blue Grosbeak in Nevada.

Action: Evaluate the efficacy of present monitoring efforts; add monitoring

stations as appropriate

Assumptions - Research and Monitoring Needs

The Blue Grosbeak objective assumes that present populations of Blue Grosbeaks in Nevada have undergone recent declines. Population status and trend should be documented through focused monitoring efforts, or in concert with monitoring protocols for associated species. Habitat use and preferences of Blue Grosbeaks should be investigated more closely, testing hypotheses that address the observed but unquantified relationship between Blue Grosbeaks and buffaloberry. Buffaloberry habitat type dynamics have never been closely studied. Such work is long overdue.

Opportunities

A large portion of the remaining wild buffaloberry habitat on the Walker River floodplain in Mason Valley occurs on the Mason Valley Wildlife Management Area, owned and operated by the Nevada Division of Wildlife. Managers of this first-class wildlife landscape have long lamented the tendency of buffaloberry to outlive its usefulness, growing into massive thickets of dead material with low vigor and low percentage of live stems. While the cover values of huge thickets of buffaloberry are highly attractive to a wide array of wildlife species, concerns over the long-term landscape health of the buffaloberry type are legitimate and should be addressed. Observations after wildfires seem to indicate that buffaloberry is a quite aggressive root sprouter after fire, and post-treatment growth appears to be quite rapid. Much thought and planning should be invested in designing a buffaloberry habitat renovation schedule that at once invigorates stands with new growth while not significantly impacting the landscape with respect to the migratory birds and other wildlife species which depend on it for sustenance.

Other major buffaloberry communities occur on the Little Humboldt near Paradise Valley and on scattered portions of the Humboldt from Rye Patch Reservoir to Elko. Partnerships with private landowners will be vital to the maintenance of these valuable wildlife habitats over the long term. For the time being, farmers and ranchers on the Humboldt system have a generally benign view toward buffaloberry, welcoming its thermal cover values during the calving season. Any significant shift in land use in these communities toward more intensive agriculture, residential or commercial development could put these stands at risk, and must be mitigated through regional planning and education.

Further Reading

Bent 1968

OTHER PRIORITY SPECIES - LOWLAND RIPARIAN

VIRGINIA'S WARBLER
Vermivora virginiae

YELLOW-BREASTED CHAT
Icteria virens

The habitat needs of these species in the lowland riparian habitat type are adequately addressed in the habitat objectives and strategies for the Southwestern Willow Flycatcher, Yellow-billed Cuckoo, and Blue Grosbeak. For a species profile of the Virginia's Warbler,

please refer to the Montane Riparian habitat section. For a species profile of Yellow-breasted Chat, please refer to the Mesquite/Catclaw habitat section.

LEWIS'S WOODPECKER
Melanerpes lewis

PHAINOPEPLA
Phainopepla nitens

WESTERN BLUEBIRD
Sialia mexicana

LUCY'S WARBLER
Vermivora luciae

The habitat needs of this suite of species in the Lowland Riparian type are adequately addressed in the Lowland Riparian habitat objectives and strategies for the Ash-throated Flycatcher. For a Species Profile of the Lewis's Woodpecker, please refer to the Montane Riparian habitat section. In terms of Phainopepla needs, mature stands of lowland riparian mesquite would provide host to mistletoe, the berries of which comprise the Phainopepla's chief preferred food item. For a Species Profile of Phainopepla, please refer to the Mesquite/Catclaw habitat secton. Lucy's Warblers are cavity nesters which require mature stands of mequite or other woody shrubs and trees. For a Species Profile of Lucy's Warbler, please refer to the Mesquite/Catclaw habitat section.

HABITAT MANAGEMENT SUMMARY: LOWLAND RIPARIAN

Most of the strategies and objectives outlined for priority bird species found in lowland riparian habitat throughout Nevada are associated with maintaining and increasing the amount of native riparian habitat available for breeding. By devising conservation actions that will provide for continual regeneration of native riparian plant communities, the majority of the priority bird species will be provided for.

Certain priority species utilize early successional stands of native riparian habitat. Others utilize more mature stands of riparian habitat. Thus, any planned conservation action should provide areas that are protected from disturbance and other areas that undergo disturbances timed to coincide with natural regeneration processes. In areas that have been altered to such a degree that natural regeneration is no longer appropriate, artificial methods, such as plantings, will be recommended.

Non-native habitat can also provide important habitat for some priority species. It is important to initiate surveys prior to undertaking any restoration activity. It is also important to note that, in many areas, non-native plant species will become established during native plant restoration projects. In these areas, it may not be practical to attempt to maintain a 100% native plant community. The goal, in these areas, should be to re-establish a native plant component within the stand.

One priority species that is not dependent on native riparian vegetation is the Bank Swallow. Bank Swallow threats are associated with human disturbance. Conservation

strategies and objectives for other priority species should not affect Bank Swallow populations.

Cowbird trapping has been cited as a potential action for several priority species. Studies need to be undertaken to evaluate the potential success of any trapping program. This includes surveying prior to any trapping effort being undertaken as well as a post-trapping survey for all priority species affected by cowbird parasitism.

HABITAT TYPE: MESQUITE/CATCLAW

General Description

The mesquite habitat type is found in areas with deep soils along washes and riparian areas, also in isolated patches in low-lying areas such as the edges of dry lake beds. Mesquite is distributed throughout Clark County and extends into southern Lincoln and Nye counties. Catclaw acacia is generally distributed along the washes of southern Nevada, particularly in extreme southern Nevada. Distribution of mesquite and catclaw tends to be linear, as in wash systems, although mesquite also occurs as isolated clumps associated with sandy dunes. Both habitat types can be infected with mistletoe, which enhances their value to fruit-eating birds. Total area of mesquite in southern Nevada is estimated at less than 8,000 hectares, while approximate area of catclaw acacia is 4,400 hectares.

Physical Characteristics

The occurrence of mesquite in the Mojave Desert is indicative of a relatively shallow water table. The northern extent of its distribution in Nevada is approximately 37 degrees north latitude, where it is most likely limited by low winter temperatures. Average annual precipitation in its Nevada range is generally between 10 and 15 cm per year. Temperatures range between the extremes of 10 and 125 degrees Fahrenheit with an average annual temperature of 67 degrees. In the arid climates of southern Nevada, mesquite requires access to a dependable groundwater source, which explains its limited distribution along washes, riparian areas, and dry lake beds. The growth form of mesquite varies from thorny, impenetrable thickets to large trees that can reach heights as great as 30 feet with stems approaching three feet in diameter. Catclaw forms thorny thickets along linear wash systems as well as isolated clumps across the desert. In southern Nevada, mesquite and catclaw habitats generally occur below 3,000 feet elevation.

Dominant Plant Species

The dominant plant species are honey mesquite (*Prosopis glandulosa*) and catclaw (*Acacia greggii*). Other species include Screwbean mesquite (*P. pubescens*), quailbrush (*Atriplex lentiformis*), desert willow (*Chilopsis linearis*), seepweed (*Suaeda torreyana*), and wolfberry (*Lycium andersonii*). Common grasses found in mesquite habitat include Great Basin wildrye (*Elymus cinereus*), saltgrass (*Distichlis spicata*), and

alkali sacaton (*Sporobolus airoides*). Desert mistletoe (*Phorodendron californicum*) is a hemi-parasitic plant that uses mesquite and catclaw as its host.

Historic and Current Conditions

Historically, large stands of mesquite existed along the major wash systems in eastern Las Vegas Valley, including Las Vegas Wash, Flamingo Wash, Duck Creek, Paradise Wash, and Big Spring. The understory included a mixture of salt-tolerant native grasses and shrubs. Today, most of these understory species have been replaced by exotics such as red brome (*Bromus rubens*) and cheatgrass (*Bromus tectorum*). Salt cedar (*Tamarix ramosissima*) has invaded more mesic mesquite and catclaw communities. In southern Nevada, human settlements tend to occupy areas in and around mesquite woodlands because of easy access to groundwater. Consequently, many mesquite bosques have

now been replaced by residential subdivisions, baseball parks, and golf courses. Most of the mesquite habitat still exists in Pahrump Valley, but has recently been exposed to increased human use as a consequence of the high population growth rates in Pahrump. The onslaught of rapid civilization threatens mesquite/catclaw habitats in many other ways. The combined impacts of woodcutting, chaining, human-caused wildfire, and sand and gravel mining threaten to destroy these habitats faster than they can be replaced.

Opportunities

Responding to the challenges of integrating rapid urban development with biodiversity conservation, Clark County officials are currently developing a Multiple Species Habitat Conservation Plan to centralize and direct the application of mitigation funds in a coordinated fashion to maximize conservation effectiveness. By providing priority species and conservation objectives, the Nevada Working Group can positively influence this effort toward the achievement of mutually identified migratory bird conservation objectives.

Priority Bird Species

The following species have been prioritized for management attention by the Nevada Working Group. “Obligates” are species that are found only in the habitat type described in this section. “Others” are Priority Species that can be found in this habitat type, but use other habitat types as well. No mesquite/catclaw obligate species were prioritized by the Working Group. A list of mesquite/catclaw obligates which were not prioritized is included for the reader’s information.

(No Obligates)

Other

Loggerhead Shrike
Ash-throated Flycatcher
Phainopepla
Yellow-breasted Chat
Lucy’s Warbler

SPECIES PROFILE 1. MESQUITE/CATCLAW

PHAINOPEPLA

Phainopepla nitens

Distribution

The Phainopepla is a small frugivorous bird with a distribution ranging from the coastal woodlands of California, southeast to Arizona, southern Nevada and southwestern New Mexico, extreme western Texas and northwestern Mexico. In southern Nevada, this species is known to breed in mesquite and catclaw habitats. Phainopeplas arrive on their breeding grounds in October and occur in flocks until the initiation of the breeding season in February or March, at which time territories are formed and nest-building begins. The breeding season typically lasts until the end of April or beginning of May, at which time the entire population vacates the area. Summer distribution in Nevada is poorly understood.

Habitat

In southern Nevada, the Phainopepla is found in wash systems dominated by catclaw acacia as well as mesquite woodlands. Older-aged stands are preferred because they are usually more heavily infected with mistletoe, a prerequisite for the presence of Phainopeplas. The species has a highly specialized digestive tract capable of processing large amounts of mistletoe berries (Walsberg 1975), its preferred food item. At higher elevations, Phainopeplas inhabit pinyon-juniper communities infected with mistletoe. Other foods include the berries of wolfberry, juniper, buckthorn, elder, mulberry, and wild grape. Mistletoe density is more important than host density, while other structural parameters seem to be somewhat variable.

Physical Factors

In southern Nevada, the Phainopepla breeds and winters below 3,000 feet elevation. Summer areas may be as high as 7,000 feet. The topography of its preferred habitat is generally flat and open.

Landscape Factors

In the desert, Phainopeplas aggressively defend territories that encompass both the nest tree and the food source against all intruders. Areas of heavier mistletoe infection generally support more birds, but otherwise the size and configuration of habitat seems to be of minimal importance. Fire disturbance is a threat where tamarisk has access to recolonize burned sites. Recent concern has also developed over the increased frequency and intensity of fires in mesquite habitats associated with urban development. Old growth successional stages are preferred. In Imperial County, California, Walsberg (1977) reported territories averaging 0.4 hectares and ranging from 0.3 to 0.6 hectares. Krueger (1998) reported breeding densities of 10 and 16 pairs per 12 hectares (calculated average territory sizes = 0.7 to 1.2 hectares) in catclaw sites. Krueger observed that Phainopepla breeding populations fluctuated with annual variability in mistletoe berry production – more so in the northern mesquite woodlands where berry production was more heavily influenced by periodically colder temperatures.

Special Considerations

The Phainopepla's affinity for mistletoe berries necessarily restricts the species to habitats infested with the parasitic plant; however, insects become an important component of the Phainopepla's diet during the breeding season, providing an important source of protein for developing chicks (Walsberg 1977, 1978). The overlap of the mistletoe berry season (October through May) and the onset of the insect season in spring provides a small window of time when both food resources are available for the rearing of young (Walsberg 1977).

Mistletoe is sensitive to cold temperatures, and a drop in berry production resulting from abnormally cold winter temperatures can cause a subsequent decline in Phainopepla populations. Population trends must be analyzed with climatic fluctuations in mind. Berry production can vary considerably between sites, necessitating the conservation of suitable habitat at a broad scale to ensure the relatively constant availability of food.

In southern Nevada, Phainopepla distribution is well-documented during the fall through spring months, yet little is known relative to summering areas. Phainopeplas breed prior to the arrival of Brown-headed Cowbirds; therefore, brood parasitism is minimal.

Associated Species

Verdin
Black-tailed Gnatcatcher
Blue-gray Gnatcatcher
Crissal Thrasher
Abert's Towhee
Lucy's Warbler
Ash-throated Flycatcher

Priority Considerations

Rapid conversion of suitable habitat to residential uses could be outstripping the ability of local Phainopepla populations to adjust. Habitat is also being altered or destroyed by wildfires and uncontrolled firewood cutting. Off-road vehicle use in desert wash habitats could have a significant disturbance effect, particularly during the nesting season. Declining groundwater levels are a serious threat to the long-term existence of mesquite woodlands in southern Nevada.

OBJECTIVE: Maintain breeding population densities between 30 and 50 pairs per 40 hectares of suitable habitat through 2004.

Strategy: Maintain the present area and distribution of late seral successional stage mesquite, with particular focus on documented important breeding sites such as the Glendale/Moapa mesquite woodland and the large catclaw washes in Piute Valley.

Action: Protect old growth stands of mesquite/catclaw as much as possible through conservation easements, land exchanges, and other cooperative efforts with private landowners as well as with land management agencies. Encourage continued federal ownership of suitable mesquite and catclaw habitats presently occurring on federal lands.

Action: Revegetate appropriate sites now for future habitats. Suggest creation of new habitat in mitigation strategies when appropriate.

Action: Implement the BLM Las Vegas District Fire Management Plan which designates mesquite woodland areas as a high-priority fire suppression zone.

Action: Prohibit uncontrolled woodcutting activities and enforce the laws regulating vegetative removal on public lands.

Strategy: Increase public awareness of the value of mesquite habitats to birds and other wildlife in southern Nevada.

Action: Use a diverse array of media (i.e., slide shows, television, brochures, magazine articles, bulletin board displays) to raise public awareness of the relationships between mesquite/catclaw habitats and their

unique birdlife.

Action: Develop mesquite habitat strategies into "backyard wildlife" programs and other wildlife extension initiatives.

Assumptions - Research and Monitoring Needs

An assumption was made that 30 to 50 breeding pairs of Phainopepla per 40 hectares is both sustainable and viable, based on a reported figure of mean territory size at 0.4 hectares, and documented nesting densities ranging between one pair per 0.7 and 1.2 hectares. The target density assumes that 0.4 hectares of defended territory and a minimum of 0.4 to 0.8 hectares of feeding area shared with adjacent breeding pairs is adequate to sustain a viable population. Further research should identify differences in breeding densities between catclaw and mesquite habitats specific to Nevada.

Long-term population monitoring should be continued to determine overall trends. Climatic events contribute to fluctuations in mistletoe berry production, and should be considered along with trends in Phainopepla nesting success and population densities when evaluating the success of management efforts. Nevada's population trends should be evaluated with consideration of the trends in other breeding range states (e.g., Arizona and California).

Opportunities

The conservation of mature mesquite and catclaw habitat will not only ensure the persistence of Phainopepla populations in its Nevada range, but will also provide important habitat for cavity-nesting birds such as Lucy's Warblers and Ash-throated Flycatchers. Future efforts should concentrate on the establishment of mesquite habitat as part of riparian restoration projects along the Muddy and Virgin Rivers. Riparian mesquite provides an important habitat feature that will support Phainopepla as well as other riparian obligate species (e.g., Bell's Vireo) that are strongly associated with mesic environments in arid climates.

Further Reading

Jones 1990.
Walsberg 1975, 1977, 1978.

SPECIES PROFILE 2. MESQUITE/CATCLAW

LUCY'S WARBLER
Vermivora luciae

Distribution

The Lucy's Warbler ranges from southeastern California, southern Nevada, southern Utah and southwestern Colorado south into extreme western Texas and northwestern Mexico. It winters in the arid interior of central Mexico. In Nevada, the Lucy's Warbler ranges from

the Colorado River north to Caliente in Lincoln County.

Habitat

The Lucy's Warbler nests in riparian mesquite and low elevation cottonwood-willow riparian and mesquite along desert washes (Johnson 1997). Tamarisk (salt cedar) may also be used if native species are not present. Lucy's Warblers require trees large enough to provide sites for nesting, usually nesting in snags 3 to 11 ft from the ground (Ehrlich et al. 1988).

Krueger (1998) reported canopy coverages at nest sites in honey mesquite varying between 46 and 69 percent. The facts that historic populations were linked to mesquite bosques and that the species will nest in tamarisk thickets suggest that dense vegetation is preferred. However, according to Meents (1983), Lucy's Warblers prefer old growth mesquite bosques, and avoid areas with dense shrub understory. Nests are located in cavities or under loose bark. When breeding in tamarisk, they use matted clumps of dead leaves for nest sites (Rosenberg et al. 1991). This may result in nests being more susceptible to cowbird parasitism.

Krueger (1998) reported population densities in honey mesquite varying from four to 25 nests per 40 hectares. In the lower Colorado River Valley, densities range from 25 to 30 breeding pairs per 40 hectares in honey mesquite and 15 to 20 breeding pairs per 40 hectares in tamarisk, screwbeen mesquite, and cottonwood/willow habitats. Laudenslayer (1981) reported territory sizes in the Lower Colorado River Valley between 1.3 and 1.6 hectares in honey mesquite, 1.0 and 1.9 hectares in honey mesquite/screwbean mesquite, and 0.8 and 1.5 hectares in screwbean mesquite/tamarisk. (Rosenberg et al.1991).

Physical Factors

Usually nests below 3,300 feet elevation. Information is lacking regarding influences of water, topography, slope, or aspect; however, in the arid Southwest, presence of water or relatively shallow groundwater facilitates suitable breeding habitat.

Landscape Factors

Information is lacking regarding fragmentation, patch size, configuration, edge effect, or compatible types. Historically, preferred habitat was naturally fragmented over the landscape. Natural disturbance regimes include flooding and fire. Both could set back successional stages in riparian areas. However, both may be needed to maintain healthy plant communities under natural conditions. Since this species often depends on cavities for nesting, late successional communities are probably the most important as breeding habitat. Nest boxes might provide a substitute for natural cavities.

Special Considerations

Lucy's Warbler is one of only two warblers that are cavity nesters. It feeds almost exclusively on insects. Lucy's Warblers are known to be a host to cowbird parasitism. Limited information is available on current population status in southern Nevada.

Associated Species

Ash-throated Flycatcher
Verdin
Bushtit
Blue-gray Gnatcatcher
Bewick's Wren
Crissal Thrasher
Vermilion Flycatcher
Abert's Towhee

Priority Considerations

Limited Breeding Bird Survey data indicate that the Lucy's Warbler may be declining in the Mojave Desert province (Sauer et al.1998), although the trend data are not statistically significant. In Nevada, uncontrolled woodcutting, wildfire, and suburban development have detrimentally impacted habitat. Riparian degradation due to improper grazing, road construction, and dam building has reduced habitat.

OBJECTIVE: Stabilize or reverse possible declines in Lucy's Warbler populations in suitable habitats through 2004, with particular emphasis on suitable habitat in Stewart Valley, Nye County.

Strategy: Maintain the present area and distribution of late seral successional mesquite. Encourage the mitigation of any loss of this habitat.

In addition to the actions listed under Phainopepla, add:

Action: In suitable habitats on the urban interface or as a temporary population-saving measure, install nest boxes to increase nesting opportunities for Lucy's Warbler and other cavity-nesting birds using mesquite habitats.

Assumptions - Research and Monitoring Needs

The Lucy's Warbler objective for mesquite/catclaw habitats assumes a current declining trend. Current Breeding Bird Survey coverage is not adequate to establish reliable status and trend data; therefore, point counts should be established in enough suitable areas to provide the coverage needed. Further research should be conducted to determine the relationship between canopy cover and breeding pair density. More information specific to Lucy's Warbler habitat use and breeding densities in catclaw habitat is needed.

Opportunities

Protection of old, undisturbed mesquite woodlands will provide the nesting cavities and food resources needed by Lucy's Warbler. Looking toward the future, promotion of the recruitment of mature mesquite and catclaw stands will ensure the continued existence of the large community of bird species that use these habitats in southern Nevada.

Further Reading

Johnson et al. 1997
Laudenslayer 1981

SPECIES PROFILE 3. MESQUITE/CATCLAW

LOGGERHEAD SHRIKE

Lanius ludovicianus

(For a species profile of Loggerhead Shrike, please refer to the Salt Desert Scrub habitat section.

OBJECTIVE - Maintain a stable or increasing population trend for Loggerhead Shrikes in mesquite/catclaw habitats in southern nevada through 2004.

Strategy: Maintain healthy, multi-aged stands of mesquite/catclaw supporting abundant prey populations.

Action: Protect existing stands of mesquite and catclaw. Revegetate appropriate sites now for future habitats. Encourage the creation of new habitat through private lands extension and mitigation opportunities whenever appropriate.

Action: Encourage reclamation and revegetation of abandoned gravel pits.

Action: Encourage minimal pad preparation on larger residential lots and native xeric landscaping techniques after building. Encourage the maintenance of naturally vegetated corridors through residential developments.

Strategy: Maintain healthy reptile prey populations.

Action: Ensure that the commercial collection of reptiles occurs within sustainable harvest parameters with no significant effect on the ecosystems in which they occur.

Strategy: Provide information about the importance of mesquite/catclaw habitats to birds in Nevada to land managers, developers, schools, and other interested persons and groups.

Action: Use a diverse array of media, (i.e. slide shows, television segments, brochures, magazine articles, bulletin board displays) to raise public awareness of the relationships between mesquite/catclaw habitats and their unique birdlife.

Assumptions - Research and Monitoring Needs

Priority status was determined for the Loggerhead Shrike based on the assumption that habitat loss was likely contributing to a declining population trend in mesquite/catclaw habitats parallel to that documented across much of the rest of the United States. In order to test that assumption, monitoring points within mesquite/catclaw habitats must be established to document population trends where BBS routes do not provide adequate coverage.

In order to test the assumption that prey populations (in this case, reptiles) are at risk to habitat loss and unsustainable commercial harvest, population status and trend of many reptile species must be determined and monitoring procedures established to determine

sustainable harvest parameters.

Opportunities

Responding to the challenges of integrating rapid urban development with biodiversity conservation, Clark County officials are currently developing a Multiple Species Habitat Conservation Plan intended to centralize and direct the application of mitigation funds in a coordinated fashion to maximize conservation effectiveness. By providing priority species and conservation objectives, the Nevada Working Group can positively influence this effort toward the achievement of mutually identified migratory bird conservation objectives.

Further Reading

Morrison 1981.
Porter et al. 1975.
Yosef 1996.

SPECIES PROFILE 4. MESQUITE/CATCLAW

YELLOW-BREASTED CHAT

Icteria virens

Distribution

The Yellow-breasted Chat breeds from the Canadian border south to central Mexico, excluding the Florida peninsula and the northern Great Lakes area. It winters from northern Mexico south to western Panama. A few winter in the southern U.S. In Nevada, the Yellow-breasted Chat is a summer resident in suitable habitats statewide.

Habitat

Yellow-breasted Chats breed in dense thickets in scrub and woodland edges in dry and moist areas. They are often associated with riparian areas, and in southern Nevada, with screwbean mesquite, willow, and tamarisk. In northern Nevada, Yellow-breasted Chats prefer riparian shrubs with strong twig support, i.e. buffaloberry and Scouler's willow. They are not as likely to be found in sandbar willow with twigs that are weak and flexible (Larry Neel unpubl.) Yellow-breasted Chats require dense vegetation structure, and nest from ground level up to 2.4 meters.

Physical Factors

Yellow-breasted Chats occur in elevations from 1,500 to 5,500 feet elevation. They are often associated with water and riparian areas. Preferred topography is generally flat to moderately sloped in riparian valleys, but they can be found as individual pairs in low-flow riparian streams at higher elevation with quite steep slopes.

Landscape Factors

Chats nest in moderate patches, contiguous or linear dense riparian habitats. They use

young to old successional stages as long as the structure is dense. In a Sacramento Valley riparian habitat, Gaines (1974) reported 10 birds per 40 hectares. In mesquite bosques in southern Nevada, St. George reported breeding densities of 1.5 to 6.2 pairs per hectare (Ash Meadows NWR, unpublished data). St. George also reported breeding densities in tamarisk ranging between 2.2 to 4.0 pairs per hectare. Territory sizes from the eastern and midwestern states range from 0.1 to 2.5 hectares. It is suspected that western territories range toward the high end of the scale.

Special Factors

Yellow-breasted Chats eat insects and berries equally, gleaning from foliage or vegetation. They are a frequent host of Brown-headed Cowbirds.

Associated Species

Verdin	Northern Mockingbird
Bewick's Wren	Yellow Warbler
Blue-gray Gnatcatcher	Bullock's Oriole

Priority Considerations

Breeding Bird Survey data have not been analyzed for Yellow-breasted Chats in the Mojave Desert province. Data from the Colorado Plateau region indicate a 14 percent decline in Yellow-breasted Chat populations since 1966, with the bulk of that decline occurring since 1980 (Sauer et al. 1998). Because the Yellow-breasted Chat prefers habitats which are constantly under threat from a multitude of human uses, the Nevada Working Group has chosen it as a priority species for the purposes of this plan.

OBJECTIVE: Maintain Yellow-breasted Chat breeding pair densities between 0.4 and 1.0 breeding pair per hectare in suitable mesquite bosque habitat through 2004.

Strategy: Maintain dense thickets of old growth mesquite with a significant component of stout twiggy material, usually within 0.4 km of water.

Action: Identify and protect mesquite bosques. Encourage the mitigation of mesquite lost to land development.

Action: When treating tamarisk where it occurs in mixed stands with mesquite, apply herbicide locally and let treated tamarisk stand (Yellow-breasted Chat use will continue as long as vertical structure remains dense) and decompose naturally without mechanical assistance.

Action: When treating stands of tamarisk to encourage mesquite recolonization, apply herbicides on blocks within contiguous habitat on a rotational basis in order to avoid losing the breeding population altogether during the initial stages of rehabilitation. Let dead tamarisk stand and decompose naturally without mechanical assistance. As treated stands approach breeding habitat suitability, continue

treatment of remaining tamarisk blocks.

Assumptions – Research and Monitoring Needs

The Yellow-breasted Chat objective for mesquite habitats assumes that breeding pair densities of 0.4 to 1.0 hectares are sufficient to maintain healthy, self-sustaining populations. A monitoring program supplemental to Breeding Bird Surveys should be implemented to determine Yellow-breasted Chat status and trend in the Mojave Desert province. Minimum patch size should also be determined for bosque-nesting chats.

Opportunities

Ash Meadows NWR personnel have taken the lead in developing habitat enhancement strategies in mesquite bosque habitat. As their methods mature, their applicability to other mesquite habitats, including upper-bench riparian belts, should be evaluated and adapted as appropriate.

Further Reading

Bent 1963.

HABITAT MANAGEMENT SUMMARY - MESQUITE/CATCLAW

Management of mesquite and catclaw habitats should emphasize the maintenance and protection of existing old-aged stands and the restoration of former habitat that has been replaced by saltcedar. Specific management needs may differ slightly between mesquite and catclaw communities because of the different impacts associated with these habitats. For example, mesquite is dependent on accessible groundwater while catclaw is not. Therefore, management actions for mesquite woodlands that may have an effect on the water table will not be applicable to catclaw habitats.

Each priority bird species associated with mesquite and catclaw communities has certain unique habitat needs that may differ slightly from one another. Phainopeplas require the presence of mistletoe, which is most often found in abundance within older mesquite and catclaw stands. Lucy's Warblers do not need mistletoe, but require suitable cavity nesting sites that are also associated with older mesquite stands, but not with catclaw. Loggerhead Shrikes require habitat with an adequate prey base, perching sites with good visibility for hunting, and the presence of sharp objects used for impaling their prey. Both mesquite and catclaw habitats offer all these components for Loggerhead Shrikes, but do not necessarily need to be old-aged stands. It is thus important to ensure that mesquite and catclaw communities have a mix of all of these habitat components across the landscape. Alteration of these habitat components will affect the ability of mesquite and catclaw communities to support Phainopeplas, Lucy's Warblers, and Loggerhead Shrikes.

HABITAT TYPE: MOJAVE SHRUB

General Description

The Mojave Desert is the smallest of the North American Deserts and is positioned between the Great Basin to the north and the Sonoran Desert to the south (Turner 1982). The Mojave Desert could actually be characterized as a transitional community between the other two deserts as it has a vegetative component similar to both. In Nevada, the Mojave shrub type is distributed across the southern portion of the state, including much of Clark County, the southern portions of Nye and Lincoln County, and a few limited extensions into Esmeralda County. Estimates for this habitat type in Nevada range between 1,200,000 and 1,600,000 hectares (BLM 1999).

Physical Characteristics

Two major shrub types are found occupying the broad, extensive "bajadas" that lie between the mountain fault lines and the flat valley floors. The creosote-bursage type ranges from 500 feet to about 4,200 feet with extensions to 5,000 feet on south-facing slopes. The other major shrub type is blackbrush - Joshua tree, which extends from roughly 4,200 feet elevation to as high as 6,000 feet. This type is generally characterized as dry and rocky. Soils, when present, are usually high in clay and mineral content, particularly calcium carbonates. Some large areas have developed a layer of hard crust or "desert pavement" (Bradley and Deacon 1965).

Rainfall in the Mojave Desert is scant, and varies widely from year to year. Annual precipitation averages 10 to 15 cm. Precipitation primarily occurs in the winter from November through March. Summer thunderstorms can be intense, but widely scattered across the landscape such that not all habitat receives significant moisture in any one summer. Often the best, most vigorous plant growth on the landscape is associated with desert washes which can receive moisture from storms occurring several kilometers away. Roadsides also magnify the accumulated effects of moisture runoff and collection with noticeably more vigorous plant growth. Temperatures can be extreme, varying from 10 degrees Fahrenheit in winter to 125 degrees Fahrenheit in summer.

Dominant Plant Species

Perhaps the most recognizable plants are members of the yucca family -- Joshua tree (*Yucca brevifolia*) and Mojave yucca (*Yucca schidigera*). Three other common plants include creosote bush (*Larrea tridentata)*, white bursage (*Ambrosia dumosa*) and blackbrush (*Coleogyne ramosissima*). Predominant shrub species include many from the *Atriplex* community - Torrey saltbush (*A. torreyi*), shadscale (*A. confertifolia*), desert holly (*A. hymenelytra*) and fourwing saltbush (*A. canescens*). Also included are desert thorn (*Lycium spp.*), spiny hopsage (*Grayia spinosa*), iodine bush (*Allenrolfea occidentalis*), Mormon tea (*Ephedra spp.*) and greasewood (*Sarcobatus vermiculatus*). Some common cacti include barrel (*Ferocactus cylindraceus*), beavertail (*Opuntia basilaris*), cholla (*Opuntia spp.*) and hedgehog (*Echinocereus engelmannii*). Other common shrubs include range ratany (*Krameria grayia*), cheesebush (*Hymenoclea salsola*) and indigo bush (*Psorothamnus fremontii*). Some common forbs and grasses include globe mallow (*Sphaeralcea ambigua*), brittlebush (*Encelia farinosa*), halogeton (*Halogeton glomeratus*), saltgrass (*Distichlis spicata*), galleta (*Hilaria spp.*), and Indian rice grass (*Oryzopsis hymenoides*).

Historic and Current Conditions

In recent history this community has probably experienced limited change. Many areas outside of land development and heavy recreational use are in relatively good condition. Exotic grasses such as red brome and cheatgrass are not as prevalent as in some areas of the Great Basin given the limited and erratic rainfall patterns. In Nevada, probably 80% of the total amount of this habitat type exists in Clark County. Within this county, an estimated 70% is under some form of protection, mostly on federal lands reserved from general use where large blocks remain undisturbed. About 20% of the habitat within Clark County could be considered as improving in condition over the past ten years due to the cessation of grazing and off-highway vehicle use resulting from desert tortoise management initiatives. Historically this community experienced cattle grazing, although recently cattle grazing has been eliminated or reduced in several areas and this trend is expected to continue. Although horses and burros continue be problematic in some areas, their numbers are declining. Throughout southern Nevada, development is occurring at a rate which could ultimately negatively impact approximately 20% of the total area of this habitat type.

Opportunities for Conservation

Since 1989, vast tracts of land in the Mojave Desert have been conserved primarily as a result of the federal listing of the desert tortoise and resulting development of a Habitat Conservation Plan. Responding to the challenges of integrating rapid urban development with biodiversity conservation, Clark County officials are currently developing a Multiple Species Habitat Conservation Plan intended to centralize and direct the application of mitigation funds in a coordinated fashion to maximize conservation effectiveness. By providing priority species and conservation objectives, the Nevada Working Group can positively influence this effort toward the achievement of mutually identified migratory bird conservation objectives.

Priority Bird Species

Obligates

LeConte's Thrasher

Other

Loggerhead Shrike
Scott's Oriole
Burrowing Owl
Ash-throated Flycatcher

SPECIES PROFILE 1. MOJAVE SHRUB

LECONTE'S THRASHER
Toxostoma lecontei

The LeConte's Thrasher is a pale, very shy thrasher of the southwest deserts. It ranges

from the San Joaquin Valley in southern California north to Amargosa Valley in southern Nevada, east to Zion National Park in Utah and southeast to Nogales, Arizona, extending southwest through the northwest tip of Mexico and down into central Baja California. It breeds in southern Nevada, where it is an uncommon resident (Alcorn 1988).

Habitat

This species prefers open habitats due to its preference for running on the ground to forage for insects such as beetles, ants and insect larvae (G. Austin pers. comm.). Scattered cactus (cholla), yuccas or shrubs are necessary for nesting substrate. In southern Nevada this species has been observed in open habitats in a mixture of plant types including Mojave yucca, Joshua tree, creosote-bursage, mesquite, saltbush and big galleta (*Hilaria rigida*) communities as well as wash systems. A study in southern Nevada revealed a big galleta/sand dune community with the highest abundance of LeConte's Thrashers in the state (Karl 1984). LeConte's Thrashers are also found in creosote bush, Mojave yucca, and Torrey saltbush types in scattered sites across the Mojave Desert of southern Nevada (D. St. George pers. comm.).

Typical vegetative structure for the LeConte's thrasher is open ground for foraging, with an interspersion of shrubs for cover. Tall vegetative structure for nesting does not appear to be a limiting factor as nests may be found fairly close to the ground. They nest 2-8 feet up in cholla cactus or low trees or shrubs.

Physical Factors

This species is found from 500 feet elevation in the creosote-bursage community up to 6,000 feet in the Joshua tree and blackbrush communities. Flat topography seems to be preferred although no pertinent documentation was found. Free water does not appear to be a limiting factor for this species as it has been found long distances from those sources. Years of high annual rainfall are important for insect production.

Landscape Factors

Sparse vegetation is needed for location of insects on the ground. Territory was reported as 6 hectares per pair in desert cholla-saltbush scrub in California (Sheppard 1970). Home range in the same study was about 40 hectares.

Special Considerations

Nesting begins in late January and two or three broods are raised (Collins 1978). This very shy bird is somewhat local within its range; even where it is relatively common, the populations are spread over large territories (Farrand 1982). They are intolerant of habitat disruption by humans (Ehrlich et al.1988). The LeConte's thrasher is listed as a species in need of further information to evaluate its status in the Draft Clark County Multiple Species Habitat Conservation Plan (MSHCP 1998). The MSHCP may provide funding to assist in status surveys for this and several other bird species.

Associated Species

Verdin Cactus Wren

Black-tailed Gnatcatcher
Blue-gray Gnatcatcher
Abert's Towhee
Brewer's Sparrow

Priority Considerations

Although its populations in the Mojave Desert region have remained relatively stable since 1966 (Sauer et al. 1998), the LeConte's Thrasher has been selected by the Nevada Working Group as a Priority Species that represents the Mojave shrub habitat type particularly well. Its patchy distribution within the Mojave shrub type suggests an elevated vulnerability to habitat changes.

OBJECTIVE: Maintain a stable population trend of LeConte's Thrashers in suitable habitats through 2004, with particular emphasis on the following areas: Pahrump Valley, Amargosa Valley, and areas adjacent to Desert NWR.

Strategy: Identify and protect presently occupied LeConte's Thrasher habitat.

Action: Validate occupied LeConte's Thrasher habitats and identify important population centers.

Action: Perform GAP analyses to determine relative vulnerability of important LeConte's Thrasher population centers.

Action: In concert with county habitat planning efforts, devise a conservation strategy that identifies lands and appropriate methods for protection.

Strategy: Quantify population status of LeConte's Thrashers in Nevada.

Action: Initiate appropriate surveys to ascertain LeConte's Thrasher population status and trend in the absence of adequate BBS coverage.

Assumptions - Research and Monitoring Needs

The LeConte's Thrasher objective assumes that stable populations can be maintained in the face of the rapid urbanization presently occurring in significant portions of its Nevada range. The objective also assumes that focus on the three priority areas will be appropriate toward conserving the species in the state over the short and long term. Much more information must be collected regarding the distribution, abundance, and population trend of this species throughout its Nevada range. Current Breeding Bird Survey coverage is inadequate and must be supplemented with point counts or other appropriate survey methods. The objective also assumes that the LeConte's Thrasher is a good representative of Mojave shrub types in general. More information regarding this species' specific habitat preferences, focusing on its observed patchy distribution, should be acquired and compared to other Mojave shrub species requirements.

Opportunities

Probably the most significant opportunity to focus conservation efforts on the LeConte's Thrasher lies in the Clark County Multiple Species Habitat Conservation Plan and its

attendant strategic planning processes. Mitigation funds will continue to be made available as more habitat is converted to residential and commercial uses. The integration of Nevada Working Group objectives and strategies into the coordinated planning process will be both appropriate and advantageous. Similar county planning efforts may commence in other counties during the planning period of this document. Every effort should be made to integrate PIF objectives and strategies into any of these efforts as may begin.

Further Reading

Karl 1984
Sheppard 1970

SPECIES PROFILE 2. MOJAVE SHRUB

SCOTT'S ORIOLE

Icterus parisorum

Distribution

The Scott's Oriole ranges from southern California east through the southwestern states and western Colorado, and south through western Texas to Mexico. In Nevada, it is a summer resident in Clark and Lincoln Counties, with isolated nesting records as far north as Unionville in Pershing County. The Scott's Oriole might possibly have enjoyed a wider distribution in Nevada's pinyon-juniper belt before the turn of the century.

Habitat

Scott's Orioles breed in yucca, pinyon-juniper, arid oak scrub, riparian woodland, and palm oases. In Nevada, they occur mostly in yucca (Joshua tree) and pinyon-juniper habitats. Scott's Orioles appear to use a wide variety of vegetation structures from open, sparse understory in yucca habitats to denser areas of riparian habitats. Nests are frequently in yuccas where these are present, but elsewhere in trees four to twenty feet above ground.

Physical Factors

Scott's Orioles occur from low elevations in riparian habitats to nearly 6,000 feet in pinyon-juniper sites. They appear to frequent canyons. Water quantity does not appear to be a factor.

Landscape Factors

Patch size or edge effect seem to affect Scott's Orioles very little, if at all. Territory sizes and breeding densities are unknown.

Special Factors

Scott's Orioles eat insects, fruits, and nectar. It is a rare Bronzed Cowbird host. In wide open habitats territories are quite large. Human disturbance is very limited in yucca and

pinyon-juniper habitats, but may be a factor in riparian areas.

Associated Species

Cactus Wren
Black-throated Sparrow
Bewick's Wren
Ladder-backed Woodpecker

Priority Considerations

Although Scott's Orioles have exhibited stable population trends over the last thirty years (Sauer et al. 1998), a slight decrease for the period since 1980 has been reported (-3.5 percent, p = 0.17). Concerns have been expressed over the rapid conversion of Mojave shrub habitats to suburban and commercial properties in the last decade. The Scott's Oriole is also particularly representative of the Joshua tree habitat type. Because of signs of population decline, a perception of rapid loss of habitat, and its representation of the Joshua tree habitat type, the Nevada Working Group has selected the Scott's Oriole as a species of priority focus.

OBJECTIVE: Stabilize or reverse the population trend for Scott's Orioles in Nevada by 2004.

Strategy: Protect and maintain open Mojave shrub habitat, particularly Joshua tree stands.

Action: Identify Joshua tree habitats and perform risk analyses for these sites projected through the planning period.

Action: Initiate conservation protection on key sites at risk.

Action: Develop a public information campaign aimed at highlighting the unique qualities of Joshua tree habitat and the interesting organisms, of which Scott's Oriole is one, that inhabit it. Foster public interest in preserving Joshua tree habitat.

Strategy: Determine population status and trend of Scott's Orioles in Nevada.

Action: Analyze Breeding Bird Atlas data for new information regarding distribution of Scott's Orioles in the state.

Action: Supplement Breeding Bird Surveys with point counts or other appropriate methodologies in specific Joshua tree stands.

Assumptions - Research and Monitoring Needs

The Scott's Oriole objective assumes that populations in Nevada are showing early signs of decline and that a reversal of trend is warranted. More specific information regarding Scott's Oriole status and trend must be gathered before attainment of the objective can be verified. The conservation strategy assumes that suitable habitat is in need of protection.

Habitat risk analysis for Joshua tree stands will provide better understanding of the situation and the task at hand.

Opportunities

So far, population pressures have not been as intense on Joshua tree habitats as they have on less specialized Mojave shrub types, but one can hardly assume the status quo will persist very far into the next century. There may be immediate opportunity, however, to capitalize on the unique attractions of undisturbed Joshua tree habitat to the casually interested public to place additional significant tracts under protection that would preclude habitat type conversion. Conservation efforts may be focused through the "Area Of Critical Environmental Concern" (ACEC's) process of federal land management agencies to achieve the objective before urban pressures are directly brought to bear on the type. Indeed, several existing ACEC's already encompass extensive Joshua tree forests. On these tracts, migratory bird objectives should be incorporated into ACEC management plans developed by the BLM. Identification of additional critical habitats and the initiation of conservation strategies can be facilitated by the Nature Conservancy. Biologists should be watchful of the federal land exchange policies as implemented around the valuable margins of the Las Vegas metroplex, and get Joshua tree habitats removed from the exchange docket whenever possible. The Clark County Multispecies Habitat Conservation Plan process will continue to be an appropriate venue for the implementation of migratory bird conservation strategies in Mojave shrub habitats.

Further Reading

Bent 1958

SPECIES PROFILE 3. MOJAVE SHRUB BURROWING OWL

Athene cunicularia

(For a species profile of Burrowing Owl, please refer to the Salt Desert Scrub habitat section.)

OBJECTIVE: Stabilize the current decreasing population trend of Burrowing Owls in Mojave shrub habitats in southern Nevada by 2004.

Strategy: Protect and maintain suitable burrowing habitats and primary burrow providers.

Action: Monitor and quantify the impacts of off-road vehicle recreation on Burrowing Owl habitats, particularly centers of breeding concentration.

Mitigate impacts by adjustment of sanctioned event routes, closure of casual use in Burrowing Owl breeding centers, education of off-road vehicle enthusiasts and consensus planning involving off-road vehicle advocacy groups.

Action: Protect and maintain populations of burrowing animals such as ground squirrels, kit foxes, desert tortoises and badgers, all of which provide nesting sites for Burrowing Owls.

Action: Work with developers in urban and suburban areas to preserve open space within developments for Burrowing Owl use.

Action: Mitigate loss of Burrowing Owl nest sites by constructing artificial burrows in suitable alternative habitat with attendant site protection.

Strategy: Determine the impacts of commercial collection of reptiles on Burrowing Owl reproductive success.

Action: Monitor reptile collection on Burrowing Owl breeding centers. Close breeding center sites to commercial collection if significant impacts to reproductive success are documented.

Strategy: Determine population status and trend for Burrowing Owls in Mojave shrub habitats.

Action: Analyze Breeding Bird Atlas data for new information about the distribution of breeding Burrowing Owls throughout the state.

Action: Supplement Breeding Bird Atlas and Breeding Bird Survey data with specific Burrowing Owl surveys. Recruit volunteers to conduct surveys and provide information.

Action: Create a Burrowing Owl colony atlas that specifically delineates areas of breeding pair concentration.

Assumptions - Research and Monitoring Needs

The Mojave shrub habitat objective for Burrowing Owls assumes that populations in the Mojave Desert are declining. Additional survey data to supplement BBA and BBS data would provide a more complete understanding of status and trend as well as validate the achievement of the objective through the projected planning period. Impacts of off-road vehicle recreation should be monitored and quantified. An assumption is implied that at some excessive level, the removal of reptiles from a landscape will have a detrimental effect on species that prey on them. Impacts, population recovery potential, and relative dietary importance should all be quantified. Another assumption is made that by focusing conservation efforts on areas of breeding pair concentration, population viability can be maintained. Better understanding of the distribution of Burrowing Owl breeding pairs and the relationship of colonies to isolated breeders should be facilitated for the purpose of fine-tuning conservation strategies.

Opportunities

The Burrowing Owl is fortunate to have a high degree of appeal to the casual observer. This positive appeal can be developed into consensus conservation planning through education and awareness. The Clark County Multiple Species Habitat Conservation Plan process will continue to be an appropriate venue through which to effect such comprehensive planning. Constructive cooperation from the off-road vehicle enthusiast community and the commercial reptile collection community will be vital in the long-term success of conservation actions. The volunteer bird census corps presently being developed by the Great Basin Bird Observatory will prove to be indispensable to the determination of population distribution, status, and trend.

Further Reading

Coloumbe 1971

OTHER PRIORITY SPECIES - MOJAVE SHRUB

ASH-THROATED FLYCATCHER
Myiarchus cinerascens

LOGGERHEAD SHRIKE
Lanius ludovicianus

Two other Nevada Partners In Flight Priority Species, the Ash-throated Flycatcher and the Loggerhead Shrike, also occur in the Mojave shrub habitat type. Both are species that use a variety of habitat types across the state. Neither had specific habitat needs within the Mojave shrub type that are not provided for in the conservation objectives and strategies of the other species featured in this habitat section. For a species profile of Ash-throated Flycatcher, see the Lowland Riparian habitat section. For a species profile of Loggerhead Shrike, see the Mesquite/Catclaw habitat section.

HABITAT MANAGEMENT SUMMARY: MOJAVE SHRUB

The primary threats to the long-term health and viability of the Mojave shrub bird community come chiefly from the direct and indirect effects of urban sprawl, either directly through habitat conversion or indirectly through recreational activity and other land uses associated with large human population centers. Although habitat conversion and degradation is occurring at such a rapid pace as to seem almost hopeless to get in front of, the prudent plan of conservation still appears to be to acquire a comprehensive inventory of habitat and the wildlife communities supported by it, plot the rate of urban expansion on the landscape most likely to be affected, and look for opportunities to keep a portion of the landscape intact and interconnected sufficient to maintain the diversity of species that depend on it. Conservation objectives and strategies for Mojave birds will be introduced into long-range planning processes such as outlined in the Clark County Multiple Species Habitat Conservation Plan to assist planners in the successful achievement of their own stated goals and objectives. After an impact assessment of recreational and other “spin-off” activities associated with urban growth, partnerships will

be sought with advocacy groups to solve impact problems for species like Burrowing Owls.

HABITAT TYPE: MONTANE PARKLAND

General Description

The term “montane parklands” as used in this document refers to mountain meadows that occur in a variety of montane landscapes in association with a variety of different upland habitat types. Montane parklands occur in mountain ranges throughout the state, but present a diverse set of bird habitat values influenced by the characteristics of the surrounding upland matrix. Montane meadows occurring in the coniferous forests of the eastern Sierra Nevada, for instance, are vastly different in character and wildlife habitat expression than are the highly exposed meadow complexes that typify certain upper watersheds in the sagebrush-covered mountains of interior Nevada. Montane meadows are among the state’s most restricted habitat type, scattered across the upper reaches of most of its mountain ranges in very small, rarely connected patches. Total area in the state for this type is very hard to estimate due to the typical small individual patch sizes that often disappear in broad-scale remote sensing classification efforts. The Nevada GAP, which admittedly has grossly underestimated small-polygon riparian and meadow habitats reports 23,040 hectares of “dry meadow” and 4,096 hectares of “wet meadow”. These are the best figures presently available.

Physical Characteristics

At 5,000 to 10,000 feet, montane parklands are primarily found in valley bottoms, are associated with streams, springs, and glacial lakes. Annual precipitation varies between 25 and 75 cm per year. Temperatures vary between -30 and 90^{o}F. Soils of wet meadows are typically saturated with water throughout most of the year and high in organic substances, while dry meadows are seasonally moist or relatively dry from mid-summer through fall.

Dominant Plant Species

Wet meadows are dominated by herbaceous plants, such as sedges (*Carex spp.*), rushes (*Juncus spp.*), reedgrass (*Calamagrostis spp.*), timothy (*Phleum spp.*), bluegrass (*Poa spp.*), hairgrass (*Deschampsia cespitosa*), willowherb (*Epilobium spp.*), and saxifrage (*Saxifraga spp.*). Some woody species are also found in this habitat, primarily willows (*Salix spp.*), honeysuckle (*Lonicera spp.*), cinquefoil (*Potentilla spp.*), and blueberry (*Vaccinium spp.*).

Dry meadows are dominated by herbaceous species. Forbs include yarrow (*Achillea millefolium*), dandelion (*Taraxacum officinale*), *Geranium spp.*, *Penstemon spp.*, mulesear (*Wyethia amplexicaulis*), golden aster (*Chrysopis villosa*), arrowleaf balsamroot (*Balsamorhiza sagittata*), hawkbit (*Agoseris pumila*), larkspur (*Delphinium spp.*), and scarlet (*Gilia pulchella*). Dominant grasses include alpine fescue (*Festuca spp.*), shorthair (*Calamagrostis spp.*), wheatgrass (*Agropyron spp.*), needlegrass (*Stipa spp.*), timothy (*Phleum spp.*), *Poa spp.*, hairgrass (*Deschampsia caespitosa*), spike trisetum (*Trisetum spicatum*), and sedges (*Carex spp.*). Associated shrubs include sagebrush (*Artemisia spp.*), rabbitbrush (*Chrysothamnus viscidiflorus*), cinquefoil (*Potentilla fruticosa*), alpine laurel (*Kalmia poliofolia*), snowberry (*Symphoricarpos spp.*), and elderberry (*Sambucus cerulea*).

Historic and Current Conditions

The historic distribution of montane wet meadows has probably been somewhat impacted by European settlement. Some areas have been lost to dam construction and reservoirs, developments for recreational use, as well as control of beaver (*Castor canadensis*), which affects woody plant encroachment on existing areas as well as the creation of new areas through damming, ponding and sediment trapping. Historic overgrazing has impacted some wet meadows by exposing their substrates to erosive events which led to de-watering and an overall dessication of the site.

Historic changes in distribution of dry meadows are not known. Local changes in distribution occur through tree and sagebrush invasion. Livestock grazing now has a major influence in this habitat affecting habitat distribution, plant composition, and vegetation structure. Improper use can expose soils to erosion which may in turn induce a headcut which moves a significant amount of substrate out of the system. Drainage increases which then induces a lowering of the water table. This in turn opens the site up to invasion to tap-rooted shrubs and eventually the site is lost. The same process can be initiated by reckless recreational practices that rut or denude sites.

Opportunities For Conservation

Meadows are naturally attractive to both man and animal. Their heightened productivity when compared to the surrounding landscape attracts foraging livestock and wild herbivores. Humans like to live and recreate on meadows. As such, meadows draw concentrated attention in the debates over land use often generated by land use planning processes. In the Tahoe Basin, meadows have been designated “critical habitat” by the Tahoe Regional Planning Agency, an interstate regulatory commission charged with preserving the Tahoe Basin’s unique qualities of life. Thresholds and mitigation standards have been set to stem the loss of meadow habitat in the Basin. The present threshold is one of non-degradation.

Small meadows were once considered “sacrifice areas” in grazing management plans – not worth the effort to compute forage values and make adjustments to try to maintain. That thinking has changed in the last 20 years to where efforts to maintain the general character and productivity of all riparian areas and meadows are much more intensive and pay considerably more attention to detail. Areas of poor management still exist, but on the whole, the “stringer” meadow and other systems of small area have a much higher profile in grazing management strategies than they had in the past. Bird conservationists must continue to advocate the preservation and enhancement of these limited habitats through participation in federal, state, and local land use planning processes.

Priority Bird Species

Sage Grouse
Short-eared Owl
Calliope Hummingbird
Vesper Sparrow

SPECIES 1. SAGE GROUSE

Centrocercus urophasianus

(See Sagebrush habitat section for species profile.)

Sage grouse broods depend on meadows in sagebrush range for both insect and plant foods during the juvenal stage of life. Sage grouse chicks and brooding hens prefer plants like dandelion, yarrow, and western aster for food during the summer months. Broods born in the uplands tend to migrate seasonally toward meadows as upland ranges dessicate, becoming more or less completely dependent on meadows for food from about July 10 until the onset of winter. As Sage Grouse mature, their ability to digest sagebrush increases, and a shift in diet toward sagebrush leaves occurs as winter approaches.

(See Sagebrush habitat section for Priority Considerations for Sage Grouse.)

Objectives and Strategies

Objectives and strategies for Sage Grouse conservation are presently being formulated by the Western States Sage Grouse Committee. Rather than try to set its own objectives, the Nevada Working Group will wait for the completion of the Sage Grouse Committee product and incorporate its recommendations into the framework of this plan.

Further Reading

Neel 1980
Oakleaf 1970
Savage 1968

SPECIES PROFILE 2. MONTANE PARKLAND SHORT-EARED OWL

Asio flammeus

(See Wetlands habitat section for species profile and Priority Considerations.)

OBJECTIVE: Maintain present distribution and abundance of Short-eared Owls in montane parkland habitats throughout their range in the northern portion of the state through 2004.

Strategy: Preserve vole populations through proper habitat management.

Action: Manage suitable meadows for dense ground cover during the nesting season for both vole cover and owl nest cover. Utilize fenced refugia and deferred turn-on dates and periodic year-round rest from grazing to achieve desired habitat structure.

Action: Study post-fledging owl-prey habitat interactions for the purpose of developing effective habitat manipulation strategies aimed at increasing fledgling survival.

Strategy: Target damaged meadows for repair activities designed to raise the water table and restore historic hydrology and attendant vegetation.

Assumptions - Research and Monitoring Needs

The Short-eared Owl objective for montane parklands assumes that present occurrence and distribution are sufficient to maintain healthy, self-sustaining populations in the state. Specific monitoring of Short-eared Owls in occupied habitat should occur on a three-year interval to determine status and trend. The objective also assumes that fledgling survival can be enhanced through innovative grazing strategies. These assumptions should be tested and evaluated.

Opportunities

Federal land management agencies are seeking innovative management strategies for meadow complexes. The integration of Short-eared Owl objectives into the land management plans that pertain to occupied habitat should occur during the existing cycle of plan revisions. Building refugia could be achieved through cooperative funding programs, such as the NRCS riparian protection program, USFWS Partnerships In Wildlife, and others.

Further Reading

Clark 1975
Johnstone 1979

OTHER PRIORITY SPECIES: MONTANE PARKLAND

CALLIOPE HUMMINGBIRD
Stellula calliope

VESPER SPARROW
Pooecetes gramineus

Calliope Hummingbirds and Vesper Sparrows also utilize montane parklands to a significant degree either for nesting or foraging. The objectives and strategies for maintaining these species in montane parkland habitats are not noticeably different than for other habitat types in which they are found. For a species profile, objectives and strategies for Calliope Hummingbird, please refer to the Montane Riparian habitat section. For a species profile, objectives and strategies for Vesper Sparrow, please refer to the Sagebrush habitat section.

HABITAT MANAGEMENT SUMMARY: MONTANE PARKLAND

While no habitat obligates were identified for montane parklands, four priority species were the target of conservation objectives for this habitat type, Sage Grouse, Short-eared Owl, Calliope Hummingbird, and Vesper Sparrow. All of these species seek out montane parklands for foraging. Montane meadows provide a variety of resources, including flowers, seeds, and buds of herbaceous and shrub vegetation, as well as rodent populations that require dense ground covers.

Threats to montane parklands center around the degradation of vegetation through a variety of land use impacts, such as improper livestock grazing, recreational overuse, loss of beaver populations through control, and lowering of the ground water table as a result of stream head-cutting. Therefore, all objectives and strategies focus on protecting the

vegetation of montane parklands, particularly forb and sedge cover of the meadows, but also shrubs of the stream banks.

Specific strategies identified for meeting the population objectives for Short-eared Owls include encouraging vole use by protecting areas of dense ground cover. Protective actions include resting from livestock grazing by fencing off “refuge” areas, deferred turn-on dates for grazing, and timing of grazing to avoid the most sensitive periods vegetation growth. Because Calliope Hummingbirds and Vesper Sparrow also occur in other habitats, strategies to meet their population objectives are discussed elsewhere.

HABITAT TYPE: MONTANE RIPARIAN

General Description

Riparian areas are often described as those sites having soils and the presence of abundant water which can support a localized, water-dependent vegetation that frequently contrasts with the surrounding landscape. Riparian areas are most often associated with streams, lakes, and wetlands, but may also occur on some upland sites if microsite conditions influenced by topography, elevation, and precipitation produce sufficient soil moisture to support the vegetation types. Most montane riparian systems, largely due to landform characteristics and the amount of energy flowing through them, are the least static habitats on Nevada's landscapes. Riparian systems are subject to dynamic changes that are controlled on the large scale by climate and meteorological events. Equilibrium through the lifespan of a human being is tenuous at best.

Mountain riparian sites as described in the U.S. Fish and Wildlife Service GAP analysis include cottonwood (*Populus* sp.), aspen (*Populus tremuloides*), alder (*Alnus* sp.), birch (*Betula* sp.), willows (*Salix* sp.), wild rose (*Rosa woodsii*), and red-osier dogwood (*Cornus sericea*) located in areas generally occurring in Nevada's mountain ranges in and above the alluvial fans of all major valleys. The GAP estimated 53,480 hectares of mountain riparian habitat which probably included snowbank aspen, and 122,000 hectares of aspen habitat in Nevada. The gross area of montane riparian habitat is likely underestimated due to the scale and accuracy limitations of the GAP methodology. Furthermore, many difficulties have been discovered in the separation of specific habitat types within the gross area, so the figures reported here give the reader only a rough idea of what actually exists. Types in the GAP mountain riparian category are similar to those described by Manning and Padgett (1995). They classified riparian communities as dominated by coniferous trees, tall deciduous trees, low deciduous trees, non-willow shrubs, low willows, tall willows, and herbaceous vegetation. (Conifer, aspen, and meadow types are described in other sections.) According to Forest Service estimates (1992), approximately 132,000 hectares of aspen, 8,400 hectares of cottonwoods, and 12,060 hectares of riparian woodlands (non-timber) are present in Nevada.

Physical Characteristics

Montane riparian habitats occur throughout Nevada on most of its mountain ranges. Annual precipitation and temperature ranges reflect Nevada's extremes – from less than 12 to over 75 cm of precipitation per year and from -30 to well over 100 degrees Fahrenheit in temperature. Riparian vegetation generally follows the saturation zone of a stream course, spring outflow, or catchment basin. Mature plant heights can range from less than five feet for tundra willow to 90-100 feet tall for riparian conifers. Left undisturbed, deciduous riparian habitats attain a complex, multi-layered vertical structure with an intermittent to continuous overstory, a midstory that is often dense and impenetrable, and an understory rich in grasses and forbs.

Dominant Plant Species

Manning and Padgett (1995) delineated 21 herbaceous riparian community types. These 21 types can be roughly grouped into six general categories. Tall, deciduous-tree dominated types include cottonwoods and aspen. Understories range from dense birch, willows, rose, and dogwood to forb and/or grass dominated stands. Cottonwood and

aspen sites are found throughout the state from 5,000 to 8,500 feet elevation. The structural diversity of these cottonwood and aspen sites are important for birds and other wildlife.

Low deciduous tree-dominated types are represented by alder and birch. These sites generally occur along narrow high-gradient stream corridors with well-aerated and young soils. Both species represent early seral types. Alder is found in the Sierra Nevada and scattered sites across northern Nevada to the Columbia River Basin in northeastern Elko County. It typically ranges between 5,600 and 8,400 feet elevation. Structural diversity is often provided by an associated tall willow, red-osier dogwood, wild rose, or other shrub layer. All alder sites provide habitat for a variety of birds and other wildlife. Birch is present in central, eastern, and southern Nevada between 6,200 and 8,300 feet elevation. Understories can range from dense shrubs to open forbs- and/or grass-dominant. Structural diversity is provided by dogwood, rose, and willow.

Tall willow-dominated types are primarily associated with streams and occur across a wide elevational range from 4,700 to 10,200 feet. Tall willow types provide important habitat for birds and other wildlife. Willows and associated understory are critical for streambank protection and habitat integrity in highly erodible alluvial soils.

Low willow-dominated types are found in subalpine zones in Nevada and are common in the Ruby Mountains and the East Humboldt Range in eastern Nevada as well as the Sierra Nevada. They are often large riparian complexes in glacial U-shaped valleys ranging from 8,000 to 10,500 feet elevation. These areas are wet with organic soils and have a short growing season. Low willow sites are often densely vegetated and have limited understory; however, some sites contain more forbs and grasses. Shrubby cinquefoil sites are small in extent and found in the higher elevations from 8,500 to 8,800 feet adjacent to or in association with low willow sites.

Non-willow shrub-dominated types include rose and red-osier dogwood. Rose (*Rosa woodsii*) sites occur throughout the state from 5,200 to 8,200 feet elevation. Rose can exist as a productive midstory plant in willow sites, or sometimes it exists as the dominant species on sites subjected to long-term heavy grazing. Co-dominant shrub species are big sage (*Artemisia tridentata*) and chokecherry (*Prunus virginiana*). These sites sometimes represent succession away from riparian conditions due to a lowered water table, or are characteristic of the ecotone between riparian and upland types. The rhizomatous roots of wild rose provide streambank stabilization in unstable soils, while the bush provides cover and forage for birds and other wildlife. Red-osier dogwood sites are common across Nevada from 5,500 to 8,800 feet elevation. Willow species are common associates. Vegetative expression is often dense, limiting streamside disturbance.

Coniferous tree-dominated types include white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), Jeffrey pine (*P. jeffreyi*), limber pine (*P. flexilis*), Englemann spruce (*Picea englemannii*), subalpine fire (*Abies lasiocarpa*), and Rocky Mountain juniper (*Juniperus scopulorum*) as dominant vegetation in the riparian zone. Elevations are from 5,200 to 8,800 feet. Understories are typically comprised of meadow, cottonwoods, birch, dogwood, or many of the other types delineated by Manning and Padgett (1995). These sites occur primarily in the Sierra Nevada and in eastern Nevada scattered from Jarbidge to Great Basin National Park. The structural diversity provided by tall conifers, deciduous trees and shrub layers provide habitat to many

avian species and are important for biological diversity.

Historic and Current Conditions

The subject of the historic and current condition of riparian areas of the West has been much debated and has generated much controversy and conflict. Many statements have been made by creditable experts with considerable experience to the effect that western riparian systems have been significantly degraded since the arrival of Europeans on the landscape 200 years ago, particularly through improper livestock grazing. Actually, most of these statements referring to pre-settlement conditions have been based on intuitive observation but lack empirical data to give them scientific weight. In Nevada, serious attempts to quantitatively inventory the condition and potential of the state's riparian areas have only begun to gain momentum in the last decade. These efforts have resulted from a shift of the overall debate from trying to affix blame to a growing collective desire by all affected parties to better understand how these systems function. There is more desire than ever before to effect positive change on the landscape through consensus and pooled resources and expertise.

From the end of the Pleistocene until approximately 1850, a riparian habitat in Nevada maintained itself in a constantly shifting equilibrium, with the rate of change subject to the long-term effects of changing climate, and was vulnerable to the violent changes associated with stochastic events such as storms, floods, and fire. Fire historically played a role in maintaining aspen sites, inducing clone regeneration and reducing competition from invading conifers. Large ungulates did not exist on the Nevada landscape in densities sufficient to significantly impact the vegetative expression of a riparian habitat. Where beaver were present (and there is much debate over exactly where beaver occurred in the state as well as the nature and intensity of their impacts), they exerted their own set of impacts and influences, both positive and negative, on watersheds. Overstories were removed and mid-stories were thinned. Beaver dams slowed water flow and raised water tables which may have ameliorated the catastrophic effects of fire on riparian vegetation, but also periodically blew out and initiated incision events up and downstream. Plant communities probably tended toward climax over the long-term, with periodic drastic removal via flood and fire, after which the entire process began again.

It is generally accepted that improper grazing occurring over a forty-year period roughly between 1880 and 1920 accelerated degradation processes on many riparian systems in the West, resulting in the loss of wildlife habitat on both high- and low-elevation ecosystems (Chaney et al. 1990). In addition, mining activities such as hydraulic ore removal and dredging have degraded floodplains and stream beds, causing streams to headcut and otherwise alter their courses. Recreational activities such as off-road vehicle travel and camping, along with road-building have also contributed to what is perceived as an overall degradation of habitat quality in the twentieth century. The suppression of fire over the past 60 years has removed an important agent of change from many riparian aspen systems which, in concert with ungulate grazing, has contributed to the progression of stands toward mature, non-regenerative conditions.

Although much has been learned about the nature and importance of riparian habitats, and efforts to relieve human pressures on them have increased in the last thirty years, an unknown percentage of Nevada's montane riparian habitats are still at risk because the historical land uses listed above have not yet been adjusted to sustainable levels.

Opportunities For Conservation

Healthy riparian habitats provide values and benefits far in excess of the small percentage of Nevada's total area which they represent. Riparian habitats serve as highly productive oases or islands in Nevada's relatively sere landscape. Opportunities exist to improve sites that are in poor ecological condition, and the desire to effect successful change has never been greater. Concerns were generated largely by the challenges of complying with the Clean Water Act of 1977. Processes to determine Proper Functioning Condition (USDI-BLM 1995) are presently being implemented to inventory stream conditions across Nevada while developing a common language by which all stakeholders of riparian habitats can seek common ground from which to begin the process of stream habitat restoration. Land managers are learning more about site conditions, ecological site potentials, and improvement opportunities which will in time be translated by land management agencies into watershed restoration and better overall ecosystem health. Under this approach, desired future conditions "above" Proper Functioning Condition will require a balancing of many priorities from a wide range of users and advocates. The challenge lies in providing "Properly Functioning Bird Habitats" while still providing forage for livestock, camp sites, and landscape access all at sustainable levels.

Recently, several major specific restoration projects have been initiated that can serve as models for action. The State of Nevada purchased The Bruneau River Ranch in 1995 for its wide variety of wildlife and fisheries values. Attendant to that purchase was the retirement of a grazing privilege and a subsequent redistribution of remaining grazing privileges that resulted in the easing of grazing pressure across an entire watershed. In 1991, a cooperative project among the BLM, Forest Service, Nevada Division of Wildlife, and affected private parties was initiated to consolidate public land holdings in the upper Mary's River drainage. Private land holdings within the basin were exchanged for other real estate outside the basin and a fence was constructed around the newly consolidated watershed to allow it to recover to excellent condition. Habitat response to both these projects has been phenomenal, and presently stand as testimony to what can be achieved with creative partnership-building among agencies, landowners, and advocacy groups.

Priority Bird Species

The following species have been prioritized for management attention by the Nevada Working Group:

Obligates

Wilson's Warbler
MacGillivray's Warbler

Other

Cooper's Hawk
Red-naped Sapsucker

Northern Goshawk
Calliope Hummingbird
Lewis's Woodpecker
Orange-crowned Warbler
Virginia's Warbler
Yellow-breasted Chat

SPECIES PROFILE 1. MONTANE RIPARIAN

WILSON'S WARBLER
Wilsonia pusilla

Distribution

The Wilson's Warbler breeds from northern Alaska across Canada to southern Labrador and Newfoundland south to southern California, central Nevada, northern Nevada, and northern New Mexico in the western U.S. As a breeder it avoids the Great Plains and the Midwest. Its range in the eastern U.S. extends south as far as Maine, Vermont, and New Hampshire. In Nevada, the Wilson's Warbler is listed in Alcorn (1988) as a "common summer resident in the higher valleys and mountain ranges. Three races are reported: *W. p. pileolata* which breeds in the state, and *W. p. pusilla* and *W. p. chryseola*, both of which migrate through Nevada.

Habitat

The Wilson's Warbler breeds in riparian habitats associated with montane forests in northern Nevada. The nest is placed on or near the ground in dense thickets of willows, aspen, rose, or dogwood within mixed conifer or subalpine forests (Ryser 1985; Bent 1953; Stewart 1973).

Physical Factors

In Nevada, the Wilson's Warbler ranges between 5,000 and 9,000 feet elevation (Linsdale 1936). The effects of topography, slope, and aspect are unknown.

Landscape Factors

Late successional stages of riparian shrubs are necessary to provide a structure that is dense enough to represent suitable nesting habitat (Stewart 1973). In an oak-bay-laurel habitat in Marin County, California, Stewart reported 24 territories averaging 0.5 hectares and ranging between 0.2 and 1.3 hectares in size.

Special Considerations

The Wilson's Warbler's preference for dense, mature riparian shrubs and trees may render it vulnerable to livestock grazing, excessive or abusive recreational activities, or willow removal to "increase water yield". The Wilson's Warbler is insectivorous, gleaning insects from riparian foliage or hawking them from the air. Breeding populations in Nevada are very small, disjunct, and as such may be especially vulnerable to local habitat changes. Nevada may actually be more important to the Wilson's Warbler through the habitat it

provides during migration than it is as a breeding state.

Associated Species

Warbling Vireo	Fox Sparrow
Broad-tailed Hummingbird	Blue Grouse

Priority Considerations

Declining population trends have been documented in adjacent states (Sauer et al. 1998). It is generally regarded that montane riparian sites are at risk throughout Nevada from a wide range of commercial and recreational uses. For the Wilson's Warbler, these threats manifest themselves through the reduction of structural vegetative diversity in the upper reaches of the watershed often dominated by aspen. Very little is known about the actual population status, breeding distribution, or habitat preferences of Wilson's Warblers in Nevada. In addition, Wilson's Warblers utilize Nevada's lowland riparian habitats extensively during migration, making conservation of lowland as well as montane riparian habitats particularly critical to the species.

OBJECTIVE: Maintain stable or increasing population trends for Wilson's Warbler by 2004 in montane riparian habitats from 5000-9000 feet in northern Nevada, with particular emphasis on five population centers -- the Sierra Nevada, the Ruby Mountains-East Humboldt Range, the Jarbidge Mountains, the Snake Range, and the Toquima-Monitor-Toiyabe Ranges.

Strategy: Manage for dense willow components and aspen mid-stories in suitable stands through habitat protection, restoration, and enhancement where opportunities exist.

Action: Evaluate the effectiveness of management activities related to the maintenance of foliage density and their effects on riparian songbird nesting.

Action: Determine Wilson's Warbler population response to habitat changes effected by a recent management action designed to bring land uses into sustainable levels at Proper Functioning Condition.

Action: Determine to what extent, if any, Wilson's Warbler habitat must exceed Proper Functioning Condition to maintain a self-sustaining or source population.

Action: Look for opportunities through land use planning processes to preserve and create suitable Wilson's Warbler breeding and migration habitat.

Strategy: Determine population trends in the five priority areas delineated in the objective.

Action: Establish point count, MAPS, or other suitable monitoring methodologies in the five priority areas.

Assumptions - Research and Monitoring Needs

The Wilson's Warbler objective assumes that sustainable populations of Wilson's Warblers exist in the five priority areas delineated. Appropriate monitoring methodologies must be established in these areas to confirm the objective as achievable. The importance of Nevada's montane riparian habitats to migrating Wilson's Warblers has been logically suggested but hardly quantified. Appropriate methodologies directed at quantifying this importance should be initiated.

Opportunities

The present consensus effort to determine Proper Functioning Condition (PFC) for Nevada's montane riparian systems is an admirable start toward long-term maintenance of healthy bird habitats. It must be recognized that PFC may in some cases be adequate for the maintenance of bird habitats, while in other cases it may be inadequate. It will be the responsibility of the advocates for bird habitats to determine what those relationships are, as well as to represent the integration of quantifiable objectives into the consensus effort to initiate positive changes in those habitats. In the case of Wilson's Warbler, the challenge will be to maintain a dense willow component in aspen or conifer overstory above 5,000 feet elevation.

Further Reading

Stewart 1973.

SPECIES PROFILE 2. MONTANE RIPARIAN

MACGILLVRAY'S WARBLER

Oporornis tolmei

Distribution

The MacGillivray's Warbler ranges across the western U.S. and Canada including the Great Basin. Austin (1968) reported breeding in the Spring Mountains. It is a summer resident in most mountain ranges (Alcorn 1988). Linsdale (1936) reported the species in 11 Nevada counties including Clark, Nye, and Lincoln.

Habitat

The MacGillivray's Warbler nests one to five feet from the ground in dense riparian willow and alder at the edges of meadow, coniferous or mixed woods (Dobkin 1992). It is found in canyons near streams, in thickets on north-facing slopes, in thick secondary growth following a fire or logging, or in dense undergrowth of an aspen grove (Ryser 1985). Johnson (1973) reported that MacGillivray's Warblers nested in at least two places in mixed thickets of chokecherry, wild rose, and cottonwoods along a stream in Sawmill Canyon, between 6600 and 6800 feet in the Quinn Canyon Mountains (Alcorn 1988). Voget (pers. comm.) reported MacGillivray's Warblers nesting in thick stands of ceanothus along the Jarbidge River between 7,500 and 8,000 feet elevation. In clear cuts in Oregon, MacGillivray's Warblers were associated exclusively with shrub cover (Morrison 1981). Dense understory is required. Nests are located on or near ground.

Physical Factors

MacGillivray's Warblers occur in Nevada between 4800 and at least 8200 feet elevation. Topography, slope, and aspect seem not to be a factor except as they affect the distribution and health of riparian habitats.

Landscape Factors

Dobkin and Wilcox (1984) found that occupied patch size preference varied between east slope and west slope canyons. In east slope canyons, MacGillivray's Warblers were equally attracted to patches less than or greater than 1000 hectares. In west slope canyons, MacGillivray's Warblers preferred patch sizes greater than 1000 hectares to those less than 1000 hectares three to one.

Riparian habitats are inherently narrow, necessitating a lowered sensitivity to "edge" on the part of the species that use it. Nevertheless, below some threshold width, riparian habitats will begin to lose species (Stauffer and Best 1980). While MacGillivray's Warblers spend much of their foraging effort in the edge between riparian and brush habitats, breeding success requires concealment of the nest in thick vegetation.

In a Wyoming study, Salt (1957) reported densities in birds per 40 hectares as 10 in a willow/sedge swamp; 30 in a flatland aspen stand; and 85 in scrub/meadow. Territory size has not been determined.

Special Considerations

MacGillivray's Warblers were found to be insensitive to campgrounds in dense riparian areas in Bear River Range of the Wasatch Mountains, Utah (Blakesley and Reese 1988). The Breeding Bird Survey trend data (1966-1996) indicate declines in breeding bird populations in northwestern Nevada.

Associated Species

Song Sparrow
Yellow Warbler
Lincoln's Sparrow
Warbling Vireo
Dark-eyed Junco

Priority Considerations

Breeding Bird Survey data indicate a slight decreasing trend for the Sierra Nevada. MacGillivray's Warblers are not adequately surveyed in the Great Basin and Columbia Plateau regions to determine trend to any extent. It is generally regarded that montane riparian sites are at risk throughout Nevada from a wide range of commercial and recreational uses. For MacGillivray's Warbler, the challenge may be in maintaining dense stands of willow and alder with sufficient understory to conceal nests.

OBJECTIVE: Maintain stable or increasing population trends for MacGillivray's Warblers in riparian habitats ranging between 4800 and 8200 feet elevation through 2004, with particular emphasis on six priority population centers – the Sierra Nevada, northern Humboldt County, the Egan-Schell Creek Ranges, the Ruby Mountains-East Humboldt complex, the White Mountains of Esmarelda County, and the Monitor-Toquima-Toiyabe Range complex of central Nevada.

Strategy: Manage for a dense willow component in suitable riparian stands through protection, enhancement, and restoration.

Action: Evaluate the effectiveness of management activities related to the maintenance of foliage density and their effects on riparian songbird nesting.

Action: Determine MacGillivray's Warbler population response to habitat changes effected by a recent management action designed to bring land uses into sustainable levels at Proper Functioning Condition.

Action: Determine to what extent necessary, if any, MacGillivray's Warbler habitat must exceed Proper Functioning Condition to maintain a self-sustaining or source population.

Action: Look for opportunities through land use planning processes to preserve and create suitable MacGillivray's Warbler breeding and migration habitat.

Strategy: Determine population trends in the six priority areas delineated in the objective.

Action: Establish point count, MAPS, or other suitable monitoring methodologies in the six priority areas.

Action: Determine if the Dobkin and Wilcox study (1984) is repeatable; replicate methods in the same study area and document changes in population, habitat conditions, etc.

Assumptions - Research and Monitoring Needs

The MacGillivray's Warbler objective assumes that sustainable populations of Wilson's Warblers exist in the six priority areas delineated. Appropriate monitoring methodologies must be established in these areas to confirm the objective as achievable. The importance of Nevada's montane riparian habitats to migrating MacGillivray's Warblers has been logically suggested but hardly quantified. Appropriate methodologies directed at quantifying this importance should be initiated.

Opportunities

The present consensus effort to determine Proper Functioning Condition (PFC) for Nevada's montane riparian systems is an admirable start toward long-term maintenance of healthy bird habitats. It must be recognized that PFC may in some cases be adequate

for the maintenance of bird habitats, while in other cases it may be inadequate. It will be the responsibility of the advocates for bird habitats to determine what those relationships are, as well as to represent the integration of quantifiable objectives into the consensus effort to initiate positive changes in those habitats. In the case of MacGillivray's Warbler, the challenge will be to maintain dense willow stands with a thriving understory of grasses and forbs suitable to conceal nests.

Further Reading

Dobkin and Wilcox 1984.
Pitocchelli 1995

SPECIES PROFILE 3. MONTANE RIPARIAN

WILLOW FLYCATCHER

Empidonax traillii brewsteri
Empidonax traillii adastus

Distribution

Two subspecies of Willow Flycatcher, *Empidonax traillii brewsteri* and *E. t. adastus* occur within the Sierra Nevada mountain range. Both are listed by the state of California as endangered, and both are considered sensitive species within Region 5 of the U.S. Forest Service. The Willow Flycatcher breeds from central British Columbia eastward to Nova Scotia and southward to northern Baja California, the southwestern U.S., Arkansas and the southern Appalachians. It winters from southern Mexico to Panama (A.O.U. 1999). Three subspecies are found west of the Rocky Mountains. Dark brownish *brewsteri* occurs from the Pacific Northwest south through the west slope of the Sierra Nevada. The intermediately-colored *adastus* occurs from the Rocky Mountains through the intermountain region into the east slope and higher elevations of the Sierras. The pale grayish *extimus* occurs within the southern portions of Nevada and the southwestern states (Browning 1993) and is treated separately in this document.

Of the two subspecies which are found within the Sierra Nevada, *brewsteri* breeds from Fresno County northward and from the Pacific coast to the Sierra Nevada crest. Its status in Nevada is unknown. While the range of *adastus* extends eastward throughout the Great Basin, most of the known breeding populations occur within the Sierra Nevada in isolated mountain meadows up to 8,000 feet elevation (Serena 1982; Harris et al. 1987). Marginal habitat may exist above 8,000 feet (Flett and Sanders 1987). Due to the lack of survey information, the status of this subspecies is poorly understood within the Great Basin. The entire breeding population within the Sierra Nevada is estimated at 200 pairs (California Dept. Fish and Game 1991). The portion of that estimate that occurs in Nevada is unknown. Willow Flycatchers, presumably *adastus*, have been documented during the breeding season on the Little Humboldt between Chimney Reservoir and Paradise Valley and on Big Cottonwood Creek above and below Paradise Valley (Nevada Division of Wildlife, unpublished data). Another population of Willow Flycatchers is known to exist on the upper Mary's River in Elko County.

Habitat

Riparian deciduous shrubs or trees such as willows and alder are essential components

on Willow Flycatcher territories (Sanders and Flett 1989; Harris et al. 1987). In mountain meadows within the Sierra Nevada, willow thickets interspersed with open spaces are typically utilized, and large, contiguous willow thickets are avoided. Within mountain meadow situations, the nests of this species are typically placed at the edges of vegetation clumps situated near streams (Valentine et al. 1988; Sanders and Flett 1989). Nests are placed within riparian deciduous shrubs which are at least 6.6 feet high, with vertical foliar density of approximately 50 to 70 percent, and with 3.3 feet of cover above the nest (Harris et al. 1987). With respect to subspecies *adastus*, a trend has been noted that meadow systems are at a minimum 8.0 hectares in extent and are characteristically broad and flat (Verner 1995).

Physical Factors

All known breeding territories have water present in the form of running water, standing pools, or saturated soils during the early stages of pair formation and breeding. Both subspecies are mostly found between 4,500 and 8,000 feet elevation, although a few pairs may reside above 8,000 feet.

Landscape Factors

In an eastern Washington scrub habitat, King (1955) found a breeding density of 9.2 to 14 pairs per 40 hectares. Territory size information for the western states is lacking. The preferred foraging technique for Willow Flycatchers is that of hawking larger insects by waiting on exposed perches and capturing insects in flight (Ettinger and King 1980; Sanders and Flett 1989). This foraging method is better suited to willow and shrub thickets interspersed with open spaces and may contribute to the avoidance of large contiguous thickets.

Special Considerations

Willow Flycatchers arrive on their breeding territories in early May when the males begin singing. Nesting occurs between late May and late July, and the primarily monogamous pair lays an average of three to four eggs in an open cup nest placed about 1.5 to 10 feet high in a willow or other riparian deciduous shrub (Stein 1963; Zeiner et al. 1990). Females construct nests by weaving bark strips, dried grass and leaves into the forks of shrubs or small trees. Only the female incubates over a period of about 12 days. Both parents feed the chicks which fledge after 12 to 15 days (USDA Forest Service 1991). While the duration of the pair bond is for one season, adults may pair again in succeeding years and will renest after a failed attempt. (Walkinshaw 1966).

In addition to hawking, Willow Flycatchers will also aerially glean insects from trees, shrubs, and other herbaceous vegetation. Their diet includes wasps, bees, beetles, flies, moths, and butterflies (USDA Forest Service 1991).

Breeding populations of Willow Flycatcher in many areas are presumed to have been reduced by the degradation and loss of riparian habitats. Verner (1995) reported that demographically unstable remnants of *adastus* persist within the Sierra Nevada montane meadow habitats and that *brewsteri*, which once occurred throughout the river systems of the central portions of California is more endangered than *adastus*.

Within the Sierra Nevada, loss of suitable habitat primarily from livestock grazing is probably the major factor resulting in the species' decline (Verner 1995). Excessive cattle grazing and trampling in willow stands can cause "highlining" of individual plants. This occurs when there are few or no green leaves or stems left on the lower portion of the plant. Willow thickets so modified become characterized by an umbrella-shaped structure. Willows with less than 40 percent foliage cover are unsuitable for Willow Flycatcher nesting (Fowler et al. 1991). Excessive grazing pressure on woody vegetation prohibits the establishment of seedlings and creates an even-aged, non-reproducing community (Kauffman et al. 1983; Carothers 1977; Crouch 1979).

Brown-headed Cowbird nest parasitism has also contributed significantly to Willow Flycatcher declines throughout most of its range. The exception appears to be within the higher elevations of the Sierra Nevada where the nesting cycles of the two species do not appear to overlap significantly (Sanders and Flett 1989; Harris et al. 1987). Brown-headed Cowbird populations increase with aggregations of livestock.

While improper livestock grazing and cowbird parasitism appear to be the two main causes of Willow Flycatcher decline in the western U.S., other factors which could contribute to the degradation of riparian habitats include improper logging practices, dam construction and use of pesticides (USDA Forest Service 1991). The spraying of willows with herbicides to increase water yield or grass area has likely also had a negative effect.

Associated Species

Lazuli Bunting
Song Sparrow
Yellow Warbler
Black-headed Grosbeak

Priority Considerations

The "northern" subspecies of Willow Flycatcher have exhibited a slight decline in the Basin and Range physiographic region between 1966 and 1996, although the trend since 1980 may be increasing. Population trends have exhibited a slight decline in the Columbian Plateau region since 1980, and a greater decline (13.3 percent) in the Sierra Nevada (Sauer et al. 1998). None of these declines is considered to be statistically significant.

It is generally regarded that montane riparian sites are at risk throughout Nevada from a wide range of commercial and recreational uses. In the case of the Willow Flycatcher, land uses that de-water floodplains may be as destructive as those that remove nesting cover.

OBJECTIVE: Maintain three viable populations of Willow Flycatchers (Empidonax traillii adastus) in northern Nevada riparian habitats – one in the Sierra Nevada; one in Paradise Valley, Humboldt County extending upstream on the Little Humboldt to Chimney Reservoir; and one in the Mary's River watershed in Elko County.

Strategy: In the Sierra Nevada and the Mary's River drainage, maintain a clumpy,

disjunct mature willow distribution interspersed with open areas on meadows where soil saturation lasts well into the Willow Flycatcher breeding period.

Action: Identify presently occupied Willow Flycatcher habitat as well as potential habitat on Sierra Nevada and Mary's River meadows.

Action: Delineate opportunities and strategies for the preservation and maintenance of Willow Flycatcher habitat through land use planning processes.

Action: Provide information to land managers regarding the importance of managing for and retaining a willow thicket component on mountain meadows.

Action: Advocate the inclusion of *E. t. adastus* on the U.S. Forest Service Region 4 Sensitive Species List to increase focus on the species inside the agency.

Strategy: In Paradise Valley, maintain a liberal distribution of mature copses of willow/buffaloberry on irrigated pastures interspersed with open areas where irrigation is likely to enhance ground saturation through the Willow Flycatcher breeding period.

Action: Identify presently occupied Willow Flycatcher habitat along the Little Humboldt through Paradise Valley as well as potential habitat.

Action: Work through established private lands consultation programs such as the Natural Resources Conservation Service and University of Nevada Extension services to encourage private landowners to maintain healthy Willow Flycatcher habitat on their lands through education and habitat management incentives.

Strategy: Target the four following areas to survey for Willow Flycatcher presence: the Humboldt River from Deeth to Halleck, the Humboldt River from Beowawe to Dunphy, the Owyhee River, and Goose Creek in northeastern Elko County. Assess these areas for Willow Flycatcher habitat suitability.

Action: Survey the target areas for Willow Flycatchers.

Action: Conduct habitat suitability analyses on the riparian habitats of the target areas.

Action: Determine if habitat suitability for Willow Flycatchers can be achieved on the target areas through land use planning and appropriate habitat improvement strategies.

Assumptions - Research and Monitoring Needs

The Willow Flycatcher objective assumes that viable populations presently exist at the three viable population target areas. Continued habitat occupation should be verified by

continuing monitoring with point counts or other appropriate monitoring schemes, particularly in those areas where the U.S. Forest Service has already established monitoring. Demographic parameters should be determined and a population viability analysis conducted for both sites.

Opportunities

The U.S. Forest Service has already taken large steps through its land use planning process to prevent the further decline of Willow Flycatchers in the Sierra Nevada. Specific habitat guidelines for Willow Flycatchers should be identified in the Sierra Amendment of the Toiyabe-Humboldt Forest Plan presently under revision, as well as integrated throughout its implementation. For working with the private landowners of the Little Humboldt, The U.S. Natural Resources Conservation Service and University of Nevada Agricultural Extension Service have established long-term working relationships, and are the proper agencies through which wildlife conservation objectives can be achieved on private lands. Several incentive programs aimed at the maintenance of good floodplain health and productive wildlife habitats on private lands exist within these agencies and are linked with others such as Nevada Division of Forestry's Stewardship Program.

Further Reading

Fowler et al. 1991
Sanders and Flett 1989
Serena 1982
Valentine, et al. 1988
Walkinshaw 1966

SPECIES PROFILE 4. MONTANE RIPARIAN

COOPER'S HAWK

Accipiter cooperii

Distribution

The Cooper's Hawk breeds from southern Canada across the entire U.S. to northwestern Mexico. It winters from the central U.S. to Costa Rica. In Nevada, Cooper's Hawks are known to breed in riparian habitats in all counties.

Habitat

Cooper's Hawks seem to prefer deciduous and mixed forest or open woodlands. Areas where woodlands tend to occur in patches, groves, or as well-spaced trees are typically used. Riparian woodlands, semiarid woodlands, and mixed groves often support Cooper's

Hawks. They rarely occur in dense forest, but when they do, they are often near forest edges such as along clearings or meadows, streams, or lake edges. In Oregon, Cooper's Hawks were found in 50-80 year-old forest with trees greater than 58 cm dbh. In the Sierra Nevada, Cooper's Hawks inhabit digger pine-oak cover types, ponderosa/ Jeffrey pine, and blue oak woodlands. In Nevada, 76 percent of documented nests occurred in aspen, 12 percent in cottonwood, and six percent in conifers, willow, or birch (Gary Herron, pers. comm.)

Habitat suitability index models for Cooper's Hawks in coniferous forest (Zeiner et al. 1990) specify that vegetative structure within a nest site should be at least 21 to 49 feet high. Tree canopy cover should be at least 41 to 69 percent, slope no greater than 49 percent, and the nest stand should be no more than three kilometers from water and 1.6 km from an opening (of undefined size). Nests are usually placed high in a conifer just below the crown (10.7 to 16.4 meters) for protection from direct sunlight and predators. Some nests are built upon clumps of mistletoe. Open flying space is important in the mid- and lower understory levels. Snag density information is lacking but snags are deemed important for providing habitat for prey, plucking posts, and fledgling flying skills development.

Physical Factors

Cooper's Hawks have been found nesting in Nevada from 4,000 feet elevation (Mason Valley, Lyon County) up to at least 9,000 feet. Cooper's Hawks migrate downslope or go further south for the winter, where they often are found in urban settings. Most nests are located within relatively close proximity to water (<1 kilometer), occur on slopes under 49 percent, and are most often located on north and east aspects.

Landscape Factors

Cooper's Hawks need patches greater than 10 hectares of undisturbed habitat for breeding. In addition, an average of about 290 hectares of suitable foraging habitat is needed to support reproductive efforts. Fragmentation and the reduction in quality and availability of nest stands may force the smaller accipiters such as Cooper's Hawks to relinquish optimal forest stands to the larger, dominant Northern Goshawk. Cooper's Hawks readily utilize edge habitats along meadows, streams, and clearings for foraging. It also appears they will inhabit either perimeter or deep forests as long as the canopy and overstory are thin enough to permit flying. Especially dense forests are not suitable foraging habitat.

Home ranges are relatively large, ranging from 100 to 400 hectares in size. Pairs often reunite and return to the same nest site they used the previous year, typically building a new nest within 100 meters of the old one.

Special Considerations

Fire poses the greatest natural disturbance regime to Cooper's Hawk habitat, although in forested habitats such as the Sierra Nevada, timber harvest has the largest impact. Improper grazing is also known to reduce the quality of riparian habitats and may result in the deterioration or loss of nesting habitat that could affect reproductive success for Cooper's Hawks. Management practices aimed at killing avian pests can reduce prey availability and may cause secondary poisoning.

Associated Species

American Robin
Northern Flicker
Bullock's Oriole
Yellow Warbler

Priority Considerations

The Cooper's Hawk has been selected for priority focus by the Nevada Working Group because of multiple threats to its habitat and because limited Breeding Bird Survey data has documented a significant decline in its population in the Sierra Nevada province (-17.5 percent between 1966 and 1996; p = 0.04).

OBJECTIVE: Reverse a declining trend of Cooper's Hawk populations throughout their range in Nevada by 2004.

Strategy: Manage mid-elevation riparian habitats to exhibit multi-storied vegetative layers including a mature overstory of aspen or tree willow for nesting, a well-developed midstory of willow and other shrubby trees, and a productive understory of grasses and forbs.

Action: Inventory sites with mature tree overstory. Evaluate for midstory and understory.

Action: Implement grazing strategies that encourage multi-storied vegetative development.

Action: Prioritize active Cooper's Hawk territories for action, then delineate expansion habitat and move toward achieving habitat objectives there.

Strategy: Update the Nevada Division of Wildlife raptor nest site database. Update status and trend projections for the state.

Action: Initiate regular periodic inventory, both ground and aerial survey, into annual work programs in each region of the state.

Action: Search the Breeding Bird Atlas database presently being compiled for new information regarding Cooper's Hawk nest sites. Include newly-identified areas in regular inventory.

Assumptions - Research and Monitoring Needs

The Cooper's Hawk objective for montane riparian habitats assumes a declining trend throughout its range in Nevada, when actually such a trend has only been documented for the Sierra Nevada. Status and trend for breeding Cooper's Hawks should be updated throughout its range in the state. In many areas of the state, the Nevada Division of Wildlife raptor nesting database generated in the 1970's and 1980's is now becoming

rather dated. Territory occupancy should be monitored and adjustments made to the estimates of statewide population.

Opportunities For Conservation

The present consensus effort to determine Proper Functioning Condition (PFC) for Nevada's montane riparian systems is an admirable start toward long-term maintenance of healthy bird habitats. It must be recognized that PFC may in some cases be adequate for the maintenance of bird habitats, while in other cases it may be inadequate. It will be the responsibility of the advocates for bird habitats to determine what those relationships are, as well as to represent the integration of quantifiable objectives into the consensus effort to initiate positive changes in those habitats. In the case of the Cooper's Hawk, the challenge will be to maintain well-developed multi-storied riparian habitats with mature trees for nesting and a productive midstory and understory to support an abundant preybase. The Great Basin Bird Observatory will continue to be particularly helpful in providing trained volunteers for the purpose of updating inventory on a wide array of nesting species, including Cooper's Hawk.

Further Reading

Herron et al. 1985.
Hoffman 1998.
Zeiner et al. 1992

SPECIES PROFILE 5. MONTANE RIPARIAN

CALLIOPE HUMMINGBIRD

Stellula calliope

Distribution

The Calliope Hummingbird breeds in the higher mountains from British Columbia and Alberta south through the Pacific states east to Utah and western Colorado. In Nevada, it is a common summer resident at higher elevations from the Sheldon NWR and the Sierra Nevada on the western edge of the state, east to Jarbidge in Elko County, and south to Lee Canyon in the Spring Mountains, Clark County.

Habitat

Timossi (in USDA Forest Service 1994) reports that this species prefers montane forest types as well as wet meadow and riparian habitat types. In California, ponderosa pine, montane hardwood, montane hardwood-conifer, mixed conifer, Douglas fir, montane riparian, aspen, red fir, Jeffrey pine, lodgepole pine, subalpine conifer, eastside pine, pine-juniper and residential-park types appear to be important habitats. These habitat relationships suggest that in Nevada the Sierra conifer and mountain riparian types are likely to be the most important habitats for Calliope Hummingbirds.

Timossi (in USDA Forest Service 1994) indicates open forest stands with canopy closures less than 40 percent and ages ranging from sapling to medium-large trees are important

nesting habitat. Since Calliope Hummingbirds depend on nectar for food, a good ground cover of flowering plants in or near nesting areas is likely an important habitat factor. Calliope Hummingbirds nest in trees from 50 ft to over 120 ft tall with the nest on the lowermost living branch (Weydemeyer 1927).

Physical Factors

Calliope Hummingbirds are found at higher elevations than other hummingbirds (Johnsgard 1983). In California, they nest above 7,800 feet up to 11,500 feet (USDA Forest Service 1994), preferring mesic climates in montane forest types where they nest in habitats with temperature range of 33 to 77 degrees Fahrenheit (Calder and Calder 1994). In California, Calliope Hummingbirds are rarely found below 3,900 ft in elevation. Nesting typically occurs between 9,800 and 11,500 ft in the Sierra Nevada (Johnsgard 1983). In central Nevada, they are known to nest at 7,000 feet and probably lower. Calliope Hummingbirds typically nest near streams with the nest often on branches overhanging the water (Weydemeyer 1927) There is no information indicating the importance of topography, slope, or aspect as habitat factors.

Landscape Factors

The Calliope Hummingbird apparently prefers nesting in naturally fragmented habitats containing a variety of seral stages near open areas. It seems to prefer edge habitats near wet meadows and shrub areas (USDA Forest Service 1994). There is no information available to indicate minimum patch size but up to four male territories have been recorded in a 2.4-hectare plot (Bent 1940).

Special Considerations

The abundance of flowering plants for foraging appears to be an important limiting factor. This species does not appear to be sensitive to human disturbance nor is it subject to brood parasitism. Both males and females establish territories. Male territories are associated with foraging areas while female territories are associated with the nest site (USDA Forest Service 1994). The species is promiscuous. The male plays no role in nest building or care of young. Females appear to show nest site fidelity between years (Johnsgard 1983). There is no information available on population size or trend in Nevada, although slight declines have been reported in BBS data for the Sierra Nevada.

Associated Species

Fox Sparrow
Warbling Vireo
Cassin's Finch

Priority Considerations

It is generally regarded that montane riparian sites are at risk throughout Nevada from a wide range of commercial and recreational uses. In the case of the Calliope Hummingbird, maintenance of a suitable wildflower component in the montane riparian zone is necessary

to sustain foraging birds. Unfortunately, the protocol for the random establishment of Breeding Bird Survey routes implemented at the onset of that venerable monitoring project resulted in a dearth of routes that sample montane riparian habitats in Nevada. Added to an insufficient coverage of routes is the general difficulty encountered in observing hummingbirds using the BBS methodology. Combined, these factors have resulted in a lack of status and trend information for the Calliope Hummingbird in the state.

OBJECTIVE: Maintain stable or increasing populations of Calliope Hummingbirds through 2004 in areas throughout their present range in Nevada.

Strategy: Maintain a productive wildflower component in montane riparian zones and wet meadows above 7,000 feet elevation.

Action: Maintain a variety of soil moisture profiles in montane riparian meadows, ranging from the drier ecotone with upland types to the wettest saturated soils in seeps and along stream courses to maintain a high diversity of flowering plants.

Action: Develop and implement "Best Management Practices" for the maintenance of healthy, diverse, and stable riparian meadows.

Strategy: Develop and implement adequate monitoring programs to determine Calliope Hummingbird status and trend.

Action: Since Breeding Bird Surveys do not adequately monitor Calliope Hummingbirds in Nevada, implement a supplemental point count monitoring program for montane riparian bird species above 7,000 feet elevation.

Assumptions - Research And Monitoring Needs

The Calliope Hummingbird objective makes the assumption that population trend can be determined for the species. Point count or other monitoring methodologies should be established in montane riparian habitats above 7,000 feet elevation to determine trend for the entire group of priority species which rely on this habitat.

Opportunities

The present consensus effort to determine Proper Functioning Condition (PFC) for Nevada's montane riparian systems is an admirable start toward long-term maintenance of healthy bird habitats. It must be recognized that PFC may in some cases be adequate for the maintenance of bird habitats, while in other cases it may be inadequate. It will be the responsibility of the advocates for bird habitats to determine what those relationships are, as well as to represent the integration of quantifiable objectives into the consensus effort to initiate positive changes in those habitats.

The U.S. Forest Service will be charged with a vital responsibility in the management of Calliope Hummingbirds in Nevada, since much of this species' habitat exists on Forest Service lands in the Sierra Nevada and on many mountain ranges from the center of the

state eastward above 7,000 feet elevation. The Forest Service will be looked to for innovative montane riparian habitat management strategies either through existing Standards and Guidelines, or if necessary, through inventory and consensus processes parallel to PFC. In the instance of the Calliope Hummingbird, good riparian system management must result in the maintenance of stable, thriving montane meadows associated with structurally diverse shrub or tree habitat components in the higher elevation drainages.

Further Reading

Calder and Calder 1994
Weydemeyer 1927

SPECIES PROFILE 6. MONTANE RIPARIAN

LEWIS'S WOODPECKER

Melanerpes lewis

Distribution

The Lewis's Woodpecker ranges throughout the western United States, southwestern Canada and northwestern Mexico, pushing northward for the summer and southward for the winter. In Nevada, it is a resident breeder in isolated pockets mainly in the northern half of the state, including the Carson Range, the Santa Rosa Mountains in Humboldt County, and the Ruby Mountains, East Humboldt Range, and Jarbidge Mountains in Elko County (Alcorn 1988). This species vacates the northeastern portion of the state during the winter months.

Habitat

During the breeding season, this species prefers open habitats that facilitate its foraging behavior of hawking for insects. Scattered trees and/or snags are necessary for nesting. Open or park-like ponderosa pine, burned-over stands of Douglas fir, mixed conifer, pinyon-juniper, riparian and oak woodlands are preferred nesting areas (USDA Forest Service 1994). Furthermore, this species prefers areas with a grassy and bushy understory; "Open forests... allow the development of an understory that supports terrestrial insects" (DeGraff et al. 1991 *in* USDA Forest Service 1994). In the Ruby Mountains, Lewis's Woodpeckers nest in riparian aspen trees surrounded by sagebrush. During the winter months, Lewis's Woodpeckers switch to a diet of acorns, piñon nuts and other fruits; therefore they move to oak-based or orchard habitats for the season. This species tends to be nomadic and travels in groups to follow good seed crops in winter.
The Lewis's Woodpecker's preferred canopy closure is sparse (Bock 1970), though it is reported that it will use a variety of canopy closures for cover (USDA Forest Service 1994). The understory needs to be brushy and thick, as much as 50 percent cover (Sousa 1983). Snags are a necessary component, preferred for nesting. Snag density was reported as 471.5 snags/hectare in a burn with an average snag height of 8.3 meters (Carter 1996).

Physical Factors

The Lewis's Woodpecker can be found breeding at elevations of 2,000 to 8,500 feet (Bent

1939). No data were found on this species' dependence on water, nor on topography, slope, or aspect.

Landscape Factors

Territories for the Lewis's Woodpecker appear to be tied more to food availability than to specific habitat needs. No data on configuration of patches were found. This species may prefer edge in riparian habitat, trees for nesting, and open areas for foraging. Edge does not appear to be important in pine savannah or wildfire burn areas (USDA Forest Service 1994). Lewis's Woodpeckers will use burned areas readily. Successional stage does not appear to be a factor except as it affects snag availability. Lewis's Woodpeckers prefer to nest near streams.

Special Considerations

Like the Red-headed Woodpecker of the eastern and midwestern United States, the Lewis's Woodpecker mostly forages for insects on the wing during the summer months. It will forage for insects on trunks and branches of trees, in brush and on the ground as well. In late fall, the bird switches to fruits and berries, completing the transition to acorns, piñon nuts and other fruits for the winter. It will cache these food items for use in that season, and defends its stores vigorously. Lewis's Woodpeckers do not seem to be sensitive to direct human disturbance (USDA Forest Service 1994) and are able to utilize areas disturbed by humans through logging and burning practices. Brood parasitism does not appear to be a factor, though there may be competition for nesting cavities with European starlings (Sousa 1983 *in* USDA Forest Service 1994). Predation does not seem to be a major problem for the Lewis's Woodpecker (USDA Forest Service 1994). The species is monogamous with both parents incubating and caring for the young. They appear to be somewhat colonial, for reasons which require further study. The Lewis's Woodpecker is a primary excavator, providing suitable sites for other cavity-nesting bird species.

Associated Species

Northern Flicker
Swainson's Thrush
Hermit Thrush
Fox Sparrow
Green-tailed Towhee
American Robin
Dusky Flycatcher
Western Wood-pewee

Priority Considerations

The distribution and habitat preferences of the Lewis's Woodpecker in Nevada are poorly understood. There is undocumented concern among biologists that Lewis's Woodpeckers no longer occur in the range and densities they did two decades ago. There is further unquantified concern that Lewis's Woodpeckers are missing from areas that appear to be identical to the areas which they currently occupy. According to BBS analyses, Lewis's Woodpeckers have exhibited an eight percent decline in the Sierra Nevada province and a five percent decline in the Columbian Plateau province between 1966 and 1996. Neither figure is statistically significant. Because its preferred habitats are considered to be at risk, and because its status in Nevada is poorly understood, the Lewis's Woodpecker has been selected as a Priority Species for this plan.

OBJECTIVE: Maintain stable or increasing populations of Lewis's Woodpeckers in all present occupied areas through 2004, with particular emphasis on three population centers – the Sierra Nevada, the Santa Rosa Mountains, and the Ruby Mountains.

Strategy: Manage for multi-aged, multi-storied montane riparian vegetative communities in occupied Lewis's Woodpecker habitats.

Action: Maintain snags and provide for snag recruitment in montane riparian overstories, particularly aspen or cottonwood.

Action: Maintain a productive grass and shrub understory to produce the insects Lewis's Woodpeckers prefer for food.

Action: When appropriate, use prescribed burning to rejuvenate stagnant riparian stands, thus providing burned snags, reviving the grass and shrub understories, and initiating overstory regeneration.

Strategy: Determine statewide population trend for Lewis's Woodpecker. Survey for unknown population centers. Determine status and trend for the three target populations.

Action: Initiate point counts or other appropriate monitoring methodologies in the target areas.

Action: Expand search areas for Lewis's Woodpeckers.

Assumptions - Research and Monitoring Needs

The Lewis's Woodpecker objective assumes that stable or increasing population trend can be achieved at least on the three target areas. Population trends need to be determined statewide through point counts or other appropriate methodologies. Breeding Bird Survey coverage is not adequate to provide those trends. Habitat assessments should be conducted in the target areas to determine habitat status and trend. More research should be conducted relative to Lewis's Woodpeckers' specific habitat preferences in Nevada. Detailed observations of food habits and preferred insect taxa and species should be conducted to facilitate better definition of habitat management goals and objectives.

Opportunities

Much of presently occupied Lewis's Woodpecker habitat seems to occur on National Forest lands. The Forest Service will be looked to for innovative montane riparian habitat management strategies either through existing Standards and Guidelines, or if necessary, through additional inventory and concensus processes parallel to PFC. In the instance of the Lewis's Woodpecker, management strategies must result in the maintenance of dynamic, multi-aged, multi-storied montane riparian habitats in occupied habitats, while striving to restore additional drainages to these conditions for the purpose of expanding Lewis's Woodpecker distribution beyond its present limits.

Further Reading

Bock 1970.
Sousa 1983.

USDA Forest Service 1994
Zeiner et al. 1990

SPECIES PROFILE 7. MONTANE RIPARIAN

RED-NAPED SAPSUCKER

Sphyrapicus nuchalis

Distribution

The Red-naped Sapsucker ranges from southeastern British Columbia south along the Rocky Mountains to the Big Bend region of Texas and from the Sierra Nevada east across Nevada and Utah to the eastern edge of the Rocky Mountains in Colorado. In Nevada, the Red-naped Sapsucker is mostly a resident from just east of the Sierra Nevada eastward across the state and is found in all counties.

Habitat

The Red-naped Sapsucker builds its nest almost exclusively in cavities occurring in riparian tree communities, usually near open water. Live trees that are infested with fomes rust are most desired for nest sites. In a study in Sierra County, California (probably on Red-breasted Sapsuckers, *S. daggetti*, which were subsequently recognized as a separate species), nest tree heights ranged from 2.4 to 38.1 meters (mean = 20.4 meters), and nest tree diameter ranged from 21.6 cm to 167.6 cm (mean = 83.8 cm). Canopy coverage appears not to matter. A midstory of willows, alder, water birch, (*Betula occidentalis*), or younger age classes of aspen is preferred, where sap wells are maintained for feeding. Red-naped Sapsuckers forage in mountain mahogany stands in proximity to riparian zones. They are also found in low densities in lowland gallery cottonwood stands on the larger river systems of western Nevada.

Physical Factors

The presence of water as it affects the health of the riparian overstory and midstory has a positive effect on sapsucker distribution. Otherwise, sapsuckers seek out riparian habitats wherever they are found and do not seem to be affected by topography, slope, or aspect. Nesting pairs range from a few at 4200 feet elevation to 8700 feet and above, with the bulk of distribution in the aspen zone above 5,000 feet.

Landscape Factors

Foraging territories range from 0.6 to 6.0 hectares and average about 3.2 hectares. Breeding densities can be quite high in limited habitat; one 2.4-hectare aspen clone was found to harbor six active sapsucker nests, and was also being shared with three other woodpecker species. Territories can be linear or polygonal, depending on patch shape and/or the availability of adjacent habitats (i.e. mountain mahogany). Overstory and midstory successional stage tends toward late and mature (greater diameters for nest construction and sap well maintenance).

Special Considerations

Red-naped Sapsuckers are considered a “keystone species” in their avian communities. They are primary excavators, providing cavities for many other bird species which require them. Another valuable service rendered to the bird community by Red-naped Sapsuckers occur through their maintenance of free-flowing sap wells. These wells are readily visited by hummingbirds, warblers, chickadees, and other species both for the sweet sap and the ants which they attract. The Red-naped Sapsucker’s diet predominantly consists of sap and insects with a small amount of berries, fruits, and tree cambium mixed in at appropriate seasons. Cowbird parasitism does not appear to be a problem.

Associated Species

Northern Flicker
Hairy Woodpecker
Downy Woodpecker
Yellow Warbler
Hermit Thrush
Cooper’s Hawk

Priority Considerations

Breeding Bird Survey trend analyses have reported a thirteen percent decline for Red-naped Sapsuckers in the Basin and Range province between 1966 and 1996. A fourteen percent decline has been reported in the same province for the last decade. Neither figure is statistically significant (Sauer et al. 1998). It is generally regarded that montane riparian sites are at risk throughout Nevada from a wide range of commercial and recreational uses. In the case of the Red-naped Sapsucker, the challenge will be to maintain montane riparian vegetation in a multi-aged, multi-storied expression providing cavity-bearing trees and snags, and healthy mid-stories of willow or alder with sufficient stem diameters to facilitate sap well drilling and maintenance.

OBJECTIVE: Maintain stable or increasing populations of Red-naped Sapsuckers throughout their range in Nevada through 2004.

Strategy: Manage for multi-aged, multi-storied montane riparian vegetative communities in occupied Red-naped Sapsucker habitats.

Action: Maintain snags and provide for snag recruitment in montane riparian overstories, particularly aspen or cottonwood.

Action: Maintain mature midstory stands of willow and alder, with a liberal occurrence of stems and trunks over 7.5 cm in diameter for sap well drilling and maintenance.

Action: Maintain mature mountain mahogany stands on uplands adjacent to riparian zones.

Strategy: Determine the statewide population trend for Red-naped Sapsuckers.

Action: Initiate point counts or other appropriate monitoring methodologies in areas of Red-naped Sapsucker occurrence.

Assumptions - Research and Monitoring Needs

In western Nevada, the Red-naped Sapsucker is replaced in the high Sierra Nevada by the Williamson's Sapsucker, and in the lower Sierra Nevada extending as far east as the Wassuk Range by the Red-breasted Sapsucker. It is assumed that these two species operate in much the same ecological niche as does the Red-naped, except that the riparian systems in which these other two species are found occur in different upland habitat matrices. Management strategies suggested for the Red-naped Sapsucker are assumed to be, in a general sense, relevant for the other two species. For the Red-breasted Sapsucker, management strategies for the upland matrix should address pinyon-juniper and Jeffrey pine. Similar considerations should be made for the Williamson's Sapsucker relative to their use of the red fir matrix. Further research should be focused on determining the specific differences in life history and habitat use between the three species which affect management strategies. Breeding Bird Survey coverage is not sufficient at this time to monitor Red-naped Sapsucker trends. A point count network sufficient to monitor the entire high-elevation montane riparian bird community is necessary to fill the knowledge gaps associated with these species in Nevada.

Opportunities

The present consensus effort to determine Proper Functioning Condition (PFC) for Nevada's montane riparian systems is an admirable start toward long-term maintenance of healthy bird habitats. It must be recognized that PFC may in some cases be adequate for the maintenance of bird habitats, while in other cases it may be inadequate. It will be the responsibility of the advocates for bird habitats to determine what those relationships are, as well as to represent the integration of quantifiable objectives into the consensus effort to initiate positive changes in those habitats.

Management responsibility for Red-naped Sapsucker habitat is shared by the U.S. Forest Service and the Bureau of Land Management. Each will be looked to for innovative montane riparian habitat management strategies either through existing Standards and Guidelines, or if necessary, through inventory and consensus processes parallel to PFC. In the instance of the Red-naped Sapsucker, good riparian system management must result in the maintenance and recruitment of cavity-bearing trees and snags in the overstory coupled with a thriving, mature midstory of willows or alder with advanced stem diameters. Some attention must also be directed toward habitat matrix management, since the western sapsucker species group represents an avian link between riparian habitats and their adjacent upland matrices.

Further Reading

Fleury 1998

OTHER PRIORITY SPECIES: MONTANE RIPARIAN

ORANGE-CROWNED WARBLER
Vermivora celata

YELLOW-BREASTED CHAT
Icteria virens

These two warbler species occur in montane riparian habitats in addition to the habitats

in which they are profiled. The Nevada Working Group determined that objectives and strategies for Wilson's Warbler, MacGillivray's Warbler, and Virginia's Warbler were sufficient to also meet the needs for these species. For a species profile of Orange-crowned Warbler, please refer to the Aspen habitat section. For a species profile of Yellow-breasted Chat, please refer to the Mesquite/Catclaw habitat section.

HABITAT MANAGEMENT SUMMARY: MONTANE RIPARIAN

Where opportunities exist, the main thrust for montane riparian habitat management will be toward multi-storied, richly diverse vegetative corridors. An ideal stretch of healthy montane riparian bird habitat would typically include a mature overstory of tree willow or aspen capable of supporting accipiter nesting and cavity-nesting, a dense midstory of shrubby willow species, alder, or birch capable of supporting a diverse community of nesting passerines, and a vigorous understory comprised of a diverse array of grass and forb species, including wildflowers. While the ideal riparian stretch would include all these layers through the same floodplain segment (truly multi-layered), it is recognized that microsite conditions sometimes preclude true multi-layering in a riparian corridor; therefore, a healthy, properly functioning stream that provides healthy segments of each component, whether layered or closely contiguous will sufficiently provide most riparian bird habitat needs. These opportunities will exist most often where montane riparian habitats are already intact and can be preserved and managed at a high level of productivity through existing or slightly modified management practices. A high priority will be placed on identifying and preserving intact montane riparian systems.

The Nevada Working Group acknowledges and supports the current efforts of riparian habitat management experts to achieve consensus among stakeholders regarding the concept of "properly functioning condition" (PFC) of riparian systems. Streams that are not currently functioning properly under the present accepted evaluation criteria should receive adjustments in management practices which will allow them to at least recover to PFC. The Nevada Working Group is aware that its ultimate goals for healthy montane riparian bird habitats exist somewhere beyond PFC. The achievement of these goals on streams currently being brought up to PFC standards will be engaged in the next level of debate between stakeholders. For this planning period, advocates of healthy riparian bird habitats need to provide realistic models of "desired future conditions" to land managers with streams in PFC which will be ready to take to the next level of productivity.

While desired habitat conditions for Willow Flycatcher (*Empidonax traillii adastus*) would appear on the surface to conflict with the "ideal" habitat model presented above, such is not actually the case. Opportunities to create and/or maintain Willow Flycatcher habitat exist on wet meadows where microsite conditions conform willow growth to large, clumpy thickets, and conditions are not conducive to the formation of a significant overstory, or a long contiguous shrubby corridor. Occupied habitat has been largely identified in the Sierra Nevada, and potential sites for range expansion should also be easy to identify if they have not already. Occupied habitat has not been completely documented in the interior of Nevada, although certain occupied sites are known and have been identified for priority action in this plan.

HABITAT TYPE: MONTANE SHRUB

General Description

This habitat generally occurs throughout the Great Basin and is most common in northeastern, eastern, central and southern Nevada. A further defined subset of the habitat type, the Sierra mountain shrub type, occurs on the eastern slope of the Sierra Nevada Mountains and some mountain ranges adjacent to the Sierra. Both types are generally found in a mosaic with other montane habitat types but can occur in large contiguous polygons. The Nevada GAP estimates 484,920 hectares of montane shrub types and 67,410 hectares of the Sierra mountain shrub type occurring within the state.

Physical Characteristics

This collection of habitat types generally occurs above the 30 cm per year precipitation zone, from 6,500 to 10,000 feet, and is widespread throughout foothill and mountain environments.

Dominant Plant Species

In the north, dominant plant species include serviceberry (*Amelanchier spp.*), elderberry (*Sambucus spp.*), currant (*Ribes spp.*), snowberry (*Symphoricarpos spp.*), bitterbrush (*Purshia tridentata*), and buckbrush *(Ceanothus spp)*. Dominant species in central and southern Nevada include cliffrose (*Cowania mexicana*), littleleaf mountain mahogany (*Cercocarpus intricatus*), alderleaf mountain mahogany (*Cercocarpus montanus*), ninebark (*Physcocarpus spp.*), squawbush (*Rhus spp.*), and manzanita (*Arctostaphylos spp.*) (Mozingo 1987). Associated plants include sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus spp.*), Rocky Mountain maple (*Acer glabrum*), singleleaf pinyon pine (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), curlleaf mountain mahogany (*Cercocarpus ledifolius*), aspen (*Populus tremuloides*), white fir (*Abies concolor*), subalpine fir (*A. lasiocarpa*) and Engelmann spruce (*Picea engelmannii*).

Dominant plant species in the west include manzanita, buckbrush *(Ceanothus spp.*), oak (*Quercus spp.*), currant (*Ribes spp.*), bittercherry (*Prunus emarginata*), and snowberry. Associated plant species include sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), singleleaf pinyon pine (*Pinus monophylla*), Jeffrey pine (*Pinus Jeffreyi*), ponderosa pine (*Pinus ponderosa*), red fir (*Abies magnifica*), mountain hemlock (*Tsuga mertensiana*), and curlleaf mountain mahogany.

Historic and Current Condition

These habitats are universally under-represented in landscape mapping efforts. In addition, there seems to be very little available natural history data, the distribution of these types is basically disjunct, and species composition varies widely among regions. Because of these deficiencies, montane shrub habitats are underrated in their importance to Nevada's birds. Although an undetermined percentage of these habitats have escaped major type conversion and remain in relatively good condition due to their inaccessibility, these habitats are vulnerable to a wide range of threats. Improper grazing practices can reduce or eliminate regeneration of the dominant shrub species. Wildfire converts habitats in areas where the fire-resistant seeds of exotic annual grasses and forbs allow them to outcompete native species during site revegetation. Herbicides are sometimes applied on mountain brush communities for the purpose of increasing yield of exotic grass species

desirable to livestock. Whole stands of montane shrub habitat are being lost to urban encroachment along the Sierra Front and other expanding human population centers.

This habitat type is critically important to a number of breeding bird species as structure for canopy-nesting species and as foraging habitat for breeding and migrating frugivores and nectivores. Also, in years when fruiting shrubs produce a mast crop that remains attached to the shrubs, and therefore above the snow pack throughout the winter, this habitat becomes extremely important for wintering and migratory frugivores. South-facing stands of montane shrub within a matrix of a healthy understory also serve as foraging habitat for large flocks of wintering granivores. These stands appear to accelerate the snow melt, thereby making understory grain more readily available

Conservation Opportunities

Range rehabilitation in the wake of wildfire has intensified in the last decade with the availability of an array of private and public funding sources – mining companies and wildlife foundations particularly in the forefront in partnership with Nevada Division of Wildlife, the Bureau of Land Management, and the U.S. Forest Service. Range rehabilitation efforts should prioritize the appropriate montane shrub species in seed mixes, particularly where such sites have been lost. Statewide, efforts to bring livestock use on public rangelands under sustainable management have resulted in the release of some montane shrub sites to regeneration processes once stifled by ungulate use. Biologists and conservationists should continue to strive for specific wildlife-driven montane shrub objectives in the public land planning process.

Priority Bird Species

(No Obligates)

Other

Black Rosy Finch
Black-throated Gray Warbler
Calliope Hummingbird
Cooper's Hawk
Loggerhead Shrike
Blue Grosbeak
Vesper Sparrow
MacGillivray's Warbler
Orange-crowned Warbler
Swainson's Hawk
Western Bluebird

SPECIES PROFILE 1. MONTANE SHRUB

BLACK ROSY FINCH
Leucosticte atrata

(For a species profile of Black Rosy Finch, refer to the Cliffs and Talus habitat section.)

OBJECTIVE: Maintain present occurrence and distribution of Black Rosy Finch wintering populations throughout their range in Nevada through 2004.

Strategy: Achieve good to excellent condition of understory vegetation (healthy grass/forb component and healthy montane shrub regeneration) in 100,000 hectares of Nevada's poor/fair condition habitats.

Action: Delineate all poor/fair condition montane shrub habitat in Nevada.

Action: Determine population concentrations of wintering Black Rosy Finches within montane shrub habitat types in Nevada.

Action: Overlay Black Rosy Finch concentrations with poor/condition habitats.

Action: Within the framework of the public land planning process, modify livestock grazing management to attain good to excellent habitat condition in all poor/fair condition montane shrub habitats found within 100 km of Black Rosy Finch priority areas.

Action: Secure high-priority fire prevention status for all montane shrub habitats in Black Rosy Finch priority areas where exotic fire-climax grasses and forbs make up the majority of the understory.

Action: Exclude all montane shrub habitats from broadleaf herbicide applications where federal dollars are being used (similar to current exclusion for aspen riparian habitat) on public and private lands.

Strategy: Secure protection for all mixed-species Rosy Finch winter night roosts where roost flocks total greater than 20 individuals.

Action: Conduct winter bird surveys on all abandoned mine workings that are slated for closure.

Action: Provide alternative closure methods (fencing, "bat-gating", etc.) where significant Rosy Finch night roosts are found.

Action: Support a "No Net Loss" mitigation policy regarding the loss of Rosy Finch night roosts. Mitigate on a one-for-one or better ratio for night roosts that must be destroyed.

Assumptions - Research and Monitoring Needs

The Black Rosy Finch objective for montane shrub habitat assumes that the present occurrence and distribution of Black Rosy Finches in Nevada is adequate to sustain healthy, self-sustaining populations in the state. Nevada's winter Black Rosy Finch population should be quantified. Mine adits scheduled for closure should be surveyed for significant winter roosts. Alternative sites conserved or constructed as a result of mitigation agreements should be monitored for performance, and mitigation agreements adjusted to achieve true "no net loss" status for the resource.

Opportunities

Mining companies have demonstrated a strong desire to mitigate the loss of critical wildlife habitat whenever and however practically feasible. Mining companies typically have access to significant engineering expertise, as well as to specialized materials sometimes necessary to modify adit entrances to satisfy all concerns. Using standardized construction plans sanctioned by Bat Conservation International, several mining companies in Nevada have successfully installed sturdy "bat gates" that preclude casual human intrusion into unsafe critical habitats, but allow for the free egress of bats and other wildlife species in and out of the adit. Conservationists should continue to look for opportunities to work with mining companies to solve the problems of the conservation of subterranean wildlife habitats creatively and cooperatively.

Further Reading

Leffingwell and Leffingwell 1931.

SPECIES PROFILE 2. MONTANE SHRUB

CALLIOPE HUMMINGBIRD
Stellula calliope

(See Mountain Riparian habitat section for species profile.)

OBJECTIVE - Stabilize or reverse possible declining trends for Calliope Hummingbirds in montane shrub habitats throughout their range in Nevada.

Strategy: Maintain golden currant stand regeneration in all montane shrub habitats in which golden currant occurs in Nevada.

Action: Work within public land planning processes to insure golden currant regeneration and range expansion.

Assumptions - Research and Monitoring

The Calliope Hummingbird objective for montane shrub habitats assumes that populations in Nevada may be reflecting declining trends measured in adjacent states. The strategies and actions assume that golden currant nectar comprises a significant portion of the Calliope Hummingbird's dietary needs within the montane shrub habitat. Basic research regarding the degree and character of this species' use of montane shrub habitat types is needed.

Opportunities

The federal land use planning processes currently implemented by the BLM and the Forest Service provide the opportunity for conservationists to help create habitat management goals and objectives on the actual landscape. Plant community diversity within montane shrub types can be addressed through land use planning and specific targets for the maintenance of key species can be set and monitored. More basic life history and habitat

use information could be gathered through any one of several university graduate programs.

SPECIES PROFILE 3. MONTANE SHRUB

LOGGERHEAD SHRIKE
Lanius ludovicianus

(See Mesquite/Catclaw habitat section for species profile)

OBJECTIVE - Maintain stable or increasing populations of nesting Loggerhead Shrikes in montane shrub habitats throughout their range in Nevada through 2004, with particular emphasis on the Shoshone Range, the Independence Mountains, the East Humboldt-Ruby Complex, and the Simpson Park Range.

Strategy: Maintain robust older age class of montane shrub species, with particular emphasis on serviceberry where the habitat type exists.

Action: Manage for longterm regeneration and maturation of montane shrub species.

Strategy: Develop and implement adequate monitoring programs to determine Loggerhead Shrike status and trend in montane shrub.

Action: Expand supplemental point count monitoring program in montane shrub type.

Assumptions - Research and Monitoring Needs

The Loggerhead Shrike objective for montane shrub habitats assumes that stable or increasing populations are achievable for the species in Nevada. The necessity of Loggerhead Shrike objectives for montane shrub habitats has resulted largely from the discovery of isolated nesting concentrations of the species that have been discovered by NDOW personnel in the region around Battle Mountain. Further research and monitoring of these sites is warranted to determine basic population ecology, status and trend, and habitat use and preferences for these unique isolated populations.

Opportunities

Federal cost-share dollars exist through the land management agencies to conduct wildlife surveys necessary to support the land use planning process. The Nevada Division of Wildlife has provided personnel on a cost-share basis to collect point count data for both the BLM and the Forest Service in allotments undergoing planning review. This program should be continued and magnified to create a reasonable coverage of areas on the review cycle.

SPECIES PROFILE 4. MONTANE SHRUB

SWAINSON'S HAWK
Buteo swainsoni

(See Agriculture habitat section for species profile.)

OBJECTIVE - Maintain stable nesting populations of Swainson's Hawks in Montane shrub habitat through 2004 throughout their present range in northeastern Nevada with particular emphasis on serviceberry habitats in the North Tuscarora Mountains, the Independence Range, the Jarbidge Mountains, and the East Humboldt-Ruby Complex.

Strategy: Maintain robust older age class of montane shrub species, with particular emphasis on serviceberry where the habitat type exists.

Action: Manage for longterm regeneration and maturation of montane shrub species.

Strategy: Initiate periodic surveys to monitor Swainson's Hawk status and trend in montane shrub.

Action: Conduct periodic aerial surveys for nesting Swainson's Hawks in the priority areas.

Assumptions - Research and Monitoring Needs

The Swainson's Hawk objective for montane shrub types assumes that the nesting pairs found in the montane shrub type contribute to a healthy, self-sustaining breeding population of Swainson's Hawks in Nevada. Long-term occupancy and stability of known nesting territories should be quantified and monitored.

Opportunities

The Nevada Division of Wildlife conducts periodic aerial surveys of Ferruginous Hawk nest territories. The monitoring of wildland Swainson's Hawk nest territories could probably be accomplished concurrently in those general regions where both species occur.

Further Reading

Herron et al. 1985

HABITAT MANAGEMENT SUMMARY: MONTANE SHRUB

Conservation strategies for the montane shrub habitat type focus on the preservation of healthy, self-sustaining stands. Landscape planning, including an inventory and condition assessment of the communities included in this category will fill information gaps and guide habitat managers to devise best management practices that emphasize natural regeneration, protection from wildfire, and sustainable land uses that do not encourage type conversion. Emphasis will be placed on maintaining the natural plant species diversity of these types, including vigorous associated shrubs (i.e., golden currant), wildflowers, and grasses.

HABITAT TYPE: MOUNTAIN MAHOGANY

General Description

The mountain mahogany habitat type generally occurs in scattered pockets on mountain slopes throughout the Great Basin and is most common in central, eastern and northern Nevada. The Nevada GAP estimates 228,320 hectares of this type occurs in the state.

Physical Characteristics

The mountain mahogany type is found from 5,000 to 10,000 feet on steep, rocky, dry slopes generally above the 30 cm precipitation zone. Temperatures vary from -30 F to 90 F. Mountain mahogany sites are typically characterized by significant rock outcropping and thin to almost nonexistent, well-drained soils. Growth form tends toward multi-stemmed trees up to 10.7 meters in height, but most often between three and 4.6 meters high. Sites with a prolonged history of heavy ungulate use can have an open midstory such that travel under the canopy is not particularly difficult, but mountain mahoganies have the potential to grow thickly with closed midstory next to impossible for humans to penetrate.

Dominant Plant Species

This habitat is generally dominated by curlleaf mountain mahogany (*Cercocarpus ledifolius*). Curlleaf mountain mahogany is a drought resistant evergreen tree that can attain a height of 10.6 meters and a diameter of 0.9 meters (Lanner 1984). Some old growth stands have been documented at over 700 years old (Schultz 1987). The mountain mahogany is often in close association with singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*). However, it can also occur in distinct elevational bands above the pinyon-juniper and sagebrush habitat types. Species typically found in the mountain mahogany type include big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), *Ceanothus spp*, Indian paintbrush (*Castilleja spp*), and arrowleaf balsamroot (*Balsamorhiza sagittata*). Associated species include subalpine fir (*Abies lasiocarpa*), white fir (*Abies concolor*), limber pine (*Pinus flexilis*), and dwarf juniper (*Juniperus communis*).

Historic and Current Condition

Over 90% of historic mountain mahogany habitat was cut down for charcoal production during the hard rock mining era. Very few old age class (>200 year old) mahogany trees still remain. Most of the mountain mahogany habitat we see today is second growth timber. Portions of this habitat, particularly the sites to which access is either poor or nonexistent, are in good condition with healthy regeneration and an understory of native shrubs, grasses and forbs. Other portions of this habitat are in poor condition mostly due to excessive historic livestock grazing, with little or no regeneration and little understory or an undesirable understory of exotic grasses and forbs.

Firewood cutting, both legal and illegal, has depleted mountain mahogany stands on a local basis where access by vehicle is not prohibitively difficult. Much mountain mahogany

habitat is protected from consumptive human use by poor vehicular access and/or by federal wilderness (USFS) or wilderness study area (BLM) designation.

While mountain mahogany evolved in North America with a natural fire regime, it did not evolve with the double threat of fire and aggressive fire-climax exotics such as cheatgrass, which outcompete native plants on burned sites and through their competitive edge eventually convert native habitats into fire-maintained types dominated by the exotics. Nevada native shrub types are increasingly vulnerable to this conversion process – mountain mahogany is not spared.

Conservation Opportunities

Mountain mahogany habitat is critically important to a number of breeding bird species and possibly even more important as thermal cover and foraging habitat for Nevada's wintering birds. Range rehabilitation in the wake of wildfire has intensified in the last decade with the availability of an array of private and public funding sources – mining companies and wildlife foundations particularly in the forefront in partnership with Nevada Division of Wildlife, the Bureau of Land Management, and the U.S. Forest Service. Some specific plantings of mountain mahogany seedlings have been attempted with varying degrees of success. Range rehabilitation efforts should prioritize mountain mahogany in seed mixes, particularly where mahogany sites have been lost. Statewide, efforts to bring livestock use on public rangelands under sustainable management have resulted in the release of some mountain mahogany sites to regeneration processes once stifled by ungulate use. Biologists and conservationists should continue to strive for specific wildlife-driven mountain mahogany objectives in the public land planning process.

Priority Species

(No Obligates)

Other

Black-throated Gray Warbler
Cooper's Hawk
Flammulated Owl
Gray Flycatcher
Juniper Titmouse
Northern Goshawk
Orange-crowned Warbler
Red-naped Sapsucker
Virginia's Warbler

SPECIES PROFILE 1. MOUNTAIN MAHOGANY

BLACK-THROATED GRAY WARBLER
Dendroica nigrescens

(See Pinyon-Juniper Habitat Section for species profile.)

OBJECTIVE: Reverse a declining population trend of Black-throated Gray Warblers in mountain mahogany habitats in central, eastern, and northern Nevada by 2004.

Strategy: Secure protection for all old growth curlleaf mountain mahogany stands (200-

700 years old) in the state. Include all pure and mixed species stands in protection plan.

Action: Delineate stand locations.

Action: Within the framework of the public land planning process, designate all of these as either Resarch Natural Areas or Areas of Critical Environmental Concern.

Action: Elevate these areas to high priority status in regional fire prevention plans.

Strategy: Achieve good to excellent condition of understory vegetation (healthy perennial grass/forb/shrub component and healthy mountain mahogany regeneration) in 100,000 hectares of Nevada's poor/fair condition curlleaf mountain mahogany habitat.

Action: Delineate all poor/fair condition curlleaf mountain mahogany habitat in Nevada.

Action: Determine population concentrations of tree-nesting and shrub-nesting Black-throated Gray Warblers within the curlleaf mountain mahogany habitat type in Nevada.

Action: Overlay Priority Warbler Species concentrations with poor/condition habitats.

Action: Within the framework of the public land planning process, implement or maintain livestock grazing best management practices to attain good to excellent habitat condition in all poor/fair condition curlleaf mountain mahogany habitats found within 100 km of Black-throated Gray Warbler concentration areas.

Strategy: Restore health of curlleaf mountain mahogany stands in areas where exotic fire climax grasses and forbs make up the majority of the understory.

Action: Delineate sites for treatment.

Action: Secure high priority fire prevention status for these stands.

Action: Revegetate understory in target stands with native perennial grasses, forbs, and shrubs.

Assumptions - Research and Monitoring Needs

Priority status was determined for the Black-throated Gray Warbler based on the importance of Nevada to the breeding population of this species in the western United States. An assumption was made, based on limited BBS route data, that mountain mahogany habitats are of equal or similar importance as the pinyon-juniper type for Black-

throated Gray Warbler nesting habitat in Nevada (Lindsdale 1938). An additional assumption was made that shrub understory within a mountain mahogany canopy was as important to breeding of Black-throated Gray Warblers in Nevada as was shown to be the case in Oregon (Bowles 1902).

Monitoring of additional BBS routes in mountain mahogany habitats will be required to measure progress toward the achievement of the objective.

Opportunities

The federal land use planning processes currently implemented by the BLM and the Forest Service provide the opportunity for conservationists to help create habitat management goals and objectives on the actual landscape. Plant community structure and diversity within mountain mahogany types can be addressed through land use planning and specific targets for the maintenance of key species and structural components can be set and monitored.

Federal cost-share dollars exist through the land management agencies to conduct wildlife surveys necessary to support the land use planning process. Nevada Division of Wildlife has provided personnel on a cost-share basis to collect point count data for both the BLM and the Forest Service in allotments undergoing planning review. This program should be continued and magnified to create a reasonable coverage of areas on the review cycle.

Further Reading

Bowles 1902.
Lindsdale 1938.

SPECIES PROFILE 2. MOUNTAIN MAHOGANY

VIRGINIA'S WARBLER

Vermivora virginae

(See Pinyon Juniper habitat section for species profile.)

OBJECTIVE - Maintain stable or increasing populations of nesting Virginia's Warblers in mountain mahogany habitats throughout their range in Nevada through 2004.

Strategy: Achieve good to excellent condition of understory vegetation (healthy perennial grass/forb/shrub component) in all curlleaf mountain mahogany habitat adjacent perennial and ephemeral stream courses.

Action: Delineate all curlleaf mountain mahogany habitat adjacent stream courses in central, eastern and north Nevada.

Action: Determine population concentrations of ground-nesting Virginia's warblers within the curlleaf mountain mahogany habitat type in

Nevada.

Action: Prioritize Virginia's Warbler concentrations, delineate on a map, and overlay with habitat condition map.

Action: Within the framework of the public land planning process, implement or maintain livestock grazing best management practices to attain good to excellent habitat condition in all poor/fair condition curlleaf mountain mahogany habitats found to contain Virginia's Warbler nesting populations.

Assumptions - Research and Monitoring Needs

The Virginia's Warbler objective for mountain mahogany habitats assumes that stable or increasing populations are achievable for the species in Nevada. Research should be conducted to determine population status and trend for Virginia's Warbler specific to mountain mahogany habitats in Nevada. Additional point counts or other appropriate survey methods may have to be initiated in mountain mahogany habitats to monitor status and trend.

Opportunities

The federal land use planning processes currently implemented by the BLM and the Forest Service provide the opportunity for conservationists to help create habitat management goals and objectives on the actual landscape. Plant community structure and diversity within mountain mahogany types can be addressed through land use planning and specific targets for the maintenance of key species and structural components can be set and monitored.

Federal cost-share dollars exist through the land management agencies to conduct wildlife surveys necessary to support the land use planning process. The Nevada Division of Wildlife has provided personnel on a cost-share basis to collect point count data for both the BLM and the Forest Service in allotments undergoing planning review. This program should be continued and magnified to create a reasonable coverage of areas on the review cycle.

SPECIES PROFILE 3. MOUNTAIN MAHOGANY

COOPER'S HAWK
Accipiter cooperii

NORTHERN GOSHAWK
Accipiter gentilis

FLAMMULATED OWL
Otus flammeolus

Three of Nevada's Priority Species, the Cooper's Hawk, Northern Goshawk, and Flammulated Owl, rely heavily on the mountain mahogany stands that inhabit the upper reaches of Nevada's many longitudinally-oriented mountain ranges during migration up

and down these ranges in spring and fall. Strategically located at high elevations along ridge crests and the lateral wings that branch from the primary ridge lines, patches of mountain mahogany have the potential to be quite vital in supplying the energy and escape cover needs of these species of raptors during migration. For species profiles for these species, please refer to the Aspen habitat section for Cooper's Hawk, the Montane Riparian habitat section for Northern Goshawk, and the Montane Conifer habitat section for Flammulated Owl.

OBJECTIVE: Maintain present occurrence and distribution of Cooper's Hawks, Northern Goshawks, and Flammulated Owls, within normal ranges of annual fluctuation, through all migration corridors in mountain mahogany habitats throughout Nevada through 2004.

Strategy: Maintain mountain mahogany habitat along all Cooper's Hawk migration corridors.

Action: Document and prioritize all major hawk migration corridors in mountain mahogany habitat.

Action: Monitor Cooper's Hawk fall migrations in prioritized sites.

Action: Within the framework of the public land planning process, implement best management practices to attain good to excellent habitat condition in all poor/fair condition curlleaf mountain mahogany habitats found within Cooper's Hawk migration corridors.

Assumptions - Research and Monitoring Needs

The raptor migration corridor objective assumes that present occurrence and distribution are sufficient to maintain healthy, self-sustaining populations of Cooper's Hawks, Northern Goshawks, and Flammulated Owls in those regions from which Nevada's migrant visitors come. Migration population parameters need to be established for Flammulated Owl. Specific surveys may have to be initiated in mountain mahogany habitats to monitor trend for all three species.

Opportunities

The federal land use planning processes currently implemented by the BLM and the Forest Service provide the opportunity for conservationists to help create habitat management goals and objectives on the actual landscape. Plant community structure and diversity within mountain mahogany types can be addressed through land use planning and specific targets for the maintenance of key species and structural components can be set and monitored.

Hawkwatch International is a nonprofit organization that monitors raptor migrations throughout the western U.S. Opportunities likely exist to coordinate Nevada PIF activities with those of Hawkwatch in order to cooperatively achieve mutual goals and objectives.

Further Reading

Hoffman et al. 1998.

OTHER PRIORITY SPECIES: MOUNTAIN MAHOGANY

GRAY FLYCATCHER
Empidonax wrightii

JUNIPER TITMOUSE
Baeolophus ridgwayi

RED-NAPED SAPSUCKER
Sphyrapicus nuchalis

The above species have all been identified by the Nevada Working Group as species deserving priority focus for a variety of reasons which are identified in other sections of the plan. All four species also occur in mountain mahogany types, and all four were considered to be adequately addressed using objectives and strategies similar to those for the Black-throated Gray Warbler. For species profiles, refer to the Sagebrush habitat section for Gray Flycatcher, Pinyon-Juniper habitat section for Juniper Titmouse, and the Montane Riparian habitat section for Red-naped Sapsucker.

HABITAT MANAGEMENT SUMMARY: MOUNTAIN MAHOGANY

Conservation strategies for the mountain mahogany habitat type focus on the preservation of healthy, self-sustaining stands. Landscape planning, including an inventory and condition assessment of mountain mahogany in Nevada will fill information gaps and guide habitat managers to devise best management practices that emphasize natural regeneration, protection from wildfire, and sustainable land uses that do not encourage type conversion. Emphasis will be placed on maintaining natural plant species diversity and structural stand complexity, as both are important to birds for nesting, migratory, and wintering needs.

HABITAT TYPE: PINYON/JUNIPER

General Description

Pinyon-juniper woodlands are often pure or nearly pure stands of either singleleaf pinyon (*Pinus monophylla*), or any of four species of junipers – Utah (*Juniperus osteosperma*), Western (*J. occidentalis*), Rocky Mountain (*J. scopulorum*), or California (*J. californica*). Trees are usually not more than 6.1 meters in height. Height and density of pinyon-juniper woodlands are highly variable throughout the state, even within a single mountain range.

Pinyon-juniper is largely absent from northwestern Nevada (from Interstate 80 north to the Oregon border, east to about Lovelock), but when present there, it occurs as pure stands of western or Utah juniper. Utah juniper dominates isolated areas in northeastern Nevada along the Utah border, and mixes freely with pinyon across the mountain ranges south of the Humboldt River. Rocky Mountain juniper occurs in pure stands in the Mountain City and Jarbidge areas. Singleleaf pinyon begins abruptly at the Truckee River and Interstate 80, then increases in dominance as one moves southward. From its northern margin, pinyon is widely distributed all across the state from the Sierra Nevada to the Utah border until the Mojave Desert, where it begins to fragment significantly into isolated stands south to the Colorado River.

Physical Characteristics

The elevational limits of pinyon-juniper vary throughout Nevada. Many factors interact in a complex manner to determine these limits, including total annual precipitation, seasonal distribution of precipitation, and thermal minima and maxima during the growing season and winter (Charlet 1998). Pinyon-juniper thrives in an annual precipitation range of 30 to 45 cm, but will survive extremes of 20 and 50 cm. They are generally found between 5,000 and 8,000 feet elevation, but will reach as far down as 4,000 feet at the edge of the Mojave Desert, and as high as 10,000 feet on the White Mountains (Trimble 1989). Juniper typically occur in pure stands at the lower elevations (Tausch and West 1988), mainly because juniper is adapted to survive on drier sites (Trimble 1989). The communities associated with this habitat are highly variable and complex distributionally and compositionally. Variability is controlled by climatic changes, modification of landform by climatic events (Tausch 1998) and variation in current environmental conditions (West et. al.1998).

Dominant Plant Species

Areas dominated by singleleaf pinyon are usually mixed variably with Utah juniper and mountain mahogany (*Cercocarpus ledifolius*). Ponderosa pine (*P. ponderosa*), white fir (*Abies concolor*), and Jeffrey pine (*P. jeffreyi*) may be present along its upper margins. Shrubs associated with this type include sagebrush (*Artemisia spp.*), oak (*Quercus gambelii* or *Q. turbinella*), alderleaf mountain mahogany (*C. montanus*), littleleaf mountain mahogany (*C. intricatus*), cliffrose (*Cowania mexicana*), manzanita (*Arctostaphylos spp.*), and bitterbrush (*Purshia tridentata*). Forbs and grasses can be largely absent from pinyon-juniper stands with high canopy coverage, but when present, are basically similar to those found in sagebrush. A unique forb community can be found in pinyon stands with dolomitic

soils.

Historic and Current Conditions

The current coverage of pinyon and juniper woodlands is more than 7.2 million hectares in the Great Basin, which is greater than it was prior to European settlement (Tausch et al. 1981). According to Tausch, approximately 3,640,750 hectares occurs in Nevada, while the Nevada GAP estimated 2,964,572 hectares of pinyon-juniper in the state.

From 1860 to about 1920, much of Nevada's pinyon-juniper forest was harvested to support the mining industry. Mostly it was used to make charcoal, which was in turn used in the gold milling process. Following the bulk of the woodland removal, intensive livestock grazing (centering between the years 1900 and 1920) was blamed for the removal of competing understory layers, which facilitated a resprouting and regrowth of pinyon-juniper greater in density than that of pre-settlement. A land management paradigm embracing fire suppression followed, and the pinyon-juniper woodland re-established itself with a vengeance between 1920 and 1950.

Starting in the 1950's, range managers armed with powerful new technologies began to scramble for ways to create more forage for livestock. Large bulldozers were hooked together with heavy anchor chains and the uprooting of millions of hectares of woodland across the West was underway. Aro (1975) estimated that 17,200 hectares of pinyon-juniper woodland were chained in Nevada between 1960 and 1972. The practice diminished after the oil embargo of 1973 rendered it economically unsound. That same oil embargo also created an increased demand for cheap heating fuel, and a spate of firewood-cutting attacked the woodlands between 1975 and 1985. Air quality concerns and a general decline in home fuel prices have strongly curtailed this demand in the last decade.
Nonetheless, pinyon-juniper removal continues at a much smaller scale to this day. Recent trends within federal land management agencies indicate an increased tolerance to wildland fire, again based primarily on the increasingly unfavorable economics of fire suppression. The proliferation of "let-burn" policies and "wildlife-objective prescribed burns" across the land management districts of the pinyon-juniper belt may prove to be this durable habitat type's newest challenge to long-term viability. At the present time, though, catastrophic change seems unlikely.

Opportunities For Conservation

At least for the time being in Nevada, pinyon-juniper woodland is winning its prolonged war with Industrial Man. Its most beneficial products, fuel wood and pinyon nuts, do not enjoy the same demand in Nevada as is demonstrated in other western states. The truce is an uneasy one, however, and new attacks could be spawned by economic trends in either direction. High fuel prices could renew the need for cheap home heating fuel. Precipitous declines in fuel prices could renew interest in range conversion by bulldozer. It would seem that bird conservationists have little opportunity to become complacent about the status and trend of Nevada's pinyon-juniper bird communities.

Priority Bird Species

Obligates

Pinyon Jay
Gray Vireo

Other

Ferruginous Hawk
Gray Flycatcher

Juniper Titmouse
Mountain Bluebird

Western Bluebird
Virginia's Warbler

Black-throated Gray Warbler
Scott's Oriole

SPECIES PROFILE 1. PINYON-JUNIPER

PINYON JAY

Gymnorhinus cyanocephalus

Distribution

The Pinyon Jay ranges throughout the range of the various pinyon pine species of the western U.S., and extends into some yellow pine forests of the interior, from central Oregon to eastern Montana, south to the Big Bend region of Texas, west across New Mexico and Arizona to Baja California. In Nevada, Pinyon Jays are sporadically distributed throughout the pinyon-juniper belt extending from the Humboldt River south into the mountain ranges of the Mojave Desert, and ranging from the Sierra Nevada to the Utah border.

Habitat

Although they are known to utilize yellow pine forests in other states, no bird species in Nevada is more strongly tied to a single habitat type than is the Pinyon Jay. Ligon (1978) described a mutualistic relationship between Pinyon Jays and pinyon pine in which Pinyon Jays served as the primary seed disseminators for the pine while the pine provided the jay's primary food item, pinyon nuts.

Physical Factors

No known physical constraints other than those that dictate the distribution of pinyon pine are known for this species.

Landscape Factors

Pinyon Jays are semi-colonial nesters and do not defend personal territories beyond the nest and eggs (Balda and Bateman 1972). In New Mexico, a flock remained in an 28.5 square kilometer range for 18 months (Ligon 1971). Nest colony size varied from 29 to 50 hectares in an Arizona study (Balda and Bateman 1971).

Special Considerations

Abundant cone crops stimulate Pinyon Jay breeding. Spotty distribution of the species across seemingly endless expanses of suitable habitat is dictated by local cone production. Flocks will wander widely in search of abundant food sources.

Associated Bird Species

Mountain Quail
Scrub Jay
Black-billed Magpie
Clark's Nutcracker
Mountain Chickadee

Priority Considerations

Limited Breeding Bird Survey data indicate that the Pinyon Jay has experienced a population decline in the Basin and Range province since 1966 (-5.9 percent, p = 0.12; Sauer et al. 1998). Sauer (1998) estimated that as much as 31 percent of the world's population of Pinyon Jays was found in the Basin and Range province. Because Nevada comprises the majority of that province, because populations seem to be on the decline, and because Pinyon Jays better than any other species represents the needs of the pinyon-juniper bird community, the Nevada Working Group has selected the Pinyon Jay for priority focus for the purposes of this planning effort.

OBJECTIVE: Stabilize or reverse the declining population trend of Pinyon Jays in five priority areas by 2004 – the belt extending from the White Mountains north to the Flowery Range in Esmeralda and Douglas Counties; the Toquima-Monitor-Toiyabe Range complex in northern Nye County; the ranges of White Pine County; the ranges of Elko County south of the Humboldt River; the Sheep Range and Spring Mountains in Clark County.

Strategy: Maintain large, cone-bearing pinyon trees (75 years or older; Little 1950) in patches at least 18 sq km (Balda and Bateman 1971) in mature pinyon-juniper woodlands or monotypic pinyon stands.

Action: The cutting of mature live trees should be discouraged in fuel wood harvest activities.

Action: Chainings and prescribed burns should leave adequate stands of mature, cone-bearing trees (see strategy) adjacent to any treatment area.

Action: Determine Pinyon Jay population status and trend in at least three of the five priority areas.

Action: Inventory pinyon stands by age class in the five priority areas. Delineate old growth stands and inventory Pinyon Jay presence in those stands.

Action: Conduct a landscape analysis of projected pinyon-juniper treatment projects through the five-year planning period. Determine potential impacts on Pinyon Jay populations.

Assumptions - Research and Monitoring Needs

The Pinyon Jay objective assumes that populations are indeed on the decline in Nevada. Better status and trend data specific to Nevada are needed. Better understanding of the relationship between Pinyon Jays and the pinyon-juniper landscape are needed in order to perform risk analyses and predict the cumulative impacts of unattended wildfires and planned conversion projects on Pinyon Jay population viability.

Opportunities

Participation in public lands planning processes is probably the best way to build a body of knowledge about what is planned in the way of pinyon-juniper conversion over the five-year planning period. Although Pinyon Jay populations appear to have recovered from the wholesale liquidation of their habitat 100 years ago, the overall effects of that event will never be known. Bird conservationists should not be eager to tempt fate in such drastic terms any time soon. Responsible landscape planning should be possible to the extent that no species are lost in the neverending quest for increased commodity outputs on our public lands.

Further Reading

Balda and Bateman 1971
Balda and Bateman 1972
Ligon 1978

SPECIES PROFILE 2. PINYON/JUNIPER

GRAY VIREO

Vireo vicinior

Distribution

The Gray Vireo has a distribution including southern California east through the southwestern states and south to Mexico. In Nevada, it is a summer resident in the southern corner of the state.

Habitat

The Gray Vireo's preferred habitat in Nevada is open pinyon-juniper forest, particularly occurring along desert washes with an understory of shrubs such as bitterbrush (*Purshia* sp.) or cliff rose (*Cowania* sp.). Preferred vegetative structure is sparse to open canopy closure of mature pinyon-juniper forest, although optimal density is not well understood. Shrub understory and herbaceous layer are both usually sparse under ideal conditions.

Physical Factors

In California, Gray Vireos range from 2,000 to 6,500 feet elevation (Zeiner et al. 1990). In Nevada, most birds are observed between 5,400 and 6,000 feet elevation. Water quality

and quantity do not appear to be a factor, except for an apparent lack of it in the Gray Vireo's preferred habitat. Preferred topography includes rocky canyon slopes and bottoms with moderate to steep slope. In chaparral, a north aspect may be favored.

Landscape Factors

Gray Vireo habitat is typically naturally fragmented with patchy to continuous stretches of suitable vegetation within fragments. Minimum patch size may be 0.8 to 1.2 hectares when habitat occurs at the head of a canyon. Often one pair of Gray Vireos occupies a canyon head. In larger patches, 1.5 pairs/sq km may occur. There are no natural disturbance regimes. Successional stage should be late to mature. Proximity to foraging areas is irrelevant.

Special Considerations

The Gray Vireo is an insectivorous species, gleaning its food from shrubs and trees, rarely from the ground. The species is sensitive to and wary of human disturbance, possibly susceptible to tape playback. It is also susceptible to brood parasitism by Brown-headed Cowbirds. Gray Vireo pairs may occur in loose colonies with adjunct territories in isolated clusters (which may reflect the nature of available habitat. In Nevada, the Gray Vireo is typically a limited range, low-density species.

Associate Species

Black-chinned Sparrow	Spotted Towhee
Cassin's Kingbird	Blue-gray Gnatcatcher
Scrub Jay	Common Bushtit.

Priority Considerations

No Breeding Bird Survey data exist for this species in the provinces that comprise Nevada; in fact, the Gray Vireo's status in Nevada is only lately becoming better understood. The species is subject to national concern, exhibiting a range contraction on its western front and making the newly-delineated Audubon Watch List (1998). Because of national concern and because much remains to be learned about this species in Nevada, the Nevada Working Group has selected the Gray Vireo for priority focus for the purposes of this planning effort.

OBJECTIVE: Verify and maintain four viable populations of Gray Vireo in pinyon-juniper habitat, one in each of the following areas – The Sheep Range and Spring Mountains of Clark County; the ranges of Lincoln County; the southern ranges of White Pine County; the White Mountains of Esmeralda County – by 2004.

Strategy: Maintain open, mature pinyon-juniper woodlands with shrubby understory on moderate, rocky slopes. Maintain small "pockets" of pinyon-juniper at the head of canyons for breeding.

Action: Identify mature pinyon-juniper areas and provide information to land

managers regarding the importance of managing for and retaining mature pinyon-juniper habitats.

Action: Determine habitat use of Gray Vireos in one or more of the priority areas identified above.

Action: Determine demographic parameters and conduct population viability analysis.

Action: Coordinate research and monitoring activities with other states.

Assumptions - Research and Monitoring Needs

The Gray Vireo objective assumes that population viability is achievable in the four prioritized areas. The northern extent of this species' range in Nevada is poorly known. It is hoped that the Nevada Breeding Bird Atlas will provide better information in this regard. Habitat selection information and population viability analysis are needed to achieve this objective.

Opportunities

National Watch List status for the Gray Vireo may influence the direction of research dollars toward better understanding of this species' status and needs. Ongoing Breeding Bird Atlas activities stand to clear up our understanding of this species' range in Nevada.

Further Reading

Johnson 1972

SPECIES PROFILE 3. PINYON/JUNIPER

JUNIPER TITMOUSE

Baeolophus ridgwayi

Distribution

The Juniper Titmouse ranges from south-central Oregon through the Great Basin to Baja California and from the east slope of the Sierra Nevada to central Colorado and New Mexico. In Nevada, the Juniper Titmouse is found in pinyon-juniper woodlands from Interstate 80 south to the Colorado River.

Habitat

The Juniper Titmouse is strongly associated with pinyon-juniper woodlands. Snags and heart rot are assumed to be important in providing nesting cavities. Dense foliage and closed canopies are preferred, while thin understory and ground cover are preferred for some feeding activities. These are all characteristics of late successional pinyon-juniper habitats. The Juniper Titmouse often nests in cavities in riparian vegetation, so juxtaposition of pinyon-juniper to riparian is assumed to be beneficial. Its distribution throughout the pinyon-juniper type seems to be quite patchy and remains poorly understood.

Physical Factors

The Juniper Titmouse follows the pinyon-juniper belt through Nevada, ranging from 4,500 to 7,500 feet elevation (Alcorn 1988; Linsdale 1936). Other abiotic criteria such as topography, slope, and aspect do not have an effect on Juniper Titmouse distribution except as they affect pinyon-juniper canopy closure. Free water is probably not a requirement, although they have been noted to frequent pinyon-juniper/riparian habitat interfaces.

Landscape Factors

Detailed understanding of the Juniper Titmouse's habitat preferences are lacking. It uses pinyon-juniper stands with canopy closure in the higher end of the scale. The Juniper Titmouse seems to frequent the interface between pinyon-juniper and riparian habitats. Pair density of 16 pairs per 40 hectares was reported in a pinyon-juniper/ponderosa pine ecotone in California (Laudenslayer and Balda 1976). The male defends a territory varying between 1.2 to 4.8 hectares (averaging around 2.4 hectares) year round.

Special Considerations

The Juniper Titmouse feeds from limbs or on the ground, where it takes many species of small insects, as well as weed seeds, pinyon nuts, and wild fruits. It is a cavity nester that can dig its own cavity if the wood is rotten enough. The Juniper Titmouse also will use nest boxes. Three to nine eggs are laid (typically six to eight) and are incubated by the female for 14-16 days. Young leave the nest between 16 and 21 days after hatching. The oldest bird on record was seven years old. Juniper Titmice frequently participate in mixed-species foraging flocks.

Associated Species

Mountain Chickadee
Spotted Towhee
Chipping Sparrow
Hairy Woodpecker

Priority Considerations

Limited Breeding Bird Survey data indicate a slight, non-significant downward trend for the Juniper Titmouse in the Basin and Range province. Since the recent split of the Plain Titmouse from the old species which included what is currently known as the Oak Titmouse, the Basin and Range province has likely taken on a much greater percentage of responsibility for the maintenance of the (new) Juniper Titmouse, although to date there has been no analysis to that effect. The Nevada Working Group has selected the Juniper Titmouse as a species for priority focus within its present planning effort because it may uniquely represent the wintering needs of an important assemblage of species that use the pinyon-juniper type.

OBJECTIVE: Maintain a stable or increasing population trend for Juniper Titmouse in the following priority areas by 2004 -- the belt extending from the White Mountains north to the Flowery Range in Esmeralda and Douglas Counties; the Toquima-Monitor-Toiyabe Range complex in northern Nye County; the ranges of White Pine County; the ranges of Elko County south of the Humboldt River; the Sheep Range and Spring Mountains in Clark County.

Strategy: Maintain old-growth pinyon-juniper stands of high density and crown coverage, particularly in the ecotone with riparian zones where stem density and crown cover are typically higher than the surrounding landscape. Maintain snags for cavity-nesting.

Action: Manage for snags, dead limbs, dead tops; shrub cover under 40 percent; pinyon-juniper crown coverage greater than 50 percent.

Action: Initiate more study of Juniper Titmouse habitat preference for the purpose of refining the habitat management model.

Action: Determine population status and trend in the five priority areas listed above by point counts or other appropriate survey methods.

Assumptions - Research and Monitoring Needs

The Juniper Titmouse objective for pinyon-juniper assumes that populations can be stabilized or increased in the five priority areas delineated. Further study of habitat preference (including winter needs) and population status and trend are needed to refine the management model.

Opportunities

The recent identification of this species within the old “Plain Titmouse” complex may well generate new research interest in it, particularly with regard to habitat selection and population parameters.

Further Reading

Laudenslayer and Balda 1976
Mason 1981

SPECIES PROFILE 4. PINYON/JUNIPER

BLACK-THROATED GRAY WARBLER
Dendroica nigrescens

Distribution

The Black-throated Gray Warbler breeds from southern British Columbia throughout Nevada, northern Utah, and northwestern Colorado, south to northern Baja California,

southern Arizona, and southern New Mexico. It winters from Mexico through Central America.

In Nevada, the Black-throated Gray Warbler breeds throughout the state from the Spring Mountains in Clark County north to the Carson Range in southern Washoe County, east to Great Basin National Park in White Pine County and north again to the Idaho border in Elko County.

Habitat

In most of Nevada, Black-throated Gray Warblers appear to be closely tied to the more arid pinyon-juniper habitats. Along the east side of the Sierra Nevada, habitat preferences include a mix of conifers, montane shrubs, and junipers. Black-throated Gray Warblers tend to be found in riparian habitats during migration.

In the Sheep Range of Clark County, Black-throated Gray Warblers are found in close association with mature pinyon featuring canopy heights up to 15.2 meters. The mix of juniper can vary from small (less than three meters) pointed-top trees to large, old rounded-top trees that often reach 9.1 meters in height. Understory vegetation can be sparse, particularly in southern Nevada ranges. Sagebrush, squawbush (*Rhus trilobata*), curlleaf mountain mahogany (*Cercocarpus ledifolius*), and cliff rose (*Cowania mexicana*) in varying densities can be present.

On the Sierra Nevada, the vegetation structure can include Jeffrey pine with manzanita (*Arctostaphylos spp.*) in the understory. In the Carson Range in northern Nevada, snowbush (*Ceanothus cordulatus*) may enter the understory mix.

Physical Factors

The Black-throated Gray Warbler breeds in the pinyon-juniper belt across the state ranging from 5,000 feet elevation in northern regions to as high as 8,000 feet in the southern ranges of Nevada. The species does not seem to be sensitive to slope or aspect. During post-breeding dispersal, Black-throated Gray Warlbers may be found in just about any habitat from coniferous forests to riparian zones, mountains to flatlands. Water is not required.

Landscape Factors

Black-throated Gray Warblers appear to favor fairly dense, mature stands of pinyon/juniper. Minimum or maximum tree basal area (used to index density) of preferred habitat has not been determined for the species. Proximity to water does not seem to influence breeding site selection. LaRue (1994) reported 11 pairs per 40 hectares.

Special Considerations

Black-throated Gray Warblers are insectivorous, gleaning directly from the dense terminal foliage of pinyon and juniper. Tree density may have an influence on feeding efficiency and the cover/concealment preferences for the species. Food abundance may vary with climate. Wildfires which consume tree canopies may be detrimental to the species, but controlled burning may not bear a significant negative impact. Cabling or other habitat

conversion methods which totally remove juniper may be detrimental to the species. Firewood cutting of pinyon/juniper could negatively impact the species, especially in areas of marginal density.

Associated Species

Hairy Woodpecker	Blue-gray Gnatcatcher
Dusky Flycatcher	Spotted Towhee
Scrub Jay	Chipping Sparrow

Priority Considerations

Limited Breeding Bird Survey data indicate decreasing trends for Black-throated Gray Warbler in the Basin and Range physiographic region since 1966 (Sauer et. al.1998), with downward trend continuing during the 1980-1996 period (-6.9 percent; p = 0.44, not statistically significant). Because it has exhibited a consistent downward trend through the last three decades, the Nevada Working Group has selected the Black-throated Gray Warbler as a species for priority focus for the purposes of this planning effort.

OBJECTIVE: Maintain Black-throated Gray Warbler breeding pair densities of 11 pairs per 40 hectares in pinyon-juniper habitat throughout their occupied Nevada range through 2004.

Strategy: Manage pinyon-juniper woodlands for a minimum of 50:50 pinyon to juniper ratio or greater pinyon percentage. Encourage understory of grasses and forbs.

Action: Initiate population density surveys in the five priority areas listed under “Pinyon Jay”.

Action: Initiate more study of Black-throated Gray Warbler habitat preference for the purpose of refining the habitat management model.

Assumptions – Research and Monitoring Needs

The Black-throated Gray Warbler objective for pinyon-juniper assumes that breeding pair densities of 11 per 40 hectares is achievable and will support healthy, self-sustaining populations in Nevada. Validation of the LaRue model (1994) in Nevada will require academic investigation and intensive monitoring.

Opportunities

The citizen-scientist corps presently being assembled by the Great Basin Bird Observatory should be useful in implementing the intensive monitoring strategies. The University of Nevada or University of California systems should be consulted about gathering the necessary imformation regarding habitat selection and management model construction.

Further Reading

LaRue 1994.

SPECIES PROFILE 5. PINYON/JUNIPER

FERRUGINOUS HAWK
Buteo regalis

Distribution

The Ferruginous Hawk breeds in semiarid western plains and cold desert from southern Alberta, Saskatchewan, Manitoba, and North Dakota south to northern Arizona, New Mexico, and Kansas. It winters over much of its breeding range south to Baja California, northern Mexico, and Texas. With the exception of Clark, Esmeralda and southern Nye Counties, nesting Ferruginous Hawks have been documented throughout the State. Highest nesting densities occur in White Pine, Elko, Eureka and northern Lincoln Counties.

Most of Nevada's Ferruginous Hawks winter south of their summer range in the southwestern United States and northern Mexico (Herron et al. 1985). Mid-winter raptor surveys have documented only a handful of wintering Ferruginous Hawks as far north as Eureka, White Pine, and southern Elko Counties in eastern Nevada (NDOW 1995). However, increasing numbers of birds have been observed wintering in agricultural areas of western Nevada.

Habitat

In Nevada, the Ferruginous Hawk prefers to nest in scattered juniper trees found at the ecotone of singleleaf pinyon (*Pinus monophylla*) - Utah juniper (*Juniperus osteosperma*) woodlands and desert shrub communities. In valleys that are known to support the highest nesting densities, the majority of active nests are located in isolated living junipers (Canopy Closure <1%) with an understory dominated by big sagebrush (*Artemisia tridentata*) or black sagebrush (*A. nova*) (Midstory Cover 40-80%) and within 3.2 km of whitesage (*Ceratoides lanata*) or low sagebrush (*A. arbuscula*) communities (Midstory Cover 25-50%, Understory Cover 25-50%). Structure values are approximations. Other nest structures include living singleleaf pinyon, dead Utah juniper and desert peach (*Prunus fesciculata*).

Whitesage and low sagebrush communities with associated native grasses and forbs generally support greater densities of preferred prey populations (rodents, e.g., Townsend's ground squirrels and lagomorphs e.g., black-tailed jackrabbits) than do adjacent monotypic big sagebrush communities.

Physical Factors

Sloping foothills (5-10% slope) (2,000-2,500 meters elevation) overlooking broad valleys (1,500-2,000 meters elevation) are preferred nesting and foraging habitats respectively. Rock outcrops and rock "chimneys" are periodically used as nesting structures especially when tree cover is missing.

Landscape Factors

Late successional to climax plant communities are preferred for nesting and foraging habitat. Nesting densities increase near pinyon-juniper/ desert shrub ecotones. More

open midstory vegetation with dense understory appears to be preferred to dense midstory vegetation types. Distance between nesting territories is dependent on topographic features and prey availability. In preferred habitat, nesting densities may approach 0.5 birds/sq km.

Special Considerations

Conversion of whitesage and lowsage complexes to stands of exotic forbs (*Halogeton spp.)* and grasses (*Bromus tectorum* and *Agropyron desertorum*), through the agents of excessive livestock grazing, mechanical seeding, and fire disturbance has reduced the productivity of many Ferruginous Hawk nesting territories.

Ferruginous Hawks generally return to their nesting territories in March, and egg-laying is initiated in early April. Young generally fledge by late June and remain within the nesting territory for several additional weeks before dispersing. Nevada populations fledge an average of 2.9 young per successful nest (Herron et al. 1985).

During the establishment of nesting territories and the incubation period, Ferruginous Hawks are extremely sensitive to human disturbance and will readily abandon the nest if disturbed. Nest structure preference and territory location preference make this species especially vulnerable to this type of disturbance. As a related disturbance factor, illegal take of juvenile birds has been documented in central Nevada.

Associated Species

None

Priority Considerations

The Ferruginous Hawk has been a species of concern throughout much of its range since precipitous population declines were documented in the Northern Plains in the 1980's. Populations seem to be relatively stable in Nevada (Sauer et al. 1998) at the present time; however, the Basin and Range province has a high responsibility for the maintenance of the U.S. breeding population (Carter et al. 1998). Because of high national concern for the status of the species as well as a high regional responsibility for population maintenance, the Nevada Working Group has selected the Ferruginous Hawk for priority focus for the purposes of this planning effort.

OBJECTIVE - Maintain stable or increasing nesting populations of Ferruginous Hawks throughout their present range in northern Nevada through 2004, with particular emphasis on pinyon-juniper habitats in the Spring-Hamlin-Lake Valley Complex, the Independence-Clover-Ruby-Butte Valley Complex, the Toana Draw-Thousand Springs-Pilot Valley Complex, the White River Valley, and Newark Valley.

Strategy: In Ferruginous Hawk nesting range, maintain isolated, mature Utah junipers along the natural ecotone between pinyon-juniper and sagebrush habitats.

Action: When planning pinyon-juniper removal by chaining or prescribed fire, keep intact the naturally-occurring woodland edge where isolated,

mature Utah junipers might provide nest sites.

Action: Avoid habitat conversion of any kind inside a 1.6 km radius buffer zone around any documented Ferruginous Hawk nest site.

Action: Maintain periodic nest occupancy monitoring for Ferruginous Hawks. Compile a nest atlas for professional reference.

Action: Increase periodic patrol of occupied nest territories, particularly during the near-fledging stage.

Action: Curtail wood-cutting activities in occupied Ferruginous Hawk nest territories during April.

Assumptions – Research and Monitoring Needs

The Ferruginous Hawk objective for pinyon-juniper assumes that it is possible to maintain population stability by focusing management efforts on the maintenance of suitable nesting habitat. Ferruginous Hawks have been subject to regular nest occupancy and production monitoring over the last decade. From monitoring processes already in place, it should be possible to project status and trend of the species, particularly as an eastern Nevada breeder.

Opportunities

The public land planning processes implemented by the U.S. Forest Service and Bureau of Land Management are the best forum in which to incorporate management strategies for the Ferruginous Hawk in pinyon-juniper habitats. Landscape analysis of proposed habitat conversion should adequately address Ferruginous Hawk needs and avoid cumulative impacts to the Nevada population.

Further Reading

Herron et al. 1985
Herron 1995
Perkins and Lindsey 1983.
Smith et al. 1981
Woffinden and Murphy 1977

OTHER PRIORITY SPECIES: PINYON/JUNIPER

GRAY FLYCATCHER
Empidonax wrightii

WESTERN BLUEBIRD
Sialia mexicana

VIRGINIA'S WARBLER
Vermivora virginiae

SCOTT'S ORIOLE
Icterus parisorum

The species listed above all spend some of their time in pinyon-juniper habitats. The Nevada Working Group believes that for the purposes of this planning effort, the needs of the Gray Flycatcher and the Virginia's Warbler can be adequately provided for if the objective for Black-throated Gray Warbler is met. For species profiles, please consult the Sagebrush habitat section for Gray Flycatcher, and the Montane Riparian habitat section for Virginia's Warbler. It is believed that the needs of the Western Bluebird in pinyon-juniper habitats can be provided for if the objective for Ferruginous Hawk is met. For a species profile, please consult the Coniferous Forest habitat section. Very little is known at this time about the use of pinyon-juniper habitats by Scott's Oriole in Nevada. The incidence of this species being found in Nevada pinyon-juniper habitats at this time is so low as not to warrant priority concern during this planning period. As more is learned from the Nevada Breeding Bird Atlas and other survey efforts, the need for priority consideration could change in subsequent planning periods. For a species profile of Scott's Oriole, please consult the Mojave Shrub habitat section.

HABITAT MANAGEMENT SUMMARY: PINYON-JUNIPER

Of the Pinyon-juniper priority birds most have negative or unknown population trends, with only the Ferruginous Hawk showing a stable trend. Again with the exception of the Ferruginous Hawk priority birds generally need mature Pinyon-juniper stands. Large, cone-bearing Pinyon trees (only trees 75 years and older bear nuts) that are found in mature stands are necessary for Pinyon Jays as well as a host of other birds and wildlife.

These trees should be protected from cutting and fire. Gray Vireos need pinyon-juniper that is open and has a shrubby understory; this situation is often found on rocky slopes and canyon heads. The Juniper Titmouse needs mature pinyon-juniper in a more closed canopy situation than Gray Vireos and is often found near riparian areas. Often tree density conforms naturally to the scenario needed for Gray Vireos and the Juniper Titmouse. Because of available moisture, trees are frequently more dense in canyon bottoms and less so on rocky slopes. Black-throated Gray Warblers also need mature pinyon-juniper but also seem to prosper where a healthy understory of grass and forbs is found. Ferruginous Hawks are a slightly different case in that they are a pinyon-juniper/sagebrush ecotone bird. It is important to protect isolated mature Utah Junipers in this ecotone as nest trees. The area around known nest trees should be protected from human disturbance during the nesting period and from conversion at other times of the year.

In a habitat that is both spreading and being impacted (witness the declining population trends), it is important to identify the conditions that are needed by the priority species as closely as possible so managers understand that not all Pinyon-juniper is of concern. Being able to identify mature Pinyon-juniper stands that meet the conditions above would be of tremendous benefit to managers trying to conserve these priority species. A project to test the ability of remote sensing to detect mature pinyon-juniper is recommended. Basic monitoring data is needed to determine population trends for most priority species,

and additional habitat use information is needed to guide management actions in pinyon-juniper habitats.

HABITAT TYPE: SAGEBRUSH

General Description

Sagebrush generally occurs throughout the Great Basin and is most common in valleys and mountain ranges north of the Mojave Desert biome. GAP analysis defined 4 major sagebrush classifications in Nevada including Sagebrush, Sagebrush/Bitterbrush, Sagebrush/Perennial Grass, and Mountain Sagebrush habitat types arranged respectively from lower to higher elevational types. For the purposes of this document, we will treat all sagebrush as one bird habitat type. Sagebrush types are generally found in a mosaic with other habitat types but can occur as large monotypic expanses.

Physical Characteristics

This habitat occurs from 4,500 to 10,000 feet, and is widespread throughout valley, foothill and mountain environments. Annual precipitation ranges from 20 to 76 cm, mostly in the form of snow, and temperatures range from -30 to 110 degrees F. Overstory structure can range from 15 cm high or less in low sage or black sage sites on exposed, rocky slopes, to two to three meters high in drainages where big sagebrush has thrust its roots into the water table. Most of the time, sagebrush canopy ranges between 60 and 90 cm high. Horizontal coverages vary from one to near 100 percent, with 20 to 40 percent being the most common range.

Dominant Plant Species

There are some 28 recognized species and distinct subspecies of sagebrush in Nevada. Dominant sagebrush varieties in the sagebrush habitat type include basin big sagebrush (*Artemisia tridentata tridentata*), mountain big sagebrush, (*A. t. vaseyana*), Wyoming big sagebrush (*A. t. wyomingensis*), subalpine sagebrush (*A. t. spiciformis*), low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), silver sagebrush (*A. cana*), timberline sagebrush (*A. rothrockii*) and bud sagebrush (*A. spinescens*) (Mozingo 1987). Co-dominant plant species include bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpos spp*), rabbitbrush (*Chrysothamnus spp*), white sage (*Ceratoides lanata*), bluebunch wheatgrass (*Agropyron spicatum*), bluegrass (*Poa spp*), needle and thread (*Stipa comata*), Idaho fescue (*Festuca idahoensis*), Indian rice grass (*Oryzopsis hymenoides*), Great Basin wildrye (*Elymus cinereus*), Indian paintbrush (*Castilleja spp*), globemallow *(Sphaeralcea spp*), and penstemon (*Penstemon spp*).

Other associated trees and shrubs include Utah Juniper (*Juniperus osteosperma*), pinyon pine (*Pinus monophylla*), mountain mahogany (*Cercocarpus ledifolius*), white fir (*Abies concolor*), subalpine fir (*Abies lasiocarpa*), Jeffrey pine (*Pinus jeffreyi*), ponderosa pine (*Pinus ponderosa*), limber pine (*Pinus flexilis*), spiny hopsage (*Grayia spinosa*), shadscale (*Atriplex confertifolia*), littleleaf mountain mahogany (Cercocarpus intricatus), currant (*Ribes spp*), cliffrose (*Cowania mexicana*), elderberry (*Sambucus spp*), western chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier spp*), squawbush (*Rhus spp*), desert peach (*Prunus andersonii*), buckbrush *(Ceanothus spp)*, and manzanita (*Arctostaphylos spp*).

Historic and Current Condition

When European settlers reached Nevada in the mid-1800's, they found what seemed to

be a veritable sea of sagebrush stretching interminably across the landscape, particularly on the eastern side of the state where valley floors were typically above 4500 feet elevation. Typical pre-livestock sagebrush sites were liberally mixed with an understory of perennial grasses and native forbs, most of which matured, set seed and cured by the first of July. The major ungulates on the landscape were pronghorn, mule deer, and bighorn sheep. By the accounts of the early trappers and settlers, it is generally regarded that herd densities were low and widely scattered. Compared to other western ecosystems (the Great Plains, for instance) grazing pressure on the vegetation was light and seasonal.

European settlers initiated massive change to the landscape when they introduced large numbers of domestic livestock (cattle, sheep, and horses) to the range in the late 1840's. By 1934, the impacts from overgrazing in the western U.S. were so severe that Congress was compelled to pass the Taylor Grazing Act, the primary stated purpose of which was to "stop the injury to the public grazing lands by preventing overgrazing and soil deterioration" (Eno and Di Silvestro 1985). By this time, the natural healing process of the land had been severely interdicted by the accidental introduction of several exotic grasses and forbs, foremost among them cheatgrass (*Bromus tectorum*), tansy mustard (*Descurainia spp.*), and halogeton (*Halogeton spp.*). In addition to being extremely aggressive competitors in foreign range, these species brought with them an aberrant fire ecology that threatened to convert Nevada sagebrush types through an accelerated fire frequency, one which sagebrush and other native plants could not tolerate. This initiated the conversion of thousands of hectares of native sagebrush habitat to a mish-mash of Euro-Asian annuals – a conversion that continues to threaten Nevada's range lands to this day.

When it became obvious that sagebrush range land was not likely to recover to its pre-white settlement level of productivity, federal land management agencies, in order to provide forage to sustain livestock operations at economically viable levels, turned to the mechanical conversion of sagebrush to largely monotypic stands of exotic wheatgrasses, e.g., crested wheatgrass (*Agropyron cristatum*), deemed more productive livestock forage. Again, thousands of hectares have been converted, at the expense of native songbirds such as the Sage Thrasher and Sage Sparrow, as well as important gallinaceous birds such as the Sage Grouse.

Increased human pressures along the sagebrush interface with more productive riparian areas will be observed into the next century. As Nevada's Great Basin cities grow, they will deplete the riparian floodplains on which they were established and spill out into the sagebrush-covered foothills. As wild land recreation increases, resulting from population growth, incidence of wild land fire will also increase. As government agency budgets continue to be cut, the resources to extinguish these fires will also decrease, putting ever more thousands of hectares of native range habitat at risk of permanent type conversion.

Opportunities for Conservation

Without going through a history of federal land policy and the litigation that ensued, let it suffice for the purposes of this plan that the Federal Lands Policy Management Act (FLPMA) and the National Forest Management Act, both passed in 1976, required federal agencies to include public involvement in the formulation of multiple use activities on public lands. The public land planning processes that have grown as a result of those critical acts

of legislation have taken great strides toward effecting sustainable levels of consumptive uses on our public range lands. Admittedly, the processes are far from perfect, have stirred considerable controversy over their short tenures, and at times have seemed to be more effective in preventing needed change than in effecting it. However, the processes are wide open to public participation, and as such still represent the bird conservationist's best avenue for the implementation of migratory bird management goals and objectives on public lands. Participating in land planning requires a substantial commitment of time and resources, a dogged commitment to purpose, and a willingness to compromise and monitor results.

Sustainable grazing management on public lands presently has more public support than ever before, and changes have been sweeping, although not always as fast as wildlife advocates would like. Rehabilitation of exotic-annual-dominated ranges through mechanical planting of shrub species has proven to be an effective, if expensive, means of restoring health of native sagebrush ecosystems. In the last decade, mitigation funds from mining companies have accelerated mechanical range rehabilitation in Nevada with some stunning results.

With a few exceptions, economics have largely put mechanical type conversion to exotic grasses on public range lands on hold for the time being. The bird conservationist should not expect the practice to die a natural death, because Man will probably never evolve out of his obdurate faith in his ability to outperform Nature; rather, a vigil must be kept to encourage land management agencies to maintain their lands in the habitat types that provide a diversity of outputs to satisfy a diversity of public expectations, among which lies a strong public desire to maintain healthy, self-sustaining native bird communities.

Associated Bird Species

Obligates

Sage Grouse

Other

Black Rosy Finch
Ferruginous Hawk
Gray Flycatcher
Loggerhead Shrike
Vesper Sparrow
Prairie Falcon
Sage Sparrow
Sage Thrasher
Swainson's Hawk

SPECIES PROFILE 1. SAGEBRUSH

SAGE GROUSE

Centrocercus urophasianus

Distribution

The Sage Grouse follows the range of sagebrush steppe from eastern California to northern Colorado, western North and South Dakota, northeast to extreme southern Alberta and Saskatchewan, south to southwestern Colorado, central Utah and central

Nevada. In Nevada, the Sage Grouse is scattered in pockets of suitable habitat across all the northern counties, becoming even more scattered as its range extends south as far as Goldfield. It was historically found in all counties but Clark; today it is still found in all counties except Clark and possibly Carson City.

Habitat

In Nevada, Sage Grouse are considered a sagebrush obligate species, even though a significant portion of their life cycle is supported by wet meadows within sagebrush range. Sage Grouse possess unique physiological adaptations designed to facilitate the digestion of sagebrush leaves -- a relatively indigestible food matter under normal circumstances. Sagebrush accounts for as much as 98 percent of an adult's diet. Sage Grouse chicks rely heavily on insects in the sagebrush uplands for the first month of their life. Broods then move with range dessication down to wet meadows, where they feed heavily on western aster (*Aster occidentalis*), dandelion (*Taraxacum officianale*), and western yarrow (*Achillea lanulosa*). Sage Grouse winter on exposed sagebrush-covered slopes, often where high wind prevents heavy snow depths. Hens typically nest under big sage, usually within a 3.2 km radius of an active lek, (strutting ground), but sometimes as far as 16 km from the lek where breeding occurred.

Physical Factors

Sage Grouse range typically includes: windswept ridges for wintering; barren, rocky, exposed sites for strutting; sagebrush uplands for nesting and early brood-rearing; and stringer and wet meadow complexes for brooding.

Landscape Factors

Sage Grouse do not defend territories except on leks. Home ranges for broods have been reported as averaging between 36.4 and 85.2 hectares in Montana (Wallestad 1971). Winter home ranges varied from 6.6 to 19.5 sq km in Montana (Eng and Schladweiler 1972). Dalke (1963) reported winter movements by flocks between 48 and 80 km in Idaho.

Special Considerations

Sage Grouse chicks utilize insects heavily for food the first two months of life. Interspersion of meadows in sagebrush matrix is important for brood rearing. Habitat conversion (fire, herbicide) around leks is detrimental (Klebenow 1970), particularly in regions of low annual precipitation.

Associated Species

Brewer's Sparrow
Western Meadowlark

Priority Considerations

Sage Grouse are declining throughout their range (Connelly and Braun 1997). Increasing national concern is being directed toward the population status of Sage Grouse, and

discussions of a future listing under the Endangered Species Act persist. The western state wildlife agencies are combining their efforts under the auspices of the Western States Sage Grouse Committee to formulate a coordinated conservation strategy for the Sage Grouse throughout its range. The Sage Grouse is also highly representative of the sagebrush habitat type. Conservation strategies for Sage Grouse are almost certain to provide healthy, productive habitat conditions for all the migratory species that breed in sagebrush. For these reasons, the Nevada Working Group has selected the Sage Grouse for priority focus in this plan.

Objectives and Strategies

Objectives and strategies for Sage Grouse conservation are presently being formulated by the Western States Sage Grouse Committee. Rather than try to set its own objectives, the Nevada Working Group will wait for the completion of the Sage Grouse Committee product and incorporate its recommendations into the framework of this plan.

Further Reading

Connelly and Braun 1997
Neel 1980
Savage 1968

SPECIES PROFILE 2. SAGEBRUSH

FERRUGINOUS HAWK

Buteo regalis

(See Pinyon Juniper habitat section for species profile.)

Priority Considerations

The Ferruginous Hawk has been a species of concern throughout much of its range since precipitous population declines were documented in the Northern Plains in the 1980's. Populations seem to be relatively stable in Nevada (Sauer et. al.1998) at the present time; however, the Basin and Range province has a high responsibility for the maintenance of the U.S. breeding population (Carter et. al.1998). Because of high national concern for the status of the species as well as a high regional responsibility for population maintenance, the Nevada Working Group has selected the Ferruginous Hawk for priority focus for the purposes of this plan.

OBJECTIVE - Maintain stable or increasing nesting populations of Ferruginous Hawks throughout their present range in northern Nevada through 2004, with particular emphasis on sagebrush habitats in the Spring-Hamlin-Lake Valley Complex, the Independence-Clover-Ruby-Butte Valley Complex, the Toana Draw-Thousand Springs-Pilot Valley Complex, the White River Valley, and Newark Valley.

Strategy: Maintain healthy stands of sagebrush and associated species (white sage, native grasses and forbs) to provide high quality foraging habitat adjacent to all Ferruginous Hawk nesting habitat (Utah juniper) in northern Nevada.

Action: Implement livestock grazing management that would promote a healthy, diverse native forb and white sage component in all valley sagebrush habitats.

Action: Discourage conversion of sagebrush habitats to exotic grass seedings.

Assumptions - Research and Monitoring Needs

The Ferruginous Hawk objective for sagebrush assumes that it is possible to maintain population stability chiefly through habitat manipulation on breeding grounds. Threats to wintering populations should be investigated. Ferruginous Hawks have been subject to regular nest occupancy and production monitoring over the last decade. From monitoring processes already in place, it should be possible to project status and trend of the species, particularly as an eastern Nevada breeder.

Opportunities

The public land planning processes implemented by the U.S. Forest Service and Bureau of Land Management are the best forum in which to incorporate management strategies for the Ferruginous Hawk and other raptor species in sagebrush habitats. Livestock grazing goals and objectives are set in Allotment Management Plans, where bird conservationists will find their opportunities to make adjustments for the improvement of critical bird habitats. Integration of bird habitat objectives and grazing objectives is not always achieveable, but the diligent participant in the process will find opportunities arise at times in which real advances in bird conservation can be made.

Further Reading

Herron et. al.1985
Kochert 1987
Perkins and Lindsey 1983

SPECIES PROFILE 3. SAGEBRUSH

SAGE SPARROW
Amphispiza belli

Distribution

The Sage Sparrow breeding range is limited mainly to the Intermountain West and south into Baja, California. In Nevada, the Sage Sparrow is a breeding species in all counties with the exception of Clark. Wintering Sage Sparrows can be found from central Nevada south to Chihuahua, Mexico (Alcorn 1988).

Habitat

In Nevada, the Sage Sparrow nests almost exclusively in big sagebrush habitats in open valleys and foothills. Areas dominated by tall (at least 45 cm) and open (10-25 percent crown cover) basin big sagebrush and Wyoming big sagebrush with sparse (less than 20 percent) grass and forb components are preferred nesting cover. Nests are usually placed on or near the ground inside or next to a dense shrub (Brack, pers. comm.).

Physical Factors

Sage Sparrows nest in Nevada between 4,500 and 7,500 feet in elevation. There is no information on topography, slope or aspect for the species although evidence suggests that the species prefers more level environments as opposed to steep mountain slopes.

Landscape Factors

Average territory size is two to four hectares. Medin (1992) reported breeding densities ranging between 134 and 139.2 individuals per 40 hectares. Nesting populations are thought to be somewhat nomadic and colonial (Ryser 1988).

Special Considerations

Sage Sparrows are known to run “thrasher-like” on open ground under the canopy when avoiding predators. Whether or not a percentage of bare ground in preferred by Sage Sparrows is not known.

Associated Species

Brewer’s Sparrow	Lark Sparrow
Black-throated Sparrow	Western Meadowlark

Priority Considerations

Limited Breeding Bird Survey data indicate that Sage Sparrows in the Basin and Range province underwent a 9.4 percent decline ($p = 0.05$) between 1966 and 1979, but rebounded between 1980 and 1986 with a 6.1 percent increase ($p = 0.02$). According to Carter et. al.1998, the Basin and Range province maintains approximately 21.2 percent of the total nesting population of Sage Sparrows in the world. Sagebrush habitats are considered to be increasingly at risk from type conversion, both natural (fire) and man-made (wheatgrass seedings, commercial and residential development). For these reasons, the Nevada Working Group has selected the Sage Sparrow for priority focus in this plan.

OBJECTIVE - Stabilize populations of nesting Sage Sparrows within natural parameters throughout their present range in northern Nevada through 2004.

Strategy: Maintain sufficient primary suitable habitat to support at least one nesting colony for every 12 to 20 hectares of sagebrush habitat. For the purposes of this strategy, a Sage Sparrow colony is defined as 3 or more singing males within 0.8 km of a sample point.

Action: Survey for breeding colonies prior to implementing activities which may disrupt nesting.

Action: Mitigate destructive activities in occupied Sage Sparrow habitat to achieve a "no net loss" of active Sage Sparrow habitat.

Strategy: Define and identify critical Sage Sparrow habitat within sagebrush habitats, including habitat requirements and preferences, colony persistence over time, nesting densities, etc.

Strategy: Determine Sage Sparrow population trends in Nevada.

Action: Expand Breeding Bird Survey to additional Sage Sparrow nesting habitats, or supplement BBS with additional point count coverage using appropriate methodologies**.**

Assumptions - Research and Monitoring Needs

The Sage Sparrow objective for sagebrush habitats assumes that present populations can be stabilized within parameters that are healthy and self-sustaining. Population status and trend should be established for the species in Nevada. More study should be conducted concerning the notion of colonialism in breeding Sage Sparrows to determine the habitat parameters which control colony location and density. Colonial tendencies may prove to be overstated in importance, or they could prove to be a source of population vulnerability if habitat loss accelerates beyond recent rates.

Opportunities

Recent study into the genetic variation of the species we know as "Sage Sparrow" has suggested a split of the species into at least two newly recognized species may be warranted. This late interest in the species could initiate the further research into habitat selection and colonialism necessary to devise responsive management strategies in future planning efforts.

Further Reading

Medin 1992
Wiens and Rotenberry 1981

SPECIES PROFILE 4. SAGEBRUSH

SAGE THRASHER

Oreoscoptes montanus

Distribution

The Sage Thrasher is a common breeder from the Sierra Nevada - Cascades axis and the Rocky Mountains, from southern British Columbia and Montana south to eastern California, southern Nevada, northern Arizona and New Mexico to northwestern Texas. In Nevada, the Sage Thrasher is listed in Alcorn (1988) as "a common summer resident throughout the state, especially in areas where tall sagebrush is abundant." Some Sage Thrashers winter in southern Nevada where resident birds stay year-round.

Habitat

The Sage Thrasher builds its nest either in the branches of a shrub, or on the ground under a shrub, usually sagebrush (Ryser 1985). Reynolds (1981) reported that the distance from the nest to the top of the shrub's living canopy varied little, regardless of whether it was a ground or limb nest. That distance was about 58 cm. In Nevada, a nest was found in black sage (*Artemisia nova*) 30.5 cm off the ground (Alcorn 1988).

Physical Factors

Elevations reported in Linsdale (1936) ranged from 4,900 to 8,200 feet, but the Sage Thrasher probable ranges even lower. A few nesting pairs probably reside in the Lahontan Valley at 3,900 feet. No other abiotic requirements are known.

Landscape Factors

In Idaho, a study reported breeding territories in short stands of big sage averaged 0.9 hectares and ranged between 0.6 to 1.6 hectares (Reynolds and Rich 1978). Mean distances between nests were 64 meters at one site and 84 meters at another.

Special Considerations

Sage Thrashers primarily eat insects, although they do enjoy fruits and berries in season. Conversion of sagebrush habitats through manipulation and wildfire are detrimental to Sage Thrasher populations.

Associated Species

Brewer's Sparrow
Lark Sparrow
Western Meadowlark
Black-throated Sparrow

Priority Considerations

According to Carter et. al.1998, the Basin and Range province maintains approximately

37.1 percent of the total nesting population of Sage Sparrows in the world. Sagebrush habitats are considered to be increasingly at risk from type conversion, both natural (fire) and man-made (wheatgrass seedings, commercial and residential development). For these reasons, the Nevada Working Group has selected the Sage Thrasher for priority focus in this plan.

OBJECTIVE - Maintain stable or increasing populations of nesting Sage Thrashers throughout their present range in Nevada through 2004.

Strategy: Maintain at least 1/3 of any given defined area (valley, open basin in mountains) in primary nest habitat condition (big sagebrush at least 60 cm tall with greater than a 30 percent canopy closure and a grass forb component – Brack, pers. comm.). Minimum effective patch size is 3.2 hectares.

Action: Incorporate Sage Thrasher habitat strategies into public land planning processes.

Action: Map preferred Sage Thrasher habitat using GAP, aerial photos, or other appropriate methodologies.

Action: Define Sage Thrasher population centers at both regional and local scales. Implement conservation strategies to preserve Sage Thrasher occurrence at both scales. Prioritize activities in regional population centers.

Strategy: Determine Sage Thrasher population trends in Nevada.

Action: Expand Breeding Bird Survey to additional Sage Thrasher nesting habitats, or supplement BBS with additional point count coverage using appropriate methodologies**.**

Assumptions - Research and Monitoring Needs

The Sage Thrasher objective for sagebrush assumes that stable or increasing populations are achievable for the species in Nevada. Better definition of population status and trend is needed.

Opportunities

The public land planning processes implemented by the U.S. Forest Service and Bureau of Land Management are the best forum in which to incorporate management strategies for the Sage Thrasher once a more complete knowledge of the status and trend of the species in Nevada is assembled.

Further Reading

Medin 1992
Reynolds 1981
Reynolds and Rich 1978

SPECIES PROFILE 5. SAGEBRUSH

VESPER SPARROW

Pooecetes gramineus

Distribution

The Vesper Sparrow ranges from coast to coast and from the Yukon Territory to northern Arizona as a breeding species. Nesting has been recorded only in the northern half of Nevada. However, the higher mountain ranges in southern Nevada may provide nesting habitat for the species as well. Alcorn (1988) describes the Vesper Sparrow as an uncommon summer resident, likely a reference to their relative low abundance when compared to some other sympatric sparrow species. Vesper Sparrows winter from the southern United States to Oaxaca, Mexico.

Habitat

In Nevada, the Vesper Sparrow nests in various open shrub habitats from high elevation valleys to higher mountain slopes and basins. Open areas with a scattered canopy of big sagebrush (Wyoming and mountain varieties) and a minimum ground cover of 20 percent grasses, forbs and young shrubs appears to be the preferred nesting habitat. Scattered shrubs are used as singing perches. Nests are normally placed on the ground under or near a shrub (Airola 1980). Some nests have been found in subalpine meadows (Ryser 1985).

Physical Factors

Vesper Sparrows nest from 5,500 feet in northern Nevada's foothills to approximately 9,000 feet in surrounding mountain ranges. Central Nevada's base nesting elevation may be closer to 7,000 feet. There is no information on topography, slope or aspect for the species, although anecdotal evidence suggests that the species nests successfully in both level environments and on steep mountain slopes.

Landscape Factors

Average territory size is 1.6 to 3.2 hectares depending on the productivity of the ground cover component (Brack, pers. comm.). Medin (1990) reported breeding densities in the Snake Range of eastern Nevada between 7.2 and 16 individuals per 40 hectares.

Special Considerations

Vesper Sparrows nest from late April to mid-August with the peak in May-June (Airola 1980). It sometimes raises two broods per year. Vesper Sparrows eat both seeds and insects and can live on air-dried seeds without drinking (Bartholomew 1972).

Associated Species

Brewer's Sparrow
Green-tailed Towhee
Western Meadowlark

Priority Considerations

Breeding Bird Survey analyses have reported a statistically significant decline (-8.2 percent; p = 0.00) in Vesper Sparrow populations in the Basin and Range physiographic region since 1980. Gaines (1977) reported population declines in the eastern Sierra Nevada, which he attributed to loss of grass understory in sagebrush habitats. In Nevada, sagebrush habitats are considered to be increasingly at risk from type conversion, both natural (fire) and man-made (wheatgrass seedings, commercial and residential development). For these reasons, the Nevada Working Group has selected the Vesper Sparrow for priority focus in this plan.

OBJECTIVE - Reverse a declining population trend of Vesper Sparrows throughout their present range in northern Nevada by 2004.

Strategy: Manage for and maintain at least 1/3 of any given defined area (valley, open basin, canyon) in primary nest habitat condition.

Action: Delineate and map occupied Vesper Sparrow habitat throughout its Nevada range.

Action: Incorporate Vesper Sparrow management strategies into public land planning processes in appropriate landscapes.

Action: Implement management practices designed to achieve and/or maintain at least 20 percent ground cover from grasses and forbs.

Action: Target a remnant of five percent shrub cover averaged over four hectare blocks for nest locations and singing perches when implementing measures to increase the native grass and forb component (prescribed fire, etc.).

Strategy: Determine Vesper Sparrow population trends in Nevada.

Action: Expand breeding bird survey to additional Vesper Sparrow nesting habitats**,** or supplement existing BBS with additional point count coverage using appropriate methodologies.

Assumptions - Research and Monitoring Needs

The Vesper Sparrow objective for sagebrush assumes a declining population trend for the species in Nevada based on incomplete data. Better definition of population status and trend for Vesper Sparrows in Nevada is needed. The objective also assumes that population trends can be reversed by implementing habitat improvement objectives on public lands. More specific information regarding Vesper Sparrow habitat selection in sagebrush habitats in Nevada should be gathered to increase the predictive power of models for assessing the impacts of habitat loss and manipulation.

Opportunities

The public land planning processes implemented by the U.S. Forest Service and Bureau of Land Management are the best forum in which to incorporate management strategies for the Vesper Sparrow once a more complete knowledge of habitat selection is assembled.

Further Reading

Medin 1990

SPECIES PROFILE 6. SAGEBRUSH

GRAY FLYCATCHER
Empidonax wrightii

Distribution

The Gray Flycatcher ranges from south-central Washington east to Colorado and south to central Mexico. In Nevada it is a common resident throughout sagebrush and pinyon-juniper habitats, including all counties.

Habitat

The Gray Flycatcher uses a couple of distinctly different habitat types in Nevada. In northern Nevada sagebrush types, Gray Flycatchers frequent tall riparian big sage two to three meters tall, sometimes with bitterbrush understory. In central Nevada Gray Flycatchers are riparian facultative in mountain mahogany and pinyon-juniper with sagebrush or bitterbrush understories. In southern Nevada, Gray Flycatchers are found in pinyon-juniper, mountain mahogany, or Joshua tree types often with blackbrush (*Coleogyne ramosissima*) understory. Vegetation structure varies from open to dense xeric shrub or tree overstory, with taller types preferred. Understory shrub cover is variable. Birds tend to increase in density with an increase in herbaceous component.

Physical Factors

Gray Flycatchers are found in Nevada from 4,000 to 9,000 feet elevation in terrain with variable topography, slope, and aspect. In northern Nevada, big sage-invaded stringer meadows are sought out. Presence of water is not required, but it does appear that nest densities tend to increase when moist soils or water is present.

Landscape Factors

Gray Flycatcher territories are typically 1.6 to 2.0 hectares in size. Birds may be drawn increasingly toward riparian areas for foraging and feeding young as summer progresses. Bird densities tend to increase toward riparian ecotones. Preferred successional stage is late mature. Distribution tends to shift with precipitation as it affects insect production. Gray Flycatchers are compatible with grazing, but chaining or burning the tall structural vegetative component is detrimental to the species.

Special Factors

The Gray Flycatcher's diet consists of flying insects caught on the wing from a tall perch. They are relatively immune to most human disturbance except those that remove habitat. Cowbird parasitism is a potential problem which should be further studied. Because of the patchy distribution of their preferred habitats, Gray Flycatchers can exhibit semi-colonial breeding distribution with clustered individual territories.

Associated Species

Brewer's Sparrow
Brewer's Blackbird
Horned Lark
Lark Sparrow

Priority Consideration

Limited Breeding Bird Survey data indicate an upward trend for Gray Flycatchers in the Basin and Range province over the last thirty years. The Nevada Working Group recognizes the importance of the Basin and Range province (of which Nevada comprises the majority of area) to the maintenance of the world's Gray Flycatcher population. As a result, the Gray Flycatcher has been selected for priority focus in this plan.

OBJECTIVE: Maintain stable or increasing populations of Gray Flycatchers throughout their range in Nevada through 2004.

Strategy: Maintain tall stands of riparian big sage in areas of natural occurrence, excepting degraded meadows where tall big sage has invaded and represents a significant anti-climax community.

Action: Before initiating riparian big sage removal and site renovation, conduct surveys on site for nesting Gray Flycatchers. Conduct landscape analysis and assess the cumulative impacts of riparian big sage removal on the regional Gray Flycatcher population. Devise a plan that does not significantly impact Gray Flycatchers.

Action: Conduct a population analysis of Gray Flycatchers in Nevada, comparing the percentage of the population that typically uses pinyon-juniper and mountain mahogany to that utilizing tall riparian big sage. Conduct cumulative impacts and risk analyses evaluating the potential of varying degrees of riparian big sage removal up to total eradication.

Assumptions – Research and Monitoring Needs

The Gray Flycatcher objective for sagebrush habitats assumes that stable or increasing populations are achievable for the species in Nevada. Landscape, cumulative impacts, and risk assessment analyses all need to be conducted for this species in consideration of treatment projects aimed at the removal of riparian big sage from meadows and stream

zones.

Opportunities

This is likely to be one of the plan's least popular objectives among land managers, who have striven and planned to remove riparian big sage from areas where it has encroached for decades. Rather than take an obstructive position, the Nevada Working Group wishes first to inform land managers of the positive wildlife outputs of riparian big sage. After that, the responsible thing to do is to analyze the impacts of habitat improvement projects scheduled for the next five years, project the future Gray Flycatcher population, and move forward from there. It would seem impossible for all the riparian big sage habitat in the state to be classified as alien to its sites, then all be eradicated in the next five years or even the next couple of decades. The Gray Flycatcher seems to be in no danger of serious decline, but the Nevada Working Group wishes to acknowledge its responsibility in the maintenance of the species' world population. Starting now, while populations are healthy, gives the Group a great advantage toward success.

Further Reading

USFWS 1978-89

OTHER PRIORITY SPECIES: SAGEBRUSH

BURROWING OWL
Athene cunicularia

LOGGERHEAD SHRIKE
Lanius ludovicianus

The Burrowing Owl and Loggerhead Shrike are nesting species in sagebrush habitat. For species profiles, objectives, strategies, and opportunities for conservation, please refer to the Salt Desert Scrub habitat section.

BLACK ROSY FINCH
Leucosticte atrata

CALLIOPE HUMMINGBIRD
Stellula calliope

The species listed above have been selected by the Nevada Working Group as Priority Species for this plan. Both spend significant portions of their year in sagebrush habitats, mostly foraging, but primarily nest in other, adjacent habitats. For the purposes of this plan, it is assumed that implementation of the objectives and strategies for other passerine birds profiled in this section will be sufficient to satisfy the requirements of these species in sagebrush habitat as well. Further study may prove such an assumption to be false, at which time separate objectives and strategies may be formulated for any or all of these species as is appropriate. For profiles of these species, please refer to the following

habitat sections: Black Rosy Finch - Cliffs and Talus; Calliope Hummingbird - Montane Riparian.

PRAIRIE FALCON
Falco mexicanus

SWAINSON'S HAWK
Buteo swainsoni

These two raptor species have also been selected by the Nevada Working Group as Priority Species, and are profiled in other sections of the plan. Individuals of each species spend significant portions of their year foraging in sagebrush habitats, but nest primarily in other adjacent habitats. For the purposes of this plan, it is assumed that the objectives and strategies outlined for Ferruginous Hawk in sagebrush habitats will also be sufficient to satisfy the needs of these two raptor species. Separate objectives and strategies may need to be refined for either or both of these species. For species profiles of these two species, please refer to the following habitat sections: Prairie Falcon - Cliffs and Talus; Swainson's Hawk - Agricultural Lands.

HABITAT MANAGEMENT SUMMARY: SAGEBRUSH

Sagebrush communities in Nevada are constantly under threat of type conversion, either by wildfire or by well-meaning efforts to improve range for livestock production. In order to achieve the objectives of this plan for sagebrush-dependent birds, conservation efforts will have to be focused on maintaining complete, diverse sagebrush communities with vigorous grass and forb understories. Low-elevation (below 6,500 feet) sagebrush sites that are vulnerable to conversion to cheatgrass type should be protected from wildfire. Low-elevation sagebrush sites that do burn should be rehabilitated with aggressive perennial grasses to prevent cheatgrass from dominating the site; but at some secondary stage in the rehabilitation plan, processes should be introduced which would encourage the re-establishment of sagebrush on stabilized sites. High-elevation sagebrush sites (above 6,500 feet) should be managed for structural diversity (e.g., vigorous grass and forb understories in both big sage and low sage sites). Wildfire rehabilitation of high-elevation sites should include liberal reseeding of sagebrush mixed with native grasses and forbs. Management of riparian big sage sites should take Gray Flycatcher habitat needs into consideration. Certain sub-communities within the sagebrush type (e.g. white sage) may require specific management attention to ensure their long-term contributions to bird conservation.

HABITAT TYPE: SALT DESERT SCRUB

General Description

The salt desert scrub type is the most extensive habitat type in the state of Nevada, covering roughly 8.9 million hectares. The term “salt desert scrub” actually encompasses several subtypes, characterized by the presence of a variety of generally salt-tolerant shrubs of the family Chenopodiaceae (“Goosefoot” family). Community composition is largely influenced by soil salinity and drainage.

Physical Characteristics

Annual precipitation in the salt desert scrub zone is generally less than 25 cm per year. Temperatures range between the extremes of –20 and 110 degrees Fahrenheit, with mean temperatures somewhere in the low fifties Fahrenheit. Distribution of the salt desert scrub type generally follows all the valley bottoms in the state which occur within the Great Basin physiographic region. Community types can vary from the Carson Desert community which includes such unique plants as smokebush (*Psorothamnus polydenius*) and pickleweed (*Allenrolfea occidentalis*) at the lowest end of the elevational gradient for the Great Basin, to the fairly diverse and productive mixed shrub types including spiny hopsage (*Grayia spinosa*), greasewood (*Sarcobatus vermiculatus*), horsebrush (*Tetradymia* spp.), green and rubber rabbitbrush (*Chrysothamnus viridulis; C. nauseosus*) and a smattering of big sage (*Artemisia tridentata*), found at the tops of the alluvial fans of the valleys in northern Nevada.

Dominant Plant Species

Most often, the salt desert scrub type is dominated by either shadscale (*Atriplex confertifolia*) or greasewood (*Sarcobatus vermiculatus* or *S. baileyi*). At the lowest flats of the valleys where soils drain poorest and salinities are highest, the most salt-tolerant plants are found, including pickleweed (*Allenrolfea occidentalis*, and Torrey saltbush or quailbrush (*Atriplex lentiformis* var.). The salt desert scrub type generally gives way to sagebrush somewhere near the tops of the alluvial fans where the primary fault lines of the mountain range are situated. These upper soils are often gravelly and well-drained, and are more likely to support spiny hopsage (*Grayia spinosa*) and associated plants.

The dominant grass species in the salt desert scrub type is Indian ricegrass *(Oryzopsis hymenoides)*, and to a lesser extent, needle-and-thread (*Stipa comata*). Indian ricegrass is a major element of one of this desert community’s keystone ecological relationships, namely the interaction between ricegrass and the kangaroo rat (*Dipodomys* spp.). As the kangaroo rat depends on ricegrass for sustenance, so does ricegrass depend on the caching activities of the rat for planting, germination, and survival. The products of this symbiotic relationship (or lack thereof) could well represent success or doom to a host of other species, including several birds, which call this severe type their home.

Historic and Current Conditions

Historically, Indian ricegrass was likely much more prevalent in this habitat type than it is today. Indiscriminate livestock grazing over the 100-year period following European

settlement has effected a change toward the more durable shrubs and unpalatable forbs on vast tracts of salt desert scrub. Invasion of exotic plants such as cheatgrass, halogeton, Russian thistle, and in certain places, tamarisk, has compromised native communities and effected an undesirable shift toward inhospitable, sere conditions. Except for certain highly palatable plants, however, this type is highly durable and under little threat to reach thresholds of alarm anytime soon.

Opportunities For Conservation

The avifauna of the salt desert scrub type is expectedly spare and lacking in diversity. Probably the most important bird species from a national conservation perspective to be found regularly in this type is the Loggerhead Shrike. Some of the highest breeding densities of this species known in the state occur in the greasewood flats and dunes surrounding the Carson Sink in Lahontan Valley (Larry Neel unpubl.). As the Loggerhead Shrike continues to shrink from its range in state after state, as documented by the Breeding Bird Survey, Nevada could continue to grow in importance as a stronghold of viability for the species, simply by maintaining this extensive habitat for which the shrike has shown an obvious affinity. Sage Thrashers utilize this type extensively, as do Horned Larks, American Crows, and Common Ravens. Burrowing Owls inhabit the dune subtypes, and Red-tailed Hawks, Swainson's Hawks, and Ferruginous Hawks frequently forage for rodents, lizards, and snakes over the salt desert scrub.

In the immediate future, the most acute conservation issues involving the salt desert scrub type may be driven by concerns for the well-being of Nevada's reptile populations. Considerable concern has been generated over the effects of commercial collection of reptiles (allowed by Nevada law) and small mammals (presently being petitioned by commercial collectors) on the viability of several species and even whole communities. As the viability of the combined reptile and rodent communities may well be critical to the sustenance of the entire salt desert scrub ecosystem, bird conservationists must be concerned about what happens in the immediate future on the reptile and small mammal fronts, and should be prepared to support management activities that reside within the bounds of sustained viability for these important ecosystem components.

Priority Species

(No Obligates)

Other

Loggerhead Shrike
Burrowing Owl
Sage Thrasher
Sage Sparrow

SPECIES PROFILE 1. SALT DESERT SCRUB

LOGGERHEAD SHRIKE
Lanius ludovicianus

Distribution

The Loggerhead Shrike ranges from southern Canada into Mexico including most of the continental United States except for the northeast. It is a common resident throughout Nevada (Alcorn 1988). There is some fall migration for individuals located in the northern part of the state (Ryser 1985).

Habitat

The Loggerhead Shrike prefers open country with short vegetation. It often nests in isolated trees or large shrubs (Yosef 1996). In Nevada it is commonly found in shrub habitat types (e.g., sage scrub, sage steppe, greasewood). Nesting also likely occurs in other habitat types including pinyon/juniper. Nests were reported to be found in black sage and juniper (Alcorn 1988).

The preferred canopy closure for the loggerhead shrike is sparse or nonexistent, though scattered small trees and taller shrubs (1 meter or more in height) appear to be an important habitat component. "Thickly foliaged trees and shrubs afford nesting and roosting sites as well as hunting perches. Shrikes hunt where the tall vegetation is scattered and where there is much bare ground or ground covered with short vegetation" (Ryser 1985). In Nevada, nests have been located in small (>0.1 ha) patches of big sagebrush at least 1 m tall surrounded by open grassland (J. Ramakka pers. obs.) as well as more contiguous stands of brush. Shrikes nest in trees or shrubs one to nine meters above ground level (Ehrlich 1988). This species hunts from perches on snags in pinyon/juniper stands or on tall shrubs. When available, they will also perch on fence posts, utility poles and wires, and other man-made features, using the height to the shrike's advantage.

Physical Factors

Alcorn (1988) reports a nest being found in the Eureka area at 6500 feet. The most common habitats for this species appears to be flat to gently rolling areas such as valley bottoms, alluvial fans, and the foothills of mountains. To date there is no information which indicates slope or aspect play a role in habitat selection. When natural perches are unavailable Loggerhead Shrikes readily substitute fence posts, telephone poles and other man-made features. Available water does not appear to be a habitat requirement (USDA Forest Service 1994).

Landscape Factors

Territory size averaged 7.5 hectares in California with a central area for lookout perches, feeding areas and roost sites. In Colorado, 77 nests were at least 400 meters apart, and territories were much smaller in diameter (Zeiner 1990; Miller 1931). Studies elsewhere indicate that nesting and foraging areas are usually within 100 meters of each other (USDA Forest Service 1994).

Special Considerations

Loggerhead shrikes are active hunters and feed on a variety of small animals. Insects such as grasshoppers and small lizards are often prey items. Grasshopper control

programs could impact the availability of food supplies in certain areas if alternate prey sources are not available. In Idaho sagebrush, Loggerhead Shrikes substantially reduced density of nesting passerines by harassing and preying on adults and nestlings (Zeiner 1990; Reynolds 1979).

Human disturbance does not seem to be a major concern with this species. The Loggerhead Shrike is often seen next to well-traveled roads and near houses built in suitable habitat. It shows a preference for perching on fences, utility lines and utility poles (Yosef 1996). One individual cached and subsequently fed on its prey (a Dark-eyed Junco, probably taken from the feeder area) in a shrub inches from a house (Jeanne Tinsman, pers. obs.).

Loggerhead Shrikes are rarely parasitized by cowbirds, and actively defend their nest (Yosef 1996). The largest source of nest failure in Colorado was predation, probably by magpies (Zeiner 1990; Porter 1975). While no information is available on Loggerhead Shrike populations in Nevada, the species appears to be relatively common and well distributed across the state. Although populations have declined elsewhere, they have remained fairly stable in the Pacific states (Zeiner 1990; Morrison 1981).

Associated Species

Horned Lark
Brewer's Sparrow
Black-throated Sparrow
Lark Sparrow

Priority Considerations

Limited Breeding Bird Survey data for the Basin and Range province indicate a slight but statistically significant decline for Loggerhead Shrike (-8.0 percent between 1966 and 1996; p = 0.01; Sauer et al. 1998). Considerable concern has been generated for this species in many parts of its range across the U.S., but Nevada populations seem to be relatively stable. By maintaining its populations in a healthy condition, Nevada may become quite important in the nationwide strategy for the conservation of this species.

Objective: Stabilize the population trend for Loggerhead Shrikes in salt desert scrub habitats throughout their range in Nevada by 2004.

Strategy: Determine population trend for Loggerhead Shrikes by habitat type throughout its range in Nevada.

Action: Implement specific Loggerhead Shrike surveys to supplement existing BBS and other existing survey designs to adequately sample all major habitat types in which it breeds.

Action: Isolate population declines by major habitat type. Identify major population centers such as Lahontan Valley.

Strategy: Design conservation strategies for identifiable Loggerhead Shrike population units, segregated by habitat type, geographic bounds, etc.

Action: Identify threats to specific Loggerhead Shrike management units. Alleviate threats and pressures as they are identified and as opportunities

arise.

Action: Conserve identified population centers where populations are productive and contributing individuals to surrounding populations, as would be expected for the Lahontan Valley population.

Action: Maintain sufficient areas of salt desert scrub habitat with large bush diameters, e.g., mature age classes of greasewood, quailbrush, and other large saltbush species, to provide suitable nesting substrate for Loggerhead Shrikes.

Action: Quantify the effects of rangeland spraying of grasshoppers and Mormon crickets on Loggerhead Shrike productivity and population maintenance. Develop Best Management Practices for rangeland spraying in Loggerhead Shrike habitat.

Assumptions - Research and Monitoring Needs

The Loggerhead Shrike objective for salt desert scrub assumes that reported regional population declines are pertinent to the salt desert scrub type. Population status and trend should be better defined using appropriate methodologies supplementing inadequate BBS coverage. Sources of population decline, if any, should be identified and isolated by habitat type, geographich area, etc. Descriptive studies of the salt desert scrub type would be useful to develop models for suitable Loggerhead Shrike breeding habitat. More knowledge of shrub age, growth morphology, and growth rate may be required for land managers and biologists to accurately assess the effects of habitat conversion by fire or mechanical removal. An inventory of habitat age classes would help land managers and biologists assess the extent of suitable nesting habitat, as well as assess the risk over time of habitat conversion to Loggerhead Shrike population viability. Certain actions listed under the conservation strategies assume that there is not yet complete understanding of the effects of rangeland spraying on songbird productivity, particularly on those species which depend heavily on species targeted by the pesticides. More specific study on the effects of rangeland spraying on priority species such as the Loggerhead Shrike is warranted.

Opportunities

Although comparative data are lacking, the Stillwater National Wildlife Refuge in Lahontan Valley has been identified by biologists as an area with Loggerhead Shrike densities that are noticeably higher than most of the rest of the landscape of northwestern Nevada. Since Stillwater NWR is already under strong administrative protection as critical wildlife habitat, it presents a unique opportunity for study of Loggerhead Shrike habitat parameters under controllable circumstances. While management priorities for this refuge are typically wetland-oriented, care should be taken not to miss an opportunity to identify Loggerhead Shrike objectives and strategies for the Refuge's upland salt desert habitats in the Management Plan revision process ongoing as this document is being written.

Further Reading

Morrison 1981
Porter et. al.1975
Reynolds 1979
Yosef 1996

SPECIES PROFILE 2. SALT DESERT SCRUB

BURROWING OWL
Athene cunicularia

Distribution

The Burrowing Owl ranges across most of the western United States from south-central Manitoba south to Brownsville, Texas, west to the California coast north to southern British Columbia, avoiding only the Cascades in Oregon and Washington and the northernmost boreal forests of Idaho and Montana. Burrowing Owls are a breeding species throughout Nevada. The majority of the nesting population migrates from northern Nevada during the winter months, but observations have been recorded throughout the state during all months of the year.

Habitat

Open, usually treeless valley bottoms and benches adjacent to the valley floor with shrub/steppe or desert shrub, and a variety of grasses and forbs are preferred for nesting. Burrowing animals such as squirrels, kit foxes, desert tortoises, and badgers also prefer these areas and their burrows provide the majority of the Burrowing Owl nesting sites that have been found in Nevada. The owls seem to be attracted to a nesting location more by available burrows than by a distinct set of topographic features. Old road cuts and soil disturbances with a squirrel population are readily used for nesting.

These adaptable birds readily nest in open urban areas. Golf courses, airport runways, and even industrial areas with open space are used if burrows are available. Concrete slabs and other debris left at the old Stead Air Force Base north of Reno, inhabited by California ground squirrels, provided high density nesting habitat for over forty years.

Physical Factors

Burrowing Owls prefer open valleys with flat to sloping terrain. Direction of exposure does not appear to be a prominent factor in nest site selection.

Landscape Factors

Sparsely vegetated habitats with adjacent open areas appear to be preferred when available; however, this may be more a function of available mammal burrows than habitat preference. When artificial burrows have been placed in moderately dense sagebrush communities with a slight slope, they have been quickly occupied. Burrowing Owls also prefer an observation point, e.g.,high brush or fence posts near the nest site. Nesting density may vary from one territory in several sq km to colonies of nesting birds numbering twelve or more pairs.

General habitat condition in many of the known nesting territories is poor. Excessive grazing by large ungulates does not seem to have a negative effect on the suitability of a site for

nesting, and may even be preferred because of increased visability. These conditions may also be favorable for some burrowing mammals.

Special Considerations

There is a propensity for the species to colonize if adequate nesting burrows are available. These owls readily occupy artificial burrows.
Although Burrowing Owls are active at all hours, most of their activity is diurnal or crepuscular. The diet is varied and can include large insects, reptiles, amphibians, and small rodents. This varied diet allows the species to successfully nest in most suitable habitats in the state. Most ground-nesting species have large broods, and the Burrowing Owl is no exception, having a clutch size that can range from four to eleven eggs with an average of five to nine. There is presently very little data for Nevada's Burrowing Owls pertaining to average number of young per successful nest.

The species is very tolerant of human associated disturbance. They nest next to airport runways, busy roads, and golf course greens. There is presently insufficient data to determine population status or trend.

Associated Species

Horned Lark
Black-throated Sparrow
Rock Wren

Priority Considerations

Limited Breeding Bird Survey data for the Basin and Range province indicates a significant increase in Burrowing Owl population trend between 1966 and 1996 (+63.3 percent; $p = 0.05$; Sauer et. al.1998), but analysis of the periods 1966-1979 and 1980-1996 indicates a static trend; therefore, these data are considered unreliable by the Nevada Working Group. Bird conservationists have observed an increasing loss of habitat at the suburban interface around urban centers like Reno, Carson City, and Minden-Gardnerville, where nesting Burrowing Owls seem to be coming under increased conflict with development activities. Because of this perceived chronic threat to habitat, the Nevada Working Group has selected the Burrowing Owl as a Priority Species for this document.

OBJECTIVE - Maintain stable or increasing nesting populations of Burrowing Owls throughout their present range in salt desert scrub habitat in Nevada through 2004.

Strategy: Encourage the maintenance of healthy, diverse salt desert scrub habitats complete with healthy Indian ricegrass component supporting a thriving rodent community.

Strategy: Minimize the effects of range land pesticide programs on Burrowing Owls and other bird species which depend on grasshoppers, Mormon crickets, and rodents for food.

Action: Collect baseline data regarding the impacts of specific range land pesticide distributions on local Burrowing Owl nesting pairs.

Action: Develop Best Management Practices for the distribution of range land pesticides with minimization of the impacts to Burrowing Owls as a

primary objective.

Action: Monitor range land pesticide work plans and provide input designed to minimize impacts to areas of significant nesting pair concentration.

Strategy: Protect and maintain suitable burrowing habitats and primary burrow providers.

Action: Monitor and quantify the impacts of off-road vehicle recreation on Burrowing Owl habitats, particularly centers of breeding concentration. Mitigate impacts by adjustment of sanctioned event routes, closure of casual use in Burrowing Owl breeding centers, education of off-road vehicle enthusiasts and consensus planning involving off-road vehicle advocacy groups.

Action: Protect and maintain populations of burrowing animals such as ground squirrels, kit foxes, desert tortoises and badgers, all of which provide nesting sites for Burrowing Owls.

Action: Work with developers in urban and suburban areas to preserve open space within developments for Burrowing Owl use.

Action: Mitigate loss of Burrowing Owl nest sites by constructing artificial burrows in suitable alternative habitat with attendant site protection.

Strategy: Develop a current status and trend analysis for Burrowing Owls in Nevada.

Action: Utilize the current Nevada Breeding Bird Atlas effort to create a picture of Burrowing Owl distribution across the state.

Action: Initiate specific Burrowing Owl surveys using citizen scientists and interested volunteers to fill knowledge gaps and establish population trend.

Assumptions - Research and Monitoring Needs

The Burrowing Owl objective for salt desert scrub habitats assumes that stable or increasing populations are achievable for the species in Nevada. A more detailed knowledge of population status and trend should be constructed to position bird conservationists more solidly with regard to future management action and priority. Certain actions listed under the conservation strategies assume that there is not yet complete understanding of the effects of rangeland spraying on songbird productivity, particularly on those species which depend heavily on species targeted by the pesticides. More specific study on the effects of rangeland spraying on priority species such as the Burrowing Owl is warranted. Certain actions assume that off-road vehicular activity has a measurable effect on Burrowing Owl productivity in areas of high use. This assumption needs to be addressed further.

Opportunities

The demonstrated readiness with which Burrowing Owls will accept artificial burrows gives bird conservationists a powerful tool in the mitigation of the loss of specific nest sites to land development. Burrowing Owl box projects are winners with developers, community service groups, and the birds themselves. When advocating a significant Burrowing Owl box project to mitigate specific losses, care should be taken to perform the mitigation on lands that will be

relatively safe from further encroachment. Thus is achieved true mitigation, as opposed to a sustained "Burrowing Owl shell game", in which birds are constantly displaced and encouraged to re-establish just beyond the suburban interface.

Further Reading

Coulombe 1971
Thomsen 1971
Zarn 1974

HABITAT MANAGEMENT SUMMARY: SALT DESERT SCRUB

In order to achieve the conservation objectives outlined in this plan, salt desert scrub habitats should be managed for large-diameter greasewood and saltbush plants sufficient to provide nesting sites that naturally repel nest predators. A vigorous Indian ricegrass understory supports a diverse, abundant rodent population that can be exploited by Burrowing Owls, and to a lesser extent, Loggerhead Shrikes. Healthy reptile populations are encouraged and a particular vigil on rangeland pesticide programs is recommended.

HABITAT TYPE: WETLANDS AND LAKES

General Description

By far the majority of Nevada lies within the Great Basin, a physiographic region of North America characterized by its interior drainage and lack of outlet to any ocean. The average visitor to Nevada's Great Basin desert is likely to be put off by its seemingly endless expanse of barren alkali playas, greasewood flats, and dry, rocky mountain ranges. However, it is easy for the casual interstate traveler to overlook the effects of the very interior drainage that gives the region its name and defining character. Runoff from the Sierra Nevada on its western margin and from all its interior mountain ranges gravitates to a vast array of valley bottoms and hardpan flats, where it collects in the regions of lowest elevation and evaporates into the air or soaks into the ground. Depending on soil characteristics and volume and flow regime of the water source, these natural basins express a wide variety of wetland types, among which are Nevada's most productive and diverse biotic communities. The Nevada GAP estimated 105,563 hectares of emergent marsh, 183,747 hectares of open water, and 758,020 hectares of playa in the state.

The strategic location of Nevada's perennial and ephemeral wetlands render them of particular importance to the avian migration of the Western Hemisphere. Not only do over one hundred thousand birds (ducks, geese, shorebirds, and wading birds) nest in the Great Basin, but hundreds of thousands more use Great Basin wetlands as migratory stopovers and staging sites where fat reserves are replenished during the epic annual journeys between winter ranges south of the Mexican border to nesting ranges spanning from Nevada to the rim of the Arctic Ocean.

Nevada's portion of the Great Basin is fed by four major river systems – the Humboldt, the Truckee, the Carson, and the Walker – and one lesser system, the Quinn. These systems all empty into the mostly dessicated bed of ancient Lake Lahontan, a physiographic basin which first began filling with fresh water between the Ice Ages of the Pleistocene. The four major rivers reach their termini within a triangle approximately 153 km long on two of its sides and 64 km across its northern side. The Truckee River creates Pyramid Lake, a huge, deep desert lake approximately 48 km northeast of Reno. The Walker River ends at Walker Lake, another deep desert lake of steadily increasing salinity north of Hawthorne. The Humboldt River reaches the Humboldt Sink, an expansive alkali pan just southwest of Lovelock, where it creates wetlands which fluctuate from centimeters deep to over four meters deep, depending on the snowpack and runoff volume of the Humboldt watershed. The Carson River empties into Nevada's most extensive complex of palustrine wetlands in Lahontan Valley. Here lay the Stillwater National Wildlife Refuge at the end of the Carson's northeastern most reach, and Carson Lake at its extreme southeastern reach. The Lahontan Valley wetland complex is world-renown for its importance to migratory waterfowl, shorebirds, and waders, and received worldwide recognition in 1988 when it was included as a site of hemispheric importance into the Western Hemispheric Shorebird Reserve Network.

The Quinn River transports a low volume of water over an amazingly flat stream course, such that very little of its flow reaches its terminus in the Black Rock Desert in any volume sufficient to overcome the permeability of the soils and the insatiable evaporation rate of its terminal landscape. Accordingly, no significant wetland exists at the end of the Quinn. Because of its interminably slow flow, however, the Quinn does periodically supply a highly

productive in-stream riverine marsh where it intersects and consumes the King's River at the south end of King's River Valley west of Orovada.

In northeastern Nevada, the Ruby Marshes are fed by runoff from the Ruby Mountains on the west and the East Humboldt Range on the east. A vast expanse of extremely fresh water permanent wetland is sustained by several high-volume freshwater springs existing on the Ruby Valley floor. Another playa that often expresses a significant area of emergent wetland, Franklin Lake, exists on the Ruby Valley floor north of and physiographically disjunct from the Ruby Marshes. Another extensive wetland complex sustained by valley floor springs lies in the Warm Springs Ranch in Independence Valley southeast of Wells.

Many other Great Basin playas provide seasonal wetlands of varying character, quality, and periodic longevity. Some of the more diverse and noteworthy of these include: Railroad Valley in Nye County; Massacre Lakes, Duck Flat, and Washoe Lake in Washoe County; Artesia Lake in Lyon County; and Snow Water Lake in Elko County.

The major wetland complex of the Colorado drainage in southern Nevada lies in the Pahranagat Valley south of Alamo. Here the subsurface flows of the White River meet the northernmost reaches of the Sheep Range fault blocks, effectively impeding its flow and forcing it to pool up in the south end of the valley where it forms an extensive emergent marsh. Other sites along the White River where it pools into significant wetlands include the old Sunnyside Ranch south of Lund, now known as the Kirch Wildlife Management Area, and what is now known as the Key Pittman Wildlife Management Area near Hiko. The State of Nevada also manages a wetland complex where the Muddy River enters Lake Mead south of Overton.

The Amargosa River system of southern Nevada forms two relatively small, but biologically important wetland complexes – one through the town of Beatty and one at Ash Meadows north of Death Valley. These small complexes support several endemic fishes and an endemic amphibian, the Amargosa toad. Of lesser importance to migratory water birds, the Ash Meadows National Wildlife Refuge that has been commissioned to protect these unique biological resources represents an important protected preserve for many species of Mojave Desert songbirds. A wetlands complex largely sustained by sewage effluent occurs in the Las Vegas Wash.

The extreme southern rim of the Columbia Plateau laps over the Nevada border from the north in Humboldt and Elko Counties. Several in-stream riverine wetlands exist in the Owyhee River drainage which exits Elko County into Idaho, including Sheep Creek Reservoir, the Petan Ranch, the Spanish Ranch, Sunflower Flat, and the upper end of Duck Valley. Other significant wetlands occur in the Upper Bruneau Meadows and at the confluence of Shoshone Creek and Salmon Falls River.

Man-made reservoirs have been incontrovertible features on the landscape of the American West for almost a century now. Although the creation of these reservoirs has necessitated a series of habitat value tradeoffs both in the way of inundated riparian habitats and wetlands affected by altered water management downstream, many of them are quite prolific fish producers, and as such have created significant summering, wintering, and migratory staging sites for fish-eating birds such as Common Loon, Western and Clark's Grebe, Double-crested Cormorant, and American White Pelican. Probably the

most significant reservoir in the state relative to bird use is Lake Mead on the Colorado River behind Hoover Dam. Although its vast size renders it practically impossible to economically survey, Lake Mead may provide staging and wintering habitat for many of the Western and Clark's Grebes in the western U.S. Other man-made reservoirs supporting significant bird resources include Lahontan Reservoir on the Carson River, Rye Patch and South Fork Reservoirs on the Humboldt River, and Wildhorse Reservoir on the Owyhee River.

Physical Characteristics

The term "wetlands" is a generic reference to a wide variety of plant communities that form on soils that remain moist or saturated through a significant portion of a year. The length and extent of soil saturation or inundation is key to the type of vegetation a site will express. A single site often carries the seed and root stocks to exhibit very different plant communities depending on the extent and duration of water on the site over a particular time. In a simple Nevada model, the playa is the basic typical wetland substrate. Playas are flat, and form at the very lowest elevation of a basin or valley. A playa began its formation at the instant in geologic time when runoff from the surrounding landscape gravitated to it and began accumulating on it. Soils and minerals are brought in with the water and precipitated out with settling and evaporation until a fine-grained, relatively impermeable layer of sodic clay is lain down, effectively sealing the site from rapid percolation of water from the surface to subsurface aquifers. The playa begins to hold water at the surface over longer and longer periods until the seeds of palustrine plants, borne on the wind or the feathers or fur of birds and mammals are germinated and a wetland community is established.

Playas can accumulate prodigious concentrations of salts from the water, to the point that they become quite hostile to plant establishment, remaining barren of almost all vegetative encroachment through most of the year. When dry, these salt flats are freshened by the wind which removes the lighter salt particles off the surface. Some palustrine plants are quite amazing in their ability to colonize and persist in spite of these harsh physical and chemical site conditions.

Dry playas are often barren of vegetation from their center out to their outer margins, where saltgrass, pickleweed, or stunted greasewood can maintain a foothold on the fresher soils. When soils are kept moist but short of saturation over several weeks or months, Baltic rush, smartweed, sedges, and spikerushes emerge, in progressive order of wetness. This community is usually less than 60 cm tall, but can become quite dense in the absence of disturbance. With prolonged saturation comes more substantial emergent vegetation in the form of cattails, hardstem bulrushes, and alkali bulrushes (known locally as "nutgrasses"). These plants range from one to three meters tall and can grow so thick as to render a site impenetrable. With long-term inundation comes the submergent plant community, most often one of the pondweeds (*Potomogeton* spp.), but sometimes wigeon grass in more saline conditions, and sometimes arrowhead in fresher conditions. These submergent plants can build to such thick mats that they finally break the water's surface and present a structure sufficient to support the nests of marsh birds such as Black Terns, Eared Grebes, Black-necked Stilts, and American Avocets.

When a marsh goes dry after having achieved the full multi-storied expression described above, the submergent plants disappear quickly and assume dormant stages in the

substrate. The bulrushes and cattails can persist in cured form for a year or two, or until significant breakdown occurs through intrusion by large mammals or wind. These cured stands of dry emergents can then fill with amazing densities of meadow voles and other rodents, making them prime hunting areas for raptors, including Short-eared Owls, Northern Harriers, Red-tailed Hawks, Ferruginous Hawks, and in winter, Rough-legged Hawks.

These same vegetative expressions can also be achieved in the floodplains of rivers and creeks where currents are not so strong as to keep the plants and reproductive stocks swept away. Oxbows, formed when stream channels finally abandon old meanders, are prime sites for wetland formation. Other floodplain wetlands can form where flows are slow and sheet-like rather than confined to a channel. Floodplain wetlands usually exhibit more permeable soils with a constant, if slow, flow of water passing through rather than standing in place.

Nevada's permanent lakes are primarily either terminal basins or man-made. Because of the natural occurrence of minerals and salts in their watersheds, Nevada's lakes and reservoirs are natural sumps for the transport and collection of a variety of salts, heavy metals and other dissolved solids. Basins are typically deep, such as Lake Tahoe and Pyramid Lake, although some lakes and reservoirs have extensive shallow littoral zones on their upper ends (Walker Lake, Wildhorse Reservoir, and others at different times) which can be exploited by waterfowl and shorebirds for their food resources.

Dominant Plant Species

The dominant emergent species of persistent wetlands are cattail (*Typha* spp.), hardstem bulrush (*Scirpus acuta*), and alkali bulrush (*Scirpus maritimus*). Prominent submergents include sago pondweed (*Potomogeton pectinatus*), horned pondweed (*Zannichellia palustris*), wigeon grass (*Ruppia maritima*), water buttercup (*Ranunculus* sp.) and arrowhead (*Sagittaria* sp.). Moist soil inhabitants include Baltic rush (*Juncus* sp.), smartweeds (*Polygonum* sp.), sedges (*Carex* sp.), flatsedges (*Cyperus* sp.), and spikerushes (*Eliochorus* sp.). Saltgrass (*Distychlis stricta*), willows (*Salix* sp.) and greasewood (*Sarcobatus vermiculatus*) often thrive on the margins of playas and floodplain wetlands.

Many plant species found today in Nevada's wetlands are not indigenous to North America, but two of relatively recent invasion deserve special mention because of the threat they pose to marsh diversity and productivity – the tamarisk (*Tamarix* sp.) and tall whitetop (*Lepidium sp*.). These highly aggressive competitors have already invaded and compromised several of Nevada's key wetland and floodplain sites. Tamarisk, also known as saltcedar, forms a small tree much like willow in growth form, but much less desirable to North American songbirds than willow. Tamarisk is quite salt-tolerant, and is prone to overtake salty playas after prolonged flooding kills and removes normal emergent vegetation, then is followed by prolonged drought. Tall whitetop is a robust herbaceous plant that grows up to two meters high and forms dense, monotypic stands of spinescent stalks that repel entry and eliminate understory competition. While not tolerant of prolonged inundation or higher salinities, tall whitetop does threaten to replace many more desirable species on moist soil sites and wetland margins.

Historic and Current Conditions

Nevada has not undergone significant physiographic change since the Pleistocene, when its naturally-formed basins began filling with the freshwater melt of the receding Ice Ages. During that time, two major lakes formed in northern Nevada. Lake Lahontan stretched from Desert Valley north of Winnemucca as far south as Walker Lake north of Hawthorne. This lake inundated all the valleys of Pershing and Churchill Counties, Pyramid Lake, the Black Rock, San Emidio, and Smoke Creek Deserts, and reached as far west as Honey Lake just across the border in California. At its peak, Lake Lahontan was 268 meters deep at its deepest point. It filled and dessicated a number of times in rapid geological time, but it has not filled significantly in the last 10,000 years. Its remnants that persist today include Honey Lake, Pyramid Lake, Humboldt Sink, Carson Sink and Carson Lake, and Walker Lake. At the same time, Lake Bonneville was filling the basins of the eastern Nevada border stretching north to south from Montello to Baker. Both systems were active long enough to develop separate parallel strains of cutthroat trout. Lake Lahontan developed endemic tui chub and the endangered cui-ui, a Pleistocene sucker that exists only in Pyramid Lake, while Lake Bonneville's endemic fishes include the Utah chub and the Bonneville sculpin. While a portion of extreme northwestern Nevada drains northward into what was ancient Lake Alvord, hardly any of that lake's inundation zone extended into Nevada.

Pleistocene humans found these ancient lakes and the wetlands that formed with their periodic dessication to be bountiful oases, supplying their year-round needs of food and raw textile materials. Almost everything that moved in or on the lakes was eaten – from the freshwater mussels in the littoral muds to the coots that skittered across the surface. Cattails and bulrush were harvested and used almost completely. Tubers and seeds were eaten; leaves and stems were stripped to their fibers and woven into baskets, sandals, and clothing. Nevada's wetlands provided good living within a matrix of sere, unforgiving desert and range.

European settlers initially passed over Nevada's interior wetlands, deeming them foul and unfit for civilized living – inhospitable hazards to be circumvented on the way to the lands of milk and honey in California. As the prime lands of California filled and settlement began to backflow into Nevada, the eyes of empire rested on the waters flowing in the rivers of the Great Basin, and plans ensued immediately to put those waters to "beneficial use". Without a thought toward the impacts such an action would have on the terminal habitats, a dam was built in the Truckee River and a ditch cut to divert water over into Lahontan Valley to supplement the slightly less than reliable Carson River flow as it was harnessed to succor the West's first irrigated lands project in 1911. This action initiated the dessication of Winnemucca Lake, site of a highly productive shallow wetland that sometimes reached 26,000 hectares in size. Pyramid Lake also began to recede, losing almost 21 meters of depth by 1981.

During the heyday of agricultural water diversion, the wetlands at the end of the Carson River waxed fat on the increased flow through the system, benefiting particularly from the water that was released through Lahontan Dam to generate electrical power during the winter months. When winter power releases were curtailed in 1967, and the federal government began to shift its emphasis in trust responsibilities away from the irrigation project toward the Pyramid Lake Indian Tribe and the cui-ui, now listed as endangered under the Endangered Species Act, the re-allocation of water between all conflicting interests threatened to dry up the Lahontan Valley wetlands completely. By the mid-1980's, death knells were sounding for these once flourishing marshes when the sites were

found to be significantly contaminated with heavy metal residues, deposited there during decades of leaching agricultural lands and dumping the drain waters into the wetlands.

A coalition of concerned biologists, hunters, and environmentalists formed to save the gravely threatened wetlands. The coalition fought bravely to establish wildlife habitat as a beneficial use of water under state law, raised money to buy water rights from willing sellers within the irrigation project for transfer to the wetlands, and convinced the federal government that walking away from the Lahontan Valley wetlands was not an acceptable solution to simplifying the "rat's nest" of public trust conflicts and problems. The efforts of the coalition culminated in the passage of The Truckee-Carson Settlement Act, a sweeping reform bill sponsored by Senator Harry Reid in 1990. This landmark legislation authorized the purchase of water rights from willing sellers within the project to sustain an average of 10,000 hectares of wetlands in Lahontan Valley, distributed proportionally between the Stillwater National Wildlife Refuge, Carson Lake, and wetlands of the Fallon Paiute-Shoshone Tribes. The bill also provided direction for Stillwater NWR past the expiration of the multiple-partner management agreement it had operated under since 1948, and authorized the transfer of Carson Lake from federal to state ownership for the expressed purpose of management as a state wildlife area. Although many of the details of implementation of the 1990 legislation are still being worked out, the Lahontan Valley wetlands have enjoyed an increase in both legal and public standing as a result of the efforts of a dedicated, diverse band of conservationists. The future looks bright with regard to the long-term preservation of these critical wildlife showpieces.

The Humboldt Irrigation Project, centered in the Lovelock Valley, was born when Rye Patch Dam was completed on the Humboldt River in 1935. This effectively cut the wetlands of the Humboldt Sink from the natural flow regime of its source river. Like Lahontan Valley, fresh water receipts to the wetlands were largely traded for drain flows, with a corresponding decline in water quality, and a similar buildup of contaminants in the playa substrates. The area has been managed by Nevada Division of Wildlife and its predecessors as a wildlife area since 1954, with minimal structural development.

Upstream, the Humboldt Project manifested itself in a different way. Starting in 1934, several ranches from Battle Mountain almost to Golconda were bought by the federal government for the purpose of transferring their diversionary water rights downstream to the Lovelock Project. Claiming that the State of Nevada had required them to prove collection of those water rights off the properties in question, the Bureau of Reclamation initiated a massive channel modification project on those properties which was dubbed the "Battle Mountain Channel Rehabilitation and Betterment Project". This resulted in an eight-kilometer gash that effectively drained what was known as the Argenta Swamp, at the time, Nevada's largest in-stream marsh. Currently, negotiations are under way between conservation advocates, the State of Nevada, the Bureau of Reclamation, and the Pershing County Water District to explore the cooperative restoration of a portion of the marsh that was lost.

In Mason Valley near Yerington, the two forks of the Walker River came together and historically tended a broad, marshy floodplain complete with a labyrinth of sloughs, oxbows, and alternate channels braided through richly fertile bottomland soils stretching the length of the valley from the confluence of the East and West forks to the river's exit from the valley east of Wabuska. Recognizing a fertile valley bottom when they saw one, European settlers began to turn the sods of Mason Valley at about the same time as the

settlement of Carson Valley (1850's), making it one of Nevada's oldest agricultural communities. When the Walker River Irrigation District, a private cooperative, completed construction of Bridgeport Reservoir on the East Fork and Topaz Reservoir on the West Fork, the systematic conversion of Mason Valley into a carefully controlled, productive agricultural center was complete.

In 1955, the Nevada Fish and Game Commission (now the Nevada Division of Wildlife) purchased the last largely undeveloped tract of natural floodplain habitat in the valley, the Mason Valley Ranch, site of one of the major base ranches in the vast Miller and Lux cattle empire of the 1880's. Upon purchase, some of the sloughs on the property with more regular water flow were developed into managed wetland units using sportsman's money, and today, in addition to its stretch of natural riparian and floodplain habitats, the Mason Valley Wildlife Management Area regularly offers up to 23,200 hectares of palustrine marsh habitat for nesting and migrating water birds (Huffman Report 1998).

The diversion of water out of the Walker River for agricultural irrigation both in Mason Valley and on the Walker River Paiute Indian Reservation initiated Walker Lake into a slow decline that to this day threatens the long-term viability of its considerable fishery. Besides the Walker Lake strain of Lahontan cutthroat trout, prized by fisherman for its size and flavor, Walker Lake also produces an overwhelming biomass of tui chub and Tahoe suckers which in turn feed a myriad of fish-eating birds. As lake level declines, the concentration of salts increases dangerously close toward the threshold beyond which Walker Lake's fishery can no longer naturally sustain itself. That threshold has already been crossed for Lahontan cutthroat trout, which remain in the lake due solely to the artificial propagation efforts of the Nevada Division of Wildlife.

The major surface wetlands of the mostly subterranean White River in southeastern Nevada have likewise been preserved for public use by state and federal wildlife agencies. The old Sunnyside Ranch south of Lund was purchased by the state of Nevada and is now known as the Wayne Kirch Wildlife Management Area. Another state-owned wildlife management area, known as the Key Pittman WMA is situated south of Hiko. The U.S. Fish and Wildlife Service owns and manages the Pahranagat National Wildlife Refuge south of Alamo. The White River changes names below the refuge to Pahranagat Wash, and is later joined by Meadow Valley Wash, to form the Muddy River, which empties into Lake Mead at Overton. Here, in the floodplain of the uppermost inundation line of Lake Mead, a constructed wetland known as Overton WMA is owned and operated by Nevada Division of Wildlife.

Opportunities For Conservation

In many respects, the battles to preserve Nevada's significant wetlands are old and many have been resolved. The preservation of several of Nevada's more significant in-stream wetlands (Mason Valley WMA, the White River properties, Alkali Lake in Lyon County, etc.) has been effected through purchase with sportsmen's user fees. Other properties (Franklin Lake, Ash Meadows NWR) have been purchased by The Nature Conservancy and transferred to public ownership. Ducks Unlimited played a critical role in the preservation and development of the marshes in Railroad Valley. Although far from complete, the restoration and preservation of the Lahontan Valley wetlands (Stillwater NWR and Carson Lake) through the purchase of water rights from willing sellers is ongoing and progressing well. As stated above, negotiations between water users, the federal

government, and a coalition of conservation and sportsmen's groups are presently shaping the future of a partially restored Argenta Marsh, probably the most exciting wetlands restoration prospect to come along since the Truckee-Carson Settlement Act. The Wetland Reserve Program administered by the U.S. Natural Resources Conservation Service provides federal assistance to private landowners wishing to restore wetlands on their property. Other opportunities to preserve significant wetland sites will continue to arise with the passage of time as long as the public places high value on the natural outputs of these limited but disproportionately important habitats.

Presently, the most severe and problematic water conservation issue centers around efforts to save Walker Lake. Because water rights on the Walker River system are privately owned and administered, sweeping environmental legislation similar to the Truckee-Carson Settlement Act will be impossible without consensus of all the stakeholders. In recent years, the specific importance of Walker Lake as both a state and international resource has become better understood, and all stakeholders are presently engaged in serious negotiations to devise solutions equitable and acceptable to all. In the meantime, a string of high-precipitation years starting with 1994 have given the lake a temporary respite from the brink of death.

In southern Nevada, several wetland enhancements have been proposed for the Las Vegas Wash as part of a Wetland Park planning effort. This denuded system has been altered as a result of flooding and increased effluent flows from recent population growth of the Las Vegas area. The major enhancements will be erosion control structures that will slow flows and eventually create emergent wetlands. Funding for development has been a limitation and several planning groups have been formed to address this and other local concerns.

Priority Species

Obligates

White-faced Ibis
Snowy Plover
American Avocet
Black Tern

Other

Sandhill Crane
Long-billed Curlew
Short-eared Owl

SPECIES PROFILE 1. WETLANDS AND LAKES

WHITE-FACED IBIS

Plegadis chihi

Distribution

The White-faced Ibis is encountered as a non-breeder over most of the wetlands of the western U.S. from central Oregon east to central Minnesota, southeast to Nebraska, southwest to southern California, Baja California and the Sea of Cortez. A disjunct population inhabits the Gulf Coast from the mouth of the Mississippi in Louisiana west to

the mouth of the Rio Grande in Texas. In the West, the White-faced Ibis breeds in disjunct colonies varying in size from a few pairs to 10,000 plus scattered across the western U.S. from Lower Klamath Lake on the Oregon-California border as far south at times as the Salton Sea in extreme southern California; several of the large wetland complexes of the Great Basin, including Lahontan Valley, Humboldt Sink, and Ruby Lakes NWR in Nevada, Malheur NWR in central Oregon, and the Bear River marshes in northern Utah; and various and sundry other sites scattered throughout its range east to Minnesota and Nebraska.

Habitat

White-faced Ibis prefer to nest in flooded stands of hardstem bulrush, but will use other types of flooded emergent marsh vegetation, including cattail, alkali bulrush, and even flooded willows and tamarisk in a pinch. They feed primarily in flooded wetlands, although the prevalence of irrigated agricultural lands through much of their historic habitat has effected a shift to foraging for earthworms in flooded crop fields (Bray 1988) as a primary foraging technique.

Physical Factors

White-faced Ibis nest colonies must be flooded underneath throughout the nesting period to discourage mammalian predators, primarily coyotes and feral dogs and cats. Conversely, once nests are constructed (typically 60 cm or less above the water's surface), water levels must not be allowed to rise to the point of flooding the nests. Often on managed wetlands, water level stability must be actively manipulated to avert abandonment in either extreme. White-faced Ibis prefer flooded fields and shallow wetland units for feeding.

Landscape Factors

For nesting, White-faced Ibis prefer mature, fully-structured emergent marsh vegetation stands capable of supporting substantial nest platforms. Emergent marshes suitable for nesting must also be associated with shallow-water wetlands or flooded agricultural fields for nesting. Ibis will commute long distances between nest colonies and feeding areas (48 km plus as the ibis flies). Although they do display considerable adaptability when drought renders traditional colony sites unfit and creates alternate sites in other places, White-faced Ibis tend to show strong fidelity to certain important colony sites. One important conservation strategy for the species has been the preservation and active management of these preferred sites, including Carson Lake, Nevada, Malheur NWR, Oregon, and Bear River Marshes, Utah.

Special Considerations

Adults feed primarily on aquatic macroinvertebrates, drowning earthworms, crayfish and freshwater mollusks when available. Bray (1988) documented the ibis gullet as capable of transporting as many as 100 red earthworms back to the nest in a single trip. The incubation period is 21-22 days and fledging occurs 35-42 days after hatching, requiring stable water levels under the colony of 65-70 days minimum from nest initiation, which usually occurs around May 1. Predation of eggs and young by avian predators can be high even during fully-flooded nesting seasons, while mammalian predation to any

significant degree usually results in colony abandonment and failure. Pesticide loading in White-faced Ibis tissues have resulted in some eggshell-thinning, documented by Henney and Herron (1989) in Lahontan Valley. Pesticide residues persist twenty years after the banning of DDT in the United States, and reproductive potential was estimated to be decreased by as much as 20 percent at some sites.

Associated Bird Species

American Bittern
Great Egret
Snowy Egret
Cattle Egret
Black-crowned Night Heron
Marsh Wren
Common Yellowthroat
Yellow-headed Blackbird

Priority Considerations

The White-faced Ibis has received priority management status in Nevada for over 25 years. Biologists became quite concerned for the long-term viability of Nevada's breeding population, critical to the maintenance of the Great Basin population, during the 1970's when drought and elevated levels of DDE residues in tissues and eggshells threatened to severely curtail production. Annual nesting pair populations in Nevada have fluctuated from zero to over 9,000 pairs between 1974 and 1998. Carter (1998) estimated that as high as 59 percent of all the world's White-faced Ibis nest somewhere in the Great Basin province. Because of continued concern over nesting population viability, as well as the Great Basin's importance to the maintenance of the world's White-faced Ibis population, the Nevada Working Group has selected the White-faced Ibis as a species of priority focus for the purposes of this planning effort.

OBJECTIVE: Maintain an annual average of 4000 nesting pairs of White-faced Ibis at suitable sites throughout the state through 2004.

Strategy: Maintain suitable nesting habitat on an annual basis at the following sites: Carson Lake, Stillwater NWR, Humboldt WMA, and Ruby Lakes NWR.

Action: Maintain suitable habitat for 3,000 nesting pairs at Carson Lake; provide suitable habitat for 1,000 nesting pairs distributed across the remaining three sites as opportunities exist.

Action: Suitable nesting habitat is described as mature stands of hardstem bulrush flooded at a constant depth between 30 and 60 cm from April 15 through August 15. Alkali bulrush and cattail can serve as suitable nesting habitat when stem densities are high enough to support nest platforms and such vegetation is selected by nesting birds.

Action: Continue to purchase water rights from willing sellers for wetlands management.

Action: Continue to monitor water quality and contaminant residues in tissues and eggs. Explore ways to reduce contaminant ingress into important nesting sites.

Action: Participate in standardized nesting colony census with other major Great Basin nesting population site managers.

Action: Coordinate annual habitat management objectives of the important colony sites in Nevada with other important Great Basin sites i.e. Bear River, Malheur, Lower Klamath, etc. Review annual reproduction performance and plan at an ecoregional scale.

Action: Coordinate management and monitoring activities of Nevada's major colony sites with national colonial waterbird planning efforts likely to be developed through the five-year planning period.

Assumptions - Research and Monitoring Needs

The White-faced Ibis objective for wetland habitats in Nevada assumes that a five-year average of 4,000 nesting pairs can be maintained across the major nesting sites in the state. Long-term average between 1984 and 1994 was a little over 3,200 pairs. The western Nevada peak was bumped up to over 9,000 pairs in 1997, and prospects for a higher five-year average seem better than they were through the drought of 1988-93. Prime water has been purchased for both Carson Lake and Stillwater NWR, enhancing habitat managers' ability to provide stable habitat conditions throughout the nesting period. The nesting pair target is optimistic, and will require reaching beyond the previous 15-year performance.

The need for regional coordination between states and land management agencies is great. Standardized census methods performed by all stewards of the major colony sites on a regular basis are warranted. Better facilitation of the transfer of information between major colony stewards would serve to better prepare specific stewards in years when their site might need to increase its burden of responsibility for annual production as other sites anticipate unsuitable nesting conditions affected by drought or flooding.

Opportunities

Several ecosystem planning efforts regarding wetlands, shorebirds, and colony-nesting birds are either well under way or in the beginning stages. As a result, communication between the various major Great Basin wetland site stewards is increasing. The potential for coordinated resource management of non-hunted bird species across state and administrative boundaries seems better than ever before.

Further Reading

Booser and Sprunt 1980
Bray 1988
Earnst, et. al.1998
Henney and Herron 1989
NDOW 1974-98

Ryder 1967

SPECIES PROFILE 2. WETLANDS AND LAKES

SNOWY PLOVER

Charadrius alexandrinus

Distribution

The Snowy Plover is found worldwide. In North America, Snowy Plovers are resident on the Pacific Coast from southern Washington south to Baja California and on Gulf Coast from Mexico to Florida panhandle. They breed locally in the interior of Oregon, California, Nevada, Utah, New Mexico, Kansas, Oklahoma and Texas. In Nevada, Snowy Plovers breed on alkaline playas from the Oregon border south through Washoe, Humboldt, Pershing, Churchill, Lyon, and Mineral counties, east into Lander and Eureka Counties, southeast to Railroad Valley in Nye County, and northeast to Franklin Lake in Elko County.

Habitat

Almost nothing but saltgrass (*Distychlis* spp.) and pickleweed (*Salicornia* spp.) will grow on the hyperalkaline playas Snowy Plovers call home. For the plovers, the barer the better. Snowy Plovers prefer unvegetated salt flats where they and brine flies are the only life that stirs. Heavy saltgrass growth is shunned, as is all other shrub and herbaceous growth along the less hostile playa margin. Eggs are laid in bare scrapes in loose alkali dust, on hardpan, or on bare cobble. The nest may be faintly demarked by pebbles and thinly lined with feathers and saltgrass.

Physical Factors

Snowy Plovers must have access to some water, but not much. Its preferred playas occur in valley bottoms between 3,000 and 4,500 feet elevation and range from faintly bowl-shaped to perfectly flat. Soils are lacustrine or palustrine and alkaline to hypersaline. Water quality must be capable of sustaining brine flies and/or brine shrimp. Artesian wells that provide a small volume of permanent water can enhance a playa's suitability as Snowy Plover habitat.

Landscape Factors

Habitat suitability fluctuates with precipitation patterns. Snowy Plovers have been known to stray as far as 1.4 km from water; therefore, suitable habitat is defined by the area of unvegetated playa that interfaces with a water source that will be traversed by the birds. When playas are full from saltgrass rim to saltgrass rim following years of high precipitation and runoff, they are unsuitable for Snowy Plovers. Suitability increases as standing water recedes, then a playa becomes unsuitable again at the point after dessication at which brine flies die off. Playa suitability can vary significantly within year between regions. Playas scattered across a broad regional landscape providing a variety of water conditions are likely to meet yearly breeding needs. More study is needed on breeding site flexibility

in the interior population, although it is suspected to be quite facilitative.

Special Considerations

Snowy Plovers feed on brine flies (*Ephydra* spp.), brine shrimp (*Artemia* spp.), chironimid worms, cladocerans, and other invertebrates. Young are precocial; nests and young are susceptible to predation by coyotes, corvids, and gulls. Hydrologic integrity of playa bottoms must be preserved – intermittently threatened by precious mineral dredging or livestock water development. On many wetlands managed for wildlife, playas occur at the end of the system, where their water budgets can be extremely high, thus rendering playas as low-priority habitats in annual water management plans. Water availability to playas can be affected by agricultural and urban diversions. Populations in Nevada and Oregon are generally thought to be in decline, but the discovery of a large population at Great Salt Lake, Utah in the last decade makes population trend analysis difficult. More long-term monitoring including Great Salt Lake will be necessary to determine if Great Basin population is static or in overall decline.

Associated Species

American Avocet

Priority Considerations

Limited Breeding Bird Survey data indicate a 125 percent increase in Snowy Plover populations in the Great Basin between 1966 and 1996 (Sauer et al. 1998). It is hard to know how much of this increase is due to better survey techniques and the discovery of the Great Salt Lake population. In Nevada, breeding populations have declined since the monumental baseline survey work of Herman (1988; NDOW 1993). The Great Basin province is estimated to provide as high as 50 percent of the western Snowy Plover breeding population. Because its numbers are perceived to be on the decline in Nevada, and because of the relative importance of our area to the western breeding population, the Nevada Working Group has selected the Snowy Plover as a species of priority focus for the purposes of this planning effort.

OBJECTIVE: Maintain a Snowy Plover breeding population of 900 adults distributed across all suitable habitat in Nevada through 2004, with special emphasis on Stillwater NWR and the Carson Sink.

Strategy: In coordination with other wetland management objectives, provide the maximum extent of wet alkaline playa habitat possible through active water management where appropriate and through the protection of natural site integrity where water management is not possible.

Action: On managed wetlands, prioritize at least one major alkaline playa unit per year for water to support Snowy Plover breeding throughout the breeding season.

Action: On unmanaged playas, preserve natural water regimes through protection of playa bottom from mineral exploration and extraction and

stock pond development.

Action: Determine the extent of nest loss to recreational vehicle use on playas. Prevent recreational vehicle use on important breeding sites during the nesting season.

Action: Conduct standardized, periodic censuses of all documented potential breeding sites using professional and volunteer help specially trained in Snowy Plover observation.

Action: Coordinate management and monitoring activities with other Great Basin states. Develop a Great Basin breeding population estimate.

Action: Coordinate planning, management, and monitoring efforts with the National Shorebird Conservation Plan, a planning process now in progress.

Assumptions - Research and Monitoring Needs

The breeding adult population estimate of 900 birds was derived from the U.S. Fish and Wildlife Service's "Management Guidelines for the Western Snowy Plover" (1984). A 1980 census documented 969 breeding adults in Nevada (Herman et. al.1988). The USFWS Management Guidelines set a management objective of 90 percent of all birds and suitable sites. The Nevada Working Group objective rounds 872 (90 percent of 969) up to 900 birds for the sake of simplicity. While this would be an optimistic target indeed for only the sites censused by the Herman team, the target takes into account the existence of several important eastern and central Nevada sites not censused by the Herman team. By including all documented sites in the target formula, the target is more realistically attainable.

Better data on loss of nests and young to predation and wildlands recreation are needed. The effects of contaminant loading in tissues and eggs are also probably warranted. Snowy Plovers are particularly challenging to census due to both the expanse and severity of their preferred habitat, as well as the difficulty of observing them in their preferred haunts. The members of the Herman team achieved a rare level of specialized acuity in their several years of pursuit of Snowy Plovers across the saltpans of the Great Basin. It may be desirable and necessary to encourage members of that team to spend some time specially training biologists and volunteers to conduct censuses that might approach the comprehensiveness and precision of the 1980 expedition for comparative purposes over time.

Opportunities

The assemblage of a skilled citizen-scientist corps such as is ongoing by the Great Basin Bird Observatory will be paramount to gaining the necessary survey coverage to adequately assess population status and trend. The purchase of water rights from willing sellers for the Lahontan Valley wetlands will increase land managers' ability to deliver water to the high-demand tertiary salt pans with time.

Further Reading

Herman et. al.1988
Herron, et. al.1991
Page and Stenzel 1991
USFWS 1984

SPECIES PROFILE 3. WETLANDS AND LAKES

AMERICAN AVOCET

Recurvirostra americana

Distribution

The American Avocet breeds along the California coast as far north as San Francisco, extending across the interior through Arizona, Nevada, central Oregon, portions of central Washington, Utah, extending east across northern Colorado to the Great Plains, where its breeding range extends from southern Saskatchewan to south Texas. In Nevada, American Avocets breed on marshes and playas throughout the state.

Habitat

American Avocets utilize a wide variety of shallow water habitats, including flooded pastures, managed wetland units, alkaline playas, river deltas, gravel bars, and the shallow shore zones of permanent lakes. Nesting is most likely to occur in flooded saltgrass pastures, where either a nest is built up of grass and other vegetation, or a depression in the mud is lined with feathers and grass. Nesting also occurs on gravel and mud bars and in flooded wetland units where submergent vegetation grows sufficiently thick to support a nest spun out of the submergent material itself. Avocets prefer to feed in flooded units and shallow lakes teeming with aquatic invertebrates.

Physical Factors

American Avocets are never found very far from water. Their preferred wetland haunts occur in valley bottoms between 3,000 and 4,500 feet elevation and range from faintly bowl-shaped to perfectly flat. Soils are typically lacustrine or palustrine and alkaline to hypersaline. Avocets tend to be more tolerant of inferior water quality than just about any Great Basin shorebird save the Snowy Plover (Rubega and Robinson 1997).

Landscape Factors

American Avocets are typically colonial nesters in abundant habitat, but will nest as solitary pairs in limited habitat. The reproductive urge of this species is strong, and limited nesting can occur during drought when wetlands have receded to the last permanent mudhole (Albarico 1993). Pairs defend small territories around themselves when feeding (up to 0.1 hectares), and defend small territories around their nests, tolerating neighbors to just outside a two -meter radius (Gibson 1971). Post-breeding dispersal in the Great Basin is quite extensive and can involve wetlands separated by hundreds of miles being visited multiple times in a single season (Robinson and Oring 1996, 1997)

Special Considerations

American Avocets feed on brine flies (*Ephydra* sp.), brine shrimp (*Artemia* sp.), chironimid worms, cladocerans, and other aquatic invertebrates. Young are precocial; nests and young are susceptible to predation by just about every predator on the marsh, including coyotes, corvids, gulls, night herons, harriers, buteos, and falcons. In well-developed colonies, Avocets display cooperative nest defense ranging from communal distractive flight displays to active predator pursuit and harassment. As a result, nesting pairs in colonies typically enjoy greater reproductive success than do solitary pairs.

Associated Species

Black-necked Stilt
Killdeer
Wilson's Phalarope

Priority Considerations

Limited Breeding Bird Survey data indicate a five percent decline in American Avocet populations in the Basin and Range province between 1966 and 1996 (Sauer et al. 1998). It has been estimated that 53 percent of the world's breeding population of American Avocets is found in the same Basin and Range province (Sauer et al. 1998). Because populations seem to be in slight decline and because Nevada comprises such a significant portion of the Basin and Range province which is critically important to the maintenance of the world's breeding population, the Nevada Working Group has selected the American Avocet for priority focus for the purposes of this planning effort.

OBJECTIVE: Maintain a breeding population of 5,000 pairs of American Avocets distributed across all suitable habitat in Nevada through 2004.

Strategy: Maintain suitable nesting habitat, including flooded saltgrass pasture, thick mats of submergent vegetation, islands, etc. to support up to 3,000 nesting pairs in the Lahontan Valley wetlands of Churchill County, and 2,000 nesting pairs or more in aggregate over the rest of the state.

Action: Continue to buy water rights from willing sellers for implementation of wetland habitat objectives and strategies.

Action: Plan to keep at least one saltgrass pasture per major wildlife management area or refuge flooded at a constant depth between five and fifteen centimeters between April 15 and August 1 annually. During years of full water allocation or better, provide adequate nesting habitat for 1500 pairs of American Avocets each at Carson Lake and Stillwater NWR.

Action: Monitor predation of eggs and chicks. Take remedial action if predation levels exceed 50 percent nest success.

Action: On unmanaged wetland sites, implement management actions designed to minimize disturbance of significant nesting colonies by livestock, motorized recreation, and other human activities.

Action: Implement survey methods designed to yield an accurate nesting

population estimate statewide. Coordinate survey between agencies and conduct on an appropriate regular interval.

Action: For migratory avocets, provide at least one unit per major management area in a mature state of invertebrate growth and gradual drawdown in each the spring (April 1 - May 10) and late summer migratory periods (August 1 - September 30).

Action: Research ways to provide unit drawdown in August without initiating significant avian botulism outbreaks.

Action: Coordinate management and monitoring activities with other Great Basin states. Develop a Great Basin breeding population estimate.

Action: Coordinate planning, management, and monitoring efforts with the National Shorebird Conservation Plan, a planning process now in progress.

Assumptions - Research and Monitoring Needs

The American Avocet breeding population target of 5,000 pairs is derived from Stillwater NWR and other Lahontan Valley wetland reports and documents. As late as 1968, Stillwater NWR reported 6,000 breeding pairs of American Avocets. In the nomination letter to include the Lahontan Valley wetlands in the Western Hemispheric Shorebird Reserve Network (1986), biologists estimated a breeding population of 1,000 pairs of American Avocets during that year's flood conditions. It is believed that with increasing stability of water receipts through water rights purchases and orders, a considerable percentage of the 1968 figure could be recovered. Other signficant breeding sites outside Lahontan Valley would be expected to contribute up to 2,000 nesting pairs in aggregate statewide. At this time, the target does not seem unreasonable.

Opportunities

Estimating breeding populations of nesting shorebirds is difficult and requires significant single-minded effort. To date, there has not been a pressing need to derive comprehensive nesting population estimates for American Avocets or Black-necked Stilts. This lack of need is expected to dissipate as wildlife planning matures on its many fronts. The need to set realistic targets to then be coordinated among all the other many wetland-based outputs on an annual basis will only become more acute in the immediate future.

The art of creating optimum shorebird feeding habitat has developed new tenets in the last decade (Helmers 1992). While habitat managers are fairly confident they have the knowledge and tools to create highly functional migratory staging habitats, the spectre of avian botulism continues to confound these efforts in late summer. Intensive research is required to push water level management to the thin margin of safety such that southbound shorebirds may be afforded the best refueling resources possible without placing them and other waterfowl at undue risk of death by botulism. Identifying the edge of the "envelope" will require creative thinking, some degree of latitude to widely experiment, and a lack of fear of failure. Such an endeavor could also require extensive pubic involvement and education to prevent negative public backlash to experimentation results.

Further Reading

Alberico 1993
Gibson 1971
Helmers 1992
Robinson et al. 1997

SPECIES PROFILE 4. WETLANDS AND LAKES

BLACK TERN

Chlidonias niger

Distribution

The Black Tern inhabits both Eurasia and North America. Its North American range extends from central British Columbia to northern Ontario, south to northern Nevada across to Kentucky. In Nevada, the Black Tern nests on shallow lakes and wetlands from Sheldon NWR to Ruby Lakes NWR south to Mason Valley WMA in western Nevada. It winters south of the U.S. border.

Habitat

The Black Tern prefers marshes in very fresh water, typically characterized by cattail (*Typha* sp.) and/or spikerush (*Eliochorus* sp.), but can also be found in more saline marshes typified by hardstem bulrush (*Scirpa acuta*) and submergent pondweeds such as sago pondweed. Black Terns seem to especially prefer spikerush marshes such as those typically found in the Modoc region of northeastern California. Distribution can shift as wetland conditions change.

Physical Factors

The Black Tern is suspected to be quite sensitive to water quality and pesticide accumulation. Freshwater marshes of the preferred water chemistry occur in the areas of primary water delivery on managed wetlands such as Carson Lake and Stillwater NWR. Where salts and dissolved solids begin to accumulate in the terminal reaches of these wetland systems, the Black Tern may feed on aquatic insects in their emergent phases, but tend to avoid salty water when nesting. Preferred nesting conditions can occur on slow-moving river systems such as portions of the Quinn River, or on playas with volcanic substrates such as is found in northern Washoe County (Mosquito Lake; Duck Flat).

Landscape Factors

The freshwater marshes Black Terns prefer occur naturally along the northwestern edge of the state in north Washoe County where playa bottoms are higher in elevation, receive mostly fresh runoff, and often have volcanic substrates. Other suitable nesting sites are usually created by a flush of very fresh water through river channel marshes or the primary delivery areas of terminal wetlands. At Ruby Lakes NWR, fresh water is supplied both by snowmelt and spring outflow in the marsh itself. Black Terns nest in loose colonies. Distance between nests within colonies at Eagle Lake, California (Gould 1974) averaged 8.5 meters apart and varied from 3.6 to 30.5 meters apart.

Special Considerations

The Black Tern feeds on insects which it takes while on the wing either from the air, water, or ground. It will feed on tiny fishes and crustaceans when available. It typically nests in loose colonies in marshes, using floating vegetation, downed tules, or muskrat houses as platforms. Three eggs are laid between May and August and incubated 21 to 22 days. Nest and chick defense by the parents is vigorous. Young fledge 21 to 28 days after hatching. Black Terns live up to 17 years.

Formerly more common in Lahontan Valley, the Black Tern is presently most common on the western edge of the Great Basin in northeastern California and at Ruby Lakes NWR. More study of its sensitivity to water quality and pesticides is probably warranted.

Associated Species

Black-necked Stilt
Least Bittern
American Bittern
Franklin's Gull
Forster's Tern

Priority Considerations

No Breeding Bird Survey data exist for Black Terns in the Basin and Range province, and BBS data for the Columbia Plateau is contradictory and inconclusive (Sauer et al. 1998). The best current information for the species exists in Shuford (1998). In his status assessment, Shuford reported that the species had exhibited a 61 percent decline in the U.S. and Canada between 1966 and 1996, with most of the decline occurring in Canada. Shuford reported that populations stabilized after 1980 and the trend actually seemed to have reversed somewhat in the 1990's. Shuford concluded that, since population declines had leveled off and the species was still found in most of its former range, listing as Threatened or Endangered in either Canada or the U.S. was not warranted. Still, because anecdotal reports from many of its past areas of concentration in Nevada suggest an unmeasured decline, and because national concern for the species remains high, the Nevada Working Group has selected the Black Tern for priority focus for the purposes of this planning effort.

OBJECTIVE: Maintain a stable or increasing population trend of breeding Black Terns in Nevada by 2004.

Strategy: Initiate priority management actions for breeding Black Terns at the following important population centers -- Ruby Lakes NWR, Stillwater NWR, Carson Lake. Determine if other important breeding sites exist and initiate priority management activity on newly defined sites where possible.

Action: Initiate intensive monitoring of nesting activity and productivity on priority management sites.

Action: Collect baseline contaminant residue information from as many nesting colonies across the state as possible.

Action: Conduct a comprehensive statewide survey of potential nesting sites using professional and volunteer personnel. Create an atlas of significant breeding sites in Nevada.

Action: Where significant nesting sites are found on private lands, initiate negotiations with land owners for the purpose of creating conservation easement agreements to protect nesting sites.

Action: Initiate intensive habitat preference investigations for the purpose of developing a viable habitat model for use by wetland managers.

Assumptions - Research and Monitoring Needs

The Black Tern objective for wetland habitats assumes that Black Tern populations have declined or are declining in Nevada. Specific status and trend information for Black Terns in Nevada should be generated before adjusting management strategies. The objective assumes that Black Terns prefer ultra-fresh wetland habitats and may be susceptible to contaminant loading. Research and monitoring specific to contaminant presence in Black Tern eggs and tissues should be conducted to verify or refute this perception. The objective assumes that there may be (but not likely) other wetland sites in Nevada more important to Black Tern breeding than Ruby Lakes and the Lahontan Valley wetlands. A specific statewide survey of potential sites is critical to the formation of a successful long-range plan to sustain the Black Tern as a breeding species in Nevada.

Opportunities

The assemblage of a skilled citizen-scientist corps such as is ongoing by the Great Basin Bird Observatory will be paramount to gaining the necessary survey coverage to adequately assess population status and trend. The purchase of water rights from willing sellers for the Lahontan Valley wetlands will increase land managers' ability to provide the freshwater marshes necessary to facilitate Black Tern nesting.

Further Reading

Shuford 1998

SPECIES PROFILE 5. WETLANDS AND LAKES

AMERICAN WHITE PELICAN

Pelecanus erythrorhyncos

Distribution

The American White Pelican breeds in widely scattered colonies across the northwestern U.S. east to Minnesota, north to central Saskatchewan and Alberta. In the Great Basin, large colonies occur at Anaho Island in Pyramid Lake, Nevada and on islands in the Great Salt Lake, Utah. Sporadic breeding occurs at Honey Lake, California and Carson Sink, Nevada.

Habitat

White Pelicans nest only on islands that are strictly isolated from land predators. Deep lakes with large islands fill the bill. White pelicans forage for fish in shallow lakes and wetlands where their cooperative dip-feeding techniques can be deployed to best advantage. White Pelicans will commute long distances daily between nesting islands and suitable foraging areas. In Nevada, the distance from Pyramid Lake to Walker Lake, some 145+ km as the pelican flies, is traversed daily or semi-daily without trepidation. Daily commutes to Lahontan Valley (97 km) and the Humboldt Sink (64 km) are more typical.

Physical Factors

White Pelican nest islands must be completely protected by landscape from land predators (basically, surrounded by deep water). Foraging areas typically range between 30 and 60 cm deep. On deep water (over 60 cm), cooperative herding and dipping techniques become useless, at which time individual birds have limited success pirating lost fish from loons and cormorants. Water quality must be sufficient to support fish life.

Landscape Factors

Nest islands must be within commuting distance of productive shallow fishing grounds. Ninety kilometers is a typical commute distance, but commutes up to 145 km will be made when necessary. Again, nest islands must be completely surrounded by terrain (or water) untraversable by land predators.

Special Considerations

While White Pelicans sometimes haul prodigiously large fish (i.e. huge adult carp) to the nesting grounds, they typically thrive on schools of immature carp and tui chub less than 20 cm long. When pressed or when opportunity presents itself, White Pelicans will utilize high biomasses of tiny fishes such as mosquitofish. White Pelicans are skilled soarers and rely on thermal air currents for long-distance travel. During times of extended drought, White Pelican populations are susceptible to die-offs, initiated by a combination of factors, including starvation and heavy parasite loading. Some death to avian botulism occurs annually, but pelicans are not nearly as susceptible as are ducks. Local nesting populations typically cycle through boom-and-bust, with active colonies fluctuating from zero to over 6,000 nesting pairs in just two or three years.

Associated Bird Species

Common Loon
Western Grebe
Clark's Grebe
Double-crested Cormorant
Great Blue Heron
Great Egret
Black-crowned Night Heron
California Gull

Priority Considerations

Because of the relative scarcity of suitable nesting sites, American White Pelicans will always be considered by biologists to be somewhat vulnerable to environmental change, whether natural or man-induced. The Great Basin is estimated to support 18 percent of the world's breeding American White Pelicans (Carter et. al.1998). Because Nevada comprises most of the Great Basin province, and because American White Pelicans are

particularly appropriate indicators of lake health and productivity, they have been selected by the Nevada Working Group for priority focus for the purposes of this planning effort.

OBJECTIVE: Maintain an average of 4,500 nesting pairs of American White Pelicans at Anaho Island in Pyramid Lake, Nevada through 2004.

Strategy: Maintain the protection and viability of the Anaho Island nest site through adequate water level management of Pyramid Lake such that a land bridge from Pyramid Point to Anaho Island would never be exposed. Maintain a variety of shallow fishing sites within easy commuting distance of Anaho Island, including but not limited to: the Truckee River delta; Humboldt Sink; Stillwater NWR; Carson Lake; Lahontan Reservoir; Walker Lake.

Action: Preserve the permanent nongame fisheries of Pyramid Lake, Walker Lake and Lahontan Reservoir. Actively manage the cyclic nongame fisheries of Humboldt Sink, Stillwater NWR, and Carson Lake.

Action: Continue to consult with Fallon Naval Air Station regarding low-altitude jet training routes. Keep training routes out of heavy pelican commuter lanes.

Assumptions - Research and Monitoring Needs

The White Pelican objective of 4,500 nesting pairs was derived from the yearly averages of the past two decades (1980's and 1990's). Peak attendance has ranged as high as 6,500 pairs in the last 15 years. Extended drought is the only anticipated factor which could curtail the attainment of the stated objective through 2004. Monitoring of the nest colony is a standard work program item for Stillwater NWR personnel, and no supplementation of that effort is anticipated.

Opportunities

Successful management of the American White Pelican resource in western Nevada is considerably less complex than rocket science as long as the general integrity of the landscape is preserved. The pelicans have been "doing their thing" since well before Early Man first appeared on their shores, and there is every indication that they will continue to do so given a modicum of space in which to operate and thrive.

Further Reading

Anderson 1982
Knopf and Kennedy 1980
USFWS 1950-98
USFWS 1984

SPECIES PROFILE 6. WETLANDS AND LAKES

CLARK'S GREBE
Aechmophorus clarkii

Distribution

The Clark's Grebe breeds in two largely disjunct geographic populations. One subpopulation's range is roughly concomitant with the Great Basin, extending from central Oregon east to the Idaho-Wyoming border, south to Grand Junction, Colorado and Green River, Utah, west to the Sierra Nevada (western Nevada). The other subpopulation follows the Great Plains along the Rocky Mountain Front from the Colorado-New Mexico border north through eastern Colorado, Wyoming, and Montana to roughly the international border with Canada. In Nevada, Clark's Grebe breeds on most suitable wetland habitats throughout the state, and winters in sizeable concentrations on Walker Lake and Lake Mead.

Habitat

Clark's Grebes are in most respects identical in habitat preference to Western Grebes, seeking out their breeding sites in shallow wetlands with fully-developed emergent and submergent vegetation communities and abundant populations of small fish. Clark's Grebes build their nests on a platform woven from cattails and bulrush which may be piled above water level from the submergent substrate, or may float while attached to a sturdy clump of emergent vegetation. Clark's and Western Grebes convene in large, loosely associated flocks on Nevada's deep lakes during migration and winter, where they probe the depths for small fish. On the lakes, no vegetation is necessary – open water being their safety and refuge.

Physical Factors

Clark's Grebes require water of sufficient quality to sustain small fish. Since their nesting cycle can be delayed until quite late in the summer (some pairs initiating nesting after August 1), Clark's Grebes require stable water conditions that last well into November, sometimes almost to freeze-up.

Landscape Factors

Clark's Grebes are semi-colonial nesters, ranging from isolated pairs to colonies of 100 pairs or more. They will nest in association with Western Grebes. Wetland unit size and prey abundance seem to dictate colony size.

Special Considerations

While much less abundant than Western Grebes range-wide, in western Nevada, breeding Clark's Grebes usually outnumber breeding Western Grebes anywhere from a 60-40 to a 90-10 split. So far as is known, no attempt to derive a total population estimate of Clark's Grebes alone has been attempted.

Associated Bird Species

Common Loon	Great Blue Heron

Western Grebe
Eared Grebe
Double-crested Cormorant
Great Egret
Black-crowned Night Heron
Forster's Tern

Priority Considerations

Because it has been regarded as a separate species for such a short time, the basic status and trend information regarding the world population of Clark's Grebes has yet to be collected. Water bird management aimed toward the species has basically been of a generic nature to benefit both species of *Aechmophorus* grebes, with little need or incentive to individually address either species. Because so little is known about the species' population parameters, and because it is suspected that the Great Basin accounts for a sizeable percentage of the world's breeding population, the Clark's Grebe has been selected by the Nevada Working Group for priority focus for the purposes of this planning effort.

OBJECTIVE: Maintain stable or increasing populations of breeding Clark's Grebes throughout their range in Nevada through 2004.

Strategy: Within managed wetlands, maintain units of semi-permanent marsh with well-developed emergent and submergent plant communities, abundant populations of small fish, and relatively stable water levels from May 1 through November 15.

Action: Monitor nest phenology and adjust water plans to accommodate nesting underway through to fledging date.

Action: Initiate coordinated census to derive a total breeding pair estimate for Nevada.

Action: Coordinate annual habitat management objectives of the important colony sites in Nevada with other important Great Basin sites e.g., Bear River, Malheur, Lower Klamath, etc. Review annual reproduction performance and plan at an ecoregional scale.

Action: Coordinate management and monitoring activities of Nevada's major colony sites with national colonial waterbird planning efforts likely to be developed through the five-year planning period.

OBJECTIVE: Maintain important staging and wintering bodies of water to accommodate as much as 90 percent of the Great Basin Clark's Grebe subpopulation through 2004.

Strategy: Maintain abundant fish populations in Walker Lake, Lake Mead, and other bodies of water that might be identified as important staging and wintering sites during the planning period.

Action: Conduct periodic censuses of staging and wintering waters using professional and volunteer personnel.

Assumptions – Research and Monitoring Needs

The Clark's Grebe objectives for Nevada's wetlands and lakes assume that stable or increasing breeding populations are achievable for the species in Nevada. More information regarding basic population ecology and connectivity of the various subpopulations is necessary to fine-tune management objectives in the next round of planning; however, except for the long-term viability of the Walker Lake fishery, few pressing issues seem to be affecting the well-being of this species.

Opportunities

The accumulation of purchased water rights for the Lahontan Valley wetlands will increase opportunities for wetland managers to provide optimum breeding habitats.

Further Reading

Storer and Nuechterlein 1985

SPECIES PROFILE 8. WETLANDS AND LAKES

LONG-BILLED CURLEW

Numenius americanus

Distribution

The Long-billed Curlew breeds on the western Great Plains from eastern New Mexico, Colorado, the Dakotas and Montana to southern Saskatchewan and Alberta; also the Great Basin from central Nevada, northwestern Utah, southern Idaho, eastern Oregon and Washington north to southern British Columbia. It winters in the Central Valley of California, along the Texas Gulf Coast, and in Florida. In Nevada, the Long-billed Curlew is a confirmed breeder at Sheldon NWR in northern Washoe County, Ruby Lake NWR in Elko County, Lahontan Valley in Churchill County, and Fish Creek Ranch in Eureka County.

Habitat

Long-billed Curlews prefer closely cropped grasslands, pastures, wet or dry meadows (but usually associated with water), either on the fringe of a marsh or in a meadow or broad riverine floodplain such as the Humboldt River. Brooding habitat is improved by intermittent patches of tall, dense foliage (>20 cm high; <1 hectare in size; approximately five percent of the total area) for escape cover and feeding habitat for chicks (Jenni et al. 1982). Non-breeding feeding areas include irrigated pastures and croplands, shallow wetlands, and newly plowed fields.

Physical Factors

The Long-billed Curlew seeks out flat areas that seasonally or perennially collect water from 3,500 feet elevation on central Nevada valley floors to well over 6,000 feet in montane meadows. Available water can be alkaline, salty or fresh.

Landscape Factors

Breeding territories are established by the last week in April. In a Utah study, Long-billed Curlew nests were spaced no closer than 457 meters apart. Brood home ranges varied between 176 hectares and 464 hectares in Idaho (Jenni, et al. 1982). Long-billed Curlews respond positively to moderate to heavy grazing (Jenni, et al. 1982).

Special Considerations

Curlew chicks forage for terrestrial insects. The openness of their preferred habitat makes curlews vulnerable to nest and chick predation by canines and corvids. Some authors suggest that the species has declined in its nesting range as grassland has been converted to agriculture.

Associated Species

Horned Lark
Western Meadowlark
Willet
Killdeer
Common Snipe

Priority Considerations

The Long-billed Curlew continues to be a species of elevated national concern, although trends seem to be static in the Basin and Range and Columbian Plateau provinces. Because of continued nationwide concern for this species, the Nevada Working Group has selected the Long-billed Curlew for priority consideration in this plan.

Objective: Maintain current breeding distribution and densities for Long-billed Curlews in northern and central Nevada through 2004.

Strategy: Maintain closely cropped pasture lands associated with wetlands, wet meadows, or vegetated playas as part of an overall landscape management strategy designed to provide biological diversity on a spatial or temporal scale.

Action: In appropriate areas, graze pastures down to stubble heights less than 20 cm (eight inches), with scattered patches of residual vegetation greater than 20 cm for the duration of nesting and brooding (May 1 to July 15). This allows for general freedom of movement of adults with their extremely long bills, while also providing escape cover for broods.

Action: Where appropriate, place Long-billed Curlew nesting sites on a

rotational schedule that allows for periodic site recuperation and the achievement of other, possibly conflicting wildlife outputs. Manage rotations and outputs at a landscape scale.

Strategy: Determine distribution and breeding densities of Long-billed Curlews throughout their range in Nevada.

Action: Analyze Breeding Bird Atlas data for nesting distribution.

Action: Conduct pair density surveys at the majority of nesting sites. Calculate a breeding pair population estimate based on coordinated survey data.

Assumptions - Research and Monitoring Needs

The Long-billed Curlew objective for wetlands assumes that the present distribution and breeding density of Long-billed Curlews in the state are sufficient to maintain healthy, self-sustaining populations. For the purposes of contributing to the national status and trend picture for this species, a comprehensive survey should be conducted and a breeding pair estimate calculated for the state.

Opportunities

Management for Long-billed Curlews tends to conflict with several wildlife management paradigms that operate from a frame of reference that overgrazing by livestock is generally detrimental to wildlife. For this reason, sometimes it is difficult for wildlife managers to embrace the Long-billed Curlew as a "flagship" species of concern. The interjection of Long-billed Curlew management objectives into a landscape management scheme requires range and wildlife managers to work together in designing closely-monitored grazing treatments aimed at achieving multiple commodity and wildlife outputs deployed over both spatial and temporal scales. This encourages land managers to look at their landscape as more than a one-output-year-after-year system. With time, this expanded approach to landscape management should lead to systems functioning more naturally, greater biodiversity distributed over space and time, and a deeper understanding of the landscape itself.

SPECIES PROFILE 9. WETLANDS AND LAKES

SHORT-EARED OWL
Asio flammeus

(For a Species Profile of Short-eared Owl, please refer to the Montane Parkland habitat section.)

OBJECTIVE: Maintain present occurrence and distribution of breeding short-eared owls in suitable habitat throughout their range in nevada through 2004.

Strategy: Maintain residual stands of emergent marsh vegetation through natural or man-induced dry cycles for the purpose of building vole populations into

abundant food sources, particularly during the breeding season from March 1 through July 1.

Action: Whenever possible, allow residual stands of bulrush/cattail to stand on dry units through the breeding season without the implementation of mechanical breakdown or fire.

Action: Highlight recognition of dry cycling as one of the natural processes of wetland management complete with its own unique wildlife outputs.

Action: Survey and identify significant winter roosts receiving repeated annual use. Document in a winter roost atlas and negotiate appropriate protection measures for long-term viability of these sites.

Assumptions – Research and Monitoring Needs

The Short-eared Owl objective for wetlands assumes that the present occurrence and distribution of breeding Short-eared Owls is sufficient to maintain healthy, self-sustaining populations in Nevada. The Nevada Working Group recognizes the periodic nature of Short-eared Owl breeding and wishes to emphasize the concept of taking advantage of favorable conditions when Nature presents them. Significant winter roosts often occur in agricultural areas. Local publicity coupled with responsible viewer ethics could develop sites into nature tourism points of interest of considerable value to local communities.

Opportunities

The opportunity to inform farmers and other landowners about the importance of their lands to Short-eared Owls, whether wintering or breeding, may exist through cooperative extension programs.

Further Reading

(See Species Profile under Montane Parkland habitat section.)

OTHER PRIORITY SPECIES: WETLANDS AND LAKES

SANDHILL CRANE
Grus canadensis

While Sandhill Cranes are often encountered in wetlands as described in this section, the management principles for each are not significantly different in wetlands than they are for lowland floodplain lands under agricultural production. For Species Profiles, objectives, strategies, assumptions and opportunities, please refer to the Agricultural Lands habitat section.

HABITAT MANAGEMENT SUMMARY: WETLANDS AND LAKES

Within the profession of wildlife management, wetland habitat management likely stands

as the most intensely studied, most highly developed of disciplines with regard to techniques of manipulation and output. Most of the strategies and techniques suggested in this plan are techniques already familiar to most wetland habitat managers. Wetland biologists are highly trained in the principles of water level management and the deployment of vegetative manipulation tools such as spraying and livestock grazing. New understanding is also developing regarding the processes which influence contaminant deposition and ways to manage them.

Beyond a facultative knowledge of the "nuts and bolts" of wetland habitat manipulation, however, the keys to successful wetlands habitat management in Nevada lie in accepting and understanding three very important principles. One is the cyclic nature of the variety of wetland habitat types possible at any one site. Wetlands are highly dynamic, and many wetland breeding birds exhibit breeding and survival strategies which are adapted to and capable of exploiting short-term habitat conditions. While wildlife professionals have amassed a formidable body of knowledge regarding wetland habitat manipulation and management, in the Great Basin wetland habitat managers all too often find their best-laid plans overwhelmed and thwarted by the larger climatic cycles in play. It may be unrealistic for wetland managers in the Great Basin to expect to provide all types of bird habitats on all landscapes all the time. It may be more important for managers to understand where they are in the wetland cycle for their particular site, what the particular wildlife outputs are for this particular habitat expression, and what is likely next or in the near future regarding habitat expression on this site given the likely progression of climatic projections. Most artificial schemes designed to thwart or otherwise rearrange natural wetland rhythms generally meet with failure or pay prices in arrears somewhere down the line.

The second principle of understanding of primary importance to wetland managers in the Great Basin is to recognize the connectivity of wetland sites throughout the region as demonstrated by the birds themselves. Most Great Basin wetland breeding birds are highly mobile and seemingly maintain "knowledge" of wetland conditions on a broad regional scale. As wet and dry climatic conditions affect different portions of the region in different ways, wetland breeding birds seem to have an uncanny knack for finding the suitable habitat which will satisfy their needs. In addition, juxtaposition of a variety of wetland habitat types is also important. American White Pelicans breeding on an island in a deep terminal lake need shallow wetlands full of fish to facilitate their "herd and dip" feeding behavior. Clark's Grebes nesting in shallow tule marshes need deep terminal lakes full of fish for staging and refueling during migration. American Avocets nesting in freshly flooded saltgrass pastures are attracted to supersaline playas for feeding on a specialized, but highly prolific invertebrate fauna. Understanding that wetland birds are reacting to wetland sites on a broad geographic scale should inspire wetland managers scattered across the region to coordinate their management efforts more closely with one another, with special attention paid to the population status and trend and breeding needs of several of the species highlighted in this plan. Successful management of wetland birds on a broad geographic scale will require cooperative problem-solving and a pooling of knowledge and resources hitherto unattempted except for a very select few high-profile species.

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