UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802- 4213

MAY 17 2007

MEMORANDUM

TO: Rodney R. McInnis
Regional Administrator

FROM: Diane Windham, PRD Recovery Coordinator
California Central Valley Recovery Domain

SUBJECT: 2007 Recovery Outline for the Evolutionarily Significant Units of Winter-run and Spring-run Chinook Salmon *(Oncohynchus tschawytcha)*, and the District Population Segment of California Central Valley Steelhead *(O. mykiss)*

This memorandum request official review and approval by the Regional Administrator, Rodney R. McInnis, of the attached "2007 Federal Recovery Outline for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon, Central Valley and Spring-run Chinook Salmon and the District Population Segment of California Central Valley Steelhead" in accordance with the NMFS Interim Recovery Planning (July 2006). This also serves a notice to Headquarters that a two-week period for review of the Outline has begun. If Headquarters does not provide comments within two weeks, and the Regional Administrator has no additional comments, it may assumed that the Outline can be approved and signed by the Regional Administrator. A copy of the approved Recovery Outline should be forwarded to the Recovery Coordinator and Headquarters with 10 days following the Regional Administrator's approval.

For any questions please contact Diane Windham at 916-930-3619

Rodney R McInnis 5-31-07 X

Rodney R. McInnis Regional Administrator	Date	Concur	Do Not Concur

2007 Federal Recovery Outline for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead

Prepared by
The National Marine Fisheries Service
Southwest Region
Sacramento Area Office

Disclaimer

This outline is meant to serve as an interim guidance document to outline recovery efforts, including recovery planning for the Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon Evolutionarily Significant Units and the Central Valley steelhead Distinct Population Segment, until a full recovery plan is developed and approved. A recovery outline is not subject to public review but intended primarily for internal use by NMFS as a pre-planning document. This is not a regulatory document and the recommendations and statements found herein are non-binding and are intended to guide, rather than require, actions. Nothing in this outline should be considered as a commitment or requirement for any governmental agency or member of the public. Formal public participation will be invited upon the release of the draft recovery plan for these Evolutionarily Significant Units and Distinct Population Segment. However, any new information or comments that members of the public may wish to offer as a result of this recovery outline will be taken into consideration during the

recovery planning process. Recovery planning has been initiated and recovery plans are targeted for completion by 2008. NMFS invites public participation in the planning process through participation in a series of public workshops, accessing information posted on NMFS' and other appropriate web pages. Interested parties may contact Diane Windham, Central Valley Domain Recovery Coordinator, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814.

Purpose and Overview

The Federal Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*) mandates the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) to develop and implement plans for the conservation and survival of NMFS listed species, *i.e.*, recovery plans. According to the NMFS Interim Recovery Planning Guidance (2004):

Recovery is the process by which listed species and their ecosystems are restored and their future safeguarded to the point that protections under the Federal ESA are no longer needed. A variety of actions may be necessary to achieve the goal of recovery, such as the ecological restoration of habitat or implementation of conservation measures with stakeholders. However, without a plan to organize, coordinate and prioritize the many possible recovery actions, the effort may be inefficient or even ineffective. The recovery plan serves as a road map for species recovery – it lays out where we need to go and how best to get there. According to the ESA §4(f), recovery plans must contain: (1) objective measurable criteria for delisting the species; (2) site-specific actions; and, (3) estimates of the time and cost for implementing the recovery plan.

Primarily, a recovery plan should do the following:

- Delineate those aspects of the species' biology, life history, and threats that are pertinent to its endangerment and recovery;
- Outline and justify a strategy to achieve recovery;
- Identify the actions necessary to achieve recovery of the species; and
- Identify goals and criteria by which to measure the species' achievement of recovery.

Recovery plans can also serve the following secondary functions:

- Serve as outreach tools by articulating the reasons for a species' endangerment, as well as why the particular suite of recovery actions described is the most effective and efficient approach to achieving recovery for the species;
- Help potential cooperators and partners understand the rationale behind the recovery actions identified, and assist them in identifying how they can facilitate the species' recovery;
- Serve as a tool for monitoring recovery activities; and,

- Be used to obtain funding for NMFS and its partners by identifying necessary recovery actions and their relative priority in the recovery process.

Recovery plans are guidance documents, not regulatory documents. The ESA clearly envisions recovery plans as the central organizing tool for guiding each species' recovery process. They should also guide Federal agencies in fulfilling their obligations under section 7(a)(1) of the ESA, which calls on all Federal agencies to "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act." In addition to outlining strictly proactive measures to achieve the species' recovery, the recovery plans provide context and a framework for implementation of other provisions of the ESA with respect to a particular species, such as section 7(a)(2) consultations on Federal agency activities or development of Habitat Conservation Plans.

As part of the pre-planning phase of recovery planning, policy guidance (NMFS 2004a) requires the development of a Recovery Outline. A recovery outline is intended primarily for internal use by NMFS as a pre-planning document that: (1) presents a preliminary conservation strategy to guide recovery actions in a systematic and cohesive manner until a recovery plan is available, and (2) provides a pre-planning framework for recovery plan development and decision-making.

The NMFS Southwest Region Protected Resources Division in Sacramento, California (SWR Sacramento), is responsible for facilitating the development of recovery plans for the following listed salmon Evolutionarily Significant Units (ESUs): Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*) and Central Valley spring-run Chinook salmon *(O. tshawytscha*), and the following Distinct Population Segments (DPSs): Central Valley steelhead (*O. mykiss*), and Southern North American green sturgeon (*Acipenser medirostris*). The NMFS Strategic Plan for 2005 established a high priority focus on recovery plan development over the next five years. SWR Sacramento will proceed with recovery planning by developing a multi-species recovery plan for Central Valley salmonids consisting of Sacramento River winter-run Chinook salmon ESU, Central Valley spring-run Chinook salmon ESU, and Central Valley steelhead DPS. A recovery plan for the North American green sturgeon will be developed in the future.

This recovery outline has been developed to guide the recovery planning process for the Central Valley Salmonid ESUs and DPS and provide public notice of NMFS' intent to prepare a draft recovery plan.

Introduction

Species' Names, Listing Status, and Dates Listed

1. Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawystcha*), listed as threatened on November 5, 1990 (55 FR 46515), reclassified as endangered on January 4, 1994 (59 FR 440), and reaffirmed as endangered on June 28, 2005 (70 FR 37160).

2. Central Valley spring-run Chinook salmon (*Oncorhynchus tshawystcha*), listed as threatened on September 19, 1999 (64 FR 50394), and reaffirmed as threatened on June 28, 2005 (70 FR 37160).

3. Central Valley steelhead (*Oncorhynchus mykiss*), listed as threatened on March 19, 1998 (63 FR 13347), and reaffirmed as threatened on January 5, 2006 (71 FR 834).

Lead Field Office/Contact Biologist

Central Valley Recovery Domain, Diane Windham, Recovery Coordinator, NMFS, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814; (916) 930-3600; fax: (916) 930-3629.

Recovery Status Assessment

Range

1. The *Sacramento River winter-run Chinook salmon ESU* includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries as well as two artificial propagation programs: winter-run Chinook salmon from the Livingston Stone National Fish Hatchery and winter-run Chinook salmon in a captive broodstock program maintained at Livingston Stone National Fish Hatchery (70 FR 37160, June 28, 2005; Figure 1). Designated critical habitat for Sacramento River winter-run Chinook salmon includes: the Sacramento River from Keswick Dam (River Mile, or RM, 302) to Chipps Island (RM 0) at the westward margin of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, all waters of San Pablo Bay north of the San Francisco/Oakland Bay Bridge (59 FR 440, January 4, 1994).

2. The *Central Valley spring-run Chinook salmon ESU* includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California, including the Feather River (64 FR 50394, September 16, 1999; Figure 2). One artificial propagation program, the Feather River Hatchery spring-run Chinook salmon program,

is considered part of the ESU (70 FR 37160, June 28, 2005). Designated critical habitat for Central Valley spring-run Chinook salmon ESU includes 1,158 miles of stream habitat in the Sacramento River basin and 254 square miles of estuary habitat in the San Francisco-San Pablo-Suisun Bay complex (70 FR 52488, September 2, 2005).

3. The *Central Valley steelhead DPS* includes all naturally spawned populations of steelhead in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries (63 FR 13347, March 19, 1998; Figure 3). Two artificial propagation programs are considered to be part of the DPS: the Coleman National Fish Hatchery and Feather River Hatchery steelhead hatchery programs. Designated critical habitat for Central Valley steelhead ESU includes 2,308 miles of stream habitat in the Central Valley and an additional 254 square miles of estuary habitat in the San Francisco-San Pablo-Suisun Bay complex (70 FR 52488, September 2, 2005).

Independent Populations

Populations of salmon and steelhead that have minimal demographic influence from adjacent populations and are viable-in-isolation have been classified as functionally independent populations. Figures 1-3 show the current and historical distribution, including the current range of independent populations, of Sacramento River winter-run and Central Valley spring-run Chinook salmon, and Central Valley steelhead. Independent and dependent populations are further discussed in subsequent sections of this outline.

Figure 1. Current and historical distribution of the Sacramento River winter-run Chinook salmon ESU.

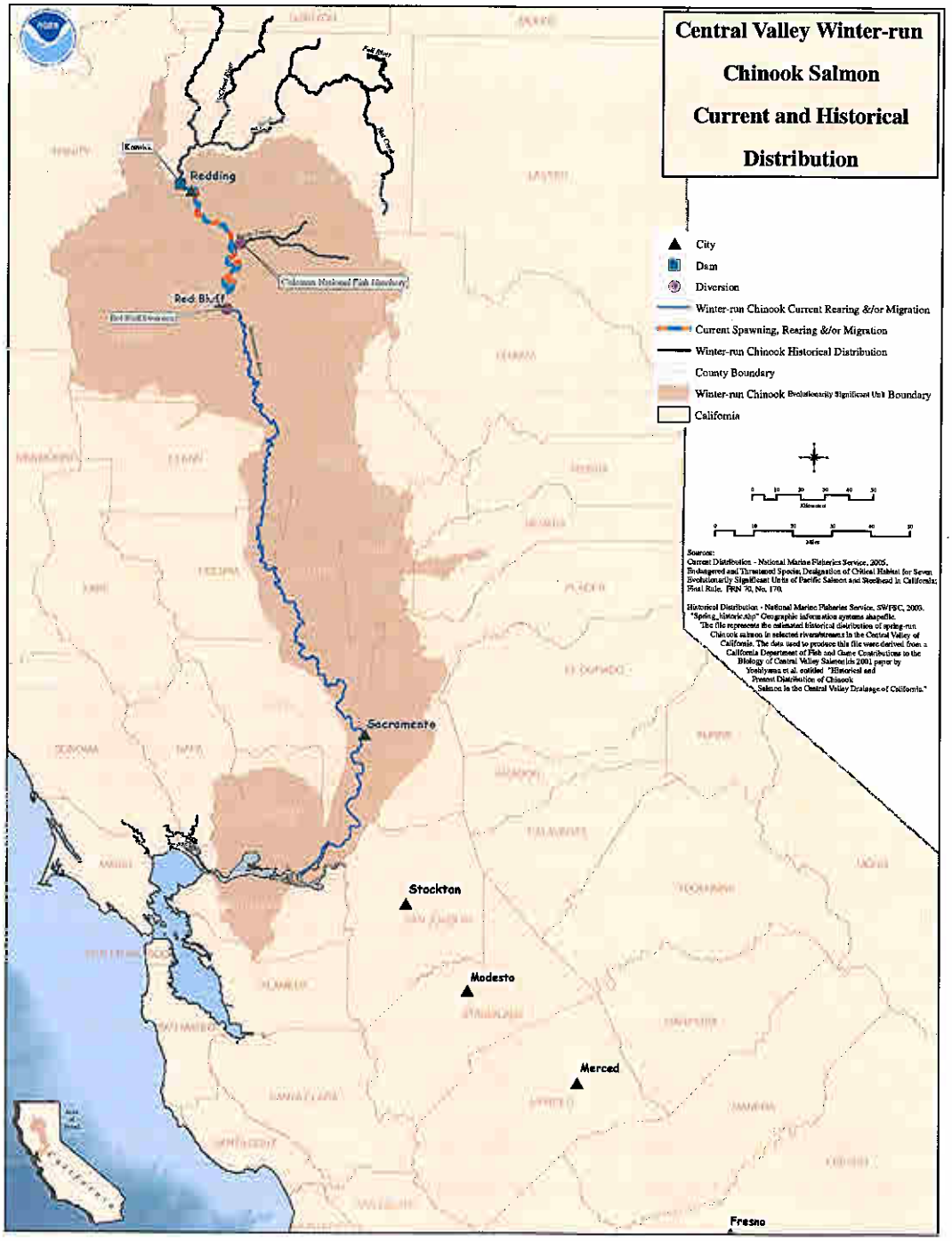


Figure 2. Current and historical distribution of the Central Valley spring-run Chinook salmon ESU.

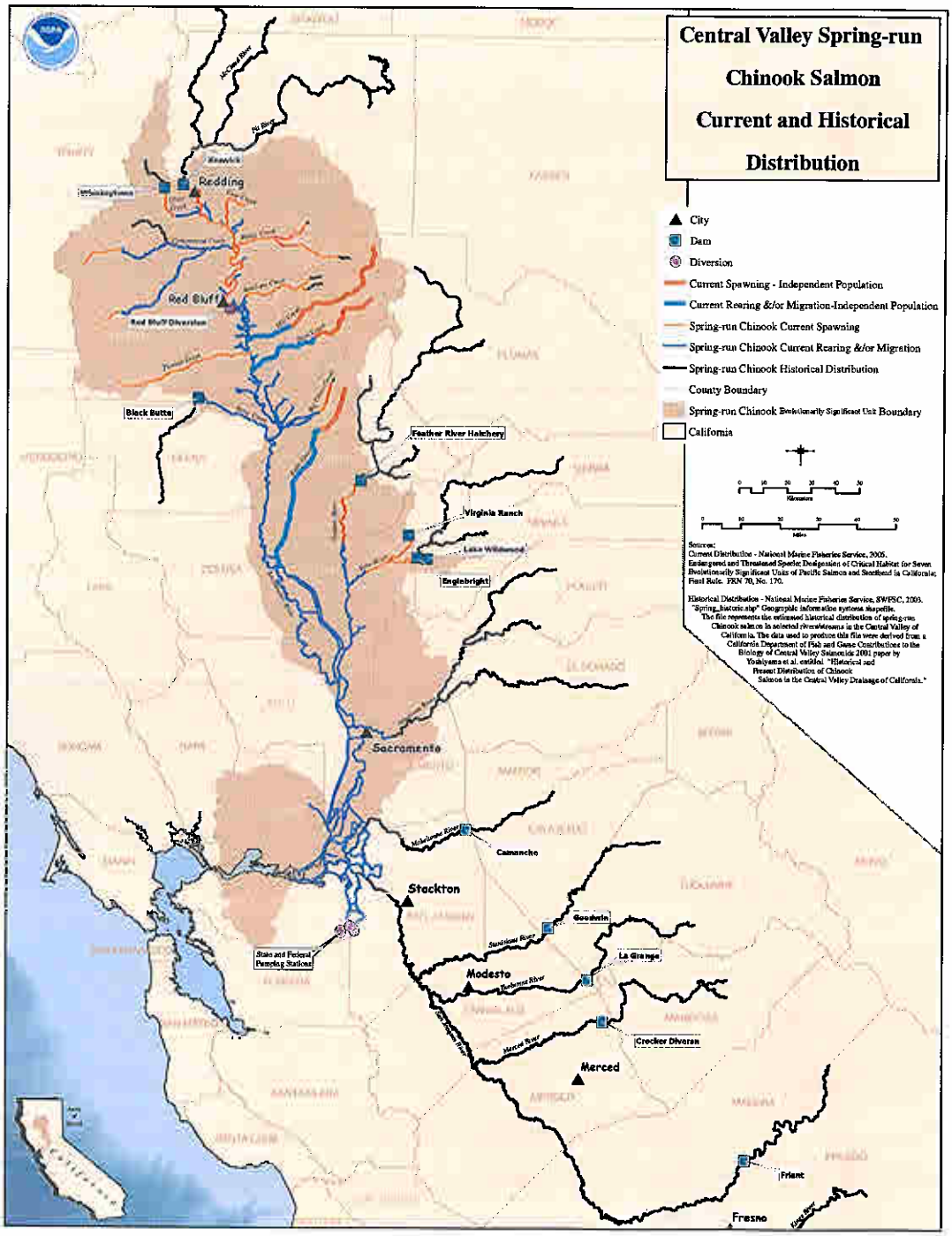
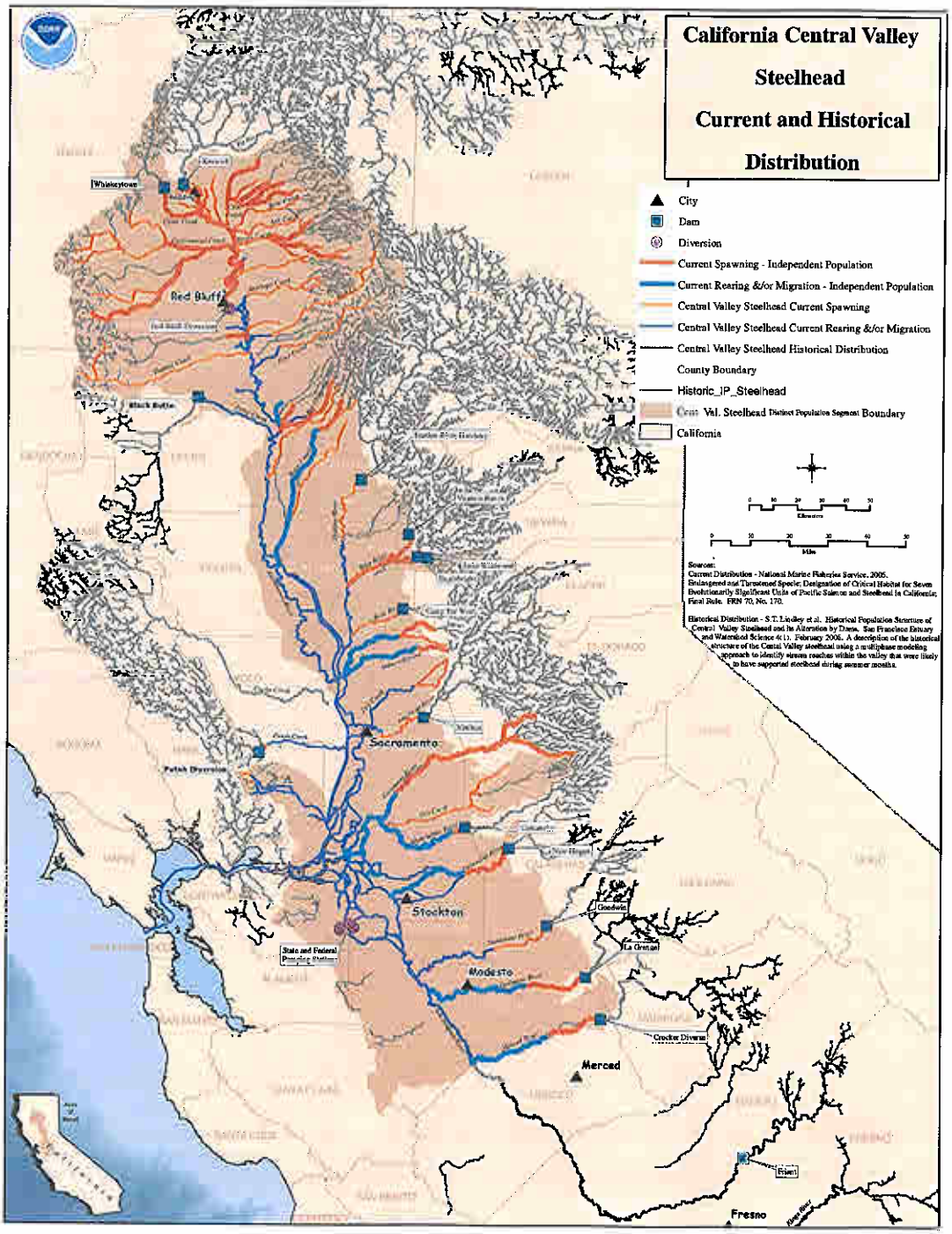


Figure 3. Current and historical distribution of the Central Valley steelhead DPS.



Status

The status of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon, and Central Valley steelhead were formally assessed by NMFS' Biological Review Team (BRT) in 1998 (Myers et al. 1998) and the status reviews of the ESUs were updated most recently by Good et al. (2005).

1. For the *Sacramento River winter-run Chinook salmon ESU*, which has only one independent population, Good et al. (2005) concluded the Sacramento River winter-run Chinook salmon ESU remains endangered. The recommended endangered status was based on the lack of diversity within the ESU, as well as the BRT's concerns regarding the ESU's spatial structure, abundance and productivity criteria as identified by NMFS' Salmonid Viable Populations guidelines (McElhany et al. 2000).

2. For the *Central Valley spring-run Chinook salmon ESU*, the BRT was concerned about the loss of diversity in the ESU caused by the extirpation of spring-run Chinook salmon populations from most of the Central Valley, including the San Joaquin River tributaries, as well as the close proximity of the remaining independent populations (Good et al. 2005). After completing the status review, NMFS formally reconfirmed the threatened status of Central Valley spring-run Chinook salmon on June 25, 2005.

3. The status of *Central Valley steelhead* was formally assessed by the BRT in 1996 (Busby et al. 1996). Information about Central Valley steelhead distribution, abundance, and productivity is very limited and further complicated by the overlap and interchangeability of anadromous and resident life forms of *O. mykiss*. Based on the little information available about Central Valley steelhead, the BRT was highly concerned that there continues to be a decline in total abundance and in the proportion of wild steelhead in the ESU. Other major concerns included the loss of the vast majority of historical spawning areas above impassable dams, the lack of status and trends data for steelhead, and the significant out-of-basin-origin stocks produced by Nimbus and Mokelumne Hatcheries. After completing the updated status review (*i.e.*, Good et al. 2005), NMFS formally reconfirmed the threatened status of Central Valley steelhead on January 5, 2006.

Historical Demographic and Genetic Structure

The ESA requires that recovery plans for listed species include objective, measurable criteria that can be used to determine when species can be removed from the list. These criteria must include both an explicit analysis of threats under the five listing factors (as described in the Threats - Listing Factors Assessment section below), in addition to evaluation of population or

demographic parameters. The Central Valley Domain Technical Recovery Team (TRT) is responsible for developing the viable salmonid population criteria for recovery planning.

The TRT described the historical populations of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon ESUs in the Central Valley (Lindley et al. 2004). The authors considered geography, migration rates, genetic attributes, life history diversity, population dynamics, and environmental characteristics in grouping the populations into independent populations and dependent populations. For the Central Valley steelhead DPS, Lindley et al. (2006; Table 1) identified historical independent populations based on a model that identifies discrete habitat and interconnected habitat patches isolated from one another by downstream regions of thermally unsuitable habitat.

Independent populations of Chinook salmon were identified based on three criteria: (1) basin isolation, (2) basin size, and (3) substantial genetic differentiation within the basin. For the basin's isolation criterion, watersheds within a critical dispersal distance of at least 50 km in the same ecoregion were grouped together. For the basin size criterion, watersheds with an area greater than 500 km^2 were considered capable of supporting independent populations. For the genetic differentiation criterion, there should exist significant environmental differences among the basins inside of the distance criterion.

Dependent populations are populations that would not exist without immigration from neighboring populations. Dependent populations play a valuable role in the viability of the ESU by linking other populations as well as containing valuable genetic traits.

1. *Sacramento River winter-run Chinook salmon.* Lindley et al. (2004) identifies four historically independent populations of Sacramento River winter-run Chinook salmon in the Central Valley. The four populations met two criteria for independence: basin isolation and minimum basin size. The historically independent populations were: Little Sacramento River, Pit-Fall-Hat Creek, McCloud River, and Battle Creek. The first three basins are blocked by Shasta and Keswick Dams, and access to Battle Creek has been blocked by the Colman National Fish Hatchery weir and various hydropower dams and diversions. Currently, there is one independent population that inhabits the area of cool water between Keswick Dam and Red Bluff. This particular area was not historically used by winter-run Chinook salmon for spawning.

2. *Central Valley spring-run Chinook salmon.* Lindley et al. (2004) identifies 18 historical populations for Central Valley spring-run Chinook salmon:

Independent Populations

Little Sacramento River
Pitt-Fall-Hat Rivers
McCloud River
Battle Creek
Butte Creek
Mill and Deer Creeks (TRT will analyze either as one or two populations)
North Fork Feather River
West Branch Feather River
Middle Fork Feather River
South Fork Feather River
Yuba River
North and Middle Forks American River
South Fork American River
Mokelumne River
Stanislaus River
Tuolumne River
Merced River
San Joaquin River

Each of these independent populations meets two of the three criteria for independence: basin isolation and minimum basin size. Two populations additionally met the third criterion of substantial genetic differentiation: Butte Creek and Mill and Deer Creeks. Currently, there are only three independent populations of spring-run Chinook salmon. They inhabit Butte Creek, Mill Creek, and Deer Creek.

Four dependent populations are also identified:

Dependent Populations

Kings River
Big Chico, Antelope, Clear, Thomes, Cottonwood, Beegum and Stony Creeks

The Kings River basin is frequently inaccessible to anadromous fish. The other basins of dependent populations do not have enough habitat for spring-run Chinook salmon to persist in isolation.

3. *Central Valley steelhead.* Historically, *O. mykiss* was once widespread throughout the Central Valley, but was less abundant in the San Joaquin River tributaries than Sacramento River tributaries because of the presence of natural barriers. Currently, the Sacramento River appears

to be the main source of steelhead production in the Central Valley. *O. mykiss* has patchy distribution throughout the Central Valley due largely to the effects of high summer water temperatures. High summer water temperatures in the Central Valley is an important driver of habitat fragmentation and consequently of population structure. High water temperatures prohibit steelhead from migrating and moving freely among habitat patches.

Lindley et al. (2006) identifies 81 historical independent populations of steelhead in the Central Valley. This figure presumes the populations are isolated by at least 35 km of unsuitable stream habitat. Climate and elevation data suggest there are at least four major subdivisions within the Central Valley steelhead DPS that correspond to: Sacramento River tributaries, Suisun Bay area tributaries, San Joaquin tributaries draining Sierra Nevada, and lower elevation streams draining Buena Vista and Tulare basins.

Table 1. Historical independent populations of steelhead in the Central Valley (Lindley et al. 2006) include:

Independent Population	Basin	Total Stream (km)	Streams
1	American River	1357.1	North Fork Auburn Ravine
2	Antelope Creek	176.5	Cold Fork
3	Battle Creek	122.8	Middle and South Forks
4	Battle Creek	349.1	Knob Gulch, North Fork, Rock Creek
5	Bear River (Feather tributary)	58.5	North Fork
6	Bear River (Feather tributary)	356.1	Long Valley Creek
7	Bear River (Sacramento tributary)	51.5	Digger Creek, South Fork Bear Creek
8	Big Chico Creek	30.9	South Fork
9	Big Chico Creek	46.8	Rock Creek, mainstem
10	Big Chico Creek	114.9	East Branch Mud Creek
11	Butte Creek	29.2	Middle Fork
12	Butte Creek	269.4	Mainstem
13	Cache Creek	1100.0	Deer Creek, Dry Creek, Wolf Creek, mainstem
14	Calaveras River	14.5	Woods Creek
15	Calaveras River	22.8	Mainstem
16	Calaveras River	34.6	San Antonio Creek, San Domingo Creek
17	Calaveras River	71.9	McKinney Creek, O'Neil Creek
18	Caliente Creek	12.4	Indian Creek
19	Caliente Creek	60.5	Tehachapi Creek
20	Caliente Creek	75.8	Walker Basin
21	Chowchilla River	12.9	Mainstem

Independent Population	Basin	Total Stream (km)	Streams
22	Chowchilla River	61.3	Willow Creek, mainstem
23	Clear Creek	255.7	Crystal Creek, mainstem
24	Coon Creek	15.6	Mainstem
25	Coon Creek	38.9	Mainstem
26	Cosumnes River	587.8	Cedar Creek, Middle, South and North Forks
27	Cottonwood Creek	16.8	Mainstem
28	Cottonwood Creek	44.2	South Fork
29	Cottonwood Creek	55.2	Jerusalem Creek, Moon Fork, North Fork Bear Creek
30	Cottonwood Creek	62.4	Duncan Creek, Soap Creek, mainstem
31	Cottonwood Creek	96.8	Wells Creek
32	Cottonwood Creek	121.2	Mainstem
33	Deer Creek (Kaweah tributary)	46.2	Bull Run Creek, Chimney Creek, South Fork
34	Deer Creek (Sacramento tributary)	299.4	Little Dry Creek
35	Del Puerto Creek	33.8	Whisky Creek
36	Elder Creek	59.3	North Fork, mainstem
37	Feather River	14.4	Briscoe Creek
38	Feather River	41.7	Rocky Honcut Creek, Canyon Creek, Concow Creek, Little Butte Creek, Middle Fork, North Fork
39	Feather River	5193.5	Elk Creek, West Branch
40	Fresno River	38.6	Big Creek, North Fork
41	Kaweah River	11.6	South Fork Tule River
42	Kaweah River	20.9	Tyler Creek
43	Kaweah River	42.9	Mainstem
44	Kern River	35.1	North Fork
45	Kern River	532.2	French Gulch, Little Poso Creek, Tillie Creek
46	Kern River	693.0	Fay Creek, Kelso Creek, Marsh Creek
47	Kings River	20.6	South Fork
48	Kings River	123.3	Bitterwater Canyon, South Fork, mainstem
49	Little Cow Creek	33.3	Clover Creek
50	Little Cow Creek	59.4	South Cow Creek
51	Little Cow Creek	83.5	Cedar Creek, mainstem
52	Little Cow Creek	88.5	Glendenning Creek, Old Cow Creek
53	Lone Tree Creek	28.5	East Fork
54	Los Banos Creek	10.2	Middle Fork Tule River
55	Los Gatos Creek	19.5	Mainstem
56	Los Gatos Creek	20.1	Rube Creek
57	Marsh Creek	82.9	South Fork

Independent Population	Basin	Total Stream (km)	Streams
58	McCloud River	1201.2	Nosoni Creek, mainstem
59	Merced River	18.1	Snow Creek
60	Merced River	227.9	Middle Fork, Miami Creek, mainstem
61	Mill Creek	158.7	North Fork Willow Creek
62	Mokelumne River	53.3	Sutter Creek, mainstem
63	Mokelumne River	276.8	North Fork
64	Panoche Creek	11.4	Warthan Creek
65	Paynes Creek	29.9	Beegum Creek
66	Pit River	146.5	Squaw Creek
67	Pit River	3948.0	Potem Creek, mainstem
68	Poso Creek	168.5	Alamo Creek, Indian Creek
69	Putah Creek	982.2	Scott Creek
70	Stanislaus River	218.3	Curtis Creek
71	Stony Creek	184.6	Grindstone Creek, North Fork, South Fork, Salt Creek
72	Stony Creek	237.2	Little Stony Creek, Salt Creek, South Honcut Creek
73	Suisun Bay tributaries, Northern Kelso Creek	573.1	Sullivan Creek, mainstem
74	Sweany Creek	127.6	Jesus Maria Creek
75	Thomes Creek	179.1	Maple Branch Mud Creek
76	Toomes Creek	34.4	Big Dry Creek, mainstem
77	Tuolumne River	323.8	Bear Creek, Corral hollow Creek, Maxwell Creek, Moccasin Creek, mainstem
78	Upper Sacramento River	766.6	Sugarloaf Creek, mainstem
79	Upper San Joaquin River	205.8	Clear Creek, Erskine Creek, Mill Flat Creek, mainstem
80	Yuba River	138.4	Mainstem
81	Yuba River	1077.1	Dry Creek, mainstem

Presently, impassable dams block access to approximately 80 percent of historically available habitat, and these dams block access to all historical spawning habitat for approximately 38 percent of the historic populations of steelhead in the Central Valley.

Biological Assessment

Information about the population structure and the distribution of the ESU/DPS is critical to guide restoration actions in the Central Valley. Recovering the ESU/DPS will likely require a mix of improved access to historically available habitat and restoration of degraded habitat, as will be identified as a priority for recovery in the *Threats Assessment* section of the actual

Recovery Plan. Understanding the current and historical structure of the ESU/DPS is important for recovery and conservation purposes. Current distribution provides an understanding on how to efficiently safeguard the existence of the ESU/DPS. Historical distribution provides an understanding of how the species might have survived catastrophic disturbances and how an altered ESU/DPS may or may not persist in the future. Genetically diverse populations within an ESU/DPS are important for the persistence of an ESU/DPS in the event of a catastrophic or gradual change in the local environment. For example, catastrophically disturbed areas were likely recolonized by neighboring populations that were adapted to similar environmental conditions. In the case of reintroductions of salmonids to an area where they have been extirpated, knowing which populations might have members that are ecologically exchangeable would help guide reintroductions into restored habitats.

In addition to protecting individual anadromous fish and their populations, NMFS seeks to restore and conserve the habitats that support the Federally-protected anadromous fish. Critical habitat is of great importance in conserving listed salmonids. Section 3 of the ESA defines critical habitat as (1) the specific areas within the geographical area occupied by the species at the time of listing, on which are found those physical or biological features that are essential to the conservation of the listed species and that may require special management considerations or protection, and (2) specific areas outside the geographical area occupied by the species at the time of listing that are essential for the conservation of the listed species. The regulations direct us to focus on the physical and biological habitat features that are essential to the conservation of the species, also called the primary constituent elements (PCE's) (70 FR 52488, September 2, 2005). Conservation and enhancement of habitat to sustain these fish should reflect consideration of habitat areas identified in NMFS' critical habitat designation, including information from the Critical Habitat Analytical Review Team (CHART) regarding PCE's and habitat rankings:

Freshwater spawning sites:

- have good water quality and quantity; and
- have substrate for spawning, incubation, and larval development.

Freshwater rearing sites:

- have good water quality and quantity and floodplain connectivity to maintain habitat conditions;
- have forage for juvenile development; and
- have natural cover to provide refuge (such as submerged and overhanging large wood, log jams, beaver dams, aquatic vegetation, large rocks or boulders, side channels, undercut banks, etc.).

Freshwater migration corridors:

- are unobstructed;

- have good water quality and quantity;
- have natural cover to provide refuge to support juvenile and adult mobility and survival; and
- afford safe passage conditions for migrations.

Estuarine areas:

- are unobstructed;
- have good water quality and quantity, with salinity conditions to support juvenile and adult physiological transitions between freshwater and saltwater;
- have natural cover to provide refuge to support migrations among systems; and
- have forage for juvenile and adult migrating fish.

Nearshore marine areas: (not included in critical habitat designation, but important to overall species lifecycle)

- are unobstructed;
- have good water quality and quantity conditions;
- have forage to support growth and maturation of fish; and
- have natural cover to provide refuge.

Offshore marine areas:

- have good water quality conditions; and
- have forage to support growth and maturation.

Threats - Listing Factors Assessment

1. *Sacramento River winter-run Chinook salmon.* The Secretary of Commerce has determined, through the regulatory process, that Sacramento River winter-run Chinook salmon remains an endangered species for several factors, as discussed in the most recent final listing determination published on June 28, 2005 (70 FR 37160). Winter-run Chinook salmon was originally listed as threatened in 1990 (55 FR 46515), then reclassified as endangered in 1994 (59 FR 440), and remains endangered today after consideration of the NMFS 2005 status review update of the ESU (Good et al. 2005).

Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

The primary threats to the Sacramento River winter-run Chinook salmon ESU have remained the same as when the ESU was first listed in an emergency interim rule in 1989 and final rule in 1990. Dams in the Central Valley have blocked access to the entire historical spawning grounds, altered water temperatures, and reduced habitat complexity, thus posing risks to the abundance, productivity, and especially to the spatial structure and genetic diversity of the winter-run Chinook salmon ESU. These four components of abundance, productivity, spatial structure, and

diversity are the basis of how NMFS determines population and ESU/DPS viability for salmonids, as defined in McElhany et al. (2000). The construction and operation of Shasta Dam alone immediately reduced the winter-run Chinook salmon ESU from four independent populations to just one. The remaining available habitat for natural spawners is currently maintained artificially with cool water releases from Shasta and Keswick Dams, thereby significantly limiting spatial distribution of this ESU.

The Red Bluff Diversion Dam (RBDD) ,constructed in 1964, presents an impediment to upstream migrants. The construction and operation of the dam were considered one of the primary reasons for the decline of winter-run Chinook salmon in listing the ESU. Although gates at the dam are now raised to allow for free passage of upstream migrants to access spawning habitat, an estimated 15 percent of the run can not pass the dam and must spawn downstream from the dam, where the river temperatures are warmer and the habitat less suitable. RBDD is still partly passable when the gates are down, but it does delay migration and forces some fish to spawn below it.

As described in the final listing determination for the ESU, the flashboard gates at the Anderson Cottonwood Irrigation District Diversion Dam and the inadequate fish ladders block passage for upstream migrant fish. The seasonal operation of the dam created unsuitable habitat upstream of the dam by reducing flow over the eggs, which has lead to reduced egg survival. In 2001, a new fish screen was placed at the diversion and a state of the art fish ladder was installed to address the threats caused by the diversion dam. The success of this project will be evaluated using pre and post construction biological monitoring. It is still too early to determine if the goal of the project has been achieved.

In the first listing determination of the ESU, pollution from Iron Mountain Mine was considered one of the main threats to the ESU. Acid mine drainage produced from the abandoned mine degraded spawning habitat of winter-run Chinook salmon and resulted in high salmon and steelhead mortality. Remediation of Iron Mountain Mine and restoration efforts as outlined in the 2002 Restoration Plan (that was developed by the Iron Mountain Mine Trustee Council composed of several Federal and State agencies) are considered to adequately mitigate the threats posed to the ESU. Pollution from Iron Mountain Mine is no longer considered a main factor threatening the ESU. Pollution from agricultural runoff carrying pesticides and fertilizers, however, is still a threat to winter-run Chinook salmon.

Bank stabilization structures to prevent bank erosion may affect the quality of rearing and migration habitat along the river. Juvenile salmon prefer natural streambanks as opposed to riprapped, leveed, or channelized sections of the Sacramento River. Bank stabilization projects in the Sacramento River are beginning to incorporate conservation measures in some areas to

provide more suitable seasonal habitat for juvenile salmon as well as reduce predation in the artificially created habitat.

Additionally, the sediment balance of the Sacramento River may be highly disrupted, resulting in reduced inputs of gravel due to dams and regulated flows, as well as gravel mining removing gravel (TNC 2006).

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial, recreational, scientific or educational purposes no longer appears to have a significant impact on winter-run Chinook salmon populations, but warrants continued assessment. Commercial fishing for salmon is managed by the Pacific Fishery Management Council (PFMC) and is constrained by time and area to meet the Sacramento River winter-run ESA consultation standard, and restrictions requiring minimum size limits and use of circle hooks for anglers. Ocean harvest restrictions since 1995 have led to reduced ocean harvest of winter-run Chinook salmon (*i.e.,* Central Valley Chinook salmon ocean harvest index, or CVI, ranged from 0.55 to nearly 0.80 from 1970 to 1995, and was reduced to 0.27 in 2001). While overutilization does not seem to be a significant factor under current ocean and terrestrial climate conditions, this could change due to global climate change implications.

Scientific and educational projects permitted under sections 4(d) and 10(a)(1)(A) of the ESA stipulate specific conditions to minimize take of winter-run Chinook salmon individuals during permitted activities. There are currently four active permits in the Central Valley that may affect winter-run Chinook salmon. These permitted studies provide information about winter-run Chinook salmon that is useful to the management and conservation of the ESU.

Disease or Predation

Naturally occurring pathogens may pose a threat to winter-run Chinook salmon, and artificially propagated winter-run Chinook salmon are susceptible to disease outbreaks such as the Infectious Hematopoietic Necrosis Virus.

Predation is a threat to winter-run Chinook salmon especially in the Sacramento-San Joaquin Delta where there are high densities of non-native fish (*e.g.,* small and large mouth bass, striped bass, catfish, sculpins) that prey on outmigrating salmon. In the upper Sacramento River, raising of the gates at the Red Bluff Diversion Dam reduces potential predation at the dam by pikeminnow. In the ocean and even the estuary environment, salmon are common prey for harbor seals and sea lions.

Inadequacy of Existing Regulatory Mechanisms

Over the past 10 to 15 years, many protective efforts have been implemented to help increase the abundance and productivity of winter-run Chinook salmon.

Federal Efforts

There have been several Federal actions to reduce threats to the winter-run Chinook salmon ESU. Actions undertaken pursuant to Section 7 biological opinions have helped to increase the abundance and productivity of winter-run Chinook salmon. The biological opinion for the Central Valley and State Water Projects has led to increased freshwater survival, and the biological opinions for ocean harvest have led to increased ocean survival and adult escapement. There have also been several habitat restoration efforts implemented under Central Valley Project Improvement Act and California Bay-Delta Authority (CALFED) programs that have led to increased abundance and productivity. There has been successful implementation of the artificial propagation program at Livingston Stone National Fish Hatchery to supplement the abundance of naturally spawning winter-run Chinook salmon and preserve the ESU's genetic resources. Section 10(a)(1)(B) of the ESA authorizes habitat conservation plans (HCP) for non-Federal actions. However, many private parties are hesitant to engage in the HCP process because it can be costly and time consuming. Developing an HCP is usually a voluntary process, thus there are no guarantees that large-scale, long-term planning efforts will occur.

However, despite Federal actions to reduce threats to the winter-run Chinook salmon ESU through conservation efforts, there is still a lack of diversity within the ESU and there still remains only one single extant population. Although there has been a marked increase in abundance of winter-run Chinook salmon over the last several years, the spatial distribution of winter-run Chinook salmon spawners has not expanded. It is uncertain whether ongoing efforts to restore habitat and passage to Battle Creek through the CALFED ecosystem restoration program will lead to successful establishment of a second independent population. The funding and implementation of that program remains uncertain. Many Federal projects have languished. As noted in Lindley et al. (2006), at least two additional populations need to be successfully established to attain ESU viability for winter-run Chinook salmon, but there has not been an active push to establish additional populations. NMFS does not believe that current protective efforts being implemented for the winter-run Chinook salmon ESU provide sufficient certainty that the ESU will not be in danger of extinction in the foreseeable future.

Non-Federal Efforts

A wide range of restoration and conservation actions have been implemented or are in the planning stages of development to aid in the recovery of the winter-run Chinook salmon ESU. Most of these actions are pursuant to implementation of conservation and restoration actions in the CALFED Bay-Delta Program, which is composed of 25 State and Federal agencies, and has aided to increase abundance and productivity of winter-run Chinook salmon. The State of California listed winter-run Chinook salmon as endangered in 1989 under the California Endangered Species Act. The State's Natural Communities Conservation Plan involves long-term planning with several stakeholders. The State has also implemented freshwater harvest management conservation measures, and increased monitoring and evaluation efforts in support of conserving this ESU. Local governments, such as the city of Redding, and grassroots organizations, such as the Battle Creek Watershed Conservancy, are engaged in the development and implementation of conservation and recovery measures to improve conditions for winter-run Chinook salmon.

Despite Federal and non-Federal efforts and partnerships, the winter-run Chinook salmon ESU remains at risk of extinction because the existing regulatory mechanisms do not provide sufficient certainty that efforts to reduce threats to the ESU will be fully funded or implemented. The effectiveness of regulations depends on compliance, and tracking and enforcement of compliance has not occurred consistently within this ESU.

Other Natural and Manmade Factors Affecting Its Continued Existence

Artificial propagation programs for winter-run Chinook salmon conservation purposes were developed to increase abundance and diversity of winter-run Chinook salmon but it is still unclear what the effects of the program are to the productivity and spatial structure of the ESU (*i.e.*, fitness and productivity). Global and localized climate changes, such as El Niño ocean conditions and prolonged drought conditions, may play a significant role in the decline of salmon, with unstable Chinook salmon populations potentially reaching lower levels. The ESU is highly vulnerable to drought conditions. During dry years, less cold water is available for release from Shasta Dam, which is the sole provider of cold water on which the fish are dependent. The resulting increased water temperature reduces availability of suitable spawning and rearing conditions.

Unscreened water diversions entrain outmigrating juvenile salmon and fry. Unscreened water diversions (*e.g.*, Red Bluff Diversion Dam, Tehama-Colusa Canal, Glen Colusa Irrigation

District) and State and Federal water project pumping plants entrain juvenile salmon, leading to fish mortality. The cumulative effect of entrainment at these diversions and delays in outmigration of smolts caused by reduced flow may affect winter-run Chinook salmon fitness.

Although the status of winter-run Chinook salmon is improving, there is only one population, and it depends on cold-water releases from Shasta Dam, which would be vulnerable to a prolonged drought. Increasing the number of independent populations has yet to occur. With only one extant population of winter-run Chinook salmon, there is a need to ensure more diversity within this ESU, because it is more susceptible to catastrophic events arising from natural and/or anthropogenic processes. The need for a second naturally spawning population has been recognized and plans have been proposed to establish a second population in Battle Creek, but implementation of restoration in this watershed continues to be delayed. However, there is no guarantee that this planned protective effort will provide enough certainty to reduce the risk to the population of becoming extinct. Additional opportunities exist to provide further protection to the species, but actions to minimize threats will require close collaboration with many agencies, stakeholders, and special interest groups.

2. *Central Valley spring-run Chinook salmon.* The Secretary of Commerce has determined, through the regulatory process, that Central Valley spring-run Chinook salmon remains a threatened ESU for several factors, as discussed in the recent final listing determination published on June 28, 2005 (70 FR 37160). Central Valley spring-run Chinook salmon was previously listed as threatened in 1999 (64 FR 50394), and remains listed as threatened after consideration of the 2005 updated status review of the ESU by the NMFS Biological Review Team (Good et al. 2005).

Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Habitat degradation is the most important source of ongoing risk to spring-run Chinook salmon. The distribution of spring-run Chinook salmon is limited by access to historical spawning habitat above impassable dams and degraded habitat in the Sacramento River. Current spawning habitat is restricted to the mainstem and a few tributaries to the Sacramento River. The remaining accessible habitat for spawning or juvenile rearing is severely degraded by elevated water temperatures, agricultural and municipal diversions and returns, restricted and regulated flows, and entrainment of migrating fish into unscreened or poorly screened diversions. Dams and water diversions for agriculture, flood control, domestic and hydropower purposes have greatly reduced or eliminated historically accessible habitat, and degraded remaining habitat.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial, recreational, scientific or educational purposes does not appear to have a significant impact on spring-run Chinook salmon populations but warrants continued assessment. Commercial fishing for salmon is managed by the PFMC and is constrained by time and area to meet the Central Valley spring-run Chinook salmon ESA consultation standard, and includes restrictions requiring minimum size limits and use of circle hooks for anglers. Ocean harvest restrictions since 1995 have led to reduced ocean harvest of spring-run Chinook salmon (*i.e.,* Central Valley Chinook salmon ocean harvest index, or CVI, ranged from 0.55 to nearly 0.80 from 1970 to 1995, and was reduced to 0.27 in 2001).

The permits NMFS issues for scientific or educational purposes stipulate specific conditions to minimize take of spring-run Chinook salmon individuals during permitted activities. There are currently five active permits in the Central Valley that may affect spring-run Chinook salmon. These permitted studies provide information about spring-run Chinook salmon that is useful to the management and conservation of the ESU.

Disease or Predation

Chinook salmon are exposed to bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and the marine environment. Naturally spawned fish tend to be less susceptible to pathogens than hatchery-reared fish, which are more susceptible to disease such as Infectious Hematopoietic Necrosis Virus outbreaks that are common in hatcheries.

Predation is a threat to spring-run Chinook salmon especially in the Sacramento-San Joaquin Delta where there are high densities of non-native fish (*e.g.,* small and large mouth bass, striped bass, catfish, sculpins) that prey on outmigrating salmon. Currently, studies are proposed to evaluate predation rates of juvenile salmonids in rip-rapped banks in the mainstem Sacramento River and at the oxbow channel near the Glenn Colusa Irrigation District fish screen. In the ocean environment, salmon are common prey for harbor seals and sea lions.

Inadequacy of Existing Regulatory Mechanisms

Federal Efforts

There have been several Federal actions to try to reduce threats to the spring-run Chinook salmon ESU. Actions undertaken pursuant to Section 7 biological opinions have helped to

increase the abundance of spring-run Chinook salmon. Actions taken under the biological opinion for the Central Valley and State Water Projects has led to increased freshwater survival, and the biological opinions for ocean harvest have led to increased ocean survival and adult escapement. There have also been several habitat restoration efforts implemented under Central Valley Project Improvement Act and CALFED programs that have led to several projects involving fish passage improvements, fish screens, floodplain management, habitat restoration, watershed planning, and other projects that have led to improved fish habitats and increased abundance of spring-run Chinook salmon. There are several important projects that have been initiated or implemented in the Central Valley, such as restoring salmonid habitat in the Battle Creek drainage, improving fish passage, riparian habitat, and stream flows in Butte, Deer, Mill and Clear Creek tributaries in the upper Sacramento River, and installing major new fish screens at large diversions in the Sacramento River.

However, despite Federal actions to reduce threats to the spring-run Chinook salmon ESU, the existing protective efforts are inadequate to ensure the ESU is no longer at risk of becoming endangered. There remain risks to the spatial structure and diversity of the ESU. There are only three extant independent populations, and they are especially vulnerable to disease or catastrophic events because they are in close proximity.

Non-Federal Efforts

A wide range of restoration and conservation actions have been implemented or are in the planning stages of development to help the spring-run Chinook salmon ESU. Most of these actions are pursuant to implementation of conservation and restoration actions in the CALFED Bay-Delta Program, which is composed of 25 State and Federal agencies, and has contributed to increased abundance and productivity of the spring-run Chinook salmon ESU. The state of California listed spring-run Chinook salmon as threatened in 1998 under the California Endangered Species Act (CESA). The State's Natural Communities Conservation Plan involves long-term planning with several stakeholders. The California Department of Fish and Game (CDFG) has established specific in-river fishing regulations to protect spring-run Chinook salmon. CDFG and the California Department of Water Resources (CDWR) have started a marking/tagging and recovery program to evaluate the contribution of hatchery and natural production in naturally-spawning populations in the Feather River, as well as to review and modify hatchery operating criteria to help ensure natural stock integrity. CDFG and CDWR are developing a hatchery and genetic management plan. CDFG's 1994 Fish Screening Policy requires screening of all diversions located within the essential habitat of a CESA-listed species. Several spring-run Chinook salmon tributaries have been identified and assigned a high priority for implementing corrective actions and receive restoration funding. Grassroots organizations, such as the Battle Creek Watershed Conservancy, are engaged in the development and

implementation of conservation and recovery measures to improve conditions for spring-run Chinook salmon.

However, despite Federal and non-Federal efforts and joint partnerships, some of the ongoing protective efforts are very recent and few address salmon conservation at a scale that is adequate to protect and conserve entire the ESU.

Other Natural and Manmade Factors Affecting Its Continued Existence

In the last two decades, the abundance of spring-run Chinook salmon has shown a positive trend in productivity, but the increase in fish numbers does not address the concern for lack of spatial structure and diversity within the ESU. The hatchery stock of spring-run Chinook salmon in the Feather River contributes to the ESU in terms of abundance. In the past three years, CDFG has been restoring and enhancing the spring-run genotype at the Feather River Hatchery, in an effort to isolate fish arriving at the hatchery early in the season from those arriving late. If efforts to isolate the spring-run phenotype in the Feather River are successful, the risks to the ESU's spatial structure and diversity would likely be reduced.

Changes in climatic events and global climate, such as El Niño ocean conditions and prolonged drought conditions, may be a significant factor in the decline of salmon as unstable Chinook salmon populations reach particularly low levels. The ESU is highly vulnerable to drought conditions. With the three independent populations located in such close proximity (Deer, Mill and Butte Creeks), any regional catastrophic event may have severe impacts to the remaining independent populations.

Unscreened water diversions entrain outmigrating juvenile salmon and fry. Unscreened water diversions (*e.g.*, Red Bluff Diversion Dam, Tehama-Colusa Canal, Glen Colusa Irrigation District) and State and Federal water project pumping plants entrain juvenile salmon, leading to fish mortality. The cumulative effect of entrainment at these diversions and delays in outmigration of smolts caused by reduced flow may affect spring-run Chinook salmon fitness.

3. Central Valley steelhead. The Secretary of Commerce has determined, through the regulatory process, that Central Valley steelhead remains a threatened DPS for several factors, as discussed in the recent final listing determination published on January 5, 2006 (71 FR 834). Central Valley steelhead was previously listed as threatened in 1998 (63 FR 13347), and remains listed as threatened after consideration of the 2005 updated status review by the NMFS Biological Review Team, which has found high risks to the abundance, productivity, and spatial structure of the steelhead DPS and moderately high risk to the diversity of the DPS.

In general, the destruction and modification of habitat, overutilization for recreational purposes and natural and man-made factors are the primary causes for decline of West Coast steelhead.

Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

The spawning habitat for Central Valley steelhead has been greatly reduced from its historical range. The vast majority of historical spawning habitat for Central Valley steelhead has been eliminated by fish passage impediments associated with water storage, withdrawal, conveyance, and diversions for agriculture, flood control, and domestic and hydropower purposes. Modification of natural flow regimes has resulted in increased water temperatures, changes in fish community structures, depleted flow necessary for migration, spawning, rearing, and flushing of sediments from spawning gravels. These changes in flow regimes may be driving a shift in the frequencies of various life history strategies, especially a decline in the proportion of the population migrating to the ocean. Land use activities, such as those associated with agriculture and urban development, have altered steelhead habitat quantity and quality.

Although many historically harmful practices have been halted, much of the historical damage to habitats limiting steelhead remains to be addressed, and the necessary restoration activities will likely require decades.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Steelhead have been, and continue to be, an important recreational fishery throughout their range. Although there are no commercial fisheries for steelhead in the ocean, inland steelhead fisheries include tribal and recreational fisheries. In the Central Valley, recreational fishing for hatchery-origin steelhead is popular and is restricted to only the visibly marked surplus hatchery-origin fish, which reduces the likelihood of retaining naturally-spawned wild fish.

The permits NMFS issues for scientific or educational purposes stipulate specific conditions to minimize take of steelhead individuals during permitted activities. There are currently eleven active permits in the Central Valley that may affect steelhead. These permitted studies provide information about Central Valley steelhead that is useful to the management and conservation of the DPS.

Disease or Predation

Steelhead are exposed to bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and the marine environment. Very little current or historical information exists to quantify changes in infection levels and mortality rates

attributable to these diseases for steelhead. Naturally spawned fish tend to be less susceptible to pathogens than hatchery-reared fish.

Introduction of non-native species and modification of habitat have resulted in increased predatory populations and salmonid predation in river systems. In general, predation rates on steelhead are considered to be an insignificant contribution to the large declines observed in West Coast steelhead populations. In some local populations, however, predation may significantly influence salmonid abundance when other prey species are not present and habitat conditions lead to the concentration of adults and/or juveniles.

Inadequacy of Existing Regulatory Mechanisms

Federal Efforts

There have been several Federal actions attempting to reduce threats to the Central Valley steelhead ESU. The biological opinions for the Central Valley and State Water Projects and other Federal projects involving irrigation and water diversion and fish passage, for example, have improved or minimized adverse impacts to steelhead in the Central Valley. There have also been several habitat restoration efforts implemented under Central Valley Project Improvement Act and CALFED programs that have led to several projects involving fish passage improvements, fish screens, floodplain management, habitat restoration, watershed planning, and other projects that have contributed to improvement of steelhead habitat.

However, despite Federal actions to reduce threats to the Central Valley steelhead DPS, the existing protective efforts are inadequate to ensure the DPS is no longer in danger of extinction. There remain high risks to the abundance, productivity, and spatial structure of the steelhead DPS.

Non-Federal Efforts

Measures to protect listed *O. mykiss* throughout the State of California have been in place since 1998. The State's Natural Communities Conservation Plan involves long-term planning with several stakeholders. A wide range of measures have been implemented including 100 percent marking of all hatchery steelhead, zero bag limits for unmarked steelhead, gear restrictions, closures, and size limits designed to protect smolts. NMFS and CDFG are working to improve inland fishing regulations to better protect both anadromous and resident forms of *O. mykiss* populations. A proposal to develop a comprehensive status and trends monitoring plan for Central Valley steelhead was submitted for funding consideration to the CALFED Ecosystem Restoration Program (ERP) in 2005. The proposal, drafted by CDFG and the interagency

Central Valley Steelhead Project Workteam, was selected by the ERP Implementing Agency Managers, and is to receive funding as a directed action. Long-term funding for implementation of the monitoring plan, once it is developed, still needs to be secured. There are many sub-watershed groups, landowners, environmental groups and non-profit organizations that are conducting habitat restoration and planning efforts that may contribute to the conservation of steelhead.

However, despite Federal and non-Federal efforts to promote the conservation of the Central Valley steelhead DPS, few efforts address conservation needs at scales sufficient to protect the entire steelhead DPS. The lack of status and trend monitoring and research is one of the critical limiting factors to this DPS.

Other Natural and Manmade Factors Affecting Its Continued Existence

NMFS and the Biological Review Team is concerned that the proportion of naturally produced fish is declining. Two artificial propagation programs for steelhead in the Central Valley, Coleman National Fish Hatchery and Feather River Hatchery, may decrease risk to the DPS to some degree by contributing increased abundance to the DPS. The hatcheries' effects on the DPS' productivity, spatial structure, and diversity, however, are either neutral or uncertain. Potential threats to natural steelhead posed by hatchery programs include: mortality of natural steelhead in fisheries targeting hatchery-origin steelhead, competition for prey and habitat, predation by hatchery-origin fish on younger natural fish, genetic introgression by hatchery-origin fish that spawn naturally and interbreed with local natural populations, disease transmission, and impediments to fish passage imposed by hatchery facilities.

Changes in climatic events and global climate, such as El Niño ocean conditions and prolonged drought conditions, can threaten the survival of steelhead populations already reduced to low abundance levels as the result of the loss and degradation of freshwater and estuarine habitats. Floods and persistent drought conditions have reduced already limited spawning, rearing, and migration habitats.

Unscreened water diversions entrain outmigrating juvenile steelhead and fry. Unscreened water diversions (*e.g.,* Red Bluff Diversion Dam, Tehama-Colusa Canal, Glen Colusa Irrigation District) and State and Federal water project pumping plants entrain juvenile steelhead, leading to fish mortality.

Conservation Assessment

NMFS has addressed Central Valley salmonid needs through biological opinions, participation in habitat conservation plans, and interagency technical work groups. Approximately 800 section 7 consultations have been issued in the Central Valley since 2000. These consultations have improved or minimized adverse impacts to listed salmonids and their habitats by improving habitat conditions and fish passage conditions in the Central Valley. Examples of reasonable and prudent alternatives that have benefited salmonids include: (1) allocation of water using a more conservative water supply forecast approach; (2) maintenance of higher end-of-year reservoir storage levels in Lake Shasta; (3) maintenance of minimum flows in the Sacramento River during the fall and winter months; (4) implementation of specific ramp-down criteria when flows from Keswick Dam are reduced; (5) establishment of water temperature criteria to support spawning and rearing in the mainstem Sacramento River upstream of the Red Bluff Diversion Dam and water releases from Shasta Dam designed to meet the specified temperature criteria; (6) re-operation of the Red Bluff Diversion Dam gates to provide improved adult and juvenile passage; (7) closures of the Delta Cross Channel gates to divert juveniles from the Delta; and (8) constraints on Delta water exports to reduce impacts on juvenile outmigrants.

There are numerous conservation programs in the Central Valley that provide benefits to listed salmonids through several habitat improvement and restoration projects, including water quality and water supply projects. The two largest programs are CALFED and the Central Valley Project Improvement Act (CVPIA) and its programs, including the Anadromous Fish Restoration Program. Both programs are important sources of funding for potential recovery-related actions. The Delta Pumping Plant Fish Protection Agreement has led to increased screening of unscreened diversions, enhanced law enforcement efforts, installation of seasonal barriers to guide fish from uninhabitable stream reaches, improved fish passage, and other salmonid restoration projects. The Tracy Fish Collection Mitigation Agreement funds habitat restoration projects. The U.S. Forest Service has a Long-Term Strategy for Managing Anadromous Fish-Producing Watersheds of the Lassen National Forest (commonly referred to as PACFISH) for management of anadromous fish-producing watersheds. The proposed northern pike eradication program for Lake Davis intends to prevent pike from threatening anadromous fish in the Central Valley rivers and delta. The Battle Creek Restoration Project, when successfully implemented, will address limiting factors for all three Central Valley salmonids.

The TRT has produced a paper which discusses determining the viability of Central Valley salmonid independent populations and ESUs/DPS (Lindley et al., In Press). Additionally, the TRT is drafting a research and monitoring needs report for listed Central Valley salmonids. There are also numerous research and monitoring projects generating information for the conservation of Sacramento River winter-run Chinook salmon, Central Valley spring-run

Chinook salmon, and/or Central Valley steelhead. These projects are described in the permitting documents under sections 10(a)(1)(A) and 4(d) of the ESA. The following sections describe additional conservation efforts that are specific to Central Valley ESUs and DPS.

1. *Sacramento River winter-run Chinook salmon.* The artificial propagation program for winter-run Chinook salmon at Livingston Stone National Fish Hatchery, located on the mainstem of the Sacramento River, has operated for conservation purposes since the early 1990s. The increased natural escapement over the last several years has led to the termination of both captive broodstock programs located at University of California at Davis' Bodega Marine Laboratory and Livingston Stone National Fish Hatchery. Harvest protective measures include seasonal constraints on sport and commercial fisheries south of Point Arena. The State of California has established specific in-river fishing regulations and no-retention prohibitions designed to protect winter-run Chinook salmon. Finally, there are plans to establish a second independent population of winter-run Chinook salmon in the upper Battle Creek watershed using the artificial propagation program as a source of fish.

2. *Central Valley spring-run Chinook salmon.* The Feather River Hatchery is making efforts to segregate spring-run from fall-run Chinook salmon to enhance and restore the genotype of spring-run Chinook salmon in the Feather River. Seasonal constraints on sport and commercial fisheries south of Point Arena benefit spring-run Chinook salmon. CDFG has implemented enhanced enforcement efforts to reduce illegal harvests. Central Valley spring-run Chinook salmon is a state listed fish that is protected by specific in-river fishing regulations. The Central Valley Salmonid Project Work Team, an interagency technical working group led by CDFG, drafted a proposal to develop a spring-run Chinook salmon escapement monitoring plan that was selected by the CALFED ERP Implementing Agency Managers for directed action funding. Long-term funding for implementation of the monitoring plan still needs to be secured.

3. *Central Valley steelhead.* CDFG's efforts to restore Central Valley steelhead is described in the "Steelhead Restoration and Management Plan for California." Measures to protect steelhead throughout the State of California have been in place since 1998, and a wide range of measures have been implemented including 100 percent marking of all hatchery steelhead, zero bag limits for unmarked steelhead, gear restrictions, closures, and designation of a size limit to protect smolts. The Central Valley Steelhead Project Work Team, an interagency technical working group led by CDFG, drafted a proposal to develop a comprehensive steelhead monitoring plan that was selected by the CALFED ERP Implementing Agency Managers for directed action funding. Long-term funding for implementation of the monitoring plan still needs to be secured.

Preliminary Recovery Strategy

Recovery Priority Number

The recovery priority numbers described below were assigned in accordance with the Recovery Priority Guidelines (55 FR 24296, Section B) and indicate the priority of each species for recovery plan development and implementation.

1. *Sacramento River winter-run Chinook salmon.* A Priority Number of "2" was assigned to the Sacramento River winter-run Chinook salmon ESU. The ranking is based on a high magnitude of threat due to a single extant population vulnerable to loss of genetic diversity, low abundance, unscreened diversions, high water temperatures, and effects of drought. The recovery potential is low to moderate due to the lack of additional populations, lack of available/suitable habitat (cold water), unscreened diversions/passage problems, and inadequate instream flow. Conflict is anticipated with respect to implementing recovery actions due to anticipated future development, habitat degradation issues, and increasing demands for Central Valley water supplies (NMFS 2004b).

2. *Central Valley spring-run Chinook salmon.* A Priority Number of "3" was assigned to the Central Valley spring-run Chinook salmon ESU. This ranking is based on a moderate magnitude of threat, due to only three remaining extant natural populations with consistent spawning that are in close geographic proximity; the lack of cool water habitat below impassable dams; and the threat to genetic integrity from the Feather River Hatchery. The recovery potential is low to moderate due to lack of suitable habitat (cool water, high elevation) below impassable barriers, and the low number (three) of extant natural populations. Conflict is anticipated with respect to implementing recovery actions due to anticipated future development, habitat degradation issues, and increasing demands for Central Valley water supplies (NMFS 2004b).

3. *Central Valley steelhead.* A Priority Number of "3" was assigned to the Central Valley steelhead DPS. The ranking is based on a moderate magnitude of threat because more than 95 percent of historic spawning habitat is inaccessible (due to impassable dams) and because Central Valley steelhead require cooler water at higher elevations (again, found largely above impassable dams). The recovery potential was determined to be low to moderate due to a lack of suitable habitat (requiring cold water and high elevation) below impassable barriers, inadequate status and trends data to assess DPS viability, and the widespread stocking of hatchery fish (which could negatively impact wild steelhead populations). Conflict is anticipated with respect to implementing recovery actions due to anticipated future development and habitat degradation issues, as well as increasing demands for Central Valley water supplies (NMFS 2004b).

Recovery Vision Statement

- Develop and implement a recovery plan for the conservation and survival of winter-run and spring-run Chinook salmon and Central Valley steelhead pursuant to section 4(f)(1) of the Federal ESA, as well as the most recent judicial and policy guidance.

- All methods and procedures which are necessary shall be used to bring winter-run and spring-run Chinook salmon and Central Valley steelhead to the point where measures pursuant to the Federal ESA are no longer necessary. Such methods and procedures shall result in the establishment and maintenance of viable populations of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead to include increased abundance, increased population growth rate, increased population spatial structure, and greater genetic/life history diversity.

Priorities to Address Factors Currently Suppressing Potential for Recovery

Preliminary recovery actions to address specific limiting factors have been identified for the winter-run and spring-run Chinook salmon ESUs and the Central Valley steelhead DPS and can be utilized as interim guidance for current conservation planning efforts until the Draft Recovery Plan is issued :

- Conduct and improve monitoring and research on distribution (especially Central Valley steelhead), status and trends.
- Improve understanding of life-stage survival through focused research and monitoring.
- Establish at least two additional populations of winter-run Chinook salmon that are spatially diverse and secure from natural and manmade threats.
- Protect and restore watershed and estuarine habitat complexity and connectivity.
- Implement freshwater habitat restoration techniques as part of construction activities (*e.g.*, set-back levees/bank stabilization/levee repair and maintenance, re-introduction of large woody debris, erosion control, etc.).
- Improve and provide additional fish passage opportunities, guided by threats information and critical habitat/CHART information.
- Develop more effective and efficient Federal and State mechanisms to correct already-documented threats to listed salmonids.
- Reduce and control impacts of urbanization through education and outreach, partnerships, collaborative teams, and protective regulations.
- Collaborate with interested public, State and Federal resource agencies, local agencies, and special interest groups in identifying and implementing early actions in priority watersheds and streams, informed by TRT and CHART reports.

- Screen water diversion structures in important/priority anadromous fish bearing streams.
- Educate the water-user community with TRT and CHART reports to inform public about priority watersheds and streams.
- Provide outreach to Federal action agencies regarding section 7(a)(1) and carrying out programs to conserve and recover Federally-listed salmonids.
- Complete development of a threats assessment.
- Continue to hold public involvement workshops throughout the Central Valley to develop integrated recovery criteria and recovery actions, and develop a strategy for implementation of recovery actions, based on the threats assessment, TRT and CHART reports.
- Collaboratively balance water supply and allocation with fisheries' needs through improving criteria for water drafting, storage and dam operations, water rights programs, development of passive diversion devices and/or offstream storage, elimination of illegal diversions in priority watersheds and streams, and other such opportunities.
- Modify channel and flood control maintenance practices, where appropriate, to increase stream and riparian complexity.
- Identify and treat point and non-point source pollution to streams from wastewater, agricultural practices, and urban environments.

Preliminary Recovery Action Plan

Goal: Ensure NMFS is fulfilling its obligation under the Federal ESA to conserve or recover Sacramento River winter-run and Central Valley spring-run Chinook salmon and Central Valley steelhead. NMFS shall focus primarily on linking and coordinating ESA and other fisheries related programs to recovery planning and implementation, and developing effective and more collaborative partnerships with other entities whose decisions and actions affect salmonid recovery.

Outline of NMFS Actions – Coordinating ESA Programs with Recovery Planning

1) Streamline section 7 and 10 processes and allocate staff time towards salmon recovery implementation efforts.
   - Provide opportunities for staff participation in recovery planning activities.
   - Utilize programmatic approaches where appropriate.
   - Participate in interagency collaborative efforts seeking to streamline project implementation while contributing to the conservation strategy for recovering listed Central Valley salmonids, utilizing TRT reports, threats assessment, and CHART reports for guidance.
   - Work with Federal action agencies to group similar actions and streamline consultations.

2) Identify types of section 7 conservation measures that may be appropriate in priority watersheds and streams.
   - Utilize opportunities for enhancement of existing habitat baseline conditions.
   - Incorporate guidance relative to priority recovery actions in consultations.

3) Streamline programs through development and utilization of programmatic strategies and best management practices that can be provided to Federal, State, County or City governments, as well as the private sector to benefit salmonid habitat.
   - Programmatic strategies include, but are not limited to: bank protection/levee improvement projects (U.S. Army Corps of Engineers, State Department of Water Resources), conservation planning efforts (Bay-Delta Conservation Plan, various HCPs), collaborative partnerships (PG&E/CalTrout Central Valley Salmon Recovery Action Assessment), water quality, instream flow, groundwater management, and water supply assessments and management.

4) Contribute to development of a database coordinating section 7 and 10 program data with recovery planning efforts.
   - Coordinate with the NMFS Geographic Information System program and the SWFSC-Santa Cruz on incorporating recovery planning information in a geographic referencing system for a relational database to incorporate the best available information related to viable salmonid population criteria (abundance, productivity, spatial structure, diversity).
   - Develop and/or improve tracking system for incidental take permits and terms and conditions/conservation measures to ensure crossover with recovery priorities.
   - Develop and implement effectiveness/performance monitoring to ensure actions contribute to recovery and facilitate adaptive management, and assure research and monitoring priorities are being addressed and met.

5) Coordinate with the Office of Law Enforcement during recovery plan development.

Outline of NMFS Actions – Coordination and Outreach

1) Promote communication and collaboration among different divisions, field offices, Science Centers/Laboratories, Regions, and the Pacific Fishery Management Council for salmon recovery planning.

2) Continue collaboration with Federal and State agencies in developing Central Valley salmonid recovery and conservation strategies and improve coordination on Federal and

State recovery actions through, but not limited to, the Bay Delta Conservation Plan and the Anadromous Fish Restoration Program.

3) Coordinate and improve communication with Federal and State agencies regarding joint management responsibilities as well as diverging responsibilities such as water supply management and allocations, and competing species' needs.

4) Provide technical information about salmonid life history (species needs) and viable salmonid population criteria to Federal, State, regional planning organizations, county governments, and special interest groups and non-governmental organizations to include in their project designs, general plans, watershed plans, etc.

5) Promote NMFS' student internship program or other types of student appointments, to recruit individuals with desired backgrounds, education, and training that would assist NMFS in achieving the tasks described herein.

Pre-planning Decisions

Product

Draft Recovery Plan for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead.

Scope of Recovery Effort

Species____ Recovery Unit____ Multi-Species __X__ Ecosystem____

Recovery Plan Preparation

NMFS, Southwest Region Protected Resources Division will initiate the preparation of a draft recovery plan for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead (using the most recent Recovery Planning Guidance updated July 2006), concurrent with the TRT distribution of draft and final reports being prepared for the salmon ESUs and steelhead DPS in the Central Valley Recovery Domain. Primary authorship of the Recovery Plan will be the responsibility of NMFS staff. Outreach by NMFS to Federal, State, and private partners will be central to the recovery effort, as well as engaging with other interested parties through participation in public workshops, public review, and peer review.

Administrative Record

The administrative record will be housed in the Sacramento office.

Schedule and Responsibilities for Draft Recovery Plan for Sacramento River Winter-run Chinook Salmon, Central Valley Spring-run Chinook Salmon, and Central Valley Steelhead

Summer 2006 (Completed)

- Published Notice of Intent to Prepare a Recovery Plan
- Initiated recovery plan threats assessment process
- Initiated public outreach efforts and recovery planning website
- Hosted initial series of public involvement workshops, focused on threats

Fall/Winter 2006

- Completed Draft Recovery Outline
- Began drafting threats assessment document
    - Developed life cycle conceptual models
    - Ranked and prioritized threats and watersheds

Winter 2006/2007 (In progress)

- Host 2nd series of public involvement workshops to utilize threats information described above to facilitate development of recovery criteria and preliminary recovery actions
- Initiate TRT review of written products
- Continue outreach efforts
- Post products on website

Spring 2007 (In progress)

- Host 3rd series of public involvement workshops to utilize recovery criteria to develop recovery actions and implementation plan
- Continue TRT/peer review of written products
- Continue posting products on website
- Finalize draft recovery plan

Summer 2007 (To be completed)

- Issuance of draft recovery plan and publish *Federal Register* Notice
- Initiate public review and comment
- Initiate independent peer review

Fall-Winter 2007 (To be completed)

- Revise draft recovery plan
- Finalize recovery plan

- Outreach to initiate recovery plan implementation

Outreach and Stakeholder Participation

While NMFS is responsible for developing recovery plans, the plans will have a greater likelihood of success if they are developed in partnership with entities that have the responsibility and authority to implement recovery actions. Therefore, NMFS initiated outreach efforts in summer 2006 through the above-described public workshops, additional presentations in various forums to ensure high levels of communication and interaction with the public, stakeholders, and agencies throughout the recovery planning and implementation process.

Anticipated Recovery Planning Actions

(1) NMFS has appointed a TRT for the Central Valley Recovery Domain comprised of scientists tasked with development of biological viability criteria for the two ESUs and one DPS in the Domain. The final TRT products were competed in the Fall/Winter of 2006.

(2) NMFS PRD staff have developed a strategy to initiate the development of the recovery plan per the most recent Federal guidelines to include inter- and intra-agency coordination and collaboration on regulatory operations, public input, and plan development.

(3) NMFS PRD has begun to coordinate with NMFS Habitat Conservation Division, Sustainable Fisheries Division, NOAA Restoration Center, Southwest Fisheries Science Center, NMFS Northwest Region, and other NOAA cooperators to ensure consistency and effectiveness in the recovery plan development.

(4) NMFS PRD has begun working with all parties to evaluate best management practices and existing regulatory programs for integration into recovery planning.

(5) NMFS has begun outreach efforts to ensure high levels of public participation in the process. Outreach will consist of website updates on the recovery planning process, public meetings, development of educational materials and public input on the draft recovery plan.

Literature Cited

Busby. P.J., T.C. Wainwright, G.J. Bryant, L. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-27, 261 p.

Good, T.P., R.S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. United States Department of Commerce, NOAA Technical Memorandum. NMFS-NWFSC-66, 598 p.

McElhany, P., M.H. Ruckelshaus, M.J Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionary significant units. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-42, 158 p.

Lindley, S.T., R. Shick, B.P. May, J.J. Anderson, S. Greene, C. Hanson, A. Low, D. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2004. Population Structure of Threatened and Endangered Chinook Salmon ESUs in California's Central Valley Basin. NOAA Technical Memorandum NMFS. NOAA-TM-NMFS-SWFSC-360

Lindley, S.T., R. Shick, B.P. A. Agrawal, M. Goslin, T.E. Pearson, E. Mora, J.J. Anderson, S. Greene, C. Hanson, A. Low, D. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2004.

Myers, J.M., R.G. Kope, G.J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K. Neely, S.T. Lindley, and R.S. Waples. 1998. Status review of chinook salmon from Washington, Idaho, Oregon, and California. United States Department of Commerce, NOAA Technical Memorandum. NMFS-NWFSC-35, 443 p.

NMFS (National Marine Fisheries Service). 2004a. Interim endangered and threatened species recovery planning guidance. National Marine Fisheries Service, Silver Spring, MD.

NMFS. 2004b. Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species: October 1, 2002 – September 30, 2004. Prepared by: Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

The Nature Conservancy. 2006. State of the System Report: November 22, 2006, prepared for CALFED.

Federal Register Notices Cited

55 FR 46515. 1990. Final Rule: Endangered and Threatened Species; Sacramento River Winter-run Chinook Salmon. *Federal Register* **55**: 46515.

55 FR 24296. 1990. Endangered and Threatened Species; Listing and Recovery Priority Guidelines. *Federal Register* **55**: 24296.

59 FR 440. 1994. Final Rule: Endangered and Threatened Species: Status of Sacramento River Winter-run Chinook Salmon. *Federal Register* **59**: 440.

63 FR 13347. 1998. Final Rule; Notice of Determination: Endangered and Threatened Species: Threatened Status for Two ESUs of Steelhead in Washington, Oregon, and California. *Federal Register* **63**: 13374.

64 FR 50394. 1999. Final Rule; Notice of Determination: Endangered and Threatened Species; Threatened Status for Two Chinook Salmon Evolutionarily Significant Units (ESUs) in California. *Federal Register* **64**: 50394.

70 FR 37160. 2005. Final Rule: Endangered and Threatened Species: Final Listing Determinations for 16 ESUs of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. *Federal Register* **70**: 37160.

70 FR 52488. 2005. Final Rule: Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. *Federal Register* **70**: 52488

71 FR 834. 2006. Final Rule: Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. *Federal Register* **71**: 834