2007 Federal Recovery Outline for the Evolutionarily Significant Unit of California Coastal Chinook Salmon

Prepared by

The National Marine Fisheries Service
Southwest Regional Office

Disclaimer

This outline is meant to serve as an interim guidance document to outline recovery efforts, including recovery planning for the California Coastal Chinook salmon Evolutionarily Significant Unit, until a full recovery plan is developed and approved. A recovery outline is not subject to formal review but intended primarily for internal use by the National Marine Fisheries Service (NMFS) as a pre-planning document. This is not a regulatory document and the recommendations and statements found herein are non-binding and 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 this Evolutionarily Significant Unit. 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. Interested parties may contact Charlotte Ambrose, North Central California Coast Recovery Coordinator, 777 Sonoma Avenue, Room 325, Santa Rosa, CA 95404.

Introduction

Recovery Plan 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 (NMFS 2006):

> Recovery is the process by which listed species and their ecosystems are restored and their future safeguarded to the point that protections under the 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 section 4(f) of the ESA, recovery plans must contain: "(1) a description of such site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the species; (2) objective, measurable criteria which, when met, would result in the determination that the species be removed from the list; and (3) estimates of the time required and the cost to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal." Case law has re-affirmed these mandates with further clarification that management actions must be site-specific wherever feasible and recovery actions or criteria must link to threats, including changes in threats since listing. Recovery plans must explicitly identify all threats to a species and track (through objective measurable criteria) how each threat (through site-specific management actions) will be reduced or eliminated. This standard has been further emphasized by the United States Government Accounting Office in a 2006 report analyzing ESA recovery plans for Congress (GAO 2006).

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;
- Identify goals and criteria by which to measure the species' achievement of recovery; and
- Estimate the costs and time needed to reach recovery goals.

Recovery plans can also serve the following secondary functions:

- Serve as outreach tools regarding a species' endangerment and provide a suite of recovery actions most effective and efficient for achieving recovery for the species;
- Help potential cooperators and partners understand the rationale behind identified recovery actions, and aid them in figuring how they can facilitate the species' recovery;

- Serve as a tool for monitoring recovery activities; and,
- Offer support for grant applications of appropriations requests 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...". In addition to outlining strictly proactive measures to achieve the species' recovery, the plans provide context and a framework for implementation of other provisions of the ESA with respect to a particular species, such as ESA section 7(a)(2) consultations on Federal agency activities or the development of ESA section 10(a)(1)(B) Habitat Conservation Plans (HCPs).

The development of a recovery outline is part of the pre-planning phase of recovery planning described in the NMFS Interim Recovery Planning Guidance (NMFS 2006). 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, 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 Santa Rosa, California (SWR Santa Rosa), is responsible for facilitating the development of recovery plans for the following listed salmon Evolutionarily Significant Units (ESUs) and steelhead Distinct Population Segments (DPSs): Central California Coast steelhead (*Oncorhynchus mykiss*), Northern California steelhead (*Oncorhynchus mykiss*), California Coastal Chinook (*Oncorhynchus tshawytscha*) and Central California Coast coho salmon *(Oncorhynchus kisutch*). Plans for the California Coastal Chinook salmon ESU (CC Chinook salmon ESU) and the Northern California steelhead DPS will be developed in coordination with the Protected Resources Division in Arcata, California. The NMFS Strategic Plan for 2005 established a high priority focus on recovery plan development over the next five years. SWR Santa Rosa will proceed with recovery planning by developing draft ESU or DPS specific recovery plans in the following sequence: Central California Coast coho salmon ESU, Central California Coast steelhead DPS, CC Chinook salmon ESU, and Northern California steelhead DPS. Each plan will contribute to a final multi-species recovery plan.

This recovery outline has been developed to guide the recovery planning process for the CC Chinook salmon ESU and provide public notice of NMFS' intent to prepare a draft recovery plan.

General information

***Species Name*:** California Coastal Chinook salmon (*Oncorhynchus tshawytscha*)

***Listing Status*:** Threatened

Date Listed: September 16, 1999 (64 FR 50394) and listing reconfirmed in a Final Rule published June 28, 2005 (70 FR 37160).

Lead Field Office/Contact Biologist: North Central California Coast Recovery Domain (NCCC Domain), Charlotte Ambrose, Recovery Coordinator, NMFS, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404.

Recovery Status

In order to establish a recovery plan for a species, the current status of that species must be understood. The recovery status indicates how the species is doing at present and steps that must be taken for improvement. Three primary components are considered when determining status: (1) the biological requirements of the species, (2) the threats that negatively impact the species, and (3) the conservation efforts that positively impact the species. By assessing these three components, the recovery needs of the species become apparent. Thus, a recovery strategy with specific actions can be developed to address the identified needs.

Biological Assessment

The biological assessment provides information about the species' biology and ecology that may affect its recovery potential and needs. The species' life history, range (including critical habitat), population trends, and historical population structure are considered in this process.

Life History: Chinook salmon follow the typical life cycle of Pacific salmon in that they hatch in freshwater, migrate to the ocean, and return to freshwater to spawn. Diversity within this life cycle exists, however, in the time spent at each stage. Juvenile Chinook salmon are classified into two groups, ocean-type and stream-type, based on the period of freshwater residence (Healey 1991). Ocean-type Chinook salmon spend a short period of time in freshwater after emergence, typically migrating to the ocean within their first year of life. Stream-type Chinook salmon reside in freshwater for a longer period of time, typically a year or more, before migrating to the ocean. After emigration, Chinook salmon remain in the ocean for two to five years (Healey 1991) tending to stay in the coastal waters of California and Oregon. Chinook salmon are also characterized by the timing of adult returns to freshwater for spawning, with the most common types referred to as fall-run and spring-run fish. Typically, spring-run fish have a protracted adult freshwater residency, sometimes spawning several months after entering freshwater, and produce stream-type progeny. Fall-run fish spawn shortly after entering freshwater and generally produce ocean-type progeny. Historically, both spring-run and fall-run fish existed in the CC Chinook salmon ESU. At present only fall-run fish appear to be extant in the DPS.

Range: The CC Chinook salmon ESU constitutes the southernmost portion of the coastal North American range of Chinook salmon. The ESU includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River (exclusive) to the Russian River (inclusive, Figure 1). Seven artificial propagation programs were considered part of the ESU at the time of listing: the Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, Mattole Salmon Group, and Mad River Hatchery fall-run Chinook hatchery programs. The Mad River Hatchery no longer rears or produces any Chinook salmon.

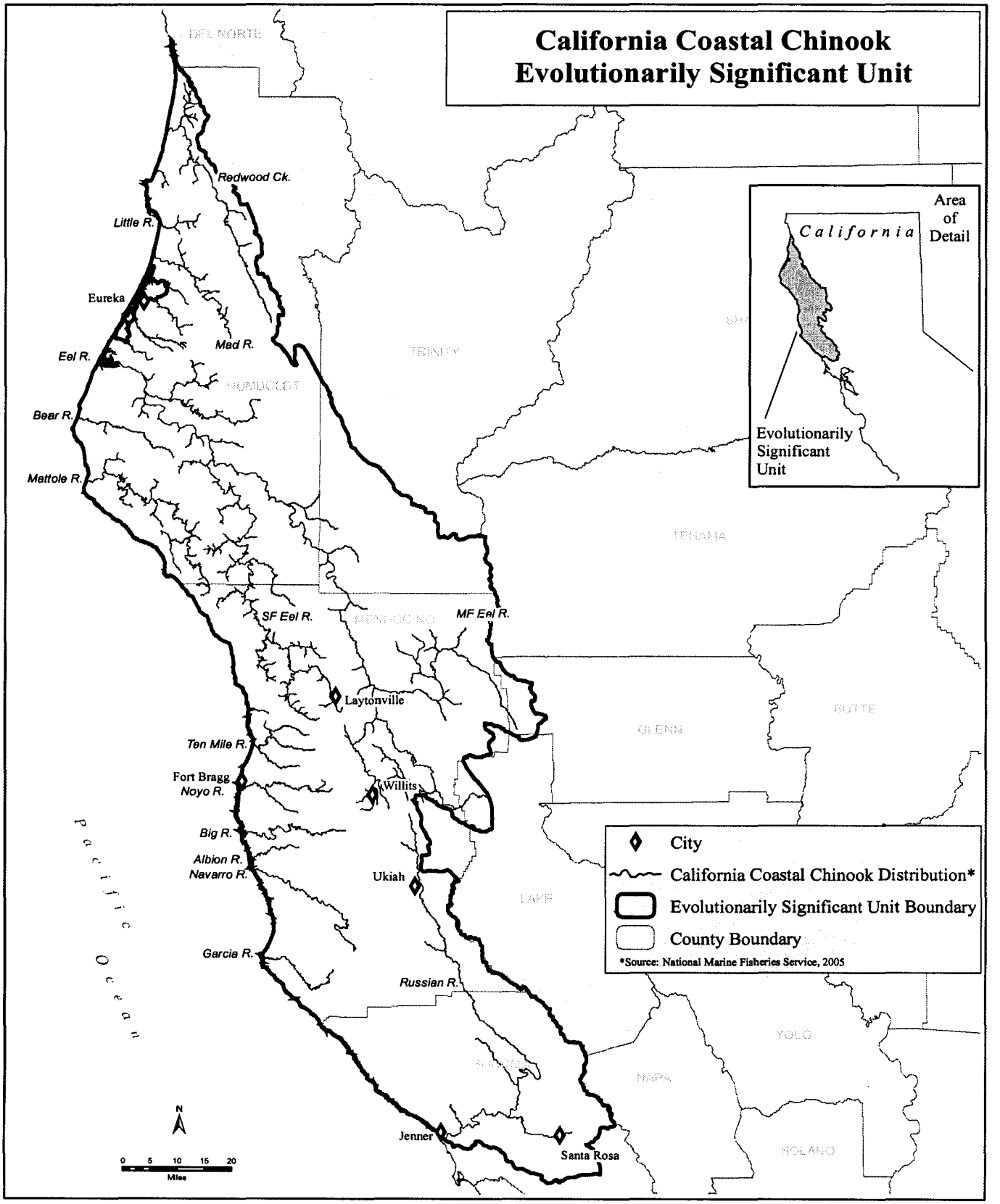

Figure 1. The California Coastal Chinook salmon ESU.

***Critical Habitat*:** NMFS is responsible for designating critical habitat for species listed under its jurisdiction. In designating critical habitat, NMFS considers the following requirements of the species: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of the species (see 50 CFR 424.12(b)). In addition to these factors, NMFS focuses on the known physical and biological features (primary constituent elements) within the designated area that are essential to the conservation of the species and that may require special management considerations or protection. Section 4 of the ESA requires that economic, national security and other relevant impacts are taken into consideration when designating critical habitat. Additionally, section 7 of the ESA requires that Federal agencies (via consultation with NMFS) ensure any action they authorize, fund, or carry out will not result in the destruction or adverse modification of critical habitat.

The final critical habitat designation for the CC Chinook salmon ESU was issued on September 2, 2005 (70 FR 52488). The specific primary constituent elements considered in the designation were freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, estuarine areas, nearshore marine areas, and offshore marine areas. No unoccupied areas or offshore marine areas were designated as critical habitat. Approximately 1,634 miles of stream habitat and 25 square miles of estuarine habitat (primarily in Humboldt Bay) were considered for designation. Of those, the following were excluded: 158 stream miles due to economic impact and 10.3 stream miles due to overlap with Indian lands. Thus, approximately 1,466 miles of stream habitat and 25 square miles of estuarine habitat were ultimately designated as critical habitat for the CC Chinook salmon ESU (70 FR 52488). The lateral extent of critical habitat in streams is the width of the stream defined by the ordinary high water line. For estuarine areas, it is the area inundated by extreme high tide.

***Status*:** Information on abundance and productivity trends for the naturally spawning component of the CC Chinook salmon ESU is extremely limited. A Biological Review Team (BRT) established by NMFS conducted a status review for west coast Chinook salmon and reported their conclusions in 1998 (Myers *et al.* 1998). In 2003, another BRT convened to analyze updated biological information for west coast salmon and reported their conclusions in 2005 (Good *et al.*). The recent BRT concluded that CC Chinook salmon continue to exhibit depressed population sizes relative to historical abundances (Good *et al.* 2005). A reduction of geographic distribution was also noted, particularly for spring-run Chinook salmon (which may no longer be extant anywhere in the range of this ESU) and from basins in the southern portion of the ESU. Analyses of the few time series of data available for this ESU showed mixed trends. Positive trends seemed apparent at Freshwater Creek and the Mad River while trends from the Eel River were generally negative. Recent strong return numbers to the Russian River have been documented, but the genetic relatedness of these fish to others in the ESU is uncertain. The lack of data and resultant uncertainty associated with estimates of abundance contributes substantially to assessments of risk facing the CC Chinook salmon ESU.

Artificial propagation of Chinook salmon from the hatcheries included in the CC Chinook salmon ESU remains at low levels (Good *et al.* 2005). It is unknown if these hatcheries are a benefit or detriment to the naturally spawning portion of the ESU. The artificial propagation programs that are part of the ESU are thought to, "decrease risk to some degree by contributing

to increased abundance, but have neutral or uncertain effects on productivity, spatial structure or diversity of the DPS" (70 FR 37160 at 37182). However, there is considerable uncertainty around this statement. In order to know that an artificial propagation program is decreasing extinction risk, information about the number of offspring produced by hatchery fish compared to fish spawning in the wild is required. Additionally, the effects of broodstock mining and genetic deviations would need to be considered. At present, data to address these issues do not exist.

***Historical Population Structure and Viability*:** The ESA requires that recovery plans for listed species include objective, measurable criteria that are used to determine when a species can be removed from the list. These criteria require both an explicit analysis of threats under the five listing factors described in the "Assessment of Threats under the Five Listing Factors" section below, and an evaluation of population or demographic parameters. The NCCC Domain Technical Recovery Team (TRT) is responsible for developing biological viability criteria to satisfy the latter portion of the recovery criteria requirement. As a first step in this process, the TRT has estimated the historical population structure of the CC Chinook salmon ESU (Bjorkstedt *et al.* 2005). Biological viability criteria are expected from the TRT in 2007.

Three types of information were used to characterize the historical population structure of the CC Chinook salmon ESU: geographic, genetic, and environmental. Analysis of these factors informed the identification of individual subpopulations within the ESU and their potential role in the structure and persistence of the ESU. Via analysis of geographic data each individual population is assigned to a population type:

- "Functionally Independent Populations" were those that historically had a high likelihood of persisting over 100-year time scales due to their population size and relatively independent dynamics (i.e., negligible influence of migrants from neighboring populations on extinction risk).
- "Potentially Independent Populations" were those that had a high likelihood of persisting in isolation over 100-year time scales due to large population size, but were likely too strongly influenced by immigration from other populations to exhibit independent dynamics.
- "Dependent Populations" were those that had a substantial likelihood of going extinct within a 100-year time period in isolation due to smaller population size, but receive sufficient immigration to alter their dynamics and reduce extinction risk.

The TRT identified 16 "functionally independent", 5 "potentially independent", and 17 "dependent" populations in the CC Chinook salmon ESU (Bjorkstedt *et al.* 2005; with modifications described in Spence *et al.* In preparation). The TRT noted substantial uncertainty to the hypothesized population structure for this ESU due to lack of historical data. Results from analysis of genetic data generally supported the population assignments, although high uncertainty stemming from lack of samples and artificial propagation warranted caution in interpretation of genetic results. Historical information on the spring-run portion of the ESU is especially sparse, so analysis for this component required the use of environmental correlates.

Beyond delineating individual populations, the TRT also identified diversity strata for the DPS by grouping together watersheds that share similar environmental characteristics. Thus, each diversity stratum identified represents a group of populations that evolved under similar

conditions. The development of viability criteria at the diversity strata scale should, therefore, account for the environmental, phenotypic, and genetic diversity that historically existed. The TRT defined five diversity strata in the CC Chinook salmon ESU. Within two of these strata, populations were further subdivided according to life history type, with fall-run and spring-run populations constituting distinct substrata (Bjorkstedt *et al.* 2005; with modification described in Spence *et al.* In preparation).

Understanding the historical population structure allows insight into the conditions under which the ESU persisted in the long term. If the populations within the ESU diverge from the historical structure, the viability of the ESU as a whole may decrease. Thus, the historical structure provides a benchmark at which we have high confidence that the ESU persisted over long periods of time; the farther the ESU departs from this historical structure, the greater our uncertainty about whether the ESU is likely to persist. This provides a biologically relevant context for recovery planning (Bjorkstedt *et al.* 2005) by guiding restoration and monitoring toward those populations most essential for successful recovery of the ESU.

Threats Assessment

A thorough understanding of the threats that impact a species is vital for recovery. Four components are considered in assessing threats. First, threats that existed at the time the species was listed must be addressed to allow a logical link between the listing package and the recovery plan. Second, changes that have occurred to those threats must be documented. Third, any new threats that have arisen since the time of listing need to be described to be sure all threats to the species are considered. Fourth, an analysis of threats must be conducted to formally determine the threats that are limiting recovery of the species.

***Threats Identified at the Time of Listing*:** Section 4(a)(1) of the ESA and NMFS implementing regulations (50 CFR part 424) direct NMFS to determine if a species is threatened or endangered through one or a combination of the following factors: (A) the present or threatened destruction, modification or curtailment of habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) inadequacy of existing regulatory mechanisms; or (E) other natural or man-made factors affecting its continued existence. Through the regulatory process, the Secretary of Commerce has determined that the CC Chinook salmon ESU is a threatened species based on a combination of factors as outlined in the final rule (70 FR 37160; June 28, 2005) and summarized below. The destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors have been identified as primary causes for the decline of CC Chinook salmon ESU.

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range: Land use activities associated with logging, road construction, urban development, mining, agriculture, ranching, and recreation have resulted in the loss, degradation, simplification, and fragmentation of CC Chinook salmon habitat, and caused resulting declines in CC Chinook salmon populations. Associated impacts of these activities include: alteration of stream bank and channel morphology; alteration of ambient stream water temperatures; degradation of water quality; elimination of spawning and rearing habitats; fragmentation of available habitats; elimination of downstream recruitment of spawning gravels and large woody debris; removal of riparian vegetation resulting in increased stream bank erosion; and increased sedimentation input into spawning and rearing areas resulting in the loss of channel complexity, pool habitat, and suitable gravel substrate.

The coastal river systems of the CC Chinook salmon ESU have specifically been affected by agriculture, logging, and mining activities (NMFS 1998). The effect of periodic flood events has been exacerbated by these practices. Additionally, the distribution of the CC Chinook salmon ESU has been restricted by dam construction in the Eel and Russian River basins. The spring-run life history form of this ESU, which historically used upstream habitat, may have been especially impacted by these structures. Specific dams known to restrict access to spawning and rearing habitat are: Peters Dam (on Lagunitas Creek), Nicasio Dam (on a tributary to Lagunitas Creek), Warm Springs Dam (on a tributary to the Russian River), Coyote Dam (on the Russian River), and Scott Dam (on the Eel River).

Summation: Destruction and modification of habitat are some of the primary reasons for the decline of the CC Chinook salmon ESU. Mining, agriculture, logging, habitat blockages, and water diversion/extraction have been identified as factors affecting this ESU.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes: Chinook salmon have supported, and continue to support tribal, commercial, and recreational fisheries, and artificial production, supplementation, and broodstock collection activities. Overfishing in the early days of European settlement depleted many Chinook salmon stocks prior to the impact of more recent habitat degradation (NMFS 1998). Unsustainable harvest rates after extensive habitat degradation likely contributed to further decline of Chinook salmon populations.

Both freshwater and ocean harvest impacts have been reduced over time by active management. Freshwater harvest is managed by the California Department of Fish and Game (CDFG). Ocean harvest is managed by the Pacific Fisheries Management Council (PFMC). Although modern harvest rates have not been estimated directly for the CC Chinook salmon ESU, they may be comparable to rates on Klamath fall-run Chinook salmon (NMFS 1998). Ocean harvest rate for this population was estimated at 21% (PFMC 1996a, as cited in NMFS 1998), and freshwater and estuarine harvest rate between 25-30% (PFMC 1996b, as cited in NMFS 1998).

Collection for scientific research and education programs has had little or no impact on CC Chinook salmon populations. Take of this nature is controlled by the issuance and conditioning of scientific collection permits by the CDFG and NMFS. Most of the permits are issued to environmental consultants, Federal resource agencies, and universities.

Summation: Overutilization for recreational purposes is one of the primary reasons for the decline of the CC Chinook salmon ESU.

C. Disease or Predation: Infectious disease can influence adult and juvenile salmon survival. Fish are exposed to numerous bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and the marine environment. Specific diseases known to affect Chinook salmon are bacterial kidney disease, ceratomyxosis shasta, columnaris, furunculosis, infectious hematopoietic necrosis, redmouth and black spot disease, and erythrocytic inclusion body syndrome (NMFS 1998). In general, very little current or historical information exists to quantify changes in infection levels and mortality rates attributable to these diseases. However, studies have shown that naturally spawned fish tend to be less susceptible to pathogens than hatchery-reared fish. Chinook salmon have co-evolved with specific communities of these organisms, but the widespread use of artificial propagation has introduced

exotic organisms not historically present in a particular watershed. Habitat conditions such as low water flows and high temperatures can exacerbate susceptibility to infectious diseases.

Introductions of non-native species and habitat modifications have resulted in increased predator populations and predator success rates. Introduced Sacramento pikeminnow, whose populations have flourished with warmer water conditions, are known to consume juvenile salmonids throughout the Eel River Basin. Numerous avian species also prey upon juveniles, and success is often improved by water development activities. Predation by marine mammals (specifically pinnipeds such as harbor seals and California sea lions) has become a concern due to the increase in pinniped numbers along the Pacific Coast and dwindling run sizes of CC Chinook salmon. However, most studies show that salmonids are a minor dietary component of marine mammals. It has been reported that predation on anadromous salmonids by harbor seals and California sea lions at the mouth of the Russian River is minimal (Hanson 1993).

Summation: Although not one of the primary driving factors for the decline of the CC Chinook salmon ESU, predation is a factor affecting this ESU.

D. Inadequacy of Existing Regulatory Mechanisms: A variety of regulatory mechanisms and protective efforts existed at the time of listing with potential positive effects for abundance and survival of the CC Chinook salmon ESU. These efforts are described in one of two sections in the listing package: (1) within the summary of factors affecting the species section, or (2) within the evaluation of protective efforts section. We have chosen to summarize the efforts here to allow changes since listing to be logically tracked in a manner similar to changes in other threats.

Federal Efforts
NMFS staff conducts ESA section 7 consultations with federal action agencies that fund, conduct or authorize projects in the range of CC Chinook salmon. NMFS staff evaluates impacts to CC Chinook salmon from a wide variety of projects including: irrigation and water diversion, timber harvest, watershed restoration, fish passage, gravel mining, grazing, and transportation projects. One important consultation was the Potter Valley Project (for the Eel and Russian Rivers). Other important consultations are ongoing with the U.S. Army Corps of Engineers and the Sonoma County Water Agency (for the Russian River). These consultations have improved, or minimized adverse impacts to, the CC Chinook salmon ESU and associated habitat.

NMFS is also engaged in an ongoing effort to assist in the development of HCPs for state and private lands under section 10 of the ESA. Important HCPs are discussed in the section describing non-federal efforts below.

The Northwest Forest Plan (NFP) is a federal management policy with potential benefits for CC Chinook salmon. Under the NFP the U.S. Forest Service and the Bureau of Land Management have made efforts to reduce adverse effects to aquatic and riparian dependent species including salmon in the range of the Northern spotted owl. The most significant element of the NFP for anadromous fish is its Aquatic Conservation Strategy, which includes an objective for salmon habitat conservation.

The Redwood National and State Parks have developed several plans to help protect and enhance anadromous salmonids habitats including the Redwood National and State Park General Management Plan and the Redwood National Park Final Management Plan. Humboldt

Redwoods State Park has also developed a State Park General Plan with one of its goals being to restore and protect terrestrial and aquatic habitats and species in accordance with federal and state laws.

The PFMC manages ocean fisheries consistent with NMFS' requirements for listed salmonids. This management reduces the impact of ocean harvest to listed salmon such as the CC Chinook salmon ESU.

NMFS is responsible for management of ocean salmon fisheries under the Pacific Coast Ocean Salmon Fishery Management Plan and the Magnuson-Stevens Act.

The Pacific Coastal Salmon Recovery Program allows NMFS to provide annual grants (from the Pacific Coastal Salmon Recovery Fund) to the State of California to assist salmon recovery efforts in coastal watersheds from the Oregon border to southern California.

Non-Federal Efforts
The CDFG has funded a development effort for a statewide coastal salmonid monitoring program. Due to the lack of comprehensive abundance and trend data for coastal salmonids, a coastal monitoring program is critical to assessing the viability of listed ESUs.

Resource Conservation Districts along the northern California coast allow the agricultural community to voluntarily address and correct management practices that impact ESA listed salmonids and their habitats. Theses Districts can assist landowners in developing and implementing best management practices that are protective of salmonids.

The North Coast Regional Water Quality Control Board is in the process of updating its north coast basin plan, which will establish water quality standards for all of the northern California rivers and streams. These plans will also incorporate newly developed Total Maximum Daily Load standards that are being developed for those water bodies that are listed as impaired under section 303(d) of the Clean Water Act. These plans will likely help reduce human impacts to the aquatic environments and thus protect ESA listed salmonids.

The Rangeland Management Advisory Committee has developed a management plan for inclusion in the state's Non-point Source Management Plan. The purpose of the plan is to maintain and improve the quality and associated beneficial uses of surface water that passes through rangeland resources.

Long-term sustained gravel mining plans have been, or are being, developed by Humboldt and Mendocino County, which comprise a substantial portion of the range of the CC Chinook ESU.

A Memorandum of Understanding between NMFS and five northern California counties (including Humboldt and Mendocino) has been developed to create a standardized county routine road maintenance manual to assist in the protection of ESA listed species and their habitat. This manual includes best management practices for reducing impacts to listed species and the aquatic environment, a five-county inventorying and prioritization of all fish passage barriers associated with county roads, annual training of road crews and county planners, and a monitoring framework for adaptive management.

The Sotoyome Resource Conservation District has developed a voluntary certification program (Fish Friendly Farming) for grape growers in Sonoma and Mendocino Counties who implement land management practices that decrease soil erosion and sediment delivery to streams.

FishNet 4C is a multi-county group (including Mendocino and Sonoma) that coordinates county efforts such as road maintenance, fish barrier assessment and removal, riparian and grading ordinances, erosion control, implementation of bioengineering projects and the development of guidelines for public works departments that enhance or protect salmonid habitat.

The Sonoma County Water Agency is conducting a passage project on the Russian River that will give CC Chinook salmon access to an additional 15 – 20 miles of spawning and rearing habitat.

Local watershed councils and other groups throughout California have successfully developed restoration plans and have worked to implement habitat restoration projects that are expected to contribute to the conservation of listed salmonids ESUs. In the range of the CC Chinook salmon ESU these groups include: the Humboldt Bay Watershed Advisory Committee for Humboldt Bay watersheds; the Eel River Watershed Improvement Group that focuses on the lower Eel River, the Van Duzen River and South Fork Eel River; the Mainstem Eel River Group; the Yager/Van Duzen Environmental Stewards; the Eel River Salmon Restoration Project; and the Mattole Restoration Council and Group (Mattole River), and Russian River watershed groups.

Many other sub-watershed groups, landowners, environmental groups, and non-profit organizations throughout the range of CC chinook salmon are conducting habitat restoration and planning efforts that may contribute to the conservation of the species.

There are three important HCPs that could contribute to the conservation of the CC Chinook salmon ESU. The Pacific Lumber Company HCP has a goal of achieving or trending towards properly functioning aquatic habitat conditions. An HCP may be developed with Green Diamond Resource Company for its industrial timber operations in northern California. The Humboldt Bay Municipal Water District HCP prevents river dry-up due to water district operations.

Summation: Despite the extent of federal and non-federal efforts, the regulatory mechanisms that existed at the time of listing were considered inadequate.

E. Other Natural and Man-made Factors Affecting the Species' Continued Existence: Natural factors that may prevent recovery of CC Chinook salmon by causing variability in the population are cyclic ocean conditions, drought, floods, fire, and landslides. Although Chinook salmon have survived such events over the millennia, coupled with deteriorating habitat conditions, natural climatic conditions may pose a threat to the persistence of the species. Cyclic ocean conditions can affect food supply, predator distribution and abundance, migratory patterns, and overall survival (NMFS 1998). Droughts and floods may reduce Chinook salmon spawning, rearing, and migration habitat, particularly when in conjunction with previously described land and water use activities. Fire, again coupled with modified habitat, can affect woody debris recruitment, shade, and soil stability. Landslides affect riparian vegetation and sedimentation.

Artificial propagation can have beneficial or detrimental effects on salmon populations. Artificial propagation of the CC Chinook salmon ESU remains at relatively low levels. No putatively independent populations of Chinook salmon in this ESU appear to be entirely dominated by hatchery production, although proportions of hatchery fish can be quite high where natural escapement is small and hatchery production appears successful (Good *et al.* 2005). It is not clear whether current hatcheries pose a risk or offer a benefit to naturally spawning populations. Extant hatchery programs are operated under guidelines designed to minimize genetic risks associated with artificial propagation, and other than historical inputs to the Mad River Hatchery stock, do not appear to be at substantial risk of incorporating out-of-basin or out-of-ESU fish. Thus, it is likely that artificial propagation and degradation of genetic integrity do not represent a substantial conservation risk to the ESU (Good *et al.* 2005).

Summation: Natural and human-made factors are some of the primary reasons for the decline of the CC Chinook salmon ESU.

***Changes to the Threats since Listing*:** This section documents changes that have occurred to the threats listed above since the time of listing. In some cases, threats may have been removed via restoration or management practices, and may no longer need to be considered for recovery actions. A thorough review of changes to the five listing factors will be done during recovery plan development. Examples of some changes by listing factor are provided here:

A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range: At the time of listing, Peters Dam (on Lagunitas Creek), Nicasio Dam (on a tributary to Lagunitas Creek) were considered to block or restrict access to historic Chinook salmon spawning and rearing habitat (NMFS 1998). Recent work indicates that, even under historical conditions, it is unlikely that Lagunitas Creek or its tributaries supported persistent populations of Chinook salmon (Bjorkstedt *et al.* 2005).

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes: A global moratorium on high seas driftnet fishing (via a United Nations resolution implemented by the U.S. in 1992) has reduced the impact of this threat to salmonids.

C. Disease or Predation: Predation by pikeminnow in the Eel River may be more substantial then previously considered.

D. Inadequacy of Existing Regulatory Mechanisms: Due to budgetary constraints, the statewide coastal monitoring program funded by CDFG is not functioning at present.

E. Other Natural and Man-made Factors Affecting the Species' Continued Existence: The Mad River Hatchery program for Chinook salmon has been terminated.

***New Threats since Listing*:** Threats that were not present, or were not documented, at the time of listing may exist for the CC Chinook salmon ESU. A thorough review of these new threats will be included in development of the recovery plan.

***Analysis of Threats*:** A formal analysis of threats will be conducted for the CC Chinook salmon ESU to identify the key factors that are limiting the recovery of the species. The analysis will be conducted using a ranking matrix developed by The Nature Conservancy (TNC). This method

breaks each identified threat down into two components, stress and source of stress, then ranks each component for a number of different criteria. As a result of these rankings a final score is established for each threat. The scores allow recovery actions to be prioritized by those threats whose alleviation will have the greatest impact on recovery.

Conservation Assessment

The objective of a conservation assessment is to identify the steps that have been or are being taken to address the conservation needs of the species of interest. By considering the existing conservation actions and comparing them with threats identified in the previous section, the types of recovery actions that still need to occur should become clear. Two types of conservation assessments are conducted for listing and recovery:

1. Protective efforts: evaluated pursuant to the "Policy for Evaluation of Conservation Efforts When Making Listing Decisions" (68 FR 15100; March 28, 2003)
2. Conservation assessment: conducted pursuant to the Interim Recovery Planning Guidance (NMFS 2006)

Protective efforts: Under section 4(b)(1)(A) of the ESA, protective efforts are required to be assessed during listing decisions. Federal agencies are required to review the status of the species using the best scientific and commercial data available after taking into account efforts being made to protect the species. The efficacy of existing efforts must consider the following: (1) substantive, protective and conservation elements; (2) degree of certainty efforts will be implemented; and (3) presence of monitoring provisions that determine effectiveness and permit adaptive management. Protective efforts for the CC Chinook salmon ESU were assessed in the original listing (64 FR 50394; September 16, 1999), and again in the final rule (70 FR 37160 June 28, 2005). Protective efforts for Chinook range in scope from regional strategies to local watershed initiatives. Major efforts are summarized above in the 'Threats under the Five Listing Factors at Time of Listing' section. Efforts are described in greater detail in the proposed listings for West Coast Salmonids (69 FR 33102 at 33143; June 14, 2004).

Conservation assessments: For recovery outlines and plans a conservation assessment is conducted pursuant to the Interim Recovery Planning Guidance (NMFS 2006). While correlating with protective efforts evaluated during listing, this assessment should provide additional information, including conservation efforts that have occurred since listing. Conservation efforts can include agreements that remain in place since listing, recovery-related research, habitat protection measures, measures implemented pursuant to ESA sections 4, 7, and 10 and other regulatory mechanisms, and the work of active conservation constituencies.

The full suite of conservation efforts will be evaluated and documented during recovery plan development. While not a complete assessment, we provide here some of the ongoing efforts NMFS believes contribute to the conservation of the CC Chinook salmon ESU by abating or reducing threats outlined above.

- NMFS has addressed CC Chinook salmon ESU needs through biological opinions, participation in HCPs (e.g., the Green Diamond Resource Company HCP, signed on June 12, 2007 (72 FR 36672), which will help secure conservation efforts for a portion of the DPS and costal basins to the north of the existing Pacific Lumber company HCP), and interagency technical work groups. These consultations have improved or minimized

adverse impacts to listed salmonids and their habitats by improving habitat and fish passage conditions.

- NMFS has developed guidelines for bank stabilization, road maintenance, instream gravel mining, maintaining instream flows to protect salmonids below water diversions, fish screening, salmonid passage at stream crossings, summer dam mitigation and impacts, and timber harvest activities.

- Numerous federal, state and local conservation programs include:

    - Pacific Coastal Salmon Recovery Fund
    - EPA Total Maximum Daily Load Programs
    - State Coho Recovery Plan (efforts to recover coho will provide benefits to Chinook salmon)
    - CalFish and California Fish Passage Forum
    - Improvements in Hatchery Programs
    - Fish Friendly Farming Program
    - 5 Counties Salmon and Roads Program
    - Mattole River Salmon Group
    - Green Diamond Resource Company HCP
    - FishNet 4C

Recovery Status Summary
The recovery status of the CC Chinook salmon ESU will be determined from a synthesis of the three assessments provided above: biological, threats, and conservation. Understanding the current status provides a basis for determining the direction that recovery actions will take.

Recovering the ESU will likely require a mix of improved access to historically available habitat and restoration of degraded habitat. Historical distribution provides an understanding of how an altered ESU may or may not persist in the future. Current distribution provides an understanding of how to efficiently safeguard the existence of the ESU.

From the determination of the status of the CC Chinook salmon ESU, a recovery strategy with specific actions will be developed. While current data are deficient and research and monitoring will be critical to recovery, NMFS believes the following outlines key needs:

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:

- 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.

Preliminary Recovery Strategy

The preliminary recovery strategy describes initial decisions that have been made about how to recover the species. First, a Priority Number was determined for the species to rank its priority for recovery plan development and implementation. Next, a Recovery Vision Statement was made to clearly define the overall goal of recovery. Priority tasks were then developed which, if implemented, would improve the species' potential for recovery. Finally, a preliminary action plan for NMFS was written. This plan outlines potential coordination efforts between divisions within NMFS and with other entities involved in salmonid management and recovery. This is a starting point from which the full recovery strategy for the species will be developed.

Recovery Priority Number

A Priority Number of "3" was assigned to the CC Chinook salmon ESU in accordance with the Recovery Priority Guidelines (55 FR 24296, Section B; June 15, 1990). Priority Numbers are determined from a matrix comparing the species' magnitude of threat of extinction, recovery potential, and potential for conflict with economic activities. Priority Numbers range from 1 – 12 with lower numbers receiving higher priority for recovery plan development and implementation. Ranking for CC Chinook salmon was based on a high degree of threat, a low-moderate recovery potential and an anticipated conflict with development projects or other economic activity.

The high degree of threat determination is based on the following factors: 1) evidence that suggests populations have been extirpated in the southern part of the ESU, or are extremely low in abundance; and 2) loss of the spring-run chinook life history in the Eel River Basin and elsewhere in the ESU. A low-moderate potential for recovery is possible for CC Chinook salmon based on the extremely limited availability of data and the moderate likelihood that

freshwater impacts can be substantially controlled or reduced through habitat protection, implementation of best management practices and focused restoration. Imminent land use changes and encroaching urbanization into rural areas result in anticipated conflict with the conservation needs of CC Chinook salmon.

Recovery Vision Statement

Recovery and delisting of the CC Chinook salmon ESU is the desired outcome of recovery planning. An outcome that evolves from a "... process by which listed species and their ecosystems are restored and their future safeguarded to the point that protections under the ESA are no longer needed" (NMFS 2006). The process shall include the development and implementation of a recovery plan that provides for the conservation and survival of the CC Chinook salmon ESU pursuant to section 4(f)(1) of the ESA as well as the most recent judicial decisions and policy guidance.

All methods and procedures which are necessary shall be used to bring CC Chinook salmon to the point at which the measures pursuant to the ESA are no longer necessary. Such methods and procedures shall result in the establishment and maintenance of a viable population of CC Chinook salmon via increased abundance, improved population growth rate, increased population spatial structure and greater genetic/life history diversity.

Priority Tasks to Improve Potential for Recovery

Priority actions that would improve the species' potential for recovery have been identified for the CC Chinook salmon ESU. These include, but are not limited to, the following:

- Conduct and improve research and monitoring on distribution, status and trends
- Protect and restore watershed and estuarine habitat complexity and connectivity
- Improve freshwater habitat quantity and quality
- Reduce and control impacts of urbanization through education, outreach, partnerships, and protective regulations
- Focus freshwater habitat restoration (*e.g.*, erosion control, bank stabilization, riparian protection and restoration and reintroduction of large woody debris)
- Balance water supply and allocation with needs and priorities for fish recovery through water rights programs, identification and designation of fully appropriated watersheds, development of passive diversion devices and/or offstream storage, elimination of illegal water diversions, and improved criteria for water drafting, storage and dam operations
- Improve agricultural, instream gravel mining and forestry practices
- Improve county/city planning, regulations (*e.g.*, riparian and grading ordinances) and county road maintenance programs
- Improve State road maintenance and management
- Screen water diversion structures in anadromous fish bearing streams
- Replace existing outdated septic systems and improve wastewater management
- Promote concept of multi-use/recycling of water to increase water supply (*e.g.*, use of tertiary treated wastewater for golf courses and other appropriate uses)
- Facilitate identification and treatment of point and non-point source pollution from wastewater, agricultural practices and urban environments to priority streams
- Modify channel and flood control maintenance practices, where appropriate, to increase stream and riparian complexity

- Improve understanding of life-stage survival at the sub-population scale through focused research and monitoring
- Provide outreach to federal action agencies regarding ESA section 7(a)(1) and the carrying out of programs that conserve and recover federally listed salmonids
- Encourage enforcement, improved performance and needed revisions to pertinent State and local rules and regulations such as Forest Practice Rules, Urban Stormwater Permits, County General Plans, and others
- Encourage recruitment and maintenance of native riparian areas by removal of livestock and incentives for tree and vegetation retention
- Improve harvest management strategies and reform hatchery practices where necessary

Preliminary Recovery Action Plan
The goal of the action plan is to ensure NMFS is fulfilling its obligation under the ESA to conserve and recover CC Chinook salmon. NMFS shall focus primarily on linking and coordinating ESA programs to recovery planning, and developing stronger, more collaborative partnerships with other entities whose decisions affect salmon recovery.

Outline of NMFS Actions ~ Coordinating ESA Programs with Recovery Planning:
1) Streamline programs through programmatic strategies and develop best management practices that can be provided to federal, state, county or city governments, and private landowners for the benefit of salmonid habitat.

- Programmatic Strategies include, but are not limited to, State of California Road Maintenance Manual, Bank Stabilization Guidelines, Gravel Mining Guidelines *(completed 2004)*, Ground Water Management Guidelines, Water Development and Rights Policies, Minimum Flow Policies for dry seasons to ensure appropriate water temperatures and conditions *(completed 2004),* Timber Harvest Guidelines *(expected completion date December 2007)*, Stream Flow Protection Standards (Public Resources Code, Division 10, Section 10800 – 11005) and active participation in County General Plan updates.

2) Streamline ESA section 7 processes by providing direction for NMFS consultations.

- Heighten awareness of NMFS consultation staff to important populations within the CC Chinook salmon ESU and threats to be addressed.
- Utilize programmatic approaches where appropriate.
- Prioritize participation in interagency collaborative efforts seeking to streamline project implementation while contributing to the conservation strategy for the CC Chinook salmon ESU.

3) Identify types of ESA section 7 conservation measures that may be appropriate on priority watersheds.

- Utilize opportunities for enhancement of existing habitat conditions.
- Incorporate priority recovery actions in consultations.

4) Coordinate recovery planning efforts with other NMFS programs (*e.g.*, those conducted by Southwest Fisheries Science Center, Sustainable Fisheries, and/or Habitat Conservation) through GIS and database development.

- Develop tracking systems for: (a)"incidental take" permits; (b) annual ESA section 10 reporting; and (c) implementation and effectiveness of NMFS recommendations (*e.g.*, terms and conditions from ESA section 7 consultations).
- Develop a formal process that outlines and prioritizes research needs to improve decision-making under the ESA and allow for a streamlined permitting process for applications that address 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) Create higher levels of efficiency and scientific rigor to work products by continued development of a spatially-linked (geo-referenced) relational database (i.e. CalFish) that provides the best available information on the distribution, abundance and productivity of the CC Chinook salmon ESU.

6) Collaborate with NOAA's Office of Law Enforcement during recovery plan development.

Outline of Actions ~ Coordination and Outreach:

1) Promote communication and collaboration between different divisions, offices, laboratories, Science Centers, Regions and the Pacific Fisheries Management Council for salmon recovery planning.

2) Assess how the State Coho Salmon Recovery Strategy and identified implementation actions can be used to facilitate coordination and outreach for CC Chinook salmon (i.e. through education and increased awareness about conservation of salmonids).

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) Conduct outreach to promote CC Chinook salmon recovery.
   - Develop specific outreach plan for the public, stakeholders and private organizations (*e.g.*, Sustainable Conservation, Natural Resources Conservation Service, Nature Conservancy, etc.).

5) Provide technical information about CC Chinook salmon life history, species needs and viable salmonid population structure to federal, state, regional planning organizations, county governments, special interest groups and non-governmental organizations to include in their project designs, general plans, watershed plans, etc.

6) Promote NMFS' student internship programs and other types of student appointments to recruit individuals with desired backgrounds, education and training.

Pre-planning Decisions

These are decisions that have been made about the development of the recovery plan for CC Chinook salmon ESU.

Product: Draft Recovery Plan for CC Chinook salmon ESU

Scope of Recovery Effort:
Species _X_ Recovery Unit __ Multi-Species __ Ecosystem __

Recovery Plan Preparation: NMFS, Southwest Region Protected Resources Division, will initiate the preparation of a draft recovery plan for CC Chinook salmon (using the most recent NMFS Recovery Planning Guidance from July 2006) concurrent with the TRT distribution of the draft reports being prepared for the salmon ESUs and steelhead DPSs in the North Central California Coast Recovery Domain. Primary authorship of the Recovery Plan will be the responsibility of NMFS staff. Outreach by NMFS to state, federal and private partners will be central to the recovery effort.

Administrative Record: The administrative record will be housed in the NMFS Santa Rosa office.

Schedule and Responsibilities for Draft Modules of CC Chinook Salmon Recovery Plan:
Completed:
Summer 2006

- Published 'Notice of Intent to Prepare a Recovery Plan'
- Initiated recovery plan threats assessment
- Developed recovery brochures

Fall/Winter 2006

- Initiated recovery planning website for public outreach
- Initiated development of specific background recovery plan chapters
- Initiated development of threats assessment using TNC protocols

To be completed:
Winter 2006/2007

- Conduct outreach on draft threats assessment
- Finalize recovery outline

Spring 2007

- Host workshops for public involvement in recovery planning process
- Request TRT/Science Center review of draft recovery criteria, where appropriate
- Post products on website for review and comment
- Complete draft recovery plan

Summer 2007

- Issue draft recovery plan and publish Federal Register Notice
- Initiate public review and comment
- Initiate independent peer review

Fall/Winter 2007

- Revise draft recovery plan and finalize
- Post final plan on website
- Outreach to initiate recovery plan implementation for priority actions

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 2006 to facilitate communication and collaboration with the public, stakeholders and agencies.

Anticipated Recovery Planning Actions:

(1) NMFS has appointed a TRT for the North Central California Coast Recovery Domain comprised of scientists tasked to develop biological viability criteria for the four ESUs in the Domain including the CC Chinook salmon ESU. The final products from the TRT are expected in early 2007.

(2) NMFS PRD staff are currently developing 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 will coordinate with NMFS Habitat Conservation Division, NMFS Sustainable Fisheries Division, NMFS Science Centers, NOAA's Restoration Center, and other NOAA cooperators to ensure consistency and effectiveness in the recovery plan development.

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

(5) NMFS will begin outreach efforts to ensure the highest level of public participation in the process. Outreach will consist of website updates on the recovery plan process, public meetings, development of educational materials and public input on the draft recovery plan.

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