CHAPTER 6: ASSESSMENT OF HABITATS & THREATS

"There is one thing more vital to science than intelligent methods; and that is, the sincere desire to find out the truth, whatever it may be."

Charles Sanders Pierce

METHODS TO ASSESS HABITAT CONDITIONS AND THREATS

Statute, case law, and agency policy guide the process NMFS uses to assess habitat conditions and threats to Federally listed species. The ESA mandates each recovery plan shall incorporate, to the maximum extent practicable, objective, measurable criteria which, when met, would result in a determination that the species has reached long term viability to the point that the protections of the ESA are no longer necessary (NMFS 2006a). Legal challenges underscore this statute and the intent of Congress. The law requires that objective, measurable criteria must link to threats identified at listing, as well as those identified since listing, and must measure whether threats have been abated. The U.S. Government Accountability Office in 2006, in an audit of Federal recovery plans, directed Federal agencies to incorporate, in all new or revised recovery plans, appropriate criteria evidencing consideration of listing factors. Thus, NMFS Interim Guidance (NMFS 2007) recommends "a structured approach to assessing threats, sources of threats, and their relative importance to the species' status…". The Interim Guidance (2007) additionally recommends recovery plans conduct an assessment explicitly identifying all threats to a species and track, through objective and measurable criteria, how each threat will be reduced or eliminated through site-specific management actions. This process includes: (1) identifying threats to the species at time of listing (Chapter 3); (2) identify changes in those threats; (3) identify any new threats; and (4) cross-referencing threats at time of listing and new threats.

Achieving population abundance necessary for viability and recovery will not be possible unless degraded habitats are restored to functioning conditions, and the threats that compromise these habitats are adequately controlled. The purpose of a threats assessment in recovery planning is to determine why, to the extent possible, the species is declining (NMFS 2007). The causes for this decline may be related to past, ongoing, and/or future stressors in the species' environment, or from direct mortality to individuals. Understanding current habitat conditions, stresses, and the sources of stress (*e.g.*, threats) to the species is essential in developing effective recovery actions. Coho salmon utilize a wide range of habitats and the condition of these habitats has different effects according to life stage. This chapter describes the methods used to: (1) assess current habitat conditions and future threats for the 28 focus populations in the CCC coho salmon ESU, and (2) develop recovery actions designed to restore functional habitat conditions, and control identified threats.

Conservation Action Planning

The Interim Recovery Planning Guidance for Threatened and Endangered Species (NMFS 2007) recommends the Conservation Action Planning (CAP) process as a method to assess current habitat conditions and future threats that affect species viability and to develop recovery strategies that address those conditions and threats. The CAP process was thus applied to CCC coho salmon recovery planning. It was developed by The Nature Conservancy (TNC) in collaboration with the World Wildlife Fund, Conservation International, Wildlife Conservation Society and others. Standards were developed by the Conservation Measures Partnership; a partnership of ten different biodiversity non-governmental organizations (www.conservationmeasures.org). CAP has been applied to more than 400 landscapes and 25 countries; TNC has officially adopted CAP as its standard conservation planning tool. CAP workbook information is available at: http://conserveonline.org/workspaces/cbdgateway/cap/index_html.

The CAP protocol was followed explicitly for CCC coho salmon recovery planning. The process involved assembling both qualitative and quantitative data on freshwater and marine conditions. All decisions, data, and references are catalogued in customized Excel tables, the CAP Workbook. This specialized CAP Workbook was designed to organize, track, and summarize large amounts of information in an easily updatable and user-friendly manner. The comprehensive documentation, transparency, and adaptability serves as the foundation for successive iterations as additional data are learned and gathered. The recovery plan only outputs the CAP workbook results for each watershed and summarized across watersheds. The metadata is extensive and was not included in the plan at this time, but can be requested.

The NMFS application of the CAP protocol included: (1) defining current conditions for habitat attributes essential for the long term survival of CCC coho salmon; (2) identifying activities reasonably expected to continue, or occur, into the future that will have a direct, or indirect, negative effect on the species; and (3) strategy development to improve current conditions (restoration strategies) and abate future threats (threats strategies). Each step culminates into a testable hypothesis of species viability across the dimensions of life stage/population viability, habitat conditions and continuing/future threats. From the hypothesis, success is measured from clearly defined objectives and strategies actions secured in CAPs adaptive and iterative framework.

In 2006, NMFS partnered with TNC for their assistance and support in applying the CAP process for the CCC coho salmon recovery plan. The hands-on training and interactions with TNC staff facilitated the custom application of the CAP workbook to CCC coho salmon. Several other NMFS recovery domains in California are also using the TNC CAP protocol, or a modified version of the process, to develop their recovery plans.

CAP Workbook Structure

Twenty-eight CAP workbooks were developed representing each of the focus freshwater populations (populations coincide with watersheds for the CCC coho salmon ESU). Each workbook was organized to assess site-specific and watershed conditions and threats, across freshwater lifestages (*e.g.*, adult spawning, egg survival, juvenile/winter survival, and smolt outmigration). This directed attention to a limiting lifestage, and the possible causes of the limitations. The conditions of all life stages collectively provide the landscape view of what may be limiting the overall population. Each CAP workbook has three structural components: the Viability Table, the Threats Tables, and a section on Strategic Actions.

The Viability Table

The Viability Table was developed to assess site-specific and watershed conditions. It was organized by a defined set of values supported by the best available scientific literature and provided a reference to assess current aquatic and upland conditions relevant to specific CCC coho salmon life stages. The Viability Table defines specific life stages as conservation targets, and assesses key habitat or population elements required for each life stage. The assessment depends on specific parameters or indicators, and reference values for each indicator.

Conservation Targets

The Conservation Targets have been defined as the following freshwater life-stages (Table 10):

- Spawning Adults – Includes adult fish from the time they enter freshwater, hold or migrate to spawning areas, and complete spawning (November 1 to March 1)[13];
- Egg – Includes fertilized eggs deposited into redds and the incubation of these eggs through the time of emergence from the gravel (December 1 to April 1);
- Summer Rearing – Includes juvenile rearing in streams and estuaries (when applicable) during summer and fall (June-October) prior to the onset of winter rains;
- Winter Rearing – Includes rearing of juveniles from the onset of winter rains through the winter months up to the initiation of smolt outmigration (November 1 to March 1);
- Smolt – Includes juvenile migration from natal rearing areas until they enter the ocean (March 1 to June 1); and
- Multiple Life Stages – Includes one or more freshwater life stages potentially affected by upslope or landscape processes. These processes have wide-ranging effects and occur at the watershed scale.

[13] The purpose in defining discrete life-stage periods is to assess habitat attributes during a representative time frame, not to encapsulate the full range of timing possibilities.

Table 14: CAP Example Workbook Page and Life Stage Targets

The Nature Conservancy
Protecting nature. Preserving life.

Conservation Action Planning Workbook
A tool for developing strategies, taking action, and measuring success
© 2008 The Nature Conservancy Version: CAP_v5a March 7, 2008

ConserveOnline Help
Online Tutorial
Full Version

To enter, edit or delete data in protected cells (which are shaded or contain entries in black font), double-click on the cell. An entry form will appear.
To change the table format, double-click on the table header. A table format form will appear.

	Project and Conservation Targets	
	Project	**Central California Coast Coho Salmon ~ Lagunitas Creek Population**
1	**Target #1**	**Spawning Adults**
2	**Target #2**	**Eggs**
3	**Target #3**	**Summer Rearing Juveniles**
4	**Target #4**	**Winter Rearing Juveniles**
5	**Target #5**	**Smolts**
6	**Target #6**	**Multiple Life Stages**
7	**Target #7**	
8	**Target #8**	

Key Attributes

Key Habitat Attributes are the freshwater elements required for the species survival and recovery. These attributes are essential to the immediate and long-term success of the species at each life stage and are presumed to limit the population if missing or degraded.

Indicators and Indicator Ratings

Indicators are the specific habitat or population parameters that define a Key Attribute. Indicator Ratings are the reference values for each Indicator. Depending on the complexity of the key attribute or the nature of available data, one or more Indicators have been identified for each Key Attribute. For example, because two types of data were available for the Egg life stage, Key Attribute of Sediment for Incubation and Emergence, two indicators were identified: bulk samples and embeddedness (Table 11).

Photo Courtesy: Inman Creek, Mendocino County, CA, Samantha Kannry and Rob Cimitile, TNC

Table 15: Example CAP Workbook Table of Key Attributes, Indicators and Ratings

Assessment of Target Viability Central California Coast Coho Salmon ~ Lagunitas Creek Population					Double-click opens entry form	Indicator Ratings **Bold = Current** *Italics = Desired*		
Conservation Target		Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good
2	Eggs	Condition	Sediment: Incubation & Emergence	Gravel Quality: Percent of fines in bulk samples of potential spawning sites	>14% 0.85mm and/or >30% 6.4mm	Between Poor and Good	**<14% 0.85mm and/or <30% 6.4mm**	
2	Eggs	Condition	Sediment: Incubation & Emergence	Gravel Quality: Percent of pool-tailouts sampled with embeddedness values of 1 and 2	<25% 1 & 2	25-50% 1 & 2	**>50% 1 & 2**	Not Defined

Indicators allow each Key Attribute to be objectively assessed by providing a means to measure a specific habitat condition with existing data. Ratings are classes bound by generally quantitative thresholds that define whether the condition of a given indicator is "Very Good, "Good", "Fair", or "Poor". To the extent possible, these thresholds were defined using values in published scientific literature. Measurable indicators were used for as many of the analyses as possible; however, data limitations demanded the formulation of other decision-making structures for qualitative information when quantification was not possible. A total of 12 indicators relied on this approach to include instream flow conditions, estuary condition (to some degree), and toxicity. A complete list is provided in Table 12 and a description of the attributes is available in Appendix D (Viability Table Report).

Geographic Limits of Analysis

To adequately rate Indicators, an analysis of data at the watershed scale was necessary. The NCCC Domain Recovery Team considered all stream reaches that historically supported the target life stages. For example, to characterize water temperature for summer rearing juveniles, all stream reaches that likely supported summer rearing were evaluated across the extent and distribution of historic habitat as defined by the TRT (IP). The IP model provided an estimate of the linear extent of potential habitat in each watershed in kilometers (km), thus providing a spatially discrete estimate of potential spawning and rearing habitat at the reach scale (Agrawal *et al*. 2005). Using this model facilitated the definition of all stream reaches within a watershed potentially suitable habitat for each life stage target and avoided biases in the assessments.

Table 16: Targeted Life Stage, Habitat Attributes and Indicators

Target Life Stage	Habitat Attribute	Indicator
Spawning Adults	Viability (Incidental Mortality)	Freshwater Harvest
Spawning Adults	Hydrology, Adult passage to spawning grounds	Passage Flows
Spawning Adults	Passage	Physical Barriers
Spawning Adults	Passage at Stream Mouth	Entry Period
Spawning Adults	Sediment, Spawning Substrate	Spawning gravel quantity/distribution
Spawning Adults	Viability, Pop. Density	Density Target
Egg	Hydrology	Redd Scour
Egg	Hydrology	Instantaneous Condition
Egg	Sediment	Gravel Quality (Bulk)
Egg	Sediment	Gravel Quality (Embed.)
Summer Rearing	Hydrology	Baseflow
Summer Rearing	Water Quality	Temperature (MWAT or MWMT)
Summer Rearing	Pool Habitat	Shelter Rating
Summer Rearing	Pool Habitat	Frequency of Primary Pools
Summer Rearing	Viability	Density (Juveniles)
Summer Rearing	Viability	Distribution
Winter Rearing	Velocity Refuge	Complex Habitat Types
Smolt	Estuary	Estuary
Smolt	Passage	# of Diversions
Smolt	Hydrology	Flow Conditions
Multiple Life Stages	Pool Habitat	Shelter Rating
Multiple Life Stages	Hydrology	Impervious Surfaces
Multiple Life Stages	Hydrology	Stand Age
Multiple Life Stages	Land disturbance	Agriculture
Multiple Life Stages	Land disturbance	Timber Harvest
Multiple Life Stages	Riparian Veg., Stream Shading	Canopy Cover
Multiple Life Stages	Riparian Veg.	DBH (North) DBH (South)
Multiple Life Stages	Riparian Veg.	Species Composition
Multiple Life Stages	Sediment Transport	Road Density
Multiple Life Stages	Sediment Transport	Road density (Riparian)
Multiple Life Stages	Pool Habitat	LWD Freq. (BFW 0-10)
Multiple Life Stages	Pool Habitat	LWD Freq. (BFW 10-100)
Multiple Life Stages	Velocity Refuge	Floodplain Connectivity
Multiple Life Stages	Water Quality, Toxins	Toxicity

Viability Table Data Sources

The data that informed the viability tables came from a wide variety of sources. Sources included the DFG, SWRCB, U.S. EPA, RCDs, private timber companies, conservation organizations, consultants, local watershed groups and other contributors. Each of the 34 indicators required its own method of integrating data. A detailed description of these methods is provided in Appendix C. The methods are briefly summarized into the following seven categories:

1. Hab-8 Data: Eight indicators were informed by the DFG stream habitat-typing dataset. These data provided wide coverage across 14 of 28 focus watersheds using a standardized data collection protocol (Flosi and Reynolds 1998).
2. Instream Flow: Lack of sufficient gage data in rearing and migration habitats led us to derive ratings for instream flow indicators from a structured decision-making model informed by a panel of local experts (appendices). Five indicators were developed with this method.
3. Instream Temperature Data: A single indicator was used to inform this habitat attribute, but it required extensive compilation of disparate datasets. In order to extrapolate temperature data taken at a specific point to inform a watershed-wide rating, point data were grouped into condition classes. Final ratings were made by estimating the proportion of a watershed's IP network that fell within each temperature class.
4. Estuary Conditions and Toxicity: The indicators for these attributes were difficult to quantify, so structured decision-making models were developed and were informed by literature review and expert opinion (appendices).
5. Land Use Assessments: Nine indicators were informed by GIS queries of available spatial datasets.
6. Population Viability: Three viability indicators were informed by review and synthesis of all available fisheries monitoring data in the ESU.
7. Other Indicators: The six remaining indicators were informed by various methods ranging from queries of existing databases (*e.g.* physical barriers) to best professional judgment.

Contributions from the Sonoma Ecology Center

To provide focused support for data acquisition, NMFS contracted with the Sonoma Ecology Center (SEC) to search for, compile, manage, and apply the disparate data necessary to inform many of the indicators and ratings previously discussed. The following is a summary of their efforts. A final report detailing these efforts is available in the appendices.

Much of SEC's effort involved the application of DFG's Hab-8 data to the 14 of 28 focus watersheds to which these data were available. SEC managed data acquisition (from DFG), spatially referenced the data, conducted bias analyses and quality control, as well as developed the necessary queries to match the data to 8 of the 34 indicators.

SEC supported assessments of passage issues using the Pacific States Marine Fisheries Council Passage Assessment Database (PSMFC 2006). They also used the National Landcover Database (2001) to calculate the percent of impervious surface and percent of land in agriculture for 28 watersheds.

Finally, SEC conducted exploratory data searches for several indicators to investigate the feasibility of using data-driven ratings for a number of indicators related to instream flows, estuaries, and toxicity. In most of these cases we reverted to using structured decision-making models due to lack of appropriate data. However, SEC supported these models with the best available data.

Spatial Analysis

NMFS Habitat Conservation Division GIS unit provided extensive information and analysis, particularly for land use attributes. For each focus watershed, an individual report was developed with detailed information on a variety of indicators. Watershed Characterizations detailed acreage and percentage of urbanization, land ownership, land cover, current and projected development, road densities, erosion potential, amount of farmland, timber harvesting history, location and types of barriers, diversions, and industrial influences (mines, discharge sites, toxic release sites) and stream temperature. These data were utilized either to directly inform the CAP workbooks viability indicator rankings or to inform the Recovery Team's general watershed knowledge (See Appendix F).

CDFG Habitat Typing Survey Data and UC Hopland Research

The NMFS Santa Rosa office has secured all CDFG habitat typing data for the NCCC Domain. These datasets are currently being standardized into an Access database under funds provided by Sonoma County Water Agency. This "*Stream Summary Application*" is in development by UC Davis Hopland Research and DFG. UC Hopland is conducting the following: (1) entering field data from datasheets and importing databases from individual surveys into the stream habitat application; (2) performing quality control and assurance on spatial datasets; and (3) creating spatial representations of stream surveys; and (4) using the stream habitat application to summarize the data for use by NMFS, DFG, SCWA, stakeholders and the general public. This database will provide summarized reach level data of all DFG surveys across all habitat parameters. The spatial application represents the upstream areas above and around each reach (e.g., reachsheds). The final product is scheduled for late October and will be used for the Domain Multispecies Plan analysis as well as finalization of the CCC coho salmon plan.

NMFS, NMFS contractors, UC Hopland and DFG will work together to develop queries for the final recovery plans, output tables and provide instructions on use of the database and its spatial output capabilities. In addition, as part of this contract these datasets will be uploaded into a Water Cyber infrastructure prototype (detailed below) for higher resolution analysis across dimensions of habitats (e.g., flow, temperature, shelter ratings, pools, etc.) and populations. The Stream Survey Application is forthcoming in October and will be used for our analyses in the final recovery plan. Below are two draft example spatial outputs of queries for the Russian River based on our habitat criteria for Percent Canopy and Pool Depth. The scales are based on poor, fair, good and very good ratings.

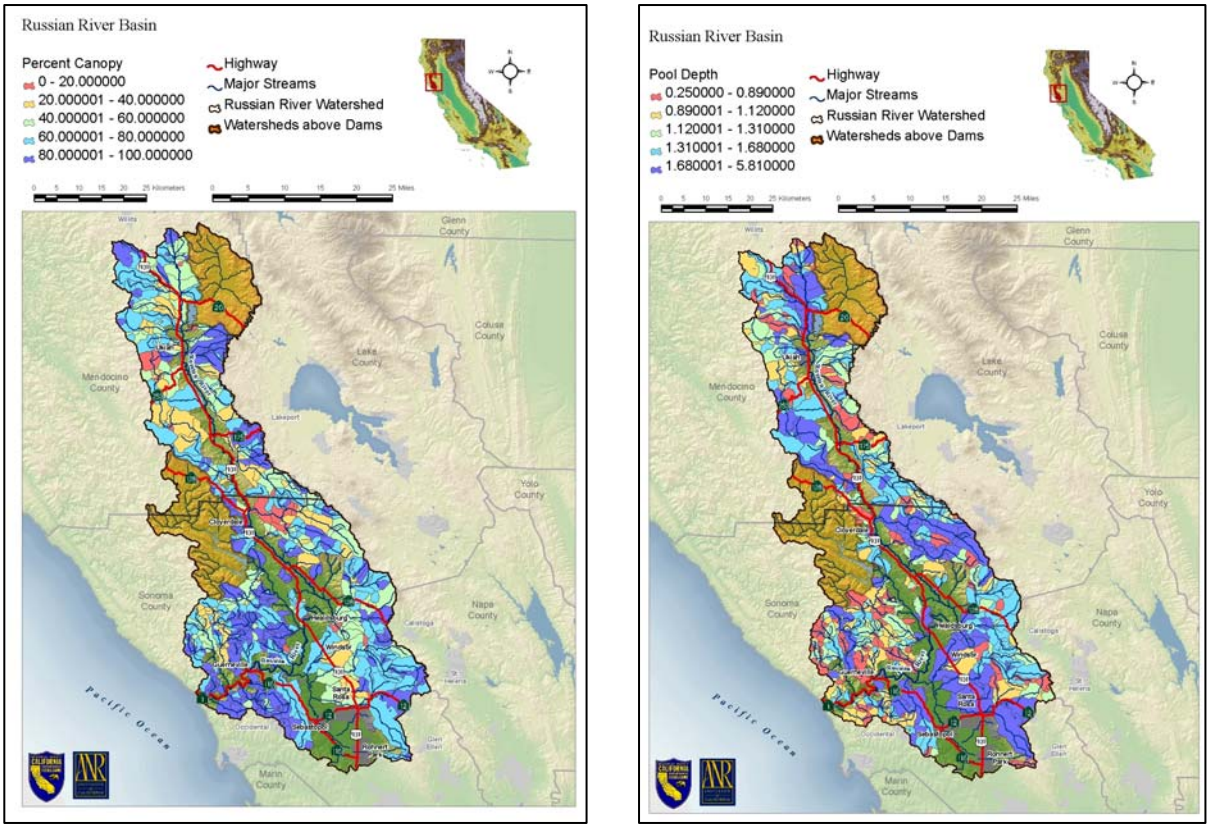

Figure 13: Example DFG data outputs by subwatershed for percent canopy and pool depth (working draft maps)

UC Berkeley, Lawrence Berkeley Laboratory and Microsoft Research

A centralized database of habitat and biological information has been an existing need in California for many years. While a number of worthwhile and important efforts and products exist that advance the goal of a centralized database (e.g., CalFish, KRIS, NCWAP, etc.), the information remains in a relatively unusable and unqueriable form. When recovery planning was fully initiated for the Santa Rosa office, the awkward nature of compiling data and conducting analyses from these various datasets became apparent. Thus, through funding provided to NMFS for recovery planning and data analysis a collaborative effort is underway to develop a centralized database of habitat and population data for the CCC coho salmon. In collaboration with California Department of Fish and Game, UC Davis Hopland Research Center, University of California Berkeley Water Center (BWC), Lawrence Berkeley National Laboratory (LBNL) and Microsoft Research eScience Group a new database prototype is being developed for CCC coho salmon that incorporates hydrological, meteorological, biological and other relevant data. This Water Cyber infrastructure prototype is being developed to provide dimensional evaluations of habitat relationships within and across watersheds to more accurately characterize the functionality of streams for salmon. The ability to perform high level analysis in California as described has not previously been feasible; this prototype will be expanded to include additional datasets for other salmon and steelhead populations in the Recovery Domain. This database is termed the "datacube". Currently a data cube prototype is being developed under a coordination agreement and pending contract between NMFS Santa Rosa, BWC, LBNL and Microsoft that includes hydrologic and meteorologic data. This datacube requires expansion to include water temperature, spatial data on stream habitat and population parameters to be of greater utility to NMFS. Following expansion, NMFS staff will have a broader range

of analysis opportunities of salmon habitats. Using demonstrations of datacube application to the CCC coho salmon ESU and with training, NMFS will be positioned to use and update the datacube for broader application to other salmon and steelhead recovery planning efforts. NMFS will produce the final datasets prior to the final release of the recovery plan and work to make the data available and usable to the public.

The Threats Table

Threats are distinct from the key attributes developed to define current conditions in each watershed. Instead of conditions that currently exist, they attempt to define future conditions likely to limit recovery resulting from currently active issues such as ongoing logging practices, or from issues likely to occur in the future (usually within 10 years), such as residential development. Each threat is compared against a series of altered or impaired key attributes for each population, and ranked using the following metrics:

The Threats Table is organized into Stresses and Source of Stresses, which, when combined, constitute a threat to the species.

Stresses

Stresses represent altered or impaired Key Attributes for each population. They are essentially the inverse of the Key Attributes, so the attribute for "passage" would be "impaired passage" as a stress. Stresses were ranked using two metrics:

1. Stresses (Severity of Damage): The level of damage to the conservation target that can reasonably be expected to occur into the future under current circumstances (*i.e.,* given the continuation of the existing situation).
2. Stresses (Scope of Damage): The geographic scope of impact on the conservation target at the site that can reasonably be expected into the future under current circumstances (*i.e.*, given the continuation of the existing situation).

Sources of Stresses

Source of Stresses are defined as the proximate cause of the stress and are ranked using the following metrics:

1. Source of Stress (Irreversibility): Reversibility of the stress; and
2. Source of Stress (Contribution): Expected contribution of the source, acting along, to the full expression of a stress under current circumstances (*i.e.*, given the continuation of the existing management/conservation situation).

Many sources of stress are driven by social, economic, or political causes that then become the focus of conservation strategies. NMFS evaluated stresses and threats according to the CAP workbook protocols. Sixteen threats were identified and evaluated in the freshwater workbooks, and nine in the marine workbook. This list, or Threat Taxonomy, (Appendix D), provided a useful categorization of all the major threats to CCC coho salmon NMFS used for this evaluation.

Threats Data Sources

NMFS Habitat Conservation Division GIS unit provided extensive information and analysis, particularly for land use attributes. For each focus watershed, an individual report was developed with detailed information on a variety of indicators. Watershed Characterizations detailed acreage and percentage of urbanization, land ownership, land cover, current and projected development, road densities, erosion potential, amount of farmland, timber harvesting history, location and types of barriers, diversions, and industrial influences (mines, discharge sites, toxic release sites) and stream temperature. These data were utilized to directly inform the CAP threats rankings (See Appendix F). Additional information was gathered by reviewing watershed assessment documents and strategic planning materials for local/state/federal agencies, contacting knowledgeable individuals, utilizing staff expertise, and consulting a number of other references.

Recovery Actions

The ESA mandates recovery actions must be site specific and include objective and measurable (though not exclusively numeric) criteria. Recovery actions and criteria are analogous to the CAP terminology of strategies and measures. The strategies and measures application included in the CAP workbook identifies specific desirable outcomes or objectives and links them to improving current viability (*e.g.* current conditions), and abating identified threats. The workbook facilitates identifying and tracking the suite of strategic recovery actions to accomplish those objectives. Strategies and actions address specific key attributes and abate or reduce anticipated future threats found to be limiting population viability. The combined set of recovery actions and criteria comprise the standards on which decisions to reclassify or delist these species will be based.

The overall objective was to shift the poor current conditions ratings to Good or Very Good, the High or Very High ranked threats to Medium or Low, and to maintain generally good habitats where they exist. Recovery actions are presented on three hierarchical levels: Objectives, Actions and Action Steps.

Recovery actions were designed to achieve specific objectives to restore functional habitat conditions, or to abate future threats to the species. Strategic actions and action steps were developed to address all habitat attributes ranked as Poor. For attributes determined to be limiting in some watersheds, strategies were also developed for those ranked as Fair. In some cases, specific strategies were developed to address attributes which ranked as good or very good over an entire watershed, but were limiting in specific sub-watersheds. However, strategies were not developed for most attributes ranked as Fair, Good or Very Good. Since multiple attributes are sometimes involved, strategies were developed if any one of the related attributes were rated as poor. Similarly, strategic actions and actions steps were developed to address future threats ranked as High or Very High, but except in certain cases, were not developed for threats ranked as Medium or Low.

A priority structure for strategy implementation has been developed. Priority 1 actions are actions that must be taken in the near future to help prevent extinction or extirpation. These actions are focused on Core areas where CCC coho currently persist, and areas where functional habitat conditions are present for coho salmon. The approach of protecting existing high quality habitat over restoration of degraded or compromised habitat follows NMFS guidance in Ecosystem Recovery Planning for Listed Salmon (NMFS 2003). However, CCC coho populations will not persist simply by protecting extant populations and

habitat within Core areas. Priority 2 actions must be taken as well to stop further decline and prevent further impairment to habitats. Priority 2 actions are focused primarily at Core or Phase I areas where efforts are directed to expand the current range to more closely resemble the historic range of CCC Coho. Priority 3 actions are directed primarily at Phase I and II areas, and are expected to improve habitat conditions for expanding populations. Priority 3 actions focus on preventing further degradation and reestablishing long-term recovery for expanding populations in all identified IP km. Priority 3 actions also include all other actions necessary to achieve full recovery of the species. Priority actions in Phase I and II areas are based on finding areas where there are feasible opportunities to significantly expand the current range of CCC Coho so these watersheds can reach their viability and recovery targets. Phase I and II areas are considered high priorities if the current populations in Core areas are secured, and opportunities to expand the overall population in the watershed are available.

NMFS did not use the TNC CAP workbook for strategy development. NMFS GIS department developed a recovery action database due to the magnitude of recovery actions and the need to include specific details associated with the required recovery action implementation schedule (*e.g.* costs, recovery partners, duration, priority number, etc.). These implementation schedules have been developed for each focus watershed (Chapter 10).

Strategies (a.k.a. Recovery Action) Data Sources

The NCCC Domain Recovery Team capitalized on a full range of resources to develop and prioritize recovery actions. The California Recovery Strategy for California Coho Salmon was used extensively for ESU and watershed specific strategies and is often identified as (DFG 2004) at the end of each strategic action or action step. Relevant actions were also developed from watershed assessment reports, TMDLs, EIR documents, strategic plans from cities/counties, coordination with other divisions of NOAA, outreach to knowledgeable individuals, staff expertise, and many other sources. A strategy database was developed for each watershed and individual actions from these sources input into each database. These databases were queried for specific strategies (*e.g.*, large wood input or barrier removal). If an action was found pertinent it was incorporated into the recovery action implementation schedule for the watershed. A partial list of the resources used to inform the recovery actions is provided in Appendix E. It is our intent to utilize as much currently existing information as possible to inform recovery actions. To that end, NMFS extends an invitation to the public, during the public comment period, to provide us with your information to more fully inform and refine these recovery actions.

Revisions to the CAP Workbook

NMFS Interim Guidance describes a threats assessment as an iterative process that should provide feedback to management actions (NMFS 2007). To ensure the effectiveness of our strategic actions, we will, in the public draft and implementation phase, work with the public to refine and update datasets and data informing our CAP workbook analysis. Furthermore, it is the intent of NMFS to make these CAP workbooks available to the public, conduct trainings in collaboration with TNC staff and provide the public an opportunity to work with and use these CAP workbooks moving forward.