

10. IMPLEMENTATION

This section of the Plan discusses the means and organizational structure by which implementation of the Plan's recommended measures will be coordinated, managed, and overseen. It melds implementation of programs and actions with the monitoring and evaluation process. It describes the mechanism that will be used to track, evaluate, and report progress. It describes the process for revising the Plan's strategies, measures, and actions. It identifies economic factors and an approach for weighing economic considerations in Plan implementation. Finally, it identifies partners involved with specific actions.

IMPLEMENTATION

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10.1. Framework

This Plan includes strategies, measures, and actions intended to: 1) reverse long term declining trends in salmon and steelhead numbers, 2) provide a trajectory leading to recovery of these species to healthy and harvestable levels with 25 years, and 3) periodically refine recovery efforts with checkpoints and course corrections throughout implementation (Figure 10-1). Lower Columbia salmon and steelhead populations have declined over decades due to a myriad of human activities. These activities have reduced the number of fish, their distribution, the quality and quantity of their habitat, and their adaptive population characteristics. Today they are threatened with extinction and listed under the federal Endangered Species Act (ESA). The immediate challenge is to halt the further decline of these populations in order to prevent extinction and to reverse the trend in the direction of recovery. The strategies and measures included in this Plan represent the current best scientific estimates of the efforts needed to meet recovery goals, objectives, and targets within the prescribed time period. It is expected that strategies and measures will be adaptively refined based on new information and observed responses as the recovery effort unfolds (Figure 10-1).

Significant uncertainties remain with regard to the incremental benefits that can be expected from each specific measure as well as the net effect of the prescribed suite of measures over time. At best, existing data, models, and theories can give only a qualified answer to the question of what it will take to recover these fish. The available information and current science is generally effective at identifying the right types of actions needed for recovery. For instance, this Plan identifies the relative order of magnitude of impacts on each population from different threat categories and the measures needed to reduce those threats. However, the science is less certain on exactly how much effort will be required in each proposed measure to achieve each incremental improvement. Many related measures also result in complex interactions among effects that are difficult to quantitatively predict with certainty.

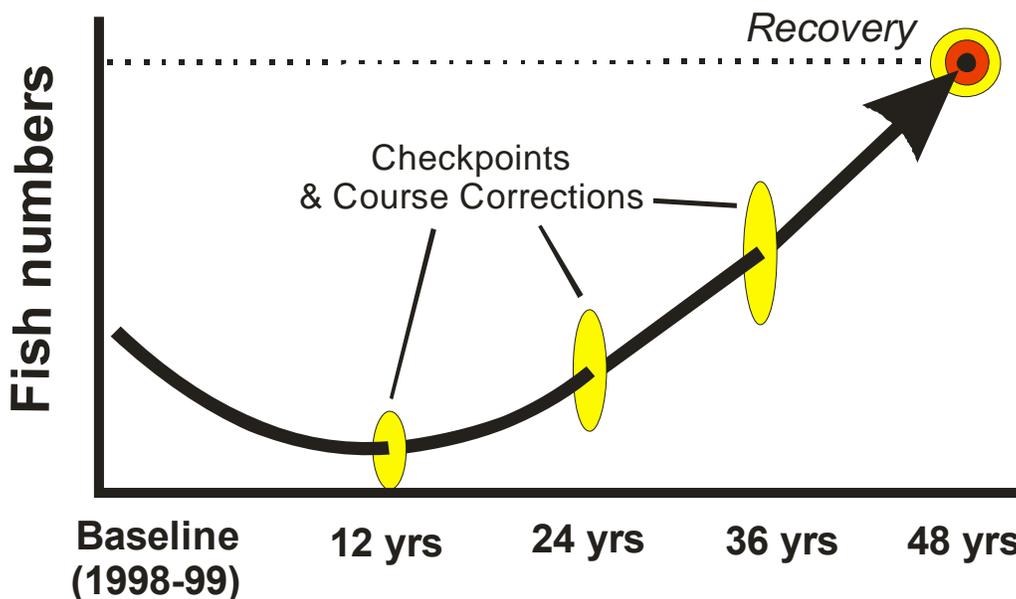


Figure 10-1. Hypothetical recovery trajectory including stabilization of current populations, reversal of declining trends and checkpoints for course corrections based on monitoring and evaluation.

The acute status of many listed salmon and steelhead populations means that it is not feasible to wait for more data, better models, or more certainty before embarking on a course toward recovery. Further delay is a recipe for irreversible consequences for the remaining lower Columbia salmon and steelhead populations. While current knowledge may not be adequate to categorically guarantee that recovery objectives will be met with the prescribed set of measures, existing information and analyses are adequate to identify the right things to do to set a recovery trajectory and a scale of effort than can reasonably be expected to achieve recovery goals, objectives, and targets.

Uncertainties are further addressed in this Plan by: 1) corroborating analyses with the best available science; 2) strong monitoring, evaluation, and adaptive management elements, and 3) a recovery scenario that identifies more than the minimum populations and improvements needed to meet recovery goals. Corroborating analyses verify that strategies, measures, and actions can reasonably be projected to reduce threats to a level where recovery is realistic. Monitoring, evaluation, and adaptive management provides the means to make course corrections during Plan implementation if initial assumptions prove to be too liberal or conservative. The recovery scenario includes contingencies that act as safety factors for failures for some populations (Figure 10-1).

Strategies, measures, and actions will be refined through adaptive management over the course of Plan implementation based on the observed response to initial efforts. Initial hypotheses, actions, and efforts can be regarded as the first in a series of successive approximations regarding what it will take to get to recovery. As the Plan is implemented, it is likely that uncertainty in initial assumptions will lead to surprises in both directions. Some actions will be more effective and some populations will respond more quickly than initially expected. Other actions or populations will prove less responsive than hoped. Monitoring, evaluation, and adaptive management will provide for capitalizing on successes and opportunities and compensating for disappointments and failures.

Effective adaptive management requires that initial actions are of a magnitude sufficient to produce a measurable response. It also requires monitoring sufficient to detect a response. The strength of the response provides a clear basis for tuning future effort. This truly adaptive management approach contrasts with an alternative approach that involves the successive addition of small scale increments of effort until a response is observed. The truly adaptive approach ensures a quick route to solutions and an effective means of addressing near-term extinction risks. The successive incremental approach postpones identification and implementation of effective recovery efforts and poses unacceptable near-term risks to salmon and steelhead threatened with extinction.

We know that recovery will ultimately be a long journey requiring substantive actions across all categories of limiting factors and threats affecting salmon and steelhead. We know the desired destination and the direction of travel. We are unsure of exactly how much mileage we will get from proposed actions, how much effort will ultimately be required to complete the journey, and the details of every twist and turn of the route. This Plan lays out an initial direction, a scale of effort appropriate to the distance of the journey, and a framework for making course corrections along the way.

10.2. Implementation Mechanism

The scale of human activities that limit or threaten salmonids throughout the Washington lower Columbia region is broad and pervasive. Recovery can only be achieved through the combined and coordinated actions of federal and state agencies, tribes, and local governments with the participation of nonprofit organizations, the business sector, and citizens. Collectively, these parties are referred to as implementing partners.

This Plan provides a blueprint for recovery. It includes specific actions needed to address all threats and identifies the partners with the authority, jurisdiction, or resources needed to implement each action. The Plan does not obligate any party but does establish specific responsibilities for taking actions that have been identified as important to fish recovery. Obligation will come through the commitment of each implementing partner to undertake and complete the actions identified as their responsibility in a timely, sound, and thorough manner. Furthermore, implementation of recovery programs and actions is not a one-time or short-term initiative. Programs and actions put in place early will have to be sustained, evaluated, adjusted, and augmented over the 25-year recovery period.

Recovery plans are guidance documents, not regulatory documents. Section 4(f) of the ESA requires that recovery plans be prepared for listed species. It envisions such plans as the central organizing tool for guiding the recovery process for each species and for implementing the ESA as a whole. A plan is intended as a road map for species recovery and is one of the most important tools to ensure sound scientific and logistical decision-making throughout the recovery process. Guidance is provided in the form of descriptions of management actions necessary to achieve goals, objective measurable criteria, and estimates of time and costs needed for implementation. The Plan offers clear guidance for programs and actions that is consistent with achieving recovery. This guidance focuses the efforts of the implementing partners on actions and areas that offer the greatest potential for protecting and recovering salmon and steelhead.

Federal, state, and local agencies all have regulatory authority and programs that will play critical role in the implementation of the Plan. It is expected that agencies with such responsibility and authority will exercise it as needed to ensure implementation of their recovery responsibilities. Although there is no requirement to implement recovery actions, NMFS is implementing other ESA provisions to be consistent with this Recovery Plan. When species are listed under the ESA, federal agencies are required to ensure that any actions they fund, permit or carry out are not likely to jeopardize the species' continued existence or destroy or adversely modify its critical habitat. Federal agencies must consult with the listing agency (NMFS or U.S. Fish and Wildlife Service) regarding actions they take that "may affect" the listed species or its critical habitat. Actions that may affect but are "not likely to adversely affect" the species undergo an informal consultation, while those that are likely to adversely affect the species or its critical habitat must undergo more lengthy formal consultation. The ESA also prohibits the "take" of listed species, either through section 9 (for endangered species) or through section 4(d) (for threatened species). The take of a listed species can occur as a result of many of the everyday activities carried out in a watershed, resulting in an ESA violation. Private citizens, landowners, businesses and local governments can all be affected by the federal consultation requirement or the ESA prohibition of take. This Recovery Plan provides the context and framework for NMFS' implementation of other provisions of the ESA, such as Section 7(a)(2) consultations on federal agency actions, development of habitat conservation plans (HCPs) under Section 10, special rules for threatened species under Section 4(d), and designation of critical habitat.

While the ultimate goal of implementation is the recovery of the region's salmon and steelhead, implementation is also intended to afford the implementing partners and the people of the region greater regulatory certainty and efficiency under the ESA. This Plan will provide improved context and certainty and a framework for streamlining and prioritizing ESA regulatory assurances. A range of ESA regulatory tools, including ESA section 4(d) limits, section 7 consultations, and section 10 Habitat Conservation Plans, is available to provide assurances, depending on the type of actions and implementing entities. NMFS will work with entities interested in obtaining regulatory assurances for implementation of actions in this Plan. This Recovery Plan will also supply technical assessment information that can be used as a shared foundation for some regulatory actions (e.g., as the basis for some Biological Assessments and Biological Opinions).

The Plan should also be used as a collective organizing framework for federal and non-federal programs that are funding recovery actions and as a means to prioritize cost-effective actions and identify additional resources necessary to achieve recovery. In this way, the Plan can be expected to serve as a vehicle in securing additional funds or other resources needed for recovery by highlighting priority actions and areas where gaps exist.

10.3. Institutional Structure

As noted above, effective implementation of this Plan depends on the combined and coordinated action of federal and state agencies, tribal governments, and local governments with the participation of nonprofit organizations, the business sector, and citizens. Effective regional implementation also requires an institutional structure that effectively links all partners involved. Responsibilities can generally be categorized into three functions: oversight, facilitation/coordination, and implementation. In some cases a single party may fall into two or three function categories (Figure 10-2). summarizes the key relationships and partners involved with Recovery Plan implementation functions for the Washington lower Columbia River.

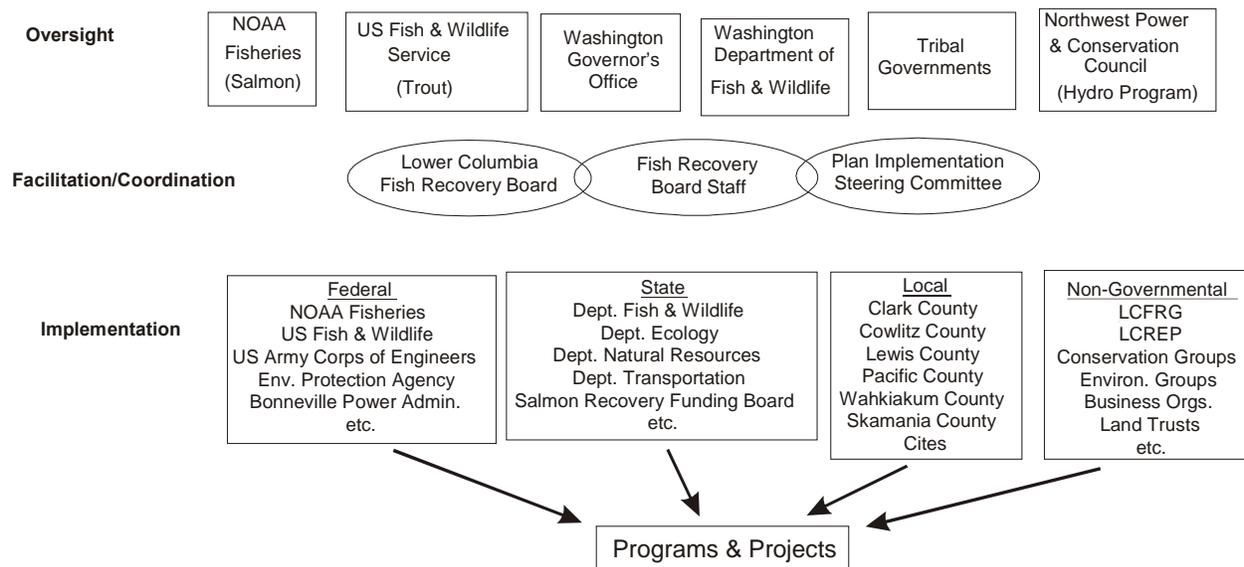


Figure 10-2. Institutional structure for implementing salmon recovery in Washington Lower Columbia River subbasins.

10.3.1. Oversight Bodies

Key oversight bodies are those entities with specific authority or responsibilities for managing the region's fish and wildlife resources. These include NMFS, U.S. Fish and Wildlife Service, the State of Washington, the Cowlitz Tribe, the Yakama Nation, and the Northwest Power and Conservation Council.

- NMFS has the primary Federal authority for the Endangered Species Act, Sustainable Fisheries Act, and Mitchell Act as they apply to salmon and steelhead.
- The U.S. Fish and Wildlife Service is responsible for Endangered Species Act implementation for bull trout.
- The Washington Governor's Office has the authority to direct and coordinate state agency actions in support of recovery. Washington Department of Fish and Wildlife has management authority for the state's fish and wildlife resources.
- The Yakama Nation is a co-manager of fish resources with the state and federal agencies.
- The Northwest Power and Conservation Council oversees implementation of the program to address Federal Columbia River Power System effects on fish and wildlife.

Other federal, state, and local agencies have oversight responsibilities for water, natural resources, land management, and land use. These agencies are considered implementation partners, since their responsibilities are not specific to fish and wildlife management.

10.3.2. LCFRB Implementation Steering Committee

The Lower Columbia Fish Recovery Board working with a Plan Implementation Steering Committee (Steering Committee) will facilitate and coordinate efforts of the oversight bodies and implementing partners. The Implementation Steering Committee, originally proposed in the interim Plan, will be reactivated to promote interagency coordination and participation in completing the revised Plan. NMFS, USFWS, NPCC, LCREP, WDFW, Governor’s Salmon Recovery Office, Washington Department of Ecology, the USFS, Counties, the Cowlitz Indian Tribe, the Yakama Nation, and the Chinook Tribe will be invited to participate on the committee. Upon adoption of the Plan, the Steering Committee will assist the LCFRB in guiding the implementation of the revised Plan.

The Steering Committee will include representatives of the oversight bodies and a cross-section of implementing partners. Working groups consisting of steering committee members and other implementing partners will be established as needed to address policy or technical issues or to coordinate implementation efforts.

Key functions of the LCFRB and Steering Committee will include:

- Developing and revising a 6-year regional implementation plan;
- Assisting implementation partners to develop and implement their individual 6-year implementation plans;
- Preparing and issuing clarifications or interpretations of Recovery Plan provisions when needed;
- Preparing and issuing revisions or updates to the Recovery Plan;
- Developing and implementing the regional public education and outreach program;
- Conducting implementation and biological evaluations in accordance with the adaptive management provisions and benchmarks set forth in this Plan;
- Tracking implementation of measures, actions, programs, and projects and issuing annual progress reports;
- Facilitating and assisting partners in resolving technical and policy issues that arise during implementation;
- Facilitating communications and the exchange of information and data among implementation and oversight partners;
- Coordinating the collection, management, synthesis, and evaluation of fish and habitat monitoring results collected by the partners; and
- Developing implementation partnerships and agreements.

10.3.3. Implementing Partners

Recovery actions will be implemented through the programs and projects of numerous federal, state, tribal, and local agencies and non-governmental entities. Collectively these agencies and entities are referred to as implementing partners. The functions of the implementing partners are:

- Developing and implementing a 6-year plan for their recovery actions;
- Monitoring and reporting their implementation progress to the LCFRB/Steering Committee;
- Advising the LCFRB/Steering Committee of issues or developments affecting progress.

The 6-year Implementation Work Schedules submitted by each partner will set forth the tasks and schedule addressing assigned recovery actions and will document the partner's commitment to fulfilling its implementation responsibilities.

Success in achieving recovery of the region's salmon and steelhead and improving the status of other resident fish and wildlife is dependent on the effectiveness of the partners in undertaking and sustaining the identified recovery actions. The actions identified for each partner are based on the partner's mission, capabilities, responsibilities, authority, and jurisdiction. It is incumbent upon each partner to develop and fully implement programs to address its assigned actions. The programs must be technically sound and adequately funded and staffed. In the case of regulatory programs, agencies must be committed to taking enforcement actions when necessary to achieve the desired outcome. Enforcement authority provides an important incentive for compliance only if it is prudently exercised in pursuing and correcting instances of noncompliance.

In some instances an implementing partner may not have the full or exclusive authority to implement a recovery action. A case in point is the setting of harvest quotas pursuant international treaty provisions. NMFS and the Washington Department of Fish and Wildlife are influential participants in this process, but do not control the outcome. In such instances, it is expected that implementing partners sharing an implementation responsibility will cooperate in working to achieve the desired outcome and will raise, support, advocate, and/or put in place those actions in appropriate forums, using whatever authorities or arguments we have available. In order to ensure needed coordination, the Implementation Steering Committee may designate a lead agency in carrying out an implementation action shared by two or more partners. Even where a single implementing partner possesses the authority to fully implement a recovery action, the action is likely to be more effectively implemented with the involvement, agreement, and support of other partners. To achieve this level of cooperation and coordination, implementing partners are requested to identify in their 6-year implementation work schedules interrelationships with other partners that will facilitate, affect, or complement implementation of their recovery actions.

10.4. Coordination & Administration

10.4.1. Six-Year Implementation Work Schedules

To provide an effective basis for the recovery program, implementation work schedules will be prepared showing the tasks, schedules, priorities, and responsibilities for implementation of the recovery actions identified in this Plan. Since this recovery program relies on the combined action of federal and state agencies, tribal and local governments, and non-governmental entities, each of these partners will be requested to prepare an implementation schedule for their recovery actions. These individual implementation work schedules will be melded into a regional implementation schedule. New implementation work schedules will be prepared on 6-year intervals. This cycle will coincide with the with the 6-year adaptive management checkpoints and allows the schedules to incorporate needed changes or modifications stemming from the adaptive management implementation and effectiveness evaluations. Six-year schedules may be revised every 2 years as necessary based on the adaptive management implementation evaluation checkpoint.

Implementing Partner Commitments

Each implementing partner will be asked to submit a 6-year implementation work schedule and commitment to the LCFRB and Implementation Steering Committee. The schedules prepared by the implementing partners will document their approach and commitment to implementing their recovery actions. The LCFRB in consultation with the Steering Committee will develop a detailed template for 6-year implementation work schedules and will assist and advise partners, as necessary, in developing their schedule. The LCFRB and the Steering Committee will review the adequacy of the partners' implementation work schedules in achieving the desired outcome in a timely manner and may request revisions or additional information. In general, each schedule will identify:

- The tasks and schedule for implementing the recovery actions for which the partner is responsible;
- A public education and outreach program consistent with the guidance in this Plan;
- Technical, funding, legal, and/or other constraints or conditions affecting the timeliness or scope implementation;
- The mechanism for monitoring implementation progress;
- Estimated costs and funding sources; and
- Dependencies on or interrelationships with actions by other implementing partners.

Regional Action Schedule

Implementation work schedules developed by the partners will be combined into a regional implementation schedule. The LCFRB/Steering Committee will prepare and adopt the regional schedule, in consultation with the implementing partners. In preparing the regional schedule the LCFRB/Steering Committee will review partner implementation work schedules and ensure that the actions of the implementing partners are coordinated and/or complement each other and are consistent with the strategies, measures and actions set forth in the Recovery Plan. The LCFRB/Steering Committee may request revisions to an individual partner's implementation work schedule or additional information in order to ensure that the regional schedule sets forth a sound course for recovery. The regional schedule will address regional implementation actions, including monitoring, evaluation, data management, and public education and outreach. Specifically, the schedule will:

- Provide a master list of tasks, schedules and responsible implementing partners;
- Address interdependencies among implementation actions and partners;
- Identify approaches, partnerships, and/or working groups needed to address implementation issues shared by multiple partners;
- Provide the means to facilitate information and data collection, management, and exchange among partners;
- Provide for a regional public education and outreach effort in accordance with the guidance of this Plan and in coordination with related efforts by individual implementing partners;
- Establish a coordinated implementation and biological monitoring program;
- Describe the process, procedures, and protocols for evaluating progress and, as necessary, revising Recovery Plan strategies, measures, and actions and corresponding implementing tasks and schedules in accordance with the adaptive management measures set forth in this Plan;
- Provide for coordinating implementation with Oregon; and
- Provide estimated costs, identify funding sources; and provide a regional funding strategy.

10.4.2. Interpretation of Recovery Plan

It is likely during the course of implementing the Recovery Plan that questions will arise that will require interpretation or clarification of the Plan goals, objectives, strategies, measures, and actions. Implementing partners may request clarifications of the Plan from the Steering Committee at any time. The Steering Committee shall be responsible for such interpretations or clarifications. In making interpretations or clarifications, the Steering Committee may consult as appropriate with federal state or local agencies or science teams convened by NMFS. The Steering Committee may also establish a working group to advise on policy and/or technical issues that may require clarification.

10.4.3. Revisions to the Plan

The Recovery Plan will be routinely evaluated and revised as necessary based on the adaptive management process and intervals set forth in this Plan. However, it may be desirable or necessary to revise the Plan between these intervals in order to address issues or new information that may arise during implementation. Such revisions may be needed to clarify provisions of the Plan or to facilitate effective Plan implementation. Interim revisions to address or incorporate new information or data may also be warranted in instances where the benefits to recovery efforts are deemed to be sufficiently significant.

The Steering Committee shall be responsible for coordinating and directing the development, evaluation, approval and issuance of all Plan revisions as follows:

- Plan revisions that are editorial in nature and clarify the intent or provisions of the Plan and do not materially alter the Plan's goals, objectives, strategies, measures, actions, or priorities shall be developed, approved and issued by the Steering Committee.
- Interim revisions to address or incorporate new information or data and result in substantive changes to the Plan's goals, objectives, strategies, measures, actions, or priorities, shall be developed and evaluated by the Steering Committee in consultation with affected implementing partners and with opportunities for the public participation. The proposed revision will be submitted to NMFS and the U.S. Fish and Wildlife Service for concurrence prior to final adoption and issuance.

- Revisions to the Plan’s goals, objectives, strategies, measures, actions, or priorities arising from the adaptive management process shall be developed and evaluated by the Implementation Steering Committee in consultation with affected implementing partners and with opportunities for public participation. The proposed revision will be submitted to NMFS and the U.S. Fish and Wildlife Service for concurrence prior to final adoption and issuance.

The Steering Committee or an implementing partner may propose Plan revisions. The Steering Committee will establish the procedures necessary to ensure the timely consideration and action on proposed revisions. The Steering Committee may use working groups to assist in the evaluation of policy and technical issues associated with a proposed revision.

10.4.4. Monitoring, Research, and Evaluation

The LCFRB and the Steering Committee will direct and coordinate the implementation of the monitoring, research and evaluation provisions of this Plan. The program will also define the procedures and benchmarks for implementing the Adaptive Management Process. The LCFRB and Steering Committee will work with a Monitoring, Research, and Evaluation Working Group to develop implementation measures and responsibilities. The Working Group will consist of representatives from federal, state, regional, and local programs engaged in biological and habitat status monitoring, effectiveness monitoring, implementation/compliance monitoring, and biological and habitat research. The Working Group will prepare and submit to the Steering Committee recommendations for a Monitoring, Research, and Evaluation Program. The program shall:

- Validate data needs;
- Develop benchmarks and procedures for evaluating action implementation, action effectiveness, and biological and habitat status;
- Establish procedures, methods, and protocols for monitoring and research, and data reporting;
- Develop the process, procedures and organizational responsibilities for data management and access;
- Set forth the necessary organizational structure and responsibilities;
- Provide a 6-year monitoring schedule and priorities for incorporation in the 6-year regional implementation plan;
- Identify and prioritize critical uncertainty research needs for the incorporation in the 6-year regional implementation schedule; and
- Identify unfunded monitoring and research needs and proposed or potential funding sources.

The program, when adopted by the Steering Committee, shall be included in the 6-year regional implementation schedule.

10.4.5. Economic and Cost Considerations

This Plan identifies strategies, measures and actions for the recovery of fish populations. The actions have been designed and selected based on their anticipated contribution to the biological objectives of this Plan. They are heavily based on biological and technical factors, although consideration was also given social, cultural, and general economic factors. Additional consideration of cost and economic factors will play an important function in developing specific implementation mechanisms and actions that are both scientifically sound and politically and fiscally feasible.

The ESA directs that recovery plans to the maximum extent practical shall incorporate “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.” [Sec. 4(f)(1)(B)(iii)]. This Plan estimates costs of actions undertaken specifically to address recovery of listed species. Not included are costs of other actions that would have been implemented regardless of whether species were listed or not. Recovery Plan Chapter 11 – Costs provides details on how recovery costs were estimated.

Estimates are based on direct costs. Costs are represented as ranges reflecting estimation uncertainties. Estimated for are provided for actions to be implemented for the 25 year duration of the Plan (beginning with 2004 when the interim Plan was completed). Costs are distinguished by near term (next 5-10 years) and long term (11-25 years). Long term estimates are obviously less certain than near term estimates. Indirect costs are not included but Appendix D provides a broader discussion of the economic context of fish recovery. Costs of implementing actions to address each category of threat are included (stream habitat, dams, fisheries, hatcheries, ecological factors). Costs are also included for recovery implementation coordination and administration and for monitoring, evaluation, and reporting (as per Recovery Plan Chapter 9).

As implementing partners complete their 6-Year Implementation Schedules, they will provide an estimate of the incremental costs associated with the implementation of their recovery actions. Incremental costs are the costs of recovery that will be incurred in addition to costs to their existing programs and activities. Partners are also requested to indicate how they will fund these costs and to identify fiscal constraints that would affect timely or full implementation of their actions. This information will be used along with biological, technical, social, and cultural considerations to help refine implementation priorities and to develop a regional funding strategy.

Economic analysis will be used to evaluate the positive and negative economic impacts of the overall regional recovery effort and will be compared to the impacts of not proceeding with a recovery effort. The comparison will identify the net cost/benefit to the region. The analysis will be used to assist in making decisions regarding implementation of this Plan and, where, appropriate, to help realign recovery improvement increments across affected parties and sectors. Decisions regarding the specifics of Plan implementation will take into account the economic and cost considerations but ultimately the overriding goal of this Plan is to recover listed stocks. Appendix D explores possible approaches to conducting such an analysis. The specific approach to be used will be developed by the Implementation Steering Committee.

10.4.6. Schedule for Coordination and Administrative Measures

The schedule for instituting Plan implementation coordination and administrative measures is provided in Table 10-1.

Table 10-1. Schedule for Coordination and Administrative Measures.

COORDINATION/ADMINISTRATIVE MEASURE	TARGET COMPLETION DATE
Organize Implementation Steering Committee	April/May 2010
Complete 6-year Implementation Schedules	July 2011
<ul style="list-style-type: none"> • Template for Schedules • Implementing Partner Schedules • Regional Schedule 	<ul style="list-style-type: none"> • completed • December 2010 • March 2011
Procedures for Plan Interpretation and Revision	June 2010
Monitoring, Research, and Evaluation Program	April 2010
Public Education and Outreach Program	August 2010

10.5. Adaptive Management

Adaptive management will be critical to effective implementation of this Plan. The directional actions identified in this Plan are the substantive steps needed to achieve a positive trajectory for recovery. They are consistent with initial estimates of incremental improvements needed to move populations from their current status to healthy and harvestable levels. Adjustments in direction and effort will be required if initial implementation efforts lag or if benefits are less than anticipated. Adjustments will be needed to capitalize on new information, more specific objectives, new developments, and evolving opportunities.

The term “adaptive management” is in wide usage among subbasin planners and has come to denote two very different processes. A broad definition involves course correction during plan implementation based on observed progress and refinements in approach or objectives. An alternative definition involves a specific approach whereby substantive actions are implemented in order to invoke a significant response that provides clear direction for tuning. This contrasts with the sequential implementation of small incremental changes intended to steadily move progress toward the objectives. Substantive actions greatly expedite the process for identifying the sufficiency of Plan actions but require significant effort by implementing parties. This Plan treats adaptive management consistent with both definitions. It identifies substantive improvement increments in productivity consistent with recovery and specific actions intended to make corresponding reductions in threats. It also includes a process for monitoring and refinement as part of Plan implementation.

The adaptive management process for this Plan is based on a series of checkpoints, assessments, benchmarks, and decisions (Figure 10-3). Checkpoints are formal decision points where substantive changes in direction will be considered. Assessments are formal evaluations of progress and results. Benchmarks are standards or criteria that will drive decisions depending on observed progress in implementation effort and effectiveness. Decisions identify refinements in efforts or new directions based on progress relative to benchmarks observed at checkpoints.

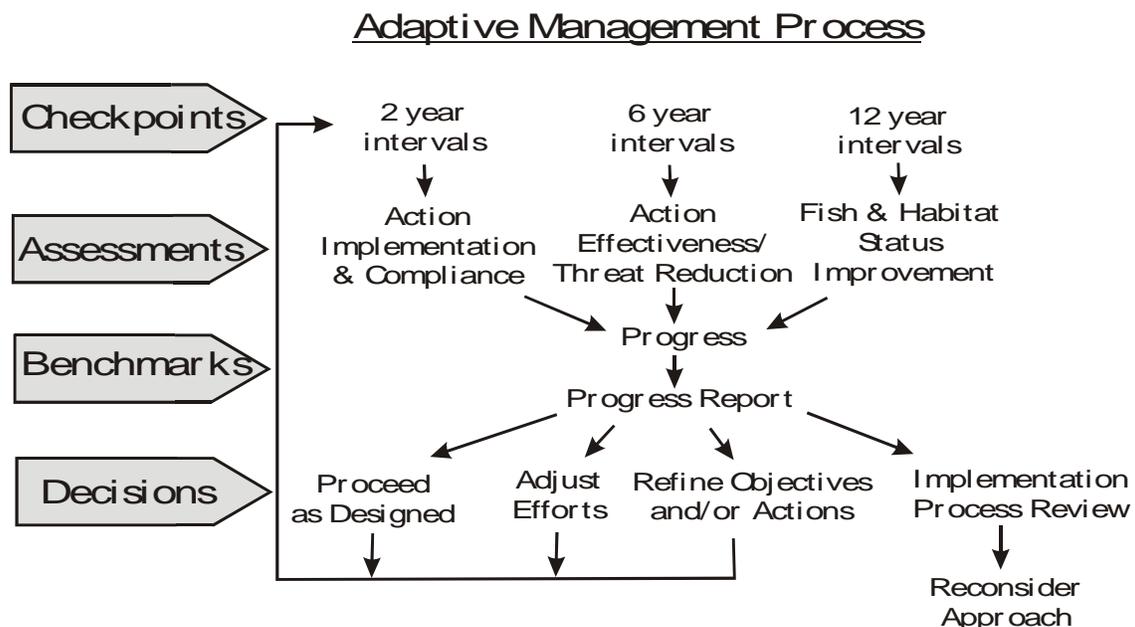


Figure 10-3. Elements and decision structure for adaptive management process for implementation of Washington Lower Columbia River Salmon Recovery Plan.

10.5.1. Checkpoints and Assessments

Checkpoints are prescribed at 2-year intervals for evaluation of progress in implementing plan actions, 6-year intervals for evaluation of effects of key actions, and 12-year intervals for evaluating biological and habitat status and response. Implementation progress will be evaluated based on 6-year implementation work schedules, the number of scheduled actions implemented, and the degree of effort invested in implementation of each action. Action effectiveness will be evaluated based on whether specific habitat, hydropower, hatchery, harvest, and ecological measures and actions produce the desired reduction in threats relative to population productivity improvement targets. Biological status and response will be evaluated based on trends in fish numbers, population characteristics, and habitat conditions. Summary assessments will be completed at the prescribed intervals although these evaluations may require annual monitoring of key indicators to provide sufficient statistical power to separate trends from normal variability.

Assessments will take the form of written report cards prepared by the LCFRB/Steering Committee in cooperation with oversight and implementing partners. Report cards at 2-year, 6-year, and 12-year intervals will focus on action implementation, action effectiveness, and fish/habitat status, respectively. When progress falls short of prescribed benchmarks, reports will document actions needed to adjust efforts or refine the approach. Technical and policy considerations and new information providing the basis for these adjustments will be described.

10.5.2. Benchmarks

Benchmarks provide tracking reference points by which progress toward recovery can be measured. Benchmarks are established for action implementation, action effectiveness, and species status. Examples of the general types of questions that would be addressed by benchmarks are shown in Table 10-2 and Table 10-3. Chapter 4 (Goals, Criteria & Objectives) defines benchmarks and describes their technical basis. Threat-specific benchmarks are detailed for each species in Chapter 6 (Species: Recovery Strategies & Benchmarks).

Implementation benchmarks will be based on implementation work schedules prepared by the implementing partners. The schedules will identify the tasks and milestones for implementing the actions identified in the Plan. Action implementation reviews will be conducted every 2 years and will gauge the actual progress made against the milestones in the implementation work schedules. Where benchmarks have not been achieved, the reasons will be evaluated and appropriate modifications or revisions to implementation work schedules will be made.

Six-year Action Effectiveness Reviews will focus on determining if a specific action has achieved its objectives or desired outcomes. Since actions achieve their objectives or outcomes over varying timeframes, the review will evaluate whether an action has achieved the results expected during the period of review. Where actions have not achieved the expected results, the reasons will be evaluated. Plan strategies, measures, and actions and implementation work schedules will be revised as necessary to address progress shortfalls.

Twelve-year biological and habitat status reviews focus the response of wild fish populations and habitat to the actions implemented. Evaluation of biological status will be made on both the individual population and ESU levels based on the Technical Review Team (TRT) recovery criteria. Abundance, productivity, spatial distribution, and diversity will be evaluated to determine if progress is consistent with the planned trajectory for recovery. Improvements in watershed functions and habitat attributes will be examined on a watershed, subwatershed, and reach basis to determine if habitat protection and restoration measures have achieved targeted levels.

Table 10-2. Example Action Implementation Review Questions

Category	Example Action Implementation Review Questions
Habitat	<ul style="list-style-type: none"> • Have planned habitat restoration projects been completed on schedule? • Have watershed and habitat protection programs such as stormwater controls, forest and park management plans and road maintenance programs been implemented on schedule? • Have regulatory programs such as land use controls, forest practice rules, and stream flow rules been implemented on schedule?
Hydro	<ul style="list-style-type: none"> • Have tasks related to fish passage been completed on schedule? • Have flow measures been implemented on schedule?
Harvest	<ul style="list-style-type: none"> • Have harvest management programs needed to protect wild populations been implemented on schedule?
Hatcheries	<ul style="list-style-type: none"> • Have planned hatchery operational modifications needed to protect wild fish populations been implemented on schedule? • Have tasks associated with planned hatchery operation and facility modifications (needed to support reintroduction, supplementation, and augmentation needs) been implemented on schedule?
Ecological Interactions	<ul style="list-style-type: none"> • Have predator control programs been developed, funded, and implemented on schedule?
Monitoring & Research	<ul style="list-style-type: none"> • Have tasks related to regional biological and habitat monitoring and data management been completed on schedule? • Have planned studies or assessments needed to address critical uncertainties been implemented on schedule?

Table 10-3. Example Action Effectiveness Review Questions

Category	Example Action Effectiveness Review Questions
Habitat	<ul style="list-style-type: none"> • Have habitat restoration projects achieved the expected improvements in conditions? • Have watershed and habitat protection programs such as stormwater controls, forest and park management plans and road maintenance programs achieved the expected reduction in habitat loss or damage? • Have regulatory programs such as land use controls, forest practice rules, and stream flow rules achieved the expected reduction in habitat loss or damage?
Hydro	<ul style="list-style-type: none"> • Have performance standards for fish passage been achieved? • Have actual flows been within target ranges?
Harvest	<ul style="list-style-type: none"> • Have harvest impacts been equal to or less than those planned?
Hatcheries	<ul style="list-style-type: none"> • Have hatchery impacts been reduced to target levels? • Have hatchery operations achieved goals for reintroduction, supplementation, or augmentation?
Ecological Interactions	<ul style="list-style-type: none"> • Have predator control programs achieved target impact reductions?
Monitoring & Research	<ul style="list-style-type: none"> • Are needed data being collected and managed according to procedures and protocols? • Have studies adequately addressed targeted critical uncertainties?

10.5.3. Decisions

Decisions at each checkpoint depend on observed progress relative to benchmarks. The following sections show the type of actions that would result from the outcomes of action implementation, action effectiveness, and fish and habitat status reviews.

Table 10-4. Actions in response to implementation assessment findings.

Review Findings	Action	Review Type
Action Implementation Review		
Progress meets or exceeds benchmarks	Proceed as planned	Policy
Progress falls below benchmarks	Revise Implementation plan or approach	Policy
Action Effectiveness Review		
Effectiveness meets or exceeds benchmarks	Proceed as planned	Technical
Effectiveness falls below benchmarks	Evaluate action and revise strategy, measure and/or action(s). Revise implementation plan.	Technical/Policy
Fish Response & Habitat Status Review		
Fish response and habitat status meet or exceed benchmarks	Proceed as planned.	Technical
Fish response meets or exceeds and habitat status falls below benchmarks.	Evaluate and, as necessary, revise habitat and hydro strategies, measures and actions. Proceed as planned for other harvest and hatchery strategies. Revise implementation plans.	Technical/Policy
Fish response and habitat status fall below benchmarks	Evaluate and, as necessary, revise strategies, measures and actions for all H's. Revise implementation plans.	Technical/Policy
Fish response falls below and habitat status meets or exceeds benchmarks	Evaluate and, as necessary, revise hatchery and harvest strategies, measures, and actions. Revise implementation plans.	Technical/Policy

10.6. Public Education & Outreach

The recovery of the region's salmon and steelhead is inherently dependent on the collective actions of the people of the region. Recovery cannot be accomplished through legislation, rules, or money. These are only tools for recovery. It depends on the cumulative efforts of people working as individuals and collectively through and with organizations and governmental entities to achieve a common goal. In this case, the goal is the recovery of salmon and steelhead to healthy, harvestable levels. The Plan must provide for the equitable sharing of burdens and benefits across affected interests. It will require a sustainable balance between the needs of fish and the values and needs of the people. It will require fundamental changes in how we view, care for and manage our fish, streams and watersheds. In short a successful recovery program must work for people and fish. It must be sound biologically and technically feasible. It must also be sensitive and responsive to regional and local cultural, social, and economic values.

In developing this Recovery Plan, efforts were made to meld biological and technical factors with social values and interests. The planning process was open to the public. Public participation was sought through workshops, meetings, working groups, and public review and comment periods. Copies of working papers and Plan drafts were made available. Attempts were made to present technical information and analysis in a clear, understandable, and transparent manner. A careful record was maintained of all comments received and the disposition of each comment was logged and made available to the public.

While these public outreach efforts have helped assure a more balanced and equitable Plan, successful implementation of the Plan will require broader public awareness, understanding, support, and participation. The public will be an active partner in the implementation of the Plan. This section sets forth the approach for engaging the public as a partner in recovery efforts.

10.6.1. Goal

It is a goal of public education and outreach to engage the public as an active partner in implementing and sustaining recovery efforts. This goal will be achieved by building public awareness, understanding, and support; and by providing opportunities for participation in all aspects of recovery implementation. The term "public" is intended to be inclusive of individuals, community groups, environmental and conservation organizations, businesses, fishing interests and others with a stake or role in achieving recovery.

Awareness: The public will be made aware of the recovery efforts and informed of the opportunities to become involved.

Understanding: Members of the public will be provided the tools and information needed to effectively support and participate in recovery. Public education and outreach will help people understand why we are attempting to recover salmon and steelhead populations and what actions are required to do so. It will help the public understand the program's goals, objectives, strategies, measures, and actions as well as the supporting science and policy decisions. It will promote the understanding that recovery is a shared responsibility, requiring coordinated and complementary participation at the federal, state, local, and citizen levels. It will assist the public in understanding their role and those of others. It will help members of the public understand how their collective efforts contribute to restoring salmon and steelhead populations to healthy, harvestable levels. Information needs will vary based on location and interests. For many, a concise overview and summary of the Recovery Plan will likely suffice. However, some may wish to examine the recovery program and its underlying technical basis in more detail. All will want to know how recovery will affect them.

Support and Participation: Support and participation will be achieved by providing the public with opportunities to become involved in recovery efforts. This includes helping to shape implementation efforts. Agencies and governments can do this by engaging the public in developing their implementation work schedules and actions. Doing so will engender public support and ownership of recovery actions, while also helping to ensure that these actions take into consideration public interests and concerns. Engaging the public in performing specific recovery actions such as habitat restoration projects and monitoring habitat conditions will also further participation and support. Schools and non-profit organizations can further the understanding of recovery concepts and participation in recovery actions through watershed and habitat studies and restoration efforts.

10.6.2. Principles

- A) Public Education And Outreach Is A Shared Responsibility. All agencies, governments, and organizations involved in recovery efforts will actively engage in public education and outreach to achieve the needed levels of public awareness, understanding, support, and participation. These efforts will be coordinated to ensure consistency across the entire recovery region.
- B) The Public Is A Key Partner In Recovery. Public education and outreach is an ongoing and integrated process that makes the public a key partner in all aspects of recovery, including designing measures and actions, implementing those measures and actions, reviewing the outcome, and, if necessary, adjusting course.
- C) Public Education And Outreach Is A Continuing Process. Public education and outreach is not a short-term activity. While it is critical to the initial implementation of recovery strategies, measures and actions, public involvement is equally important to sustaining recovery efforts over the many years needed to achieve healthy harvestable salmon and steelhead populations.
- D) Public Information Must Be Timely, Accurate, Relevant, And Consistent. Information is critical to effective public understanding and participation. The public must have access to needed information in time to apply or act on it. To be credible, it must be complete, accurate, and understandable. It must also be relevant to the issue or action being considered and responsive to the public interests involved. Finally, given the numerous parties engaged in the implementation of recovery actions, it must be consistent. Conflicting or inconsistent information will damage public confidence.
- E) The Public Will Have Meaningful Opportunities To Participate. The public should be involved from the outset of planning and implementing recovery actions, not after decisions have been made. Public input on or involvement in implementation actions should be encouraged and actively solicited. The public should be advised of how its input shaped the decision made.
- F) Public Contributions Should Be Recognized. Public contributions to recovery should be recognized and celebrated within their community and throughout the region. Doing so builds support and encourages broader participation.

10.6.3. Approach

As noted above, public education and outreach is a responsibility shared by all implementing partners. Each implementing partner will have an effective public education and outreach effort tailored to its recovery responsibilities and the needs of its constituency. Each implementing partner will also be able to represent the regional recovery effort accurately and consistently and to put its actions in the broader context of the regional effort. While the purpose of these programs is to build awareness,

understanding, support and participation, multiple public education and outreach efforts also have the potential to overwhelm and confuse the public and to be needlessly repetitive and wasteful.

The implementation approach relies largely on the individual implementing partners. It also identifies measures and actions to coordinate and integrate these individual efforts into an effective regional public education and outreach effort that will help ensure consistency, avoid redundancy, and leverage efforts and resources.

A regional education and outreach program will be established to support, assist and coordinate the efforts by individual implementing partners. The LCFRB and the Steering Committee in consultation with the implementing partners will develop the regional program. The program will be incorporated in the 6-year regional implementation plan. The program will be consistent with the principles discussed above and will:

- Develop and distribute informational and educational materials explaining the reasons for the recovery effort and the Recovery Plan's goals, strategies, measures, actions, and priorities.
- Coordinate and facilitate communications and information sharing among agencies, governments, and organizations and with the public. This will include a regional communications network, information clearinghouse, and identification of informational contacts for implementing partners.
- Identify opportunities for and assist implementing partners in integrating or consolidating similar, duplicative, or complementary education and outreach efforts.
- Provide the public with information on implementation actions throughout the region, including notice of opportunities to participate and locations of information sources.
- Provide the public with information on the progress, status, and achievements of recovery actions throughout the region.
- Encourage and assist schools and educational organizations such as conservation districts and WSU cooperative extension to integrate salmon recovery into their environmental, agricultural, watershed, water quality curriculum, and classes. Also support agency, local government, and utility educational programs promoting actions by individuals to protect and conserve water resources.
- Coordinate briefings and presentations to civic, business, trade, environmental, conservation, and fishing organizations on the regional recovery program, actions and progress.
- Establish regional measures to acknowledge and celebrate the contributions of organizations, businesses, and individuals.
- Publicize incentive programs for the protection and restoration of water resources and habitat and encourage landowner participation.
- Encourage business and professional organizations to adopt and promote implementation of best management practices for the protection and restoration of fish and habitat.
- Encourage and assist local or community organizations interested or involved in watershed and habitat protection and restoration.

In concert with the development of the regional recovery public education and outreach plan, the implementing partners will be requested to prepare an education and outreach plan for their implementing activities. These plans would be an element of the 6-year implementation work schedule to be prepared by each partner. While public entities are already required by law or rule to have some form of public education and outreach, these plans would help to ensure efforts by the implementing partners are consistent with the principles and regional program discussed above and coordinated with the efforts of other implementing partners.

10.7. Evaluating Plan Sufficiency

Evaluation of the sufficiency of this Plan is based on: 1) substantive strategies, measures, and actions that address all current threats to the viability and harvestability of Washington lower Columbia salmon and steelhead populations, 2) incorporation of effective monitoring, evaluation, and adaptive management measures and actions as well as an institutional framework for Plan implementation, and 3) assessments confirming that reductions in threats are of an order of magnitude consistent with recovery.

Threats to viability and harvestability include all categories of human activities that impact fish numbers, adaptive population characteristics, and habitats. This Plan has treated threats grouped by category including stream habitat, estuary and mainstem habitat, hydropower, harvest, hatcheries, and ecological interactions. These threats are cataloged at length and related to fish limiting factors. Impacts of key factors in each threat category were quantified based on the best available information and were related to improvement increments needed to achieve biological objectives. These impacts estimates also provide baseline values for modeled assessments of threats. Detailed strategies, measures, and actions were developed to address each category of threat. Actions for addressing threats are further detailed in subbasin volumes. All recovery measures are cross-referenced with the threats they address.

Monitoring, evaluation, and adaptive management components of the Plan consider whether actions were implemented as designed, actions produce the expected effect, and the net effects of multiple actions produce the desired improvement in fish populations. The recovery actions detailed for each threat provide a checklist for evaluating the scope of Plan implementation. Quantitative estimates of the impacts of key threat factors and expected responses projected from fish life cycle and habitat models provide testable hypotheses for the monitoring, evaluation, and adaptive management effort.

The immediate test of Plan sufficiency is whether current working hypotheses, strategies, measures, and actions provide a plausible scientific basis for reversing declining fish trends and providing a significant trajectory toward recovery. The complex dynamics of biological systems introduces large uncertainty into fine-scale, long-term predictions of response to recovery actions. Existing data, models, and theories are not adequate to categorically prove that a given set of actions will guarantee recovery. No amount of additional research, modeling, and theorizing is likely to provide an iron-clad projection. Existing information and tools are adequate to evaluate whether proposed actions are of an order of magnitude to significantly reduce threats to the level where a response in fish populations can feasibly be measured and a trajectory for recovery can be detected.

These assessments will be completed as part of the Plan development and implementation process. Assessments will determine whether prescribed actions are sufficient to reverse declining trends in fish numbers and provide a significant trajectory to recovery. Expected responses to recovery actions will be based on: 1) composite effects of target reductions in human impacts in each threat category on fish population trends and extinction risks, and 2) net effects of habitat improvements in subbasins on fish productivity and capacity. Probability life cycle modeling of composite effects will determine whether the combined reduction in impacts in all threat categories can reasonably be expected to provide the desired trajectory toward recovery objectives. Habitat modeling will determine whether projected improvements in habitat conditions associated with recovery actions are of the scale necessary to make substantive contributions to the overall recovery effort.

10.8. Measures

10.3.1 Coordination

P.M1. Establish an oversight group for Plan implementation (NMFS, USFWS, WDFW, NPCC) and an implementation facilitation and coordination function to be carried out by the LCFRB, LCFRB staff, and a Plan Implementation Steering Committee.

P.M2. Regularly review and revise this Plan in a collaborative agency, stakeholder, and public process.

Responsible Parties: LCFRB/Steering Committee

P.M3. Refine draft benchmarks for assessing implementation progress, implementation effectiveness and biological and habitat status.

Responsible Parties: LCFRB/Steering Committee

P.M4. Develop and implement cost and economic analysis methods to assist in decision-making and meet ESA needs.

Responsible Parties: LCFRB/Steering Committee and NMFS

P.M5. Develop ESA threats criteria and prioritization for incorporation into the Lower Columbia and domain recovery plans. Relate actions, strategies, and measures to threats.

Responsible Parties: LCFRB/Steering Committee and NMFS

P.M6. Conduct qualitative evaluation of program sufficiency.

Explanation: This measure will involve close coordination of work by NMFS' science center and the LCFRB staff to develop a systematic approach to modeling effects of actions on fish habitat and watershed processes and to use this approach to evaluate alternative restoration scenarios.

Responsible Parties: LCFRB/Steering Committee

P.M7. Coordinate the development of a regional monitoring, research, and evaluation program.

Responsible Parties: LCFRB/Steering Committee

P.M8. Coordinate the development of a regional public education and outreach program.

Responsible Parties: LCFRB/Steering Committee

10.3.2 Implementation

P.M9. Develop and periodically update 6-year implementation work schedules.

Responsible Parties: LCFRB/Steering Committee and implementing partners.

P.M10. Evaluate whether recovery strategies, measures, and actions are being implemented as planned.

Explanation: This Recovery Plan describes an ambitious series of strategies, measures, and actions based on the gap between where we are now and where we want to go. The Plan will fail at its most fundamental level if these strategies, measures, and actions are not implemented.

Responsible Parties: LCFRB/Steering Committee

P.M11. Refine and reprioritize Plan implementation at the programmatic level based on evaluations of implementation and compliance.

Explanation: Plan implementation at the program and project level will be a dynamic process requiring continual adaptation by implementing parties. Plan implementation will also be formally evaluated at intervals as prescribed in the implementation chapter.

Responsible Parties: LCFRB/Steering Committee

P.M12. Prepare written Plan implementation progress reports to participating agencies, stakeholders, and the public at 2-year intervals.

Explanation: These include descriptions of refinements based on findings.

Responsible Parties: LCFRB/Steering Committee

10.3.3 Action Effectiveness

P.M13. Evaluate whether specific strategies, measures, and actions are producing the desired effects in each limiting factor/threat category (stream habitat, mainstem/estuary habitat, hydropower, harvest, hatcheries, and ecological interactions).

Explanation: Factor-specific responses are based on action effectiveness monitoring. A series of monitoring activities have been identified specific to each limiting factor/threat category to occur at different scales and periods. Evaluations will be ongoing and also incorporated into regular plan-wide reviews.

Responsible Parties: LCFRB/Steering Committee

P.M14. Refine and reprioritize existing recovery strategies, measures, and actions for each limiting factor/threat category based on results of action-effectiveness evaluations.

Explanation: Adjustments in the implementation of related measures can be made as new information is gained on the effects of specific measures and actions. Large-scale adjustments and compensation among measures across limiting factor/threat categories will be considered.

Responsible Parties: LCFRB/Steering Committee

P.M15. Prepare written action effectiveness progress reports to participating agencies, stakeholders, and the public at 6-year intervals.

Explanation: These include descriptions of refinements based on findings.

Responsible Parties: LCFRB/Steering Committee

10.3.4 Fish and Habitat Response

P.M16. Periodically evaluate biological status relative to population and ESU objectives to determine whether necessary improvements are being achieved.

Explanation: The success of the Recovery Plan will ultimately be determined based on observed response in fish populations across the ESU as well as trends in other fish and wildlife species of interest. Trends will be evaluated on an annual basis with more comprehensive assessments prescribed at 12-year intervals. Evaluations will also consider and correct for confounding effects of regional climate patterns.

Responsible Parties: LCFRB/Steering Committee

P.M17. Periodically evaluate habitat status relative to baseline conditions and benchmarks to determine whether appropriate progress is being made toward desired future conditions.

Explanation: Desired conditions are based on specific objectives identified in subbasin sections of Volume II. The baseline corresponds to conditions at the time of listing and is intended only as a reference point for measuring significant trends. Desired conditions may be similar to the baseline in areas targeted for preservation. Desired conditions will be more suitable for objective species in areas targeted for recovery. Trends will be evaluated on an annual basis with more comprehensive assessments prescribed at 12-year intervals. Evaluations will also consider and correct for confounding effects of regional climate patterns.

Responsible Parties: LCFRB/Steering Committee

P.M18. Refine and reprioritize existing recovery strategies, measures, and actions for each limiting factor/threat category based on results of biological and habitat status evaluations.

Explanation: Adjustments in the implementation of related measures can be made as new information is gained on the observed response. Large-scale adjustments and compensation among measures across limiting factor/threat categories may be considered.

Responsible Parties: LCFRB/Steering Committee

P.M19. Prepare written fish and habitat status reports to participating agencies, stakeholders, and the public at 12-year intervals.

Explanation: The interval coincides with the action effectiveness and implementation reporting requirements. Reports will include descriptions of refinements based on findings.

Responsible Parties: LCFRB/Steering Committee

10.3.5 Adaptive Management

P.M20. Use results of critical uncertainty research to identify new, or refine and reprioritize existing, recovery strategies, measures, and actions.

Explanation: Adjustments in the implementation of related measures can be made as critical uncertainty research provides new insights. Large-scale adjustments and compensation among measures across limiting factor/threat categories will be considered at intervals as prescribed in the Implementation Chapter.

Responsible Parties: LCFRB/Steering Committee

P.M21. Refine analytical tools and methods to better support adaptive management process.

Explanation: Evaluations of limiting factors and threats as well as recovery objectives are based on a series of analyses and models. All of these evaluations will be subject to refinements and testing. Considerations related to uncertainties in the various models will be incorporated into the monitoring, evaluation, and adaptive management framework for this Plan.

Responsible Parties: LCFRB/Steering Committee , TRT, NMFS

P.M22. Refine biological objectives consistent with recovery as new information becomes available on status and viable population or ESU characteristics.

Explanation: The biological objectives identified in this Plan are working hypotheses based on incomplete data and a series of assumptions regarding what constitutes a viable population or ESU. These assumptions were identified as subjects for further evaluation and it is anticipated that substantial advances in understanding will occur as a result of efforts in the lower Columbia recovery domain as well as in other domains across the Pacific Northwest. These advances will inevitably lead to refinements in recovery criteria which will need to be incorporated into the biological objectives of this Plan.

Responsible Parties: LCFRB/Steering Committee

P.M23. Periodically evaluate strengths and weaknesses of the available monitoring and research to determine adequacy for assessing progress and identifying appropriate course corrections.

Explanation: The monitoring, research, and evaluations program itself will be subject to regular review and refinement in response to available resources for implementation.

Responsible Parties: LCFRB/Steering Committee

P.M24. Identify appropriate alternative approaches and revise priorities for monitoring and research based on results of evaluations. Responsible Parties: LCFRB/Steering Committee

Explanation: Adjustments in the implementation of related measures can be made as new information is available. Large-scale revisions will be considered at intervals as prescribed in the Implementation Chapter.

Responsible Parties: LCFRB/Steering Committee

10.9. Implementation Actions

The following table organizes by impact the actions and entities who will be involved in implementation. In some cases, no single entity has full authority to implement an action, and successful implementation will depend on the coordination and cooperation of a number of agencies. In other cases, while one entity may have lead authority and implementation responsibility, effective implementation will depend on the involvement, support, and agreement of a number of agencies. In the process of developing implementation plans, as discussed earlier in this chapter, lead entities will be identified where appropriate for each action.

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Habitat (stream)	101	--	Vol II	Assist local governments in protecting floodplain impacts from new development through land use controls and Best Management Practices	Ecology	Ongoing
	102	--	Vol II	Protect and restore native plant communities from the effects of invasive species	Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD	Within 10 years ¹
	103	--	Vol II	Increase education, enforcement, and if necessary, control activities related to tributary noxious instream and riparian plant species	County Noxious Weed Control Boards, State Noxious Weed Control Board	Within 5 years
	104	--	Vol II	Within authorities, prevent floodplain impacts from new development through land use controls and Best Management Practices	Battle Ground, Camas, Cathlamet, Clark Co, Cowlitz Co, Kalama, Kelso, Lewis Co, Longview, Pacific Co, Skamania Co, Vancouver, Wahkiakum Co, Washougal, Winlock, Woodland	Within 5 years
	105	--	Vol II	Monitor, evaluate, and enforce the Stordahl Habitat Conservation Plan	NMFS, USFWS	Within 5 years
	106	--	Vol II	Assess the impact of fish passage barriers and restore access to potentially productive habitats	Clark CD, Clark Co, Cowlitz Co, Kelso, NGO, Lewis Co, Pacific Co, Skamania Co, USFS, Wahkiakum Co, WDFW, WDNR, Woodland, WSDOT	Within 10 years
	107	--	Vol II	Restore access through the hydropower system for anadromous and resident fish, unless proven to be infeasible or biologically unnecessary	BPA	Within 5 years
	108	--	Vol II	Build partnerships with landowners and agencies and provide financial incentives to restore floodplain function	LCFRB	Ongoing
	109	--	Vol II	Conduct floodplain restoration where feasible along the mainstem and in major tributaries that have experienced channel confinement. Build partnerships with landowners and agencies and provide financial incentives	Clark CD, Cowlitz Co, Tribes, Cowlitz CD, Wahkiakum CD, Kelso, Lewis CD, NGO, Port of Kalama, Port of Vancouver, Underwood CD, USACE, WDFW	Within 10 years

¹ Many of these actions are ongoing. The estimated schedule, in many cases, refers to the time allocated for initial implementation of these programs.

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Habitat (stream)	110	--	Vol II	Proactively conduct floodplain restoration on lands being phased out of agricultural production. Survey landowners, build partnerships, and provide financial incentives	NGO, USACE, WDFW, WDNR	Within 10 years
	111	--	Vol II	Address water quality issues through the development and implementation of water quality clean up plans (TMDLs)	Ecology	Within 5 years
	112	--	Vol II	Local jurisdictions should assess and require upgrading and replacement of on-site sewage systems, in conformance with current regulations	Clark Co, Cowlitz Co, Lewis Co, Pacific Co, Skamania Co Wahkiakum Health Districts	Within 5 years
	113	--	Vol II	Implement the recommendations of the Watershed Planning Unit regarding water quality	Woodland	Within 5 years
	114	--	Vol II	Manage existing and future water supplies consistent with WRIA 27/28 Watershed Management Plan recommendations; Initiate the development and implementation of a regional water source in the Stiegerwald Refuge vicinity	Camas	Within 5 years
	115	--	Vol II	Manage existing and future water supplies consistent with WRIA 27/28 Watershed Management Plan recommendations; Initiate the development and implementation of a regional water source for Clark County, including Ridgefield and Battleground	CPU	Within 5 years
	116	--	Vol II	Work with federal, state, and local agencies to equitably resolve groundwater quality issues in the Vancouver Lake Lowlands related to a regional water source for Clark County	Port of Vancouver	Ongoing
	117	--	Vol II	Initiate instream flow rule-making in the lower Columbia region consistent with recommendations from the WRIA 25/26 and WRIA 27/28 Planning Units	Ecology	Ongoing (WRIA 25/26) and Completed (WRIA 27/28)

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Habitat (stream)	118	--	Vol II	Provide technical assistance to Ecology relative to instream flow rule-making consistent with recommendations of the WRIA 25/26 and WRIA 27/28 Planning Units	WDFW	Ongoing (WRIA 25/26) and Completed (WRIA 27/28)
	119	--	Vol II	Manage existing and future water supplies consistent with WRIA 27/28 Watershed Management Plan recommendations; Participate in the development and implementation of a regional water source for residents, businesses, and industries within its Urban Growth Boundary	Vancouver	Within 5 years
	120	--	Vol II	Implement recommendations of the WRIA 25/26 Planning Unit through identification of funding, coordination, and monitoring of progress	Castle Rock, Cathlamet, Cowlitz Co, Kelso, Lewis Co, Longview, Morton, Mossyrock, Skamania Co, Toledo, Vader, Wahkiakum Co, Winlock, WRIA 25/26 Planning Unit	Ongoing
	121	--	Vol II	Implement recommendations of the WRIA 27/28 Planning Unit through identification of funding, coordination, and monitoring of progress	Battle Ground, Camas, Clark Co, Clark Public Utilities, Cowlitz Co, Kalama, North Bonneville, Skamania Co, Tribes, Vancouver, Washougal, Woodland, WRIA 27/28 Planning Unit	Ongoing
	122	--	Vol II	Manage regulated stream flows in the NF Lewis to maximize fish habitat use	PacifiCorp, Tacoma Power	Ongoing
	123	--	Vol II	Monitor and enforce stream flows in hydro-regulated streams to ensure critical components of natural flow regimes	Ecology, FERC, WDFW	Ongoing
	124	--	Vol II	Ensure compliance with hydropower relicensing agreements	FERC, USFWS, WDFW	Ongoing
	125	--	Vol II	Ensure Best Management Practices and appropriate regulatory controls are applied to agricultural lands	NRCS, WADA	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
	126	--	Vol II	Increase funding levels for habitat restoration, preservation, and research projects to help achieve recovery goals. Evaluate the use block grants to LCFRB to fund projects consistent with recovery plan and the Salmon Recovery Act	SRFB	Within 5 years
	127	--	Vol II	Fully implement the Environmental Mitigation Program consistent with the lower Columbia salmon recovery plan	WSDOT	Within 5 years
	128	--	Vol II	Manage federal forest lands to protect and restore watershed processes and habitat conditions	USFS	Ongoing
	130	--	Vol II	Increase technical support and funding to small forest landowners faced with implementation of Forest Practices Rules to ensure full and timely compliance with regulations	WDNR	Within 5 years
	131	--	Vol II	Increase funding levels for habitat restoration, preservation, and research projects to help achieve recovery goals	BPA, NPCC	Within 5 years
	132	--	Vol II	Increase the level of implementation of habitat enhancement projects in high priority reaches and subwatersheds. This includes building partnerships, providing incentives to landowners, and increasing funding	Clark CD, Cowlitz CD, Wahkiakum CD, Lewis CD, NGO, Pacific CD, Underwood CD, WDFW, Tribes, Yakama Nation	Within 10 years
	133	--	Vol II	Initiate habitat restoration and protection projects to mitigate impacts of hydroelectric facilities	BPA, Cowlitz PUD, PacifiCorp, Tacoma Power	Ongoing
	134	--	Vol II	Implement existing restoration, protection, and education USFWS programs in the lower Columbia region	USFWS	Ongoing
	135	--	Vol II	Develop partnerships and increase funding available to purchase easements or property in sensitive areas in order to protect watershed function where existing regulatory programs are inadequate	LCFRB, NGO, WDFW	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
	136	--	Vol II	Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing the incentives (financial or otherwise) and increasing program marketing and outreach	Battle Ground, Camas, Castle Rock, Cathlamet, Clark CD, Clark Co, Cowlitz Co, Cowlitz CD, Wahkiakum CD, Kalama, Kelso, NGO, Lewis CD, Lewis Co, Longview, Morton, Mossyrock, NRCS, Pacific CD, Tribes	Within 5 years
	137	--	Vol II	Ensure standards in land use and environmental programs and plans afford adequate protection of ecologically important areas (i.e. stream channels, riparian zones, floodplains, CMZs, wetlands, unstable geology)	Battle Ground, Camas, Castle Rock, Cathlamet, Clark Co, Cowlitz Co, Kalama, Kelso, Lewis Co, Longview, Morton, Mossyrock, Pacific Co, Skamania Co, Vancouver, Wahkiakum Co, Washougal, Winlock, Woodland	Within 5 years
	138	--	Vol II	Review and adjust operations to ensure compliance with the Endangered Species Act.	Battle Ground, Camas, Castle Rock, Cathlamet, Clark Co, Cowlitz Co, Kalama, Kelso, Lewis Co, Longview, Morton, Mossyrock, Pacific Co, Skamania Co, Vancouver, Wahkiakum Co, Washougal, Winlock, Woodland, Pacific Co, Skamania Co, Underwood CD, Vancouver, Wahkiakum Co, Washougal, WDFW, WDNR, Winlock, Woodland, Yakama Nation	Within 5 years
	139	--	Vol II	Using available planning tools (e.g., GMA, comprehensive planning, zoning, best management practices, etc.), manage future growth and development patterns to ensure the protection of watershed processes. This includes limiting the effects of conversion of agriculture and timber lands to developed uses	Battle Ground, Camas, Castle Rock, Cathlamet, Clark Co, Cowlitz Co, Kalama, Kelso, Lewis Co, Longview, Morton, Mossyrock, Pacific Co, Skamania Co, Vancouver, Wahkiakum Co, Washougal, Winlock, Woodland	Within 5 years
	140	--	Vol II	Within authorities, create and/or restore lost side-channel/off-channel habitat for chum spawning and coho overwintering	Clark CD, Cowlitz CD, Wahkiakum CD, Lewis CD, NGO, Pacific CD, Underwood CD, WDFW	Within 10 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Habitat (stream)	141	--	Vol II	Conduct forest practices on state lands in accordance with the Habitat Conservation Plan in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	WDNR	Ongoing
	142	--	Vol II	Develop and implement stormwater management practices needed to protect stream flows and water quality	Camas, Kalama, Kelso, Longview, Port of Camas-Washougal, Port of Kalama, Port of Longview, Port of Vancouver, Vancouver, Washougal, Woodland	Within 5 years
	143	--	Vol II	Increase implementation of voluntary habitat enhancement projects in high priority reaches and subwatersheds. This includes building partnerships with landowners and agencies and increasing funding	LCFRB	Ongoing
	144	--	Vol II	Identify and initiate habitat restoration projects in Stiegerwald and other wildlife refuges consistent with goals in the salmon recovery plan	USFWS	Within 5 years
	145	--	Vol II	Address fish passage and sediment issues at the Sediment Retention Structure on the NF Toutle	USACE, WDFW	Ongoing
	146	--	Vol II	Monitor and enforce fish harassment laws throughout the region	WDFW	Within 5 years
	147	--	Vol II	Within existing authorities, coordinate with appropriate entities to limit the effects of intensive recreational use of the mainstem Lewis during critical periods, where problems are identified.	Clark Co, Cowlitz Co, State Parks, Vancouver	Within 5 years
	148	--	Vol II	Restore volitional access through the hydropower system for anadromous and resident fish, unless proven to be infeasible or biologically unnecessary	Cowlitz PUD, PacifiCorp	Within 5 years
	149	--	Vol II	Ensure volitional passage for salmonids and Bull Trout is attained through hydro relicensing unless shown to be infeasible or biologically unnecessary	Cowlitz PUD	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Habitat (stream)	150	--	Vol II	Assist in evaluation and solution of fish passage and sediment issues at the Sediment Retention Structure on the NF Toutle	WDFW	Ongoing
	151	--	Vol II	Fully implement and enforce the Forest Practices Rules (FPRs) on private timber lands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	WDNR	Within 5 years
	152	--	Vol II	Increase funding available to purchase easements or property in sensitive areas in order to protect watershed function where existing regulatory programs are inadequate	LCFRB	Within 5 years
	153	--	Vol II	Assist in the development and promote the implementation of Best Agricultural Practices for the protection and restoration of watershed functions, riparian conditions, habitat and water quality	Ecology, WACC, WSDA	Within 5 years
Estuary	209	E.M1	Vol I, Ch 5	Protect intact riparian areas in the estuary and its tributaries and restore riparian areas that are degraded.	BPA, CREST, LCFRB, LCREP, NGOs, Tribes, WDFW, Pacific Co, Wahkiakum Co, Cowlitz Co, Clark Co, Skamania Co, Pacific CD, Cowlitz-Wahkiakum CD, Clark CD, Port of Camas-Washougal, Port of Kalama, Port of Longview, Port of Vancouver, Camas, Cathlamet, Kalama, Kelso, Longview, Ridgefield, Vancouver, Washougal, Woodland	Ongoing
	210	E.M2	Vol I, Ch 5	Operate the hydro system to reduce the effects of reservoir surface heating, or conduct mitigation measures	BPA, Ecology, NPCC, USACE	Within 5 years
	211	E.M3	Vol I, Ch 5	Establish minimum instream flows for the Lower Columbia River mainstem that would help prevent further degradation of the ecosystem	BPA, Ecology, NPCC, Oregon, USACE	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Estuary	212	E.M4	Vol I, Ch 5	Adjust the timing, magnitude, and frequency of flows (especially spring freshets) entering the estuary and plume to better reflect the natural hydrologic cycle, improve access to habitats and provide better transport of coarse sediments and nutrients in the estuary, plume, and littoral cell	BPA, NPCC, USACE	Within 5 years
	213	E.M5	Vol I, Ch 5	Study and mitigate the effects of entrapment of sediment in reservoirs, to improve nourishment of the littoral cell.	BPA, USACE	Within 5 years
	214	E.M6	Vol I, Ch 5	Reduce the export of sand and gravels via dredge operations by using dredged materials beneficially.	Ecology, Port of Camas-Washougal, Port of Kalama, Port of Longview, Port of Vancouver, USACE, WDFW, WDNR	Ongoing
	215	E.M7	Vol I, Ch 5	Reduce entrainment and habitat effects resulting from main- and side-channel dredge activities and ship ballast intake in the estuary.	Ecology, EPA, Port of Camas-Washougal, Port of Kalama, Port of Longview, Port of Vancouver, USACE, WDFW, WDNR	Within 5 years
	216	E.M8	Vol I, Ch 5	Remove or modify pile dikes that have low economic value when removal or modification would benefit juvenile salmonids and improve ecosystem health.	BPA, LCREP, NGO, USACE, WDFW, WDNR	Ongoing
	217	E.M9	Vol I, Ch 5	Protect remaining high-quality off-channel habitat from degradation and restore degraded areas with high intrinsic potential for high-quality habitat.	BPA, CREST, LCFRB, LCREP, NGOs, Tribes, WDFW, Pacific Co, Wahkiakum Co, Cowlitz Co, Clark Co, Skamania Co	Ongoing
	218	E.M10	Vol I, Ch 5	Breach or lower dikes and levees to improve access to off-channel habitats	BPA, CREST, LCFRB, LCREP, NGOs, Tribes, USACE, WDFW, Pacific Co, Wahkiakum Co, Cowlitz Co, Clark Co, Skamania Co	Ongoing
	219	E.M11	Vol I, Ch 5	Reduce the square footage of over-water structures in the estuary.	USACE, WDNR, Camas, Cathlamet, Kalama, Kelso, Longview, Ridgefield, Vancouver, Washougal, Woodland	Within 5 years
	220	E.M12	Vol I, Ch 5	Reduce the effects of vessel wake stranding in the estuary.	Port of Camas-Washougal, Port of Kalama, Port of Longview, Port of Vancouver, USACE	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Estuary	221	E.M13	Vol I, Ch 5	Implement pesticide and fertilizer best management practices to reduce estuarine and upstream sources of nutrients and toxic contaminants entering the estuary.	Ecology, EPA, LCREP, NRCS, WDNR, WSDA, Cowlitz-Wahkiakum CD, Clark CD, Pacific CD, Pacific Co, Wahkiakum Co, Cowlitz Co, Clark Co, Skamania Co, Camas, Cathlamet, Kalama, Kelso, Longview, Ridgefield, Vancouver, Washougal, Woodland	Ongoing
	222	E.M14	Vol I, Ch 5	Identify and reduce terrestrially- and marine-based industrial, commercial, and public sources of pollutants	EPA, Ecology, Camas, Cathlamet, Kalama, Kelso, Longview, Ridgefield, Vancouver, Washougal, Woodland, Pacific Co, Wahkiakum Co, Cowlitz Co, Clark Co, Skamania Co, Port of Camas-Washougal, Port of Kalama, Port of Longview, Port of Vancouver	Within 5 years
	223	E.M15	Vol I, Ch 5	Monitor the estuary for contaminants and restore or mitigate contaminated sites.	CREST, Ecology, EPA, LCREP, NMFS, USGS	ongoing
	224	E.M16	Vol I, Ch 5	Implement storm water best management practices in cities and towns.	Ecology, EPA, LCREP, Pacific Co, Wahkiakum Co, Cowlitz Co, Clark Co, Skamania Co, Camas, Cathlamet, Kalama, Kelso, Longview, Port of Camas-Washougal, Port of Kalama, Port of Longview, Port of Vancouver, Ridgefield, Vancouver, Washougal, Woodland	ongoing
Hydro	301	D.M1	Vol I, Ch 5	Evaluate and adaptively implement anadromous fish reintroduction upstream of Cowlitz, Lewis, and White Salmon dams and facilities as part of relicensing processes or requirements.	Cowlitz PUD, FERC, NMFS, PacifiCorp, Tacoma Power, WDFW	Within 5 years
	302	D.M2	Vol I, Ch 5	Develop, maintain and operate effective juvenile and adult passage facilities (including facilities, flow, and spill) at Bonneville Dam and tributary dams when populations are reestablished.	BPA, NPCC, PacifiCorp, Tacoma Power, USACE	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Hydro	303	D.M3	Vol I, Ch 5	Maintain adequate water flows in Bonneville Dam tailrace and downstream habitats throughout salmon migration, incubation and rearing periods.	BPA, NPCC, USACE	Ongoing
	307	D.M4	Vol I, Ch 5	Operate the tributary hydro systems to provide appropriate flows for salmon spawning and rearing habitat in the areas downstream of the hydro system.	PacifiCorp, Tacoma Power	Ongoing
	305	D.M5	Vol I, Ch 5	Establish an allocation of water within the annual water budget for the Columbia River Basin that simulates peak seasonal discharge, increases the variability of flows during periods of salmonid emigration, and restores tidal channel complexity in the estuary	BPA, NMFS, NPCC, USACE	Within 5 years
	306	D.M6	Vol I, Ch 5	Implement and monitor effects of hydropower license agreements	NMFS, WDFW	Ongoing
Harvest	433	F.M1	Vol I, Ch 5	Implement actions to limit the exploitation rate of lower Columbia River tule Fall Chinook in order to protect weak populations.	NMFS, WDFW, ODFW	Within 5 years
	434	F.M2	Vol I, Ch 5	Define appropriate fishery impact rates for fall Chinook based on assessments of near- and long-term risks to species viability and considerations of the needs to preserve fishery viability, manage hatchery surpluses, and incentivize implementation of other recovery measures.	NMFS, WDFW, ODFW	Ongoing
	407	F.M3	Vol I, Ch 5	Consider and expressly evaluate the potential for a sliding scale harvest plan based on annual abundance indicators for representative tule fall Chinook populations.	NMFS, WDFW	Within 5 years
	408	F.M4	Vol I, Ch 5	Conduct periodic reviews of fall Chinook harvest relative to habitat productivity and capacity to assure harvest objectives are synchronized with habitat changes	NMFS, WDFW	Every 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Harvest	409	F.M5	Vol I, Ch 5	Seek commitment from agencies and tribes in the Pacific Fisheries Management Council, North of Falcon, and Columbia River Compact processes to specifically manage annually for lower Columbia naturally-spawning tule fall Chinook and to establish a collaborative US policy position for the international table at the Pacific Salmon Commission	NMFS, Tribes, USFWS, WDFW	Within 5 years
	410	F.M6	Vol I, Ch 5	Improve tools to monitor and evaluate fishery catch to assure impacts to naturally-spawning fall Chinook are maintained within agreed limits	NMFS, Tribes, WDFW	Within 5 years
	411	F.M7	Vol I, Ch 5	Manage ocean, Columbia River, and tributary fisheries to meet the spawning escapement goal for lower Columbia bright fall Chinook	NMFS, WDFW	Within 5 years
	412	F.M8	Vol I, Ch 5	Develop a more detailed process for in-season monitoring of stock specific harvest of fall Chinook in the Columbia River	WDFW	Within 5 years
	413	F.M9	Vol I, Ch 5	Implement basin wide marking plan for hatchery tule fall Chinook that is adequate for monitoring interception rates in specific fisheries, tributary harvest management, and monitoring escapement of naturally-spawning fish	NMFS, Tribes, USFWS, WDFW	Within 5 years
	414	F.M10	Vol I, Ch 5	Address technical and policy issues regarding mass marking and help develop programs to mark and monitor recovery of fall Chinook in fisheries and escapement	NMFS, Tribes, USFWS, WDFW	Within 5 years
	415	F.M11	Vol I, Ch 5	Columbia River Compact agencies will evaluate effectiveness of the current time and area management strategy for chum salmon protection in the commercial fishery	WDFW	Within 5 years
	416	F.M12	Vol I, Ch 5	Develop more specific chum management details for pre-season and in-season management of the late fall commercial fishery	WDFW	Within 5 years
	417	F.M13	Vol I, Ch 5	Monitor chum handle rate in tributary winter steelhead and late coho sport fisheries	WDFW	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Harvest	435	F.M14	Vol I, Ch 5	Define appropriate fishery impact rates for steelhead based on assessments of near- and long-term risks to species viability and considerations of the needs to preserve fishery viability, manage hatchery surpluses, and incentivize implementation of other recovery measures.	NMFS, WDFW, ODFW	Ongoing
	418	F.M15	Vol I, Ch 5	Monitor and evaluate commercial and sport impacts to naturally-spawning steelhead in salmon and hatchery steelhead target fisheries	WDFW	Within 5 years
	419	F.M16	Vol I, Ch 5	Continue to improve gear and regulations to minimize incidental impacts to naturally-spawning steelhead	WDFW	Within 5 years
	420	F.M17	Vol I, Ch 5	Establish specific naturally-spawning steelhead encounter triggers for in-season Columbia River fishery adjustments needed to support lower Columbia recovery goals and strategies	WDFW	Within 5 years
	421	F.M18	Vol I, Ch 5	Work through U.S. v. Oregon and with Columbia River treaty Indian tribes to develop harvest plans for Wind River summer steelhead	NMFS, Tribes, USFWS, WDFW	Within 5 years
	422	F.M19	Vol I, Ch 5	Monitor naturally-spawning steelhead handle rate in tributary salmon and steelhead fisheries	WDFW	Within 5 years
	423	F.M20	Vol I, Ch 5	Manage Columbia River commercial fisheries by time, area, and gear to target on hatchery fish and minimize impacts to naturally-spawning steelhead	NMFS, WDFW	Within 5 years
	436	F.M21	Vol I, Ch 5	Define appropriate fishery impact rates for coho based on assessments of near- and long-term risks to species viability and considerations of the needs to preserve fishery viability, manage hatchery surpluses, and incentivize implementation of other recovery measures	NMFS, WDFW, ODFW	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Harvest	437	F.M22	Vol I, Ch 5	Implement actions to regulate the fishery impact rate on naturally-spawning lower Columbia River coho in order to protect weak indeed populations and reduce risks using a sliding scale harvest based on annual abundance indicators	NMFS, WDFW	Within 5 years
	425	F.M23	Vol I, Ch 5	Maintain selective sport fisheries in Ocean, Columbia River, and tributaries and monitor naturally-spawning coho stock impacts	NMFS WDFW, USFWS	Within 5 years
	426	FM.24	Vol I, Ch 5	Manage Columbia River commercial fisheries managed by time, area, and gear to target on hatchery fish and minimize impacts to naturally-spawning coho	NMFS, ODFW, WDFW	Within 5 years
	427	F.M25	Vol I, Ch 5	Review and evaluate the harvest management strategy developed to protect naturally-spawning Clackamas late coho in terms of its ability to protect naturally-spawning Washington late coho	NMFS, WDFW	Within 5 years
	438	F.M26	Vol I, Ch 5	Define appropriate fishery impact rates for spring Chinook based on assessments of near- and long-term risks to species viability and considerations of the needs to preserve fishery viability, manage hatchery surpluses, and incentivize implementation of other recovery measures	NMFS, WDFW, ODFW	Ongoing
	428	F.M27	Vol I, Ch 5	Continue to monitor Columbia River selective fisheries and provide estimates of impacts to naturally produced lower Columbia spring Chinook	NMFS, WDFW	Within 5 years
	429	F.M28	Vol I, Ch 5	Monitor and evaluate handling mortality impacts to released naturally-spawning spring Chinook in Columbia River fisheries	WDFW	Within 5 years
	430	F.M29	Vol I, Ch 5	Develop gear and handling techniques, as well as regulatory options in both commercial and sport fisheries, to minimize selective fishery impacts to naturally-spawning spring Chinook.	WDFW	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Harvest	431	F.M30	Vol I, Ch 5	Develop a lower Columbia naturally-spawning spring Chinook harvest rate plan for management of Columbia River fisheries at such time as significant populations are re-established	WDFW	Within 10 years
	432	F.M31	Vol I, Ch 5	Manage Columbia River commercial fisheries by time, area, and mark-selective requirements to target hatchery fish and minimize impacts to naturally spawning spring Chinook	NMFS, WDFW	Within 5 years
Hatchery	544	H.M1	Vol I, Ch 5	Reconfigure and reform hatchery programs for Fall Chinook consistent with responsibilities identified in this Recovery Plan and standards established by the Hatchery Scientific Review Group.	USFWS, WDFW	Ongoing
	512	H.M2	Vol I, Ch 5	Maintain or establish wild fish refuges for fall Chinook in selected watersheds by eliminating or limiting release and escapement of hatchery-origin fish into natural spawning areas	USFWS, WDFW	Within 5 years
	513	H.M3	Vol I, Ch 5	Implement hatchery reforms for fall Chinook in phases in order to limit demographic risks of the reduction in hatchery supplementation of natural abundance in the interim until natural habitat and population productivity is sufficient to sustain local populations.	USFWS, WDFW	Within 10 years
	514	H.M4	Vol I, Ch 5	Use local watershed brood stock and integrated production strategies in fall Chinook hatchery programs in order to promote local adaptation and natural productivity	USFWS, WDFW	Within 5 years
	515	H.M5	Vol I, Ch 5	Use fall Chinook juvenile release strategies to minimize ecosystem effects of and ecological interactions.	USFWS, WDFW	Within 5 years
	516	H.M6	Vol I, Ch 5	Use hatchery operation strategies to protect Lewis River naturally-spawning fall Chinook from ecosystem effects and ecological interactions.	USFWS, WDFW	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Hatchery	517	H.M7	Vol I, Ch 5	Mark hatchery fall Chinook fish in priority watersheds to promote fishery utilization, facilitate the utilization of natural-origin fish in integrated programs, and enumerate hatchery fish in natural spawning areas	USFWS, WDFW	Within 5 years
	545	H.M8	Vol I, Ch 5	Continue to produce, in a manner consistent with other recovery strategies and measures, sufficient numbers of hatchery fall Chinook to sustain significant fishery opportunities until harvestable naturally-spawning populations are restored	USFWS, WDFW	ongoing
	546	H.M9	Vol I, Ch 5	Reconfigure and reform hatchery programs for Spring Chinook consistent with responsibilities identified in this Recovery Plan and standards established by the Hatchery Scientific Review Group	USFWS, WDFW	ongoing
	519	H.M10	Vol I, Ch 5	Reintroduce spring Chinook in upper Cowlitz and Lewis beginning with hatchery supplementation.	Cowlitz PUD, PacifiCorp, Tacoma Power, WDFW	Ongoing
	520	H.M11	Vol I, Ch 5	Develop plans for future hatchery programs relationship with reestablished natural-origin spring Chinook populations, including integrated and segregated options	USFWS, WDFW	Within 5 years
	521	H.M12	Vol I, Ch 5	Develop and apply hatchery brood stock watershed transfer policies for spring Chinook	USFWS, WDFW	Within 5 years
	522	H.M13	Vol I, Ch 5	Use spring Chinook juvenile release strategies to minimize ecosystem effects and ecological interactions	USFWS, WDFW	Within 5 years
	523	H.M14	Vol I, Ch 5	Mark spring Chinook hatchery production for identification and harvest	USFWS, WDFW	Within 5 years
	547	H.M15	Vol I, Ch 5	Continue to produce, in a manner consistent with other recovery strategies and measures, sufficient numbers of hatchery spring Chinook to sustain significant fishery opportunities until harvestable naturally-spawning populations are restored	USFWS, WDFW	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Hatchery	548	H.M16	Vol I, Ch 5	Implement and expand hatchery programs for chum consistent with responsibilities identified in this Recovery Plan and standards established by the Hatchery Scientific Review Group.	USFWS, WDFW	Ongoing
	524	H.M18	Vol I, Ch 5	Initiate additional conservation propagation programs for chum in order to restore depleted or extirpated populations and to reduce demographic risk.	USFWS, WDFW	Within 5 years
	525	H.M17	Vol I, Ch 5	Continue to enhance local chum populations using Grays and Chinook hatcheries	NGO, WDFW	Ongoing
	527	H.M19	Vol I, Ch 5	Use DNA data to select appropriate brood stock for chum	USFWS, WDFW	Within 5 years
	528	H.M20	Vol I, Ch 5	Develop and apply hatchery brood stock watershed transfer policies for chum	USFWS, WDFW	Within 5 years
	549	H.M21	Vol I, Ch 5	Reconfigure and reform hatchery programs for steelhead consistent with responsibilities identified in this Recovery Plan and standards established by the Hatchery Scientific Review Group.	USFWS, WDFW	Ongoing
	550	H.M22	Vol I, Ch 5	Maintain or establish wild fish refuges for steelhead in selected watersheds by limiting or eliminating release and escapement of hatchery-origin fish into natural spawning areas.	WDFW	Ongoing
	551	H.M23	Vol I, Ch 5	Expand use of local watershed brood stock and integrated production strategies in selected steelhead hatchery programs in order to promote local adaptation and natural productivity.	USFWS, WDFW	Ongoing
	552	H.M24	Vol I, Ch 5	Improve segregated programs for steelhead, where appropriate, to meet established wild population protection criteria.	USFWS, WDFW	Ongoing
	529	H.M26	Vol I, Ch 5	Utilize hatchery production to reintroduce winter steelhead in upper Cowlitz and Lewis rivers	Cowlitz PUD, PacifiCorp, Tacoma Power, WDFW	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Hatchery	532	H.M25	Vol I, Ch 5	Use steelhead juvenile release strategies to minimize detrimental ecosystem impacts and ecological interactions	WDFW	Within 5 years
	534	H.M27	Vol I, Ch 5	Continue to mark steelhead hatchery production	WDFW	Within 5 years
	535	H.M28	Vol I, Ch 5	Maximize harvest and removal of non-local summer and early winter steelhead produced from segregated hatchery programs.	WDFW	Within 5 years
	553	H.M29	Vol I, Ch 5	Continue to produce, in a manner consistent with other recovery strategies and measures, sufficient numbers of hatchery steelhead to sustain significant fishery opportunities until harvestable naturally-spawning populations are restored.	USFWS, WDFW	Ongoing
	554	H.M30	Vol I, Ch 5	Reconfigure and reform hatchery programs for coho consistent with responsibilities identified in this Recovery Plan and standards established by the Hatchery Scientific Review Group.	USFWS, WDFW	Ongoing
	555	H.M31	Vol I, Ch 5	Maintain or establish wild fish refuges for coho in selected watersheds by limiting or eliminating release and escapement of hatchery-origin fish into natural spawning areas.	WDFW	Ongoing
	556	H.M32	Vol I, Ch 5	Expand use of local watershed brood stock and integrated production strategies in selected coho hatchery programs in order to promote local adaptation and natural productivity.	USFWS, WDFW	Ongoing
	557	H.M33	Vol I, Ch 5	Improve segregated programs for coho, where appropriate, to meet established wild population protection criteria.	USFWS, WDFW	Ongoing
	536	H.M34	Vol I, Ch 5	Develop conservation hatchery programs to restore native for coho in selected populations	USFWS, WDFW	Within 10 years
	537	H.M35	Vol I, Ch 5	Reintroduce coho in upper Cowlitz and upper Lewis rivers.	Cowlitz PUD, PacifiCorp, Tacoma Power, WDFW	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Hatchery	539	H.M36	Vol I, Ch 5	Develop coho transfer policies as local brood stock is developed	USFWS, WDFW	Within 5 years
	540	H.M37	Vol I, Ch 5	Use coho juvenile release strategies to minimize detrimental ecosystem impacts and ecological interactions	USFWS, WDFW	Within 5 years
	541	H.M38	Vol I, Ch 5	Mark coho hatchery harvest production	USFWS, WDFW	Within 5 years
	542	H.M39	Vol I, Ch 5	Establish naturally-spawning production sanctuary areas to be used for coho indicator stock programs	USFWS, WDFW	Within 5 years
	558	H.M40	Vol I, Ch 5	Continue to produce, in a manner consistent with other recovery strategies and measures, sufficient numbers of hatchery coho to sustain significant fishery opportunities until harvestable naturally-spawning populations are restored.	USFWS, WDFW	Ongoing
Ecological Interaction	601	I.M1	Vol I, Ch 5	Implement regulatory, control, and education measures to prevent additional species invasions.	USFWS, WDFW	Ongoing
	611	I.M2	Vol I, Ch 5	Prevent new introductions of aquatic invertebrates and reduce the effects of existing infestations.	WDFW, USFWS, WSDA, Port of Camas-Washougal, Port of Kalama, Port of Longview, Port of Vancouver	Ongoing
	602	I.M3	Vol I, Ch 5	Establish a moratorium on intentional introductions of aquatic species and importation of high-risk species	USFWS, WDFW	Within 5 years
	603	I.M4	Vol I, Ch 5	Take proactive steps to control or reduce the impacts of introduced, invasive, or exotic species	USFWS, WDFW	Ongoing
	612	I.M5	Vol I, Ch 5	Implement education and monitoring projects and enforce existing laws to reduce the introduction and spread of invasive plants.	USACE, BPA, USFWS, LCREP, Cowlitz - Wahkiakum CD, Clark CD, Underwood CDPacific Co, Wahkiakum Co, Cowlitz Co, Clark Co, Skamania Co, Tribes, WDFW	Ongoing
	604	I.M6	Vol I, Ch 5	Manage established populations of introduced gamefish to limit or reduce significant predation or competition risks to salmon, and to optimize fishery benefits within these constraints	WDFW	Within 10 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule	
Ecological Interaction	613	I.M7	Vol I, Ch 5	Reduce the abundance of shad in the estuary.	USACE, USGS, WDFW	Within 5 years	
	605	I.M8	Vol I, Ch 5	Evaluate positive and negative impacts of American shad on salmon, sturgeon, and other species as well as the feasibility and advisability of shad management measures	BPA, NMFS, NPCC, USFWS, WDFW	Within 5 years	
	606	I.M9	Vol I, Ch 5	Experimentally evaluate nutrient enrichment programs (LLT) and risks using fish from hatcheries or suitable analogs	WDFW	Within 5 years	
	607	I.M10	Vol I, Ch 5	Consider ecological functions of salmon, including nutrients in establishing escapement goals	WDFW	Within 5 years	
	608	I.M11	Vol I, Ch 5	Continue to manage the northern pikeminnow fishery to help offset increased predation on salmon that resulted from habitat alteration	BPA, NPCC, WDFW	Ongoing	
	614	I.M12	Vol I, Ch 5	Manage pikeminnow and other piscivorous fish, including introduced species, to reduce predation on salmonids.	USACE, BPA, WDFW, NMFS	Ongoing	
	609	I.M13	Vol I, Ch 5	Continue to manage predation by avian predators, such as Caspian Terns, to avoid large increases in salmon predation while also protecting the viability of predator populations	USFWS, WDFW	Ongoing	
	615	I.M14	Vol I, Ch 5	Identify and implement actions to reduce salmonid preparation by pinnipeds.	USACE, BPA, NMFS, WDFW	Ongoing	
	616	I.M15	Vol I, Ch 5	Implement projects to redistribute part of the Caspian tern colony currently nesting on East Sand Island	USACE, USFWS, USGS, WDFW	Ongoing	
	617	I.M16	Vol I, Ch 5	Implement projects to reduce Double-crested Cormorant habitats and encourage dispersal to other locations.	USACE, USFWS, USGS, WDFW	Ongoing	
	Implementation	701	P.M1	Vol I, Ch 10	Establish an oversight group for plan implementation (NOAA, USFWS, WDFW, NPCC) and an implementation facilitation and coordination function to be carried out by the LCFRB, LCFRB staff, and a Recovery Plan Implementation Steering Committee	LCFRB	Within 1 year

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Implementation	702	P.M2	Vol I, Ch 10	Regularly review and revise this plan in a collaborative agency, stakeholder, and public process.	LCFRB	Every 6 years
	703	P.M3	Vol I, Ch 10	Refine draft benchmarks for assessing implementation progress, implementation effectiveness and biological and habitat status	LCFRB	Every 6 years
	704	P.M4	Vol I, Ch 10	Develop and implement cost and economic analysis methods to assist in decision-making and meet ESA needs	LCFRB, NMFS	Ongoing
	705	P.M5	Vol I, Ch 10	Develop ESA threats criteria and prioritization for incorporation into the Lower Columbia and domain recovery plans. Relate actions, strategies, and measures to threats.	LCFRB, NMFS	Within 5 years
	706	P.M6	Vol I, Ch 10	Conduct qualitative evaluation of program sufficiency	LCFRB	Every 2 years
	707	P.M7	Vol I, Ch 10	Coordinate the development of a regional monitoring, research, and evaluation program	LCFRB	Ongoing
	708	P.M8	Vol I, Ch 10	Coordinate the development of a regional public education and outreach program	LCFRB	Within 5 years
	709	P.M9	Vol I, Ch 10	Develop and periodically update 6-year implementation schedules	LCFRB	Every 2 years
	710	P.M10	Vol I, Ch 10	Evaluate whether recovery strategies, measures, and actions are being implemented as planned	LCFRB	Every 2 years
	711	P.M11	Vol I, Ch 10	Refine and reprioritize plan implementation at the programmatic level based on evaluations of implementation and compliance	LCFRB	Ongoing
	712	P.M12	Vol I, Ch 10	Prepare written plan implementation progress reports to participating agencies, stakeholders, and the public at 2-year intervals	LCFRB	Every 2 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Implementation	713	P.M13	Vol I, Ch 10	Evaluate whether specific strategies, measures, and actions are producing the desired effects in each limiting factor/threat category (stream habitat, mainstem/estuary habitat, hydropower, harvest, hatcheries, ecological interactions)	LCFRB	Ongoing
	714	P.M14	Vol I, Ch 10	Refine and reprioritize existing recovery strategies, measures, and actions for each limiting factor/threat category based on results of action-effectiveness evaluations	LCFRB	Every 6 years
	715	P.M15	Vol I, Ch 10	Prepare written action effectiveness progress reports to participating agencies, stakeholders, and the public at 6-year intervals	LCFRB	Every 6 years
	716	P.M16	Vol I, Ch 10	Periodically evaluate biological status relative to population and ESU objectives to determine whether necessary improvements are being achieved	LCFRB	Ongoing
	717	P.M17	Vol I, Ch 10	Periodically evaluate habitat status relative to baseline conditions and benchmarks to determine whether appropriate progress is being made toward desired future conditions	LCFRB	Ongoing
	719	P.M19	Vol I, Ch 10	Prepare written fish and habitat status reports to participating agencies, stakeholders, and the public at 12-year intervals	LCFRB	Every 12 years
	720	P.M20	Vol I, Ch 10	Use results of critical uncertainty research to identify new or refine and reprioritize existing recovery strategies, measures, and actions	LCFRB	Ongoing
	721	P.M21	Vol I, Ch 10	Refine analytical tools and methods to better support adaptive management process	LCFRB, NMFS	Within 5 years
	722	P.M22	Vol I, Ch 10	Refine biological objectives consistent with recovery as new information becomes available on status and viable population or ESU characteristics	LCFRB	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Implementation	723	P.M23	Vol I, Ch 10	Periodically evaluate strengths and weaknesses of the available monitoring and research to determine adequacy for assessing progress and identifying appropriate course corrections	LCFRB	Every 6 years
	724	P.M24	Vol I, Ch 10	Identify appropriate alternative approaches and revise priorities for monitoring and research based on results of evaluations	LCFRB	Every 6 years
	725	--	--	Develop appropriate ESA assurances for entities implementing actions of the Lower Columbia Fish Recovery Plan	NMFS	Within 5 years
	726	--	--	Utilize the Lower Columbia Fish Recovery Plan as a basis for its section 7 consultations and its section 4 and 10 permits	NMFS	Ongoing
	727	--	--	Utilize the Lower Columbia Fish Recovery Plan as a basis for enforcement actions	NMFS	Ongoing
	728	P.M18	Vol I, Ch 10	Refine and reprioritize existing recovery strategies, measures, and actions for each limiting factor/threat category based on results of biological and habitat status evaluations	LCFRB, RPIC	Every 6 years
	Monitoring	837	M.M1	Vol I, Ch 9	Maintain current biological sampling efforts for representative priority populations of all species and strata.	Implementing Partners
838		M.M2	Vol I, Ch 9	Implement additional intensive biological monitoring for juveniles and/or adults in all strata to meet representative monitoring needs of multiple species.	Implementing Partners	Within 5 years
839		M.M3	Vol I, Ch 9	Implement a comprehensive natural coho sampling program in Washington in all strata.	Implementing Partners	Within 5 years
840		M.M4	Vol I, Ch 9	Expand current chum salmon sampling efforts to include more intensive and inventory monitoring of adults and juveniles.	Implementing Partners	Within 5 years
841		M.M5	Vol I, Ch 9	Augment current sampling programs for fall Chinook and winter steelhead with more intensive adult and juvenile sampling levels in selected areas.	Implementing Partners	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Monitoring	842	M.M6	Vol I, Ch 9	Maintain current habitat monitoring efforts for representative priority areas.	Implementing Partners	Ongoing
	843	M.M7	Vol I, Ch 9	Establish a baseline habitat characterization and database of current stream conditions in the lower Columbia region based on existing data for use as a reference point in future analysis as well as specific guidance for additional sampling needed to fill information gaps.	Implementing Partners	Ongoing
	844	M.M8	Vol I, Ch 9	Develop and implement an empirical sampling program to fill specific data gaps in the habitat baseline relative to sampling criteria identified by this program.	Implementing Partners	Within 5 years
	845	M.M9	Vol I, Ch 9	Develop and implement a sampling program to address long-term watershed, stream, and water quality monitoring needs not currently being addressed by other parties.	Implementing Partners	Within 5 years
	846	M.M10	Vol I, Ch 9	Maintain current landscape scale habitat monitoring efforts for application as available in periodic status and trend assessments.	Implementing Partners	Ongoing
	847	M.M11	Vol I, Ch 9	Seek and utilize opportunities to supplement existing landscape scale information collection, synthesis, and reporting activities appropriate.	Implementing Partners	Within 5 years
	848	M.M12	Vol I, Ch 9	Maintain existing stream flow gauges over the long term and install additional permanent gages as per recommendations and priorities identified in Watershed Plans.	Implementing Partners	Ongoing
	849	M.M13	Vol I, Ch 9	Implement a systematic water quality monitoring program based on existing and enhanced activities as per recommendations and priorities identified in Watershed Plans.	Implementing Partners	Within 5 years
	850	M.M14	Vol I, Ch 9	Incorporate selected water quantity and quality metrics into systematic stream habitat survey protocols identified in section 1.2.6 of the MRE program in order to provide broad regional coverage of key limiting factors.	Implementing Partners	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Monitoring	851	M.M15	Vol I, Ch 9	Maintain a coordinated database of federal, tribal, state, local, and non-governmental programs and projects implemented throughout the recovery region.	Implementing Partners	Within 5 years
	852	M.M16	Vol I, Ch 9	Periodically summarize and report action implementation progress at the task level using the LCFRB Salmon PORT database system.	Implementing Partners	Every 2 years
	853	M.M17	Vol I, Ch 9	Prepare biennial reports of progress in implementation and compliance of recovery actions.	Implementing Partners	Every 2 years
	854	M.M18	Vol I, Ch 9	Maintain current habitat effectiveness monitoring activities of all significant habitat protection and restoration programs.	Implementing Partners	Ongoing
	855	M.M19	Vol I, Ch 9	Develop and maintain a comprehensive up-to-date database inventory of habitat-related actions across the region.	Implementing Partners	Ongoing
	856	M.M20	Vol I, Ch 9	Formalize effectiveness monitoring activities for habitat-related actions by every implementing party by identifying expected benefits, describing criteria by which effectiveness will be monitored, and referencing the basis for estimated benefits.	Implementing Partners	Within 5 years
	857	M.M21	Vol I, Ch 9	Implement focused investigations of critical assumptions and uncertainties related to the effectiveness of representative types of habitat protection and restoration actions.	Implementing Partners	Within 5 years
	858	M.M22	Vol I, Ch 9	Maintain current monitoring and evaluation of adult and juvenile collection, passage, and survival rates at Bonneville Dam.	Implementing Partners	Ongoing
	859	M.M23	Vol I, Ch 9	Maintain current monitoring and evaluation of the relative abundance, distribution and dewatering of redds of chum (and fall Chinook from the unlisted Middle Columbia River population) in the Bonneville Dam tailrace.	Implementing Partners	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Monitoring	860	M.M24	Vol I, Ch 9	Continue to implement intensive monitoring and evaluation of reintroduction efforts for coho, spring Chinook and steelhead in the upper Cowlitz and Cispus rivers.	Implementing Partners	Ongoing
	861	M.M25	Vol I, Ch 9	Implement intensive monitoring and evaluation of reintroduction efforts for coho, spring Chinook and steelhead in the upper Lewis River as per license direction and agreements.	Implementing Partners	Ongoing
	862	M.M26	Vol I, Ch 9	Monitor the downstream channels of Mayfield (Cowlitz), the Sediment Retention Structure (Toutle), and Merwin (Lewis) dams for changes in flow, substrate, stream morphology, and water quality.	Implementing Partners	Within 5 years
	863	M.M27	Vol I, Ch 9	Implement focused investigations of critical assumptions and uncertainties in current hydro-related monitoring and evaluation efforts.	Implementing Partners	Within 5 years
	864	M.M28	Vol I, Ch 9	Maintain current monitoring programs of annual harvest and harvest rates of representative index stocks in ocean, Columbia River mainstem, and tributary fisheries.	Implementing Partners	Ongoing
	865	M.M29	Vol I, Ch 9	Implement additional intensive biological monitoring of wild adult escapements of all species in order to improve the accuracy of fishery impact assessments.	Implementing Partners	Within 5 years
	866	M.M30	Vol I, Ch 9	Evaluate and expand where appropriate current Chinook and coho wild index stock marking efforts to provide an adequate basis for stock identification and fishery impact estimation.	Implementing Partners	Within 5 years
	867	M.M31	Vol I, Ch 9	Implement focused investigations of critical assumptions and uncertainties in current fishery monitoring and evaluation efforts (to include efficacy of selective fisheries).	Implementing Partners	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Monitoring	868	M.M32	Vol I, Ch 9	Develop and implement a comprehensive annual assessment and report of fishery impact, effect, and opportunity information for each listed ESU (to include assessments of the accuracy of impact estimates and effects on ESU viability).	Implementing Partners	Within 5 years
	869	M.M33	Vol I, Ch 9	Maintain current monitoring programs for performance and practice of every hatchery.	Implementing Partners	Ongoing
	870	M.M34	Vol I, Ch 9	Implement additional biological monitoring of adult escapements of all species in order to accurately assess levels of hatchery contribution to natural production.	Implementing Partners	Within 5 years
	871	M.M35	Vol I, Ch 9	Develop and implement a comprehensive regular assessment and report of hatchery impact, performance, and practice for all lower Columbia hatchery programs for use in periodic recovery action effectiveness assessments.	Implementing Partners	Within 5 years
	872	M.M36	Vol I, Ch 9	Implement collaborative research to resolve critical uncertainties regarding hatchery-wild interactions to guide assessments of hatchery effects.	Implementing Partners	Within 5 years
	873	M.M37	Vol I, Ch 9	Monitor occurrences of new exotic aquatic fishes, invertebrates or plants based on a dedicated sampling program in indicator sites and incidental observations during other biological status monitoring, anecdotal reports, and follow-up sampling where appropriate.	Implementing Partners	Within 5 years
	874	M.M38	Vol I, Ch 9	Continue to monitor abundance of American shad based on Bonneville Dam counts.	Implementing Partners	Ongoing
	875	M.M39	Vol I, Ch 9	Monitor annual angler participation, harvest, and exploitation rate in northern pikeminnow management program in Columbia River mainstem.	Implementing Partners	Ongoing
	876	M.M40	Vol I, Ch 9	Conduct periodic censuses of the abundance, distribution, and diet of avian predator including Caspian terns and Cormorants.	Implementing Partners	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Monitoring	877	M.M41	Vol I, Ch 9	Conduct periodic censuses of the abundance, distribution, and diet of marine mammals throughout the lower Columbia River mainstem and near Bonneville Dam and evaluate response to hazing, exclusion, and other management measures as implement.	Implementing Partners	Ongoing
	878	M.M42	Vol I, Ch 9	New and ongoing estuary projects should consider applying monitoring protocols in the plan.	Implementing Partners	Ongoing
	879	M.M43	Vol I, Ch 9	Develop an analytical model to quantify and evaluate the cumulative effects of multiple hydrologic reconnection restoration projects.	Implementing Partners	Within 5 years
	880	M.M44	Vol I, Ch 9	Conduct research of salmonid status and population viability to evaluate critical assumptions, reduce uncertainty, and guide Recovery Plan implementation.	Implementing Partners	Within 5 years
	881	M.M45	Vol I, Ch 9	Conduct research on stream habitat and watershed health to evaluate critical assumptions, reduce uncertainty, and guide Recovery Plan implementation	Implementing Partners	Within 5 years
	882	M.M46	Vol I, Ch 9	Conduct research on hydropower operations and impacts to evaluate critical assumptions, reduce uncertainty, and guide Recovery Plan implementation.	Implementing Partners	Within 5 years
	883	M.M47	Vol I, Ch 9	Conduct research on fisheries impacts to evaluate critical assumptions, reduce uncertainty, and guide Recovery Plan implementation.	Implementing Partners	Within 5 years
	884	M.M48	Vol I, Ch 9	Conduct research on hatchery impacts to evaluate critical assumptions, reduce uncertainty, and guide Recovery Plan implementation.	Implementing Partners	Within 5 years
	885	M.M49	Vol I, Ch 9	Conduct research on ecological interactions to evaluate critical assumptions, reduce uncertainty, and guide Recovery Plan implementation.	Implementing Partners	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Monitoring	886	M.M50	Vol I, Ch 9	Conduct research on mainstem and estuary conditions to evaluate critical assumptions, reduce uncertainty, and guide Recovery Plan implementation.	Implementing Partners	Within 5 years
	887	M.M51	Vol I, Ch 9	Conduct a data management needs assessment and use it to develop a data management plan.	Implementing Partners	Within 5 years
	888	M.M52	Vol I, Ch 9	Maintain consistent regionally-standardized datasets and archive in regional data storage and management facilities (e.g., Pacific State Marine Fisheries Commission StreamNet, Washington Department of Fish and Wildlife SSHIAP, NMFS's biological datasets).	Implementing Partners	Within 5 years
	889	M.M53	Vol I, Ch 9	Produce and distribute regular progress and completion reports for monitoring and research activities.	Implementing Partners	Within 5 years
	890	M.M54	Vol I, Ch 9	Closely coordinate Washington lower Columbia River monitoring, research, and evaluation efforts with similar efforts throughout the basin, including prioritization of activities and standardization of data methods.	Implementing Partners	Ongoing
Watershed Planning Habitat (WRIA 25/26)	901	--	Watershed Management Plan	Planning studies to explore alternative sources of supply to replace an existing source (selected communities)	WRIA 25/26 Planning Unit	Within 5 years
	902	--	Watershed Management Plan	Enhanced conservation exceeding state requirements in selected communities	WRIA 25/26 Planning Unit	Within 10 years
	903	--	Watershed Management Plan	Consider the effects of individual domestic wells when modifying or adopting comprehensive plans, zoning designations, or other land use regulations	WRIA 25/26 Planning Unit	Within 5 years
	904	--	Watershed Management Plan	Consider and address effects of forest practices on stream flow. Monitor effectiveness of F&F Rules and NW Forest Plan. Report to public periodically	WRIA 25/26 Planning Unit	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Watershed Planning Habitat (WRIA 25/26)	905	--	Watershed Management Plan	Within authorities, identify floodplain restoration projects and implement where feasible	WRIA 25/26 Planning Unit	Within 10 years
	906	--	Watershed Management Plan	When modifying or adopting comprehensive plans, zoning designations, or other land use regulations, consider the water balance implications of allowing extension of sewer service to communities formerly served by septic systems	WRIA 25/26 Planning Unit	Within 5 years
	907	--	Watershed Management Plan	Water conservation by farmers practicing irrigated agriculture. Technical assistance by Conservation District in each county	WRIA 25/26 Planning Unit	Within 10 years
	908	--	Watershed Management Plan	Wetlands inventories and ordinances: assess and protect hydrologic functions, consider strengthening mitigation ratios	WRIA 25/26 Planning Unit	Within 5 years
Water Supply (WRIA 25/26)	909	--	Watershed Management Plan	Public Water Systems develop new or expanded supplies. Requires engineering studies; approval of water system plan; water rights processing; other permitting; SEPA compliance; construction; operations & maintenance. Standard procedures exist for all of these	WRIA 25/26 Planning Unit	Within 5 years
	910	--	Watershed Management Plan	Planning studies to explore alternative sources of supply to replace an existing source (selected communities)	WRIA 25/26 Planning Unit	Within 5 years
	911	--	Watershed Management Plan	Replace an existing source of supply with a different source to reduce impacts on stream flow. Requires engineering studies; water rights processing; other permitting; inter-local agreements or contracts; construction; operations & maintenance	WRIA 25/26 Planning Unit	Within 5 years
	912	--	Watershed Management Plan	Enhanced conservation exceeding state requirements in selected communities	WRIA 25/26 Planning Unit	Within 10 years
	913	--	Watershed Management Plan	Industrial supplies: Expand conservation & reuse; develop non-potable sources; connect to municipal systems	WRIA 25/26 Planning Unit	Within 10 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Water Supply (WRIA 25/26)	914	--	Watershed Management Plan	Consider the effects of individual domestic wells when modifying or adopting comprehensive plans, zoning designations, or other land use regulations	WRIA 25/26 Planning Unit	Within 5 years
	915	--	Watershed Management Plan	Agricultural supplies: switch from surface to ground water. Discourage new uses of surface water (use ground water instead)	WRIA 25/26 Planning Unit	Within 10 years
Stream Flow Management (WRIA 25/26)	916	--	Watershed Management Plan	Maintain existing stream gauges. Install new gauges at selected locations. Select exact sites; permit and construct gauges; O&M; data management	WRIA 25/26 Planning Unit	Within 5 years
	917	--	Watershed Management Plan	Adopt closures and/or minimum instream flows in State Rule	WRIA 25/26 Planning Unit	Within 1 year
	918	--	Watershed Management Plan	Selected actions involving water supply. See Section 3.6.	WRIA 25/26 Planning Unit	Within 5 years
	919	--	Watershed Management Plan	Establish target flow monitoring and management program	WRIA 25/26 Planning Unit	Within 5 years
	920	--	Watershed Management Plan	Initial surveys in selected subbasins to identify unauthorized uses and take enforcement actions. Follow-up in other basins if warranted	WRIA 25/26 Planning Unit	Within 5 years
	921	--	Watershed Management Plan	Consider and address effects of forest practices on stream flow. Monitor effectiveness of F&F Rules and NW Forest Plan. Report to public periodically	WRIA 25/26 Planning Unit	Within 5 years
	922	--	Watershed Management Plan	Within authorities, protect floodplains from modifications that would impair hydrologic functions or habitat	WRIA 25/26 Planning Unit	Within 5 years
	923	--	Watershed Management Plan	Review effects of stormwater discharges on stream flow and habitat. Where needed to protect key habitat, implement programs that exceed minimum requirements	WRIA 25/26 Planning Unit	Within 5 years
	924	--	Watershed Management Plan	Purchase or lease of water rights from willing sellers, for State Trust program	WRIA 25/26 Planning Unit	Within 10 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Stream Flow Management (WRIA 25/26)	925	--	Watershed Management Plan	Within authorities, identify floodplain restoration projects and implement where feasible	WRIA 25/26 Planning Unit	Within 10 years
	926	--	Watershed Management Plan	When modifying or adopting comprehensive plans, zoning designations, or other land use regulations, consider the water balance implications of allowing extension of sewer service to communities formerly served by septic systems	WRIA 25/26 Planning Unit	Within 5 years
	927	--	Watershed Management Plan	Water conservation by farmers practicing irrigated agriculture. Technical assistance by Conservation District in each county	WRIA 25/26 Planning Unit	Within 10 years
	928	--	Watershed Management Plan	Source substitution for selected areas served by domestic wells: relatively higher densities and likelihood of stream impacts; dependent on feasibility and cost	WRIA 25/26 Planning Unit	Within 5 years
	929	--	Watershed Management Plan	Wetlands inventories and ordinances: assess and protect hydrologic functions, consider strengthening mitigation ratios	WRIA 25/26 Planning Unit	Within 5 years
Surface Water Quality (WRIA 25/26)	930	--	Watershed Management Plan	Develop water body cleanup plans (TMDLs) for subbasins, in prioritized sequence as indicated in Watershed Management Plan. Carry out necessary modeling, reporting, public involvement, and waste load allocations	WRIA 25/26 Planning Unit	Within 5 years
	931	--	Watershed Management Plan	Within authorities and as staffing and funding allow, expand water quality monitoring activities to improve understanding of status and trends. Install monitoring equipment; collect and analyze samples; manage and analyze data; report results	WRIA 25/26 Planning Unit	Within 5 years
Watershed Planning Habitat (WRIA 27/28)	932	--	Watershed Management Plan	Planning studies to explore alternative sources of supply to replace an existing source (selected communities)	WRIA 27/28 Planning Unit	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Watershed Planning Habitat (WRIA 27/28)	933	--	Watershed Management Plan	Consider the effects of individual domestic wells when modifying or adopting comprehensive plans, zoning designations, or other land use regulations.	WRIA 27/28 Planning Unit	Within 5 years
	934	--	Watershed Management Plan	Agricultural supplies: switch from surface to ground water. Discourage new uses of surface water (use ground water instead)	WRIA 27/28 Planning Unit	Within 10 years
	935	--	Watershed Management Plan	Within authorities an as staffing and funding allow, develop water-level monitoring program for aquifers	WRIA 27/28 Planning Unit	Within 10 years
	936	--	Watershed Management Plan	Consider and address effects of forest practices on stream flow. Monitor effectiveness of F&F Rules and NW Forest Plan. Report to public periodically	WRIA 27/28 Planning Unit	Within 5 years
	937	--	Watershed Management Plan	Within authorities, identify floodplain restoration projects and implement where feasible	WRIA 27/28 Planning Unit	Within 10 years
	938	--	Watershed Management Plan	Wetlands inventories and ordinances: assess and protect hydrologic functions, consider strengthening mitigation ratios	WRIA 27/28 Planning Unit	Within 5 years
	939	--	Watershed Management Plan	Large water users and hydropower facilities: short-term drought response curtailment programs, to protect stream flows	WRIA 27/28 Planning Unit	Within 5 years
	940	--	Watershed Management Plan	When modifying or adopting comprehensive plans, zoning designations, or other land use regulations, jurisdictions should consider the water balance implications of allowing extension of sewer service to communities formerly served by septic systems	WRIA 27/28 Planning Unit	Within 5 years
	941	--	Watershed Management Plan	Water conservation by farmers practicing irrigated agriculture. Technical assistance by Conservation District in each county	WRIA 27/28 Planning Unit	Within 10 years
	942	--	Watershed Management Plan	Within authorities, improve public awareness of ground water quality issues. Information outlets. Mass-media campaign. Schools program. Public opinion surveys	WRIA 27/28 Planning Unit	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Watershed Planning Habitat (WRIA 27/28)	943	--	Watershed Management Plan	Within authorities, improve local wellhead protection. Determine which Group A Systems have wellhead program. Apply technical assistance and enforcement to meet state requirements. Facilitate use of computer modeling. Encourage Group B systems to voluntarily establish wellhead programs	WRIA 27/28 Planning Unit	Within 5 years
	944	--	Watershed Management Plan	Public Water Systems develop new or expanded supplies. Requires engineering studies; approval of water system plan; water rights processing; other permitting; SEPA compliance; construction; operations & maintenance. Standard procedures exist for all of these	WRIA 27/28 Planning Unit	Within 5 years
	945	--	Watershed Management Plan	Planning studies to explore alternative sources of supply to replace an existing source (selected communities)	WRIA 27/28 Planning Unit	Within 5 years
	946	--	Watershed Management Plan	Replace an existing source of supply with a different source to reduce impacts on stream flow. Requires engineering studies; water rights processing; other permitting; inter-local agreements or contracts; construction; operations & maintenance	WRIA 27/28 Planning Unit	Within 5 years
	947	--	Watershed Management Plan	Develop map of region's aquifers with emphasis on surface water hydraulic continuity	WRIA 27/28 Planning Unit	Within 10 years
	948	--	Watershed Management Plan	Enhanced conservation exceeding state requirements in selected communities	WRIA 27/28 Planning Unit	Within 10 years
	949	--	Watershed Management Plan	Industrial supplies: Expand conservation & reuse; develop non-potable sources; connect to municipal systems	WRIA 27/28 Planning Unit	Within 10 years
	950	--	Watershed Management Plan	Consider the effects of individual domestic wells when modifying or adopting comprehensive plans, zoning designations, or other land use regulations	WRIA 27/28 Planning Unit	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Water Supply (WRIA 27/28)	951	--	Watershed Management Plan	Agricultural supplies: switch from surface to ground water. Discourage new uses of surface water (use ground water instead)	WRIA 27/28 Planning Unit	Within 10 years
	952	--	Watershed Management Plan	Within authorities an as staffing and funding allow, develop water-level monitoring program for aquifers	WRIA 27/28 Planning Unit	Within 10 years
Stream Flow Management (WRIA 27/28)	953	--	Watershed Management Plan	Maintain existing stream gauges. Install new gauges at selected locations. Select exact sites; permit and construct gauges; O&M; data management	WRIA 27/28 Planning Unit	Within 5 years
	954	--	Watershed Management Plan	Adopt restrictions on issuance of new water rights in State Rule	WRIA 27/28 Planning Unit	Completed
	955	--	Watershed Management Plan	Selected actions involving water supply and intended to protect stream flow. See water supply items listed above	WRIA 27/28 Planning Unit	Within 5 years
	956	--	Watershed Management Plan	Establish target flow monitoring and management program	WRIA 27/28 Planning Unit	Within 5 years
	957	--	Watershed Management Plan	Initial surveys in selected subbasins to identify unauthorized uses and take enforcement actions. Follow-up in other basins if warranted	WRIA 27/28 Planning Unit	Within 5 years
	958	--	Watershed Management Plan	Consider and address effects of forest practices on stream flow. Monitor effectiveness of F&F Rules and NW Forest Plan. Report to public periodically	WRIA 27/28 Planning Unit	Within 5 years
	959	--	Watershed Management Plan	Within authorities, protect floodplains from modifications that would impair hydrologic functions or habitat	WRIA 27/28 Planning Unit	Within 5 years
	960	--	Watershed Management Plan	Review effects of stormwater discharges on stream flow and habitat. Where needed to protect key habitat, implement programs that exceed minimum requirements	WRIA 27/28 Planning Unit	Within 5 years
	961	--	Watershed Management Plan	Purchase or lease of water rights from willing sellers, for State Trust program	WRIA 27/28 Planning Unit	Within 10 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Stream Flow Management (WRIA 27/28)	962	--	Watershed Management Plan	Within authorities, identify floodplain restoration projects and implement where feasible	WRIA 27/28 Planning Unit	Within 10 years
	963	--	Watershed Management Plan	Wetlands inventories and ordinances: assess and protect hydrologic functions, consider strengthening mitigation ratios	WRIA 27/28 Planning Unit	Within 5 years
	964	--	Watershed Management Plan	Large water users and hydropower facilities: short-term drought response curtailment programs, to protect stream flows	WRIA 27/28 Planning Unit	Within 5 years
	965	--	Watershed Management Plan	When modifying or adopting comprehensive plans, zoning designations, or other land use regulations, jurisdictions should consider the water balance implications of allowing extension of sewer service to communities formerly served by septic systems	WRIA 27/28 Planning Unit	Within 5 years
	966	--	Watershed Management Plan	Water conservation by farmers practicing irrigated agriculture. Technical assistance by Conservation District in each county	WRIA 27/28 Planning Unit	Within 10 years
	967	--	Watershed Management Plan	Source substitution for selected areas served by domestic wells: relatively higher densities and likelihood of stream impacts; dependent on feasibility and cost	WRIA 27/28 Planning Unit	Within 5 years
	968	--	Watershed Management Plan	Evaluate the need to take additional actions addressing shallow aquifer interactions (See Section 4.5.5).	WRIA 27/28 Planning Unit	Within 5 years
	969	--	Watershed Management Plan	Develop clear guidance for mitigation (See Section 3.3.1)	WRIA 27/28 Planning Unit	Completed
	Surface Water Quality (WRIA 27/28)	970	--	Watershed Management Plan	Develop water body cleanup plans (TMDLs) for subbasins, in prioritized sequence as indicated in Watershed Management Plan. Carry out necessary modeling, reporting, public involvement, and waste load allocations	WRIA 27/28 Planning Unit
971		--	Watershed Management Plan	Within authorities, develop full scale assessment strategy for non-point sources	WRIA 27/28 Planning Unit	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Surface Water Quality (WRIA 27/28)	972	--	Watershed Management Plan	Carry out source assessment of non-point sources	WRIA 27/28 Planning Unit	Within 10 years
	973	--	Watershed Management Plan	Actions to correct sources of impairment	WRIA 27/28 Planning Unit	Within 10 years
	974	--	Watershed Management Plan	Within authorities and as staffing and funding allow, expand water quality monitoring activities to improve understanding of status and trends; and, install monitoring equipment; collect and analyze samples; manage and analyze data; report results	WRIA 27/28 Planning Unit	Within 5 years
	975	--	Watershed Management Plan	Within authorities, improve public awareness of ground water quality issues. Information outlets. Mass-media campaign. Schools program. Public opinion surveys	WRIA 27/28 Planning Unit	Within 5 years
	976	--	Watershed Management Plan	Within authorities, assess susceptibility of ground water supplies to contamination. Risk assessment. Evaluate data management and improve if necessary. Regional mapping	WRIA 27/28 Planning Unit	Within 5 years
	977	--	Watershed Management Plan	Within authorities, improve local wellhead protection. Determine which Group A Systems have wellhead program. Apply technical assistance and enforcement to meet state requirements. Facilitate use of computer modeling. Encourage Group B systems to voluntarily establish wellhead programs	WRIA 27/28 Planning Unit	Within 5 years
	978	--	Watershed Management Plan	Within authorities, coordinate and promote management strategies to prevent impacts to ground water quality from land use activities	WRIA 27/28 Planning Unit	Within 5 years
	979	--	Watershed Management Plan	Within authorities, clean up sources of ground water contamination. Evaluate need for greater involvement by local organizations. Evaluate need for independent cleanup actions outside Ecology programs	WRIA 27/28 Planning Unit	Within 10 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Climate and Ocean Effects	1001	C.M1	Vol I, Ch 5	Establish fish population recovery objectives that explicitly consider the effects of variable ocean productivity on extinction risks and improvements necessary to ensure future viability	NMFS	Within 5 years
	1002	C.M2	Vol I, Ch 5	Consider likely future habitat trends in relation to global warming in establishing protection and recovery priorities for fish populations, watersheds or stream reaches, and recovery measures	NMFS	Within 5 years
Other Species	1101	OS.M1	Vol I, Ch 8	Identify and monitor status, limiting factors, and threats of Columbia River eulachon	NMFS, Tribes	Within 5 years
	1102	OS.M2	Vol I, Ch 8	Protect preferred spawning and rearing habitat of eulachon in the estuary and tributaries of the lower Columbia River.	NMFS, Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co	Within 5 years
	1103	OS.M3	Vol I, Ch 8	Avoid and/or mitigate incidental mortality of eulachon embryos and juveniles during dredging operations.	USACE, NMFS	Within 5 years
	1104	OS.M4	Vol I, Ch 8	Continue to monitor and regulate Columbia River fisheries for eulachon to inventory population status, limit impacts, and protect spawning escapement.	NMFS, WDFW	Ongoing
	1105	OS.M5	Vol I, Ch 8	Identify factors related to green sturgeon use of the Columbia River estuary and lower mainstem (timing, habitat use, diet analysis, etc.) and associated threats.	NMFS, WDFW	Within 5 years
	1106	OS.M6	Vol I, Ch 8	Manage Columbia River salmon and white sturgeon fisheries to avoid direct and indirect impacts to green sturgeon.	NMFS, WDFW	Within 5 years
	1107	OS.M7	Vol I, Ch 8	Protect critical habitats for green sturgeon in the lower Columbia River.	NMFS, Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP	Within 5 years

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Other Species	1108	OS.M8	Vol I, Ch 8	Evaluate and improve migration and passage conditions for juvenile and adult lamprey at mainstem and tributary dams, ensuring no negative effects on salmonid passage.	NMFS, BPA, PacifiCorp, Tacoma Power, USACE, WDFW, USFWS	Ongoing
	1109	OS.M9	Vol I, Ch 8	Reduce critical uncertainties regarding lamprey status, limiting factors, and threats through dedicated research and monitoring.	NMFS, USFWS, WDFW	Within 5 years
	1110	OS.M10	Vol I, Ch 8	Protect and restore all components of a healthy mainstem and estuary ecosystem that sustains sturgeon recruitment, survival, growth, and maturation.	NMFS, Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP	Within 5 years
	1111	OS.M11	Vol I, Ch 8	Protect preferred spawning habitat in extended tailrace zones downstream of Bonneville and The Dalles dams.	NMFS, BPA, USACE, WDFW	Ongoing
	1112	OS.M12	Vol I, Ch 8	Continue to monitor and manage Columbia River fisheries at sustainable levels, ensuring adequate spawner abundance through consistent recruitment to adulthood and protecting adult spawners from significant impacts.	NMFS, WDFW	Ongoing
	1113	OS.M13	Vol I, Ch 8	Avoid incidental mortality as a result of Bonneville Dam operations.	NMFS, BPA, USACE, WDFW	Ongoing
	1114	OS.M14	Vol I, Ch 8	Continue to mitigate hydropower impacts on fishery opportunity for white sturgeon upstream from Bonneville Dam.	NMFS, BPA, USACE, WDFW	Ongoing
	1115	OS.M15	Vol I, Ch 8	Evaluate and manage emerging threats to white sturgeon due to an increased incidence of predation by sea lions on the adult spawner population.	NMFS, WDFW	Within 5 years
	1116	OS.M16	Vol I, Ch 8	Protect and enhance existing foraging habitat of Columbian whitetail deer to insure no further net degradation.	NMFS, Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Other Species	1117	OS.M17	Vol I, Ch 8	Increase forested areas in lowlands and floodplain with hardwood and some coniferous riparian species to enhance habitat of Columbian whitetail deer.	NMFS, Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing
	1118	OS.M18	Vol I, Ch 8	Decrease conversion of pastures and woodlots to intensive development to protect habitat of Columbian whitetail deer.	NMFS, Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Within 5 years
	1119	OS.M19	Vol I, Ch 8	Minimize interactions of Columbian whitetail deer with black-tailed deer.	USFWS, WDFW	Ongoing
	1120	OS.M20	Vol I, Ch 8	Reintroduce Columbian whitetail deer to suitable habitat.	WDFW, USFWS, Tribes	Ongoing
	1121	OS.M21	Vol I, Ch 8	Reduce predation mortality on fawns of Columbian whitetail deer.	USFWS, WDFW	Ongoing
	1122	OS.M22	Vol I, Ch 8	Minimize flood mortality effects on Columbian whitetail deer.	USFWS, WDFW	Ongoing
	1123	OS.M23	Vol I, Ch 8	Minimize occurrence of parasites and disease in Columbian whitetail deer.	USFWS, WDFW	Ongoing
	1124	OS.M24	Vol I, Ch 8	Monitor and minimize mortality resulting from vehicle collisions of Columbian whitetail deer.	USFWS, WDFW, WSDOT	Ongoing
	1125	OS.M25	Vol I, Ch 8	Protect existing preferred habitat to insure no future net degradation of river otters.	Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing
	1126	OS.M26	Vol I, Ch 8	Reduce contaminant exposure of Bald Eagles.	Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing

Impact	Action #	Measure Code	Chapter in Plan	Description	Partners	Estimated Schedule
Other Species	1127	OS.M27	Vol I, Ch 8	Protect existing nesting and foraging habitat of Bald Eagles.	Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing
	1128	OS.M28	Vol I, Ch 8	Minimize human disturbance of Bald Eagles.	USFWS, WDFW	Ongoing
	1129	OS.M29	Vol I, Ch 8	Minimize persecution or other man-induced mortality of Bald Eagles.	USFWS, WDFW	Ongoing
	1130	OS.M30	Vol I, Ch 8	Protect existing overwintering habitat of Dusky Canada Geese to insure no future net degradation.	Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing
	1131	OS.M31	Vol I, Ch 8	Encourage use of public lands of Dusky Canada Geese over private lands.	USFWS, WDFW	Ongoing
	1132	OS.M32	Vol I, Ch 8	Increase the availability of overwintering habitat for Dusky Canada Geese on public lands.	USFWS, WDFW	Ongoing
	1133	OS.M33	Vol I, Ch 8	Limit crop depredation by Dusky Canada Geese.	USFWS, WDFW	Ongoing
	1134	OS.M34	Vol I, Ch 8	Protect existing nesting habitat of Osprey to insure no future net degradation.	Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing
	1135	OS.M35	Vol I, Ch 8	Reduce contaminant exposure of Osprey.	Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing

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Other Species	1136	OS.M36	Vol I, Ch 8	Protect existing preferred habitat of Red-eyed Vireo to insure no future net degradation.	Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing
	1137	OS.M37	Vol I, Ch 8	Protect existing overwintering habitat of Sandhill Crane to insure no future net degradation.	Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing
	1138	OS.M38	Vol I, Ch 8	Encourage use by Sandhill Cranes of public lands over private lands.	USFWS, WDFW	Ongoing
	1139	OS.M39	Vol I, Ch 8	Increase the availability of overwintering habitat for Sandhill Cranes on public lands.	USFWS, WDFW	Ongoing
	1140	OS.M40	Vol I, Ch 8	Limit crop depredation by Sandhill Cranes	USFWS, WDFW	Ongoing
	1141	OS.M41	Vol I, Ch 8	Protect existing preferred habitat of Yellow Warbler to insure no future net degradation.	Tribes, Clark CD, Cowlitz CD, Wahkiakum CD, NGO, Lewis CD, Pacific CD, Underwood CD, Clark Co, Cowlitz Co, Pacific Co, Skamania Co, Wahkiakum Co, LCREP, WDFW, USFWS	Ongoing