

FCRPS Adaptive Management Implementation Plan

September 11, 2009

2008-2018
Federal Columbia River Power System
Biological Opinion

This Page Intentionally Left Blank

Table of Contents

I. Introduction

A. Summary of the Adaptive Management Approach

B. Executive Summary of the Adaptive Management Implementation Plan

1. Acceleration and Enhancement of RPA Mitigation Actions
2. Enhanced RM&E
3. Early Warning Indicators & Significant Decline Triggers for Initiating Contingencies
4. “On-the-Shelf” Contingency Procedures & Actions
5. Regional Collaboration, Science Review, & Dispute Resolution

C. Relationship of AMIP to the RPA Actions

II. Acceleration & Enhancement of RPA Mitigation Actions

A. Estuary Habitat Improvements & Memorandum of Agreement on Columbia River Estuary Habitat Actions with the State of Washington (Estuary MOA)

B. Reintroduction

C. Predator & Invasive Species Controls

D. Spill

III. Enhanced Research Monitoring & Evaluation

A. Enhanced Life-cycle Monitoring for Evaluation of Contingencies

B. Adult Status & Trend Monitoring

C. Juvenile Status & Trend Monitoring

D. Habitat Condition Status & Trend Monitoring

E. Intensively Monitored Watersheds

F. Climate Change Monitoring & Evaluation

IV. Contingency Plans in Case of Early Warning or Significant Fish Declines

A. Expanded Contingency Process

1. Early Warning Indicator for Chinook Salmon & Steelhead
2. Significant Decline Trigger for Chinook Salmon & Steelhead
3. Contingency Plan Implementation for Snake River Sockeye Salmon

B. Rapid Response Actions (Implementation promptly after Significant Decline Trigger is tripped)

1. Hydro Actions
2. Predator Control
3. Harvest
4. Safety Net Hatchery Programs

C. Long-term Contingency Actions (Greater Than One Year to Implement)

1. Phase II Hydro Actions
2. Reintroduction
3. Predator Control
4. Harvest
5. Conservation Hatcheries
6. Hatchery Reform
7. John Day Reservoir Operations at Minimum Operating Pool (MOP) from April through June
8. Breaching Lower Snake River Dams

V. Regional Collaboration, Reporting and Science Review

VI. Federal Agency Decision-making and Issue Resolution Process

VII. Conclusion

Figures

Figure 1: Refined Adaptive Management Implementation Provisions

Figure 2: Adaptive Management Implementation Plan & Contingency Process

Appendices

Appendix 1: Obama Administration Review & Court Guidance

1. Estuary & Tributary Habitat Projects
2. Contingency Plans
3. Additional Flow
4. Spring & Summer Spill
5. Oversight of RPA Implementation
6. Conclusion

References

Exhibit A: Participant Lists

FCRPS Listening Sessions 1-5

FCRPS Science Workshop

Exhibit B: Discussion Questions

Exhibit C: List of Materials for FCRPS Science Workshop

Appendix 2: Adaptive Management

Appendix 3: Estuary MOA with the State of Washington

Appendix 4: Development Concepts for the Significant Decline Triggers and Early Warning Indicators

Appendix 5: Rapid Response Actions

1. Predation Management Rapid Response Actions
2. Rapid Response Harvest Actions
3. Rapid Response Safety Net Hatchery Actions

This Page Intentionally Left Blank

I. Introduction

Under the 2008 FCRPS Biological Opinion (2008 BiOp), federal dams are operated by the Action Agencies¹ through 2018 for multiple purposes, subject to a number of fish conservation actions set out in the Reasonable and Prudent Alternative (RPA). The dams are configured and operated under the RPA to meet objective performance standards for fish passage survival. Their management is subject to modification in response to new fish survival information. In addition, the RPA requires mitigation actions for the benefit of all ESA protected salmonid species adversely affected by the FCRPS: projects to improve tributary and estuarine salmon and steelhead habitat, to reduce fish and bird predation, and to use hatcheries to help protect wild stocks. These programs are informed by ongoing research, monitoring and evaluation (RM&E) about the status of the listed species and the effects of the RPA on them. The Action Agencies and NOAA Fisheries are managing the RPA actions adaptively, through 2018, to insure they incorporate the best available science and are informed by the current status of listed salmonids.

The 2008 BiOp and RPA have received intense scrutiny – through extensive regional collaboration, as a consequence of ongoing court challenges and, most recently, due to the change of federal administrations. The Court presiding over the NWF v. NMFS litigation (challenging issuance of the 2008 BiOp) specifically allowed the new administration of President Obama time to fully understand the 2008 BiOp and RPA and, especially, the adaptive management provisions. Using that time, the Obama Administration² has engaged in a substantial and thorough consideration of the 2008 BiOp and RPA, the science on which they are based, issues raised by litigants, and United States District Court Judge James A. Redden’s perspectives in his May 18, 2009, letter. This review process highlighted several issues centering on implementation of the RPA and the ability to provide a rapid response to a significant decline in the status of listed fish. A detailed description of the review process, which included listening to the views of the parties as well as those of agency and independent scientists, is provided in Appendix 1 of this document, which also includes a consideration of the points raised in the Court’s letter.

Based on the new Administration’s review, this Adaptive Management Implementation Plan (AMIP) was developed to infuse the implementation of the 2008 RPA with the best science currently available. The AMIP makes full use of the adaptive management provisions of the

¹ The Action Agencies are the U.S. Army Corps of Engineers, (Corps), the Bureau of Reclamation (Reclamation), the federal dam operators, and Bonneville Power Administration (BPA), which markets and transmits the power generated at these dams.

² Four different Cabinet-level agencies and the White House were represented in this process. The lead official for each agency in this review was: NOAA Administrator Dr. Jane Lubchenco for the Department of Commerce; Council on Environmental Quality Chair, Nancy Sutley for the White House; Principal Deputy Assistant Secretary of the Army, Terrence “Rock” Salt for the Department of Defense; Associate Deputy Secretary, Laura Davis for the Department of the Interior; and, for the Department of Energy, Bonneville Power Administration Administrator Steve Wright.

RPA, describing an aggressive program to develop and implement contingency actions if the biological indicators described below reach pre-defined warning levels. Salmonid research, monitoring and evaluation are enhanced to make more data and analytic tools available, which the Action Agencies and NOAA Fisheries can use to evaluate the status of each Evolutionarily Significant Unit or Distinct Population Segment (ESU or DPS, or collectively, species) and to inform the choice of actions in the case of a significant decline. Certain RPA actions will be implemented as soon as practicable to further benefit the status of salmon and steelhead in the short term.

A. Summary of the Adaptive Management Approach

The 2008 RPA uses adaptive management to respond to results of new research and other scientific information on fish survival. As more is learned over time, mitigation actions and studies will be updated to reflect the best available scientific information and to achieve the biological performance standards and survival improvements articulated in the 2008 BiOp. The adaptive management provisions incorporated into the 2008 RPA are an outgrowth of the remand collaboration process directed by Judge Redden. Its specific components are described in the August 2007 FCRPS Biological Assessment (BA) (Appendix 2). The provisions increase accountability for results in a number of ways, including, but not limited to specific hydro and habitat performance standards, an extensive research and monitoring program to evaluate progress toward those standards, a transparent process for annual progress reporting to the region, and full involvement of the sovereigns' Regional Implementation Oversight Group (RIOG). It also includes a contingency plan process to address the possibility of a significant decline in the abundance of listed fish. The contingency plan includes biological triggers at the species level and an "All-H Diagnosis" to determine appropriate contingency actions.

With a more complete understanding of the 2008 BiOp as a result of these efforts, the Administration believes that while the science underlying the 2008 BiOp is fundamentally sound, there are uncertainties in some of the predictions regarding the future condition of the listed species. Further contributing to these uncertainties is the Administration's understanding about how climate change may affect these species and their habitats. The Administration also identified the need to better understand the impact of invasive species and predators on the listed species, as well as the interactions among the listed species. In light of these uncertainties, the Administration believes these issues would be addressed by accelerating and enhancing existing RPA mitigation actions; collecting more data and improving analytic tools to better inform future adaptive management decision-making; and adding new biological triggers that when tripped will activate near- and long-term contingency actions, should the agencies detect a significant decline in the species' condition.

The Administration consequently directed the development of the AMIP to address these issues, taking a more precautionary approach in implementing the RPA through the adaptive management provisions in the 2008 BiOp. The AMIP therefore sets up pre-defined biological triggers, which will alert the federal agencies if further action is warranted. Actions will be

ready for prompt implementation when triggered to deliver survival benefits in response to the indications of significant fish declines. Planning will begin immediately for longer term, tailored contingency actions to avoid delay if these are needed and the longer term actions will benefit from diagnostic work at the time the trigger is tripped to make sure they are the right actions to address the species' decline. Because this strategy relies on the best science available, this AMIP also enhances the RPA's RM&E activities so that more information will be available for making implementation decisions. In addition, this AMIP identifies actions already called for in the RPA for priority (earlier) implementation, which will provide protection for listed species, taking advantage of the latest research and other biological information.

This AMIP:

- Describes the Administration's process to understand the science and issues pertaining to the 2008 BiOp, which led to development of the AMIP (see also Appendix 1)
- Accelerates and enhances specific RPA implementation actions (Section II)
- Enhances Research, Monitoring and Evaluation (RM&E) actions to fill data gaps, including the development of an expanded life-cycle model which, among other uses, will aid in determining the suite of identified Rapid Response and Long-term Contingency Actions (see below) to be implemented if triggered (Section III)
- Establishes new biological triggers that when tripped will activate near and longer term responses to address significant fish declines (Section IV)
- Identifies and establishes the process for implementing those near and longer term responses if a trigger is tripped (termed Rapid Response Actions and Long-term Contingency Actions, respectively) (Section IV)
- Describes processes for transparency in adaptive management, scientific review, issue resolution, and reporting (Sections V and VI)

Five appendices provide specific technical details that support the AMIP.

As implemented through this AMIP, the 2008 BiOp and its RPA are biologically and legally sound, based on the best available scientific information, and satisfy the ESA jeopardy standard. That is, as implemented through this AMIP, the effects of the operation of the FCRPS are not likely to jeopardize the continued existence of the listed species (i.e., combined with the effects of the environmental baseline and cumulative effects, the species are expected to survive with an adequate potential for recovery) nor destroy or adversely modify designated critical habitat.

The 2008 BiOp is supported by the analyses in the Supplemental Comprehensive Analysis (SCA). As an implementation of the RPA, within its adaptive management provisions, the

effects of this AMIP are consistent with those evaluated in the SCA analysis. Thus, the SCA remains unchanged and continues to support the conclusions of the FCRPS, Upper Snake, and *United States v. Oregon* Biological Opinions.

The enhanced and strengthened adaptive management framework, including the uses of early warning indicators, triggers and contingency plans as described below, is not intended to suggest that the Federal Columbia River Power System will be the guarantor against all negative impacts on the affected species. NOAA Fisheries will consider a comparable precautionary approach and adaptive management provisions for all future biological opinions for these affected species.

B. Executive Summary of the Adaptive Management Implementation Plan

Through this AMIP, the Action Agencies and NOAA Fisheries are collectively committing to the enhancement, strengthening, development and implementation of activities, research, and contingencies for Interior Columbia Basin species within the 2008 RPA's adaptive management provisions. Key elements of these adaptive management activities include:

Acceleration and Enhancement of RPA Mitigation Actions

Estuary MOA: A Memorandum of Agreement on Columbia River Estuary Habitat Actions with the State of Washington (Estuary MOA) will add 21 protection and restoration projects including significant research, monitoring and evaluation by committing an additional \$4.5 million annually (equivalent to \$40.5 million over the 9-year term of the MOA).

Reintroduction: By December 2010, NOAA Northwest Fisheries Science Center (NWFSC) will complete a report examining conditions under which reintroductions of salmonids into previously occupied areas would be suitable as a tool to decrease the risk of extinction. Reintroductions will be considered in areas downstream of Chief Joseph Dam and the Hells Canyon Complex.

Predator Control: The Action Agencies have worked collaboratively with regional scientists to identify priorities to manage non-native predators such as shad, catfish and smallmouth bass. Based on this information, the Action Agencies will accelerate research study designs, independent scientific review and development of specific management strategies.

Spill: Spring spill is not an acceleration of an RPA, but does represent a significant adaptive management change to address concerns raised by the ISAB. A decision is being made each year on which passage operation or combination of operations for spill or transport provides the best survival of returning adult fish. For spring 2009, after consultation with the RIOG, the federal agencies decided to continue spill during May 7 - 20 at the three Snake River dams previously identified for transportation. Data on fish survival will be reviewed with RIOG again in 2010, and each year thereafter, to determine the best operation for the fish, and there is no longer a presumptive operation for this time period as set forth in the RPA.

The Action Agencies and NOAA Fisheries are also augmenting the summer spill program in a manner consistent with a more precautionary implementation of the RPA. By the 2010 juvenile outmigration, the federal agencies will develop a safeguard based on adult returns (i.e., low fish abundance) that, when tripped, would continue summer spill at the Snake River projects through August 31 of the following year.

Enhanced RM&E

Research, monitoring and evaluation are essential components of the adaptive management provisions in the 2008 RPA. They provide ongoing mechanisms to track salmonids, evaluate the effectiveness of RPA actions, and thus address inherent uncertainties in knowledge or the potential for unanticipated changes. Improvements under the AMIP will expand the geographic coverage and improve the statistical certainty of the information needed for decision-making and support the evaluation of Long-term Contingency Actions. The federal agencies are significantly enhancing their RM&E efforts in the following areas:

Expanded Life Cycle Model: By December 2012, NOAA Fisheries and the Action Agencies will complete updates to the existing life-cycle models to better evaluate Rapid Response and Long-term Contingency Actions. Updates will include emerging climate data; habitat and hatchery effects and monitoring; interactions among species (e.g., competitors or predators); assessment of the biological effects of operating John Day reservoir at minimum operating pool (MOP) and short-term, transitional and long-term effects of lower Snake River dam breaching.

Adult Status and Trend Monitoring: By December 2011, NOAA Fisheries will improve existing adult status and trend monitoring where technically feasible to obtain estimates of (1) natural-origin spawner abundance and (2) full life-cycle productivity, with known statistical certainty and power, for additional populations of each listed species in the basin. Additionally, by December 2010, NOAA Fisheries will develop mechanisms for the timely and efficient reporting and dissemination of these data, in order to ensure they provide for the early detection of species- or population-specific changes in status.

Juvenile Status and Trend Monitoring: By December 2011, the Action Agencies will enhance the monitoring of juvenile production and survival for at least one population per Major Population Group (MPG), to better inform decisions regarding the Rapid Response Actions and Long-term Contingency Actions that will be taken if a trigger is tripped, as well contributing to viability assessments. In addition to allowing the detection of downturns in freshwater production and juvenile survival, this monitoring will help to assess climate change impacts.

Habitat Status and Trend: By December 2011, the Action Agencies will expand habitat status and trend monitoring for at least one population or watershed per MPG to further inform relationships between habitat conditions and fish survival and to improve habitat and life cycle modeling capabilities, ensuring that estimated benefits of habitat restoration actions are

reasonable. By December 2011, the Action Agencies will also ensure monitoring of appropriate habitat metrics (e.g., flow and temperature) across a diversity of ecological regions and habitat types to assess responses to climate change.

Intensively Monitored Watersheds (IMW): By September 2010, NOAA Fisheries and the Action Agencies will complete an analysis of existing IMWs to ensure timely funding and implementation of habitat actions (at intensities that allow the detection of resulting habitat changes), sufficiently diverse representation of IMWs (geographically and with respect to limiting factors) and appropriate monitoring (e.g., temperature, flow) to detect climate change impacts. Results will be applicable to future habitat project planning and to the implementation of Rapid Response Actions. The IMW work will be combined with Juvenile Status and Trend Monitoring and Habitat Status and Trend Monitoring to enhance assessment and adaptive management capabilities.

Climate Change Monitoring and Evaluation: Beginning in 2010, NOAA Fisheries will annually provide the Action Agencies with a scientific literature review regarding habitat and ocean conditions, habitat project priorities and forecasting and modeling results to ensure that the latest scientific information on climate change is considered throughout implementation of the RPA.

Early Warning Indicators & Significant Decline Triggers for Initiating Contingencies

Beginning with the availability of 2009 data, NOAA and the Action Agencies are establishing:

An Early Warning Indicator: This indicator will alert NOAA Fisheries and the Action Agencies to a decline in a species' abundance level for natural-origin adults that warrants further scrutiny because it indicates that a Significant Decline (see below) may be reached in one to two years. The indicator for each species will be a running four-year mean of adult abundances that falls below a 20% likelihood of occurrence.

Within 120 days of NOAA Fisheries' determining that the Early Warning Indicator abundance levels have been observed, the Action Agencies, in coordination with NOAA Fisheries, the RIOG, and other regional parties will determine whether the species in question is likely to decline to a level that will trip the Significant Decline Trigger. This evaluation will be based on additional indicators and predictors of status (e.g., jack counts, ocean conditions, and habitat disturbances). If the early implementation of Rapid Response Action(s) is warranted, the evaluation will determine which actions to take. The Action Agencies will implement the Rapid Response Actions as soon as practicable, but no later than 12 months from the date the indicator is observed.

A Significant Decline Trigger: Each year, the federal agencies will check for a significant decline in the natural abundance of the species. A significant decline is judged to occur when the

running four-year mean of natural-origin adult abundance falls below a 10% likelihood of occurrence based on historical data (see Appendix 4, Table 1 for these thresholds). The principle underlying the Significant Decline Trigger is that these thresholds represent significant deviations from the biological expectations in the 2008 BiOp.

Within 90 days of NOAA Fisheries determining that the Significant Decline Trigger has been tripped, the Action Agencies, in coordination with NOAA Fisheries, the RIOG, and other regional parties will determine what Rapid Response Actions to take. The Rapid Response Actions will be implemented as soon as practicable, but no later than 12 months from the date the trigger is tripped. Rapid Response and Long-term Contingency Actions will be periodically reviewed to determine whether the actions continue to be necessary and if so, whether alternative actions might be more beneficial.

Concurrent with the initiation of efforts to determine what Rapid Response Actions will be taken, the Action Agencies will initiate an All-H Diagnosis informed by life-cycle modeling of potential Long-term Contingency Actions. Within four to six months after the Significant Decline Trigger is tripped, the Action Agencies (in coordination with NOAA Fisheries, the RIOG, and other regional parties) will complete this analysis and determine if the Rapid Response Action(s) are likely to be sufficient or if Long-term Contingency Actions (other than lower Snake River dam breaching, see below) will need to be implemented and if so, what Long-term Contingency Actions will be implemented. If necessary, those Long-term contingency actions will be implemented as soon as practicable.

“On-the-shelf” Contingency Procedures & Actions

Rapid Response Actions: This AMIP identifies potential “Rapid Response Actions” in four areas (hydro operations, predator control, harvest, and safety-net hatchery programs). In addition, by December 2011, the Action Agencies and NOAA Fisheries will develop a Rapid Response Plan, which will include a detailed description of these potential Rapid Response Actions together with implementation milestones. As noted above, within 90 days of a Significant Decline Trigger being tripped, a determination will be made as to which actions are to be taken. Those actions will be implemented as soon as practicable, but no later than 12 months from the date the trigger is tripped. Those Rapid Response Actions will be targeted to the species/MPG/population at issue.

Long-term Contingency Actions: This AMIP identifies a menu of potential Long-term Contingency Actions, which will further be refined over the next two years. Specifically, by December 2011, the Action Agencies and NOAA Fisheries will develop a more detailed description of potential Long-term Contingency Actions, including implementation milestones. “Long-term Contingency” Actions would take more than 12 months to implement and will be targeted to the species/MPG/population at issue.

With respect to lower Snake River dam breaching, a science driven study of dam breaching is included as a potential Long-term Contingency Action. By March 2010, the Corps will develop a study plan regarding the scope, schedule and budget for the technical studies that would be needed. Within six months of a Significant Decline Trigger being tripped for a Snake River species, the Corps would initiate those technical studies, if an All-H Diagnosis is completed that concludes dam breaching is necessary to address and alleviate the biological trigger conditions for the applicable Snake River species.

Regional Collaboration, Science Review, & Dispute Resolution

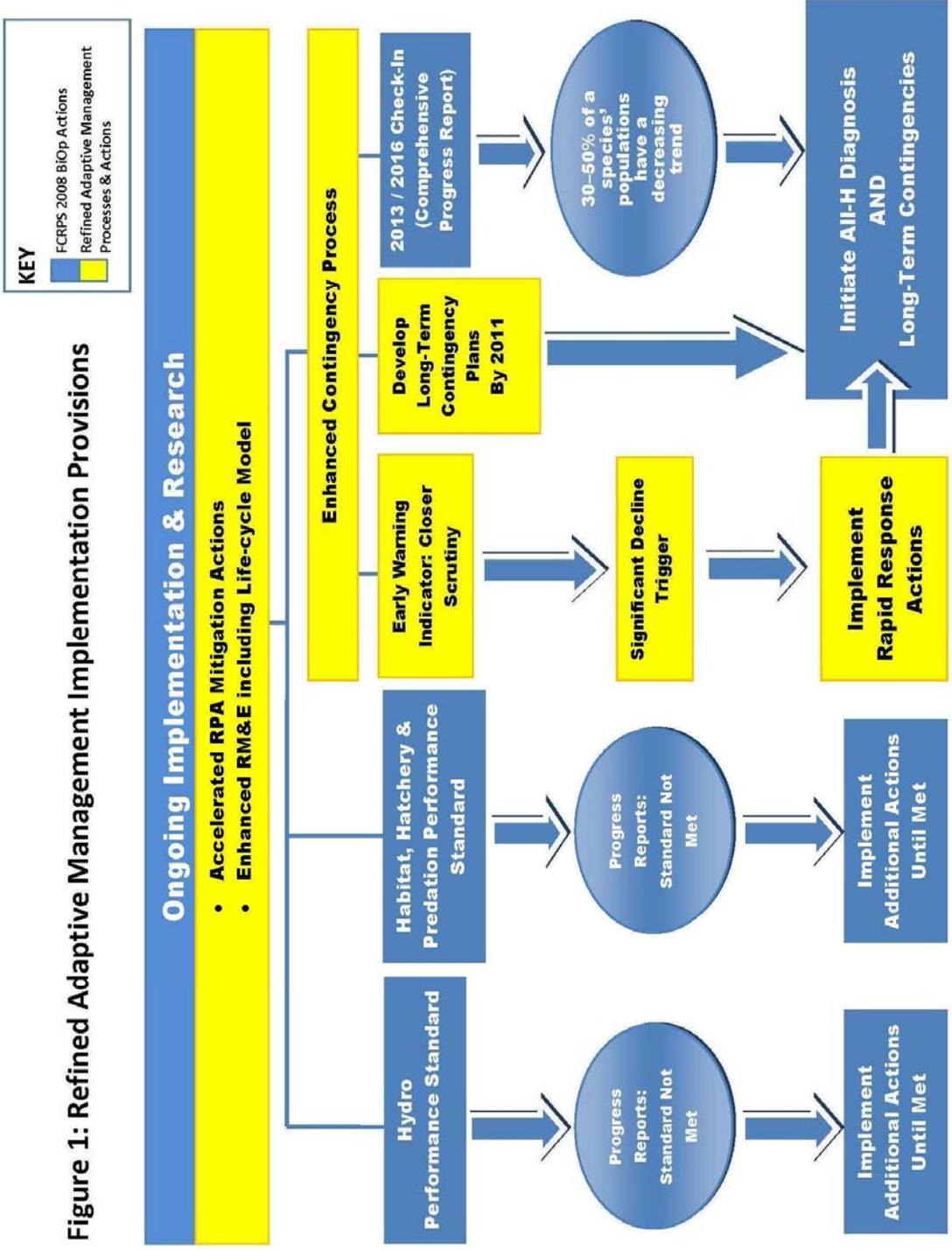
This AMIP will ensure a more precautionary approach to implementation of the 2008 BiOp for the species' benefit and increase its responsiveness to emerging climate change information. AMIP activities will incorporate the best available science and will be discussed with the sovereign states and tribes through the RIOG. Instances in which there is disagreement among sovereigns on specific scientific issues can be submitted for independent scientific review, as described below.

C. Relationship of AMIP to RPA Actions

For each component of the AMIP, the applicable RPA action is identified and the adaptive management application is described. The provisions of this AMIP inform the measures of the 2008 RPA with greater detail and specificity, and the agencies intend the AMIP to be consistent with the objectives and requirements of the RPA. Clarifications and adjustments in RPA measures under the AMIP will be documented in writing by the Action Agencies and provided to NOAA Fisheries for concurrence.

The AMIP expansions and implementation details and their integration into parts of the existing RPA's adaptive management provisions and process are represented graphically in Figure 1 (Refined Adaptive Management Implementation Provisions). Elements in blue represent 2008 RPA actions; elements in yellow represent updated AMIP implementation details, especially in the area of contingencies.

Figure 1: Refined Adaptive Management Implementation Provisions



II. Acceleration & Enhancement of RPA Mitigation Actions

The Administration's review of the 2008 BiOp identified several RPA mitigation actions that should be accelerated and enhanced as part of its more precautionary approach to implementation. As described below, these actions are in the areas of estuary habitat improvements, species reintroduction, predator and invasive species controls and summer spill.

A. Estuary Habitat Improvements & Memorandum of Agreement on Columbia River Estuary Habitat Actions with the State of Washington (Estuary MOA)

The Columbia River estuary is a critical environment supporting an important part of the life cycle of salmon and steelhead, providing refuge from predators and offering a rich feeding environment where individuals can grow to larger sizes and improve their survival in the ocean. Under RPA Actions 36 and 37, the Action Agencies are implementing a major program of estuary habitat restoration and research which is substantially increased from that in the 2000 FCRPS BiOp. The Estuary MOA will enhance this effort significantly by identifying and describing estuary projects and augmenting the suite of RPA actions in the 2008 RPA. The Estuary MOA provides more certainty that estuary habitat projects will occur by adding \$4.5 million annually (for total of \$40.5 million) to the Action Agencies' BiOp commitments and by securing the State of Washington as a committed implementing partner. The estuary MOA will be signed in September 2009.

In selecting the projects for inclusion in the Estuary MOA, an initial suite of potential projects was evaluated by Washington Department of Fish and Wildlife (WDFW) scientists for biological benefits and certainty of success using the scientific methodology described in the RPA (Actions 36 and 37). As a result of this evaluation, an additional 21 projects were selected for implementation. Appendix 3 provides a list of Estuary MOA projects and a sample benefits calculation.

In addition to "on the ground" projects, the Estuary MOA relies on a significant estuarine RM&E effort, which helps the Action Agencies and regional partners evaluate progress toward implementation objectives and assists in evaluating the biological benefits of all the habitat estuary projects. The benefits will be evaluated by the expert regional technical group that has been established to support implementation of the RPA and will be reported in annual progress reports.

B. Reintroduction

Under RPA Actions 34 and 35 and related programs, the Action Agencies are currently implementing a number of small scale, passive reintroduction efforts as well as larger scale, active efforts to reestablish salmon and steelhead populations in the Columbia basin. Since

2005, the Action Agencies' implementation of passage improvements, removal of barriers, and instream flow restoration has opened up access to over 1,700 stream miles of fish habitat. In addition, under the RPA, the Action Agencies have been implementing reintroduction efforts for Snake River sockeye salmon, and are initiating reintroduction efforts for Upper Columbia River spring Chinook salmon in the Okanogan River.

The Administration's recent review confirmed that the reintroduction of salmon and steelhead to locations where extirpation has occurred is a useful tool to decrease the risk of extinction. The NWFSC is now initiating an evaluation of additional opportunities for reintroduction of listed fish in areas downstream of Chief Joseph Dam and the Hells Canyon Complex. The NWFSC will examine the potential benefits of additional reintroductions, considering locations where reintroduction will advance recovery and further lower the risk of extinction. This evaluation will include the following elements:

- **Conditions under which reintroductions would be suitable.** Reintroducing fish in some situations, e.g., where there is high quality habitat, is likely to be successful. In other instances, such as when unoccupied habitat has been significantly degraded, reintroduction may not be a beneficial strategy. The NWFSC will evaluate the conditions under which reintroduction would be a robust strategy and describe the relative costs and benefits in this and other situations.
- **Reintroduction techniques.** Reintroductions can occur naturally, where fish volitionally enter and spawn in reopened historical habitat. Alternatively, artificially propagated fish can be outplanted in unoccupied areas or where current abundance is extremely low. The NWFSC will evaluate the costs and benefits of the alternative reintroduction strategies and techniques.

The NWFSC will complete a report outlining potential reintroduction projects in the Columbia Basin by December 2010. This report will guide both decisions regarding which Long-term Contingency Actions should be implemented if a trigger is tripped and actions taken to implement recovery plans. This report will be discussed with the federal agencies and the RIOG.

C. Predator & Invasive Species Controls

Based on the Administration's review, the Action Agencies are investigating predation and ecological effects of invasive species as areas for additional salmon and steelhead survival improvements. Currently, the RPA includes actions that address predation by birds (RPA Actions 45-48), fish (RPA Actions 43-44), and sea lions (RPA Action 49).

To implement the RPA actions associated with fish predation, the Action Agencies, in September, 2008, hosted a non-native species predation workshop with approximately 100 in attendance representing 18 federal, state and tribal entities, and several regional universities. A report on the proceedings identified a number of predation management strategies, most

requiring a level of basic field research as a first step toward implementing full-scale management actions. A follow-up meeting in May, 2009, narrowed the focus to a few high priority approaches that warranted further development. Now, based on this regional consensus, the Action Agencies and NOAA Fisheries will move forward in the three highest priority areas to establish baseline information for future predator control activities:

- **Shad:** document the influence of juvenile shad on the growth and condition of introduced predators in the fall as they (the predators) prepare for overwintering
- **Catfish:** document the distribution and predation rates of channel catfish
- **Smallmouth bass:** document whether removals of smallmouth bass in areas of intense predation could reduce the mortality of juvenile salmonids

For these three priority approaches and in order to accelerate implementation of the RPA, by November 2009 BPA will develop a research study design proposal, and will promptly request an expedited review of the proposal by the Independent Scientific Review Panel (ISRP) to accelerate field implementation. The Action Agencies will implement the research study during the next field season(s), anticipated by December 2010. Once this research supports a specific management strategy, the Action Agencies could implement site-specific removals of smallmouth bass and could exclude adult American shad from upper mainstem dams as early as the following migration season.

D. Spill

Spring Spill

Adaptive management modifications in spring spill are not an acceleration of an RPA action; however they are consistent with the ISAB review and are responsive to concerns raised by the Court. Under the RPA, the spill and transport program is based upon biological data, i.e., which passage method provides the best survival of returning adult fish. Spill reductions at the lower Snake River collector projects in early May are no exception. The analysis supporting the RPA's emphasis on transport from May 7-20 was based on the best available scientific information. NOAA Fisheries assessed the adult return rates for Snake River steelhead and Chinook salmon, which formed the basis for terminating spill from May 7-20 at these projects. This information shows return rates consistently higher for both Chinook and steelhead transported during that time.

Although NOAA Fisheries' interpretation of recent data was supported by the ISAB (Snake River Spill-Transport Review, 2008-5), the ISAB recommended continuing the current spill program to collect additional information. After consultation with RIOG parties, NOAA Fisheries recommended that spill at the three Snake River collector projects continue through the spring period in 2009 and that data from previous years be assessed and discussed with the RIOG

parties each year to inform transport/spill operation decisions for the subsequent year. There is no longer a presumptive operation for this time period as set forth in the RPA.

Summer Spill

The Action Agencies and NOAA Fisheries are enhancing the summer spill program consistent with a more precautionary approach to implementation of the RPA for the species' benefit. RPA Action 29 and RPA Table 2 specify the use of a biological trigger for determining the timing of cessation of voluntary summer spill in August at the four Snake River projects; developed as part of the Fish Accords with the Columbia River Tribes; namely when collection numbers of subyearling Chinook fall below 300 fish per day for three consecutive days at Snake River collector projects. Under this program, spill could be terminated as early as August 1, but no later than August 31. The Fish Accords modify the implementation of this requirement so the trigger is applied at each dam and the cessation of spill progress downstream as follows: spill at Little Goose ceases no earlier than three days after cessation at Lower Granite, Lower Monumental ceases no earlier than three days after Little Goose, and Ice Harbor ceases no earlier than two days after Lower Monumental. In the event that collection numbers exceed 500 fish per day for two consecutive days after spill termination, spill will resume at that project until the 300 fish per day trigger is tripped again.

To further enhance the summer spill program, the Action Agencies will develop an appropriate safeguard, based on adult returns, that continues summer spill at the Snake River projects through August 31, during the subsequent juvenile outmigration. Using this trigger, low abundance of naturally-produced Snake River fall Chinook in one year would trigger spill through August 31 at the Snake River projects the following year, regardless of the number of juveniles collected. The Agencies will coordinate with the RIOG in developing the trigger, to be in place for the 2010 juvenile fish migration.

III. Enhanced Research Monitoring & Evaluation

Research, monitoring and evaluation are essential components of the RPA because they enable adaptive management. The AMIP augments the geographic coverage and improves the statistical certainty of the information that will be collected for decision-making, including decisions regarding which Rapid Response and Long-term Contingency Actions to take if a trigger is tripped.

Currently, the 2008 BiOp includes a substantial RM&E effort as described in RPA Actions 50-73. In support of RPA implementation, NOAA Fisheries also funds status and trend monitoring, critical uncertainties research, and restoration action effectiveness monitoring. Under the adaptive management provisions, RM&E results can lead to changes in RPA implementation to optimize fish survival and productivity. RM&E results are reported through publicly available annual progress reports to the RIOG. This includes reporting on the annual abundance of natural fish at the species level based on dam counts, one of the metrics used for the new contingency triggers, as well as improved abundance data at the population level.

Since the release of the 2008 BiOp, NOAA Fisheries and the Action Agencies have been jointly reviewing existing federal, state and tribal RM&E efforts in the Columbia Basin to identify and address critical gaps in the monitoring necessary to fully support RPA adaptive management decisions. This review is being conducted in partnership with the NPCC, the Columbia Basin Fish and Wildlife Authority (CBFWA) and its member state and tribal natural resource agencies. In Summer 2009, BPA, CBFWA, NOAA Fisheries and NPCC began convening a series of sub-regional workshops with state and tribal co-managers to develop a shared Columbia Basin Monitoring Strategy. The goal of these workshops is to develop an efficient salmon and steelhead monitoring framework and implementation strategy that will support viable salmonid populations (VSP) and habitat and hatchery effectiveness monitoring needs, including those of the 2008 BiOp and RPA, recovery plans, regional fisheries management objectives, and other programs. This collaborative process will be completed in December, 2009.

A. Enhanced Life-cycle Monitoring for Evaluation of Contingencies

The 2008 BiOp used a combination of life-cycle modeling and passage modeling (COMPASS) for evaluation of impacts and All-H actions. The COMPASS model was supported and improved by Independent Science Advisory Board (ISAB) reviews. The 2008 BiOp's analyses provided state of the art evaluations, based on the best available scientific information including fish status and trends, hydropower effects, mitigation actions, and ocean/climate scenarios, which estimated how changes in life-stage specific survival would affect long-term viability metrics (productivity, mean abundance, and probability of quasi-extinction).

The Administration identified the need for better information about recovery actions at the species level and across the salmon life cycle. To be responsive, the Action Agencies and NOAA Fisheries will jointly fund enhanced, data-driven life cycle modeling for contingencies, augmenting the current BiOp modeling. Based on newly available and emerging data, the existing models will be expanded further in order to explicitly evaluate a variety of other factors, described below. The primary purpose of this revision is to allow the federal agencies to better evaluate which Rapid Response Actions and Long-term Contingency Actions will be taken if a trigger is tripped.

These model revisions will be developed through regional collaboration and will go through both an independent science review process and review by the Northwest Power and Conservation Council (NPCC). The goal of the effort will be to develop models that are well grounded in empirical data and the latest research findings and to identify data gaps that are a high priority for regional RM&E coordination. In addition, the models will characterize the uncertainty in the underlying mechanistic relationships.

As part of this effort, the Interior Columbia Technical Recovery Team's (ICTRT) stochastic life-cycle models will be updated to incorporate most recent population data (abundance of adults and juveniles, stage-specific survival, etc.) and expand the number of populations considered where practicable (Snake River spring/summer Chinook, Snake River steelhead, Upper Columbia River spring Chinook, and Middle Columbia River steelhead). Data availability will be explored and data-supported models will be developed for populations within species that have not been modeled to date (Snake River fall Chinook; Snake River sockeye; and Upper Columbia River steelhead). The federal agencies will enhance the existing models to address the following:

- 1. *Climate—Sensitivity of Species.*** Analyzing the potential effects of climate change is a key element of the adaptive management approach in the 2008 RPA. Ultimately, as part of the spatially explicit modeling discussed below, it would be helpful to identify the species most sensitive to climate variability and the restoration actions most resilient to climate change. Results will be used to guide 2008 RPA implementation decisions and determinations regarding priorities.
- 2. *Climate—Adaptive Management.*** The effects of climate variability and change will be evaluated by incorporating observed climate conditions, such as freshwater conditions (e.g., snow pack), mainstem conditions (flow and temperature), and ocean conditions on survival throughout the life cycle. Long term effects of climate will be modeled based on projected changes in freshwater and marine climate conditions from various future climate scenarios (IPCC, NOAA Fisheries, UW-CIG). The models will also produce near-term (1- to 2-year) predictions of population performance based on short-term weather forecasts and current abundance levels. Such outputs will be considered qualitatively in the context of the running 4-year averages in adult escapement “triggers” in the AMIP and used to further judge trend patterns.

3. ***Hatchery Effects.*** A critical uncertainty is the effect of hatchery spawners on the success of wild spawners, the impact of hatchery releases on wild populations, and density-dependent effects of hatchery production on the productivity of wild fish. Each of these issues has been evaluated to some degree, and the effects of hatcheries on populations will be modeled under various ocean productivity regimes and climate scenarios. This will provide a sensitivity analysis of the potential role of hatchery production in recovery and to possibly identify alternative production release timing strategies that increase survival of wild fish and hatchery fish.
4. ***Habitat Actions & Monitoring.*** The potential effects of habitat improvements on population viability metrics will be incorporated into the life cycle models as the information becomes available from IMWs and RM&E activities. Results of analyses of key assumptions on how fish populations respond to habitat alterations will be used to guide future RM&E and IMW activities, and used qualitatively as part of the Early Warning Indicator and Significant Decline Trigger components of the AMIP.
5. ***Spatially Explicit Modeling.*** Analyses will be developed to assess the degree of geographic concordance among populations. Establishing spatial patterns by which populations co-vary will enhance our ability to identify similarities and differences in their responses to variability in freshwater and marine productivity, differing levels of habitat restoration across watersheds, and influences of total hatchery composition on the wild component of the species, among others. In addition, spatially explicit meta-population models will be developed for MPGs. Such models can help to identify populations that are especially vulnerable to extinction due to spatial isolation. Taken together, these modeling efforts can inform the spatial structure metric of VSP.
6. ***Inter-species Interactions.*** Available data on the effects of other native species (competitors, piscivorous fish and avian predators, and prey), invasive species (competitors, predators, or pathogens), or other populations (i.e., tradeoffs among species) on target salmon and steelhead populations will be evaluated. If sufficient data exist, potential effects will be evaluated through food web or bioenergetics models, or other analyses to estimate the magnitude of their impact.
7. ***John Day MOP.*** This potential Long-term Contingency Action will be analyzed with the COMPASS model using the available biological information. COMPASS can model the changes in river velocity associated with reservoir drawdown, which in turn is translated into increased migration rates and an assessment of direct survival. The changes in migration rates will result in different arrival times to the estuary, and COMPASS can translate this information into adult return rates. Because COMPASS does not address the effects of operating John Day to MOP on shallow water habitat and the resulting biological consequences to the life-cycle of salmon, these effects will be considered in development of the expanded life-cycle model.

8. Dam Breach Module. A module will be developed to assess the effects of breaching one or more lower Snake River dams on salmonid populations. This will involve a combination of life-cycle modeling and COMPASS modeling, along with other sources of information such as predicted changes in hydrology, sediment transport, contaminants, habitat conditions, and predator densities. COMPASS can readily model the loss of dam mortality and decreased travel times associated with increased water velocity, but other factors will require assumptions generated by working groups. The effects of dam breaching will be separated into short-term, construction related effects and long-term benefits. Estimated benefits from dam breaching will be incorporated into life-cycle models along with changes in hatchery production to provide a comprehensive assessment.

Starting in 2010, NOAA Fisheries and the Action Agencies will jointly fund and implement updates to the existing life cycle models. The updates to the life-cycle models will be implemented by December, 2012. These enhancements will be developed using the same approach as for the COMPASS model, a transparent process and independent science peer review. Results will be discussed with the RIOG and reported annually to the region.

B. Adult Status & Trend Monitoring

The collection and timely reporting of natural adult abundance and productivity data each year at the population scale is needed to detect changes in status at the species, MPG, or local population levels in response to RPA actions. NOAA Fisheries and the Action Agencies provide annual funding for state and tribal monitoring programs for adult salmon and steelhead status and trends in the Columbia Basin. The RM&E review being conducted by the Action Agencies, NOAA Fisheries and the co-managers has identified data gaps for some populations, given the goals of the program.

By December 2011, NOAA Fisheries will improve existing adult status and trend monitoring to obtain adult natural spawner abundance and full life-cycle productivity estimates, with known statistical certainty and power, for additional ESA-listed populations. These improvements will better inform decisions regarding which Rapid Response Actions and Long-term Contingency Actions will be taken if a trigger is tripped, as well as ongoing viability assessments. Additionally, by December 2010, NOAA Fisheries will develop mechanisms for the timely and efficient reporting and dissemination of these data, in order to ensure they can provide for the early detection of regional or population specific changes in status.

C. Juvenile Status & Trend Monitoring

A robust juvenile monitoring program for the Interior Columbia Basin species supports the early detection of substantial changes in abundance, productivity, or survival. Juvenile out-migrant monitoring complements adult status and trend monitoring by detecting trends in recruits per

spawner based on tributary habitat improvements that might otherwise be masked by the effect of year-to-year variation in ocean survival rates. By December, 2011, the Action Agencies will enhance the existing monitoring of juvenile production and survival. This will ensure that at least one population per MPG is being monitored to better inform decisions regarding what Rapid Response and Long-term Contingency Actions will be taken if an adult trigger is tripped, as well as informing viability assessments. In addition to allowing the detection of downturns in natural freshwater production and juvenile survival, this monitoring will help to assess climate change impacts. The Action Agencies will develop a strategy to improve the management and timely reporting of juvenile salmon and steelhead monitoring data by December, 2010.

D. Habitat Condition Status & Trend Monitoring

Status and trend monitoring of habitat condition is coupled with adult and juvenile monitoring to allow the agencies to assess fish survival and habitat productivity improvements expected from All-H FCRPS and recovery actions. By December, 2011, the Action Agencies will expand habitat status and trend monitoring (for at least one population or watershed per MPG) and support updated modeling of the expected benefits of habitat actions. By December, 2011, the Action Agencies will also ensure monitoring of appropriate metrics across a diversity of ecological regions and habitat types to assess responses to climate change.

E. Intensively Monitored Watersheds

An IMW is a formal cause and effect experiment designed to clarify the connections between restoration actions and the fresh-water survival of salmonids. The findings from the IMWs will inform the future selection of the type, location, and intensity of restoration actions to achieve improvements required by the RPA or to efficiently implement rapid responses to significant declines. IMWs also provide data for the detection of various climate change impacts including tributary temperatures, flows, and the presence or severity of diseases and pathogen or parasite outbreaks.

The Action Agencies are implementing IMWs under RPA Actions 56 and 57 for fish status monitoring and habitat effectiveness monitoring in the John Day, Wenatchee, Entiat, Methow, Lemhi, and South Fork Salmon basins. NOAA Fisheries funds five additional or complementary IMWs in interior subbasins in Idaho (Upper Potlach River, Lemhi River); Oregon (Upper Middle Fork John Day River); and Washington (Yakima River, Asotin Creek). The Action Agencies' IMWs have been through independent science evaluation and review by the NPCC. Under the RPA provisions, enhancements to these efforts are already planned or underway.

As part of an enhanced commitment to IMWs, by September, 2010, NOAA Fisheries and the Action Agencies will complete an analysis of existing IMWs to ensure:

- Timely funding and implementation of intensive habitat actions to ensure, where practical, an adequate treatment effect

- Sufficiently diverse representation of IMWs (geographically and with respect to limiting factors) and appropriate monitoring (e.g., temperature, flow) to detect climate change impacts
- Results are applicable to future habitat planning and for the implementation of Rapid Response Actions

This review will inform the prioritization of BPA placeholder funds budgeted for IMWs, as well as the allocation of new or re-focused NOAA Fisheries funds (e.g., distributed through the Pacific Coastal Salmon Recovery Fund). IMW updates will go through an independent science review process and review by the NPCC. Results will be coordinated with the RIOG and reported annually to the region.

F. Climate Change Monitoring & Evaluation

The Administration's review recognized the importance of detecting and tracking climate change and its effects on listed species. RPA Action 2 requires the inclusion of new climate change research findings in the Action Agencies' annual progress reports. NOAA Fisheries will annually provide the Action Agencies with a literature review relevant to the implementation of the RPA. Climate change impacts will also be assessed through life-cycle modeling described above in Section III.A. The RPA includes the following additional requirements:

- **Habitat and Ocean Conditions:** Consistent with RPA Actions 56-61, data on habitat conditions and action effectiveness will be collected during ongoing and enhanced tributary habitat and ocean research. While not an explicit requirement of the RPA, by December 2011, the Action Agencies and NOAA Fisheries will ensure that this information is appropriately managed in a database allowing changes to be tracked over time.
- **Habitat Project Priorities:** Under RPA Actions 35 and 37, the Action Agencies will use the new climate change information to guide tributary and estuary habitat project selection and prioritization and other aspects of adaptive management.
- **Forecasting and Modeling:** Under RPA Action 7, the Action Agencies investigate the impacts of possible climate change scenarios on listed salmon and steelhead. As part of this effort, the Action Agencies will use new climate change information to improve regional hydrological models. In addition, the Action Agencies will review existing forecasting tools. As new procedures and techniques are identified with significant potential to reduce forecast error and improve forecast reliability, the Action Agencies will review these with the RIOG and other interested parties.

Enhanced monitoring of adult status and trends, juvenile status and trends, habitat condition status and trend and IMWs (flows and temperature) will contribute to climate change assessments. Climate change information will be discussed with the RIOG and reported to the region annually.

IV. Contingency Plans In Case of Early Warning or Significant Fish Declines

As part of this more precautionary approach to implementation of the RPA, the AMIP includes a new biological trigger, which if tripped, will activate a Rapid Response (within 1-12 months) and, if warranted, long-term responses (contingency actions) to address Significant Declines in the abundance of naturally produced salmon and steelhead. The AMIP also includes a biological indicator,³ which if observed, will activate an evaluation of the species' likely status and a determination of whether and what Rapid Response Actions to take. Figure 2 (Adaptive Management Implementation Plan and Contingency Process) illustrates the process that the federal agencies will use if there is a Significant Decline in salmon status as determined by the biological trigger or Early Warning Indicator, as defined in this AMIP. The details of the expanded contingency process and actions are more fully explained below.

Guide to Figure 2:

Adaptive Management Implementation Plan & Contingency Process

In Figure 2, elements in blue represent 2007 BA / 2008 BiOp actions. Elements in yellow represent further refinements of these contingency processes.

Box 1: RM&E is an essential component of the adaptive management provisions in the 2008 BiOp. RM&E will inform the development of Rapid Response and Long-Term Contingency Plans and enhance our scientific understanding for future decision-making. RM&E will also include the development of a life-cycle model for assessing the likely effectiveness of alternative Rapid Response and Long-term Contingency Actions.

Boxes 2, 3 & 4: Rapid Response Actions and Long-term Contingency Actions will be developed to ensure that the Action Agencies and NOAA Fisheries can rapidly implement effective actions if needed (after triggers are tripped or indicators are observed). Ongoing evaluations of productivity, biological and environmental metrics, and performance standards will provide essential information for assessing triggers, indicators, and the effectiveness of alternative Rapid Response and Long-term Contingency Actions.

Boxes 5, 6, 7, & 8: Indicators would result in closer evaluation of species' status and preparation for Rapid Response Action implementation; triggers would result in implementation of Rapid Response Actions.

Box 9, 10, and 11: If the Rapid Response Actions are likely insufficient, then the Action Agencies and NOAA Fisheries begin an All-H diagnosis process (including a life-cycle analysis) and determine whether and what Long-term Contingency Actions to implement.

³ Biological indicators and triggers are based on fish status.

A. Expanded Contingency Process

The adaptive management provisions in the 2007 BA and 2008 RPA establish contingency planning if fish abundance and productivity are decreasing at the time of the 2013 and 2016 Comprehensive Evaluations (RPA Action 3). As described in the 2007 FCRPS BA, decreasing abundance in 30% to 50% of a species' populations (as indicated by evaluations of recruits per spawner (R/S), lambda, and other productivity, biological, and environmental metrics), would initiate an All-H diagnosis to determine the limiting factors. Based on its review, the Administration has decided to take a more precautionary approach for implementing the RPA by enhancing the contingency planning processes to provide additional early warning indicators and significant decline triggers. This enhancement ensures that contingency planning can occur throughout the ten-year term of the 2008 BiOp and RPA, and at the earliest possible juncture after a problem is discovered.

A summary of the new indicator and trigger follows and is depicted in Appendix 4, Table 1. Additional information with respect to the use of the indicator and trigger in decision-making by the federal agencies is provided below. Additional details regarding the development of the Early Warning Indicator and Significant Decline Trigger and the abundance of the species in relation to the indicator and trigger are included in Appendix 4.⁴

Specifically, for Chinook salmon and steelhead species, NOAA Fisheries will annually evaluate:

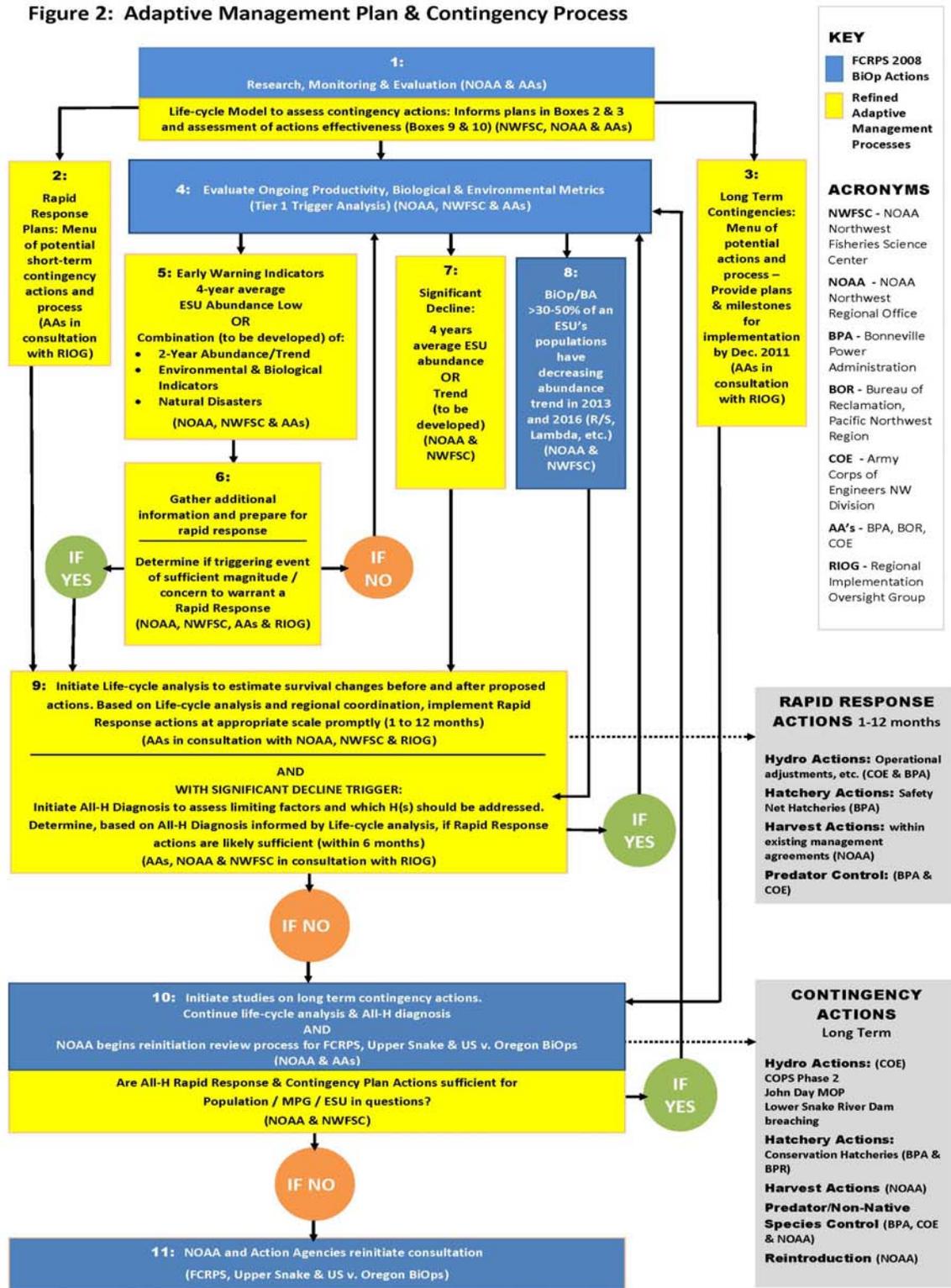
- An Early Warning Indicator (a running four-year mean of adult abundance falling below a 20% likelihood of occurrence), which results in an assessment of whether a future Significant Decline is likely to occur in the next one to two years and if so, which Rapid Response Actions should be readied for possible implementation.
- A Significant Decline Trigger (a running four-year mean of adult abundance falling below a 10% likelihood of occurrence), which, if tripped, results in implementation of Rapid Response Actions.

⁴ Note: The Administration, based on its review of the 2008 BiOp and SCA, does not believe that a Significant Decline is an expected outcome. Indeed, implementation of the RPA actions should increase the average abundance of each species over time. However, the inclusion of this biological trigger provides additional assurances that the BiOp RPA is implemented in a more precautionary fashion for the benefit of the ESA-listed species.

Table 1. Summary of expanded contingency triggers.

	Early Warning Indicator	Significant Decline Trigger
Response	Closer scrutiny of available scientific information (jack counts, ocean ecosystem indicators, habitat disturbances) to assess if Significant Decline is likely. If so, consider and prepare for Rapid Response Actions--	Implement Rapid Response Actions as indicated by the life-cycle analysis
Interim Trigger	4-year running average falls below 20% of recent historical observations	4-Year running average represents falls below 10% of recent historical observations of adult salmon abundance
Additional Components of Triggers To Be Developed in 2010	Potentially add components for two years of adult return information, preliminary biological information and environmental indicators, or known environmental disasters	Potentially add trend component
Future Juvenile Triggers	Evaluate development and feasibility of a juvenile salmon status trigger, once RM&E is sufficient to support a juvenile trigger	Evaluate development and feasibility of a juvenile salmon status trigger, once RM&E is sufficient to support a juvenile trigger

Figure 2: Adaptive Management Plan & Contingency Process



1. Early Warning Indicator for Chinook Salmon & Steelhead

The purpose of the Early Warning Indicator is to alert NOAA Fisheries and the Action Agencies to a decline in a species' natural adult abundance level that warrants further scrutiny because it indicates that a Significant Decline (described below) in numbers of natural-origin adults may be reached in one to two years. The indicator will be evaluated annually, along with other predictors of future condition (e.g., jack counts, ocean ecosystem indicators, habitat disturbances) to determine whether the Significant Decline Trigger is likely to occur. The indicator for any particular species will be when the running four-year mean of adult abundance falls below a 20% likelihood of occurrence based on historical data (the Significant Decline Trigger has a 10% likelihood of occurrence). Preliminary abundance levels for each species that if observed, would result in an Early Warning Indicator are included in Table 1 of Appendix 4.⁵ The base period that will be used for each species is set out in Figures 1 and 2 of Appendix 4.

Within 120 days of NOAA Fisheries' determining that the Early Warning Indicator abundance levels have been observed, the Action Agencies, in coordination with NOAA Fisheries, the RIOG, and other regional parties will more closely evaluate the species' likely status and determine whether and what Rapid Response Actions (i.e., actions that minimize or mitigate for the decline) to take. After the Early Warning Indicator has been observed and the early implementation of Rapid Response Actions has been deemed warranted, the Rapid Response Actions will be implemented as soon as practicable and not later than 12 months.

The Action Agencies and NOAA Fisheries will develop, in coordination with the RIOG, at least one additional Early Warning Indicator by December, 2010, which may be revised pending additional analyses and discussion. Specifically, the additional Early Warning Indicator(s) would evaluate whether a species is likely to have substantially reduced abundance (and productivity) in the future based on two years of adult return information, preliminary biological information, and environmental indicators or known environmental disasters. These indicators may include, but are not limited to, low jack counts or numbers of juvenile outmigrants (biological), indicators of ocean conditions predicting very low abundance of adult returns for recent outmigrants (environmental indicators), or wide-spread forest fires, increased distribution and virulence of pathogens, new invasive species, prolonged severe droughts, etc. (environmental disasters). Unlike the interim Early Warning Indicators, which evaluates information at the species level, the additional Early Warning Indicators may use information more representative of effects on major population groups (MPGs), important management units (e.g., A-run vs. B-run Snake River steelhead, or key populations). Responses to impacts affecting a specific MPG or subset of populations would be tailored to the appropriate scale.

⁵ It is likely that during the early course of the 2008 BiOp, a species may exceed the Early Warning Indicator. This is not a function of the BiOp's conclusions, but rather the effect of variability in adult returns, the lag effect of some of the benefits of the RPA, and setting this indicator at a sufficiently high level so as to be sensitive to moderate trends or declines.

Additional Early Warning Indicators will conform to the level of risk (i.e., < 20% likelihood of occurrence) used for the interim abundance metric.

2. Significant Decline Trigger for Chinook Salmon & Steelhead⁶

The purpose of the Significant Decline Trigger is to check each year for a significant decline in the natural abundance of species.⁷ A significant decline is judged to occur when the running four-year mean of natural-origin adult abundance falls below a 10% likelihood of occurrence based on historical data (generally since 1978-80 and ending with the most recent year available,⁸ depending on species). The principle underlying the Significant Decline trigger is that the observed condition would be a significant deviation from the biological expectations in the 2008 BiOp. If it were to persist despite the AMIP's short and long-term contingency actions, it could call into question the BiOp's No Jeopardy conclusion for one or more species, resulting in the reinitiation of consultation. Specific abundance levels for each species that result in a Significant Decline trigger being tripped are included in Table 1 of Appendix 4. The base period that will be used for each species is set out in Figures 1 and 2 of Appendix 4.

Within 90 days of NOAA Fisheries' determining that the Significant Decline Trigger has been tripped, the Action Agencies, in coordination with NOAA Fisheries, the RIOG, and other regional parties will determine what Rapid Response Actions (i.e., actions that minimize or mitigate for the decline) they will take. Once the Significant Decline Trigger is tripped, the responsive actions would be implemented as soon as practicable after a decision is made, and not later than 12 months after the trigger has been tripped.

The Action Agencies and NOAA Fisheries, in coordination with the RIOG, will further improve the Significant Decline Trigger no later than December 2010 by incorporating a metric indicative of trend. Appendix 4 includes an example of a possible approach for a trigger based on trends in abundance.

⁶ See following section regarding Snake River sockeye salmon and footnote 8 regarding Mid-Columbia River steelhead.

⁷ Species-level (i.e., ESU or DPS) adult abundance information is the most readily available information at present. Future refinements of the Significant Decline trigger could potentially be extended to consider MPGs, important management units (i.e., A-run vs B-run Snake River steelhead, or key populations).

⁸ Species-level (i.e., ESU or DPS) adult abundance information is the most readily available information at present - excepting Mid-Columbia steelhead for which the Yakima River MPG data is most readily available. Mid-Columbia River steelhead populations pass one to four mainstem dams and cannot be distinguished at those dams from other listed species traveling further upstream. Prosser Dam is an adult counting site on the Yakima River that does provide a census of adults in this MPG. The Yakima River MPG is a single MPG and may or may not be representative of the DPS as a whole; therefore this trigger will initiate a rapid review to determine whether the problem is limited to the MPG or represents a DPS-wide decline. In addition to the Yakima River MPG, it may be possible to develop MPG level indices for other MPGs in the relatively near future.

The Action Agencies and NOAA Fisheries also will evaluate the potential development of a future Significant Decline Trigger based on information for juvenile salmon and steelhead. This is a longer term task because additional monitoring will be necessary to gather the data to support a juvenile trigger.⁹ The process for developing this trigger, as well as its accompanying steps, is described in Appendix 4. Additional Significant Decline Triggers will conform to the level of risk (i.e., < 10% likelihood of occurrence) used for the interim abundance metric.

Concurrent with the initiation of efforts to determine what Rapid Response Actions will be taken, the Action Agencies will initiate an All-H Diagnosis informed by life-cycle modeling of potential Long-term Contingency Actions. Within four to six months after the Significant Decline Trigger is tripped, the Action Agencies (in coordination with NOAA Fisheries, the RIOG, and other regional parties) will complete this analysis and determine if the Rapid Response Action(s) are likely to be sufficient, or if Long-term Contingency Actions will need to be implemented, and if so, which Long-term Contingency Actions are appropriate for implementation. Rapid Response and Long-term Contingency Actions will be reviewed periodically to determine whether the actions continues to be necessary and if so, whether alternative actions might be more beneficial. The federal agencies expect that the planning and implementation of several of the potential Long-term Contingency Actions (Section IV.C) will require coordination with the agencies' leadership in Washington, D.C. If needed, the Long-term Contingency Actions will then be implemented as soon as practicable.

3. Contingency Plan Implementation for Snake River Sockeye Salmon

The Administration does not propose any triggers for Snake River sockeye salmon at this time. This species, after falling to extremely low levels in the early 1990s, is effectively managed under ongoing contingency actions. The contingency actions include continuation of the safety-net hatchery program; further expansion of the sockeye program (up to 1 million fish released as smolts); investigation of the feasibility of transporting adults from Lower Granite Dam to Sawtooth Valley lakes or artificial production facilities and investigation of the highly variable juvenile mortality rates between Sawtooth Valley and Lower Granite Dam.

B. Rapid Response Actions (Implementation promptly after Significant Decline Trigger is tripped)

Rapid Response Actions for prompt implementation after a trigger has been tripped have been developed by the Action Agencies, NOAA Fisheries, and U.S. Fish and Wildlife Service (USFWS), collectively, the federal agencies within their respective authorities. The Rapid

⁹ NOAA Fisheries has not had sufficient time to gather and assess the availability, accuracy, and applicability of the currently available estimates of smolt abundance (primarily from tribal and state monitoring efforts). Using an exceedence approach, as has been adopted for adult abundance estimates, at least 10 years of data would be necessary. In 2010, NOAA Fisheries and the Action Agencies will assess this information as part of their effort to develop a longer-term Significant Decline Trigger.

Responses Actions below are a menu of short-term contingency actions and a decision-making process for implementing these actions. Within 90 days of NOAA Fisheries determining that a significant decline trigger has been tripped, the Action Agencies, in coordination with NOAA Fisheries and the RIOG, will assess alternative Rapid Response Actions and determine which action(s) will be implemented. The Rapid Response Actions will be implemented as soon as practicable after a decision is made, and not later than 12 months after a Significant Decline Trigger is tripped. Most, if not all, Rapid Response Actions will be temporary in nature.

The Rapid Response Actions have been identified for their potential to immediately improve fish survival. The needed regulatory process for their implementation is largely in place. Therefore, these are actions that could be implemented relatively quickly (within 1-12 months) and provide immediate survival benefits, if the evaluations of productivity, biological, and environmental metrics in Figure 2, Box 6 indicate that triggers have been tripped. Boxes 6, 7 & 8 indicate potential triggering circumstances. The Rapid Response Actions will be held ready to be implemented, if necessary.

The following are the identified Rapid Response Actions. Each of these actions is discussed in greater detail in Appendix 5. In addition, by December 2011, the Action Agencies and NOAA Fisheries will develop a Rapid Response Plan, which will include a detailed description of these potential Rapid Response Actions together with implementation milestones:

- 1. Hydro Actions:** The Corps will implement, in coordination with NOAA Fisheries and the other Action Agencies, hydrosystem actions that will increase the survival of the species in question beyond the current juvenile dam passage performance standards. Specific actions will be based on the most recent data available and might include targeted spill and changes in fish transportation operations based on recent survival data. The federal agencies, in collaboration with the RIOG and appropriate technical groups, will review the current status of biological research and discuss where additional project survival benefits could be gained for the species in question.
- 2. Predator Control:** BPA and the Corps, in conjunction with the USFWS and the States, will implement more aggressive, targeted efforts to control predatory fish, birds, and invasive species to increase survival of listed fish. This will include a temporary increase in the pikeminnow sport fishery reward program and increased hazing of birds in close proximity to the dams.
- 3. Harvest:** All fisheries that affect the species of concern, including ocean, mainstem, and terminal will be reviewed by NOAA Fisheries to assess whether existing harvest management agreements provide adequate protection. Under the *United States v. Oregon* agreement, if the performance measure of any indicator stock declines for three consecutive years when

compared to the base period,¹⁰ any party may request that an analysis of the decline is conducted. The analysis must be completed within one year. After review of the analysis, the parties may make recommendations to modify the agreement. If it is determined that additional protection is necessary, NOAA Fisheries will use existing procedural provisions of the agreements to seek consensus among the parties to modify the agreements.

- 4. Safety-Net Hatchery Programs:** BPA and NOAA Fisheries use safety-net hatchery programs to address short-term extinction risk. By December 2011, the federal agencies will consult with the RIOG and identify opportunities and further processes to implement safety-net programs that could be used for each interior species. BPA is the primary agency for safety-net hatchery program implementation. Such actions may require additional approvals and NEPA reviews. The goal is to establish safety-net programs within one year at existing hatchery facilities where only minor facility modifications are needed.

C. Long-term Contingency Actions (Greater than One Year to Implement)

Potential Long-term Contingency Actions have been identified by the federal agencies. These will be evaluated for implementation in coordination with the RIOG following an All-H Diagnosis and life-cycle modeling (Figure 2, Box 9).

As noted above, within four to six months of a Significant Decline trigger being tripped, the Action Agencies (in coordination with NOAA Fisheries, the RIOG and other regional parties) will conduct an All-H Diagnosis and life-cycle model analysis to determine if the Rapid Response Action(s) are likely to be sufficient or if Long-term Contingency Actions will need to be implemented, and if so, what Long-term Contingency Actions are appropriate for implementation. If necessary, the Long-term Contingency Actions will then be implemented as soon as practicable thereafter. Unlike the Rapid Response Actions, all of which have been determined to be implementable within 1-12 months of a triggering event, each Long-Term Contingency Action has a unique timeline for implementation depending on its complexity.

In the selection of Long-term Contingency Actions for a particular species, emphasis will be on actions that would significantly improve the survival of the fish experiencing the significant decline. Implementation of Long-term Contingency Actions will likely require negotiations to modify existing agreements, regulatory compliance (e.g., permits), and administrative planning (environmental review, seeking additional authorities, etc.).

The following have been identified as potential Long-term Contingency Actions. In addition, by December 2011, the Action Agencies and NOAA Fisheries will develop a Long Term Contingency Plan, which will include a detailed description of potential Long-term Contingency Actions, a selection process and implementation milestones:

¹⁰ The “base period” of 1988 to 2007 is used to represent the status of the stocks before the completion of the agreement.

1. **Phase II Hydro Actions:** The Corps, in coordination with NOAA Fisheries and the other action agencies will identify and implement additional hydro system actions beyond those needed to meet the current juvenile dam passage performance standards. These are Phase II actions in the Configuration and Operational Plans (COPs), which are collaboratively developed, science-based plans that identify additional dam improvements needed to achieve the performance standards identified in the RPA. Based on the All-H diagnosis, and life-cycle analysis, these actions may be implemented regardless of whether the RPA's dam passage performance standards are being met. RPA Actions 18- 25 identified project COP completion dates.
2. **Reintroduction:** This action will re-establish salmon populations (excluding areas upstream of the Hells Canyon Complex and Chief Joseph Dam) that are functionally extirpated to increase the diversity and abundance of an ESU. These actions will be drawn from the results of the reintroduction review being conducted by NOAA Fisheries (Section II.B) and will be implemented in coordination with the states and tribes.
3. **Predator Control:** These actions to control predatory fish and birds and invasive species are in addition to those described in the RPA or other sections of this AMIP. The Corps and BPA are working with NOAA Fisheries and USFWS to accelerate administrative processes to control Caspian terns and double-crested cormorants and predatory fish. Accelerated efforts to provide baseline information on predators, described in Section II of this AMIP, will support contingency predator control actions. Information will be available to support implementation by 2012.
4. **Harvest:** NOAA Fisheries will use the existing *United States v. Oregon* process to seek modifications to reduce take or add contingency provisions for listed species and populations of concern. NOAA Fisheries will also begin a re-initiation review process of existing harvest agreements (Figure 2, Box 10).
5. **Conservation Hatcheries:** The federal agencies will work with hatchery operators to convert safety-net programs to longer-term conservation hatchery programs where appropriate. The goal of conservation programs is to help rebuild existing populations through supplementation with hatchery fish, or to provide hatchery fish for reintroduction efforts where the benefits outweigh risks. Implementing conservation hatchery programs may require design and construction of new adult holding, spawning, incubation, and juvenile rearing facilities, as well as weirs, adult traps, and juvenile acclimation ponds.

BPA is the lead agency for converting FCRPS safety-net hatchery programs to conservation programs. The estimated timeframe for such actions would range from one year, if only a minor modification was required, to three to four years for major construction projects costing over \$1 million, which would also require Congressional approval.

6. **Hatchery Reform:** Uncertainties exist concerning hatchery effects on wild salmon. One of the most important of these is the ecological interactions that occur between hatchery and wild fish in the mainstem, estuary, and ocean environments. As an example, the potential effect of total hatchery production on wild fish is unknown at this time. These effects could be either positive or negative, depending on what factors limit wild fish survival. In addition to the reforms being implemented at individual programs [RPAs 39-42], Columbia River Basin hatchery production is currently being evaluated to determine whether releases have density dependent impacts on listed species. Large scale experiments will be considered that could produce significant new information, but the design and implementation of such experiments will involve considerable collaboration and require approval of legal settlements such as *United States v. Oregon*. In the event that long-term contingency actions are triggered, the evaluation of hatchery production and its effects on listed species will be accelerated to determine whether alternative operational strategies should be implemented.

Hatchery reform actions will also include modified hatchery operations and release strategies to reduce mixed stock harvest problems. Processes are now underway to encourage and implement actions which reduce hatchery impacts to listed species. Within the existing management structure, NOAA Fisheries and the state and tribes will consider adjusting the future size, location and type of hatchery releases to provide harvest opportunities while providing adequate protection for listed species. Future hatchery consultations will include contingency plans and actions as part of their adaptive management provisions.

7. **John Day Reservoir Operations at Minimum Operating Pool (MOP) from April through June:** By December 2011, the Corps, in coordination with the other federal agencies, will complete study plans to include milestones, scope and schedule as well as a decision making process appropriate. Implementation of this operation will require the Corps to conduct an evaluation and prepare National Environmental Policy Act (NEPA) documentation, which are necessary to seek authority from Congress to mitigate for related impacts. Currently the Corps does not have authority to mitigate for related impacts, such as those identified in previous studies affecting irrigation, municipal water supplies, hatchery water supplies, anadromous and resident fish habitat, wildlife habitat, recreation sites, cultural resource sites, and adult passage facilities.

8. **Breaching Lower Snake River Dams:** One Long-term Contingency Action in the event there is a significant decline in the status of a Snake River species,¹¹ is a science driven study of breaching one or more of the lower Snake River dams. This is considered a

¹¹ The Administration does not propose any triggers for Snake River sockeye salmon at this time. This species, after falling to extremely low levels in the early 1990s, is effectively managed under ongoing contingency actions. at the present time. The contingency actions include continuation of the safety net hatchery program; further expansion of the sockeye program (up to 1 million fish released as smolts), investigation of the feasibility of transporting adults from Lower Granite Dam to Sawtooth Valley lakes or artificial production facilities; and investigation of highly variable juvenile mortality rates between Stanley Basin and Lower Granite Dam.

contingency of last resort and would be recommended to Congress only when the best scientific information available indicates dam breaching would be effective and is necessary to avoid jeopardizing the continued existence of the affected Snake River species, taking into account the short-term and long-term impacts of such action. Additionally, a study of lower Snake River dam breaching will also have to consider the federal government's Treaty and Trust responsibilities to Indian Tribes, and compliance with other statutory and regulatory requirements.

It is reasonable to study breaching of lower Snake River dam(s) as a contingency of last resort because the status of the Snake River species is improving and the 2008 BiOp analysis concluded that breaching is not necessary to avoid jeopardy. In addition, breaching lower Snake River dams would have significant effects on local communities, the broader region and the environment. It would require a major investment of resources and time. Therefore, any decision to seek the requisite congressional authority must be driven by the "best available scientific information."

The Action Agencies and NOAA Fisheries are including the study of lower Snake River dam breaching as a potential Long-term Contingency Action if the scientific information indicates it is warranted. As noted above, the best available science does not support moving forward with breaching lower Snake River dams at this time. Additionally, the Administration's review of the 2008 BiOp noted uncertainty about the short-term negative biological effects of lower Snake River dam breaching (e.g., construction, sediment, contaminants) that may compromise the estimated long-term benefits. This and other uncertainties would need to be better understood if a biological trigger is tripped for a Snake River species.

The federal agencies also recognize that there may be conditions, such as global climate change and its effects on regional climate conditions and potential effects on the life cycle of salmon that are not yet well understood. To address conditions that may occur in the future, the Action Agencies and NOAA Fisheries believe including the study of lower Snake River dam breaching as a potential Long-term Contingency Action, if a biological trigger is tripped, is consistent with the precautionary approach adopted in this AMIP.

The Action Agencies and NOAA Fisheries will take the following actions:

- 1) By March 2010, the Corps in coordination with NOAA Fisheries and the other Action Agencies will complete a "Study Plan" for breaching of lower Snake River dams. The Study Plan will detail the scope, schedule and budget to conduct and complete technical studies and decision-making process, including the following:
 - Aquatic ecosystem effects (e.g., resident fish, biological analysis of anadromous fish using results from life-cycle model analyses, potential changes in hatchery and habitat programs, and other additional relevant technical evaluations)

- Socio-economic effects (e.g., hydropower replacement, navigation, recreation, etc.)
 - Other environmental effects (sediment, water quality, air quality, etc.)
 - Additional engineering analyses (e.g., rock source explorations for rip-rap, and additional modeling of the by-pass channel)
- 2) By December 2012, NOAA Fisheries, in coordination with the Action Agencies will develop the component of the life-cycle model (Section III.A, “Enhanced Life-cycle Monitoring for Evaluation of Contingencies”) for evaluation of the short-term, transitional and long-term biological effects of dam breaching. This model will use existing and new data collected through the enhanced research, monitoring and evaluation described in the AMIP.
- 3) As discussed in Section IV.C, if the Significant Decline biological trigger is tripped for a Snake River species, dam breaching technical studies identified in the Study Plan would be initiated by the Corps if one of these three conditions applies: (a) an All-H analysis, including life-cycle modeling results,¹² identifies lower Snake River dam breaching as necessary to address and alleviate the biological trigger conditions for the applicable Snake River species; (b) the analysis is sufficiently inconclusive to identify what actions are necessary to address and alleviate the biological trigger conditions for the applicable Snake River species; or (c) the analysis is not completed within six months of the biological trigger being tripped, with a completion goal of four months.

The technical studies, including appropriate independent technical review, would be completed by the Corps in two years if one of these three conditions is met. The information from these studies, along with the results of the life-cycle modeling, would be used by the Administration (through the Salmon Policy Team) to make a decision whether the Corps should move forward with an overall evaluation study and NEPA documentation. If it is decided to proceed with this overall evaluation study/NEPA documentation, they would be initiated within two years after the initiation of the technical studies. This overall evaluation study/NEPA documentation would be used for the public decision making process to determine whether to seek congressional authority to undertake dam breaching, and it is estimated that this overall evaluation study/NEPA documentation (including the public decision making process) would take from two to three years to complete.

¹² The goal is to have the All-H diagnosis, informed by the life-cycle modeling, identify what factors in the life cycle of the Snake River species are limiting survival improvements and develop potential actions that would address those limiting factors.

- 4) If, after the Corps has initiated the technical studies, an All-H Diagnosis is completed that concludes that lower Snake River dam breaching is not necessary to address and alleviate the biological trigger conditions for the applicable Snake River species, the Corps with the concurrence of NOAA Fisheries and the other Action Agencies, may terminate the technical studies at that time.

V. Regional Collaboration, Reporting & Science Review

The 2008 RPA adopted a collaborative process with regional policy makers and scientists to reinforce the best available information throughout its implementation. NOAA and the NWFSC will provide the latest information on global climate change and its impacts on the region. Upon request, the NWFSC and ISAB will brief the RIOG teams on various scientific topics, as occurred during the Remand Collaboration. The RIOG teams, made up of federal, state and tribal scientists, will assess RM&E results, review climate change information and recommend adaptive management actions to the federal agencies and RIOG senior policy team.

Each fall, the Action Agencies will prepare and discuss annual progress reports with the RIOG, including progress on specific performance standards and targets and progress on implementation of the RPA. The NWFSC will assist NOAA in its reviews of the Progress Report. The RPA requires, in 2013 and 2016, the Actions Agencies complete a Comprehensive Evaluation and prepare a report which will be reviewed by the NWFSC and RIOG.

Following this collaboration on adaptive management, implementation plans will be developed through the respective RIOG technical and policy teams. Independent scientific review is incorporated into the selection process for tributary and estuary habitat projects, as described in Appendix 1, Section 1. Hydro related activities such as the annual water management plan, the fish passage plans, and the Anadromous Fish Evaluation Program (AFEP) will be developed collaboratively with regional and scientific input through the appropriate RIOG technical committees. These plans will all be available to the public at www.salmonrecovery.gov.

VI. Federal Agency Decision-making & Issue Resolution Process

Decisions about the development and implementation of the Significant Decline Trigger and Early Warning Indicator are ultimately the responsibility of NOAA Fisheries. Decisions regarding the implementation of Rapid Response and Long-term Contingency Actions are the responsibility of the Action Agencies. However, the federal agencies will endeavor to continue to use collaboration with regional sovereigns and stakeholders to address issues before any decisions are made and to work collaboratively within the federal agencies to assure decision-making is coordinated. Where there are disputes between the federal agencies that are not resolved regionally, or as in the case of lower Snake River dam breaching where significant national issues are at stake, issues will be elevated to the Administration and resolved at the appropriate level.

The Action Agencies and NOAA Fisheries will commit the resources necessary to achieve milestones described in the AMIP, subject to annual congressional appropriations. However, if funding issues or other circumstances arise (e.g., regional coordination or scientific review delays) that either change the assumptions under which the milestones were created or new scientific data indicates different goals and milestones are more appropriate, changes in the AMIP will be the product of a transparent “change management” process. As described in the 2007 BA and adopted in the 2008 RPA, an agency that desires a change in a milestone will provide to NOAA Fisheries, and coordinate with the RIOG, the rationale and supporting documentation for the proposed modification in advance to making the change. Once coordinated through this process, which may be elevated to the Administration, changes will be reported in the Annual Progress Report.

VII. Conclusion

The Administration completed a comprehensive review of the 2008 BiOp and RPA in the context of the Court's guidance. As a result of that review, the Administration developed the AMIP to ensure that "on-the-shelf" actions are available if the ESA-listed species do not respond as predicted in the BiOp, which provides the robust contingency plan the Court was seeking.

As implemented through the AMIP, the BiOp and its RPA are biologically and legally sound, based on the best available scientific information, and satisfy the ESA jeopardy standard, that is, the effects of the operation of the FCRPS are neither likely to jeopardize the continued existence of the listed species (i.e., combined with the effects of the environmental baseline and cumulative effects, the species are expected to survive with an adequate potential for recovery) nor destroy or adversely modify designated critical habitat.