

Fish and Wildlife Management Questions and RM&E Strategies

Key Management Questions

1. *Are we meeting biological and programmatic performance objectives established within the Columbia Basin Fish and Wildlife Program, FCRPS BiOp and ESA Recovery Plans?*
2. *Where objectives are not being met, what factors are limiting our ability to achieve performance standards or objectives?*
3. *What is the effectiveness of different hydro and offsite mitigation actions in addressing factors limiting achievement of performance standards and objectives?*
4. *Is research and monitoring information accessible to the region and compatible with regional standards and protocols for monitoring, data collection and access?*
5. *Are actions being implemented and accomplished as proposed?*

Strategic Category: Fish Population Status Monitoring

The following are the primary management questions with respect to the status of fish populations.

- What are the abundance, productivity, and spatial distribution of key fish populations affected by the FCRPS and other hydro projects?
- What is the proportion of spawners within ESA-listed salmonid populations that are of hatchery origin?

The following strategies are focused on providing information needed to answer these questions in support of planning, implementation, and adaptive management.

Strategy: *Monitor the status and trend of anadromous and resident fish populations relative to Program or Provincial level biological objectives.*

Strategy: *Develop regional fish population monitoring approaches with common data collection and data management protocols as part of collaborative cost-sharing and coordination with other regional monitoring programs and non-hydro agency responsibilities.*

Strategic Category: Hydro RM&E

The following are the primary management questions with respect to FCRPS hydrosystem fish passage strategies.

- Are salmon and steelhead meeting juvenile and adult hydrosystem passage performance objectives?
- What are the most effective configurations and operations for achieving desired performance objectives in the FCRPS?
- What is the post-Bonneville mortality effect of changes in fish arrival timing and transportation to below Bonneville?
- Under what conditions does in-river passage provide greater smolt-to-adult return (SAR) rates than transport?

The following strategies are focused on providing information needed to answer these questions in support of planning, implementation, and adaptive management.

***Strategy:** Monitor and evaluate fish performance within the hydro electric corridor relative to biological objectives.*

***Strategy:** Monitor and evaluate migration characteristics and river conditions relative to environmental and physical performance objectives.*

***Strategy:** Monitor and evaluate the effects of changes in hydro system configurations and operations.*

***Strategy:** Assess and investigate as appropriate critical uncertainties related to the scientific relationships that determine the survival and condition of fish passing thru or transported around the hydro system.*

Strategic Category: Tributary Habitat RM&E

Management Questions: The following are the primary management questions with respect to tributary habitat offsite mitigation strategies.

- Are tributary habitat actions achieving the expected biological and environmental performance objectives?

- What are the tributary habitat limiting factors or threats preventing the achievement of desired tributary habitat performance objectives?
- What are the relationships between tributary habitat actions and fish survival or productivity increases, and what actions are most effective?

The following strategies are focused on providing information needed to answer these questions in support of planning, implementation, and adaptive management.

Strategy: *Monitor and evaluate tributary habitat conditions that may be limiting achievement of biological performance objectives.*

Strategy: *Evaluate the effectiveness of tributary habitat actions relative to environmental, physical, or biological performance objectives.*

Strategic Category: Estuary and Ocean RM&E

The following are the primary management questions with respect to Estuary Habitat mitigation strategies.

- Are aquatic, riparian, and upland estuary habitat actions achieving the expected environmental, physical or biological performance objectives?
- What are the limiting factors or threats in the estuary/ocean preventing the achievement of desired estuary habitat performance objectives?
- What are the relationships between estuary habitat actions and fish survival or productivity increases, and what actions are most effective?

The following strategies are focused on providing information needed to answer these questions in support of planning, implementation, and adaptive management.

Strategy: *Monitor and evaluate fish performance in the estuary and plume relative to environmental, physical, or biological performance objectives.*

Strategy: *Monitor and evaluate estuary/ocean migration and habitat conditions that may be limiting achievement of biological performance objectives.*

Strategy: *Evaluate the effectiveness of habitat actions in the estuary relative to environmental, physical, or biological performance objectives.*

Strategy: Assess and investigate as appropriate critical uncertainties related to the scientific relationships that determine the survival and condition of fish residing and/or migrating through the estuary and ocean.

Strategic Category: Harvest RM&E

The following are the primary management questions related to FCRPS-sponsored harvest management strategies.

- What is the effect of acquiring more accurate and precise in-river harvest estimates on the resultant estimates of straying and adult passage survival?
- Can selective fisheries targeting hatchery fish or healthy populations reduce impacts on ESA-listed populations?

The following strategy is focused on providing information needed to answer these questions in support of planning, implementation, and adaptive management.

Strategy: Assess and investigate as appropriate critical uncertainties related to harvest estimates and harvest management practices.

Strategic Category: Hatchery RM&E

The following are the primary management questions with respect to hatchery strategies.

- Are hatchery improvement programs and actions achieving the expected biological performance objectives?
- What is the proportion and origin of hatchery fish within naturally spawning salmon and steelhead populations?
- What deleterious effects does artificial production have on natural populations of anadromous fish?
- How can hatchery reforms reduce the deleterious effects of artificial production on listed populations?
- Can properly designed intervention programs using artificial production make a net positive contribution to recovery of listed populations?

- What is the reproductive success of hatchery fish spawning in the wild relative to the reproductive success of wild fish?

The following strategies are focused on providing information needed to answer these questions in support of planning, implementation, and adaptive management.

***Strategy:** Evaluate the effectiveness of hatchery safety-net/conservation programs and the effectiveness of hatchery reform actions on the achievement of biological performance objectives.*

***Strategy:** Assess and investigate as appropriate critical uncertainties regarding the effects of artificial propagation on the viability of wild fish populations.*

Strategic Category: Predation and Invasive Species Management RM&E

The following are the primary management questions with respect to predation and invasive species management.

- What are the distributions, population sizes, and productivity for the major predators within the Columbia River Basin? Are there aquatic invasive species present within the habitat of Columbia Basin fish populations?
- What are the impacts and consumption rates of major piscivorous, avian, and marine mammal predators on juvenile salmonids within the Columbia River Basin?
- Are predation management programs and actions achieving the expected biological performance objectives, including consideration of inter- and intra-specific compensation?
- Are there alternative management alternatives/actions to those currently being implemented to reduce the impact of predation? What are the most effective management alternatives/actions?

The following strategies are focused on providing information needed to answer these questions in support of planning, implementation, and adaptive management.

Strategy: Monitor the status of the Caspian Tern and the Double-Crested Cormorant populations in the Columbia River Estuary, their impacts on juvenile salmonids and the effectiveness of management strategies that may be implemented.

Strategy: Monitor the status of Inland Avian Predator populations in the Mid-Columbia River, their impacts on juvenile salmonids and the effectiveness of management strategies that may be implemented.

Strategy: Monitor the population status of marine mammals (e.g., Sea Lions and seals) below Bonneville Dam, their fish predation rates, and the effectiveness of deterrent actions.

Strategy: Evaluate the effects of the northern pike minnow removal program and investigate strategies to reduce non-indigenous piscivorous (e.g., walleye, bass) predation on salmonids.

Strategy: Develop guidelines and procedures for monitoring for presence and prevalence of aquatic invasive species.

Strategic Category: Wildlife RM&E

The primary management questions with respect to wildlife mitigation programs are:

- Are wildlife mitigation programs and actions achieving expected habitat unit or acreage objectives?
- What are the most effective actions for achieving wildlife habitat unit or acreage objectives?

Strategy: Evaluate the effectiveness of the wildlife mitigation program actions in meeting objectives.

Strategic Category: Coordination and Data Management

The following is the primary management question with regard to RM&E coordination and data management.

- Is research and monitoring information accessible to the region and compatible with regional standards and protocols for monitoring, data collection and data access?

The following strategies are focused on addressing this question.

Strategy: *Actively support the coordination and standardization of regional and Program monitoring efforts with other federal, state, and tribal monitoring programs including the development and adoption of standard requirements for metrics, sample designs, data collection protocols, data dictionary, meta-data, and data access.*

Strategy: *Work with regional federal, state and tribal agencies, and non-governmental entities to establish a coordinated, standardized, web-based distributed information network and a regional information management strategy for water, fish, and habitat data. Establish necessary administrative agreements to collaboratively implement and maintain the network and strategy.*

Strategic Category: Project Implementation and Compliance Monitoring

The following is the primary management question with regard to project implementation and compliance monitoring.

- Are actions being implemented, accomplished, and functionally maintained as proposed?

The following strategies are focused on addressing this question.

Strategy: *Maintain a comprehensive project implementation tracking system with standard performance metrics that are coordinated with other regional federal, state, and tribal project tracking systems.*

Strategy: *Develop a project compliance monitoring program for independent post-project auditing of project performance to assess ongoing performance of habitat based mitigation projects in support of adaptive management planning.*

Standard Definitions of the Types of RM&E Projects

1. Fish/Wildlife Population and/or Environmental Status and Trend Monitoring – census or statistically designed monitoring of fish or wildlife population and/or environmental conditions (i.e. watershed conditions) to assess the current status or change (trend) over time. This is sometimes referred to as an observational study (ISRP, 2005). These monitoring data may also be used to correlate fish performance with environmental conditions.

- Ecosystem/Landscape level, broad-scale, periodic monitoring
 - Geographically localized, frequent monitoring
2. Action Effectiveness Research – research to determine the effects of an action or suite of actions on fish survival, productivity and/or habitat conditions. This is a manipulative experiment that statistically assesses the effect of a treatment (action) condition relative to a control or reference condition. Action effectiveness research can be performed for a localized effect (project or stream reach level effect) or for a watershed level effect (intensively monitored effect). Localized (project level) effects most commonly identify changes in habitat conditions associated with the action, while fish or biological responses may require a watershed level (intensively monitored approach) to capture a broader area in which a biological response is expressed.
 3. Uncertainties Research – research to resolve scientific uncertainties regarding the relationships between fish or wildlife health, population performance (abundance, survival, productivity, distribution, diversity), habitat conditions, life history and/or genetic conditions (e.g., the existence and causes of delayed mortality, hatchery spawner reproductive success relative to wild populations, etc.). This is a manipulative experiment where variables are manipulated to infer or demonstrate cause and affect relationships using statistical-designed hypothesis testing. Uncertainties research does not include experimental research and monitoring specifically targeting the effect of a mitigation or restoration action (this is Action Effectiveness Research).
 4. Project Implementation and Compliance Monitoring – monitoring the execution and outcomes of projects. This type of monitoring does not require environmental response data directly linking restoration actions to physical, chemical, or biological responses.
 - *Project Implementation* monitoring determines whether projects were carried out as planned, through documentation of the type and location of management action, and whether the action was implemented properly or complies with established standards. This is generally carried out as an administrative review and does not require any parameter measurements beyond those specified by the project design requirements. It is usually a low-cost monitoring activity that should be included for all mitigation activities.

- *Project Compliance* monitoring determines whether specified project criteria are being met, through a post-project auditing of project performance. This type of monitoring would typically not be carried out by the project sponsor, and may require the development of independent, compliance monitoring projects. A limited, statistical-designed sample of projects could be monitored annually for compliance.