**Klamath Fish Monitoring Plan**

**Straw Fish DRAFT**

**11/13/2025**

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# Overview

This working draft plan is based on facilitated discussions by Klamath Basin fish monitoring and evaluation partners to identify a menu of options to inform budgeting decisions in these uncertain funding times. Federal funding agencies are seeking flexibility to navigate their budget processes regardless of whether operating under a continuing resolution (CR), a new budget with significant cuts, a new budget with slight increases, and/or whether access remains to the final year of Bipartisan Infrastructure Law (BIL) funding. This draft plan is intended to provide information to funding considerations based on the funding available.

As a straw proposal for further discussion by the work group, this draft plan attempts to categorize fish monitoring activities into tiers which reflect the applicability of related information to monitoring goals and objectives (Table 1). Classifications are intended to provide a starting point for further work group discussions and were subjective choices by the authors based on a review of related references and previous work group discussions. Tiers are not intended to be priorities *per se* but rather descriptions of related project purposes intended to inform priority considerations. Tier 1 activities directly address legal requirements or related obligations. Tier 2 activities inform to annual or critical path management decisions. Tier 3 activities provide locally or programmatically important information which does not otherwise qualify for a Tier 1 or Tier 2 classification.

Table 1. Index of Klamath Basin fish monitoring activities.

| **Question** | **Activity** | | | | | **Species** | | | | | | | **Tier** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***No.*** | ***Type*** | ***Life***  ***stage*** | ***Season*** | ***Location*** | ***Spr Chk*** | ***Fall Chk*** | ***Coho*** | ***O. mykiss*** | ***Lamprey*** | ***Suckers*** | ***Bull trout*** |
| **1. Sustainability** | 1.1.1.1 | Spawning Surveys | Ad | Fall | Klamath mainstem |  | 1 |  |  |  |  |  | 1 |
| 1.1.1.2 | Spawning Surveys | Ad | Fall | Salmon R |  | 1 |  |  |  |  |  | 1 |
| 1.1.1.3 | Spawning Surveys | Ad | Fall | Scott/Shasta/Bogus |  | 1 |  |  |  |  |  | 2 |
| 1.1.1.4 | Spawning Surveys | Ad | Fall | Klamath lower tribs other |  | 1 |  |  |  |  |  | 2 |
| 1.1.1.5 | Spawning Surveys | Ad | Fall | Trinity mainstem lower |  | 1 |  |  |  |  |  | 1 |
| 1.1.1.6 | Spawning Surveys | Ad | Fall | Trinity mainstem middle |  | 1 |  |  |  |  |  | 2 |
| 1.1.1.7 | Weir/Video | Ad | Fall | Scott/Shasta/Bogus |  | 1 |  |  |  |  |  | 1 |
| 1.1.1.8 | Weir/Trap | Ad | Fall | Trinity mainstem |  | 1 |  |  |  |  |  | 1 |
| 1.2.1.1 | Snorkel Surveys | Ad | Sum | Salmon R | 1 |  |  |  |  |  |  | 1 |
| 1.2.1.2 | Spawning Surveys | Ad | Sum | Klamath lower tribs other | 1 |  |  |  |  |  |  | 3 |
| 1.2.1.3 | Weir/Trap | Ad | Sum | Trinity mainstem | 1 |  |  |  |  |  |  | 1 |
| 1.2.1.4 | Spawning Surveys | Ad | Sum | Trinity South Fork | 1 |  |  |  |  |  |  | 3 |
| 1.2.1.5 | Spawning Surveys | Ad | Sum | Trinity tributaries | 1 |  |  |  |  |  |  | 3 |
| 1.3.1.1 | Snorkel Surveys | Ad | Sum | Klamath lower tribs |  |  |  | 1 |  |  |  | 3 |
| 1.3.1.1 | Snorkel Surveys | Ad | Sum | Trinity tributaries |  |  |  | 1 |  |  |  | 3 |
| **2. ESA Species** | 2.1.1.1 | Spawning Surveys | Ad | L Fall | Klamath mainstem |  |  | 1 |  |  |  |  | 2 |
| 2.1.1.2 | Spawning Surveys | Ad | L Fall | Salmon R |  |  | 1 |  |  |  |  | 2 |
| 2.1.1.3 | Spawning Surveys | Ad | L Fall | Scott/Shasta/Bogus |  |  | 1 |  |  |  |  | 3 |
| 2.1.1.4 | Spawning Surveys | Ad | L Fall | Klamath L tribs |  |  | 1 |  |  |  |  | 3 |
| 2.1.1.5 | Spawning Surveys | Ad | L Fall | Trinity tributaries |  |  | 1 |  |  |  |  | 3 |
| 2.1.1.6 | Weir/Video | Ad | L Fall | Scott/Shasta/Bogus |  |  | 1 |  |  |  |  | 1 |
| 2.1.1.7 | Weir/Trap | Ad | L Fall | Trinity mainstem |  |  | 1 |  |  |  |  | 1 |
| 2.1.2.1 | Outmigrant trap | Juv | Spr | Scott/Shasta/Bogus | 1 | 1 | 1 | 1 | 1 |  |  | 1 |
| 2.1.2.2 | Outmigrant trap | Juv | Spr | Salmon R | 1 | 1 | 1 | 1 | 1 |  |  | 1 |
| 2.1.2.3 | Outmigrant trap | Juv | Spr | Klamath L tribs |  | 1 | 1 | 1 | 1 |  |  | 2 |
| 2.1.2.4 | Outmigrant trap | Juv | Spr | Trinity L tribs |  | 1 | 1 | 1 | 1 |  |  | 2 |
| 2.2.1.1 | Trammel net | Ad |  | Klamath Lake |  |  |  |  |  | 1 |  | 1 |
| 2.2.1.2 | Trap net | Juv |  | Klamath Lake |  |  |  |  |  | 1 |  | 1 |
| 2.2.1.3 | PIT tag arrays | All |  | Klamath Lake & tribs |  |  |  |  |  | 1 |  | 1 |
| 2.2.1.4 | Weir | Ad |  | Williamson R |  |  |  |  |  | 1 |  | 1 |
| 2.2.1.5 | Population sampling | All |  | Clear Lake |  |  |  |  |  | 1 |  | 2 |
| 2.2.1.6 | Population sampling | All |  | Klamath headwaters other |  |  |  |  |  | 1 |  | 3 |
| 2.2.1.7 | Stock status update | All |  | Klamath headwaters |  |  |  |  |  | 1 |  | 2 |
| 2.2.2.1 | Ecological limitations | Juv |  | Klamath headwaters |  |  |  |  |  | 1 |  | 1 |
| 2.2.2.2 | Environmental limitations | Juv |  | Klamath headwaters |  |  |  |  |  | 1 |  | 1 |
| 2.2.2.3 | Waterbird predation | Juv |  | Klamath headwaters |  |  |  |  |  | 1 |  | 3 |
| 2.2.3.1 | Hatchery-assisted rearing | Juv |  | Klamath headwaters |  |  |  |  |  | 1 |  | 1 |
| 2.2.3.2 | Post release assessment | Juv |  | Klamath headwaters |  |  |  |  |  | 1 |  | 1 |
| 2.2.3.3 | In-hatchery evaluations | Juv |  | Klamath headwaters |  |  |  |  |  | 1 |  | 2 |
| 2.3.1.1 | Population sampling | All |  | Klamath headwaters |  |  |  |  |  |  | 1 | 1 |
| 2.3.2.1 | Assessment modeling | All |  | Klamath headwaters |  |  |  |  |  |  | 1 | 1 |
| 2.3.2.2 | Restoration evaluations | All |  | Klamath headwaters |  |  |  |  |  |  | 1 | 1 |
| **3. Fisheries** | 3.1.1.1 | Run reconstruction | Ad | Fall | Basinwide |  | 1 |  |  |  |  |  | 1 |
| 3.1.1.2 | Run forecast | Ad | Fall | Basinwide |  | 1 |  |  |  |  |  | 1 |
| 3.1.1.3 | Harvest objective | Ad | Fall | Basinwide |  | 1 |  |  |  |  |  | 1 |
| 3.1.1.4 | Fishery assessment | Ad | Fall | Basinwide |  | 1 |  |  |  |  |  | 1 |
| 3.1.2.1 | Harvest survey | Ad | Fall | Yurok fishery |  | 1 | 1 |  |  |  |  | 1 |
| 3.1.2.2 | Harvest survey | Ad | Fall | Hoopa fishery |  | 1 | 1 |  |  |  |  | 1 |
| 3.1.2.3 | Harvest survey | Ad | Fall | Other tribal fishery |  | 1 | 1 |  |  |  |  | 2 |
| 3.1.2.4 | Harvest survey | Ad | Fall | Non-tribal fishery |  | 1 | 1 |  |  |  |  | 1 |
| 3.1.3.1 | Fishery Assessment | Ad | All | Ocean |  | 1 |  |  |  |  |  | 1 |
| 3.2.1.1 | Run reconstruction | Ad | Spr | Basinwide | 1 |  |  |  |  |  |  | 1 |
| 3.2.1.2 | Fishery assessment | Ad | Spr | Basinwide | 1 |  |  |  |  |  |  | 1 |
| 3.2.2.1 | Harvest survey | Ad | Spr | Yurok fishery | 1 |  |  |  |  |  |  | 1 |
| 3.2.2.2 | Harvest survey | Ad | Spr | Hoopa fishery | 1 |  |  |  |  |  |  | 1 |
| 3.2.2.3 | Harvest survey | Ad | Spr | Non-tribal fishery | 1 |  |  |  |  |  |  | 1 |
| 3.3.1.2 | Fishery assessment | Ad | Fall | Basinwide |  |  | 1 |  |  |  |  | 1 |
| 3.3.3.1 | Fishery Assessment | Ad | All | Ocean |  |  | 1 |  |  |  |  | 1 |
| **4. Dam Removal** | 4.1.1.1 | Spawning Surveys | Ad | Fall-Win | Klamath U mainstem |  | 1 | 1 | 1 | 1 |  |  | 1 |
| 4.1.1.2 | Spawning Surveys | Ad | Fall-Win | Klamath U tribs CA |  | 1 | 1 | 1 | 1 |  |  | 2 |
| 4.1.1.3 | Spawning Surveys | Ad | Fall-Win | Klamath U tribs OR |  | 1 | 1 | 1 | 1 |  |  | 2 |
| 4.1.1.4 | Weir/Video | Ad | Fall-Win | Klamath U tribs CA |  | 1 | 1 | 1 | 1 |  |  | 1 |
| 4.1.1.5 | Weir/Video | Ad | Fall-Win | Klamath U tribs OR |  | 1 | 1 | 1 | 1 |  |  | 1 |
| 4.1.1.6 | Weir/Video | Ad | Fall-Win | Klamath U mainstem OR |  | 1 | 1 | 1 | 1 |  |  | 3 |
| 4.1.1.7 | Sonar | Ad | Fall-Win | Klamath U mainstem |  | 1 | 1 | 1 |  |  |  | 2 |
| 4.1.1.8 | Netting | Ad | Fall-Win | Klamath U mainstem |  | 1 | 1 | 1 |  |  |  | 2 |
| 4.1.1.9 | Telemetry | Ad | Fall | Klamath U |  | 1 | 1 | 1 |  |  |  | 2 |
| 4.1.2.1 | Outmigrant trap | Juv | Spr | Klamath U tribs CA |  | 1 | 1 | 1 | 1 |  |  | 1 |
| 4.1.2.2 | Outmigrant trap | Juv | Spr | Klamath U tribs OR |  | 1 | 1 | 1 | 1 |  |  | 1 |
| 4.1.2.3 | Outmigrant trap | Juv | Spr | Klamath U mainstem OR |  | 1 | 1 | 1 | 1 |  |  | 1 |
| 4.1.2.4 | Snorkel/Sampling | Juv | Sum | Klamath U tribs CA |  |  | 1 | 1 |  |  |  | 2 |
| 4.1.2.5 | Snorkel/Sampling | Juv | Sum | Klamath U tribs OR |  |  | 1 | 1 |  |  |  | 2 |
| 4.1.2.6 | PIT tagging & arrays | Juv | Sum | Klamath U tribs CA |  |  | 1 | 1 |  |  |  | 3 |
| 4.1.2.7 | PIT tagging & arrays | Juv | Sum | Klamath U tribs OR |  |  | 1 | 1 |  |  |  | 3 |
| 4.2.1.1 | Spawning Surveys | Ad | Fall-L Fall | Klamath headwaters |  | 1 | 1 | 1 |  |  |  | 1 |
| 4.2.1.2 | Spawning Surveys | Ad | Fall-L Fall | Klamath headwaters | 1 | 1 | 1 | 1 |  |  |  | 2 |
| 4.2.1.3 | Weir/Video | Ad | Fall-L Fall | Klamath headwaters | 1 | 1 | 1 | 1 | 1 |  |  | 2 |
| 4.2.1.4 | Telemetry | Ad | Fall-L Fall | Klamath headwaters |  | 1 | 1 | 1 |  |  |  | 2 |
| 4.2.2.1 | PIT tagging | Juv | Spr | Klamath headwaters | 1 |  |  |  |  |  |  | 1 |
| 4.2.2.1 | PIT tag arrays | Juv | Annual | Klamath headwaters | 1 |  |  |  |  |  |  | 1 |
| 4.2.2.1 | PIT tag arrays | Juv | Annual | Klamath headwaters | 1 |  |  |  |  |  |  | 1 |
| 4.2.2.1 | PIT tag arrays | Juv | Annual | Klamath Lake | 1 |  |  |  |  |  |  | 1 |
| 4.2.3.1 | Outmigrant trap | Juv | Spr | Klamath headwaters | 1 | 1 | 1 | 1 |  |  |  | 2 |
| 4.2.3.2 | PIT tagging | Juv | Spr | Klamath headwaters | 1 | 1 | 1 | 1 |  |  |  | 2 |
| **5. Passage** | 5.1.1.1 | Ladder count | Ad | Sum-Win | Keno Dam | 1 | 1 | 1 | 1 | 1 |  |  | 1 |
| 5.1.1.2 | Ladder count | Ad | Sum-Win | Link River Dam | 1 | 1 | 1 | 1 | 1 |  |  | 1 |
| 5.1.1.3 | Telemetry | Ad | Sum-Win | Keno/Link River Dams | 1 | 1 | 1 | 1 |  |  |  | 2 |
| 5.2.1.1 | PIT tag arrays | All | Sum-Win | Keno Dam | 1 | 1 | 1 | 1 |  |  |  | 2 |
| 5.2.1.2 | PIT tag arrays | All | Sum-Win | Lake Ewauna | 1 | 1 | 1 | 1 |  |  |  | 2 |
| 5.2.1.3 | PIT tag arrays | All | Sum-Win | Link River Dam | 1 | 1 | 1 | 1 |  |  |  | 2 |
| **6. Water Management** | 6.1.1.1 | Outmigrant trap | Juv | Spr | Klamath L mainstem | 1 | 1 | 1 | 1 | 1 |  |  | 1 |
| 6.1.1.2 | Outmigrant trap | Juv | Spr | Klamath L mainstem | 1 | 1 | 1 | 1 | 1 |  |  | 1 |
| 6.1.1.3 | Outmigrant trap | Juv | Spr | Klamath L mainstem | 1 | 1 | 1 | 1 | 1 |  |  | 1 |
| 6.1.2.1 | Disease monitoring | Juv | Spr | Klamath L |  | 1 | 1 |  |  |  |  | 2 |
| 6.1.2.2 | Disease analysis | Juv | Spr | Klamath L |  | 1 | 1 |  |  |  |  | 2 |
| 6.1.3.1 | S3 Model calibration | Juv | Spr | Klamath L |  | 1 |  |  |  |  |  | 2 |
| 6.1.3.2 | S3 Model analysis | Juv | Spr | Klamath L |  | 1 |  |  |  |  |  | 1 |
| 6.1.3.3 | S3 Model calibration | Juv | Spr | Klamath L |  |  | 1 |  |  |  |  | 2 |
| 6.1.3.4 | S3 Model analysis | Juv | Spr | Klamath L |  |  | 1 |  |  |  |  | 1 |
| 6.2.2.1 | Outmigrant trap | Juv | Spr | Trinity mainstem Willlow Cr | 1 | 1 | 1 | 1 | 1 |  |  | 1 |
| 6.2.2.2 | Outmigrant trap | Juv | Spr | Trinity mainstem Pear Tree | 1 | 1 | 1 | 1 | 1 |  |  | 1 |
| 6.2.3.1 | S3 Model calibration | Juv | Spr | Trinity mainstem |  | 1 |  |  |  |  |  | 2 |
| 6.2.3.2 | S3 Model analysis | Juv | Spr | Trinity mainstem |  | 1 |  |  |  |  |  | 1 |
| **7. Hatcheries** | 7.1.1.1 | Hatchery releases | Juv | Spr | Fall Creek Hatchery |  | 1 | 1 |  |  |  |  | 1 |
| 7.1.1.2 | Hatchery marks/tags | Juv | Spr | Fall Creek Hatchery |  | 1 | 1 |  |  |  |  | 1 |
| 7.1.1.3 | Hatchery processes | Juv | Spr | Fall Creek Hatchery |  | 1 | 1 |  |  |  |  | 1 |
| 7.1.2.1 | Hatchery collection | Ad | Sum-Win | Fall Creek Hatchery |  | 1 | 1 |  |  |  |  | 1 |
| 7.1.2.2 | Hatchery composition | Ad | Sum-Win | Fall Creek Hatchery |  | 1 | 1 |  |  |  |  | 1 |
| 7.1.2.3 | Hatchery-origin spawners | Ad | Sum-Win | Fall Creek Hatchery |  | 1 | 1 |  |  |  |  | 1 |
| 7.1.2.4 | Hatchery return | Ad | Sum-Win | Fall Creek Hatchery |  | 1 | 1 |  |  |  |  | 1 |
| 7.2.1.1 | Hatchery releases | Juv | Spr | Trinity Hatchery | 1 | 1 | 1 | 1 |  |  |  | 1 |
| 7.2.1.2 | Hatchery marks/tags | Juv | Spr | Trinity Hatchery | 1 | 1 | 1 | 1 |  |  |  | 1 |
| 7.2.1.3 | Hatchery processes | Juv | Spr | Trinity Hatchery | 1 | 1 | 1 | 1 |  |  |  | 1 |
| 7.2.2.1 | Hatchery collection | Ad | Sum-Win | Trinity Hatchery | 1 | 1 | 1 | 1 |  |  |  | 1 |
| 7.2.2.2 | Hatchery composition | Ad | Sum-Win | Trinity Hatchery | 1 | 1 | 1 | 1 |  |  |  | 1 |
| 7.2.2.3 | Hatchery-origin spawners | Ad | Sum-Win | Trinity Hatchery | 1 | 1 | 1 | 1 |  |  |  | 1 |
| 7.2.2.4 | Hatchery return | Ad | Sum-Win | Trinity Hatchery | 1 | 1 | 1 | 1 |  |  |  | 1 |
| **8. Habitats** | 8.1.1.1 | Snorkel survey | Juv | Sum | Klamath L tribs |  |  | 1 |  |  |  |  | 3 |
| 8.1.1.2 | PIT tagging & arrays | Juv | Sum | Klamath L tribs |  |  | 1 |  |  |  |  | 3 |
| 8.2.1.1 | Snorkel survey | Juv | Sum | Klamath mid tribs |  |  | 1 |  |  |  |  | 3 |
| 8.2.1.2 | Juvenile collection | Juv | Sum | Klamath mid tribs |  |  | 1 |  |  |  |  | 3 |
| 8.2.1.3 | PIT tagging & arrays | Juv | Sum | Klamath mid tribs |  |  | 1 |  |  |  |  | 3 |
| 8.3.1.1 | Snorkel survey | Juv | Sum | Salmon, Scott & Shasta R | 1 |  | 1 | 1 |  |  |  | 3 |
| 8.3.1.2 | Juvenile collection | Juv | Sum | Salmon, Scott & Shasta R | 1 |  | 1 | 1 |  |  |  | 3 |
| 8.3.1.3 | PIT tagging & arrays | Juv | Sum | Salmon, Scott & Shasta R | 1 |  | 1 | 1 |  |  |  | 3 |
| 8.4.1.1 | Outmigrant trap | Juv | Spr | Trinity L tribs |  | 1 | 1 | 1 |  |  |  | 3 |
| 8.4.1.2 | Snorkel survey | Juv | Sum | Trinity U tribs | 1 |  | 1 | 1 |  |  |  | 3 |
| **9. Oth** | 9.1.1.1 | Work group | -- | -- | Basinwide | 1 | 1 | 1 | 1 |  |  |  | 2 |
| 9.1.1.2 | Annual workshops | -- | -- | Basinwide | 1 | 1 | 1 | 1 |  |  |  | 2 |
| 9.2.1.1 | PIT Tag database | -- | -- | Basinwide | 1 | 1 | 1 | 1 |  |  |  | 2 |
| 9.2.1.2 | PIT Tag data entry | -- | -- | Basinwide | 1 | 1 | 1 | 1 |  |  |  | 2 |

# Approach

This plan draws upon a complex of related planning and regulatory documents including the Klamath Basin Integrated Fisheries Restoration and Monitoring Plan (IFRMP 2023). Ten focal fish species identified in the IFRMP are addressed by this plan. These include Chinook Salmon (Spring and Fall Runs), Steelhead, Lost River Sucker, Shortnose Sucker, Bull Trout, Redband Trout, Pacific Lamprey, Green Sturgeon and Eulachon.

Fish monitoring objectives, tasks and activities are organized by key management applications and questions which drive the need for fish monitoring in the Klamath Basin (Figure 1). Many activities inform multiple applications. Key activities are identified for each application and related activities identified under other applications are also cross referenced where appropriate. Additional descriptions and references for activities may be found in the companion *Inventory of Klamath Basin Fish Monitoring & Research Activities* document to this plan

Figure . General applications of fish monitoring and research activities in the Klamath system.



Figure . Map of the Klamath Basin showing sub-basin labels used throughout this plan.

### Assumptions

1. A common understanding of the scope and needs for fish monitoring was a key outcome of this collaborative planning and prioritization effort by fish monitoring and evaluation partners.
2. The process assumes that priorities identified by monitoring and evaluation partners are a preferrable alternative to leaving it strictly up to the high-level funding sources.
3. Monitoring is essential for effective fish conservation, management and restoration efforts. Current projects all address important needs.
4. A comprehensive monitoring plan will identify objectives, requirements, priorities, a core program and additional needs to address critical uncertainties and emerging issues.
5. Research and synthesis to understand key drivers and mechanisms are also critical to identification of effective conservation, management and restoration measures.
6. Information sharing and data archiving are important elements of a comprehensive plan.
7. Monitoring priorities are a product of legal obligations and management decisions informed by the corresponding information. Information can have immediate and longer-term management applications.
8. Reductions in monitoring will decrease precision and accuracy and accuracy of assessments, and increase management uncertainty in a changing environment.
9. There are potential opportunities for scaling across many or most project areas. Even high importance activities can absorb some scaling reduction in order to make room for other priorities.
10. Projects can absorb incremental reductions only to a certain point beyond which incremental reductions critically impair function to the point where the project is no longer effective.
11. Keeping entities and partnerships intact over the long term is also essential for long term success of conservation and restoration in the basin. Tribal presence is a key value for success over long term.
12. Even if the funding source of a particular project is not at risk, distribution of funds might be reconsidered to backfill in other areas (within the constraints of funding obligations of the source).
13. Some projects might also be candidates for skipping a few years – particularly where applications are more long term and not annual in application.

### Potential Project Considerations

Table 2 identifies potential considerations in project decisions.

Table . Related monitoring project considerations.

|  |  |
| --- | --- |
| Subject | 1. Target Species: What fish species are we most concerned about? |
| 2. Purpose: Does the information primarily address status/trends, action effectiveness or critical uncertainties of target fish species? |
| 3. Relevance: How critical is the information to key decisions or management applications? |
| 4. Applicability: Is the information directly or indirectly applicable to key decisions or management applications? |
| 5. Scale: Does the information address broad basin-wide or more narrow local questions? |
| 6. Responsiveness/Proactivity: Does the information address new or emerging developments, opportunities or innovations? |
| 7. Data Gaps: Does the information address a key question that is not otherwise being addressed? |
| Approach | 8. Methodology: Is the monitoring approach appropriate, effective and robust for the application? |
| 9. Confidence: Does the methodology produce information with low, medium or high levels of confidence? |
| 10. Infrastructure: Does the methodology utilize existing, expanded or new infrastructure or technology? |
| 11. Data/Reporting: Is there an effective system in place for regular reporting and sharing of related information, documentation and data? |
| 12. Evaluations: Is the information subject to evaluations using structured analysis and/or decision tools? |
| Programmatic | 13. Cost/ Cost Effectiveness: Is the cost low, medium or high in total and in relation to the value of the information? |
| 14. Funding Security: Is the activity fully, partially or not funded for the future? |
| 15. Continuity: Does the information contribute to a long-term evaluation or dataset? |
| 16. Collaboration: Is the activity a collaborative effort among organizations? |
| 17. Program Integrity: Is the work integral to the engagement/involvement/sustainability of the participating entity? |
| 18. Weighting: What is the relative weight of each of the above questions? |

### Tiers

As a straw proposal for further discussion by the work group, this draft plan attempts to categorize fish monitoring activities into tiers which reflect to applicability of related information to monitoring goals and objectives. Tiers are not intended to be priorities per se but rather descriptions of related project purposes intended to inform priority considerations. Classifications are intended to provide a starting point for further work group discussions and were subjective choices by the authors based on considerations and a review of related references.

Tier 1 activities directly address legal requirements or related obligations. Examples include ESA Biological Opinions and legally binding agreements. Note that while a project may be tagged as obligatory, this doesn’t necessarily mean that the entire scope of the project is obligatory. Effort and methodology of obligatory projects may be scalable consistent with project objectives.

Tier 2 activities inform to annual or critical path management decisions. All projects inform management decisions at some level but we distinguish critical projects as those where there is no reasonably effective alternative for the information provided. Examples include annual stock assessments used to generate run forecasts necessary to establish fishing seasons. Monitoring to evaluate the response to dam removal may be another example of a critical project as the effectiveness of current reestablishment efforts would be otherwise unknown. A project can be both obligatory and critical but not every critical project is obligatory and *vice versa*.

Tier 3 activities provide locally or programmatically important information which does not otherwise qualify for a Tier 1 or Tier 2 classification. These activities have *significant* implications to the long-term conservation and restoration Klamath Basin fishes. Locally-important projects inform restoration and management decisions in specific areas of the basin. Programmatically-important projects help sustain programs, staff and infrastructure of management, conservation and restoration partners that are key to the long-term health of the basin’s habitat and ecosystems.

# Question: Are klamath focal fish species naturally self-sustaining?

The sustainability of key fish species is a fundamental mission, goal and requirement of natural resource managers and interests throughout the Klamath Basin. Naturally self-sustaining native fish populations were also identified as a primary goal of the IFRMP for ten focal fish species. This section identifies monitoring objectives, tasks and activities for evaluation of the sustainability of focal fish species including Chinook Salmon (Fall and Spring Runs), Steelhead and related trout species (*Oncorhynchus mykiss*), lamprey and green sturgeon. ESA-listed fish species (Coho Salmon, Lost River Sucker, Shortnose Sucker and Bull Trout), which have been determined to not be self-sustaining, are addressed under Question 2 in the context of related requirements for conservation and recovery.

## Objective Species: Fall Chinook

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| ***Related Questions***   * What is the status of the Klamath Fall Chinook run in relation to basin capacity and natural escapement objectives? * What is the spatial distribution of spawning in Klamath and Trinty River mainstems and tributaries? * What are the trends in abundance, productivity and distribution over time? * What are the biological characteristics of the Klamath Basin return (including age and hatchery:wild composition)? |

Fall Chinook are the predominant salmon run type in Klamath Basin salmon (ESSA 2017; PFMC 2019). Adults generally return to freshwater during August-September and spawn from October to December. Spawning occurs in the mainstem Klamath and Trinity Rivers and in large tributaries including the Salmon, Scott and Shasta rivers. Juveniles generally emerge from the gravel in February-March and migrate to the ocean in June- August. Fall Chinook are also currently produced by Trinty River and Fall Creek Hatcheries (and previously by Iron Gate Hatchery). Klamath Fall Chinook generally inhabit coastal waters of northern California and southern Oregon. Adults typically return to freshwater at 2-5 years of age (predominately at age 4). Significant numbers of Klamath Fall Chinook are harvested in ocean and freshwater fisheries. Stock-recruitment analyses indicate that maximum sustained yield is produced by natural spawning escapements of approximately 40,700. Natural escapement has averaged approximately 28,000 per year in 2015-2024 following a downturn in marine survival. Fall Chinook returning to Klamath hatcheries comprised about 30% of the total annual run during this period.

### Task: Stock assessment – Monitor annual run size, run composition, spawning escapement, distribution and productivity of adult Fall Chinook in the lower Klamath Basin.[[1]](#footnote-1)

Fall Chinook are intensively monitored throughout the basin in support of the long-term sustainability of this stock which is subject to high-value fisheries in freshwater and the ocean. The current monitoring program includes a comprehensive annual assessment of the Fall Chinook return to the river and to natural spawning escapements. All significant mainstem and tributary spawning areas are monitored in order to produce a census estimate of the entire run. Fish are counted by a combination spawning ground surveys and weirs equipped with video cameras or fish traps. Spawning ground surveys typically count live fish, fish redds and fish carcasses. Biological data on age hatchery:wild composition and pre-spawn mortality is collected in weir traps and carcasses encountered in spawning surveys. Comprehensive surveys identify spawning distribution throughout the basin. Productivity is estimated from spawners and corresponding brood year adult recruits in subsequent years.

Comprehensive monitoring data of Fall Chinook provide robust estimates of stock status and detailed information needed for sustainable fishery management. Spawning escapement is the essential metric for monitoring natural stock status while effective fishery requires a more comprehensive suite of information including the total basin return and biological composition. Tier 1 activities below are identified based on their applicability to stock status and fishery management. Tier 2 activities also contribute to comprehensive status and management assessments but potentially provide opportunities for scaling monitoring efforts in areas where other data are available or where fish numbers are relatively small in relation to the total run.

Numerous basin partners participate in annual escapement monitoring including the Hoopa Valley Tribe, Karuk Tribe, Mid-Klamath Watershed Council, Northern California Resource Center, Quartz Valley Indian Reservation, Siskiyou Resource Conservation District, Salmon River Restoration Council, U.S. Forest Service, USFWS, AmeriCorps Watershed Stewards Program, Yurok Tribe, and CDFW (CNRS & CDFW 2024, KRTT 2024).

#### Activity: Fall spawning ground surveys in the mainstem Klamath downstream from the Iron Gate site to assess Fall Chinook status. [Tier 1]

#### Activity: Fall spawning ground surveys in the Salmon River to assess Fall Chinook status. [Tier 1]

#### Activity: Fall spawning ground surveys in Shasta River, Scott River and Bogus Creek to assess Fall Chinook status. [Tier 2]

#### Activity: Fall spawning ground surveys in other lower and middle Klamath tributaries to assess Fall Chinook status. [Tier 2]

#### Activity: Fall spawning ground surveys in Trinity River mainstem downstream from Willow Creek Weir to assess Fall Chinook status [Tier 1]

#### Activity: Fall spawning ground surveys in Trinity River mainstem upstream from Willow Creek Weir to assess Fall Chinook status. [Tier 2]

#### Activity: Fall adult video weir counts in the Shasta River, Scott River and Bogus Creek to assess Fall Chinook status. [Tier 1]

#### Activity: Fall adult weir counts in Trinity River mainstem near Willow Creek and Junction City to assess Fall Chinook status. [Tier 1]

##### Related activities identified under other objectives:

*3.1.1.1. Activity: Annual run reconstruction of Fall Chinook return to the Klamath River including natural escapement, hatchery escapement, in-river harvest and run to river. [Tier 1]*

*4.1.1.1 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in the Klamath River mainstem between the Iron Gate Dam site and Keno Dam to assess stock status. [Tier 1]*

*4.1.1.2 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch, Camp, Jenny, Fall, Shovel creeks) to assess stock status. [Tier 2]*

*4.1.1.3 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (e.g., Spencer Creek) to assess stock status. [Tier 2]*

*4.1.1.4 Activity: Fall-Winter adult video weir counts for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Shovel Creeks) to assess stock status. [Tier 1]*

*4.1.1.5 Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (Spencer Creek) to assess stock status. [Tier 1]*

*4.1.1.6 Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon portion of the Klamath River mainstem to assess stock status. [Tier 3]*

*5.1.1.1 Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Keno Dam fish ladder to assess passage. [Tier 1]*

*7.1.1.2 Mark and/or coded wire tag samples of Fall Creek Hatchery juvenile releases of Fall Chinook and Coho for subsequent evaluation. [Tier 1]*

*7.1.2.3 Identify Fall Creek Hatchery contributions of Fall Chinook and Coho in natural spawning areas. [Tier 1]*

*7.2.1.2 Mark and/or coded wire tag samples of Trinity Hatchery juvenile releases of Spring Chinook, Fall Chinook, Coho and Steelhead for subsequent evaluation. [Tier 1]*

*7.2.2.3 Identify Trinity Hatchery contributions of Spring Chinook, Fall Chinook, Coho and Steelhead in natural spawning areas. [Tier 1]*

## Objective Species: Spring Chinook

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| ***Related Questions***   * What is the status of the Klamath Spring Chinook run? * What is the spatial distribution of spawning in Klamath and Trinty River mainstems and tributaries? * What are the trends in abundance, productivity and distribution over time? * What is the hatchery:wild composition of the run? |

Spring Chinook salmon historically returned to major tributaries throughout the lower Klamath Basin (Trinity, Scott, Shasta, and Salmon rivers) and above Upper Klamath Lake into the Sprague, Williamson and Wood rivers (ESSA 2017). The current run is predominately to the Trinity River including natural and hatchery production components. A small naturally-produced population also spawns in the Salmon River. Adults generally return to freshwater during February – July peaking from March to mid-June. Migrating adults hold in deep pools throughout the summer before spawning from September through mid-October. Juveniles generally emerge from the gravel beginning in February, rear in runs and pools for a year, then migrate to the ocean as smolts in the following year at age 1 between February and mid-June. In the ocean, Spring Chinook are generally distributed farther offshore than Fall Chinook. Adults typically return to freshwater at 3-4 years of age. Spring Chinook are harvested in lower Klamath and Trinity River fisheries. Natural escapement has averaged approximately 4,300 adults per year in 2013-2022 of which over 90% was in the Trinity River.

### Task: Stock assessment – Monitor annual abundance, spawning escapement and run composition of adult Spring Chinook in the lower Klamath Basin.[[2]](#footnote-2)

The current monitoring program includes an annual assessment of the Spring Chinook return to the river and to natural spawning escapements. All significant mainstem and tributary spawning areas are monitored in order to produce a census estimate of the entire run. Fish are counted by a combination spawning ground surveys and weirs equipped with video cameras or fish traps. Spawning ground surveys typically count live fish, fish redds and fish carcasses. Biological data on age and hatchery:wild composition is collected in weir traps and carcasses encountered in spawning surveys. Stock assessments are a cooperative effort of a number of basin partners.

#### Activity: Summer dive survey in the Salmon River to assess Spring Chinook status. [Tier 1]

#### Activity: Summer spawning ground surveys in other lower Klamath tributaries to assess Spring Chinook status. [Tier 3]

#### Activity: Summer adult weir counts and mark-recapture estimates in Trinity River mainstem to assess Spring Chinook status. [Tier 1]

#### Activity: Summer spawner surveys in the South Fork Trinity River to assess Spring Chinook status. [Tier 3]

#### Activity: Summer spawner surveys in other Trinity River tributaries to assess Spring Chinook status. [Tier 3]

##### Related activities identified under other objectives:

*5.1.1.1 Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Keno Dam fish ladder to assess passage. [Tier 1]*

*7.2.2.3 Identify Trinity Hatchery contributions of Spring Chinook, Fall Chinook, Coho and Steelhead in natural spawning areas. [Tier 1]*

## Objective Species: Steelhead / O. mykiss

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| ***Related Questions***   * What is the status of the Klamath Steelhead run? * What is the spatial distribution of spawning in Klamath and Trinty Rivers and tributaries? * What are the trends in abundance, productivity and distribution over time? * What is the hatchery:wild composition of the run? |

To be completed

From CNRA & CDFW 2024: Fall and winter Steelhead are more widely distributed than any other anadromous salmonid in the Klamath River system downstream of Iron Gate Dam (State Water Resources Control Board 2018). Research completed by Hodge et al. (2016) found a diverse life-history portfolio that the authors partitioned into 38 life-history types. While fall and winter Steelhead are more widely dispersed, most remaining summer Steelhead are believed to spawn in tributaries between the Trinity River (RKM 69.7 [RM 43.31) and Seiad Creek (RKM 213.6 [RM 132.71).

### Task: Stock assessment – Monitor abundance and distribution of Steelhead/O. mykiss the lower Klamath Basin.

Current monitoring efforts focused on adult fall and winter Steelhead in the Klamath Basin are limited. Under the KRP, video monitoring conducted by CDFW on the Shasta River, Scott River, and Bogus Creek provide recent adult fall and winter Steelhead counts. However, in most years, video monitoring was terminated in December or January due to high flow events or other limitations and did not capture the full migration period. In years where video monitoring and SONAR counts covered the full migration period (i.e., 2013 and 2016-2020 for Bogus Creek, 2012, 2015, and 2016 for Shasta River) more complete Steelhead counts were generated.

Since 1985, the USFS has conducted summer Steelhead holding counts on tributaries located on or adjacent to lands administered by the USFS Orleans and Happy Camp Ranger districts in the lower Klamath River. Counts are performed through snorkel surveys and include adults and half pounders and are a sum of the surveys conducted on Bluff Creek, Red Cap Creek, Camp Creek, Wooley Creek, Dillon Creek, Clear Creek, Elk Creek, Indian Creek, Thompson Creek, Grider Creek, and other tributaries to the Klamath River between Aikens Creek and Beaver Creek. As previously mentioned, the Salmon River Restoration Council conducts annual snorkel surveys for spring-run Chinook salmon and summer Steelhead (adults and half pounders) on the Salmon River.

#### Activity: Summer snorkel surveys in selected lower Klamath tributaries to count summer steelhead. [Tier 3]

#### Activity: Summer snorkel surveys in selected Trinity River tributaries to count summer steelhead. [Tier 3]

##### Related activities identified under other objectives:

*1.1.1.7 Activity: Fall adult video weir counts in the Shasta River, Scott River and Bogus Creek to assess Fall Chinook status. [Tier 1]*

*1.1.1.8 Activity: Fall adult weir counts in Trinity River mainstem near Willow Creek and Junction City to assess Fall Chinook status. [Tier 1]*

*1.2.1.3 Activity: Summer adult weir counts and mark-recapture estimates in Trinity River mainstem to assess Spring Chinook status. [Tier 1]*

*2.1.2.1 Activity: Spring juvenile outmigrant trapping in Scott River, Shasta River and Bogus Creek to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 1]*

*2.1.2.2 Activity: Spring juvenile outmigrant trapping in the Salmon River to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 2]*

*2.1.2.3 Activity: Spring juvenile outmigrant trapping in lower Klamath tributaries (Blue, McGarvey, etc.) to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 2]*

*2.1.2.4 Activity: Spring juvenile outmigrant trapping in lower Trinity tributaries to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 2]*

*4.1.1.4 Activity: Fall-Winter adult video weir counts for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Shovel Creeks) to assess stock status. [Tier 1]*

*4.1.1.5 Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (Spencer Creek) to assess stock status. [Tier 1]*

*4.1.1.6 Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon portion of the Klamath River mainstem to assess stock status. [Tier 3]*

*4.1.2.1 Activity: Spring juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Fall, Shovel Creeks) to assess production. [Tier 1]*

*4.1.2.2 Activity: Spring juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (e.g., Spencer Creek) to assess production. [Tier 1]*

*4.1.2.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in Klamath River mainstem between Shovel and Spencer Creeks to assess production. [Tier 1]*

*5.1.1.1 Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Keno Dam fish ladder to assess passage. [Tier 1]*

*5.1.1.2 Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Link River Dam fish ladder to assess passage. [Tier 1]*

*6.1.1.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at the Weitchpec site above the Trinity River confluence. [Tier 1]*

*6.1.1.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at Kinsman and Big Bar sites between the Shasta and Trinity Rivers. [Tier 1]*

*6.1.1.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the Mainstem Klamath River at I5 and Bogus Creek sites between the Iron Gate Dam site and the Shasta River. [Tier 1]*

*6.2.2.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the in Trinity River mainstem at Willow Creek. [Tier 1]*

*6.2.2.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the in Trinity River mainstem at Pear Tree Gulch. [Tier 1]*

## Objective Species: Redband Trout

To be completed

## Objective Species: Lamprey

The Pacific lamprey (Lampetra tridentata) is the most common lamprey in the Klamath Basin, a Tribal Trust species and significant to Native American tribes (ESSA 2017). Tribal fisheries in the Klamath target fresh adults of Pacific lamprey for subsistence and cultural purposes. Seven additional non-anadromous lamprey species are also present in the Klamath Basin. Adult Pacific Lamprey return from the ocean after several years to spawn in the Klamath Basin.

Spawning habitat of Pacific lamprey is generally characterized as gravel-bottomed substrate, at the upstream edges of riffles. Rearing habitat consists of fine sediments or sand deposits along the channel margins. After emergence from spawning gravels, ammocoetes drift downstream to nearby pockets of fine sediments (sand deposits). There they burrow and grow into juveniles. Ammocoetes spend up to seven years in the freshwater environment before migrating back out to the ocean.

### Task: Status assessment

From CNRA & CDFW 2024: There are no comprehensive monitoring programs for Pacific lamprey in the Klamath Basin. Anadromous lampreys such as the Pacific lamprey are unusual among anadromous fishes in that they do not appear to locate spawning habitat through philopatry (Spice et al. 2012). The lack of river or stream fidelity makes monitoring Pacific lamprey populations challenging. Pacific lampreys tend to be incidentally observed and recorded during salmonid monitoring efforts. They are also commonly observed during instream restoration projects, as well as during fish screen maintenance on water diversion structures.

In 2006, the Yurok Tribal Fisheries Program initiated a pilot study using sonic (acoustic) telemetry to assess the movements and distribution of migrating Pacific lamprey in the Klamath River and associated tributaries (McCovey and Benson 2006). Fourteen individuals were tagged, and no detections were made over the course of the study. Although the results suggest that acoustic telemetry may not be a feasible method to study Pacific lamprey, recent advances in acoustic telemetry technology (e.g., Jsat tags) have likely made it a feasible tool for use today.

In 2008, the Pacific Lamprey Conservation Initiative (PLCI) was formed by Native American Tribes, federal, state, and local agencies, and non-government organizations for the purposes of achieving long term persistence of Pacific lamprey and their habitats, and to support traditional Tribal uses of Pacific lamprey across their historical range (Pacific Lamprey Conservation Initiative 2022). The PLCI maintains a data repository with general Pacific lamprey distribution data, including the Klamath River Basin. This data is available on the PLCI web page at [www.pacificlamprey.org/](http://www.pacificlamprey.org/).

##### Related activities identified under other objectives:

*2.1.2.1 Activity: Spring juvenile outmigrant trapping in Scott River, Shasta River and Bogus Creek to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 1]*

*2.1.2.2 Activity: Spring juvenile outmigrant trapping in the Salmon River to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 2]*

*2.1.2.3 Activity: Spring juvenile outmigrant trapping in lower Klamath tributaries (Blue, McGarvey, etc.) to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 2]*

*2.1.2.4 Activity: Spring juvenile outmigrant trapping in lower Trinity tributaries to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 2]*

*4.1.2.1 Activity: Spring juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Fall, Shovel Creeks) to assess production. [Tier 1]*

*4.1.2.2 Activity: Spring juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (e.g., Spencer Creek) to assess production. [Tier 1]*

*4.1.2.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in Klamath River mainstem between Shovel and Spencer Creeks to assess production. [Tier 1]*

*5.1.1.1 Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Keno Dam fish ladder to assess passage. [Tier 1]*

*5.1.1.2 Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Link River Dam fish ladder to assess passage. [Tier 1]*

*6.1.1.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at the Weitchpec site above the Trinity River confluence. [Tier 1]*

*6.1.1.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at Kinsman and Big Bar sites between the Shasta and Trinity Rivers. [Tier 1]*

*6.1.1.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the Mainstem Klamath River at I5 and Bogus Creek sites between the Iron Gate Dam site and the Shasta River. [Tier 1]*

*6.2.2.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the in Trinity River mainstem at Willow Creek. [Tier 1]*

*6.2.2.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the in Trinity River mainstem at Pear Tree Gulch. [Tier 1]*

## Objective Species: Green Sturgeon

Green sturgeon that spawn in the Klamath River belong to the Northern Distinct Population Segment (nDPS) and are listed by NOAA Fisheries as a Species of Concern, due to impacts from fisheries harvest, alterations to freshwater habitat, and the lack of population data. Green sturgeon is a Tribal Trust species and a tribal fishery exists for green sturgeon in the Lower Klamath Basin. The number of green sturgeon spawners returning to the Klamath River annually in recent times is largely unknown. The Klamath River is generally believed to support significant and relatively stable spawning population. Green sturgeon enter freshwater to spawn in April-June and then return to the ocean where they spend most of their adult lives. Spawning occurs in the Klamath mainstem. Juveniles spend 1-4 years in freshwater before migrating seaward. Monitoring of Klamath Green Sturgeon is limited.

# Question: What IS the status & trend for esa Fish species?

Federally-listed fish species in the Klamath Basin include Coho Salmon, Lost River Suckers, Shortnose Suckers and Bull Trout.[[3]](#footnote-3) Status of ESA-listed salmon species is assessed based on Viable Salmonid Population parameters defined to include abundance, productivity, spatial structure and diversity. Federal ESA listing determinations also consider statutory listing factors, also sometimes called “threats,” which include (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation;(D) the inadequacy of existing regulatory mechanisms; or(E) other natural or manmade factors affecting its continued existence.

## Objective Species: Coho Salmon

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| ***Related Questions***   * What is the long-term viability of Klamath Coho in relation to ESA recovery criteria and goals? * What are the status and trends in abundance, productivity, spatial structure and diversity? * What are the status and trends in limiting factors and threats contributing to the status of Klamath Coho? |

Coho Salmon are widely distributed in Klamath and Trinity River tributaries but natural production is low. Coho are also propagated at Fall Creek and Trinity River Hatcheries, and previously at Iron Gate Hatchery. Klamath populations are part of the Southern Oregon/Northern California Coastal ESU listed as threatened under the Federal ESA in 1997 and by California in 2005. SONCC Coho are subject to a 2014 Recovery Plan (NMFS 2014) and periodic status reviews (NMFS 2022, 2024). Nine populations have been identified (Lower Klamath, Middle Klamath, Salmon, Scott, Shasta, Upper Klamath, Lower Trinity, Upper Trinity, South Fork Trinity). Coho were extirpated upstream from Iron Gate Dam. All remaining populations are considered to be at a moderate or high risk of extinction.

Adults generally return to freshwater from mid-September through mid-January to spawn small, low gradient tributary streams (ESSA 2017). Spawning may also occur in side channels, tributary conferences and shoreline habitat in the river mainstem. Juveniles generally emerge from the gravel in from March to July and generally spend one year rearing in freshwater before migrating to the ocean as smolts between March and July. Juveniles may also emigrate downstream areas shortly after emerging from spawning gravels. Juveniles may rear in the tributaries where spawned or redistribute into suitable habitat in other tributaries. Klamath Coho generally inhabit coastal waters of northern California and southern Oregon. Adults return to freshwater at three years of age with a small percentage returning as precocious jacks at age two.

For the purposes of recovery, NMFS (2014) categorizes Coho populations as core (Lower Klamath, Scott, Shasta, Upper Klamath, Lower Trinity, Upper Trinity) or non-core (Middle Klamath, Salmon, South Fork Trinity). The Recovery Plan recommends that, at a minimum, adults and juveniles should be monitored in all Core and Non-Core Klamath Coho populations.

Tier 1 activities include adult and juvenile monitoring which provide estimates of abundance and productivity in long-term index populations (Shasta, Scott, Bogus, Trinity). Tier 2 activities provide adult or juvenile index data in other core populations. Tier 3 activities provide supplemental information for other activities (spawning ground surveys vs. weirs) or are primarily focused on distribution and habitat use.

### Task: Stock assessment – Monitor annual abundance and distribution of adult Coho in the lower Klamath Basin.[[4]](#footnote-4)

Long-term population-level estimates of abundance are available only for the Shasta and Scott Rivers, both based on video counts at weirs. A weir has periodically also been operated on Bogus Creek. There are long-term population aggregate abundance estimates in the Trinity River based on mainstem weirs. Spawning surveys provide additional information on Coho escapements in other areas including the Klamath River mainstem, Klamath tributaries, and Trinity tributaries. Spawner surveys generally provide index rather than census level information on relative abundance and trends due to inclusion of only a portion of the distribution or run timing of the subject population.[[5]](#footnote-5)

#### Activity: Late Fall spawning ground surveys in the mainstem Klamath downstream from the Iron Gate site to assess Coho status. [Tier 2]

#### Activity: Late Fall spawning ground surveys in the Salmon River to assess Coho status. [Tier 2]

#### Activity: Late Fall spawning ground surveys in the Shasta River, Scott River and Bogus Creek to assess Coho status. [Tier 3][[6]](#footnote-6)

#### Activity: Late Fall spawning ground surveys in other lower-middle Klamath tributaries to assess Coho status. [Tier 3]

#### Activity: Late Fall spawning ground surveys in Trinity River tributaries to assess Coho status. [Tier 3]6

#### Activity: Late Fall[[7]](#footnote-7) adult video weir counts in the Shasta River, Scott River and Bogus Creek to assess Coho status. [Tier 1]

#### Activity: Late Fall adult weir counts in Trinity River mainstem to assess Coho status. [Tier 1]

##### Related activities identified under other objectives:

*4.1.1.1 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in the Klamath River mainstem between the Iron Gate Dam site and Keno Dam to assess stock status. [Tier 1]*

*4.1.1.2 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch, Camp, Jenny, Fall, Shovel creeks) to assess stock status. [Tier 2]*

*4.1.1.3 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (e.g., Spencer Creek) to assess stock status. [Tier 2]*

*4.1.1.4 Activity: Fall-Winter adult video weir counts for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Shovel Creeks) to assess stock status. [Tier 1]*

*4.1.1.5 Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (Spencer Creek) to assess stock status. [Tier 1]*

*4.1.1.6 Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon portion of the Klamath River mainstem to assess stock status. [Tier 3]*

*5.1.1.1 Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Keno Dam fish ladder to assess passage. [Tier 1]*

*7.1.1.2 Mark and/or coded wire tag samples of Fall Creek Hatchery juvenile releases of Fall Chinook and Coho for subsequent evaluation. [Tier 1]*

*7.1.2.3 Identify Fall Creek Hatchery contributions of Fall Chinook and Coho in natural spawning areas. [Tier 1]*

*7.2.1.2 Mark and/or coded wire tag samples of Trinity Hatchery juvenile releases of Spring Chinook, Fall Chinook, Coho and Steelhead for subsequent evaluation. [Tier 1]*

*7.2.2.3 Identify Trinity Hatchery contributions of Spring Chinook, Fall Chinook, Coho and Steelhead in natural spawning areas. [Tier 1]*

### Task: Stock assessment – Monitor productivity and life history diversity of juvenile Coho in the lower Klamath Basin.

Information on juvenile Coho distribution and relative abundance is also widely available in tributary and mainstem outmigrant trapping, snorkel surveys and habitat assessments. Stock assessments are a cooperative effort of a number of basin partners.

#### Activity: Spring juvenile outmigrant trapping in Scott River, Shasta River and Bogus Creek to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 1]

#### Activity: Spring juvenile outmigrant trapping in the Salmon River to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 2]

#### Activity: Spring juvenile outmigrant trapping in lower Klamath tributaries (Blue, McGarvey, etc.) to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 2]

#### Activity: Spring juvenile outmigrant trapping in lower Trinity tributaries to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 2]

##### Related activities identified under other objectives:

*4.1.2.1 Activity: Spring juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Fall, Shovel Creeks) to assess production. [Tier 1]*

*4.1.2.2 Activity: Spring juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (e.g., Spencer Creek) to assess production. [Tier 1]*

*4.1.2.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in Klamath River mainstem between Shovel and Spencer Creeks to assess production. [Tier 1]*

*4.1.2.4 Activity: Summer juvenile snorkel surveys for Coho and O. mykiss in California tributaries (Scotch/Camp, Jenny, Fall, Shovel Creeks) to assess production. [Tier 2]*

*4.1.2.5 Activity: Summer Juvenile snorkel and/or electrofishing surveys for Coho and O. mykiss in Oregon tributaries (e.g., Spencer Creek) to assess production. [Tier 2]*

*4.1.2.6 Activity: Juvenile PIT tagging and tag detection arrays in California tributaries (Scotch/Camp, Jenny, Fall, Shovel Creeks) to assess production. [Tier 3]*

*4.1.2.7 Activity: Juvenile PIT tagging and tag detection arrays in Oregon tributaries (e.g., Spencer Creek) to assess production. [Tier 3]*

*6.1.1.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at the Weitchpec site above the Trinity River confluence. [Tier 1]*

*6.1.1.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at Kinsman and Big Bar sites between the Shasta and Trinity Rivers. [Tier 1]*

*6.1.1.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the Mainstem Klamath River at I5 and Bogus Creek sites between the Iron Gate Dam site and the Shasta River. [Tier 1]*

*6.2.2.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the in Trinity River mainstem at Willow Creek. [Tier 1]*

*6.2.2.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the in Trinity River mainstem at Pear Tree Gulch. [Tier 1]*

*8.1.1.2 Activity: PIT tag juvenile Coho in lower Klamath tributaries and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

*8.2.1.2 Activity: Sample juvenile Coho with seines and traps to evaluate use and life history characteristics in representative habitats in middle Klamath tributaries for assessment of habitat restoration effectiveness. [Tier 3]*

*8.2.1.3 Activity: PIT tag juvenile Coho in middle Klamath tributaries and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

*8.3.1.2 Activity: Sample juvenile Coho and O. mykiss with seines and traps to evaluate use and life history characteristics in representative habitats in the Salmon, Scott and Shasta Rivers. [Tier 3]*

*8.3.1.3 Activity: PIT tag juvenile Coho in the Shasta and Scott Rivers and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

*8.4.1.1 Activity: Operate fyke nets lower Trinity River tributaries (Campbell, Hostler, Mill, Pine, Soctish, Supply, and Tish Tang Creeks) to quantify the abundance of out-migrating juvenile Chinook, Coho and Steelhead. [Tier 3]*

## Objective Species: Lost River Sucker & Shortnose Sucker

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| ***Related Questions***   * What is the long-term viability of Lost River and Shortnose suckers in relation to ESA recovery criteria and goals? * What are the status and trends in abundance and population dynamics? * How are suckers arranged on the landscape? * What is limiting sucker recruitment? * Why are suckers are dying and what can be done about it? * What is the effectiveness of artificial propagation/assisted rearing for conservation? * How are juvenile suckers from the hatchery contributing to the wild populations * When could we phase out hatchery production? (Is this a goal?) * How do we monitor to understand patterns of sucker movement in the Lost River system? * How do suckers interact with large scale restoration projects? * Salmon are now part of the upper basin, how are they interacting with suckers? |

Lost River (*Deltistes luxatus*) and shortnose (*Chasmistes brevirostris*) suckers are large, long-lived, lake-dwelling species endemic to the upper Klamath Basin (Burdick 2023; USFWS 2024). Both species are currently on the federal, Oregon, and California endangered species lists. The species are most abundant in Upper Klamath lakes with spawning populations extending upstream to tributaries such as the Williamson and Sprague rivers. Populations also exist elsewhere in the basin, including Clear Lake, with smaller numbers of individual observed in J.C. Boyle Reservoir, Tule Lake, and Copco Reservoir. The number of adult endangered Lost River and shortnose suckers in Upper Klamath Lake, the primary remaining habitat for these species, declined by 65 to 85 percent between 2001 and 2020 (Burdick 2023). Extinction is increasingly likely for these species unless their population trajectories can be changed.

Shortnose sucker adults average about 21 inches in length, mature at four to six years and have been aged to 33 years (ESSA 2017). Lost River Sucker adults average about two and a half feet long, mature at four to nine years and have been documented to live as long as 57 years. Both species generally migrate approximately 7 to 12 miles into a river or stream to spawn. Lost River suckers will also spawn at shoreline springs along lake margins in Upper Klamath Lake and similar water bodies within their range. Spawning occurs from March through May. Both species are limited by very high mortality within the first year or two of life. There are many hypothesized causes of high juvenile sucker mortality, including poor water quality, diseases aggravated by warming water temperatures, and the reduction in wetland habitat that provides food and cover.

### Task: Stock assessment – What is the abundance, productivity, spatial structure, diversity of Lost River Suckers and Shortnose Suckers in the Klamath Basin?

#### Activity: Annual adult sampling in upper Klamath Lake by trammel net to evaluate population characteristics & tag Lost River and Shortnose Suckers for population estimation [Tier 1]

#### Activity: Annual juvenile sampling in upper Klamath Lake by trap net to evaluate Lost River and Shortnose Sucker juvenile production [Tier 1]

#### Activity: Operation of PIT tag arrays continuously throughout upper Klamath Lake and tributaries for capture-recapture Lost River and Shortnose Sucker population estimates [Tier 1]

#### Activity: Annual weir sampling in Williamson River in spring for Lost River and Shortnose Sucker population assessment. [Tier 1].

#### Activity: Annual Lost River and Shortnose Sucker population assessments in Clear Lake by trammel and trap net. [Tier 2]

#### Activity: Expand monitoring and assessment of Lost River and Shortnose Suckers in new places. [Tier 3]

#### Activity: Complete comprehensive periodic Lost River and Shortnose Sucker stock status updates. [Tier 2]

### Task: Recruitment Factor Limitations – Habitat, disease, mortality, etc.

#### Activity: Investigations into ecological limitations including disease, parasitism, and predation on survival of wild and hatchery-reared juvenile Lost River and Shortnose Suckers. [Tier 1]

#### Activity: Investigation into effects of environmental conditions (water level, water quality, etc.) and related management on juvenile survival of Lost River and Shortnose Suckers. [Tier 1]

#### Activity: Assessment of waterbird predation on Lost River and Shortnose Suckers based on abundance monitoring of colonial waterbird breeding colonies and recoveries of PIT tags. [Tier 3]

### Task: Action effectiveness – Hatchery reintroduction evaluation

#### Activity: Annual juvenile sampling in upper Klamath Lake to collect Lost River and Shortnose Sucker juveniles for hatchery-assisted rearing [Tier 1].

#### Activity: Post-release assessment of hatchery-origin abundance and survival of Lost River and Shortnose Suckers. [Tier 1]

#### Activity: In-hatchery evaluations of effective for hatchery-assisted rearing practices for Lost River and Shortnose Suckers. [Tier 2]

## Objective Species: Bull Trout

To be completed: There are three core populations of Bull Trout in the Klamath Recovery Unit - Upper Klamath Lake (2 resident populations Sun Creek and Threemile Creek), Sprague River (1 resident population = Deming Creek), and Sycan River (1 resident population = Long Creek). The Sun Creek population maybe could be considered a migratory population at this point. Four resident populations were extirpated in 2021 (Boulder, Dixon, Brownsworth, and Leonard) after the Bootleg Fire, either through acute lethal temperatures or through ash and sediment flows after heavy rainfalls shortly after the fire.

The major field tasks ahead of us include brook trout removal, bull trout monitoring, and reintroduction. - current estimates are needed to model effects on donor populations for reintroduction. Brook trout are a major problem throughout the basin, but Long Creek may be most in need of removal efforts as they are approaching extirpation through displacement and hybridization that is reducing the bull trout range every year. This stream is ideal for an upstream fish exclusion barrier with a trap to pass bull trout - ideal location is on TNC property and TNC has offered their on-site staff to aid in passing fish. Most of Long Creek is on Green Diamond land. I am working on a Conservation Benefit Agreement with them, but as of now they are preventing access to FWS until an agreement is signed. Other upstream barriers to exclude brook trout are needed throughout the basin including Crane Creek (UKL core pop) and Boulder Creek (Sprague core pop). No funds are have been dedicated to upstream exclusion barriers at this time and will be sought in the near future. Dave and his crew are working to eradicate brook trout in Annie Creek and a barrier is funded for installation on this stream either next year or the year after. This stream will likely be our first reintroduction priority. Testing the feasibility of methods for reintroduction and acquiring funding for hatchery space (permanent broodstock space would be most ideal) and materials to aid in those efforts are needed.

### Task: Status assessment – Abundance, productivity, spatial structure, diversity

Population estimates for resident populations besides Sun Creek are approaching 20 years old.

#### Activity: Periodic assessments of resident Bull Trout population status in the Klamath headwaters tributaries. [Tier 1]

### Task: Restoration evaluations

Restoration efforts include habitat protection and restoration, brook trout removal, upstream fish exclusion barriers and reintroduction.

#### Activity: Apply a bull trout reintroduction structured decision-making model to Identify restoration opportunities. [Tier 1]

#### Activity: Assess effectiveness of Bull Trout conservation and restoration efforts. [Tier 1]

# Question: What levels of fishery harvest are sustainable?

Fisheries in the Klamath basin and ocean are monitored to support sustainable management of Klamath salmon and Steelhead. Sustainable fisheries optimize benefits of harvestable surpluses, ensure adequate natural spawning escapement of target stocks and protect weak stocks from fishery impacts which might affect long-term viability. Klamath Fall Chinook and Coho are subject to significant harvest in both freshwater and the ocean. Smaller fisheries occur for Spring Chinook in freshwater. A freshwater fishery for Steelhead is mostly catch and release. Tribal and non-tribal fisheries in freshwater are managed by the respective authorities. Regulatory jurisdiction for ocean fisheries is the responsibility of the states within 3 miles of shore and by the federal Pacific Fishery Management Council (PFMC) from 3 to 200 miles off the coasts of California, Oregon and Washington. PFMC fisheries are managed according to a Salmon Fishery Management Plan developed and implemented under the Magnuson Stevens Fishery Conservation and Management Act of 1976 as amended in 1996 and 2007.

## Objective Species: Fall Chinook

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| ***Related Questions***   * What is the harvestable surplus of the adult fall run chinook on an annual basis? * What harvest levels and strategies are consistent with long term sustainability? * What is the forecast run size on an annual basis? * What fishery exploitation rate is appropriate based on the run forecast? * How is the harvestable surplus equitably shared among the various fisheries? * Did the harvest match the planned projection? |

Klamath Fall Chinook are subject to significant harvest in freshwater and the ocean. In-river fisheries are conducted by the Yurok Tribe within the lower 44 miles of the Klamath River and the Hoopa Tribe in the Trinity River from one mile above the confluence with the Klamath River upstream approximately 12 miles to the boundary of the Hoopa Valley Reservation. Fall fisheries occur from August to November. In-river non-tribal recreational fisheries may occur in the Klamath and Trinity Rivers in some years depending on abundance. Klamath Fall Chinook are also harvested in ocean commercial and recreational fisheries in California and Oregon. Harvest is regulated based on abundance of natural-origin spawners. Exploitation rates and allocation among fisheries is governed by a complex management plan developed by fishery co-managers and implemented through the annual Pacific Fishery Council process (PFMC 2007, 2019, 2025a, b).

### Task: Fishery assessment – Estimate annual run forecasts, harvestable surplus, actual run size and fishing rates necessary for effective fishery management.

Extensive annual stock assessments of numbers and harvest are essential for management of Fall Chinook fisheries. Comprehensive annual run reconstructions based on estimated escapement of hatchery and natural spawners by area, in-river harvest by fishery and total run size by age class to the river. This information is compiled each year and reported in the form of a “megatable” by the CDFW. Age composition breakdowns within the run are determined by PFMC’s Klamath River Technical Advisory Team of co-managers based on scale reading age determinations, length frequency distributions and Coded Wire Tag (CWT) data. These metrics are used in a Klamath Ocean Harvest Model to predict ocean abundance which is then used in annual management processes to identify appropriate harvest rates and allocate sustainable harvest levels for various user groups in the Klamath Fishery Management Zone for the following fishing season. Klamath Fall Chinook stock assessment information collected in adult monitoring was used to establish risk-based harvest rules used to regulate ocean and freshwater fisheries (PFMC 2021).

#### Activity: Annual run reconstruction of Fall Chinook return to the Klamath River including natural escapement, hatchery escapement, in-river harvest and run to river. [Tier 1]

#### Activity: Forecast annual run size of Fall Chinook to ocean fisheries and the Klamath River. [Tier 1]

#### Activity: Identify annual harvest objectives and allocations for Fall Chinook in ocean and Klamath River fisheries. [Tier 1]

#### Activity: Assess annual fishery performance relative to established objectives and limits for Fall Chinook. [Tier 1]

##### Related activities identified under other objectives:

*1.1.1.1 Activity: Fall spawning ground surveys in the mainstem Klamath downstream from the Iron Gate site to assess Fall Chinook status. [Tier 1]*

*1.1.1.2 Activity: Fall spawning ground surveys in the Salmon River to assess Fall Chinook status. [Tier 1]*

*1.1.1.3 Activity: Fall spawning ground surveys in Shasta River, Scott River and Bogus Creek to assess Fall Chinook status. [Tier 2]*

*1.1.1.4 Activity: Fall spawning ground surveys in other lower and middle Klamath tributaries to assess Fall Chinook status. [Tier 2]*

*1.1.1.5 Activity: Fall spawning ground surveys in Trinity River mainstem downstream from Willow Creek Weir to assess Fall Chinook status [Tier 1]*

*1.1.1.6 Activity: Fall spawning ground surveys in Trinity River mainstem upstream from Willow Creek Weir to assess Fall Chinook status. [Tier 2]*

*1.1.1.7 Activity: Fall adult video weir counts in the Shasta River, Scott River and Bogus Creek to assess Fall Chinook status. [Tier 1]*

*1.1.1.8 Activity: Fall adult weir counts in Trinity River mainstem near Willow Creek and Junction City to assess Fall Chinook status. [Tier 1]*

*4.1.1.1 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in the Klamath River mainstem between the Iron Gate Dam site and Keno Dam to assess stock status. [Tier 1]*

*4.1.1.2 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch, Camp, Jenny, Fall, Shovel creeks) to assess stock status. [Tier 2]*

*4.1.1.3 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (e.g., Spencer Creek) to assess stock status. [Tier 2]*

*4.1.1.4 Activity: Fall-Winter adult video weir counts for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Shovel Creeks) to assess stock status. [Tier 1]*

*4.1.1.5 Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (Spencer Creek) to assess stock status. [Tier 1]*

*4.1.1.6 Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon portion of the Klamath River mainstem to assess stock status. [Tier 3]*

*5.1.1.1 Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Keno Dam fish ladder to assess passage. [Tier 1]*

*7.2.2.1 Count numbers of Spring Chinook, Fall Chinook, Coho and Steelhead returning to Trinity Hatchery. [Tier 1]*

*7.2.2.2 Collect age, sex, length, mark and coded wire tag information for Spring Chinook, Fall Chinook, Coho and Steelhead in Trinity Hatchery returns. [Tier 1]*

*7.2.2.3 Identify Trinity Hatchery contributions of Spring Chinook, Fall Chinook, Coho and Steelhead in natural spawning areas. [Tier 1]*

*7.2.2.4 Estimate the Trinity River hatchery return of Spring Chinook, Fall Chinook, Coho and Steelhead. [Tier 1]*

*7.1.2.1 Count numbers of Fall Chinook and Coho returning to the Fall Creek Hatchery. [Tier 1]*

*7.1.2.2 Collect age, sex, length, mark and coded wire tag information on Fall Chinook and Coho in Fall Creek Hatchery returns. [Tier 1]*

*7.1.2.3 Identify Fall Creek Hatchery contributions of Fall Chinook and Coho in natural spawning areas. [Tier 1]*

*7.1.2.4 Estimate the Fall Creek Hatchery return of Fall Chinook and Coho. [Tier 1]*

### Task: Freshwater Harvest assessment – Monitor annual harvest & catch composition needed to estimate run size and fishery impact rates in relation to target levels.

Numbers and biological characteristics of fishery harvest are surveyed each year by the responsible management authorities. Surveys generally include counts of participants and interviews or questionnaires to determine catch, effort and catch composition. The Yurok Tribe monitors their primarily-gillnet subsistence, ceremonial and sometimes commercial fisheries within the lower 44 miles of the Klamath River (Williams 2015). The Hoopa Valley Tribal Fisheries Department surveys their gillnet, hook-and-line and weir fisheries within the Hoopa Valley Reservation in the Trinity River between miles 2 and 12 (NMFS 2022; HVTFD 2023). The HVT also surveys non-tribal recreational anglers in the lower 13-22 miles of Trinity River in years when they occur. CDFW conducts a creel survey of recreational anglers in the Lower Klamath from the Pacific Ocean to the Iron Gate damsite during fall in years when the fishery is open (Troxel & Lindke 2019, 2020, 2021).

#### Activity: Annual fall season harvest survey of Yurok Tribe fisheries for Fall Chinook and Coho. [Tier 1]

#### Activity: Annual fall season harvest survey of Hoopa Valley Tribe fisheries for Fall Chinook and Coho. [Tier 1]

#### Activity: Annual fall season harvest survey of other tribal fisheries for Fall Chinook and Coho. [Tier 2]

#### Activity: Annual fall season harvest survey of non-tribal tribal fisheries for Fall Chinook and Coho. [Tier 1]

### Task: Ocean Harvest assessment – Monitor annual contributions of Klamath Fall Chinook to ocean fisheries.

Ocean harvest of Chinook and Coho is estimated by CDFW and ODFW from statistical angler survey programs for recreational fisheries and fishing landing reports for commercial fisheries. Catch is apportioned among stocks based on mark and coded wire tag information in subsampled catch. Ocean harvest of Klamath Fall Chinook is estimated from ocean fishery monitoring and stock apportionment using recoveries of coded wire tags in Fall Chinook produced by Klamath and Trinity salmon hatcheries.

#### Activity: Annual assessment of Klamath Fall Chinook harvest and exploitation rates in ocean fisheries based on coded wire tags placed in a portion of the Klamath and Trinity River hatchery production. [Tier 1]

##### Related activities identified under other objectives:

*7.1.1.2 Mark and/or coded wire tag samples of Fall Creek Hatchery juvenile releases of Fall Chinook and Coho for subsequent evaluation. [Tier 1]*

*7.2.1.2 Mark and/or coded wire tag samples of Trinity Hatchery juvenile releases of Spring Chinook, Fall Chinook, Coho and Steelhead for subsequent evaluation. [Tier 1]*

## Objective Species: Spring Chinook

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| ***Related Questions***   * What is the harvestable surplus of the adult spring run chinook on an annual basis? * What harvest levels and strategies are consistent with long term sustainability? * How is the harvestable surplus equitably shared among the various fisheries? |

Spring Chinook run are harvested in the Klamath and Trinity Rivers from May to July primarily by tribal fisheries. In-river fisheries are conducted by the Yurok Tribe within the lower 44 miles of the Klamath River and the Hoopa Tribe in the Trinity River from one mile above the confluence with the Klamath River upstream approximately 12 miles to the boundary of the Hoopa Valley Reservation. Non-tribal recreational fisheries may occur in the lower Klamath and Trinity Rivers in many years depending on abundance. Klamath Spring Chinook harvest is not assessed in ocean fisheries due to their low numbers.

### Task: Fishery assessment – Estimate annual run forecasts, harvestable surplus, actual run size and fishing rates necessary for effective fishery management.

Related assessments of numbers and harvest include run reconstructions based on estimate escapement of hatchery and natural spawners by area, in-river harvest by fishery and total run size of adults and grilse to the river. This information is compiled each year and reported in the form of a “megatable” by the CDFW.

#### Activity: Annual run reconstruction of Spring Chinook return to the Klamath River including natural escapement, hatchery escapement, in-river harvest and run to river. [Tier 1]

#### Activity: Assess annual fishery performance relative to established objectives for Spring Chinook. [Tier 1]

##### Related activities identified under other objectives:

*1.2.1.1 Activity: Summer dive survey in the Salmon River to assess Spring Chinook status. [Tier 1]*

*1.2.1.2 Activity: Summer spawning ground surveys in other lower Klamath tributaries to assess Spring Chinook status. [Tier 3]*

*1.2.1.3 Activity: Summer adult weir counts and mark-recapture estimates in Trinity River mainstem to assess Spring Chinook status. [Tier 1]*

*1.2.1.4 Activity: Summer spawner surveys in the South Fork Trinity River to assess Spring Chinook status. [Tier 3]*

*1.2.1.5 Activity: Summer spawner surveys in other Trinity River tributaries to assess Spring Chinook status. [Tier 3]*

### Task: Freshwater Harvest assessment – Monitor annual harvest & catch composition needed to estimate run size and fishery impact rates in relation to target levels.

Fisheries are surveyed each year by the responsible management authorities. Surveys generally include counts of participants and interviews or questionnaires to determine catch, effort and catch composition.

#### Activity: Annual spring season harvest survey of Yurok Tribe fisheries for Spring Chinook. [Tier 1]

#### Activity: Annual spring season harvest survey of Hoopa Valley Tribe fisheries for Spring Chinook. [Tier 1]

#### Activity: Annual spring season harvest survey of non-tribal tribal fisheries for Spring Chinook. [Tier 1]

## Objective Species: Coho

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| ***Related Questions***   * What is the harvestable surplus of the adult fall run chinook on an annual basis? * What harvest levels and strategies are consistent with long term sustainability? * What is the forecast run size on an annual basis? * What fishery exploitation rate is appropriate based on the run forecast? * How is the harvestable surplus equitably shared among the various fisheries? * Did the harvest match the planned projection? |

Due to their depressed status and ESA listing, Klamath Coho are not subject significant harvest (ESSA 2017, PFMC 2021). Klamath Basin Tribes (Yurok, Hoopa, and Karuk) harvest a relatively small number of Coho salmon for subsistence and ceremonial purposes under federal reserved fishing rights in the Klamath River. Coho salmon are encountered occasionally during fisheries targeting Fall Chinook and are targeted during their peak migration in October. Coho are caught in gillnets and by hook-and-line. The Hoopa Valley Tribe selectively harvests marked hatchery-origin Coho Salmon at a Trinity River weir. Coho salmon-directed fisheries and Coho salmon retention have been prohibited off the coast of California since 1996. California’s freshwater sport fishing regulations prohibit retention of Coho salmon. Incidental mortality occurs as a result of non-retention impacts in California and Oregon Chinook-directed fisheries and in Oregon’s mark-selective Coho fisheries.

### Task: Fishery assessment – Estimate annual run size, harvest and fishing rates necessary for effective fishery management.

Klamath Coho fisheries are monitored and regulated to limit incidental impacts to low levels which are deemed not likely to jeopardize viability. Klamath Coho stock assessment information collected in adult monitoring was used to establish corresponding risk-based harvest rules used to regulate ocean and freshwater fisheries (PFMC 2021). Fisheries impacting Southern Oregon North Coast California Coho are regulated not to exceed a total fishery (marine and freshwater) exploitation rate (ER) limit specified in NMFS’s ESA consultation of 15% for all populations within the Evolutionary Significant Unit, except the Trinity River Coho population unit (Upper Trinity River, Lower Trinity River, SF Trinity River) which has a total fishery ER limit of 16%. Freshwater impacts are determined based monitoring and harvest and returns provided by co-managing agencies and tribes (i.e., the Oregon Department of Fish and Wildlife, Yurok Tribe, Hoopa Valley Tribe, California Department of Fish and Wildlife).

#### Activity: Annual run reconstruction of Coho return to the Klamath River including run size, hatchery escapement, harvest. [Tier 1]

#### Activity: Assess annual fishery performance relative to established objectives and limits for Coho. [Tier 1]

##### Related activities identified under other objectives:

*2.1.1.3 Activity: Late Fall spawning ground surveys in the Shasta River, Scott River and Bogus Creek to assess Coho status. [Tier 3]*

*7.1.1.2 Mark and/or coded wire tag samples of Fall Creek Hatchery juvenile releases of Fall Chinook and Coho for subsequent evaluation. [Tier 1]*

*7.1.2.4 Estimate the Fall Creek Hatchery return of Fall Chinook and Coho. [Tier 1]*

*7.2.1.2 Mark and/or coded wire tag samples of Trinity Hatchery juvenile releases of Spring Chinook, Fall Chinook, Coho and Steelhead for subsequent evaluation. [Tier 1]*

*7.2.2.4 Estimate the Trinity River hatchery return of Spring Chinook, Fall Chinook, Coho and Steelhead. [Tier 1]*

### Task: Freshwater Harvest assessment – Monitor annual harvest & catch composition needed to estimate run size and fishery impact rates in relation to target levels.

Numbers and biological characteristics of fishery harvest are surveyed each year by the responsible management authorities. Surveys generally include counts of participants and interviews or questionnaires to determine catch, effort and catch composition. The Yurok Tribe monitors their primarily-gillnet subsistence, ceremonial and sometimes commercial fisheries within the lower 44 miles of the Klamath River (Williams 2015). The Hoopa Valley Tribal Fisheries Department surveys their gillnet, hook-and-line and weir fisheries within the Hoopa Valley Reservation in the Trinity River between miles 2 and 12 (NMFS 2022; HVTFD 2023). The HVT also surveys non-tribal recreational anglers in the lower 13-22 miles of Trinity River in years when they occur. CDFW conducts a creel survey of recreational anglers in the Lower Klamath from the Pacific Ocean to the Iron Gate damsite during fall in years when the fishery is open (Troxel & Lindke 2019, 2020, 2021).

##### Related activities identified under other objectives:

*3.1.2.1 Activity: Annual fall season harvest survey of Yurok Tribe fisheries for Fall Chinook and Coho. [Tier 1]*

*3.1.2.2 Activity: Annual fall season harvest survey of Hoopa Valley Tribe fisheries for Fall Chinook and Coho. [Tier 1]*

*3.1.2.3 Activity: Annual fall season harvest survey of other tribal fisheries for Fall Chinook and Coho. [Tier 2]*

*3.1.2.4 Activity: Annual fall season harvest survey of non-tribal tribal fisheries for Fall Chinook and Coho. [Tier 1]*

### Task: Ocean Harvest assessment – Monitor annual contributions of Klamath Fall Chinook to ocean fisheries.

Ocean harvest of Chinook and Coho is estimated by CDFW and ODFW from statistical angler survey programs for recreational fisheries and fishing landing reports for commercial fisheries. Catch is apportioned among stocks based on mark and coded wire tag information in subsampled catch. Ocean harvest of Klamath Coho is estimated from ocean fishery monitoring and stock apportionment using recoveries of marked Coho produced by Klamath and Trinity salmon hatcheries.[[8]](#footnote-8)

#### Activity: Annual assessment of Klamath Coho harvest and exploitation rates in ocean fisheries based on marked and tagged Klamath and Trinity River hatchery production. [Tier 1]

##### Related activities identified under other objectives:

*7.1.1.2 Mark and/or coded wire tag samples of Fall Creek Hatchery juvenile releases of Fall Chinook and Coho for subsequent evaluation. [Tier 1]*

*7.2.1.2 Mark and/or coded wire tag samples of Trinity Hatchery juvenile releases of Spring Chinook, Fall Chinook, Coho and Steelhead for subsequent evaluation. [Tier 1]*

# Question: What is the anadromous fish response to dam removal?

Extensive monitoring has been implemented or is planned to measure and track the reintroduction of anadromous fishes and progress toward viable self-sustaining populations of anadromous fishes in the upper Klamath River following removal of the four hydroelectric dams. This data will inform and guide future restoration efforts including the effectiveness of a volitional passage strategy and the staging/sequencing of future management decisions. Monitoring required under the lower Klamath Project is summarized in California’s Klamath River Anadromous Fishery Reintroduction and Restoration Monitoring Plan (CNRS & CDFW 2024), an anadromous fish reintroduction plan by the Oregon Department of Fish and Wildlife and the Klamath Tribes (ODFW & KT 2021), and the KRRC’s Definite Plan for the Lower Klamath Project (KRRC 2018) and Definite Decommissioning Plan (KRRC 2020) include monitoring of project effects on aquatic and terrestrial resources.

## Objective: Upper Klamath Mainstem & Tributaries Fish Status Assessment

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| ***Related Questions***   * How long will it take for upper basin anadromous species to return and reestablish themselves? * What species and runs are utilizing areas in or above the dam removal reach? * What tributaries or parts of the river are being utilized and how are they arranged on the landscape? * What thermal refugia areas are fish utilizing in the new reach? * What is the timing and survival of outmigration? * Are there fine scale differences in migration runs? * What factors are affecting survival. * How are recruits per spawner changing over time? * How has the fall chinook population downstream responded to dam removal? * Where are the bottlenecks for juvenile and adult salmon in the dam removal reach? * What barriers exist to reintroduction of anadromous fishes - Are there limit barriers to success that we don't fully understand? * What changes across the basin are we seeing due to dam removal? * What is the environmental condition of the river basin post dam removal, (water quality, riparian)? * What actions might we take if they are trying to migrate during known poor water quality? |

### Task: Assess distribution and abundance of anadromous fish adults in newly-accessible areas.

Returns of Fall Chinook, Coho, Steelhead and Lamprey to the mainstem and tributaries between the Iron Gate Dam site and Keno Dam are being or are planned to be assessed with a combination of spawning ground surveys, adult weirs, and sonar. Spawning ground surveys are generally effective for identifying presence, distribution, timing and relative abundance of returning adults. Carcass sampling in these surveys provides information on run characteristics (e.g., age, size, sex, prespawn mortality, hatchery contribution). A robust statistical design may also allow estimates of total return. Video weirs generally provide robust estimates of total escapement. Sonar is a promising technology for quantifying fish numbers in large rivers and is being tried in the Klamath.

#### Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in the Klamath River mainstem between the Iron Gate Dam site and Keno Dam to assess stock status. [Tier 1]

#### Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch, Camp, Jenny, Fall, Shovel creeks) to assess stock status. [Tier 2]

#### Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (e.g., Spencer Creek) to assess stock status. [Tier 2]

#### Activity: Fall-Winter adult video weir counts for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Shovel Creeks) to assess stock status. [Tier 1]

#### Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (Spencer Creek) to assess stock status. [Tier 1]

#### Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon portion of the Klamath River mainstem to assess stock status. [Tier 3][[9]](#footnote-9)

#### Activity: Fall-Winter adult sonar counts of Chinook, Coho and Steelhead in the Klamath River mainstem near the Iron Gate damsite to assess stock status. [Tier 2][[10]](#footnote-10)

#### Activity: Capture and release returning adult Chinook, Coho, and Steelhead near the Iron Gate damsite for species identification, PIT tagging and radio tagging. [Tier 2]

#### Activity: Telemetry survey of Klamath mainstem and tributaries for the presence of returning adult salmon radio-tagged near the Iron Gate damsite. [Tier 2]

### Task: Assess anadromous fish production of juveniles out of newly-accessible areas.

Successful reproduction and productivity are estimated by juvenile snorkel surveys and outmigrant trapping. PIT tagging and PIT tag arrays provide information on juvenile survival and movements. Snorkel surveys are particularly useful for identifying successful reproduction, distribution, relative abundance, and habitat use. outmigrant traps provide robust estimates of total production of juveniles, juveniles per adult, migration timing and individual fish sampling opportunities when used in conjunction with adult escapement estimates. outmigrant traps are identified as Tier 1 because of they provide census level estimates of abundance. Snorkel surveys are identified as Tier 2 because they supplement information from outmigrant traps. PIT tags and arrays are identified as Tier 3 as they provide useful information on survival but utility may be constrained by recapture numbers.

#### Activity: Spring juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Fall, Shovel Creeks) to assess production. [Tier 1]

#### Activity: Spring juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (e.g., Spencer Creek) to assess production. [Tier 1]

#### Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in Klamath River mainstem between Shovel and Spencer Creeks to assess production. [Tier 1]

#### Activity: Summer juvenile snorkel surveys for Coho and O. mykiss in California tributaries (Scotch/Camp, Jenny, Fall, Shovel Creeks) to assess production. [Tier 2]

#### Activity: Summer Juvenile snorkel and/or electrofishing surveys for Coho and O. mykiss in Oregon tributaries (e.g., Spencer Creek) to assess production. [Tier 2]

#### Activity: Juvenile PIT tagging and tag detection arrays in California tributaries (Scotch/Camp, Jenny, Fall, Shovel Creeks) to assess production. [Tier 3]

#### Activity: Juvenile PIT tagging and tag detection arrays in Oregon tributaries (e.g., Spencer Creek) to assess production. [Tier 3]

##### Related activities identified under other objectives:

*6.1.1.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at the Weitchpec site above the Trinity River confluence. [Tier 1]*

*6.1.1.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at Kinsman and Big Bar sites between the Shasta and Trinity Rivers. [Tier 1]*

*6.1.1.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the Mainstem Klamath River at I5 and Bogus Creek sites between the Iron Gate Dam site and the Shasta River. [Tier 1]*

*8.1.1.2 Activity: PIT tag juvenile Coho in lower Klamath tributaries and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

*8.2.1.3 Activity: PIT tag juvenile Coho in middle Klamath tributaries and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

*8.3.1.3 Activity: PIT tag juvenile Coho in the Shasta and Scott Rivers and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

## Objective: Klamath Headwaters Fish Status Assessment

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| ***Related Questions***   * Are adult anadromous fishes migrating upstream past the former dam sites, and if so, what is their abundance and species composition? * If anadromous fishes are migrating past the former dam sites, where are they spawning (distribution)? * Are adult anadromous fishes migrating above Keno Dam and Link River Dam? * Are anadromous species able to navigate the waters of upper Klamath lake? * Will there be utilization of upper Klamath lake? * Are adult anadromous fishes migrating into tributaries above Upper Klamath Lake? * How long will it take for upper basin anadromous species to return and reestablish themselves? * Are juvenile anadromous fishes successfully emigrating out of the Upper Klamath Basin? * Are anadromous life histories being expressed by O. mykiss (Steelhead trout) above the former dam sites? * What is the abundance and species composition of adult anadromous fishes within each sub-basin of the Upper Klamath Basin (UKB)? * What is the productivity, emigration timing, and health of juvenile fishes from each Upper Klamath Basin sub-basin? * What are the temporal characteristics of adults migrating up to the upper basin? * What is the source population of anadromous fishes? * What life histories are expressed by anadromous fishes and which ones are dominant? * What is the genetic diversity and characterization of anadromous fishes? * How does genetic diversity of Pacific Lamprey and Steelhead trout compare to the resident populations? * What is the spatial distribution of anadromous fishes in the Upper Klamath Basin? * To what extent are the reintroduction plans being implemented in Oregon and California)? * What is the success of re-introduction methods? * In the case of active reintroduction/re-establishment from natural donor stocks, are there effects on natural stocks from management actions? * How are populations in the upstream of dams now interacting with new salmonid passage? * What genetic considerations or questions in reintroduction strategies for these various species? * How can we utilize information we are learning about habitat needs and life history of wild spring run from new genetic research to inform successful recolonization of the upper basin? * What kind of diseases might salmon introduce and how might that affect suckers and trout? |

While Fall Chinook, Coho, Steelhead and Lamprey may volitionally migrate into Klamath Basin headwater streams following mainstem dam removal, prospects for natural recovery are uncertain. Oregon and the Klamath Tribes have also developed an active reintroduction plan for spring-run Chinook Salmon (ODFW & KT 2021). The reintroduction plan describes a phased approach to monitoring based on how things unfold.

Under this objective, Tier 1 identifies near-term activities needed for phase 1 monitoring of the initial stages of anadromous fish recolonization and/or reintroduction. Tier 2 identifies longer-term activities necessary for comprehensive monitoring in subsequent phases.

### Task: Assess distribution and abundance of anadromous fish returns in newly-accessible areas.

Monitoring has been implemented to assess numbers and distribution of anadromous fish that migrate to and through Klamath Lake into suitable habitats upstream. Detection of migrating adults at Keno Dam and/or Link River Dam Fish Ladder will trigger the initiation of additional monitoring activities in Upper Klamath Lake and its tributaries. Ideally, a proportion, if not all, adults encountered at Keno Dam and/or Link River Dam fish ladders will be sampled and tagged with telemetry and/or PIT tags.

#### Activity: Fall-late Fall reconnaissance-level surveys in the Sprague, Williamson, and Wood Rivers for the presence of live or dead adult Chinook, Coho or O. mykiss to assess stock status. [Tier 1]

#### Activity: Fall-late Fall spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in the Sprague and Wood Rivers to assess stock status. [Tier 2]

#### Activity: Fall-late Fall adult video weir counts in the Williamson River to assess stock status at such time as significant numbers of Chinook, Coho or Steelhead have been observed to return. [Tier 2]

#### Activity: Survey Klamath Lake and tributaries for the presence of Chinook, Coho, or O. mykiss that were radio-tagged downstream to identify upstream migration. [Tier 2]

##### Related activities identified under other objectives:

*5.1.1.1 Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Keno Dam fish ladder to assess passage. [Tier 1]*

*5.1.1.2 Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Link River Dam fish ladder to assess passage. [Tier 1]*

*5.1.1.3 Activity: Radio tag and/or PIT tag a sample of adult of Chinook, Coho, and O. mykiss collected in fish ladders to monitor upstream distribution and movements. [Tier 2]*

### Task: Assess potential effectiveness of Spring Chinook reintroduction by release of hatchery-origin juveniles.

Phase 1 will involve reintroduction studies which include release of tagged juveniles to monitor their migration behavior and survival post release. An in-basin stock (Salmon or Trinity River) will be used for this effort. Phase 2 (Repopulation Phase) will build on the results of Phase 1 to use the most effective methods, extent, and intensity of transplantation required to repopulate habitat above Upper Klamath Lake. PIT tag arrays operated throughout Klamath Lake and tributaries for assessment of Lost River Suckers and Shortnose Suckers also provide the opportunity to monitor the presence, movements and distribution of adult and juvenile salmon throughout the system.

#### Activity: Release PIT-tagged hatchery juvenile Spring Chinook in Klamath Lake tributaries to monitor migration behavior and survival post release. [Tier 1]

#### Activity: PIT tag detection arrays in the Sprague, Williamson, and Wood Rivers to monitor migration behavior and survival. [Tier 1]

#### Activity: PIT tag detection arrays in other Klamath Lake tributaries to monitor migration behavior and survival. [Tier 1]

#### Activity: PIT tag detection arrays for Spring Chinook in Klamath Lake to monitor migration behavior and survival. [Tier 1]

##### Related activities identified under other objectives:

*5.2.1.1 Activity: PIT tag detection array at Link River Dam to monitor adult and juvenile salmonid movements. [Tier 1]*

*5.2.1.2 Activity: PIT tag detection array at Lake Ewauna to monitor adult and juvenile salmonid movements. [Tier 1]*

*5.2.1.3 Activity: PIT tag detection array at Keno Dam to monitor adult and juvenile salmonid movements. [Tier 1]*

*6.1.1.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at the Weitchpec site above the Trinity River confluence. [Tier 1]*

*6.1.1.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at Kinsman and Big Bar sites between the Shasta and Trinity Rivers. [Tier 1]*

*6.1.1.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the Mainstem Klamath River at I5 and Bogus Creek sites between the Iron Gate Dam site and the Shasta River. [Tier 1]*

*8.1.1.2 Activity: PIT tag juvenile Coho in lower Klamath tributaries and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

*8.2.1.3 Activity: PIT tag juvenile Coho in middle Klamath tributaries and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

*8.3.1.3 Activity: PIT tag juvenile Coho in the Shasta and Scott Rivers and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

### Task: Assess anadromous fish production in newly-accessible areas.

As fish populations become more widely established, monitoring will become more specific and focused on management objectives, such as determining the productivity and emigration timing of juveniles from each sub-basin (ODFW & KT 2021).

#### Activity: Spring juvenile outmigrant trapping in the Sprague, Williamson, and Wood Rivers to assess potential production of Chinook, Coho, O. mykiss and Lamprey. [Tier 2]

#### Activity: Juvenile PIT tagging in the Sprague, Williamson, and Wood Rivers to monitor migration behavior and survival post release of Chinook, Coho, and O. mykiss. [Tier 2]

##### Related activities identified under other objectives:

*5.2.1.1 Activity: PIT tag detection array at Link River Dam to monitor adult and juvenile salmonid movements. [Tier 1]*

*5.2.1.2 Activity: PIT tag detection array at Lake Ewauna to monitor adult and juvenile salmonid movements. [Tier 1]*

*5.2.1.3 Activity: PIT tag detection array at Keno Dam to monitor adult and juvenile salmonid movements. [Tier 1]*

*6.1.1.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at the Weitchpec site above the Trinity River confluence. [Tier 1]*

*6.1.1.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at Kinsman and Big Bar sites between the Shasta and Trinity Rivers. [Tier 1]*

*6.1.1.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the Mainstem Klamath River at I5 and Bogus Creek sites between the Iron Gate Dam site and the Shasta River. [Tier 1]*

*8.1.1.2 Activity: PIT tag juvenile Coho in lower Klamath tributaries and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

*8.2.1.3 Activity: PIT tag juvenile Coho in middle Klamath tributaries and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

*8.3.1.3 Activity: PIT tag juvenile Coho in the Shasta and Scott Rivers and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]*

# Question: Can anadromous fish successfully pass Keno & Link River Dams?

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| ***Related Questions***   * Are anadromous fish reaching Keno and Link River Dams, and if so, how many, what species and when? * Are fish ladders effective in passing adult salmon, Steelhead and lamprey upstream? * Do dams result in significant delay or mortality of adults attempting to pass? * Are juvenile salmon and Steelhead tagged in the Klamath headwaters surviving to reach Keno and Link River Dams in their downstream migration? * Is gas bubble disease an issue with dam passage? |

Fish ladders are operated at both Keno Dam (RM 239.2) and Link River Dam (RM 260.5) on the upper Klamath River. Effectiveness for salmon passage is unknown and under evaluation. The Keno Dam fish ladder does not currently meet state and federal fish passage criteria and is currently in the process of being upgraded. The Link River Dam fish ladder was replaced in 2005 to allow efficient passage of endangered suckers, Redband Trout, and lampreys migrating from Lake Ewauna to Upper Klamath Lake.

## Objective: Assess anadromous fish adult runs to and through upper Klamath River dams.

Fish ladders can be effective counting structures for adult fish with the addition of video cameras or fish collection with the addition of traps. Fish ladder counts are identified as Tier 1 activities because they provide census estimates for the total abundance of upstream passage.

#### Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Keno Dam fish ladder to assess passage. [Tier 1]

#### Activity: Daily video or trap counts of Chinook, Coho, O. mykiss and Lamprey in the Link River Dam fish ladder to assess passage. [Tier 1]

#### Activity: Radio tag and/or PIT tag a sample of adult of Chinook, Coho, and O. mykiss collected in fish ladders to monitor upstream distribution and movements. [Tier 2]

##### Related activities identified under other objectives:

*4.2.1.4 Activity: Survey Klamath Lake and tributaries for the presence of Chinook, Coho, or O. mykiss that were radio-tagged downstream to identify upstream migration. [Tier 2]*

*4.2.2.2 Activity: PIT tag detection arrays in the Sprague, Williamson, and Wood Rivers to monitor migration behavior and survival. [Tier 1]*

*4.2.2.3 Activity: PIT tag detection arrays in other Klamath Lake tributaries to monitor migration behavior and survival. [Tier 1]*

*4.2.2.4 Activity: PIT tag detection arrays for Spring Chinook in Klamath Lake to monitor migration behavior and survival. [Tier 1]*

## Objective: Assess anadromous fish juvenile production to and through upper Klamath River Dams.

PIT tag arrays operated at or near dams allow for monitoring of juvenile and adult passage of fish tagged in upstream or downstream areas (numbers, timing, survival). Operation of PIT sonar arrays provide an indication of movements and survival of juvenile salmonids outmigrants from Klamath headwaters areas downstream through Klamath Lake. Given sufficient detection efficiencies and sample sizes, sequenced arrays potentially also have the capability of producing absolute estimates of juveniles Although sampling power will likely be constrained by small sample sizes due to limited tag numbers and detection efficiencies, PIT tag arrays are identified as Tier 1 as they are relatively inexpensive to operate.

#### Activity: PIT tag detection array at Link River Dam to monitor adult and juvenile salmonid movements. [Tier 1]

#### Activity: PIT tag detection array at Lake Ewauna to monitor adult and juvenile salmonid movements. [Tier 1]

#### Activity: PIT tag detection array at Keno Dam to monitor adult and juvenile salmonid movements. [Tier 1]

##### Related activities identified under other objectives:

*4.2.2.1 Activity: Release PIT-tagged hatchery juvenile Spring Chinook in Klamath Lake tributaries to monitor migration behavior and survival post* release. [Tier 1]

*4.2.3.2 Activity: Juvenile PIT tagging in the Sprague, Williamson, and Wood Rivers to monitor migration behavior and survival post release of Chinook, Coho, and O. mykiss. [Tier 2]*

# Question: are water management measures being implemented effectively?

Fish monitoring has long been an integral component in development and evaluation of water management and mitigation measures for the Klamath Hydroelectric and Trinity River Diversion Projects. Water resources are also affected by extensive irrigation and other modifications and operations throughout the basin (ESSA 2017). Water management requirements have evolved over the years as specified in a series of regulatory agreements and biological opinions.

## Objective Area: Klamath River Projects

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| ***Related Questions***   * What are juvenile disease rates in the spring? * What are the adult disease rate in the late summer or fall? * How is water management affecting fish management and behavior? * How might water management actions affect chinook outmigrants survival and abundance to the ocean? * What is the level of (insert species) disease during outmigration and how does this change over time? * What changes to water quality has dam removal had in the basin? * Higher flows cooler temps encourage Fall chinook survival? |

Klamath River water management has long been regulated by requirements of the USBR’s Klamath Project and PacifiCorp’s Klamath Hydroelectric Project. The Klamath Project operates three reservoirs (Upper Klamath Lake, Clear Lake Reservoir and Gerber) in the upper basin to store, divert and convey water for a service area that contains approximately 230,000 acres of irrigable land. The Klamath Hydroelectric Project operated four dams and reservoirs in the lower basin until their removal in 2024.[[11]](#footnote-11)

In 2024, NMFS issued their most recent biological opinion (Biop) governing post-dam removal operations of the Klamath Project from 2024 to 2029. This opinion affirms support by the USBR for research and monitoring projects that inform managers on the status of ESA-listed species populations and evaluation of project impacts as appropriated funds allow. Terms and conditions of the current Biop direct USBR funding for monitoring the abundance, prevalence of infection and predicted mortality of emigrating juvenile salmon in the Klamath River (NMFS 2024). Finally, the 2024 Biop calls for new fish monitoring to assess the fish response to dam removal.

### Task: Juvenile outmigrant Trapping

The Arcata Fish and Wildlife Office of the USFWS and its Tribal partners operate rotary screw traps and frame nets each spring and summer during the juvenile Chinook and Coho salmon emigration period to estimate the timing, abundance and condition of outmigrant juvenile salmon at locations on the Klamath River. Mark-recapture information estimates characteristics and abundance of outmigrant populations on a weekly-stratified basis, which are used to calibrate and validate a Stream Salmonid Simulator Population Dynamics Model (S3 Model). These data also inform managers in real-time on population levels and effects of infectious diseases for both Chinook and Coho salmon.

#### Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at the Weitchpec site above the Trinity River confluence. [Tier 1]

#### Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at Kinsman and Big Bar sites between the Shasta and Trinity Rivers. [Tier 1]

#### Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the Mainstem Klamath River at I5 and Bogus Creek sites between the Iron Gate Dam site and the Shasta River. [Tier 1]

##### Related activities identified under other objectives:

*2.1.2.1 Activity: Spring juvenile outmigrant trapping in Scott River, Shasta River and Bogus Creek to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 1]*

*4.1.2.1 Activity: Spring juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Fall, Shovel Creeks) to assess production. [Tier 1]*

*4.1.2.2 Activity: Spring juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (e.g., Spencer Creek) to assess production. [Tier 1]*

*4.1.2.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey in Klamath River mainstem between Shovel and Spencer Creeks to assess production. [Tier 1]*

### Task: Disease Monitoring

A basin wide fish disease monitoring program is currently led by the USFWS and Oregon State University in coordination with others including NOAA Fisheries, U.S. Bureau of Reclamation, CDFW, the Karuk Tribe, and the Yurok Tribe. Prevalence of mortality estimates for juvenile Coho and Chinook collected and processing for *C. shasta* infection at juvenile monitoring sites completed by USFWS that are completed by Karuk and Yurok Tribes and Oregon State University. Monitoring is also conducted based on the parasite's life cycle including sentinel fish exposures, annelid host sampling and molecular quantification of parasite DNA in water samples.

#### Activity: Estimate prevalence of mortality in juvenile Coho and Fall Chinook sampled at Klamath River monitoring sites based on C. Shasta infection. [Tier 2]

#### Activity: Conduct C. Shasta life cycle monitoring based on sentinel fish exposures, annelid host sampling and molecular quantification of parasite DNA in water samples. [Tier 2]

### Task: S3 Modeling

The Stream Salmonid Simulator S3 Model was developed and implemented by the USGS as a decision-support tool to aid in water and basin management (Bartholow et al. 2002; Perry et al. 2018, 2019, 2023; Plumb et al. 2019). The tool consists of an integrated subset of models used to predict the effects of water management alternatives on movement, health, and production of juvenile Chinook salmon (ESSA 2017). The model tracks causes of mortality (i.e., red scour, habitat limitations, disease, water quality, etc.) over time throughout the sub-adult life history of Chinook salmon within the 223-mile section of the mainstem Klamath River spanning from Keno Dam in Oregon to its confluence with the Pacific Ocean in California. The 2024 Biop calls for continued funding by the USBR for updates to the S3 Population Dynamics Model with contemporary data on hatchery production and *C. shasta* spore concentrations.

#### Activity: Calibrate Stream Salmonid Simulator (S3) model based on annual juvenile salmonid outmigrant trap data to estimate production of Fall Chinook in the lower Klamath River. [Tier 2]

#### Activity: Assess annual effects of annual water management on Fall Chinook population dynamics and mortality in the lower Klamath River. [Tier 1]

#### Activity: Calibrate Stream Salmonid Simulator (S3) model based on annual juvenile salmonid outmigrant trap data to estimate production of Coho in the lower Klamath River. [Tier 2]

#### Activity: Assess annual effects of annual water management on Coho population dynamics and incidental take in the lower Klamath River. [Tier 1]

## Objective Area: Trinity River Project

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| ***Related Questions***   * How is water management effecting fish management and behavior? * Are current operations producing the expected effects? |

The purpose of the Trinity River Restoration Program (TRRP) is to mitigate impacts of dam construction and related diversions of the Trinity River Division of the Central Valley Project on anadromous fish populations. The long-term goals of the Program are to: 1) restore the form and function of the Trinity River; 2) restore and sustain natural production of anadromous fish populations in the Trinity River to pre-dam levels; and 3) to facilitate full participation by dependent tribal, commercial, and sport fisheries through enhanced harvest opportunities.

Water management in the Trinity River mainstem is governed by a 2000 Fishery Record of Decision (ROD) by U. S. Department of the Interior. Flow schedules are managed to encourage outmigration of salmonids, maintain favorable water temperatures and reduce potential fish disease outbreaks. Primary fish monitoring activities include juvenile population monitoring at rotary screw traps in the Trinity River mainstem, adult population monitoring by fish trapping and tagging at weirs near Willow Creek and Junction City to estimate escapement, harvest and contributions of hatchery and natural-origin fish; and mainstem carcass and redd surveys to provide information on timing and spatial distribution of spawning and pre-spawn mortality.

### Task: Adult Monitoring

Monitoring activities of the TRRP address multiple objectives and adult monitoring was described under other objectives where applicable.

##### Related Activities

*1.1.1.5 Activity: Fall spawning ground surveys in Trinity River mainstem downstream from Willow Creek Weir to assess Fall Chinook status [Tier 1]*

*1.1.1.6 Activity: Fall spawning ground surveys in Trinity River mainstem upstream from Willow Creek Weir to assess Fall Chinook status. [Tier 2]*

*1.1.1.8 Activity: Fall adult weir counts in Trinity River mainstem near Willow Creek and Junction City to assess Fall Chinook status. [Tier 1]*

*1.2.1.3 Activity: Summer adult weir counts and mark-recapture estimates in Trinity River mainstem to assess Spring Chinook status. [Tier 1]*

*2.1.1.5 Activity: Late Fall spawning ground surveys in Trinity River tributaries to assess Coho status. [Tier 3]6*

*2.1.1.7 Activity: Late Fall adult weir counts in Trinity River mainstem to assess Coho status. [Tier 1]*

### Task: Juvenile outmigrant Trapping

Monitoring of juvenile outmigrants provides information on abundance, productivity and life history but is particularly focused on effects of water management including the response to implementation of the 2000 ROD (e.g., Pinnix et al 2022). Information is produced on Spring Chinook, Fall Chinook, Coho and Steelhead.

#### Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the in Trinity River mainstem at Willow Creek. [Tier 1]

#### Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the in Trinity River mainstem at Pear Tree Gulch. [Tier 1]

### Task: S3 Modeling

#### Activity: Calibrate Stream Salmonid Simulator (S3) model based on annual juvenile salmonid outmigrant trap data to estimate survival, movement and food consumption of Fall Chinook in the restoration reach of the Trinity River. [Tier 2]

#### Activity: Assess annual effects of annual water management on Fall Chinook habitat and population dynamics in the Trinity River. [Tier 1]

# Question: Are Hatchery programs achieving established objectives?

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| ***Related Questions***   * What is the role and goal of hatcheries in the basin? * What is the survival and return from hatchery releases? * How many hatchery fish are needed to meet goals? * Can natural production of chinook take the place of hatchery production at Fall Creek? |

Hatchery production and returns of salmon and Steelhead are monitored in order to assess hatchery effectiveness, evaluate potential wild fish tradeoffs and adaptively management programs for established objectives. The primary objective of Klamath Basin salmon and Steelhead hatcheries has historically been to mitigate for habitat lost due to dam construction by producing fish to support harvest. Objectives have evolved over time to include support of conservation and recovery of depleted stocks including ESA-listed Coho Salmon and reintroduction of Spring Chinook into Klamath headwaters rivers. Hatcheries also serve key functions in various monitoring and evaluation activities including coded wire tagging of Fall Chinook for fishery stock assessment and management purposes.

## Objective: Fall Creek Hatchery Evaluation

Iron Gate hatchery operations have been moved to an improved Fall Creek Hatchery upon dam removal (KRRC 2022, NMFS 2023). PacifiCorp is funding hatchery renovation and operations for up to eight years following removal of Iron Gate Dam. Hatchery production goals include 75,000 Coho yearlings; 250,000 Fall Chinook yearlings (25% marked); and 3 million fall-run Chinook salmon sub-yearlings (≥50% coded wire tagged).

### Task: Assess hatchery production of Fall Chinook and Coho relative to established goals.

#### Identify numbers of juvenile of Fall Chinook and Coho released from Fall Creek Hatchery by year and life stage. [Tier 1]

#### Mark and/or coded wire tag samples of Fall Creek Hatchery juvenile releases of Fall Chinook and Coho for subsequent evaluation. [Tier 1]

#### Document Fall Creek Hatchery broodstock and production processes for Fall Chinook and Coho relative to established genetic management plan requirements. [Tier 1]

### Task: Assess hatchery returns of Fall Chinook and Coho relative to established goals.

#### Count numbers of Fall Chinook and Coho returning to the Fall Creek Hatchery. [Tier 1]

#### Collect age, sex, length, mark and coded wire tag information on Fall Chinook and Coho in Fall Creek Hatchery returns. [Tier 1]

#### Identify Fall Creek Hatchery contributions of Fall Chinook and Coho in natural spawning areas. [Tier 1]

#### Estimate the Fall Creek Hatchery return of Fall Chinook and Coho. [Tier 1]

##### Related activities identified under other objectives:

*1.1.1.1 Activity: Fall spawning ground surveys in the mainstem Klamath downstream from the Iron Gate site to assess Fall Chinook status. [Tier 1]*

*1.1.1.2 Activity: Fall spawning ground surveys in the Salmon River to assess Fall Chinook status. [Tier 1]*

*1.1.1.3 Activity: Fall spawning ground surveys in Shasta River, Scott River and Bogus Creek to assess Fall Chinook status. [Tier 2]*

*1.1.1.4 Activity: Fall spawning ground surveys in other lower and middle Klamath tributaries to assess Fall Chinook status. [Tier 2]*

*2.1.1.1 Activity: Late Fall spawning ground surveys in the mainstem Klamath downstream from the Iron Gate site to assess Coho status. [Tier 2]*

*2.1.1.2 Activity: Late Fall spawning ground surveys in the Salmon River to assess Coho status. [Tier 2]*

*2.1.1.3 Activity: Late Fall spawning ground surveys in the Shasta River, Scott River and Bogus Creek to assess Coho status. [Tier 3]*

*2.1.1.4 Activity: Late Fall spawning ground surveys in other lower-middle Klamath tributaries to assess Coho status. [Tier 3]*

*2.1.1.6 Activity: Late Fall adult video weir counts in the Shasta River, Scott River and Bogus Creek to assess Coho status. [Tier 1]*

*4.1.1.1 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in the Klamath River mainstem between the Iron Gate Dam site and Keno Dam to assess stock status. [Tier 1]*

*4.1.1.2 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch, Camp, Jenny, Fall, Shovel creeks) to assess stock status. [Tier 2]*

*4.1.1.3 Activity: Fall-Winter spawning ground surveys for Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (e.g., Spencer Creek) to assess stock status. [Tier 2]*

*4.1.1.4 Activity: Fall-Winter adult video weir counts for Chinook, Coho, Steelhead and Lamprey in California tributaries (Scotch/Camp, Jenny, Shovel Creeks) to assess stock status. [Tier 1]*

*4.1.1.5 Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon tributaries (Spencer Creek) to assess stock status. [Tier 1]*

*4.1.1.6 Activity: Fall-Winter adult video weir counts of Chinook, Coho, Steelhead and Lamprey in Oregon portion of the Klamath River mainstem to assess stock status. [Tier 3]*

## Objective: Trinity River Hatchery Evaluation

Trinity River Fish Hatchery began operations in 1963 at RM 111.7 immediately downstream from Lewiston Dam in order to help mitigate for lost production of habitats upstream from the Trinity River diversion. Hatchery effectiveness is assessed relative to salmonid escapement goals established by the Trinity River Restoration Program based on estimates of lost adult production in blocked areas. Corresponding hatchery release goals for Spring Chinook are 1 million fingerlings (June release) and 400,000 subyearlings (October release). The Fall Chinook goal is 2 million fingerlings in June and 900,000 subyearlings in October. Spring and Fall Chinook are marked at a rate of 25% with an adipose fin‐clip and coded wire tag. The current Coho release goal is 300,000 juveniles (100% ad-clips + CWT) produced from natural-origin broodstock collected for spawning from the hatchery ladder or the upper Trinity fish weir. The current release goal for Steelhead is 448,000 (100% ad-clipped).

### Task: Assess hatchery production of Spring Chinook, Fall Chinook, Coho and Steelhead relative to established goals.

#### Identify numbers of Spring Chinook, Fall Chinook, Coho and Steelhead juveniles released by year and life stage. [Tier 1]

#### Mark and/or coded wire tag samples of Trinity Hatchery juvenile releases of Spring Chinook, Fall Chinook, Coho and Steelhead for subsequent evaluation. [Tier 1]

#### Document hatchery broodstock and production processes relative to established genetic management plan requirements. [Tier 1]

### Task: Assess hatchery returns of Spring Chinook, Fall Chinook, Coho and Steelhead relative to established goals.

#### Count numbers of Spring Chinook, Fall Chinook, Coho and Steelhead returning to Trinity Hatchery. [Tier 1]

#### Collect age, sex, length, mark and coded wire tag information for Spring Chinook, Fall Chinook, Coho and Steelhead in Trinity Hatchery returns. [Tier 1]

#### Identify Trinity Hatchery contributions of Spring Chinook, Fall Chinook, Coho and Steelhead in natural spawning areas. [Tier 1]

#### Estimate the Trinity River hatchery return of Spring Chinook, Fall Chinook, Coho and Steelhead. [Tier 1]

##### Related activities identified under other objectives:

*1.1.1.5 Activity: Fall spawning ground surveys in Trinity River mainstem downstream from Willow Creek Weir to assess Fall Chinook status [Tier 1]*

*1.1.1.6 Activity: Fall spawning ground surveys in Trinity River mainstem upstream from Willow Creek Weir to assess Fall Chinook status. [Tier 2]*

*1.1.1.8 Activity: Fall adult weir counts in Trinity River mainstem near Willow Creek and Junction City to assess Fall Chinook status. [Tier 1]*

*1.2.1.3 Activity: Summer adult weir counts and mark-recapture estimates in Trinity River mainstem to assess Spring Chinook status. [Tier 1]*

*2.1.1.5 Activity: Late Fall spawning ground surveys in Trinity River tributaries to assess Coho status. [Tier 3]6*

*2.1.1.7* Activity: Late Fall adult weir counts in Trinity River mainstem to assess Coho status. [Tier 1]

*3.1.2.1 Activity: Annual fall season harvest survey of Yurok Tribe fisheries for Fall Chinook* and Coho. [Tier 1]

*3.1.2.2 Activity: Annual fall season harvest survey of Hoopa Valley Tribe fisheries for Fall Chinook* and Coho. [Tier 1]

*3.1.2.3 Activity: Annual fall season harvest survey of other tribal fisheries for Fall Chinook* and Coho. [Tier 2]

*3.1.2.4 Activity: Annual fall season harvest survey of non-tribal tribal fisheries for Fall Chinook* and Coho. [Tier 1]

# Question: what habitats are critical to fish, what restoration measures are effective & has restoration improved fish status?

|  |
| --- |
| ***Related Questions***   * Are multimillion dollar restoration projects moving the needle? * What factors limit distribution and abundance of anadromous fish species? * What areas do we still need to work on to improve habitat? * Is restoration working and how do we know? What hard stick are we using to say whether or not the needle is being moved? * What fish monitoring can we do that can inform us on the habitat (process and parts) necessary to support sustainable fish populations and communities? * How has juvenile productivity changed over time in response to habitat status? |

Habitat effectiveness monitoring determines whether restoration activities have achieved desired results. Related assessments help identify how are fish using the habitat, what factors are limiting and which habitat restoration actions are most effective. ESSA (2017) distinguishes three types of project effectiveness monitoring. Implementation monitoring evaluates whether project objectives are carried out as planned. Physical effectiveness monitoring evaluates whether restoration actions are resulting in the expected physical effects. Biological effectiveness monitoring evaluates whether an expected biological response occurred. This plan is focused on fish biological monitoring which is typically based on fish habitat use, distribution, abundance, density, and parameters such as growth and survival.

## Objective Area: Lower Klamath Tributaries

### Task: Assess juvenile salmonid habitat use, distribution, movements and productivity.

Fish production effects of constructed off-channel habitats, wood jams and riparian replanting in several streams are being monitored by Yurok Tribe Fisheries Program. Sites included Hunter, McGarvey, Hoopaw and Terwer Creeks. Physical habitat and water quality assessments are a significant component of this program.

#### Activity: Summer snorkel surveys in Lower Klamath tributaries to identify juvenile Coho distribution and habitat use. [Tier 3]

#### Activity: PIT tag juvenile Coho in lower Klamath tributaries and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]

##### Related activities identified under other objectives:

*2.1.2.3 Activity: Spring juvenile outmigrant trapping in lower Klamath tributaries (Blue, McGarvey, etc.) to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 2]*

## Objective Area: Middle Klamath Tributaries

### Task: Assess juvenile salmonid habitat use, distribution, movements and productivity.

Middle Klamath Tributaries: Fish benefits of a series of off-channel ponds constructed in tributary streams are being monitored by the Mid Klamath Watershed Council in conjunction with the Karuk Tribe and Humboldt State University (MKWC 2015, 2019, 2022). Juvenile Coho salmon are the focus of this work. Monitoring includes including Beaver Creek, Horse Creek, Seiad Creek, Stanshaw Creek and others tributaries.

#### Activity: Summer snorkel surveys of juvenile Coho in middle Klamath tributaries for assessment of habitat restoration effectiveness. [Tier 3]

#### Activity: Sample juvenile Coho with seines and traps to evaluate use and life history characteristics in representative habitats in middle Klamath tributaries for assessment of habitat restoration effectiveness. [Tier 3]

#### Activity: PIT tag juvenile Coho in middle Klamath tributaries and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]

##### Related activities identified under other objectives:

*6.1.1.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at the Weitchpec site above the Trinity River confluence. [Tier 1]*

*6.1.1.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at Kinsman and Big Bar sites between the Shasta and Trinity Rivers. [Tier 1]*

*6.1.1.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the Mainstem Klamath River at I5 and Bogus Creek sites between the Iron Gate Dam site and the Shasta River. [Tier 1]*

## Objective Area: Salmon, Scott and Shasta Rivers

### Task: Assess juvenile salmonid habitat use, distribution, movements and growth.

The Scott River Watershed Council is conducting an extensive juvenile Coho salmon monitoring program to assess effects of habitat restoration in the Scott River and its tributaries (SRWC 2023, 2024). Seines and minnow traps to capture and collect data from fish inhabiting both restored and untreated habitat units in these streams. Juveniles are PIT tagged. A network of PIT arrays is operated in these streams allowing tagged fish to be detected as they move throughout the watershed. Recaptures of tagged fish also provide information on fish growth rates. Since 2008, CDFW’s Yreka Program has used PIT tags to monitor juvenile Coho movements and survival in the Shasta and Scott Rivers (Chesney et al. 2009; CDFW 2016; SRWC 2024). A detector in the weir also provides information on returning adults.

#### Activity: Summer snorkel surveys in document distribution, relative abundance and habitat use of juvenile Chinook, Coho and O. mykiss in the Salmon, Scott and Shasta Rivers in relation to habitat restoration. [Tier 3]

#### Activity: Sample juvenile Coho and O. mykiss with seines and traps to evaluate use and life history characteristics in representative habitats in the Salmon, Scott and Shasta Rivers. [Tier 3]

#### Activity: PIT tag juvenile Coho in the Shasta and Scott Rivers and operate a network of PIT tag arrays to assess movements and habitat utilization patterns. [Tier 3]

##### Related activities identified under other objectives:

*2.1.2.1 Activity: Spring juvenile outmigrant trapping in Scott River, Shasta River and Bogus Creek to assess Chinook, Coho, Steelhead and Lamprey production. [Tier 1]*

*6.1.1.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at the Weitchpec site above the Trinity River confluence. [Tier 1]*

*6.1.1.2 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the mainstem Klamath River at Kinsman and Big Bar sites between the Shasta and Trinity Rivers. [Tier 1]*

*6.1.1.3 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the Mainstem Klamath River at I5 and Bogus Creek sites between the Iron Gate Dam site and the Shasta River. [Tier 1]*

## Objective Area: Trinity River Tributaries

### Task: Assess juvenile salmonid habitat use, distribution and productivity.

Juvenile salmonid production has been monitored in a seven reservation streams since 1997 by the Hoopa Valley Tribal Fisheries Program to assess habitat restoration success (NOAA 2025).

#### Activity: Operate fyke nets lower Trinity River tributaries (Campbell, Hostler, Mill, Pine, Soctish, Supply, and Tish Tang Creeks) to quantify the abundance of out-migrating juvenile Chinook, Coho and Steelhead. [Tier 3]

#### Activity: Summer snorkel surveys of juvenile Chinook, Coho and O. mykiss in upper Trinity and South Fork Trinity tributaries to assess habitat restoration and hatchery supplementation effectiveness. [Tier 3]

##### Related activities identified under other objectives:

*6.2.2.1 Activity: Juvenile outmigrant trapping of Chinook, Coho, Steelhead and Lamprey during spring and summer in the in Trinity River* mainstem at Willow Creek. [Tier 1]

# Question: how to we optimize Cooperative implemenation & coordination monitoring efforts?

## Objective: Work Groups / Coordination

### Task: Facilitate cooperative information sharing and coordination of fish monitoring activities to optimize implementation effectiveness and efficiency.

The Klamath Basin has a long history of collaborative information sharing and cooperation activities including the Klamath Basin Monitoring Program (KBMP) which is focused on water quality monitoring and restoration, and the Klamath Dam Removal Science Collaboration (KDRSC) which was organized to coordinate dam removal science and monitoring focused on fisheries, water quality, and physical processes. These programs have sponsored and coordinated a series of workshops and annual meeting with broad participation by cooperators. Most recent the PSMFC has organized a collaborative work group process and workshops under the Klamath Basin Fisheries Collaborative project to develop this plan.

#### Activity: Continue to facilitate work group process of fish monitoring and evaluation entities to coordinate monitoring activities and provide guidance to funding agencies. [Tier 2]

#### Activity: Hold annual fish monitoring workshops for information sharing and implementation coordination [Tier 2]

## Objective: Data Archive & Sharing

### Task: Facilitate access to fish monitoring data among state, federal, tribal, and non-profit organizations.

The Klamath Basin Fisheries Collaborative (KBFC) is a partnership of entities conducting research and monitoring using PIT technology throughout the Klamath Basin. Primary active partners include Karuk, Yurok, and Klamath Tribes, USGS, USFWS, CDFW and the Scott River Watershed Council. The KBFC replacing the 2017 Klamath River Basin (KRB) PIT Tagging Database with a new standardized and structured database system. The PIT Tag Network was created to house hundreds of thousands of records on tag releases and detections of endangered Coho Salmon and suckers and other species including bull trout, Chinook Salmon, Steelhead, and lamprey. PSMFC maintains a web-based data exchange portal to facilitate access and share PIT tag data.

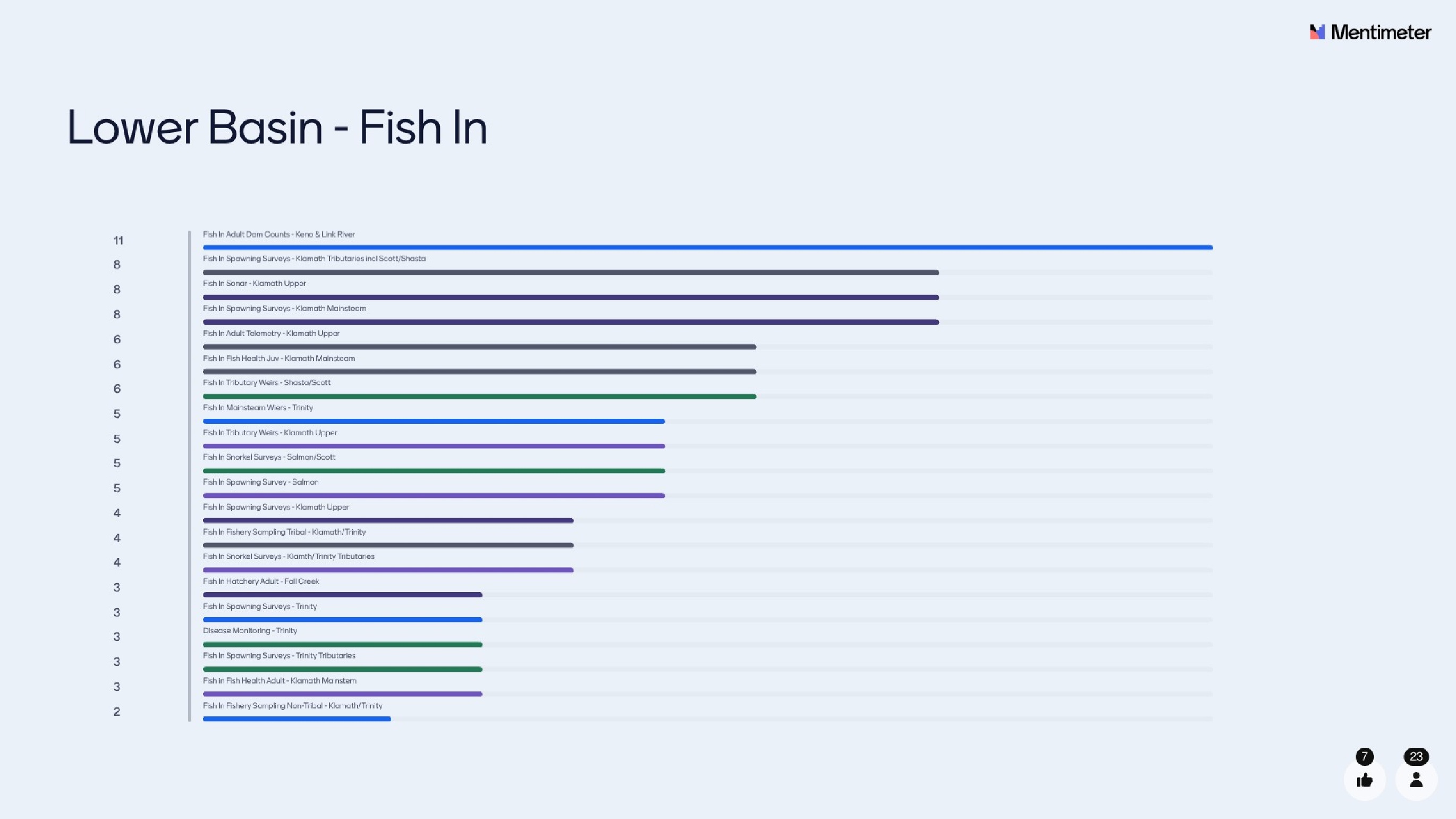
#### Activity: Maintain a centralized, web-accessible PIT tag database. [Tier 2]

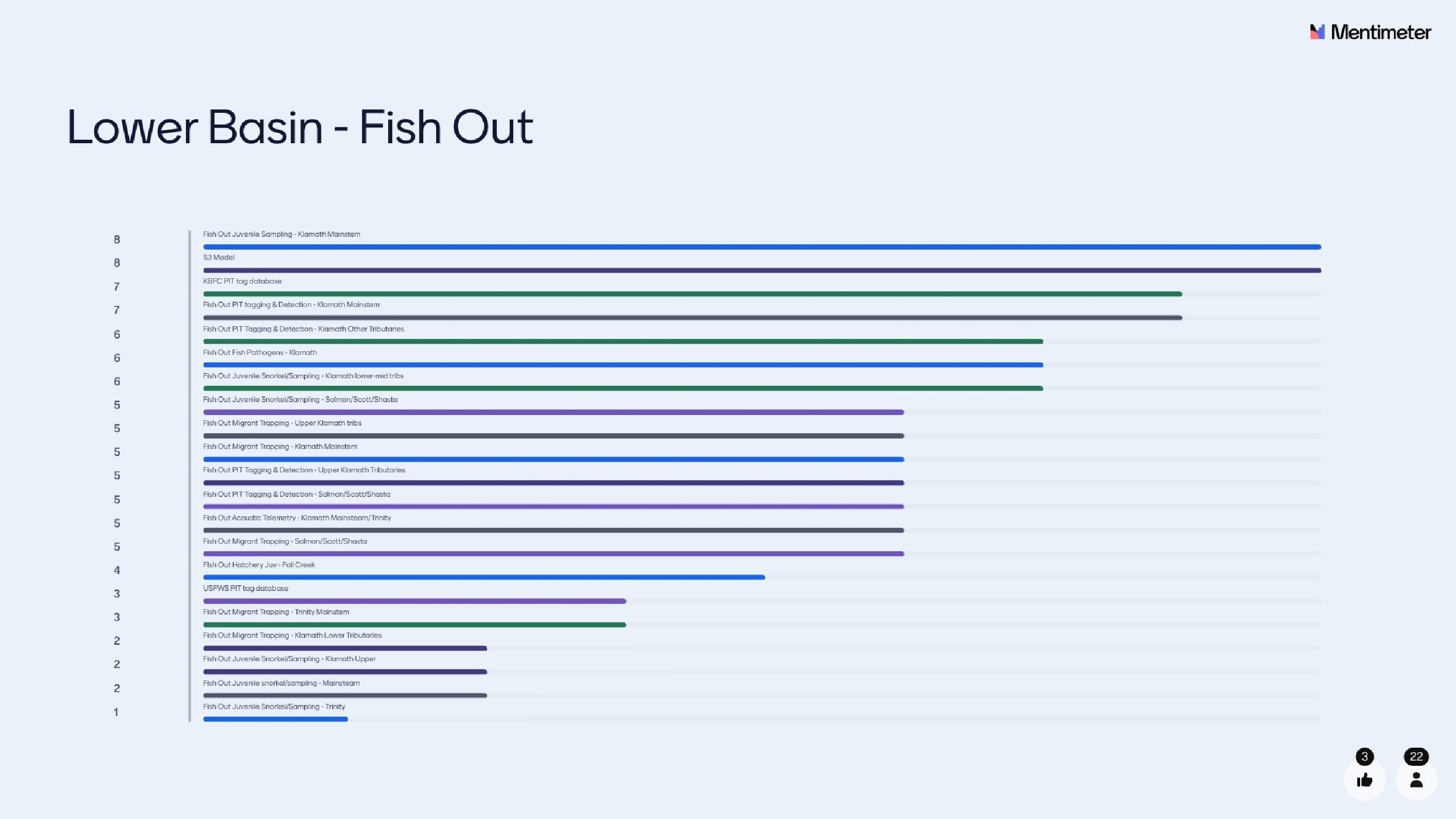
#### Activity: Annual updates of new PIT tagging and detection data. [Tier 2]

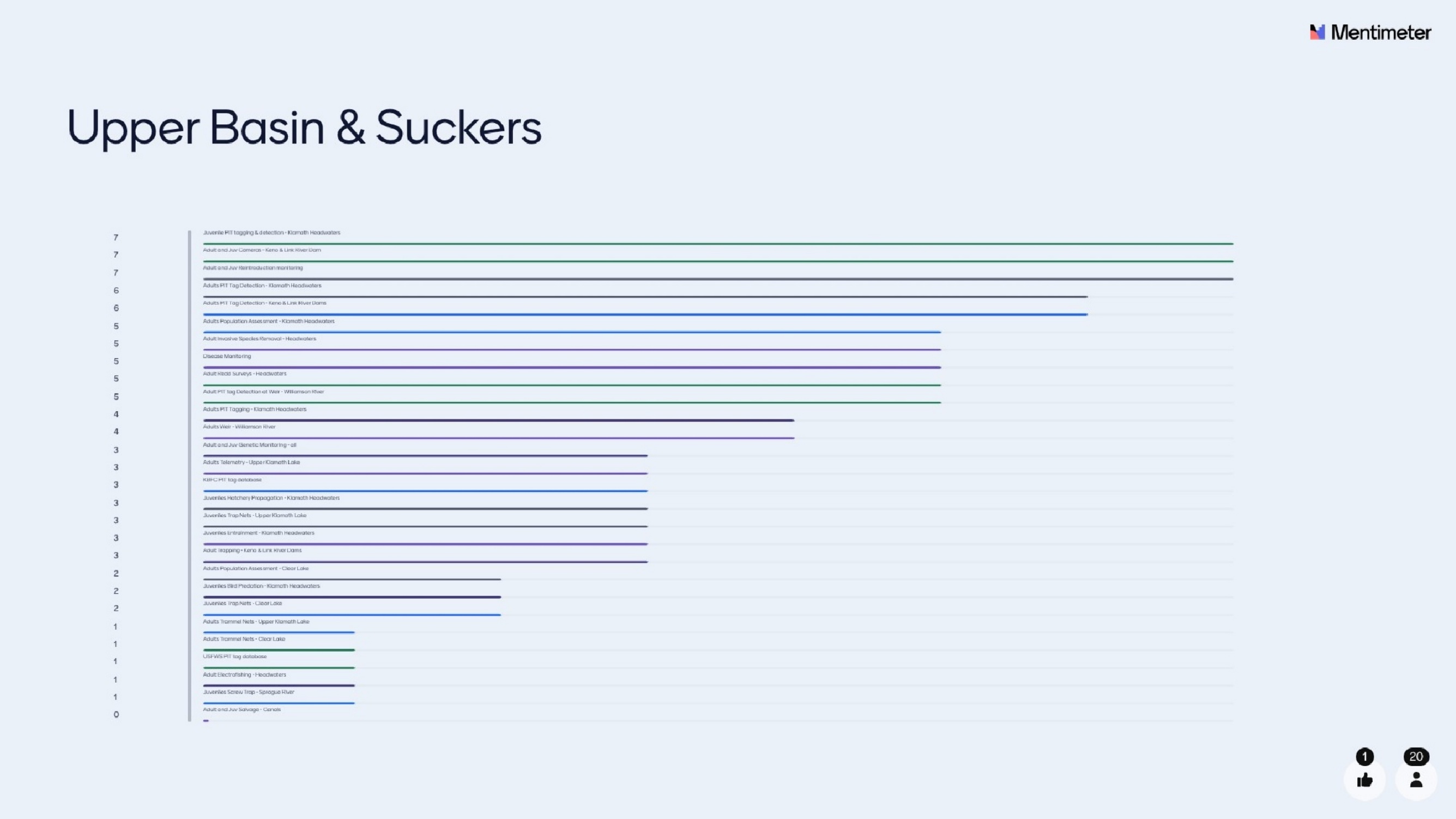
# References

To be completed

# Appendix - Workshop Survey Results (Mentometer)







1. *This task identifies long-standing Fall Chinook stock assessment activities in areas downstream from the Iron Gate damsite. Related activities upstream from the damsite are detailed under Question 4 for dam removal effects.* [↑](#footnote-ref-1)
2. *This task identifies long-standing Fall Chinook stock assessment activities in areas downstream from the Iron Gate damsite. Related activities upstream from the damsite are detailed under Question 4 for dam removal effects.* [↑](#footnote-ref-2)
3. *Eulachon are also federally-listed but not addressed by this plan. Species are also subject to state listings by California and Oregon.* [↑](#footnote-ref-3)
4. *This task identifies stock assessment activities in areas downstream from the Iron Gate damsite. Related activities upstream from the damsite are detailed under Question 4 for dam removal effects.* [↑](#footnote-ref-4)
5. *For instance, spawn timing of Coho extends later into the fall and even early winter than that of Fall Chinook which are the primary focus of many spawning ground surveys. Survey conditions in late fall are often unfavorable for Coho due to high flows and turbidity associated with fall rains which stimulate Coho spawning migrations.* [↑](#footnote-ref-5)
6. *Long-term* c*ensus information is provided by weirs.* [↑](#footnote-ref-6)
7. *Coho run timing identified as “late” Fall in recognition of later and more extended run timing of Coho than Fall Chinook which are often assessed with the same efforts.* [↑](#footnote-ref-7)
8. Klamath and Rogue hatchery stocks have traditionally been used as a fishery surrogate stock for estimating exploitation rates on SONCC Coho. [↑](#footnote-ref-8)
9. *Identified in the Oregon Plan but assumed to be secondary to Keno and Link River Dam counts.* [↑](#footnote-ref-9)
10. *Tier 2 recognizes the trial exploration of this technology and the corresponding challenges of species apportionment. Category could be modified if the methodology proves out.* [↑](#footnote-ref-10)
11. The project also included Keno Dam. [↑](#footnote-ref-11)