Klamath Basin Integrated Fisheries Restoration and Monitoring Plan (IFRMP)

Objectives, Performance Indicators & Monitoring Workshop

Workshop Summary

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Prepared for the Pacific States Marine Fishery Commission

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Klamath Basin Integrated Fisheries Restoration and Monitoring Plan (IFRMP) Task 1.2

Objectives, Performance Indicators & Monitoring Workshop Summary

July 10 – 11, 2018

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1 Workshop Background & Objectives

1.1 Introduction

The journey towards restoration of the Klamath Basin, like most journeys, will be accomplished in a series of steps rather than a single leap. On July 10-11 ESSA held a workshop at the Holiday Inn Express in Klamath, California to continue the development of an Integrated Fisheries Restoration and Monitoring Plan (Plan) for the Klamath Basin. Phase 2 of the project emphasizes definition of Conceptual Models, Goals, Objectives and Key Performance Indicators that will guide eventual identification of priority restoration and monitoring activities in the Plan during subsequent phases 2019-2021. The objectives of the July 2018 workshop were as follows:

1. **Review draft goals & objectives hierarchy and assign candidate key performance indicators to each objective.**
2. **Working at a basin-wide scale, review major monitoring needs and uncover gaps in our ability to: a) detect cumulative benefits of portfolios of restoration actions, and b) where required, reduce critical uncertainties related to the effectiveness of different classes of restoration actions.**
3. **Review preliminary ideas for methods to help prioritize restoration actions and monitoring activities.**

Our efforts at the July 10-11 2018 workshop were fundamentally about four things:

A. Eliciting Sub-regional Working Group (SRWG) feedback on whether we have captured the appropriate mix of **objectives** to frame the desired state of the system;

B. Getting more of your help to **clarify what performance indicators are truly core** to knowing whether packages of restoration actions are helping to recover focal species;

C. Eliciting your input on some **initial ideas for developing a basin-wide status & trend and action effectiveness monitoring framework**; and

D. Eliciting your input on some initial **ideas for prioritizing restoration actions in future phases** of Plan development.

The purpose of this document is to summarize July 2018 workshop outcomes and identify key questions remaining for Basin-Wide Technical Working Group and SRWG members.

2 Draft Goals & Objectives Hierarchy

2.1 Topic Activities & Outcomes

Overview

For this topic area, workshop participants were invited to comment on and build upon a draft hierarchy of goals and objectives assembled from existing management and recovery plans relevant to the basin in a series of open brainstorming and discussion rounds. These activities and their outcomes are discussed briefly below, and the outputs of these activities are presented in Table 1.

Review of Goals and Objectives Hierarchy

Participants were asked to provide feedback and/or propose changes to the goals and objectives hierarchy in open discussion. Several minor changes in language were proposed to clarify objectives, and two objectives were considered less relevant and eliminated (i.e., "understanding impacts of native predators on fish" was considered more of a research objective, and "reduce the number of harmful aquatic blooms" was considered more of an indicator of underlying improvements in water quality). Revisions occurred iteratively over the course of the workshop. By the end of this process, participants expressed broad agreement on the final revised set of goals and objectives for restoring self-sustaining populations of focal fish in the Klamath River basin.

Generation of Performance Indicators

For each objective, participants were asked to propose candidate performance indicators that could be used to track progress against the objective. Participants generated candidate indicators in open brainstorming, and group discussions led to revisions of past indicators or generation of new indicators.

During this discussion around performance indicators, three major themes emerged:

- Performance indicator suitability values should not be directly tied to regulatory thresholds that are prone to changing (e.g., # days temperature TMDL exceeded) because this would compromise time series comparability of the indicator. Instead, **specific values for the metrics themselves should be extracted and used consistently** (e.g., IFRMP should identify and stick to specific numeric suitability threshold cirteria for temperature, dissolved oxygen, etc.).
- **There was a long discussion about the difficulty of selecting a small set of standardized performance indicators for habitat quality that would be relevant to all focal fish when each species has very different habitat requirements.** Ultimately, the participants determined that the standard "measuring stick" should be a measure of both **the total area and level of occupancy of suitable habitat**, where "suitable habitat" would be determined using a different suite of biologically-relevant metrics for each species. Options for how to calculate area of suitable habitat were discussed at length, including the use of *Intrinsic Potential modelling (for physical habitat), and*

Habitat Capacity Outputs of Salmonid Stream Simulator (S3) modelling, as well as the potential of using these approaches together.

- **There was a sense that participants present were biased towards fish and habitat expertise, and that more input is needed from physical scientists with expertise in fluvial geomorphology** and higher-order watershed processed on the most suitable core performance indicators for objectives related to those processes.

Participants periodically became sidetracked in thinking about how these data would be collected and by whom, and these ideas were parked as being part of the broader discussion on monitoring, which allowed the group to focus on determining ***what*** to measure. *Participants were very interested to learn how measurement of these performance indicators might proceed in practice through discussions on the monitoring framework, and were eager to see how existing programs could fill the identified performance indicator needs*.

Once all participants had the opportunity to propose indicators, the groups used stickers to vote on those indicators they considered to be best suited as Core Performance Indicators for that objective. By the end of this process, **participants reached broad agreement on a set of potential performance indicators to track progress against each of the objectives, and also achieved a high degree of agreement on which of the proposed indicators should constitute Core Performance Indicators**, with the caveat that *these lists require further input from participants not present before it can be considered complete.*

Figure 1: Participants brainstorming candidate performance indicators (left) and voting on core performance indicators (right) for each restoration objective.

Generation of High-Benefit Actions for Each Objective

Following identification of performance indicators, participants were asked to brainstorm specific restoration actions at specific locations in the basin that might have a disproportionately high benefit towards addressing each objective. Because participants were speaking to the benefit of activities within their own region or area of expertise, this activity was carried out through silent

brainstorming on sticky notes, followed by group discussion of proposed actions once they were placed on the wall.

During this discussion around actions, three major themes emerged:

- **Many actions proposed remained broad in scope or non-specific** (e.g., riparian fencing in the Sprague basin), while only a minority (~30%) were sufficiently specific in scope and locations to be amenable to implementation planning (e.g., improve passage for lamprey at Keno dam; install beaver dam analogues in Moffatt Creek and Big Slough).
- **Responses reflected the fact that some objectives are more amenable to rapid "leapfrog" progress through major individual actions that can rapidly improve conditions over a large area (e.g., fish passage), while others are constrained to more incremental progress at a large number of sites**, which eventually provide a cumulative benefit over a larger area (e.g., improving riparian vegetation).
- **Participants expressed reluctance to propose actions that could have a basin-wide benefit, and felt that their expertise with a small part of the basin did not qualify them to speak to basin-wide benefit**. In response, *the group discussed how basin-wide benefits would only accrue as the result of localized actions, and that high-benefit actions in a given sub region or sub-basin were also likely to contribute to overall basin restoration* and should be proposed.

Identification of Suitability Thresholds for Indicators

There was not sufficient time to solicit possible suitability thresholds for proposed performance indicators, but the group briefly discussed this topic and next steps. The group agreed this would be difficult to do in a workshop setting and preferred that the project team populate the table of core performance indicators with any already published suitability thresholds for further consideration by participants. *This task is underway, and the table will be ready for participant review and input in time for the next Sub regional Working Group call.*

2.1 Workshop Outputs

Workshop sessions around this topic were very productive and generated substantial agreement around goals and objectives as well as ideas for high-benefit actions that could help progress towards objectives and suggestions for core and supporting performance indicators that could be used to track this progress. The physical workshop outputs from this work are shown in Figure 2, and transcribed for clarity into Table 1.

Figure 2: A photomosaic of workshops outputs from this session including modifications to goals and objectives, candidate performance indicators and sticker votes on core performance indicators (green and red indicate only different groups, not importance), and proposed high-benefit actions for each class of objectives.

Table 1: Klamath IRFMP Goals and Objectives Hierarchy and suggested performance indicators and actions generated at the workshop.

Klamath Basin IFRMP Overall Goal:

Restore and sustain viable, naturally self-sustaining native fish populations in the Klamath Basin to facilitate enhanced harvest opportunities for dependent Tribal, recreational and commercial fisheries, while improving Basin flows, water quality, habitat and ecosystem processes.

Whole-Basin Scale Nested Goals	Whole-Basin Nested Core Objectives	Candidate Performance Indicators (WORKSHOP DAY 1) (# Votes as Core PI)	Candidate Restoration Actions (WORKSHOP DAY 2) *(other relevant objectives)* (# of Related Suggestions)
Fish Populations 1. Naturally self-sustaining native fish populations with healthy demographic traits capable of providing harvestable surplus	1.1 Increase juvenile production	• *Juveniles per Adult **(12)** (measuring at different times can also tell you things about survival in 1.2).* • *Presence / Absence of Juvenile Larvae (e.g., eulachon, not clear if they're there at all) (1.1 and 1.2)*	
	1.2 Increase juvenile survival and recruitment to spawning populations	• *Loss of Tagged Fish by Reach Over Time (to pinpoint spatial choke points in survival) **(1)***	
	1.3 Increase overall population abundance and productivity, particularly in areas of high existing abundance or potential future abundance or in special or unique populations	• *Overall Abundance (by species) **(12)*** • *Whether or not there can be a fishery (social benefit indicator)*	• *Establish conservation hatchery for Eulachon in Lower Klamath River (1.3 and 3.1)* • *Restart Fall Creek hatchery for Coho (already planned for ~ 8 years to compensate for loss of Iron Gate Hatchery) (1.3 and 3.1)*
	1.4 Maintain or increase life history and genetic diversities	• *Genetic Diversity Indicators (metric unclear, geneticist input) **(3)*** • *Age Structure & Demographics **(2)***	• *Include Salmon River Spring Chinook in Reintroduction Plan (1.4, 1.5, 3.1) **(2)***
	1.5 Maintain or increase spatial distributions as necessary *(i.e., expansion may not be appropriate goal for all species)*	• *Habitat Occupancy (presence/absence AND/OR total river miles occupied) **(14)***	• *Address fish passage requirements for Pacific Lamprey, which are different than for salmonids (1.5, 4.1)*
Fisheries Actions 2. Regulate harvest so as to support achievement of goal #1.	2.1 Improve management and regulations/enforcement of harvest, bycatch and poaching of naturally produced fish such that populations do not decline and can recover	• *Handled by PSMFC, CDFW, ODFW, NOAA*	• *Implement separate management of in-river spring and fall Chinook fisheries **(2)*** • *Work with PSMFC to curtail ocean salmon fishing in Klamath Mgmt. Zone for 3-4 generations to seed areas above Iron Gate Dam.* • *Create recovery plan for Klamath River spring Chinook*
Biological Interactions (BI) 3. Support goal #1 by reducing biotic interactions (ecological, genetic) that could have negative	3.1 Do not generate adverse competitive or genetic consequences for native fish when carrying out conservation-oriented hatchery supplementation as needed.	• *pHOS (proportion of hatchery origin spawners) **(4)***	• *Reorient hatchery activities from mitigation to conservation (raise less fish, only spawn wild fish, cull hatchery-origin fish). (1.4, 3.1)*

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effects on native fish populations	3.2 Minimize disease-related mortality by reducing vectors and factors known to lead to fish disease outbreaks	• *Prevalence of Infection* ***(12)*** • *Prevalence of Mortality (new indicator in development by NMFS, gets at severity of disease)* ***(12)*** • *Occurrence of fish kills (presence/absence, number) (also relates to 4.2, could be caused by WQ issues)* ***(1)***	• *Actions for this objective all related to restoring natural flows (see Goals 5 and 6) (3.2)*
	3.3 Reduce impacts of exotic plant and animal species on native fish	• *Distribution and abundance of non-native species* ***(2)*** • *CPUE of non-native species in culling programs (for abundance trends)*	• *Allow spearfishing for brown trout in the Trinity River; remove catch limits for brown trout (3.2, 3.3, 3.4)* ***(2)***
Habitat (H) 4. Support goal #1 by improving freshwater habitat access and suitability for fish and the quality and quantity of habitat used by all riverine (*or freshwater and estuary*) life stages	4.1 Restore fish passage and re-establish channel and other habitat connectivity, particularly in high-value habitats (e.g., thermal refugia)	• *Number of fish passage barriers*	• *Implement removal of major Klamath River dams (1.5, 4.1)* • *Remove sediment berms at tributary mouths (expected to accumulate with dam removal) (1.5, 4.1, 4.4, 4.5)* • *Resolve fish passage issues at Dwinnel Dam (1.5, 4.1)* • *Improve Keno bypass for passage of outmigrant juveniles and adults of salmon and lamprey via a mechanical chute or pipe (4.1)* • *Restore passage to / reconnect cold water tributaries and springs (4.1)* • *Address fish passage requirements for Pacific Lamprey, which are different than salmonids (1.5, 4.1), at culverts and bridges in tributaries throughout the lower and mid Klamath River.* • *Purchase and reconnect lakeshore agricultural lands by Upper Klamath Lake (4.1)* • *Restore year-round flows through tailings reach in the Scott River (4.1)* • *Remove flashboard dam on Shasta River downstream or the confluence with Parks Creek (4.1)*
	4.2 Improve water temperatures and other local water quality conditions and processes for fish growth and survival	• *Temperature* ***(1)*** • *Site Shade Potential (established indicator, relates to temperature in small streams)* • *% of days TMDL objectives met (with criteria on data completeness, i.e., how many data gaps you allow before you discard a year).*	• *Install aeration in Keno Reservoir to address anoxic barrier to fish passage (4.2)* • *Restructure Keno Dam to reduce water residence time and improve water quality in reservoir and downstream (4.2)* • *Retrofit Trinity-Lewiston Complex to better conserve cold water resources (4.2)* • *Protect montane wet meadows and wetlands in upland Scott and Shasta basins for groundwater recharge and cold-water storage (4.2)* • *Mechanical restoration / reconnection of thermal refugia in lower / mid Klamath (4.2)*

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	4.3 Enhance and maintain community and food web diversity supporting native fish *(more holistic?)*	• *SWAMP (Surface Water Ambient Program) macroinvertebrate and community diversity metrics* ***(2)*** • *Community diversity Indices (a more holistic measure of whole food web recovery which also speaks to food availability – but more cost prohibitive)* ***(1)*** • *Primary productivity (e.g., chlorophyll)* • *Stream Condition Index (SWAMP can be used to derive this)*	•
	4.4 Reduce fish mortality due to entrainment, scour, stranding	• *% of diversions unscreened (entrainment)* • *% of days tributaries drop below minimum recommended ecological flows (4.4 and 6.1)*	• *Screening unscreened diversions (basin-wide) (4.4, for entrainment)* • *Provide incentives to landowners to permanently dedicate water to instream beneficial uses (Wood, Shasta, Sprague, Scott Rivers) (4.4, for stranding)*

	4.5 Enhance and maintain estuary, mainstem, tributary, lake and wetland habitats for all freshwater life stages and life histories of resident and anadromous fish	• *Area & Occupancy of Suitable Spawning Habitat* ***(15)***
		• *Area & Occupancy of Suitable Rearing Habitat* ***(8)***
		• *Intrinsic Potential (more of a method, species-specific)* ***(3)***
		  ○ *Used by NOAA, estimate of physical habitat potential based on value width with constraint, discharge, and stream gradient. Done for Coho (in CONCC Recovery Plan), but can be adapted to other species and different life stages if habitat use curves are defined with spatial abundance data. Increasing abundance in areas of high IP is an indicator of improvement in habitat suitability. This is a simplistic metric, but can be used in combination with Habitat Capacity Output.*
		• *Habitat Capacity Output (more of a method, species-specific)* ***(3)***
		  ○ *Used by USFWS, an output of the SSS model which is based on real habitat mapping layers from Level 4 Rapid Habitat Typing (every 5-10 yrs), right now available for coho and Chinook, but could be extended to other species. If overlaid on IP, tells you how much of the intrinsic habitat potential is realized with actual habitat (based on riparian, in-stream conditions), and then abundance data tells you how much of realized habitat is occupied. Comparisons can be diagnostic for which habitat factor is limiting – e.g., if low IP, may need to improve geomorphic variables; if high IP but low habitat, may need to improve watershed input conditions; if high IP and high habitat output, the issue may be fish*
			• *Restore historic lake fringe wetlands in Upper Klamath Basin* ***(4)*** *(4.2, 4.3, 4.5, 6.1, 6.3, 6.4)*
			• *Land acquisition and conservation easements for wetland and stream habitat in Upper Klamath Basin (Wood River, and Sprague River areas) (4.5)* ***(2)***
			• *Restore tributaries downstream of Blue Creek to enhance coho production (4.5)*
			• *Enhance or create off-channel ponds, side-channels, and other productive juvenile rearing habitat as an interim measure while process-based restoration takes effect (1.2, 4.5)*

Whole-Basin Scale Nested Goals	Whole-Basin Nested Core Objectives	Candidate Performance Indicators (WORKSHOP DAY 1) (# Votes as Core PI)	Candidate Restoration Actions (WORKSHOP DAY 2) *(other relevant objectives)* (# of Related Suggestions)
		passage to access those habitats. • *Acres of cold-water habitat* **(1)** • *Area & Occupancy of Suitable Migratory Habitat* • *Area & Occupancy of Suitable Foraging Habitat* • *Acres of restored or reconnected wetland habitats* • *# Primary pools deeper than X ft (varies for sturgeon, salmonids, others)*	
Fluvial Geomorphic Processes (FG) 5. Support goal #1 by creating and maintaining spatially connected and diverse channel and floodplain morphologies	5.1 Increase and maintain coarse sediment recruitment and transport processes	• *% of days above X cfs per year (critical volume able to mobilize coarse sediment)* **(6)** • *Coarse sediment storage capacity (e.g., by channel structure, large woody debris, is an indicator in the Trinity)* **(1)**	
	5.2 Increase channel and floodplain dynamics and interconnectivity	• *Acres seasonally inundated wetland* **(13)** • *Area available for channel migration* **(9)** • *% of river in stage 0 (dynamics)*	• *Protect beavers and their habitats or install beaver dam analogs (BDAs) to promote floodplain connectivity, sediment sorting, slow water refugia, groundwater recharge, and riparian communities, especially in Moffet Creek and Big Slough (5.2, 5.3, 6.1)* **(2)** • *Construct or enhance floodplain and off-channel habitat in low-gradient reaches currently used by focal fish species (5.2) (2)* • *Restore floodplains in mining-impacted reaches (especially in the Salmon, Scott, and Mid-Klamath Rivers) (5.2)*
	5.3 Promote and expand establishment of diverse riparian and wetland vegetation that contributes to complex channel and floodplain morphologies	• *% Site Shade Potential Realized* **(1)** • *Large Woody Debris Recruitment*	• *Fencing / grazing management in South Fork Sprague, Scott, and Shasta sub-basins (5.3)* **(2)** • *Restore riparian areas above Upper Klamath Lake (5.3)* • *Improve riparian corridors via planting where soils can support riparian growth (5.3)* • *Reduce down-cutting in montane meadows in the Scott River's headwater streams (5.2, 5.3)*
Watershed Inputs (WI) 6. Support goal #1 by improving water quality, quantity, and ecological flow regimes	6.1 Improve instream ecological flow regimes year-round for the Klamath River mainstem and tributary streams	• *# cfs returned to stream (distinguish between temporary and permanent)* ***(17)*** • *Surface-groundwater interaction metrics (metric itself TBD)* **(2)** • *% diversions metered (gives a sense of how many actively managed for flows)*	• *Strategic groundwater recharge with tailwater returns filtered via constructed diffuse-source treatment wetlands (DSTWs) (4.2, 5.2, 5.3, 6.1, 6.2, 6.3) (Upper Basin: Wood, Sprague, and Williamson Rivers)* **(3)** • *Restore healthy fire processes through forest management, prescribed fire, and managed wildfire to thin encroaching pones from montane meadows and improve snowpack accumulation and potential water storage* **(3)**

Whole-Basin Scale Nested Goals	Whole-Basin Nested Core Objectives	Candidate Performance Indicators (WORKSHOP DAY 1) (# Votes as Core PI)	Candidate Restoration Actions (WORKSHOP DAY 2) *(other relevant objectives)* (# of Related Suggestions)
			• *Strategic groundwater recharge in Shasta River, Scott River, Eastside Gulches and Moffet Creek (6.1)* ***(2)*** • *Establish or revisit instream flow requirements in Shasta, Scott, Klamath Rivers* • *Readjudicate water rights where appropriate* • *Purchase land and water rights for permanent instream flow protection in the upper basin (6.1)* • *Reduce or eliminate diversions to Fall Creek to restore flow to Jenny Creek (6.1)* • *Complete instream flow studies on the Scott and Shasta rivers (6.1)* • *Reduce on-farm water withdrawals through improvements to irrigation efficiency, crop types, tracking of groundwater use,* • *Promote overall watershed stewardship by private landowners (6.1, 6.3)*
	6.2 Reduce anthropogenic fine sediment inputs while maintaining natural and beneficial fine sediment inputs	• *% embedded / % fines (6.2 and 5.1)* • *Source of sediments in the system (e.g., roads vs. mine tailings, etc. Tells you where you need to focus efforts, via for example % of Roads Surveyed)*	• *Prioritize and implement upland road decommissioning in areas with high fine sediment input, transport, and storage (Scott, Trinity sub-basins) (6.2)* ***(2)*** • *Replace culverts on road crossings in Klamath National Forest, upper basin*

	6.3 Reduce external nutrient and pollutant inputs that contribute to biostimulatory conditions	• *Nutrient concentrations and algae concentrations (both specified in TMDL targets, includes metrics below)* ***(18)***
		  ○ *Dissolved oxygen*
		  ○ *pH*
		  ○ *Total Phosphorous (concentration)*
		  ○ *Total Nitrogen (concentration)*
		• *# acre-feet tailwater return flows* ***(2)***
		• *# of harmful algae blooms*
			• *Develop Safe Harbour and HCPs with Upper Basin landowners that contribute largest nutrient loads to UKL, and broker agreements to reduce or eliminate inputs over the long-term*
			• *Agricultural land retirement in the Upper Sprague and Wood Rivers*

3 Monitoring Framework

3.1 Overview

This session began with a plenary presentation intended to establish a common understanding of concepts and terminology. This included a description of the different types of monitoring and their relevance to the IFRMP and the necessary components of any monitoring framework. The presentation also included a synthesis of results from the pre-workshop survey questions. Plenary discussions continued with workshop participants being invited to provide feedback on draft prioritization criteria and the proposed approach for developing the IFRMP monitoring framework by comparing the needs to the current monitoring. Plenary discussions wrapped up with a discussion of priority basin-wide monitoring questions and a review of current monitoring strengths and weaknesses. Three additional sessions occurred in smaller sub-groups over the course of the workshop. The first session involved ground truthing the summary of current data and identification of gaps as well as providing feedback on the monitoring framework. The second and third sessions focused on road testing the proposed monitoring framework for a subset of monitoring questions. These activities and their outcomes are discussed briefly below.

3.2 Pre-workshop survey feedback

Pre-workshop survey feedback was synthesized and presented at the workshop thus informing discussions throughout. Below is a brief summary of the survey feedback. Raw survey responses are provided in Appendix A.

Indicator selection criteria

Question: Are any important core performance indicator selection criteria missing from our current subset (Table 3)? Which criteria are most important to you and why?

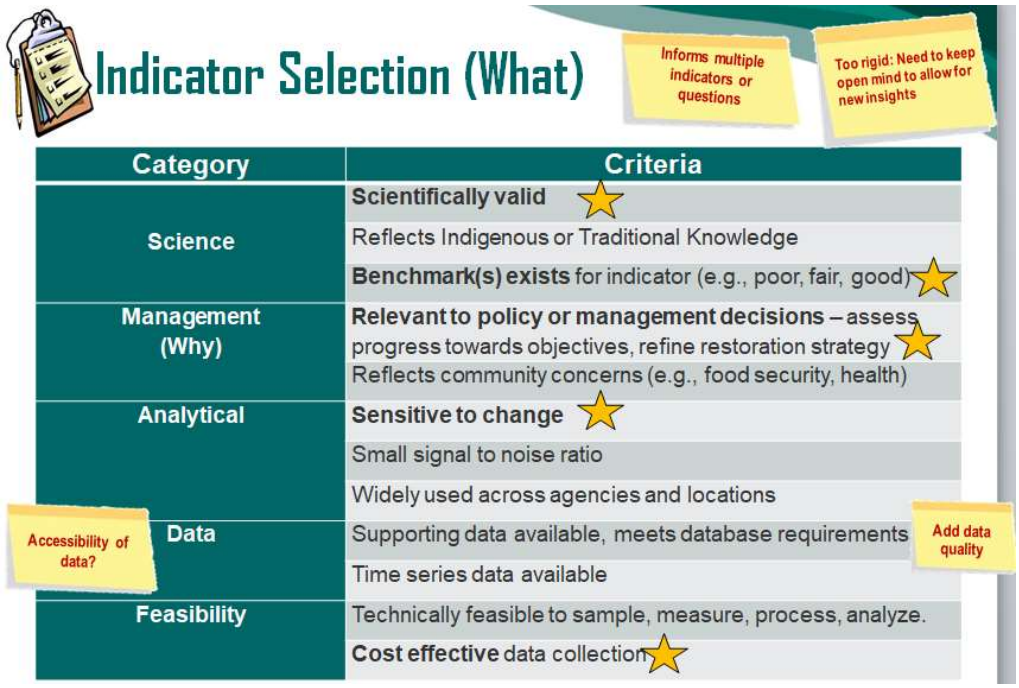


Figure 3: Survey feedback on proposed indicator selection criteria.

Results: 13 respondents provided feedback for this question (Figure 3). In general there was support for the indicator selection strategy however one respondent cautioned being too rigid in application of the criteria may miss potential new insights. Several additional criteria were suggested including: data quality, data accessibility, and the ability to inform multiple questions. Five indicators were flagged as particularly important by at least one respondent: scientifically valid, benchmarks exist, sensitive to change, and cost effective.

Basin-wide questions

Question: Having considered the objectives hierarchy, identify the top 3 basin-wide monitoring questions from your perspective?

Results: 15 people responded to this question and between them a total of 43 questions were proposed. The questions could be organized in several different ways:

- Types of monitoring: Action Effectiveness (14), Status and Trends (22), research questions (9)
- Spatial scale: Basin-wide (31), Upper or Lower focus (10)
- Species: Salmonids (7), Suckers (4), Lamprey (1)
- Habitat (22), Population (11), Both (9)
- Focus on Dam removal (10)

A variety of themes were touched upon in the proposed questions including:

- Adult fish abundance & distribution
- Fish passage
- Juvenile fish (limiting factors)
- Productivity, survival, condition, growth

- Suckers in upper Klamath Lake
- Habitat [instream]
- Water quality
- Water quantity, Baseflow
- Landscape condition
- Sediment
- Nutrient delivery
- Climate change (riparian restoration; refugia)
- Temperature

Monitoring if the dams are removed

Question: Monitoring if the dams are removed – are the four proposed categories of major system-wide changes valid from your perspective? Are there any additional categories to add?

Results: There were 16 respondents for this question. Survey feedback generally supported the four proposed categories listed below in black with a few minor suggestions, shown in red italics.

Direct habitat effects

- Channel redevelopment
- Changing water quality *and quantity*

Distribution and abundance of fish

- Reintroduction of native anadromous species *and non-anadromous species*
- Unintended introductions of non-native species.
    - *Respondents were less interested in this question.*
- *Consider adding a question about disease dynamics*

Current Monitoring

Question: Status quo monitoring summary – are we missing any ongoing monitoring activities by agency, monitoring type or focal fish species in our Basin-wide summary (included as an ***attachment*** in the email distributing this Briefing Document). Are there types of monitoring that you think are particularly effective or deficient?

Results: 17 respondents identified current monitoring efforts that are either done well or deficient in some way, a brief summary of feedback is provided here.

Done Well

- WQ in Upper Basin & Shasta
- Fall Chinook
- Escapement data for salmonids
- Juvenile salmon smolt out-migration
- Endangered suckers (adults & juveniles) in Upper Klamath Lake (e.g. USGS PIT tag network)
- Habitat restoration in Upper Klamath Lake
- Disease in lower Basin
- Water temperature monitoring – good (but way overdone across basin)
- Implementation data across restoration projects (but data often not readily available)

Deficiencies

- Integration & coordination of monitoring data across agencies
- Scott River – sediment & water temperature
- Steelhead and coho
- Spatial distribution of all species
- Wintertime & event-based assessments of nutrient loads
- Carbon quality and sources
- Juvenile salmon distribution & survival
- Flow regimes in Klamath R. & tributaries
- Fish loss to unscreened diversions
- Fish passage at Keno & Link dams
- No lower river monitoring station for juvenile and adult salmon (or other species)
- Funding for WQ monitoring

3.3 Monitoring framework

Path forward

There was general support for the proposed path forward for the monitoring framework including the proposed monitoring framework components. A few key themes or additional ideas emerged during the discussion.

- A show of hands indicated agreement in principle of the need to scope the IFRMP to a shorter list of core PIs. **"We need to identify the core indicators that are broadly informative"**. There were no objections to this recommendation.
- Core PI to act as the 'vital signs' or 'symptoms', which may be followed up with more detailed surveys as needed.

- A simple organizing structure like the 'big questions' in the Platte River Recovery Implementation Program might be useful, both for focusing the technical folks and communicating findings to the public.
- Need to consider how modeling can support the framework (both in terms of prediction and interpretation of results).
- Participants indicated a lack of clarity on how identified uncertainties are being addressed. This needs to be clarified and built in to the framework.

Sample design and response design components

There was general support for the considerations and proposed template for defining the sample and response designs. A few specific comments from the discussion are shown here.

- Sample Effort: We need to make sure we know how much is enough and not do more (e.g., current water temperature monitoring may be overkill, we should be able to assess this with available data).
- The large spatial scale of the Klamath and high variability in data will be a challenge.
- Thermal refugia should be accounted for in the design (e.g., treat as separate strata or a separate population of interest depending on the question).
- Participants liked the recommendation to look at new/emerging techniques.

Prioritization of monitoring

There was general support for the proposed approach. Participants liked the concept of evaluating the tradeoffs from several lenses without a formalized scoring system. There was however limited time for discussion. Specific comments from the brief discussion are shown here.

- 2 additional lenses were suggested: Gap analysis (i.e., is the indicator already being collected by an established program) and Public benefit.
- There was some confusion over the term 'monitoring activity' which needs to be clarified in the write up. Monitoring activity refers to a data collection activity (e.g., operating a screw trap, or tagging fish, or taking water quality samples etc.) which in many cases can collect data for more than one indicator (e.g., a tagging study may inform multiple questions). Typically, a monitoring activity corresponds to a line item in a budget. We therefore find it useful to evaluate the cost/benefit of the monitoring activity (e.g., how many questions can you inform for a given cost).
- While there is agreement in principle over the need to prioritize the monitoring, there was also recognition that a challenge of this program is figuring out how to convince participants to put the greater good ahead of individual jobs or programs.

Integration

Integration has repeatedly been identified as a key objective of the IFRMP. Participants discussed barriers to integration as well as examples where integration has been effective.

- Barriers to integration
  - Don't know who is doing what
  - Accessibility of data
  - Timeliness
  - Security issues with DOI information systems
  - Can't rely on good will for data sharing. Even with the best of intentions people are often too busy to 'get to it'.
  - Concerns over job protection, hard to convince people of the 'greater good'
  - Desire to monitor everything
- Examples of data sharing
  - Participants identified the following datasets which they are successfully sharing (using data from programs they don't directly work with): water quality, stream flow, weather, groundwater, PIT tag database, stream temperature, fish habitat, riparian, barriers
  - Online public databases are most easily and most commonly used by others

Data management

Data management and accessibility was raised as an ongoing challenge. Workshop participants discussed options and tradeoffs.

- While the IFRMP is not the vehicle for developing a data management system it may be well positioned to make a strong recommendation regarding the need.
- The IFRMP will not be developing an integrated database but it could serve as road map to help ID 'who' is doing what –see the metadata summary.
- Carrot vs. stick approaches may be employed to encourage data sharing (e.g., OWEB holds back 10% until data are received).
- Development of queries to download data from different sites is one potential solution.

3.4 Gap Analysis

Approach

The proposed gap analysis involves both a top down and bottom up approach. What information do we need? And what information is out there already? Participants noted that there were different types of gaps or data deficiencies: outright gaps (i.e., no information is available), data

that are deficient in terms of quality, or data that are deficient in terms of spatial or temporal coverage.

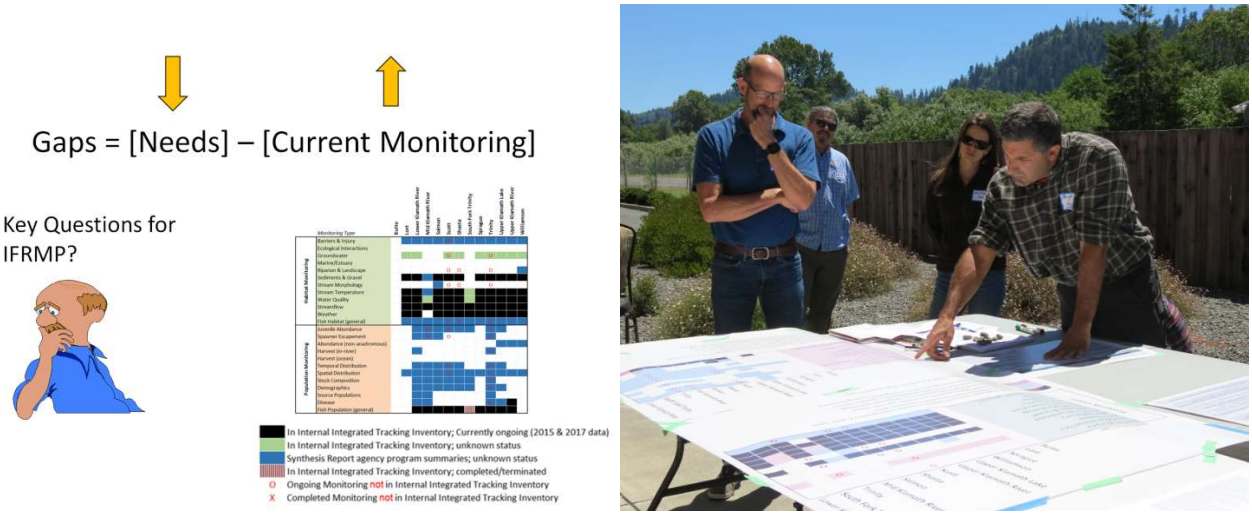


Figure 4. Gap analysis strategy (left). Participants ground truthing the summary of current monitoring (right).

Conceptually, participants agreed with the approach of comparing the needs to the available data. However, in practice it was difficult for participants to provide adequate feedback on the availability and quality of the data in each category without first having an understanding of the data needs. For different questions different levels of data quality might be acceptable. Given the scale of the basin and the complexity of the questions participants agreed that it was too onerous of a task to do an **exhaustive** bottom up summary and that this may in fact be of limited value. Through workshop discussions in subgroups and then validated in plenary, the gap analysis task was redefined as follows:

1. Identify glaring omissions in our summary of current data (focus on the white cells);
2. Identify any missing databases or broad scale monitoring efforts with their potential value to IFRMP;
3. Come back later with a more detailed 'data ask' once specific core indicators/monitoring questions are identified. In other words, narrow the task first, then do the gap analysis (i.e., look to see what current data are available **and suitable**).

Summary of current monitoring

As described in the previous section, the focus of this activity was adjusted to identify glaring omissions and broadly useful databases.

- Through discussions with workshop participants we assembled a summary of major monitoring infrastructure currently present in the basin (e.g., screw traps, USGS gauges, weirs etc.).
- Through a pre-workshop survey and further discussions with participants at the workshop we also assembled additional information on current/recent past monitoring efforts across Klamath subbasins, as a supplement to the extensive metadata summary developed in this regard for the Synthesis Report. This exercise was focused on

identifying any other broader scale, longer term monitoring efforts that might have been missed in the earlier metadata collection efforts and is intended to help identify whether any major monitoring gaps currently exist. Our general summary of the known current/recent past habitat and fish population monitoring (by indicator type) across Klamath subbasins is presented in the matrix below (Figure 5).

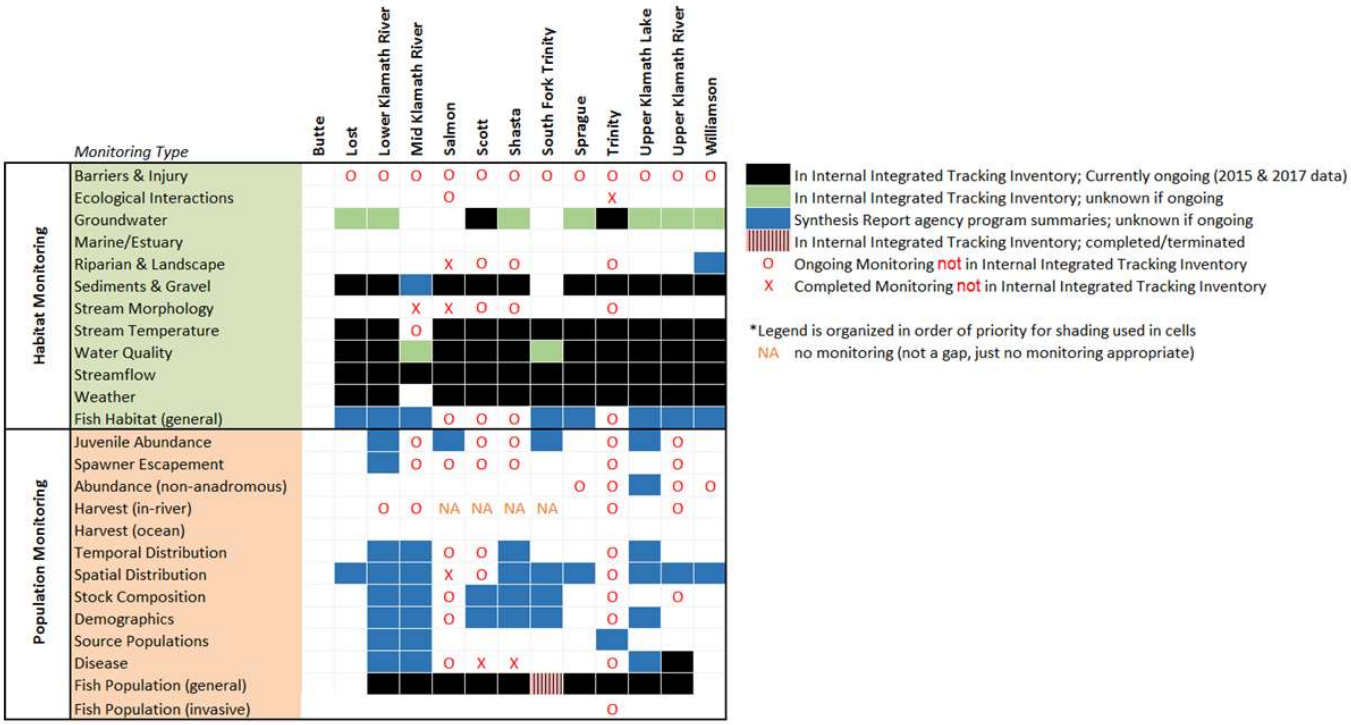


Figure 5. Summary of current monitoring after being updated / ground truthed by workshop participants.

3.5 Road testing the framework

Participants worked in subgroups to road test the monitoring framework template for a series of case studies. The primary objective of this exercise was to develop a common understanding of the approach and revise or adjust the approach as necessary. This was the first opportunity to dive into some of the weeds of the monitoring and provided participants with a chance to start to think about what a basin-wide monitoring program might look like and what challenges might result for different types of indicators.

Figure 6: Participants road testing the monitoring design template.

A monitoring design template and associated cheat sheet were provided to help guide participants through the necessary components of monitoring design. Participants selected three general case studies based on the subgroup discussions about core indicators from Day 1 as well as two case studies that were specific to dam removal. For the first three case studies the group worked from a blank template, for the latter two case studies focused on dam removal we first presented draft documents summarizing our understanding of the relevant monitoring considerations.

- Diversions (fish mortality due to, and # of unscreened diversions)
- Area available for channel migration
- Fine sediment
- Dams out – recolonization
- Dams out – sediment

General case studies

Each subgroup collaboratively produced a draft monitoring document for one or more indicators by working through each of the components in the monitoring design template. While the outcomes are preliminary the exercise achieved its goal of demonstrating the different challenges associated with different types of indicators and helped to solidify a common understanding of terminology and the path forward. Consistent with most guidance documents on monitoring design, participants found that lack of a clear monitoring question created

challenges in evaluating design options. A number of insights emerged from the discussions including:

- The need for clearly framed monitoring questions to guide the development of the monitoring design.
- The dependence between the response design and sample design was demonstrated through this exercise. In the case of channel migration, the response design primarily involved mapping using LIDAR, which can be done as a census (at least for larger streams) therefore removing any spatial sampling considerations. Whereas, fine sediment requires a 'boots on the ground' response design, and therefore the sampling considerations are more complex.
- The type of indicator was discussed at length. After exploring the sample design associated with a basin wide indicator related to TMDL participants generally found it was better to have the indicator be the raw measurement (e.g., volume of fine sediment) rather than a # of days where a benchmark (e.g., TMDL) is exceeded. Here, one can have different thresholds in different sub-basins with the same indicator. This also allows better assessment of progress towards or away from targets (how far away from the target are you), rather than a simple binary (pass/fail) assessment.
- Frequency of monitoring tends to be event driven for physical parameters (e.g., high flow event, sequence of drought years etc.) whereas for biological parameters fixed frequencies (e.g., seasonally or annually) are more appropriate.
- Discussion tended to focus on salmonids but participants raised the need to increase the focus on other species such as lamprey.
- Participants discussed the difference between list sample frames and area sample frames (e.g., a list of permitted diversions vs. a continuous stream network).
- Participants raised the concern of losing long term datasets because they were not randomly selected. A number of potential strategies for addressing this issue were discussed. These vary from treating the 'historic' sites as a separate stratum which is not used to make inference to the broader population, to assuming that 'historic' sites are random. In general, it is necessary to at a minimum acknowledge the potential bias of sites that are not randomly selected. Depending on the nature of the parameter (e.g., biological vs. physical) and the method used to select sites originally (e.g., convenience based; targeting good or bad conditions) the potential for bias may be more or less severe. In general, trend estimation may be less susceptible to bias than status estimation but there are examples of biological data (e.g., index red sites) where trend has also been unreliable at non-randomly selected sites (Courbois et al. 2008).

Dam removal case studies

For each of the dam removal case studies a short 4-8 page preliminary monitoring vision which addressed each of the monitoring design components was presented for discussion. Included in these were draft tables describing the expected change by reach after dam removal in the style of McHenry and Pess (2008). Participants were asked to provide feedback on the expected

changes and the preliminary monitoring visions to identify any gaps, errors, or alternative approaches. There was insufficient time to adequately review the draft material and have extensive subgroup discussions. However, there were a number of useful insights which emerged from the workshop conversations. Participants will have an additional opportunity to review and provide feedback on the preliminary monitoring visions prior to the finalization of the Phase 2 report.

(1) Recolonization

- Participants generally supported the need for a phased approach to monitoring for action effectiveness, particularly with respect to dam removal (e.g., Peters et al. 2014).
- First want to evaluate change in distribution (i.e. presence/absence) (e.g., eDNA), then later focus on abundance after distribution re-established. The sampling strategy will change over time.
- Acoustic tracking is already being done for redband trout and suckers that could be used for salmon. However, acoustic tracking doesn't work so well in a big, active, turbid river where there is a lot of noise.
- Will require inter-agency cooperation in developing a revised sampling framework above the past dams, not just an ODFW component
- The key metrics for monitoring around this topic need to be well defined, and whether the concern is genetic diversity from a restoration perspective vs. harvest management (the sampling focus would shift).
- The monitoring of escapement will need to become adaptive based on where we see fish occurring; there will be a changing baseline going forward (the underlying relationship will be revised)
- How to now account for fish numbers between Keno and IGD? Hope that during the fall period would measure escapement at Shovel Ck., other small streams above IGD. With removal of the dams, would there be potential for a mainstem weir above IGD, as in the Trinity, which would lend itself to mark-recapture estimation of escapement of salmon, steelhead, above that location?
- Reach specific survival rates (by species) could be important to track in all new potential areas upstream of IGD. If there are clear passage "bottlenecks", etc., they may be more easily revealed, however, by simply field measurements of temps, DOs, etc., rather than estimated survival rates based on tag recovery data which may have substantial uncertainty in any event and may be quite expensive to get.

(2) Sediment changes

- The whole Klamath is in an unnatural sediment condition down to IGD and down to Cottonwood Creek (18 miles below IGD).

- The primary changes expected from a sediment point of view are between JC Boyle and Cottonwood (~40mile reach). Everything below that is expected to be largely unchanged.
- There is a need to make sure the necessary baseline measurements are taken prior to dam removal. Some of this is addressed in the Definite Plan but the IFRMP may have additional questions and therefore additional baseline data needs than the Definite Plan.
- Most of the proposed monitoring in the Definite Plan is for baseline, plus 2 years immediately post-dam removal and is primarily regulatory in nature. However, there are a lot of questions to be asked beyond the regulatory requirements.
- Movement of coarse and fine sediment post post-dam will be dependent on flow events.
- To evaluate all the potential questions identified in the draft would be an expensive proposition – in the millions of dollars. **Getting baseline data in the short term is critical**, further prioritization on key critical questions for evaluating whether these actions were beneficial for helping fish can occur later.

4 Preliminary Prioritization Framework

July 2018 workshop participants (Appendix B) were principally restoration proponents and practioners (vs. Federal/State agencies largely responsible for funding much of the contemplated restoration).

Workshop participants were supportive of developing a **multi-criteria scoring approach** for prioritizing future IFRMP restoration actions (scores of 2 and 3; Figure 7). Multi-criteria scoring is transparent and relies on a set of criteria associated with simple scales and weighting systems (Roni et al. 2013b). The key point raised by participants was that the system needed to be very clear (i.e., consistent scales, higher numbers always better), use clear wording and definitions, and generate comparisons of restoration benefits that were roughly comparable (e.g., system-wide dam removal not equated and scored equally with restoration of 200m of a stream channel). A repeated warning was to not apply the system blindly, but rather to use the system to inform a rational, neutral dialogue by an **independent rating committee**.

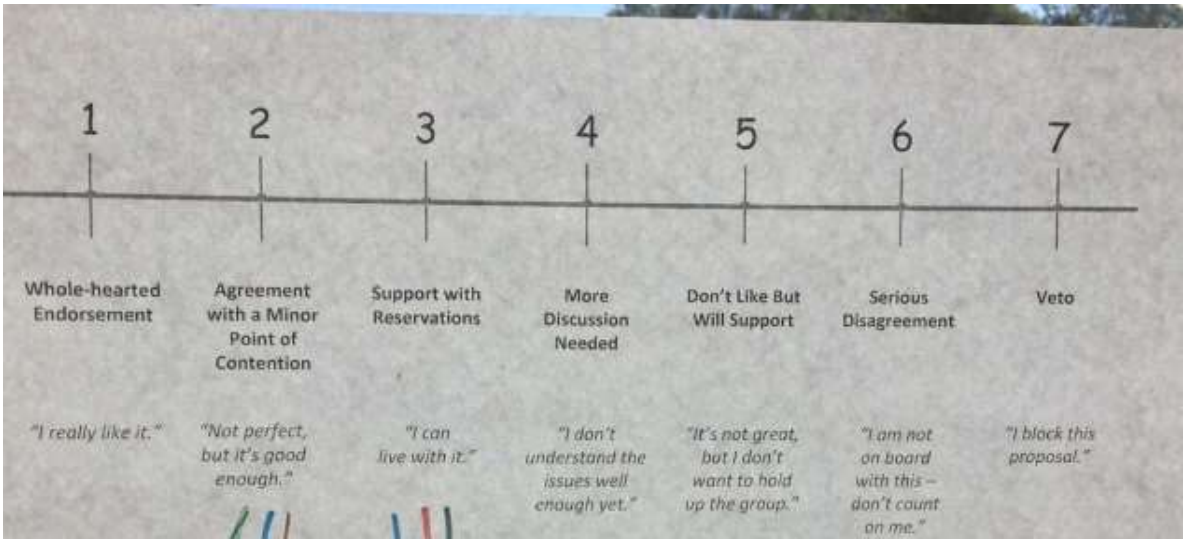


Figure 7: Level of participant agreement with a multi-criteria scoring approach for prioritizing future IFRMP restoration actions.

Multi-criteria scoring approaches are widely used in restoration programs, for example:

- By agencies setting project priorities for Species Recovery Plans (e.g., for SONCC Coho, Table 6-3 in NMFS 2014; for Pacific lamprey in Appendix B of Goodman and Reid 2015).
- By programs setting project priorities for a specific type of restoration action with multispecies benefits (e.g., prioritizing fish passage projects in Oregon, ODFW 2013).
- By grant programs selecting among project funding proposals that best meet their program's regional restoration priorities (e.g., the Oregon Watershed Enhancement Board's Prioritization Framework, OWEB 2005).

During the July 2018 workshop, we proposed a framework that included following broad categories:

- **Technical Merit/Scientific Benefit**
- **Feasibility & Social Considerations**
- **Cost**

4.1 Technical Merit / Scientific Benefit

Technical merit and scientific benefit criteria were much more preferred over feasibility and social considerations (53 positive "green" votes, only 10 red) vs. 5 green, 36 red for feasibility and social considerations. Participants felt that actions should be chosen which are first and foremost scientifically defensible, and then folks can work through the feasibility and social constraints in a separate and subsequent step. They did **not** want effective actions to be vetoed based on rolling in feasibility and cost considerations into a single overall score (e.g., dam removal would never have got this far if social and economic constraints were primary or even equal to technical / scientific benefit). A single combined score was widely perceived as being too rigid and likely to inadvertently screen out worthwhile projects.

With respect to Technical merit and scientific benefit criteria, most participants favoured the following criteria: # of key limiting factors improved for focal species (ability to address critical bottlenecks), level of watershed processes targeted (some folks missed this criterion because it's at a higher level than others), spatial scale of anticipated benefits, expected level of benefit, importance in avoiding the extinction of a species, reduced risk of negative impact to other species, and longevity of benefits. These preferences are reflected in the updated post-workshop version of the framework in Figure 8.

4.2 Feasibility & Social Considerations / Cost

Feasibility / Cost. Several participants were willing to drop the following prioritization criteria: duration to plan and implement and whether the restoration technique had been successfully applied elsewhere. With respect to the latter criterion, people were concerned that you could box yourself in by only applying restoration techniques that had already been applied. For example, 10 years ago, nobody was using Beaver Dam Analogs (BDA) but now they are very common. In general, most people felt that since the problem was complex, it would require complex, large, time-consuming projects which were not easy to implement; hence feasibility should receive a lower weight. Participants did not want effective actions to be vetoed from the get go based on feasibility / economic constraints..

Additional criteria mentioned were risk of failure and ease of monitoring effectiveness (easier to move forward with implementation) and the value of taking advantage of ephemeral opportunities that could be lost if not pursued.

Social Considerations. There were differing views on Level of Landowner Cooperation required. Some felt that this could easily change as land ownership changed, and therefore was not a permanent constraint, whereas others felt that willing landowners (and willing partners in general, not just landowners) were an essential asset to a restoration project. Where the inability to access

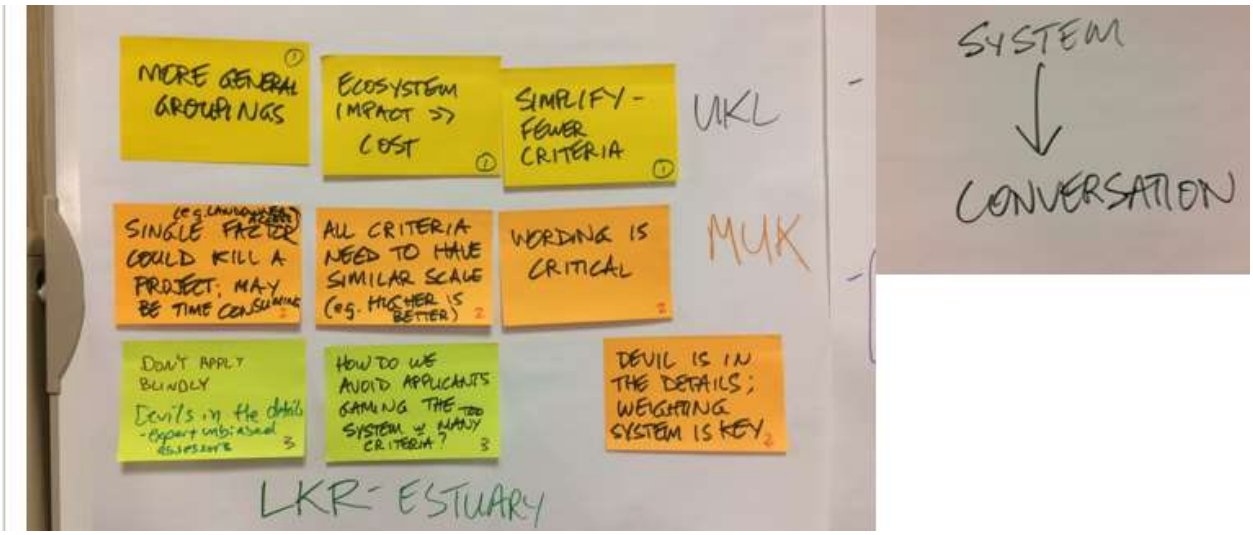
land could kill a project it is clearly worth evaluating early in the process. If access is impossible, it may not be worth evaluating all of the other criteria.

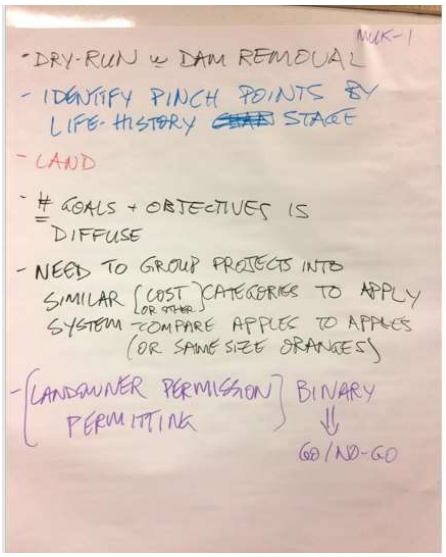
These preferences are reflected in the updated post-workshop version of the framework in Figure 8.

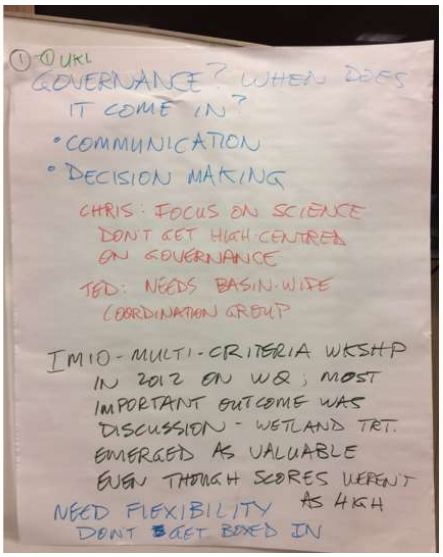
4.3 Interpreting Prioritization Outcomes

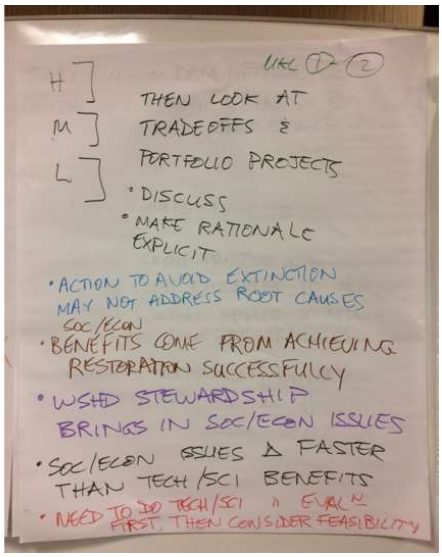
It is important to understand that a low prioritization rank for a project does not necessarily mean it should never be implemented. For example, some projects may have greater benefit if implemented later in the restoration sequence after other tasks have already been completed, and other projects scoring high on potential benefit but low on proven effectiveness may be candidates for research studies coupled with effectiveness monitoring before they are widely implemented. Finally, we should always remember that prioritization frameworks provide guidance, but groups of people will ultimately make the ranking final decisions. In practice, lower ranking projects are sometimes implemented first because they are either easy to implement or less expensive.

General workshop advice on interpretation/application of the IFRMP prioritisation framework are provided in the images below.




MGK-1
- DRY-RUN w DAM REMOVAL
- IDENTIFY PINCH POINTS BY LIFE-HISTORY STAGE
- LAND
- # GOALS + OBJECTIVES IS = DIFFUSE
- NEED TO GROUP PROJECTS INTO SIMILAR [COST OR OTHER] CATEGORIES TO APPLY SYSTEM - COMPARE APPLES TO APPLES (OR SAME SIZE ORANGES)
- [LANDOWNER PERMISSION PERMITTING] BINARY ⇓ GO/NO-GO


① ① UKL
GOVERNANCE? WHEN DOES IT COME IN?
• COMMUNICATION
• DECISION MAKING
CHRIS: FOCUS ON SCIENCE DON'T GET HIGH CENTRED ON GOVERNANCE
TED: NEEDS BASIN-WIDE COORDINATION GROUP
IMIO - MULTI-CRITERIA WKSHP IN 2012 ON W&; MOST IMPORTANT OUTCOME WAS DISCUSSION - WETLAND TRT. EMERGED AS VALUABLE EVEN THOUGH SCORES WEREN'T AS HIGH
NEED FLEXIBILITY DON'T GET BOXED IN


UKL ① ②
H
M
L
THEN LOOK AT TRADEOFFS & PORTFOLIO PROJECTS
• DISCUSS
• MAKE RATIONALE EXPLICIT
• ACTION TO AVOID EXTINCTION MAY NOT ADDRESS ROOT CAUSES SOC/ECON
• BENEFITS COME FROM ACHIEVING RESTORATION SUCCESSFULLY
• WSHD STEWARDSHIP BRINGS IN SOC/ECON ISSUES
• SOC/ECON ISSUES & FASTER THAN TECH/SCI BENEFITS
• NEED TO DO TECH/SCI & EVAL^N FIRST, THEN CONSIDER FEASIBILITY

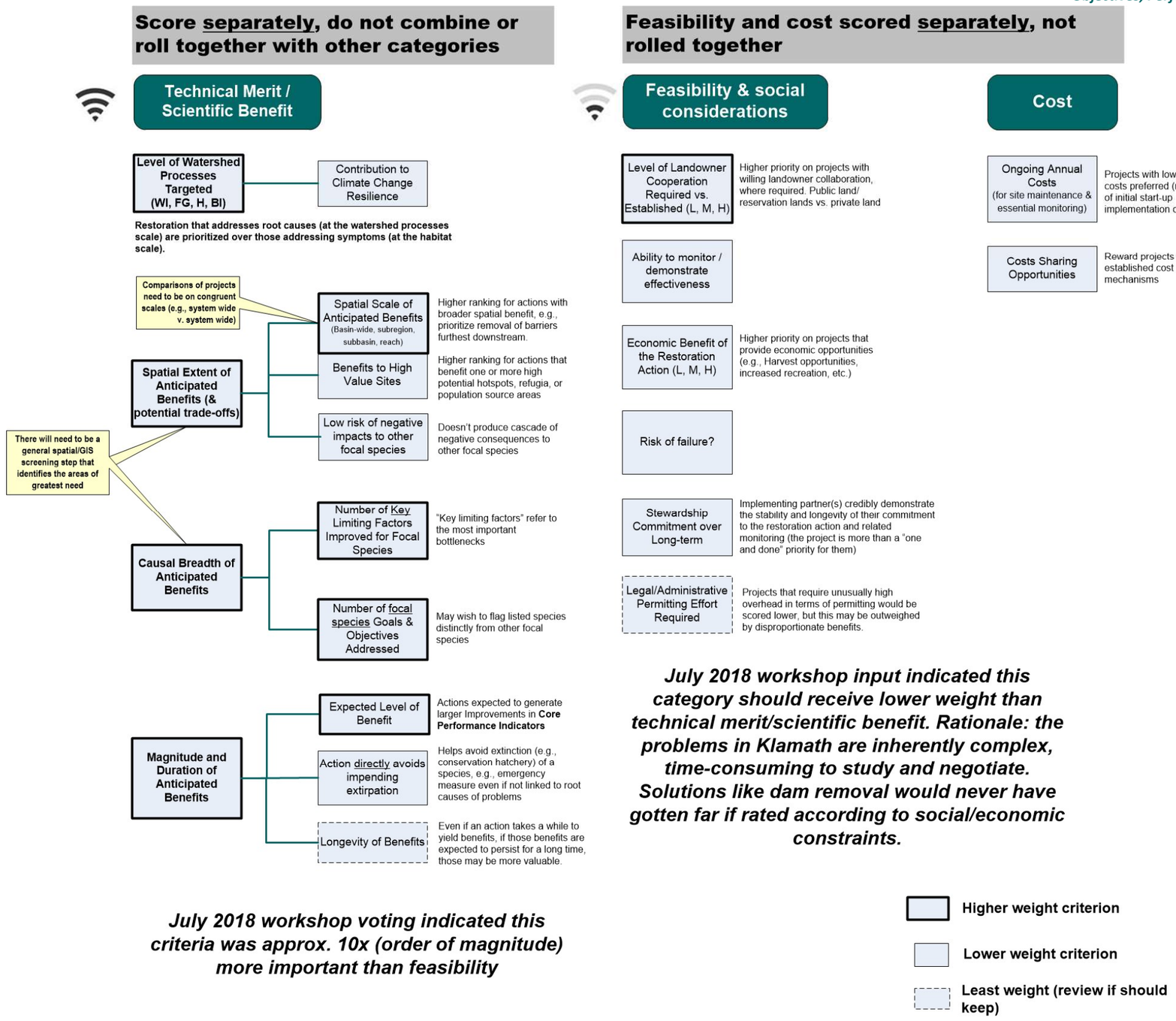


Figure 8: Post July 2018 multi-criteria scoring framework for the Klamath River Basin IFRMP. {Note: Intentionally displayed on 11x17 page}.

4.4 Remaining Questions

During the upcoming August 30 2018 multi-region webinar, **with reference to Figure 8**, we would like participants to assist our team and confirm our current direction as follows:

Technical Merit / Scientific Benefit Category

1. Have we correctly characterized workshop advice on the **priority amongst** the technical merit / scientific benefit **criteria**? **Yes/No**.
2. Are there any Technical Merit / Scientific Benefit criteria that should be **dropped**?

{August 30 2018 we will likely subsequently ask participants to rank or categorize these criteria on a L/M/H scale}.

Feasibility and Social Consideration Category

3. Workshop participants largely advised us to down-weight or drop most of these criteria (see Figure 8). What, if any criteria do the US Fish and Wildlife Service and NOAA Fisheries recommend we **drop**?

Cost

4. Based on July 2018 workshop participant feedback we dropped the initial planning and implementation cost criteria for restoration projects in favour of ongoing costs (see Figure 8). Do the US Fish and Wildlife Service and NOAA Fisheries support this perspective? **Yes/No**.

4.5 Next steps

In developing the multi-criteria scoring in the **Initial Rough Draft IFRMP document** in September, we will:

- Produce **draft** scoring scale definitions for each criterion;
- Suggest a general spatial/GIS screening step that identifies the areas of greatest need;
- Suggest recommended weighting methods;
- Being clear on the sequence in which criteria should be calculated/estimated (e.g., if answers on some criteria were “no”, there may be no need to proceed with scoring);
- Propose data collection and ongoing inventory analysis needs to assist with scoring; and
- Propose rules for integrating scores from independent rating committee members (incld. Frequency of application), and ways of stratifying and normalizing results to promote structured conversations.

In the Initial Rough Draft IFRMP we will also attempt to illustrate an **example** of how the prioritization framework might be applied.

Note: that the finalization of specific scales and weighting factors for each criterion selected will be further revised and finalized in Phase 3.

Readers may wish to refer to the workshop backgrounder document for additional background on the pros and cons of different prioritization frameworks that were considered.

4.6 Pre-Workshop Survey Responses

Please refer to responses in Appendix C for Questions 12-15.

5 References

Courbois, J., Katz, S. L., Isaak, D. J., Steel, E. A., Thurow, R. F., Wargo Rub, A. M. i. c. h. e. l. l. e., . . . Jordan, C. E. (2008). Evaluating probability sampling strategies for estimating redd counts: An example with chinook salmon (oncorhynchus tshawytscha). *Canadian Journal of Fisheries and Aquatic Sciences, 65*(9), 1814-1830. doi:10.1139/F08-092

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McHenry, Michael and George Pess. 2008. An Overview of Monitoring Options for Assessing Response of Salmonids and Their Aquatic Ecosystems in the Elwha River Following Dam Removal. Northwest Science, Vol. 82, Special Issue.

Oregon Department of Fish and Wildlife (ODFW). 2013. Oregon Department of Fish and Wildlife Fish Screening and Passage Program – Fish Passage Priority List. 65 pp. Available via this link.

Oregon Watershed Enhancement Board (OWEB). 2005. OWEB Prioritization Framework – Improvement Priorities at Basin and Watershed Scales. 21 pp. Available via this link.

Peters, R.J., Duda, J.J., Pess, G.R., Zimmerman, M., Crain, P., Hughes, Z., Wilson, A., Liermann, M.C., Morley, S.A., McMillan, J. and Denton, K., 2014. Guidelines for monitoring and adaptively managing restoration of Chinook salmon (Oncorhynchus tshawytscha) and steelhead (O. mykiss) on the Elwha River. In Joint Federal Interagency Conference.

Reynolds, Joel H., Melinda G. Knutson, Ken B. Newman, Emily D. Silverman, William L. Thompson. 2016. A road map for designing and implementing a biological monitoring program. Environmental Monitoring Assessment. 199: 399.

Roni, P., Beechie, T., Schmutz, S., and Muhar, S. 2013b. Prioritization of Watersheds and Restoration Projects. Chapter 6 in: Roni, P. and Beechie, T., eds. 2013. Stream and Watershed Restoration: A Guide to Restoring Riverine Processes and Habitats, First Edition. John Wiley & Sons, Ltd.

Additional Reading:

ESSA, 2018. Objectives, Performance Indicators & Monitoring Workshop Pre-Workshop Briefing Package. Report prepared by ESSA Technologies Ltd., Vancouver, BC. Available at: http://kbifrm.psmfc.org/file/objectives-performance-indicators-monitoring-workshop-pre-workshop-briefing-package/ p. 27.

Appendix A: Klamath IFRMP: July 10-11 Pre-Workshop Survey Results

Q1 Participant Information

Answered: 31 Skipped: 0

There were 31 survey respondents.

Q2: Do you believe that the high-level goals and objectives in Table 2 of the Workshop Briefing Document reflect the full suite of issues and activities required for whole-basin recovery? If not, provide feedback on missing whole-basin goals and objectives.

Answered: 21 Skipped: 10

#	RESPONSES	DATE
1	Although I do believe that the high-level goals and objectives in Table 2 of the Workshop Briefing Document reflect the full suite of issues and activities required for whole-basin recovery, some of the potential Candidate Restoration Actions could fit under multiple goals and objectives. Also, add BDAs and off channel habitat creation to section 5.2 under objectives and gravel augmentation/supplementation under objective 6.	7/3/2018 2:24 PM
2	I am extremely grateful for narrowing the list down to the key points. This is a super critical step and I believe you all have done a wonderful job. A few points. 3.3 and 3.4 highly related. 4.5 "native" anadromous and...	7/2/2018 5:09 PM
3	This looks like a comprehensive list	7/2/2018 3:52 PM
4	I would suggest making 5.3 more broad to include lake fringe wetland restoration	7/2/2018 1:07 PM
5	It seems complete.	7/2/2018 12:26 PM
6	Besides restoration efforts that treat sources of water quality impairment, some actions may be needed to immediately improve water quality conditions within UKL and downstream. With water quality conditions often well in exceedance of species and reach specific thresholds, 'band-aid' type projects such as aeration, algal filtration, or other innovative or aggressive approaches to improve water quality should be on the table. Given the dire nature of suckers populations and the potential for spring chinook to be listed, all these species may be directly harmed by existing water quality conditions without even considering worsening impacts in the near future due to climate change. Knowing that common restoration efforts such as riparian protection done today may not produce significant results for years if not decades, some direct actions should be considered as a high level objective to improve water quality in the short term to avoid direct loss of listed species that may result in extinction or poor survival/failure of re-introduced species. Overallocation of water needs to be factored in. While adjudication is ongoing in Oregon, the recent Klamath Tribes lawsuit and known climate change impacts to snowpack are going to make status quo water use more difficult moving forward. When fish pretty much only get the minimum flows required under Bi-Ops, is that enough to truly recover the species? Understanding all these issues is important as we try to maintain some level of land/water use for agriculture while fundamentally addressing the issue of overallocation of water/water rights.	7/2/2018 11:55 AM
7	yes.	7/2/2018 11:00 AM
8	Seems like you attempted to cover the suite of actions	7/2/2018 9:36 AM
9	Not quite. I don't see upper Klamath Lake sucker recovery listed as a specific goal, and most if not all of the fisheries goals or nested goals I see appear to be salmonid oriented. I also think reduction of cyanobacterial blooms and associated human health impacts should be a whole-basin goal, although I recognize this is a fisheries restoration plan. There is a connection, however, from the poor water quality that occurs during blooms. Other species that don't appear represented include other native fish and lamprey in the lower basin, especially sturgeon & eulachon.	6/30/2018 2:27 PM
10	The high-level goals and objectives reflect the full suite of issues for fish populations. I do not believe Workshop Briefing Document reflects the whole suite of issues and activities for "whole-basin" recovery. It may be an ongoing disconnect of those of us who represent a broader base of goals and objectives and were hoping that this initiative would incorporate a more comprehensive approach. For example, the cited candidate restoration actions for Goal#1 do not speak directly to the clearest threats presented to achieving the objectives, water quality and fish disease.	6/29/2018 3:49 PM

11	There are other things needed for full basin recovery, but fall outside the scope of this plan (this is more on the human interaction & political side of things)	6/29/2018 11:34 AM
12	Yes. It appears to capture everything broadly.	6/29/2018 6:14 AM
13	It seems to me that the Whole-basin objectives are more like sub-goals of the Basin Goal they are nested under. Which at this stage I think is okay, but at some point an effort needs to be undertaken to establish objectives that are truly SMART objectives. Also, I think there should be some effort to establish escapement goals for the Basin, this could lead to an estimate of the amount of spawning habitat that is necessary to meet escapement objectives (Salmonids only)	6/28/2018 3:15 PM
14	yes	6/28/2018 2:53 PM
15	yes	6/27/2018 12:29 PM
16	Perhaps we're close, but I can't really tell. The Pess citation urges us to identify measurable objectives; not all in the table are able to be measured at levels of precision useful to management (e.g. changes in juvenile survival) In some instances, the Table 2 entries are vague, e.g. 5.2 "increase channel and floodplain dynamics, stability and interconnectivity". Where are the unstable channels to which this refers?. An example candidate restoration action on p.8 is "...minimize WQ barriers", but without a location I don't know if this refers to the WQ barrier at Keno/Ewauna that I find to be of priority. Similarly, "reduce agricultural nutrient inputs" sounds right if you are referring to lands above UKL. The candidate restoration actions on p.7 include "increase scour to pre-dam levels", and I'm not sure where you are thinking of (Shasta below Dwinnell?) or how we would assess depth of scour, per se, in any below-dam reach.	6/27/2018 9:49 AM
17	Missing water quality under fish populations. Water Quality plays a large role in fish survival and no mention of WQ in this section leaves a hole in the overall goal and objective of the final plan. You can have all of the habitat enhancements you want but without pairing that with WQ improvement in the basin you will be missing the mark.	6/27/2018 8:56 AM

18	There are two major issues, with associated activities, that are, in my opinion, critically missing from Table 2. While I realize that the overarching goal of the IFRMP is “Restore and sustain viable, natural, self sustaining natural fish populations in the Klamath Basin to facilitate to enhanced harvest opportunities for dependent Tribal, recreational and commercial fisheries, while improving Basin flows, water quality, habitat, and ecosystem process”, which does not reference human needs other than fishing. Ignoring these issues will likely sabotage buy in on the plan from the start, and contribute to the social polarization in the basin that has stymied efforts to achieve large-scale restoration in the basin to date. The goals and issues I am about to suggest address two socioeconomic issues, and as such, involve more controversial and political topics, which are often painful to address. However, ignoring them leaves huge gaps in the foundation of a plan intended to support basin wide restoration into the future, and, in my opinion, imperials the potential for success from the start. My first suggested additional goal is something like: “Support and sustain the basin’s natural resource based economic activities, such as agriculture and timber production, in becoming net ecological contributors to the basin”. Activities could include, conservation easements retiring develop right and/re water rights, supporting alternative agricultural practices that improve soil carbon and water storage, supporting increased wetlands that are co-used for agriculture, providing regulatory restrictions for land conversion for development etc. There is mention in the current IFRMP document of improved irrigation efficiency as a restoration action, but the science associated with this is not 100% clear as to the net ecological value (Van Kirk, Robert W. and Seth W. Naman, 2008. Relative Effects of Climate and Water Use on Base-FlowTrends in the Lower Klamath Basin. Journal of the American Water Resources Association (JAWRA) 44(4):1035- 1052. DOI: 10.1111/j.1752-1688.2008.00212.), and listing it as one of a very few actions associated with agricultural practices is limiting. The loss of large blocks of land being used for resource production, and their subsequent conversion to rural residential properties would have devastating effects on stream flows and fisheries. Given the current funding and political climate, it is unlikely that properties taken out of production will be converted to public lands,; instead they will most likely they will be utilized at a much higher intensity such as recreational properties. We are already seeing these trends emerging, with houses with lawns, dogs, septic tanks, cars taking multiple trips etc replacing low intensity timber production and grazing. Preventing this land use conversion should be a very high priority. The other major issue I see is consistently and effectively enforcing existing water right allocations, and preventing unauthorized usage of basin water. Actions would be instituting comprehensive basin-wide water-master services and accelerating groundwater monitoring and regulation. This needs to be done prior to considering re-opening adjudications for improving in-stream flows. Until current water management is accurately quantified and effective monitored, we do not know how much water is currently legally and illegally being removed. Regulatory “gray areas” in current adjudications, such as utilization of so called “surplus flows”, or after irrigation water use need to be clarified and enforced. The States needs to support comprehensive basin-wide water-mastering with appropriate, but not overly burdensome, fees for the users, and substantial support from the state to preform this service in the obligation to care for the public trust resource.	6/26/2018 8:46 AM
19	Yes	6/25/2018 11:15 AM
20	Yes	6/21/2018 11:03 AM
21	Yes	6/21/2018 8:20 AM

Q3: Please list your input on your "Top 3" specific actions at specific locations that would have disproportionately high benefit for some or all of the BIOLOGICAL INTERACTIONS objectives listed in Table 2 for the sub-basin(s) for which you have the most experience. Someexamples heard at the last workshop are included in Table 2.

Answered: 19 Skipped: 12

ANSWER CHOICES	RESPONSES	
3.1 Conduct hatchery supplementation, rearing and re-introduction (as needed) to meet fish restoration objectives without generating adverse competitive or genetic consequences for native fish	84.21%	16
3.2 Minimize disease-related mortality by reducing vectors and factors known to lead to fish disease outbreaks	89.47%	17
3.3 Reduce impacts of exotic fish species on native fish	68.42%	13
3.4 Reduce impacts of predation on native fish	47.37%	9

#	3.1 CONDUCT HATCHERY SUPPLEMENTATION, REARING AND RE-INTRODUCTION (AS NEEDED) TO MEET FISH RESTORATION OBJECTIVES WITHOUT GENERATING ADVERSE COMPETITIVE OR GENETIC CONSEQUENCES FOR NATIVE FISH	DATE
1	Conservation hatchery at Fall Creek	7/3/2018 2:24 PM
2	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
3	1.) rearing and stocking of 60,000 endangered suckers/year into Upper Klamath Lake; 2.)	7/2/2018 1:07 PM
4	Conduct using best available approach to avoid genetic bottlenecks (especially if Spring Chinook are targeted). Require 100% tagging rate for hatchery salmon to better protect wild fish via harvest and stock management.	7/2/2018 11:55 AM
5	minimize disease related mortality	7/2/2018 11:00 AM
6	1	7/2/2018 9:36 AM
7	Selectively target species requiring conservation support (i.e., coho) and scale back all other operations.	6/29/2018 3:49 PM
8	Minimization of nutrient input from agriculture and cattle around Upper Klamath Lake in addition to the restoration of fringe wetland habitat.	6/29/2018 11:34 AM
9	I believe this will be required to successfully reintroduce target species to the habitats upstream of the dams upon removal.	6/29/2018 6:14 AM
10	Artificial propagation of Lost River and shortnose suckers through the USFWS Sucker Assisted Rearing Program.	6/28/2018 2:53 PM
11	This action is important in the short term to quickly expand the range of species beyond dams post removal but should be careful monitored to avoid genetic risk. Consider coho in jenny creek, fall creek, shovel creek, spencer creek and chinook in Sprague, Williamson, spring creek, wood river (deference to ODFW plan)	6/27/2018 12:29 PM
12	IGH is not slated for funding beyond 8 years after dam removal. Are you addressing Trinity River Hatchery in particular, suggesting IGH be considered as a long-range conservation tool, or what?	6/27/2018 9:49 AM
13	Location of this program will be crucial to its success.	6/27/2018 8:56 AM
14	Section 5 FG, though I don't like how you organize the sub-categories	6/26/2018 8:46 AM
15	1)Maintain Iron Gate Hatchery as a conservation hatchery for coho salmon genetics; 2) locate facility upstream of Iron Gate to supplement Chinook Salmon populations for 10-20 years (use good HGMP to minimize negative impacts of hatchery reared fish);	6/25/2018 11:15 AM

16	Rearing for sucker #1	6/21/2018 8:20 AM

#	3.2 MINIMIZE DISEASE-RELATED MORTALITY BY REDUCING VECTORS AND FACTORS KNOWN TO LEAD TO FISH DISEASE OUTBREAKS	DATE
1	restore natural flow regimes in the Upper Klamath	7/3/2018 2:24 PM
2	flow mgt, flow mgt and flow mgt	7/2/2018 5:09 PM
3	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
4	1.) Remove dams; 2.) Ensure that flood frequencies are adequate; 3.) Reduce fathead minnow populations in UKL	7/2/2018 1:07 PM
5	Increase cold water inputs in the sub-basins (Scott, Shasta), decrease tailwater inputs (Shasta), Increase riparian shading (Scott, Shasta)	7/2/2018 12:26 PM
6	Prioritize spring pulse flows to reduce population density of C Shasta intermediate host and better flush nutrient rich sediments downstream of lowermost dam (now IG, soon Keno). Significantly reduce nutrient loading from UKL and Keno to reduce organic matter feeding C Shasta intermediate hosts downstream.	7/2/2018 11:55 AM
7	minimize impacts of exotics (plants and animals) where possible	7/2/2018 11:00 AM
8	2	7/2/2018 9:36 AM
9	1) Dam removal; 2) Improved water quality conditions in the upper basin; 3) Improved water quality and flows in sub-basins (e.g., Shasta River)	6/29/2018 3:49 PM
10	For disease minimization, removal of the four lowermost mainstem dams on the Klamath to (at least partially) restore a nature flow regime. This will increase bed mobilization which will disrupt the life cycle of the intermediate polychaete worm host (M. speciosa) and the effects the associated pathogen (C. Shasta) has on juvenile salmonid populations.	6/29/2018 11:34 AM
11	I believe this is the highest priority to continue to protect and improve the condition of the existing native stocks downstream of IGD.	6/29/2018 6:14 AM
12	Reduce number of juvenile salmon released from Iron Gate Hatchery or change time of release to minimize infection levels.	6/28/2018 2:53 PM
13	This action has the greatest benefit to fish and will occur by focusing on water quality (nutrient inputs to Upper Klamath Lake and Lake Ewana. Consider removing Keno dam to reduce poor water quality leading to disease.	6/27/2018 12:29 PM
14	#1 as a problem, perhaps mitigated substantially by removal of mainstem dams. An enormous problem in Klamath mainstem, impacting both Trinity and non-Trinity fish.	6/27/2018 9:49 AM
15	Water Quality stressors should be mentioned here. Disease and WQ are two separate issues.	6/27/2018 8:56 AM
16	W I (6.1)	6/26/2018 8:46 AM
17	Ensure a natural flow regime is implemented, similar to the current water management	6/25/2018 11:15 AM

#	3.3 REDUCE IMPACTS OF EXOTIC FISH SPECIES ON NATIVE FISH	DATE
1	Have no bag limit on exotic fish species such as brown trout and bass, Cull all non natives captured through monitoring efforts. Control invasives in localized hotspots such as the Lower Seiad off channel pond and other warm water features adjacent to the Klamath and tributary floodplains.	7/3/2018 2:24 PM
2	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
3	1.) Experimental lake level management to reduce fathead minnow reproduction; 2.) Targeted removal of yellow perch and fathead minnows in UKL	7/2/2018 1:07 PM
4	conservation hatcheries for recovery purposes of declining species	7/2/2018 11:00 AM
5	4	7/2/2018 9:36 AM

6	1) Provide more than marginal water quality conditions for preferred (native) species to be more resilient in the face of exotics.	6/29/2018 3:49 PM
7	This action doesn't have a specific location as it's applicable everywhere, but tailwater reuse and irrigation efficiency upgrades would have a significant impact.	6/29/2018 11:34 AM
8	This is a low priority 3	6/29/2018 6:14 AM
9	The 3 Bull Trout recovery units. Upper Klamath Lake	6/28/2018 3:15 PM
10	Competition rather than predation, I take it.	6/27/2018 9:49 AM
11	H 4.2, 4.3, 4.4, 4.5	6/26/2018 8:46 AM
12	implement AIS removal programs (i.e. fishing derbies, bounties, etc.)	6/25/2018 11:15 AM
13	Removal of brook trout in bull trout streams	6/21/2018 8:20 AM

#	3.4 REDUCE IMPACTS OF PREDATION ON NATIVE FISH	DATE
1	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
2	1.) Restore fringe wetlands around UKL	7/2/2018 1:07 PM
3	3	7/2/2018 9:36 AM
4	1) Improved habitat conditions in sub-basins.	6/29/2018 3:49 PM
5	This is a low priority 3	6/29/2018 6:14 AM
6	Not sure how 3.4 differs from 3.3?	6/28/2018 3:15 PM
7	Such a mix of fishes! Lost River Sucker fry are decimated by fathead minnows, Trinity River brown trout consume significant fraction of coho, and on. Overall, I don't know how to prioritize this.	6/27/2018 9:49 AM
8	Habitat structures?	6/27/2018 8:56 AM
9	Increase bag limit for non-native fishes	6/25/2018 11:15 AM

Q4 Please list your input on your "Top 3" specific actions at specific locations that would have disproportionately high benefit for some or all of the HABITAT objectives listed in Table 2 for the sub-basin(s) for which you have the most experience. Some examples heard at the last workshop are included in Table 2.

Answered: 20 Skipped: 11

ANSWER CHOICES	RESPONSES	
4.1 Restore fish passage and re-establish channel and other habitat connectivity	90.00%	18
4.2 Improve water temperatures and other local water quality conditions for fish growth and survival	100.00%	20
4.3 Enhance and maintain food availability	45.00%	9
4.4 Reduce fish mortality due to entrainment, scour, stranding	70.00%	14
4.5 Enhance and maintain habitats for all freshwater life stages of resident and anadromous fish	65.00%	13

#	4.1 RESTORE FISH PASSAGE AND RE-ESTABLISH CHANNEL AND OTHER HABITAT CONNECTIVITY	DATE
1	Remove fish passage barriers along the hwy 96 state highway system including Portugese Creek, Cade Creek, Sandy Bar, Stanshaw Creek. Remove the Novy/Rice flahboard dam on the Shasta River. Remediate the 1-5 state highway barrier on Parks Creek in the Shasta River. Remove the County Road Barrier on Seiad Creek. Remove the road crossing barrier on Fall Creek.	7/3/2018 2:24 PM
2	Dams out and associated restored anadromy to the upper basin and its various tributaries. Screening at all water permitted withdrawls.	7/2/2018 5:09 PM
3	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
4	Remove minor impoundments downstream from critical habitat	7/2/2018 12:26 PM
5	1- Culvert replacement/fish passage where historic/suitable habitat is blocked (including at mouths of Klamath tribs to allow summer access as refugia). 2- UKL fringe wetland connectivity, 3- floodplain reactivation at appropriate locations	7/2/2018 11:55 AM
6	Implement Klamath Dam Removal (including Keno)	7/2/2018 11:00 AM
7	1	7/2/2018 9:36 AM
8	1) Improve water quality (temperature, DO, BGA) through the Keno reach into Upper Klamath Lake; 2) Riparian habitat restoration in Wood, Sprague, and Willamson; 3) Improved habitat, flow, and water quality in critical sub-basins (e.g., Shasta, Scott)	6/29/2018 3:49 PM
9	Removal of the four lowermost mainstem dams and improve passage at Keno and Link River dams	6/29/2018 11:34 AM
10	This is number two - we need to eliminate fish passage barriers to access the areas with suitable water quality and quantity and then improve the channel function and complexity in all reaches with suitable water quality quantity	6/29/2018 6:14 AM
11	removal of Iron Gate, Copco 1&2, and J.C. Boyle dams	6/28/2018 3:15 PM
12	Removal of the four Klamath RIver dams.	6/28/2018 2:53 PM
13	Consider removing Keno dam to improve upstream and downstream passage. Consolidate diversions from Lake Ewana so that diversions are screened	6/27/2018 12:29 PM
14	Mixed bag here. Fish passage beyond Klamath mainstem dams is a first-tier priority. My personal #3 Re-establishing habitat connectivity on Trinity below Lewiston, via management of Lewiston flow releases and channel/floodplain reconstruction remains a HUGE need.	6/27/2018 9:49 AM

15	1	6/27/2018 8:56 AM
16	Screening diversion, channel, reconfiguration, BDAs, beaver support (stop depredation, support living with beaver), planting and exclusionary fencing	6/26/2018 8:46 AM
17	1) remove dams, 2) monitor fate of stored sediments, 3) ensure tributaries do not become perched	6/25/2018 11:15 AM
18	Connect historic lake fringe wetlands (UKL), remove Sprague River levees	6/21/2018 8:20 AM

#	4.2 IMPROVE WATER TEMPERATURES AND OTHER LOCAL WATER QUALITY CONDITIONS FOR FISH GROWTH AND SURVIVAL	DATE
1	Remove Keno Dam. Replumb the irrigation systems, identify opportunities for water storage and forebearance, utilize section 1707 of the CA water code to provide water for fish and wildlife on the Shasta and Scott Rivers.	7/3/2018 2:24 PM
2	Restore tributary inflows. Enforce regulations on illegal water diversions.	7/2/2018 5:09 PM
3	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
4	1.) Reduce P inputs to UKL (cattle fencing, riparian restoration, tailwater treatment); 2.) Restore fringe wetlands around UKL	7/2/2018 1:07 PM
5	increase cold water inputs, restore riparian shading and large woody debris at cold water inputs, eliminate tailwater inputs to areas of potential cold water refugia	7/2/2018 12:26 PM
6	1- Riparian restoration/fencing in ag zones, 2- Reduce anthropogenic nutrient inputs to UKL with Diffuse Source Treatment Wetlands beyond the current pilot scale. 3- Purchase (ideally) or lease water rights to ensure cold springs in Shasta and Scott can provide critical refugia during and following dam removal.	7/2/2018 11:55 AM
7	Protect cold water springs instream	7/2/2018 11:00 AM
8	2	7/2/2018 9:36 AM
9	Mainstem will require major flow enhancements -- protection of existing refugia. That said 1) Reconnection/ restoration of springs in spring dominated tributaries (Wood, Shasta); 2) Riparian restoration / protection starategies throughout basin. 3) Enhanced flows through agriculture conservation measures with environmental capture of conserved water (also reduces maintenance activities).	6/29/2018 3:49 PM
10	Promote and encourage irrigation efficiency upgrades and tailwater reuse in the Upper and Mid basins	6/29/2018 11:34 AM
11	I feel the number one priority is improving water temperatures and most importantly flow and habitat volume. If we have no water or poor quality water then all of the habitat restoration will not be able to produce fish due to inhospitable conditions.	6/29/2018 6:14 AM
12	Reduce nutrient loading into Upper Klamath Lake, purchase lakeshore ag lands that are converted lake-fringe wetlands and revert them back to lake-fringe wetlands.	6/28/2018 3:15 PM
13	Improve instream flow and restore riparian habitat in the Shasta and Scott rivers.	6/28/2018 2:53 PM
14	Improve Upper Klamath Lake water quality by limiting nutrient inputs from agriculture operations and restoring wetlands to treat existing nutrient input.	6/27/2018 12:29 PM
15	Lake Ewauna/Keno reach is impassable for much of the year (April-November) due to low-to-zero dissolved oxygen.	6/27/2018 9:49 AM
16	2	6/27/2018 8:56 AM
17	Enforcement of water right use.	6/26/2018 8:46 AM
18	Ensure River discharge is as close to natural as possible, monitor water temperature at a few key locations to identify any problematic zones	6/25/2018 11:15 AM
19	1. Tailwater reduction, 2. Headwaters improvements that increase retention times and volumes	6/21/2018 11:03 AM

20	Improve riparian vegetative cooridors	6/21/2018 8:20 AM

#	4.3 ENHANCE AND MAINTAIN FOOD AVAILABILITY	DATE
1	Hyper-eutrophic system, with food assumed to not be limiting.	7/2/2018 5:09 PM 7/2/2018 11:55 AM
2	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
3	1- Restore riparian cover to promote leaf litter and macroinvertebrate populations, 2- reduce nutrient inputs to UKL to reduce HABs and shift invert community towards more palatable species,	7/2/2018 11:00 AM
4	Readjudicate water rights in the Shasta and Scott River watersheds (and other basins where appropriate)	
5	5	7/2/2018 9:36 AM
6	Shasta is an example where good habitat / fair water quality can result in abundant production of prey species -- try to mimic those conditions elsewhere.	6/29/2018 3:49 PM
7	Again, natural river flow will facilitate this...not flat line flows, need variability	6/25/2018 11:15 AM
8	1. Improve adjacent uplands and riparian vegetation, 2. Increase structural heterogeneity longitudinally and cross-section	6/21/2018 11:03 AM
9	Instream habitat complexity	6/21/2018 8:20 AM

#	4.4 REDUCE FISH MORTALITY DUE TO ENTRAINMENT, SCOUR, STRANDING	DATE
1	Screen all irrigation diversions throughout Lake Euwana and Keno Resevoir. Screen diversions on Ft Goff Creek in the Mid Klamath	7/3/2018 2:24 PM
2	I believe this would be covered adequately under 6.1 if implemented correctly.	7/2/2018 5:09 PM
3	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
4	establish instream flow requirements that ensure fish passage can be met and fish are able to migrate to cold water refugia at temperatures increase, sub-basin reservoirs release flushing flows in the winter to increase scour (ie: Dwinnel in the Shasta).	7/2/2018 12:26 PM
5	1- Screen ALL pumps and diversions throughout the basin (why is this not already required!), 2- follow best available science for ramping rates below dams to avoid strandings (see recent fish kill below Keno).	7/2/2018 11:55 AM
6	Rectify water quality issues in Klamath Lake	7/2/2018 11:00 AM
7	4	7/2/2018 9:36 AM
8	Fish screens and ag conservation (piping strategies).	6/29/2018 3:49 PM
9	We need to improve flows in summer to reduce entrainment and stranding and restore stream function (especially floodplain connectivity) to decrease winter scour	6/29/2018 6:14 AM
10	Screening on all major diversions, then ID critical locations by species and stressors and prioritize screening efforts from that data	6/28/2018 3:15 PM
11	Construct fish screens in the Upper Klamath Basin. High priority is Wood River 200 cfs unscreened diversion.	6/27/2018 12:29 PM
12	Not in the reaches I'm directly familiar with (Trinity and Klamath mainstems below dams)	6/27/2018 9:49 AM
13	Ensure ESA ramping rates are developed and followed	6/25/2018 11:15 AM
14	Screens on large diversions	6/21/2018 8:20 AM

#	4.5 ENHANCE AND MAINTAIN HABITATS FOR ALL FRESHWATER LIFE STAGES OF RESIDENT AND ANADROMOUS FISH	DATE

1	Create off channel habitats and reconnect floodplains in the lower Klamath (Terwer, McGarvey, Blue Creek, Hunter), mid Klamath (Seiad, Horse, Beaver, Indian), and Scott River (French Creek, Sugar Creek, Mill and Shackleford). Add channel complexity to low gradient reaches throughout the watershed.	7/3/2018 2:24 PM
2	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
3	1.) Reduce P inputs to UKL (cattle fencing, riparian restoration, tailwater treatment); 2.) Restore fringe wetlands around UKL	7/2/2018 1:07 PM
4	riparian planting in all areas that can support it and are deficient, increase cold water inputs, eliminate tailwater inputs	7/2/2018 12:26 PM
5	1- Promote beaver reintroduction where appropriate and BDA's elsewhere, 2- Riparian protections to intercept runoff/provide shading/promote future naturally sourced LWD	7/2/2018 11:55 AM
6	3	6/29/2018 11:34 AM 7/2/2018 9:36 AM
7	Reducs sediment inputs throughout suystem to better maintain channel complexity.	6/29/2018 3:49 PM 6/29/2018 3:49 PM
8	Increase stream complexity through LWD (ELJ's or BDA's) in incised stream channels to slow water velocity and reconnect with the floodplain	6/29/2018 6:14 AM
9	This seems to be an umbrella category that contains the other four. Therefore it would be Number 1 but it is so general it does not give any concrete guidance.	6/28/2018 3:15 PM
10	hard to answer this in such a general way as the question was presented. We need to have functioning riparian habitat across the entire Klamath Basin.	
11	Fringe wetland restoration and the addition of large woody debris to tributaries.	6/28/2018 2:53 PM
12	3	6/27/2018 8:56AM
13	A naturally functioning river will provide this. Just need to identify those places that may require mechanical restoration and prioritize these for restoration. These may not all be known until the new river hydrograph is developed	6/25/2018 11:15 AM

Q5 Please list your input on your "Top 3" specific actions at specific locations that would have disproportionately high benefit for some or all of the FLUVIAL GEOMORPHIC PROCESSES objectives listed in Table 2 for the sub-basin(s) for which you have the most experience. Some examples heard at the last workshop are included in Table 2.

Answered: 17 Skipped: 14

ANSWER CHOICES	RESPONSES	
5.1 Increase and maintain coarse sediment recruitment and transport processes	94.12%	16
5.2 Increase channel and floodplain dynamics, stability and interconnectivity	82.35%	14
5.3 Promote establishment of diverse riparian and wetland vegetation that contributes to complex channel and floodplain morphologies	88.24%	15

#	5.1 INCREASE AND MAINTAIN COARSE SEDIMENT RECRUITMENT AND TRANSPORT PROCESSES	DATE
1	Remove all large scale (Klamath mainstem) and flashboard dams (Novy/Rice on Shasta River)	7/3/2018 2:24 PM
2	flow mgt coupled with dam removal.	7/2/2018 5:09 PM
3	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
4	install large woody debris to encourage scour, provide flushing flows if sub-basins contain large impoundments, minimize inputs of fine sediment (tailwater, excess bank erosion)	7/2/2018 12:26 PM
5	1- Geomorphically valuable pulse flows below Keno and Dwinell dams, 2- Beavers and BDA's to better sort fine sediments to improve existing course sediment load.	7/2/2018 11:55 AM
6	Increase floodplain connectivity and function	7/2/2018 11:00 AM
7	1	7/2/2018 9:36 AM
8	1) Dam removal mainstem; 2) riparian restoration tributaries UKL; 3) Reduce sediment load within USFS tributaries in mid to lower Klamath corridor	6/29/2018 3:49 PM
9	Levee setback and lateral floodplain connectivity throughout Scott River valley	6/29/2018 11:34 AM
10	This is also very important and should be considered in the implementation of the other two points. I see these three as a holistic approach to restoring natural stream function to allow process restoration.	6/29/2018 6:14 AM
11	removal of Iron Gate, Copco 1&2, and J.C. Boyle dams	6/28/2018 3:15 PM
12	Remove Keno dam	6/27/2018 12:29 PM
13	Comes along with mainstem Klamath dam removal	6/27/2018 9:49 AM
14	Address Scott Tailings	6/26/2018 8:46 AM
15	Ensure mainstem flows are timed with natural storm events. This will ensure that coarse sediment is moved appropriately through the system. 2. See if there is a coarse sediment deficit in the reaches below current dams. 3) supplement gravel is needed/feasible	6/25/2018 11:15 AM
16	Restore floodplain and give river access to dredge tailings	6/21/2018 11:03 AM

#	5.2 INCREASE CHANNEL AND FLOODPLAIN DYNAMICS, STABILITY AND INTERCONNECTIVITY	DATE
1	Create off channel habitats and reconnect floodplains in the lower Klamath (Terwer, McGarvey, Blue Creek, Hunter), mid Klamath (Seiad, Horse, Beaver, Indian), and Scott River (French Creek, Sugar Creek, Mill and Shackleford). Add channel complexity to low gradient reaches throughout the watershed. Restore Buck Lake on Spencer Creek.	7/3/2018 2:24 PM

2	These two goals, as stated, can be contradictory. In certain lower gradient reaches, we should strive for a dynamic alluvial channel rather than a stable channel.	7/2/2018 5:09 PM
3	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
4	riparian planting, managed riparian grazing, beaver dams where appropriate to sequester fine sediment and increase floodplain connectivity	7/2/2018 12:26 PM
5	1- Seek willing landowners at properties adjacent to streams to set back levees and reconnect floodplains and secure in-stream water rights.	7/2/2018 11:55 AM
6	Remove barriers to allow natural coarse sediment recruitment	7/2/2018 11:00 AM
7	2	7/2/2018 9:36 AM
8	1) UKL tributary riparian restoration particularly the Sprague	6/29/2018 3:49 PM
9	LWD installation in upper/mid klamath basins	6/29/2018 11:34 AM
10	This is the most important by far. The restoration of floodplain dynamics will assist the restoration of wetland and riparian habitats. While reducing the de stabilization of the channel and banks during winter runoff events.	6/29/2018 6:14 AM
11	removal of Iron Gate, Copco 1&2, and J.C. Boyle dams	6/28/2018 3:15 PM
12	Comes along with mainstem Klamath dam removal. HUGE on Trinity below Lewiston, as much restoration/construction remains and changes are needed in flow management during winter and early spring	6/27/2018 9:49 AM
13	Levee set back, channel reconfiguration. Exclude bank stabilization as restoration action, the whole point of floodplain projects is to create more dynamic systems. May need to do bank stabilization as a trade off to address landowner needs, but is very seldom a primary restoration action.	6/26/2018 8:46 AM
14	Ensure a variable flwo regime that mimics a 'natural' system	6/25/2018 11:15 AM

#	5.3 PROMOTE ESTABLISHMENT OF DIVERSE RIPARIAN AND WETLAND VEGETATION THAT CONTRIBUTES TO COMPLEX CHANNEL AND FLOODPLAIN MORPHOLOGIES	DATE
1	Fence out cattle, avoid riparian grazing and plant native riparian species on ranch lands on the Sprague, Williamson, Wood Rivers (Upper Klamath), Scott and Shasta Rivers (Mid Klamath) and Lower Klamath.)	7/3/2018 2:24 PM
2	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
3	riparian planting, managed riparian grazing, riparian fencing with setbacks that allow for meanders	7/2/2018 12:26 PM
4	1- Beavers and BDA's where appropriate, 2- Look for opportunities to set back levees to expand riparian zone	7/2/2018 11:55 AM
5	Increase sinuosity in valley reaches where appropriate.	7/2/2018 11:00 AM
6	3	7/2/2018 9:36 AM
7	1) UKL tributaries; 2) Shasta River; 3) Scott River -- owever there are any number of smaller tributaries where this is an important need / objective (e.g., Horse),	6/29/2018 3:49 PM
8	Incorporate native plantings with all floodplain connectivity projects	6/29/2018 11:34 AM
9	This should be performed in conjunction with the channel/ floodplain dynamics restoration.	6/29/2018 6:14 AM
10	hard to answer this in such a general way as the question was presented. We need to have functioning riparian and wetland habitat across the entire Klamath Basin.	6/28/2018 3:15 PM
11	Fencing and planting of riparian areas on Upper Klamath Lake Tributaries	6/28/2018 2:53 PM
12	Restore fringe wetlands in Upper Klamath Lake to improve water quality and fish rearing habitat	6/27/2018 12:29 PM
13	Part and parcel of channel/floodplain restoration wherever that is to be implemented	6/27/2018 9:49 AM

14	large wood, BDAs widely deployed to jump start geofluvial processes at comparatively low cost	6/26/2018 8:46 AM
15	AGain, variable flows that include 'simulated' or actual high flow events timed with natural events will meet this objective	6/25/2018 11:15 AM

Q6 Please list your input on your "Top 3" specific actions at specific locations that would have disproportionately high benefit for some or all of the WATERSHED INPUTS objectives listed in Table 2 for the sub- basin(s) for which you have the most experience. Some examples heard at the last workshop are included in Table 2.

Answered: 18 Skipped: 13

ANSWER CHOICES	RESPONSES	
6.1 Improve instream ecological flow regimes for the Klamath River mainstem and tributary streams	100.00%	18
6.2 Reduce fine sediment inputs	77.78%	14
6.3 Reduce external nutrient and pollutant inputs	83.33%	15
6.4 Minimize the impact of harmful algae blooms	61.11%	11

#	6.1 IMPROVE INSTREAM ECOLOGICAL FLOW REGIMES FOR THE KLAMATH RIVER MAINSTEM AND TRIBUTARY STREAMS	DATE
1	replumb the irrigation systems, identify opportunities for water storage and forebearance, utilize section 1707 of the CA water code to provide water for fish and wildlife on the Shasta and Scott Rivers. Remove the Klamath Dams including Keno, Purchase and retire water rights in the Wood, Williamson, Sprague, Shasta and Scott Rivers.	7/3/2018 2:24 PM
2	Incorporate critical elements of environmental flows into mgt and BiOps... sediment maintenance or "flushing flows" (fine, deep). channel maintenance flows.	7/2/2018 5:09 PM
3	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
4	1.) Remove dams; 2.) Winter/spring floods	7/2/2018 1:07 PM
5	establish instream flow requirements, improve irrigation efficientcy	7/2/2018 12:26 PM
6	1- Ensure yearly flow allocations in Bi-Op have enough water for providing spring pulse flows to flush sediments and reduce fish disease in the mainstem Klamath, 2- Consider that to recover listed species, flows greater than 'minimum flows' in BO's may be needed in the mainstem Klamath, Scott, and Shasta, 3- Prioritize purchase of water rights/adjacent land to dedicate permanent instream flow protections	7/2/2018 11:55 AM
7	Improve instream ecological flow regimes for the Klamath River mainstem and tributary streams	7/2/2018 11:00 AM
8	1	7/2/2018 9:36 AM
9	1) Dam removal; 2) Ag water conservation piping strategies with ecological water capture; 3) Spring rehabilitation / reconnection (primarily Shasta)	6/29/2018 3:49 PM
10	Removal of four lowermost mainstem Klamath dams, irrigation efficiency upgrades in Scott/Shasta valleys, and permanent/temporary forbearance of water rights in Scott/Shasta.	6/29/2018 11:34 AM
11	Throughout the Scott River, Shasta River with emphasis on tributaries currently supporting key coho salmon populations. Improving the Klamath mainstem flows especially during periods of rearing and out migration.	6/29/2018 6:14 AM
12	removal of Iron Gate, Copco 1&2, and J.C. Boyle dams	6/28/2018 3:15 PM
13	Remove instream barriers on mainstem Klamath and tributaries of the Klamath RIver.	6/28/2018 2:53 PM
14	Remove Keno Dam, reduce diversions from Upper Klamath Lake tributaries (Wood, Sprague)	6/27/2018 12:29 PM
15	My personal #2. Most all we learned in the Hardy studies has been cast aside, leaving only the NOAA Fisheries coho flows which are grossly inadequate	6/27/2018 9:49 AM
16	Watermastering all diversions. Clarifying and enforcing current laws re water use.	6/26/2018 8:46 AM

17	Develop natural flow regime and triggers (index river, i.e. Williamson) for lower most dam to get as close to a natural hydrograph as possible.	6/25/2018 11:15 AM
18	1. Control conifer encroachment on headwaters meadows, 2. Conduct prescribed fires and large scale thinning projects in headwaters forests	6/21/2018 11:03 AM

#	6.2 REDUCE FINE SEDIMENT INPUTS	DATE
1	Decomission high priority mid and lower slope roads in Blue Creek, Terwer Creek, Hunter Creek and McGarvey Creek in the Lower Klamath. Resre natural fire regimes in the mid and upper klamath and Salmon and Scott Rivers through thinning and controlled burns.	7/3/2018 2:24 PM
2	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
3	1.) Cattle fencing; 2.) Riparian restoration; 3.) Wetland restoration	7/2/2018 1:07 PM
4	improve upland roads, stabilize banks, manage riparian grazing to reduce erosion	7/2/2018 12:26 PM
5	1- Road removal/improvements throughout the watershed, 2- Require/prioritize riparian protections for ag in reaches of greatest nutrient/sediment impairments, 3-	7/2/2018 11:55 AM
6	Reduce stream warming	7/2/2018 11:00 AM
7	4	7/2/2018 9:36 AM
8	1) Riparian restoration / riparian protection grazing strqategies; 2) Improved road engineering and culverts within USFS lands; 3) Improved irrigation practices (piping)	6/29/2018 3:49 PM
9	Important in the Scott River and Klamath River. In the Scott fine sediment inputs in key tributaries (French Cr and Sugar) that support key populations of coho salmon potentially reduce spawning habitat and egg to fry survival and reduce pool volume.	6/29/2018 6:14 AM
10	Fencing and restoring riparian areas on the tributaries of Upper Klamath Lake.	6/28/2018 2:53 PM
11	Implement fencing projects and riparian planting to keep livestock out of the stream in Upper Klamath Lake tributaries (Sprague, Wood, Williamson)	6/27/2018 12:29 PM
12	Improve agricultural and forestry practices to improve soil water and carbon retention.	6/26/2018 8:46 AM
13	Identify sources of fine sediment that can be controlled. Ensure that high flows are released to mobilize fine sediment in the mainstem.	6/25/2018 11:15 AM
14	1. Replace stream crossings on national forest lands, 2. Managed grazing in riparian zones	6/21/2018 11:03 AM

#	6.3 REDUCE EXTERNAL NUTRIENT AND POLLUTANT INPUTS	DATE
1	Develop fringe wetlands and nutrient capture wetlands on the williamson, Wood and Sprague Rivers. Fence cattle and develop large (100+ ft) riaparian buffers that will not be grazed until the trees become established on the williamson, Wood and Sprague Rivers. Use sprinkler or pivot irrigation instead of flood irrigation on the williamson, Wood and Sprague Rivers.	7/3/2018 2:24 PM
2	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
3	1.) Cattle fencing; 2.) Riparian restoration; 3.) Wetland restoration	7/2/2018 1:07 PM
4	eliminate tailwater input, develop treatment wetlands, improve sewage treatment infrastructure	7/2/2018 12:26 PM
5	1- For reaches with nutrient impairments, regulatory agencies should disallow springtime ag 'pump off' from fields into waterbodies and promote tailwater re-use, 2- Riparian fencing/restoration,	7/2/2018 11:55 AM
6	Reduce external nutrient and pollutant inputs	7/2/2018 11:00 AM
7	2	7/2/2018 9:36 AM
8	1) Riparian restoration / DSTW thoughout Upper Klamath Basin; 2) improved irrigation practices; 3) Lake fringe wetland restoration (UKL)	6/29/2018 3:49 PM
9	Riparian fencing throughout upper basin (allow managed flash grazing). Promote tailwater reuse and creation/restoration of wetlands.	6/29/2018 11:34 AM

10	Important in the Shasta and Klamath, especially. Less important in the Scott River.	6/29/2018 6:14 AM
11	Establish and restore wetlands throughout the Upper Klamath watershed.	6/28/2018 2:53 PM
12	Take regulatory actions to prevent discharge of nutrient rich water from agricultural properties into Upper Klamath Lake	6/27/2018 12:29 PM

13	important in the farm lands above UKL, perhaps elsewhere. Likely a big issue in regards to widespread cannibis	6/27/2018 9:49 AM
14	beavers and beaver dam analogues to increase water storage, trap sediments and nutrients	6/26/2018 8:46 AM
15	Yes	6/25/2018 11:15 AM

#	6.4 MINIMIZE THE IMPACT OF HARMFUL ALGAE BLOOMS	DATE
1	I suggest deleting the word "harmful" as negative consequences are inferred by the word "impact", yet "harmful algae blooms" mean microsystin to many of us and not other blooms that can cause BOD issues in UKL.	7/2/2018 5:09 PM
2	I don't yet have enough experience in any of the sub-basins to rank actions	7/2/2018 3:52 PM
3	1.) Reduce nutrient inputs (as above); 2.) Increase wetland area around UKL	7/2/2018 1:07 PM
4	reduce nutrient inputs, increase cold water inputs	7/2/2018 12:26 PM
5	1- Greatly reduce nutrient loading into UKL and other nutrient impaired reaches through stricter regulation of ag runoff/tailwater, 2- Riparian restoration to reduce temps and nutrient inputs, 3- With HABs creating conditions where DO, pH, and other parameters are well outside of thresholds, consider more aggressive band-aid methods to improve conditions locally such as aeration, algal filtration, alum treatment, etc. since other measures may take decades to reduce source inputs enough to effect blooms in UKL and ultimately, WQ conditions that are conducive to suckers and unimpeded salmon migration. We are not being innovative enough.	7/2/2018 11:55 AM
6	3	7/2/2018 9:36 AM
7	1) Reduce nutrient (TP) loading; 2) improved flows; 3) reduced temperature	6/29/2018 3:49 PM
8	Employ artificial destratification of water column at areas water is impounded (Dwinnell, Keno, Link River dams) through use of bubble plumes or propeller/impellers. Additionally consider use of floating shade structures at these areas until	6/29/2018 11:34 AM
9	Reduce nutrient loading into UKL	6/28/2018 3:15 PM
10	See Ewauna/Keno issues	6/27/2018 9:49 AM
11	I don't have experience with this	6/25/2018 11:15 AM

Q7 Can you think of any other specific actions at specific locations that you consider to be important but do not fit under any of the objectives above? If so, describe them below.

Answered: 8 Skipped: 23

#	RESPONSES	DATE
1	Gravel supplementation beneath dams such as Dwinell and in areas that have been significantly altered through placer mining such as the Scott River, Salmon River and their tributaries.	7/3/2018 2:24 PM
2	No	7/2/2018 3:52 PM
3	Consider more active steps to reduce cyanobacteria cells and particulate organic material from entering Keno (e.g. filter, centrifuge, screen, harvest, etc.) where they die, settle to the bottom, and create high sediment oxygen demand and anoxic conditions.	7/2/2018 11:55 AM
4	Re-adjudication of the Shasta and Scott River water rights. Klamath Project water rights evaluation and redistribution for additional instream flow.	7/2/2018 11:00 AM
5	no	7/2/2018 9:36 AM
6	Scott River groundwater recharge / management program	6/29/2018 3:49 PM
7	Not a component of this plan, but OUTREACH with ag interests and private landowners.	6/29/2018 11:34 AM
8	No.	6/28/2018 2:53 PM

Q8 Based on your knowledge of monitoring efforts in the basin, are there particular elements of current monitoring that you think are being DONE WELL or are DEFICIENT (for habitat and/or population monitoring, for particular focal fish species, and/or for particular areas of the Basin)?

Answered: 17 Skipped: 14

#	RESPONSES	DATE
1	There is a pretty good Chinook adult monitoring program in the Klamath to inform the harvest model. The Scott and Shasta have informative Life Cycle Monitoring stations for Chinook and Coho. Most every other type of monitoring is deficient in the lower and mid Klamath below Iron Gate.	7/3/2018 2:43 PM
2	Deficient- Need better linkages between monitoring of water quality and juvenile sucker health in order to ID suite of sub-lethal stressors so we can target restoration actions on existing life cycle bottlekneck. Is it lake level, habitat availability, water quality, predation/competition by non-natives? Deficient- Need to better fund integration of monitoring data across organizations to avoid isolating data in federal/state databases so it can be more easily used to answer monitoring questions and adaptive management.	7/2/2018 2:02 PM
3	Water quality monitoring on the Shasta River has an extensive network of high resolution DO/Temp sensors that measure main stem conditions from Dwinnell down to the mouth. Could be improved by being made real-time. Scott River needs more extensive and timely sediment and water temperature monitoring.	7/2/2018 1:01 PM
4	Fall run chinook monitoring and management is being done well. Monitoring deficiencies include - comprehensive steelhead assessments, current spatial distribution of all species of interest, expanded coho population monitoring	7/2/2018 11:39 AM
5	i do not have any experience in the basin	7/2/2018 9:49 AM
6	I can't tell if the question is specifically fisheries related or includes water quality. I won't comment on fisheries. For water quality, I feel wintertime and event based monitoring of nutrient loads is missing and deficient, which will make assessment of the results of the dam removal difficult. I also think organic carbon, including carbon quality and sources, is understudied in the basin and could offer more insights to nutrient sources as well as effects of restoration actions.	6/30/2018 2:43 PM
7	Extend KBMP coordination framework into the sub-basins.	6/29/2018 3:56 PM
8	Water temp monitoring is being WAY overdone across the basin. A stratified approach at set locations (headwaters, every 3 miles (reach length dependent), and at confluences.	6/29/2018 11:56 AM
9	I believe the current cooperative efforts to enumerate adult salmon spawner escapements and distribution are being done well and need to be continued. I think there are deficiencies in the understanding/ monitoring of juvenile distribution and survival (especially coho salmon through all life stages) in the basin. I think the juvenile smolt out migration efforts are being done well and need to be continued. I think the major water quality deficiency is a thorough monitoring of the flow regime throughout the Klamath and tributaries.	6/29/2018 6:22 AM
10	Lost River and shortnose sucker monitoring in Upper Klamath Lake is well executed. Habitat restoration in the Upper Klamath Basin is well monitored.	6/28/2018 3:56 PM
11	Water quality data from the Klamath Tribes in the Upper Basin, disease monitoring in the lower basin. Implementation data on restoration projects, but the data may not be readily available. Escapement data for salmonids. We know the location and acres/miles of instream/riparian restoration work completed by USFWS.	6/28/2018 3:39 PM
12	USGS PIT tag monitoring network for suckers is done well and can be expanded or simply used as-is to monitor salmonids as they recolonize the Upper basin. Coordination between agencies in existing monitoring networks would provide efficiencies. Need improved monitoring to quantify fish loss to unscreened diversions. What are the risks to fish that recolonize these stream reaches? need improved monitoring of fish passage at Keno and Link dams to understand seasonal and physical limitations for new species	6/27/2018 1:06 PM

13	No comment	6/27/2018 10:58 AM
14	The primary deficiency is a lack of coordination of data gathering across the basin, and support for integrated data management. Differing data collection methodologies, data storage and management make it impossible to start looking at larger trends. Managing this volume of data is beyond the capability on any single non-governmental agency, and must be taken on by one of the larger agencies. Universal data protocols must be established. Grant funders must require all project data to be open and transparent and entered into these supported data management system so that all researchers and other interested parties can access it.	6/26/2018 9:05 AM
15	Deficient: A lower river monitoring station for juvenile and adult salmon (could be used for other species as well). Could be a downstream monitoring station combined with an adult weir.	6/25/2018 11:21 AM
16	1. Funding for water quality monitoring is inconsistent. 2. State has monitoring requirements but does not fund its own staff to meet those requirements, so 3rd parties need to apply to CDFW for funds to fulfill CDFW's responsibilities.	6/21/2018 11:07 AM
17	Done well: WQ monitoring, adult sucker monitoring, juvenile sucker monitoring	6/21/2018 8:22 AM

Q9 Having considered the objectives hierarchy, what are the "Top 3" key basin-wide monitoring questions from your perspective?

Answered: 16 Skipped: 15

ANSWER CHOICES	RESPONSES	
1.	100.00%	16
2.	87.50%	14
3.	62.50%	10

#	1.	DATE
1	My answers to these questions are answered in a "dams out" scenerio. What is the new distribution of coho, Chinook, Steelhead and lamprey once the dams come out?	7/3/2018 2:43 PM
2	What factors influence recruitment?	7/2/2018 2:51 PM
3	If we reduce nutrient loading/cycling in Upper Klamath Lake, will the severity/frequency/duration of HAB events reduce enough to show a measurable improvement in water quality such as DO and pH? Will that lead to survival of juvenile suckers?	7/2/2018 2:02 PM
4	Is rearing habitat shrinking, stabilizing, or expanding?	7/2/2018 1:01 PM
5	Baseflow monitoring throughout the basin	7/2/2018 11:39 AM
6	How do fish populations respond to dam removal?	7/2/2018 9:49 AM
7	Better documentation of loading of annualized nutrients and sediment downstream of Keno, including tributaries	6/30/2018 2:43 PM
8	Water quality conditions (temperature, flow, DO, nutrients, organic carbon, turbidity / sediment measures, BGA, and fish disease indicators	6/29/2018 3:56 PM
9	What are the (in priority order) reasons for no recruitment of suckers in the Upper Basin	6/29/2018 11:56 AM
10	Water quantity and quality throughout basin	6/29/2018 6:22 AM
11	how many fish can the habitat produce or the minimum we expect it to produce and are we increasing that number.	6/28/2018 3:39 PM
12	As fish recolonize the Upper Basin, what are the life history stages and stream reaches that contribute to the highest mortality? i.e. how and when are fish dying and where should we focus restoration?	6/27/2018 1:06 PM
13	Lower Klamath fall chinook: movement, infection, disease rates. Our data are thin on these topics, relating to flow management to avoid a repeat of the disastrous 2002 fish kill	6/27/2018 10:58 AM
14	Water Quality	6/26/2018 9:05 AM
15	Distribution of adult salmon spawners, especially upstream of Iron Gate DAm	6/25/2018 11:21 AM
16	Predation on sucker	6/21/2018 8:22 AM

#	2.	DATE
1	What are the new limiting factors (bottlenecks) for juveniles and smolts above the 4 Klamath Dams once removed?	7/3/2018 2:43 PM
2	How does restoration influence habitat quality/sediment delivery/nutrient delivery?	7/2/2018 2:51 PM
3	Will restoration of key habitats and hatchery rearing be enough to recover suckers absent drastic improvements in UKL water quality?	7/2/2018 2:02 PM
4	How are changing climatic conditions impacting cold water refugia?	7/2/2018 1:01 PM

5	Temperature monitoring throughout the basin	7/2/2018 11:39 AM
6	What are the ecosystem effects to dam removal?	7/2/2018 9:49 AM
7	Better documentation of sediment sources in the upper basin	6/30/2018 2:43 PM
8	Key habitat elements for focus species	6/29/2018 3:56 PM
9	Are habitat restoration efforts actually moving the needle on population recovery and/or water quality	6/29/2018 11:56 AM
10	Habitat condition, volume and complexity throughout the basin	6/29/2018 6:22 AM
11	are we improving the nutrient input to Upper Klamath Lake	6/28/2018 3:39 PM
12	What are the impacts of Keno Dam? Specifically, how does is contribute to water quality problems and fish passage limitations (upstream and downstream)?	6/27/2018 1:06 PM
13	Adult and juvenile fish populations (distribution and trends)	6/26/2018 9:05 AM
14	Productivity of basin (i.e. smolts produced per spawner)	6/25/2018 11:21 AM

#	3.	DATE
1	Has the overall population of salmonids increased post dam removal or have the fish just spread out throughout the newly accessible habitat? Have the natural Chinook spawners replaced the hatchery spawners once the Iron Gate Hatchery shuts down in 8 years? Was the sediment transport model correct or is their a slug of sediment moving down the river?	7/3/2018 2:43 PM
2	How do rearing efforts influence population outcomes?	7/2/2018 2:51 PM
3	Can restoration of riparian shade keep up with increases in air and water temperature expected due to climate change?	7/2/2018 2:02 PM
4	Are management measures implemented to improve water quality and habitat conditions being effective?	7/2/2018 1:01 PM
5	Nutrient monitoring throughout the basin	7/2/2018 11:39 AM
6	What are/will we learn that can help others with future dam removals?	7/2/2018 9:49 AM
7	Landscape conditions within sub-basins	6/29/2018 3:56 PM
8	Survival, growth and condition of salmon through all life stages	6/29/2018 6:22 AM
9	Amount and type of habitat	6/26/2018 9:05 AM
10	Inventory, fate, and movement of stored sediments behind current dams	6/25/2018 11:21 AM

Q10 From your perspective, do you think that any important performance indicator selection criteria are missing from our current subset (Table 3)? Which indicator selection criteria are most important to you and why?

Answered: 13 Skipped: 18

#	RESPONSES	DATE
1	Relevant to policy or management is the most important to me because many of the other criteria can be captured under this framework.	7/3/2018 2:43 PM
2	Scientifically valid, benchmark exists, and sensitive to change. If an indicator does not meet these criteria it won't be a good indicator.	7/2/2018 2:51 PM
3	The most important performance indicators are: 1- important to be scientifically justified. 3- Important to have a threshold for comaring against. 12- With extremely limited $ for restoration, and even less for monitoring, we must choose monitoring and performance indicators which we can afford so we can continue to collect data and see spatial and temporal trends to evaluate progress. Something missing may be a criteria that factors in activities that may benefit multiple KPI's and stressors. E.g. if restoration of water quality occurs in Upper Klamath Lake, this may lead to increased fish populations and produce broadscale benefits downstream. However, if restoration actions such as habitat structures increase fish populations, it may not solve other KPI's and lead to water quality improvement.	7/2/2018 2:02 PM
4	Water Quality performance indicators (DO, Temp, sediment, pH, toxins, etc), as water quality is the basis for in-stream habitat quality.	7/2/2018 1:01 PM
5	NA	7/2/2018 11:39 AM
6	I do not have any on indicator	7/2/2018 9:49 AM
7	I don't see any criteria about data quality (meeting QA/QC criteria) or public accessibility and sharing of data. I think those need to be represented.	6/30/2018 2:43 PM
8	Thought it was a useful and complete tool.	6/29/2018 3:56 PM
9	No	6/29/2018 6:22 AM
10	Most important: #4 - relevant to policy or management	6/27/2018 1:06 PM
11	No comment	6/27/2018 10:58 AM
12	I think you have selected criteria that will facilitate answering very specific questions- which is a stated objective of your process. However, some of the greatest advances in science have come from having un-expected outcomes or observations surface. Natural systems are inherently extremely multi-varient, and you are working very hard to exclude that from your criteria selection. I believe that your selection criteria would be highly appropriate for laboratory science, similar to a drug trial where variables are deliberately controlled. However, if this type methodology is the only one supported that ability to have unexpected, but critically important new understandings, will be eliminated. As an example, the juvenile salmonid monitoring we are doing in the Scott showed diurnal "commuting" in the morning and evening from an off-channel pond to a stream channel. Further conversations with an associated scientist suggests a correlation with invertebrate drift occurring at those hours. This was an unexpected finding from work done for other reasons, but is leading to a new understanding of how these listed species utilize habitat and what is needed for their recovery. So, I think there needs to be a category for basic science that does not have the clarity you have outlined. Keeping people's evaluations and thinking in exactly the same tracks as they have been will lead to exactly the same results.	6/26/2018 9:05 AM
13	No	6/25/2018 11:21 AM

Q11 If the dams were removed, are the following four proposed categories of monitoring for major system-wide changes valid from your perspective? Dynamics of channel “redevelopment” Dynamics of changing “water quality” Reintroduction of native anadromous species above former dams Possible unintended introductions of non- native species populations above and below former dams Are there any additional categories to add?

Answered: 16 Skipped: 15

#	RESPONSES	DATE
1	These are valid. You might want to add disease prevalence.	7/3/2018 2:43 PM
2	Disease dynamics	7/2/2018 2:51 PM
3	The last category seems like it should not be on the same level as the first three. It does not seem like non-native fish are going to go where they want once the system is opened up and there isn't much we would be able to do about the spread of fathead minnows downstream, etc. without being a huge expense or impacting native species. This is more of a secondary consideration relative to the other categories.	7/2/2018 2:02 PM
4	Valid. No additions.	7/2/2018 1:01 PM
5	Yes, they are valid. Please add, "Dynamics of changing water quantity." Please include native non-anadromous species to bullet three. Thanks	7/2/2018 11:39 AM
6	this looks good	7/2/2018 9:49 AM
7	1). Salmonid habitat quality and water quality in currently unaccessible areas, including tributaries to the hydroelectric reach 2). Riparian condition (might be part of "channel redevelopment" but it should be explicitly included. 3). Dynamics of fish disease 4). changes in macroinvertebrate community assemblages and food webs in the main channel	6/30/2018 2:43 PM
8	Patterns of fish infection / disease.	6/29/2018 3:56 PM
9	They are valid, though I'm not as concerned with bullet #4 as the others.	6/29/2018 11:56 AM
10	As long as flow regime and sediment is included in water quality then this is inclusive. I know they are.	6/29/2018 6:22 AM
11	Habitat development. I don't know if it fits into the channel redevelopment or not.	6/28/2018 3:56 PM
12	what is the response of our target species is something we should monitor.	6/28/2018 3:39 PM
13	no.	6/27/2018 1:06 PM

14	Pasted here is my working list of topics, inclusive of developing ideas for monitoring of Klamath dam removal Overview In addition to mitigation requirements related to dam removal, as coordinated through the KRCC, there is also a need to implement science investigations to ascertain the effects of dam removal on the Klamath Basin fishery. HVT Fisheries Department is interested in science investigations to fully assess the effects of dam removal on the Klamath River and its fishery. Task 1: Pre/Post Dam Removal Geomorphic Assessment Multi-year geomorphic evaluation (pre, one year after removal, five years after removal) to assess the effects of dam removal on geofluvial processes and channel form between JC Boyle Reservoir and the estuary, and the related effects to fish habitat. The core hypotheses to date regarding a post-dam geomorphic/sediment setting are borne from Blair Greiman's 2011 technical evaluation for the Secretarial Determination. Greiman's work estimated the volume of sediment stored in the reservoirs and took a hydraulic modeling approach. His work did not relate geomorphic processes to potential fish habitat. He also had limited physical data upon which to base his results, and his predicted channel responses are likely coarse (i.e., doesn't assess riparian berms). The potential body of work focuses on the entire Klamath River downstream of JC Boyle Reservoir. The distance from the top of JC Boyle Reservoir to Iron Gate Dam is approximately 37 miles. JC Boyle reservoir is approximately 27 upstream of Copco Reservoir. The reach between Iron Gate Dam and the top of Copco Reservoir is more than 10 miles of near-continuous reservoir-to-river habitat. Cottonwood Creek is approximately 18 miles downstream of Iron Gate Dam is and currently described as the point of geomorphic equilibrium downstream of Iron Gate Dam. Key study questions to be addressed: Studies will focus on the areas within and downstream of reservoirs and use index sites with actual field-based data to assess topographic change. 1. Fine sediment. · Will fine sediment route out of the Klamath River within one year of removal, as predicted by Greiman (2011)? · Will berms form? · Will passage issues arise at tributary confluences? · Will the (already perched) estuary "clog?" · How will salmonid habitat be affected? · Will an increase in fine sediment increase polychaete hosting densities/fish disease? · How will fine sediment routing downstream of JC Boyle Reservoir affect the associated downstream reach, which is a very different physical environment than the reach fine sediment will route through downstream of Iron Gate? 2. Coarse sediment. · How will coarse sediment routing change within the footprints of the existing reservoirs and downstream of Iron Gate Dam? · How will this affect channel complexity and physical processes in this area? · What types of fish habitat will result? 3. Spatial effects. · How far downstream will the effects of altered fine and coarse sediment processes propagate, relative to each reservoir (Iron Gate/Copco and JC Boyle)? Assessment overview: · Pre-dam: Use LiDAR and field surveys to establish monitoring sites between Iron Gate Dam and Cottonwood Creek as well as sites in the riverine environments between JC Boyle Dam and Iron Gate Dam. Assessments to include: § Change in floodplain cross sections (to support future berm formation evaluation). § Change in grain size distribution on floodplain and in-channel surfaces and the relationship to spawning habitat. § Change in floodplain area at several index flows. § Change in number (or length/area) of side channel and off-channel habitat features at several index flows. § Change in physical conditions the mouth of the Shasta River? · Post-dam: Repeat assessments after removal to evaluate physical changes related to index (or actual) flows. Timeline: · Pre-construction assessments: 2019 · Post-removal assessment: One year after dam removal, followed by five years after dam removal. Task 2: Lakebed Vegetation Recovery Monitoring HVT Fisheries interested in how to develop and implement a plan for lake bed recovery monitoring. Through the dam removal process, lakebed revegetation is required as a mitigation measure. Revegetation survival one item on the list. HVT might also consider providing nursery starts for the revegetation effort. Timeline: Post-dam removal Task 3: Riparian Response Below Dams Assess changes in riparian initiation, scour, survival, and acreage in the reaches downstream of reservoirs. Timeline: Pre- and Post-dam removal	6/27/2018 10:58 AM
15	Impacts (positive/negative) to existing populations below the dams.	6/26/2018 9:05 AM
16	Dynamics of salmon populations (not just re-introduced populations)	6/25/2018 11:21 AM

Q12 What are your general likes and dislikes for the criteria listedin Figure 8?

Answered: 17 Skipped: 14

#	RESPONSES	DATE
1	Dislikes - Figure 8 is very complex and, in my experience, I find it to be more efficient to have fewer criteria and still get the same prioritization as a complex matrix. Figure 8 has a lot of overlap (Spatial scale of anticipated benefits is very similar to expected level of benefit). Most of the criteria will not differentiate the projects effectively. For example "restoration technique successfully implemented elsewhere" will likely have the same score everywhere because all of the candidate actions have been implemented throughout the Klamath. Permitting effort is the same....all instream projects need the same permits except for one additional permit for Coastal Zone projects. We dont have the data to answer many of these questions such as cost data, level of collaboration, educational value, etc until the project is designed and it will be difficult for folks to score these criteria. "Contribution to overall diversity of restoration portfolio" doesn't make sense to me. I read that as " Let's do this project because we haven't done one of these in this basin yet". These criteria will need to be scored for each geographic region which will be difficult in the mid Klamath due to several differing limiting factors between each tributary (Seiad - floodplain connection vs Portugese Creek - Fish Passage and Screening). Likes number of G and O addressed, # of species benefiting, addresses key limiting factors, level of benefit, onset of benefits, level of landowner benefit except we dont know that when we will score so I recommend changing that criterion to "public land/reservation vs private land". I have other thoughts but too much to write in this survey. I would like to work with ESSA to further develop this in the future.	7/3/2018 3:05 PM
2	The number of key limiting factors improved is not necessarily that important. An action could be hugely beneficial but only address a single very important limiting factor. Planning horizon: At the watershed scale, it makes sense to tackle some of the larger projects that may take a long time to complete and bear fruit. These actions may be more likely to have large, widespread benefits.	7/2/2018 3:01 PM
3	Spatial Scale box- Similar to higher priority of removing a barrier downstream, does this give more weight to water quality improvements upstream (which will benefit water quality downstream too)? Monitoring is often shortchanged and should be included within 'Cost' category (OK with this being a separate box). If it is not accounted for, how does it get done, how do we learn from it, and how can we count this as Adaptive Management? Social Consideration --> Economic Benefit box- Here, monitoring is considered a benefit but elsewhere it is NOT considered a cost. Yes, there is a monitoring job associated but we can't have it both ways. See point 2 above. Social Consideration --> Economic Value box- Including fishing as a value devalues important restoration actions related to species with less economic value such as eulachon, lamprey, suckers, etc. We should be careful not to tie recovery efforts too closely to fishing/harvest prior to actually recovering the species so we can avoid prematurely valuing harvest of fish we spend millions of dollars trying to recover.	7/2/2018 2:22 PM
4	They seem appropriate and thorough. "Level of collaboration" doesn't seem like it should be a binary Y/N. Maybe a number of partners a project has would be more appropriate than "yes this creates collaboration" or "no it doesn't"	7/2/2018 1:17 PM
5	looks good	7/2/2018 11:58 AM
6	seems like you cover everything but it is unclear how things are linked	7/2/2018 9:51 AM
7	I don't really understand it. I'm not sure I have specific likes or dislikes at this point.	6/30/2018 2:46 PM
8	I thought Table 8 was very thoughtfully developed.	6/29/2018 4:02 PM
9	The "Projects NOT implemented as planned" and "Projects implemented as planned" isn't clear as to what that actually means.	6/29/2018 12:07 PM
10	It is rather busy and difficult to read. It seems to be inclusive but again the difficulty of reading takes away from the ability to determine if it is complete.	6/29/2018 6:50 AM
11	The technical/scientific benefits could be further consolidated, other than that it is good.	6/28/2018 4:05 PM

12	Cost could be considered under feasibility. I would be cautious with the weighting of the restoration technique success box. There are new techniques like BDA's and ELJ that are beneficial but might not be selected under this criteria.	6/28/2018 3:51 PM
13	Looks good. I like that root causes are being addressed and watershed processes are targeted for restoration - not just stand-alone habitat elements.	6/27/2018 1:21 PM
14	Unclear meaning of acronyms (WI, FG, H, BL, KPIs). I question reasoning for direct consideration of portfolio diversity. I would prioritize longevity of benefits over rapid onset of benefits, generally. I support the focus on high potential hotspots, refugia and population source areas.	6/27/2018 11:11 AM
15	Ouch- painful to think about. Overall, not a bad framework. I'd like to introduce a concept of "watershed care". Our watersheds have reached their extensively degraded condition by having experienced decades and even centuries of abuse. It is unreasonable to assume that a single specific action will "fix" much of anything. Our systems are very dynamic, and this will increase with climate change and with dam removal. I think the criteria of "watershed commitment" and ability to manage a location (with its natural or restored state) should be a ranking criteria and should be financially supported. Even projects that are highly engineered, and designed to be "stable" have, not infrequently, significantly changed (failed) during dynamic fluvial events (plug and pond, bank stabilization, off-channel ponds etc). BDAs have lower initial costs, but require on-going site care until beavers take over or geofluvial stability and floodplain connectivity have been achieved, however the overall project cost may be less that a project with high implementation cost and no after care, and also result in higher ecological benefit. I would like to encourage this process to consider including watershed care teams who could do adaptive management work on all types of projects, monitoring, invasive species management, fuel break work etc as an important and fundable activity.	6/26/2018 9:28 AM
16	I like that there is a structure that can be followed.	6/25/2018 11:28 AM
17	I don't like that landowner participation changes the ranking. If something needs to be done, it should be ranked high so that it is communicated that the action is a high priority, regardless of ownership. I don't like the educational value piece, the ecological merit should rise to the top. Same for legal/admin- just because something is hard and costly, doesn't mean it isn't important.	6/21/2018 8:28 AM

Q13 Do the overall categories and criteria capture the range of values embodied by your agency/group? What else should be added? What should be removed? Please include your rationale.

Answered: 11 Skipped: 20

#	RESPONSES	DATE
1	See above.	7/3/2018 3:05 PM
2	How can we account for water quantity and restoration of flow/lake levels as a metric to monitor recovery of species?	7/2/2018 2:22 PM
3	We are concerned that social considerations not be used to eliminate high value ecosystem restoration projects.	7/2/2018 11:58 AM
4	how the figure and its components interact	7/2/2018 9:51 AM
5	Yes.	6/29/2018 4:02 PM
6	Adaptive management is only implied in feedback loops in the model. There should be an element that describes a shift in approach when results are not in line with those desired.	6/29/2018 12:07 PM
7	yes, we want to see the system recover so it benefits all stakeholders.	6/28/2018 4:05 PM
8	Looks good. Some of the social considerations could be minimized. Not sure how it is weighted against the other categories. Landowner cooperation can be key but some of the other criteria are just "nice to have" like visibility, collaboration, etc.	6/27/2018 1:21 PM
9	No comment	6/27/2018 11:11 AM
10	I've made comments about values, alternative ways of thinking, embracing human needs and complexity more directly, moving away from "engineering restoration" to watershed care. While nothing is very wrong with this, much of it seems very status quo. There is that old, annoying saying "Keep doing the same thing and you keep getting the same result". I didn't see a criteria that explicitly said "Re-establishes natural geofluvial process". I think should be a very high level goal, as if those processes are occuring there is a very chance that high quality habitat will result.	6/26/2018 9:28 AM
11	There should be some criteria that evaluates benefit to recreational and subsitence opportunites (i.e. salmon fishing, guides, usual and accustomed fishing areas)	6/25/2018 11:28 AM

Q14 Comment on which if any criteria should be given greaterweight than others, and if you can, provide a brief rationale.

Answered: 15 Skipped: 16

#	RESPONSES	DATE
1	# of goals addressed, # of limiting factors addressed, # of species benefiting, and level of benefit should be weighted higher because they all lead to multiple, large benefits that address the factors that are creating recovery bottlenecks.	7/3/2018 3:05 PM
2	Expected level of benefit, benefits to high value sites, and longevity of benefits. Projects need not address all of the problems in the basin at once. They can be targeted to important components and may achieve a greater overall value than the criteria that focus on achieving a diversity of benefits. Of course, diversifying these high value projects to capture different issues would be important.	7/2/2018 3:01 PM
3	Restoration of water quality in Upper Klamath Lake is essential to recovery of suckers and will reduce need for band-aid approaches to trap and haul programs for adult and juvenile salmon to avoid Keno and Upper Klamath Lake at certain times of the year. The Klamath is unique based on it's 'Upside down' nature and hyper-eutrophic conditions. A focus on recovering water quality may very well be the key factor in reducing lethal and sub-lethal stressors that allows disease to take hold and impact fish populations from UKL to the ocean.	7/2/2018 2:22 PM
4	Climate resilience should be given a greater weight. Considering the role of temperature and flow regimes in fishery health, If these projects do not provide long-term refugia/improvement over current conditions under uncertain weather patterns and a warming climate, they should be weighted lower.	7/2/2018 1:17 PM
5	Extent and breadth of anticipated impacts.	7/2/2018 11:58 AM
6	i do not know	7/2/2018 9:51 AM
7	Currently do not have any recommendation on weighting criteria.	6/29/2018 4:02 PM
8	Baseline and biological effectiveness monitoring should be given greater weight.	6/29/2018 12:07 PM
9	Scientific benefit should be weighted more heavily because that is the reason we are implementing this.	6/28/2018 4:05 PM
10	I think projects that provide benefits faster should be weighted higher initially, again this all depends on what the species/objective is.	6/28/2018 3:51 PM
11	Highest weight should go to projects that target repair of ecosystem processes. ESA listed species should be prioritized as their recovery is most critical and there will be supporting agencies, regulations, funds, etc to support their recovery. REstoration projects should be considered high priority if they address a limiting life stage or habitat. For example if monitoring shows us that outmigration of smolt coho salmon is a limiting factor to population recovery, we should prioritize actions that improve survival at that life stage such as passage and water quality.	6/27/2018 1:21 PM
12	The ordering of criteria seems about right, with exceptions stated above	6/27/2018 11:11 AM
13	See comments above	6/26/2018 9:28 AM
14	It all depends on the action. If possible, a team should decide in advance what criteria and weight that a particular action will be evaluated.	6/25/2018 11:28 AM
15	Ecological benefit, highest rank	6/21/2018 8:28 AM

Q15 Do you think the scoring system should be applied and updated annually? Every 2-3 years? Other? Why?

Answered: 15 Skipped: 16

#	RESPONSES	DATE
1	I am a believer in adaptive management and revising plans as new information becomes available. 5 years seems like a reasonable time to learn from some actions that are implemented that might inform a tweaking of the criteria and weighting.	7/3/2018 3:05 PM
2	2-3 years. If it is one year, you don't really have time to accumulate experience with the previous one and see how it worked.	7/2/2018 3:01 PM
3	Likely reassess every few years but base an update on any changes to Bi-Ops, changes to scientific understanding, etc.	7/2/2018 2:22 PM
4	If at all, every 5 years. Certainty surrounding the scoring criteria should be highly valued, especially as many projects take 3-5 years to plan and implement, and many of these actions will be grant-funded and rely on alignment with agency priorities. This means it is extremely important to get it right now and only adapt the scoring criteria if it is clearly deficient.	7/2/2018 1:17 PM
5	Not annually - takes too long for projects to get implemented and for change to occur and be detectable. How about every 3 to 5 years for updating the priority table to account for the length of time necessary for changes to occur.	7/2/2018 11:58 AM
6	things should be updated annually, indifferent on a scoring system	7/2/2018 9:51 AM
7	yes -- adaptive management. Early on emphasize collaboration to build partnership network, later emphasize technical scientific benefit.	6/29/2018 4:02 PM
8	Annually (at first). To keep the process fresh in everyone's minds and to get a better understanding of how "fast" the restoration efforts are actually happening.	6/29/2018 12:07 PM
9	Should be adaptive and updated every couple of years.	6/28/2018 4:05 PM
10	At least every 3 years, we should be learning and hopefully work done will influence the work remaining, and we should be flexible and able to respond to changing conditions on the ground. We really need to fine to the priorities/objectives to focus what needs done.	6/28/2018 3:51 PM
11	We should discuss if it is appropriate to do scoring. Although it is necessary to prioritize actions, scoring can be tricky and sometimes be too rigid, eliminating good projects. It would be good to re-visit the scoring system regularly and see how it is being used and any short falls. It may be that we find a place where good projects fall through the cracks because a criteria was not weighted properly or identified early on. perhaps the "scores" should be broad ranges so all high-ish priority actions are considered individually on their own merits against other high-ish priority actions.	6/27/2018 1:21 PM
12	To whom would the scores be instructive, i.e. which agencies, offices or collectives are expected to make use of basin-wide scoring?	6/27/2018 11:11 AM
13	What do you mean applied? Go out and score existing projects? Use it as a basis to fund new projects? Absolutely it should be updated. Hopefully we will be learning important new things about the habitat and fish, and we should revise our thinking based on the knowledge gained- the old adaptive management processes	6/26/2018 9:28 AM
14	I think it should be annually because the system will evolve, our knowledge will grow, and new information will occur at least annually	6/25/2018 11:28 AM
15	Yes, as part of adaptive management. Maybe I'm wrong and the administrative burden is really worth considering more. We should be able to adapt	6/21/2018 8:28 AM 6/21/2018 8:28 AM

Appendix A: Workshop Attendees

Last Name	First Name	Group	Organization
Abrams	Jeff	LKR	NOAA - lead rep from NOAA
Baun	Matt	FCG / TWG	USFWS
Carpenter	Winne	Intern	Hoopa Tribal Fisheries Department
Creager	Clayton	UKL	North Coast Regional Water Quality Control Board
Edwards	Mike	LKR	USFWS
Fingerle	Amy	MUK	Salmon River Restoration Council
Fogerty	Ryan	FCG/ TWG/ MUK	USFWS
Franklin	Robert	MUK	Hoopa Tribe
Greenberg	Karuna	MUK	Salmon River Restoration Council
Hereford	Mark	MUK	Oregon Department of Fish & Wildlife
Hetrick	Nicholas	FCG / TWG	USFWS
Hiatt	Mike	TWG / UKL	ODEQ
Knechtle	Morgan	MUK	California State Wildlife Agency
McCovey	Barry	LKR	Yurok Tribe
Nichols	Christie	UKL	Klamath Falls Fish and Wildlife Office
Pinnix	Bill	LKR	USFWS
Scott	Eli	MUK	North Coast Regional Water Quality Control Board
Scott	Nell	UKL	Trout Unlimited
Simondet	Jim	FCG/ TWG	NMFS
Stanton	Ed	MUK	Shasta Valley RCD and KBMP fellow KBMP presenter
Stapleton	Betsy	MUK	Scott River Watershed Council
Turner	Randy	UKL	Klamath Basin Monitoring Program - Coordinator
Wheaton	Chris	FCG	PSMFC
Williams	Thomas (Tommy)	FCG	NOAA Fisheries Southwest Fisheries Science Centre
Wise	Ted	TWG/ MUK & UKL	Oregon Department of Fish & Wildlife
Witmore	Shari	FCG / UKL	NOAA Fisheries
Yokel	Erich	MUK	Scott River Watershed Council

Appendix C: Workshop Agenda

Development of an Integrated Fisheries Restoration & Monitoring Plan for the Klamath Basin:

Objectives Hierarchy, Key Performance Indicators & Monitoring Framework Workshop

Tuesday JULY 10, 2018 (9am-5:00pm) &
Wednesday JULY 11, 2018 (9am-4:00pm)
Holiday Inn Express, 171 Klamath Boulevard, Klamath, California 95548

Meeting Purpose

Dear Invitee,

The Pacific States Marine Fisheries Commission (PSMFC) has engaged ESSA Technologies Ltd. to develop an Integrated Fisheries Restoration and Monitoring Plan (Plan) for the Klamath Basin. The initial stage of the project developed a **Synthesis Report** (available here: https://tinyurl.com/y969lztr) which summarizes past and current information and lays the groundwork for the broader Plan.

We are currently embarking on the next stage of the planning process (Task 1.2): *Defining Conceptual Models, Goals, Objectives and Key Performance Indicators that will guide eventual identification of priority restoration and monitoring activities in the Plan*. A short **Plan Vision Pamphlet** is available describing the approach and planning elements: https://tinyurl.com/yc7d6h6q. We have scheduled our third major project workshop **Tuesday and Wednesday, July 10 and 11, 2018** (Holiday Inn Express, 171 Klamath Boulevard, Klamath, CA).

This workshop is by invitation. A list of invited participants (primarily Sub-regional Workgroup members) is found on the bottom of the http://kbifrm.psmfc.org home page. If you would like to suggest other individuals who have technical expertise and experience related to content in the IFRMP Plan Vision, please contact Laurelle Santana who is leading our arrangements to ensure our venue and logistical arrangements can accommodate more attendees.

Objectives

4. Review **draft goals & objectives hierarchy** and assign *candidate* **key performance indicators** to each objective.

5. Working at a **basin-wide scale**, **review major monitoring needs and uncover gaps** in our ability to: a) detect cumulative benefits of *portfolios* of restoration actions, and b) where required, reduce critical uncertainties related to the effectiveness of different *classes* of restoration actions.

6. Review preliminary ideas for methods to help **prioritize restoration actions and monitoring activities.**

What to Expect / Preparation before you arrive

We have designed a highly participatory two-day workshop that builds on feedback received at our March workshop which encouraged increasing opportunities for plenary discussions amongst participants. **A workshop briefing document will be released on June 21 2018 that includes fundamental background on the workshop**. *In particular, this document will include specific questions/requests of participants to complete by* ***June 29 2018***. We thank participants in advance for reviewing and completing the pre-workshop questions therein. As always, please bring to the meeting:

- Your enthusiastic willingness to collaborate in an important process and to follow the agenda;
- Your wisdom, experience, advice and insights;
- Your openness to listen to differing perspectives on major limiting factors, priority restoration actions, monitoring needs, and your recognition that each person brings unique insights and knowledge;
- Your suggestions for key documents and supporting evidence on the topics of objectives, key performance indicators, monitoring and concepts for prioritization ***(ideally with digital copies on a USB drive)***

Anticipated Follow-up

The journey towards restoration of the Klamath Basin, like most journeys, will be accomplished in a series of steps rather than a single leap. We will continue to iteratively provide participants with draft and revised Plan products as we move forward. This includes **a major peer review period beginning in October 2018 on the Initial Rough Draft IFRMP Plan document.**

Agenda – Day 1 (Tuesday July 10, 2018)

8:45am-9:00am	**Arrive – settle in**	
9:00am-9:40am	**Welcome, project overview & workshop objectives** ☐ *Kick-off participatory exercise*	Chris Wheaton (PSMFC); Clint Alexander (ESSA)
9:40am-10:15am	**Introduction to Draft IFRMP Objectives Hierarchy & Draft Key Performance Indicators** ☐ *Overview of work so far on qualitative ranking of important subregional restoration actions to date (based on interviews, conceptual models, survey, workshop 2), and relationship to objectives hierarchy and KPIs* ☐ *Participant comments/questions on Objectives & KPIs (guided)* ☐ *Briefly describe task/process of the Objectives & KPI* ***workstation***	Natascia Tamburello (ESSA)
10:15am-11:15am	**Big picture overview of considerations for a Klamath integrated monitoring framework** ☐ *Participant comments/questions on monitoring vision (guided)* ☐ *Briefly describe task/process of the monitoring* ***workstation***	Darcy Pickard (ESSA)
11:15am-12:30pm	**Introduction to initial concepts for prioritizing (sequencing) restoration actions and monitoring activities** ☐ *Participant comments/questions on initial prioritization concepts (guided)* ☐ *Briefly describe task/process of the prioritization* ***workstation***	Clint Alexander (ESSA)
12:30p-1:30pm	**Lunch – ON YOUR OWN**	
1:30pm-1:45pm	**We need your input! ⇒ Divide participants amongst 3 stations** ☐ *Please note: participants will have an opportunity on Day 2 to participate in either a restoration action*	ESSA workstation facilitators

	and KPI focused group or a monitoring group (prioritization concepts will only be discussed on Day 1) ☐ Balance subgroups according to subregional expertise and topic expertise	
1:45pm-4:00pm	**Subgroup workstations (round 1) …** ☐ Objectives and KPIs (Natascia) o Review framework of goals and objectives: ▪ *Building on our last workshop, participants propose highest benefit ('no brainer') restoration projects for each level 2 objective within each sub-region they believe should happen immediately, and* ▪ *Begin reviewing and classifying lists of proposed basin-wide KPIs into two groups: (i) core KPIs that everyone agrees on and (ii) supplemental (or candidate core KPIs).* ☐ Monitoring framework (Darcy) o *Day 1: Solicit feedback on the draft summary of the current monitoring activities for both habitat and population across the sub-basins and confirm any gaps. Second, is to discuss the proposed monitoring framework including: the overall structure, the level of detail proposed for the IFRMP, identify any missing components, and review the proposed system-wide monitoring questions.* ☐ Prioritization concepts (Clint) o *Review how prioritization has been handled elsewhere and do a compare, contrast, pros/cons exercise re: what would work best in Klamath* Participants free to roam to water/coffee/tea station and take health break mid-way through afternoon	ESSA workstation facilitators
4:00pm-5:00pm	**Reconvene in Plenary: Day 1 Closure** ☐ Report from station 1: Objectives and KPIs	ESSA workstation

	(Natascia) ☐ Report from station 2: Monitoring framework (Darcy) ☐ Report from station 3: Prioritization concepts (Clint) *~ PLENARY DISCUSSION, guided (cross-pollination) ~* ☐ *+/- wall – after 10 min. silent generation participants identify what topics should receive more/less attention within the objective & KPI and monitoring workstations on Day 2?*	facilitators
5:00p	**Adjourn**	

Agenda – Day 2 (Wednesday July 11, 2018)

8:45am-9:00am	**Arrive – settle in**	
9:00am-9:40am	**Opening: Day 2 workstation task/process** ☐ Review workstation focal topics for Day 2 ☐ *Review participant groupings, where people are to go next. Folks allowed to select 1 of 2 workgroups.*	Clint Alexander (ESSA)
9:40am-12noon	**Subgroup workstations (round 2) …** ☐ Objectives and KPIs (Natascia) ○ *If all core KPIs have been identified, move on to ranking the supplemental KPIs to surface discussion on which, if any, should be added to the list of core KPIs.* ☐ Monitoring framework (Darcy) ○ *Building on Day 1, Day 2 will focus on 3 steps. First, the list of core KPIs identified on day 1 will be compared to the current monitoring activities and system-wide questions to identity critical gaps. Second, for a subset of core KPIs the group will work together to populate a monitoring design template, including spatial and temporal considerations as well as options and tradeoffs for the field protocols, and next steps required for implementation. (Third step will occur following lunch).*	ESSA workstation facilitators

12:00p-1:00pm	**Lunch – ON YOUR OWN**	
1:00pm-2:30pm	**Subgroup workstations (round 3) …** ☐ Objectives and KPIs (Natascia) ○ *If tasks from prior stages complete, this session will focus on identifying interim benchmarks, suitability thresholds, or triggers for the core KPIs or key references where such values might be found.* ☐ Monitoring framework (Darcy) ○ *The third step for Day 2 is to identify and discuss specific monitoring design implications associated with dam removal and/or any other high priority restoration activities which are identified on Day 1.*	ESSA workstation facilitators
2:30pm-3:50pm	**Plenary discussion** ☐ Report from station 1: Objectives and KPIs (Natascia) ☐ Report from station 2: Monitoring framework (Darcy) *~ PLENARY DISCUSSION, guided (cross-pollination) ~* 	Clint Alexander (ESSA)
3:45pm-4:00pm	**Workshop Closure** ☐ Workshop plus/delta review ☐ Next steps	Clint Alexander (ESSA)
4:00pm	**ADJOURN** ☐ Folks departing for travel home	

The presentation summary for the workshop is found at the following location: http://kbifrm.psmfc.org/file/development-of-an-integrated-fisheries-restoration-monitoring-plan-for-the-klamath-basin-objectives-hierarchy-key-performance-indicators-monitoring-framework-workshop/