**Overarching monitoring questions**

ESA

* Inventory of what suckers are left, their age and genetics?
* Is the sucker population successfully recruiting
* What is limiting sucker recruitment?
* How are suckers arranged on the landscape?
* What is the coho trajectory by ESU
* When could we phase out hatchery production? (Is this a goal? What is the role of hatcheries in the basin?)

MSA /Fishery

* What the harvestable surplus of the adult fall run chinook on an annual basis
* Did the harvest match the planned projection
* What is the exploitation rate of coho on an annual basis
* How many fish can be sustainably harvested? (If anadromous spp this would be a PFMC product)
* What are the status and trends for (insert species)? (And are we on a trajectory of sustainable harvest?  How long will it take for upper basin anadromous runs to establish? )
* How many adult fish are available for harvest? (SPP other than Fall Chinook)

Water management

* What are juv disease rates in the spring
* What are the adult disease rate in the late summer or fall
* How water management effects fish management and behavior
* How is water management effecting fish management and behavior?

Dam Removal and Reintroduction

* Is the upper river system being dispersed (reestablished) and by what species and run, in what tribs, parts of the river. How are they arranged on the landscape. What thermal refugia areas are fish utilizing in the new reach?
* How is the recruits per spawner changing over time
* What is the environmental condition of the river basin post dam removal, (water quality, riparian)

**More specific monitoring questions**

* How are juvenile suckers from the hatchery contributing to the wild populations
* How do suckers interact with large scale restoration projects?
* What factors are affecting survival. What is Juvenile out migration survival rate
* To what extent are the reintroduction plans being implemented (Or and CA) some of that experimental aspect have already taken place (Some of these are addressed in the ODFW for reintroduction for chinook reintroduction strategies (maybe Klamath Tribes and USFW for bull trout)) what actions might we take if they are trying to migrate during known poor water quality?
* How are the coho and fall chin repop to areas in and above the areas of the dam removal.
* How the entire pop of fall chinook responding to the areas below the dam.
* What is the timing of outmigration?
* What life histories are dominant in the upper basin?
* What are the different life history strategies that will be emerging post dam removal?
* Will there be utilization of upper Klamath lake?
* Understanding the fine scale differences in migration runs?
* Do re-established [species] survive and reproduce in recipient habitats?
* What changes to water quality has dam removal had in the basin?
* How might water management actions affect chinook outmigrants survival and abundance to the ocean?
* In the case of active reintroduction/re-establishment from natural donor stocks, are there effects on natural stocks from management actions?
* · What is the trend in Chinook, coho, and steelhead adults return annually to the Scott and Shasta Rivers?
* · What is the productivity of Fall Chinook in the Scott and Shasta over time?
* Are multimillion dollar restoration projects moving the needle?

Limiting Factors

* What factors limit distribution and abundance of (insert species)?
* What is the level of (insert species) disease during outmigration and how does this change over time?
* Are there limit barriers to success that we don't fully understand?
* What are barriers to migration that haven't been considered?
* What barriers exist to reintroduction of anadromous fishes?

**Short Term Research Questions**

* Salmon are now part of the upper basin, how are they interacting with suckers?
* Can natural production of chinook take the place of hatchery production at Fall Creek?
* What are the barriers to success? What are the limiting factors for production by species
* Where are the bottlenecks for juvenile and adult salmon in the dam removal reach?
* How are pops in the upstream of dams now interacting with new salmonid passage?
* What kind of diseases might salmon introduce and how might that affect suckers and trout?
* Steelhead and redband interactions, what might we see there?
* How can we utilize information we are learning about habitat needs and life history of wild spring run from new genetic research to inform successful recolonization of the upper basin?
* What genetic considerations or questions in reintroduction strategies for these various species
* What areas do we still need to work on to improve habitat?
* Are Spring Chinook able to navigate the waters of upper Klamath lake?
* Is gas bubble disease an issue with dam passage?
* What is the impact of nonnative trout (brook trout and brown trout) on the abundance and persistence of native fish populations within the Klamath Basin? (emphasis on headwater spawning habitats).

**Methods refinement questions**

* How do we monitor to understand patterns of sucker movement in the lost river system?
* How do we evaluate the data gaps to produce the production estimates?
* Where would we have a RST in the mainstem to help produce these estimates?
* What are the essential monitoring activities for informing the MSA
* How do we detect and quantify successful cohorts?
* How to understand the repopulation of the upper basin?
* What does a baseline PIT tag monitoring system look like in the upper basin?
* Where can PIT arrays be placed to maximize detection and minimize cost and effort?
* Are we setting up our monitoring programs to successfully measure water quality throughout the basin?
* What is the effectiveness of artificial propagation/assisted rearing for conservation?
* Is restoration working and how do we know? What hard stick are we using to say whether or not the needle is being moved?

**Management questions:**

* Flow through process
* Capture the entire life cycle, not just adults
* Are culturally important species thriving?
* How does TEK fit into everything?
* What are the success measures for reintroduction (viability).
* How do we recover spring run chinook in the basin as a whole in a way that improves rather than endangers the status of the remaining wild run?
* Limited high quality habitat available
* Where are Chinook, coho, and steelhead present above in the CA dam removal reach? Where are Chinook, coho, and steelhead established/persisting above in the CA dam removal reach?
* What changes to fish populations has dam removal had in the basin?
* Life history of the upper basin fish?
* What changes across the basin we’re seeing due to dam removal?
* What is the success of re-introduction methods?

Water quality and management

* Higher flows cooler temps encourage Fall chinook survival

Restoration

* One a scale of 1 or 10, how well is current monitoring capturing the information needed to guide restoration decisions in the Klamath basin?
* Connectivity of high-quality habitats during all life stages for all life histories?
* Is there any planned effort for assisted migration above Keno? PIT Tagging to see how they navigate the lake?
* Keno? Lake River dam management and its affect on outmigration
* How does Keno res. (fish whirlpool) affect bird pops and fish pops?
* Could there be habitat cover or guidance structures installed to provide safer passage?
* Bringing marine derived nutrients back to the basin, how might that benefit(?) suckers?
* What are the primary bottlenecks to restoring salmon in the Upper basin?
* Passage barriers? Fish screens and other existing infrastructure

Access to Data and other considerations

* What data that you believe or know is being collected isn’t easily accessible?
* Is there important data not easily accessible?
* How would having access to this data help you or other scientists or managers?
* How do we make sure it is more accessible to users, managers
* What data is accessible?
* Wouldn’t want to lose basin wide accessibility if pairing down
* Where/what are the data gaps?
* Is it missing metadata pieces?
* How do we reduce the duplication of effort?
* How do we know what data is out there and how to retrieve it?
* How do we build the trust to share data?
* By adding new tech to these systems, how might they reduce the costs/efforts of past monitoring?
* How can all the interested/invested orgs communicate data/science to the community?

* What fish monitoring can we do that can inform us on the habitat (process and parts) necessary to support sustainable fish populations and communities

(all categories)Status and trends/Life history/Habitat use-ecology/Limiting factors/Reintroduction-effects/Supplementation:

How to develop predictive models to measure the effects of different types of management?

Life history/Habitat use-ecology/Limiting factors:

What habitat use at each life stage of (insert species)?

Life History/Diversity

What are life history strategies over time?

What is survival across life history?

Habitat Use/Ecology

Where do both juveniles and adults use refugia?

What are the characteristics of successful habitats?

How should we measure habitat effectiveness?

What is the aquatic community structure in these habitats?

Supplementation

What is the range of life history that has been observed?

What is the survival and effects of hatchery releases?

How many hatchery fish will be needed to maintain sustainable populations?