LFA Phase 2 Core Kickoff Meeting Notes

9/11/24 USFWS Arcata, CA 9:00-12:00

Attendees: Ty Wallin, Jason Hall, Joe Merz, Kais Ross, Scott McBain, Ken Lindke, Morgan Knechtle, Brad Nissen, Taylor Daley, Justin Alvarez, Seth Naman, Eric Peterson, Annie Brodsky, Andrew Paul, Shane Quinn, Trevor Morgan, Oliver Rogers, Kurt Fausch, Smokey Pittman, Patrick Flynn, Kiana Abel, John Buffington, Todd Buxton, Chris Laskodi

Notice of recording meeting for meeting minutes. Only recording CFS portion of meeting.

Housekeeping-

In person: exits and restroom locations, water fountains, ring doorbell if have to leave and come back, First Aid and defibrillator, lunch options

Online- two screens so they can see raised hands. Questions at end. Questions are encouraged. Mics are sensitive so will pickup slide-conversations. Alert if screen freezes- notify in chat

Introductions

Ty Wallin -USFWS

Jason Hall - CFS

Joe Merz – CFS

Kai Ross – CFS

Scott McBain – McBain Associates under Contract of Hoopa Valley Tribe

Ken Lindke – CDFW

Morgan Knechtle – CDFW

Brad Nissen – USFWS

Taylor Daley – USFWS

Justin Alvarez – Hoopa Valley Tribe

Seth Naman – NOAA Fisheries

Eric Peterson – TRRP

Annie Brodsky – CFS

Trevor Morgan – DWR

Patrick Flynn – TRRP

Oliver Rogers – TRRP

Shane Quinn –Yurok Tribe

Smokey Pittman – Consultant, Hoopa Valley Tribe

Kiana Abel – TRRP

Andy Paul –University of Calgary

John Buffington – USFS

Kurt Fausch –Colorado State University

Background (Eric):

- **Purpose:** The limiting factors analysis aims to understand why juvenile salmon outmigration from the Trinity River has increased since restoration flows began in 2005, but there has not been a corresponding increase in returning adult salmon.
- **Issue:** Despite the rise in juvenile outmigration, adult returns have not shown a similar trend. The goal of this analysis is to determine why this discrepancy exists and to identify solutions.
- **Phases:**
    - **Phase 1:** Involved developing a study plan, which was completed by CFS and awarded through a competitive bidding process.
    - **Phase 2:** This phase will implement the study plan and is set to be completed by August 2026. CFS has again been contracted for this phase. This phase will involve an accelerated schedule with a hard deadline.

Jason/CFS:

- **Introduction and Acronyms:**
    - **Familiar:** CFS (Cramer Fisheries Science), TAG (Technical Advisory Group), SAB (Science Advisory Board), and IDT (Interdisciplinary Team). Additional terms include LFA (Limiting Factors Analysis), LCD (Life Cycle Diagram), LCM (Life Cycle Model), GUI (Graphical User Interface), and RShiny.

    - **TAG/IDT:** The TAG is effectively synonymous with the IDT, with the addition of Scott from the tribe participating directly in the TAG. TAG includes Scott from the Hoopa tribe, in addition to the IDT members.

- **Phase 1 Recap and Goals:**
    - **Options:** Three levels of effort were evaluated in Phase 1, with Option 3 (full Life Cycle Model) selected. The life cycle model framework developed during Phase 1 will guide Phase 2.
- **Phase 2 Goals:**
    - Develop a lifecycle modeling tool with a user-friendly GUI.
    - Ensure the tool is open source, transparent, and does not require extensive expertise in R.
    - The tool should be adaptable, maintainable, and able to identify and prioritize factors and data gaps.
    - Evaluate action strategies and scenarios to support fisheries and restoration goals.
    - Provide materials for public outreach and support the program.
- **Scope and Deliverables:**
    - **Kickoff and Regular Interaction:** Engage with the TRRP, IDT, and Scott. Includes quarterly meetings and workshops.
    - **Data Gathering:** Collect background information, identify data gaps, and conduct a literature review. Emphasis on using Trinity-specific data, with literature as a backup.
    - **Model Development:** Create a draft and final quantitative LCM with a supportive GUI.
    - **Analysis:** Analyze current limiting factors.
    - **Reporting:** Produce a technical report with concise communication and supplemental material in appendices.
- **Rationale for LCM Approach:**
    - **Purpose:** The LCM framework will allow for a comprehensive understanding of factors affecting Chinook salmon, including those occurring outside the

Trinity River. It supports hypothesis testing and scenario evaluation, which is difficult to achieve with field studies alone.

    - **Adaptability:** The model must be adaptable to new issues and emerging data. An open-source platform ensures transparency and usability.

- **Overview of LCM and GUI:**
    - **Turning complex data into actionable outputs.**
    - **Simulating "what-if" scenarios.**
    - **Identifying data gaps and informing future restoration efforts.**
    - **Lifecycle Models:**
        - Transform life cycle diagrams into quantitative outputs using mathematical relationships and empirical data.
        - Focus on converting diagrams into mathematical models and numerical data that can be analyzed.
    - **R and R Shiny:**
        - **R:**
            - An established, open-source programming language for statistics and scientific inquiry.
            - Free to use and widely supported, especially in academic settings.
        - **R Shiny:**
            - Developed by the creators of R Studio.
            - Allows for easy translation of complex analyses into interactive web applications.
            - Users can interact with models through dials and input boxes without needing to know R programming.
            - Useful for creating tools that can visualize outcomes and test various scenarios.
- **Applications:**
    - **Sandbox and Gaming:**

        - Explore different scenarios and outcomes.
    - **Ecology and Other Fields:**
        - Helps in identifying limiting factors and analyzing complex data.
- **Discussion:**
    - **Uncertainty in Lifecycle Modeling:**
        - **Andrew Paul:** Inquired about incorporating uncertainty into the lifecycle modeling, including parameter values and functions.
        - **Kai Ross:** Explained that models usually start as deterministic to enable faster calculations and reduce data requirements. Uncertainty can be integrated, especially for key parameters with available data. Methods include automated approaches, bootstrapping, or user-defined ranges. The inclusion of uncertainty will depend on data availability and project goals.
        - **Significance of Uncertainty:**
            - **Andrew Paul:** Emphasized the importance of understanding uncertainty, particularly in relation to survival rates and physical variables (e.g., temperature). This understanding is crucial for identifying limiting factors and assessing model accuracy.
                - **Action Item:** Include discussions with TAG when reviewing/evaluating data and inputs to identify parameters where uncertainty can be quantified and included in modeling tools. But note the model will primarily be deterministic. Describe in modeling plan.
- **Success Criteria:**
    - **Objective:** Develop open-source, transparent tools to identify and prioritize limiting factors and data gaps.
    - **Key Focus:** Create an adaptable tool that informs and evaluates management actions.
    - **Importance of Feedback:** Incorporate ongoing feedback and discussions into the development process.

- **Discussion Points:**
    - **Lifecycle Model Tool:**
        - **Changing Conditions:** Acknowledge the dynamic nature of systems, with the Klamath River being a key example of change and uncertainty.
        - **Spatial Component:** Address spatial dynamics and data gaps related to juvenile and adult migration stages.
        - **Data Limitations:** Consider limitations due to changes like dam removals, focusing on current data while preparing for future updates.
    - **Model Flexibility and Parameters:**
        - **Model Scope:** Focus discussions on how changing conditions affect Trinity populations, without delving too deeply into uncertainties in the Klamath River.
            - **Action Item:** Focus on Trinity River Chinook and factors in the Klamath that will influence those populations to reduce scope creep and focus our efforts on Trinity River Chinook. Include in model plan.
        - **Parameterization:** Ensure the model is adaptable to future changes with flexible parameters that can be adjusted as new data becomes available.
    - **Future-Proofing:**
        - **Built-In Relationships:** Include parameters that may not currently impact outcomes but could be relevant as new information arises.
            - **Action Item:** Use conceptual LCD to frame up life stage transitions and drivers/causes that do not currently have data with placeholders so that they can be adapted in the future. Describe in modeling plan.
        - **Calibration:** Calibrate the model using empirical data, employing both automated and manual methods to adjust parameters based on real results.
    - **Model Adjustments:**

        - **Data Comparison:** Tune the model with available empirical data, recognizing that similar outcomes can be achieved through different parameter adjustments.
        - **Handling Uncertainties:** Build in flexibility to adapt to new data and uncertainties as they emerge.

- **Klamath and Trinity Rivers LFA:**
    - **Temperature and Flow:** Evaluate how temperature and flow impact fish survival and migration, and integrate these factors into the model.
    - **Future Adjustments:** Prepare the model to accommodate potential changes due to dam removals and other factors affecting the Klamath and Trinity Rivers.
        - **Action Items:** As noted above, focus on Trinity River Chinook populations and how conditions in the Klamath influence Trinity River Chinook.

- **Roles and Responsibilities:**
    - **Partnership Approach:** Emphasize the collaborative nature of the project, with close interaction between teams.
    - **Data Handling:**
        - **Data Categories:** Include abundance at key life stages, transition rates, and quality. Address data gaps and variability.
        - **Data Requests:** Clearly define needed data types and formats.
        - **Data Preparation:** Rely on team members who know the data to prepare it for model integration.
        - **Data Roles:** Ty will coordinate data collection efforts. It is crucial to specify data needs and manage data quality, including temporal and spatial variations.
            - **Action Item:** Include Ty as POC in communication plan for data requests. Also include Eric.
        - **Workflow:** Iterative process for parameterizing the model, involving data evaluation and hypothesis testing.
    - **Data Requirements:**

        - **Abundance Estimates:** Essential for estimating transition rates and survival.
        - **Monitoring Techniques:** Use various methods for accurate data at different life stages.
        - **Data Quality:** Address limitations and accuracy of data sources.
    - **Modeling:**
        - **Survival Rates:** Consider various survival strategies and their effectiveness.
        - **Driver and Cause Data:** Incorporate demographic, biological, and environmental data to understand influences on model outcomes.
    - **Data Quality Considerations:**
        - **Error and Variance:** Evaluate data quality to ensure it can accurately reflect model parameters.
        - **Model Effectiveness:** Ensure data errors do not obscure the effects of drivers or causes.
- **Data Discussion:**
    - **Data Categorization:** Discussed organizing data by type (e.g., habitat, biological) to streamline identification and addressing of data needs.
    - **Collaborative Data Sharing:** Proposed creating a Google Drive for participants to share and update data collaboratively.
        - **Action Item:** Create Google Drive document to help identify, catalogue, and curate data requests, status, and evaluation.
    - **Data Collection and Analysis:**
        - **Time Series Data:** Emphasized the need for comprehensive data spanning 10-20 years for better variance assessment and gap identification. Five years would be minimum/ideal. Error discussion/assumption if less than 5 years.
        - **Historical Data Challenges:** Highlighted issues with incomplete or inconsistent historical data and the impact of management decisions on data quality.

- **Specific Data Discussions:**
    - **Data Types:** Reviewed available data on adult escapement, juvenile outmigration, and spawning surveys.
    - **Data Gaps:** Identified gaps, especially regarding fry contributions to adult returns and missing winter data.
    - **Methodological Evolution:** Noted changes in data collection methods (e.g., from flow-based estimates to mark-recapture).
  - **Notes:** Notes regarding data types available and associated details will be put into a Google Drive spreadsheet for confirmation/editing and additions as data becomes available.

- **Data Availability Discussion – organized by life stages and data types:**

General Notes/Comments:

Evaluating data quality is important – can't evaluate/model relationships if errors/uncertainty are greater than your response or its effects. However, even if we exclude data due to quality issues, this is a useful outcome because it identifies areas that monitoring or improvements in monitoring can address to support future use.

Fry emergence to outmigration

<u>Biological/Demographic</u>

Fry emergence, outmigration-Likely no info on fry outmigrants or their contribution to adult returns. Short data set from RST at Pear Tree. Mostly run in winter. Raw catch no mark recapture or CPUE. Fyke data in 90's from Hoopa.

Couple years where Pair Tree RST ran full year, but it generally starts in January and goes to August; Willow Creek starts in march generally.

No smolt trap monitoring in Klamath below Trinity. Beach seine in early 80's/90's. Hard to compare against RST. Start with two initial plots Eric showed. Many components will not have data-collapsed in model or many assumptions.

RST for over 20 years- 1 in upper River at base of restoration site, 1 at Willow Creek.

Mark recap started in 2007 with hatchery fish. Maybe 2002 with other marking methods (Photonic-natural). 4 years of comparison of two methods similar. Prior to that, expansion is based on the proportion of flow. Flow based expansion was re-evaluated given the mark-recap results. Now is agreed upon timeseries of juvenile outmigration abundance. *Cannot

distinguished between spring and fall. Willow creek is limited by flow but can't operate pre-March.

Survival study- fist year from Pear Tree down to estuary, 2nd-and 3rd years-hatchery down to estuary.

Emergence- seine snorkel and traps, ETF? None…

Any long term for estimate of fry emergence/utilization, non-natal rearing, Ray Capman? Last year. Did not work well. FWS Carly, Charlie? Fuzzy area

Estimating fish that are moving out of rearing and emigrating. Numbers AND strategy- early vs late, ghostly yearlings, etc. Surrogate for timing -80% (?) Size and weight at emigration, but once hatchery fish arrive it gets fuzzy. Lots of fuzziness due to hatchery marking.

Lower 25 miles (trap to confluence with Klamath. = little monitoring. 1-2 years of Yurok RST data

RST in Blue Creek >25 years. Seining 20+ years. The goal is for fish health. Not sure what data looks like. Dept seining and e-fishing in lower estuary. Not intended for abundance but might have some info on timing of arrival of hatchery fish. Yearlings release in Oct and caught in following spring. Some complexity.

Non natal rearing on Klamath side producing fish YoY and older utilizing habitat as they move to ocean. Fyke and frame nets in tributaries. (Klamath). Assumed similar work done on the Trinity

Smolts per spawner data available.

No outmigrant monitoring in tribs, but Chinook mainly spawn in mainstem

15 miles downstream from lower trap to Klamath – and no monitoring below lower trap or in Klamath below confluence. Some RST data for 25 years near Blue Creek (assumed to be upstream of confluence in Klamath), and some beach seining for 20+ years…but goal is for fish health

Yearlings get released from hatchery in mid-October and they catch them in estuary and may not go directly to ocean.

In lower Klamath they get tags from all over the basin. Some Hoopa coho in fyke traps in estuary and tribs, PIT tags and could be data to inform composition of pops that are PIT tagged.

Adult Migration to Spawning

Biological/Demographic

Traps off of spawning grounds (tribs or mid-section of watershed). Spawning throughout the entire mainstem. Most in upper 40. Willow creek is 15 miles from Klamanth-best indication of outmigrants. Capturing fish from SF Trinity, New River, NF Trinity, etc. Compounded and not necessarily function of work being done in upper 40 or dam operations.

Spawning surveys through mainstem. None on SF. Upper 40 are done by USFW. Willow creek-USFS.

Adult escapement- mark recap. Weir in upper 40 targeting spring CHN that misses CHN spread out downstream. (missed some of this-look at transcription)

Carcass-what info captured? Sex, size, spawned, hatchery/wild, prespawn morts, (Using thirds-since 2009. Reports from 1950's). Higher rates or PSM in lower river early, but abundance is low so pop effect is low. % is misleading.

*only mainstem spawning -no tribs surveyed *black box* Hoopa and upper 40 but not much. Less of an issue if mainstem is focus. Downstream of counting fence on tribs if focus (confirm). USFS-have reports DS of counting station. Should have data available. Eric Wiesman for data. Some forest service surveys in upper 40, and some limited tribs just outside the reservation.

Discrepancy between mark recap at willow creek and sum total of returns to hatchery. Hypothesis as to why- potential bias in mark recap est. likely positive bias. Redd based-very comprehensive in mainstem so lots of space not accounted for and not redd = 2 adults assumption. No validation of red = 2 adults assumption.

Age structure going back to at least 2000, maybe 1978 – ages 2 through 5-6 and by origin (marked and unmarked) – possible conflicting info here with statements after unless these were specific to Fall and Spring Chinook?

Mark 25% since 2004 – fractional marking…age structure from hatchery returns but would have to assume they represent wild fish age structure. Fractional marking will make it difficult to distinguish wild/hatchery for certain. Some possible effects from hatchery practices, but TAG suggests its close.

Spawning to Incubation and Emergence

Biological/Demographic

Fecundity- are hatchery fish going to be able to be used to estimate wild-only marked 25%. However, given the size of a hatchery fish can estimate fecundity of wild fish. Assume wild

are same size as hatchery-no size data on wild fish. No information that natural origin females are different size [than wild].

Redd surveys. Spawning is well covered. Steve Wiles/Goff? <2009 reach scale. >2009 GPS specific. Others are not spatially explicit. Generalized

Carcass surveys include sex, size, and whether or not it was spawned – no egg retention directly but categorically scaled in thirds by volume.

Chris – current methodology since 2009, but spawning reports go back to 1950s from CDFW and they give yearly prespawn mortality number but no egg retention.

Pre-spawn mortality has a temporal component, e.g., high rates of prespawn mortality early in season but abundance is low – so percentages can be misleading.

John – there was an emergent study approved in last couple of years?

Ty – Red cap study done last year, it didn't work well but one before that FWS did

Habitat

Substrate quality to extrapolate on incubation/emergence survival? 2010 40 mile hydraulic model/map from dam to NF 2008-2010 HS criteria and preference for gravel size. Strong % between 11-90 in D83. Rock transport data is available. Todd- sub size and quality. Upper river fine sediment deficit. Egg jostling in pockets could reduce success. Another hydraulic model that's a bit older. Spawning criteria can also be produced.

We just know that there's a deficit of fines, as you mentioned, and you know that can benefit incubation because of inner gravel flows - Todd

Incubation-surface and subsurface. GMA hydrology. Area map of sand size and higher. (missed convo -lost connection)…(refer to transcription GMA Todd and Smokey).

Geomorphic data- topographic and bathymetric, sediment augmentation rates, grain size data, bed/sediment mobility thresholds and scour depths keyed to diff flows, sed transport rates, turbidity-15 years, gravel bar area 2014-2023, topographic diversity, temperature, 2D hydraulic model in upper 40 only. Terrestrial topo at high resolution. With rough bathymetry from upper 40

In 2008-2010 did habitat suitability criteria for spawning preference for Chinook relative to gravel size, strong relationships – and some info from hydraulic modeling.

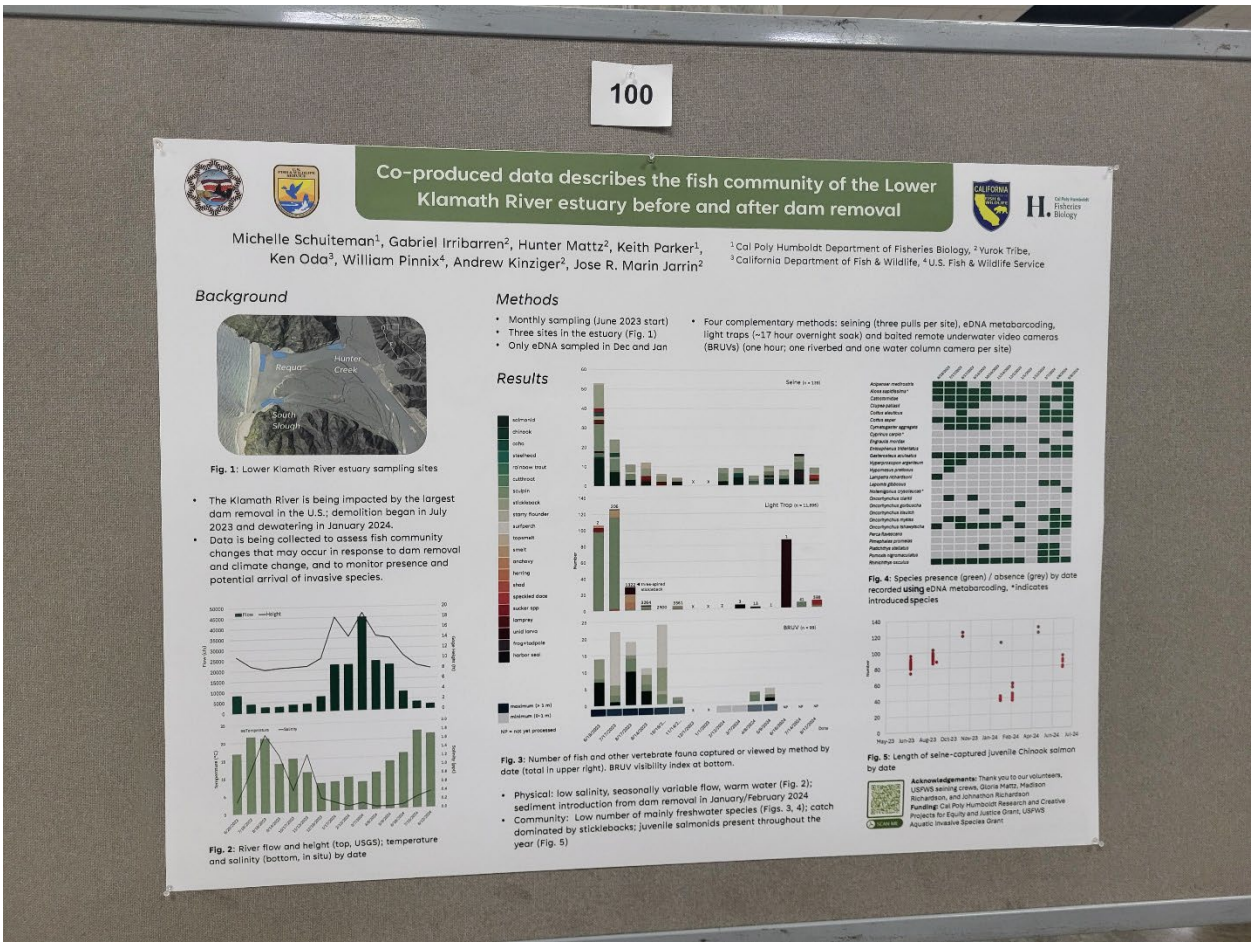
Smokey - A variety of groups have collected bulk sample data, Bain and Associated. Todd Buxton has aerial map of fine sediment deposits…some updated surveys in 2010?

Many tribs burned over, fine sediment impacts…Synchronization of flows proposed to mitigate impacts from runoff.

Estuary and Transition

Biological/Demographic

Estuary research going on for last 14 months now…will be continued. Note – spoke with group at AFS in Hawaii and they have not done fin clips before…but plan to so data on population composition in estuary will be coming – poster from AFS



Estuary research-Taylor-light trap with camera. Seine at 3 locations, length measurements from traps, depth, turb, sal, DO, (YSI plus depth). All fish, no salmonid focus. Genetics. CPUE is taken.

Ocean rearing and maturation

Biological/Demographic

Ocean fishery- Pacific States-CWT, extrapolations of Trinity harvest including age classes.

Data/summary of abundance in ocean at ages.

- **Data Management and Sharing:**
    - **Sensitive Data Handling:** Develop a system to flag and manage sensitive and draft data, ensuring proper handling of public-facing and restricted information.
        - **Action Item:** Include in model plan.
    - **Existing DOI Data Management Plan:** Review and update the data management plan. Ensure it reflects current practices and agreements among program partners.
    - **Documentation and Credit:** Maintain clear documentation of data assumptions and updates. Ensure data is logically organized and credit is given to contributors. Create documentation for continuity in case of personnel changes.
- **Communication and Stakeholder Engagement:**
    - **Internal Communication Plan:** Develop a plan for internal updates, data requests, and communication protocols. Define how and when updates are shared with the team.
        - **Action Item:** Include in study plan.
    - **Public Involvement:** Plan for public engagement and stakeholder outreach in future phases. This will be managed separately and discussed later.
- **Timeline and Milestones:** This is a two-year project with complex dependencies and iterations. Use project management tools to track progress and ensure timely completion of milestones.
- **Risk Management:** Develop a risk management plan focusing on communication and project continuity. Identify and address potential risks to ensure smooth operations.
    - **Action Item:** Include in study plan (referred to as Summary of Study Plan in RFP/SOW).
- **Additional Notes:**

- **Science Advisory Board (SAB):** SAB will provide independent oversight and advice but will not contribute data. Kurt F. is the contact person for SAB-related queries.

- **Summarized Questions:**
  - **Process Management and Sensitivity Analysis:**
    - How will the IDT (8 people) manage the non-milestone-based process with many leaders? See Communication Plan for communication methods (in development). Quarterly meetings will not be the only place to discuss progress but more for decision points made, and updates, next steps.
      - **Action Item:** Include communications plan in study plan.
    - What is the plan for modeling the strategic plan and running sensitivity analyses? There will be data we can't use. Kai will zoom in and expand on the conceptual model. Standard productivity model used to see if we need a more specific model. Sensitivity analysis helps to give a list of factors that have influence including things outside of our control.
      - **Action Item:** Include modeling plan in study plan.
  - **Engagement and Documentation:**
    - How will the team engage and handle contentious issues through consensus? Eric and Ty will bring consensus on the path forward if there are contentious situations.
      - **Action Item:** Include in communications plan.
    - How should documentation be tracked and managed, including deciding what information goes into the main document versus the appendix?
  - **Risk Management:**
    - How to mitigate the risk of bias when using internal data? It was suggested to use solid ecological data and seek external data sources.

        - **Action Item:** Include in risk management plan, CFS will provide external oversight to evaluate inputs and outputs objectively to reduce this risk.
    - **External Factors:**
        - How will issues affecting Chinook populations outside the Trinity system be incorporated? It needs to be part of the conversation. Lifecycle diagram is taken from general Chinook ecology, not from this system specifically. Team members will be bringing in knowledge from other systems where it is needed.
        - How can information from other systems be utilized without excessive scope creep? We have access to long-term data from systems outside of the Trinity that can be utilized without extensive effort. However, we are limited to the tools and data available to us. If a major factor influencing the model is beyond our control, we can only work with what we have. Our goal is to build the best possible model using the best science, without becoming an advocate for any particular viewpoint. Our focus should be on developing a model that supports broader discussions and informed decision-making.
    - **Model Building and Expertise:**
        - The need to build a robust model while avoiding bias and ensuring it facilitates broader conversations.
        - CFS's role in providing expertise and context, with an emphasis on both modeling and input.
- **Action Items:**
    - Develop Phase 2 Study Plan: Include data management, risk management, communication plan, and model plan– to be discussed with Eric/Ty for timeline implications.
    - Review and request existing data.
    - Create Google Drive document to support data discovery, data requests and documentation.
    - **Upcoming Meetings:** Schedule TAG meetings in October, potentially aligning with IDT meetings. SAB will also be involved.