

Science Integration Team Schedule & Objectives, 2018–2019

The Anadromous Fish Program (AFP) Restoration Strategy will be developed at a coarse resolution scale, consistent with the scale of the National Marine Fisheries Service's diversity groups, to match the resolution of the current decision-support models (DSMs). Specifically, representatives from the Science Integration Team (SIT) will meet with regional watershed experts to develop 10-year candidate strategies. Notably, these candidate strategies are *not* SIT priority recommendations. Instead, these candidate strategies will be comprised of management actions (and sequence of management actions, if applicable) that the watershed experts believe need to be completed over the next decade to promote recovery of anadromous fishes in their region. These meetings will begin with a brief review of the SIT's process to date, but the focus of the meetings will be on the watershed experts' candidate strategies. These discussions will be aided with the modeling and visualization tools developed by the SIT. These candidate strategies may use the SIT's defined units of effort, as long as these candidate strategies are as specific as possible to minimize uncertainty associated with their management recommendations.

Once compiled, the candidate strategies will be presented to the SIT for discussion. Keeping these candidate strategies in mind, the SIT will develop 5-year management strategy scenarios. These scenarios will be modeled using the SIT DSMs and the tradeoffs of each will be evaluated and ranked based on the SIT's fundamental objectives. Sensitivity analyses will be performed to identify key uncertainties. Notably, a key uncertainty is a parameter that results in different rankings of management strategies when changing the value of the parameter across some fixed range of values. This process will also highlight monitoring data that would allow the SIT to reduce these uncertainties in the future. The SIT will consider the initial scenario evaluations, the sensitivity analyses, and across taxa/run results to compile a set of recommended priorities that will be submitted to the Science Coordinator (and the Core Team). These recommendations will include priority management actions, a process to evaluate implemented management actions, and essential monitoring efforts. Priority management action recommendations will incorporate a set of location-specific (coarse scale), quantifiable management actions and the sequence of management actions (if applicable) across California's Central Valley. The process by which the SIT arrived at these management action recommendations will be described in detail to ensure transparency, including an addendum (if necessary) that includes rebuttals and/or recommended amendments by specific members of the SIT for any of the recommended priorities. Along with these recommendations, the SIT will provide a process by which they would like the success or failure of specific management actions to be evaluated. This process may include a before-after, control-impact (BACI) monitoring design, where the project-specific monitoring efforts are focused on quantifying the fundamental objectives identified by the SIT. Notably, focusing the monitoring efforts on the SIT's fundamental objectives will ensure monitoring, management, and modeling efforts are integrated, which is needed to facilitate learning (i.e., adaptive management) and reduce DSM uncertainties over space and time. By extension, this will allow the program to better evaluate the tradeoffs of proposed alternative management actions using the DSMs in the future. Last, the SIT will compile a list of recommended monitoring efforts across California's Central Valley that will be essential to the prioritization process in the future. For example, data that are needed as DSM inputs and data that are used to calibrate the DSMs. Collectively, these documents will be recommended to the CVPIA Program as a restoration strategy for the AFP.

Once these recommendations are adopted by the CVPIA as an initial AFP Restoration Strategy, continued involvement and support from the SIT will be essential to the success of the program. Therefore, the SIT will continue to meet quarterly or semi-annually, depending on the need for feedback from the SIT, to review progress on recommended refinements to DSM inputs and rulesets. In addition to these update meetings, there will be a larger, annual SIT meeting to review the 5-year priorities, monitoring results, DSM improvements, results from new DSM simulations and sensitivity analyses after DSM improvements have been made, and any recent information (i.e., publications, reports, etc.) relevant to the SIT activities. During the annual meeting, SIT will review (grade) the state of the DSMs and inputs, request refinements to the DSM inputs and rulesets via the established SIT proposal process, and make recommendations for modifications to the AFP Restoration Strategy priorities, if necessary. This annual process will be documented in an annual technical memorandum that will be attached to the AFP Restoration Strategy as an additional addendum. When at year 4 in the process, a comprehensive review will be initiated for the existing DSMs and all of the monitoring data collected to date. The Science Coordinator will be tasked with conducting the review and recruiting outside experts to aid in the review. The results of the review will be made available to the SIT and Core Team. The Science Coordinator will then begin engaging with regional watershed experts as described above to identify changes (if any) from the previously identified region-specific 10-year candidate strategies.

Realizing the AFP Restoration Strategy: A Path from Jan. 1, 2018 to Aug. 1, 2019

Over the past cycle the Science Integration Team (SIT) has made substantial progress towards achieving the first draft of the Anadromous Fisheries Program (AFP) Restoration Strategy. Below, we provide a brief summary of where we are in this process, outline what needs to be accomplished in the next 16 months to realize the strategy for Chinook and *O. mykiss*, and include plans for sturgeon, recognizing that the time constraints will not allow for a 5-year restoration strategy to be developed for this species in the next 16 months.

We began this cycle by reviewing the fall run Chinook DSM and identifying any changes that were desired by the SIT. Most of the changes that were requested were centered on DSM inputs, with minor changes to the structure of the DSM. We also met with the spring and winter run Chinook experts to develop conceptual models for these other runs. This resulted in minor differences from the new fall run DSM structure, but again required modifications to the DSM inputs. These modifications were largely governed by the temporal mismatch in the different Chinook runs. Recalibration of the DSMs and their integration requires the new DSM inputs, which are currently being collated by FlowWest.

We also focused on refining the objectives and decision alternatives (scenarios) for Chinook. These efforts have resulted in a substantially reduced set of fundamental objectives (now 5 instead of 18); however, the SIT has not agreed on what juvenile metric they would like to use. This too requires a recalibration of the DSMs (since changes have to be implemented). This will allow the SIT to review the metric and think about its interpretability in relation to the objective they are trying to capture. The SIT has also spent a considerable amount of effort refining scenarios by examining what a unit of effort would be that could be applied in the different

tributaries to make more direct comparisons. The SIT is collating information on previous habitat restoration projects to finalize what a unit of effort should be. The SIT is in the process of developing and finalizing new pulse flow scenarios.

We have also developed a Bayesian integrated model to link escapement estimates to juvenile screw-trap monitoring data to derive empirical estimates of juvenile survival, growth, and movement transition probabilities. This is important because these transition probabilities are solely based on expert opinion at this time, which were graded poorly by the SIT at the end of the last cycle. Simulations are currently underway to evaluate the performance of this model. Once these simulations are completed, the models will be fit using the new DSM inputs to evaluate different predictors of these transition probabilities and derive empirical estimates.

We have also met with the *O. mykiss* group this past cycle to identify objectives, create decision alternatives, and develop a quantitative *O. mykiss* DSM. The model components have been built and we just received feedback from the group on the rulesets that are to be used. At this time, we are beginning to link these model components to form the larger DSM, after which the new DSM inputs will be needed to calibrate this DSM and evaluate scenarios.

We have also met with the sturgeon group this past cycle to identify objectives, create decision alternatives, develop sturgeon conceptual models, and create a sturgeon score sheet to rank the decision alternatives based on the sturgeon objectives. This score sheet has been sent out and we are currently receiving filled-out score sheets from the group. We plan to have a call-in meeting in February to review the score sheets before asking the group to develop priorities for FY2019.

During the next cycle, we will continue to include more frequent conference calls and fewer in person meetings. The reasoning for this approach is threefold. First, we believe that more frequent contact will provide more opportunities for SIT members to interact and minimize the amount of down time so there is no loss of momentum. Second, we believe that more frequent contact will help maintain greater consistency in meeting deadlines for products, such as changes to model components. Finally, we wanted to minimize the total amount of time devoted by SIT members to the process. The schedule below includes two hour conference calls and 1.5–2 day in-person meetings. Notably, this schedule includes SIT meetings for all three species, but the specific dates for the region watershed expert meetings will be scheduled at a later date to maximize the participation of watershed experts. The topics covered by the conference calls include primarily big picture discussions, discussions of progress, and discussions about topics that will be included in upcoming in-person meetings. Thus, they are intended as follow-ups and preparation for in-person meetings. The topics covered in the in-person meetings are those that will require greater intensity communication, such as detailed discussions about modifications to the DSMs and identifying priorities.

Notes and other SIT generated documents will be posted on the data portal or alternative web-based location (TBD), with meeting notes being posted within one week of the end of the meeting. In addition, these documents will be sent as email attachments to SIT members who request them. Requests should be made in advance to the Science Coordinator. Note that the subject heading in these emails will include “INFORMATIONAL” in caps to differentiate these emails. Some feedback from SIT may be required before conference calls and in-person

meetings. This feedback will be solicited via email with the subject heading “FEEDBACK REQUESTED” in caps.

SIT members will have an important role in guiding the science that will be used to inform decision making by the CVPIA fish programs. SIT members will participate in the refinement of the DSM and the synthesis of new and existing information. Thus, SIT members will be required to spend time researching topics relevant to model refinement, reviewing published manuscripts and reports and, at times, writing reports for review by fellow SIT members, the Science Coordinator, the Core Team, and technical experts. We anticipate that this may require up to 20 hours per month to complete reviews and write reports plus approximately 12 days to attend SIT meetings. SIT members can propose changes to the DSMs and will review the scientific basis for changes proposed by fellow SIT members and other stakeholders.

Watershed experts also have an important role in this process, but the time commitment is much lower. We anticipate watershed experts participating in one 1–1.5 day in-person meeting, which will take place within their respective region during May – August, 2018; however this may change in order to maximize participation. If available, at least one representative from each set of regional watershed experts may be asked to attend a regular SIT meeting to help answer any questions the SIT may have on the submitted 10-year candidate strategies from their region.

The following schedule includes tasks that need to be completed for achieving the objectives identified above. Note that progress may be slower or faster than anticipated so it should be considered tentative and subject to revision.

January – April 2018

The first benchmark is centered on identifying priorities for FY2019 and getting the *O. mykiss* process caught up with the Chinook efforts. These efforts will ultimately put the SIT on track to developing the AFP Restoration Strategy by August 1, 2019, but the focus will be on completing objectives set during the 2017–2018 cycle.

Chinook:

- 1) Finalize Chinook management scenarios that could be used to evaluate big questions/hypotheses in an adaptive management framework (i.e., unit of effort, pulse flows, and delta productivity)
- 2) Complete modifications to the Chinook DSM inputs
- 3) Complete integrated analysis of screw-trap data and escapement estimates to reduce critical uncertainties in juvenile survival, growth, and movement transition probabilities
- 4) Calibrate and evaluate the performance of the Chinook DSMs
- 5) Integrate the 3 Chinook DSMs into a single DSM
- 6) Identify Chinook priorities
- 7) Grade DSM performance and identify needed refinements

***O. mykiss*:**

- 1) Refine management scenarios that could be used to evaluate big questions/hypotheses in an adaptive management framework

- 2) Complete modifications to the *O. mykiss* DSM and inputs
- 3) Calibrate and evaluate the performance of the *O. mykiss* DSM
- 4) Identify *O. mykiss* priorities
- 5) Grade DSM performance and identify needed refinements

Sturgeon:

- 1) Identify priorities based on the sturgeon score sheet that was developed and distributed in 2017

May – August 2018

Once the *O. mykiss* efforts are caught up with the Chinook efforts, the schedule of tasks to be completed will be identical for both species, except for the reduction of critical uncertainties using a hindcasting approach for Chinook (if data become available). In particular, during this time the SIT will focus efforts on eliciting the 10-year candidate strategies from the regional watershed experts and then developing 5-year management strategies for these two species. Additionally, the SIT will start developing a quantitative sturgeon DSM and gather DSM inputs for all of the DSMs. **It is imperative that all DSM inputs for all species and runs are made available by September 1, 2018** to maintain momentum and develop the AFP Restoration Strategy within the time constraints.

Chinook and *O. mykiss*:

- 1) Meet with regional watershed experts to identify 10-year candidate strategies
- 2) Document expert 10-year candidate strategies and disperse to SIT
- 3) SIT develops candidate 5-year strategy scenarios
- 4) Complete any requested DSM and DSM input refinements
- 5) Compile DSM inputs

Sturgeon:

- 1) Refine big questions/hypotheses regarding the effectiveness of conservation and recovery actions for sturgeon in the Central Valley
- 2) Refine management scenarios that could be used to evaluate these big questions/hypotheses in an adaptive management framework
- 3) Develop a sturgeon coarse resolution DSM
- 4) Compile DSM inputs

September – December 2018

The next benchmark is for the SIT to complete DSM refinements, simulate scenarios using the DSMs, and conduct sensitivity analyses to identify key uncertainties. Completing all of the simulations during this time is needed to ensure enough time is allotted for the documentation of the AFP Restoration Strategy and the technical memorandum for the sturgeon efforts to meet the needs of the prioritization process for FY 2020. It is important to note that none of the simulations can be conducted without the DSM inputs.

Chinook and *O. mykiss*:

- 1) SIT develop 5-year management strategies (continued, if needed)

- 2) Complete hindcasting of Chinook to reduce DSM uncertainties (if data become available)
- 3) Integrate *O. mykiss* DSM with Chinook DSM
- 4) Simulate candidate 5-year management strategies using the DSM
- 5) Conduct sensitivity analyses to identify key DSM uncertainties

Sturgeon:

- 1) Refine sturgeon DSM
- 2) Depending on data availability, calibrate and evaluate the performance of the sturgeon DSM
- 3) Simulate potential management strategies using the DSM
- 4) Conduct sensitivity analyses to identify key uncertainties in sturgeon DSM

January – April 2019

The next benchmark is for the SIT to develop recommendations for priorities and develop the first draft of the AFP Restoration Strategy and sturgeon technical memorandum. During this time period the SIT will also follow up on any tasks that were not completed.

Chinook and *O. mykiss*:

- 1) Rank priorities using the DSM and management scenarios identified above
- 2) Complete the first draft of the AFP Restoration Strategy
- 3) Send draft AFP Restoration Strategy out for comments

Sturgeon:

- 1) Rank priorities using the DSM and management scenarios identified above
- 2) Complete the first draft of the sturgeon technical memorandum
- 3) Send draft sturgeon technical memorandum out for comments

May – July 2019

During this time period the comments on the AFP Restoration Strategy and sturgeon technical memorandum will be reviewed, appropriate edits will be made, and the final draft of these documents will be released.

Provisional Meeting schedule. Text in bold represents meetings in which the invitations have already been sent out. The shaded pattern matches the sets of months referenced in the schedule outlined above.

| Year | Month | Day | Type |
|------|-----------------|----------------|------------------|
| 2018 | January | 17 | Call |
| | January | 31 | Call |
| | February | 14 | Call |
| | February | 21 – 22 | In-person |
| | March | 7 | Call |
| | March | 21 | Call |
| | April | 4 – 5 | In-person |
| | April | 18 | Call |

SIT Schedule 2018–2019

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|------|------------|---------|--|
| | May – June | TBD | 3 Regional watershed expert in-person meetings |
| | May | 2 | Call |
| | May | 16 – 17 | In-person |
| | May | 30 | Call |
| | June | 13 | Call |
| | June | 27 – 28 | In-person |
| | July | 11 | Call |
| | July | 25 | Call |
| | August | 8 – 9 | In-person |
| | August | 22 | Call |
| | September | 5 | Call |
| | September | 19 | Call |
| | October | 3 – 4 | In-person |
| | October | 17 | Call |
| | October | 31 | Call |
| | November | 14 | Call |
| | November | 28 | Call |
| | December | 12 – 13 | In-person |
| 2019 | January | 9 | Call |
| | January | 23 – 24 | In-person |
| | February | 6 | Call |
| | February | 20 – 21 | In-person |
| | March | 6 | Call |
| | March | 20 | Call |
| | April | 3 – 4 | In-person |
| | April | 17 | Call |
| | May | 8 | Call |
| | May | 29 | Call |
| | June | 19 – 20 | In-person |
| | July | 10 | Call |
| | July | 31 | Call |