

Delta ISB Discussion: Draft Ecosystem Amendment Performance Measures

September 9, 2019

Background and Request from the Council

The Sacramento-San Joaquin Delta Reform Act of 2009 (Delta Reform Act) requires the Delta Plan to include performance measures that enable the Delta Stewardship Council (Council) to track progress in meeting the objectives of the Delta Plan. (Water Code section 85211.) These performance measures must include “quantitative or other measureable assessments of the status and trends” of the “health of the Delta’s estuary and wetland ecosystem for supporting viable populations of aquatic and terrestrial species, habitats, and processes, including viable populations of Delta fisheries and other aquatic organisms,” as well as the “reliability of California water supply imported from the Sacramento or the San Joaquin River watershed.” (Water Code section 85211). The Delta Reform Act requires that the Delta Plan be “based on the best available scientific information and the independent science advice provided by the Delta Independent Science Board.” (Water Code section 85308(a).)

In 2017, the Council initiated an effort to develop an approach to amend Chapter 4 of the Delta Plan (Ecosystem Amendment) to update its strategic direction for attainment of the coequal goal of protecting, restoring, and enhancing the Delta ecosystem. (The coequal goals for the Delta are set forth in Water Code section 85054). The Ecosystem Amendment effort includes key scientific findings and potential revisions to Delta Plan Chapter 4, including policies and recommendations, administrative performance measures, and output/outcome performance measures.

To comply with the requirements of Section 85308(a) of the Delta Reform Act of 2009, the Ecosystem Amendment must also be based on best available science and the independent science advice of the Delta Independent Science Board (Delta ISB). Consequently, pursuant to Section 85308(a), the Council requested the Delta ISB to provide input on the following draft documents for the Ecosystem Amendment:

1. Ecosystem Performance Measures Summary - Delta Plan Appendix E Format
2. Proposed Performance Measure Detailed Datasheets:
 - a. 4.12 Subsidence Reversal for Tidal Reconnection [ New]
 - b. 4.13 Barriers to Migratory Fish Passage [ New]
 - c. 4.14 Increase Funding for Restoring Ecosystem Function [ New]
 - d. 4.15 Seasonal Inundation [ New]
 - e. 4.16 Acres of Natural Communities Restored [ New]
 - f. 4.6 Doubling Goal for Central Valley Salmon Natural Production [ Modified]

In addition, the Council provided a copy of the preliminary Chapter 4 narrative for the Amendment, along with the proposed policies/recommendations that were presented to the Council on June 27, 2019, as reference materials, to provide more context for these performance measures.

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The Council asked the Delta ISB to address the following questions:

1. Given the goals and strategies for protecting, restoring, and enhancing the Delta ecosystem in the 2009 Delta Reform Act, and the core strategies identified in the proposed Chapter 4 amendment, are the proposed ecosystem performance measures appropriate, given the current scientific knowledge, available data, and monitoring capabilities?
2. Are the proposed ecosystem performance measures informative to provide measureable assessments of the status and trends of the health of the Delta as outlined in the ecosystem subgoals of the Reform Act (Water Code section 85302(c))?
3. Are the scale and time of the targets and measurement intervals appropriate for the proposed measures based on available scientific information and baseline/monitoring data?

Based on the request from the Council, the Delta ISB will discuss the draft performance measures at its September 12, 2019, meeting. To help inform the discussion, individual Delta ISB members provided high-level comments before the meeting using the questions provided by the Council, and specific comments on selected performance measures in which the Delta ISB member has expertise.

Individual comments are compiled in the sections below and are not attributed to individual Delta ISB members. **These comments are preliminary, have not been vetted by the Delta ISB, as a whole, and should not be cited. These individual comments are meant to help guide the Delta ISB's response to the Council's request.**

Feedback #1

In our August meeting, we had requested that the Council include an expanded explanation of the material (i.e. the above documents) that would be provided to us to make our review easier and more efficient. Unfortunately, this was not done, which resulted in more difficulty in understanding the relationship among the documents sent and how best to complete our (high-level) review. Below are responses based on the questions that were provided to the Delta ISB.

1. **Given the goals and strategies for protecting, restoring, and enhancing the Delta ecosystem in the 2009 Delta Reform Act, and the core strategies identified in the proposed Chapter 4 amendment, are the proposed ecosystem performance measures appropriate given the current scientific knowledge, available data, and monitoring capabilities?**

Performance measures are defined to include quantitative or other “measureable assessments of the status and trends of the health of the Delta, as well as the reliability of the state’s water supply exported from the Sacramento and San Joaquin River watersheds” (Water Code sections 85211 and 85308).

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Each of the performance measures has a description of the issue to be examined, metrics to be used, baseline data to test against, and target. In other documents, basis for selection, expectation, linkage to Delta Reform Act and other information is provided.

Certainly, the core strategies identified are appropriate and are related to the synthesis papers that have been prepared by the Council, which we commented on earlier. Descriptions of the problem, metrics and baselines are good. Not unexpectedly, the basis for the targets is not often clear and dependent on other documents.

The numbering of the outcome performance measures are not in a numerical sequence (4.15, 4.16, 4.6, 4.2, 4.10, 4.12, 4.13, and 4.14) or in a numbering system that was clear to me.

2. Are the proposed ecosystem performance measures informative to provide measurable assessments of the status and trends of the health of the Delta as outlined in the ecosystem subgoals of the Reform Act (Water Code section 85302(c))?

Yes, they are and in general are reasonable in terms of their ability to be quantified and assessed.

3. Are the scale and time of the targets and measurement intervals appropriate for the proposed measures based on available scientific information and baseline/monitoring data?

The validity of the time scale in reaching the targets is unclear given changes that are occurring in the Delta, the political landscape, and available funding. Certainly, some are admirable but probably unrealistic. For example, the Target: “Zero new non-native invasive species of fish, plants, and invertebrates established in the Delta.” This is an admirable goal, but given past history very unlikely to be met.

Feedback #2

Ecosystem Performance Measures Summary - Delta Plan Appendix E Format

Performance Measure	Section	Delta ISB Member Comment
4.15 Seasonal Inundation	Target: By 2050, 51,000 additional acres that are physically connected to the fluvial river and tidal system	51,000 more than 15,000 or 51,000 more than the estimated 75,000? Please clarify.
4.15 Seasonal Inundation	Footnote 2	Change “the available data does not include” to “the available data do not include.”

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Performance Measure	Section	Delta ISB Member Comment
4.16 Acres of Natural Communities Restored	Target	What does “restored” mean in this context? Is it where retraction actions have occurred? Is dominance by native species required?
4.10 Terrestrial and Aquatic Invasive Species	Target: Zero new nonnative invasive species of fish, plants, and invertebrates established in the Delta	This seems unrealistic; need to define “established.”
4.10 Terrestrial and Aquatic Invasive Species	Target (Vegetation)	The reduced areas should be linked to the areas treated so that treatment effectiveness is measured.
4.12 Subsidence Reversal for Tidal Reconnection	Metric: Acres of land with subsidence reversal activity in the Delta and Suisun Marsh...	Subsidence activity is not sufficient to measure subsidence reversal. Can you measure actual reversal?

Feedback #3

Performance Measure 4.12: Subsidence Reversal for Tidal Reconnection

Performance measure 4.12 addresses subsidence reversal – recovery of relative land elevation – in intertidal wetlands in the Delta and Suisun Marsh. Without this effort, ongoing sea level rise and organic soil subsidence will have caused permanent loss of land at or near intertidal elevations. The goal is to ensure that 3,500 acres in the Delta and 3,000 acres in Suisun Marsh are restored as intertidal wetlands. Success in this effort as proposed is essential to meet and to be consistent with the strategies in the Delta Reform Act to restore large areas of interconnected habitats, to support a healthy estuary, and to restore habitat for migratory birds.

While the scale of the proposed effort is appropriate, we wonder if the deterministic assumptions that underlie the performance measure might be optimistic. For example, in 2100 if either sea level rise exceeds the 50th percentile estimate of 2.6 feet or organic matter does not accumulate at 4 cm/yr, the performance measure will not be met and the restoration effort potentially deemed unsuccessful when it was the assumptions that were at fault. Both sea level rise and organic matter accumulation rates are statistics. We recommend that you consider basing the performance measure on a range of sea-level increases and organic accumulation rates. Alternatively, one could use a more conservative estimate of rates rather than a median estimate. The actual sea level rise by 2100 is unknown and depends on human behavior. The effective rate of organic soil accumulation also is poorly constrained. As was pointed out by Miller et al. (2008), “... the deeper interval of accumulated (organic) material may be subject to compaction as the accumulated thickness reaches many meters. This compaction needs to be considered when estimating the long-term subsidence reversal potential of re-

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established marshes.” The 4 cm/yr value assumed for ΔE , i.e., change in elevation from subsidence reversal by 2100 (Page 11), that is used to estimate the mapped areal band of subsidence reversal may be overoptimistic considering the implied thickness of new organic soil if the Miller et al. warning applies. There also may be a long-term elevation instability caused by secondary consolidation, i.e., a post pore-pressure drainage phenomenon observed in soils under load. Organic soils are prone to significant secondary consolidation and subsidence, which could cause intertidal wetlands underlain by thick new organic soils to lose elevation for decades.

Regarding the third question about the timing of the targets, “Subsidence reversal activities must be initiated by 2030 and be ongoing to continue to 2100 in order to prevent the land loss due to sea level rise and potential subsidence” (Page 2), the timing seems reasonable given the scope of infrastructure development that will be required to implement this effort. However, we remain concerned about a strict reliance on the “2100 planning horizon for the Delta Plan given by the Delta Reform Act of 2009 (see: WAT § 85302(e)(1))” (Page 5) when applied to the subsidence reversal effort. Nothing magical happens in 2100. In fact, sea level rise is anticipated to be accelerating in most scenarios which implies that preservation of these newly restored intertidal zones may become more challenging. We made a similar comment in our review of the Synthesis Papers to inform the Delta Plan Ecosystem Chapter Amendment.

Feedback #4

The Delta ISB reviewed the background papers prepared to inform the amendment of the Delta Ecosystem chapter of the Delta Plan. In that review, transmitted June 5, 2018, the 5th summary comment reads:

There is a fundamental contradiction between future environmental uncertainties and the establishment of planning criteria, especially in a complex environment like the Delta. This contradiction is the underlying basis for adaptive management. Both this tension and how adaptive management should be incorporated in “planning,” “planning criteria,” and the setting of decision thresholds are insufficiently addressed.

This fundamental contradiction shows up in the proposed performance measures in that the measures are set in absolute terms regardless of the contingencies of the future.

This scientific tension is also institutional. It is embodied in the Delta Reform Act of 2009 requiring a Delta Plan with clear performance measures and the April 2015 Executive Order B-30-15 of then Governor Brown where item 6 reads: *State agencies shall take climate change into account in their planning and investment decisions, and employ full life-cycle cost accounting to evaluate and compare infrastructure investments and alternatives.* With climate changing along uncertain paths, clear performance measures have to depend on which path actually emerges and how far along that path we have progressed.

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The proposed performance measures acknowledge that sea level will likely rise between 1.6 and 10.2 feet by 2100 according to the Ocean Protection Council's estimates of 2018 (OPC 2018).¹ The technical possibility and economic costs of "performing" to meet many of the performance goals interrelate with how fast sea level rises. For example, performance measure 4.15 stipulates that the "seasonal inundation goal" for the fluvial- tidal connected areas will be an additional 51,000 acres and that flooded land will be an additional 19,000 acres by 2050.

In rapidly changing and uncertain times, unconditional performance measures are not reasonable. Reasonable performance measures, however, could be made contingent on key conditions beyond the control of Delta decision-makers. For example, those performance measures that are contingent on Delta topography such as areas seasonally inundated might be set in terms of the rate of sea level rise that actually unfolds.

Considerable effort will be required now to restate the performance measures in contingent terms, but this effort will also both better prepare Delta ecosystem science for the future and keep the performance measures relevant for a longer period of time.

Feedback #5

Performance Measure 4.12: Subsidence Reversal for Tidal Reconnection

This performance measure aims to prevent net loss of future opportunities to restore tidal wetlands at elevations suitable for such restoration. Subsidence reversal activities must be initiated by 2030 and be ongoing to continue to 2100 in order to prevent the land loss due to sea level rise and potential subsidence.

This measure aims at those Delta islands with large enough areas (1,235 acres) at subtidal elevations. These areas (Map 1) have the potential to reach intertidal elevations by 2100 if subsidence reversal activities are ongoing.

¹ This report updates the OPC report of 2013 that relied heavily on an NRC report of 2012 that relied heavily on the 4th assessment IPCC report released in 2007 based on scientific research prior to that. The update for 2018 provides an H++ scenario to reflect the higher rates of sea level rise that could occur with the loss of the West Antarctic ice sheet. While this likely provides a good extreme case, new measurements of the rate of melting of the Greenland ice sheet suggest that H scenarios are more likely than thought in 2017 when the work on OPC 2018 was undertaken. The OPC report stresses that the science of sea level change is advancing rapidly, yet the report is based on findings of a decade earlier. It is partly for this reason that predictions of the rate of climate change and its effects have pretty consistently proven too conservative.

Expert assessments such as that of the IPCC also may be inherently conservative because they are required to assess what has appeared in the peer-reviewed literature at the time the assessment was initiated and this may be as much as five years before the report is actually published (Michael Oppenheimer *et al.* 2019. *Discerning Experts: The Practices of Scientific Assessment for Environmental Policy*. University of Chicago Press).

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Target: By 2030, 3,500 acres in the Delta and 3,000 acres in Suisun Marsh with subsidence reversal activities on islands with large areas of land capable of reaching intertidal elevations (Map 1).

- 1. Given the goals and strategies for protecting, restoring, and enhancing the Delta ecosystem in the 2009 Delta Reform Act, and the core strategies identified in the proposed Chapter 4 amendment, are the proposed ecosystem performance measures appropriate given the current scientific knowledge, available data, and monitoring capabilities?**

Subsidence reversal is key to maintaining current elevations and allowing locations to “keep-up” with sea level rise. Other ecological benefits can derive from subsidence reversal and can improve outcomes. This PM is consistent with the goals of protecting, restoring and enhancing the Delta ecosystem. It addresses restoration, the interconnectedness of Delta habitats, and increasing habitat for migrating birds and other organisms.

- 2. Are the proposed ecosystem performance measures informative to provide measureable assessments of the status and trends of the health of the Delta as outlined in the ecosystem subgoals of the Reform Act (Water Code section 85302(c))?**

Although the need to track projects is clear, it is unclear whether keeping track of projects, alone, will be most informative. There is a possibility that accretion in some areas could be balanced by erosion in other areas, leading to no net accretion in the Delta over the time period.

Assessment of this PM should consider placement of subsidence reversal projects as well as total acreage. This would allow prioritization of projects in areas that are more vulnerable and/or likely to be more successful. Encourage a focus on areas that provide vital ecosystem services and/or areas that are important to maintaining or promoting ecosystem connectivity.

- 3. Are the scale and time of the targets and measurement intervals appropriate for the proposed measures based on available scientific information and baseline/monitoring data?**

Many islands have high risk for flooding so it will be important to select best candidate islands (see Bates & Lund, 2013) and initiate subsidence reversal projects as soon as possible. The draft PM has conducted an assessment and makes recommendations about islands where projects have the highest likelihood of success.

Bates and Lund (San Francisco Estuary and Watershed Science (2013) estimated the amount of time it would take to restore 36 Delta islands to within 1.5 m of mean sea level assuming conservatively high rates of accretion (4 cm/yr), and predicted that over 20 islands would likely experience levee failure and subsequent inundation before this target elevation was reached. Thus, activities that promote accelerated accretion should be considered (see Stumpner et al. (2018) Ecol. Engineering 111: 176-185).

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Performance Measure 4.13: Barriers to Migratory Fish Passage

This performance measure tracks instream barriers and unscreened diversions that are resolved for migratory fish passage. “Resolve” in this context means to construct, modify, or remove a barrier to allow for a proportion of fish to travel past the barrier or former barrier.

Target: By 2050, resolve all (100%) priority fish migration barriers, and screen 100% of unscreened diversions within the Delta and Suisun Marsh.

- 1. Given the goals and strategies for protecting, restoring, and enhancing the Delta ecosystem in the 2009 Delta Reform Act, and the core strategies identified in the proposed Chapter 4 amendment, are the proposed ecosystem performance measures appropriate given the current scientific knowledge, available data, and monitoring capabilities?**

This PM addresses the role that barriers to migration and unscreened diversions play in affecting fish survival. Because of limited resources, this PM establishes priorities for the most important barriers to resolve and diversions to screen based on information from the California Department of Fish and Wildlife (CDFW; 2018) and the Central Valley Flood Protection Program Conservation Strategy (2016). Additional priorities include rim dams on the Sacramento or San Joaquin Rivers and their tributaries and unscreened diversions along native, anadromous fish migration corridors within the Delta and Suisun Marsh.

- 2. Are the proposed ecosystem performance measures informative to provide measureable assessments of the status and trends of the health of the Delta as outlined in the ecosystem subgoals of the Reform Act (Water Code section 85302(c))?**

Yes. The baseline is all priority barriers identified by CDFW and DWR. The target is to resolve all fish passage priorities by 2050. Data sources seem appropriate and information will be collected annually and tracked graphically.

- 3. Are the scale and time of the targets and measurement intervals appropriate for the proposed measures based on available scientific information and baseline/monitoring data?**

Scale and timeline may be ambitious. Would be helpful to have short- and long-term goals. Will targets be managed adaptively?

Performance Measure 4.14: Increase Funding for Restoring Ecosystem Function

Funding and implementing projects that restore hydrological and geomorphic processes, are large-scale, improve connectivity, support native vegetation communities, and contribute to recovery of special-status species contributes to restoring ecosystem functions and supporting a resilient, functioning Delta ecosystem.

Target: By 2030, 80 percent of total funding for covered action projects under ER Policy ‘A’ is the cost of projects with Ecosystem Restoration Tier 1 or 2 attributes.

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- 1. Given the goals and strategies for protecting, restoring, and enhancing the Delta ecosystem in the 2009 Delta Reform Act, and the core strategies identified in the proposed Chapter 4 amendment, are the proposed ecosystem performance measures appropriate given the current scientific knowledge, available data, and monitoring capabilities?**

Current science supports restoration efforts aimed at promoting ecosystem function. This PM would prioritize funding for projects aimed at restoring key ecosystem functions and that support a resilient, functioning Delta ecosystem (e.g., see Robinson et al. (2016) A Delta Renewed: A Guide to Science-Based Ecological Restoration in the Sacramento-San Joaquin Delta. SFEI Contribution No. 799. San Francisco Estuary Institute - Aquatic Science Center: Richmond, CA).

- 2. Are the proposed ecosystem performance measures informative to provide measureable assessments of the status and trends of the health of the Delta as outlined in the ecosystem subgoals of the Reform Act (Water Code section 85302(c))?**

Project certifications will be tracked. High priority will be given to Delta projects that restore ecosystem functions and support a resilient, functioning Delta ecosystem. High priority projects will have the following attributes: restore hydrological and geomorphic processes, are large in scale, improve connectivity, support native vegetation communities, and contribute to recovery of special-status species.

Tracking covered action certifications would provide a measure of projects aimed at improving status and trends of health in the Delta. Consider complementary information that could be provided by project proponents that would lead to assessment of actual improvements to ecosystem function.

- 3. Are the scale and time of the targets and measurement intervals appropriate for the proposed measures based on available scientific information and baseline/monitoring data?**

Timeline seems reasonable. Recommend early assessment of methods for covered action certifications approach.

Performance Measure 4.15: Seasonal Inundation

Restoring land-water connections to increase seasonal floodplain inundation.

Expectation:

Increased hydrologic connectivity and seasonal inundation contributes to achieving a healthy Delta ecosystem and viable populations of native species.

Target: By 2050:

(1) 51,000 additional acres that are physically connected to the fluvial river and tidal system, of which:

(2) At least additional 19,000 acres of floodplain area inundated on a two-year recurrence interval.

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- 1. Given the goals and strategies for protecting, restoring, and enhancing the Delta ecosystem in the 2009 Delta Reform Act, and the core strategies identified in the proposed Chapter 4 amendment, are the proposed ecosystem performance measures appropriate given the current scientific knowledge, available data, and monitoring capabilities?**

This PM supports increased hydrologic connectivity and seasonal inundation of floodplains. This goal is consistent with current scientific knowledge showing that connectivity is a fundamental property of healthy ecosystems (see Pringle (2003) What is hydrologic connectivity and why is it ecologically important? Hydrol. Process. 17, 2685–2689). Enhancing connectivity has been shown to improve habitat quality, increase species diversity and increase ecosystem function.

- 2. Are the proposed ecosystem performance measures informative to provide measureable assessments of the status and trends of the health of the Delta as outlined in the ecosystem subgoals of the Reform Act (Water Code section 85302(c))?**

The PM assumes that greater connectivity and inundation will lead to a healthier Delta. This expectation is consistent with current science for other systems (e.g., references cited in this PM).

- 3. Are the scale and time of the targets and measurement intervals appropriate for the proposed measures based on available scientific information and baseline/monitoring data?**

Difficult to assess the feasibility of these targets. It might be useful to set short- and long-term goals to assess whether the targets are feasible. Consider setting decadal targets that lead up to the 2050 targets.

Performance Measure 4.16: Acres of Natural Communities Restored

Restoring large areas of natural communities to provide for habitat connectivity and crucial ecological processes, along with supporting viable populations of native species. Increase of acres of natural communities for providing suitable habitat to fish and other wildlife.

Metric: Acres of natural communities restored. Evaluated every five years.

Target: Target acres of natural (riparian and wetland ecosystems; upland ecosystems) communities by 2050

- 1. Given the goals and strategies for protecting, restoring, and enhancing the Delta ecosystem in the 2009 Delta Reform Act, and the core strategies identified in the proposed Chapter 4 amendment, are the proposed ecosystem performance measures appropriate given the current scientific knowledge, available data, and monitoring capabilities?**

Yes. Restoration of riparian/wetland ecosystems and upland ecosystems will increase habitat available for organisms that use the Delta ecosystem. There is merit in having targets that apply to specific types of habitat as outlined in the PM. Although these are the types of habitats that have supported native species

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in the past, it's unclear whether restoration will favor native species specifically. Will parcels of land be available that are appropriate for the meeting the proposed targets (e.g., elevation, soil type, inundation regime, etc.)?

- 2. Are the proposed ecosystem performance measures informative to provide measureable assessments of the status and trends of the health of the Delta as outlined in the ecosystem subgoals of the Reform Act (Water Code section 85302(c))?**

Reporting will include maps comparing the acres of natural community restoration progress from the baseline to the current status. Maps will be linked to tables that report the change of acres of each community compared to the baseline. Data will be updated every five years. I have some concern about the considerable lag between when data are collected and when the database will be updated (e.g., 2016 dataset will be completed in 2019). Explore ways to make this lag shorter over lifetime of the PM.

- 3. Are the scale and time of the targets and measurement intervals appropriate for the proposed measures based on available scientific information and baseline/monitoring data?**

Yes, but see comment above about trying to reduce time lags between collection of data and reporting.

Performance Measure 4.6: Doubling Goal for Central Valley Chinook Salmon Natural Production

Achieve the state and federal doubling goal for Central Valley Chinook salmon natural production (990,000 fish) relative to the period of 1967-1991 levels (497,054 fish).

Target: The 15-year rolling average of natural production for all Chinook salmon runs: (1) will be 990,000 by 2065, doubling the baseline of 497,054; (2) the slope of the 15-year rolling average is greater than zero (i.e. positive). This metric will be measured annually.

- 1. Given the goals and strategies for protecting, restoring, and enhancing the Delta ecosystem in the 2009 Delta Reform Act, and the core strategies identified in the proposed Chapter 4 amendment, are the proposed ecosystem performance measures appropriate given the current scientific knowledge, available data, and monitoring capabilities?**

This is an appropriate goal, but it seems ambitious given current stressors in the Delta and anticipated stressors related to climate change. What adaptive measures will be taken if the PM is not met?

- 2. Are the proposed ecosystem performance measures informative to provide measureable assessments of the status and trends of the health of the Delta as outlined in the ecosystem subgoals of the Reform Act (Water Code section 85302(c))?**

Reporting will include the annual natural production of all salmon runs and the status compared to the baseline. The 15-year rolling averages will be plotted against year and a slope will be calculated to measure if the salmon population is

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growing (positive slope). This information will be useful in assessing the status and health of the Delta, particularly when coupled with other information.

3. Are the scale and time of the targets and measurement intervals appropriate for the proposed measures based on available scientific information and baseline/monitoring data?

Unclear. The targets seem ambitious to me. It would be helpful to know the size of the current population to assess whether it is reasonable to expect to double the 1967-1991 baseline levels, especially in light of current stressors and anticipated changes to the Delta (e.g., warming and other effects of climate change).

Feedback #6

The long-term goals do not seem connected to any specific set of actions that could be altered along the way if the target thresholds are not met. In fact, no target thresholds are defined whereby alternative actions must be considered. Therefore, the connections to these goals to adaptive management per se does not seem evident.

The scientific arguments to the Goals and the specific steps needed to achieve these goals needs a stronger scientific basis.