INFORMATION ITEM

Lead Scientist's Report

Summary: Delta Lead Scientist Dr. Laurel Larsen will discuss a study by Cloern et al. (2021) regarding net primary productivity (NPP). Dr. Larsen will also discuss the update to the Science Action Agenda, including the release of the draft management needs and the upcoming Science Actions Workshop.

ON THE HUMAN APPROPRIATION OF WETLAND PRIMARY PRODUCTION. SCIENCE OF THE TOTAL ENVIRONMENT. CLOERN ET AL. 2021.

The Sacramento-San Joaquin Delta has undergone tremendous landscape transformations due to human activity in the last 200 years. Historically one of the largest estuarine wetlands in the U.S., much of the Delta's highly productive marshes and riparian wetlands have been drained and converted to agriculture. By diverting the region's productivity toward agriculture, humans have altered one of the Delta's key ecological functions: the production of food to support fish, waterfowl, and other aquatic wildlife. Several global-scale studies have addressed the magnitude of such human appropriation of ecological production; although wetlands are some of the world's most highly productive ecosystems, the effects of wetland loss on ecosystem food resources are less understood. This study, led by the San Francisco Estuary Institute (SFEI), aims to quantify how landscape modifications in the Delta have affected NPP available to support aquatic food webs and estimate the possible recovery of this ecosystem function using Delta Plan restoration targets. An important ecosystem function, NPP is the amount of biomass (or energy) produced through photosynthesis by plants and algae, minus that lost from the system through decomposition and respiration. Changes in the Delta's NPP alter the amount of energy available at the base of the food web and therefore affect all Delta fish and wildlife species. To track changes in NPP with human land alterations, this study quantifies NPP in historical, modern, and possible future Delta landscapes.

The authors of the study combined historical mapping, measurements from the scientific literature, and models of production to derive a historical baseline of NPP in the Delta from dominant habitat types, from each of the five major primary producer communities, and for both wet and dry years. Modern observations and measurements of the Delta landscape were compiled to provide current values of

these NPP estimates. To estimate NPP gains with future restoration, the authors applied primary production values to a restoration scenario based on habitat restoration targets from the Delta Plan Ecosystem Amendment.

The authors found that the Delta has lost 77 percent of hydrologically connected habitat, with more than 98 percent of its tidal and nontidal marsh area lost between today and the early 19th century. As a result of these enormous losses, the Delta has also seen an estimated decrease in NPP of 94 percent, which exceeds the total habitat loss percentage because of the disproportionate contributions of tidal and nontidal marsh to historical NPP. However, future wetland restoration has the potential to offset some of these historical losses. The authors estimate that meeting Delta Plan targets for marsh and riparian restoration would recover 12 percent of the Delta's historical NPP, nearly tripling the NPP currently available to aquatic consumers.

This study is highly relevant to the ongoing Voluntary Agreements, in which flow and non-flow actions (i.e., habitat restoration) are being balanced to achieve fish management objectives. In these negotiations, the quantifiable, direct impact of habitat acreage on food available to fish is critical information to assess the equivalency between habitat vs. flow actions. This study is also in line with action three (develop tools and methods to support and evaluate habitat restoration) of the 2017-2021 Science Action Agenda and Chapter 4 of the Delta Plan (protect, restore, and enhance the Delta ecosystem). The study is groundbreaking in the application of a new methodology to investigate landscape-scale changes in wetland NPP, which makes the study important and potentially influential on a global scale to science and management communities

DELTA SCIENT PROGRAM ACTIVITIES

Science Action Agenda - Draft Management Needs

In late May, the Delta Science Program circulated the draft Management Needs for the 2022-2026 Science Action Agenda (SAA) update for public review. Staff organized the collaboratively developed 65 Top Delta Management Questions from 2020 into the six draft Management Needs. Public feedback was requested to ensure that the Management Needs accurately reflect overarching and pressing gaps in management that are critical to achieving policy or regulatory objectives. The final list of Management Needs will shape the Science Actions Workshop in July and update the SAA.

ON YOUR RADAR

Science Action Agenda - Science Actions Workshop

On July 13-14, 2021, from 9:00 AM to 12:00 PM, the Delta Science Program will virtually host the Science Actions Workshop as part of the update to the SAA for 2022-2026. Workshop participants will work collaboratively to develop near-term priority science actions for the Delta that are responsive to the Management Needs. Building on the collaboratively-developed list of 65 Top Delta Management Questions developed in 2020 and the summary of progress made on the 2017-2021 SAA (publicly reviewed last month), these actions will provide a framework for science funding by the Delta Stewardship Council and its partners. Registration is available on the Council's Events calendar.

BY THE NUMBERS

Delta Science Program staff will provide a summary of current numbers related to Delta water and environmental management. The summary (**Attachment 1**) will inform the Council of recent counts, measurements, and monitoring figures driving water and environmental management issues.

LIST OF ATTACHMENTS

Attachment 1: By the Numbers Summary (provided at the Council Meeting)

Attachment 2: Visual Abstract of Article Summary 1

CONTACT

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