INFORMATION ITEM

Lead Scientist Report

Summary

Phragmites australis, or Common Reed, is a Eurasian wetland plant that is one of the most widespread invasive species affecting North American wetlands. In Suisun Marsh, its rapid expansion has threatened biodiversity and the quality of habitat for fish and wildlife. It is notoriously difficult to control, but the Suisun Resource Conservation District leads a program to incentivize individual landowners to treat stands of Phragmites with herbicide. However, data to support monitoring of both the spread of Phragmites and the effectiveness of control have been lacking. Funded through the 2021 Delta Research Proposal Solicitation administered by the Delta Stewardship Council, the research team developed a new method to convert publicly available, annual aerial photographs to maps of *Phragmites australis*. Applying this method to the Suisun Marsh, they found that overall, *Phragmites* is spreading more rapidly than has been observed elsewhere, but within some individual managed wetlands where treatment can be applied, its extent has declined. However, expansion was highly likely in land parcels adjacent to other parcels with *Phragmites*, suggesting the importance of a coordinated approach to control across the mosaic of land managers in Suisun.

A remote sensing approach to assess the historical invasion of *Phragmites australis* in a brackish coastal marsh

Hagani JS, Takekawa JY, Chappell SC, Tanner RL, Ernst AR and Kettenring KM (2023) A remote sensing approach to assess the historical invasion of Phragmites australis *in a brackish coastal marsh. Front. Ecol. Evol. 11:1171245. doi: 10.3389/fevo.2023.1171245*

The 2022-2026 Science Action Agenda emphasizes the importance of developing tools that will facilitate management of invasive species through Action 3E: “Synthesize existing knowledge and conduct applied, interdisciplinary research to evaluate the costs and benefits of different strategies for minimizing the introduction and spread of invasive species, and to inform early detection and rapid response strategies.” *Phragmites australis*, the common reed, has spread rampantly through Suisun Marsh in the last decade, and the best strategies for control likely involve early detection and rapid response of new patches,

followed by efforts to decrease the expansion of larger patches. Once established, *Phragmites* patches serve as a source of seeds and can promote rapid expansion elsewhere.

Unfortunately, early detection and rapid response (EDRR) to *Phragmites* patches in Suisun Marsh is complicated by several factors. First is the fact that Suisun Marsh is a mosaic of managed wetlands surrounded by levees, with controlled inflow, and tidal wetlands, and allowable treatment strategies (such as herbicides) are restricted in tidal wetlands to prevent dispersal into the estuary and threats to endangered species habitat. Second, Suisun Marsh also has a mosaic of ownership type, including both public and private, with historically little coordination on *Phragmites* management. Third, data has not been available to assess rates of *Phragmites* spread, locations of new patches, or effectiveness of treatment. The California Department of Fish and Wildlife publishes expert-developed vegetation maps for Suisun every three years, depicting the distribution of vegetation for the previous three years, which does not provide ample time for an EDRR response.

To address data challenges associated with EDRR for *Phragmites australis* management, Jason Hagani from the Suisun Resource Conservation District and team developed an approach to automatically generate vegetation maps from publicly available aerial imagery collected through National Agriculture Imagery Program (NAIP) of the U.S. Department of Agriculture. The imagery was available from 2003 to 2023, at a 3-year increment until 2009 but at a two-year frequency since then. They found that their maps could identify *Phragmites* patches at 90% accuracy, which is comparable to the expert-developed vegetation maps, but that their artificial intelligence-powered approach could produce the vegetation map within days, facilitating the identification of new patches when there is still an opportunity to treat them.

In applying their new mapping technique to the available imagery, the research team found that *Phragmites australis* is expanding more rapidly in Suisun Marsh than has been reported elsewhere, suggesting that Suisun Marsh may have characteristics that make it particularly susceptible to *Phragmites* invasion. These characteristics likely include frequent dry years, when expansion rates were observed to be high in the dataset. However, despite widespread expansion of *Phragmites australis* in Suisun Marsh overall, declines were observed in some land parcels, predominantly in managed wetlands, where most treatment has occurred. While there was no available data about where and when *Phragmites* treatments have been applied, the researchers suggested that their observations likely provide some indication of the potential success of treatment.

Results also indicated that expansion within a parcel is more likely when the parcel is surrounded by other parcels with *Phragmites australis*, whether or not levees separate the two locations. Thus, the research team concluded, it is important to coordinate EDRR efforts regionally. Such coordination may now be more possible with the new tools that they developed, enabling the generation of vegetation maps that reflect the current condition with publicly available datasets. Last, they called for more research on the social aspects of *Phragmites australis* management, including decision-making processes.

Delta Science Program Activities

Delta Independent Science Board Workshops

The Delta Independent Science Board (Delta ISB) provides oversight of the scientific research, monitoring, and assessment programs that support adaptive management in the Delta. This is achieved by reviewing "programs" by thematic areas or by reviewing specific products related to adaptive management. Current thematic reviews include subsidence and food-webs.

From **October 19-20,** the Delta ISB hosted a workshop to inform its review on subsidence (the sinking of the land surface). Subsidence increases pressure on levees and heightens the chance of flooding of individual islands and saltwater penetration further into the Delta. The workshop consisted of presentations from local science experts and panel discussions to understand management practices and evaluate the state of science. Information obtained will help inform recommendations to fill knowledge gaps on managing subsided lands in the Sacramento-San Joaquin Delta.

From **November 8-9,** the Delta ISB hosted a workshop to evaluate the degree to which the inclusion of food-web interactions across different levels of the food chain could benefit and facilitate ecosystem management and whether the available data and science can support the development of tools (such as models). It included presentations from scientists, managers, and stakeholders with experience in food-web dynamics.

If you missed either workshop, you can watch the recordings on Cal-Span (available here: https://cal-span.org/meetings/DISB/).

Tidal Wetland Restoration Symposium

The Tidal Wetland Restoration Symposium, hosted by the State Water Contractors and California Department of Water Resources, took place on November 1. Workshop goals were to: 1) provide a forum for wetland researchers and restoration managers to collaboratively discuss the state of the science surrounding tidal wetland restoration for at-risk fish species, 2) identify high-priority science activities needed to fill knowledge gaps,

and 3) identify high-priority adaptive management activities needed to maximize effectiveness of wetland restoration. The Symposium featured presentations and discussions about the latest research on tidal wetland restoration for support of native fishes in the Delta and Suisun Marsh, including how species respond to restoration. It also featured a panel on adaptive management led by Delta Science Program Environmental Program Manager Dylan Chapple. A recording of the Symposium can be accessed here: https://www.youtube.com/@swcscience6994.

Delta Breeze Newsletter

The fall edition of the Delta Breeze newsletter was released earlier this month and is accessible here: https://bit.ly/465ZiX5. As discussed in last month's Lead Scientist Report, the theme of the newsletter is open science—the global movement to make scientific research processes and products accessible to all.

By the Numbers

Science Program staff will summarize 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

Attachment 2: Visual Summary of Article

Contact

Dr. Laurel Larsen

Delta Lead Scientist

Phone: (916) 275-6888