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Regional  
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Program

## People & Wetlands Indicators Proposal

Date: December 4, 2023

To: WRMP Steering Committee

From: WRMP Staff

Subject: Proposal to adopt new Monitoring Questions, Indicators, and Special Studies into the Science Framework as recommended by the People & Wetlands Workgroup

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### Background on the People & Wetlands Workgroup

WRMP staff proposed formation of the People & Wetlands Workgroup in March 2022 to further develop the human dimensions of the WRMP under an EPA Wetland Program Development Grant. The workgroup is also supported by the San Francisco Bay Restoration Authority (SFBRA) and the State Revolving Fund for development of indicators that inform progress on SFBRA equity goals and can be used as State of the Estuary Report indicators for the human dimensions of estuarine health. Ideally, WRMP human dimensions and equity indicators will meet the needs of multiple entities to maximize alignment and efficiency.

The WRMP Program Plan articulates the Program's interest in monitoring the interactions between people and wetlands under Guiding Question 5: "How do projects to protect and restore tidal marshes affect public health, safety and recreation?" Management Questions under this Guiding Question were initially developed to focus on mosquito and disease vector control to address the public health aspect, while also stating that "the WRMP intends to assess other aspects of the relationship between tidal marsh restoration and human health and safety and recreation, including appropriate access to open space and flood management benefits and risks, with special regard for environmental justice and social equity considerations."

Further developing the questions and indicators under Guiding Question 5 can help the WRMP connect to communities and understand the broader ways of assessing wetland health, processes, and functions. In addition, developing indicators and Standard Operating Procedures for monitoring interactions between people and wetlands makes available new lines of potential funding opportunities for the WRMP that would otherwise be inaccessible to the program. Data on human-wetland connections can support advocacy for additional regional funding, inform design and adaptive management of wetland projects, provide new perspective on the effectiveness of efforts to sustain healthy aquatic habitats and resources, and more.

Adding indicators to measure the wetland benefits that communities and Tribes value can enable the WRMP to evaluate whether these benefits are being provided equitably. Furthermore, community and Tribal knowledge will help us better understand the Estuary's wetlands. An increasing focus on equity and human connections to wetlands aligns with the more holistic ways that other regional entities and programs are beginning to view restoration and management, such as the inclusion of benefits to disadvantaged communities and involvement by youth and volunteers in the San Francisco Bay Restoration Authority's Performance Measures for restoration projects.

The People & Wetlands Workgroup was approved by the Steering Committee in March 2022 to pursue the following:

- Re-evaluate the Guiding and Management Questions associated with human/wetland interactions. Suggest revisions and additions as needed to reflect interactions with people. Consider the driving forces of WRMP monitoring, such as connections to SFBRA Performance Measures and information needs of decision-makers.
- Identify priority monitoring questions and indicators for understanding the connections between people and wetlands.

- Determine metrics and data collection protocols and/or standards for monitoring the priority indicators.
- Increase the inclusion of different forms and sources of knowledge and identify ways to serve the information needs of different groups.

Following Steering Committee approval, WRMP staff began recruiting workgroup members and reviewing scientific literature and other monitoring programs to inform development of indicators for the WRMP. The workgroup has met nine times since October 2022. WRMP staff have also consulted with decision-making audiences for potential indicators to inform this proposal, including the SFBRA Advisory Committee and Equity Ad Hoc Subcommittee, Bay Conservation and Development Commission (BCDC) staff, and Delta Stewardship Council staff (for alignment with human dimensions indicators in the Delta).

## Workgroup Composition

The People & Wetlands Workgroup comprises experts in environmental justice, environmental education, regulatory agencies, social science, and more. Workgroup members include Steering Committee and Technical Advisory Committee representatives in addition to external experts. The full roster is available [here](#).

The workgroup is co-facilitated by Keta Price (Hood Planning Group) and Denise Walker (SFEI), with planning and coordination by WRMP staff.

## Management Questions

The Steering Committee approved the following Management Questions recommended by the People & Wetlands Workgroup in June 2023. The recommended Monitoring Questions, indicators, and metrics in the following section have been developed to address these Management Questions:

1. [Revised] MANAGEMENT QUESTION 5B: What monitoring data and/or analyses are needed to improve the relationships between tidal marsh restoration, fish and wildlife support, mosquito and vector control, and public access?
2. [New] MANAGEMENT QUESTION 5C: How are the benefits of wetlands (such as flood protection, water quality, public access, opportunities for community stewardship, knowledge production & transmission, and cultural & spiritual experiences) distributed regionally and among different demographic groups?
3. [New] MANAGEMENT QUESTION 5D: How does the provision of benefits (such as flood protection, water quality, public access, opportunities for community stewardship, knowledge production & transmission, and cultural & spiritual experiences) progress over time at existing and restored wetland sites?

## Monitoring Questions, Indicators, Special Studies

The workgroup proposes for the following Monitoring Questions, indicators, and special study to be added to the WRMP Science Framework. In the near term, this means adding rows to the living [Monitoring Matrix](#) and identifying funding or opportunities to pursue development of SOPs and indicator products (e.g. new grants not applicable to biophysical monitoring, fellowship projects creating visualizations and calculating metrics). Over the longer term, these will also be incorporated into the Monitoring Plan and Implementation Plan (subject to the review process for those documents).

Indicators described as “equity indicators” are primarily products, with associated metrics, that evaluate the distribution of environmental features or qualities through a social lens (e.g. how water quality varies between wetlands adjacent to environmental justice communities and wetlands adjacent to other communities around the Bay). Indicators described as “human dimensions indicators” are intended to monitor social aspects of wetlands, such as how people are interacting with wetland spaces and involved in wetland stewardship. These human dimensions and equity indicators will be adapted as needed to ensure they address continued information needs. Some indicators may serve as initial, baseline products to guide other long-term monitoring.

## Topics & Monitoring Questions

Inclusive access:

- How is wetland access, including quality of access, distributed around the estuary? How does access vary between environmental justice (EJ) communities and other communities?
- At wetland sites where public access is allowed, what are levels, types, and demographics of usage?

Flood protection:

- What level of flood ~~protection~~ risk reduction are wetlands and wetland projects providing to nearby communities around the estuary? How do flood ~~protection~~ risk reduction benefits to EJ communities compare with benefits to other communities?

Engagement, learning, and stewardship:

- To what degree are communities and Tribes involved in wetland stewardship, learning, and engagement activities, and what are the demographics of those involved?

Water quality:

- How does water quality in wetlands proximate to EJ communities compare with water quality of wetlands proximate to other communities?

## Low Hanging Fruit Indicator Recommendations

*Low cost/effort, leveraging or analyzing existing data, involving minimal new data collection in the near term. See proposed [People & Wetlands Monitoring Matrix additions](#) for more details on potential metrics, data types/sources, overall workgroup priority, and other criteria. Indicators for this section are listed in order of workgroup priority. Indicators may be pursued out of order depending on Steering Committee priorities, availability of staff/partners with appropriate expertise, opportunistic funding, and coordination with related efforts.*

*Note: Many of these indicators reference environmental justice (EJ) maps and EJ communities. There are many definitions and maps of EJ and socially vulnerable communities; the workgroup may recommend a definition for the WRMP to use and will aim to set up equity indicators and products that can be tailored to definitions used by different decision-makers.*

- A. Regional map of wetland restoration projects and their stated benefits (flood protection, water quality improvement, wildlife habitat, and public access), overlaid with EJ maps. *Tentative frequency: updated annually.*

This equity indicator evaluates how wetland restoration projects and their stated benefits are distributed regionally and in relation to EJ communities. For example, are the public access projects clustered in a certain area? In combination with EJ maps and other indicators below, where are there EJ communities and areas with less or lower quality public access that are underserved by projects? SFBRA projects can serve as a starting point for this indicator, as these projects are already mapped and coded with their stated benefits (Measure AA program areas align with the benefits listed in the indicator title). Additional projects could be added from EcoAtlas Project Tracker, with benefits coded through text analysis of project documentation (leveraging related efforts by UC Davis researchers and a working group organized by the Delta Science Program) and/or a new field in Project Tracker for reporting these benefits.

- B. Regional map of wetlands with nearby public access and key amenities/features, overlaid with EJ maps. *Tentative frequency: updated every 5 years.*

This equity indicator evaluates how public access is distributed regionally and relative to EJ communities with a greater level of information than the map of projects above, such as metrics about quality of access (presence of key

amenities and features like bathrooms, picnic tables, interpretive centers). In combination with EJ maps, this public access map can inform funder decisions about selecting and suggesting additional public access considerations for projects, regulatory (BCDC) decisions about what amenities/features are needed at a particular proposed site, and project implementers planning and justifying the need for projects providing public access improvements. This indicator would synthesize existing datasets (Bay Trail, BCDC permitted trails, publicly available data on amenities/features) and make them more useful. Other agencies or efforts may be more appropriate leads for producing this map (BCDC, SFEI's Shoreline Resilience Framework); the WRMP's role may be to recommend workgroup ideas to these groups and calculate metrics based on maps that others produce.

C. Regional map of wetland wave attenuation metrics (modeled capacity to attenuate waves to a safe height), overlaid with EJ maps. Tentative frequency: updated every 5 years.

This equity indicator evaluates how one aspect of wetland flood ~~protection risk reduction~~ is distributed regionally and in relation to EJ communities at a greater level of detail than the map of projects above, by ~~evaluating where modeling the ability of~~ wetlands ~~are and are not wide enough~~ to attenuate waves to a safe height. This indicator can inform funder decision-making about project selection, regional planning about restoration for climate resilience, and community organizations and project implementers justifying the need for projects improving flood protection. This indicator is derived from the Baylands Change Basemap (Indicator 1) and can be reproduced based on updated maps using code developed by the Shoreline Resilience Framework (SFEI). The role of the WRMP would be to visualize and interpret the recently produced wave attenuation map(s) in a new way and calculate new summary metrics. This could be made more robust by incorporating ground truthing of modeled wave attenuation, and could be augmented with indicators for other aspects of wetland flood protection (e.g. wetland capacity to absorb and hold water).

D. Temporal trends in proportion of wetland decision-makers from underrepresented groups. Tentative frequency: updated every 2-3 years.

This human dimensions indicator tracks the diversity of perspectives on committees that make decisions about wetlands (such as percent of committee members representing EJ communities or Tribes, or percent identifying as people of color). Trends in this indicator can inform committee managers about whether progress is being made on recommendations from the public and community-based organizations to include community voices and diverse backgrounds at the table. In combination with other indicators, this can be used to evaluate whether increased diversity in stewardship and education program participants, improved public access near EJ communities, and other factors lead to increases in committee members from underrepresented groups by getting more people from these groups connected with shoreline areas and increasing their capacity to engage on committees. This could be measured with low effort through a survey distributed to established committees (e.g. those affiliated with the WRMP, SFBRA, SFBJV) and project proponents.

E. Map of basic water quality metrics (dissolved oxygen) & nearshore contaminants, overlaid with EJ maps. Frequency TBD, depends on available data.

This equity indicator evaluates how two aspects of water and environmental quality (dissolved oxygen and nearshore contaminants) vary between EJ communities and others. Funders can use this information to inform selection of projects that improve water quality (e.g. by increasing tidal flow/flushing), and community groups can use it to inform where accessible shoreline areas may be unsuitable for fishing, other uses, or need cleanup or further contaminant testing. Initial maps would use nearshore contaminant data from the Regional Monitoring Program for Water Quality (Bay RMP) and would be enhanced with future dissolved oxygen data collected by the WRMP (Indicator 18). A map of CRAM scores (Indicator 11) could also be added as an assessment of how general wetland condition varies near EJ and non-EJ communities, though this was not identified as a priority by the workgroup.

## More Involved Indicator Recommendations

*Moderate cost/effort, new data collection protocols needed. See proposed [People & Wetlands Monitoring Matrix additions](#) for more details on potential metrics, data types/sources, overall workgroup priority, and other criteria. Indicators for this section are listed in order of workgroup priority. Indicators may be pursued out of order depending on Steering Committee priorities, availability of staff/partners with appropriate expertise, opportunistic funding, and coordination with related efforts.*

- F. Temporal trends in wetland restoration projects reporting paid community or Tribal partners, public meetings, and outreach strategies to EJ communities or Tribes. *Tentative frequency: updated every 2-3 years.*

This human dimensions indicator tracks the degree to which projects are engaging EJ communities and Tribes in wetland stewardship (i.e. as funded partners or through targeted public outreach in restoration planning or implementation). Trends in this indicator can inform funders about whether progress is being made on recommendations from the public and community-based organizations to meaningfully include community perspectives and partners in project planning and implementation. This may also inform regulators with equity policies (BCDC) about trends in projects meeting the intent of those policies, or may be informed by criteria that regulators already use to evaluate compliance with equity policies. These data could be collected with low effort through collaboration with funders and/or regulators. For example, the People & Wetlands Workgroup could help develop criteria that funders could use to categorize projects based on planned engagement and partnerships, and funders could share summary data with the WRMP, or the workgroup could suggest questions/metrics for funders to incorporate into final report templates. Identifying case studies of successful outreach strategies could be an additional action related to this indicator to help restoration practitioners share lessons learned.

- G. Spatial and temporal trends in visitation estimates, visitor origins, reasons for visiting, and demographics. *Tentative frequency: updated every 5 years.*

This human dimensions indicator measures levels, types, and demographics of visitation to publicly accessible wetland areas to inform decision-making on public access. This indicator can help land managers understand their visitors and make decisions about management changes (e.g. new amenities, features, programs) tailored to current visitors or targeted to new groups. It can also help funders evaluate whether sites are equitably serving local communities and inform both funders and regulators about amenities and features based on visitor demographics and types of uses. Initially, the WRMP could inventory existing data and methods for monitoring visitation and make them publicly available for decision-making audiences. A later step could be to develop a visitation SOP that standardizes the methods, meets decision-maker needs, and could be adopted by land managers and/or implemented by the WRMP. In combination with other indicators and special studies, we can better understand whether changes to public access (amenities, features, other factors that make people feel more safe or welcome) and participation in stewardship and education programs lead to increased visitation by local communities. Inventorying visitation data could also include learning about existing data or data gaps pertaining to public access/wildlife relationships.

- H. Temporal trends in representative participation in stewardship and education events/programs. *Tentative frequency: updated annually.*

This human dimensions indicator monitors numbers and demographics of participants in stewardship and education events/programs, such as volunteer planting days and internships. This indicator can help managers understand who their programs are reaching, learn from other programs successfully reaching target demographic groups, and adapt programs accordingly. Funders can use this indicator to evaluate whether projects involving stewardship and education are equitably serving communities if managers report this information associated with specific events/projects. An initial step would be to compile a list of known organizations that run these programs and identify what demographic information they already collect about participants. The WRMP could then develop

standardized demographics questions in collaboration with some of these organizations, and willing organizations/programs could add those questions to their existing participant surveys/sign-up forms and provide summary information to the WRMP on an annual basis.

## Special Studies

Inclusive access: [Sense of belonging](#)

A particularly important question raised by the People & Wetlands Workgroup has been: “How safe and welcome do people in different demographic groups feel in publicly accessible wetland spaces?” Several workgroup and Steering Committee members have shared stories of frontline community members and people of color not wanting to visit nearby shoreline areas because they feel unsafe, unwelcome, or like they don’t belong. We are recommending a special study on this topic to pilot a method for gathering information on sense of belonging and using it in decision-making.

An objective of the special study would be to identify whether there are communities or demographic groups that do not feel a sense of belonging around the baylands, where they are located, and factors that positively or negatively influence their sense of belonging, with a particular focus on EJ communities. The goal would be to inform decision-makers about these factors so they can address them and improve equitable access to the mental and physical well-being benefits of visiting the Bay’s wetlands. Initial steps could include a literature review about factors associated with sense of belonging (including reviewing past surveys done on this topic) and working with one or several community-based organizations to gather qualitative information from community members through interviews or focus groups.

By identifying these factors (e.g. more programming & outreach, signage in different languages, etc.), and monitoring visitation rates and demographics (see recommended indicator above), we can evaluate whether management changes to these factors lead to greater visitation by historically underserved groups and local communities.

## Other Indicators Considered (Not Currently Recommended)

These indicators were not prioritized by the workgroup or were an uncertain fit given the WRMP’s wetland focus. These could be reconsidered depending on Steering Committee interest/support.

- [Spatial and temporal trends in safety of eating wetland-associated foods.](#)  
This indicator could help people who consume wetland-associated foods (fish, shellfish, edible parts of plants) make informed decisions about where they can (or cannot) safely harvest these foods. People who depend on these foods in the Bay are disproportionately low-income and people of color ([SFEI 2000](#), [Antinori et al. 2022](#)). Some interest in this topic has been expressed by Tribes, and this indicator could be explored further with interested Tribal partners.
- [Map of relative trash metrics \(collected by community monitoring\) at wetlands, overlaid with EJ map.](#)  
The workgroup discussed trash as a factor that may make people feel less safe and welcome at wetland sites, and was interested in a community-based monitoring program for trash, but this was not identified as a priority in relation to the other indicators. However, we believe this indicator has management relevance (targeting upstream trash pickup or trash prevention efforts) and likely sources of funding.
- [Map of water quality metrics relevant to safe recreation \(bacterial levels for swimming\), overlaid with EJ map.](#)  
The workgroup identified a need for improved access to information about swimming safety along the Bay shoreline, and consideration for testing at unofficial swimming spots (where testing is not required because an area is not designated as a public beach). Because many swimming areas in the Bay are not adjacent to wetlands, staff will identify appropriate decision-makers with whom to share the workgroup’s recommendations.

## Contact

For questions about this workgroup, please contact Alex Thomsen ([alexandra.thomsen@sfestuary.org](mailto:alexandra.thomsen@sfestuary.org)).