Best Practices for Building Effective and Culturally Relevant Wetland Monitoring and Assessment Programs

December 2023

This report has been prepared as part of the *Working With Tribal Communities to Build Wetland Program Capacity* project, a joint effort between the National Association of Wetland Managers (NAWM) and Saint Mary's University of Minnesota GeoSpatial Services (SMUMN-GSS). The report includes an introduction to monitoring and assessment for tribal wetland programs; describes "best practices" or "lessons learned" for developing a wetland monitoring and assessment program; and provides information on incorporating cultural relevance into a wetland program.

Introduction

Monitoring and assessment are key components of tribal wetland programs for many reasons. Most notably, they can help tribes establish a baseline for the extent, condition, and function of their aquatic resources. Establishing this baseline allows for detecting changes and observable trends over time. Monitoring and assessment can also provide data towards establishing and informing regulatory programs (e.g., whether standards or permit conditions are being met) and can help prioritize wetlands for protection or restoration (EPA 2022).

The EPA recently provided guidance to tribes on establishing a wetland program, including a monitoring and assessment component, in "Protecting Waters and Wetlands in Indian Country: A Guide for Developing Tribal Wetland Management Programs" (EPA 2022). The guide describes the EPA's recommended three-tier framework for wetlands monitoring and assessment:

> **Level 1:** Landscape assessments, which rely on coarse landscape-scale inventory information, typically gathered through remote sensing and stored in a GIS format; can provide a rough gauge of wetland condition within a watershed.

> **Level 2:** "Rapid assessment" level of monitoring, with site-specific field observations using relatively simple metrics or measures to assess wetland condition or functions based upon readily observable information at the wetland site scale.

> **Level 3:** Intensive site assessments involving a more rigorous approach to collecting data and measuring or assessing wetland condition; provides more precise measures for assessing wetland condition and understanding the ecological processes or functions the wetland performs.

The guide also notes that wetland monitoring and assessment programs typically start with a Level 1 inventory of wetlands, often supplemented by Level 2 (rapid assessment) ground-truthing of a sub-sample of the wetlands. The Roundtable Workgroup, comprised primarily of tribal representatives, recommended some common questions to ask when developing a

monitoring and assessment program (EPA 2022, see p. 12). In their Core Elements Framework (EPA 2023), the EPA has offered a "menu" of possible actions and activities that tribes could draw from during the different phases of monitoring and assessment program development (Appendix A).

"Best Practices" for Monitoring and Assessment

The EPA Office of Water has defined a 'best practice' as "a process or methodology that consistently produces superior or innovative results" (EPA 2017). Throughout the extent of this grant project, NAWM and SMUMN-GSS have repeatedly heard several "lessons learned" or tips for developing a wetland monitoring and assessment program (or a wetland program in general) from tribal advisory work group members and webinar presenters. These recommendations or "best practices" are summarized here.

1. Identify your tribe's wetland goals and objectives and design your monitoring and assessment program to help meet those goals/objectives. Consulting with tribal leadership, elders, and other tribal natural/cultural resource departments can help refine these goals, ensure they are consistent with overall tribal goals, and build community support.

In NAWM's April 2023 webinar, Chippewa Cree Wetlands Coordinator Bubby Gopher shared that their program on the Rocky Boy Reservation deferred to local elders for their sweetgrass population monitoring design, objectives, and to establish appropriate protocol during sweetgrass observations. Elders are also consistently consulted to locate all known sweetgrass populations and for information on population size and abundance at historic sweetgrass sites. In interviews, the elders described sweetgrass characteristics/properties and the traditional method of "picking" to encourage further sweetgrass growth.

Table 1. Examples of Tribal Wetland Program goals and/or objectives, according to Wetland Program Plans (found on EPA WPP website). Tribes underlined in the table include links to a webinar with more information on their programs.

Tribe (State)	Goals/Objectives
Stockbridge-Munsee Community (WI)	• Preserve the extent and functions of wetlands that are intact and benefitting Tribal members. • Enhance Tribally-owned wetlands that are degraded from historical and ongoing land uses. • Restore Tribally-owned wetlands that were historically converted and are located in positions that will improve water quality and fish and wildlife habitat on Tribal lands. • Restore non-tribally owned wetlands that are positioned upstream and will help improve water quality and fish and wildlife habitat on the reservation.

Tribe (State)	• Goals/Objectives
Grand Portage Band of Lake Superior Chippewa (MN)	• Determine wetland quality and quantity and measure changes over time • Develop wetland-specific water quality standards • Ensure no net-loss of wetlands • Uphold the current regulations protecting wetlands and identify opportunities for future expansion.
Saint Regis Mohawk Tribe (NY)	• Focus on the biological aspects (inventory) of wetlands, including undeveloped areas, based on the premise that the community of plants and animals living in a wetland will reflect the health of that wetland. • Reduce the amount of wetland drainage and destruction for the purpose of creating suitable areas for agricultural, residential, and commercial development. • Recreate basins previously drained for agriculture and other land uses in order to restore the historical configuration of the wetlands that formerly existed on any particular site. • Implement U.S. EPA approved water quality standards in order to manage ambient water quality, non-point source pollutants, construction activities, and direct discharges to waters throughout wetlands.
Kickapoo Tribe in Kansas (KS)	• Gain a greater understanding of the functionality and condition of wetland systems within the Reservation boundary by way of wetland monitoring and condition assessment. • Work to improve wetland condition and functionality through coordinating resources and collaborating with landowners and partners. • Promote public interest and knowledge of wetlands through education and information distribution. • Maintain a comprehensive inventory of wetlands. • Develop and enforce wetland definitions and regulations to further protect the land and its' resources.
Chippewa Cree Tribe (MT)	• Develop headwater wetland water quality standards, preserve and restore headwater wetland condition to improve downstream water quality, protect invaluable wetland cultural resources and to ensure no-net-loss of wetlands
Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians (OR)	• To protect and preserve existing healthy Tribal wetlands for their ecosystem services and cultural significance. • To restore the function and extent of unhealthy Tribal wetlands for the ecosystem and cultural services they provide. • To establish long-standing partnerships with state and local agencies, stakeholders, and private land owners, and encourage integrated decision making that supports Tribal wetland protection and restoration.

2. Don't try to reinvent the wheel. Review what other tribal programs have done; reach out to peers or regional working groups to ask questions. Also, talk with your EPA regional tribal wetland contact (find contact information here). The EPA's Tribal Wetland Management Program Guide includes a case study of the Pacific Northwest (PNW) Tribal Wetlands Working Group (TWIG), formed in 2010 to share wetland and aquatic resource restoration and monitoring techniques, tribal approaches, and learn from one another on reservations across the Northwest (EPA 2022, p. 56-57). The group hosts trainings for its members twice each year, some of which were recorded and have been shared online (available through the Snoqualmie Tribe Youtube channel).

The NAWM tribal wetland program page includes a "Wetland Program Explorer" (Figure 1), where users can click on a tribe/native community on a map and view information about their program (e.g., TAS status, grants/funding received). Tribal wetland staff may use this app to find tribes in their region that have experience with a particular grant or program that they are interested in pursuing and who may be able to offer guidance or advice.
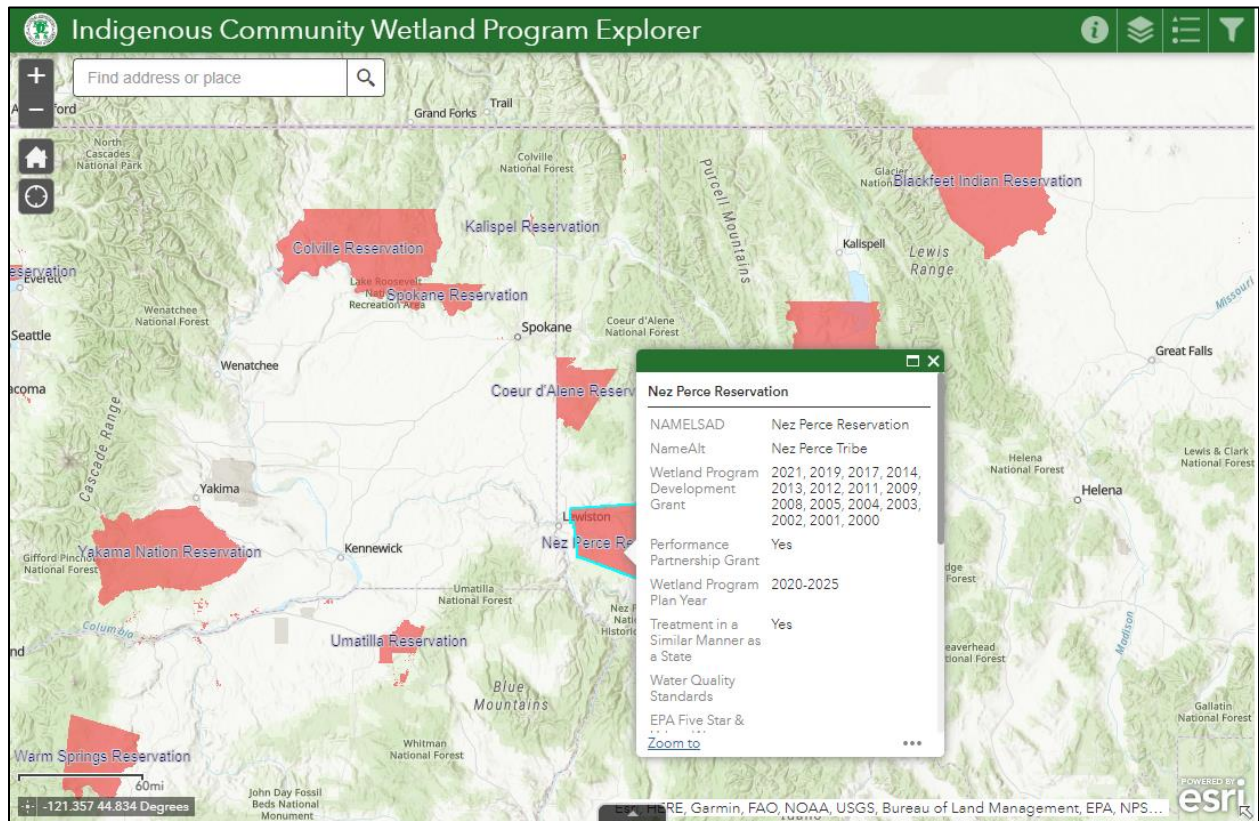

Figure 1. Screenshot of the "Wetland Program Explorer" on the NAWM Tribal Wetland Program webpage, showing the pop-up window for the Nez Perce Tribe of Idaho.

3. Be realistic. It's better to start small and grow than to go big and be discouraged if you don't succeed. For example,

- Know what your resources are (staff expertise, funding, equipment, etc.) and don't bite off more than you can chew. This also includes knowing what your wetland resources are (e.g., type, location, condition) – many programs start off with a wetland inventory/mapping to learn what they are working with.
- Planning and funding applications will likely take longer than expected. Give yourself enough time for review/approval by tribal leadership or other departments. For grant applications, familiarize yourself with the submittal process in advance – some online systems require setting up an account, which may take several days or more to complete.
- Some grants are highly competitive, with many more applicants than awards available. If your first application is not approved, ask for feedback to improve your application for next time around.
- There will be complications in monitoring and assessment – be prepared to adapt. Methods that seem sound and realistic in theory may prove to be impractical in the field. Also, program resources can change over time and often trigger re-evaluation and adjustments.

Several tribes shared their stories of wetland program development and the wetland program development grant application process in our September 2022, December 2022, and February 2023 webinars.

4. Have a data governance/sovereignty policy or data use agreement for working with agencies/contractors/partners to protect culturally sensitive information. A growing movement for indigenous data sovereignty advocates for "the right of Indigenous peoples and nations to decide what data development occurs and the controls over the collection, governance, ownership, and application of data about their peoples, territories, lifeways and natural resources" (Lovett et al. 2019, p. 26). According to a 2020 Native Nations Institute Policy Brief, a data governance policy helps Native Nations/Tribes articulate "the appropriate methods by which to collect, store, analyze, and use data and, as a result, the appropriate way to conduct research" within the nation's/tribe's jurisdiction (Hiraldo et al. 2020). The Collaborative Research Center for American Indian Health released a data management toolkit (CRCAIH 2019) that includes an example of a data use agreement.

A data governance policy or data use agreement could be part of a larger data management plan. Preparing a plan that outlines what you're going to do with the data you collect and how, *before* that data starts accumulating can make data management more efficient and less stressful. Documenting and organizing this information will also make it easier for future staff and data users to understand and implement the process.

Another potential approach or tool to protect data sovereignty, tribal rights, and traditional knowledge is to develop research regulations and a permit system for any research not specifically requested or contracted for by the tribe. The Coeur d'Alene Tribe has adopted Tribal Research Regulations and requires external researchers to apply for a permit, which requires researchers to agree to the tribal regulations. The Coeur d'Alene Tribe also worked with the University of Idaho to publish a Protocol and Best Practice for the Research on and Public Distribution of Information from Projects involving Indigenous Peoples (Campbell et al. 2015). The introduction to the research permit application reads:

> *"…it is the Coeur d'Alene Tribe's expectation that research conducted within our homeland is done so with respect for all members of our community, including people, plants, animals, water and land; that it is done with reciprocity, understanding its benefits to both the researcher and our community; that the researcher does so through relationship in our community that embraces and upholds the five pillars; and that the researcher carries the responsibility of ensuring that his or her research is conducted in an ethical way that benefits the Coeur d'Alene people."*

Incorporating Cultural Relevance into a Wetland Program

Culture and science – particularly indigenous cultures and "western" science – are often seen as separate and sometimes opposing worlds. However, there is increasing recognition that scientific studies can inform cultural resource management and traditional cultural knowledge can inform/guide scientific study. The following sections provide information on recently-developed federal guidance on integrating indigenous knowledge into management and some guidance from tribes.

Existing Federal Guidance on Indigenous Knowledges/Traditional Ecological Knowledges

The EPA's Guide for Developing Tribal Wetland Management Programs recognized that wetlands and water resources are essential parts of many Indigenous/ Traditional Ecological Knowledges (IK/TEK), given their critical importance to tribal communities (EPA 2022). It defines IK/TEK as

> "the knowledge held by Indigenous cultures about the environment, the cultural practices that build on that knowledge, and the evolving relationship between humans and the natural world. It includes knowledge, practices, and beliefs that have developed over generations and in some cases centuries or millennia, passed down through storytelling, songs, dance, and ceremonies… Practically, IK/TEK offers techniques and stewardship principles to guide all activities within the natural world, including ecosystem management practices, as well as hunting, fishing, plant collection, cultivation, harvesting, and forestry." (EPA 2023, p. 10)

In November 2021, the White House Office of Science and Technology Policy (OSTP) and Council on Environmental Quality (CEQ) announced the initiation of new federal guidance on Indigenous Traditional Ecological Knowledge (ITEK), to elevate it in federal scientific and policy

processes (OSTP and CEQ 2021). Just over a year later, in December of 2022, the OSTP and CEQ released the new government-wide [guidance](#), along with an accompanying implementation memorandum for federal agencies. While this new guidance recognizes the value of ITEK, it also acknowledges the importance of "ensuring that Agencies appropriately include Indigenous Knowledge, while respectfully working with the Tribes and Indigenous Peoples who hold it" (OSTP and CEQ 2022, p. 5). The guidance recommends and describes the following principles and practices to help Agencies build and maintain trust to support Indigenous Knowledge (p. 8-12):

1. Acknowledge Historical Context and Past Injustice – "Agencies should acknowledge the history of the department or agency they represent, and the Federal Government broadly, when working with Tribes and Indigenous Peoples. Recognizing past injustice, while upholding Tribal treaty and reserved rights, and respecting Tribal and Indigenous communities, cultures, and values will assist Agencies in developing collaborative processes that are more equitable and inclusive of Indigenous Peoples and their knowledge systems."

2. Practice Early and Sustained Engagement – "When Agencies pursue policies that have Tribal implications, they must engage in regular, meaningful, and robust consultation with Tribal Nations consistent with the agency's Tribal consultation action plan, the Presidential Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships (Jan. 29, 2021), and Executive Order 13175 on Consultation and Coordination with Indian Tribal Governments (Nov. 9, 2000)."

3. Earn and Maintain Trust – "Agencies should proceed with patient and respectful persistence, and honest and transparent communication, to demonstrate that the desire to collaborate with and listen to Tribes and Indigenous Peoples is genuine."

4. Respect Different Processes and World Views – "Tribes and Indigenous Peoples may use decision-making processes substantially different from those used by Agencies and may approach issues from a different perspective."

5. Recognize Challenges – "Agencies should recognize that Tribes and Indigenous Peoples face obstacles to equitable collaboration, including: (1) mistrust or skepticism; (2) lack of funding, personnel, and capacity among Tribes and Indigenous Peoples to respond to Federal requests to engage; (3) lack of coordination and communication between Agencies may result in duplicate requests, causing frustration and extra work for Tribes and Indigenous Peoples; (4) changes in political administrations, budgets, and leadership priorities may affect relationship continuity and collaborative efforts; and (5) telecommunications infrastructure and lack of broadband or internet in rural areas."

6. Consider Co-management and Co-stewardship Structures – "such collaborations may help avoid challenges around and breaches of confidentiality or data, and imbalances in power and resources."

7. Pursue Co-Production of Knowledge – "Knowledge co-production is a research framework based on equity and the inclusion of multiple knowledge systems. It requires the full partnership of Tribes and Indigenous Peoples in all aspects of a research endeavor from the outset."

In spring 2023, the USGS's National Climate Adaptation Science Center (CASC) hosted a webinar series on how to integrate IK into Federal research and resource management programs. The series featured "Indigenous voices to explore ethical, legal, and scientific considerations for working within different knowledge systems and provides guidance reflecting best practices." Webinar recordings can be found on the CASC website.

Guidance for Working with Indigenous Knowledge-holders

Tribes and Indigenous communities often have world views and decision-making processes that vary from those of federal agencies and western science, including a unique connection to the lands and waters of their traditional homelands (OSTP and CEQ 2022). This can include different views of knowledge and information. During a forum at the June 2023 Society of Wetland Scientists annual meeting organized as part of this project, staff from the Tulalip Tribes of Washington shared the following advice for interacting with indigenous knowledge and knowledge-holders (Michelle Bahnick, pers. comm.):

- Information is a *gift*, not a right – don't assume people will give you information just because you ask for it.
- Balance sharing information with protecting sovereignty and tribal resources.
    - Don't assume you can share information.
    - Don't assume you know what information is sensitive and what is not.
    - Don't assume you know all the risks of sharing information.

For example, the online sharing of "citizen science" data, such as species observations, is growing in popularity. Anyone can share photos of plants and animals seen in the field in minutes with just a few taps or clicks. It is important for tribal staff and cooperators to keep in mind that this seemingly-simple information sharing about tribal lands/resources could have cultural or even legal ramifications that others are not aware of.

Additional Resources

Many of the resources created and collected for this project are available on the NAWM website at https://nawm.org/wetland-programs/tribal-wetland-programs.html

Guidelines for Considering Traditional Knowledges in Climate Change Initiatives (2014), by the Climate and Traditional Knowledges Workgroup (CTKW). Download at http://climatetkw.wordpress.com/guidelines/

Building Authentic Collaborations with Tribal Communities: A Living Reference for Climate Practitioners, by the Climate Science Alliance. Available at https://www.climatesciencealliance.org/info/meaningful-engagement.

Literature Cited

Campbell, L., R. Frey, and J. Kenyon. 2015. Protocol and best practice for the research on and public distribution of information from projects involving Indigenous Peoples. Coeur d'Alene Tribe and University of Idaho. Available at: https://www.sciencebase.gov/catalog/item/56ddf1e1e4b015c306fb22fa.

Collaborative Research Center for American Indian Health (CRCAIH). 2019. CRCAIH Research Data Management Toolkit: Version 2. Collaborative Research Center for American Indian Health, Sioux Falls, South Dakota.

Hiraldo, D., S. Russo Carroll, D. M. David-Chavez, M. B. Jäger, and M. Jorgensen. Policy Brief: Native Nation Rebuilding for Tribal Research and Data Governance. Native Nations Institute, University of Arizona.

Lovett, R., V. Lee, T. Kukutai, D. Cormack, S. Carroll Rainie, and J. Walker. 2019. Good data practices for Indigenous Data Sovereignty and Governance. Chapter 2 *in* Good Data. Daly, A., S. K. Devitt, and M. Mann, eds. Institute of Network Cultures, Amsterdam, Netherlands.

Office of Science and Technology Policy and Council on Environmental Quality (OSTP and CEQ). 2021. Memorandum for the Heads of Departments and Agencies: Indigenous Traditional Ecological Knowledge and Federal Decision Making. https://www.whitehouse.gov/wp-content/uploads/2021/11/111521-OSTP-CEQ-ITEK-Memo.pdf (accessed 12 July 2023).

Office of Science and Technology Policy and Council on Environmental Quality (OSTP and CEQ). 2022. Memorandum for the Heads of Departments and Agencies: Guidance for Federal Departments and Agencies on Indigenous Knowledge. https://www.whitehouse.gov/wp-content/uploads/2022/12/OSTP-CEQ-IK-Guidance.pdf (accessed 12 July 2023).

U.S. Environmental Protection Agency (EPA). 2017. National Water Program Performance, Trends, and Best Practices Report: Fiscal Year 2016. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 2022. Protecting Waters and Wetlands in Indian Country: A Guide for Developing Tribal Wetland Management Programs. U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 2023. Tribal, State, and Territory Wetlands Program Core Element Framework. U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, D.C.

Appendix A. List of wetland monitoring and assessment action and activity options by program phase, from the EPA's Core Element Framework (EPA 2023).

Table 1. Phase 1: Monitoring and Assessment Planning Considerations

Actions	Menu of Activities
a. Identify program decisions and long-term environmental outcome(s) that will benefit from a wetland monitoring and assessment program (i.e., develop a wetland monitoring strategy)	- Document program's long-term environmental goals - Identify programs that may use monitoring data (e.g., CWA section 401 certifications, restoration, permitting programs) - Collaborate with water quality programs in a state/tribe - Identify how wetland data can be used to implement watershed planning and integrated into existing water quality monitoring efforts, other critical issues like environmental justice and climate change, and emerging issues related to aquatic resource health and management
b. Define wetland monitoring goals and objectives, which generate data that serve management decision needs	- Coordinate with most relevant partners, for example: federal, state, tribal, and local agencies, universities, regional and national work groups - Examine other sources for monitoring information within the Tribe or State to identify monitoring objectives and goals - Define data needs and uses, including emerging issues
c. Select and integrate multiple designs to meet the full range of decision needs	- Determine classification scheme to group the type, class, and size of wetlands - Develop mapping system to be used as part of the sampling design (including how wetland inventory maps will be updated) - Describe site selection process - List/map universe of wetland resources using the National Wetland Mapping Standard from which sites could be selected if available - Determine which data are already available.
d. Select a core set of indicators to represent wetland condition or a suite of functions	- Identify indicators that are relevant for established monitoring objectives - Confirm indicators are scientifically defensible - Develop/select field method(s) and timing - Add supplemental indicators, including socio- economic indicators, to provide insight on wetland role in overburdened communities.

Table 2. Phase 2: Monitoring, Data Collection, and Assessments Considerations

Actions	Menu of Activities
a. Ensure the scientific validity of monitoring and laboratory activities	• Draft and peer review Quality Management Plan and Quality Assurance Project Plan • Develop Field Operations Manual • Select, prioritize, and peer review candidate site assessment indicators • Review Tribal/State environmental justice policies and data collection requirements • Review Tribal/State climate strategies and data needs at the regional and local level • Train staff in monitoring and assessment techniques
b. Monitor wetland resources as specified in strategy	• Conduct pilot monitoring projects (e.g., small-scale projects to test methods, calibrate, enhance reference network) • Develop a schedule for monitoring wetland resources • Engage or expand involvement in National Wetland Condition Assessment or intensification projects • Partner with other programs (e.g., fish, forest, highways), federal agencies, underserved or overburdened communities, academic institutions, or NGOs
c. Establish reference condition	• Define reference condition (the gradient from unimpaired to impaired) • Define reference standard condition (e.g., Best Attainable Condition, Least Disturbed Condition, Minimally Disturbed Condition, Historical Condition, Best Professional Judgment) • Determine process for measuring reference standard condition (e.g., reference sites, historical data) • Select reference sites using systematic approach
d. Track monitoring data in a system that is accessible, updated on a timely basis, and integrated with other state or tribal water quality data	• Design a data management system that supports program objectives • Administer and update data system so that state or tribal can use it for analysis. Plan for data storage in a location that is accessible to all users • Geo-reference data as it is gathered for reporting • Identify sites to sample repeatedly for a trend network • Integrate with other water quality data systems (e.g., State watershed planning databases)
e. Analyze monitoring data to evaluate wetlands extent and conditions/function or to inform decision-making	• Document data analysis and assessment procedures • Develop assessment method to determine condition thresholds relative to reference standard condition (i.e., departure from reference standard condition) • Establish baseline condition • Analyze changes in wetland extent or condition relative to reference conditions and/or in response to climate change • Assess wetlands status and trends (e.g., annual reporting of no net loss, net gain, or CWA section 305(b) reports for wetlands)

Table 3. Phase 3: Refinement and Wetland Management Decision-Making Considerations.

Actions	Menu of Activities
a. Evaluate monitoring program to determine how well it is meeting a Tribe/State's monitoring program objectives	• Develop schedule to evaluate monitoring program • Track program reviews • Ensure assessment method(s) are providing the necessary information • Make changes as necessary to the program • Review other wetland program elements (e.g., restoration, regulation, water quality standards) • Modify other aspects of wetland program as needed based on review of monitoring data • Plan for and consider long term needs – frequency of repeated monitoring, covering of cost, etc.
b. Evaluate the environmental consequences of a federal or state/tribal action or group of actions; modify programs as needed based on M&A data	• Inform state/tribal wetland permit decisions or determinations of "waters of the tribe" or "waters of the state" • Inform CWA section 401 certification decisions on federal licenses or permits • Inform CWA section 401(a)(2) reviews and objections to discharges from neighboring jurisdictions • Modify licensing/permitting or CWA section 401 certification practices as needed based on assessment information • Demonstrate the use of M&A data in decision making (e.g., list and track) including targeting risk reduction strategies in overburdened communities and mitigation of hazards related to climate change • Make data accessible to EPA and the Corps to help inform their determinations of federal jurisdiction
c. Improve the site-specific management of wetland resources	• Incorporate monitoring and analysis into restoration techniques • Establish ecologically meaningful benchmarks for gauging restoration success • Evaluate the performance of compensatory mitigation sites • Evaluate the ecosystem services provided by individual wetlands, consider using screening tools to connect ecosystem services to underserved or overburdened communities • Innovative mapping tool develop and use using the National Wetlands Mapping Standard (e.g., NWI plus and other refinement tools, consider including socio economic data to reflect underserved or overburdened communities) • Partner with other programs (e.g., fish, forest, highways), federal agencies, academic institutions, underserved/overburdened communities, or NGOs to share information, ideas, technologies

Actions	• Menu of Activities
d. Develop geographically defined wetland protection, restoration, and management plans	• Identify and prioritize management areas (e.g., identify vulnerable wetlands, prioritize restoration potential underserved or overburdened communities) • Incorporate wetlands into a comprehensive watershed plan that serves Tribal or State water quality management needs and addresses all waters • Evaluate progress toward meeting wetland objectives identified in other projects/programs (e.g., wildlife action plans, climate action plans, and water and equity strategies) • Inform broader watershed activities (e.g., reducing erosion, providing floodplain storage, reducing nutrient loading, reducing risks to underserved/overburdened communities)