**Motivations:**

1. A request to utilize the monitoring results from adaptively managed restoration sites in the San Acacia Reach to inform standardization was brought to the Program in 2021.
2. August 2021 Habitat Restoration Workshop identified three primary needs regarding habitat restoration in the MRG:
	* A need to inform adaptive management – maintenance thresholds
	* A need for more versatile restoration response metrics/indicators
	* A need for a standardized approach to measure restoration “success”
3. Habitat restoration is one of the “nonflow management actions” used to predict Rio Grande silvery minnow abundance in the integrated population model (Yackulic et al. 2022).
4. October 2022 Workshop on Management of Vegetated Islands and Bank-Attached Bars identified planning and research needs that would benefit from an ecosystem approach with characterization of ecosystem services, trade-offs and synergies at various spatial scales.
5. Several speakers at the October 2022 NM Water Conference discussed the importance of ecosystem services to resilience, as well as the important roles of agriculture in the modern MRG ecosystem.

**Questions for SAMC consideration:**

1. Do you agree that restoration efforts within the MRG could benefit from organization under a common framework?
2. Should we recommend development of an ecosystem-level conceptual model?
3. Should we recommend the use of ecosystem services to navigate complex management scenarios and to provide greater context for species-specific actions and decisions?
4. Do any of the tools or approaches listed below seem appropriate/adaptable for the MRG?

**I. Potential approach to standardized monitoring guidance for habitat restoration:**

* Sacramento-San Joaquin Delta Conservancy’s “Compendium of Resources, Protocols, and Guidelines for Environmental Monitoring”
	+ Stated purpose: *“…to provide guidance to project proponents and programs with the intent to enhance habitat restoration monitoring and data management in the Bay-Delta by providing a short overview of available resources and facilitate coordination in approaches among efforts*.”
		- For a quick summary, see the Overview Table on pages 23-24 of the Compendium (<http://deltaconservancy.ca.gov/wp-content/uploads/2020/02/Monitoring-Compendium-for-Habitat-Restoration-Projects.pdf>)
	+ Is consistent with the concepts and terms of California’s State Wetlands and Riparian Area Monitoring Plan (plus the tools EcoAtlas and the California Rapid Assessment Method)
	+ Uses the three-level classification system for assessments developed by the U.S. Environmental Protection Agency (USEPA).
		- Level 1 – Remotely sensed and Geographic Information System (GIS)- or model-derived landscape-scale assessment: aquatic resource and project inventories;
		- Level 2 – Field-based rapid assessment of the condition of aquatic resources at the project or site scale;
		- Level 3 – Field-based intensive site assessment of specific resource function and condition (e.g., biological assessment, water quality evaluation, diagnosing the cause of degraded conditions).
	+ For the MRG, we might consider adapting this compendium with three types of monitoring required for the State Wildlife Grants (SWG) Program to be consistent with the NM State Wildlife Action Plan (SWAP)
		- <https://nhnm.unm.edu/sites/default/files/nonsensitive/New-Mexico-State-Wildlife-Action-Plan-SWAP-2017_Links.pdf#Chapter11>
			* Type 1 - species and habitats
			* Type 2 - effectiveness of conservation actions
			* Type 3 - adaptive management
	+ If adapted for the MRG, this compendium would need to link to other resources being developed, to avoid any duplication of effort:
		- NM Conservation Information System <https://nhnm.unm.edu/data>
		- NM Water Data Initiative <https://catalog.newmexicowaterdata.org/>
* **FYI**: NM SWAP seems to be initiating a standardized monitoring framework already:
	+ “*A coordinated effort among resource managers to compile in a database and disseminate results of monitoring programs in the State in a format that is comparable between projects and over time should be a priority for SWAP implementation*.”
		- Stated purpose: “…*assessing whether the portfolio of implemented conservation actions is improving the overall status of wildlife species and habitats across the State*.”

**II. Potential assessment framework for ecological restoration:**

* Society for Ecological Restoration (SER) 5-Star Recovery Wheel
	+ Well-vetted by the restoration research community
		- Has been applied internationally
	+ Potentially very useful for tracking and quickly communicating changes in condition at restoration sites
		- Module attributes vary by habitat type, but visual presentation of results is standardized across all types
	+ Also useful for identifying research needs to fill-in unknown or poorly known attributes
* 2009 (ERDC) MRG Bosque Ecosystem Restoration Feasibility Study Habitat Assessment Using Habitat Evaluation Procedures (HEP)
	+ <https://apps.dtic.mil/sti/pdfs/ADA566399.pdf>
	+ Developed a driver/stressor-based conceptual model for MRGBER
	+ Used a single community-based functional HSI model (Bosque Riparian Community) for HEP calculation
		- Three categories were identified as the key functional components necessary to model the ecosystem integrity:
			* Hydrology
			* Structure/Soils/Biotic Integrity
			* Spatial Integrity and Disturbance
	+ Analysis does not appear to address trends in hydrology due to climate change and would need to be updated for more realistic projections
	+ Use of HEP is somewhat outdated, but generally accepted
		- Use of technical jargon and clunky presentation of results make it less effective as a communication tool for stakeholders
		- The HSI model used was certified by the Ecosystem Restoration Planning Center of Expertise (ECO-PCX) with One-Time Use Approval in April 2009

**III. Potential decision-support approach using ecosystem services:**

* Felipe-Lucia, M. R., F. A. Comín, and E. M. Bennett. 2014. Interactions among ecosystem services across land uses in a floodplain agroecosystem. Ecology and Society 19(1): 20. <http://dx.doi.org/10.5751/ES-06249-190120>
	+ Authors propose a classification of ecosystem services (ES) interactions that incorporates societal values as drivers of management decisions along with biophysical factors as likely causes of ES trade-offs.
		- Measured 12 ES (each with a specified indicator metric):
			* Climate regulation, gas regulation, nutrient regulation,
			* Soil stability, habitat quality,
			* Raw material production, food production, fishing,
			* Sports, recreation, education, and social relationships.
		- Seven common land-use types at three spatial scales:
			* Patch, municipality, and landscape, in a riparian floodplain in Spain.
	+ Results (scenarios analysis) illustrated that each land-use type provides unique bundles of ES and that the spatial scale at which measurements were taken affected the mixture of services.
	+ Authors “*expect this classification would be applicable to other ecosystems for trade-offs analysis. Knowledge about the driving forces that provoke trade-offs can improve management for multiple ES*.”
	+ Adapting this methodology to the MRG might help to simplify the complex management decision space by:
		- Comparing different actions with a common set of ES indicators,
		- Identifying optimal spatial scales for management actions,
		- Recognizing trade-offs, and
		- Capitalizing on synergies.
	+ Definitions applied to ecosystem services:
		- Trade-off: Situation in which land use or management actions increase the provision of one ecosystem service and decrease the provision of another. This may be caused by simultaneous responses to the same driver or caused by true interactions among services.
		- Synergy: Situation in which the combined effect of a number of drivers acting on ecosystem services is greater than the sum of their separate effects. In other words, a synergism occurs when ecosystem services interact with one another in a multiplicative or exponential fashion. These can be positive, i.e., multiple services improving in provision, or negative, i.e., multiple services declining in provision.