Site Selection Criteria: Monitoring the Effectiveness of Conservation Practices

Criteria	Considerations	Importance
Land cover, land use, and watershed characteristics	*Dominant Land Use and Basin Size* - Land use should predominantly ag, ideally >50 % ag and less than 5% urban (Dubrovsky et al., 2007). Consider focusing on small watersheds (generally < 100 square miles) where specific types of agricultural operations (i.e. dairy, poultry, or cattle) dominate sub watersheds and can be isolated to best monitor conservation practice effects.	Will help ensure water-quality monitoring is detecting ag land use and practices and will help assess how specific types of ag operations are responding to BMPs.
	Atypical land use – Avoid areas that may have a particularly salient feature(s) that are unrepresentative of the ag land use of interest (i.e. nursery, point sources, quarries, gas well pads, etc.)	Atypical land uses are not representative of baywide conditions. Impacts of features like point source reductions (i.e. wastewater treatment plants) mask water-quality response to other drivers.
	Change - Avoid areas that have recent past (~10 years), current, or planned future landscape scale land use changes away from agriculture. Land use changes associated with conservation practice implementations are acceptable.	Major changes in land use activities could confound our ability to identify conservation practice effects.
	Growing season - Site selections should span the varying latitude, elevation, and temperature ranges of the Bay watershed.	Nutrient uptake and transport vary based on climatic conditions.
	Geology - watersheds should be selected representing various physiographic/geologic settings in the watershed and will include a range of residence time.	The fate and transport of nutrients and sediment vary based on watershed characteristics in different physiographic provinces for instance, fate and transport of nutrients differ in carbonate vs noncarbonate settings. Will increase our ability to link watershed changes with water-quality response on management-relevant timescales.
	Flowpaths - sampling design should consider monitoring slow flow (groundwater), fastflow (runoff) and drainflow (tile drains, etc.). For instance, consideration should be given to issues such as legacy sediment and nitrogen in GW.	Monitoring different flowpaths within a watershed or choosing representative watersheds dominated by such flowpaths will help researches see conservation practice signals in water quality.
Existing/recent monitoring and monitoring infrastructure	*Existing Monitoring Data* - Ideally there should be existing long-term monitoring (>=5 years) across multiple hydrologic conditions (a combination of wet, dry, and normal rainfall conditions).	Typically, at least 5-years of data are needed for load analysis and 10 years for trend analysis.
	High Frequency – Preference for locations with, has had, or could be equipped with capabilities for continuous water quality monitoring (such as nitrate sensor, etc.).	Continuous monitoring provides better resolution of water-quality change response to land practices and could indicate system responses to unanticipated events and conditions.
	Scale and Nested design – Study design requires watersheds large enough to accommodate a nested monitoring and analysis approach. An example of descending sized watersheds might go from large watersheds (NTN, gaged; generally less than 100 square miles)-> small watershed (combination of practices, showcase) -> headwaters (less practices/types of operation)	Nested design will better detect changes of practices across spatial scales. In general, we are lacking information at smaller scale, which would represent "watershed-wide" conservation practice effects. It is important that smaller catchments can be related up to the larger watershed. If possible, a control site/monitoring location (upper watershed) in the nested design would be a benefit.

	-> field studies (individual practices, LTAR/CEAP; 10s of acres).	
	SW/GW – Basin studies should include both surface and groundwater monitoring	Nitrogen moves through groundwater; and in some settings groundwater is the dominant water source to streams and human use, so wells are needed to help understand conservation practice response.
	Fixed/Synoptic Sampling – Site selections should include watersheds that can accommodate both fixed monitoring and synoptic sampling for spatial/characterization of water quality.	It is important to understand temporal changes at fixed sites and spatial component of water quality to better understand spatial loading variations within a watershed.
	Historical Sampling – Watersheds and sites with existing infrastructure, data, and analysis are preferred in site selections.	Previously sampled sites will generally allow new work to build on existing understanding and infrastructure, opening possibilities for enhanced temporal analysis.
Conservation Practice Implementation	*Implementation* – Studied watersheds should have a high amount of implementation (25-30% reduction in the amount of nitrogen or phosphorus) in order to see a water quality response. Conservation practices can be existing or planned.	Information on the amount of implementation is needed to understand water-quality response.
	Placement – Look for sites where a high amount of implementation is or can be coupled with targeted areas of high yield and in important flowpaths.	More strategic conservation practice planning and prioritization would likely show improvements in water quality sooner.
	Maintenance - places would be ideally in areas where farmers are apt to be maintaining ongoing practices.	Areas where tracking exists to know if farmers are maintaining/following practices would strengthen analysis results.
	Conservation Practice Data – It will be most useful to study watersheds with good understanding about implementation of federal/state conservation practices for comparison with water quality results.	More reliable and complete conservation practice data over space and time will help with water quality response analysis.
	WQ Conservation Practices – Study watersheds will ideally contain a majority of conservation practices designed to reduce nitrogen, phosphorus, and sediment. Improvements in water quality will likely occur in watersheds with practices that target reducing manure/fertilizer inputs, as well as those watersheds with practices that prevent the movement of inputs off fields and into streams.	These types of practices are expected to result in nitrogen, phosphorus, and sediment reductions.
Cooperation	*Funding* - watersheds should be selected with dedicated funding for and conservation practice implementation and maintenance and long-term monitoring thereof.	Monitoring may take a long time to see a water quality response and areas with dedicated funding for conservation practice implementation, maintenance, monitoring, and analysis would help guide site selection
	Multiple Agencies - benefit from areas that leverage multiple agency efforts including state and local (NRCS, USGS, ARS, State Depts of Ag, Conservation Districts, etc.).	Identify existing long running multi-agency efforts could be leveraged such as the NRCS Showcase Watershed or other places seeing significant conservation practice investment.
	Stakeholder - watersheds with an existing or developable framework of stakeholders	Would reduce the long time it takes to establish the relations and trust in the community.
	Farmer Support - watersheds should have farmers/landowners willing to commit to or already involved in long term conservation	Strong landowner partnerships increase the ability to identify and implement conservation practice opportunities

	practice implementation and if possible associated monitoring efforts	