Conservation Innovation Grant
Nutrient Management Cooperatives

Final Report from The Nature Conservancy
RCDMC Agreement Number: SC-2017-02

Background

From the onset, the Salinas Nutrient Management Cooperatives Conservation Innovation Grant aimed to establish a set of nutrient management cooperatives formed of local landowners in 2-3 subreaches of the lower Salinas River. The goal of the cooperatives was to introduce a new structure for managing water quality that would allow growers to monitor water quality at a common outflow and implement on-farm on edge-of or off-farm water quality management actions accordingly, while also providing a streamlined reporting structure on water quality monitoring and outcome to the state of California. In the first year of the project, the state's framework for regulating was also in flux and new groundwater regulation was in formation. As a result, some of the foundational regulatory drivers that our original cooperative design was based on began to change. Over the course of the project, the CIG lead partner, RCDMC and the project partners, including TNC, adapted the project and our approach to be applicable with to the changing conditions in the watershed.

TNC's role and participation

TNC's involvement also shifted from a large role initially described in the grant proposal to a smaller role, with key tasks and responsibilities shared with other project team members, including RCDMC, the California Marine Sanctuary Foundation, and a couple of contractors: Conservation Collaborative and WaterWays, Inc. Within TNC, the key staff members who participated in the project were Abigail Hart, the Project Director who led our engagement in the Salinas Valley, and for a short period of time, Ruthie Redmond, who participated during Abigail's maternity leave. TNC GIS expert, Charlotte Stanley, also supported the project team in refining watershed maps and parcel information to determine who was in each of the affected subwatersheds and guide outreach to those stakeholders. Charlotte worked closely with Pam Krone and Sarah Greene Lopez to revise and prepare the maps.

TNC's primary responsibilities as described in the original grant proposal was to support Tasks 1, 4, and 5 of the grant which focused on formalizing the structure of two nutrient management cooperatives, expanding the fate and transport model for the lower Salinas watershed, and knowledge transfer to other stakeholders. The grant began during a period in which the regulation which governs water quality for the region – the Ag Waiver – was under negotiation. While this created a specific opportunity for the project team to advocate for inclusion of nutrient management cooperatives, it also meant the regulatory environment was in flux and the uncertainty led to concern amongst partners and landowners to launch a new cooperative structure. TNC held an initial set of landowner conversations and hired a consultant, Donna Meyers with Conservation Collaborative, to conduct a series of outreach meetings. Donna presented the findings of the outreach meetings to the team in a pair of memos: the Coop

Design and Strategy Memo and the Summary Feasibility Analysis for Nutrient Management Cooperatives and an accompanying Feasibility Matrix. (See Attachments 1-3)

Based on the recommendations laid out in the memos above, the project team shifted away from immediately forming the cooperatives as originally design and took a new approach of advocating for a "third-party alternative" to reporting and complying with the next Waiver under the Ag Order. The project team's advocacy focused on presenting a cooperative approach modelled after the design the team had been developing as a third-party alternative for the region. While TNC was not the main proponent of this advocacy, we did support and participate in engagement of the Regional Water Quality Control Board along with other team members. Notably, we shared the approach at one of the Board's quarterly meetings with positive reception from board members.

These regulatory changes alongside changing programmatic priorities at TNC led TNC to amend it's contract with RCDMC to support only Task 1, and to do so primarily by supporting the Grower Shipper Association, Preservation Inc., and the National Marine Sanctuary in developing a revised cooperative approach pilot in the watershed. As a result of this shift, TNC contracted Pam Krone with the California Marine Sanctuary Foundation to conduct outreach and prepare a set of case studies and recommendations on governing principles and potential governance structures for a nutrient management cooperative under these new conditions. (See Att. 4-5)

Finally, in late 2020-early 2021 the project team decided to focus on scoping a set of off-farm water treatment projects in the Alisal Creek portion of the watershed, where the pilot cooperative approach was being tested. The goal of scoping the projects was to develop an initial set of concept designs and cost information for the subwatershed members to consider as a joint water quality management effort. TNC led the contracting of WaterWays to assess the project sites and develop the initial concept designs and cost information, the technical report and additional mapping will be delivered prior to submission of the final grant report. Although the grant is now closing, the team hopes that these designs will lead to a collaborative project among growers in the watershed that also helps them address compliance and regulatory requirements.

Conclusions and Recommendations

As a result of changing regulatory conditions in the watershed, the original project design changed significantly as well as TNC's role in the project. However, the project has developed several key products and outcomes that advance cooperative management of water quality in the watershed and position growers to have better/more information. TNC was able to support the team with in-kind match contributions, staff expertise on GIS and stakeholder engagement, and advocacy with regional regulatory bodies. TNC is optimistic that the project team's efforts were influential in shaping the current water quality regulatory framework and making space for more cooperative approaches to water quality management in the lower Salinas.

CONSERVATION COLLABORATIVE

Memo Report

Prepared for: **Conservation Innovation Grant Project Team**
Date: **March 27, 2018**
RE: **Nutrient Cooperative Design and Management Strategy**

Introduction

This memo has been prepared to identify a possible structure and outcomes for nutrient management cooperatives in the Moro Cojo and Blanco Drain watersheds respectively. The nutrient management cooperative concept has been developed by partners in the Conservation Innovation Grant for the Lower Salinas River and Monterey Bay Nutrient Management Cooperatives. Advantages for establishing a nutrient management cooperative would include increasing growers understanding of nutrient transport through the pilot watersheds and pooling resources to reduce nutrient loading through implementation of on-farm practices and off-farm treatment areas (e.g., constructed wetlands, bioreactors, and vegetated drainages). The nutrient management cooperative would be created based on the results of spatially explicit modeling that would help plan on- and off-farm treatment practices based on model outputs. Other benefits for the nutrient management cooperative could be streamlined regulatory compliance for cooperative members and increasing the efficiency and affordability of practices targeted at nutrient management.

Regulatory Setting

To achieve the identified benefits of the cooperative, the efforts should fit within the current regulatory context of the Central Coast Regional Water Quality Control Board's Irrigated Lands Regulatory Program (referred to as the Ag Order). The current Ag Order 3.0 is in effect through March 2020 and a new Ag Order 4.0 is currently under development by the Central Coast Regional Water Quality Control Board (Regional Board). Broadly these the Ag Orders regulate the discharge of pollutants from irrigated lands. The Ag Order's purpose is to improve water quality in irrigated agricultural areas and those areas in close proximity to irrigated agriculture. The Ag Order establishes regulations to protect public health, ensure safe drinking water, and protect aquatic habitat and agricultural beneficial uses. The Ag Order implements adopted Total Maximum Daily Loads (TMDLs) for the Moro Cojo and Blanco Drain. TMDLs for the Moro Cojo and Blanco Drain include nitrogen and orthophosphate and chlorpyrifos and diazinon. TMDLs are currently under development for salts, sediment, and turbidity. The Ag Order seeks to remedy issues related to nitrate pollution of drinking water supplies. Pesticides are another focus of the Order as related to toxicity of both sediment and the water column. Finally, the Ag Order also seeks to address elevated levels of turbidity, sedimentation, erosion and excess salts.

In conclusion, the proposed nutrient management cooperatives should be developed to meet existing and pending irrigated lands regulation and future TMDLs. The cooperatives should also anticipate new data and reporting variables that new regulations may bring. The cooperatives may want explore the lack of existing research affecting agricultural operations in the Central Coast including but not limited to calculations and or coefficents for harvest removal, A/R ratios, and yield calculations, among other research needs. The cooperatives should keep in mind the variability of grower leases for the lands in the subwatersheds of focus thus necessitating both landowner and grower commitment to the cooperative. Finally the cooperative should examine other regulatory requirements (1600 permits, water rights, etc.) that may affect structural management practices such as constructed wetlands or bioreactors and should plan for such costs and reporting as needed.

Value of Cooperative to Growers in the Moro Cojo and Blanco Drain

In evaluating the value of a nutrient management cooperative for the two pilot watersheds, the regulatory setting is one factor to weigh but other factors also should be analyzed. Broadly these fall into the categories of (1) commitment to improving water quality; (2) incentives to participating and (3) structure to limit liability.

<u>Commitment to Improving Water Quality</u>. Commitment to improving water quality generates from a subset of growers and landowners who are currently working on management practices in the pilot area and willing to cooperatively share results and findings from these efforts. These early leaders are critical for gaining committed landowners and growers into a cooperative structure. The number of committed landowners and growers could be scalable and increased through effective education and outreach. If the subwatershed suffers from growers and landowners that are evading current Ag Order requirements this can erode establishment of an effective cooperative. The cooperative must identify early on how it will handle landowners and growers in the watershed that are non-participatory in required regulatory processes and what impacts that inactivity may mean to practices envisioned by the cooperative, especially off-farm landscape scale treatment systems. Recent experience with the

Salinas River Stream Maintenance Program demonstrates that non-members can erode a cooperative structure because the costs are born by fewer landowners but benefits are spread throughout the watershed. Cost is more important than regulatory relief in most cases with landowners and growers.

Incentives to Participating. While regulatory relief may see the most compelling incentive to cooperative membership, other incentives for the cooperatives should not be undervalued at this time due to shifting regulatory requirements. R&D efforts for continued nutrient management and research for requirements such as A/R ratios, A-R, yield calculations, evapotransporation estimates, etc. specific to Central Coast crops should not be overlooked as incentives as well. These research projects can have direct impact on the nutrient management education for a grower and can be conducted with grants and other support for a cooperative's benefit. These efforts may be low hanging fruit and could broaden cooperative membership in the early stages gaining trust with growers and landowners. Other ideas could be development of templates for compliance including Farm Evaluations, INM Plans, TNA, Sediment and Erosion Control Plans.

The current regulatory environment surrounding irrigated lands in the Central Coast may be moving away from credit for land management activities to a focus on reporting of total applied nitrogen and receiving water monitoring results. This change began with Ag Order 3.0. Ag Order 3.0 also prioritizes conditions to control nitrate loading to groundwater and control of pesticides that are known sources of toxicity. "If we build it they will come…to be a member of the cooperative" will need to navigate this current emphasis on individual discharge reporting versus management practices. Further the agriculture community is currently very distrustful of recent agreements reached with the Regional Board and is hesitant to commit to third party approaches at the current time. This sentiment may limit the success of recruiting members to a cooperative without using some other mechanism such as an individual or general order to negotiate watershed cooperative compliance.

Meaningful regulatory relief is obviously an important outcome to reach for the cooperative and will draw additional membership to the cooperative. With the pending regulations to be developed for Ag Order 4.0 by the Central Coast Regional Board and the conclusion of the East San Joaquin Order for Members of a Third Party Group, precedential outcomes are clearer from the State Board and opportunities can be further developed for the cooperative model.

Structure to Limit Liability. The cooperative structure should be developed to fit the needs of the landowner and grower primarily as they have the most exposure to compliance and enforcement actions. Landowners and growers operate their businesses through complicated legal structures so as LLCs, LLPs, etc. Landownership is also complicated in that land is often held in extensive trust holdings requiring agreement from multiple parties to enter and participate in a legal framework, especially one that promises some level of regulatory compliance. The recently formed Salinas River Stream Maintenance Program River Management Unit Association operates with a seven member Board of Directors and approximately 60 members over 90 miles of the river. The Association is registered as a 501(c)(5) and provides administrative oversight and technical assistance for landowners and operators working under state and federal permits issued for the Stream Maintenance Program. Indemnity is a crucial aspect of the governing documents for the Association and agreements must be signed by all members to be in good standing. Landowners and growers both must pay fees to the Association for operating under state and federal permits, however only landowners are legal members of the Association.

Any cooperative formed to provide regulatory relief for landowners and growers under Ag Order 3.0 and future Ag Order 4.0 should be structured on clear indemnification language and then structured to document individual management practices at the farm level in order to bolster documentation of individual practices by growers. Inputs from cooperative member farms to the "treatment system" of off-farm treatment areas needs to be documented. Allowances for non-member lands based on crop type (or appropriate variable) that drain to the treatment system should also be estimated, if possible. This level of reporting differentiates inputs to off-farm treatment systems for members and non-members thus increasing transparency for cooperative members.

Conclusion

A nutrient management cooperative is a viable organizational structure for the Moro Cojo watershed and in some ways has been operational for over 20 years due to productive relationships between NGOs and landowners and development of viable off farm treatment systems. However, landowners in the watershed recognize that not all landowners and growers are participating in Ag Order 3.0 compliance and reporting. Thus landowners that would participate in a cooperative must have strong indemnity from liability of noncompliance or degraded water quality conditions. Members of the cooperative may also desire additional benefits from a cooperative such as developing more exact science for crops grown on the Central Coast and to increase efficiencies in regulatory reporting through common templates. Reliance on receiving water quality results may or may not be acceptable to Central Coast Regional Board staff. The cooperative should forecast viable monitoring and reporting of practices, nutrient inputs, and any regional treatment systems in any negotiations with the Central Coast Regional Board staff. Landowner leaders will be key to a successful watershed cooperative and transparency will be important to understand those who are contributing to improved water quality and those who are benefiting without contribution to the cooperative. This social contract aspect of the cooperative should not be overlooked.

CONSERVATION COLLABORATIVE

Memo Report

Prepared for: **Conservation Innovation Grant Project Team**
Date: **March 27, 2018**
RE: **Feasibility Summary for Creating Nutrient Cooperatives**

Introduction

The Conservation Innovation Grant for the Lower Salinas River and Monterey Bay Nutrient Management Cooperatives has identified two watersheds as possible pilot areas for cooperatives. These include the Moro Cojo watershed and the Blanco Drain. Both of these subwatersheds have had significant investments in practice outreach and treatment systems that are reducing nutrient loads into the lower Salinas River, the Salinas River lagoon, the Old Salinas River Channel and Moss Landing Harbor. The Moro Cojo subwatershed is 9,836 acres or 15.4 square miles. 3,185 acres of agricultural land is estimated to be farmed in the Moro Cojo watershed. The Blanco Drain subwatershed is 4,442 acres or 6.9 square miles. 4,374 acres of agricultural land is in the Blanco Drain subwatershed. The Moro Cojo land cover is just under 50% agriculture while the Blanco subwatershed is 100% agriculture.

The Moro Cojo and Blanco Drain subwatersheds are characterized in the *Total Maximum Daily Loads (TMDLs) for Nitrogen Compounds and Orthophosphate completed by the Central Coastal Regional Water Quality Control Board* (2013). The TMDL states that Moro Cojo surface water was not impaired based on the MUN beneficial use nitrate objective of 10 mg/l and that Moro Cojo stream reaches support the GWR beneficial use with respect to nitrate and thus supports MUN of the underlying groundwater resources[1]. Of 368 samples collected from 1999 – 2009 only 3% of all tributaries exceeded the MUN drinking water standard of N 10 mg/L. In comparison the Blanco Drain exceeded the MUN standard 100% of the time. The Moro Cojo and Blanco Drain both overly the 180/400 foot aquifer. Other subwatersheds such as Quail Creek and the

[1] TMDL, page 133.

Reclamation Ditch exhibited MUN exceedences as well and may be suited to pilot approaches as well.

Table 1 summarizes mean annual and dry season nitrate concentrations, loads, and % reduction goals for Moro Cojo and Blanco Drain. Percent reduction goals are for information purposes only, not TMDL requirements. These values provide a context for how the nutrient cooperatives could potentially assess effectiveness for regulatory compliance purposes as well as cooperative incentives and benefits. The TMDL sets targets for the primary pollutants of concern: nitrates, unionized ammonia, and/or orthophosphate. Table 2 summarizes the final load allocations for these pollutants for the TMDL.

Table 1: Mean Concentration, Load and Reduction Goal - Nitrate

	Mean Nitrate Annual Concentration (mg/L)	Mean Nitrate Annual Existing Load (lbs.)	% Reduction Goal	Mean Nitrate Dry Season Concentration (mg/L)	Mean Nitrate Dry Existing Load (lbs)	% Reduction Goal
Moro Cojo*	5.3	62,614	0%	4.5	18,386	62%
Blanco Drain**	61.76	699,229	87%	57.67	317,945	89%

Note: Compiled from TMDL Tables 6-1 and 6-2 pp. 229-230 and 231. Percent reduction goals are for information purposes only, and should not be viewed as the TMDL. Monitoring sites: * 306MOR ** BLA-PUM

Table 2: Final Load Allocations Lower Salinas River Watershed Subwatersheds

	Receiving Water Nitrate as N (mg/L)	Receiving Water Orthophosphate as P (mg/L)	Receiving Water Total Nitrogen as N (mg/L)	Receiving Water Unionized Ammonia as N (mg/L)
Moro Cojo Slough	Not applicable (biostimulation will be assessed on the basis of total nitrogen)	Dry Season 0.13 Wet Season 0.3	Dry Season 1.7 Wet Season 8.0	Year-round 0.025
Blanco Drain	Dry Season 6.4 Wet Season 8.0	Dry Season 0.13 Wet Season 0.3	Not applicable	Year-round 0.025

Note: Compiled from TMDL Table 6-6 pp. 239-243.

Current Conditions for Potential Cooperative Watersheds – Moro Cojo and Blanco Drain

The data analysis presented in the *Appendix A: Agricultural Managing Practice and Project Benefits to Water Quality in the Moro Cojo Slough by the Central Coastal Wetlands Group and the Monterey Bay National Marine Sanctuary Water Quality Protection Program* documents significant progress in improved water quality over the sampling period 2005-2016. Results showed significant progress especially for pH, un-ionized ammonia, and total nitrogen. Continued improvement is needed for nitrate, turbidity and orthophosphate. Improvements in water quality were documented at sampling site Moro Coho Slough and Highway 1 (309MOR)[2]. Results from specific off farm landscape treatments were also documented including 68 acres of restored wetlands and a woodchip bioreactor installed in 2016. Off farm treatments show benefits to receiving waters of Moro Cojo.

Blanco Drain data has not been analyzed as extensively nor have treatment activities taken place in the Blanco Drain subwatershed. As noted above the Blanco Drain contributes significant loads (669,229 lbs/yr.) to the lower Salinas River receiving water. The Blanco subwatershed is all agricultural land use. The Blanco system has been effected through one recent project, the Salinas River Diversion Facility, and is the focus of an upcoming treatment wetland project in the future by the Resource Conservation District. The Salinas River Diversion affects the amount of nitrate-N load entering the lower Salinas River. In 2010 and 2011 the Salinas River Diversion Facility load reductions ranged from 66,200 pounds to 205,958 pounds per year[3]. These load reductions will be helpful in reducing biostimulatory response. The Blanco Drain is also being considered as a dry weather water source for the PureWater Monterey Project. The PureWater Project has applied for an Industrial Discharge permit and water rights for the Blanco Drain water and feasibility analysis is ongoing. Treatment can be completed for the Blanco Drain water, but PureWater Monterey would like to explore further on-farm management prior to treatment to save treatment costs.

While the CIG Project Team envisioned these two subwatersheds as possible pilots, the team remains open to other subwatersheds and or strategies on testing the cooperative vision and applicability. One option to consider would be to look to a more highly impacted subwatershed as identified in the TMDL for required load reduction.

[2] It should be noted that the TMDL utilizes 306MOR as a primary reporting site in data analyzed. Table 3-13.

[3] TMDL.

Nutrient Cooperative Outcomes Versus Regulatory Realities – Ag Order 3.0 and 4.0

The Nutrient Management Cooperatives are envisioned to accomplish following kinds of goals:

- Collaboration at a sub-watershed level to manage on-farm practices to reduce runoff and nutrients from impacting surface and groundwater resources.
- Creation of off-farm treatment systems to further clean and improve water quality entering receiving waters.
- Provide alternative regulatory compliance options and support reduction in reporting and monitoring obligations related to existing Ag. Order 3.0 and future Ag Orders.
- Examine cost-share benefits and market concepts for members including nutrient credit or trading options.
- To achieve water quality standards and remove waterways from the 303(d) list.

The Central Coast Regional Board has identified load reductions and nutrient response indicator targets as well as subwatershed receiving water monitoring, monitoring of water bodies with biostimulatory impairments, waterbodies with drinking water (nitrate) impairments, and waterbodies with unionized ammonia impairments as methods to determine TMDL load reduction success. Dissolved oxygen and chlorophyll samples for waterbodies exhibiting biostimulatory impairments are recommended for use as supplementary or proxy indicators of attainment or non-attainment of biostimulatory water quality objectives, consistent with numeric targets identified in the TMDL.

Depending on a growers Tier status, Ag Order 3.0, which implements the TMDL, requires individual discharge monitoring results (Tier 3), prioritizes conditions to control nitrate loading to groundwater through groundwater monitoring and impacts to public water systems (Tier 2 and 3), and prioritizes conditions to address pesticides that are know sources of toxicity (Tier 2 and 3). Under Ag Order 3.0, in addition to water quality monitoring, dischargers are required to submit a farm water quality plan, report Total Nitrogen Applied (TNA), develop and initiate an Irrigation and Nutrient Management Plan (Tier 3).

For Tier 3 dischargers with farms/ranches adjacent to or containing a waterbody identified in the 2010 List of Impaired Waterbodies as impaired for temperature, turbidity or sediment, a Water Quality Buffer Plan is required or evidence can be provided that discharge is of sufficient quality that it will not cause or contribute to exceedances of water quality standards. In summary, Ag Order 3.0 is a farm-focused order with practice reporting and monitoring back up for assessing conditions annually.

According to data compiled by Pam Krone for the Moro Cojo subwatershed in 2016 there were 24 ranch operations enrolled in the Irrigated Lands Regulatory Program (IRLP) reporting on 2,904 acres of irrigated lands. One of the enrolled operations was a nursery and one was a greenhouse. The remaining were crop producers. 10 of the ranches reporting were Tier 1 ranches and 14 were Tier 2 ranches according to Ag Order 3.0 tier definitions. There were no Tier 3 ranches enrolled.

The TMDL estimates there is 3,195 acres of agricultural land in the Moro Cojo. Enrollment of land in Ag Order 3.0 therefore represents almost 90% of the irrigated operations. Of the 2,904 acres enrolled approximately 1,072 acres (36%) are assigned to Sea Mist Farms LLC.

Practices documented in the Prop 84 Salinas Valley Irrigation and Nutrient Management Program from 2017 demonstrate improvements in nutrient loading are possible through a systems based approach. This program focused on precision management to reduce both the amount of runoff and the concentration of nutrients in the runoff. Treatment systems (i.e., treatment wetlands, bioreactors, etc.) are located and installed to “finish” water quality conditions prior to discharge to public water bodies. Treatment systems included one vegetated treatment system, one treatment wetland, and two bioreactors. Irrigated nutrient management assessment and implementation was conducted with 14 growers and a CIMIS station was installed in Soledad to help provide current data for application efficiency. Annual load reduction for nitrate was then estimated for the performance management and treatment systems.

The irrigated and nutrient management assessments, recommendations and implementation was estimated to remove 421,964 lbs/year of nitrate. The treatment wetland was estimated to remove 6,419 lbs/year of nitrate. The wetland system also provide additional benefits of aquatic habitat for fish and wildlife which currently do not receive recognition by the Ag Order. One bioreactor was estimated to provide 44% load reduction. The vegetated treatment system provided 100% load reduction but it was noted that the grower in this case managed irrigation so efficiently that there were only two runoff events of less than 5,000 gallons which was completely infiltrated prior to reaching the outlet. Costs for various actions tested in the program varied quite considerably and operation and maintenance costs were not calculated for these systems.

Data for the Blanco Drain were not detailed in the Appendix A report.

Recommendations for Implementing the Nutrient Management Cooperative

The following recommendations are provided for consideration by the CIG Team in finalizing the approach to the Nutrient Management Cooperative concept. Final decisions are to be made by the CIG Project Team after reviewing this recommendations.

Recommendation #1 – Do not constrain the management cooperative pilots to just nutrients or surface water outcomes. Ag Order 3.0 clearly establishes priorities for groundwater, pesticides, and toxicity. The East San Joaquin Order clearly establishes priority for sediment management and turbidity. The management cooperative pilot should start knowing the likely scope of agricultural regulations and anticipate those needs from the beginning. The cooperative will only succeed long term if it recognizes the complexity of agricultural regulations on the horizon.

Recommendation #2 – Go for an early win with the Mojo Coho and assist Sea Mist Farms in negotiating a tier reduction in the near term. Document performance practices and treatment systems utilized within Sea Mist operations and prepare a transfer to lower tier request to the Central Coast Board Executive Officer. Sea Mist Farms represents 36% of the enrolled agricultural lands. Utilize this tier change as an early win or as an assessment of how a subwatershed could be positioned to achieve tier reductions for members. Documenting and succeeding in this type of outcome would show significant success to other potential cooperative members. The pathway to less regulation is very blurry right now. Provide clarity to gain trust.

Recommendation #3 – Recognize dischargers are the starting point for cooperative membership. Incentives have to fit to the dischargers burden. Don't ignore hotspots in lieu of other goals. Scour data for hotspots and plan for approach based on personal connections and early leaders. Spatial planning should not just be about siting treatment systems if hot spots are clearly identifiable.

Recommendation #4 – Understand role of management practices in the cooperative so that a trading market may be envisioned for the future. Utilize spatial analysis to better understand this across the lower Salinas River landscape and combine with other factors such as groundwater basins, soils, discharge, crop type, etc. Link practices to risk for a better understanding of the role of practices in improving water quality. Add cost benefit analysis as a final step.

Feasibility Matrix

Agricultural Watershed Management Cooperative
Set goal of 2024 reporting for Salinas River TMDLs (not Ag Waiver?)

Pilot Watershed Questions:

- Are we trying to show improvement across all water quality standards in the watershed or are we identifying targets?
- Are we targeting the worst watersheds or those that are impaired for some pollutants but not others?
- A more degraded watershed may be more attractive to a cooperative watershed approach versus one that is not as degraded or closer to achieving water quality standards – Santa Rita Creek versus Moro Cojo? Reclamation Ditch? Others?
- Can we target biostimulatory response and other surrogates and get buy off on those as "results" for the watershed coop
- Who is the cooperative – the landowners? CIG partners? Both?
- Need to answer how many Tier 3 growers there are and where are they – none in Moro Cojo for example
- Offer a suite of practices and other actions (riparian for example) that drops a tier or establishes the coop "minimum" watershed management activities – proof is in implementation initially with results documented further down the line

Potential Coop Objectives	Individual Actions (examples)	Required or Desired Achievement	Possible Coop Actions (examples)
Reduce nutrient load to surface and groundwater	• Reduce/eliminate discharge • INM practices • INM plan • Nutrient stewardship • Actions during crop season and non-crop season • Crop rotation • Buffers, filter strips, and swales	Ag. Order 3.0 sets goal of water quality standards met by October 1, 2019 – way before the TMDL date of 2024 Tier 3 only – 50% load reduction in nutrients in individual surface water	Targeted cost share efforts on practices and decision support tools such as CropManage for precision management outcomes INM Plans – is there enough CCA assistance in the lower Salinas area? Could we offer to

	• Constructed wetlands • Vegetated treatment systems • Bioreactors	discharge relative to 10/1/2016 load by 10/1/2018 Tier 3 only – 75% load reduction in nutrients in individual surface water discharge relative to 10/1/12 load by 10/1/19 Achieve annual reduction in nitrogen loading to groundwater based on INM Plan effectiveness and load evaluation – 10/1/2019	create a sub-basin INM Plan? Tier 3 only required to do INM Plans – growers in the same GW basin or subbasin can submit one certified INM Plan. Load reduction reporting – can the coop do this and how would it be reported? What does this data report look like? Load is the variable we need to offer – not necessarily water quality data or delisting per se
Pesticide Management	• Cover crops • IMP • Application per label • Use of PAM or LanGuard • Hedgerows • Install treatment system (granulated activated carbon) • Reduce pesticide use	Tier 3 Only – 1 out of 3 individual surface water discharge monitoring samples is not toxic by 10/1/2018 2 out of 2 individual surface water discharge monitoring samples is not toxic by 10/1/2019	This seems hard to incentivize – pesticides are a choice - this hard to influence
Sediment management	• Limit bare soil • Conservation cover • Grassed waterway • Contour farming	Tier 3 Only – 75% reduction in turbidity to sediment load in individual surface water discharge relative to 10/1/2016 load – 10/1/2019	2NFORM sediment sub-basin mapping may be helpful in selecting focus areas for this assistance – but again only applicable to Tier 3 – how big is this group and how much incentive do they need

Maintain appropriate stream temperature	• Require re-establishment of riparian and wetlands • Incentives in exchange for creating wetlands/riparian • Regional approaches • Cooperative treatment wetlands • Increase canopy cover	No standard yet	Moves towards condition of waterway which may be more applicable to the CIG watershed cooperative concept – how do we improve the watershed condition and the receiving waters for which beneficial uses?

Sample Cost Comparisons for Actions:

INM Assessment and Implementation - $0.34 per lb of nitrate removed
Treatment Wetland - $10.00 per lb of nitrate removed
Bioreactor - $1.70 per lb of nitrate removed
Bioreactor with carbon enrichment - $2.30 per lb of nitrate removed
Monitoring - CMP – cost is calculated per acre not by risk which reflects issue with per acre and tiering approach
Monitoring - Treatment Wetland Receiving Water - $12,000 annually

So what is the cooperative annual cost then – what are the benefits – what do we charge and how do we match the charge to the benefit?

Possible Cooperative Members:

- Members who cannot reach nutrient load or water quality standard reduction would “buy” credits from the watershed cooperative. Noncompliance would need to be documented before ability to buy credits. This is long term play

- Members who do not have room to provide to a treatment system would invest in the system construction and pay operation fees for treatment available. Focus would be on tailwater capture first.
- Members who seek centralized development of treatment systems for finishing step for water quality to receiving water.

- Members needing assistance in Ag order requirements including INM Plans, TNA or A/R ratio development for specific crops, template development, farm level evaluations, effectiveness evaluations.

OVERVIEW OF WATER QUALITY TRADING INVOLVING AGRICULTURAL NONPOINT SOURCES

By Pam Krone-Davis DRAFT 1:

The use of market based incentives rather than a strictly command and control approach to regulation was initiated by the EPA in the 1980s to encourage effluent trading within watersheds (Jarvie 1998). The purpose of this approach is to achieve water quality standards in a more cost effective manner through allowing trading of credits between polluters that have differences in pollution control costs. The prevailing thought driving the market incentive approach between point and nonpoint sources (P-NP) has been that the cost of best management practices (BMPs) for reducing nonpoint source pollution is lower than the cost of implementing the technological changes needed for achieving point source reductions (Ribaudo 2011). There are few cases of nonpoint to nonpoint trading within the United States, as most trading programs are between point sources or are between point source and nonpoint sources.

The driver for the development of most water quality trading programs in the US has been a TMDL or the threat of a TMDL (Greenhalgh and Selman 2012). In other cases, the desire of an emitter to expand their facility while under an NPDES permit cap has brought about the incentive to create a trading program (Shortle 2013). During TMDLs development, if the intent is to facilitate water quality trading, it is important that the TMDL create sufficient specificity about attainment time frames and actions for load reduction as a part of determining the baselines for trading (Willamette Partnership 2014). The water quality trades (WQT) between point and nonpoint sources (P-NP) in the US normally involves the exchange of discharge allowance by the regulated point source for an emission reduction credit from the nonpoint unregulated source. A payment is made by the polluter wishing to purchase credits and this payment (less transaction costs) is received by the nonpoint source for implementing BMPs that will reduce the pollutant to the same water body. There are different ways to structure the trade arrangement; however the most common for WQT are through clearinghouses or bilateral agreements (Shortle 2014). Clearinghouses purchase emission reduction credits from sellers and sell these allowances to buyers. The advantage of the clearinghouse approach is that contractual and regulatory links between the buyer and seller are eliminated and all trades are made through the clearinghouse as an intermediary. The Greater Miami program is an example of this (EPA). The other common market structure is a direct transaction between the buyer and the seller or with the help of a broker, called a bilateral negotiation (Shortle 2012). In this case the buyer faces a diversity of credit choices regarding which BMP credit to purchase. An example of this was trades between waste water pollution agency, Clean Water Services, and landowners on the Tualatin River in the Willamette basin. In some but not all bilateral trades, the buyer maintains responsibility for the effectiveness of the BMP and for meeting for water quality requirements (Shortle 2012).

Although there has been interest in WQT programs for thirty years, many of the initiatives have not been successful and have resulted in little or no trading activity (Shortle 2012). Evaluations of the lessons learned from these unsuccessful programs undertaken revealed the following four basic requirements that form the underpinning for a successful program (Shortle 2012):

1) Compulsory regulatory limits on pollution levels must exist for trading to occur, otherwise there is not incentive for polluters to pursue options for pollution control cost savings.

2) Sufficiently large differences in the cost of reducing pollution between polluters must exist in order to provide an economic incentive to trade as well as to cover the transaction costs.

3) Rules for trading must be clear and not overly complex to assure that water quality goals are satisfied and that trading is facilitated. Overly complex rules create barriers to trading activity.

4) Institutions for organizing the trading program must be trusted by program participants and must be effective.

Calculating Nonpoint Source Nutrient Reduction

Credits have to be determined by estimating the nutrient load reductions from the practices the grower uses. Three approaches have been used to develop estimates (Greenhalgh and Selman 2012): 1) General Models using standardized reduction values for BMPs. The advantage is simplicity and also that farmers know in advance how much credit they will receive from implementing a practice. A disadvantage is low accuracy and lack of account for heterogeneity. 2) Site Specific Models taking into account variables such as soil type, slope, and fertilizer application rate when estimating the nutrient load reduction from BMPs. This is more cost effective than monitoring and more accurate than the general model. 3) Monitoring the performance of BMPs practices and crediting actual pollutant reduction is the most accurate approach, however is also the most costly (Greenhalgh and Selman 2012).

Determining a Baseline

Establishing a baseline for nonpoint sources is necessary for determining what BMPs can be credited (Greenhalgh and Selman 2012). The seller can only receive trade credits for practices that go above and beyond this baseline. These baselines can be established either based on a point in time or by prescribing a set of base practices that are expected and are not credited. When the baseline is a point in time, current management practices already installed cannot be credited and only future practices can be credited. An alternative method is to define farmers into “good actors” who have been consistently employed BMPs and “bad actors” who have not employed BMPs. This is establishes a baseline of expected BMPs, for which growers do not receive credit. In Virginia, these practices include conservation tillage, cover crops, streambank fencing, all of which must be implemented before a grower becomes eligible for earning credits (Greenhalgh and Selman 2012).

BMP Performance Uncertainty:

An important decision made during the design of the WQT involves accounting for the uncertainty of BMP performance and the determination of how much pollutant load is actually eliminated. Because of the highly variable nature of agricultural runoff and the many factors that influence its contribution to pollutant load, including soil type, topography, season and rainfall, developing water quality trading (WQT) credit systems has been challenging (Greenhalgh and Selman 2012). This is further complicated by the difficulty of measuring runoff, the unpredictability of BMP effectiveness, and the high level of temporal variability in pollutant concentrations. To deal with the uncertainty regarding whether BMPs will achieve the expected load reduction, WQT involving P-NP trades commonly develop trading ratios, where there is not a 1:1 credit for the pollutant (EPA 2007a). In Ontario Canada, an offset ratio of 4:1 was negotiated such that a nonpoint source must remove an estimated 4 kg of phosphorus to every kg contributed by a point source (McNeill 2013). In the Great Miami River Watershed Water Quality Credit Trading Program in Ohio, the offset ratios were 3:1 for drainages to impaired water and 2:1 for non-impaired waters (EPA 2007b). Another way to deal with uncertainty of load reduction from BMPs is to have an "insurance" or contingency pool of back-up of credits from BMPs in the event of underperformance or failure (EPA 2007b). A further issue is the lag time between BMP installation and water quality improvements. In this case, credits may not be available for a period of time after BMP installation or may be prorated to reflect the ramp up of performance until full effectiveness is achieved (EPA 2007a).

Verification and Monitoring

Verification that the BMP has been correctly installed and properly maintained is undertaken in most trading programs (Walker 2014). This verification can be accomplished by a third party, project staff or a state agency and can be provided for all projects or for a subset of projects. Verification creates transparency so that landowners and the project developers can be held accountable for sustaining the BMP for its project life. This verification is often a visual inspection rather than water quality monitoring. Direct monitoring of water quality at the location of the BMP, the edge of field, or the water body discharged to is likely the most reliable way to verify performance; however due to the high labor, cost and sophistication monitoring is not commonly used to quantify pollutant reductions (Walker 2014).

Regulatory Uncertainty

Due to the inevitability of changing regulations, there have been attempts by the USDA and USEPA to develop agricultural certainty programs to alleviate concerns over how these changes might affect credits that have already been certified or transacted (Walker 2014). Grandfathering of credits is one approach, so that once they are issued if rules change the currently certified credits are not called into question. Another is through the development of agricultural certainty programs as outlined conceptually in a guidance document from the USDA and US EPA in 2011. Agricultural certainty programs attempt to help agriculture conduct business in a predictable regulatory environment through providing assurances, for example that the BMP activities are certified as meeting the regulatory requirement for the life of the agreement. The issue with regulatory certainty is that it could become a loophole if these requirements are weaker than future regulations (Walker 2014).

Legal Challenges

Legal challenges confront many WQTs due to public concerns regarding water quality degradation that may occur due to trades (Walker 2014). This litigation has led to uncertainty among buyers and sellers regarding the market and the future of trades. Many different WQTs have been designed and some are better at ensuring additionality, verification, credit tracking and registration, and load reduction estimations that could result in program ineffectiveness. The EPA is considering developing new standards for the trading programs in order to increase consistency of design and implementation, improve transparency and reduce uncertainty (Walker 2014).

Case Studies

We have chosen three water quality trading programs to evaluate through a case study to help us learn from the ways these programs were developed and implemented. Each of them is unique and provides insights into how water quality trading can occur within a watershed, as well as providing insight into the challenges and pitfalls of such programs.

1. Grassland Area Farmers Tradeable Loads Program

This program was chosen for a case study because it is a long term example of a tradeable load program between agricultural nonpoint to nonpoint sources (NP-NP) of pollution and because it occurred in California, under California law. The pollutant traded was selenium and the location was the San Joaquin Valley. Although currently inactive, this program could at a future time be re-instigated.

2. Greater Miami River Watershed Trading Program

The Greater Miami River Watershed Trading Program provides a good example of a program driven by the threat of a TMDL and how stakeholders took pro-active action to develop a more cost effective way to achieve the water quality goals prior to TMDL implementation. It involved multiple trades between point sources (waste water treatment facilities) wanting to purchase credits and farmers willing to adopt BMPs to reduce nutrient loads (phosphorus and nitrogen). A relatively broad diversity of BMPs were allowed for trading, and the program was set up to build new BMPs into the trades through time.

3. Willamette Partnership Water Quality Trading Programs in the Northwest

The Willamette Partnership has been actively developing protocols for ecosystem service accounting and water quality trading in the Northwest. It is an example of a program that started from the ideal of creating healthy watersheds in vibrant economies with residents sharing a collective responsibility for restoring the rivers and streams (WRI 2001). The development of water quality trading has been seen as both a way to reduce the cost of achieving TMDL and NPDES load allocations and simultaneously providing other ecosystem services through establishing trades between point and nonpoint sources.

CASE STUDY 1: GRASSLAND AREA FARMERS TRADEABLE LOADS PROGRAM

LOWER SAN JOAQUIN RIVER, CALIFORNIA

OVERVIEW:

The Tradable Loads Program in the Grassland Drainage area was the only agricultural nonpoint to nonpoint water quality trading (WQT) program in operation in the United States that was found during this literature review. This WQT program involved selenium trading between seven irrigation and drainage districts on the west side of the San Joaquin Valley. The geology of this Grass Land Area has naturally high levels of selenium that is leached from the soil when irrigation water is applied. This leaching caused high concentrations of selenium in the San Luis National Wildlife Refuge's Kesterson Reservoir, which caused considerable harm to birds and other wildlife and became a nationally publicized environmental catastrophe.

The WQT program was established when the Grassland Bypass Project was developed to divert irrigation drainage around sensitive grasslands into the San Luis drain, which eventually enters the San Joaquin River (EPA 2007b). To secure the use of the San Luis Drain as an outlet for agricultural drainage, a Use Agreement between the drain owner, the federal Bureau of Reclamation in 1995 and the Delta-Mendota Water Authority was signed with the stipulation of a selenium cap. This Use Agreement capped the total amount of selenium load permitted to be discharged through the Grassland Bypass Project and allocated this load among the seven contributing member irrigation and drainage districts (EPA 2007b). Another incentive driving the development of a WQT for selenium reduction was the desire to avoid further bad press, such as that received over the effect of selenium on wildlife in the Kesterson Reservoir (Wallace 2007).

These seven districts formed a consortium called the Grassland Area Farmers with the legal authority to distribute selenium load allocations among the districts and to enforce discharge requirements (Breetz et al. 2004). The Grass Land Area covers 97,000 acres of irrigated farmland growing primarily cotton, melons, vegetables, alfalfa, grains, grapes and orchard fruit (Austin 2001). Districts were permitted to exchange load allocations through the tradable loads program through the purchase load allocations from other districts in the event that a district failed to meet its own load allocation (Austin 2001). A monitoring program at the drains and sumps of the Districts informed the Grassland Area Farmers when district level exceedances occurred. Trading does not occur between individual farmers, but occurs only at the district level among members of the Grass Land Area (EPA 2007). The cost of trading between individual farmers was considered to be too high to allow efficient trading at this level due to the added cost of increased monitoring and reporting that would have been incurred (Wallace 2007).

The Grasslands WQT program was originally proposed by Young and Condon from the Environmental Defense Fund in 1994 as an aspect of the regulatory system (Wallace 2007). The original goals of the tradeable load program were to distribute the costs of selenium reduction equitably between districts, to encourage innovation at a local level and to allow trading to achieve the load reductions at the lowest cost (Austin 2000). Additional advantages Young identified were a decentralized strategy that would allow districts to tailor programs to meet their own needs, the utilization of existing monitoring systems to verify compliance, and a way to minimize administrative costs of districts and agencies (Wallace 2007).

The Tradeable Loads Program was initiated by the Use Agreement in 1995 and later adapted based on the development of a selenium TMDL in 2001 (EPA 2007). In 1996 the San Joaquin River Basin Plan was amended by the Central Valley Regional Water Quality Control Board. This amended Basin Plan lead to the development of a TMDL for Selenium in the Lower San Joaquin River in 2001. The TMDL establishes monthly selenium load limits, which take into account the type of water year from critically low to wet as well as the season in order to establish the pounds of selenium that can be added on a monthly and annual basis. During low flow years, less selenium load can be assimilated by the water body and still achieve water quality objectives. The TMDL includes background load and a 10% margin of effort to calculate the load allocation:

TMDL – (Background Load + Margin of Safety) = Load Allocation (EPA 2007)

The TMDL load allocation is used to set permit limits for the Waste Discharge Requirement Order (EPA 2007). In 2001 the CVRWQCB issued Waste Discharge Requirement Order No. 5-01-234, which included regional caps for selenium for the Grassland Area Farmers (EPA 2007b). If the aggregate selenium cap under the WDR Order is exceeded, then districts are subject to fees and the use of the drain is cut off if the cap is exceeded by 20% (Austin 2001). The Grassland Drainage area is subject to a fee if they exceed the aggregate cap, and these fees are passed on to districts based on their district level exceedance

The Waste Discharge Requirement does not address WQT as a mechanism. Trading is the tool used by the districts to comply with the regional selenium cap. Two different types of trading mechanisms have been used between participating districts, formal and informal (EPA 2007b). Formal trading occurred early in the program through written bilateral agreements between districts. These bilateral agreements specified the parties, the month and year of the trade, and the load allocation being traded. There have been 39 formalized trades. Informal trades were the mechanism used after the first couple years, and do not require any written documentation. The trade can involve the purchase of credits by another district or the exchange of allocations between districts (EPA 2007). Because credits to districts are based on actual monitored selenium loads, the trades cannot occur until after the load allocation has been exceeded; and therefor these trades occur retroactively (Breetz 2004). The number of informal trades is unknown.

After a period of trading, a strategy emerged that brought an end to trading (Wallace 2007). A more affordable regional solution called the San Joaquin River Water Quality Improvement Project (SJRIP) reduced the need for discharging to the San Joaquin River (Wallace 2007). Under the SJRIP, land was purchased and converted to a Regional Reuse Area where the drainage water was mixed with fresh water and used to irrigate salt tolerant crops. Grassland Area Farmers purchased land for this Regional Reuse Area with the objective of decreasing drainage volume through evapotranspiration and storing the water for later treatment through reverse osmosis or other means. This treatment has not yet been installed. The SJRIP was implemented through federal and state funds, which paid $23.5 million or 97% or the project costs. The subsidization of this project caused a distortion in the costs; otherwise trading would have been the lower cost alternative (Wallace 2007). Even with this Regional Reuse Area, the Grassland Bypass Project continues to have a Use Agreement, which was most recently renewed in 2009, to discharge water into the San Luis Drain. The most recent Use permit continues to impose an incentive fee that is levied when exceedances occur, however it also contains an incentive credit that can accrue when loads are 10% less than the allocation (GBPOC 2013).

GOVERNANCE STRUCTURE

Oversight Committee

The Oversight Committee composed of US Fish and Wildlife, Ca Dep of Fish and Game, CVRWQCB, EPA and Bureau of Reclamation developed the Use Agreement, with clear enforcement and accountability conditions (Wallace 2007).

Steering Committee

The Grassland Area Farmers are governed by a Steering Committee with representatives from all seven districts. The US Bureau of Reclamation, California Dept. of Fish and Wildlife and the Central Valley Reginal Water Quality Control Board also participate on the Steering Committee. This Steering Committee determined the load allocation among districts based on tilled acreage, total acreage and historical selenium loads (Breetz 2004). Each district defined its own means for complying with their allocation, including measures such as tiered water pricing, workshops, low interest loans and recycling of drainage water. Monthly steering Committee meetings make it easy for districts to find partners and negotiate trades, resulting in a low transaction cost (Wallace 2007).

Economic Advisory Committee

An Economic Incentives Advisory Committee, including an environmental lawyer, a farmer, an EPA regulator, an environmentalist from the Environmental Defense Fund and an academic from UC Davis Dept. of Environmental Science and Policy. The Advisory Committee was formed to design the Tradeable Loads Program (Breetz 2004, Wallace 2007). The advisory committee developed rules for trading, but left the price of trades up to Districts to negotiate.

Coordinators

The Grassland Area Farmers had a Regional Coordinator and a Field Coordinator to collect and analyze the seven districts loading data. The role of the Regional Drainage Coordinator was to collect regional information, prepare reports, represent the GAF at meeting and hearings, and to facilitate trades among districts (Dewan 2004).

CHALLENGES

The greatest initial challenge of implementing the trading program was determining the price of trades, defining a penalty fee structure and allocating load among the districts (Austin 2001, Wallace 2007). District managers had difficulty making a price determination, which their council guided them to base on cost of abatement practices to bring about improvements and how far off they were from their load target (Austin 2001).

A later challenge to trading occurred when grant money was secured for the purchase of land that was used for the production of salinity tolerant crops and storage of high salinity water. This grand funded land purchase distorted the market value of trades and made them relatively uneconomical. Currently, the plans of the Grassland Bypass Project Oversight Committee are to continue to expand the land area that can be used for water reuse and storage of saline water and to implement technology for purifying this water (Wallace 2007).

WATER QUALITY RESULTS

The Grassland Bypass Project compared 1996, pre-project discharge, with 2011 discharge and found reductions in selenium load of 82%, in salt load of 63%, and in boron load of 52% (GBPOC 2013). The reported selenium load discharged to the San Joaquin River in 2011 through the GBP was 2100 pounds. Conservation practices saved 4800 pounds of selenium from entering the San Joaquin River. These reductions were accomplished through tiered water pricing, improved irrigation application, tailwater controls and tradable loads. The Grassland Bypass Project Oversight Committee reported that 5800 pounds of selenium was sent to the Regional Reuse area for recycling and use on salt tolerant crops. The selenium load discharged into the San Luis Drain in 2011 was 55% below the amount allocated in the 2009 use agreement.

CASE STUDY 2: GREAT MIAMI RIVER WATERSHED WATER QUALITY TRADING PILOT PROGRAM

OHIO

OVERVIEW

The Great Miami River Watershed WQT pilot program was developed in response to stakeholder desire to address water quality issues of impaired 303(d) listed waterways prior to the impending development of TMDLs (EPA SA). Forty percent of the waterways in the Great Miami Watershed do not meet state water quality standards and were scheduled for TMDL development (EPA). The Miami Conservation District is a regional water management agency authorized by the State of Ohio originally for flood control and later also given the responsibility for solving water quality and other watershed management issues. In response to this mandate, the District engaged an economic consultant to estimate the cost savings of achieving nutrient reductions from agriculture compared with waste treatment plants. The economic report found that the agricultural BMPs would be about 20 times less expensive than technical additions to waste treatment facilities to meet water quality objectives (Keiser 2004). This finding created interest in starting the WQT program on the Great Miami (GMTP). The GMTP started operating in 2006 with initial funding of $1 million from the USDA NRCS grant and contributions from waste treatment plants that were used to cover BMP costs. The Greater Miami Trading Program (GMTP) is among the most successful WQT programs because many trades have taken place covering multiple types of agricultural BMPs. These trades are based on a demand from waste water treatment plants to purchase credits and based on agricultural BMPs available for delivering credits (EPA 2007b). The program has resulted in the installation of a large number and diverse collection of BMPs to reduce pollution (Newburn 2012).

The greater Miami River Watershed in southwest Ohio is 4000 sq. miles and about 83% of this land is used for agriculture, primarily dedicated to livestock, corn, soybeans and wheat. Nonpoint source pollution from both urban and agricultural lands is identified as the primary source of impairment of the watershed, however nonpoint sources are not regulated under federal or Ohio law (MCD 2005). With the TMDL development scheduled to be initiated in <> and the noted high cost to point source polluters of meeting the challenges of load reduction, the Miami Conservancy District developed the GMTP as a more cost effective solution to meeting future targets through a nitrate and phosphorus trading program. This program allows NPDES permit holders to purchase credit for nitrogen and phosphorus loads from BMPs installed by upstream agricultural producers (EPA SA). BMP installation is voluntary and credits are not generated until after they are installed.

Driving forces for the GMTP were the imminent TMDL for impaired waterways in the Miami Basin and the encouraging economic analysis provided by Keiser and Associates estimating that substantially more cost efficient nutrient reductions could be achieved through agricultural BMPs than through technological modification of waste treatment facilities (EPA 2007b , Newburn 2012). Agriculture is not regulated under The Clean Water Act, nor is it regulated under Ohio law, so achieving nutrient load reduction is voluntary for farmers. Farmers were incentivized to participate in the program by way of payments for nitrate and phosphorus load reduction credits in return for applying BMPs.

The Keiser economic analysis included three BMPs and a thorough credit supply feasibility analysis that involved using the SWAT model over the 105 subwatersheds to determine nitrogen and phosphorus load reduction for BMP installation (Kesier 2004). Farmers already practicing these BMPs did not receive credit and model simulations did not include reductions from their lands in the nutrient reduction forecast. The three BMPs initially simulated by the SWAT model were 1) converting land to no-till, 2) nutrient management to a 50% reduction in fertilizer, and 3) converting from soy-corn to hay operations (Keiser 2004). Later additional BMPs were included in the credit program. The cost results are shown in Table 3. The most cost effective BMP for both nitrogen and phosphorus reduction was conversion to no-till, with the fractional cost of nitrogen and phosphorus reduction amounting to 1/10 and 1/23 respectively of the cost of reduction for point sources (Keiser 2004).

Table extracted from the Keiser economic analysis:

Table 3. Costs of total phosphorus and total nitrogen load reduction in the Great Miami River watershed.

Total Phosphorus				
Agricultural management practices	Watershed Point Source Load Reduction Cost (million)[a]	Watershed Point Source Unit Reduction Cost (/lb)	Watershed BMP Cost (million) [b]	Watershed BMP Unit Cost (/lb)
No-till on 50% ag. land			$37.8	$1.08
No-till and 50% fertilizer reductions			$108.5	$2.70
No-till, 50% fertilizer reductions, and hay-only in select sub-watersheds	$422.5	$23.37	$425.1	$8.48
Total Nitrogen				
Agricultural management practices	Watershed Point Source Load Reduction Cost (million)[a]	Watershed Point Source Unit Reduction Cost (/lb)	Watershed BMP Cost (million) [b]	Watershed BMP Unit Cost (/lb)
No-till on 50% ag. land			$37.8	**$0.45**
No-till and 50% fertilizer reductions			$108.5	$1.23
No-till, 50% fertilizer reductions, and hay-only in select sub-watersheds	$422.5	$4.72	$425.1	$3.99

[a] Net present worth over 20 years and 5% interest rate for wastewater treatment upgrades to BNR; same value for TP and TN.
[b] Net present worth over 20 years and 5% interest rate is assumed here for comparison to point source treatment plant upgrades

Water quality credits are generated from pounds of phosphorus and nitrogen that are prevented from entering waterways based on BMP installations (EPA 2007b). One credit is issued for one pound of nitrate or phosphorus removed by the BMP. A qualified professional from the Soil and Water Conservation District (SWCD) uses a Load Reduction Spreadsheet to determine the number of credits to allocate for each BMP (MDC 2005). On farm BMPs are periodically inspected by these qualified professionals to insure they remain operational in removing nutrients. If a BMP fails then two strategies are available: 1) a BMP contingency plan and 2) an insurance pool of credits. Overall BMP effectiveness is also periodically reviewed and the Load Reduction Spreadsheet is modified to more accurately estimate nutrient reduction (EPA). If the farmer fails to maintain the BMP, he must return the money received to the trading program.

The market between buyers (NPDES permit holders) and sellers (agricultural producers) is set up like a reverse auction with the MCD acting as a third party clearinghouse. A money pool is first created by contributions from NPDES dischargers. Farmers submit bids for credits based on the cost of their BMP and their desired compensation (EPA 2007b). Projects that are the most cost effective are awarded funding from the pool of money that was created by the NPDES permit holders. This process , in theory, encourages implementation of the lowest cost solution to load reduction. However, after a period of time, the SWCDs learned what price would be accepted for the purchase of credits. The SWCDs began advising farmers on what price to bid for credits and the resulting bidding distribution after the first couple rounds was nearly uniform around a bid of just under $2/credit (Newburn et al. 2012).

BMP performance is validated through monitoring by the SWCD at a subset of all sites where BMPs were implemented. Monitoring occurs at the site of BMP installation with a goal of collecting data on 5-10% of sites (MCD 2005). These SWCDs also have frequent contact with farmers and periodically perform informal visual inspections of the BMPs for functionality. Subwatersheds are monitored to substantiate overall trading program performance (MCD 2005).

Waste water treatment plants (WWTPs) contributed over $1.2 million to the program as of 2010 (Newburn et al. 2012). These contributions have been used to fund BMPs and to support administrative and water quality monitoring costs. However the credits have not actually been used as offsets for the pollution reduction from WWTPs since they do not currently have binding requirements. When National Pollution Discharge Elimination System (NPDES) permits are issued to WWTPs to meet final TMDL requirements, then credits will be used as offsets and a trading ratio will come into play. WWTPs are incentivized to participate in the market prior to the instigation of the NPDES permits, in order to earn a better trading ratio. For example, when discharging into impaired waters, the ratio is 2:1 for WWTPs who participated in the program early and purchased credits, whereas a ratio of 3:1 for those who wait until the NPDES is issued. Demand for credits has been primarily driven by this difference in credit ratio (Newburn et al. 2012).

Farmers who apply for funding for BMPs work with soil and water conservation districts (SWCDs) to submit bids for a dollar amount for a proposed BMP installation (Newburn et al. 2012). The SWCD calculates the number of credits that the BMP generates, using a standardized spreadsheet and submits the bid application to the GMTP for the farmer. The SWCD also adds their agent's time for assisting and for annual BMP inspections. To be eligible for credits, BMPs must be new, funding cannot be received from other sources and they must be voluntary (not a legal mandate) (Shortle 2014). Most BMPs have a life of 5 to 10 years, although some infrastructure projects are 20 years. If the BMP fails, the farmer is assisted in upgrading it or putting in a substitute BMP to retain credits. If he does not retain his credits, then he has to return the money that he received for the BMP.

CHALLENGES/ ROADBLOCKS

- Credits for purchase by dischargers in the headlands, where there are few opportunities to generate upstream credits. (EPA)
- The uncertainty associated with calculating BMP nutrient load reductions and having to deal with the uncertainty through increased monitoring. (EPA).
- Delays in the TMDL and lack of a binding obligation to numeric nutrient criteria for the rivers, which has limited the demand for credits (Newburn et al. 2012).
- Innovation in BMPs is hindered by the long time period required to develop BMP modules into the Spreadsheet Tool for Estimating Pollutant Load (Newburn et al. 2012)
- Dues to their important role, the SWCDs sometimes became a barrier in the GMTP. The SWCDs in many of the eligible counties did not participate substantially in the program for two reasons. Some counties did not receive a high acceptance rate in the early bidding rounds and decided that the cost of administering the program relative to the income generated was not worthwhile. Other counties felt their farmers would not be competitive or could more easily get federal assistance (Newburn et al. 2012).
- SWCDs also began advising farmers what bids would be adopted, and thus the credit market became uniform around a cost point (Newburn et al. 2012).

ORGANIZATION STRUCTURE

Miami Conservation District (MCD)

Miami Conservation District designed the GMTP program. The GMTP was developed with input from more than a hundred meetings with stakeholders (Newburn 2012). The program gained broad support from diverse groups included municipalities, agricultural producers, the Ohio Farm Bureau, SWCDs and local watershed groups. The MCD also serves as the clearing house for all transactions. This reduces transaction costs and improves trading efficiency. The MCD also performs other tasks such as issuing requests for BMP proposals, maintained data on credits, managing the insurance pool of additional credits, and supervising the water quality monitoring data (MCD 2005).

Soil and water conservation districts (SWCD)

Fourteen SWCDs are eligible to participate. County SWCD offices recruit farmers to be in the program through promotion, assistance with applications, distributing the funds to the farmers, and overseeing the implementation and monitoring of BMPs (Newburn et al. 2012). The way that SWCDs recruited and assisted growers affected the bids farmers made and how many were accepted in the auction. Individually assisting the farmer in the bid application proved most effective. Using SWCDs proved to be a cost efficient way to manage the program, only representing 4% of the total program cost for recruitment and 1% for effectiveness monitoring. However it is important to note that the SWCDs did not charge for all the time it cost them to implement the program, as they received compensation from federal conservation programs that covered time and overhead costs (Newburn et al. 2012).

Ohio EPA

The Ohio EPA supported the development of the watershed trading program, regulates NPDES permits, modifies NPDES permits based on program participation and supports adaptive management (Breetz 2004).

Ohio Department of Natural Resources (ODNR)

ODNR develops and approves the BMP modules in the standardized Spreadsheet Tool for Estimating Pollutant Load, which includes 17 field based practice types (Breetz 2004). More BMPs can be added through time; however their addition requires considerable effort and time.

Ohio Farm Bureau and county farm bureaus

Farm Bureaus participated in the development of the program, facilitated agricultural involvement, and trained farmers to perform conservation self-assessments in order to identify BMP installation (Breetz 2004)

Ohio River Valley Sanitation Commission – participated in program development and will evaluate the program for extension to other Ohio basins (Breetz 2004)

USDA NRCS – participated in the development of the GMTP and helps with quantifying credits for BMPs (Breetz 2004)

Keiser & Associates – conducted economic and market analysis (Breetz 2004)

Environmental Trading Network – supply educational outreach and trading information (Breetz 2004)

Agricultural Producers – apply for and implement and maintain BMPs with the support of SWCDs

Regulated Dischargers – purchase credits and furnish administrative funding (Breetz 2004)

RESULTS

Water quality results from the effect of the GMTP have not been analyzed because the trades that have occurred represent a small part of the nutrient load in contributing watersheds (Newburn et al. 2012). However a Water Quality Study was published containing subwatershed monitoring results from 2005-2011 (MCD 2012). Monitoring stations located near river confluences to recorded water quality conditions for the four major subwatersheds of the Great Mimi River. This study found that nitratet concentrations vary with flow and season in three of these watersheds, with higher concentraiotns found in winter and spring compared with summer and fall. One watershed had more consistent nitrate concentrations across seasons and flow regimes. Phosphorus concentration also varied seasonally and with flow, however with less variability than nitrate concentration. Total nitrogen and phosphorus loads were higher for the combined watersheds in 2007, 2008 and 2011 than the mean loads for 1980-1996.

As of May 2014, nine rounds of project submittals were completed, 397 BMPs were funded and 1.14 million credits were generated (MCD 2014). More than $1.6 million will be paid to agricultural producers for these credits and $90,000 to SWCDs for assistance and oversight (Shortle 2014, MCD 2014). The reduction in nutrient discharges in the Greater Miami watershed from these BMPs represents a 572 ton reduction in load (MDC 2014).

Bid applications by BMP (from Newburn et al. 2012)

			Approved Projects			
Practice Type	Bids Submitted	Approved Projects	Total Nutrient Reduction (lbs.)	Nutrient Reduction (lbs.)/ Project	Min and Max Bid ($/lb.)	Contract Length (years)
Bank stabilization	7	5	39,466	789	1.69-1.75	10
Cover crops	55	47	67,342	1030	0.36-2.00	1.3
Filter strips	2	0	NA	NA	NA	NA
Grass waterways	14	9	36,224	458	1.24-2.00	9.4
Fertilizer management	10	0	NA	NA	NA	NA
Hayfield establishment	11	9	26,357	358	1.12-1.60	8.6
Livestock management	12	12	467,768	2435	1.20-1.99	15.8
Conservation tillage	49	18	171,689	1350	0.58-2.00	5.6
Total	160	100	808,845	1142	0.36-2.00	5.6

CASE STUDY 3: WILLAMETTE PARTNERSHIP

Note: As this is a relatively new program, much of the information was found on the Willamette Partnership website as the scientific literature has not yet evaluated this program: http://willamettepartnership.org/. If no citation is provided, then the information was taken from this website.

OVERVIEW

The Willamette Partnership, founded in 2004, emerged from a restoration effort initially developed by a basin task force to coordinate restoration in the Willamette Basin in Oregon. The Willamette Partnership pursues the development of market and incentive based approaches to achieve better habitat restoration and water quality outcomes by developing an ecosystem market that can address a broader diversity of conservation and community efforts (Willamette Partnership 2016). In their own words,

> "The Willamette Partnership oversees the Ecosystem Credit Accounting System, a package of protocols, tools, and resources that allow buyers and sellers to track, account, and trade in multiple types of ecosystem credits." (Willamette Partnership online 2016)

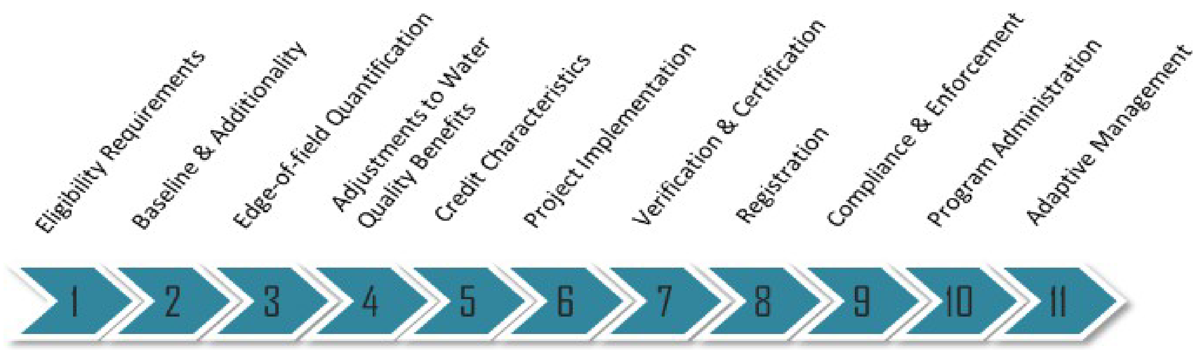
The Willamette Partnership has developed their credit trading program to support trading for both water quality and habitat benefits in a way that can serve as a model that can be used by other states and networks. Towards this end, they have developed a series of publications that can be found online to provide guidance to those interested in building a water quality trading program or broader ecosystem services trading program, available at http://willamettepartnership.org/publications/. Furthermore, they have developed two separate sets of credit tools and rules, one for Water Quality Trading and the other for habitat restoration. These tools support conservation investments that are either voluntary or driven by regulations and include protocols that can be used under regulatory requirements, safe harbor agreements or consumer goods certification programs. The Willamette Partnership also provide services for those wanting to start a program or needing advice along the way including ecosystem accounting, capacity building and operational support.

KLAMATH TRACKING AND ACCOUNTING PROGRAM

Starting in 2014, the Willamette Partnership committed to working with participating states (Idaho, Oregon and Washington) to launch pilot projects to test these recommendations and protocols. One effort under development with the assistance of the Willamette Partnership is the Klamath Tracking and Accounting Program (KTAP). KTAP is a voluntary program that allows landowners to participate in creating water quality benefits from completed projects. The program also creates a framework for use by regulatory agencies to credit point source polluters with benefits achieved by stewardship projects they have funded. Its goal is to increase the pace and reduce the cost of water quality improvements that support beneficial uses (http://www.klamathpartnership.org/KTAP.html). KTAP has recently completed its pilot phase (2013-2015) that engaged many stakeholders in the development of tools and protocols for WQTs where regulated point source polluters and trade for credit offsets. Subsequent to the pilot phase, the support tools will be upgraded prior to further program implementation. This initial pilot phase was supported by a CA 319 grant.

DEVELOPMENT OF GUIDING PRINCIPLES FOR WQT IN THE NORTHWEST

Another effort of the Willamette Partnership has been to develop guiding principles that can help the Northwest states in the development of their water quality trading programs so that these can be consistent with the Clean Water Act as well as state and local water quality laws (Willamette Partnership 2014). The initial focus of this effort is to develop trading program recommendations to facilitate trades between point sources and nonpoint sources (P-NP). In the future they will broaden the framework to include trades between nonpoint sources (NP-NP) and point sources (P-P). Establishing a water quality trading program that is transparent, credible and produces the intended water quality benefits has been a foremost goal. The development of this framework was supported by a USDA Conservation Innovation Grant. The framework they are using for program definition is show in the diagram below:



TEMPERATURE TRADING ON THE ROGUE RIVER

A third project has been cooling the water temperature of the Rogue River for salmon protection. Temperature trading is similar to nutrient trading, only thermal energy becomes the basis for the trade rather than nutrient load. Water discharged from the Medford waste treatment facility was too warm for salmon habitat and the $12 million cost to put in a cooling pond was not the best way to achieve lower temperatures. The Willamette Partnership adapted its Ecosystem Credit Accounting System to include benefits of shading the river through riparian forest restoration (Willamette P website). A total of five restoration projects have been verified covering 15 acres of land and two miles of stream length that will reduce the solar load to the system by 201 million kilocalories. These projects include animal exclusion fencing and off channel watering, treatment wetlands and riparian vegetation restoration. They have identified five different tools for quantifying water quality benefits and results: three for temperature, one for nutrients and one for fish. The Nutrient Tracking Tool developed by NRCS will be used for quantifying reductions in nutrient load. Project descriptions and funders can be found at http://ktap.willamettepartnership.org/2014-2015-pilot-projects/.

TEMPERATURE TRADING ON THE TUALATIN RIVER

The Willamette Partnership published case study reviews of Oregon Water Quality trading efforts. One case study reviewed the success of the Tualatin River program to reduce temperature, with the intent to extend this program to the entire Willamette basin (Willamette 2012). The Tualatin River temperature trading program was driven by the wastewater treatment facility's need to meet NPDES permits and has primarily involved the restoration of riparian forests to provide shade. This restoration has taken place in both urban and agricultural areas. The regulatory flexibility of the Oregon Department of Environmental Quality and the US EPA along with leadership from the regional wastewater utility, Clean Water Services, provided the underpinning for generating the first trade. The stakeholder committee for the Tualatin River trading program was chaired by a local farmer/landowner. There was also a Technical Advisory Committee with representation from another farmer/landowner, the USDA Farm Services Agency, the Oregon Small Woodlands Association and the Tualatin Soil and Water Conservation District. A criticism of the program centered on whether the best restoration locations to provide beneficial shade had been utilized or whether landowner willingness to provide restoration opportunities was preeminent in determining restoration sites. There was also criticism of the restoration ratios of 2:1 that were used. The trading program provided a much more cost effective means of achieving water quality objectives. Clean Water Services avoided spending $150 million on mechanical chillers by investing $4.6 million in riparian forest restoration along 35 miles of stream banks and also augmented flow releases from reservoirs.

The involvement of stakeholders in a process to define restoration protocols and ecosystem markets has been critical to the success of this program. Developing a scientific foundation with appropriate standards and a framework for crediting ecosystem services has been an important role of the 30 plus organizations involved (Willamette 2012). Although there are multiple practices that could be employed for cooling, including irrigating crop fields, restoring wetland or restoring riparian areas for shading, most credits have been generated by this last option (Willamette 2012). To assess the potential credit supply for shading involved using a model (Shade-a-Lator) to calculate the reduction in solar energy that would result from implementation of trees along a stream reach. This reduction in solar gain is then used to model the change on ambient stream temperature during the low flow summer months. Stakeholders completed the credit supply analysis and prioritized restoration areas using spatial datasets for the Willamette basin. Then the Willamette Partnership evaluated the waste load allocations for point sources under the Willamette TMDL to determine organizations who might create a demand for credits to offset their waste loads, identifying 108 candidate facilities. The industrial facilities identified and interviewed were hesitant to engage in trading due to their concern that trades could be contested and result in legal proceedings. However 15 municipal wastewater treatment plants were identified with a demand of about 3 billion kilocalories per day (Willamette 2012).

PROGRAM DESIGN

The Willamette Partnership developed a stakeholder process using a consensus based approach to make decisions about the design of the water quality trading program. This process was guided by standards in the Counting on the Environment Process developed by the Willamette Partnership. Five separate groups were formed to provide different inputs, and ultimately a Joint Statement of Agreement was consummated by 25 stakeholders, including NGOs and state and federal agencies.

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NUTRIENT COOP BASIS

DRAFT DOCUMENT 6/24/16

WHAT WOULD MOTIVATE A SUCCESSFUL PROGRAM?

1) The primary regulatory benefit to growers is reduced liability. This occurs through anonymity of reporting for the Nutrient Tracking (TNA) and other aggregated data on a sub-watershed basis for all coop members.
2) Initially seek a longer term regulatory agreement with an extended period beyond the 5 year cycle to provide increased regulatory certainty.
3) A regulatory benefit for Tier 3 growers is no individual monitoring.
4) Reduced individual burden of administration and reporting
5) Modelling will provide information that can increase the likelihood of choosing and locating BMPs so that they will achieve improved water quality and potentially lower the risk of failure or non-performance to growers as they attempt new methods and technologies.

Commented [AH1]: The incentive at this point may just be an agreement that last longer than the current Ag Order and perhaps the next. In other words, a more stable regulatory agreement.

MISSION

To bring together a collective of growers, mutually responsible for regulatory compliance at a watershed scale, who will conjointly work together to more effectively manage agricultural runoff by implementing on-farm BMPs and strategically placed structural practices to achieve water quality objectives and promote healthy watersheds and sustainable agriculture.

COOP GOAL

To create a watershed scale coop of growers who work together mutually to accomplish water quality objectives and reduce agriculturally related pollutant loads so that agricultural sources can be delisted from the TMDL for that waterbody.

Commented [AH2]: We could clarify a short-term and long-term goal. What you have here is the long-term goal. The short-term could be something like: a cost-effective and streamlined approach to regulatory compliance and achieving milestones toward TMDLs.

GOVERNING PRINCIPLES

Geographic Scope

A sub-watershed will form the geographic basis for taking collective action to reduce nutrients, pesticides and sediment in agricultural runoff and to make progress toward water quality objectives.

Legal Entity

Coop members will form a legal entity that will be collectively responsible for implementing the terms and conditions of the Regional Water Quality Control Board (RWQCB) Irrigated Lands Ag Order or WDR. No individual member will be required to report separately to the RWQCB, nor will individual coop members be legally liable to the RWQCB so long as they maintain membership in the coop.

All sub-watershed cooperatives will contract with the RWQCB separately, however the foundational principles will be the same for all cooperatives and the administration will fall under the same governance structure.

A Board of Directors with membership by growers from the watershed, , a legal advisor, and technical advisors will oversee that the organization is administered and operates in keeping with legal requirements.

Participation

A minimum of 70% of the growers in a sub-watershed must opt into the coop in order for it to become a viable entity. If participation falls below this level, the potential success of the coop will re-evaluated prior to initiation to assess whether there will be enough of a collective to share the financial impact andaccomplish water quality goals.

Agricultural producers (and dairies?) with operations in a sub-watershed may opt to join the cooperative provided they are willing to meet the membership requirements. Members will be audited for compliance and those not implementing and maintaining BMPs, paying dues, or working toward improving water quality in the watershed as a whole will be excused from the coop.

Minimizing Liability

Throughout the start-up phase over the first three year test phase of the watershed based coop approach, the coop will seek to reach a hold harmless agreement with those CC region environmental groups who may threaten legal action.

To avoid increased potential for legal action against the co-op or regional board for perceived regulatory ease that could lead to lower water quality, the coop will pursue similar regulations to other regulated entities, through either seeking a WDR or abiding by Tier 2 requirements with TNA and transitioning to future ag order regulations. The regional board will be less likely to try to impose additional regulations.

Nutrient Management Practices

Cooperative members will all utilize on-farm practices to effectively manage nutrient applications and application of irrigation water at the time and amount needed by the plant to minimize leaching to groundwater, and to minimize runoff and soil erosion. Growers can choose their own practices to effectively meet these goals.

Coop members will be encouraged to engage in training and education related to BMPs and other innovations and research that pertain to improving water quality, minimizing inputs and conserving resources.

Commented [AH3]: Or a new WDR crafted by the coop members and RWQCB

Commented [AH4]: Idea is to create a template that could be used

Commented [PKD5]: AH Comment: We might take ourselves off of the Board of Directors. I think we would want to transition to an advisory role – maybe an Advisory Committee or Advisory Board

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Commented [AH6]: We would like to, but I don't think this can be a governing principle. It is a strategy we could employ, but we might have to have another approach to working with or around Coastkeeper.

A model showing options of multiple arrangements of on- and off-farm treatments both traditional and innovative in the pilot sub-watersheds will be used to inform siting of practices and treatment areas, as well as estimate the potential nitrogen reduction benefits.

The location for larger off-farm treatment structures such as wetlands or bioreactors will be strategically chosen by the Board of Directors, with input from the Advisory Committee, based on the best location to intercept and treat drainage water according to modeled pollutant transport, the need to treat water prior to entry into state waterways and based on land availability.

Cost Sharing and Credits

Nutrient coop members will share the cost of implementation of off-farm practices in proportion to their contribution to the need for water treatment and will collectively pursue grants or other outside funding sources for their implementation.

Commented [PKD7]: Should we simplify and use acreage?

Additional charges/ costs may be allocated to members who fail to meet minimum implementation of on-farm practices and where site specific discharges place an undue burden on the cooperative.

Credits will be apportioned to landowners that benefit the cooperative by providing lands where treatment systems are implemented that benefit the success of the cooperative.

An agreed upon annual budget share that will be allocated to support ongoing monitoring, reporting, technical support, and expansion of treatment systems within the sub-watershed.

Water Quality Goals and Monitoring

A location at the base of the watershed will be monitored to provide feedback to the collective on overall performance toward meeting water quality objectives. This monitoring will match the schedule and analytes monitored by the Cooperative Monitoring Program.

Water quality goals will be established and updated by the Board of Directors targeting collective ongoing incremental progress toward the water quality objectives for the beneficial use of the receiving water body, with the ultimate goal of removing the waterbody from the 303-D list..

If water quality goals are not achieved, source analysis will be undertaken to identify potential sources of pollutant addition and to suggest solutions such as on-farm, edge of field or larger structural practices for remediation.

Discharge at the inflow and outflow of off farm practices will be monitored to provide feedback on their performance in terms of load and concentration reduction .

Commented [AH8]: This is subject to change given ag legal counsel review

Reporting

The Cooperative will report the combined results and level of effort taken by members to reduce nutrient loading within the sub-watershed.

TNC Nutrient Management Cooperatives Report Attachment 5

In an effort to demonstrate continuous progress towards water quality improvement, the cooperative will report:

1) Agricultural lands participating in the cooperative; acres of land within each sub-watershed (total and participating members), percentage of various crops in production for those drainages, total nutrients applied by coop members and average per acre allocation within each drainage area.
2) Location, size, status and effectiveness of cooperative treatment systems
3) Cumulative load reductions achieved within sub-watershed due to the combined effect of treatment systems and on-farm practices.
4) Additional actions that will be employed to ensure "continuous improvement and sufficient progress towards water quality improvement"
5) A list of on-farm management practices employed by coop members and the percent of coop farms (or acreage?) engaging in specific practices.

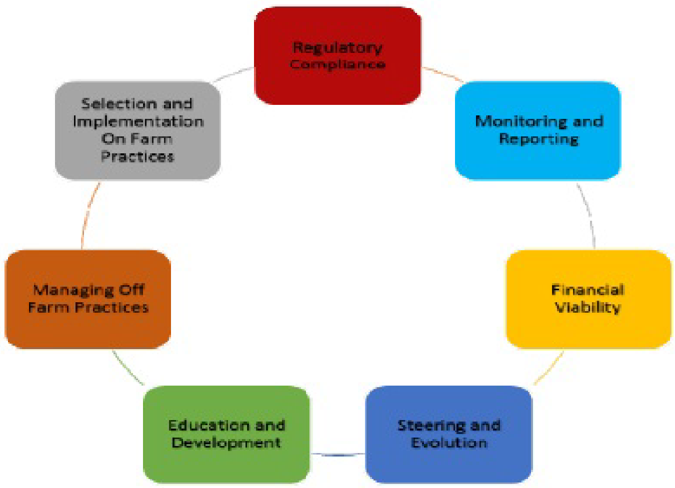
On-Farm Practices:

Assumption: There should be a base level of BMP practices that all growers in the coop are expected to adopt over time. Below are some possibilities, however growers need to choose the specific practices that will work best for their situation (crop, soil, slope, organization).

1) An irrigation distribution uniformity (DU) assessment and training of irrigation operators and field managers on system operation and maintenance.
2) Implementation of flow meters for irrigation systems
3) Irrigation Scheduling implemented with a choice of methodologies: CropManage, Soil moisture sensor, etc.
4) Nutrient tracking
5) Nutrient management with a choice of methodologies: CropManage,
6) NRCS practices enumerated in the grant

ORGANIZATION STRUCTURE FUNCTIONS

TNC Nutrient Management Cooperatives Report Attachment 5



Core Purpose

Core Process

Core Value

Steering and Evolution –

The steering committee will develop the initial conceptual model for the nutrient coop; assess the likelihood of establishing a successful program based on evaluating costs, grower incentives to join, and regulatory uncertainty; establish the governance structure for the cooperative; pursue funding for the time involved in establishing the coop; create alliances with outside organizations for services and support; and negotiate an agreement with the CCRWQCB for establishing the nutrient watershed coop. The steering committee is composed of TNC, RCDMC, CCWG, MBNMS, Grower Shipper Association, and Preservation Inc. and (others?). The steering committee will initially take an active role in the operation of the coop, but will pass this on to the Board of Directors and organization following a startup period of 3 years. (How long does the steering committee stay involved in the coop negotiations with the RB? When do they pass the baton or do they maintain an active strategic planning role?-)

Commented [AH9]: I think the steering committee becomes and advisory committee as soon as the Coop is established.

Board of Directors

- Oversee the fulfillment of the regulatory and financial obligations of the nutrient coop
- Perform all generic legal responsibilities of a BOD.
- Hires and evaluates the performance of individuals

TNC Nutrient Management Cooperatives Report Attachment 5

- Reports issues, strategies, successes and failures to the Steering committee and Regional Board and aids with the development of adaptive management strategies for the regulation and development of the coop and future coops.

Regulatory Compliance

- Holding firm boundaries with the regional board regarding the coop's regulatory obligations.
- Negotiating changes with the regional board at the end of the timeframe for the coop Agreement.
- EInsuring all reports and forms are completed and submitted and are complete and on-time

Grower Technical Support:

- Helps with BMP selection and adoption,
- Provides growers with an understanding of NRCS EQIP and other funding opportunities,
- Helps with Nutrient budgeting and all technical aspects required, eg soil testing, nitrate water calcs, etc.
- Reports information to the coop re Total N Applied and practices implemented.

Monitoring and Reporting

- Monitoring at the base of the watershed will take place on the same timeframe and constituents as the CMP and the site will be included in CMP reports.
- Growers will be enrolled in the CMP (probably?) and this monitoring and reporting will be included as a service from the CMP.
- Monitor off farm practices for performance effectiveness. Monitoring for these will be monthly performed on a three year cycle, for those constituents that the practice is designed to remediate.
- Source tracking for pollutants will occur when the base of the watershed fails to meet the environmental objectives. Growers found to be contributing to elevated pollutant concentrations or loads will be informed and provided options for managing the application more effectively to reduce contaminant runoff. (What happens if the source is someone outside the coop?)

Managing Off farm practices

- Manage off farm to sustain their performance for nutrient and other selected pollutant removal.
- Visually inspect practices for issues on a periodic basis and assess the monitoring data from the inlet

- Perform maintenance as needed so sustain performance.
- Evaluate performance versus water quality objectives and develop improvement ideas for adaptive management as needed.
- Questions: Should we develop close relationships with a university to use our watershed as a test site for new practices? How should we attempt to optimize performance and prevent rundown? Should this be contracted or managed by the coop?

Financial Viability

- Develop a budget for the operation, maintenance and improvement of the nutrient coop services and regulatory compliance mandates and for offsite practices.
- Sustain a list of referrals for services provided by technical service providers for sediment control, irrigation and nutrient management.
- Maintain up-to-date, complete and accurate accounting records for the nutrient coop.
- Invoice growers for the coop expenses (?)
- Develop vendor contracts for offsite practice installation, monitoring and lab work, and any other coop needs.

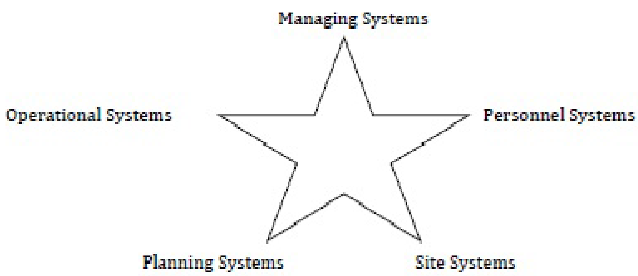
Education and Development

- Should involvement in education be a requirement? For everyone? For those who have not yet installed BMPs? For those found through source tracking to need better practices or organization effectiveness? For the different levels of the organization to include irrigators and supervisors as well as growers and higher level?
- Base education and development on the specific needs and opportunities observed in the watershed.

Grower Members

- Growers will be self managing in providing information in a timely and complete manner. This will help to minimize the cost of administering the program.
- Growers will sign up for membership for a three year period.
- Growers will pay dues and help with grants by writing letters of support.

ORGANIZATION SYSTEMS



ORGANIZATION PROCESSES

Problem Solving Processes,

Processes for sustaining grower anonymity and protecting competitive information

Source tracking

Modelling nutrient movement and scenarios for BMP installation and off site practice location