



# Adaptive Management Case Study: The Silver Creek Pilot Project

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## 1. Introduction

In the ongoing effort to reduce phosphorus pollution in our water bodies, Wisconsin is pioneering a new, innovative approach to water quality improvement: the adaptive management option (AMO). Introduced as a part of Wisconsin's 2010 phosphorus rules, which established numeric water quality criteria and options for point sources to meet those criteria, the AMO is a cost-effective and comprehensive approach to phosphorus reduction at the watershed level. That is, the AMO focuses on phosphorus reductions not only from specific wastewater discharges (point source pollution), but also from polluted runoff (nonpoint source pollution) across a given watershed.

The AMO is a way for permitted point sources to meet their regulatory requirements by reducing nonpoint source phosphorus pollution in their watershed. Although nonpoint sources are subject to some regulation, most nonpoint control measures are voluntary, putting most of the regulatory responsibility for phosphorus reduction on point sources. The AMO shifts the focus of phosphorus reduction from facility-level controls to watershed-wide efforts, involving contributions from various stakeholders across a community.

The major benefit of the AMO for permitted facilities is the potential to comply with phosphorus limits for a significantly lower cost than more traditional, facility-level “brick and mortar” upgrades. In addition to cost-effectiveness, implementation of an adaptive management plan:

- Allows a facility more time to comply with discharge limits than they would have otherwise,
- Provides a facility with less restrictive interim discharge limits that have the potential to become permanent, and
- Incentivizes practices that result in verified phosphorus reductions, since compliance under the AMO depends on attaining water quality criteria.

Because the AMO is a new compliance option in Wisconsin, permitted facilities are just now beginning to explore this option. The AMO allows for flexibility in its implementation, which can be a benefit for point sources to creatively meet phosphorus requirements but also leave several questions about how the AMO can and should work. To address these questions, some facilities have begun implementing pilot projects to test adaptive management on a smaller scale before selecting it as a compliance option for phosphorus. One of the state’s first projects is getting underway in the Lower Fox River Basin in northeastern Wisconsin, led by the Green Bay Metropolitan Sewerage District (referred to by its brand name, NEW Water).

This report provides a step-by-step overview of this innovative project, focusing not only on the actions taken in the project so far, but also on how and why project planners decided to take specific actions. The purposes of this report are to answer common questions about implementation decisions, encourage the implementation of adaptive management elsewhere in the state, and assist in the development of additional adaptive management projects in their beginning stages by providing an example project.

## **2. Project Background and Rationale**

The Silver Creek Pilot Project is an initiative led by Green Bay’s Metropolitan Sewerage District, whose brand name is NEW Water. NEW Water discharges to the Fox River just before it empties into Green Bay, the largest freshwater estuary in the world.

The Lower Fox River, whose basin contains NEW Water and the pilot’s sub-watershed, is subject to a total daily maximum load (TMDL) for phosphorus. The TMDL establishes limits for how much phosphorus point and nonpoint sources can contribute to water bodies in the basin without impairing water quality. The load limitation in the TMDL translates into a discharge limit for point sources in the Lower Fox River basin, including NEW Water. The need to comply with this phosphorus limit and the associated costs of doing so initiated NEW Water’s consideration of adaptive management. Cost-effectiveness was the main driver in NEW Water’s decision to implement adaptive management, but NEW Water also considered the relative environmental impact of adaptive management on the basin. Historically, the

basin has struggled with impairment from various industrial pollutants, and nutrient pollution has become a critical issue in the basin. Illustrating the scope of the problem, excessive nutrients have caused a dead zone, or an area no longer able to support most life due to oxygen depletion, to develop in Green Bay.

The pilot project is focusing on the Silver Creek watershed, which is a sub-watershed of the Duck Creek watershed west of the city of Green Bay. It was chosen as a pilot area due to its manageable size, its potential to be restored to a trout stream, and because it drains into the highly impaired Green Bay. Ownership of the land in the project area makes this pilot particularly unique. The Oneida Tribe, a traditionally conservation-minded sovereign nation, owns the majority of the land in the project area, and therefore has specific regulatory control over the land and includes conservation requirements in agricultural land leases.

The objective of the Silver Creek project is to test the feasibility of the AMO in the Lower Fox and determine if enough land can be converted from high-phosphorus-loading practices to lower-phosphorus-loading practices while still remaining economically viable. Eventually, looking beyond the pilot project, NEW Water envisions a watershed-by-watershed approach in the full-scale implementation of the AMO, altering the strategy by watershed to account for watershed-specific factors. Ideally, this approach will increase implementation and participation in the basin.

### 3. Wisconsin DNR Steps 1-9

This section is organized by the nine steps required in an adaptive management plan, which are explained in the Wisconsin DNR Adaptive Management Technical Handbook, to highlight the actions and rationales applied to each step in the Silver Creek planning process.

Each of the summaries below includes the tasks laid out by the WDNR for each step, the purpose of each step in the context of developing a plan, and the main stakeholders involved in each step to give a sense of the types of organizations that can assist in AMO planning. Although there is not a one-size-fits-all approach to adaptive management, this information is included to demonstrate the planning and resources that went into the Silver Creek project and provide ideas and lessons for future projects.

#### Step 1: Identify Partners

**Tasks according to the WDNR:** *Identify potential partners, their role in adaptive management, and develop a communication strategy. Create Memorandum of Understanding between partners, if desirable.*

**Purpose:** *To obtain support, community buy-in, and resources, and to identify future contributions to your project by entities in affected area.*

**Involved Stakeholders:**

- *Lead: NEW Water, Oneida Tribe*
- *Others: Consultant Team, County Conservationists, Environmental Groups, UW Green Bay, Wisconsin DNR etc.*

Establishing relationships with partners is fundamental to a collaborative project such as adaptive management. NEW Water knew that it needed the cooperation and partnership of the majority land owner in the area, the Oneida Tribe, in order to progress with the adaptive management option. The Oneida Tribe has historically been very interested in restoring their natural resources and very quickly stated their support<sup>1</sup>. NEW Water then began contacting potential partners, such as the county conservationists and local crop consultants, keeping in mind specific roles that each partner could fulfil in the AMO. The project currently has several partners with technical expertise to assist in landowner outreach, monitoring and conservation practice implementation. A full list of project partners is available in the project charter document, available here:

[http://www.gbmsd.org/media/138092/silvercreek\\_charter\\_v2\\_9-8-14.pdf](http://www.gbmsd.org/media/138092/silvercreek_charter_v2_9-8-14.pdf).

### *Communication*

A communication strategy for AMO projects is important to foster collaboration and ensure progress on the plan. Communication in the Silver Creek pilot project will be coordinated through five different advisory committees each in charge of a specific role: monitoring, implementation, modeling, communication and steering committees. For example, the communication committee will most likely compose of NEW Water's and the Oneida Tribe's current communication specialists, and USGS will be a member of the monitoring committee. In summer 2014, NEW Water contracted with CH2M Hill, an environmental consulting firm, to serve as a facilitator of the project and consult each individual committee. As of the end of 2014, NEW Water was in the process of developing a specific MOU for the project.

## **Step 2: Describe the watershed and set load reduction goals**

***Tasks according to the WDNR:*** *Describe the adaptive management action area including the counties in the watershed, available water quality data, number of reaches, hydraulic retention time and/or stream order data.*

***Purpose:*** *Determine the characteristics of the watershed that will influence development of the AMO plan, and calculate the phosphorus load reduction needed to meet water quality standards.*

### ***Involved Stakeholders:***

- *Brown and Outagamie County LCDs*
- *Oneida Nation*
- *CH2M Hill Consultant Team*
- *NRCS*

Familiarization with the facility's watershed is an important part of determining where implementation of phosphorus control practices will be the most effective in reducing phosphorus in the watershed. Baseline phosphorus data for the selected watershed is necessary to determine the load reduction needed to achieve water quality criteria. For the pilot project, the targeted water body is Silver Creek, but for an eventual full-scale project, the main targeted water bodies for NEW Water would be the Fox River and Green Bay. Gathering data on a watershed level can be a labor-intensive task, so to reduce the amount of internal work, NEW Water relied on outside professionals who were already conducting watershed analysis to gather the information required such as county conservation department staff, NRCS, the Oneida Tribe and their consultant team. By doing so, NEW Water is able to reduce some of the workload from its internal team.

### Step 3: Conduct a watershed inventory

**Tasks according to the WDNR:** *Gather current and historic land use data, and describe the physical features of the action area, typical agricultural practices in the watershed, and potential land uses in the future.*

**Purpose:** *Justify the need for adaptive management by determining the degree of impairment due to nonpoint phosphorus sources and collect the level of data necessary to do so. Determine what information exists and what information is still needed to develop an implementation plan. Establish a baseline phosphorus level to measure the progress of your project.*

**Involved Stakeholders:**

- *Brown and Outagamie County LCDs*
- *NRCS*
- *Consultant Team*
- *Oneida Tribe*

To demonstrate the feasibility of adaptive management to WDNR and to determine a baseline phosphorus level as a reference point for the project, it is necessary to identify not only the physical features of the project watershed, but also agricultural and other land use practices. The inventory for the Silver Creek pilot project is being supplied by several different sources. For a few examples, watershed data from sources like county LCDs, USDA surveys and the Lower Fox Basin TMDL report is informing project development. This existing data is also being supplemented with SNAP-Plus modeling analysis on all farms in the pilot project area to determine if adaptive management will be a feasible compliance option<sup>3</sup>. Current and historic land use data, nutrient levels and management plans, and physical features of the area such as soil type and topography are to be collected through a combined effort of the county conservationists and NRCS staff.

An accurate watershed analysis and phosphorus baseline calculation are crucial to the remaining steps of the AMO plan because modeling, implementation and monitoring are all

based off of this step. Therefore, NEW Water's work with experts in agriculture and water science is an important takeaway from this step.

#### Step 4: Identify where reductions will occur

**Tasks according to the WDNR:** Evaluate all data gathered in step 3 for decision making purposes and identify critical areas within the action area to target management practices.

**Purpose:** Prioritize and coordinate best management practices in area to efficiently remove sources of phosphorus from the watershed

**Involved Stakeholders:**

- Implementation Committee
- Modeling Committee
- County conservation staff

Once watershed data has been collected, the next step is determining where and how to implement conservation practices that will result in an adequate reduction in phosphorus. Due to the high concentration of agricultural land use in the area, changes to land use will be a key component of the Silver Creek project. Particularly, the area has experienced large shifts in agricultural practices from hay production to corn production. Corn, as a row crop, leaves more bare ground, making these fields more susceptible to nutrient and sediment runoff. Therefore, one of the main objectives of the pilot project is to determine the amount of land that needs to be converted from agricultural use to conservation reserves and from corn production to hay production to achieve the necessary phosphorus reductions for the area<sup>1,2,3</sup>.

A large concern is that the extent of land changes required to achieve water quality standards will not be economically feasible to area farmers – that is, changing land use or taking land out of production would not make business sense. Therefore, the pilot is not only an attempt to reduce phosphorus in the watershed, but to do so in a way that is still profitable to farmers. SNAP-Plus modeling on land in the pilot project area will help determine the amount of phosphorus that can be reduced through the implementation of certain practices, helping address these questions prior to implementation.

#### Step 5: Describe management measures

**Tasks according to the WDNR:** Complete a facility plan to comply with interim limits, if necessary, and identify management measure that will be installed throughout adaptive management implementation to control nonpoint sources of excess phosphorus.

**Purpose:** Demonstrate how point and nonpoint pollution reduction measures will result in adequate phosphorus reductions to meet compliance requirements.

***Involved Stakeholders:***

- *NEW Water*
- *Oneida Tribe*
- *Agricultural professionals like county LCDs and crop consultants*

After the watershed is analyzed and critical areas are targeted, an AMO plan requires the identification of practices will be implemented as well as the rationale behind the selection of these practices. Determining which practices will be implemented and why helps to demonstrate potential phosphorus reductions and ensure that all practices are a part of a coordinated approach to effective water quality control.

NEW Water has developed a specific, targeted agricultural outreach strategy for the pilot project area. First, project planners determined the organizations that have existing relationships with producers in the project area, such as county conservation department staff, crop consultants, and NRCS staff. These agricultural professionals will then communicate about the pilot project with the producers they already know and work with. These existing relationships are an important factor in determining who will perform the role of agricultural messengers in an adaptive management project.

Building off of outreach to producers, the next step is implementing conservation practices to reduce phosphorus. The Oneida Tribe farms as well as leases its land to other farmers, and the tribe is able to regulate land use practices for a large portion of the land in the pilot project area. Due to the conservation provisions in these leases, implementing certain conservation practices on this land is relatively straightforward compared to other areas in the basin. On land that is not owned by the tribe, however, securing farmer participation will be critical and NEW Water has been working with county conservationists to foster cooperation. This step will be particularly important if the project expands beyond the pilot area and into the rest of the basin.

As for the specific BMPs to be implemented, NEW Water has expressed strong interest in “perpetual” conservation practices, rather than practices that have a limited life span depending on the length of conservation agreements. The rationale behind this decision is to ensure longevity of practices<sup>1</sup>, which increases certainty of long-term phosphorus reduction for point sources participating in AMO. The Oneida Tribe is also interested in managed and rotational grazing of livestock as an additional approach to reducing nutrient and sediment loss in the basin. These practices align with the Oneida Tribe’s traditional beliefs and practices along with reducing phosphorus input<sup>2</sup>.

## **Step 6: Estimate load reductions expected by permit term**

***Tasks according to the WDNR: Quantify the phosphorus reductions needed from point sources, and approximate the phosphorus reductions expected from nonpoint source management measures.***

**Purpose:** *Ensure that the chosen management practices will produce the phosphorus reductions required to meet permit requirements.*

**Involved Stakeholders:**

- *Modeling Committee*

Estimating the potential phosphorus reductions of planned practices is important for demonstrating that compliance with water quality criteria will be achieved in the time frame of adaptive management. The Silver Creek pilot will rely on professional judgments of the County Conservationists and USGS to model the expected phosphorus reduction. Programs aiding the modeling committee will include modeling programs like BARNY for farm-scale modeling, SNAP-Plus, and SWAT<sup>3</sup>.

## Step 7: Measuring Success

**Tasks according to the WDNR:** *Develop a monitoring strategy that will identify who will collect phosphorus data, who will analyze these data, when and where samples will be collected, and the quality assurance protocols that will be followed.*

**Purpose:** *Ensure that the project is making progress toward water quality goals and requirements, and verify the in-stream effect of implemented practices.*

**Involved Stakeholders:**

- *US Geological Survey—data collection and analysis*
- *County LCDs—data collection and analysis*
- *Monitoring Committee*

A monitoring plan is important to keep the AMO project on course and provide evidence of compliance with the permit. The monitoring committee for the Silver Creek project will lead monitoring efforts in the project<sup>1</sup>. Since the short time frame of the pilot limits the observable phosphorus reductions, the goals of the pilot project consist of more than simply phosphorus reduction, but also collection of before-and-after data that demonstrates the real-world effectiveness of practices implemented in the project. Some of the planned actions include: before-and-after soil samples of fields in the project area, collection and analysis of 590 nutrient management data on all fields in the sub-watershed, creation of a web-based GIS that can be shared between partners, installation of wetland and buffer strips, and ideally, lowering soil test phosphorus levels to 30 ppm<sup>5</sup>.

Long-term success of adaptive management for NEW Water will first be defined as compliance with the phosphorus requirements in the permit, followed by a combination of longevity of partnerships and economic feasibility<sup>1</sup>.

## Step 8: Financial security

**Tasks according to the WDNR:** Evaluate adaptive management implementation costs, and provide a written statement from adaptive management participants that these financial needs are achievable.

**Purpose:** Demonstrate that the AMO project has sufficient funding.

**Involved Stakeholders:**

- NEW Water
- Project partners (particularly time commitments)

Cost estimates and funding sources to cover the costs of an AMO plan are important not only because they're a WDNR requirement for adaptive management, but because they justify the selection of the AMO as a cost-effective alternative to facility upgrades. NEW Water's efforts are supported not just by monetary contributions, but through contribution of partners' time. NEW Water itself is budgeting for staff to consult on the project, but much of the implementation and installment costs will come from external sources, such as the grant money and the time commitment of various partners. Once a committee is established for the project, further cost modeling will be performed.

An important consideration in the pilot project is not only the cost to NEW Water and other partners, but to participating farmers. Farmers in the area have been experiencing economic hardship, so conservation practices implemented in the project will need to make business sense as well as reduce phosphorus. The economic feasibility of adaptive management for farmers is one of the main questions that NEW Water and partners hope to answer through the implementation of the Silver Creek pilot project<sup>1,2</sup>.

This variety of funding sources is an important aspect of the Silver Creek pilot that should be taken into account in other projects. Public funding, like federal and state cost-share grants, and private funding, like contributions from municipal partners, can defray the cost of implementing AMO for an individual facility

## Step 9: Implementation schedule with milestones

**Tasks according to the WDNR:** Prioritize implementation measures, and develop a schedule by setting compliance dates for adaptive management interim limits and water quality milestones.

**Purpose:** Ensure that phosphorus reduction goals are met, and interim and final phosphorus limits are attained, within the required time frame.

**Involved Stakeholders:**

- NEW Water
- Project partners

To complete the AMO plan, the WDNR requires that an implementation schedule and milestones be set to ensure that the project is meeting interim and final phosphorus limits. Because the Silver Creek project is a pilot and not tied to a permit at this time, it's not subject to regulatory timelines or interim limits. However, it still has an implementation timeline designed to help NEW Water make a compliance decision by the time its permit is renewed in 2019, and there are final project milestones that will define success and the future feasibility of adaptive management for NEW Water.

Success of the AMO to NEW Water would primarily mean compliance with the phosphorus reduction requirements based on the basin's TMDL, but success would also potentially include a positive biological response in the watershed and SNAP-Plus predictions of less phosphorus and sediment. A lower cost per pound of phosphorus reduced than a traditional brick-and-mortar upgrade is also essential for NEW Water to move ahead with a full-scale implementation<sup>1</sup>. In the meantime, NEW Water is also supporting other phosphorus reducing efforts such as the Fox P Trade and Demonstration Farms as explorations of other ways to reduce phosphorus.

NEW Water officially kicked off the pilot project at a meeting August 2014, which brought together project partners to go over the project structure and goals. Moving ahead, NEW Water and partners will spend winter 2014-15 strategically planning with farmers and continue with practice implementation in spring 2015. Implementation measures and milestones will be influenced by a variety of different sources, but ultimately decided by the implementation committee under the guidance of the consultant team. The project will be set up for self-evaluation and mid-course corrections, if necessary. Ideally, the project will function as a model for future sub-watershed by sub-watershed approaches. The project will also combine incentives for land use change, economics, and compliance with state requirements to progress to a full-scale project throughout the Lower Fox<sup>3</sup>.

#### 4. Initial Lessons

No AMO project will look exactly the same, and many factors will influence how a facility develops and implements an AMO plan. However, there are some key common factors that contribute to the success of a project, as evidenced by the Silver Creek pilot project. While the Silver Creek pilot project is just getting started and more lessons will arise as it progresses, the following are some initial takeaways for project planners to keep in mind when developing an AMO plan:

- Rely on previously established relationships and best professional opinions to supplement project tasks and save the time of starting from scratch.
- Establish and maintain long-term, cooperative relationships with open communication.
- Be realistic in your capacities as a facility and bring in outside help when needed.
- Look for funding from nontraditional sources, such as state and federal agricultural conservation grants and private dollars from other partners.
- Allow time for mistakes, readjustments and results.

## 5. Project Timeline

- **2012:** Establishment of NEW Water's Environmental Programs Division
- **Aug 20, 2014:** Kick off meeting for Silver Creek Pilot Project
- **2014:** Stakeholder work planning, field inventories and soil sampling, identification of conservation needs, committee development, water quality monitoring<sup>4</sup>
- **2015:** Begin implementing BMPs in growing season<sup>4</sup>
- **2015-2017:** Conservation planning and designing BMPs, securing agreements with landowners, implementing and monitoring conservation plan, water quality monitoring, modeling<sup>4</sup>
- **2018:** End of pilot project; NEW Water makes compliance decision

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