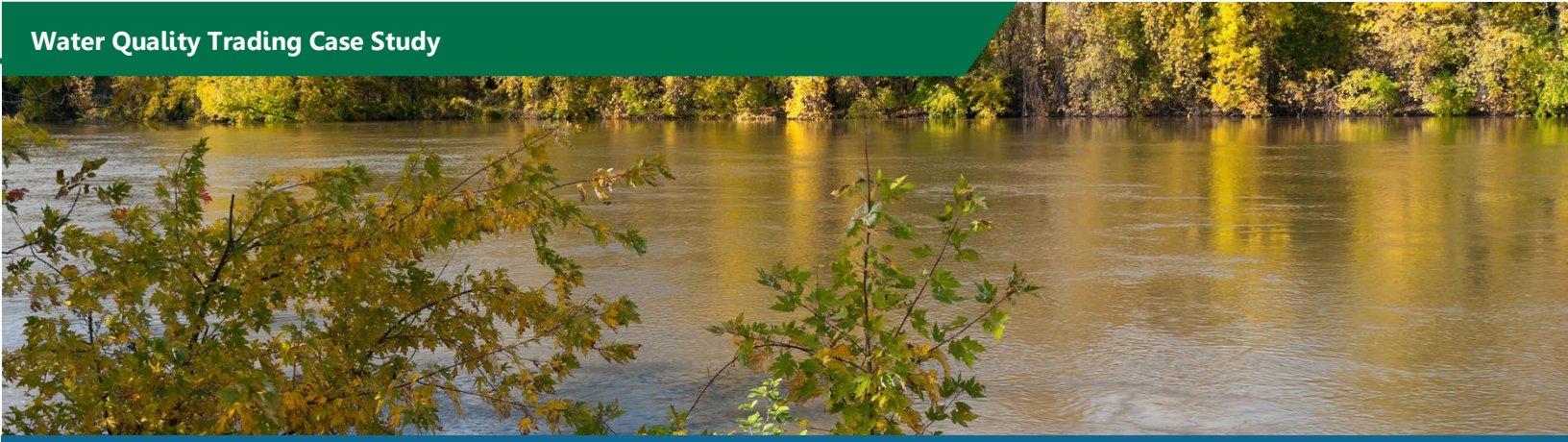

Southern Minnesota Beet Sugar Cooperative Permit

Minnesota

Overview

Type of Trading

Point Source–Nonpoint Source

Pollutant(s) Traded

Phosphorus

Basis for Trading

CBOD and ammonia TMDL

Participants

Southern Minnesota Beet Sugar Cooperative; nonpoint sources

The Southern Minnesota Beet Sugar Cooperative (SMBSC) is a farmer-owned cooperative with a beet processing facility located in southern Minnesota. The facility produces granulated sugar, dried pulp, and molasses from sugar beets.

Originally, SMBSC stored wastewater in lagoons during the processing season and used it to irrigate alfalfa and grassland during the growing season. However, in 1995, the company proposed to build a wastewater treatment plant (WWTP) to serve the facility instead. Wastewater would be treated at the WWTP and discharged to Beaver Creek, a tributary to the Minnesota River, rather than be used for irrigation. This WWTP would allow SMBSC to expand sugar production and resolve air quality and hydrogen sulfide odor problems associated with its wastewater storage lagoons and irrigation practices.

However, due to an existing total maximum daily load (TMDL) for carbonaceous biochemical oxygen demand (CBOD) and ammonia in the Minnesota River, the WWTP would not be allowed to discharge additional phosphorus that would contribute to algal growth and decomposition which would further decrease dissolved oxygen. In 1999, the Minnesota Pollution Control Agency (MPCA) issued a National Pollutant Discharge Elimination System (NPDES) permit (MN0040665) to SMBSC for the WWTP that established effluent limitations for phosphorus and required the company to offset all phosphorus loading through nonpoint source projects. This initial permit required SMBSC to establish a $300,000 trust fund to finance the projects, which was overseen by a trade board made up of a processing plant official, SMBSC's consultant, a Soil and Water Conservation District official, the Hawk Creek watershed coordinator, and an environmental advocacy representative (Breetz et al., 2004). The permit has subsequently been reissued without the trust fund requirement.

The initial permit required nonpoint source offsets up to 13,000 pounds of total phosphorus per year (SMBSC, n.d.a). Since 2005, the permit has required nonpoint source offsets of 6,500 pounds of total

phosphorus per year to offset SMBSC's discharged load. Over the last 17 years, SMBSC has averaged over 15,000 pounds of total phosphorus reduction per year through nonpoint source projects (Henningsgaard, 2022).

Benefits

By agreeing to offset phosphorus through nonpoint source trading, SMBSC was allowed to construct and operate its own WWTP, which alleviated the odor problems and allowed the company to expand its beet processing operations. One nonpoint source project that was used to generate offset credits was an innovative cover crop project that keeps soil from blowing off fields and eroding during windy and rainy conditions. The project also protects young sugar beet plants by retaining phosphorous in the field and providing shelter from damaging weather events. (SMBSC, n.d.a).

In 2021, SMBSC's total approved credit count was 18,383 pounds of total phosphorus per year, which far exceeded the required 6,500 pounds per year. Through these reductions in excess of the offset requirement, SMBSC's nonpoint source offset projects are providing a greater overall water quality benefit than required by the permit (Henningsgaard, 2022).

Analyses of the costs and benefits of trading are not available from the SMBSC or MPCA, but a 2003 study by Fang and Easter suggested that it is likely that SMBSC initially achieved cost savings through trading rather than treating. The researchers estimated the capital and operation costs for a WWTP with comparable design flow to treat to 1 milligram per liter (mg/L) of phosphorus[1] ranged between $4 and $18 per pound of phosphorus reduced, based on a 20-year investment life and an 8 percent annual interest rate. SMBSC paid farmers $6.22 per pound of phosphorus reduction; however, the actual cost to implement the cover crops necessary to reduce phosphorus was $18.66 per pound. Farmers incurred an additional cost of $12.43 per pound of phosphorus reduced. This estimate did not include the production costs saved by avoiding the replanting that was often necessary when the young sugar beet plants were not protected from the wind by cover crop best management practices (BMPs) (Fang and Easter, 2003; Klang, 2006b; Birr, 2011). Although not quantified, these and other ancillary benefits may help to explain why the growers were willing to incur the added cost to implement cover crops beyond the price paid by SMBSC. No cost analyses have been conducted for the other nonpoint source BMPs that have generated additional reductions.

Summary of Trading Activity

In 2021, SMBSC had contracts on approximately 700 sites totaling nearly 85,000 acres and yielding nearly 17,000 pounds of total phosphorus reduction per year through sugar beet cover cropping (Henningsgaard, 2022). SMBSC established one contract for cattle exclusion and bluff/channel stabilization BMPs, yielding 1,475 pounds of total phosphorus reduction per year (Geselius, 2013).

Eligible Trading Partners

SMBSC is the sole point source covered by the permit. Landowners, including sugar beet farmers and cattle ranchers, in the lower two-thirds of the Minnesota River basin are eligible nonpoint source trading partners. Landowners do not have to be members of SMBSC in order to be eligible to trade (Breetz et al., 2004). There are 500 beet growers in this region (SMBSC, 2013).

[1] SMBSC was required to completely offset its discharge, meaning that in the absence of trading, it would have to meet a 0.0 mg/L phosphorus limit. Because costs cannot be estimated for getting to zero phosphorus discharge, SMBSC's costs were compared to that of WWTPs with comparable design flow that were required to reduce phosphorous concentration to 1 mg/L.

Market Driver

Before 1999, SMBSC disposed of its wastewater from processing sugar beets by storing it in lagoons during the processing season and spray-irrigating it over 500 acres of alfalfa and grassland during the growing season. This process resulted in unpleasant hydrogen sulfide odors that brought complaints from neighboring areas. To resolve this problem and accommodate a 40 percent production expansion, in 1999, SMBSC proposed building a WWTP that would treat the wastewater and discharge into a tributary of the Minnesota River.

SMBSC planned to have its WWTP discharge into Beaver Creek, a tributary to the Minnesota River. The lower Minnesota River was subject to a 1988 TMDL for CBOD and ammonia-nitrogen, The lower Minnesota River TMDL estimates that 70 percent of the upstream CBOD loading was caused by decaying dead algae and phosphorus is the limiting nutrient for algal growth in the basin. MPCA developed a permit that includes phosphorus limitations with a requirement to offset all phosphorus discharges, and an allowance for nonpoint source trading (Klang, 2006d).

Trading Mechanisms

Sections 5.84.77 through 107 of SMBSC's May 1, 2021, NPDES permit describe the provisions for trading. Additional details are provided in attachment 1 to the permit.

SMBSC's 2021 permit requires the company to operate and maintain treatment technology to meet effluent limits at the WWTP, in addition to maintaining the existing nonpoint source controls. One of the facility's outfalls has a total phosphorus annual average limit of 0.75 mg/L during the hydrologic year (September through April) and an annual maximum limit of 1,135 kilograms per year (approximately 2,500 pounds per year), over a rolling 12-month period. The permit specifies that phosphorus loading from this outfall must be offset through trading.

Generally, credits to meet the offset requirement can only be generated from projects that have been funded by SMBSC or the landowner. However, if cost sharing or grant funding is also used, the requirements associated with that funding may specify if or how load reductions are eligible for credit generation (MPCA, 2020).

SMBSC has annual contracts for cover crops with the sugar beet farms that are generating credits and a five-year contract for a cattle exclusion and bluff/channel stabilization site (Henningsgaard, 2022). The land managers are paid through these contracts based on annual credits generated.

The 2021 permit states that MPCA will grant credits using a schedule that will give the point source greater flexibility in meeting the permit requirements: 45 percent are granted when the contractual agreements are reached, 45 percent when the nonpoint source controls have been implemented, and 10 percent when vegetation establishment criteria are reached (MCPA, 2020).

Credit Generation

At least 80 percent of the credits must be generated in the Minnesota River basin. SMBSC can request to implement new BMPs within the Lake Pepin basin.

The permit specifies that soil erosion BMPs, cattle exclusion, rotational grazing with cattle exclusion, critical area set asides, constructed wetland treatment systems, alternative surface tile inlets, cover

cropping, and storm sewer system retrofitting[2] are acceptable nonpoint source practices that can be used to generate credits. Other BMPs must be approved by MPCA.

The formulas used to calculate phosphorus credits from each BMP are detailed in the Water Quality Trade Crediting Calculations document that is incorporated into Attachment 1 of the permit. For BMPs installed at and above the Chippewa River mile 10, credit is only given to 50 percent of the estimated load reduction to account for a structure that diverts approximately 50 percent of the total annual flow from the Chippewa River into the Lac Qui Parle Reservoir.

SMBSC must propose BMP sites for generating credits to MPCA for approval. The proposal must include documentation of the use and condition of the site over the previous five years, the BMP(s) to be implemented, and specifics on the implementation process, operation and maintenance, and the detailed calculations justifying the phosphorus credits requested.

After the project is implemented, SMBSC must submit an implementation report to MPCA and a third-party auditor's report certifying that the project was completed as approved. The auditor inspects and certifies the project implementation. If the project is implemented according to MPCA's approval, the auditor will recommend the issuance of credits. MPCA will then approve or deny the credits (MPCA, 2020). The permit also requires SMBSC to submit a "phosphorus trading site annual report."

Pollutant Trading Ratios

The permit applies a trade ratio of 1.2:1 for all point source–point source trades and 2.6:1 for point source–nonpoint source trades (e.g., if a point source needs 10 pounds of reduction it would have to purchase 26 nonpoint source credits).

The nonpoint source trade ratio includes three different components: a base of 1:1 to offset the discharge, +0.6 to account for uncertainty and variations among sites, and +1 to provide additional water quality improvements (i.e., retirement) (MPCA, 2020).

Monitoring and Assessment

SMBSC must certify in a Phosphorus Trading Site Annual Report that the BMP sites remain active. The report must include photographs of each site taken during the previous year or the landowner's written certification that the project remains in place and effective (MPCA, 2020). MPCA monitors the status of BMPs with annual site inspections; however, for the initial trades, MPCA did not verify pollution reduction with systematic monitoring. SMBSC is not required to conduct water quality monitoring at any nonpoint source BMP site.

Challenges

The environmental community was initially hesitant to support the trading arrangement due to past permit compliance issues at SMBSC. To address these concerns, MPCA and SMBSC signed a Compliance Agreement with a schedule of actions to correct prior compliance problems before the permit was issued (Breetz et al., 2004).

[2] BMPs cannot be tied to new development or re-development and cannot be in an area that is subject to NPDES or State Disposal System (SDS) stormwater permitting requirements (municipal separate storm sewer system, industrial, or construction) (MPCA, 2020).

Resources

Birr, Adam. 2011. The Watson Partners and the Southern Minnesota Sugar Beet Cooperative. Ecoagriculture Partners. https://ecoagriculture.org/publication/the-watson-partners-and-the-southern-minnesota-sugar-beet-cooperative/

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Henningsgaard, Bruce 2022. Personal communication. March 30.

Klang, James. 2006b. Personal communication. May 5.

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MPCA. 2020. NPDES and SDS Permit MN0040665.

Southern Minnesota Been Sugar Cooperative (SMBSC). (n.d.a). Phosphorus Reduction. https://www.smbsc.com/environment/phosphorus-reduction.html

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