Thermal Trading in a Local, State, and Federal Regulatory Context: The Vermillion River

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1. Introduction

The United States Environmental Protection Agency (EPA) encourages states to develop and implement programs and policies that use trading to meet water-quality targets. Many states have developed such policies; Minnesota's Pollution Control Agency (MPCA) is currently working on this state's version. Trading is a mechanism under which regulated sources of pollution can meet their required emissions reductions by purchasing environmentally equivalent or greater reductions from another source, either point or nonpoint. When a trading program works well, it can offer significant advantages over more traditional policies. Put one way, it can reduce the overall costs of achieving a given environmental objective. Put another way, it can allow a greater reduction of pollutant or thermal loading than could be achieved at the same cost by other means. The cost savings arise because regulated sources, responding to a profit motive in their search for least-cost reduction opportunities, have both the incentive and the necessary information to distribute reductions among themselves in a cost-effective manner.

The growing popularity of trading programs appears to be due at least in part to the success of the national market in SO_2 allowances. Evidence shows that the allowance program has saved billions of dollars annually for the U.S. electric power industry. It is far from certain, though, that trading for other pollutants will be as successful. The SO_2 market has several features that contribute to its success, features that are unlikely to be present in quite the same way in a typical water-quality trading market. Sulfur dioxide emissions are easy to measure and monitor. The molecule travels great distances before being deposited on the ground. At least approximately, a ton of SO_2 emitted in one location has much the same effect as a ton emitted elsewhere. There are hundreds of sources of SO_2, and trading takes place between any and all of them. The market is based upon a single well-defined currency: a ton of SO_2.

The potential for water-quality trading to yield significant cost savings is real, and the enthusiasm with which the EPA and state agencies have embraced it in recent years is understandable. There are, though, reasons to ask whether and under what regulatory conditions a trading program for water quality might succeed. After all, in a typical watershed the number of potential traders is relatively small. Loading of pollutants at one point in a river can have very different effects than loading at a distant point downstream. Though it is possible to measure the effects on nutrient delivery or on thermal changes of land-use practices across a watershed, this task is technically challenging. Even the best models leave us with considerable uncertainty about the ultimate outcome. Variability in stream flow and weather events introduces further uncertainty.

Indeed, the literature related to water-quality trading is quite large and, for the most part, discouraging. In most of the trading markets in the U.S., very few trades have taken place. Morgan and Wolverton (2005), for example, list 36 nutrient trading and offset projects in the United States.[1] Of these, four have seen 20 or more trades while the remainder have three or fewer trades. There is a reason for the low trading activity seen in many cases: the challenges facing water-quality trading programs are real and significant. Uncertainty is great, the number of traders tends to be small, and contributions from nonpoint sources are difficult to measure. Still, the potential costs savings and the possibility of environmental

[1] See also the summaries in Environomics (1999), King and Kuch (2003), and Breetz *et al.* (2004).

improvement beyond that achievable by traditional regulations mean that further attempts to make trading work are justified too.[2]

What does success mean in the context of water quality trading? A useful definition is the following:

1. *Market activity:* trades occur in numbers that indicate an active, vibrant market;

2. *Reliability*: participants know what to expect from the program and find that they can trust its functioning—a minimum of surprises; and

3. *Transparency:* parties to a trade—potential buyers and sellers—are able to understand the way the market works and to find one another with relative ease.

These three ingredients require the presence of willing buyers, willing sellers, and—perhaps most important of all—willing environmental officials. A program that attracts interest from many potential buyers, but few or no sellers, will not succeed. Likewise, a program that leaves participants unsure about the future and whether their investments in trading activities will bear fruit over time is unlikely to foster the confidence necessary for trading to flourish. Local and state agencies and officials who develop and implement the program need to be aware of the importance of providing information to buyers, sellers, and the general public. Given the history of water-quality trading programs in the U.S., we know that not all programs are successful. It is essential that these three items be kept in mind as the Vermillion River Thermal Trading Program is developed.

In order to work well, a trading program must offer flexibility for participants, characterized by the ability to make off-site trades with as many potential trading partners as possible. Any trading program will be pulled in two opposite directions by the desire to offer broad market opportunities, on one hand (which will increase the number of potential participants and help lead to a successful program), and to control water quality precisely along the length of the river, on the other. We will see that decisions regarding limitations on who may trade with whom, and where within the watershed, will have important implications for this fundamental tradeoff.

King and Kuch (2003) believe that the primary barrier to successful trading is the small number of parties who stand ready to create credits for sale and/or to buy the credits. They say that so-called "institutional obstacles," such as the surrounding regulatory environment, are less of a problem. Unless the regulatory environment is attended to, though, the number of traders and trades will be low, and thus that the trading program will be unlikely to succeed.

The primary purpose of this paper is to outline the current regulatory environment within which the Vermillion River Thermal Trading Program is situated and to describe the ways in which federal, state, and local policies might affect it. In short, will the conditions be right for our trading program to have a chance at success?

2. Federal Policy

[2] The cost savings that trading can deliver are potentially quite large. The U.S. EPA has estimated that the annual cost of meeting TMDLs nationally would be $900 million lower with trading than without trading (as cited in King and Kuch, 2003, p. 10359). Doering *et al.* (1999) estimated that the cost of nutrient reductions required to eliminate the hypoxia problem in the Gulf of Mexico would be $14 billion lower with trading than without it.

The U.S. EPA is serious about promoting and encouraging the use of trading to achieve improvements in the nation's waters. One indication of this is the fact that of the twelve grants awarded in 2005 under the EPA's Targeted Watershed Grants program, trading programs are featured in four: the Vermillion River in Minnesota; Tuttle Creek Lake in NE and KS; the Willamette River in Oregon; and the Skagit River in Washington.

In 2003 the EPA released a document regarding water-trading policy, which provides states with guidance regarding the development of trading programs. It also encourages them to do so, stating as its purpose "[T]o encourage states, interstate agencies and tribes to develop and implement water quality trading programs for nutrients, sediments, and other pollutants" (p. 2). Among the objectives stated by the EPA, the agency supports trading where it:

1. Reduces the cost of implementing TMDLs through greater efficiency and flexible approaches;

2. Establishes economic incentives for voluntary pollutant reductions from point and nonpoint sources within a watershed;

3. Offsets new or increased discharges resulting from growth in order to maintain levels of water quality;

4. Achieves greater environmental benefits than those under existing regulatory programs;

5. Secures long-term improvements in water quality through the purchase and retirement of credits by any entity; and

6. Combines ecological services to achieve multiple environmental and economic benefits.

The EPA policy statement on water-quality trading describes several requirements, some more firmly stated than others, that any trading program should satisfy. For the most part these do not appear likely to impinge on the success of a proposed thermal trading program for the Vermillion River. One or two exceptions, possible causes for worry, are noted below.

Trading programs must be consistent with the Clean Water Act (CWA) and trading should occur within a watershed. The EPA supports trade in nutrients and sediment loads, but is more guarded in its support of trade in other pollutants. Such trades, it says, "may pose a higher level of risk and should receive a higher level of scrutiny to ensure that they are consistent with water quality standards"' (p. 4). Trading in persistent bioaccumulative toxics is not supported at all. Any party wishing to sell credits must reduce its nutrient loading below a baseline established by an approved TMDL, or (before a TMDL is established) "the applicable water quality based effluent limitation" (p. 4). The credits generated for sale will be measured relative to the seller's baseline, computed in this way.

Trading may be used to maintain high water quality in nonimpaired waters, prior to a TMDL in impaired waters, or under a TMDL. The Vermillion River is not yet listed as an impaired water by the Minnesota Pollution Control Agency (MPCA). Thus, if it is implemented soon a thermal trading program for the river would fall under the first of these three categories. Indeed, the program could help to avoid listing altogether. If the river is listed as impaired at some future date (about which more below), trading could play an important pre-TMDL role and it is expected that the trading program would be built into the TMDL itself. The EPA encourages this.

A trading program does not change permitting requirements, though trades can sometimes be included as part of a NPDES permit. Other features of the CWA that are required as usual under a trading program include: public notice for NPDES permits; protection of designated uses; and antibacksliding.

The EPA lists several elements that should be part of a "credible" trading program. The first of these is that the CWA provides authority for the EPA and the states and tribes to establish trading programs. No new statutory authority is needed. Other elements include the following.

- Trading programs should establish clearly defined "units of trade." In the case of thermal trading, it is not entirely clear what these units should be. The most likely candidate is Joules or some other measure of energy appropriate for establishing a thermal cap.

- Credits should be generated either before or during the period in which they are used to comply with the buyer's limitation requirement. The policy appears to be silent on whether a credit generated in one year could be sold and used the following year.

- States and tribes should establish standardized protocols for quantifying load reductions and credits. These should be included in NPDES permits so that trades and compliance can be tracked.

- Where trade involves nonpoint sources, states must account for increased uncertainty in estimates of nonpoint source loads. The EPA requires using trading ratios greater than 1:1 for trades involving nonpoint sources, and other methods that reflect increased uncertainty.

- States should establish mechanisms for ensuring compliance and for enforcement of a trading program. If a permittee purchases credits and the seller defaults on its commitment, the permittee remains responsible for the effluent limitation that was to be satisfied by the seller's reduction.

- The public should be invited to participate in the development of a trading program and, once it is in place, should be notified of all trades.

- Trading programs should be evaluated periodically, with focus on environmental and economic effectiveness. Revisions should be made as necessary.

This list, here in summary form, is the heart of the EPA policy. Each of the listed elements is reasonable; the Vermillion River thermal trading program will be designed with the EPA guidelines very much in mind. Only one of the items *might be a cause for concern*. This has to do with trades between nonpoint sources and permitted point sources.

Because thermal trading in the Vermillion watershed, as currently envisioned, will rely heavily upon credits generated by nonpoint sources—mainly agriculture—and sold to permitted point sources, any prohibitions that make such trades unattractive could present a serious barrier to the working of the program. According to MPCA staff who have spoken with officials at the EPA, the EPA's interpretation is that a nonpoint source would need to satisfy its share of a TMDL's load allocation before it could generate any credits for sale to permittees. If a TMDL specifies a 30% load allocation, for example, a farmer would need to implement land-use changes that achieve a 35% reduction in thermal loading simply to be able to sell credits equivalent to 5% of the reduction. Because reductions of this size are costly, farmers are unlikely to find it attractive to participate in trading under these conditions. Because their obligations under a TMDL are entirely voluntary, we can expect that farmers will choose to opt out of the TMDL compliance picture altogether. In this scenario, with no farmers willing to sell thermal credits, the only trades would be between permitted point sources. Trade between point sources can potentially work, but in our case it would mean

no additional cooling in agricultural areas along the trout reaches. And, by taking farmers out of the pool of ready sellers, trading activity would be significantly reduced.

Discussions with staff at the MPCA have revealed that they expect to have a certain amount of flexibility on this matter. Moreover, their sympathies are very much in line with the research team involved with the Vermillion thermal trading initiative. That is, if the Vermillion is listed as impaired, and a temperature TMDL is developed, these staff will seek to incorporate trading in the TMDL in such a way that nonpoint sources will have an incentive to become involved. Thus, there is reason to hope that the MPCA's essential point-nonpoint trading rule will be favorable to the trading program envisioned for the Vermillion.

Of course, this matter becomes relevant only if the Vermillion River is listed as impaired for temperature. Even apart from the rule regarding nonpoint sources and load allocation, the interaction between TMDL requirements and the thermal trading program are important. The effect of a TMDL on trading in other watersheds around the country is somewhat difficult to judge. Three of the trading programs that have seen the largest trading volume—on the San Joaquin River in California, in Long Island Sound in Connecticut, and on the Truckee River in Nevada—all have TMDLs. In the Clear Creek watershed in Colorado, there is no TMDL but only one trade has been observed. Thus, the presence of a TMDL in a given watershed does not mean that trading will fail. Neither does the absence of a TMDL mean that trading will succeed. Still, most of the trading programs in the U.S. have seen little or no trading activity, and most do face TMDLs.

Depending on the circumstances, a TMDL can inhibit trade (by requiring nonpoint sources to incur high costs in order to participate) or promote trade (as permitted sources face a new and powerful incentive to identify low-cost ways to meet the TMDL's more stringent effluent limits).

3. Policies in Other States

A number of states have issued their own rules for water-quality trading, under the auspices of the EPA's policy document.[3] Two, for Oregon and Ohio, are summarized here. Oregon's document is perhaps the more extensive of the two with respect to the modeling protocols for computing credits. Ohio's document, which became effective in January of 2007 and is thus the most recent, is said to be the EPA's "model" trading policy.

Oregon

In January 2005 the Oregon Department of Environmental Quality (DEQ) released an Internal Management directive on water quality trading. Based on past experience, including with temperature trading in the Tualatin River, the Oregon DEQ expects trading to be "a site-specific custom solution to an unusually difficult compliance problem." Oregon's policy follows the EPA document in many respects, but some features are worth noting.

1. Baselines for use in calculating the generation of credits are based on relevant effluent limitations for nonimpaired waters and for impaired waters before a TMDL is established. After approval of a TMDL, the baseline is the waste load allocation (for point sources) or load allocation (for nonpoint sources) in the TMDL.

2. Credits must be generated before or during the period in which they are used by the buyer. An exception to this requirement is granted for temperature trades because of the time lag between

[3] See Breetz, *et al*. (2005) or Morgan and Wolverton (2005) for summaries of all state policies and projects.

planting trees along a stream and the protective shade that they later provide. An appendix illustrates how to calculate the credits generated by the planting of shade trees.

As in the EPA policy document, trading may occur under a TMDL, before a TMDL in impaired waters, or to maintain water-quality standards. The Oregon DEQ does not allow trades that would circumvent technology-based effluent limitations imposed through regulations outside the purview of the trading program. Because more than 80% of the impaired listings in Oregon are for temperature, with fewer than 10% for nutrients, the DEQ expects that most trading opportunities will be for temperature. Cross-pollutant trading for oxygen-related pollutants is supported, as is trading in bioaccumulative toxics. The latter is discouraged or disallowed by the EPA document; Oregon will consider such trades and seek EPA approval.

Oregon describes three categories of trades: single buyer; multi-party/closed-market; and multi-party/open-market. A *single-buyer trade* occurs when a permitted facility obtains credits from one or more point or nonpoint sources or when a single permittee trades credits between two or more of its own outfalls. A *multi-party/closed-market* trade occurs when multiple permitted parties are involved in buying and selling credits among themselves. The trade can involved pre-approved nonpoint sources. This sort of trade typically involves a set of municipal wastewater treatment plants. So long as their aggregate loadings remain below the overall cap (determined by their aggregate baseline), all permittees are considered to be in compliance. Nonpoint sources may also be involved, as when the collection of permittees together purchase wetland restoration credits. A *multi-party/open-market* trade is different from the closed-market trade in that a wider group of parties are eligible to participate.

The Oregon document provides more detail than the EPA's trading policy with respect to its treatment of uncertainty and its sample trading protocols. In order to deal with uncertainty, Oregon suggests three possible approaches: increased trading ratios; margins of safety; and monitoring of surrogates. A trading ratio of 1:1 means that each credit generated by one party can by used as a full credit by its buyer. A trading ratio greater than one, as Oregon recommends for example with point-nonpoint trades, means that the seller of credits must generate more than one credit for each credit that it sells. When the effect of nonpoint sources on loading is difficult to measure, this leads to a conservative policy. Margins of safety are designed to protect against unanticipated or unusual environmental occurrences. Monitoring of surrogates may be an effective way to measure water quality for an inherently variable parameter, such as temperature. If a trade based on planting of shade trees is approved, monitoring plant survival or shade density could be a reasonable surrogate for the effectiveness of the trade.

Ohio

The Ohio rules for water-quality trading were finalized in December 2006 and became effective on January 1, 2007. The Ohio trading program is voluntary and aims to: (1) facilitate watershed-wide approaches to water-quality improvement; (2) minimize the costs of achieving and maintaining water quality standards; (3) provide incentives for pollutant reductions from point and nonpoint sources; and (4) achieve further environmental benefits.

Under the Ohio rules, trading must not lead to a violation of water-quality standards or a TMDL. Trading is not allowed for bioaccumulative chemicals. Special rules apply to concentrated animal feeding operations (CAFOs), which may not use credits to meet no-discharge technology limits. Nonpoint-source load reductions can generate credits "in direct proportion to the percent local contribution, where the BMPs are funded under a federal grant program," but not if the grant was issued under section 319 of the Federal Water Pollution Control Act.

Trading can occur in a watershed, in a TMDL area, or in any area where the director determines that trading will achieve the goals of the policy. Nonpoint sources can participate in trading: "After applying the appropriate trading ratio, all nonpoint source pollutant reductions funded by a permittee shall be available as water quality credits for the permittee to use in meeting its NPDES permit effluent limits." Under the Ohio rules, nonpoint sources do not evidently need to meet their share of the load allocation reduction before they are able to sell credits. Trading activity that occurs in impaired waters before a TMDL is approved is allowed to count toward meeting water-quality standards.

The Ohio rules do not provide example calculations of trades, as does the Oregon document, but they are specific regarding the information required in a watershed management plan in order that point-nonpoint trades are allowed. The plan application must:

1. Identify persons, organizations, and agencies responsible for implementing the proposal;

2. Describe current and projected land-use activities within the area where trading will occur;

3. Include a map on which is identified all hydrologic assessment units where nonpoint sources that might participate are located; and;

4. Include a map on which is identified all hydrologic assessment units where nonpoint sources that might participate are located; and

5. Include a list that illustrates the range of BMPs expected to be used.

These requirements are consistent with the land-use, hydrology, and stream-flow models under development for the Vermillion River thermal trading program.

Under the Ohio policy, baselines for nonpoint sources are the pollutant load associated with existing land uses and management practices. The baseline must be "established by using an accurate, representative, and reliable process and operational information, and available flow and monitoring data, pollutant loading data, and records that are available, and that are deemed acceptable by the director." Nonpoint baselines are to be based on three-year averages before a change is made to reduce pollutant loads. For point sources regulated under an NPDES permit, the baseline is the effluent limit in an NPDES if one is established in the permit, or the loading achieved after implementation of practices approved in the NPDES if it is not.

For trades between permitted sources, credit ratios are 1:1. For trades between a permittee and a nonpoint source the trading ratio is 2:1 where there is no TMDL and 3:1 where there is a TMDL.

As in the Oregon policy, there does not appear to be any language in the Ohio policy document that requires nonpoint sources to meet their proportional share of reductions under a TMDL's load allocation before any credits are generated as a result of load reduction activities. So long as other requirements are met, the first unit of reduction can be sold as a credit to a permittee.

4. Water-Quality Trading in Minnesota

Minnesota's Pollution Control Agency has some experience with point-nonpoint nutrient trading, having engineered the trade involving Rahr Malting. Members of the MPCA staff have indicated a keen interest in the Vermillion thermal trading program and would very much like to see it succeed. There are certain parameters within which the agency must operate, though, and existing state rules might affect the

Vermillion market. The potential challenges are most significant in connection with two sets of rules: the no-material-increase standard for temperature; and the potential listing of the Vermillion River as impaired for temperature.

Minnesota temperature standards

The Vermillion River is a trout stream, one of the premier urban trout streams in the country. The MPCA, the VRWJPO, and all interested parties would of course like to see it preserved as a viable trout fishery. In fact, though, only some of the reaches of the river system are classified by the MPCA as Class 2A waters, or a cold-water fishery. These are the "trout reaches." The rest of the river and some of its tributaries are Class 2B waters, or cool- or warm-water sport fishery.[4] The rule that applies to the trout reaches with respect to temperature is "no material increase."

Federal temperature standards are designed to protect designated uses in a waterway. For the Vermillion River, the maintenance of trout is a designated use.[5] The federal temperature standard also contains a nondegradation statement.

Minnesota's standards for the Vermillion River include the designated uses described above, a temperature criterion of "no material increase" for the 2A reaches, and a requirement that all waters are to be "protected from point and nonpoint sources and wetland alternations, and to maintain existing water uses." The interpretation of the phrase "no material increase" is quite important for a temperature trading program in the Vermillion watershed. If it means that no statistically significant increase in temperature will be allowed *at any location*, then trading will be virtually prohibited. This is because any trading program that allows trades between point and nonpoint sources is likely to affect in-stream temperature differently at different points along the stream. A trade that reduces the average temperature in the system, and is therefore desirable, might have the effect of increasing temperature at a particular point. Indeed, this is likely to be the result of many desirable trades. Such trades would violate the standard on the interpretation that temperature cannot increase at all, in any place in the system.

If, on the other hand, no material increase means that the designated use must be preserved, then any increase short of a critical temperature (for example, harmful or even lethal) should be allowed. On this interpretation trading would be much more likely to satisfy the standard. A point-nonpoint trade that leads to a small increase at one point on the river (and an equivalent or larger decrease elsewhere) would be allowable so long as trout are still able to survive in the river. It is important to keep in mind that trout are capable of moving upstream or downstream to find cooler water during the warmest weeks of the year. Moreover, the temperature along the river and its trout tributaries changes due to local groundwater inflows and other effects. Because of this, trout are not distributed uniformly through the trout stream.

One approach to addressing the Minnesota temperature standard would be to include in the thermal trading program a margin of safety sufficient to ensure, to the extent possible, that temperature conditions in the river decline in the first few years of the program. This could possibly be achieved by a one-time

[4] The Minnesota DNR's classification scheme for designated trout streams does not coincide with the MPCA's rules regarding 2A waters. The DNR bases its classification on the presence of trout, while the MPCA uses a "pristine reference condition" for its 2A "cold-water fishery." Some years ago the DNR designated the Vermillion between Hwy 3 in Farmington and Hwy 52 as a trout stream. The MPCA designation, though, is made under Minnesota Rule 7050, which classifies water bodies in the state and also specifies water-quality standards for each classification. A new 7050 rule changing the designation for this reach of the Vermillion has been submitted by the MPCA for review by the governor and subsequent release for public comments. It is expected to be released soon.

[5] Portions of this section draw upon an October 2006 memorandum submitted to John Jaschke by Barr Engineering Company.

purchase of land-use rights in the watershed, as well as retrofitting low-impact-development practices on existing residential and commercial properties. If the cost of this activity were funded out of public monies collected throughout the watershed, the financial burden would not fall on a few developers or property owners who happen to create increased temperature loading in the near future.

The Barr Engineering memo notes that because there is no quantitative state-wide numeric temperature standard, the VRWJPO may have the opportunity to develop its own criterion.

Impaired listing and a TMDL

At the present time, the Vermillion River is not listed as an impaired water for temperature. Therefore, a trading program that is developed and implemented in the near future would not be a part of a TMDL process. Indeed, one hope is that the program could possibly help to avert a listing altogether.

In discussions with MPCA staff, it has emerged that the Vermillion is likely to be listed as impaired on the basis of temperature, but not before 2009 or even later. If the listing takes place, the model that supports a trading program will be an important tool for developing the TMDL. During the time it takes to develop the TMDL, trading could continue. The goal in this phase would be to incorporate the existing trading program into the TMDL rules, relying upon point-nonpoint trades to help the system meet the requirements of the TMDL. MPCA staff expect that, if a trading program is adopted, this will be an important component of their work on gaining approval for a TMDL—if that occurs.

Still, an impaired listing and the resulting TMDL could create problems for a trading program. First, there is a chance that calculation of load allocations could possibly be disruptive to the thermal market. Second, future changes to the thermal cap upon which a trading system is based could be difficult.

5. VRWJPO Standards

The VRWJPO's own Standards document from October 2006 will possibly affect a thermal trading program. In particular, the Runoff Volume Control Criteria could have a significant effect on trading activity. The Standards say, "Development that creates one acre or more of new impervious surface must incorporate volume control practices sufficient to hold the runoff volume for the 2-year 24-hour storm at pre-development conditions." The 2-year 24-hour storm even represents over 95% of all storm events during a typical year. Thus, the standard would limit trading to 5% of storm events that occur each year and which are flooding events that will be captured in detention ponds.

A successful trading program requires both willing buyers and willing sellers of credits. Agricultural landowners are potential sellers in this case; developers and urban landowners are potential buyers. The rule requiring that all runoff from a 2-year 24-hour storm be held on-site will significantly reduce thermal loading from stormwater. This is good in that it will protect the river. It will also, however, mean that there are fewer willing buyers or, more accurately, a lower need on the part of potential buyers to acquire thermal credits off-site.

The various credits that can be used to meet volume-control requirements resemble thermal trading, but with only one party involved they do not constitute trades as that term applies to the trading program under development. Single-party "credits," to the extent that they reduce the demand for credits from nonpoint sources, will certainly reduce activity in the thermal market as well.

The VRWJPO's Standards document, then, contains provisions that appear to work against the functioning of a thermal trading program. Three points are worth noting in this connection, however, all of

which provide reasons for optimism that the Standards will not present undue challenges to the thermal trading program. First, if significant problems are identified it will always be possible to amend the VRWJPO plan so as to remove barriers to trading. Second, the Standards include provisions for regional approaches to water-quality protection. A regional approach could include activities resembling trading, perhaps between subwatersheds. Third, stormwater runoff appears to be closely related to thermal effects, so the possibility of incorporating volume controls in the trading program may arise.

6. Summary

The potential for thermal trading to achieve cost savings in protecting the valuable trout resource in the Vermillion River watershed is significant. The record shows that success has been spotty at best in similar trading programs that have been established around the country. Among the factors that could negatively affect the program are existing water-quality regulations that are designed for related purposes but might inhibit potential buyers or sellers of credits from participating.

At the federal level, EPA's requirement that nonpoint sources meet their share of load allocation reductions before they are allowed to generate credits for sale to point sources would very likely squelch point-nonpoint trading completely. This requirement is not relevant except on impaired waters and under the TMDL, so the trading program does not need to address the concern quite yet. At the state level, MPCA's interpretation of the "no material increase" rule will be critical to the design and functioning of the trading program. At the local level, the VRWJPO's own rule regarding runoff volume control for the 2-year 24-hour storm will reduce the need for trading, perhaps dramatically. These and other consideration must be borne in mind as the trading program is developed.

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