

## APPENDIX B

### **Models for water quality trading with agriculture**

The following collection of trades and programs are examples of trading efforts that involved or involve water quality transactions with agricultural producers. While this list is by no means complete, it does provide examples that illustrate issues we might potentially face here in the Northwest. It is relevant to note that none of the water quality trading schemes found in this review have apparently involved point to non-point trades with forest lands.

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#### ***a) Great Miami River Watershed:<sup>1</sup>***

Over 80 percent of the private land in the Great Miami River watershed in Ohio is in agricultural use. The watershed covers some 3,800 square miles and crosses 15 counties. It also has 314 regulated point sources that discharge pollutants. Seventy percent of the population lives in urban areas covering about 5 percent of the total land base. This watershed is believed to be a significant contributor to pollution in the Gulf of Mexico.

Anticipating stricter state-wide nutrient pollution standards in 2005, the Miami Conservancy District (MCD), a regional government agency, assembled a broad group of stakeholders in the watershed to create a trading program. By allowing point sources to avoid large investments in wastewater treatment facilities, the program is saving local utility ratepayers some \$300 million over the next 20 years and providing substantial funding to local farmers in exchange for improved conservation practices. In 2006, USDA-NRCS also provided a three-year grant of \$1 million. MCD serves as a non-regulatory, third party broker by obtaining credits through contract with agricultural producers who implement BMPs that reduce phosphorous and nitrogen in the watershed. MCD aggregates those credits and then sells them to regulated point source dischargers under separate contract.

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Producers and local conservation districts apply for funding in response to an RFP offered by MCD. Those projects that result in the highest reductions in phosphorous and nitrogen per dollar cost are approved through a decision process by a broadly representative advisory group that establishes criteria and actually approves applications. MCD, in turn, separately contracts with point source polluters for their sale and thereby recoups its investment. MCD also establishes rules for the approval of transactions, including trading ratios (to insure against uncertainty), certification of credits, liability and recovery of funds from failed projects.

The following practices are considered eligible for this program:

- Animal waste storage structure
- Settling basins and filter strips
- Critical area protection
- Off-stream watering and stream crossing stabilization
- Roof and gutters
- Water diversions
- Grassed waterways
- Water and sediment control basins
- Erosion control structures
- Wetland treatment facilities
- Manure and mortality composting facilities
- Heavy use areas
- Swine manure aeration systems
- Tile outlet control for liquid manure

Considerations:

Along with the point sources, wastewater authorities, MCD, USEPA, Ohio EPA, Ohio Department of Natural Resources, and other affected governments and agencies, agriculture was closely involved in the initial development and is involved in the operation of this program:

- The Ohio Farm Bureau Federation and local county Farm Bureaus participated in development of the program, participate in project selection and establishing criteria, and help facilitate and enlist agricultural participation;
- EQIP funds contribute to this program, so USDA Farm Service Agency helps assure that farmers are eligible for EQIP;
- The County Soil and Water Conservation Districts participated in program development, advise and support farmers to identify and install BMPs, and help quantify credits for the program;
- USDA Natural Resources Conservation Service also participated in program development and helps to quantify credits; and, of course,
- Individual producers are implementing the BMPs to create these credits, with the help of conservation districts and NRCS.

MCD initially purchases the credits, so it essentially establishes their price (in \$ per pound of pollutant discharge prevented). The RFP system places farmers in direct competition with one another and has tended to keep the price of credits very low, despite the very large savings for point source polluters these credits provide. It is theoretically possible to cover up to 100 percent of the cost of installing BMPs under the program, but agricultural participation has been

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somewhat limited. Efforts are now underway to improve this structure so as to provide greater encouragement for farmer participation.<sup>2</sup>

About five to 10 percent of the BMPs are monitored each year. This adds to program administrative cost but provides some assurance that producers are complying with their contracts.

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***b) Alpine Cheese Company, Sugar Creek, OH:***<sup>3</sup>

The Alpine Nutrient trading program in Sugar Creek Watershed, Ohio was initially driven by a single point source – the Alpine Cheese Company – under a single point source National Pollutant Discharge Elimination System (NPDES) permit. The company had phosphorous discharge levels of 225 parts per million (ppm) and was required to reduce that to 1 ppm. The last 3 ppm of that requirement were very difficult and costly to achieve through a technological fix (filtering) and this limitation was preventing the company from expanding its operations, creating new jobs, and creating increased demand for local milk.

Alpine filtered their phosphorous down to 3 ppm, and then provided funding to pay local farmers to reduce phosphorous to remove the remainder. The Holmes Soil and Water Conservation District provided technical assistance to farmers in implementing BMPs, brokered transactions, , and developed measures for conservation and cost-share. Ohio State University did monitoring, research, planning, and public education.

Farmers in the basin are paid to adopt BMPs such as grazing plans, biofilters, contour farming, no-till, cover crops, fencing, etc.

Considerations:

Because the point source initially involved is a cheese factory that provides an important market for local dairies in the same watershed, this project was particularly logical – everyone involved could immediately see the mutual economic benefit of making a deal. (Additional point sources are invited to join as the project proceeds.) There were immediate, recognizable economic benefits for the community in facilitating the expansion of the cheese factory (including 12 new jobs at the factory itself and a stronger local market for milk from local farmers).

Local farmers, particularly in the dairy industry, were already familiar with and already had a positive relationship with Alpine Cheese. And the local conservation district was also trusted and so was a natural choice to serve as a broker in transactions with farmers and to help them implement the conservation practices required. Finally, OSU Extension was also trusted in the

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community so was a logical choice to assist with monitoring, research, planning and education. Note that this area includes many conservative Amish farmers who wanted a low level of outsiders on their farms – but some level of outside monitoring/involvement was necessary. The program was able to sort out this concern by involving trusted, existing community institutions like the SWCD and Extension.

Success of this project required Ohio EPA to be willing to accept the plan as sufficient over an initial five year period. If there is reasonable success in the first five years, they will fine-tune and proceed for an additional renewal period.

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***c) Kalamazoo River Demonstration – MI:***<sup>4</sup>

The Kalamazoo River watershed (draining into Lake Michigan) covers some 2,000 square miles in SW Michigan with parts of 10 counties. Eight percent of the watershed is urban, with about 57 percent in crops and livestock pasture, 21 percent forested, and 3 percent wetland. The watershed has over 50 NPDES permitted point source dischargers including municipal wastewater treatment plants and industrial sites.

The project calls for non-point source participants to reduce two pounds of phosphorous for each one pound credited for the point source permit. Such trading ratios (which are a common element in the water quality trades described here) are designed to compensate for uncertainties in these transactions – especially where there is more geographical distance in the watershed between the point source purchaser and the non-point source provider. They also provide a net environmental benefit to the watershed that helps justify and support the trading arrangements with the public. In this case, the 2 for 1 trading ratio could result in a net 50 percent overall reduction of pollutants in the Kalamazoo watershed below those called for in the TMDL.

The project met with initial resistance that was ultimately dispelled by providing accurate public information and employing a broad-based Steering Committee that includes the Michigan Department of Agriculture, Michigan Farm Bureau, USDA/NRCS, Michigan Integrated Food & Farming Services, and Michigan Agricultural Stewardship Association. The project also involved a broad partnership that included the above groups as well as the Michigan Department of Environmental Quality and various local groups and interests. The program pays farmers to use improved livestock practices like exclusion from waterways, grassed swales and limestone filters for diversion of and treatment of feedlot runoff, and soil fertility sampling to optimize fertilizer application. Technical assistance to farmers is provided the NRCS and local conservation districts and conservation plans and engineering designs are approved by certified NRCS planners.

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Non-point source “credits” generated by the project are “banked” with the Steering Committee and then “sold” to point sources that contribute funding to support the project.

Considerations:

Among the issues and barriers that were addressed in this project were the following:<sup>5</sup>

- “It is rare to find accurate, (if any), historical data for specific sites that might impact how baselines and timelines are established. This often resulted in discounting factors applied in addition to the trading ratio to account for uncertainty.
- “Credibility of the credit generator and/or the credit marketer is important for a successful market. The non-traditional and lasting partnerships formed during the process transcended many of these related concerns.
- “Any and all uncertainties must be recognized and addressed to the satisfaction of all parties. Broad-based participation and an open dialogue allowed consensus to be reached on a wide range of programmatic and technical issues.
- “Identification of real or potential political and legal obstacles at local, state and national levels must be addressed. Community-based trading initiatives can only succeed if the regulatory framework and clear legal authority are present. The project achieved the former through an open, Steering Committee process; state of Michigan water quality trading rules are now pending which will provide the latter.
- “Risks (liability, accountability, etc.) are present for the credit purchaser and generator that often are not readily shared. Service Agreements (private contracts) between user and generator define these issues for both parties, and participation by a third party (e.g., USDA Natural Resources Conservation Service) minimizes these risks.”

The Keiser & Associates report on the project at the Environmental Trading Network<sup>6</sup> describes the issues in this project for agriculture as follows:

“For the agricultural sector, the concepts of: a) having recognized and trusted contacts to serve as the communicators for the project, and; b) providing a degree of anonymity for site owners proved largely successful. Approaches that stress what is in the best interest of the farm, the farmer and the landowner are likely to be well received. Anything else will be typically viewed as inappropriate and thus not likely successful. Agricultural improvements, potentially funded through outside sources, can provide financial benefits to on-farm operations as well as credits that become a marketable commodity. Commodities are well understood by agriculture. Publicity (good or bad) for the farming community, however, tends to make producers shy away from programs that are regulatory in nature, especially as they may pertain to their operations and defined environmental impacts. Private contracts with trading credit users, rather than the inclusion of the farmer in a point source permit, are a much preferred approach for agriculture to participate in trading.”

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***d) Lower Boise River Effluent Trading:***<sup>7</sup>

The Lower Boise River Watershed drains about 64 miles of river basin extending eastward from the confluence with the Snake River and about 1,290 square miles including of Idaho's most populous areas along the I-90 corridor in and around the city of Boise and including, important agricultural areas in Ada and Canyon Counties. An expectation that a restrictive Total Maximum Daily Load (TMDL) for phosphorous that would require up to an 80 percent reduction in Phosphorous loads drove the study of a means to ameliorate its impacts. (Delay in that TMDL delayed implementation of the trading framework.) Participants included Idaho Department of Environmental Quality, USEPA Region 10, Idaho Soil Conservation Commission, Idaho Clean Water Cooperative, NRCS, Idaho Rivers United, Bureau of Reclamation, several municipal governments (Boise, Nampa, Middleton, Star, Notus, and Parma and the Association of Idaho Cities), several industrial stakeholders (Simplot, Micron, Idaho Power Company), and several agricultural stakeholders, including:

- Idaho Water Users Association
- Idaho Farm Bureau, Pioneer Irrigation District
- Payette River Water Master,
- Ada and Canyon Soil Conservation Districts.

The Idaho Soil Conservation Commission created a list of surface irrigated cropland BMPs approved for credits, including sediment basins, filter strips, irrigation systems, constructed wetlands, and crop sequencing. Measurement was on a watershed scale with each BMP assigned an "effectiveness ratio" and an uncertainty discount (the discount being eliminated if the farmer implemented a fully certified nutrient management plan). Some 22 typical BMPs were listed as potentially controlling phosphorous (practices such as: buffer strips, filter strips, grassed waterways, irrigation systems, irrigation water conveyance, mulching, nutrient management residue management, sediment basins, waste storage, etc.) Trades could be between point sources, directly between point and non-point, or between a point source and an organized group of non-point sources (such as an irrigation district<sup>8</sup>).

While it is not clear that there have been active trades under this program, the State of Idaho did follow up on the Lower Boise project and Idaho's Division of Environmental Quality has adopted a water quality pollutant trading handbook that now spells out how such trades can be made in the State of Idaho.<sup>9</sup>

***Considerations:***

The Lower Boise project did succeed in drawing a diverse interest group together to lay the foundations for possible future trades. Clearly this effort benefited from the early participation of both the agriculture and environmental communities. The use of irrigation districts as potential brokers or aggregators also suggests how local government, private, or non-profit groups representing (and having the trust of) the agriculture community may be able to play an important role. And the involvement of the Soil Conservation Commission and NRCS was also potentially a positive given their well-known traditional non-regulatory role, their long-standing

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relationship with the agriculture community, and their expertise in designing, implementing and understanding the use of BMPs.

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***e) Clean Water Services - OR - Tualatin Basin Shade Credit Temperature Trading***

**Program:**<sup>10</sup>

The Tualatin River travels some 80 miles and drains some 712 square miles in Northwestern Oregon including some of the more heavily populated areas of the State as well as some of the most productive agricultural lands. Clean Water Services (CWS), a local public wastewater utility, serves some 500,000 customers in 12 local cities (Beaverton, Tigard, Tualatin, Hillsboro, King City, Forest Grove, Sherwood, Cornelius, Banks, Gaston, Durham, and North Plains) in the Portland suburban area and manages four treatment plants subject to NPDES permit.

A new TMDL issued in 2002 substantially limited CWS pollution impacts on the Tualatin. (Chief among these was temperature, although bacteria, DO, ammonia, and phosphorus are also addressed). CWS had the option of spending about \$150 million (and substantial annual operating cost) on an effluent refrigeration system. Instead, they decided on an approach that would pay farmers (and others) to plant trees in riparian areas to cool the water naturally. They provide two agriculture-related programs:

- Enhanced Conservation Reserve Enhancement Program (ECREP) substantially adds to payment levels currently available under the existing Conservation Reserve Enhancement Program (in view of higher land costs in the area). These increased payment levels, along with strong technical assistance and suitable plant materials, are designed to provide additional inducement for farmers to participate in establishing CREP buffers of 35 feet or more.
- Vegetated Buffer Areas for Conservation and Commerce (VEGBACC) is a less generous program that does not include CREP contributions but helps farmers plant trees in riparian buffers narrower than the 35 foot minimum under the CREP program.

CWS surveyed agricultural producers and designed the programs to address the concerns that were expressed in the survey. Both programs are voluntary – with the VEGBACC program designed to provide a less remunerative option for farmers who do not wish to live with some of the restrictions of CREP. Both programs provide suitable plant materials and technical assistance. Both offer conservation easement options, if desired, and offer possible services to transfer and protect water rights.

Among the advantages of these programs and of CWS's approach is that the result is much more beneficial for the overall health of this watershed, addressing a host of additional issues beyond the water temperature limitation that initially drove its creation. Many of the indirect benefits (like habitat creation, for example) are not easily quantifiable. Rather than spending \$150 million on a refrigeration facility, since 2004, CWA has spent about \$4.3 million on all four of

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its watershed programs (of which ECREP and VEGBACC are just the agriculture components), a substantial savings for ratepayers.<sup>11</sup>

Considerations:

The CWS program does not involve specific “trades” between point sources and non-point sources. Rather it is a regulated point source achieving compliance with its NPDES permit by establishing and funding a more effective voluntary, watershed-wide program designed to reduce load levels to a level that will allow it to operate. Nonetheless, it amounts largely to the same thing – providing financial and other incentives to non-point sources in exchange for their producing improved environmental quality.

From an agriculture perspective, CWS created a “souped up” version of CREP (ECREP) and a less restrictive version (VEGBACC) to interest additional farmers to participate. Until this program was in place, not one Multnomah County farmer had enrolled in CREP. There were, however, 27 ECREP projects in 2008,<sup>12</sup> testifying to the program’s ability to meet the needs of farmers. The program uses known institutions (like the soil and water conservation districts and NRCS) and piggy-backs on known programs (like CREP) to build a system with which farmers can easily interact.

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***f) Rahr Malting Company - MN<sup>13</sup>***

The Rahr Malting Company decided to build its own, new wastewater treatment facility (with discharge into the Minnesota River) rather than continue to send its wastewater to the metropolitan facility in the local town of Shakopee, MN. Because the entire potential load for dissolved oxygen (CBOD5) and phosphorous for the Minnesota River was already allocated to the Shakopee municipal treatment plant and treatment could not reduce its pollutant discharge to zero, Rahr needed an innovative solution. The answer was a permit that conditioned Rahr’s discharge upon its reducing upstream pollution loading by an amount equal to the discharge of the new plant. Rahr created a program to fund BMPs in agricultural lands upriver, including: options reducing sheet, rill, and gully erosion and stabilization of gully and bank erosion, exclusion of livestock from streams and riparian zones, rotational grazing and wetland treatment for storm runoff. These particular BMPs were chosen because they will produce the right kind of effect, because they would be additional to what farmers were typically already doing, and because they could be easily and visually tracked and monitored and subject to contracts with Rahr.

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Rahr worked with the Coalition for Clean Minnesota River (a broad-based local group) to identify potential trades. Using a ratio of two pounds reduced for each one pound credited as an offset, as of January 2002 it had exceeded its required goal of offsetting 150 pounds per day of CBOD5 (dissolved oxygen) with direct trades at four sites up the river for total offsets of 204 pounds per day.

All four of the projects that achieved these savings involved agricultural land. Two of them converted existing farmland back into floodplain by restoring vegetation and applying conservation easements. Two other project sites (on 8-Mile Creek and Rush River) appear to have worked to the advantage of the farms by stabilizing eroding stream banks – one of which was advancing toward a feedlot and barn at a rate of eight feet per year, the other of which was threatening a farmer’s house. Banks at these two sites were planted with hybrid poplar and other vegetation, re-contoured, and stabilized with root-wads and timber cribbing and cattle were fenced and excluded. Maintenance was the landowner’s responsibility under the contract with Rahr. These were direct contract transactions between Rahr and the farmers – apparently with some assistance provided by the Coalition for a Clean Minnesota River. Other than the participating farmers, it does not appear that local agriculture groups were involved.

Considerations:

Rahr’s choice of which BMP practices would be included is interesting – based in part on ease of verification and contracting (as well, of course, as ones that would produce the needed offsets). This clearly produced the type of projects that were selected – essentially riparian restoration projects rather ongoing conservation management practices continuing over time. Also, the choice of practices that were not already commonly in use in the watershed is instructive. Typically, if pollution credits earned with BMP’s are to be sold and counted in a trading scheme, they need to be “additional” to what one might expect the landowner to do without such a sale. The Rahr approach to this was fairly simple.

This example does not involve creation of a broad public program. Rather the Rahr Company program is more like a few semi-private transactions between the point source and a few farmers. The regulatory authorities were, of course, involved. It does not appear that there was any broad involvement in the design or operation of the program by the agriculture industry generally. Finally, it is to be noted that two of the four projects took land out of agriculture with restoration projects. The other two, on the other hand, appear to have helped keep land in agriculture by stabilizing eroding stream banks.

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***g) Red Barn Trading Company - PA<sup>14</sup>***

Red Barn Trading Company is a private, for-profit environmental credit trading service associated with the established Lancaster, PA agricultural consulting firm of Red Barn Consulting with an existing agricultural client base of some 500 operators. Red Barn Trading serves as a broker, working with its existing client base of farmers to help them produce credits that will be certified under the new Pennsylvania Chesapeake Bay Watershed program. In particular, Red Barn's client farmers are exporting poultry manure from Chesapeake Bay Watershed soils that are too nutrient rich out to locations where the soils are nutrient poor and can be sold with no harm to the watershed.

Among the buyers was the Township of Fairview, in York County, PA which became the first municipality in the Chesapeake Bay Watershed to meet its water quality improvement requirements entirely through water quality trading. It did so at a cost that is 75 percent less than the \$6.4 million that would have been required to upgrade its existing sewage treatment system. As aggregator, Red Barn reduces risk a municipality might face dealing directly with farmers. It establishes the relationships with farmers and takes on risk that one or more of the individual transactions with farmers may not work out. For a seller (in this case, the Township of Fairview) this then becomes a clean, trouble-free transaction with a predictable outcome and a single, large contractor. It turns out, however, that the transaction may not have been as profitable for Red Barn as hoped, so there is some question about the future for their effort.

***Considerations:***

This example illustrates the possibilities of entrepreneurship on the part of potential brokers or aggregators of pollution credits. Because of its preexisting consulting relationship with local farmers and experience, Red Barn knew it was possible to simply ship manure to an adjacent watershed in better pollution shape and sell it. Combined with what it would be paid by the municipal point source client, the transaction made sense. Other opportunities of this type may exist for private business in the future.

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***h) Southern Minnesota Beet Sugar Cooperative - MN<sup>15</sup>***

In 1999, the Southern Minnesota Beet Sugar Cooperative (SMBSC) and the Minnesota Pollution Control Agency (MPCA) announced a deal that would allow SMBSC to offset its wastewater discharge by working with farmers to implement BMPs in the watershed. The SMBSC is a farmer-owned cooperative whose members grow sugar beets in Southwestern Minnesota. The deal allowed the factory to build a new treatment plant and increase its output of sugar products by 40 percent even though no new discharge into the Minnesota River could be allowed. To avoid additional pollution load, SMBSC contracted with farmers to provide offsets, particularly

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phosphorous. Environmental and river advocacy groups participated, along with SMBSC, MPCA and other affected local governments, in the design of this program.

SMBSC created a trust fund of \$300,000 to implement non-point projects. A board was created to oversee the program including SMBSC's consultant, a conservation district official, a watershed coordinator, and an environmental advocate. As a result of these transactions, SMBSC is able to discharge 5,000 pounds of phosphorous per year. In the first two years it offset these discharges by contracting with its member-growers to grow spring cover crops on about 36,000 acres upstream. BMPs authorized by the permit include cattle exclusion from streams, buffer strips, constructed wetlands, set-asides, alternative water conveyance, and cover cropping. SMBSC contracts with landowners in the Minnesota River Basin to accomplish the offsets and is required to monitor the results. Modeling formulas determine how much phosphorous is prevented from entering the river basin as a result of the practices.

In addition to the water quality benefits, some air quality benefits were also realized. The cooperative's previous practice of storing wastewater until it could be used to spray irrigate some 500 acres of alfalfa and grassland during the growing season was creating nuisance odor problems and the new facility allowed them to discontinue this practice.

Considerations:

The motivation for participation in this project is like that in the Alpine Cheese Company example (described above) but even stronger, since the NPDES permit applicant is a cooperative owned by the farmers. It appears that they were able to meet their need for BMP coverage within the ranks of their own member-farmers who would have had multiple motivations: helping their cooperative, helping their bottom line, reducing environmental worries, and good citizenship.

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*i) Chesapeake Bay Nutrient Trading – VA, MD, PA & DC<sup>16</sup>*

Virginia, Maryland, Pennsylvania, and Washington, DC came together to create the Chesapeake Bay Program which has developed guidelines for reducing nutrients in the bay. A collective cap was established on nitrogen and phosphorous with formal allocations for each state and basin. If the nutrient reduction goals are not achieved by 2010, TMDLs will be imposed. Under the guidelines, each State is to adopt its own rules and trades are likely to occur within each state, at least initially. Thus these guidelines provide a basic outline for water quality trading in a pre-TMDL situation.

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The guidelines specify that the buyer should be ultimately responsible for complying with its own permit requirements, should be given time to correct for noncompliance when a seller defaults, and should be able to take legal action against the defaulting seller. Depending on the contract, a seller could potentially become liable for penalties, for the return of the trading money, and for loss of potential certification for future trades. Each State is responsible for certifying contracts.

The guidelines recommend that point source purchasers be required to do self monitoring of water quality on a monthly basis and non-point sources on a seasonal basis. Non-point monitoring should also include annual site visits to assure BMPs are still functioning, with credits calculated annually. An online trading Registry called NutrientNet may become a mechanism for identifying trading partners. (See: <http://www.nutrientnet.org>.)

There have been a number of water quality trading efforts around the Chesapeake, but without a great deal of success – mostly because the water quality limits that would drive those trades have been slow to be imposed. Chesapeake Bay trading advocates believe that developing common rules across the various states whose waters drain into the Bay will motivate polluters to reduce their discharges even before the rules require it. USDA/NRCS indicated their faith in this concept with a recent Conservation Innovation Grant of \$500,000 to support the effort in a project by several groups in the area.

Considerations:

There is some analogy between the Chesapeake Bay situation and our own Puget Sound – each is a large estuary fed by a multitude of individual rivers. While we do not have the multi-state issues for Puget Sound (we do have international impacts from Canada), the struggle to clean up the Sound still involves working in a multitude of separate watersheds and the Chesapeake Bay experience seems potentially relevant. For example, the monitoring and legal responsibility guidelines may generally suggest a minimum level of performance requirements for a trading program that we might expect in a program locally.

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***j) New York City Watershed Program - NY<sup>17</sup>***

New York City and its surrounding suburbs get their drinking water from reservoirs located further upstate in the Catskill and Delaware Watersheds. These watersheds cover some 1,900 square miles, but New York owns less than 10 percent of the land, the balance belonging to some 77,000 local and additional summer residents. There are some 350 farms in the area which represent an important economic base for the region. By 1993, it was apparent that action needed to be taken to protect the City's water supplies which had increasing evidence of

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microbial contamination. It was estimated that the cost of building a water treatment facility was between \$3 and \$8 billion. Annual operating costs would be in the hundreds of millions.

Thus motivated, New York City entered into negotiations with leaders in the communities in the Watershed to develop a program that would protect the City's water supplies while also supporting and improving the quality of life in the Watershed. This resulted in a multi-part program that, among other things, includes the following:

- Full compensation is provided to agricultural landowners for implementing BMPs that protect water quality. The Watershed Agricultural Council (<http://www.nycwatershed.org/index.htm>) works with the farm community and, as of June 2000, had 318 farms in the program or over 90 percent participation.<sup>18</sup>
- A purchase of development rights program allows farmers to keep their land in agriculture in the face of considerable development pressure from recreational, retirement, and other buyers and prevents the fragmentation of the land base which would make protection of water quality impossible.
- An economic development program is provided to improve farm profitability and help farmers remain in business and on the land.
- An enhanced CREP program that pays the full cost of CREP installation and provides a bonus for signing. (Riparian practices can pay as much as 150 percent of the cost of installation.)

Considerations:

By most standards, this program has been a success with over 90 percent of the farmers implementing BMPs in the Watershed. Why?

A key consideration has to be money – with the drinking water of New York City at stake and \$3 to \$8 billion to be saved, clearly there was motivation to do this right. Still, less dramatic, but nonetheless very large savings have also been involved in other similar water quality trading programs included among the examples discussed here – but they did not necessarily produce the level of agriculture participation that occurred in the Catskill and Delaware Watershed communities.

A contributing feature of the NYC Watershed program was probably its comprehensiveness. The program deals with the direct BMPs needed to secure the needed water quality, but it also provides long-term guarantees through purchased easements assuring that land will remain in farming. This probably makes it easier for farmers to consider long-term BMP participation. At the same time, the program also greatly enhanced the payment for CREP participation. And it provides comprehensive economic development help to assure a profitable future for agriculture. All of these, taken together, have probably provided a confidence in the future needed to assure broad participation by farmers.

Finally, it clearly helps that the program can pay 100 percent (and, at times 150 percent) of the cost of BMP implementation. In many cases the actual, personal cost and effort involved in these practices probably exceeds the simple cost of initial installation. The Watershed Project had enough resources to place “cost-share” at a level that would insure broad participation by the community.

**For further information about this paper, contact Don Stuart through: [www.donstuart.net](http://www.donstuart.net)**

The analogy to our situation in Washington and Oregon may be imperfect. But we do have a strong desire to save our region's salmon. We also have considerable pressure to clean up Puget Sound. And our many 303(d) listed waterways and existing or likely TMDLs here would suggest that the will to make similar changes here might be possible.

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***k) Tar-Pamlico Basin - NC<sup>19</sup>***

The Tar-Pamlico is the fourth largest river basin in North Carolina and a contributor to estuaries that are a part of US EPAs National Estuary Program. The river is 180 miles long and its watershed covers 5,440 square miles and includes habitat for nine State or federally listed threatened or endangered species and two national wildlife refuges.

The Tar-Pamlico Basin Association is a group of point source dischargers in North Carolina who have a joint cap for nitrogen and phosphorous and represent some 94 percent of the point source discharge flows in the Basin. If they exceed their joint cap, they are required to pay a fixed per-kilogram price (\$29/kg in 2004) to the North Carolina Agricultural Cost Share Program (NCACSP). NCACSP then pays farmers up to 75 percent of the cost of installing BMPs that address these pollutants. Because caps were stepped down from initial levels, the Association's members have been able to reduce their discharges sufficiently without actually being required to contribute to the NCACSP. Nonetheless, they have provided \$1.4 million to NCACSP for demonstration projects, estuary nutrient modeling and trade identification, and the program is in place in case of need.

NCAVSP is a State program that provides assistance to farmers implementing BMPs – supplementing federal programs like the Environmental Quality Incentives Program (EQIP). It is administered throughout the State through the Soil & Water Conservation Districts. Completed BMPs are subject to random checks by district personnel to assure contract compliance and farmers who fail to maintain them are subject to repay some or all of the original funds. Between the start of the program in 1984 through 6/30/05, over 45,000 contracts had been approved for BMPs saving an estimated 7.2 million tons of soil.. The program is mostly supported by appropriations from the State, but supplemented by the Tar-Pamlico Basin Association's contributions, when they occur.

Considerations:

This approach really amounts to a tax on point source dischargers to the extent that they exceed their cap on pollution. It uses North Carolina conservation district infrastructure and simply pays an appropriate amount into the existing programs. One of the interesting aspects of this

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(and perhaps of some of the other programs described here) is that the Tar-Pamlico Basin Association and its municipal point source members are very probably supportive of State appropriations to the NCACSP since reduced pollution in the Basin reduces the likelihood that there will be a need for them to contribute to the fund themselves.

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***l) Piasa Creek Watershed Project - IL<sup>20</sup>***

As a permit condition for the Illinois-American Water Company, the Illinois Environmental Protection Agency approved an agreement between Illinois-American and the Great Rivers Land Trust (GRLT) designed to prevent non-point sediment discharge into the Mississippi River through a combination of land acquisitions and BMPs. The Company avoided installing a costly lagoon opposed by the public and was allowed to discharge its residual back into the River.

The arrangement calls for non-point sediment reductions to be achieved through the use of such practices as stream bank stabilization, silt basins, dry dams, terraces, grassed waterways, filter strips, and grade control structures. It also involves land acquisitions by the Great Rivers Land Trust (GRLT) that were funded through the project. GRLT worked through the local county Soil & Water Conservation Districts to identify cooperating landowners and to estimate sediment reductions achieved through BMPs. Landowners are responsible for maintenance of the sediment control structures built on their land.

Considerations:

This program included the Great Rivers Land Trust as a partner because there was a fair amount of outright land acquisition involved in the program. Some land was clearly taken out of agriculture, although it is not clear how much. In some cases, however, the program simply paid for the described conservation practices, working through the local conservation districts.

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***m) Red Cedar River Nutrient Trading Pilot – City of Cumberland, WI*<sup>21</sup>**

The City of Cumberland, WI pays farmers in the Red Cedar River tributary to the Hay River to use no-till on lands that test high for phosphorous and nutrient management planning to avoid building an expensive upgrade for their sewage treatment plant. Each year they contract with about 22 farmers in the watershed and have been able to obtain 5,000 pounds of phosphorous credit, allowing them to avoid the upgrade. The Barron County Land Conservation Department serves as liaison with the farmers and verifies the BMPs for the program.

The Red Cedar Watershed drains 1,800 square miles and 93 percent of the phosphorous in the watershed comes from non-point sources. There are 18 municipalities in the watershed contributing point source pollution.

The program pays \$18.50 per acre for no-till, and \$15.00 per acre for conservation tillage. No-till is credited with three tons of soil saved per acre and conservation tillage with two tons saved per acre. Each ton saved is credited for four pounds of phosphorous reduction. Farmers sign up for three years and are responsible for completion of their contracts – but they do not receive payment until it has been verified that the practice has been implemented. Cumberland can cease trading at any time if it installs appropriate phosphorous removal equipment.

***Considerations:***

This program depended on the Land Conservation Department, which was a credible contact for the farmers in the region. It also established a clear, per-acre price to be paid for a very specific, well understood, and easily verifiable BMP.

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***n) Previous water quality trading pilot efforts in Washington State*<sup>22</sup>**

(1) Chehalis River: The Chehalis River was considered for a trading program, but later rejected. The allocated contribution by non-point sources on the Chehalis River above the Skookumchuck

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was zero and all of the potential point source purchasers and the sections of the river with the least assimilative capacity were above the Skookumchuck, so any trades would have resulted in unacceptable levels of pollutants in this river section. Thus, a trading program was determined not to be feasible in 1996.

(2) Puyallup River: A study was also completed for a project on the Puyallup based on biochemical oxygen demand and ammonia. Two point sources would have qualified for permit modification for point source to point source trading, but the economic needs of the point sources changed and no trades occurred. It is not clear that point to non-point trading was seriously involved in this study.

(3) Yakima River: The Yakima River TMDL apparently set attainment targets rather than load allocations on the Yakima River, thus making it difficult for individual point-sources to identify cost savings and benefits. So, while the Yakima does seem like a reasonable prospect for water quality trading, what has emerged is a water (quantity) trading network called the Yakima Water Exchange. Advocates claim the same network could be used to address water quality, but the primary mission is facilitation of exchanges of water and water rights in the Yakima Basin among willing participants. Trading is not necessarily focused on trading for purposes of water quality.

(4) Spokane River: In September 2005, Ross & Associates Environmental Consulting prepared a report for US EPA to assess the appropriateness of the Spokane River Watershed for water quality trading for phosphorous. Their conclusion was that it appeared that trading with non-point sources of phosphorous in the watershed appeared viable, but that, among other things, trading would depend upon real controls being implemented that required the reductions for the point sources in the watershed. As of the date of this writing, it does not appear that any trades have taken place – possibly because TMDL limits on the Spokane River are not stringent enough to require point sources to trade.

#### Considerations:

The Washington Department of Ecology is seeking a candidate site for a water quality trading demonstration project. But the above three Washington examples suggest that not just any site will do. On the Chehalis, the locations of the potential point and non-point participants proved unworkable. On the Puyallup, point sources to point source trades were apparently the extent of the interest. And on the Yakima, the interest was limited to water rights trading and transfers. For these transactions to work in each individual watershed, the physical, economic, and community interest issues need to come together in the right way, in each particular watershed under consideration. And, of course, for the Spokane, until there are sufficiently restrictive cap requirements in place, point sources will have little motivation to trade.

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## **APPENDIX B ENDNOTES**

<sup>1</sup> Materials for this section came from: a) The website of the Miami Conservancy District's Water Quality Credit Trading Program: [http://www.miamiconservancy.org/water/quality\\_credit.asp](http://www.miamiconservancy.org/water/quality_credit.asp), and the links there provided; b) "Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey," Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) and available on line at: <http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf>; and, c) "Preliminary Economic Analysis of Water Quality Trading Opportunities in the Great Miami River Watershed, Ohio," (Kieiser & Assoc., 6/23/04) on line at: [http://www.envtn.org/docs/Great-Miami\\_Trading\\_Analysis.pdf](http://www.envtn.org/docs/Great-Miami_Trading_Analysis.pdf).

<sup>2</sup> Personal communication with Brian Bandt, Director with American Farmland Trust's Agricultural Conservation Innovation Center: <http://www.farmland.org/resources/innovation/default.aspx> who has been involved with development of this program.

<sup>3</sup> Materials for this section were based upon an 8/24/06 PowerPoint presentation by Richard Moore of the Dept. of Human and Community Resource Development at Oregon State University to be found on line at: [http://www.envtn.org/ETN\\_workshop/Presentations/Microsoft%20PowerPoint%20-%20Alpine\\_ETN\\_8\\_24\\_06\\_Moore.pdf](http://www.envtn.org/ETN_workshop/Presentations/Microsoft%20PowerPoint%20-%20Alpine_ETN_8_24_06_Moore.pdf) and "A Plan to Reduce Phosphorous Loading and Improve Stream Ecological Function in the Middle Fork and Adjoining Watersheds of the Sugar Creek Watershed" (1/1/06) to be found on line at:

[http://www.epa.state.oh.us/dsw/WQ\\_trading/alpine%20cheese%20trading%20plan%201%201%2006.pdf](http://www.epa.state.oh.us/dsw/WQ_trading/alpine%20cheese%20trading%20plan%201%201%2006.pdf)

<sup>4</sup> Materials for this section were based upon: a) Material at the Michigan Department of Environmental Quality website at: [http://www.michigan.gov/deq/0,1607,7-135-3313\\_3682\\_3719-14305--00.html](http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3719-14305--00.html); b) A report "Kalamazoo Water Quality Trading Demonstration Project" (Kieiser & Associates) at the Environmental Trading Network website at: <http://www.envtn.org/wqt/programs/kazoo.htm>, and c) "Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey," Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) and available on line at: <http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf>.

<sup>5</sup> See: "Kalamazoo Water Quality Trading Demonstration Project" (Kieiser & Associates) at the Environmental Trading Network website at: <http://www.envtn.org/wqt/programs/kazoo.htm> pg. 8.

<sup>6</sup> Id. At p.10

<sup>7</sup> Materials for this section were based upon: a) "Lower Boise River Effluent Trading Demonstration Project: Summary of Participant Recommendations For a Trading Framework" (Ross & Assoc. Sept. 2000) found at the EPA website at:

[http://yosemite.epa.gov/r10/oi.nsf/Webpage/Lower+Boise+River+Effluent+Trading+Demonstration+Project/\\$FILE/summary.pdf](http://yosemite.epa.gov/r10/oi.nsf/Webpage/Lower+Boise+River+Effluent+Trading+Demonstration+Project/$FILE/summary.pdf), and b) "Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey," Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) and available on line at: <http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf>.

<sup>8</sup> "Water Quality Trading in the United States, (June, 2005), Cynthia Morgan and Ann Wolverton Working Paper # 05-07, accessible through USEPA site at:

<http://yosemite.epa.gov/ee/epa/eed.nsf/WPNumberNew/2005-07>.

<sup>9</sup> See: "Pollutant Trading in Idaho: A Step-by-Step Agricultural Community Guidebook" to be found on line at: [http://www.deq.state.id.us/water/prog\\_issues/waste\\_water/pollutant\\_trading/index.cfm](http://www.deq.state.id.us/water/prog_issues/waste_water/pollutant_trading/index.cfm).

<sup>10</sup> Materials in this section are based upon: a) "Watershed-based Permitting Case Study: Tualatin River Watershed, Oregon" (EPA 2007) on line at: [http://www.epa.gov/npdes/pubs/wq\\_casestudy\\_factsht4.pdf](http://www.epa.gov/npdes/pubs/wq_casestudy_factsht4.pdf); b) Clean Water Services, "Sustainable Integrated Watershed Management in the Tualatin Basin", 2008; and, c) West Multnomah Soil & Water Conservation District website at: <http://www.westmultconserv.org/swcd/index.php?id=183>

<sup>11</sup> For a map and details on projects in the Tualatin Basin, see the CWS website at:

<http://www.cleanwaterservices.org/PlansAndProjects/Projects/default.aspx>.

<sup>12</sup> Personal communication between Bobby Cochran, Environmental Marketplace Analyst for Clean Water Services, May 12, 2008 with Catherine Bombico of Evergreen Funding Consultants.

<sup>13</sup> Materials for this section were based upon: a) "Pollutant Trading to Improve Riparian Habitats" (Stormwater, SW Jan./Feb. 2006), see: [http://www.gradingandexcavation.com/sw\\_0601\\_pollutant.html](http://www.gradingandexcavation.com/sw_0601_pollutant.html); b) Rahr Malting Company "trading" permit – MPCA Fact Sheet (1997) at: <http://www.pca.state.mn.us/water/pubs/rahrtrad.pdf>; and, c) "Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey," Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) and available on line at:

<http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf>

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<sup>14</sup> Materials in this section based on the Red Barn Trading Company website at: <http://www.redbartrading.com/index.html> and on two Katoomba Group Ecosystem Marketplace website articles: “U.S. WQT: Growing Pains and Evolving Drivers” at: [http://ecosystemmarketplace.com/pages/article.news.php?component\\_id=5796&component\\_version\\_id=8501&language\\_id=12](http://ecosystemmarketplace.com/pages/article.news.php?component_id=5796&component_version_id=8501&language_id=12), and: “Pennsylvania Water Deal: Blip or Boom?” at: [http://ecosystemmarketplace.com/pages/article.news.php?component\\_id=5905&component\\_version\\_id=8654&language\\_id=12](http://ecosystemmarketplace.com/pages/article.news.php?component_id=5905&component_version_id=8654&language_id=12).

<sup>15</sup> Materials for this section were based upon: “Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey,” Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) and available on line at: <http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf>; and, News Release from Minnesota Pollution Control Agency (5/12/99) at: <http://www.pca.state.mn.us/news/may99/nr51299.html>.

<sup>16</sup> Materials for this section were based upon: a) “Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey,” Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) and available on line at: <http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf>; b) The Chesapeake Bay Program website at: <http://www.pca.state.mn.us/news/may99/nr51299.html>; c) Katoomba Group Ecosystem Marketplace news “Chesapeake Bay Water Scheme Gains Traction” Steve Zwick, (6/25/08) at: [http://ecosystemmarketplace.com/pages/article.news.php?component\\_id=5921&component\\_version\\_id=8744&language\\_id=12](http://ecosystemmarketplace.com/pages/article.news.php?component_id=5921&component_version_id=8744&language_id=12).

<sup>17</sup> Materials for this section were based upon: a) “Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey,” Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) and available on line at: <http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf> b) The New York City Watershed Agricultural Council website at: <http://www.nycwatershed.org>; c) “Watershed Progress: New York City Watershed Agreement,” a description of the project at the EPA website at: <http://www.epa.gov/OWOW/watershed/ny/nycityfi.html>.

<sup>18</sup> Personal communication with Watershed Council Chair, Dick Combe.

<sup>19</sup> Materials for this section were based upon: a) “Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey,” Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) and available on line at: <http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf>; b) North Carolina Agricultural Cost Share Program described at: <http://www.enr.state.nc.us/dswc/pages/agcostshareprogram.html>; c) “Tar-Pamlico River Basin Nutrient Reduction Trading Program” article on the NC Division of Soil & Water Conservation website at: <http://www.enr.state.nc.us/dswc/pages/tar-pamlico.html>.

<sup>20</sup> Materials for this section were based upon: a) “Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey,” Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) pg. 110, available on line at: <http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf>; b) See also the website of the Great Rivers Land Trust: [http://www.greatriverslandtrust.com/fall\\_2001.htm](http://www.greatriverslandtrust.com/fall_2001.htm).

<sup>21</sup> Materials for this section were based upon: a) “Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey,” Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) pg. 110, available on line at: <http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf>; b) City of Cumberland, WI Report and memo from Barron County Soil and Water Conservation Department found at: [http://www.dnr.state.wi.us/runoff/pt/cumberland\\_pt\\_report.pdf](http://www.dnr.state.wi.us/runoff/pt/cumberland_pt_report.pdf); c) Katoomba Group Ecosystem Marketplace website at: [http://ecosystemmarketplace.com/pages/marketwatch.transaction.other.php?component\\_id=1926&component\\_version\\_id=3050&language\\_id=12](http://ecosystemmarketplace.com/pages/marketwatch.transaction.other.php?component_id=1926&component_version_id=3050&language_id=12).

<sup>22</sup> Materials for this section were based upon: a) “Water Quality Trading and Offset Initiatives in the US: A Comprehensive Survey,” Breetz, Vanden, Garzon, Jacobs, Kroetz, & Terry (Dartmouth College Hanover, New Hampshire, 8/5/04) pg. 332-334, on line at: <http://www.dartmouth.edu/~kfv/waterqualitytradingdatabase.pdf>. For the Puyallup, see also: Agreement on the allocation of the Puyallup River TMDL at: [http://www.ecy.wa.gov/programs/wq/tmdl/puyallup/puy\\_bod\\_allo.pdf](http://www.ecy.wa.gov/programs/wq/tmdl/puyallup/puy_bod_allo.pdf). For the Yakima, see also the Yakima Water Exchange website at: <http://www.roundtableassociates.com/ywe/ywe.htm>, and see the Yakima River Water Bank Project – summary at: <http://www.roundtableassociates.com/ywe/Bank%20Documents/Summary%20Yakima%20water%20bank%20accomplishments1.pdf>. The Ross & Associates report for the Spokane River is at: [http://www.client-ross.com/spokane-river/docs/Spokane%20River%20Trading%20Analysis\\_Final%20Report.pdf](http://www.client-ross.com/spokane-river/docs/Spokane%20River%20Trading%20Analysis_Final%20Report.pdf).