Incorporating Environmental Integrity in Water Quality Trading

*Lessons from the Willamette*

by

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ABSTRACT

In Oregon’s Willamette Basin a group of diverse leaders are working to expand an existing water quality-trading program from the Willamette’s Tualatin Watershed to the entire Basin, with a goal of moving beyond regulatory compliance to meet the ecological needs of the entire landscape. In increasing the scale of the existing water quality-trading program and meeting the ecological goals of the program, two concerns have arisen: (1) assuring that restoration activities generating water quality credits are credible and contribute to ecosystem recovery, while (2) maintaining adequate participation of non-point sources willing to supply credits of high environmental quality.

Using a qualitative analysis, my research examines the two primary concerns of scaling up a water quality-trading program to the landscape level. Through focus group sessions, I examine how conservation practitioners believe ecological and environmental quality should be incorporated into a large-scale water quality-trading program. Through semi-structured interviews with agricultural landowners in the Basin, I gain insight into their motives for participating in a water quality-trading program and how environmental quality standards affect their willingness to participate.

This analysis results in the classic economic trade off between market simplicity and assurances for environmental integrity. The results indicate that initially a water quality-trading program should be perceived as simple and straightforward in order to generate robust participation. Once there is adequate nonpoint source participation, environmental integrity standards or economic incentives can be incorporated into a market to target ecologically significant areas within a landscape or high environmental quality restoration and conservation actions.
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I. INTRODUCTION

The Willamette Partnership, a coalition of diverse leaders, is working to develop an ecosystem marketplace for the Willamette Basin that facilitates strategic investments in conservation and restoration projects, moving beyond regulatory compliance to meet the ecological needs of the entire landscape. The marketplace will allow landowners to produce and sell a variety of credits, including water quality, wetland, carbon, and species protection, on multiple markets. This provides landowners with an opportunity and incentive to manage their property to improve its ecological functionality.

The first stage of the marketplace is to expand an existing water temperature-trading program from the Willamette’s Tualatin Watershed to the entire Willamette Basin. The Partnership expects its first transaction for water temperature to occur in June 2008. In increasing the scale of the existing water temperature-trading program and meeting the ecological goals of the marketplace, two concerns have arisen: (1) assuring that restoration actions generating water quality credits are credible and contribute to ecosystem recovery, while (2) maintaining adequate participation of nonpoint sources willing to supply credits of high environmental quality. The second concern is important because nonpoint source participation is crucial for water quality improvements and, to date, water quality markets have lacked robust nonpoint source participation (See “Background” for details).

Using a qualitative analysis, my research examines the two primary concerns of scaling up a water quality-trading program to a landscape level. Through focus group sessions, I examine how conservation practitioners in the Willamette Basin believe ecological and environmental quality should be incorporated into a large-scale water quality-trading program, and eventually into an ecosystem marketplace. Through semi-structured interviews with agricultural landowners in the Willamette Basin, I gain insight into their motives for participating in a water quality-trading program and how environmental quality standards affect their willingness to participate.

This paper reviews the literature on water quality-trading programs and provides background on the study area. This sets the stage for the qualitative analysis of how a water quality-trading program should be structured to ensure high environmental quality and robust agricultural landowner participation. The paper concludes with a discussion of the findings and policy recommendations.
II. RESEARCH OBJECTIVES

The objectives of this study are to:

1. Assess how a water quality-trading program can ensure that restoration activities are credible and contribute to ecosystem recovery.
2. Gauge agricultural landowners’ motivation and willingness to participate in a water quality-trading program.
3. Provide decision-makers with recommendations about how to increase the credibility and environmental integrity of a water quality-trading program while ensuring adequate landowner participation.

III. BACKGROUND

A. Water Quality Trading and Nonpoint Source Participation

The Clean Water Act of 1972 significantly improved water quality in the United States through the regulation of industrial and municipal point sources. Despite these successes, water quality remains a substantial problem. Nationwide, 45% of rivers and streams, 47% of lakes and reservoirs, and 32% of bays and estuaries are impaired, meaning the waterway does not support one or more of its designated beneficial uses (i.e. public water supply; the protection of fish, shellfish, and wildlife; or recreational, agricultural, industrial, and navigational purposes) (USEPA, 2002). Many of these problems are associated with runoff from agricultural activities, which has become the leading source of impairment to rivers and streams (Figure 1).

Agricultural runoff has historically been difficult to manage. Nonpoint source pollution originating from a spatially extensive area causes measuring and monitoring to be complicated and difficult to trace back to specific landowners. Moreover, runoff is highly variable due to changes in weather (e.g. rainfall), non-observable farming practices (e.g. crop management, chemical management, water management, and conservation practices), and site-specific characteristics (e.g. slope and soil characteristics) (Ribaudo et al., 1999). These variable factors determine the amount of nutrients, sediment, pesticides, and salts that leave the land and enter surface and groundwater sources (Ribaudo et al., 1999).
Figure 1: Leading sources of River and Stream impairment in the United States. States assessed 19% of their total river and stream miles for the 2000 National Water Quality Inventory. From the assessment, 61% were rated good water quality and 30% were considered impaired. Of the impaired river and stream miles, agriculture was the leading source of river and stream water impairment. 
Source: USEPA National Water Quality Inventory, EPA 841R02001, August 2002

To address nonpoint source pollution, natural resource policy has begun to shift from end-of-pipe regulation to a holistic watershed-based approach. Under this approach, water quality trading has been endorsed as a cost effective tool for achieving or preserving water quality and watershed goals (USEPA, 1996, 2003). As the need and the ability to incorporate nonpoint sources into these trading programs have become increasingly apparent, the U.S. Department of Agriculture (USDA) has also become very supportive of water quality trading (Johanns, 2007). The USDA has recently promoted trading as a means of cooperative conservation with the agricultural sector that can accelerate the restoration and protection of the nation’s watersheds (Abdalla et al., 2007).

Theoretically, water quality trading allows sources with high pollution control costs to meet regulatory obligations through purchasing environmentally equivalent or superior pollution reductions from a source that can provide those reductions at a lower cost (USEPA, 2007). There are three necessary components in point/nonpoint source water quality-trading programs: willing buyers, willing sellers, and trade rules and regulations (Figure 2) (King and Kuch, 2003). Willing
buyers are typically point sources, including wastewater treatment plants, municipalities, or utilities, that are required to reduce their emissions into an impaired water body. In point/nonpoint source water quality-trading programs, willing sellers are farmers and agricultural landowners, as well as institutions that own land (e.g., land trusts). These entities are the ‘low hanging fruit,’ meaning they can cost-effectively improve water quality through the implementation of best management practices (Faeth, 2000; Ribaudo et al., 2005). Since buyers are primarily concerned with minimizing the price of purchasing a credit and sellers are concerned with maximizing their profits, these entities are only as conscious of environmental quality as is required by the rules and regulations of the trade (King and Kuch, 2003). As such, rules and regulations that increase environmental integrity are a critical component of water quality trading. Trade regulators develop the rules and regulations that define the terms of a trade. Regulators include the natural resource agencies writing the permit for what constitutes a water quality credit, as well as the market regulators developing more stringent guidelines for the program.

![Diagram](image)

**Figure 2:** Necessary Conditions for a Point/Non-Point Source Trade

**Source:** King and Kuch, 2003

**B. Study Area**

The Willamette River Basin has an area of 12,000 square miles. It is home to Oregon’s three largest cities — Portland, Eugene, and Salem — and comprises over 70-percent of Oregon State’s population. The basin is bound by the Cascade Mountain Range in the east and the Coast...
Mountain Range in the west. The Willamette River flows north from the confluence of the Coast and Middle Forks to the Columbia River. See Appendix I for a map of the Willamette Basin.

Population growth and land use change has greatly altered terrestrial and aquatic ecosystems of the Willamette Basin (Grossman, 2002). Riparian forests that were once one to seven miles-wide have been converted to agricultural land and commercial and residential developments (Grossman, 2002). In the last 150-years, eighty-percent of the historic riparian buffers, floodplains, and bottomland forest have disappeared resulting in increased solar radiation on waterways of the Willamette Basin (see Appendix I for schematic of spatial change in the Willamette Valley from 1850 to 1995) (ODEQ, 2006). The current levels of solar radiation have been detrimental to salmon, trout, and other cold-water species.¹

A number of mechanisms have been employed to decrease river and stream water temperature in the Willamette Basin, including a market-based water temperature-trading program. This program has successfully been implemented in the Willamette’s Tualatin Watershed. Its success in restoring the ecological functionality of riparian buffers and incorporating nonpoint sources into restoration action has resulted in a proposal to expand the program to the entire Willamette Basin.

*The Tualatin River Water Quality Trading Program*

Approximately 60-percent of the 900 stream miles within the Tualatin Watershed are in a degraded state due to elevated temperature (ODEQ, 2007). This has resulted in stringent standards for heat emissions from point sources. Clean Water Services (CWS), a wastewater and stormwater public utility within the Tualatin Watershed, opted to meet regulatory standards through the development of a trading program with nonpoint sources able to reduce water temperature through riparian buffer restoration (Figure 3). This decision was economically and environmentally beneficial for the utility company. The installation of refrigeration machinery would have cost between $60 and $150 million, with yearly operations between $2.5 and $6 million (CWS, 2005). Furthermore, refrigeration technology would have required significant

¹ Biological assessment of salmonid life stages—fish spawning and rearing—has established temperature standards for the Willamette Basin between 54°F and 68°F varying with season and habitat use. Temperature data collected by the Oregon Department of Environmental Quality (ODEQ) in 1998 indicated that 52 stream segments within the nine Willamette subbasins exceeded temperature standards. Another 43 stream segments were out of compliance in 2002. (ODEQ, 2006)
amounts of electricity and the benefits would have only improved the stretches of the Tualatin River directly downstream of utilities’ treatment plants (CWS, 2005).

Figure 3: Clean Water Services’ Restoration Project. This is a 2200-foot enhancement of the Raleighwood Marsh. This marsh has been severely impacted by urban development, flooding, and invasive species. In 2004 the site was prepared for extensive planting of native trees and shrubs. In the early spring of 2005, 25,000 native trees and shrubs were planted throughout the marsh. This has increased stream bank stability and reduced solar radiation. The project generated 3.1 million kcal of thermal credits in 2005. 
Source: Clean Water Services

To develop a water quality-trading program that achieves adequate nonpoint source participation, CWS enhanced the familiar, but historically unpopular, Conservation Reserve Enhancement Program (CREP). The Enhanced CREP doubled soil rental rates and increased cost share payments (Bryant, 2008). This has resulted in high nonpoint source participation and, recently, has allowed CWS to target the agricultural land that can best contribute to improvements in water temperature and the ecological health of the entire watershed (Guillozet, 2008).

IV. METHODS
This section provides the methodology used to answer the objectives of this study, including research design, subject selection, research questions, and how the data was analyzed.

A. Research Design
This research was developed in two phases. The first phase employed a focus group method to gain insight and perspective on how to incorporate environmental integrity into a point/nonpoint source water quality-trading program. The focus group method allowed for an in depth understanding of opinions, attitudes, and perceptions, as well as an opportunity to identify innovative ideas, in a permissive, non-threatening environment among participants of common
characteristics (Krueger, 1994; Rea and Parker, 2005).

Krueger (1994) suggests that a focus group should have six main characteristics: they should be composed of (1) people that are (2) assembled in a series of groups, (3) possessing certain characteristics, and (4) providing data (5) of a qualitative nature (6) in a focused discussion. Table 1 indicates that these recommended characteristics were observed throughout the focus group process for purposes of this research. In particular, a series of three focus group sessions allowed for a clear detection of patterns and trends in the findings and avoided bias that could affect outcomes, such as incendiary comments or an overbearing participant. In addition, conservation practitioners had homogeneous characteristics in regards to the subject matter, allowing for an open dialogue among all participants. There were some slight differences between recommended and actual characteristics of the focus groups. For instance, the actual focus groups had slightly more people engaged in discussion than is recommended.

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Focus group sessions were conducted in the summer and fall of 2007. A professional moderator, familiar with the subject matter, was used for all three focus group sessions and the author was the primary note taker.

The second phase of research for this study used semi-structured phone interviews with agricultural landowners and key informants to elicit opinions and perceptions of water quality-trading programs and willingness and interest in increasing the environmental and ecological quality of land that is generating credits through management practices. Interviews were conducted to gather specific data on predetermined questions and topics, while allowing respondents to express themselves in their own words and at their own pace (Bernard, 1988). Semi-structured interviews were conducted between June 2007 and March 2008, with the majority of interviews between December 2007 and March 2008. The author conducted most of the interviews.

B. Subject Selection

Subject selection in the first phase of this research was critical for achieving a forum where participants could openly discuss and exchange ideas. Professional judgment, as opposed to randomness, was used to select respondents. Experts from the Willamette Partnership, Clean Water Services, and The Nature Conservancy-Oregon were consulted to identify a list of potential participants from the Willamette’s conservation community who had demonstrated knowledge and innovation in the restoration and conservation field. From this list, participants were selected based on the valuable insight they could provide to the focus group. In addition, participants were selected to ensure a representative sample.

Twenty-seven conservation practitioners were invited to the focus group sessions. Attendance ranged from eight to fifteen individuals. There were approximately three land trusts participants, six participants from organizations with conservation missions, three participants from natural resource agencies, one participant from a watershed council and one participant from a soil and water conservation district (Figure 5).

The second phase of the research employed a snowball sampling technique (Rea and Parker, 2005) (Figure 4). Using this method, the initial respondents were selected through established relationships with Clean Water Services and a watershed council staff member. These individuals were knowledgeable about water quality-trading programs in the Willamette
Basin and familiar with issues and concerns of agricultural landowners. These individuals were able to identify key informants who could provide an additional perspective on this topic and agricultural landowners who would be willing to participate in semi-structured interviews.

**Figure 4:** Snowball Sampling Technique used for Semi-Structured Interviews. Dashed lines indicate interviews that were conducted for research not connected to this analysis.

Four landowners from the Tualatin Watershed participated in semi-structured interviews. All four of the Tualatin landowners managed small-scale family farms, approximately 20 to 500 acres, with an average of 205 acres. At the time of the interviews, these respondents were participants in the Tualatin’s water trading program; 8 to 15 acres (or approximately 3- to 41-percent) of respondent’s land was in the water-trading program. These interviews provided a perspective on the experience of agricultural landowners in the current water quality-trading program.

A watershed council staff member, who served as a key informant, conducted six interviews with agricultural landowners in early 2008. These interviews were not intended for this research analysis, but as part of a larger project on landowner willingness to participate in water quality trading. Some of the information collected by this key informant was applicable to this analysis and an informal interview with the key informant provided the relevant information. Respondents from this watershed were medium- to large-scale agricultural operations, ranging from 1,000 to 2,500 acres of land. Currently, there is no water quality-trading program.
established in the watershed where these landowners operate; however, they were asked about their willingness to participate in a future water quality-trading program. Figure 5 does not indicate where these landowners reside or the location of the key informant.

Lastly, one large-scale landowner within the Willamette Basin was interviewed. This landowner primarily served as a key informant to this analysis. Again, for confidentiality, Figure 5 does not indication the location of this landowner.

Figure 5: Subject selection within the Willamette Basin. This figure used circles to depict the location of focus group participants. Interview respondents from the Tualatin Watershed are depicted in grey. For confidentiality, the locations of other agricultural landowners and key informants interviewed for this analysis are not included in this figure.

C. Interview Questions

To inform the research objectives of this study, conservation practitioners and agricultural landowners were asked to consider (1) what “quality criteria” should be incorporated into a water quality-trading program, (2) how the credit approval process — including the restoration actions
that generate credits, verification processes, and monitoring and maintenance during the credits lifecycle — should be structured to ensure environmental integrity, and (3) how restoration actions that generate credits should be protected a long time horizon or in perpetuity (Figure 6).

![Figure 6: Schematic of research questions for conservation practitioners and agricultural landowners](image)

The key questions for focus group sessions with conservation practitioners and semi-structured interviews with agricultural landowners are outlined below with an explanation of the intent of each question. Literature reviews and interviews with experts in the water quality field were conducted to develop the focus group and interview questions.

**Quality**

*Should environmental quality be incorporated into a water quality-trading program?*

This question prompted respondents to think about environmental and ecological quality in the context of water quality-trading programs.

**Quality Criteria**

*What quality criteria should be incorporated into a water quality-trading program to ensure high restoration and conservation outcomes?*

This question asked focus group participants to develop the definition of a high quality credit, including a list of the environmental and ecological characteristics that should be incorporated into restoration and conservation activities that generate credits.

Agricultural landowners, on the other hand, were not asked to define quality. These respondents were given with the quality criteria developed by the focus groups of conservation practitioners and promoted to comment on the quality criteria.

**Structure**

*How should the credit approval process of the market be structured?*

This question prompted respondents to consider how the restoration,
verification, and monitoring and maintenance should be structured in a water quality-trading program to ensure restoration activities are credible and contribute to ecosystem recovery.

**Permanence**  *How should the land (i.e. riparian buffers) generating water quality credits be protected over time?*

Long-term protection of credit generating land is essential in achieving the goal of ecosystem recovery. As such, this question prompted respondents to consider if a water quality-trading program should be structured to ensure that the riparian buffers generating credits are protected. If respondents suggested that land should be protected, a follow-up question prompted respondents to consider how, and for what length of time, the land should be protected.

Agricultural landowners were also asked about their motivations for participating in water quality-trading programs, as well as perceived barriers to participation.

**Motives**  *What is (would be) your motivation to participate in water quality-trading programs?*

This question prompted respondents to consider motivation for participation in water quality-trading programs in order to understand what types of landowners enter into these programs. Theoretically, if credit suppliers are driven primarily by conservation and stewardship motives, then an environmental market may not need stringent environmental or ecological standards. However, if suppliers are motivated by profits, quality assurances become more important in these market-based programs.

**Barriers**  *What are the current barriers to participating in water quality-trading programs?*

This question prompted respondents to consider the actual or perceived barriers to entering and remaining in a water quality-trading program. The question was intended to provide insight as to what factors should be taken into account when develop a water quality-trading program.
D. Data Analysis
The qualitative data collected from the focus group sessions was recorded on tape for later transcription. There was also a debriefing with the moderator to outline the key findings of each focus group session. Data collected from telephone interviews was recorded and notes were generated.

The notes from the focus groups and semi-structured interviews were analyzed to reveal trends and key themes. The main findings for each question are summarized in the results section. In addition, the key findings have been compiled in a comparison table. This allows for an understanding of the similarities and differences in opinions, perceptions, and ideas between conservation practitioners and agricultural landowners.

V. RESULTS
The results are reported in the two phases of this study: (1) focus group sessions of conservation practitioners and (2) semi-structured interviews with agricultural landowners. The results include selected quotes from participants in focus groups and semi-structured interviews. In addition, a comparison of the responses is tabulated in Table 2 to depict convergence and divergence among conservation practitioners and agricultural landowners.

Phase 1: Conservation Practitioners

Quality
There was consensus during the first focus group session (June 2007) that environmental and ecological quality standards should be incorporated in a large-scale water quality-trading program.

A conversation ensued regarding the credit standards for water quality-trading programs with an understanding that baseline standards are defined by federal, state, and local rules and regulations, but that the quality of a credit may be enhanced by an incentive structure that ties quality information to a credit as it moves from the seller to the buyer.

Quality Criteria
Conservation practitioners felt that five “quality” metrics should be tied to water quality credits:

1. Location, where a credit generated within an ecologically significant area or adjacent to an existing conservation project – thus enhancing connectivity of priority areas within the Basin – is of higher quality than
credits generated outside of priority locations.

2. **Scale** of the restoration project, where larger scale projects are considered higher value.

3. **Ecological efficiency**, where proposed conservation actions best match the ecological potential of a site. This might include trending toward historic habitats and/or current site characteristics.

4. **Stewardship**, where the credit is tied to a mechanism that ensures long-term stewardship.

5. **Multiple ecosystem service benefits**, where credits that benefit multiple ecosystem services (i.e., water quality, wetlands, carbon, and endangered species) are of higher value than credits that just benefit one of these services.

There was also an agreement among participants that these quality metrics should be incorporated into other ecosystem markets in the Willamette Basin.

### Structure

**Restoration Actions for Water Quality Credit Generation.**

Participants of the focus group sessions expressed the need to have qualified third parties undertake restoration activities for market-based environmental programs. There was a recommendation among a few of the participants that an accreditation process should be established to provide restoration crews with the information and tools they need to perform high quality restoration.

When asked to consider what entity should undertake the restoration work that generates water quality credits, two responses were common. Some participants felt that watershed councils or soil and water conservation districts should undertake restoration work since they interact with agricultural landowners on a regular basis. Other participants, however, indicated a need for companies that specialize in large-scale restoration in order to cost-effectively perform the quantity and quality of restoration needed at the landscape scale.

**Verification of Water Quality Credits.**

Focus group participants felt that a trusted third-party should verify credits. Most participants believed the verifier should be required to go through a certification program in order to assure environmental integrity standards are upheld. During focus group sessions, some conservation practitioners felt that
soil and water conservation districts (SWCD) and watershed councils could be potential verifiers.

It is interesting to note that outside of focus group sessions and during informal interviews with conservation practitioners, a few individuals hesitated to endorse SWCD or watershed councils as potential verifiers, indicating that these organizations may not have the proper training or expertise to perform verification. Respondents did state, however, that these organizations could be trained to carry out verification roles. They also suggested that a new business organization might perform the role of verifier. One respondent cited GreenE, a certification and verification organization for renewable energy and greenhouse gas mitigation products, as a good example of what may be needed in water quality-trading programs.

“Watershed councils and soil and water conservation districts are not qualified to fill the role of verifier/certifier because they do not have the proper training or restoration experience. Instead there should be a separate organization to verify credits. The organization should go through a specific qualification process.”

**Monitoring and Maintenance of Water Quality Credits.**

Conservation practitioners felt that there should be a quarterly monitoring process, completed by a third-party entity, during the first one to five years that land is generating credits. After the first five years, agricultural landowners should be able to conduct the routine maintenance protocols.

There was also a great deal of discussion regarding how a market-based program would pay for monitoring and maintenance, particularly in terms of which entity would be responsible for funding these procedures. One respondent suggested the creation of an enforcement fund that could be developed to ensure credit generation and maintenance is in compliance with the rules and regulations of the market. Under this system, a portion of credit sales would be placed in a fund for the market to support enforcement efforts, including monitoring and legal costs associated with enforcement of contractual agreements.
Incentives to Increase Environmental Integrity.

Focus group participants discussed a number of incentives that could increase the environmental integrity of a water quality-trading program. The main incentive developed by the group was a quality rating system, which would attach information to a credit indicating the level of the credit’s environmental and ecological quality. For example, credits generated by conservation and restoration projects would be rated at different levels of environmental quality (i.e., standard, silver, gold, or platinum) based primarily on the quality criteria (i.e., location, scale, ecological efficiency, stewardship, and multiple benefits). This system would indicate to a buyer the level of a credit’s environmental quality. Buyers would be willing to pay more for higher quality credits for a variety of reasons, such as “green” marketing. See Appendix II for more detail and an example of how a ranking system may be created for a water quality-trading program.

“The quality ratings sound like Lake Wobegone – where all the children are above average.”

The focus group also discussed a number of incentives that should not be incorporated into a water quality-trading program. These included concrete and steel solutions to water quality problems or inter-basin transfer of water. There was agreement that projects generating credits should closely mimic natural processes.

Permanence

Conversations about long-term assurances began with the majority of practitioners stating that they would like perpetual easements placed on all land generating credits. Respondents indicated that permanent protection would ensure an efficient expenditure of money and time for restoration, monitoring and maintenance purposes, as well reaching the water quality-trading program’s overall goal of ecological recovery and functionality. There was some concern that agricultural landowners may revert back to their previous land use practices once a credit’s lifecycle, and thus payments for the restoration and maintenance of land generating the credit, had terminated.
“It seems like we would want to tie any project to at least 50 years of stewardship commitment. In fact, I’d argue that all of these contracts should be tied to a perpetual protection mechanism of some form. The riparian areas are just too important and have been too abused for too long.”

Conservation practitioners who worked directly with farmers and agricultural landowners countered arguments for permanent protection mechanisms, asserting that a program that requires permanent or long-term (more than 20-years) protection will likely have low rates of participation. These participants indicated that farmers and landowners are familiar with rental payments. As such, land protection mechanisms similar in structure to rental payments are likely to have higher rates of participation. In a rental payment contract, land is generally protected for 5- to 20-years, with options to renew the contract. Conservation practitioners familiar with these programs indicated that landowners typically renew contracts at the end of each cycle.

“High participation transcends quality.”

There was also a discussion about using other mechanisms to reduce risk and uncertainty in the permanence of restoration quality, such as trading ratios or insurance and assurance pools.

**Phase II: Agricultural Landowners and Key Informants**

**Motivation** Motivation for becoming involved in a water quality-trading program varied slightly between respondents currently active in the Tualatin water quality-trading program and those asked to consider participation in a future program.

The four agricultural landowners in the Tualatin trading program were primarily motivated by a stewardship or conservation ethic, although they also acknowledged the monetary benefits of these programs. One respondent indicated that “profits were coupled with being viewed as a good steward of the land.” He further stated “it is good to have your neighbors recognize that you take care of the land.” Respondents from the Tualatin trading program also indicated that assistance from a credible and trustworthy organization in
carrying out restoration and performing monitoring and maintenance has been extremely beneficial. One respondent stated that he had always wanted to “improve the ground and take care of his land,” but never had time. The Tualatin water quality-trading program provided him with restoration experts and the financial support necessary to take care of his land. Another respondent indicated that age motivated her to participate in the trading program. Her stream buffers have been restored to historic wooded condition, a task she indicated she could not have done without the restoration expertise and financial support of the program.

“I like the idea of restoring the stream banks and providing habitat for wildlife. I have lived in the area a long time and have seen the stream banks go from vegetated to un-vegetated. And I enjoy having wooded area along the stream banks back.”

The six agricultural landowners asked to consider participation in future water quality-trading programs suggested they would be motivated largely by profits; however, there was an underlying stewardship ethic for at least two of the respondents. There were a number of concerns noted by these respondents, particularly surrounding the programs realistic monetary returns (see below for more detail regarding this barrier to participation).

**Barriers**

The major barriers to participation in water quality trading programs centered around (1) complexity, (2) uncertain results or profit returns, and (3) unknown traders, lawyers, government or non-government entities (especially in the verification and monitoring process). Respondents not active in water quality trading, but asked to consider participation in a future program, also indicated philosophical barriers to participation. These are explained in more detail below.

Respondents active in the Tualatin program suggested educational outreach and more information about the benefits of these programs as a solution to many of the barriers.
1. Complexity.
Respondents who were asked to consider a future water quality-trading program indicated that they would be more likely to participate in a program that they perceive is straightforward and provides them with upfront information about what they need to do to generate and maintain water quality credits.

2. Perceptions of Profits in Water Quality Trading Programs.
Respondents asked to consider future programs seemed to be very concerned about the uncertainty in profits. These agricultural landowners stated that profits from credit generation needed to be at least as good as profits generated by agricultural crop production. Some indicated that agricultural landowners own a finite amount of property and if land management is their primary source of income, landowners must ensure that generating credits is at least as profitable as agricultural production. Landowners were generally not concerned about putting aside fringe riparian buffers that are not currently in active production, such as odd shaped parcels. However, they were not willing to set aside land of high production for credit generation in a water quality-trading program with uncertain returns.

3. Concern over Government Control and being in Public Records.
Most respondents indicated some concern about being tied to a program that is associated with the government. There is a fear that they will be connected to public records and subjected to more regulations.

In addition, a few respondents asked to consider future participation in a water quality-trading program indicated that they know how best to manage their land and that they do not want regulators or other entities telling them to implement best management practices, which may or may not be the best management practice for their land.

Philosophical Reasons.
A few of the respondents asked to consider participation in future water quality-
trading programs were concerned about point sources getting off too easy.

“The city is getting off easy. Perhaps it’s better to deal with problem at its source.”

**Quality Criteria**

Respondents were not opposed to incorporating environmental and ecological quality into a water quality-trading program. There were some concerns, however, with the quality criteria developed by the focus group.

One respondent felt that placing a premium on large-scale projects creates adverse incentives. This respondent indicated that small landowners are often more willing to participate in innovative projects. For instance, smaller landowners in the Willamette Basin were the first to grow “organic” crops. Furthermore, there is a potential for smaller properties to be more ecologically valuable (i.e., greater in biodiversity) than the large-scale property. Disincentivizing small landowner participations may result in harming the environmental integrity of a water quality-trading program, instead of enhancing it.

“Smaller landowners will take the risk.”

In addition, some respondents voiced concern about the *stewardship* criteria. These individuals were primarily concerned that participation in a water quality-trading program would comprise their ability to exert control over their land and flexibility in future land management decisions. These respondents state that they want their children to have the option to continue farming the land or to sell the land as development pressure drives up prices.

Lastly, some agricultural landowners did not understand the purpose of a *multiple ecosystem service benefit* criterion. They felt that robust landowner participation, even if each landowner only contributes one or two benefits, is potentially more valuable than a few participants who can supply multiple benefits.

“The goal should be to get as many folks as possible.”

**Structure**

*Restoration Actions for Water Quality Credit Generation.*

Only one respondent was interested in performing the restoration work on his
land for credit generation. The other five respondents asked to consider a future water quality-trading program and all four of the respondents active in the Tualatin water quality-trading program, felt that qualified professionals with experience working with native vegetation material and local habitat types should install riparian buffer.

“Restoration should be taken care of by a private company with a lot of experience in this type of work. Without experience, problems arise in these programs.”

**Verification of Water Quality Credits.**

Respondents indicated that verification should be carried out by a trusted third-party entity. Most respondents suggested that soil and water conservation districts should undertake verification. There was general concern about a federal or state agencies coming onto private land to verify credits; however, there was one respondent who indicated that verifiers should be “coordinated with a government agency.”

All respondents indicated that they are comfortable with verifiers coming onto their land as long as they have adequate notice. One respondent was concerned about verifiers reporting violations beyond the contractual agreement of the water quality-trading program. A key informant suggested that these concerns could be reduced or eliminate through a clause in the contract stating that only violations in the credit generating process would be reported.

“The landowner cannot always be around to let verifiers onto land, so it needs to be someone responsible.”

**Monitoring and Maintenance of Water Quality Credits**

Respondents active in the Tualatin water quality-trading program indicated that monitoring and maintenance is necessary for three to five years after restoration work is performed. After that period of time, the landowner can perform these duties. Most of these respondents suggested that monitoring should be done quarterly. Respondents generally did not have a problem with monitors and maintenance crews coming onto their land, but indicated that there needed to be
advanced notice. Respondents considering participation in a future program indicated that they were willing to have the annual payments tied to a successful monitoring report.

Incentives to Increase Environmental Integrity.
Respondents were provided with an outline of the quality rating system (Appendix I) in order to determine willingness to participate in a program that incentivized the generation of high environmental quality. Overall, respondents considering future participation in a water quality-trading program were not interested in generating a higher “quality” credit, even with a monetary benefit. These respondents indicated that the rating system added to the complexity of a program that should be straightforward and easy to comprehend. One respondent active in the Tualatin water quality-trading program indicated that tax incentives might be a more effective method for encouraging higher quality output from restoration actions that generates credits.

“Simple first and then make more complex”

Respondents were also very concerned about disincentives created by a water quality-trading program, specifically requirements for projects to be “additional.” Respondents stated that “additionality” rules place landowners who were doing good work prior to the implementation of the program at a disadvantage. These rules also create a perverse incentive for farmers and landowners to cut down trees or uproot vegetation in order to qualify for “additional” restoration in the trading program.

Permanence Respondents indicated that a requirement to place a long-term protection mechanism on land generating water quality credits would be a barrier to participation. They particularly noted concern when the requirement or incentive is structured as a perpetual easement. As previously stated, respondents indicated a need for flexibility in future land management decisions.
Clean Water Services developed a program that links contracts to land that is restored and protected for the Tualatin water quality-trading program. Key informants were interviewed about this program. These respondents indicated that agricultural landowners active in the Tualatin water-quality trading program have generally been willing to place in 20-year contracts on their land; however, they have historically been unwilling to participate in longer-term and permanent contracts. Of the first twenty-five agricultural landowners in the Tualatin water quality-trading program, only one agreed to participate in a permanent contract. This landowner was fundamentally different from the others in the Tualatin watershed; he helped develop the Tualatin water quality-trading program. With increased education, however, key informants indicated that agricultural landowners are likely to be more willing to place longer-term contracts on land generating credits, especially once the landowner is familiar with the contract process and its restrictions.

**Comparison of conservation practitioners and agricultural landowners**

Table 2 compares the data collected from focus groups with conservation practitioners and interviews with agricultural landowners for each of the major research questions. This table depicts the key findings.

It is evident that conservation practitioners and agricultural landowners have similar viewpoints on most of the issues discussed for the purposes of this study. For instance, all respondents agree that trusted third parties should perform restoration actions, verification protocols, and monitoring and maintenance. There is some discrepancy, however, regarding which third party entity that should perform these protocols. Some focus group participants indicated that credibility should be ensured by having new, highly qualified organizations carry out the steps of the credit approval processes. These respondents recommended modeling certification and verification processes for water quality trading after carbon trading programs. Agricultural landowner respondents, however, fully endorsed soil and water conservation districts as the entity to undertake the credit approval steps. The major divide among respondents was in determining what quality criteria should be incorporated into a water quality-trading program. Most agricultural landowners discouraged complicating the program through the
incorporation of additional quality criteria. They also indicated incentives for large-scale projects and stewardship requirements are likely to decrease agricultural landowner participation.

Table 2: Comparison Table of Key Results

<table>
<thead>
<tr>
<th>Quality &amp; Quality Criteria</th>
<th>Conservation Practitioners</th>
<th>Agricultural Landowners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental and ecological quality of a water quality credit should be incorporated into a market-based program. Credits with a higher quality should be of more value. This creates an incentive for environmental integrity in a water quality or other ecosystem service market-based program. Environmental quality should be based on: • The location of the credit relative to a priority conservation area or credits that increase connectivity of restored lands. • Larger scale restoration project should be of higher value. • Increased Ecological Efficiency, such that a proposed conservation action matches the ecological potential of the site. • Credits that are tied to a mechanism that ensures long-term stewardship should be of higher value. • Auxiliary ecosystem benefits should increase the quality of the credit.</td>
<td>No objections to incorporating environmental and ecological quality into a water quality-trading program. There is concern that a quality criterion creates a disincentive for landowner participation. A requirement for large-scale projects in priority areas places some landowners—particularly small-scale, innovative landowners—at a disadvantage. In addition, stewardship criterion that ties credits to a long-term or permanent contract limits their families’ future access to land, making this a barrier to participation. Landowners noted that reduced participation might compromise the environmental integrity of the program. They believe that robust landowner participation—even if the land is not in priority areas, of a large scale, or providing multiple ecological benefits—is more important than a program with limited, but targeted participation.</td>
<td></td>
</tr>
</tbody>
</table>

| Structure | Restoration Actions for Credit Generation. Restoration should be undertaken by a qualified third-party. A trusted certification program should certify agricultural landowners who decide to undertake restoration actions on their land. Verification of Credits. A trusted third-party should verify credits. The verifier should be certified to perform verification tasks. Soil and Water Conservation Districts were considered a potential verifier. In addition, another business organization might perform this role. Monitoring and Maintenance of Credits. | Restoration Actions for Credit Generation. Landowners are generally uninterested in carrying out restoration on their land from credit generation. Verification of Credits. A trusted third-party should verify credits. Any verifiers must give adequate notice before coming onto private land. Soil and Water Conservation Districts were considered a good verifier. Monitoring and Maintenance of Credits. |
Within the first five years of a restoration job, monitoring should be done quarterly by a third-party entity or trusted entity. After that period, landowners should be able to conduct routine maintenance.

Within the first five years of a restoration job, monitoring should be done quarterly or annually. There must be adequate notice that an individual is coming onto land to monitor restoration work.

Credit payment can be tied to successful monitoring report.

Incentives to Increase Environmental Integrity.

A number of incentives and disincentives were discussed. As a potential incentive mechanism, conservation practitioners discussed a rating system that would attach information to a credit, indicating various levels of the credit’s ecological or environmental quality.

There were concerns about disincentives created by a water quality-trading program, specifically the use of non-natural solutions for water quality problems.

There was concern about disincentives created by a water quality-trading program, specifically requirements for additionality.

**Permanence**

Perpetual easements are considered the optimal, but there is an understanding that shorter-term contracts with opportunities for renewal may ensure permanence of the restoration site.

Other mechanisms to ensure permanence of restoration sites, such as trading ratios, insurance/assurance pools, performance bonds, were considered by participants.

Agricultural landowners are opposed to long-term or permanent contracts. Most landowners are familiar with rental payments and prefer to enter into a contract that mimics a rental payment, such as a 5- or 10-year contract that may be renewed.

**VI. Sources of Error**

There are three potential sources of error: (1) subject selection using non-probability sampling, (2) a small sampling frame of agricultural landowners, and (3) a comparison of two groups of respondents using different methods of data collection.

This study utilized two non-probability sampling methods: purposive and snowball sampling. Although these methods were critical for targeting respondents that would provide substantive insight and opinions on the subject matter, they do not provide an opportunity to statistically generalize the findings to a larger population (Rea and Parker, 2005). As such, the
results from this study provide a preliminary understanding of the key issues underlying the incorporation of environmental integrity in water quality markets.

The second source of error is the small, and potentially biased, sample of agricultural landowners. Four agricultural landowners active in the Tualatin water quality-trading program were chosen and agreed to participate in the semi-structured interviews. All of these landowners indicated strong stewardship ethics and were very positive about their experience in the program. The characteristics of these respondents may not represent all of the agricultural landowners active in the Tualatin trading program since this sample was small. Moreover, the six respondents asked to consider future participation in water quality trading were not interviewed for this study. These interviews were independent of this research and a different method (i.e., on-site interviews) was used to conduct the interviews. This study is unable to control bias that may have occurred from those interviews.

Lastly, this study compares results from focus groups with results from semi-structured interviews. Because these two method are applicable in different scenarios, error potentially increases when results generated from these different methods are compared. Focus group sessions, for instance, allowed for discussion among participants. This often introduced participants to new ideas they may not have considered without the focus group discussion. Semi-structured interviews, on the other hand, limit the opportunity for discussion or an exchange of ideas among respondents. In addition, interviews were conducted over the phone, reducing the types of questions that can be successfully used to generate data. Although error is introduced when comparing results that used two distinct methods to generate the data, this study does provide a preliminary examination of how two stakeholder groups believe a large-scale water quality-trading program should be structured to ensure environmental integrity, while maintaining adequate nonpoint source participation.

VII. DISCUSSION

Water quality-trading programs are likely to be more successful if they are perceived as simple, especially for credit suppliers. Complexity is a major barrier to nonpoint source participation. Although these programs may be based on a complex legal or regulatory framework, they should be seemingly straightforward with clearly defined and accessible trading rules and regulations. Once a water quality-trading program has adequate nonpoint source participation, it can begin to
incorporate standards that increase its environmental integrity.

Perceptions of simplicity can be developed through a number of methods. Water quality-trading programs, for instance, can use existing agricultural programs that are familiar to nonpoint sources, such as the NRCS’s Conservation Reserve Enhancement Program (CREP) or Conservation Reserve Program (CRP), to increase participation. Perceptions of simplicity can also be enhanced through the use of trusted, third parties throughout the credit approval process. Communication and outreach efforts that help nonpoint sources overcome some of the programs’ perceived hurdles can also reduce the complexity of a program, increasing participation.

Communication and outreach was advocated by all of the agricultural landowners active in the Tualatin water quality-trading program. Many respondents indicated that the use of local leaders, with influence over others attitudes or overt behavior, can provide laggards with an opportunity to observe the actual costs and benefits of the program. Observations may include the technicalities of how water quality credits are generated, as well as the requirements for long-term protection of credit generating land. Education and outreach can also provide an opportunity to build trust and communication among suppliers and the key regulators in the market.

Although simplicity is key to the success of a water quality-trading program, attaining goals of environmental integrity will require quality assurances. Many agricultural landowners interviewed for this study suggested that participation was primarily motivated by profits. As such, market regulators must develop incentives that place a premium on high quality restoration and conservation actions generating credits or increase the stringency of quality standards. Economic incentives may include the quality rating system that attaches information about environmental quality to a credit as it moves from the buyer to the seller in a water quality-trading program.

A key informant articulated the overall finding when he states “focus on the elementary level and make it the first goal. This gets farmers in… Then make it more complex.”

VIII. RECOMMENDATIONS

A. Policy Recommendations.

I. Simplicity first, and then quality assurances. Water quality-trading programs should be simple and straightforward in order to increase nonpoint source participation. Once
a program has adequate participation, it can begin to incorporate high standards for environmental integrity. These may include requirements for specific quality characteristics, incentives to increase quality, such as a credit rating system, or targeting land in priority areas or of high ecological functionality.

II. Communication and Educational Outreach. Building trust and collaboration among parties will decrease perceptions of complexity and increase participation. During interviews, most agricultural landowners in the Tualatin water quality-trading program suggested that increased education among the agricultural community could increase participation. There were suggestions to hold workshops to inform landowners about the monetary and environmental benefits of participation in a water quality-trading program. In addition, many of these respondents indicated that a local leader within the community can generate enthusiasm for participation at the local level.

B. Research Recommendations.

I. Focus group sessions of farmers and agricultural landowners. This would provide an opportunity to exchange ideas and for self-disclosure among farmers and agricultural landowners. In addition, focus group sessions could be used as an educational tool to enhance the knowledge about the benefits of participating in an emerging water quality-trading program or other market-based programs. Furthermore, focus groups of agricultural landowner would enhance this study in allowing for a more robust comparison of results.

II. Assembly of agricultural landowners and conservation practitioners. This would provide an educational opportunity for both groups of stakeholders to exchange ideas and create innovative solutions to current nonpoint source participation barriers and hurdles in achieving the environmental and ecological goals of a water quality-trading program.
WorCited


ODEQ (Oregon Department of Environmental Quality), 2006. Willamette Basin TMDL. www.deq.state.or.us/wq/TMDLs/TMDLs.htm, last accessed January 2008.

ODEQ (Oregon Department of Environmental Quality), 2006. Willamette Basin TMDL. www.deq.state.or.us/wq/TMDLs/TMDLs.htm, last accessed January 2008.


APPENDIX I
MAP OF THE WILLAMETTE BASIN

Figure 7: Map of Land Use in the Willamette Basin
Source: Kerkering, 2007

Figure 8: Change in Spatial Extent Variation of Willamette Basin from 1850 to 1995
Source: ODEQ, 2006
APPENDIX II
QUALITY RATING SYSTEM FOR ENVIRONMENTAL QUALITY

A quality rating system would attach information to a credit indicating the various levels of credit quality (standard, silver, gold, or platinum). Currently, the environmental and ecological quality is guaranteed in trading rules approved by regulators. These credits are considered “standard” credits in this analysis. A tiered approach would apply a quality gradient of “silver,” “gold,” and “platinum” to credits that exceed the “standard” credit.

<table>
<thead>
<tr>
<th>Tier 1: Quality credit</th>
<th>Credits are defined within the trading rules approved by regulators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 2: Silver credit</td>
<td>Credits provide additional ecosystem benefit beyond requirements</td>
</tr>
<tr>
<td>Tier 3: Gold credit</td>
<td></td>
</tr>
<tr>
<td>Tier 4: Platinum credit</td>
<td></td>
</tr>
</tbody>
</table>

As conservation and restoration projects increased their quality in terms of the location, scale, ecological efficiency, stewardship, and multiple benefits metrics, they could be certified as quality, silver, gold, or platinum as quality increased. Below is a sample of how a 4-tiered credit quality rating system might work for the temperature water-quality trading market.

Table 3: Proposed Quality Rating System for Temperature Credits

<table>
<thead>
<tr>
<th>Quality Metrics</th>
<th>Standard Credit (Tier 1)</th>
<th>Silver Credit (Tier 2)</th>
<th>Gold Credit (Tier 3)</th>
<th>Platinum Credit (Tier 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>N/A</td>
<td>Adjacent to a priority area, thus increasing conservation area</td>
<td>In a priority area</td>
<td>In a priority area, increasing connectivity</td>
</tr>
<tr>
<td>Scale</td>
<td>150 ft. stream buffer restored</td>
<td>150 ft. stream buffer restored on both sides of stream</td>
<td>200 ft. stream buffer restored on both sides of stream</td>
<td>300 ft. stream buffer restored on both sides of stream</td>
</tr>
<tr>
<td>Ecological Efficiency</td>
<td>Diversity of site-appropriate natives and management to control invasive plants to less than 5%</td>
<td>Plantings beyond the tree layer into the shrub and herbaceous layer</td>
<td>Silver plus in-stream benefits to fish habitat</td>
<td>Gold plus restoration of upland and wetland supporting functions</td>
</tr>
<tr>
<td>Stewardship</td>
<td>Contract to preserve temperature benefits</td>
<td>Credit tied to 20-year contract</td>
<td>Credit tied to 50-year contract</td>
<td>Credit tied to permanent, recorded conservation easement</td>
</tr>
<tr>
<td>Multiple Ecosystem Benefits</td>
<td>Reduces water temperature $x$ kilocalories</td>
<td>Credit improved beneficial uses (fish habitats)</td>
<td>Silver plus increases other riparian functions (fish habitats, flood storage, wetland, carbon)</td>
<td>Gold plus increases upland habitat functions (sediment filtration, carbon, wildlife corridors, etc)</td>
</tr>
</tbody>
</table>