Developing the Willamette Ecosystem Marketplace

Willamette Partnership

Increasing the pace, scope
and effectiveness of conservation

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SECTION 1

Introduction

In November 2004 the Willamette Partnership had an idea about creating incentives to restore the ecosystems we care about and depend on. We thought that if people with no regulatory obligation knew they could make profits restoring ecosystems that clean and cool our water and support the fish and wildlife we care about, they would do it. We also thought that if people facing strict regulations to reduce environmental impacts could choose to pay others to restore streamside vegetation, wetlands, flow, and floodplains to meet those regulations, they would do so. We thought that if regulatory agencies had technically sound and credible ways to compare the benefits of restoration with the impact being regulated, they would allow it. Finally, we thought that if credible and transparent infrastructure to support these transactions was in place to ensure integrity and protect the public interest in its ecosystems, it would be accepted. Now, more than 4 years later, we are a lot smarter about what it takes to make that happen, and an ecosystem services marketplace in the Willamette Basin is well on its way to becoming a reality.

With the help of stakeholders and funding from the U.S. Environmental Protection Agency's Targeted Watershed Grant Program, over the last 2 ½ years the Willamette Partnership and its many partners have developed the tools, templates, and market infrastructure needed to implement just such a system. A marketplace for temperature improvements is ready for business and the framework of a multi-credit marketplace where many types of ecosystem services credits are traded is in place. The Willamette Partnership has registered three riparian restoration projects with a significant number of temperature credits on a new centralized credit registry and exchange tracking platform and the Partnership is prepared to work with partners to register dozens of additional projects during the coming months. The framework is in place, and the Willamette Partnership is poised to facilitate the first complete temperature trade between buyers and sellers in the marketplace. This transaction can occur once legal issues that have temporarily postponed demand for temperature credits are resolved.

The Willamette Partnership, its many active partners, and its consultants can count the following as major accomplishments in the marketplace development process:

- Created a tool to guide marketplace investment toward high-priority conservation and restoration areas in the Willamette Basin.
- Developed protocols to ensure that restoration projects meet high ecological performance standards.
- Identified technically sound methods for quantifying temperature credits generated from riparian shade restoration, wetland restoration, flow augmentation, and wastewater reclamation and reuse, and made substantial progress in developing a path forward to do the same for floodplain restoration.
- Determined that there is enough potential supply of temperature credits from restoration actions in priority conservation and restoration areas in the Willamette Basin to meet the expected demand for temperature credits created by the Oregon Department of Environmental Quality's new Willamette temperature total maximum daily load (TMDL).
- Created an easy-to-use temperature credit calculator that potential sellers in the marketplace can use to estimate how many credits they could generate if they restored riparian shade, wetlands, or flow.
- Created screening tools that facility managers can use to develop compliance strategies that include trading. Facilities managers can also use a calculator to evaluate the temperature benefits from wastewater reclamation or reuse.

- Applied and tested a methodology to rapidly assess a restoration site's ecological values and its potential to generate multiple types of ecosystem service credits.
- Worked with the Oregon Department of Environmental Quality to develop (1) agency policies that will encourage participation in the marketplace and maximize investment in high-priority restoration areas; and (2) draft permit language that will allow dischargers to use temperature trading to comply with the requirements of the new Willamette temperature TMDL.
- Created centralized market infrastructure—a credit registry and exchange platform—to register, certify, bank, and track different types of ecosystem service credits as they are generated, bought, and sold; created templates of contracts, agreements, and other documents needed to support transactions in the marketplace.

We know what the ecological problems in the Willamette Basin are. We know what to do—and where—to improve conditions. We developed the techniques and tools to translate the ecological benefits of things that need to be done into a temperature measurement that is strictly regulated. We created permit language that enables cities and businesses facing strict temperature limits in their discharge permits to pay people who can do the things that need to be done ecologically to off-set their temperature impacts. We created the market infrastructure needed to enable these transactions to occur in a transparent and credible way.

In short, we made it possible for people with regulatory obligations to buy the ecological services created by others who restore ecosystems. We made the tools technically sound so that regulators would allow this new approach and we put the infrastructure in place to make it credible so the public would accept it.

Origins of the Willamette Marketplace

An Opportunity in the Willamette Basin

When functioning properly, the Willamette River and its tributaries would naturally have lots of dispersed, cold-water habitat for salmon, steelhead, and trout. But changes to the environment that keep our farms and forests productive and our cities clean and safe have decreased the availability of the right type of cold-water habitat in the right places, at the right times of year. As a result, current temperature conditions in the river are not good for native species that reside in and visit the river. To help these species thrive, the river's temperature conditions need to be improved.

The Oregon Department of Environmental Quality responded to this problem by designing a temperature TMDL for the Willamette Basin—a regulation that requires permitted entities that contribute to the warming of the river to reduce their impact. Under the TMDL, municipal and industrial dischargers who release clean but warm water to the river are required to meet very specific temperature load limits. The final Willamette temperature TMDL was signed in September 2006.

Development of the TMDL created an opportunity in the Willamette Basin to establish an ecosystem marketplace where multiple types of ecosystem credits could be created and traded. The temperature TMDL created the needed catalyst to build a framework that serves the emerging temperature market, but it also laid the foundation for the transactions involving a wide range of other credits for fish and wildlife habitat, water quality and quantity, and more. Significant demand for temperature credits would be created by the TMDL because options to meet the requirements under the regulation are limited. One expensive option is to install technology to cool water before it is discharged to the river. Such solutions achieve the desired end-of-pipe conditions and ensure regulatory compliance, but they do little to improve river conditions that fish depend on.

An ecosystem marketplace, on the other hand, would encourage restoration of streamside vegetation, wetlands, and gravel in river channels by people who have no regulatory obligation to do so. In addition to keeping the river water cool, these types of "natural infrastructure" would create the full range of habitat conditions that fish and wildlife need. In addition, market-driven restoration projects in the Willamette River and its tributaries would produce a wide variety of other ecological benefits, such as habitat for other species, erosion control, water storage, and filtration. Thus, an ecosystem marketplace could be used to achieve large-scale ecological goals and not just reduce the cost of regulatory compliance.

Those with permits to discharge clean but warm water have not generally had the ability to "build" or acquire natural infrastructure to meet their permit requirements or mitigate their impacts. Likewise, landowners who could choose to "build" natural infrastructure have not had the financial capacity or incentive to do so. If those required through permits to reduce water temperature could pay for others to create the natural infrastructure that provides the conditions that fish need—including cool water—then both permit compliance and significant ecological restoration could occur simultaneously.

U.S. EPA Targeted Watershed Grant

In November 2005, the Willamette Partnership received a 2 ½-year Targeted Watershed Grant worth $779,000 from the U.S. Environmental Protection Agency. The grant was to fund initial development of an ecosystem marketplace, with a particular focus on temperature objectives. The marketplace was to be designed to eventually accommodate trades of credits or currencies for a range of other ecological services and to enhance general watershed integrity and function in the Willamette Basin.

The overall goal of the project was to develop the technical, legal, and regulatory frameworks needed to facilitate exchanges of ecosystem service credits that improve ecological health and sustainability in the Willamette Basin. The ideal initial ecosystem marketplace would have the following characteristics:

- Be trusted by regulated parties, private land managers, regulatory agencies, and the public
- Meet specific TMDL objectives for reducing temperature in the Willamette river
- Drive investments to the restoration actions that will provide the greatest environmental return to the Willamette watershed
- Provide financial incentives for land managers to restore ecological values in priority areas
- Be capable of facilitating transactions in a variety of ecosystem service credit types that address a full suite of ecological values.

The project work was broken down into five technical tasks: a market appraisal, credit definition and currency development, temperature credit portfolio, development of the marketplace infrastructure, and market transaction. The technical tasks are summarized below.

Task 1: Market Appraisal—Who needs what types of credits for what purpose, and can supply be created through ecological restoration actions?

The market appraisal involves analyzing the demand for different types of ecosystem service credits (in part by quantifying temperature reduction obligations under the TMDL) and developing an understanding of the potential supply of credits, when and where they are located, and who would generate them. Because the primary goal of the Willamette Ecosystem Marketplace is ecological restoration, an important aspect of assessing the supply of credits was determining where the high-priority restoration areas are in the Willamette Basin so the marketplace could be structured to encourage activities in those locations and thus produce multiple ecological benefits.

Task 2: Credit Definition and Currency Development—How can the ecological benefits of restoration actions be translated into units of measure people understand and want to buy?

In ecosystem service markets, offset credits are the unit of trade. Offset credits can be measured in a variety ways, such as tons of carbon, acres of wetlands, or kilocalories per day of water temperature. The credit definition process establishes the basis for calculating the credits that would be generated from different types of restoration projects. For the Willamette Ecosystem Marketplace, this meant working to develop practical and technically sound methods for quantifying the water temperature reductions that would result from wastewater reclamation and reuse, flow augmentation, riparian shade restoration, wetland restoration, and floodplain restoration. Currency development refers to examining the feasibility of a common or "universal" currency that multiple types of ecosystem service credits (temperature reduction, wetlands habitat, carbon sequestration, etc.) could be translated into for use in comparing or exchanging credits.

Task 3: Temperature Credit Portfolio—Is it possible to reach the goals established in the temperature TMDL and create significant other environmental benefits by restoring ecosystems?

Credit portfolios are developed at two scales: basinwide and site-specific. The basinwide portfolio reflects investments that, if implemented, would result in attainment of the Willamette TMDL for temperature and provide other ecological benefits. The site-specific portfolio characterizes the potential for a specific site to generate multiple types of restoration-related credits for sale or trade in a multi-credit marketplace.

Task 4: Marketplace Infrastructure—If people restore ecosystems instead of building onsite or end-of-pipe controls, what systems need to be in place to ensure that restoration actions are real and are being managed over time?

Ecosystem marketplaces require unique infrastructure to register, track, and account for credits and ensure their validity and quality through time. A centralized credit registry is needed to operate a credit ledger and the accounting tools that track ecosystem service credits. An administrative and electronic exchange platform is needed to track and report transactions between buyers and sellers. Agreed-upon, documented measurement criteria, performance standards, and verification protocols for credit-generating activities help ensure their quality, and restoration projects need to be monitored over time to ensure that they continue to provide the ecosystem services that give their credits value. These and other regulatory, administrative, and transactional components of the marketplace require a host of documents, databases, written protocols, agreements, and regulatory instruments that together make up the marketplace infrastructure.

Task 5: Market Transaction—Can we make a deal?

The goal of this task was for the Willamette Partnership to coordinate, facilitate, or support one or more real temperature-reducing actions as credit trading or banking transactions under the auspices of the Willamette Ecosystem Marketplace. This included selecting, researching, and evaluating potential transaction projects and working with agency staff to augment regulatory language to allow temperature trading as a TMDL compliance option.

The activities, products, and results of Tasks 1 through 5 are described in detail in the following chapters.

Background on Ecosystem Services Markets

Why Do We Need an Ecosystem Services Marketplace?

As a society, we generally value clean air, clean water, fish and wildlife, and natural landscapes. This concern is demonstrated consistently in polls and validated by the willingness of voters and policymakers at all levels of government to approve the use of public funds for conservation purposes. There are also many regulations that constrain activities deemed harmful to the environment, like destroying endangered species habitat, harming migratory birds, or harvesting fish beyond a legal limit.

During the last 30 years, we have made progress addressing some of the most visible and egregious sources of environmental degradation by applying landmark environmental laws such as the Clean Water Act, National Environmental Policy Act, and Endangered Species Act. These laws were intended to address specific environmental problems, such as industrial and wastewater discharges into rivers and streams, site-specific habitat damage, and impacts on individual species.

Over time, the limitations of compliance options within existing regulatory frameworks have become increasingly clear. For example, regulations are often effective for stopping or limiting harmful acts, but they may not be particularly effective for encouraging positive or restorative actions. There is growing concern that site-by-site, species-by-species, and pipe-by-pipe approaches to conservation do not create the incentives needed to restore and conserve the ecosystems that sustain the resources we depend on and care about.

Worldwide, there is growing interest in the use of market-based approaches for conserving and restoring the important ecological processes that provide services to people. These "ecosystem services" are produced by intact ecosystems: well-managed forests, functioning river floodplains, contiguous bands of diverse streamside shrubs and woodlands, and healthy wet prairies and wetlands. When these ecosystems are allowed to do their work, they purify, cool and store water; they produce oxygen and store carbon; they reduce or prevent damage from flooding; they improve pollination; and they provide fish and wildlife habitat. The shift worldwide is toward quantification of these ecosystem services so the people who can restore and maintain them can get paid for doing so.

It is also clear that despite significant investments in land protection and restoration, conservation is not occurring at a scale that will substantially reverse the trend of major declines in native habitat, plants and animals, and clean air and water. Development pressure is projected to continue, especially in the Willamette Valley. Even with existing federal and state regulations, it is likely that ecosystem health in the Willamette Basin will continue to degrade, undermining the region's economy, natural resource base, and quality of life. Given the current situation, it is difficult to avoid the conclusion that something more is needed to protect and restore the natural resources we value.

The Willamette Partnership is seeking to demonstrate alternative compliance options within the regulatory approach—options that reduce the cost and conflict of compliance with regulations while delivering broader ecological results. One way the Partnership is doing this is by leading the effort to build the Willamette Ecosystem Marketplace, which uses market-based incentives and a new suite of tools to drive investment toward ecological priorities in the Willamette Basin

The Willamette Partnership. *The Willamette Partnership is a coalition of conservation, city, business, farm, and science leaders committed to increasing the pace, scope, and effectiveness of conservation in the Willamette Basin. Board members represent the many diverse interests in the basin that have a stake in its ecological and economic future. Board members have a long history of working together to build the relationships needed to form a consensus on innovative conservation action. The Willamette Partnership believes that restoring the health of an ecologically, socially, and economically complex watershed like the Willamette will require a coordinated approach that no jurisdiction, agency, or private interest has the resources or incentive to undertake alone.*

What Is an Ecosystem Services Marketplace?

An ecosystem marketplace is an organizational structure that leverages the power of economics with landowners and others investing to protect, restore, and maintain ecological values such as clean air, clean and abundant water, fish and wildlife habitat, and other ecosystem "products" that are generally considered public goods. These goods typically are not bought and sold in the way that food, building products, and manufactured goods are, and protecting them for the benefit of everyone usually does not offer the same type of financial rewards. An ecosystem marketplace changes that dynamic by making ecosystem services—temperature or pollution reduction, water purification, carbon sequestration, habitat preservation, natural flood control, and so on—tradable items that can be priced and sold.

In the Willamette Ecosystem Marketplace, regulated entities that spend millions of dollars each year on environmental compliance will be able to pay farmers, foresters, and other land mangers for ecological restoration actions that control or offset impacts more effectively than traditional, site-specific approaches to compliance do. Payment occurs through the purchase of offset credits generated once a landowner completes a restoration project and registers the credits for sale in the marketplace. As an example, cities and industries that are required to reduce the impact of their discharges of clean but warm water into rivers and streams would be able purchase temperature offset credits created when land managers plant streamside shade trees, restore wetlands, or reconnect floodplains so that water is cooled naturally.

Restoration of natural processes has the potential to create substantially more benefits to the larger ecosystem than traditional engineered approaches to environmental compliance, and in many cases it may be less expensive. In a ground-breaking temperature trading program in the Tualatin River Basin, for example, Clean Water Services (the area's wastewater utility) invested approximately $12 million to restore streamside vegetation that actually improved conditions for fish, instead of spending $60 million in refrigeration technology that would have guaranteed compliance but provided little environmental benefit.

There are many other advantages to developing an ecosystem marketplace that complements existing environmental regulations:

- An ecosystem marketplace would tap into sources of investment that currently are not participating in coordinated conservation activities. This increases the scope and scale of investment in conservation, providing additional ecological benefits for the public.
- An ecosystem marketplace would provide greater ecological benefits at lower cost to the regulated parties, with the potential to reduce the costs of goods and services to taxpayers and consumers.

- Development of industrial sites in the Willamette Valley is severely constrained because land zoned for industrial use within urban growth boundaries tends to be wet, requiring significant mitigation. A functional ecosystem marketplace will increase the availability of large, ecologically significant mitigation banks that have mitigation credits to sell. This expedites development where it belongs while directing investment in conservation to the areas that will provide the greatest environmental benefits.
- Rural landowners find it increasingly difficult to remain profitable. Generating ecosystem service credits can create a new source of income, thereby diversifying revenue for rural landowners and providing society with ecological benefits.

For these reasons and others, the Willamette Partnership has pursued development of an integrated ecosystem marketplace in the Willamette Basin that will accommodate the sale of multiple types of offset credits, representing many different ecosystem services.

SECTION 2

Roles and Responsibilities

A host of individuals, businesses, organizations, associations, municipalities, educational institutions, and agencies played a role in the development of the Willamette Ecosystem Marketplace. Briefly, the effort was led by the Willamette Partnership with the aid of its board of directors and partners and a project steering committee. The Mid-Willamette Valley Council of Governments acted as the Willamette Partnership's fiscal agent. Much of the technical work was done by a consulting team consisting of David Evans and Associates, Inc. and CH2M HILL. This was augmented with work by Parametrix and three limited-duration task teams. Extensive financial and in-kind services were provided by project partners and friends. Clean Water Services, Defenders of Wildlife, the City of Albany, the City of Eugene, the Association of Clean Water Agencies, The Nature Conservancy, and the Long Tom Watershed Council, in particular, supplied regular, consistent, and practical regulatory and technical expertise that was invaluable. Representatives from Oregon Department of Environmental Quality, the U.S. Environmental Protection Agency, and other government agencies participated extensively in every stage of the project, both formally on the steering committee and task teams and informally through review and advice as the project progressed. Roles, responsibilities, and the administration and management of the project are described in more detail below.

Project Organization

Willamette Partnership and its Partners

The EPA Targeted Watershed Grant was awarded to the Willamette Partnership in November 2005 after being nominated by Oregon Governor Ted Kulongoski and the Confederated Tribes of Grand Ronde. The original proposal included letters of support from 23 Oregon-based organizations who saw value in pursuing an ecosystem marketplace. Supporters included the following:

American Heritage Rivers Initiative
Oregon Association of Conservation Districts
Associated Oregon Industries
Oregon Business Association
City of Albany
Oregon Business Council
City of Eugene
Oregon Department of Environmental Quality
City of Portland
Oregon Environmental Council
City of Salem
Oregon State University
Clean Water Services
Portland State University
Conifer Group
SOLV
Defenders of Wildlife
University of Oregon Institute for a Sustainable Environment
Heritage Seedlings, Inc. Wildwood Mahonia
Oak Lodge Sanitary District
Willamette Riverkeeper
Oregon Association of Clean Water Agencies

Development of the Willamette Ecosystem Marketplace was led and managed by the nonprofit Willamette Partnership, a coalition of conservation, municipal, industry, agriculture, development, and academic leaders who represent the interests needed to develop consensus on innovative conservation policy and action in the Willamette Basin. The project manager was Willamette Partnership Executive Director David Primozich.

The Willamette Partnership was responsible for the strategic direction, general oversight, and stakeholder access needed to establish the Willamette Ecosystem Marketplace. The organization also convened, coordinated, and otherwise supported the activities of the project steering committee and task teams, supervised contractors and consultants, and was responsible for all project deliverables associated with grant-funded activities.

Board of Directors

The Willamette Partnership Board of Directors met quarterly throughout the project to inform and direct the project management staff and offer strategic guidance and decisions. In addition, the Willamette Partnership Executive Committee participated in day-to-day project oversight activities and served on the project steering committee. Much of the outreach for the project was conducted by board members, who have extensive business and political contacts. Board members worked to ensure that project development occurred in an open and transparent manner and helped to create opportunities for stakeholder input and feedback.

During the 2 ½ years of the project, the Willamette Partnership Board of Directors maintained a broad view of the marketplace and helped the project stay focused on the financial and ecological benefits of an integrated, multi-credit marketplace, not just a water quality trading program. The board also worked on policy issues connected to the marketplace. In February 2007, it made the key decision that the Willamette Partnership would take on the responsibility of managing the basic marketplace infrastructure, until another organization could step into that role.

The following people serve on the board of directors:

- Bill Gaffi (President), General Manager of Clean Water Services, the wastewater management service for the Tualatin River Basin
- John Miller (Vice President), President of Wildwood, Inc., an urban design and development firm
- Sara Vickerman (Secretary), Senior Director of Biodiversity Partnerships for Defenders of Wildlife
- Mike Burton, Vice Provost and Executive Director for extended studies at Portland State University
- David Hulse, professor of Landscape Architecture at the University of Oregon and former chair of the Landscape Architecture department
- Jim Irvine, president of The Conifer Group, a multifaceted real estate development company
- Mark Krautmann, past president of the Oregon Association of Nurseries and the founder and owner of Heritage Seedlings Nursery
- Marv Lewallen, Weyerhaeuser's Environmental Affairs Manager for Oregon
- Tom Lindley, partner in the Portland office of the law firm of Perkins Coie LLP

- Dean Marriott, Director of Portland's Bureau of Environmental Sciences
- John McDonald, Executive Director of the Oregon Association of Conservation Districts and Director of the Tualatin Soil and Water Conservation District
- Jack McGowan, Executive Director of SOLV, an organization that builds community though volunteer action
- Chris Mercier, Confederated Tribes of Grand Ronde Tribal Council member
- John Moriarty, Statewide Coordinator for the Network of Oregon Watershed Councils
- Liz Redon, North Santiam Watershed Council Coordinator
- Travis Williams, Executive Director of Willamette Riverkeeper
- Duncan Wyse, President of the Oregon Business Council, a nonprofit organization of business executives

The Willamette Partnership also received vital financial and in-kind support for its activities from:

Clean Water Services
City of Albany
City of Eugene
Defenders of Wildlife
Oregon Business Council
Oregon Department of Environmental Quality
Oregon Association of Clean Water Agencies
Associated Oregon Industries
City of Portland
City of Salem
Conifer Group
Heritage Seedlings Nursery
Long Tom Watershed Council
Network of Oregon Watershed Councils
Oak Lodge Sanitary District
Oregon Association of Conservation Districts
Oregon Business Association
Oregon Department of Agriculture
Oregon Department of Fish and Wildlife
Oregon Department of State Lands
Oregon DepartOregon Economic and Community Development Department
Oregon Environmental Council
Oregon Governor's Office
Oregon State University
University of Oregon Institute for a Sustainable Environment
Portland State University
SOLV
Wildwood Mahonia Nursery and Vineyard
Willamette Riverkeeper

Mid-Willamette Valley Council of Governments

The Mid-Willamette Valley Council of Governments is the fiscal agent for the Willamette Partnership and provided staffing, fiscal management for grants and other revenue and expenses, contracting services, and reporting.

Project Steering Committee

The project steering committee consisted of the Willamette Partnership Executive Committee and two additional board members, regulatory agency staff, interest group representatives, landowners, and other individuals with knowledge and interest in marketplace development. The committee met monthly for the first 1 ½ years of the project and then occasionally after that as needed. There was less need for guidance from the steering committee as the project progressed and attention shifted to completing tasks and project deliverables, rather than setting the direction for marketplace development.

On the project steering committee, stakeholders worked closely with project staff, the consultant team, and task teams; participated directly in development of the marketplace; and provided input and guidance during the various stages of the project. Throughout the marketplace development process, the project steering committee focused on the issues related to water temperature trading and transactions. Key contributions of the project steering committee included pushing for simpler, more easily understood marketplace documents and protocols, acting as a sounding board on policy issues, and encouraging the development of a centralized market structure instead of decentralized or facilitated.

The following people served on the project steering committee:

- Bill Gaffi, Clean Water Services
- Neil Mullane, Oregon Department of Environmental Quality
- Ranei Nomura, Oregon Department of Environmental Quality
- Sonja Bjorn-Hansen, Oregon Department of Environmental Quality
- Bobby Cochran, Clean Water Services
- John Miller, Wildwood Mahonia
- Allen Henning, U.S. Environmental Protection Agency
- Claire Schary, U.S. Environmental Protection Agency
- Sara Vickerman, Defenders of Wildlife
- Gina LaRocco, Defenders of Wildlife
- Bob Deal, U.S. Forest Service
- Travis Williams, Willamette River Keeper
- Marv Lewallen, Weyerhaeuser Company
- Louise Solliday, Department of State Lands
- Cathy Macdonald, The Nature Conservancy
- David Hulse, University of Oregon
- David Wester, Oregon Association of Conservation Districts
- Ray Jaindl, Oregon Department of Agriculture
- Jane Bacchieri, Oregon Governor's Office
- Peter Ruffier, Metropolitan Wastewater Management Commission
- Larry Devroy, Port of Portland
- Tom Paul, Oregon Water Resources Department

Scientific and Technical Work

Clean Water Services

Staff of Clean Water Services—a wastewater management service that has been instrumental in developing and implementing water quality trading in Oregon—provided regulatory assistance and coordinated technical aspects of the marketplace's creation. This included work by Charles Logue, Clean Water Services' Director of Regulatory Affairs, who managed scientific and technical contractors, and Bobby Cochran, who managed market appraisal and marketplace infrastructure tasks.

Consulting Team (Technical)

Much of the technical work for the Willamette Ecosystem Marketplace was done by consultants David Evans and Associates, Inc. and CH2M HILL. Among other things, the consulting team analyzed temperature reduction obligations under the TMDL, assessed potential credit definition methodologies, developed a thermal credit calculator, researched existing credit trading programs, developed marketplace infrastructure documents and protocols, designed a centralized credit registry, helped prepare for a transaction, and worked to develop permit language that would allow temperature trading as a compliance option.

Additional Consultants (Scientific)

The Willamette Partnership also contracted with scientists David W. Hulse (University of Oregon) and Stanley V. Gregory (Oregon State University) to investigate the scientific foundation of potential methodologies for defining temperature credits from floodplain restoration. Additional scientific work was done by Parametrix under contract with the City of Albany and Clean Water Services. For the City of Albany, Parametrix developed and applied a rapid assessment methodology for evaluating existing and potential future ecosystem services at individual restoration sites. For Clean Water Services, Parametrix applied a multi-parameter accounting methodology to restoration sites to quantify significant ecological values, beyond just temperature, that occur from restoration. Parametrix also participated heavily in development of the Ecosystem Credit Registry, which records and tracks credits in the marketplace.

Task Teams

Guided by input from the project steering committee and the Willamette Partnership Board of Directors, project staff convened and coordinated three teams of experts and key stakeholders for various marketplace development tasks. The task teams were intensive, limited-duration work groups that provided input, data, and guidance to project staff and consultants.

Synthesis Map Working Group

The Synthesis Map Working Group met quarterly for the last year of the project to guide the GIS analysis needed to re-delineate the conservation priorities synthesis map, as described in Chapter 3. The team consisted of representatives from the Oregon Department of Fish and Wildlife, Oregon Habitat Joint Venture, The Nature Conservancy, The Wetlands Conservancy, Oregon Biodiversity Project, Oregon Parks and Recreation, Oregon Department of Environmental Quality, Defenders of Wildlife, Willamette Futures (at Oregon State University), and the Willamette Partnership. The revised synthesis map reflects more recent vegetation and land use data, uses consistent spatial units to delineate high-priority conservation areas, and includes a confidence rating system to convey the accuracy of the data sets. These changes make the synthesis map more meaningful to conservation organizations and more accurate with regard to existing land use and vegetation than previous analyses were.

Practitioners Working Group

The Practitioners Working Group brought together diverse restoration practitioners—the potential suppliers of credits in the Willamette Ecosystem Marketplace—during the second half of the project. The group's purpose was to inform processes for project identification, planning, implementation, maintenance, reporting, certification, and payments for offset credits that would help ensure practical, high-quality restoration in the Willamette Basin. Among its activities, the Practitioners Working Group prepared a white paper that explored structural and regulatory incentives to encourage participation in the marketplace and developed a multi-tiered credit quality rating system for temperature credits. The group also developed minimum riparian planting protocols for shade restoration projects that are designed to generate temperature credits.

The following organizations were represented in the Practitioners Working Group: the Willamette Partnership, Clean Water Services, Yamhill Soil and Water Conservation District, Tualatin Soil and Water Conservation District, SOLV, Long Tom Watershed Council, Marys River Watershed Council, The Nature Conservancy, Greenbelt Land Trust, McKenzie River Trust, Oregon Habitat Joint Venture, Willamette Riverkeeper, Good Company, Parametrix, the Oregon Department of Environmental Quality, the U.S. Environmental Protection Agency, and the U.S. Fish and Wildlife Service. The group was convened jointly by The Nature Conservancy and Willamette Partnership.

Transaction Working Group

The transaction working group work intensively over a 2-month period to develop key credit trading documents, such as the credit exchange and registration agreements (see Section 6). These documents help to support near-term credit transactions by outlining (1) buyer and seller responsibilities in exchanging credits, and (2) credit owner and registrar responsibilities in registering credits. The transaction working group consisted of representatives from the City of Eugene, the Long Tom Watershed Council, a private landowner, and the City of Albany.

Technical Team

A technical team met several times in the summer of 2006 to explore ways of quantifying the ecological outputs of floodplain restoration in the Willamette Basin. Members included scientists from the University of Oregon and Oregon State University and representatives from the Oregon Department of Environmental Quality, the Willamette Partnership, and private consulting firms.

Two main concepts emerged from the technical team: "stepping stones" and, as an outgrowth, fish density conversion.

"Stepping stones" refers to creation of appropriately located areas in the river characterized by reduced temperature or improved habitat for migrating salmonid species or both. The fish density conversion concept is based on a data-intensive model that incorporates habitat characteristics into estimates of the impact of water temperature on salmon productivity. (See Step 4 of Chapter 4 for more information.) Initial research on the stepping stones concept was completed in 2007, and additional research is under way. The fish density conversion concept also is being explored for application in the Willamette Ecosystem Marketplace.

Additional Organizational Elements

Government Agencies

The Oregon Department of Environmental Quality and the U.S. Environmental Protection Agency played a central role in development of the ecosystem marketplace, in part by serving on the project steering committee and project task teams. The project management structure was designed to encourage agency participation and involvement in marketplace development. In fact, the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Forest Service, Oregon Department of Environmental Quality, Oregon Department of State Lands, Oregon Water Resources Department, and Oregon Department of Agriculture all were represented on the steering committee or task teams. Less formally, agency personnel worked with project staff and consultants via meetings and consultations to clarify the supply and demand for offset credits, identify and resolve policy issues that affect the marketplace, modify permit language, and update an internal management directive to guide trading of ecosystem service credits as a compliance option. The Oregon Department of Environmental Quality, represented by Neil Mullane, Ranei Nomura, Sonja Bjorn-Hansen, Pamela Wright, Ryan Michie, and Pete Dalke, and the U.S. Environmental Protection Agency, represented by Alan Henning and Claire Schary, were both actively involved in multiple task teams and the steering committee, providing valuable feedback and support throughout every stage of the project.

Stakeholder Communication, Outreach, and Involvement

The project steering committee and task teams were the primary mechanism for active stakeholder participation and involvement at all stages of marketplace development. Stakeholder communication and outreach was conducted through the individual efforts of the members of the Willamette Partnership Board of Directors and project staff. Executive Director David Primozich accompanied members of the steering committee and the Willamette Partnership Board of Directors to numerous meetings and conferences of stakeholder interest groups to deliver presentations and get feedback on framework development. In addition, a Web site posted during the last year of the project describes ecosystem marketplaces work, the Willamette Partnership's efforts to develop a marketplace, and publications that document the marketplace development process. The challenges of building an integrated ecosystem marketplace require a diverse set of spaces for information sharing and decision making. It was important to have a core group of stakeholders involved in all aspects of the project, but it was also important to reach out to diverse audiences to build awareness and seek feedback.

SECTION 3

Market Appraisal (Task 1)

Assessing supply and demand for the potential Willamette Ecosystem Marketplace was a challenging process. Supply and demand work differently in ecosystem markets than in markets for other kinds of goods and services. In ecosystem markets, supply is driven by the existing natural resource base and the willingness of landowners to manage their lands to produce ecosystem services—either actively through restoration projects or passively by leaving a portion of the landscape to function naturally, without interference. When it comes to demand in an ecosystem market, the drivers are both regulatory (in the form of rules and regulations that require people who impact the environment to buy credits to offset those damages) and voluntary (such as people purchasing carbon credits to offset their own carbon-generating activities or a municipal or industrial discharger seeking an alternative to costly investments in new infrastructure). Regulatory drivers are likely to stimulate the greatest volume of trades and demand. Other factors that shape supply and demand include transaction costs, uncertainty, ecosystem dynamics, and the political environment.

Major Accomplishments

Assessment of marketplace potential. Determined that temperature could be a viable market in the Willamette Basin, and that the potential supply of shade in high-priority conservation areas along temperature-impaired streams is more than enough to meet the demand for temperature credits created by the TMDL.

Synthesis map. Delineated areas in the Willamette Basin where rivers and streams are temperature impaired and there is agreement among a variety of conservation organizations that restoration is a high priority. This "synthesis map" can be used to inform marketplace investments. Work is continuing to refine the synthesis map, incorporate more recent data, and develop a web-based spatial tool that will make the map data readily available for users. The Oregon Department of Environmental Quality expects to use data from the synthesis map as it sets its priorities for TMDL implementation.

Market analysis. Characterized the drivers for various potential ecosystem service markets in the Willamette Basin, analyzed the potential demand for wetland mitigation credits in the basin, calculated the demand for temperature credits created by the Willamette temperature TMDL, and identified potential buyers of temperature credits, based on the requirements of the TMDL; also compiled and mapped the potential supply of temperature credits that could be created through restoration of riparian shade along the Willamette River and its major tributaries.

Market Appraisal Process

Step 1: Synthesis Map. Created a synthesis map of conservation and restoration priority areas based on existing plans, documents, and stakeholder input. The map includes responsibilities identified in the Willamette TMDL for temperature and points to opportunities for investment.

Step 2: Market Characterization. Identified currently functioning and potential future ecosystem markets in the Willamette Basin and characterized their drivers, participants (regulatory agencies, buyers, and sellers), and potential growth.

Step 3: Promising Markets. Identified markets that are ripe for inclusion in the Willamette marketplace, meaning markets where the demand for credits is high and the ecological and economic return on investment would be relatively quick (within 5 years).

Step 4: Temperature Reduction Obligations According to the TMDL. Reviewed the final Willamette temperature TMDL to quantify demand for water temperature reduction credits in terms of kilocalories per day (kcal/day).

Step 5: Demand for Wetland Credits: Worked with the Department of State Lands to quantify (1) the number of wetland mitigation credits scheduled to be available from existing wetland banks or banks in the process of being established; (2) the number of credits needed to mitigate the impacts associated with some of the largest expected sources of development; and (3) representative prices for wetland mitigation credits.

Step 6: Temperature Supply Using Shadelator. Compiled data that calculated and mapped, at 100-foot increments along much of the Willamette River and its major tributaries, the estimated temperature reductions that would occur if riparian vegetation were restored.

What the Market Appraisal Revealed

Thanks to earlier work by conservation organizations, Oregon's public universities, and state and federal natural resource management agencies, there already is considerable information about which areas of the Willamette Basin are most important to restore to improve conditions for cold-water-dependent fish and other native plants and animals. Priority areas for restoration have been established, and many ecological restoration activities have been identified. These priority areas are likely to supply water temperature reduction credits and other types of credits to the Willamette marketplace.

Demand for ecosystem service credits is strong when environmental regulations are enforced and when a permittee's ability to comply with regulations using traditional approaches is limited or would require large expenditures. In these situations, an opportunity to meet regulatory requirements using markets creates demand for environmental offset credits, as long as it is easier and more efficient to participate in the market than it is to comply with regulations using traditional options. Thus regulatory agencies play a key role in creating demand for credits, both through the regulatory standards they establish and through particular policies that ease or complicate participation in the market.

In the Willamette Basin, regulatory requirements create significant demand for wetland mitigation and water temperature reduction credits; however, demand for temperature credits is concentrated in a limited geographic region (the upper Willamette Basin) and involves only a few parties, the largest of which are the cities of Albany and Corvallis and the Eugene-Springfield metropolitan area. (The current thermal loads of most other point sources in the middle and lower Willamette are below what they were allocated under the TMDL, so they have little or no need for credits.)

Given the limited number of parties in the Willamette Basin needing temperature credits, a fully operational financial exchange platform is not needed at this time; however, some new and unique infrastructure will be required, such as a credit registry. The registry is used to register, track, and account for credits to ensure their validity and quality. This registry function is essential because ecosystem services credits retain their value only if the restoration project that generated them continues to perform its specified ecological function. Thus, the Willamette marketplace will need infrastructure to track ongoing management, monitoring, and reporting regarding restoration projects that generate credits sold in the market. (See Chapter 6 for information on the credit registry and other marketplace infrastructure.)

The market appraisal indicates that the total potential supply of temperature credits from shade in the Willamette Valley in priority areas alone is 5 billion kcal/day (not taking into consideration how many landowners would actually conduct restoration projects on their property). This supply is more than adequate to meet the total expected demand of 3 billion kcal/day in the Willamette Basin created by the temperature TMDL, and riparian shade is only one of many types compliance strategies that could be employed.

Lessons Learned

Focus the market appraisal on the information that is most relevant to your situation and objectives. It is important to understand the general contour of supply and demand, including the general amount, time frame, sources, and geographic range of the demand. But key questions can be answered without comprehensive data about every aspect of the market. For example, the Willamette marketplace appraisal focused on current demand for wetland mitigation and temperature credits. Although it would have been advantageous to know more about future demand for temperature credits, having that information would not have changed the fundamental structure of the marketplace that is being created for the Willamette.

Monitor the market. Understanding market supply and demand is an ongoing process because the market is always changing. If there is not already a structure for monitoring the market and making market information available to others, resources may need to be allocated to do so. Monitoring the market is easier if the number of trades is small.

When writing TMDLs, make sure that they are perceived as fair and that technical issues are addressed. Perceived equity in the distribution of the waste load allocation heads off legal challenges and spreads the responsibility for reducing temperature more widely. Additionally, any technical weaknesses in the TMDL could be grounds for challenges that will slow implementation and undercut demand for credits.

SECTION 4

Credit Definition and Currency Development (Task 2)

In order to buy and sell ecosystem services, the ecological outputs of specific land management activities need to be quantified in units of measure that mean something to the people willing to buy them. In the same way that various agricultural and forest products are described and sold in units relevant to their markets, ecosystem services credits must be described in units of measure relevant to water and air quality, endangered species populations, and habitat types. In other words, the technical basis must be established for calculating the environmental benefits of various types of restoration actions that will generate credits in the marketplace. This is the process of defining credits.

Major Accomplishments

Temperature credit definitions. Identified technically sound methods for calculating the temperature reductions that would result from riparian shade restoration, wetland restoration, flow augmentation, and wastewater reclamation or reuse. These methods are based on existing agency flow and temperature models, precedents set by Clean Water Services in the Tualatin River Basin, and wetland demonstration sites in the mid-Willamette Valley.

Thermal credit calculator. Developed a downloadable, Excel-based thermal credit evaluation tool that allows users to quantify the temperature credits that could be created through riparian shade restoration, wetland restoration, flow augmentation, and wastewater reclamation and reuse. The credit calculator allows individual landowners to do a rough estimate of the amount of temperature credits that would be generated through restoration on their property. The tool also provides detailed guidance on how to do a more accurate calculation of actual credits that would be generated, although this more detailed analysis requires additional, fairly sophisticated computer models and some modeling expertise.

Riparian planting protocols. With a diverse group of practitioners, defined minimum revegetation requirements for shade restoration projects designed to generate temperature credits. Having riparian planting protocols and other performance and implementation measures ensures that restoration projects accomplish a range of ecological benefits while also achieving temperature goals.

Floodplain restoration research. Convened and facilitated discussions by technical experts on how to calculate the temperature reductions that would result from floodplain restoration; funded preliminary research on the "stepping stone" concept (the concept of providing appropriately spaced refugia of high-quality habitat for cold-water fish) and developed a strategy for research needed to develop methodologies for calculating temperature reductions from floodplain restoration. Scientists at the University of Oregon and Oregon State University are continuing this research.

The suite of potential temperature reduction activities to be included in the Willamette marketplace was limited to restoration activities—actions that improve the ecosystem and provide a variety of ecosystem benefits, including temperature improvements. This decision reflects the Willamette Partnership's primary goal of restoring the ecosystem of the Willamette Basin, not just reducing the cost of compliance for NPDES permittees (although that is expected too). As described in this section, work was done to define temperature credits from five types of activities:

Riparian shade restoration: Planting trees within riparian areas to provide stream shading, which reduces water temperature.

Wetland restoration: Developing constructed wetlands to cool effluent prior to discharge, restoring natural wetlands, and restoring floodplain wetlands.

Floodplain restoration: Restoring a river's access to side channels and other floodplain features.

Flow augmentation: Increasing the flow of water instream to increase the velocity of the stream and thus reduce the amount of time water is exposed to solar warming; flow augmentation occurs by diverting water from other uses (for example, releasing water from upstream reservoirs and transferring and/or leasing surface water rights).

Wastewater reclamation/reuse: Reducing the volume of clean, warm water that is discharged to the river.

In the first stages of the Willamette marketplace project, it was expected that temperature credits from these activities would first need to be defined; however, because the Willamette marketplace is ultimately intended to be a multi-credit marketplace, the Willamette Partnership also explored ways to define other types of ecosystem services credits. For both, the goal was to develop practical and technically sound methods of estimating, measuring, reporting, and verifying the ecological benefits of various types of restoration. Getting agreement on these credit definitions and making credits easy to calculate are essential in establishing an ecosystem marketplace.

For the Willamette marketplace, the credit definition process involved evaluating different ways of defining temperature reduction credits that would result from restoration activities and wastewater reuse and then developing an analytical tool that helps projects sponsors calculates the number of market-ready credits that would be created as a result of those activities. Environmental performance and implementation measures were identified, for use in tracking the short-term biological performance of restoration projects and forecasting long-term gains. Also as part of this task, other, non-temperature credits that could be created through restoration projects were considered. In the credit definition and currency development process, the Willamette Partnership, its consultants, its partners, and various stakeholders performed the steps described below.

Eyes on the Prize: Broad Ecological Goals

One of the things that distinguishes the approach the Willamette Partnership is taking to marketplace development from other programs around the country is the organization's emphasis on using markets to achieve broad ecological goals. The Willamette Partnership approached markets with a clear understanding of what the ecosystem needed and then attempted to translate those actions into units that could be applied to various regulatory drivers.

The Willamette Partnership is interested in building ecosystem service markets to improve ecosystem health and function, rather than simply to reduce the cost of regulatory compliance (although this is expected to happen, too).

Credit Definition and Currency Development Process

Step 1: USGS Heat Trading Tool. Developed a point-source trading tool that quantifies the likely effects on river temperature of any heat trade between two point sources along the length of the Willamette River.

The latest version of the trading tool can be downloaded from http://or.water.usgs.gov/proj/will_temp/download/tools/trading_tool_v1p4.xls.

Step 2: Survey of Credit Definition Methodologies. Surveyed candidate methodologies for defining temperature reduction credits that would result from wastewater reclamation or reuse and four ecological restoration actions in the Willamette Basin: flow augmentation, riparian shade restoration, floodplain restoration, and wetlands restoration.

Step 3: Assessment of Credit Definition Methodologies. Assessed whether the existing analytical tools for credit definition are scientifically and mathematically sufficient for use in calculating temperature reduction credits in the Willamette Basin and, if so, how a crediting protocol could be formalized for the associated temperature reduction activity.

The findings of Steps 2 and 3 are captured in Methods for Defining Temperature Offset Credits at http://www.willamettepartnership.org/publications/MarketplacePubs/MethodsforDefiningTemperatureOff-SetCredits.pdf .

Step 4: Gaps in Methodologies. Where existing tools are not sufficient to define temperature credits for a temperature reduction activity, developed guidance to focus resources on the research needed to support credit definition.

These issues are described in more detail in Methods for Defining Temperature Offset Credits at http://www.willamettepartnership.org/publications/MarketplacePubs/MethodsforDefiningTemperatureOff-SetCredits.pdf.

Step 5: Thermal Credit Calculator. Developed a thermal credit evaluation tool that allows users to quantify the thermal credits, in million kilocalories per day that would result from four types of restoration activities in the Willamette Basin: riparian shade restoration, wetland restoration, flow augmentation, and wastewater reclamation and reuse.

The Willamette River Thermal Credit Calculator is available online at http://www.willamettepartnership.org/tools-templates.

Step 6: Site Assessment. Identified other types of ecological benefits and potential credit (besides temperature) that would be created from candidate restoration project sites in the Tualatin Basin and in the vicinity of Albany—i.e., other pollutant reductions, habitat, wetlands, or carbon sequestration.

Step 7: Habitat Assessment Methodology. Reviewed a methodology to quantify the ecosystem services that a given site provides—under existing and restored conditions—and to express that as a single value.

Step 8: Riparian Planting Protocols. Developed minimum revegetation requirements for shade restoration projects that are designed to generate temperature credits; developed recommended planting and maintenance procedures to guide riparian revegetation projects.

Riparian planting protocols are available at http://www.willamettepartnership.org/tools-templates/draft_riparian_planting_protocols.pdf.

What Credit Definition and Currency Development Revealed

The credit definition and currency development process highlighted the need for current, reliable tools for defining temperature and other credits for the Willamette Ecosystem Marketplace, particularly credits generated from floodplain restoration. Floodplain restoration provides myriad ecological benefits, and incorporating a widely accepted, scientifically sound method of defining credits from floodplain restoration into the protocols for the Willamette marketplace could contribute meaningfully to ecological restoration in the basin. Again, the primary purpose of the Willamette marketplace is to facilitate restoration of the ecosystem. Even though it will take considerable effort to develop the scientific and technical tools needed to define credits from floodplain restoration, this effort is worthwhile because it is these credits that will motivate the investments needed to significantly improve ecosystem function. Time, money, and policy decisions now that will advance the science of calculating temperature credits from floodplain restoration could pay off in actual on-the-ground projects that start providing ecological benefits within a decade.

The analytical tools developed during this task—the USGS point-source heat trading tool and the thermal credit calculator—are designed to be user friendly and are, in fact, easier to use than their component models. However, the credit calculator's detailed analysis requires GIS software, comprehensive external analyses, and some fairly sophisticated computer modeling to develop the inputs to the tool; developing these inputs most likely will need to be done by an experienced outside party. This situation illustrates the type of adjunct business opportunities an ecosystem marketplace can create. As the Willamette marketplace becomes established, private companies, nonprofit organizations, and others are expected to carve out their own niches in performing these types of analyses, doing the actual restoration, or both.

From an ecological perspective, the Willamette River is in desperate need of increased flows and additional functioning floodplain, riparian, and wetland habitats. The process of defining temperature credits illustrated how tied the regulatory system is to numerical standards in defining ecological relationships and benefits, and how difficult it can be to describe desired habitats and ecological conditions in terms of a few specific metrics, such as water temperature. The limitations of a single parameter in describing ecosystem health reinforce the importance of developing an integrated multi-credit marketplace—one that encompasses a wide range of ecological conditions and functions and whose metrics relate more closely to the ultimate goals of species and habitat conservation and overall ecological uplift.

Lessons Learned

Create standards and protocols that meet your ecological needs. The many participants in an ecosystem marketplace have different processes, approaches, and motivations, not all of which are consistent with ecological restoration. Therefore, it is important to develop specific, carefully designed standards and protocols. These will guide marketplace participants toward actions that will help achieve ecological objectives, and not just satisfy the letter of the regulatory requirements. There is public skepticism about the emerging use of ecosystem service markets. Developing credit protocols that achieve greater environmental benefits than would otherwise be possible will be a key to public acceptance. If ecologically questionable or—worse—negative actions are credited as offsets in a marketplace, the public will lose trust and the conservation community and regulated community will lose the opportunity to use these powerful new tools to achieve our ecological goals.

Understand your motivation in creating a marketplace and be clear and consistent in your message. Ecosystem marketplaces can appear complex, uncertain, and overwhelming. Communicating a consistent message to stakeholders is essential to building the relationships and trust needed to launch a successful project. By repeatedly communicating its intentions, the Willamette Partnership was able to garner support, turn skeptics around, and expand the network of potential market participants.

Involve restoration practitioners early on. Restoration practitioners can provide specific information about the species composition, planting procedures, and maintenance measures needed for successful restoration projects. This information is useful in defining credits, identifying appropriate performance and implementation measures, and laying the groundwork for project verification protocols. The involvement of trusted practitioners also lends credibility to market development.

Pay attention to how the TMDL or other regulations are written. Regulated parameters may not correspond very directly to the ecological goals that you (and others) are trying to achieve. If so, look for ways to expand the marketplace, revise policy, or advance scientific understanding in a way that creates stronger linkages.

SECTION 5

Temperature Credit Portfolio (Task 3)

A credit portfolio is needed to help guide market participants to projects that create desired ecological outcomes, regulatory compliance, and monetary returns. The market appraisal shows there is substantial future projected demand and significant potential supply for temperature credits. Buyers, especially, will be considering a full range of options for compliance, including technology controls, point-to-point trading, and ecosystem market options to meet their obligations. Sellers will be weighing options about the types of activities that create credits and will be looking for places that are likely to yield the greatest returns on their investments. Third parties such as the Willamette Partnership would like to encourage investments in areas known to have significant conservation value. There is no way to completely control where investment in a marketplace happens, but under this task a variety of tools and methodologies were created that provide information about opportunities in priority conservation and restoration areas that will help marketplace participants make decisions that are right for them.

Major Accomplishments

Temperature supply calculation and mapping. Confirmed that the potential supply of credits that could be generated from restoration projects in priority areas alone is adequate to meet the demand created by the TMDL; compiled data to show the locations where significant temperature credits could be generated from riparian shade restoration.

USGS heat trading tool. Contributed to development of a tool that quantifies and graphs the effects to river conditions from temperature credit trades between point sources in the Willamette Basin. The U.S. Geological Survey is poised to refine the tool so that it also enables users evaluate the use of temperature off-sets created through restoration projects, such as shade restoration, when drafting permit compliance strategies for temperature.

Credit quality rating system. Developed a credit quality rating system for temperature credits that can be used to distinguish ecologically high-value restoration projects in a fully functioning ecosystem marketplace.

Policy preferences. Worked with stakeholders to identify policy issues related to credit valuation that will influence buyers' and sellers' participation in the Willamette marketplace; recommended specific agency policies that would create incentives for participation and direct, but not limit, investments to areas with high conservation value.

Rapid assessment methodology. Developed a methodology for rapidly assessing a candidate restoration site's habitat functions and characterizing the site's potential to generate multiple types of restoration-related ecological credits for sale or trade in a multi-credt marketplace.

Albany site assessment. Applied a habitat-based rapid assessment methodology to six sites in the Albany area to evaluate their general ecological characteristics, restoration potential, credit potential, and preservation opportunities.

Developing the temperature credit portfolio involved determining whether restoration of riparian shade in the Willamette Basin would provide enough temperature reductions to achieve TMDL goals; identifying those locations where shade restoration would provide the greatest reductions; working with restoration practitioners, the Oregon Department of Environmental Quality, the U.S. Environmental Protection Agency, and various stakeholders to identify preferred public policies regarding the valuation of temperature reduction credits; and recommending policies that would encourage participation in the market and direct investment in restoration projects to high-priority locations in the Willamette Basin. Development of a quality rating system and a multi-credit site assessment methodology also were part of the process. In developing the temperature credit portfolio, the Willamette Partnership, its consultants, its partners, and various stakeholders performed the steps described below.

Credit Portfolio Process

Step 1: Temperature Supply Using Shadelator: Determined the temperature reduction potential of riparian shade restoration along the Willamette River and its major tributaries and whether this is enough to meet the thermal load reductions specified in the Willamette temperature TMDL.

Step 2: USGS Heat Trading Tool. Developed a point-source trading tool that quantifies the likely effects on river temperature of any heat trade between two point sources along the length of the Willamette River.

The latest version of the trading tool can be downloaded from http://or.water.usgs.gov/proj/will_temp/download/tools/trading_tool_v1p4.xls.

Step 3: Credit Rating System and Preliminary Issues. Developed a credit quality rating system for temperature credits that could be used to distinguish ecologically high-value restoration projects; identified other incentives that would encourage participation in the market in a way that maximizes ecological benefits.

Findings of the Practitioners Working Group are summarized in the *Practitioners' Working Group White Paper 2*.

Step 4: Preferred Policy. Worked with the U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, and stakeholders to develop policy recommendations that would encourage and enable initial temperature markets to work efficiently to achieve ecological goals.

Step 5: Rapid Assessment Methodology and Albany Site Assessment. Revised and expanded the Oregon Department of Transportation's Habitat Assessment Methodology to create a functions-based, rapid assessment methodology for use in evaluating individual restoration sites for their ability to generate multiple types of ecosystem credits. Parametrix applied the rapid assessment methodology at six sites near Albany.

Step 6: Methodology for Identifying and Prioritizing Restoration Projects. Under contract with the City of Eugene, the Long Tom Watershed Council developed a methodology for identifying and prioritizing water quality improvements that can be applied throughout the Willamette Basin.

The methodology is documented in Ecosystem Restoration in the Long Tom River Basin for Water Quality Improvement in the Willamette River: Preliminary Findings (Long Tom Watershed Council 2008), which provides recommendations regarding restoration project types and priority restoration areas in the Long Tom watershed as a method to accomplish water quality improvement in the Willamette River.
A link to the final report is available in the Willamette Partnership's Web site at http://www.willamettepartnership.org/publications/ecosystem-restoration-in-the-long-tom-river-basin-for-water-quality-improvement-in-the-willamette-river-preliminary-findings.pdf

What Development of the Temperature Credit Portfolio Revealed

The original objectives for the temperature credit portfolio task assumed that a great deal of ecological and financial information related to the ecosystem marketplace could be quantified during the grant period, and that development of an integrated, multi-credit marketplace would be far enough along that the number and types of credits generated at specific sites could be calculated, along with the costs of the associated restoration projects and the approximate value of the credits in a prototype marketplace. This information could be used as the basis of a cost/benefit analysis to guide investors. The objectives for Task 3 also assumed that a single optimal temperature credit portfolio could be developed for the Willamette Basin that, if pursued, would direct investment to the highest priority restoration areas and thus maximize environmental gain.

Several obstacles emerged as the Willamette Partnership pursued these objectives, one being the difficulty of gaining consensus on the restoration priorities and opportunities that would represent an optimal portfolio for temperature credits across the Willamette Basin. Different agencies and conservation organizations in the basin have different ecological priorities. Although these stakeholders agreed that it was wise to invest strategically, the question of what should be included in an optimal portfolio, and where, is a highly subjective one. Questions challenging the underlying assumption that we need an "optimal portfolio" or that one was even possible hampered this effort. In a marketplace, goals and rules should be set and participants would determine their individual optimal portfolios. The idea of an "optimal" portfolio led to many questions about who would be able to play in the market—anyone, or only those people who could create projects with multiple values. For this reason, the portfolio portion of this project focused on development of information, tools, and methodologies that would enable participants to develop their own strategies to fit their specific situations.

The portfolio development process demonstrated the limitations of current technical tools and methods; yet for a multi-credit marketplace to work, widely accepted methods for calculating multiple types of ecosystem services credits are desperately needed. We cannot attract investment in large-scale multi-parameter restoration in a market unless investors know the units they are to be measuring. In the Willamette Basin, temperature credits from restoration of riparian shading have been the easiest to quantify, and at this time, shade is the only type of restoration for which the basinwide potential can be calculated with confidence. This is so in part because the number

of temperature credits that would be generated from other types of restoration—floodplain restoration, wetland restoration, and flow augmentation—rely on so many site-specific and quite variable conditions. Substantial additional technical work would be needed to calculate the total volume and location of temperature credits that could be generated basinwide from floodplain restoration, wetland restoration, and flow augmentation. But before going to this expense, the ultimate value of such an exercise should be carefully considered. Even without detailed information about potential credit supply from these types of restoration projects, we know that temperature reduction credits from shade restoration alone are more than adequate to offset the thermal load demand generated by the TMDL. Additional efforts related to these activities should focus on simplifying credit calculation procedures so we can get these additional actions started, rather than estimating total supply, especially related to floodplain restoration

In response to the limitations of current technical tools and methods, the Willamette Partnership focused its portfolio development efforts on the type of activity where most activity is likely to occur to generate temperature credits for the marketplace: riparian shade restoration. The Partnership has been able to quantify the potential supply of temperature credits in the basin that could be created from shade, map the credits' locations, and provide market participants with a variety of tools to help them structure their investments in shade restoration projects for maximum ecological benefit.

At the basin level, decisions about where to invest in shade restoration projects can be informed by a new set of tools: the synthesis map developed for the market appraisal, DEQ's Shadelator mapping and analysis, and, eventually, Oregon State University's shade tool once it is fully developed. At the site level, temperature credits from riparian shade and other types of restoration can be quantified using the credit calculator described in Chapter 4. In addition, using the rapid assessment techniques applied as part of this project at specific sites can help land managers evaluate their property's ecological value and potential to generate a variety of types of ecosystem services credits that eventually could be sold in a multi-credit marketplace. This could encourage not just restoration to generate temperature credits, but conservation of resources for which there is not yet a market demand (such as pollinator habitat or oak woodlands) but that might generate credits that could be traded in the future.

Lessons Learned

Try to keep administrative complexity low initially and expand as market conditions require greater control.

In exploring different policy options to direct investment to the highest priority restoration areas, the Practitioners Working Group developed a detailed, descriptive quality rating system for temperature credits. The rating system was too complicated for use in the fledgling Willamette temperature market, which is expected to have a small volume of transactions. To attract participants, ecosystem markets must have efficient mechanisms and procedures—ones that are easier for participants to use than traditional approaches to compliance. If you expect a large volume of market transactions, you have more leeway to use more complex options that could add ecological value. But in low-volume markets, the need for efficiency demands simpler approaches.

Pay attention to the areas where most potential market participants will need the most help. It can take considerable time and technical work to develop the tools and methodologies needed to create a multi-credit marketplace, or even to accurately quantify a single type of credit that would be created from a desired suite of desired restoration actions. For the types of restoration actions considered for the temperature market, it is likely that riparian restoration will involve the largest number of projects and the most people who need help participating in markets. So it made sense to focus much of our technical effort toward that activity. Undertaking large-scale wetland restoration and floodplain restoration will require significant initial capital and professional expertise to undertake. Consequently, there are likely to be a limited number of people who initiate those actions, and they will likely be well financed and have access to considerable

professional expertise. Focusing on the areas most in need allows you to continue to make progress and develop the foundation for a larger marketplace by accessing a larger number of potential participants.

Pay attention to priority areas, but don't exclude or minimize the value of restoration in areas that do not fall within priority area designations. Markets represent a great opportunity to leverage investments and direct them toward ecological priorities at a landscape scale. Market rules need to create incentives for restoration in priority areas, but they should not create penalties for taking restoration actions in areas that fall outside of priority areas. Markets need to balance the need to encourage strategic investment with the risk of sending the wrong message to landowners in non-priority areas that restoration on their land is not valued.

SECTION 6

Market Infrastructure (Task 4)

Ecosystem services markets have unique characteristics. Because ecosystem services markets differ from traditional commodity markets like wheat or corn, they require unique market infrastructure to ensure credible transactions. In traditional commodity markets, once a transaction has been completed the seller has no interest or responsibility for the product and the buyer has complete freedom to decide how and where to use the purchased product. Traditional commodities are well defined, steps for making a transaction are clear, and information is available to guide decisions.

In contrast, ecosystem services markets are characterized by a mix of stakeholders who form long-term contractual relationships, transaction steps are minimally defined, and uncertainty levels are high. "Offset credits" are the units of trade. Offset credits can be measured in a variety ways, such as tons of carbon, acres of wetlands, or kilocalories per day. Unlike a commodity, an offset credit is derived from—and forever attached to—a specific project that must be managed and maintained over decades. This is so because an offset credit maintains its value only as long as the project that generated it continues to perform the specific ecological function for which the credit was purchased. In addition, ecosystem service markets trade on public goods governed by public goals. As a result, market infrastructure needs to ensure accountability and legitimacy, yet it must also be adaptable to the features—parameter, geography, and stakeholders—of specific local markets. Given the nature of ecosystem markets, it can be challenging to design new infrastructure that will support credible transactions of offset credits.

Major Accomplishments

Market structure. Determined that a centralized market structure would provide the greatest opportunity to ensure transparency and credit integrity for a multi-credit marketplace. A centralized model would offer the greatest opportunity to leverage investment for ecological goals by enabling tracking and accounting of multiple types of ecosystem service credits and trades.

Centralized credit registry and exchange tracking platform. Developed a self-contained desktop application that functions as a centralized registry and exchange tracking platform for use in registering, certifying, banking, and tracking credits as they are generated, bought, and sold.

Templates. Developed a set of standardized templates for contractual agreements, certificates, protocols, and other documents that support transactions in the marketplace, to guide participants in transactions.

For the Willamette marketplace, comprehending the unique characteristics of offset markets and necessary infrastructure to support them involved interpreting market appraisal results, evaluating different market structures for other trading programs, and working through tough issues of transparency, credibility, and efficiency with stakeholders. To make matters even more challenging, the Willamette Partnership, stakeholders, regulators, and the public were all thinking and learning together while at the same time working through the design and building process. In the end, though, the market infrastructure that was needed to support credible and transparent transactions was built.

Developing the market infrastructure involved reviewing and evaluating different market models to determine the appropriate structure for the Willamette marketplace; creating a centralized credit registry and exchange system to register, certify, bank, and track credits; and developing the associated instructional templates to guide participants in transactions. In developing the market infrastructure, the Willamette Partnership, its consultants, its partners, and various stakeholders performed the steps described below.

Market Infrastructure Development Process

Step 1: Market Structure Analysis. Conducted the analyses needed to determine the appropriate structure for the Willamette marketplace. This involved reviewing existing trading programs, evaluating the feasibility of different market models in the Willamette Basin, selecting a market structure, and performing a gap analysis.

Step 2: Centralized Credit Registry and Exchange Tracking System. Determined the infrastructure components needed for the Willamette ecosystem marketplace; developed a centralized credit registry and exchange tracking platform so different types of ecosystem service credits could be registered, certified, banked, and tracked as they are generated, bought, and sold.

The registry software is built in MS Access and a copy of an empty version is available for download at the Willamette Partnership's "Tools and Templates" Web page: http://www.willamettepartnership.org/tools-templates

Step 3: Standard Templates. Developed standard templates for contractual agreements, certificates, protocols, and other documents that support transactions in the marketplace, to guide participants in transactions.

These templates are described below and are available at the Willamette Partnership's "Tools and Templates" Web page http://www.willamettepartnership.org/tools-templates.

Standard Agreement for Credit Registration. The *Standard Agreement for Credit Registration* is a template for describing credits that have been generated and are ready to be recorded in the registry.

Standard Agreement for Credit Exchange. The *Standard Agreement for Credit Exchange* template was created to help buyers and sellers negotiate a contractually binding agreement for exchanging ownership of the credits.

Standard Agreement for Credit Verification Services. Third-party verification of projects is one of the mechanisms used to ensure credit integrity and reduce risk in markets. The *Standard Agreement for Credit Verification Services* describes the tasks to be performed by the credit buyer or seller (the client) and the verifier.

Water Temperature Offset Verification Protocol. The *Water Temperature Offset Verification Protocol*, provides guidance on the review and assessment of temperature credit projects.

Verifier Accreditation Agreement, Conflict of Interest Code, and Confidential Business Information Guideline. These documents are intended to ensure third-party, objective verification and confidentiality of sensitive credit transaction information.

- The *Verifier Accreditation Agreement* functions as a regulatory-approved certificate of professional capabilities to perform verification services.
- The *Conflict of Interest Code* protects the integrity of the verification process and the quality of a credit owner's offsets by identifying situations in which a verifier may be viewed as having an impaired ability to objectively review a potential participant's estimated offsets,, usually because of a pre-existing business or personal relationship.
- The *Confidential Business Information Guideline* protects credit owners who may need to divulge sensitive information in the credit verification process but want the information to be kept confidential.

What Development of the Market Infrastructure Revealed

The market infrastructure development process highlighted the immediate need for a centralized registry and exchange tracking system rather than development of a centralized marketplace. It was clear that market transparency and credibility were key factors to implementing a successful marketplace. The centralized registry and exchange tracking system is the information hub for buyers, sellers, regulators, and the public that ensures credits sold on a market are real, that they are not sold more than once, and that they are maintained and perform the services intended over time. While developing a centralized marketplace could eventually be necessary when other regional or local markets merge and transaction volumes are high, this level of infrastructure was not required, nor could it be supported by the expected initial transaction volume in the Willamette Basin. Market appraisal results revealed that there were potentially hundreds of sellers, but there are fewer than 10 buyers who will need temperature credits in the Willamette Basin in the short-term. Focusing efforts on the development of a centralized registry and exchange tracking system would allow anticipated restoration actions to be credibly documented and tracked over time. Credibility and integrity emerged as a key element for a successful marketplace and will likely become so for other markets emerging around the country.

Lessons Learned

Be aware of skepticism and be clear about credit quality and integrity. Markets for ecosystem services are new, are not well understood, and are mistrusted. People are becoming more familiar with ecosystem markets through increased media coverage of voluntary and anticipated regulatory greenhouse gas markets. To date, those markets have lacked clear standards and a centralized system to ensure credit quality. As a result, media have reported "bad-apple" examples where offset credits were purchased but the offset actions were not credible. Markets are an opportunity to improve the ecological effectiveness of planned regulation-driven investment. The public needs to be assured that the people building markets have the best interest of the public's ecological resources in mind.

Don't start from scratch – use other infrastructure that has been developed. When the Willamette Partnership started this process there were no other entities working on similar programs. Now there are at least five separate programs around the county that could share infrastructure. The learning curve and costs of developing centralized market infrastructure are high. When possible, use existing infrastructure to minimize costs and increase standardization of programs.

Set goals that are achievable and meaningful. Before setting extremely ambitious goals, make sure you have a diverse and inclusive understanding of the situation. There is always a natural learning and evolution that is born through actually going through the process, but be aware of what can be learned ahead of time and determine whether obtaining this knowledge would provide assurance to the process, help in the long run, or provide other benefits.

Know the size of the market and what it means. Knowing current and projected quantities of potential buyers, sellers, and transactions will improve efficiency in developing a market infrastructure that (1) meets marketplace participants' needs; and (2) is within the scope and geographic scale of the trading program.

Understand resource capacities. Involving stakeholders and providing the necessary guidance for successful marketplace development requires time and resources. It is important to know what resources the stakeholder group has available, their level of commitment, and how that may affect development of the marketplace. Avoid designing market rules that reduce all risk but leave few resources to be invested in actual restoration.

Involve regulatory agencies early on. Current regulatory structures are not designed to support quantification of multiple ecosystem services. Therefore, it is important for both market enthusiasts and regulatory staff to understand that regulations will need to be augmented to allow for ecosystem marketplace transactions. In addition, markets involve new roles for many stakeholders, including agencies. Third parties may be in a position to lead activities previously done by agencies, and vice versa. It is important to begin the discussion of roles and responsibilities early on.

SECTION 7

Transaction Project and Regulatory Language Development (Task 5)

The policies, tools, and infrastructure to support transactions in the Willamette Ecosystem Marketplace are in place. The best way to test the new tools and infrastructure is to conduct a transaction to see if they work. As described in earlier chapters, challenges to the TMDL for temperature have postponed the implementation of the market driver in the Willamette temperature market. The sudden shift in market demand illustrated a long-held suspicion that focusing too narrowly on a single credit market has important limitations, including risks for potential participants and for the ecological goals we want to accomplish. Although the tools and infrastructure we developed under this grant will support the Willamette temperature market when demand is created, they are applicable to other markets, too. And we were able to demonstrate the value of the infrastructure by banking three restoration projects in the Tualatin Basin, which is subject to its own TMDL for temperature.

Major Accomplishments

Identified and evaluated multiple potential restoration projects that could supply credits. Conducted an assessment of existing and planned restoration projects and conducted stakeholder outreach and site assessments to evaluate their potential as an initial transaction in the Willamette Ecosystem Marketplace.

Developed agency- and stakeholder-approved permit language to support trading when NPDES permits with temperature limits are issued. Worked with NPDES permittees, the Department of Environmental Quality, and other stakeholders to develop template permit language to support trading in NPDES permits.

Banked three riparian restoration projects in the Ecosystem Credit Registry that can be used in one of three potential temperature credit markets in Oregon. Registered three riparian restoration projects representing more than 37 million kilocalories per day using market infrastructure developed as part of this grant.

Because of the large geographic scale and institutional breadth of the Willamette Ecosystem Marketplace, identifying a pilot transaction and developing regulatory language to support basinwide multi-credit trading required significant coordination, collaboration, and support from various stakeholders and project partners.

At the beginning of the grant period, various types of restoration projects, coordinated by many different organizations, were under way and anticipated in the Willamette Basin. Because of the wide range of restoration efforts, existing restoration potential, and conservation opportunity maps and tools were used as a filter to select meaningful transaction project sites that would generate a portfolio of ecosystem service credits. Once these potential transaction project sites were selected, additional information was gathered from project supporters and technical experts to guide the scope and development of those sites. Although the refined selection process for the potential transaction sites took into consideration the scale of restoration and types of credits that would be generated by the restoration actions, the objective of the transaction project was still to facilitate the transaction of at least one thermal load credit through the Willamette Ecosystem Marketplace framework.

For the exchange of credits to actually occur, many other requirements had to be met besides generating at least one thermal load credit through the transaction project. Many of the contractual and legal agreements required to support the centralized registry and exchange system were completed under Task 4. However, the actual NPDES permit language needed to authorize and facilitate temperature trading was completed under Task 5. For trading to work at the scale of the Willamette, it was important for NPDES permits to share common language and trading requirements. This process required working closely with the Oregon Department of Environmental Quality to evaluate existing permit language, identify gaps, and secure approval of template permit language for trading. Agency staff participated in meetings, provided guidance and support, and helped officially approve the final version of the permit language. In the transaction project and regulatory language development process, the Willamette Partnership, its consultants, its partners, and various stakeholders performed the steps described below.

Transaction Project Development Process

Step 1: Existing Restoration Projects Inventory. Identified (1) research that was under way to monitor and quantify ecosystem services, (2) opportunities for a "pilot transaction site," and (3) academics and technical experts who could inform further development of the transaction project.

The *Matrix of Current and Ongoing Research and Restoration in the Willamette Basin* helped inform the selection of possible locations for the pilot transaction project, at a coarse scale.

Step 2: Potential Transaction Sites. Identified potential sites for a pilot transaction in the Willamette marketplace and key factors that could affect the feasibility of a transaction project at those locations.

Step 3: Investigation of Potential Transaction Project Sites. Investigated the suitability of the three potential transaction project sites through a site visit (at Green Island) and meetings, research, and discussions.

Green Island. The ecological restoration opportunities at Green Island were enormous. However, Green Island site managers had adopted a U.S. Fish and Wildlife Service restoration plan, and this plan did not include some of the dynamic processes of the river, such as hyporheic restoration and other ecosystem services that the Willamette Partnership was interested in pursuing for ecosystem credit portfolio development. The Partnership wanted to include additional restoration efforts in the adopted management plan that would provide a portfolio of a broader range of ecosystem credits.

Because a federal management plan for Green Island had been approved for funding and was in the process of being implemented, potential credits generated through these restoration projects could not be traded in a marketplace. In addition, during initial discussions with federal managers there was tremendous resistance to exploring credit opportunities at Green Island. For these reasons the Willamette Partnership and its consultants did not pursue launching a transaction project at Green Island.

Albany site. The Albany site was identified as providing various ecosystem services related to water quality, such as biological oxygen demand, nutrient and temperature reduction, and flow improvements through wetland restoration and habitat benefits. The restoration project at the Albany site would need to be completed in two phases. When fully implemented, it will represent one of the largest restoration projects on the Willamette River and will generate significant ecological value and potentially multiple ecosystem credit types. However, the first phase of the project, would address only temperature, through constructed wetlands.

The first phase of the Albany project was not of a scale that would be large enough to generate a portfolio of ecosystem service credits. But the first phase would substantially address the City of Albany's temperature load limits. Thus, the Willamette Partnership decided to continue to work closely with the City of Albany as the project developed but to not pursue developing an initial transaction project at the site in the short term.

Long Tom. Long Tom was identified as an opportunity for providing temperature reduction through riparian shading restoration. TMDL data indicate that the Long Tom River is the most underperforming tributary for shade in the Willamette Basin. The difference between current and potential effective shade levels at the Long Tom is 32 percent (Long Tom Watershed Council 2008). Modeling suggests that shading the entire lower section of the Long Tom River, from Fern Ridge Reservoir down to the southern confluence at Norwood Island, could reduce the temperature of the river as much as 4° C. Therefore, there is significant thermal load reduction potential along the lower Long Tom River (Long Tom Watershed Council 2008).

The Long Tom Watershed Council also has a strong and ongoing relationship with the City of Eugene—one of the largest potential buyers in the Willamette temperature market. The City of Eugene contracted with the Long Tom Watershed Council to investigate opportunities for restoration to meet thermal load obligations and was actively engaged and interested in ecosystem service credit generation. In March 2008, The Long Tom Watershed Council produced a report for the city of Eugene titled *Ecosystem Restoration in the Long Tom River Basin for Water Quality Improvement in the Willamette River*. The report documents the process of identifying restoration opportunities and assessing landowner concerns and interest in participation in an ecosystem marketplace.

The Willamette Partnership determined that the Long Tom was a suitable site to launch a pilot transaction project.

Step 4: Transaction Project Initiation. Created a transaction working group to address details of a transaction between the Metropolitan Wastewater Management Commission (Eugene-Springfield) and a land manager in the Long Tom watershed and drafted standard agreements for use in this and other transactions.

Step 5: Transaction Coordination. Coordinated a banking transaction using the new Willamette Ecosystem Marketplace framework.

Regulatory Language Development Process

Step 1: Existing Permit Framework. Determined the types of restoration actions that could be incorporated into the existing NPDES permitting framework for thermal load trading and where additional research should be focused to further develop methods for quantifying thermal load reductions from restoration actions.

Step 2: Permit Language Development. Developed NPDES permit language that will allow temperature credit trading as a compliance option for NPDES permittees.

What the Transaction and Regulatory Language Development Process Revealed

The *Willamette River Basin Planning Atlas* (Pacific Northwest Ecosystem Research Consortium 2002) and the synthesis map developed for the market appraisal provided extremely useful information about which areas in the basin were opportune for restoration and thus helped guide the selection and development of the transaction project.

Reviewing ongoing and planned restoration projects and using the restoration potential and conservation opportunity area maps as screening tools revealed that, despite the quantity of ongoing and planned restoration projects in the Willamette Basin, the majority of these efforts did not represent an integrated, systems approach to holistic ecosystem restoration. Many of the planned projects were focused on one species, one habitat type, or one restoration action, or they were too small to provide an understanding of the multiple types of ecosystem services that could be generated from different restoration actions. This realization became important in the Willamette Partnership's rationale for developing a marketplace and its efforts to further develop the synthesis map into a user-friendly and interactive tool to facilitate larger scale restoration across the basin in priority conservation opportunity areas. "Postage stamp" restoration projects will not achieve the level of ecological integrity necessary to create a sustainable future for the basin. There clearly is a growing need to match ecological opportunity areas with restoration actions and to facilitate basinwide restoration actions.

Secure and sound drivers are fundamental to market success. The willingness of people to consider restoration actions in advance of impacts with the expectation of using or selling them later vanishes when drivers are uncertain.

The importance of developing an integrated multi-credit market was confirmed when the demand driver for temperature was postponed. If an integrated ecosystem service market were operational and markets for other ecological values existed, people who could take restoration actions to participate in markets would be able weather the temporary loss of one market option, because several would be available to them. An integrated, multi-credit marketplace would have the effect of reducing risk for land managers and potentially lessening the dampening effect of a major regulatory driver being postponed.

Lessons Learned

Involve the regulatory agency early on. Consistent regulatory agency participation is essential throughout the policy augmentation process to ensure approval and an easy, fluid adoption of the altered regulatory language into the permitting process. While coordinating agency participation may seem like a daunting task, it is crucial if trading of credits is to be incorporated into the permitting framework.

Make it real for stakeholders early. Identify candidate buyers and sellers early and complete a sample transaction, even if incomplete, as soon as possible. Much confusion about roles and perceptions about the complexity of the marketplace were eliminated once contract agreements started to be developed and interested parties talked through some of the details of a transaction between actual buyers and sellers of credits—even though the exercise was hypothetical.

Use the tools you have. Restoration evaluation tools that had been previously developed for the basin became extremely useful in selecting meaningful transaction project sites. Leveraging the work of others saves resources, broadens support, and communicates a more collaborative and involved message to stakeholders.

Allow yourself some options. The development and selection phase of a transaction project is challenging because of the amount of coordination among parties, the technical and scientific effort needed to validate the transaction project, and, sometimes, a lack of information about funding. Because of the level of effort required to orchestrate a transaction project, you must initiate conversations with potential transaction project partners early on in the process. It is extremely important to start broad and have multiple options for potential transactions, so that if the project that was originally envisioned does not pan out, you still have time to focus on another potential project site for the transaction.

SECTION 8

Policy Considerations Specific to the Temperature Market

The amount and quality of conservation and restoration that is achieved in the Willamette Ecosystem Marketplace will depend greatly on regulatory agencies—particularly the Oregon Department of Environmental Quality. A water temperature credit program represents a significant opportunity to facilitate restoration of natural conditions that cool water in streams and create habitat for cold-water-dependent fish species—especially in rural parts of the Willamette Valley where regulatory controls are limited. Agency policies obviously play a key role in creating demand for ecosystem service credits that can be sold on a market. In the case of the Willamette, the temperature TMDL is the single largest driver of demand for temperature credits. It is doubtful that the Willamette Ecosystem Marketplace would have been initiated without the introduction of a restrictive TMDL. But agency choices influence much more than demand. The right policies, rules, and regulations can make it easier for people to participate in the marketplace, increase the ecological quality of credits generated and sold, instill confidence about the long-term integrity of the marketplace, and help marketplace organizers capitalize on the growing momentum to use market forces to address pressing environmental challenges. Throughout the process of developing the Willamette Ecosystem Marketplace, the Willamette Partnership has worked to identify and explore relevant policy issues that will help the marketplace succeed as a vehicle for effective ecological restoration.

The process of developing the marketplace has illustrated the delicate balance that exists between supply and demand when a new market-based initiative is launched. In the Willamette marketplace, demand for temperature credits is created largely by the TMDL. Supply is made available once credit definition methodologies have been agreed upon, restoration protocols have been developed, marketplace infrastructure has been created, and an adequate number of actual restoration projects have been completed. In the early stages of the marketplace, supply will be partly a function of capacity and motivation—how quickly can the restoration sector complete projects that generate credits, and how certain is it that buyers will need or want the credits they produce? Development of supply and demand needs to be coordinated so supply is available within a reasonable amount of time after demand is created; otherwise, potential buyers will find other ways to meet their regulatory obligations. At the same time, regulatory drivers need to be firm enough to give suppliers confidence that demand is real. Also, knowledge and awareness of pending demand need to develop in a timely manner so there is adequate time to develop supply before obligations need to be met.

Clearly, a lack of ready supply can hamstring early efforts at marketplace development. So, too, can elaborate or complicated marketplace procedures. To attract buyers and sellers, an ecosystem marketplace must be easier, faster, and less expensive to use than conventional options for permit compliance. This is especially true in a low-volume marketplace like the Willamette, which does not have the economies of scale that larger markets offer.

Recognizing the challenges of small size and the need to balance supply and demand, the Willamette Partnership supports policies that speed development of supply, maximize marketplace efficiency, and support "early adopters," meaning those who choose to engage in market trading early on.

The Willamette Partnership has encouraged the Oregon Department of Environmental Quality to consider the following policy issues that will improve the ecological effectiveness, administrative efficiency, and credibility of marketplace activity for temperature credits in the Willamette. Policy recommendations include:

- **Set a baseline date**. Allow restoration projects that meet minimum standards and were completed after the date the TMDL was adopted in September 2006 to be eligible to sell credits against a temperature TMDL obligation. The date the TMDL was signed represents the date that a cap on thermal load was officially established in the Willamette Basin. Enabling projects after that date will increase the early supply of credits.

- **Encourage credit "banking" to promote early actions.** When a project is completed in advance of an impact, credits generated from that project can be held for use or sale at a later date. Such credits are called "banked" credits. Such projects are similar to a savings account or an investment that is expected to grow in value over time. Early actions are good for the environment and should be encouraged. It does not appear likely there will be a large demand for immediate temperature credits driven by Willamette temperature TMDL permit requirements. Allowing credit banking would encourage third parties to make significant investments in credit projects that they could sell to buyers who need them at a later date.

- **Encourage the use of a centralized credit registry.** A centralized credit registry is the core of an ecosystem services marketplace. It provides the information needed to assure regulators, buyers, sellers, and the public that credits are valid. A registry must be transparent. The Willamette Partnership favors the use of a centralized credit registry operated by a third-party non-profit governed by a coalition of stakeholders who have an established interest in ensuring the integrity and quality of credits.

- **Encourage investment in priority areas.** Scientists and stakeholders have worked for more than a decade to identify conservation and restoration priorities in the Willamette Basin. Markets represent an opportunity to increase investment into the places and activities most likely to improve conditions for the cold-water-dependent species the TMDL for temperature is intended to address. After considering a wide range of options, the Willamette Partnership supports the use of a percentage requirement to direct marketplace investment to high-priority areas. This would mean that, for a given permit, a certain percentage of the offset credits used would need to come from restoration projects in priority areas. (The required percentage could be tied to the amount of priority area within the particular trading area.) The benefit of this policy is that it would guarantee investment in priority areas, regardless of market prices and conditions.

- **Establish service areas.** Service areas mark the geographic boundaries within which buyers and sellers of an ecosystem service credit can interact. Service areas are determined based on the service being performed. For temperature credits in the Willamette, three service areas should be established, defined by the three points of maximum impact identified in the TMDL. It is the Willamette Partnership's preference that water temperature credits generated anywhere in the watershed upstream of a point of maximum impact be available for use by buyers within or downstream of that service area.

Such a system would create a nested pyramid of trading areas in which, for example, the City of Salem could buy credits from projects around Eugene, but the city of Eugene could not buy credits from projects in the Salem area because Salem is below the point of maximum impact to which Eugene is subject. The Wil lamette Partnership does not support a policy that would limit trading to areas upstream of a specific buyer's point of discharge. Such a pol icy would reduce the opportunity to leverage the resources of multiple buyers for large projects in strategic areas.

- **Do not discount credits for time and distance to points of maximum impact.** Given that flowing water is subject to multiple cycles of heating and cooling, spatial and temporal discounting is sometimes used to account for the difference between the temperature benefit provided at the site of a restoration project and the temperature benefit at some point downstream from the restoration site.For example, if a mile of streamside shade were planted along a tributary stream, modelers would estimate the cooling effect of that action at a specific point in the river downstream, such as at an agency-determined point of maximum impact or a specific credit buyer's point of discharge. The Willamette Partnership supports current DEQ policy that a kilocalorie per day produced by an ecological restoration or flow augmentation project is worth a kilocalorie per day, regardless of the distance between the credit generation site and the credit buyer's physical location. Although the Willamette Partnership recognizes that spatial and temporal discounting may be appropriate when point sources are trading TMDL allocations amongst themselves, it is the Partnership's view that applying spatial discounting to ecological restoration activities could discourage strategic actions that would provide substantial benefits to fish and wildlife habitat. The TMDL for temperature is driven by the needs of cold-water-dependent species that need more and better habitat at the right times of year. Encouraging strategic investment in ecological restoration is one of the primary purposes of a point-source to non-point-source trading program.

At the time of this writing, the internal management directive that will guide temperature credit trading in the Willamette Basin was still being revised.

SECTION 9

Continuing the Ecosystem Marketplace

Significant financial investments in ecosystem conservation and restoration are needed to achieve a sustainable future in which healthy and resilient ecosystems are the foundation of healthy communities and economies. Ecosystem service markets can help, but to ensure that the Willamette Ecosystem Marketplace grows and is capable of improving ecological conditions at a scale that will make a difference, we need an integrated marketplace that trades in multiple credits driven by multiple drivers.

One of the key lessons of this project is the limitation of single market drivers that have limited scope and scale and are subject to political and legal challenges. The future of ecosystem conservation and restoration will require us to achieve a higher degree of integration across ecosystem objectives than currently exists. Ecological and economic goals must become aligned in the marketplace so that they provide, the resources needed to finance restoration, drive new business opportunities, and achieve an economic and environmentally sustainable future.

Strategies for moving forward to continue and expand the ecosystem marketplace need to focus on three core areas:

- Supportive policies that encourage and enable markets to integrate and thrive
- Development of a third-party organization to manage centralized market infrastructure and standards that ensure efficiency and credibility
- Technically sound credit accounting protocols that define multiple credit types based on ecological functions

Activities in these three core areas will not succeed if they are undertaken in isolation. The policies, infrastructure, and technical tools needed for an integrated ecosystem services marketplace to thrive must be mutually supportive and must be developed and implemented together. The strategies described in this section represent the next steps for bringing an integrated ecosystem services marketplace to fruition.

An Integrated Ecosystem Services Marketplace

Even with the landmark state and federal environmental laws of the last 30 years in place, our most fervent efforts at conservation and restoration are not keeping pace with ecological decline. We are falling behind, despite the best of intentions. Continued degradation of ecosystem health will have negative effects on our economies, resource base, and quality of life.

Oregon is home to many significant innovations that use market-based programs to provide ecosystem services. For example, the Climate Trust, the Oregon Water Trust, the Deschutes River Conservancy,

and Clean Water Services have been national leaders in using carbon and water markets to help achieve ecosystem goals. Leadership at the local and regional levels has been and continues to be strong and creative, and business and political leaders at the highest levels across the state are engaged in and informed about ecosystem service issues and tools.

Early in the development of the Willamette Ecosystem Marketplace, it was clear that the policy, infrastructure, and technical innovations needed to ensure success of an integrated marketplace were of statewide and even regional significance, not bound by the geography of a watershed like the Willamette. The experience of developing the policies, tools, and infrastructure to support a multi-credit marketplace under the auspices of the Willamette Ecosystem Marketplace enabled us to see clearly that a fully integrated ecosystem marketplace will need to cross geographic, jurisdictional, and institutional boundaries.

Why Is an Integrated Marketplace Needed?

There are many reasons to create an integrated ecosystem marketplace, the most significant being that existing regulatory programs could realize greater ecological results than they currently do. As we have seen in the Willamette temperature market, a narrow regulatory focus on temperature limits our ability to address the full suite of habitat features needed by the species the regulation is intended to protect. As a result, temperature for fish may be improved, but critical habitat elements like gravel, food, and wood remain unchanged and will continue to degrade without other regulatory or market drivers to reverse the trend. Such a system is equivalent to attempting to grow a plant by spraying the roots with water but providing no soil or sunlight.

An integrated ecosystem services marketplace would enable a variety people who are regulated by a variety of regulations that are enforced by a variety of regulatory agencies to pay for large-scale restoration actions that address a whole spectrum of ecological conditions. In an integrated ecosystem services marketplace, the policies, infrastructure, and tools would be in place to enable a person who needs only temperature credits to buy just the temperature benefits of a restoration project, while someone who needs habitat credits could buy the large wood and gravel recruitment portions of the project. Such a system would create incentives for larger and more ecologically holistic actions and would guard people who take voluntary restoration actions against the risk of week or fickle demand drivers.

Existing markets address individual ecological elements like wetlands, water temperature, nitrogen, phosphorus, endangered species, and carbon. Each operates at a different scale and is governed by a unique set of laws and administrative rules. The effect of this approach is to discourage investors and landowners from participating in multiple markets. Although there may be a smattering of individual projects, it will be difficult to finance large significant restoration projects that provide multiple ecosystem values if it is not easy for land mangers to sell the services they have created. In an integrated ecosystem services marketplace, agencies would be able to coordinate programs more effectively so that landowners are not intimidated by the administrative complexity of participating in the market and transaction costs would not exceed the value of the credits generated.

A marketplace is simply a location—real or virtual—where buyers, sellers, and intermediaries meet to exchange goods and services. Markets emerge where the buyer perceives that benefits exceed the costs of engaging in trade. Two types of costs predominate in most markets. One is the payment made to sellers to compensate them for providing the good or service. The other is payments to intermediaries or other costs such as time, processing, fees, and appraisals. The latter are called transaction costs. A fundamental requirement for markets to emerge is that there must be gains from trade for the buyer and seller, after adding up the costs to participate.

Ecosystem services present a uniquely complex case in market development. With "products" such as reduced water pollution, restored aquatic habitat, and sequestered carbon, the purchase costs are probably the most studied and relatively well known element of the equation. At the same time, while many people have been convinced that ecosystem conservation and restoration provide important benefits, these benefits are difficult for any one group or individual in society to capture. As a result, the demand to buy these services has often seemed limited. Finally, the general economic principle that transaction costs in new areas of exchange will typically be high has been confirmed by initial experiences with market-based approaches in this field. Thus the emergence of an integrated marketplace will require clear financial and economic incentives. Stimulating market demand will be essential, as will efforts to keep transaction costs low and credibility high. Because government regulations and agencies will be central to stimulating demand, many of the strategies that need to be employed revolve around stimulating demand, minimizing transaction costs, and ensuring credibility.

An ecosystem marketplace can be viewed as a broad umbrella covering the full suite of mechanisms that promote investment in our ecosystems. Currently we have a well-intentioned but ad-hoc set of programs, rules, initiatives, and pilots. There are a vast number of regulatory and non-regulatory ("voluntary") programs that span a number of ecosystems and specific ecosystem goods and services. Creating a marketplace using a comprehensive and integrated approach involves finding and resolving the gaps and overlaps in existing initiatives and moving to more efficient strategies for stimulating demand and conducting transactions in the marketplace.

Core Area: Supportive Policies that Encourage and Enable Markets to Integrate and Thrive

It is important to acknowledge that over the last 30 years, landmark changes in public policy and new environmental laws have made progress addressing some of the most visible and egregious sources of environmental degradation. However, these laws have too often focused solely on specific impacts and individual species and habitats. In addition, legal requirements have typically steered efforts toward the mitigation of specific impacts at or near the site of impact, leading to a hodgepodge of small, localized efforts. Treating isolated problems fails to consider the overall health of our natural environment. While such efforts may reduce the impacts, they may not effectively cope with the cumulative nature of gradual erosion and degradation of our ecosystems.

The future of ecosystem conservation and restoration will require us to achieve a higher degree of integration across ecosystem objectives. This will enable ecological and economic goals to become aligned in the marketplace, providing the needed resources to finance restoration and drive new business opportunities.

Integration across services in a market must start with public policies to encourage and support the development and use of ecosystem service markets. In order to attract both buyers and sellers of ecosystem services, markets need to be accessible, transparent, and not overly burdened by administrative complexity. Agency policies, rules, and procedures need to balance precision and risk avoidance with effectiveness and cost. Special attention to reducing risk for early market participants may be necessary to launch marketplace initiatives and develop pilot projects.

Agree on Ecosystem Goals

In the Willamette Valley, different researchers and agencies have developed multiple conservation and restoration priority schemes. The Nature Conservancy and Willamette Partnership integrated these disparate schemes into a single synthesis map of conservation priorities and discovered, not surprisingly, there was substantial alignment. The synthesis map can be used to direct ecosystem marketplace investments in a much more strategic, ecologically viable manner. Adoption and use of a framework for developing priorities based on the Willamette and other experiences may assist other regions in undertaking similar efforts.

A coordinating body is needed to work with stakeholder groups at different scales to use existing plans and information to select and agree upon priority ecosystems and sites. The Synthesis Map Working Group that has already been convened by the Nature Conservancy and the Willamette Partnership is a logical starting point for this coordinating body. Any effort to prioritize investments must be adaptive and dynamic.

- Priority maps should be based on best available science (but will never be perfect).
- Priority maps and policies should be dynamic and flexible enough to include new information and knowledge and to adapt to unintended consequences.
- Policies should encourage and, where possible, reward the use of priority maps but should not imply that work happens only in priority areas.
- Policies must avoid sending a message to landowners and managers that lands that do not fall within priority maps are not ecologically valuable.
- Local priorities need to be included alongside state - or landscape-level priorities.

Balance the Use of Outcome-based and Prescriptive Rules

The prescriptive nature of many regulations can lead to a focus on fixing small, specific problems using predefined approaches and existing technologies. Such rules may fail to harness market forces and promote private-sector innovation. An alternative to a focus on narrow prescriptive measures is to clearly state the desired outcomes of regulations and the acceptable indicators of having achieved the outcomes. Specifying the outcome and leaving the path to achieving that outcome open spurs innovation. Although the Willamette temperature market will certainly create significant ecological improvements when fully implemented, the narrow focus of measurement criteria kilocalories per day—proved a significant barrier to including floodplain restoration actions in the marketplace. Floodplain restoration is known to improve stream temperature regimes and provide significant habitat for cold-water-dependent species, but the dynamic nature of floodplain systems currently does not enable precise measurement of kilocalories per day. Still, not all ecosystem services are amenable to measurement and enforcement. ecosystem services. There is little point in developing an outcome-based approach if the resulting rule will be unclear or lack "teeth." The route to compliance needs to be clear.

Identify opportunities to improve existing prescriptions and/or shift to outcome-based approaches. Floodplain restoration is the most logical place to start this work for integrating market activities. Floodplain restoration could generate significant offset credits for water quality, endangered species, and flood damage protection. Floodplain restoration activities would be relevant to the full suite of state and federal regulatory agencies involved in both driving demand through regulations and regulating actions for restoration. When developing outcome-based policies, the following need to be considered:

- Outcomes need to be tracked against restoration goals, so that it is clear how individual actions and projects contribute to meaningful restoration at scale.
- Outcomes need to be measurable and enforceable to be meaningful.
- Straightforward surrogates for the outcome may be chosen as a second-best approach.
- Whether rules are prescriptive or outcome-based, regular monitoring and evaluation of outcomes and actions is required.
- Agencies may wish to certify third-party firms to carry out evaluations, particularly if similar outcomes or technologies are being evaluated in non-regulatory (voluntary) ecosystem markets.

Encourage Adaptive Management and Risk-Taking

The threat of third-party litigation makes agencies risk-averse, by training and experience. Risk aversion is a fundamental cause of prescriptive rule-making as agencies seek to limit the ability of those being regulated to deviate from a prescribed path for fear that the agency would then be culpable. This can lead to long and costly routes to regulatory approval and discourages the adoption of newer, outcome-based approaches. There are multiple of examples of programs where agency risk-taking has resulted in dramatically better results for the environment. Altering institutional incentives within agencies will be central to promoting a willingness to take risks, experiment with new approaches, and then learn and adjust as needed. This is a large and complicated task and not one to be taken lightly.

Large-scale, multi-agency pilot projects should be used to test innovative approaches and encourage an agency culture of adaptive management. The Willamette Partnership will begin work in July 2008 with private and public partners to develop new ecosystem-based accounting approaches to credit calculation.

The project represents an opportunity to develop a large-scale multi-agency pilot that will address multiple ecological values and potential credit types. The pilot would offer agencies an opportunity to explore ways to:

- Provide for oversight but lighten the regulatory requirements so as to avoid litigation when testing out new and promising approaches.
- Use internal management directives to provide staff with incentives to take risks and develop new effective internal procedures that achieve ecological goals.
- Build safety margins (or trading ratios) into mitigation obligations to reduce risk.
- Find ways for agencies to adopt adaptive management approaches.

Integrate Agency Responses across Ecosystem Services

The agency-by-agency and service-by-service nature of regulatory response leads to "silo" approaches and single-purpose markets, which are too thin to be economically viable and are likely to be ecologically ineffective if they simply facilitate many small, disconnected conservation projects. Instead, opportunities to bundle and stack credits and implement other incentive programs need to be explored so landowners can capitalize on a sufficient set of ecosystem services to warrant adoption of new land uses and practices.

Complementary ecosystem services should be identified and opportunities assessed for integrated approaches to regulations and incentives, bearing in mind that integration is best achieved in a particular location where all the silos and levels of government come together. Developing approaches for agency integration could be accomplished through pilot projects tied to a large-scale multi-credit project, with multiple public and private funding sources and agency regulations.

Core Area: Third-Party Organization to Manage Centralized Market Infrastructure and Standards That Ensure Efficiency and Credibility

Worldwide, environmental regulations, improving science, and consumer demand is driving an explosion of ecosystem service markets. Carbon, water quality, habitat and species services are all actively traded in markets. In 2005, the Katoomba Group estimated that these respective markets will invest more than $1.7 billion per year in ecosystem protection and restoration by the year 2010, a four-fold increase over 2005 investments.

These predictions were validated as trading activity jumped significantly. In 2007, the value of trade in the voluntary carbon market grew by 240 percent to $331 million (Hamilton, Sjardin, Marcello, and Xu 2008). As of 2006, there were 48 water quality trading programs in North America (Guiling et al., 2007), 31 states with wetland mitigation banking (Wilkinson and Thompson, 2006), and 10 states with endangered species conservation banking (Fox and Nino Murcia, 2005).

Ecosystem service trading programs have been established to improve water quality in Chesapeake Bay and reduce carbon emissions in Europe. Similar programs in Oregon are reducing water temperatures in the Tualatin River and offsetting carbon emissions from Oregon power plants. However, most of these markets trade individual ecosystem services and operate in limited geographic areas. This results in fragmented ecosystem investments with thin supply and demand streams that limit opportunities to capitalize on investment efficiencies and economies of scale.

As these markets grow, they share common opportunities and challenges. Ecosystem credits can be traded like commodities, but they differ from commodities in terms of their complexity, both before and after the trade. Actions and technologies that create offset credits must meet specific and rigorous performance standards to be sold in ecosystem service markets, and it requires significant work to document and verify credit attributes and performance, both before a credit is sold and for many years—or even decades—afterwards. Because the basic value and credibility of an individual offset or mitigation credit depends on rigorous verification and ongoing monitoring of performance, a centralized credit registry is a necessity. The registry consists of two parts: an institution that inventories and accounts for all credits available and sold within a market by documenting their generation, ownership, and trade; and the resulting database of information. A credit registry must be transparent to regulators, the public, and market participants. In addition, it must be supported by user-friendly technology and backed by the financial resources necessary to protect against accounting errors.

In order to track ecosystem credits and provide overall transparency and credibility to the market, credits need to be verified, certified, recorded, and tracked over time. The system has yet to be designed, but progress has been made by the Willamette Partnership in defining what it should look like. No Web-based infrastructure exists to accommodate multiple ecosystem services credit types across jurisdictional boundaries. And none has been created with an independent mission of accounting for and tracking credits over time to ensure transparency and quality.

This limitation creates a unique opportunity for ecosystem market leaders. In Oregon, the Willamette Partnership, the Nature Conservancy, Defenders of Wildlife, Eco-Trust, Earth Advantage, Sustainable Northwest, the Climate Trust and others have begun to catalyze formation of a national Ecosystem Services Council to develop accounting and tracking systems, vet credit protocols, accredit third party verifiers, and oversee a credit registry and tracking system.

Such a council should be a consortium of non-profit organizations with a common interest in ensuring that emerging ecosystem service credit markets are credible, efficient, and achieve the high-quality ecological improvements that are needed. The primary function of the national council would be to build and govern the centralized market infrastructure to support ecosystem service markets. Roles of the national body could include the following.

Develop and Certify Measurement, Performance, and Verification Protocols

For ecosystem service markets to operate efficiently, the validity of individual credits must be certain. Credits for various markets can be created in numerous ways. For example, to create stream temperature reduction credits, investors can plant streamside shade trees, restore wetlands, make technological upgrades, or take other actions. For credits to be exchanged in a market, buyers, sellers, regulators, and the public need to understand and agree to the measurement criteria, performance standards, and verification protocols for each credit-generating activity. A wide range of organizations are working to develop the criteria and performance standards needed to generate credits in both local markets and global markets. A national Ecosystem Services Council would provide a credible venue to convene local, regional, and global experts to establish standards for credit measurement, performance, and verification in global markets and procedures for local markets.

Develop and Certify Credible Verification Entities for Each of the Markets

Each market type will require credible experts to verify that credit performance standards and criteria are met. The credibility of credits in ecosystem markets depends on the integrity of the credit sold. Working with regulatory entities, local experts, and other stakeholders, the national council would train, certify, and monitor verification entities and audit procedures for ecosystem service markets.

Develop and Manage a Centralized Ecosystem Credit Registry

A database and accounting system is needed as to register, certify, bank, and track ecosystem credits. Parties generating credits need an efficient system to register credits and have them certified by a third party. Buyers, regulators, and the public need a way to ensure that the credits created and purchased are valid and performing the services intended and that an individual credit is not sold more than once. In a credit registry, all relevant information about a credit (origin, vintage, ownership, life expectancy, etc.) would be tracked and accounted for. The credit registry would function similarly to a bank in that it would serve as the repository of credits deposited by sellers and purchased by buyers. Credits deposited would be registered and held until they are certified and then made available for sale. The repository would maintain records of accounts and transactions. The system would produce selected reports about individual registry accounts and trading activities in formats to serve a variety of tracking and evaluation needs, including regulatory reporting requirements. The centralized system would help credit buyers and sellers find each other and facilitate efficient transactions through the use of pre-approved credit verification and certification procedures. It also would support and regulate credit standards that ensure the credibility of credits for the protection of the participants, especially those using credits as part of a regulatory or contractual compliance strategy.

Manage Assurance Pools Needed to Buffer Against Failure of Mitigation and Offset Credits

An assurance pool of credits is needed to protect against project failures and other market risks. The national council could manage a fund created as a percentage of total sales, or as insurance premium to invest in ecological restoration projects and conservation activities. The assurance pool would create a bank of credits that protect the public interest in the event of project failure in the market. The portfolio of assurance credits would be geographically and functionally equivalent to cover existing credits and transactions in the market.

Foster Nationwide Coordination by Supporting Existing Efforts

Work has already begun to develop such a National Ecosystem Services Council. In June 2008, a coalition of not-for-profit organizations with a common need for infrastructure and standards to support their local, regional, and national work on ecosystem markets developed a funding request to the Oregon Economic and Community Development Department to:

- Develop a charter for the organization to formalize operating expectations and commitments and define a decision-making process.
- Define its role and services.
- Research and evaluate alternative organizational structures and evaluate the potential client base for the registry, develop protocols, test regulatory agency acceptance of a national organization and registry, and develop and explore potential revenue models to complete a proof of concept for the marketplace infrastructure and its operation.
- Develop a stepwise strategy for registry development, including interim management.

Dozens of new local market programs and initiatives are emerging throughout the United States. Action to coordinate efforts now will improve the chances that markets develop in credible ways that achieve ecological goals. If they do not, the public mistrust that will result from market failures or mistakes could limit markets' long-term sustainability.

Core Area: Technically Sound Credit Accounting Protocols That Define Multiple Credit Types Based on Ecological Functions

A key component of an ecosystem marketplace is the technical capability to clearly identify and quantify relationships between development impacts and required mitigation or offsets. Developing the scientific and technical ability to develop, certify, and track such ecosystem service obligations and credits will be critical to the development of both supply and demand in an integrated marketplace. Technically sound and agency-approved credit accounting protocols are a critical step in making the full potential of an integrated ecosystem services marketplace a reality.

We know that restoration actions produce multiple ecological services that are difficult, expensive, or impossible to replace once have been lost. As we have documented throughout this project, markets are emerging that attempt to assign values to these services, expanding the opportunities for land managers to capitalize on the investments they have made in sustainable landscapes and to generate revenue from larger, more comprehensive restoration.

However, a credible ecologically based accounting system to turn ecosystem benefits into credits that can be traded is still missing. If we are to realize our vision of an integrated ecosystem services marketplace, technically sound methods to quantify multiple ecosystem credit types must be developed and receive regulatory approval for use.

A system to account for impacts and credits must be open for anyone to look into and must be accepted by the public and private parties operating markets.

Coordinate Efforts to Create Credit Calculating Methods

Beginning in July 2008, the Willamette Partnership will begin a major effort with agency leaders and stakeholders to:

- Obtain Oregon's first multi-stakeholder agreement to use a shared accounting system to quantify impacts and credits to ecosystem services for application in ecosystem markets.
- Lead a pilot project to demonstrate real environmental benefits and compare the results from this functions-based accounting system with the results from current approaches.

Success in this effort will represent a significant milestone in development of an integrated ecosystem services marketplace and will support development of centralized market infrastructure. But other efforts at developing credit calculating methods are developing in other parts of the country as well. It will take concerted, intentional effort to ensure that credit calculating methods do not develop in ways that confuse market participants, regulators, and the public in different regions of the county.

SECTION 10

Lessons Learned

Developing the Willamette Ecosystem Marketplace was a process that involved lots of hard work, technical and regulatory challenges, obstacles to effective communication and collaboration, and, as a result, seemingly endless opportunities to learn. Some of the lessons that emerged from the marketplace development process are listed in Sections 3 through 8 of this report in connection with specific project tasks. Larger scale lessons that apply to the entire process are presented in this section. This information is provided for the benefit of other entities who are considering developing an ecosystem marketplace to help smooth their path to success.

Know whether you are ready. Before embarking on the process of developing an ecosystem marketplace, you need to have (1) clear ecological goals so you can design the marketplace to achieve them; (2) regulations or some other motivating factor in place that will drive demand for credits; (3) well-informed, fully engaged partners and stakeholders who not only will support the effort but who understand the basics of ecosystem markets; and (4) a neutral third party who can lead development of the marketplace—someone who is trusted by the environmental community, the regulated community, and regulatory agencies and does not have a financial or regulatory stake in market outcomes.

The Willamette Partnership was clear and consistent about its ecological goals, but it experienced a setback when the TMDL that was driving demand for temperature credits was challenged by four of the largest potential buyers in the market. The sense of urgency that existed for the regulatory agencies and buyers—and therefore their demand for a marketplace solution—waned when implementation of the TMDL was postponed. This added to the Partnership's workload. The organization had to simultaneously develop the marketplace, educate potential buyers and sellers about how they could benefit from a marketplace, and try to stimulate demand when the expected demand driver—the TMDL—lost steam. Having firm regulations and a business community that already understood ecosystem markets would have freed up time for the Willamette Partnership to perform other activities such as additional technical work, project coordination, or broader outreach and education.

Consider carefully whether or not to take a collaborative or advocacy role. This is a strategic decision that affects the pace of marketplace development and the level of buy-in from regulatory agencies, the business community, and others. The Willamette Partnership took a collaborative, relationship-oriented approach in working with potential marketplace participants. This may have slowed down the process of developing the marketplace, but the Partnership now has strong relationships with regulatory staff and other active stakeholders that will be of benefit to the market for years. In some cases an advocacy approach might be a better choice, especially if speedier results are required and there is little to no confusion or uncertainty about the approach or needed outcomes.

Harness the regulated community to push for regulatory changes. Current regulatory structures are not designed to support multi-credit trading systems, and regulatory agency staff tend to be overworked and risk averse. Thus, agencies need encouragement to develop policies, rules, and regulations that allow ecosystem markets to work. This push must come from those who are most affected by agency regulations: regulated businesses and municipalities and watchdog groups who protect the public interest.

Be sensible about your infrastructure needs. A new ecosystem marketplace could require anything from just a few key infrastructure components to an elaborate infrastructure along the lines of the New York Stock Exchange. To save money, time, and effort, be realistic about what you need and try to make use of already-existing marketplace components as much as possible. Otherwise, the prospect of creating a totally new, comprehensive marketplace infrastructure could be daunting (at best) or completely overwhelming (at worst).

Get to scale. A small, single-parameter marketplace with few transactions is unlikely to drive ecosystem-scale restoration and may not be efficient enough to compete with traditional compliance approaches in terms of costs to marketplace participants. To be economically efficient and as ecologically effective as possible, an ecosystem marketplace must get to scale by expanding the number of participants, transactions, and types of credits generated and sold. An integrated, multi-credit marketplace allows a landowner to profit from a full-scale restoration project (because he or she can sell more types of credits or at least has a menu of choices), increases the volume of transactions, and widens the circle of people who have a stake in the marketplace's long-term success. Even though you may be starting with just one type of credit in a small marketplace, plan to expand. This means working with regulatory agencies to align regulations more closely with the desired ecological outcomes, educating stakeholders about the many types of credits that could be part of the marketplace, and looking for opportunities to expand technical analyses to include many parameters and types of credits.

Plan for extensive, consistent, and persistent education and outreach. Ecosystem markets cannot succeed if people do not understand what they are, how they work, and the ecological and financial advantages they offer. This is particularly true for the regulated community, which is who will ultimately decide to purchase ecosystem services credits—or not. The concept of ecosystem markets is new to most people, and they may need help understanding what it means to them. It is likely that education and outreach will need to be extensive, and continue throughout the marketplace development process; therefore, thorough education and outreach should be built into the project work plan. Fortunately, there are many venues for spreading the word. For example, existing professional organizations can help inform their constituents about the opportunities that markets represent for them.

Stay engaged with stakeholders. It is important to maintain a conversation with stakeholders throughout the project, even when there is no significant news to share, and to follow up on stakeholder issues. There was great interest in a Willamette Ecosystem Marketplace early in the project, and many constituents were highly engaged; however, for various reasons, communication lapsed somewhat part way through. Without regular communication from the Willamette Partnership, the door was open for stakeholders to come up with their own explanations for what was happening on the project, and this took time and effort to correct. Open lines of communication builds the trust that all parties rely on when working through issues that inevitably arise.

Balance technical work, communication, and process management. It takes time to work out the details needed to support a trade in an ecosystem marketplace, to communicate with stakeholders and the public, and to manage the marketplace development process, particularly decision making. Yet these activities are essential, and time for them should be built into the project work plan. The work plan then needs to be followed so all parties know when and how to participate in the process; key outreach and education tasks that support the marketplace get accomplished; stakeholders stay informed; and there is still enough time to create a solid foundation for the marketplace and complete the first transaction. The Willamette Partnership focused on the technical aspects of marketplace creation and used informal project management and decision-making processes. A more balanced and methodical approach might have slowed the overall process, but it may also have enhanced stakeholders' understanding, made decision making more open or transparent, or allowed time for other products to be developed.

Keep your eye on your ultimate goal. Businesses, municipalities, individual landowners, and regulatory agencies have immediate needs and may not have the luxury of being able to think about how their participation in the marketplace will contribute to the long-term, large-scale goal of ecosystem restoration. It is important to help stakeholders meet their short-term needs using an ecosystem marketplace but also to keep framing the project as a long-term effort that eventually will pay dividends, both financially and ecologically. Maintaining this view broadens the discussion and the political space to make an ecosystem marketplace possible.

Be willing to accept some imperfections. Developing an ecosystem marketplace that quantifies and translates ecosystem services into tradable units is a recent and innovative concept—one that still has embedded uncertainties and surprises. Ideally, market-based solutions would not be implemented until they were better understood and more fully developed. But at this point in the natural history of the Willamette Basin, time is of the essence. Large-scale restoration is desperately needed and cannot be postponed to the point that we know exactly how ecosystem markets will function.

The Willamette Basin is an example of how important an ecosystem marketplace can be. Even if imperfect, ecosystem markets offer an opportunity to go beyond complying with regulation to achieve holistic, integrated restoration that reestablishes the ecological integrity of the ecosystem. It is not necessary to have every minute detail sorted out before you start capitalizing on these marketplace opportunities. There is time later for adjustments and refinements, once the marketplace starts providing its ecological and financial gains. One of the most frequently quoted statements throughout this whole project came from Stan Gregory on June 22, 2006, at a conference at Oregon State University. He said, "we could spend 10 years and $10 million to develop models that will predict the temperature benefits of floodplain restoration and at the end we would still just have a model. Or we could spend $10 million dollars to complete the restoration action now, and in 10 years we would have empirical data to confirm the results." The wisdom of this statement resonates with stakeholders.

Plan for the post-grant period. An ecosystem marketplace is a long-term endeavor that requires a financially sound business model and a designated party to manage the marketplace activities for years into the future. If marketplace development is funded through grants, you must plan ahead, organizationally and financially, for when grant funding ends. This could require careful thought about your organization's long-term role in the marketplace and whether you need to build organizational capacity to manage or support marketplace activities in some way. Deciding early on who will administer the marketplace infrastructure in the future provides certainty to stakeholders and reassures them that, although an ecosystem marketplace has its risks, it is a viable alternative to traditional compliance options.

* * *

Creating an ecosystem marketplace is a large and complex process, and the Willamette Partnership made several missteps and wrong assumptions along the way that were challenging to recover from. The Willamette Partnership and the many stakeholders involved in the process were learning as the project progressed, and the continually increasing knowledge necessitated frequent adjustments in expectations. The organization struggled to bring the project to completion by facilitating a market transaction before the end of the 2 ½-year grant period. Nevertheless, even just the effort to develop the Willamette Ecosystem Marketplace has attracted a high level of interest from people outside the state. From the beginning of the project, it was believed that Oregon could become the national center for an ecosystem services "industry" that provides significant new business opportunities in the state in the form of consulting, verification, and other ancillary marketplace services. This is already happening. Businesses, utilities, governments, and non-profit organizations from around the country are already looking to the Willamette as a model of an integrated, multi-credit marketplace. For example, a group in the Chesapeake Bay working to create a "Bay Bank" is contracting with Oregon firms to build information technology to support the ecosystem marketplace they are forming, and British Columbia Hydro Power is contracting with other Oregon firms to help the utility implement a policy of no net loss of ecosystem services. These intellectual exports are the result of experience gained working on marketplace efforts in Oregon. Such business deals are likely to continue growing as Oregon works to quantify ecosystem services and translate them into tradable units.

Perhaps the more important legacy of this project is that the Willamette Partnership's efforts in the last 2 ½ years have changed the dialogue in Oregon about ecosystem markets and created a type of political and policy space where an integrated, multi-credit marketplace can become a reality. Oregon business and civic leaders, regulatory agency staff, and environmental organizations now know what an ecosystem marketplace is, how it should work, and what steps are needed to make it work. They also understand much better their own roles in a marketplace, and how their participation can not just improve their bottom line, but reverse the ecological degradation in the Willamette Basin. The Willamette Partnership looks forward to continuing to work with its partners and stakeholders to do just that.

APPENDIX A

Trading Temperature Credits From Riparian Shade

A Handbook for Buyers and Sellers in the Willamette Basin

This Temperature Trading Handbook provides natural resource managers with information they need to develop and sell temperature credits generated from planting riparian shade in the Willamette River Basin. It also provides regulated entities that have an obligation to reduce their temperature impacts to river water with information they need to purchase these temperature credits. Under a grant from the Environmental Protection Agency, the Willamette Partnership designed a framework of technically-sound infrastructure for this innovative market for temperature credits that regulators, and the public, can trust and accept as a viable alternative to more traditional engineered-approaches to meeting environmental regulation. In some cases, traditional engineered-approaches do not address the root environmental problems needed for real ecological improvement—a shortcoming that emerging ecosystem service credit markets like this one helps to rectify.

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SECTION I

Executive Summary

Emerging markets for ecosystem services will connect people in new ways. Markets such as these provide land managers with a new suite of options when it comes to generating profits from their land. Improved water quality, increased water quantity and habitat creation represent some of the "products" land managers will soon be able to produce and sell through ecosystem service markets. These markets also provide anyone impacting the environment with viable alternatives for making-up for it—alternatives that meet regulatory standards, reduce costs and fortify natural resources.

What follows is a practical description of how land managers and regulated entities in the Willamette Basin may participate in a market for one ecosystem service—water temperature—through planting and maintaining riparian shade according to standards and processes developed by the Willamette Partnership.

The Willamette Partnership created tools that allow land managers to quickly assess a restoration site's potential, to quantify ecosystem services credits produced by the site and to allow for these credits to be tracked and traded. It has also defined a process through which trades may occur between willing buyers and sellers, and has developed the forms and practices needed to ensure transactions efficiently deliver the benefits that they are designed to.

This market for temperature credits represents the first of many markets that are likely to develop in the Willamette Basin and further abroad. Those land managers and regulated entities that make the effort to understand and participate in this market for temperature will be ideally-situated to participate in future markets for carbon, wetlands or other regulated ecosystem services.

In the meantime, the immediate objective of this Temperature Trading Handbook is to encourage the participation of buyers and sellers in a market for temperature credits, thereby leading to an overall increase in the Willamette Basin's ecological health by redirecting planned investments marked for improving water quality to the places and types of activities that provide the greatest ecological benefits.

SECTION II

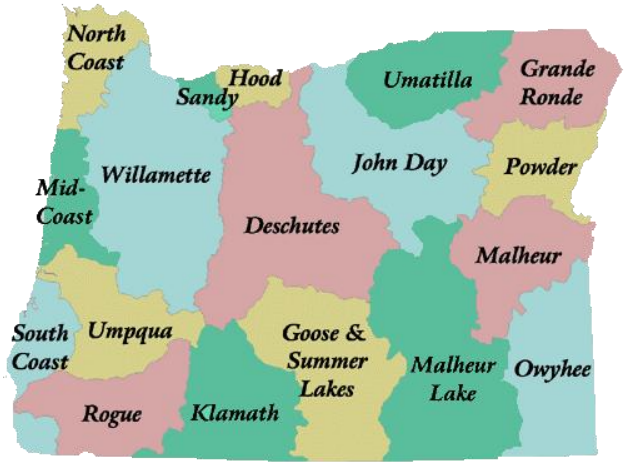
Introduction

On a patch of agricultural land in the Central Willamette Valley, a farmer considers planting plans and crop rotations for the coming years. This farmer has options when it comes to generating profits. Flat ground may be turned from grass-seed fields into wheat fields or nurseries. Sloping hills may be turned from berry bushes into vineyards or tree farms. The suite of alternatives selected by such a farmer depends on many things, but few are more important than economic viability.

A municipal sewage treatment plant operator downstream of this farmer reviews operations from his office window. The plant cleans water used by agriculture, industry and the people who live and work in the Willamette Basin. The plant, which collects the sewer waste of thousands, produces unavoidable impacts to the environment. Few alternatives exist for the plant operator to make-up for these impacts, and the options that are available don't adequately protect and restore the natural resources that the manager, and the people he serves, care about and depend on.

Emerging markets for ecosystem services will connect people, like the farmer and plant operator above, in new ways. Markets provide land managers with a new suite of options when it comes to generating profits from their land. Improved water quality, increased water quantity and habitat creation represent some of the "products" land managers will soon be able to produce and sell through ecosystem service markets. These markets also provide municipal plant operators, or anyone impacting the environment, with viable alternatives for making-up for their environmental impact—alternatives that meet regulatory standards, reduce costs and fortify natural resources. What follows is a practical description of how land managers and regulated entities in the Willamette Basin may participate in a market for one ecosystem service—water temperature. This market represents the first of many ecosystem service markets that are likely to develop in the near future. Those land managers and regulated entities that make the effort to understand and participate in this market for temperature will be ideally-situated to participate in future markets for carbon, wetlands or other regulated ecosystem services. These people and organizations will understand, early on, how market infrastructure and processes work. And, as our ability to quantify and organize ecosystem service markets in a meaningful way develops, they will be able to participate quickly in an Ecosystem Services Marketplace currently under development by the Willamette Partnership.

In the meantime, the immediate objective of this Temperature Trading Handbook is to encourage the participation of buyers and sellers in a market for temperature credits, thereby leading to an overall increase in the Willamette Basin's ecological health by redirecting planned investments marked for improving water quality to the places and types of activities that provide the greatest ecological benefit.



What is the Willamette Partnership

The Willamette Partnership formed in 2004 to capture the momentum created upon completion of the Willamette Restoration Strategy. The Strategy—created by a diverse set of stakeholders—articulates a vision for ecological health and economic vitality in the Willamette Basin and outlines critical actions needed to achieve success. Working with the stakeholder leaders who developed the Strategy, the Partnership was formed to accelerate needed innovations. One of these innovations is the establishment of an integrated marketplace for ecosystem services.

The U.S. Environmental Protection Agency selected the Willamette Partnership to receive funding through its Targeted Watershed Grant program in 2005 (one of 12 projects nationwide). The funding supported the Partnership's effort to create an innovative water quality trading program, which was designed to reduce stream temperatures to support salmon recovery. This handbook provides the buyers and sellers of temperature credits in the Willamette Basin with an easy reference manual for conducting trades within the framework established by this program.

Physical Context

The Willamette Valley in Northwestern Oregon unfolds between the volcanic cones of the Cascade Range to the East and the forested Coast Range Mountains to the West. Over the last 150 years, the Valley has amassed a large human population and a diversified industrial economy anchored by the Portland Metropolitan Area to the North and past Eugene and Springfield to the South.

Amidst all of these natural amenities and human development, the Willamette River and its tributaries drains enough water to make it the 13th largest river in the lower 48 states. The entire Willamette River Basin includes a land area of around 11,500 square miles, a population of around 2.5 million and around 75 percent of Oregon's economic activity. This economic activity produces substantial impacts to the environment, including municipal and industrial discharges into streams and rivers that warm their water temperature. All expectations are for the human presence to grow substantially over the next 30 years, along with the impacts such a presence carries with it. A temperature credit market, as envisioned by this effort, will occur only within the Willamette Basin for the purposes of supporting aquatic species threatened by human actions. Other trading programs will undoubtedly emerge for other geographies and this handbook will help guide participation when they do.

Regulatory Context

A major goal of the Willamette Partnership is to develop an Ecosystem Service Marketplace that accommodates transactions of the full spectrum of ecological functions and values present in the Willamette River Basin. Some programs that deliver pieces of this greater whole already exist, such as wetland mitigation and endangered species conservation banking. When fully developed, the Marketplace will build on these pieces and accommodate multi-party transactions that attract enough investment to support projects at a scale that will make an ecological difference. Currently, in response to the urgency of compliance with new temperature standards and significant investment by the Environmental Protection Agency, the Willamette Partnership developed the infrastructure and processes to facilitate transactions that reduce water temperature in the Willamette River and its tributaries. It is upon these transactions that this handbook is focused.

The Willamette River, operating properly, would naturally produce the cool water fish need. However, essential human activities warm it and rising river temperatures negatively affect native species that use the river. To protect these species, the river's temperature must be lowered. A public agency, the Oregon Department of Environmental Quality (DEQ),

responded to this problem by designing a regulation that requires those responsible for warming the river to mitigate their activities—lessoning or eliminating their impact on water temperature. Called the Willamette Basin Temperature TMDL (Total Maximum Daily Load), this regulation requires reductions until water quality standards are met. Traditionally, methods designed to cool water and meet TMDL standards might include expensive concrete and steel infrastructure. Such solutions may produce cooler water at the end of the pipe, but they do little else to improve the environment. However natural infrastructure, like vegetation along streams and active gravel channels, cools river water too (or at least prevent it from warming). Such infrastructure also has the added benefit of producing a wide variety of other ecological benefits like habitat, erosion control, flood-control and water filtration.

Those who increase water temperatures generally don't have the ability to restore or acquire natural infrastructure to meet their permit requirements. Even if they have the land or natural resources to build it, permits issued by regulatory bodies generally don't have practical way to compare the restoration of natural infrastructure to the impacts they are designed to offset. Conversely, many landowners who could "build" natural infrastructure, due to their ready access to the natural resources needed, have little financial incentive to do so and no capacity to connect their activities to those of regulated entities. However, if those increasing temperature could pay others with the capacity to reduce temperature naturally, and if these reductions could be strategically targeted on the landscape, then both compliance and significant ecological restoration might occur simultaneously.

Temperature credits represent a new way of thinking about ecological restoration. The Willamette Partnership, working in concert with a variety of vital stakeholders, designed a market for temperature credits, based on demand created by the Willamette River TMDL, which allows for natural resource managers to be compensated for actions that produce desired ecological benefits. Taken from another perspective, it allows regulated parties to meet their compliance requirements as inexpensively as possible by connecting their environmental impacts to the voluntary actions of the land managers conducting restoration. In short, the temperature market makes it possible for people with regulatory obligations to buy the ecological service of cool water from others who restore ecosystems.

SECTION III

The Unit of Exchange

Temperature Credits: Making a Credit

In the Willamette Basin, the Willamette TMDL for water temperature drives demand for temperature credits. DEQ issued this regulation in response to human activities that were warming the Willamette River and its tributaries to a point where the water body could no longer fulfill its established beneficial uses. The base unit of trade for the temperature market, a credit, is composed of kilocalories. According to DEQ, a credit is the amount of pollutant reduced over a specified time period by a particular action that goes beyond the threshold established by existing regulations. Specific to this handbook, each credit in the temperature trading market represents one kilocalorie per day generated by riparian shade

What is a kilocalorie?

A kilocalorie is a unit of heat equal to the amount required to raise the temperature of 1000 kilograms of water by one degree at one atmosphere. There are other ways to quantify heat and or energy (such as joules) but DEQ settled on this metric as one that is commonly understood and practical for application to water-quality trading.

Five Activities that Create Credits

The suite of potential temperature reduction activities included in the market for temperature was limited to restoration activities that provide a variety of ecosystem benefits, including temperature improvements. This decision reflects the Willamette Partnership's primary goal of restoring the ecosystem of the Willamette Basin, not just reducing the cost of compliance for permit-holders (although this is expected to).

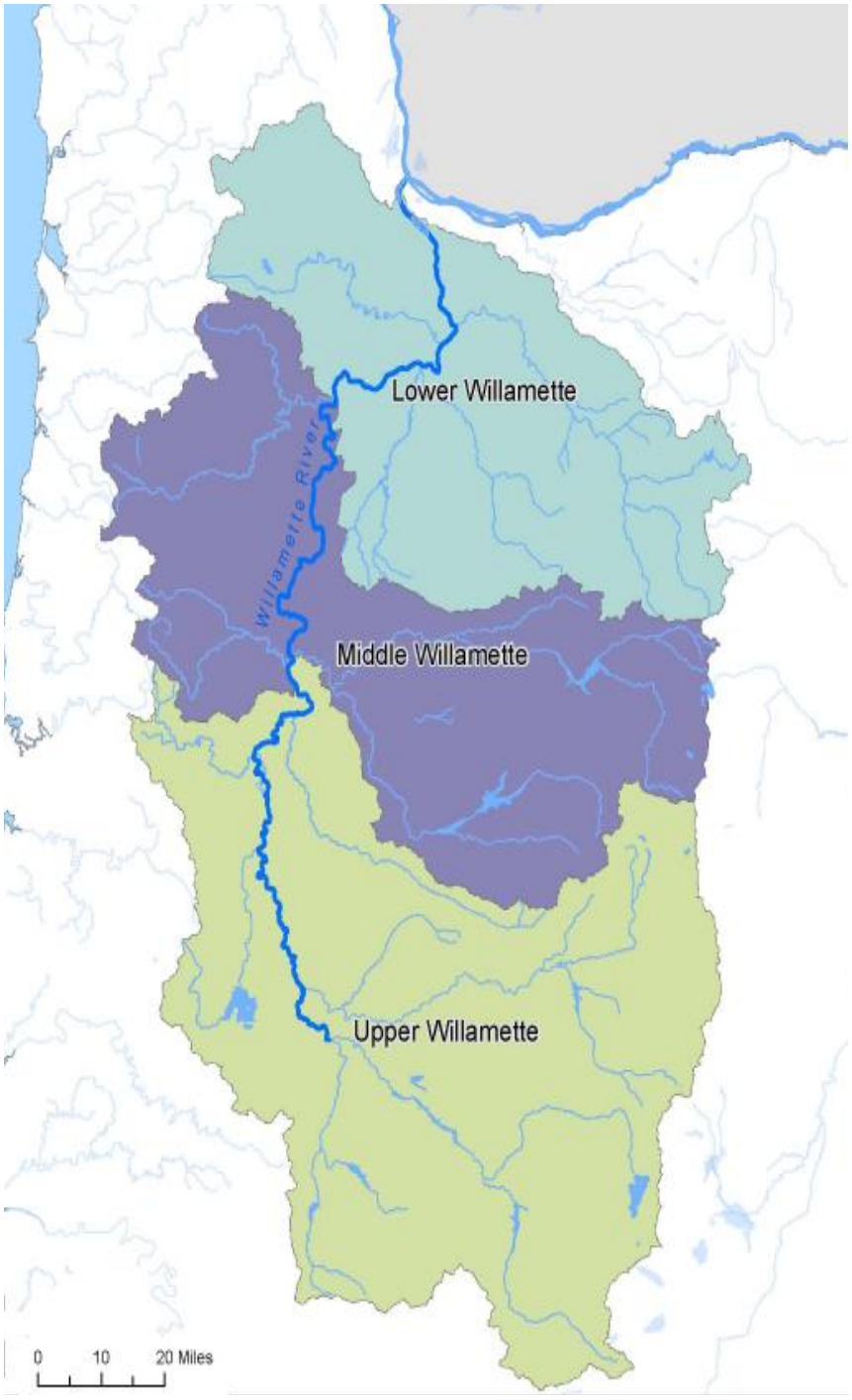
Work has been done to define temperature credits from five types of activities:

- Riparian shade restoration: Planting trees and shrubs next to streams to provide shading
- Flow augmentation: Increasing the flow of water in-stream to increase the velocity of the stream and thus reduce the amount of time water is exposed to solar warming.
- Wetland restoration: Developing wetlands to cool effluent prior to discharge, restoring natural wetlands.
- Floodplain restoration: Restoring a river's access to side channels and other floodplain features.
- Wastewater reclamation/reuse: Reducing the volume of clean, warm water that is discharged to the river.

The scope of this handbook is limited to buyers and sellers involved in riparian restoration projects. While the other types of projects from the list above will likely occur over the long term, this handbook focuses its attention on riparian shading, because it seems like the place where the largest number of people with the most questions will become engaged in the near term.

Service Areas

Service areas mark the geographic boundaries within which buyers and sellers of an ecosystem service credit can interact. The areas are based on the service being performed. The Willamette Basin Temperature TMDL identifies three points of maximum impact, which help define three service areas for temperature offsets. Temperature credits generated anywhere upstream of a point of maximum impact in the basin are available for use by buyers within, or downstream of that service area. The three service areas for temperature trading in the Willamette Basin are the Lower, Middle and Upper Willamette Service areas. (please see map below)



SECTION IV

Tools, Forms and Parties Involved

Tools and Forms

The Willamette Partnership created new processes and technology to efficiently, equitably and transparently match potential buyers and sellers of temperature credits. It also developed a technical and legal framework that facilitates exchanges of temperature credits and it made sure that the framework:

- is trusted by regulated parties, private land managers, regulatory agencies and the public,
- meets specific TMDL objectives for reducing temperature in the Willamette River,
- drives investments to restoration actions that provide the greatest environmental return to the Willamette watershed, and provides financial incentives for land managers to restore priority areas on a coordinated schedule.

Overall, this framework allows landowners or their representatives to assess lands that have the potential to deliver temperature credits; independently verify the land's ability to provide them; register and certify their availability; and then allow for their exchange. Given the limited number of parties in the Willamette Basin needing temperature credits, a fully operational financial exchange platform is not needed at this time; however, some innovative and unique infrastructure has been developed. The following pages describe this infrastructure in greater detail.

Credit Calculator Tool

The Credit Calculator is a standardized spreadsheet tool (using Microsoft Excel software) developed to help market participants calculate temperature credits from different types of restoration activities, including riparian shading, wetland systems, flow augmentation, and the reclamation and reuse of wastewater. In each of the Credit Calculator worksheets, there is a "screening level analysis" and a "detailed analysis" section. The screening level is intended to enable a user to provide some relatively simple inputs to evaluate if a particular activity is likely to generate temperature reduction credits. It is intended to provide users with estimates of credit generating potential and its outputs do not constitute agency approved credits. The detailed analyses section provides guidance for more comprehensive analysis using an agency-accepted model that provides the exact number of credits a restoration activity will receive. The detailed analysis section requires specialized technical skills, so people considering participation should complete the detailed analysis before investing heavily in this market.

The Willamette Partnership's Credit Calculator may be accessed and downloaded on the following page of the Partnership's website: http://www.willamettepartnership.org/tools-templates

Credit Registry-Tool

The Partnership, working with private and public partners, developed a Registry and exchange tracking platform that (1) serves the initial transactions in the Willamette Basin temperature market; and (2) lays the groundwork for evaluating the infrastructure needed for eventual implementation of the fully functional web-based system that will accommodate credit accounting and tracking across markets, jurisdictions, and regions. The Credit Registry performs three major functions. It centrally registers credits, tracks their development and assignment, and then accounts for them over time to ensure their validity and quality. The functions served by the Registry are essential because temperature credits retain their value only if the restoration action that generated them continues to perform its specified ecological function(s). Thus, the Credit Registry for temperature credits tracks ongoing management, monitors, and then reports on restoration projects that generate temperature credits to be sold in the market. Currently the Willamette Partnership has registered, with certification pending, three completed projects capable of offsetting more than 17 million kilocalories per day in the lower Willamette Service Area.

The Willamette Partnership's Registry may be accessed and downloaded on the following page of the Partnership's website: http://www.willamettepartnership.org/tools-templates

Riparian Planting Protocols

The Oregon Department of Environmental Quality (DEQ), working with other partners, established a precedent on the Tualatin River for defining temperature credits based on riparian restoration plantings. DEQ used a model to predict the thermal benefit of increased shade provided by restoration plantings. Credits were defined as modeled temperature reductions measured in kcal/day that would be generated from restoration plantings at full maturity. The credits were then used to offset the operational impacts of a local wastewater utility.

The Riparian Planting Protocols developed by practitioners working with the Willamette Partnership builds off of this work and provides 1) the minimum riparian re-vegetation requirements for projects to be eligible to generate credits, and 2) voluntary guidance and recommendations for successful riparian re-vegetation based on early localized experiences with thermal credits, but with modifications for the broader Willamette Basin. The minimum re-vegetation requirements define what a sites vegetation should be when the restoration action is complete and what it should look like five years after completion assuming it is successfully registered and verified.The Willamette Partnership's riparian planting protocols may be accessed and downloaded on the following page of the Partnership's website: http://www.willamettepartnership.org/tools-templates

Forms

Buyers and sellers in the temperature market will consistently use forms created by the Willamette Partnership to standardize the process through which credits are registered and tracked. The actual sales agreement between buyers and sellers, in which the price of credits is established, will be drafted by the parties involved in the specific transaction. The Willamette Partnership has created templates buyers and sellers can use as a starting point, but contractual relationships between buyers and sellers will be unique. Each form below serves a distinct purpose essential for smooth registration and transaction.

Standard Agreement for Credit Registration.

The Standard Agreement for Credit Registration is a template for describing credits that have been generated and are ready to be recorded in the Registry. The agreement template guides users through information needed to register projects with credits and forms the basis of the relationship between a credit seller and the registrar. The agreement provides general information about the credits to be registered—including calculation methods, credit assurances, maintenance, monitoring and use—so that credits can be offered to prospective buyers.

Standard Agreement for Credit Verification Services

The third-party verification of projects is one of the mechanisms used to ensure credit integrity and to reduce risk in markets. The Standard Agreement for Credit Verification Services formalizes a relationship between a sellers and a verifier. Under this agreement, a verifier audits the credits and associated documentation, procedures, processes, and plans submitted by a seller to ensure compliance with applicable standards. These standards include credit generation practices, credit calculation methodologies, credit assurance protocols, maintenance requirements, and monitoring obligations. The agreement identifies the specific credits to be verified and the necessary components required for verification. It refers to guidance, standards, and other information specific to the types of credits being verified. Third-party verification of this sort is not currently required by DEQ. However, it is required by the Willamette Partnership to record credits in the Registry. Verification provides credit buyers, credit sellers and the general public with assurance that the quality of credits is consistent and high.

Standard Agreement for Credit Exchange

The Standard Agreement for Credit Exchange template helps buyers and sellers negotiate a contractually-binding agreement for exchanging the ownership of credits. This template is essentially a checklist and overview document that provides the information needed to assure a potential buyer that the credits he or she is buying are real and meet regulatory standards and requirements. This agreement also provides general information about the credit to be exchanged, credit assurances, registration, maintenance, monitoring, compensation, and other information. This document is only a template. Each contract between buyers and sellers will be unique. This document was created to help provide guidance.

Buyers Registration Form

The *Buyers Registration Form* establishes a buyer with the Registry. The form asks for general information about the buyer and creates an account for the buyer that tracks the certified credits it purchases.

Buyer's Notice of Sale Form

This form will be submitted to the Registry after the sale of credits is finalized between the buyer and the seller. It memorializes the sale and serves to notify the Registry to transfer ownership of a certified credit from a seller to a buyer in the Registry.

The Willamette Partnership's forms may be accessed and downloaded on the following page of the Partnership's website: http://www.willamettepartnership.org/tools-templates

Parties Involved in a Transaction

Outside of the seller who creates the credit, and the buyer who wants it, a few other parties will consistently be involved with all temperature credit transactions in the Willamette Basin. These include DEQ, which will need to grant permission to regulated entities (buyers basically) under its jurisdiction to allow them to participate in temperature trading as part of their permits. DEQ has also made it clear that they support public participation throughout the development of water quality programs. Permit holders seeking to incorporate trading should expect to go through a formal public review and comment process prior to receiving permission to do so from the agency. At the tail end of the trading process, DEQ will also review the credit verification process periodically to ensure credits meet agency standards.

The Willamette Partnership is another player present in all transactions. As currently planned, the Partnership will operate and maintain the Credit Registry and also manage the independent verification of credits. The Partnership will not be doing the actual verification of credits. Instead, it will be selecting professionals through a standardized process to do this work. These professionals will be trained through a standard curriculum created by the Partnership, but will not be employed or paid by the Partnership. It is also important to note that all temperature credit transactions are going to be temporary, in that sales contracts will limit them to being active for a specific number of years. According to DEQ guidance, however, shade credits are viable and contracts can be renewed so long as projects continue to provide shade. Therefore, credits may be renewed and placed under a new contract when an old one expires.

Selling Credits in Priority Areas

DEQ trading guidance will ask buyers to purchase a majority of their credits from priority areas. There are several tools available to identify these priorities, including maps developed by DEQ. A coalition led by The Nature Conservancy has also developed a "Synthesis Map"—or a map that combines the results of several prioritization efforts.

The Synthesis Map identifies, according to a combination of respected studies, the prioritized areas for restoration in the Willamette River Basin. Any land manager with land in the Basin has the potential to participate in the temperature trading market. However, public policy has created incentives for restoration actions in prioritized areas, making them the most attractive places for land managers to focus their restoration efforts. DEQ has provided guidance that half of all credits purchased by any single permit must be from priority areas. A copy of the Synthesis Map is included in the addendum. A more detailed version is available on the Partnership's website, along with information on how to reference the map using tax lot information for each county in represented in the Basin.

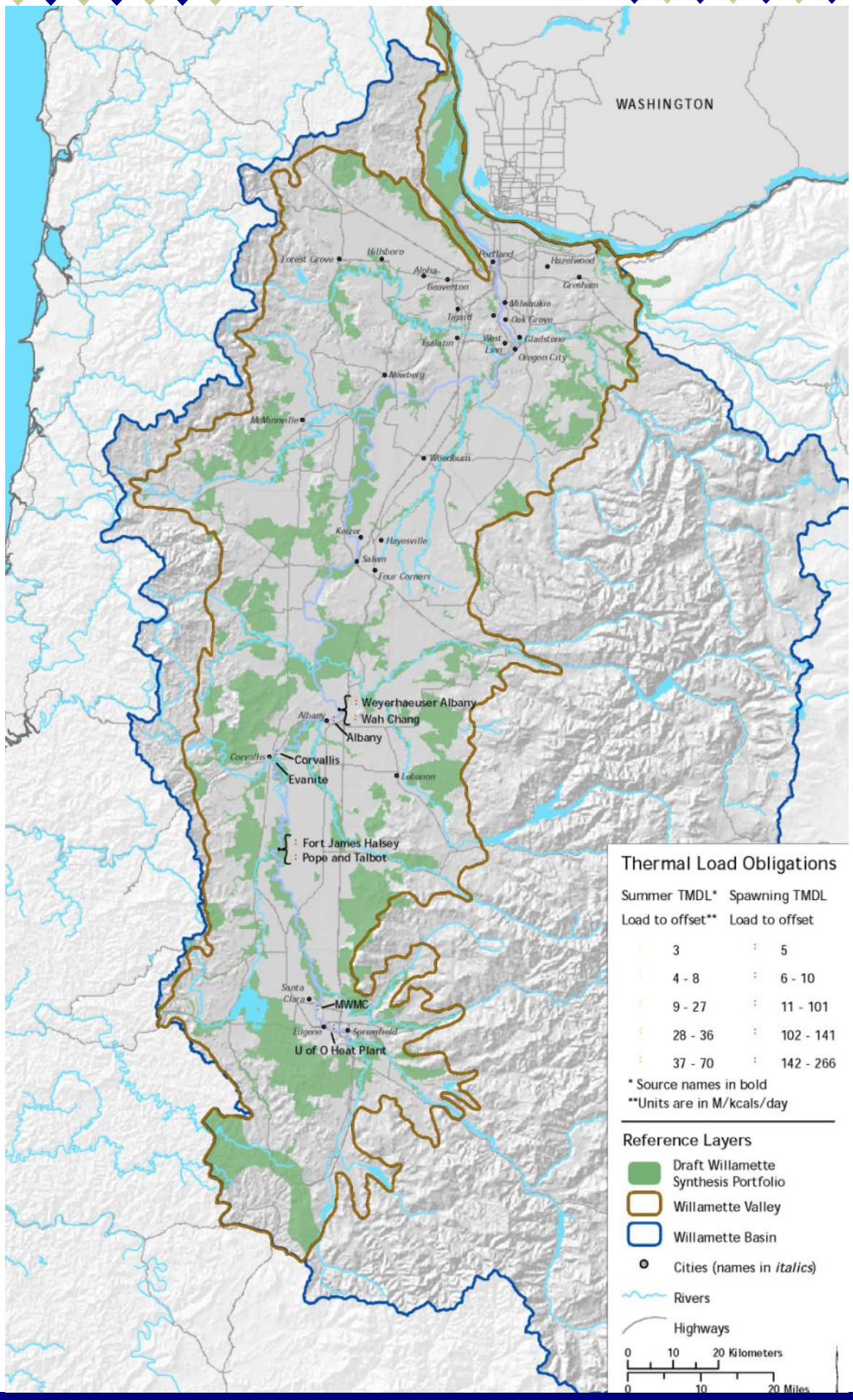
SECTION V.

Sellers

The sellers in the market for temperature credits will be land managers in the confines of the Willamette Basin who have undertaken restoration actions that meet approved criteria. As previously mentioned, this handbook focuses exclusively on the riparian shade methodology for generating temperature credits. Floodplain restoration, wetland restoration, flow augmentation and wastewater reuse will be included in future versions of the handbook. It is likely that these activities will be undertaken as part of larger programs operated by regulated entities, not private landowners. Land managers that participate as sellers in the temperature market will need some administrative, regulatory and legal expertise—although anyone with a basic familiarity of Microsoft's Excel program should be able to do an initial evaluation of a site's potential.

The following steps outline the process a land manager would follow to generate, register and sell temperature credits based off of a riparian shade restoration project.. Site Selection. A seller selects a potential site to conduct restoration activities. Steps include:

a. Review of a DEQ-Approved map of priority places: Identify which riparian areas proposed for restoration fall within priority areas established by this map. The Partnership is currently developing an easily accessible resource for making such determinations.
b. Determining Eligibility: Confirm the site's potential to deliver temperature credits prior to engaging in restoration work. Review the eligibility requirements issued by DEQ and augmented by the Credit Registry. If the site and design are eligible, sellers will use the Credit Calculator's "screening level analysis" for an initial investigation of credit potential. This step represents a back of the envelop analysis that determines whether or not a more detailed analysis of the site is warranted. A screening level analysis requires geophysical data that defines the size, location and orientation of the proposed project. It also requires data about existing vegetation at the site.


WASHINGTON
Forest Grove
Hillsboro
Portland
Hazelwood
Alpha
Beaverton
Gresham
Tigard
Milwaukie
Oak Grove
Tualatin
West Linn
Gladstone
Oregon City
Newberg
McMinnville
Woodburn
Keizer
Hayesville
Salem
Four Corners
Albany
Corvallis
Evanite
Lebanon
Weyerhaeuser Albany
Wah Chang
Albany
Corvallis
Fort James Halsey
Pope and Talbot
Santa Clara
MWMC
Eugene
Springfield
U of O Heat Plant
Thermal Load Obligations
Summer TMDL* Load to offset**
Spawning TMDL Load to offset
3
5
4 - 8
6 - 10
9 - 27
11 - 101
28 - 36
102 - 141
37 - 70
142 - 266
* Source names in bold
**Units are in M/kcals/day
Reference Layers
Draft Willamette Synthesis Portfolio
Willamette Valley
Willamette Basin
Cities (names in italics)
Rivers
Highways
0 10 20 Kilometers
0 10 20 Miles

2. Initial Credit Calculation. With a basic understanding of the site's location and the site's potential to generate temperature credits, sellers may then choose to carry on with a more in-depth analysis of the site to determine the exact number of credits it can produce. Steps include:

a. Pre-restoration Planning and Documentation: Prior to credit calculation, sellers will need to de lineate the project boundary and develop initial restoration designs that include plant species, planting densities, anticipated vegetation height, and the extent of planting. Sellers will also need to document the existing conditions at the proposed restoration site. Photo monitoring points should be established, photos must be dated and cover the proposed site from multiple perspectives and distances.

b. Credit Calculation: Sellers will use the Credit Calculator's "detailed-level analysis" to determine the number of credits that will be produced at a site. This function of the Credit Calculator establishes the existing ecological conditions of the site (baseline), defines the restoration actions to take place, determines the total amount of additional ecological benefit these actions will produce and then assigns the project credits.

Restoration: Complete the restoration work according to the geographic boundaries established by the Credit Calculator and the Partnership's riparian planting protocols.

3. Conditional Credit Registration. Up to this point, potential sellers have worked independently (perhaps with a consultant's help) to evaluate a site's potential to produce temperature credits and to conduct the restoration work needed to make them a reality. Before credits can be sold, it is necessary to go through a more formal process to register the credits. Steps include:

a. Completion of a Standard Agreement for Credit Registration: This form is available online and in the addendum of this handbook. It must be mailed to the Partnership's Registrar (The Willamette Partnership, Attn: Joni Shaffer, 2550 SW Hillsboro Highway Hillsboro OR 97123).

b. Payment: Applicants for temperature credits must pay a registration fee that covers the cost of administering the Registry and other direct costs associated with tracking and maintaining records of credit projects. This fee is independent of the costs associated with actually verifying the credits in question. The pricing structure for the Credit Registry and other services will be established at the time of registration.

c. Receive Conditional Acceptance Notification: The Willamette Partnership Registrar will notify sellers when their credits have been conditionally accepted into the Registry and ask if seller wants to begin verification. It will also notify sellers if registration has been denied and what corrections, if any, would be required for a successful application.

4. Credit Verification. It is expected that those interested in generating temperature credits will be acting in good faith. However, to provide assurance to regulators and to the public, all conditionally-accepted credit registrations undergo independent verification through the following process:

a. A seller is randomly assigned an accredited verifier from a list managed by the Partnership.
b. The seller and verifier sign a *Standard Agreement for Credit Verification Services.*
c. The verifier conducts a full verification of the conditionally-accepted credits, starting with the credit calculation process and ending with a site visit.
d. The verifier provides the seller with a draft copy of their findings in a report and:

- If the restoration activity meets standards, then the verifier will submit the project into the Registry for accreditation.
- If the restoration activity does not meet standards, then the seller can either accept the revised credit quantities proposed by the verifier, make changes that will lead to full verification (if noted as possible by the verifier) or enter a formal dispute resolution process with the verifier.

5. Credit Certification. Certified credits are the only credits available for sale on the Credit Registry. Conditional credits enter certification only after the Registry receives a verification report from the verifier and approval from the seller to certify. Certification includes:

a. A Registry review that guarantees all paperwork. and site documentation is accurate and complete
b. Issuance of credit certificates by the Registry which are then entered into the Credit Registry by the Registrar.

6. Selling Credits. The actual sale of credits is a straightforward process that mainly involves the seller and buyer. The Registry and the partnership will not be involved with any financial transaction between buyers and sellers.

a. When credits are certified, a seller will be notified and asked whether they want to list credits for sale and at what price.
b. If seller approves credits for sale, they will be listed on the exchange portion of the Registry.
c. A seller can find their own buyers, or the Registry will make lists available of all credits for sale to any interested buyers.
d. All terms of sales are negotiated directly between buyers and sellers.
e. Once a deal is finalized, both parties will complete a Standard Agreement for Credit Exchange and submit it to the Registry.
f. The Registry will mark the credits as sold in the seller's account and link the credits to the buyer's account.

7. Track the Credits. Sellers will need to conduct annual verifications of all credits they develop until the credits are sold. The failure to verify credits will result in their removal from the Registry. Sellers will use the same verifier for the first five years.

SECTION VI.

Buyers

The buyers of temperature credits include any public or private entity with a regulatory obligation to reduce the impact of their operations on the water temperature of the Willamette River and its tributaries. Buyers might also include any entity interested in purchasing a credit to retire, use or resell. The process for these buyers to purchase credits demands interaction with many parties and a commitment to the long-term monitoring of restoration projects associated with purchased credits. While buying and selling credits does require third party registration, verification and tracking, the final contract of sale for credits will be exclusively between a buyer and the seller.

1. Permit Allowance. The potential buyers of temperature credits must receive formal approval from DEQ, within their NPDES permit, to achieve partial or full compliance with their permit through the trading of credits. The Willamette Partnership has draft permit language available on its website that DEQ has accepted for existing permit-holders. Buyers should be aware that this process will require a public comment process.

2. Credit Calculation. The number of credits a potential buyer is required to purchase depends on the amount of heat, in kilocalories per day, allowed under their NPDES permit, and the options available to them to meet this standard. This amount will therefore be determined by regulations enforced by DEQ.

3. Credit-Type Selection. Much like the variety of options new ecosystem service markets bring to land managers from ecological restoration activities, markets also provide new options for buyers to meet their regulatory requirements. For temperature, this includes three main categories: standard pre-market compliance options, point source to point source trading and point source to non-point source trading. A buyer must therefore decide on how heavily to depend on each of these options by asking the following questions:

a. How much of a temperature reduction from process improvements or technology might be achieved?
b. How many credits from point sources are available?
c. How many credits from non-point sources are available?
d. What are the costs for each of these options?

Some regulated entities, by nature of their location in the Willamette Basin or inability to find reasonably priced technological fixes, will move towards the non-point source option out of necessity. All evidence suggests that, in a mature market for water temperature credits, the purchase of credits from non-point sources will be the least expensive option for buyers.

4. Finding a Seller. Buyers will not be obligated to buy temperature credits listed on the Registry. They will have the opportunity to contact potential sellers directly, or even develop credits themselves for their own use. In any case, DEQ suggests that all credits be certified by a Registry, such as the Partnership's Registry, prior to use. Credits not placed on the Registry will not be required to go through the same process, but will require DEQ-approval before being released for sale. The Partnership expects that, by having the most current and comprehensive database of available credits in the Basin, buyers will want to work through the Registry first.

5. Set up a Buyer's Account. This requires that a buyer fill out a buyer's registration form and submit it to the Registry. Buyers will pay an account origination fee to help defer the costs of managing the Registry.

6. Negotiate and Finalize a Credit Purchase. The Registry does not set the price of the credits listed, nor does it set the terms and conditions of sales. The price, terms and conditions are all set and agreed upon by the seller and buyer—with the only exception being the monitoring requirements associated with final certification. All buyers will follow the process below:

a. Buyer and seller fill out a Standard Agreement for Credit Exchange that includes price, moni toring, liability, duration and other terms of the sale once a willing seller is found.
b. Buyer reports the sale, upon completion, to the Registry.
c. Once a transaction is complete, the Registrar moves the credits from the seller's account to the buyer's account. The buyer will get regular reports regarding the status of the credits including monitoring reports.

7. Annual Monitoring Reports. The natural landscape is dynamic, requiring the ongoing monitoring of restoration sites to make sure that they continue to provide the ecosystem services credits for which they are intended. Sellers will pay verifiers to conduct a full verification of the entire credit calculation process, which is likely to include a site visit, in years one and five. A verifier will also conduct desk audits in years two, three and four. In every instance, the verifier will be selected through a standard process managed by the Registry and paid for by the seller. Sellers are responsible for submitting annual monitoring reports to the Registry, buyer and DEQ (these reports are designed to meet DEQ's reporting requirements).

A Case Study for Temperature Trading

In 2004, DEQ issued a new kind of permit to a public wastewater and surface water management utility operating in the Willamette Basin. This utility discharged clean but warm water from its water treatment plants into a local river. The discharges degraded the ability of the river to provide vital ecosystem services. Facing new and more stringent regulation, the utility chose to pursue a more natural approach to manage its temperature impact one encouraged by its new permit. By purchasing temperature credits generated on private lands through planting riparian shade, this approach has successfully generated profits for private landowners, savings for the utility and a variety of benefits for the environment over the last five years.

Credits are sold by farmers upstream from the utilities points of discharge. They create credits through planting streamside vegetation. Through contracts, sellers guarantee to the utility that they will maintain their improvements for decades. The utility has saved its ratepayers money because, in this case, relying on natural processes was cheaper than installing technological fixes. The landowners, mostly farmers, are paid for managing their land for its ecological value and the ecosystem services it can provide, rather than for commodity production. They receive a stead and predictable stream of revenue for enrolling their lands and shade generating programs offered by the utility.

Native vegetation cools the water naturally, which aids struggling salmon and other cold-water species. This satisfies the requirements of the new and more stringent regulation. More broadly, natural processes are restored that provide a multitude of ecosystem services: erosion control, flood control, runoff filtration, carbon sequestration, and expansion of habitat for native fish and wildlife.

In the first three years of using the approach, the utility signed agreements with about 20 different landowners and enrolled over 130 acres, or about 4.5 miles of stream shade. The trees planted under these programs are relatively fast growing natives that will shade the tributaries within the 10-15 year life of enrollments. Cost savings for the utility have been estimated in excess of $50 million dollars. Money that would have been spent on concrete and steel refrigeration units, that could not supply the diversity of benefits riparian shade does and is concurrently working to provide the ecological resiliency people depend upon for clean water and a host of other vital services.

SECTION VII.

Addenda

All of the following tools and forms may be downloaded at: http://www.willamettepartnership.org/tools-templates

- Credit Calculator
- Credit Registry
- Riparian Planting Protocol
- Standard Agreement for Credit Registration
- Standard Agreement for Credit Exchange
- Standard Agreement for Credit Verification Services
- Buyer's Registration Form: Just says buyer has these credits and no body else owns them

Buyer's Notice of Sale Form

SECTION 11

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