# BEYOND COMPLIANCE: TRANSFORMING THE WAY WE MANAGE, REGULATE, RESTORE AND SUSTAIN ECOSYSTEMS BY BUILDING THE WILLAMETTE ECOSYSTEM MARKETPLACE

The Willamette River Basin is a landscape of cities, rural communities, farms, forests, and wild lands where natural beauty and quality of life are cherished by citizens and enticing to thousands of newcomers each year. The basin stretches 180 miles from Cottage Grove to Portland and encompasses over 11,000 square miles, or 12% of the state. This is a landscape defined by its waters, where nearly 16,000 miles of wetlands, creeks, streams and rivers feed the Willamette River main stem that flows from its headwaters in the Cascades and Coast Range, north to its confluence with the Columbia River. It is the 13th largest river by flow and produces the most runoff for its land area of any river in the continental United States.

Here the dynamic interactions between rivers and their floodplains, riparian areas and wetlands play a critical role in the maintenance of biological diversity and water quality. On the southern valley floor the Willamette River floodplain was historically a complex network of braided channels cutting through river sediments and glacial flood deposits. Since the influx of settlers began in earnest in the 1850s, people have altered the landscape to the degree that river channels and islands have decreased by more than 60%, and the total length of all channels has dropped from 210 to 115 miles. Valley riparian forests that provide shade, floodwater storage and habitat have diminished by 80 percent. In the absence of seasonal fires, oak woodlands and savannas have declined by 88%. Willamette upland prairies are among the most endangered ecosystems in North American and less than 5% of valley wetlands that existed in 1850 exist today. These losses result in decline of biological diversity and water quality including raised water temperatures in the lowland areas of the Willamette River Basin. Restoring the health of a complex watershed, continually altered to meet the needs of an ever-growing population, will require a coordinated approach that focuses investments on the strategic actions that provide the greatest ecological benefit.

People in the Willamette Basin spend tens of millions of dollars every year to improve the quality of the environment. They trust that the regulations and institutions they have put in place will protect the ecological integrity of the place they love. Yet despite the past successes of strong regulations and the good intentions of current investments, we haven't achieved desired results. Site-by-site, species-by-species, and pipe-by-pipe approaches to conservation are narrowly focused, uncoordinated and do not support the natural dynamic processes that sustain the resources we depend on and care about.

The Willamette Partnership is creating a system for making these high priority strategic investments in ways that benefit landowners, regulated industries, urban areas and basin citizens. This is the story of how this effort began, where it stands today and what we anticipate will happen next.

**The Willamette Partnership**

For well over a decade, citizens of the Willamette River Basin have been striving to develop a workable harmony between society's use and conservation of its natural resources. Over the years, a number of leaders have come forward to champion, guide and energize the research, planning, education and restoration actions that have retained the livability enjoyed in the Willamette River Basin, and secured Oregon's reputation nationwide for conservation innovation. After more than a decade of building trust and a common vision for ecological health and economic vitality, these leaders formed a coalition representing the interests of cities, businesses, agriculture, industry, research, conservation and education. They called it the Willamette Partnership.

The organization's mission is to secure the means to focus significant investments in large scale restoration actions in the highest priority areas of the basin. Worldwide, there is a 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 healthy intact ecosystems--sustainably 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 provide fish and wildlife habitat. The shift worldwide is in thinking of these ecosystem services as having intrinsic value that can be priced and purchased or traded.

The concept behind ecosystem markets is fairly simple. Environmental regulations set standards to protect natural resources. Industries, businesses and individuals who engage in practices that change the land or water must meet these regulatory standards or compensate for additional degradation. For example a developer who damages a wetland must replace it with a wetland, either onsite or elsewhere. Cities and industries must clean and cool wastewater before releasing it into a river. Ecosystem markets provide a way for regulated parties to pay others--farm and forest land owners and managers--to restore wetlands, plant trees along streams or provide other ecosystem improvements. In so doing, markets provide a way to attain greater environmental benefit at lower cost. Ecosystem markets make good economic sense, letting us invest money much more effectively.

The Willamette Partnership is harnessing and guiding these market-based incentives in order to make significant progress toward strategic conservation goals. The Partnership recognizes a thriving marketplace as the means to increase investment in the most ecologically important areas, to restore the ability of natural systems to renew themselves and by so doing protect the public interest and reduce the likelihood of increased regulations into the future.

**The Work**

A marketplace is not built in a day. As momentum for market-based incentive programs was building, the Partnership needed an initial market with immediate demand in which to craft the structure and test the efficacy of basin-scale trading programs. Within the Basin there was an emerging market for water quality. In 2003 and 2004, the Oregon Department of Environmental

Quality was working with stakeholders to complete a draft management plan for reducing the temperature of surface water in the Willamette Basin. The plan would set a temperature threshold called a *total maximum daily load* or *TMDL* for rivers and streams within the basin. The agency would then allocate responsibility for temperature reductions to the cities and industries that have permits to release effluent into these rivers.

Each of these permit holders would be required to reduce the temperature of their effluent by a specific amount (expressed in kilocalories per day) or face penalties. Permit holders could install on-site, end-of-the-pipe wastewater refrigerators but these are extremely expensive to construct and operate and provide limited environmental benefit. Cities, industries, and conservation organizations wanted instead to find more ecologically beneficial ways of investing in temperature reduction.

**Cooling a River**

Rivers and streams have ways of cooling themselves naturally. Recent studies show that a significant amount of Willamette River water flows through floodplain gravels below and alongside the river in an area called the *hyporheic zone*. Water that emerges from this subsurface gravel is significantly cooler than other parts of the river. By one estimate, the river's historic access to hyporheic gravels may have been five times as great as under current conditions.

Wetlands, like floodplains, accept floodwaters, filter the overflow and provide space for gradual percolation into the groundwater aquifer. Historically, during hot summer months, many streams in the basin were fed cold spring water from these groundwater aquifers. Where wetlands have been drained and streams over-tapped for irrigation and domestic use, summer stream flows have dropped and temperatures have risen. Even in a normal year some 60 miles of streams in the basin go dry from water withdrawals.

Rivers naturally remain cool by flowing through shady corridors of trees and shrubs. River riparian areas work as a buffer between the water and the land, provide habitat for a suite of animals and plants, and filter runoff before it reaches the river. In 1850 the Willamette was lined with riparian forests averaging one to two miles wide. Near the confluence of the Santiam and Willamette it was seven miles wide. Today only 20% of the area covered by riparian vegetation in 1850 remains, much of it one or two tree-lengths wide.

Elevated temperature in the Willamette River system poses a major threat to cold-water-dependent aquatic species, especially upper Willamette River spring Chinook and winter steelhead.

The draft TMDL for temperature noted "water quality trading is an approach that can offer greater efficiency in achieving water quality goals on a watershed basis." There is a model within the Basin that serves as the prototype for the economic efficiency and ecological effectiveness of trades for water temperature. Clean Water Services, the waste water treatment agency serving the rapidly urbanizing Tualatin Basin, had established a water temperature trading process. In March 2004, working with the U.S. Environmental Protection Agency and the Oregon Department of Environmental Quality, Clean Water Services negotiated the first integrated municipal watershed-based permit in the nation. The permit covers their four municipal wastewater treatment facilities

and allowed for Oregon's first water quality trading program. The new permit reached beyond water pollution control to address the complex interrelationships between water quality (Clean Water Act), water quantity (water supply) and wildlife habitat (Endangered Species Act) and helped streamline water quality programs in ways not possible using technology and the existing regulatory framework.

Given pending temperature restrictions facing cities and industries in the basin, there was a high level of interest in exploring application of a trading concept across the basin, adapting it to the unique qualities of each watershed and ultimately expanding it to address interests beyond water temperature. Voila! Water temperature trading emerged as the logical initial Willamette Ecosystem Marketplace transaction.

In spring 2004, stakeholders in the basin recognized that the new temperature standards would require permit holders to manage wastewater differently. As a result, researchers, wastewater managers, industry representatives and restoration practitioners began discussing in earnest the opportunity to use floodplain restoration and river hyporheic zones to cool effluent through direct discharge or by restoring the river's access and movement of gravels and cobbles. A coalition of interests submitted a proposal for funding from the federal Environmental Protection Agency's Regional Geographic Initiatives program to convene stakeholders and gain better understanding of the issues and complexities of such an endeavor. It was clear from conversations with waste water managers that a single organization needed to take the lead. The Partnership submitted a proposal to the Department of Environmental Quality for funding to explore temperature trades.

In November 2004, the Partnership received $42,500 from EPA's Regional Geographic Initiatives grant program to convene stakeholders to address long-term ecosystem restoration, especially focused on floodplain and hyporheic restoration and the use of this natural infrastructure for temperature reductions.

The Willamette Partnership proposed four actions: 1) establish a common understanding among stakeholders of the floodplain-hyporheic zone functions in the Upper Willamette; 2) identify costs and benefits of restoring lost functions; 3) develop projects that improve understanding of these functions or demonstrate restoration techniques; and 4) explore and develop a conceptual framework for a trade to promote floodplain restoration.

There was uncertainty and confusion about what "water quality trading" would look like in the Willamette. Following release of the draft TMDL, cities and industries became very interested in discovering economical ways to meet their temperature requirements and some conservation advocates viewed water quality trading as a means for investing in ecologically effective activities. As a result the Willamette Partnership was able to quickly gather stakeholders for substantive local discussions on meeting temperature standards by repairing natural infrastructure. Cities and industries that discharge hot water into rivers and streams would be able pay land managers who plant streamside shade trees and reconnect floodplains to naturally cool water. Restoration of floodplains and riparian areas will produce substantially more temperature and ecosystem benefits at less expense than traditional engineered approaches.

From November 2004 to March 2005, the Willamette Partnership initiated a number of productive discussions with individual stakeholders and organizations about the potential of water temperature trading as well as the technical, institutional, and legal limitations to building market-based tools for regulatory compliance. The Partnership Board identified critical technical, political, social, and economic issues that would need to be addressed in order to move forward with practical innovations to conservation policy. They compiled the results into a [Stakeholder Response Synthesis Document].

Participants in these discussions recognized that the logical benefits of floodplain restoration are well documented. Economic costs and social and political uncertainties remain. The process helped clarify fundamental research questions and initiate efforts to answer remaining question. There was widespread enthusiasm for developing a stakeholder-driven water quality trading program that incorporates restoration of natural processes, functions, and dynamics, especially floodplains, hyporheic zones, riparian areas, wetlands, and flow. There is a high level of demand for an ecosystem service trading program for regulatory compliance in the Willamette Basin that addresses the whole suite of ecological values. The discussions and concept development provided much needed clarification and direction to stakeholders and enabled a strong coalition to take the next step.

In March of 2005, the Willamette Partnership worked with the Oregon Governor's office, the Oregon Association of Clean Water Agencies, The Oregon Department of Environmental Quality, Associated Oregon Industries, the Confederated Tribes of Grand Ronde, Defenders of Wildlife, Willamette River Keeper, and others to develop a proposal under the federal Environmental Protection Agency's [(Final Revised Proposal)EPA Targeted Watershed Watershed Work Plan] Program. The proposal was jointly nominated by Governor Ted Kulongoski and the Confederated Tribes of Grand Ronde.

The proposal defined additional research needs to assess the drivers and opportunities for natural infrastructure investments; formulate scientifically sound methods to quantify the ecological value of conservation actions; create a portfolio of investment opportunities; establish the technical, legal, regulatory, and institutional mechanisms to allow trading of conservation credits; and execute transactions in a Willamette Ecosystem Marketplace. The Partnership would have to wait until grants were awarded in November 2005 to find out if they would received funding for their proposal to construct much of the basic infrastructure needed for the operation of the Willamette Ecosystem Marketplace.

Throughout the spring and summer of 2005, the Willamette Partnership worked with key stakeholders to evaluate the state of the science needed to quantify the temperature benefits of specific targeted restoration, especially floodplain and hyporheic zone restoration, riparian shading, wetland restoration, and flow augmentation.

The Partnership, DEQ and researchers in the Department of Geosciences, developed a [Request for Information regarding hyporheic process and function]. The Willamette Partnership convened experts from Oregon State University, University of Oregon, the Corvallis EPA lab, and the Oregon

Department of Environmental Quality to begin discussions about current and planned research and the RFI to be issued by the Oregon Department of Environmental Quality. Based on these early discussions a [Prospectus] was developed by researchers at Oregon State University. The proposed project would answer two basic questions: (1) does injection of wastewater into subsurface gravel mitigate excess thermal load from a municipal wastewater plant and (2) does restoration of floodplains cool rivers during the critical summer/early fall months. The results of the study are described in a December 30, 2005 report entitled, [*Investigation of the Temperature Impact of Hyporheic Flow: Using Groundwater and Heat Flow Modeling and GIS Analyses to Evaluate Temperature Mitigation Strategies on the Willamette River, Oregon*]. The outcome of the study was very encouraging and prompted further discussions to design a research program that could provide the higher level of detail that would be required in a trading program.

The report confirmed that better information on the "heat budget" (heat load coming in and heat load going out) of hyporheic zones was central to our ability to understand the process and function of hyporheic zones. In November 2005, researchers at Oregon State University, submitted a successful proposal to begin the first quantitative, physics-based investigation of the heat budget in the hyporheic zone of a large river and will be relevant to current research in stream temperature, hyporheic flow, and their interaction. Research will attempt to answer the questions: Does flow through the hyporheic zone result in a net reduction of summer maximum stream temperature? If so, what is the mechanism for that reduction? Hypotheses:

1. Warm, daytime water is not actually cooled in the hyporheic zone but does push out cool, nighttime water during the day.
2. Warm, daytime water is significantly cooled via:
    a. heat flow by conduction to and mixing with deeper groundwater with longer flow paths,
    b. heat flow by latent and sensible heat fluxes to the vadose zone, and/or
    c. temporary heat storage in gravels and "dead" zones in the hyporheic zone.

On November 9, 2005 the Willamette Partnership received a $779,000 Targeted Watershed Grant to develop the Willamette Ecosystem Marketplace. Work began immediately and proceeded over the next several months to develop a work plan and budget.

In April 2006, the Willamette Partnership convened researchers, municipal wastewater treatment managers, the Department of Environmental Quality, and the U.S. Army Corps of Engineers for a small group workshop to further coordinate and define additional research needed to enable floodplain and hyporheic restoration activities to be included in a marketplace for ecosystem services. As a foundation for the level of technical detail the Department of Environmental Quality required as part of the trading program in the Tualatin Basin, Charlie Logue, Regulatory Affairs Director for Clean Water Services presented the considerations and formulas used in their integrated watershed-based permit to demonstrate the kilocalorie offsets from shade and flow restoration actions. These formulas were developed jointly by DEQ and Clean Water Services and they demonstrate the level of technical detail/certainty DEQ requires to credit restoration actions. Importantly, the groundwork laid by the Clean Water Services Permit, gave stakeholders confidence that restoration alternatives involving floodplain restoration were possible.

At the workshop, researchers gave brief presentations regarding current understanding of floodplain/hyporheic interactions, process, and function. The presentations revealed that while the technical information on the temperature benefits of floodplain restoration and hyporheic exchange appear very clear and encouraging, data and tools do not currently enable the quantification of benefit from specific restoration actions in a way that is comparable with end-of-the pipe measurements (i.e., kilocalories per day). For example, researchers are presently incapable of calculating the specific kilocalorie reduction that would result from removing a revetment. The group agreed that a larger full day workshop with a larger group of stakeholders was needed to develop a unified approach for completing the additional research required to provide a sufficient level of detail to "credit" floodplain/hyporheic restoration activity as an offset to end-of-pipe impacts on temperature.

The April workshop helped both the Department of Environmental Quality and municipal wastewater treatment plant managers better define their questions, concerns, and needs in order to consider floodplain restoration as an alternative to traditional technical options. As a result, DEQ compiled and distributed a document developed in consultation with staff that described [permitting issues and concerns]. They raised these questions:

1) Does the trade have to result in a water quality improvement at the point of discharge?

2) What responsibility does the permittee have to assure waste load reduction?

3) Who does DEQ enforce against if the heat reduction is not achieved?

4) How long can implementation take?

5) Does point source mitigation need to be in addition to the temperature reduction required in the watershed?

6) How does DEQ determine that water quality standards or waste load allocation have been achieved?

Likewise, the Eugene Springfield Metropolitan Wastewater Management Commission also distributed a [document] describing their needs and concerns related to participation as a buyer of temperature offsets. These concerns included calculating specific temperature reductions, tracking and accounting, certainty of results, and flexibility. They also wanted sustainable systems that benefited the natural environment and encouraged partnerships. A successful trading program based on use of natural infrastructure for regulatory compliance would need to address these group's concerns.

The issues and concerns expressed by DEQ and the Metropolitan Wastewater Management Commission formed the basis for a workshop convened by the Willamette Partnership on June 22, 2006 for a larger group of stakeholders. The stakeholders discussed a path forward for developing

methods to quantify specific ecological outputs from targeted floodplain restoration activities. Meeting objectives included:

- Clarify the state of science and policy for quantifying ecological outputs from floodplain restoration in units of measure relevant to regulatory drivers (especially kilocalories, and fish and wildlife habitat)
- Establish a working knowledge of multiple research efforts underway and planned
- Develop agreement on research gaps
- Develop a collaborative approach and timeline to fill research gaps that leverages multiple funding sources to complete the work

In creating the temperature TMDL, the Department of Environmental Quality allocated thermal load to municipal and industrial wastewater treatment facility managers in terms of kilocalories per day. Scientists agree at some point it will be possible to describe specific temperature impacts of floodplain and hyporheic restoration in terms of kilocalories per day, but more empirical data will be needed.

A fundamental outcome of a full day of presentations and discussions was a clear statement by DEQ representatives that, in the absence of data and tools capable of calculating specific kilocalorie reductions, the Department was willing to consider compliance alternatives that addressed the "narrative" standard of the TMDL and other beneficial uses. The narrative standard describes cold water microhabitats, or "refugia," for cold-water-dependent species such as spring Chinook salmon. Studies in the Pacific Northwest have demonstrated that salmon gather in coldwater microhabitats and can use coldwater habitats as "stepping stones" to move through reaches that are too warm. University researchers believe they have sufficient data to create a technically credible and legally defensible rationale for specific targeted floodplain restoration that would support coldwater microhabitats for migrating salmon. By pursuing a "stepping stones" approach, restoration could begin immediately and generate the data on temperature reductions that researcher currently lack. Money and time invested thus would achieve dual goals – large scale strategic floodplain restoration and empirical data to demonstrate the biophysical benefits.

In April, 2006 the Partnership received final approval of the work plan for the Targeted Watershed Grant from the Environmental Protection Agency. On April 19, 2006, they convened the Willamette Ecosystem Marketplace Project Steering Committee, representing key marketplace stakeholders, to guide development of the Willamette Ecosystem Marketplace. The committee and Partnership staff began the recruitment process for a consulting team by writing a Request for Qualifications that was advertised in the Journal of Daily Commerce on April 25, 2006 with a due date of May 25, 2006

Nine teams and individuals responded. The selection committee unanimously chose to hire David Evans and Associates partnered with CH2MHill. This pairing of firms received the highest overall score and was the only team that demonstrated the capacity and capability to perform all project elements. Other teams were qualified on an as-needed basis for specific project elements. The Partnership and consulting team signed the master contract and first task order on July 18, 2006.

To build on progress made at the June 22 meeting and in order to better clarify a route forward, members of the consulting team and representatives of the Willamette Partnership met with DEQ staff, university researchers, and consultants on July 18 to share data and define opportunities. In preparation for the meeting, DEQ staff outlined key questions related to restoring floodplain "stepping stones" as a network of cold water microhabitats for migrating salmon. Participants recognized there was greater progress to be made by established demonstration sites where data could be gathered in a real life setting than there would be through abstract expensive computer modeling. Following this meeting, university researchers submitted several proposals to funding partners to initiate preliminary work on the stepping stones concept at high priority restoration sites where restoration actions can be implemented and monitored over time.

The Partnership Board, steering committee and consultants recognized they needed to establish the distinction between the EPA Targeted Watershed Grant *project* and the development of the Willamette Ecosystem Marketplace *program*. The water temperature trading project is the means for creating the framework of a scientifically credible, legal, socially acceptable and ecologically beneficial water temperature trade as the first step in development of a broader marketplace. As a longer term endeavor, the marketplace will eventually be the mechanism through which a wide array of participants can exchange money for a broad array of ecosystem services. The marketplace will enable investors to pay for restoration and conservation of highest priority locations, habitats and processes while meeting the requirements of environmental regulations.

Key project objectives for the EPA Targeted Watershed Grant project are as follows:

## KEY PROJECT OBJECTIVES

1. **Market Appraisal**
    a. Beginning with thermal load reductions and the Willamette TMDL, identify and describe marketplace drivers.
    b. Using existing data, build a GIS-based interactive decision support tool that focuses conservation and restoration investment toward the places and restoration activities that will produce the greatest ecological benefits.
    c. Identify and quantify the potential supply of water quality and conservation credits that could be generated through restoration of priority areas.

2. **Credit Definition and Currency Development**
    a. Develop and describe technically and socially acceptable techniques to quantify water quality and other conservation credit values generated from specific restoration activities.
    b. Identify other "conventional" credit units that reflect other benefits the projects may create, including other pollutants, habitat, wetlands, or carbon sequestration.

c. Evaluate candidates for a "common currency" into which all credits can be converted to facilitate comparisons across credits and develop a work plan to design and implement such a system.

3. **Temperature Credit Portfolio**
   a. Develop an investment portfolio prototype based on real buyer and seller data to evaluate the costs and benefits for a sample group of multi-credit transactions
   b. Based on the criteria, develop a temperature credit portfolio for Willamette watershed priority areas that reflect an optimized set of investments in different types of projects at different locations that if implemented will result in attainment of the Willamette TMDL for temperature, as well as providing other benefits.

4. **Marketplace Creation**
   a. Develop the technical, legal, and regulatory mechanisms for permitting trades and the banking and transferring of credits in the Willamette Ecosystem Marketplace
   b. Develop monitoring, enforcement, and adaptive management mechanisms to ensure restoration activities produce needed environmental benefits
   c. Develop a prototype of a marketplace and credit registry to support transactions conducted during the grant period and to simulate a watershed-wide market.

5. **Market Transaction**
   a. Facilitate a conservation credit transaction within the Marketplace

6. **Project Evaluation and Market Business Plan**
   a. Document and evaluate the accomplishments of this project, including lessons learned.
   b. Provide guidance for transferring successful elements of the approach taken in this project to other watersheds in Oregon and elsewhere.
   c. Develop a strategic plan and business model to continue and expand the Willamette Ecosystem Marketplace.

## INITIAL RESULTS

Through summer and fall of 2006, the consulting team, Partnership staff and partners began substantial work on three of seven primary project components necessary to build a marketplace trading structure and complete a water temperature trade as outlined in the Targeted Watersheds grant proposal (market appraisal, credit definition and currency development, and marketplace creation). These formative tasks are intended to refine approaches and guide project and program development. One of the first tasks was to explore supply and demand, identifying likely initial buyers in the Willamette Ecosystem Marketplace, their drivers, and where they will most likely find available credits.

## OBJECTIVE 1: MARKET APPRAISAL

### Where is the supply?

A number of plans and GIS tools identify restoration priorities areas, including areas that if restored would reduce river temperatures. The first task of the consulting team and key partners was to collect and reorganize this information into a single, credit-market-oriented analytical framework to accurately describe key characteristics of a multi-credit market. The resulting decision support tool will aid in analysis of expected relationships between credit demand and supply, relative costs and benefits, and other tradable ecological values to guide creation of the marketplace.

Data layers compiled by Oregon State University for the Willamette River Basin Planning Atlas (2004) and subsequent work provide the most comprehensive dataset for priority restoration areas. The Atlas identifies 65 kilometers of high priority restoration areas and 108 kilometers of medium priority areas. The majority of high priority areas are upstream of the Salem/Keizer area and the majority of medium priority areas are downstream of Salem/Keizer

In order to quantifying credit supply, the consultants identified activities that might take place at priority areas and the benefits that would come from these activities in terms of desired credits such as water temperature reduction (kilocalories), wetland restoration (acres), habitat restoration (acres), and carbon sequestration (tons of CO2).

Additionally, they focused on Green Island, a site flagged for consideration as the potential location of the first trade and that falls within the high priority areas identified in the Atlas. Working with the McKenzie River Trust, consultants gathered information on site conditions and calculated the ecosystem benefits that could be generated by restoration activities that would yield desired credits--water temperature reduction, wetland, habitat, flood control, carbon sequestration, and air pollution reduction. After testing assessment at this local site, they will be able to calibrate assessment tools and conduct a more comprehensive assessment of the potential supply of ecosystem credits in the basin.

### Digging into demand

In Oregon, and specifically the Willamette Basin, there are certain regulatory drivers generating demand for ecosystem credits and this demand is being met to varying degrees by market mechanisms already established:

- Wetland and stream mitigation banking (very active)
- Carbon emissions trading (active)
- Renewable energy credits and green tags (active)
- Water quality trading (one example)
- Endangered species mitigation banking (one example)
- Water supply trading (one example)

The Partnership has developed a primer on each of these markets. Overall, it seems that most potential ecosystem buyers need small numbers of credits at irregular intervals. This fluctuation in demand can lead to mismatches with supply in new markets. Most buyers are looking to transfer

regulatory liability and their demand is tied closely to their estimates of how many credits they will need to comply with regulations on their own.

**Anticipated Demand**

**Demand for water quality credits** to meet Clean Water Act standards is driven by newly established Total Maximum Daily Loads in Oregon for water quality parameters such as temperature, dissolved oxygen, bacteria, and more. In general, the analysis suggests that all the major point sources in the Upper Willamette reach (upstream of river mile 108) have excess thermal loads that exceed waste load allocations and thus may have an interest in acquiring thermal credits. Another way to think about this is that all the major point sources on the Upper Willamette will need to reduce or offset their loads, and those that are able to reduce loads more than required by their waste load allocations could generate credits for others. On the other hand, point sources in the middle and lower Willamette reaches have excess thermal loads at or below their waste load allocations.

**Demand for wetland mitigation credits** in Oregon is driven by various forms of development such as industrial site development, high density residential development, and public infrastructure projects, which are required by section 404 of the Clean Water Act and State Removal-Fill Law to mitigate permanent impacts to wetlands. The Oregon Economic and Community Development Department, attempting to project demand, is using the state Industrial Site Certification Program which certifies sites as being "project ready" within 180 days once barriers to development have been addressed. Site assessment for wetlands is a key element of the program. The current queue of industrial sites seeking state certification is concentrated along the I-5 corridor between Salem and Eugene, particularly around Corvallis, Albany, and Lebanon. The northwestern segment of Clackamas County and the western segment of Multnomah County also appear to be areas with potentially high demand and limited supply.

If all certificated sites developed all delineated and estimated wetland areas within them, they would impact about 1700 acres of wetland. The Economic Revitalization Team estimates that if they made reasonable efforts to avoid and minimize impacts at these sites, the total mitigation needs would run about 900 acres, concentrated largely around Eugene, Lebanon, and Corvallis. The Oregon Department of Transportation is estimating potential demand over the next 5-7 years, and communities in the West Cascades Council of Governments are identifying their need for mitigation credits. In the next few years, these three sources are likely to represent the largest consolidated demand for mitigation credits. Considering availability of credits from wetland banks in the valley there is a shortfall of 600 credits just to meet the need of these certified sites. Assuming an average value of $60,000 per acre, this equates a total unmet demand value of $36 million.

There are some significant policy changes on the horizon for wetland mitigation. The Economic Revitalization Team is exploring a resale program similar to the North Carolina Ecosystem Enhancement program, where the state or other third party would buy credits and hold them in advance of demand from buyers.

**Demand for carbon offset credits** is emerging in Oregon, growing out of the carbon dioxide emissions standards for new energy facilities as regulated by the Energy Facility Siting Council. The Climate Trust has purchased greenhouse gas emission offsets for new power plants and is seeking new sources of investment. Although Oregon is not likely to see new power plants in the near future, demand for carbon offsets nationally is developing quickly. The Governor convened The Carbon Allocation Task Force in August 2005 to develop a proposed cap-and-trade system and legislative proposal in time for the 2007 legislative session.

**Demand for endangered species habitat conservation credits** is being generated by state and federal species listings under the Endangered Species Act (ESA). It is unclear how strong a driver this will be and how much investment in conservation banking is likely given limited reach of ESA regulations and fish and reluctance to accept trading to comply with ESA. The Oregon office of the US Fish and Wildlife Service is developing banking policy for the entire state due out in 2007. National Marine Fisheries Service is moving toward authorizing a salmon habitat accounting system under the Dept. of Transportation's bridges program.

**Demand for stormwater infiltration and treatment credits** is increasing as more land us covered by impervious surface. The City of Portland is exploring the feasibility of using a marketplace to more cost effectively meet stormwater compliance challenges. The OR Dept. of Transportation is exploring options. Demand will likely be high but there are institutional challenges to trading stormwater credits.

**Implications**

The most accessible markets today are wetlands mitigation banking and water quality trading. In terms of the demonstration project, the most marketable projects will be geared toward generating credits for these markets. "Reserve" areas or actions in the project could be held for carbon, species, or other credits, but the economic return will not be immediate. There may be specific opportunities to meet the ecosystem credit needs of a particular "client." For example, the Port of Portland has a simultaneous need to mitigate for wetland impacts, species impacts, and natural resource damages. The Willamette Partnership could define a role there or not. The Partnership has opportunities to shape future demand by engaging in discussions with the Governor's Economic Revitalization Team, the Governor's Carbon Allocation Task Force, and US Fish and Wildlife Service's upcoming conservation banking policy. [Complete Market Appraisal Summary]

## OBJECTIVE 2: CREDIT DEFINITION AND CURRENCY DEVELOPMENT

Initially, the consulting team and Partnership staff explored methods of defining and valuing temperature credits used by existing programs including Clean Water Services, as well as other methods suggested by stakeholders or found in respected literature. Kilocalories per unit of time will likely remain the basic currency for water temperature trades. A significant amount of research has been compiled on methods to calculate kilocalorie reductions from various activities including the work conducted to support the Clean Water Services trading program and ongoing efforts by Oregon State University, University of Oregon and the United States Geological Survey. The staff and consultants focused on five potential sources of kilocalorie reduction: wastewater

reclamation/reuse; flow augmentation; riparian shading; floodplain/hyporheic restoration; and wetlands discharge/restoration. They assessed whether existing science and mathematical calculations are sufficient to support kilocalorie reduction through these measures for crediting and waste load allocation compliance purposes. Where one or more methods was found to be sufficient for one or more actions, they identified how to proceed with formalizing a crediting protocol. Where gaps exist, they identified research needs.

**Methods for Defining Temperature Credits**

The consulting team determined that the only example of a water temperature trading program in the country that employs restoration as a means for reducing temperature is the National Pollution Discharge Elimination System (NPDES) permit for the Tualatin Basin, issued by Oregon Department of Environmental Quality to Clean Water Services.

***Wastewater Reclamation/Reuse***

Permit holders that are able to reduce their thermal loads through reclamation and reuse, to temperatures below their waste load allocations, would generate credits that could be traded (subject to potential temporal and spatial constraints that might be included in a fully developed trading program). USGS has recently developed a point source trading tool for the Willamette River for the Oregon Association of Clean Water Agencies (ACWA) and the Willamette Partnership. This tool simulates temperature effects of trades assuming that the point source discharges creating credits are doing so by reclaiming/reusing some or all of their wastewater discharges. It provides a means by which potential trading partners can visualize the temperature effects of any particular trade along the entire length of the river. The tool also shows how much the temperature changes as a result of any trade at the Point of Maximum Impact (a location on the river established by DEQ where there is the greatest increase in temperature caused by human sources and activities. On the Willamette, one Point of Maximum Impact is just above the Santiam River, where Willamette water has reached its warmest temperatures from cumulative inflow from upstream sources. Below this point, the influx of cold water from the Santiam River reduces Willamette temperatures. This point was used as a benchmark for setting TMDL standards).

***Flow Augmentation***

Clean Water Services Tualatin River Basin has established the precedent for defining flow augmentation temperature credit. A river temperature model *Heat Source* was used to predict how much of a temperature change would occur at two critical locations just upstream of each of Clean Water Service's advanced wastewater treatment facilities as a result of flow augmentation from released from Hagg Lake. July and August were determined to be the critical period for reconciling the thermal load to offset with credits. The augmentation flow of 30 cubic feet per second more than offset the excess load from the Durham facility and offset more than half of the excess load from the Rock Creek facility. The credits were calculated by multiplying the reduction in temperature in the river upstream of each facility by the seasonal river flow. A similar process could be used for the Willamette River, taking into consideration the unique temporal and spatial aspects of the Willamette.

One issue unique to the Willamette TMDL is that reservoirs were not assigned load allocations in thermal load units but instead in terms of monthly temperature targets downstream of the reservoir.

Thus, in order to generate credits, a reservoir owner would not only have to achieve cooler temperatures than those in the load allocation tables, but these would have to be translated into the kilocalorie currency used for other trades. This assumes that DEQ and others would see temperatures lower than load allocations as desirable when in fact the goal may be for outflows to mimic Natural Thermal Potential [NTP].

***Riparian Shade Restoration***

Clean Water Services also established a precedent for defining riparian shade restoration temperature credits for the Tualatin River. Shade credits are defined using DEQ's shade model to predict the effective shade provided by a specific grouping of restoration plantings. Credits were calculating by defining kilocalories per day blocked by shade and estimating affected stream surface area. Annual credits were defined as those that would occur when the vegetation reaches full maturity. A ratio of 2:1 (2 miles of vegetation planted for every mile of offset credit) because it be years before the vegetation reaches full maturity. A similar process could be used for the Willamette River, with consideration for the unique temporal and spatial aspects of the Willamette.

***Floodplain/Hyporheic Restoration***

Floodplain restoration reconnects side channels in the floodplain allowing periodic inundation of during higher river flows in fall, winter and spring. This leads to recharge of the hyporheic zone, which allows cooler water to seep into the mainstem on a delayed basis during the lower flow in warmer summer months. The injection of warm wastewater into the hyporheic zone of the river is another form of restoration considered here. The gravels, sands and silt of the hyporheic zone would act as a heat exchange mechanism for the excess wastewater thermal loads. In addition, this type of discharge could lead to a delay in the movement of the wastewater so that the remaining thermal load might be delivered to the river during a less critical time. Other floodplain restoration measures could include selective removal of bank hardening structures to allow bank erosion, channel widening, and deposition of new gravel bars that lead to higher hydraulic conductivity and greater hyporheic flows.

As mentioned on page 8 of this summary, researchers at Oregon State and University of Oregon believe they have sufficient data to create a technically credible and legally defensible rationale for restoring floodplains to support coldwater microhabitats for migrating salmon. This approach would meet the TMDL "narrative standard" which cites studies in which salmon use coldwater habitats as "stepping stones" to move through reaches that are too warm.

Credits for floodplain/hyporheic restorations would likely be defined in a manner similar to flow augmentation in that the credits would be generated by knowledge of how a given project would change flows and temperatures temporally and spatially in the river. An agency and publicly accepted analytical framework such as computer modeling likely would be needed to predict the flow and temperature changes in the river calculated project by project. Much like temperature trading between individual point sources, effects of a trade might not be measurable in the field and thus the trade credits have to be established via river temperature modeling as was done for the TMDL and also by USGS for the temperature trading tool.

[1] "Investigation of the Temperature Impact of Hyporheic Flow: Using Groundwater and Heat Flow Modeling and GIS Analyses to Evaluate Temperature Mitigation Strategies on the Willamette River, Oregon." Oregon State University. December 2005.

The cited OSU study involved hypothetical situations but suggests that it is possible to develop analytical tools. These tools need further development and validation prior to their use in a regulatory process. The ramifications of this issue are further discussed in the "Data Gaps" and "Road Map."

### *Wetlands Discharge/Restoration*

Wetlands treatment systems can be designed, constructed, and operated to achieve cost-effective and efficient effluent cooling. In such wetland systems, reductions in effluent temperature occur through both passive evaporative and radiant cooling. This can be accomplished using a relatively large land area with shallow depths and dense emergent vegetation for shading. In some situations, restoration of wetlands can also provide cooling benefits in much the same way as restored floodplains and hyporheic zones. The credit definition process for wetlands discharge restoration would be similar to floodplain and hyporheic restoration in that credits would have to be established project-by-project. *Heat Source* has been used for temperature modeling for a potential wetland system being considered by the City of Albany. In this example with Teledyne Wa Chang and Weyerhaeuser as partners, thermal models of 160 acres of constructed wetlands show evaporative and radiant cooling would significantly reduce temperatures, far exceeding the thermal reduction requirement in the TMDL, thus providing tradable credits. This cooling in wetlands is also something that could be directly measured in the field after the wetland system has been constructed or modified, much like temperature and thermal loads can be measured at the end-of-pipe for a point source discharge.

### Gap Analysis

For the most part, the analytical tools needed to define temperature credits already exist, several of which have received agency approval and support. Examples include the CE-QUAL-W2 models for the Willamette mainstem and the *Heat Source* model for tributary shade restoration and wetland treatment projects. Although running the CE-QUAL-W2 models can be cumbersome, this should not be a major impediment to trading, especially if tools such as the Willamette point source trading tool developed by USGS can be extended or further developed to include mkcal/d calculations and to evaluate other types of trades (such as effects of tributary cooling on the mainstem).

Although models are available for and have been applied to floodplain/hyporheic restoration, these models and methods have not yet been formally validated with real world projects, or adopted or deemed acceptable for regulatory decision-making such as trading to comply with TMDLs. This modeling framework will be needed for proposed restoration projects where it will be difficult to validate temperature benefits with post-implementation field data. Models will also be needed for planning purposes for floodplain/hyporheic projects to provide some assurance that costs will be justified by anticipated benefits.

Important regulatory decisions will be needed for several key aspects of temperature trading. They are as follows:

- **Temporal considerations.** The timing of and mechanisms for credit creation and trading need to be developed. It appears that the variable permit limit approach developed by EPA Region 10 for the Idaho trading framework might have merit for Willamette temperature trading involving one or more point sources and thus should be further explored.

- **Spatial considerations**

  - **Localized impacts**. What decision criteria regarding localized impacts will define an acceptable trade? One simple approach would be to conclude that a trade is approvable as long as the temperature increase in the river at the POMI is not greater than under the TMDL allocated condition. This however may be an overly simplistic approach in several respects (for example, does not consider number of river miles benefited, possible error in the analyses, or if the increase would materially affect designated uses, etc.). Another approach would be for DEQ to retain discretionary judgment for approving trades on a case-by-case basis. This is how the localized impacts issue was resolved for the Lower Boise River trading program.

  - **Tributary projects.** How will restoration projects on tributary rivers and streams be handled with respect to offsetting thermal loads to the mainstem? Will the Tualatin approach be used (for example, regarding shading) or will changes to tributaries have to be modeled and input to the mainstem model(s) to be assessed in a similar fashion as point source discharges?

  - **Integration of magnitude and extent of trade effects.** Could a currency that includes the length of river affected be developed and used?

  - Trades affecting other river reaches and shift POMIs. How will the trading program accommodate trades that affect other reaches and shift POMIs within a reach?

- **Flow augmentation from reservoirs**. Flow augmentation from existing reservoirs in the basin could presumably only be generated if releases are cooler than the LAs in the TMDL. Assuming such cooler releases could be achieved, would that be a desirable outcome and potentially creditable under a trading program?

- **Other environmental benefits of restoration projects**. Most of the restoration project types discussed in this TM will provide ancillary environmental benefits such as wildlife habitat benefits from wetlands and riparian vegetation. How will these benefits be considered within a temperature trading decision-making framework?

### The Path Forward

The "road map" that should be followed to address the issues, gaps and unanswered questions identified above is as follows:

- A modeling and analytical framework needs to be further developed, validated, and accepted for defining credits related to floodplain/hyporheic restoration projects. It is assumed this effort would be led by OU/OSU researchers with technical and regulatory input from DEQ and others.

- A framework for credit trading involving one or more point source (such as variable permit limits should be developed).

- The USGS tool for Willamette point source trading should be further developed to include kcal/d calculations and to include other types of trades (such as effects of tributary cooling).
- The process for working through the technical and policy aspects of the numerous regulatory decisions regarding the key aspects of temperature trading, such as localized impacts, trades that affect other reaches and/or shift POMIs, tributary credits applied to the mainstem, how to integrate magnitude and extent of trade benefits, and how to consider other environmental benefits need to be initiated.

Determinations regarding the feasibility, desirability, and technical aspects of flow augmentation from existing reservoirs need to be made by reservoir owners, DEQ and other agencies.

## OBJECTIVE 4: MARKETPLACE CREATION AND STRUCTURE

Work was initiated in the summer of 2006 to review institutional gaps and better define stakeholder needs in order to make recommendations on a workable marketplace exchange framework for consideration by the Willamette Partnership.

### Gap Analysis Of Market Framework Elements

Numerous gaps must be addressed to develop and support the envisioned Willamette Ecosystem Marketplace:

- A few elements exist in a form immediately applicable and available to the Willamette Ecosystem Marketplace;
- Other elements exist by way of example or analogy and must be tailored and adapted for use in the Willamette Basin;
- Some critical gaps can be filled by assembling existing building blocks, which in their current form are insufficient without modification or augmentation; and
- Other critical gaps can only be filled with new advancements in science, policy, or technological tools.

A secondary but important finding is that elements or building blocks that exist are generally in a decentralized or situation-specific form. An evaluation of alternative options for various market elements characterized them on a spectrum from decentralized to centralized in nature. A subsequent presentation and discussion with the Willamette Partnership Board explored examples and aspects of market models reflecting different degrees of decentralization and centralization, including clearinghouse functions, facilitation services, credit brokering, and market making Powerpoint presentation from September 27, 2006, Slides 35-71.

The result of these evaluations and discussions was a general consensus and direction from the Board that many of the elements would need to be implemented in a centralized fashion in order to achieve the informational, transactional, and resource efficiencies assumed necessary to successfully launch and operate a multiple credit market serving the entire Basin. Thus, to the extent market

elements already exist in whole or in part but are decentralized, a gap exists until they can be centralized or duplicated with some degree of consistency or standardization across the marketplace.

**Gap Analysis Summary**

The gap analysis shows that there are many needs and challenges in getting started to create the marketplace, including:

- Technical and scientific gaps;
- No dependable regulatory framework;
- No credit standards, no transaction rules;
- Questions about how buyers and sellers find each other;
- No clear process and procedures completing deals; and
- No automatic monopoly with respect to who can easily be the first to provide the range of needed market services.

The potential options for marketplace creations include 1) leave the status quo of an unorganized marketplace, 2) develop a marketplace through decentralized approaches or 3) develop a centralized market.

Based on discussions with the Willamette Partnership Board of Directors and the project team's consideration of the options, including successful examples in water quality credit trading and other environmental credit markets, a market framework with predominantly centralized features is recommended for further consideration.

## NEXT STEPS

Work completed in the summer and fall of 2006 was intended to analyze concepts, and develop recommendations regarding the missing pieces needed to develop a Willamette Ecosystem Marketplace. The Partnership now has a clearer understanding of the near term and longer term needs for specific credit markets and that will influence the near term actions within the EPA Targeted Watershed grant period. While we have a better understanding of options for how exchanges will occur, it is not yet clear how all buyers and sellers of ecosystem credits will engage. The assessments conducted to date identify clear needs and in the months ahead the Partnership, working with its consultant, stakeholders, and the Marketplace Steering Committee will develop a

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[2] *This section presents essentially the same information and recommendations as were presented in the "Preliminary Draft Prospectus for the Willamette Ecosystem Bank and Exchange" (a seven page document delivered on December 11, 2006). Selected language was modified, including specifically the grammatical tenses, to make this presentation more suitable for a Technical Memorandum. Additionally, graphic representations of the overall market and elements thereof that were developed for the PowerPoint presentations to the Board and the Steering Committee (December 13th and 14th, 2006, respectively) are included in this TM, but were not yet developed when the Preliminary Draft Prospectus was first delivered and circulated. The terms WillamEx, WillBR, and WillMA were "Googled" with no meaningful results. If these or other terms are ultimately used, a trademark search would need to be performed to develop and register sufficiently unique names.*

[3] It would be optimal to have a web-based registry, but this will be dependent on funding.

[4] It would be optimal to have an internet accessible database, but this will be dependent on funding.

transaction framework that will work for immediate credit exchanges, but will be expandable to other parameters as needed.

The technical foundation and regulatory approvals on which all exchanges will occur is a central feature of operating a marketplace. The work conducted through the summer and fall of 2006 to assess the current state of the science for crediting specific targeted restoration actions provides an excellent foundation from which we can begin discussions with regulators. Next steps are being defined in cooperation with the consulting team in a work plan that describes tasks through June 2008.

Meanwhile, the Willamette Partnership is engaging key stakeholders to assist in resolving issues and improving various elements of market design and implementation. In December 2006, the Partnership conducted interviews with representatives of permitted industries and wastewater agencies, public land management agencies, and watershed councils to gain perspective and identify concerns. Additional upcoming interviews with a broad array of stakeholders will further inform the development of the marketplace. As key issues are identified through this process the Partnership will host roundtable discussions and focused small group meetings to help bring prospective marketplace participants and stakeholders to agreement on key elements of the marketplace design. In addition, the Partnership is developing a wide variety of informational materials and expects to post updates to a new and improved website later this spring.

# HIGHLIGHTS OF RECENT ACTIVITIES IN THE ONGOING DEVELOPMENT OF THE WILLAMETTE ECOSYSTEM MARKETPLACE

Through the winter and spring of 2007, the Partnership took key lessons and next steps derived from their work in the fall and initiated several strategic outreach and planning efforts. Those efforts are highlighted here.

## Decision Support Tool Summit – March 19, 2007

The Decision Support Tool Summit brought together several developers who gave presentations on the tools they have or are developing to assist in natural resource credit trading. Presenters included:

- Shaun McKinney of the USDA Natural Resources Conservation Service is developing a nitrogen measuring tool with precise historical weather and soils data that allows farmers to submit agronomic baseline and proposed land management practices and compare the amount of nitrogen captured at three levels.
- Stewart Rounds, United States Geological Survey, has been working on a model with Portland State University, DEQ, USGS, and others to project water temperature changes in the Willamette watershed streams based on vegetative plantings.
- John Lambrinos, Oregon State University, presented the basis of a USDA Conservation Innovation Grant he is using to develop an accessible tool for individual landowners to assess current and potential ecosystem portfolio values they could market if they installed riparian buffers on their land.
- Kevin Halsey, Parametrix, provided some background and discussed an ecosystem market accounting system that could measure changes from the affects of development and restoration sites.
- A representative from Sandia National Laboratories discussed a model developed with the U.S. Corps of Engineers, David Evans and Associates, the Willamette Partnership, and others to manage water resources through the development and application of water transportation technology and informed decision support computer models using open public involvement.

The discussion led to recognition of the need to identify common goals and opportunities for collaboration. Several actions arose including a half-day meeting to discuss currency, which resulted in Marketplace Currency Development and Integration Summit that was held in

April. For a more detailed description of the discussion and recommended actions, see the meeting notes (attached).

**Natural Resources Cabinet Meeting – April 6, 2007**

John Miller, Sara Vickerman, and David Primozich gave an informational presentation to the Governor's Natural Resources Cabinet. John Miller set a positive and friendly tone by outlining the history of Willamette planning efforts that led to formation of the Willamette Partnership. Sara Vickerman set the stage for the discussion by describing the big picture benefits of a marketplace and what we hope to accomplish. She also helped convey the importance of state agency involvement in making the marketplace successful – emphasizing the need for encouragement to be innovative. Sara also articulated that an ecosystem marketplace does not replace current programs, but will help agencies do what they already do better and more efficiently. David Primozich described key elements of work underway with the EPA Targeted Watershed Grant and the work the Partnership hopes to undertake if successful with the NRCS Conservation Innovations Grant.

An informational packet (enclosed) prepared by David Primozich, Sara Vickerman and Kassandra Kelly was presented to the directors, who followed along during the presentation.

Overall, the presentation and discussion went very well. Directors and staff offered thoughtful feedback and positive encouragement. Specific comments and questions from state agency representatives can be found in the summary of the presentation (enclosed).

**Marketplace Currency Development and Integration Summit – April 19, 2007**

One of clearest short-term actions that arose from discussions at the Decision Support Tool Summit on March 19, 2007 was the need for a ½-day workshop to discuss credit definitions and currencies of trade. The workshop enabled interested parties to have a dedicated discussion about issues, concerns, and opportunities around defining credits and currencies of trade in multi-credit markets, single-credit markets, common currency markets and bundling or stacking credits. The discussion at the meeting was outstanding and thoughtful and engaged participation on a variety of very big topics. For example, there was a high level of consensus to stop using the term "currency" to describe a unit of trade, such as kilocalorie/day. Instead, we should refer to specific environmental outputs that will be measured and traded (i.e., pounds of nitrogen, tons of carbon, acres of habitat, etc.) A unit of trade is simply a measurement of environmental change that can be measured and traded and is accepted by regulators, buyers, sellers, and the public.

Another concept that gained a lot of traction and interest is the construction of a user-friendly, "turbo-tax" style site-assessment tool, and the Partnership has continued to facilitate discussion on this topic.

For a more detailed description of the meeting and the conclusions drawn from it, see the attached meeting notes.

**Practitioner's Working Group**

In February 2007 a group of practitioners from around the Willamette Basin met to help identify issues associated with implementation of the Willamette Ecosystem marketplace. The meeting raised a number of important issues that practitioners had regarding the marketplace. These issues were consolidated into five major headings:

- Background information on ecosystem markets, ecosystem marketplaces, and the Willamette Marketplace;
- Structuring the valuation system to match conservation goals;
- Methods to ensure long-term conservation benefits;
- Possible interactions between the marketplace and other conservation approaches and programs;
- Practitioner's participation in the marketplace.

The Partnership and The Nature Conservancy are facilitating several meetings to address these issues and to discuss important logistical issues associated with becoming suppliers of credits in an ecosystem marketplace.

The first meeting in July began with a field trip to see a Clean Water Services restoration project to give practitioners a more hands on view of how Clean Water Services has approached their water quality trading program. Following the field trip, the group met to discuss questions regarding structuring a marketplace to result in better conservation outcomes. The second meeting addressed questions relating to risks and liabilities in the marketplace, such as: How can a marketplace be designed so as to no undercut current conservation work and high quality restoration? What are the risks and liabilities in a marketplace for regulators, buyers, and sellers?

An offshoot meeting of this group included a discussion with Kendra Smith of Clean Water Services and her experience implementing restoration projects for the Clean Water Services program. The meeting produced several tangible actions that will improve the ability for practitioners to be more effective with implementation. Several key issues that facilitated additional discussion included: availability of plant materials, availability of trained people to complete the restoration, and options for contracts and/or easements on sites where credits are produced.

The attached agendas, meeting summaries, and background materials provide more details of the meetings and discussions.

## Synthesis Mapping Project

May 18 marked the kick-off meeting to develop a long-sought synthesis tool that combines the numerous conservation and restoration priority maps in the basin into a user-friendly GIS-based tool. The Nature Conservancy took on the technical challenge and facilitated a series of meetings bringing together knowledgeable individuals to make the synthesis a useful reality.

At the first meeting, the group worked through some tough issues in order to frame the approach to synthesizing the available ecoregional prioritization efforts. There were more questions than answers so TNC agreed to try some different approaches on limited areas and present the results to the group

At the second meeting, the group assessed the test approaches to a synthesized portfolio for the terrestrial portion of the ecoregion and discussed the benefits and shortcomings of each approach. They also began discussing the functional and technical requirements for the final products.

The main goal of the third meeting was to come to a consensus on what to portray in the portfolio and set a realistic timeframe for the analysis work. The meeting produced several follow-up action items, including a meeting to gather together all vegetation layers and determine the most important components to produce one or more vegetation maps, as one step toward completing the portfolio.

The attached agendas, meeting summaries, and background materials provide more details of the meetings and discussions.

## Building a Centralized Registry and Exchange for the Willamette Ecosystem Marketplace

Through the fall of 2006 the Willamette Partnership worked with stakeholders and conducted extensive analysis regarding the needs and structure of a centralized registry and exchange system. The structure was described in detail in the document entitled, "A Centralized Platform for Trading in the Willamette River Basin" (attached). On February 21 the Willamette Partnership Board of Directors resolved to take steps to manage development of such a system. At that time there were no other groups or entities with the immediate need or interest in the short-term. On February 27, 2007, five western governors announced a commitment to reduce regional carbon emissions and to develop an action strategy in 18 months that would include market-based approaches. Since that time, other non-profit organizations who have been actively cultivating their role in ecosystem markets locally, nationally, and globally have developed strong interest in a centralized credit registry to track and monitor ecosystem service credits.

The Partnership has taken a lead in helping coordinate discussions and describing the needed roles of a centralized exchange system. The document titled "How Does and Ecosystem Marketplace Work" (attached) is an attempt to simplify the discussion of roles and remaining questions.

**Linking Cold-water Refuges into a Biologically Effective Network in the Southern Willamette**

Providing ecosystem services is emerging as a motivating purpose for environmental management. With the recognition that ecosystem services are valuable, questions arise about the comparative value of such services, especially when complex trade-offs must be made among biophysical, economic and socio-cultural values. In large river floodplains of the Pacific Northwest, recent research indicates the opportunity to simultaneously derive multiple ecosystem services from single restorative acts: water temperature reductions, terrestrial and aquatic habitat enhancements, increased recreation and improved non-structural flood storage all are possible from individual on-the-ground restoration projects. Water temperature reductions are especially compelling due to the convergent mandates of the federal Clean Water and Endangered Species Acts.

In the Willamette River Basin, efforts are underway to create WillamEx, an ecosystem marketplace exchange where credits for multiple ecosystem services will be bought and sold. Initially, entities that discharge heated effluent into the river from point sources such as municipal sewage treatment facilities may buy credits for any combination of three approaches aimed at creating cold water refuges: floodplain restoration projects, increased shade along streams or augmented water flow in the main river channel. These cold water-oriented trades are intended to be the first of many multiple ecosystem service trades through WillamEx. Studies indicate that salmonids gather in coldwater microhabitats and may use coldwater habitats as stepping stones to move through reaches that exceed their thermal tolerances. These studies and the goals of WillamEx have led to questions about using floodplain restoration to provide cold water refuges for native biota, particularly where refuges could provide multiple ecosystem and social benefits.

Using a three-part approach, this study sampled river bottom water temperatures at select locations in the Willamette River floodplain between Eugene and Albany, mapped observed and expected cold water areas and compared their spacing to literature-based estimates of effective travel distances for two native fish species. Findings indicate that there are four contiguous river reaches in the study area that lack any observed or expected cold water refuge over a distance far exceeding even the most generous estimate of adult cutthroat trout and adult steelhead effective travel distance. Based on temperature patterns and a set of key biophysical and socio-cultural factors, one kilometer sections of the floodplain were then prioritized for their suitability as cold water stepping stone floodplain restoration sites. Finally, a team of experts was assembled to outline the science questions most in need of answers to determine the extent to which floodplain restoration can be added to the list of

viable approaches in meeting Clean Water Act temperature requirements in the Willamette River.

This study attached is an essential step in helping to quantify the specific temperature benefits from floodplain restoration actions in the Willamette River Basin.

See our website for documents relating to the development of the ecosystem marketplace: www.willamettepartnership.org

This packet includes informational materials that we regularly hand out to participants.