

Financing Mechanisms that Advance Ecosystem Service Markets and Promote Rural Sustainability

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for the
Bullitt Foundation

June 2010



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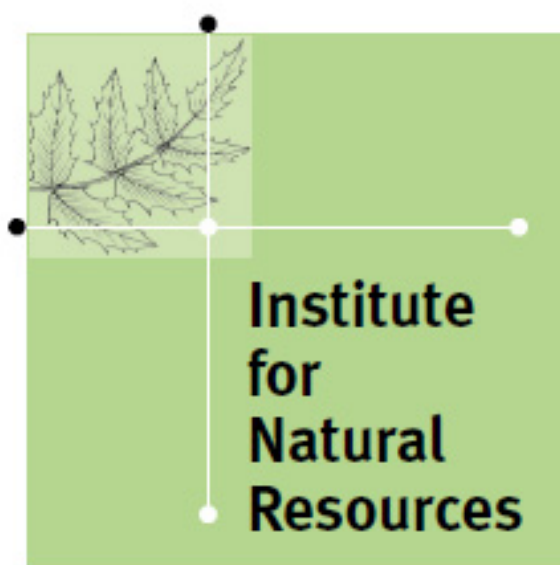
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Bullitt Foundation

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Created by the Oregon Legislature through the 2001 Oregon Sustainability Act, the Institute for Natural Resources' mission is to provide Oregonians with ready access to current, relevant, science-based information, methods, and tools for better understanding natural resource management challenges and developing solutions.

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Executive Summary

Ecosystem services markets represent potential revenue streams for small- and medium-scale rural agricultural and forest producers, many of whom have faced significant economic downturns over the past several decades. Demand for ecosystem services (ES) in the form of investments by public agencies, mitigation funds from regulated entities, and voluntary payments from corporations and individuals will require credits predominantly supplied by rural areas. Participation on the supply side entails high transaction costs and financial risks that may, however, discourage many rural landowners from participating in projects that would generate supply credits. The project purpose was to explore rural landowner financing needs for ES projects in the growing marketplace.

The Institute for Natural Resources (INR) explored those issues in two phases. Phase I entailed preliminary identification of the range of financial approaches for payments for ecosystem services (PES) projects. That was followed by a December 1, 2009, workshop which brought together financial industry professionals along with non-governmental and government leaders active in developing ecosystem services markets to discuss the challenges and opportunities for financing ES projects.

Workshop findings from Phase I, entailing participation by financial experts, helped inform the investigation for Phase II involving rural landowners. Phase II combined multiple approaches including focus groups, case studies and a pilot project evaluation.

Phase I – Identifying Supply Credit Development Barriers and Solutions

The Phase I workshop identified several supply credit development barriers. They included issues such as small project size, high levels of project performance risk, and unclear demand for eventual credits. Initial financing is not consistently available. For some buyers, financiers' unwillingness to fund projects is perceived as an indicator that ES credits currently represent high-risk or bad investments, accompanied by an assumption that financing will become available when such projects become competitive with other market opportunities.

There are several solutions to current low financing availability and perceived high ES project risks. They include designing appropriate market rules and strengthening market infrastructure with strategies such as standardizing contracts and appraisal techniques and other mechanisms to help overcome institutional constraints. Government and non-profit sector financing for projects represents another set of market tools.

Phase I resulted in a March 2010 report titled "Ecosystem Service Market Development: The Role and Opportunity for Finance." The report is accessible from the INR website.

Phase II – The Gales Creek Pilot Project

Forest Grove, in the northern Willamette Valley, is the location for an innovative pilot project involving multiple ecosystem credits: salmon, water temperature and wetlands. INR evaluated the project to determine whether and how such projects make financial sense for the participating landowner.

The landowners run a native plant nursery. A portion of the property has a creek flowing through it which had been straightened into a ditch. Restoration will include re-meandering the creek and restoring a wetland on some of the property while the rest is used for agricultural production. Project funding appeared to be unique in that the funding agency acquired liability for project performance, thereby minimizing landowner risk. It also involved sale of a permanent easement on a portion of the land to

provide cash for the operating portion of the property. The easement contains multiple land uses: acreage that is not suitable for farming, acreage that will no longer be in production and acreage that will still be used for agricultural production. In addition, the landowners retain rights to collect seeds for their nursery operation. The evaluation provided the following conclusions:

- Projects are complex and site specific, so any generalizations to other opportunities may be difficult. Two of the factors contributing to the value proposition for the landowners are unlikely to be repeatable: the value of seed collection and the owner's involvement in the restoration business opportunity are factors not broadly applicable to other landowners. In addition, the lack of alternative sources for working capital for the farm was driven largely by landowner needs being coincident with a historic financial crisis.
- Three major factors contributed to success in negotiating a mutually acceptable transaction: (1) a reasonable cash payment for the easement; (2) significant value to the landowner from seed collection rights and the restoration business opportunity; and (3) a motivated landowner in search of capital without other immediate options.
- The Gales Creek project, though groundbreaking and successful, does not necessarily provide evidence that ecosystem services project investment constitutes a broadly applicable, attractive opportunity for rural landowners. It may also illustrate that there is not yet — and may not be for some time into the future — a common profile for ecosystem services projects.

Phase II – Willamette Valley Focus Groups

INR held two focus groups in March 2010, one in Forest Grove at the northern end of the Willamette Valley and one in Eugene toward the southern end of the valley. The purpose of the focus groups was to determine landowners' levels of knowledge and interest in ecosystem services projects as well as perceived barriers to undertaking ecosystem services projects. Selection was purposive; participants were property owners actively engaged in non-industrial scale farming, ranching and/or timber production.

Ecosystem services markets remain an obscure concept for many landowners. There were mixed opinions regarding their potential and meaning. Some expressed an open-minded and supportive outlook. Others, despite concerns, indicated some level of acceptance regarding the concept. In other instances, there was significant suspicion of, and resistance to, markets based on the potential for non-local and corporate, Wall Street-type influence to erode local autonomy. Scale and trust are interlinked issues affecting social acceptance; landowners perceive greater trustworthiness in a localized marketplace.

Participants identified several elements as important for decreasing transaction costs and uncertainty. A major improvement would be reducing the generally burdensome amount of time involved in paperwork to coordinate funding, design and implementation. In addition, if landowners perceive that they'll be opening themselves up to punitive actions while trying to improve ecosystems, they're unlikely to volunteer for projects. One way to deal with administrative disincentives is to have an ombudsman or case manager to act as a liaison with cooperating organizations and to manage paperwork. To reduce potential risks and liabilities, there need to be clear agreements regarding agencies' commitments to handle land use issues through negotiation. Further, if agencies can propose projects and therefore shoulder liabilities, landowners will be more inclined to become involved.

The potential growth in ecosystem services markets represents both desirable and undesirable pressures. For some landowners, acquiring ecosystem service credits validates that they are employing environmentally beneficial land use practices. To some, a growing number of people involved in ecosystem services markets can be threatening in that they may experience undue pressure to manage their lands in different ways, when they believe they're already managing well. While the pressure to conform will increase as the number of landowners participating in restoration projects expands, the outcome will be more acres managed with a view to stronger ecosystem service function overall.

Phase II – Deschutes Basin Case Studies

The objective of the work in Central Oregon was to confirm, enhance, or refine the understanding of landowner market needs and opportunities generated in the first phase of the project. The report revisited the concept of ecosystem services and applied it to environmental management in Central Oregon. The emphases were on (1) identifying and understanding incentive mechanisms relating to ecosystem services and (2) investigating how financing availability affected their use and development in an area outside of the Willamette Valley. The World Resource Institute's Dependence and Impact Assessment Tool was used for the various evaluations to highlight ecosystem services projects risks and opportunities.

Investigation revealed, not surprisingly, that ecosystem management in the dry interior Columbia River Basin is likely to involve a different set of ecosystem services priorities than the wetter, temperate coastal region of the Pacific Northwest. There is no shortage of incentive mechanisms available in Central Oregon. Many of the federal programs for land management are similar to those in the rest of the state (and the country).

If ecosystem management in the interior Columbia Basin is a matter of trading (and retiring) resource use rights linked to removing causes of ecosystem service degradation, this may pose a different set of challenges to establishing new permits for environmental quality – such as water quality permits in the Willamette. It should not be surprising that efforts in Central Oregon have produced programs that look different from those in the Willamette, even using tools that fit within the framework put forward in the report.

Ecosystem service credit markets are typically assumed to be less developed in Central Oregon than in the Willamette Valley. This may be partly a semantics issue. In the Willamette Valley, much effort has gone into trying to develop water quality “trading” through regulatory programs. However, to date only a single regulated buyer, Clean Water Services, has entered into such a “trade.” The Deschutes Basin has a regulated market for instream habitat created through the State's Deschutes Groundwater Mitigation Program and implemented in 2003. Purchases have restored flow and offset groundwater depletion in different parts of the basin. Prevailing semantics appear to construe water quality trading as an ecosystem services market, while trading flow for instream fish habitat represents water or resource markets. However, at base, both programs are designed to allow resource users and polluters to use the resource or pollute while funding transactions that aim to offset the use/pollution with corresponding investments to provide ecosystem services.

Central Oregon's status as a mature marketplace can be sustained if different entities define objectives and possibilities clearly and can acquire the funds to implement projects. For example, the Deschutes River Conservancy's innovation in finding new sources of financing for instream flow restoration projects suggests that funding rather than project supply is the limiting factor. The Groundwater Mitigation Program's long start-up phase can be attributed to a lack of easy financing for permanent mitigation projects. In this case, credit provision was left to the “market.” Some have insisted that, had the state financed early projects, the program might have developed more quickly. By comparison, federal programs that provide clear financing terms, including cost-share reimbursement for up-front costs, signing incentives and yearly rental payments, seem to have little trouble attracting potential participants. In this regard, the Central Oregon case suggests that having the public sector take a more active role in financing emerging markets might be a proactive strategy for getting such markets launched.

Conclusions

The project explored significant issues with respect to ecosystem services credit trading—not just for rural landowners, but for the evolving marketplace more generally. There appears to be a tacit

assumption among credit transaction advocates that national and international markets covering large expanses of landscape have the best chance to achieve and maintain viability. Closer examination reveals that this perspective may be misplaced; the market is vastly complex and a number of necessary verification, accounting and other rules are turning out to be difficult to resolve. Among rural landowners, the emphasis on large, non-local markets may reduce social acceptability.

Evaluation of the pilot project revealed, unsurprisingly, that projects are complex and site specific. There is not now, and may not be for some time into the future, a common profile for ecosystem services projects. The pilot project evaluation did not provide firm evidence that ecosystem services project investments constitute a broadly applicable, attractive opportunity for rural landowners. However, this conclusion needs to be considered in context: this may be a function of the emergent status of the marketplace.

Landowners who participated in the two focus groups held in the Willamette Valley indicated mixed levels of knowledge and interest—mostly low—regarding ecosystem services and the concept of PES, especially as it concerned credit trading. Several institutional issues need to be resolved to increase social acceptability. They include ensuring individual and local community autonomy through transparent agreements and market rules; reducing transaction costs; providing inter-organizational coordination; assuring that projects do, in fact, deliver ecosystem improvements through credible monitoring and evaluation; and reducing potential legal liabilities by (1) providing clear agreements that any land use issues on private property outside of project boundaries will be dealt with through negotiation rather than threat of sanctions, and (2) if appropriate, shifting liability for project outcomes from landowners to sponsoring entities.

The Willamette Valley of Oregon – an area acknowledged in and beyond Oregon as a leader in market development, is considerably less developed than it first appears based on the reality of how complex even a regional market is in practice. Even at its nascent development level, it may continue to be an outlier in terms of regulatory market credit systems far into the future. The Deschutes Basin, on the other hand, has a mature, effective water transactions market that supports the restoration of habitat for fish and wildlife. The tendency to overlook this type of market relative to activities in the Willamette Valley may represent a semantic issue with regard to markets generally, at least so far. This illustrates how imprecise and confusing the language around markets continues to be.

The ecosystem services marketplace demand side will need to look to various local rural markets for supply for two important reasons. First, there is likely to be increasing demand for both credit trading and direct investment. Perhaps more important, however, is the possibility that local markets employing one-time transactions, rather than credit transactions relying on secondary market development, will develop more rapidly and maintain better viability. Such markets are less complex, and the social acceptability rate is likely to be higher.

The study suggests that a logical next step involves examining various institutional strategies for their potential to promote development of local marketplaces. Such approaches should employ both the opportunism inherent in pilot, projects and the development of coherent programs that respond to local conditions and stakeholder needs. In particular, they should explore landscape-level, whole watershed designs that move away from the current shotgun approach that tends to be opportunistic but not strategic. The whole watershed approach could help draw upon the social networks that drive social acceptability of new strategies in rural settings.

In addition, such efforts should build wherever possible on existing property markets in land and water. The creation of new crediting systems in actual ecosystem services is proving to be complicated and expensive – witness water quality “trading” - and has yet to prove easily replicable from one geography to

the next. Meanwhile the regulatory credit systems that have seen growth and appear replicable are those based on property rights that have a long history of being clearly defined and enforceable – either acres of property as in wetland or species mitigation banks, or acres (or acre-feet) of water rights in markets for instream flow and aquatic habitat. As start-up transaction costs are often the hardest costs to finance, exploring ways to minimize these costs will reduce the financing burden and spur the local experimentation to find better approaches and models to creating such marketplaces.

Contents

EXECUTIVE SUMMARY	iii
INTRODUCTION	1
CHAPTER 1: GALES CREEK ECOSYSTEM SERVICES CREDIT AND RESTORATION PROJECT	4
Ray Hartwell and Bruce Aylward, Ecosystem Economics LLC	
1.1 FINANCIAL FLOWS IN THE GALES CREEK PROJECT	4
1.2 CONCEPTUAL FRAMEWORK	6
1.3 THE LANDOWNERS' FINANCIAL EXPERIENCE	7
1.4 PERSONAL FINANCE CONTEXT	12
1.5 IMPLICATIONS FOR OTHER PROJECTS	12
CHAPTER 2: WILLAMETTE VALLEY FOCUS GROUPS.....	13
Sue Lurie and Amy Ewing, Institute for Natural Resources	
2.1 THE FOCUS GROUPS	13
2.2 FINDINGS.....	16
2.3 CONCLUSIONS	17
CHAPTER 3: INCENTIVES AND FINANCING FOR ECOSYSTEM SERVICES IN CENTRAL OREGON.....	18
Katrina Van Dis, Central Oregon Intergovernmental Council, and Bruce Aylward, Ecosystem Economics LLC	
<i>The Economic Benefits of Ecosystems</i>	<i>19</i>
<i>The Ecosystem “Marketplace”</i>	<i>20</i>
<i>Central Oregon.....</i>	<i>21</i>
3.1 ECOSYSTEM SERVICES AND CENTRAL OREGON	26
<i>Ecosystem Service Production Types (Ecotypes).....</i>	<i>26</i>
<i>Ecosystem Services Scoping Assessment</i>	<i>29</i>
<i>Assessment Results.....</i>	<i>35</i>
3.2 THE ECOSYSTEM MARKETPLACE IN CENTRAL OREGON	38
4.2.1 Land Management Incentive Programs	38
4.2.2 Water Management Incentive Programs	46
4.2.3 Energy Management Incentive Programs.....	51
3.3 OUTREACH AND SCOPING FOR INCENTIVE MECHANISMS	53
<i>Case Studies.....</i>	<i>58</i>
3.4 CONCLUSIONS	65
3.5 REFERENCES	68
APPENDICES.....	69
A. DEFINITIONAL ISSUES	70
THE ECONOMIC BENEFITS OF ECOSYSTEMS	70
ECOSYSTEM SERVICES: THE CRUX OF THE ISSUE	70
COMPETING NOTIONS OF ECOSYSTEM SERVICES	71
ECOSYSTEMS AND BIODIVERSITY: PUTTING IT ALL TOGETHER.....	72
B. THE ECOSYSTEM “MARKETPLACE”	74
ECOSYSTEMS, PUBLIC GOODS AND MARKET FAILURE	74
FIXING MARKET FAILURE: INCENTIVE MECHANISMS AND THE ECOSYSTEM MARKETPLACE	75

List of Tables

Table 1.	<i>Incentive Mechanisms</i>	21
Table 2.	<i>Deschutes Basin and Central Oregon: Land and Water Units and Population</i>	22
Table 3.	<i>Farmland in Central Oregon</i>	25
Table 4.	<i>Ecosystem Services Listed in the Dependence and Impact Assessment Tool</i>	31
Table 5.	<i>Assessment for Irrigated Farmland</i>	36
Table 6.	<i>Assessment for Public Forests</i>	37
Table 7.	<i>Land Management Incentive Programs in Central Oregon by Ecotype</i>	39
Table 8.	<i>Water Management Incentive Programs in Central Oregon by Ecotype</i>	47
Table 9.	<i>Energy Management Incentive Programs</i>	51
Table 10.	<i>NRCS Conservation Programs by Land Management Type</i>	59
Table A1.	<i>Incentive Mechanisms</i>	76

List of Figures

Figure 1.	<i>Ecosystem Service Credit Production, Cash Flow, and Landowner Financing Need</i>	7
Figure 2.	<i>Gales Creek Project Financial Flows by Participant</i>	8
Figure 3.	<i>Landowner Financial Impact of Gales Creek Project</i>	12
Figure 4.	<i>Deschutes Basin</i>	23
Figure 5.	<i>Land Ownership in the Deschutes Basin</i>	24
Figure 6.	<i>Prineville BLM</i>	24
Figure 7.	<i>Central Oregon Land Use</i>	25
Figure 8.	<i>Summary of Methodology: the Dependence and Impact Assessment Tool</i>	30
Figure 9.	<i>EQIP Eligibility Principles</i>	61
Figure A1.	<i>Economic Values of Ecosystems</i>	71
Figure A2.	<i>Ecosystem Benefits and Ecosystem Services</i>	72

Introduction

In the last few decades, structural shifts in forestry and agricultural economies with their roots in both local and global drivers have depressed many rural communities across the country, as traditional resource dependent industries have closed or moved to lower levels of productivity and competitiveness. This phenomenon is particularly prominent in the Pacific Northwest (PNW) where growing environmental concerns and actions to protect endangered species have had significant consequences for forestry and hydropower production. These trends have had implications for agriculture as well, raising costs of production to abide by new regulations, reducing acreage to provide area for wetlands and other restored ecosystems, and moving water from irrigated agriculture to fish and wildlife purposes. Perhaps more significantly for agriculture in the PNW has been the continued population influx. The broad trend towards population in-migration to cities and the localized trend of amenity migrants moving to high quality of life and quasi-rural areas has also led to land use change, as farms become towns and as large commercial farms are partitioned into smaller “hobby” farms. These influences, and their implications for Oregon’s developing ecosystem services marketplace, are examined in two areas: the Willamette Valley in Western Oregon and the Deschutes Basin in Central Oregon.

In Oregon, the Central Oregon area comprised of Deschutes, Crook and Jefferson counties is emblematic of these two broad categories of trends and concerns, having seen a wholesale reduction in the timber industry over the last 20 to 30 years. At the same time, explosive urban growth and hobby farming have found their way onto rural lands previously devoted to irrigated agriculture and dryland ranching. Concerns over fish, wildlife and ecosystem health have also driven aggressive land and water restoration programs further impacting traditional resource use activities. Of course, countering these negative economic trends in Central Oregon has been the creation of new manufacturing, research and service industries centered around new and expanding economic areas including recreation and tourism, hobby farming, information technology, renewable energy, aviation, and medical/retirement services oriented towards an aging population. In other words, despite the current retrenchment in the building sector and relatively high unemployment levels, the Central Oregon economy has continued on a long term growth path, but one that features continuous change in terms of the favored economic sectors.

The Willamette Valley in western Oregon is bounded by the Columbia River on the north and ends just south of Eugene. The east-west boundaries are the Cascade Mountains and the Oregon Coast Range. Roughly 5,200 square miles in land area and containing parts of 11 counties, the Willamette Valley is the most densely populated and agriculturally productive area of the state. It was the original destination for many people who made up the western migration of the 1800s due to its legendary agricultural potential. When population growth and subsequent suburban sprawl threatened the Willamette Valley’s agricultural base in the 1960s, Oregon passed groundbreaking legislation for state land use planning in the early 1970s to protect its agricultural and other natural resource assets. Despite technology’s rise in economic importance, agricultural and forest products still play a large role in the state and in the Willamette Valley. Oregon’s population is currently projected to grow approximately 40 percent between 2010 and 2040¹. As the state’s most populous area and most likely to remain that way, it is probable that the greatest increase in ecosystem services demands will be in the Willamette Valley.

¹ Oregon Office of Economic Analysis, Forecasts of Oregon's County Populations and Components of Change, 2000 – 2040. http://www.oregon.gov/DAS/OEA/docs/demographic/pop_components.xls.

On a global scale, prospects for upward trends in global population growth through 2050 imply increasing global demand for water, food, fiber, mineral and energy products. This suggests that careful stewardship of the productive capacity of Central Oregon's rural lands and waters and the social capital of rural communities remains vital, even in the face of long-term decline in the traditional productive activities. Also, as the Central Oregon cities of Bend, Redmond, Sisters, Prineville, Madras and La Pine grow, this growth is placing further demands on the rural sector, not just in terms of traditional rural products, but also in terms of the ecological functions that support urban production and consumption, key among these being ecosystem support for quality of life and recreational opportunities away from urban centers.

These drivers in part explain the rapid rate of innovation and experimentation in the Pacific Northwest to develop market-based mechanisms for ecosystem services. The broad vision is one where stable, long-term revenues derived from the growing ecosystem restoration economy are progressively integrated with improved but traditional primary production activities, leading to productive and sustainable economies for rural communities. Recognizing and acting on the economic value of these ecosystem linkages between urban well-being and rural well-being is central to this transition. Ideally, the nature of the urban-rural economic relationship will itself be transformed from one of extraction and disconnection to one of mutual support. These new relationships will be developed across different scales, from the local watershed, to the river basin and even to the global scale, as in the emerging carbon economy.

Oregon is often cited as a hub of innovation in the area of ecosystem services and market development, with much of the experimentation with ecosystem service credit markets taking place in the Willamette Valley. Central Oregon located to the east and across the Cascades mountain range is part of the drier interior Columbia Basin and has been witness to its own form of experimentation and development of market-based mechanisms, loosely grouped under the rubric of a "marketplace" for ecosystem services.

This report is part of a multi-phase project designed to explore how financing mechanisms can advance the development of ecosystem services markets and promote rural sustainability. The objective of the project is to examine the challenges and opportunities related to financing ecosystem services marketplace development, with an emphasis on how such markets can contribute to rural sustainability. The first phase of the overall project consisted of research, interviews with financiers and a workshop that brought together public, private and non-profit experts in the field to explore and discuss the findings. The focus of the project is on ecosystem service credit markets, as one component of the larger ecosystem marketplace. The resulting final report for this first phase of the project presents a generic model of ecosystem services production, with project activities, timeline and financial flows (Hartwell et al. 2010). This model identifies the financing needs that need be overcome in market development and the report goes on to explore a range of issues and potential solutions, both public and private. In the second phase of the project, financing needs and opportunities are explored in the context of the Deschutes and Willamette Basins. Findings, including assessment of a pilot project and focus group responses in the Willamette Valley, and the different opportunities and strategies being used in Central Oregon's Deschutes River Basin, illustrate the varying developmental stages of the ecosystem services marketplace.

Although credit transaction market development among government, non-profits and private sector interests is almost exclusively focused on the Willamette Valley, creating appropriate institutions and educating landowners regarding the potential benefits of market involvement nonetheless comprises a highly emergent process. INR evaluated an in-progress pilot project in the Willamette Valley which involves development of multiple ecosystem credits: wetland credits, water temperature credits, and salmon credits. The Oregon Department of State Lands (DSL) and Clean Water Services (CWS), the Wastewater Authority for Washington County, Oregon partnered to share costs for design and construction of a restoration project on private land which includes purchase of a conservation easement. The landowners have received payment for the conservation easement and will receive other minor

benefits. The agency partners will own the ecosystem credits upon project completion. Developing the project and negotiating for sale of the easement entailed significant transaction costs. Final figures for the project will not be available until late 2010.

All parties appear to be satisfied with results to date and consider the project groundbreaking and successful. At this point, the project illustrates two significant points. First, ES projects are complex and site specific – few, if any, generalizations from the pilot project to other opportunities are currently possible. Second, the project cannot be assumed to provide evidence that ecosystem services project investment constitutes a broadly applicable attractive opportunity for rural landowners. Both details highlight the reality that an inability to make generalizations or determine the broad attractiveness of such projects may be the case for a significant length of time into the future, even in a “market” that is presumed to be advanced compared to other areas.

Two focus groups held in different areas of the Willamette Valley revealed that the concept of ecosystem services markets was obscure for many landowners, and participants expressed a full spectrum of opinions about them. Some were open-minded; others were accepting; still others were suspicious of, and resistant to, markets based on the potential for non-local and corporate, Wall Street-type influence to erode local autonomy. Scale and trust are interlinked issues affecting social acceptance: landowners perceive greater trustworthiness in a localized marketplace. Based on focus group findings, potential growth in ecosystem services markets represents both desirable and undesirable pressures. For some landowners, the potential to acquire ecosystem service credits validates that they are indeed employing environmentally beneficial land use practices.

The objective of the work in Central Oregon was to confirm, enhance, or refine our understanding of the market needs and opportunities generated in the first phase of the project. Given the relative lack of development of ecosystem service credit markets in the Deschutes Basin, compared to the Willamette Basin, the work in the Deschutes Basin is necessarily more formative and less rigidly limited to credit markets per se as a tool. Thus the work attempts to:

- Identify the range of land and water uses found in Central Oregon and classify them according to their potential for ecosystem service generation, broadly speaking
- Identify the ecosystem marketplace incentive mechanisms already in place in Central Oregon including credit markets
- Identify what opportunities exist for bringing criteria and protocols for ecosystem service credits from outside the region to bear on ecosystem service issues that exist in the basin (i.e. voluntary carbon credit markets)
- Identify opportunities to develop new credit market opportunities, either whole cloth development of new credit types, or adapting credit criteria and protocols to the particular context of Central Oregon
- Interview landowners and project participants engaged, or interested, in ecosystem service generation in these different classes and record how the suite of ecosystem marketplace incentive mechanism, is viewed from the perspective of a landowner; and identify the financing challenges and opportunities that result from this analysis
- Work with a small number (1 to 5) landowners to develop worked case studies of the financing problem and the application of potential solutions (from the first phase of the project)

With a topic so vast, the Central Oregon report can only cover current advances and attempt to point the way forward by organizing relevant material and experiences and exploring a limited number of initial experiences through case studies.

Chapter 1: Gales Creek Ecosystem Services Credit and Restoration Project

Project Economics and Finance from the Landowner Perspective

An innovative ecosystem restoration project (the Gales Creek Project) in development on George and Sara Kral's farm outside of Forest Grove, Oregon will reestablish wetlands, riparian vegetation, and natural stream meanders on portions of Roderick and Gales Creeks, tributaries of the Tualatin River. The restoration benefits of the project will be used to establish multiple types of ecosystem services credits under various State and Federal regulatory frameworks. Specifically, the Roderick Creek restoration will generate 12 acres of wetland mitigation credits pursuant to section 404 of the Federal Clean Water Act, while the Gales Creek work is forecast to generate 705 salmon credits under the Willamette Partnership's crediting protocol.² There may also be an opportunity to generate temperature credits used for Clean Water Act mitigation obligations.³

The project features a multi-agency public-private partnership in which the Oregon Department of State Lands and Clean Water Services, the Wastewater Authority for Washington County, Oregon have collaborated to construct the restored ecosystem on private land secured through purchase of a conservation easement. The two agencies share the costs for site acquisition and project construction and also own the resulting ecosystem services credits. The landowner receives payment for the conservation easement as well as other minor benefits.

This case study examines the economics and finance of the project from the perspective of the landowner. While ecosystem services credit development holds theoretical promise for rural landowners as an economic opportunity that also is environmentally sustainable, there is little empirical information on whether these projects are financially beneficial to landowners. Boosters maintain that the projects are economically attractive but that institutional or policy barriers have impeded their development. Skeptics argue that the dearth of projects evidences marginal finances in these markets. This case study examines the Gales Creek project to determine whether, and how, it makes financial sense for the participating landowner. It is part of a larger research effort into how ecosystems services finance can support market development and rural sustainability. The research is funded by the Bullitt Foundation of Seattle Washington and is being conducted by Ecosystem Economics, LLC in conjunction with the Oregon University System's Institute for Natural Resources.

The project was still in process when this report was completed. Dollar figures are therefore preliminary estimates.

1.1 Financial Flows in the Gales Creek Project

There are three main financial participants in the Gales Creek Project: the Oregon Department of State Lands (DSL), Clean Water Services (CWS), and landowners George and Sara Kral. The basic financial

² See at <http://willamettepartnership.org/ecosystem-credit-accounting/willamette-ecosystem-marketplace-documents/General%20Crediting%20Protocol%207.20.09.pdf>.

³ Some portions of the restored area could generate either wetland, salmon, or temperature credits, but claiming one type of credits reduces the number of another type of credits that can be established (to avoid double counting). The numbers and types of eventual credits established will likely be driven in part by market demand.

profile of the project for each participant is explained below at a general level. This establishes the context for a more detailed analysis of the project from the landowner's perspective.

Department of State Lands

For DSL, the Gales Creek project is essentially an investment in developing wetland mitigation credits. DSL can establish wetland mitigation banks to generate credits for sale on the private market to those with regulatory mitigation obligations. The agency faces a rule-based cap on the sales price for any credits at the average cost charged at private mitigation banks in the state, currently \$83,000 per credit/acre. Assuming that the credits can command this sales price, then DSL should be willing to invest in projects that will generate credits for less than \$83,000 per credit/acre.

The Gales Creek project is forecast to generate 18 wetland mitigation credits for DSL, worth an estimated \$1,002,000. The total project cost is estimated at \$629,000, implying a surplus of \$373,000 based on wetland sale alone, without accounting for other project benefits. DSL funded the project through a grant of \$629,000 to CWS, who is managing the project and also holds the easement on the land. There is some risk that the wetland credits either will not be generated or will not be able to be sold for the expected price, or a private mitigation bank will establish in the same area, in which case DSL will generally not compete for business. Presumably the sales price risk is minor given the long time horizon appropriate for a public agency. Any agency profits from credit sales go into a statutory account dedicated to funding wetland and stream restoration work.

Clean Water Services

For CWS, the Gales Creek project was a way to invest in mitigation credits that would be available either for sale or to meet a future self-mitigation need. Specifically, the Gales creek portion of the restoration project will treat eight acres of riparian land, generating 705 salmon credits that could potentially be sold to buyers such as the state or county transportation departments. For CWS, the project is low-cost restoration compared to a customary USDA Conservation Reserve Enhancement Program (CREP) project that would typically cost \$14,000 per acre. Final project figures will not be available until late 2010. It is therefore not possible to compare the cost to the agency in contrast to a comparable CREP project.

CWS is managing the Gales Creek project, including managing a \$115,000 endowment fund earmarked for project maintenance in perpetuity (primarily weed control on the project site). The agency also has the right of first refusal on the wetland credits DSL is establishing through the project. CWS attributes the project's attractiveness to economies of scale – the project is relatively large and generates multiple types of credits while efficiently engaging only a single landowner.

CWS is interested in the restoration both for the ability to acquire mitigation credits (CWS will have an option to purchase them from DSL) and to meet its mission. The sales price of the credits if sold to agencies is currently undetermined except that credit prices for the DSL side are fixed at the statewide per/credit average. CWS does not plan on selling credits from its portion at this point.

Landowners George and Sara Kral

For landowners George and Sara Kral, participation in the Gales Creek project took the form of a conservation easement sale on 32 acres of their 60-acre farm for a one-time payment of \$160,000 at the end of 2009. With this sale, the Krals face the loss of production value of on 20 arable acres and retain the right to farm on five acres. Seven acres of the easement are not suitable for farming. In addition, the landowners retain rights to collect seeds for their nursery operation.

Landowner project risks are primarily related to satisfaction with the restoration project in terms of its aesthetic impact and ecological functionality. The major financial risks related to construction, permitting, maintenance, credit establishment, and credit sale are entirely borne by DSL and CWS. This allocation of risk has interesting implications for the landowner experience of the project – while much of this research effort has been around the financial mechanisms and characteristic risks and opportunities of investing in ecosystem services credit production, the Gales Creek project is essentially equivalent to a basic land deal for the landowner. While use of the easement to produce ecosystem services credits is secondary, and analysis of the landowner’s financial experience is very similar to that for sale of a conservation easement to a land trust with no restoration work or ecosystem service credit development contemplated, appraisal of the process is highly instructive for purposes of this project.

1.2 Conceptual Framework

In the report for the first phase of this research project, a conceptual framework for the challenge of ecosystems services finance was developed. The framework illustrated the challenge, for an individual landowner, of making an up-front investment in project development in anticipation of future revenues from sales of ecosystem services credits in newly established and highly risky markets. The financial challenge was whether the timing, amount, and certainty of financial flows could be arranged so that they had a positive net present value that could attract investment. This framework is illustrated in Figure 1.

This generic framework is not directly applicable to the Gales Creek project because the project has three different participants rather than a single entrepreneurial landowner-developer. The figure has been adapted below to accommodate the specifics of the Gales Creek project.

Figure 1. Ecosystem Service Credit Production, Cash Flow, and Landowner Financing Need

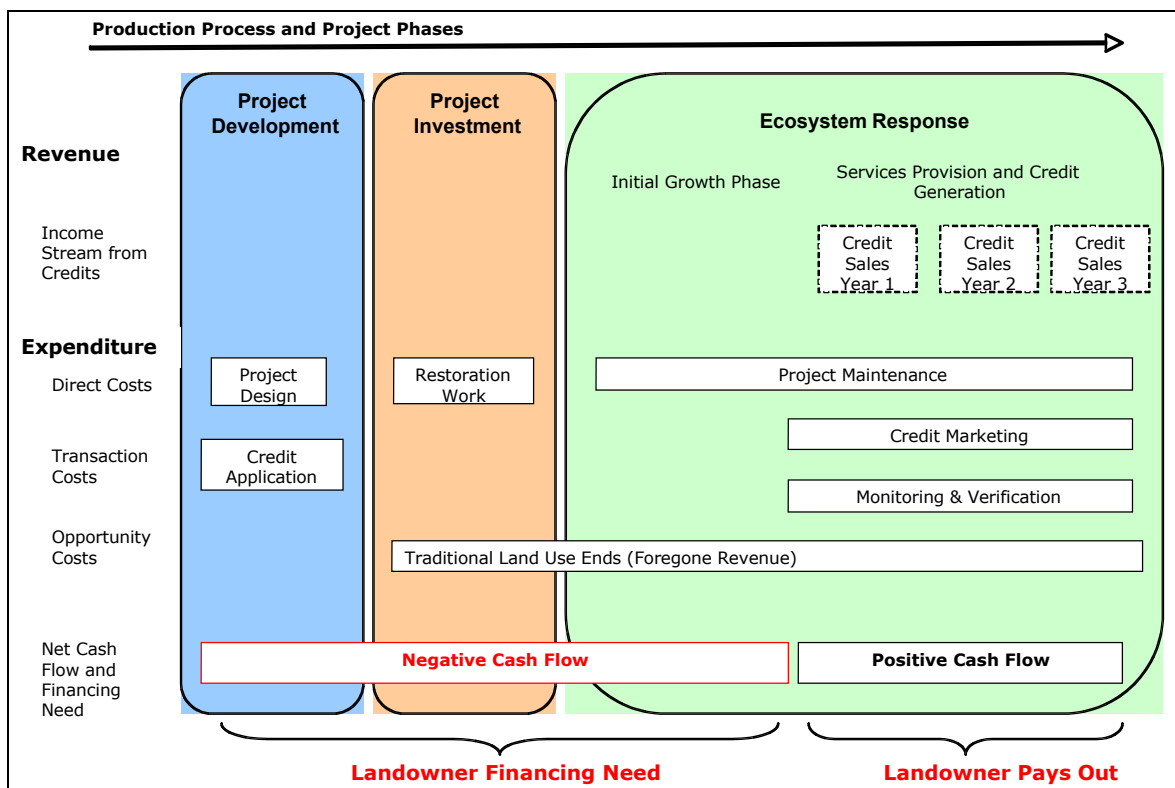


Figure 2. Gales Creek Project Financial Flows by Participant

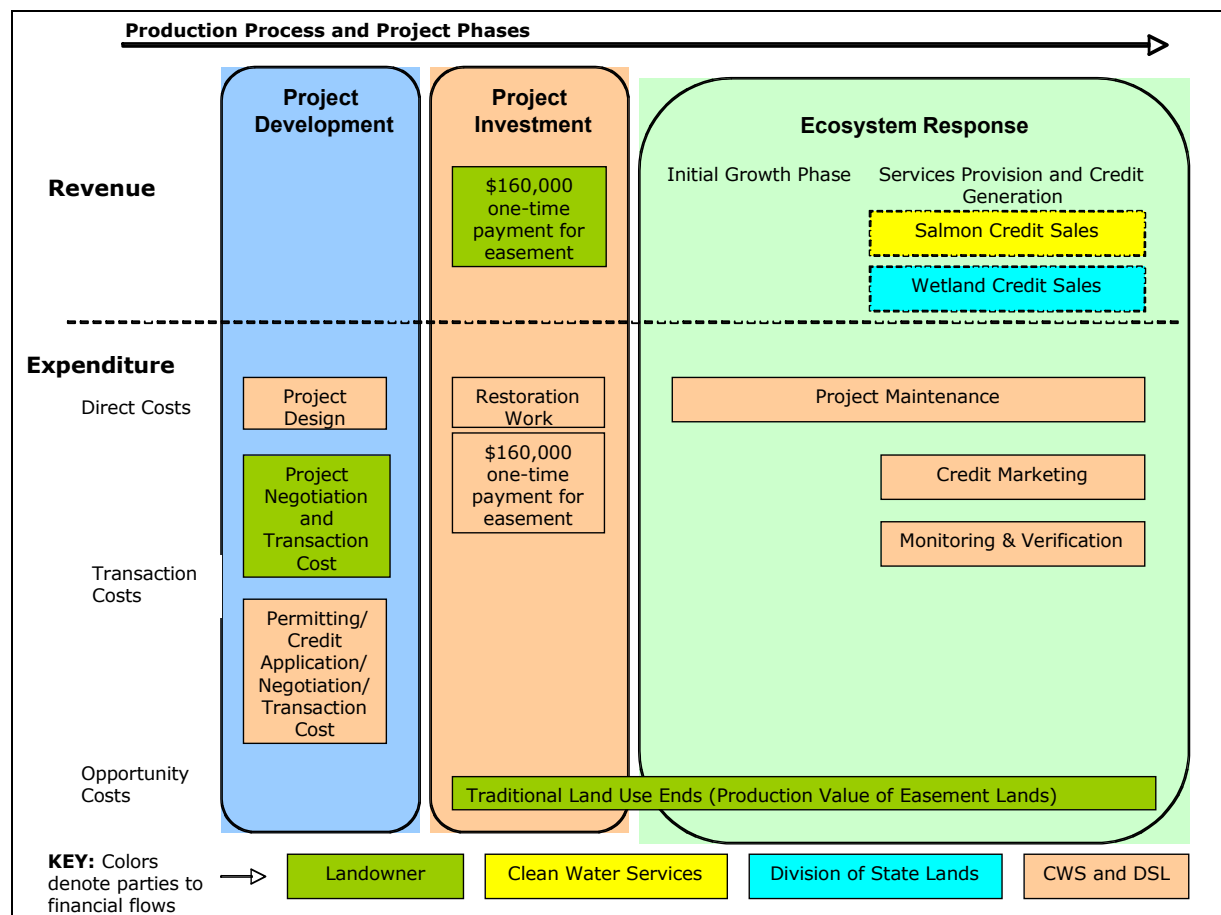


Figure 2 portrays the financial flows of the Gales Creek project by participant, with revenues or expenditures flowing to or from each participant coded by color. Due to the cost sharing of project development between DSL and CWS, there is a separate color (salmon) denoting shared costs. The uncertain future revenues from credit sales appear in the upper right (uncertainty denoted by the dashed-boxes), but these risks (and potential benefits) are borne by DSL (blue) and CWS (yellow). Flows involving the landowner are coded green – this illustrates that for the Krals, the project trades foregone land uses (the production value of the conservation easement) and transaction costs for a one-time payment of \$160,000. The following section explores this transaction further, with the objective of understanding whether and how participation in the ecosystem services market enables the landowner to simultaneously safeguard the environment and prosper economically.

1.3 The Landowners' Financial Experience

The Krals sold a conservation easement to CWS and DSL for \$160,000 to enable the Gales Creek project. The question, in terms of the project's implications for rural economic sustainability, is whether this indirect participation in the ecosystem services market left the landowners better off than they would otherwise have been. The upfront assumption is that he is indeed better off participating, because if not he presumably would not have sold the easement. This then leads to other questions about whether the experience is generalizable: does any economic gain from the project to Kral imply a broader opportunity in ecosystem services markets for other landowners, or is there something particular about the Gales

Creek project that makes it succeed where other efforts might not? To answer this question, a detailed analysis of the costs and benefits of Kral's participation follows below, complemented with a discussion of what implications it has for the broader market, if any.

Conservation Easement

The Krals received a one-time payment of \$160,000 for the conservation easement on 32 of their farm's 60 acres. Given that this is the primary landowner benefit from the project, understanding whether this is a good price is central to project finances. Two primary methods can be used to understand this price:

- analysis of the change in production value of the land under the easement;
- analysis of the change in market value of the farm under the easement.

Production Value

The easement affected 32 acres of the Kral farm. Of this total, seven acres were not arable, 20 were being farmed but will be converted to wetland by the project, and five farmed acres will continue to be farmed under the easement.⁴ This distribution of land implies a loss of production associated with 20 acres as an appropriate measure for the cost of the easement.

According to George Kral, dryland farming in the area yields net revenues of \$400-500 per acre annually, equivalent to a net present value of approximately \$10,000. Assuming net revenues of \$500 per acre, a \$10,000 net present value of production per acre equates to a low discount rate of approximately 2.85% over 30 years. While real interest rates are presently extremely low, it is worth noting that if a higher interest rate is used in the amortization, the NPV will be significantly lower – at 6% the NPV is roughly \$6,900 and at 10% it is approximately \$4,700.

The \$160,000 easement payment equates to \$8,000 per acre of foregone production, lower than the \$10,000 suggested by Kral as the amortized value, but greater than the net present value at a typical 6% interest rate (\$8,000 is equivalent to \$500 annually over 30 years at 4.65%). Clearly, if the \$400 annual net revenue figure is used, the present values will be proportionally lower. Without undue haggling over the mathematics of amortization calculations, the payment of \$160,000 for the easement is reasonable compensation for the lost production of the land used in the project.

Market Value of the Farm

Another method for gauging the appropriateness of the \$160,000 easement payment is to contrast the market value of the farm with and without the easement. This, in turn, necessitates assumptions about from what the value of the property derives. If the property's value is primarily for agricultural production, then the market value should be reduced by the value of that production (which is discussed above). If the value of the property is primarily supported by future real estate development, then the easement is likely to seriously reduce that value by precluding some subdivision and building. Given the location of the property and the expected trajectory of development in Washington County, it seems unlikely that potential development is a significant foundation for the property's value. In a third scenario, the conservation easement is not likely to significantly reduce the value of the property as a vacation home or hobby farm. Indeed, under such a use the project could be a source of value as a natural and aesthetic amenity.

⁴ The Krals operate a Salmon Safe certified nursery. As a result, easement restrictions limiting conventional farming practices produce less impact on the Krals than they might on a farmer more heavily reliant on pesticides, herbicides, and high-impact cultivation techniques.

It is difficult to say which of these property valuation assumptions is appropriate for the Kral property – each argument was considered in the course of developing the transaction. Though coming to a firm value for the easement is difficult under this circumstance, one critical factor is that the bank holding the mortgage to the Kral property allowed the easement to proceed. This implies that the bank felt that the property value would not be so diminished under the easement as to constitute an unacceptable risk. On the one hand, the bank's acceptance of the easement could imply that the easement does not diminish property value, perhaps because that value is driven by the hobby farmer/vacation home market that is concerned neither with development nor with production. On the other hand, the Kral's plan to reinvest the money from sale of the easement into capital improvement to the farm, including buildings. This raises the question of whether the bank valued any such improvements as offsetting any reduced property value from the easement.

The Kral's purchased the farm, which includes a house and some outbuildings, in 2008 for \$640,000. Anecdotal reports on the value of farmland in Washington county suggests that real estate values have not significantly decreased. The bank's agreement to the conservation easement provides some support to the notion that the property value was not significantly reduced by the easement. While these general directional factors provide little basis for valuation, the \$160,000 payment for the easement is broadly consistent with observable market value indicators.

Transaction Costs

Unsurprisingly, developing the project and negotiating for sale of the easement entailed significant transaction costs. While the financial costs were paid by DSL and CWS, George Kral estimates that he spent hundreds of hours working on the project. Notably, the amount of time required to complete the easement sale and negotiate easement language were much greater than he expected.

It is clearly difficult to formally value hundreds of hours spent on the project, but the range might reasonably be expected to fall between \$2,500 and \$15,000 (lower bound of 100 hours at \$25 per hour, upper bound of 300 hours at \$50 per hour).

Other Benefits

Beyond the easement payment, there are significant other benefits accruing to the landowner from the project that should be considered in the analysis. These include weed control, seed collection, and the business opportunity to participate in the project.

Weed Control

In the project, CWS is responsible for maintaining the restored areas in perpetuity, and a \$115,000 endowment has been established to fund this work. According to George Kral, the weed control is a significant benefit to his nursery operations – without the project, this expense would fall on the nursery. The project incorporates a 4.5% capitalization rate in the weed control endowment. At this rate, the endowment is equivalent to a 30-year annuity payment of \$7,060 per year. Presumably not all of this value reflects activities that the landowner would have to undertake absent the project, but if 50% is avoided cost to the landowner, that would amount to \$3,500 annually (or \$57,500 in present value).

Seed Collection

The easement also contains provisions that allow the landowner access to the wetland for collection of seeds to be used in their native plant nursery. While the opportunity to collect these seeds is not unique to the property – collection opportunities for these plant species are available elsewhere in the

county – there is significant value to the nursery to having the seed source onsite. George Kral confirmed that they had used previous nursery lands for the same purpose when they were leasing another farm, and would have had to develop a source for the seeds themselves without the project.

It is difficult to value the right to collect seeds on the property. George Kral estimated the cost of restoring wetland areas with native plantings at \$6,000 per acre. Assuming that a three-acre restored area could supply the seeds, the collection rights are worth roughly \$18,000. This amount is equivalent to an annual value of roughly \$1,000 annually over 30 years (using a 4.5% discount rate), which seems a reasonable estimate of annual avoided travel and access cost to collect seeds for the nursery off site.

Business Opportunity

An additional source of project value for the landowner stems from the expectation that CWS will contract with him for the restoration work related to the project. Specifically, the Krals own a nursery that provides plants to wetland mitigation banks and other restoration projects as well as a restoration company that is under contract with CWS to work on its projects. As a result, the Krals expect to enter into an agreement to work on the Gales Creek project as a contractor (contracting with the landowner for restoration activities is common practice in projects including CREP).

The value of this additional aspect of the project depends on both the profitability of the restoration contract and the opportunity cost. Assuming that the Gales Creek work was incremental to any other activity – that is, that absent the project the Krals' businesses would have had no other project and would have sat idle - then there is no opportunity cost to the project⁵. Kral estimated a cost for the restoration plantings of \$6,000 per acre, equivalent to \$162,000 for the 27 restored acres of the project. At the same time, he expects to charge CWS significantly less than \$6,000 for the work. Assuming a cost of \$4,000 per acre for the restoration and a margin of 20% on the work, then the value to Kral of the restoration business opportunity is \$21,600. Because the initial restoration planting is conducted at the start of the project, the year one value is the total value of the opportunity.

There also may be an opportunity for the Krals' company to provide the weed control and site maintenance funded by the CWS \$115,000 endowment. As discussed above, the endowment equates to annual payments of \$7,060 for 30 years. Assuming that this amount is actually expended and that there is a similar 20% margin on the work, then the value of a weed control business opportunity could be \$1,412 per year or \$23,000 capitalized (at 4.5%).

Between work on initial restoration and project maintenance, the Gales Creek project could yield business opportunities worth up to \$44,600 in present value of profits to the Krals. Clearly, there is some risk in these estimates that is material for landowner decision-making.

Summary

The figure below summarizes the discussion above in an estimate of the net benefit of the Gales Creek project from the perspective of landowner George Kral.

⁵ An interesting related question is whether George Kral's firm would have gotten the contract on a similar restoration project on some other property. If so, then the value of the business opportunity is related to someone undertaking a project like Gales Creek, rather than directly dependent on George Kral's undertaking the project on the farm.

Figure 3. Landowner Financial Impact of Gales Creek Project

	Case 1: High Benefits, Low Costs	Case 2: High Benefits, High Costs	Case 3: Low Benefits, Low Costs	Case 4: Low Benefits, High Costs
Project Benefits	High	High	Low	Low
Easement Payment	\$ 160,000	\$ 160,000	\$ 160,000	\$ 160,000
Other Benefits				
Weed Control [1]	\$ 57,500	\$ 57,500	\$ 10,000	\$ 10,000
Seed Collection [2]	\$ 18,000	\$ 18,000	\$ 5,000	\$ 5,000
Business Opportunity [3]				
Initial Restoration	\$ 21,600	\$ 21,600	\$ -	\$ -
Maintenance/Weed Control	\$ 23,000	\$ 23,000	\$ -	\$ -
Subtotal Benefits	\$ 280,100	\$ 280,100	\$ 175,000	\$ 175,000
Project Costs	Low	High	Low	High
Cost of Easement [4]				
Foregone Production	\$ (100,000)	\$ (200,000)	\$ (100,000)	\$ (200,000)
or Lost Property Value	\$ -	\$ (160,000)	\$ -	\$ (160,000)
Transaction Cost	\$ (2,500)	\$ (15,000)	\$ (2,500)	\$ (15,000)
Subtotal Costs	\$ (102,500)	\$ (215,000)	\$ (102,500)	\$ (215,000)
Project Net Impact	\$ 177,600	\$ 65,100	\$ 72,500	\$ (40,000)
<p>Note:</p> <p>[1] High estimates taken from text, low estimates assumes at \$10,000.</p> <p>[2] High estimates taken from text, low estimate assumed at \$5,000.</p> <p>[3] High estimates taken from text, low estimates reflect landowner not getting contract.</p> <p>[4] The relevant cost of easement will depend on the land use. The landowner expects to use the farm for production, and therefore the foregone production value is operative in the near term. The high estimate for foregone production value reflects landowner's \$10,000 per acre estimate, with the low estimate at 50% of that value. The lost property value estimate ranges from the easement payment amount of \$160,000 to \$0 (reflecting no loss of value in sale to a hobby farmer). Note that the lost property value is not used in any case because (1) if the property were sold and the value were relevant, several of the benefits would no longer accrue to the landowner and (2) the landowner's motivation for undertaking the project was to acquire working capital to support farm production.</p>				

The table above illustrates that depending on assumptions made about the costs and benefits of the project, the net present value of the effort ranges from positive \$177,600 to negative \$40,000. While these figures are really estimates, they do highlight that for the landowner, the project may or may not be economically attractive. In fact, it is very possible that the project will leave the landowner worse off than he would otherwise have been. Further, a significant portion of the project value is from sources that are not fungible – if George and Sara Kral were not engaged in nursery and restoration businesses, the seed collection and business opportunity would not provide value, altering the project economics for the worse. Though scant hard valuation information impedes confidently drawing a conclusion, analysis suggests modest positive expected net present value for the project from the perspective of these landowners.

1.4 Personal Finance Context

Assuming that the rough analysis presented above is reasonable, the question arises as to why a landowner would pursue a project with modest expected value and some risk. The decision to proceed suggests that pre-project assessments of expected project value were at the higher end of the range projected the analysis. Another possibility is that the landowner derived some non-economic benefit from project participation, including potentially satisfying an interest in effecting restoration or realizing environmental goals. This possibility is of course legitimate – the project is groundbreaking and has generated much interest as an exemplary effort – but if landowner commitment to sustainability drove willingness to participate in a project with marginal economics, it is unlikely that less environmentally committed landowners would participate in similar projects.

In the case of the Gales Creek project and George Kral, this speculation can be avoided. In interviews, Kral explained that although he is personally very invested in ecological restoration, the primary motivation for participating in the project was sale of the easement to provide working capital to reinvest in improvements to the farm. There was no willingness to accept a below-market price for the easement that could be described as a landowner subsidy of the project. As a result, the economics of the project as described above likely reflect a complete picture of the transaction.

Knowledge that the project was initially pursued as a way to provide working capital for the farm raises the question of how it might compare with other sources of finance. Bank finance such as an equity loan on the property or a business loan for the nursery would be possible alternative sources of funding for the improvement. Here the timing of project development, roughly coincident with the financial crisis, comes into play. George Kral reported that after purchasing the farm, he was unable to secure any additional bank financing for property improvements, despite having over 20% equity in the property. In May 2008 when he was seeking a source of finance, a lack of liquidity foreclosed traditional options, and the Gales Creek project presented a possible alternative solution. Though a second option, the project did present a viable option for acquiring needed capital, and this was the landowner's primary motivation for participation. The implication for the project generally is that a serendipitous combination of landowner need and acceptable financial terms led to the transaction.

1.5 Implications for Other Projects

- Projects are complex and site specific – any generalization from the Gales Creek effort to other opportunities should keep this in mind.
- Three major factors contributed to the success in negotiating a mutually acceptable transaction:
 - A reasonable cash payment for the easement.
 - Significant value to the landowner from seed collection rights and the restoration business opportunity.
 - A motivated landowner in search of capital without other immediate options.
- Two of the factors contributing to the value proposition for the landowners are unlikely to be repeatable – the value of seed collection and the restoration business opportunity are not broadly applicable to other landowners, and the lack of alternative sources for working capital for the farm was driven largely by landowner needs being coincident with a historic financial crisis.
- The Gales Creek project, though groundbreaking and successful, does not necessarily provide evidence that ecosystem services project investment constitutes a broadly applicable attractive opportunity for rural landowners.

Chapter 2: Willamette Valley Focus Groups

March 2010

Ecosystem service markets have the potential to enhance ecosystem restoration and stewardship while providing long-term revenue sources to help revitalize rural economies in the Pacific Northwest. However, participation on the supply side will entail high transaction costs and financial risks that may discourage many rural landowners. If ecosystem service markets are to help rural communities make the transition to a sustainable future, barriers to participation need to be examined and strategies for overcoming them need to be explored.

As an important element of this project, the Institute for Natural Resources (INR) held two focus groups in Oregon's Willamette Valley during March 2010, one in Forest Grove and one in Eugene. The purpose of the focus groups was to determine landowners' levels of knowledge and interest in ecosystem services projects as well as perceived barriers to undertaking ecosystem services projects. We sought to improve our knowledge about landowner needs with respect to ecosystem services markets, consistent with Bullitt Foundation project purposes.

2.1 The Focus Groups

Criteria for potential participants consisted of property owners actively engaged in non-industrial scale farming, ranching and/or timber production. INR asked local watershed council staff in Forest Grove and watershed council and Eugene Water and Electric Board (EWEB) staff in Eugene to act as liaisons for contacting landowners who might be interested in focus group participation. INR sent out invitations for the two-hour focus groups to those who indicated interest in being invited.

After a brief presentation on what is meant by ecosystem services and what comprises ecosystem services markets, INR facilitators asked a series of open ended questions to encourage discussion among landowners. Due to confidentiality requirements, landowner insights and perspectives are provided without reference to specific individuals or to a particular focus group.

At each focus group landowners were asked to introduce themselves, to provide some general information about their property, and to describe their knowledge of or interest in ecosystem services. This introduction helped acclimate landowners to the group setting and gave them an opportunity to talk about their land management practices, knowledge and feelings about ecosystem services. In some cases, this evoked a description of their land ethic.

Examples of property uses among those who attended included ranching; woodlots including old-growth trees; pasture and hay; fruits and vegetables, including certified organic production; and livestock. In most cases, property uses comprised a mix of the foregoing production types. Most property owners had either set aside land to maintain its unmanaged or uncultivated state or had implemented various protection and restoration projects. Landowners involved in protection and restoration projects frequently mentioned interaction with sponsoring organizations such as the National

Resources Conservation Service, the Oregon Department of Fish and Wildlife, the Forest Stewardship Council, or the local watershed council or soil and water conservation district.

Landowners were generally well aware that they were providing *environmental* services on some level. This was evidenced by their reported efforts to promote sustainable and/or beneficial land management practices and their descriptions of their ideas and goals. While landowners had considerable knowledge of and interest in their land and its value to ecosystems, the majority had little to no knowledge of the concepts of ecosystem services or ecosystem service markets.

Though unprompted, several landowners took the opportunity to describe personal philosophies or land ethics. One described feeling that owning the land demanded improving its condition for future generations but also that the land must produce and “pay for itself”. Others indicated hoping to share their land with the community or to provide a social benefit such as a park or open space. Still others described the desire to leave a legacy through the land. One participant stated that he was proud of what his father had done with the land and that he hoped his children would feel the same about his actions. He felt that it would be beneficial if someone put a value on the generational interest in being land stewards. Those who want to pass their land on to their heirs would like to find additional ways to ensure that can happen. Landowners also talked about the importance of educating the public generally and, in particular, grade school students, regarding what constitutes good land management practices. Participants felt that this would build a sense of shared responsibility for taking care of the environment and further encourage good land use practices.

Several talked about the general lack of recognition they received for land stewardship. In many instances, they felt they were unfairly characterized, especially by environmental groups, as engaging in environmentally harmful land use practices. On the other hand, some contrasted individual and corporate ownership by noting the “missing land ethic” of nearby industrial commodity production and expressed particular interest in restoration and land management to protect ecosystems and manage for fire protection at the watershed scale.

There was a split between those who were enthusiastic about ecosystem services market and those who perceived them as potentially threatening. Some were concerned with understanding what an ecosystem service marketplace entails: what is tradable, and who wants to buy it? Several landowners voiced willingness to consider application of all aspects of ecosystem service marketplaces, noting that many possible types of ecosystem service markets exist and that they offer the possibility of a net gain to landowners and the environment. One landowner mentioned having certification for specific production practices for several decades. Another participant noted that obtaining certified credits for ecosystem services would be a strong validation of environmental stewardship. Some who were already engaged in restoration projects liked the idea of having the work both acknowledged and paid for through a marketplace approach while others voiced strong objections to adopting a commodity perspective regarding the environment. One producer expressed criticism of ecosystem services credits as derivatives.

A property owner noted that, as ecosystem service marketplaces develop and increasing numbers of agricultural and forest producers participate, reluctant landowners may be compelled to take part. Furthermore, this dynamic would threaten autonomy regarding decisions about land management practices. This tended to be the perspective of landowners who were critical of markets involving corporations and “Wall Street types” and who expressed deep distrust of any system involving corporate interests. The market was seen by some as setting up a system that allowed polluters in distant places to use local producers to buy off their polluting activities instead of changing their activities.

A participant stated that until roles in ecosystem service marketplaces are defined, small-scale landowners remain most vulnerable to market rules that negatively affect them. Another suggested that participating

early in market development might offer the benefit of creating preferred roles for landowners rather than roles defined by opposing interests. There was interest in a local and/or regional market. Such a market was seen as creating more of a sense of community as producers and credit purchasers would be more closely related. Such a market would also provide more local control over market structure and activities.

Concern for the trustworthiness of ecosystem service marketplaces extended beyond potential financiers to any oversight structure. Some expressed unease for adding “another bureaucracy”, questioning who or what interests would comprise that bureaucracy. Landowners questioned whether, if they were to enter into an ecosystem services agreement, it would endure and whether a reliable structure to ensure accountability for delivering ecosystem benefits would persist. There was also concern regarding whether entering into an agreement might expose a producer to demands that might not make sense for the land. Some landowners stated that only those who lived on and worked the land could be trusted to manage it properly due to their intimate knowledge of it.

There were contrasting opinions on the trustworthiness and knowledge of Oregon State University and OSU Extension faculty, with some landowners expressing complete reliability and others expressing complete unreliability.

Among landowners who were interested in participating in ecosystem services markets, there was apprehension regarding a number of issues. Some were concerned that their beneficial efforts would be undermined by non-participating neighbors. While landowners wanted to maintain their own decision making autonomy regarding land use practices, they nonetheless expressed interest in finding ways to compel neighboring landowners to do a better job of managing their land in more environmentally sustainable ways.

In some cases there was uneasiness that environmental groups would become involved, with negative consequences: some landowners expressed the opinion that environmentalists tended to see only what they perceived as landowners’ negative activities and would focus on those rather than on the positive actions inherent in restoration projects. Others were troubled by the prospect that participating would require completing a lot of administrative tasks—in particular, a burdensome amount of paperwork. There was a suggestion that entities wanting to enroll landowners in restoration projects should provide a “case manager” to oversee all aspects of project design and implementation including finding funding, obtaining scientific and technical assistance, being a liaison with involved organizations and agencies, and taking care of the paperwork. Some landowners noted that their local watershed council plays this role for the projects in which it is involved; however, if there were ways to expand project opportunities that would result in credit development, other organizations would need to play a similar role.

Some participants were concerned that participating in restoration projects would interrupt their privacy by allowing people onto their land and might lead to unwelcomed advice or even penalties with respect to their other land management practices outside of project boundaries. One recommended that agency staff coming onto someone’s property need to be flexible and understanding. For instance, agency representatives have entered property and noted that some of the land use not involved in restoration projects was potentially in violation of land use regulations. In some instances, there were discussions regarding what needed to be changed and how the agency could help the landowner make those needed changes. In other instances, different agency staff threatened to bring actions against the landowners without any deliberation or negotiation. The landowners noted that they’re carrying out what they assume are good land use practices; however, rules often change, and they may not be aware of those changes. They suggested that there needs to be a “daily amnesty” when agency personnel come on to their property.

In one area there seemed to be particular concern with respect to county-level personnel. There was also a sense that, due to inconsistencies between state and county requirements, especially concerning floodplain work, there were significant prospects for landowners to suffer financial consequences as a result of the ambiguities. The general perspective was that in such instances the benefit of a project was not worth the potential cost. A participant suggested that a way to limit landowner liability would be to have the county propose the project as the county would therefore have to shoulder many of the project liabilities.

Those who had implemented restoration projects mentioned a couple of other day-to-day issues. One project failure was likely due to planting the wrong types of cover. In another instance, wildlife had eaten most of the young plantings. It was not clear whether these outcomes were due to not having the correct scientific and technical support. Time was also cited as a problem with respect to both front-end involvement and to maintenance – it's difficult to carry out things like weed control during summer when other production operations already take up all of the property owner's time. Someone suggested that it would be extremely helpful to have some kind of compensation for someone to help maintain projects during the busy times of the year.

2.2 Findings

Based on focus group discussions, the findings comprise the following suggestions for developing a well functioning, acceptable market:

- Putting a **value** to the ecosystem services that have been in place for years. Several landowners expressed that their management practices have benefitted the ecosystem but gone unvalued for years while they struggle to financially maintain those ecosystem services. Having a system acknowledge and value this important work is significant, and to some perhaps as much or more important than the economic benefits to be provided in the marketplace.
- Finding ways to **manage for healthy ecosystems at the landscape level**. Various landowners believe that, while they are managing land for environmental sustainability, their neighbors are not. While landowners want to maintain decision making autonomy, there need to be institutions and incentives to manage for ecosystem services at the landscape level to increase effective restoration outcomes. Verifying all landowners are applying stewardship principles while working the land may further motivate individuals to buy into the group effort by lowering transaction costs and reducing liabilities.
- Developing programs that promote **community, youth, and the future**. These ideas arose repeatedly and are of deep concern to landowners. Landowners want to remain on their lands, pass lands on to children and keep lands productive. Programs should provide additional ways to ensure those requirements can be met, perhaps through institutional support and revenue. Situating marketplaces within a local geographical area would help. Ecosystem service marketplaces need to incorporate elements that enhance the well being of community and its youth and take the future into account.
- Having a trustworthy person or entity act as a **case manager**. Not all landowners have the time and technical skills to wade through paperwork for funding, project design and implementation. A case manager could centralize these tasks to provide more efficient and comprehensive outcomes to a group of landowners. Alternatively, a county could dedicate a portion of its labor and funding to developing projects. These options may increase the likelihood of successful, coordinated projects. They may also encourage landowners to participate by limiting personal liability and reducing transaction costs.
- Reconciling, standardizing, and clearing up **regulations**. Landowners feel uncertain not only about ecosystem service markets but also about the county and state regulations affecting their

property. An example is the competing county and state and within county regulations that govern projects involving floodplain work. Not having a clear framework of rules in which to operate creates skepticism for entering into ecosystem services projects.

- **Reducing landowner liability.** Landowners repeatedly expressed the desire to “do good things” for the environment with respect to their property. At the same time, they are wary of having agency staff come onto their property based on experiences with government personnel looking at land use practices beyond project boundaries and threatening sanctions for uses that did not meet regulations. Those with such experience indicated full willingness to work to correct problems but want to be assured negotiation and help will be the operating standard rather than threats of legal actions, especially since landowners may not always be aware of land use requirement changes. Some participants also talked about the potential of getting “caught in the middle” of conflicting regulations at different levels of government. The proposed solution would be to have the government propose the project and therefore maintain the liability for carrying out project requirements.

2.3 Conclusions

The concept of ecosystem services markets is obscure for many landowners and participants expressed a full spectrum of opinions about them. Some expressed an open-minded outlook. Others, despite concerns, expressed some level of acceptance regarding the concept. In other instances, there was significant suspicion of, and resistance to, markets based on the potential for non-local and corporate, Wall Street-type influence to erode local autonomy. Scale and trust are interlinked issues affecting social acceptance: landowners perceive greater trustworthiness in a localized marketplace.

Elements identified as important for reducing transaction costs and uncertainty include reducing the generally burdensome amount of time involved in paperwork and in coordinating funding, design and implementation. In addition, landowners want to be certain that they will not be subjected to scrutiny of land use practices beyond project boundaries unless there is an understanding that any potential problems will be dealt with in a helpful rather than punitive manner. There also need to be mechanisms to shield landowners for any problems that might arise from ambiguous regulations or conflicting regulations among various levels of government involved in projects. If landowners perceive that they’ll be committing themselves to a tedious and time-consuming amount of paperwork when their time is already at a premium, or opening themselves up to punitive actions while trying to improve ecosystems, they’re unlikely to volunteer for projects. One way to deal with administrative disincentives is to have an ombudsman or case management person to act as a liaison with cooperating organizations and to manage paperwork. To reduce potential risks and liabilities, there need to be clear agreements regarding agencies’ obligations to handle land use problems through negotiation. In addition, if agencies can propose projects and therefore shoulder liabilities, landowners will be more inclined to become involved.

The potential growth in ecosystem services markets represents both desirable and undesirable pressures. For some landowners, the potential to acquire ecosystem service credits validates that they are indeed employing environmentally beneficial land use practices. This is a possible incentive for entities wanting to engage more landowners in ecosystem services projects provided they also incorporate other landowners’ needs regarding lowering transaction costs and reducing liabilities. To some, a growing number of people involved in ecosystem services markets can be threatening in that they may experience undue pressure to manage their lands, which they already feel they’re managing well, in different ways. For others, as the number of landowners participating in restoration projects expands, it increases pressure on others to do the same but represents a positive outcome: more acres managed in ways that provide for healthier ecosystems overall.

Chapter 3: Incentives and Financing for Ecosystem Services in Central Oregon

Reflecting structural shifts in forestry and agriculture, the Central Oregon area comprising Deschutes, Crook and Jefferson has experienced a wholesale reduction in the timber industry over the last 20 to 30 years. At the same time, explosive urban growth and hobby farming have found their way onto rural lands previously devoted to irrigated agriculture and dryland ranching. Concerns over fish, wildlife and ecosystem health have also driven aggressive land and water restoration programs further impacting traditional resource use activities. Of course, countering these negative economic trends in Central Oregon has been the creation of new manufacturing, research and service industries centered around new and expanding economic areas including recreation and tourism, hobby farming, information technology, renewable energy, aviation, and medical/retirement services oriented towards an aging population. In other words, despite the current retrenchment in the building sector and relatively high unemployment levels, the Central Oregon economy has continued on a long term growth path, but one that features continuous change in terms of the favored economic sectors.

Careful stewardship of the productive capacity of Central Oregon's rural lands and waters and the social capital of rural communities remains vital, even in the face of long-term decline in the traditional productive activities. Also, as the Central Oregon cities of Bend, Redmond, Sisters, Prineville, Madras and La Pine grow, this growth is placing further demands on the rural sector, not just in terms of traditional rural products, but also in terms of the ecological functions that support urban production and consumption, key among these being ecosystem support for quality of life and recreational opportunities away from urban centers.

Oregon is often cited as a hub of innovation regarding ecosystem services and market development with much of the experimentation taking place in the Willamette Valley. Central Oregon, located to the east and across the Cascade Mountains, is part of the drier interior Columbia Basin. It has implemented its own form of experimentation and development of market based mechanisms loosely grouped under the category of a "marketplace" for ecosystem services.

This report explores this experimentation in Central Oregon and examines its future prospects using the lens of finance as the way into the discussion. The objective of the work in Central Oregon is to confirm, enhance, or refine our understanding of the market needs and opportunities generated in the first phase of the project. Given the relative lack of development of ecosystem service credit markets in the Deschutes Basin, compared to the Willamette Basin, the work in the Deschutes Basin is necessarily more formative and less rigidly limited to credit markets per se as a tool. Thus the work attempts to:

- Identify the range of land and water uses found in Central Oregon and classify them according to their potential for ecosystem service generation, broadly speaking
- Identify the ecosystem marketplace incentive mechanisms already in place in Central Oregon including credit markets
- Identify what opportunities exist for bringing criteria and protocols for ecosystem service credits from outside the region to bear on ecosystem service issues that exist in the basin (i.e. voluntary carbon credit markets)

- Identify opportunities to develop new credit market opportunities, either whole cloth development of new credit types, or adapting credit criteria and protocols to the particular context of Central Oregon
- Interview landowners and project participants engaged, or interested, in ecosystem service generation in these different classes and record how the suite of ecosystem marketplace incentive mechanism is viewed from the perspective of a landowner; and identify the financing challenges and opportunities that result from this analysis
- Work with a small number (1 to 5) landowners to develop worked case studies of the financing problem and the application of potential solutions (from the first phase of the project)

With a topic so vast this report can only aspire to take stock of current advances and attempt to point the way forward by organizing relevant material and experiences and exploring a limited number of initial experiences through case studies.

The paper begins with a quick review of three fundamental pillars for the analysis. First is a review of ecosystem services and how they provide economic benefits. Second, is the presentation of a framework for organizing the large range of incentive mechanisms that make up the “ecosystem marketplace.” Third is an introductory section on Central Oregon. The paper then turns to an examination of ecosystem services in Central Oregon – defining a set of ecotypes and applying a systematic assessment scheme to identifying these services in the case of irrigated lands and public forestlands. This is followed by a review of the large number of incentive programs that affect land, water and energy use in the region. The paper closes with some conclusions regarding differences between the Willamette Valley and Central Oregon ecosystem services marketplaces and their implications for market development.

The Economic Benefits of Ecosystems

The term “ecosystem services” suffers from a lack of precision and a number of competing definitions (Boyd and Banzhaf 2007). This is not new in the field of conservation; much the same has occurred with the term “biodiversity”. Likewise the use of the term “market” or “marketplace” at least when it is applied in conjunction with “ecosystem services” or “biodiversity” in public discourse may have a variety of meanings to different groups of people. Ultimately, however, to be useful, policy research must not only appeal to policy-makers – but be useful for those who carry out policy instructions on the ground. In the field of environmental policy, so-called “buzz-words” often bounce back and forth between academia and policy think tanks, but often fail to touch base with those who implement conservation projects and design and implement payment and market approaches. Maintaining some consistency in the meaning and use of key words between academia, policy-makers and implementing agencies is a tall order. We have selected the following definitions and attempt to use them consistently throughout the report. A more detailed discussion is included in Appendix A.

The basic insight involved in coining the term “ecosystem services” was an effort to draw attention to the value to humans (and therefore the economy) of ecological functions rather than the products of such function per se. Many of these ecological functions only indirectly enter into human welfare and are typically neither well-understood nor well-integrated into decisions and policy regarding the fate of ecosystems. For example, even though fish may have a clear human use and market value, functions that support their life cycle may not be well-recognized or taken account of in their management. The ecological function of a tributary stream in providing spawning and rearing habitat for salmonids that are later harvested at sea or on their return migration may not be well understood. When the flow in the stream is diverted, the stream is dammed or channelized, or the riparian are is denuded of vegetation to allow grazing or farming, then the spawning and rearing functions are lost. As a consequence the salmonid population declines, and, at some distance to the tributary, indigenous, commercial and sport

fishers experience reduced availability of fish, higher fishing effort, and lower harvest levels. This example demonstrates why understanding the cause and effect involved in natural systems is critical. The support and protection provided by natural ecosystems for economic activity and property may prove to be a very powerful argument in conserving these systems (Aylward and Barbier 1992).

Daily (1997) provides a list of functions that have economic value (i.e. ecosystem services) including:

- purification of air and water
- mitigation of floods and droughts
- detoxification and decomposition of wastes
- generation and renewal of soil and soil fertility
- pollination of crops and natural vegetation
- control of the vast majority of potential agricultural pests
- dispersal of seeds and translocation of nutrients
- maintenance of biodiversity, from which humanity has derived key elements of its agricultural, medicinal, and industrial enterprises
- protection from the sun's harmful ultraviolet rays
- partial stabilization of climate
- moderation of temperature extremes and the force of winds and waves
- support of diverse human cultures
- providing aesthetic beauty and intellectual stimulation that lift the human spirit

We perceive one of the main advantages of adopting the Dailey definition being that it avoids the potential trap – experienced by the Millennium Ecosystem Assessment (MA) – of confusing the fact that many of the provisioning services or goods we consume are in fact joint products of ecosystem services and conventional (human) goods and services (Boyd and Banzhaf 2007). More to the point, it enables attention to focus on how the value of these services that currently goes unnoticed and unincorporated in decision-making can be addressed through incentive or market-based mechanisms.

The Ecosystem “Marketplace”

In this paper, the term “marketplace” is adopted to reflect the full diversity of mechanisms that can be used to provide improved incentives for managing ecosystems sustainably. The challenges and opportunities of using markets to manage ecosystems is explained and the set of incentive mechanisms available to confront these challenges is elaborated in full in Appendix B.

One way to affect behavior is to create regulated markets in which a cap is placed on pollution (or resource use), permits to pollute (or use the resource) are issued, and permittees are allowed to trade in the permits. Such systems create regulated markets that shift the incentives for pollution and resource use to coincide with the public good. While less well studied, it is also possible for such programs to be developed absent a regulatory cap. These so-called “voluntary” ecosystem service credit markets rely on the commitment of individuals, corporations or government to reduce their impact or limit their environmental footprint. The difference is that instead of merely donating funds to a good cause and taking credit (little “c”), in credit markets the purchaser actually acquires a Credit (big “C”) that certifies that the reduction in impact (or the restoration action) has taken place.

Along with markets, there are a number of other voluntary programs and actions that can help with efforts to restore and protect ecosystems. Product certification is led by the supplier (or seller of ecosystem services) and involves not only improving the environmental (or social) sustainability of production processes, but the subsequent marketing of this information through certification (or eco-labeling) programs in order to attain a price premium or increased market share. Another option is for the producer

and user of ecosystem services to enter into voluntary contractual arrangements in which payments are made by the user to the producer with respect to benefits generated. These are examples of “pure” payment for ecosystem service schemes in that the beneficiary from the services directly compensates the provider of the service (whereas a government direct payment scheme simply represents the public subsidizing general behavior). Finally, there is a wide range of ways that individuals, corporations and other groups can voluntarily contribute to conservation activities, typically through philanthropy or the donation of funds to non-profit organizations that engage in these activities.

Table 1. Incentive Mechanisms

Category	Sub-Category	Generic Example
Public Ownership	Public Operation	National Forests
	Private Operation	Recreation Concessions
Public Investment	Appropriations	Pollution Control
Regulations (Command & Control)	Technology Standards	Fishing Gear Specifications
	Performance Standards	Emission Limits, Bans
Market-based Instruments	Taxes and Charges	Water Tariffs
		Environmental Tax / Payment in Lieu
		Environmental Charge
	Subsidies	Product Subsidies
		Direct Payments
		Tax Credits
		Subsidized Loans
Regulated Markets	Tradable Resource & Pollution Permits / Ecosystem Service Credit Systems	Tradable Pollutant Discharge Permits
		Surface Water Markets
		Groundwater Mitigation Programs
		Conserved Water
Voluntary Actions and Markets	Voluntary Offset Credits	Carbon Offset Credits
	Product Certification	Sustainable Timber Certification
	Contractual Arrangements	Payments for Ecosystem Services
	Philanthropy	Cash Donations to Environmental NGOs

As evidenced by the discussion that follows, in a particular locale it can be hard to focus simply on one or the other of these tools as in reality they are often layered in an ad hoc fashion one on top of the other by a host of competing governmental and non-governmental entities. A central issue driving the discussion is whether the existing set of marketplace tools internalizes the full range of ecosystem services and their values into private and public behavior. In other words, are there significant ecosystem services that are not covered by existing incentive mechanisms, and if so, what is the potential for ecosystem service markets and other tools to be applied to better managing and providing these services?

Central Oregon

In this section relevant background information on Central Oregon is presented in order to provide the necessary context for the later sections that examine ecosystem services in Central Oregon.

Basin Geography and Population

The Deschutes Basin is the second largest river basin in Oregon covering 10,700 square miles (see Figure 4). Crook, Deschutes, Jefferson, Sherman and Wasco counties make up a majority of the basin. Central Oregon, which is comprised of Crook, Deschutes and Jefferson counties, constitutes 73% of the land area

of the basin (see Table 2). Central Oregon is roughly congruent with the upper Deschutes Basin defined as the area above the confluence of the Metolius, Deschutes and Crooked Rivers at the Pelton-Round Butte hydropower complex in mid-basin. The total area of Central Oregon is just over 5,000 square miles. Another important unit from a water resources perspective is the large regional aquifer which is largely congruent with the upper Deschutes Basin. A large proportion of the precipitation and recharge from the Cascades moves through this aquifer before discharging to the north at the confluence area of the three rivers.

Table 2. Deschutes Basin and Central Oregon: Land and Water Units and Population

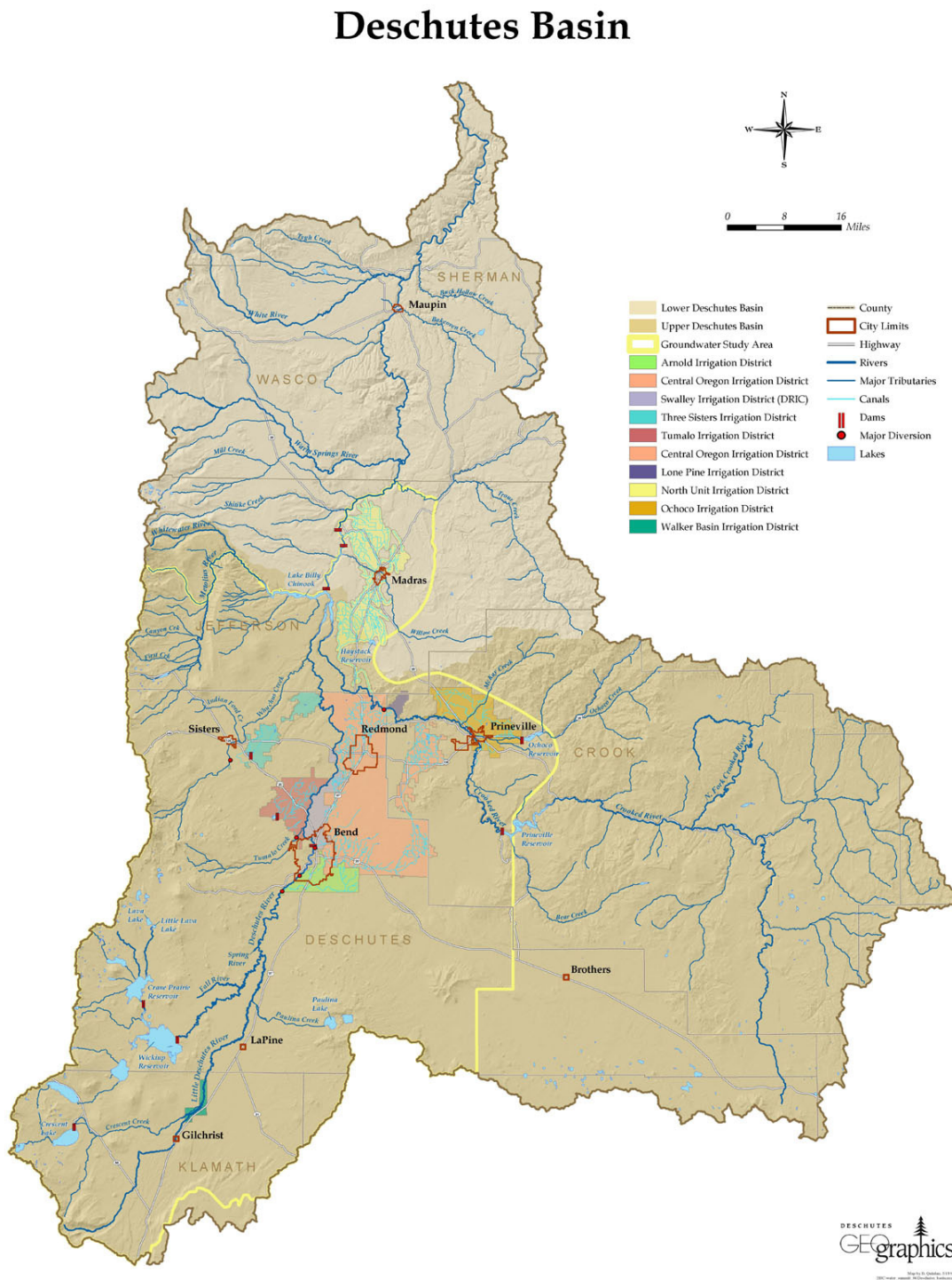
	Population					Land Total (acres)
	Total (#)	Urban (#)	(%)	Rural (#)	%	
Administrative Units - Counties						
Crook	20,650	8,640	42%	12,010	58%	1,914,231
Deschutes	135,450	84,800	63%	50,650	37%	1,955,191
Jefferson	20,250	7,070	35%	13,180	65%	1,146,235
Subtotal - Central Oregon	176,350	100,510	57%	75,840	43%	5,015,656
Drainage Unit - Watershed						
Deschutes Basin						6,847,968
Upper Deschutes Basin						5,004,800
Groundwater Unit - Aquifer						
Groundwater Study Area						2,879,987
Oregon	3,582,600	2,434,922	68%	1,147,678	32%	61,437,792

Source: Aylward (2006)

Land Ownership and Management

In the Deschutes Basin, 40% of the land area is privately owned, 7% is held by The Confederated Tribes of the Warm Springs Reservation, and the remainder is publicly owned lands (see Figure 5). Unlike Western Oregon, a large percentage of Eastern and Central Oregon lands belong to the public and is administered by public agencies. In Central Oregon forests and grazing lands are managed by the United States Forest Service (USFS) and the Bureau of Land Management (BLM), with additional areas under control of the Department of State Lands and Oregon State Parks. The Deschutes and Ochoco National Forests accounts for 2.4 millions acres while the BLM Prineville District lands (shown in Figure 6) totals 1.65 million acres in Central Oregon (both of these land areas extend beyond the tri-county region of Deschutes, Crook and Jefferson Counties). The Prineville BLM is one of the larger districts in Oregon with 406 grazing allotments (122 grazing permits and 284 leases).

Figure 4. Deschutes Basin



Source: Deschutes River Conservancy and GeoGraphics

Figure 5. Land Ownership in the Deschutes Basin

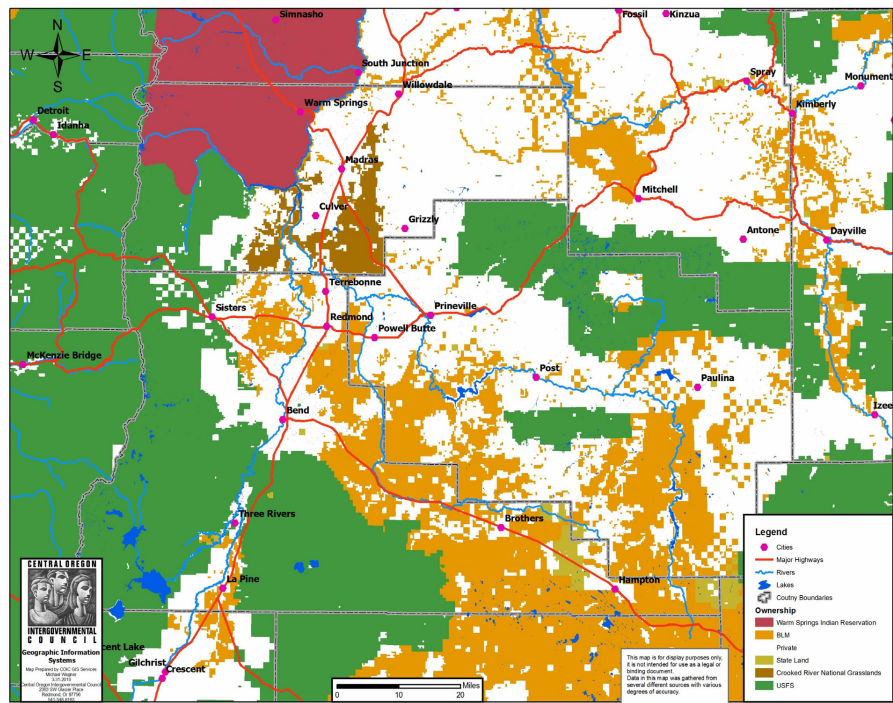
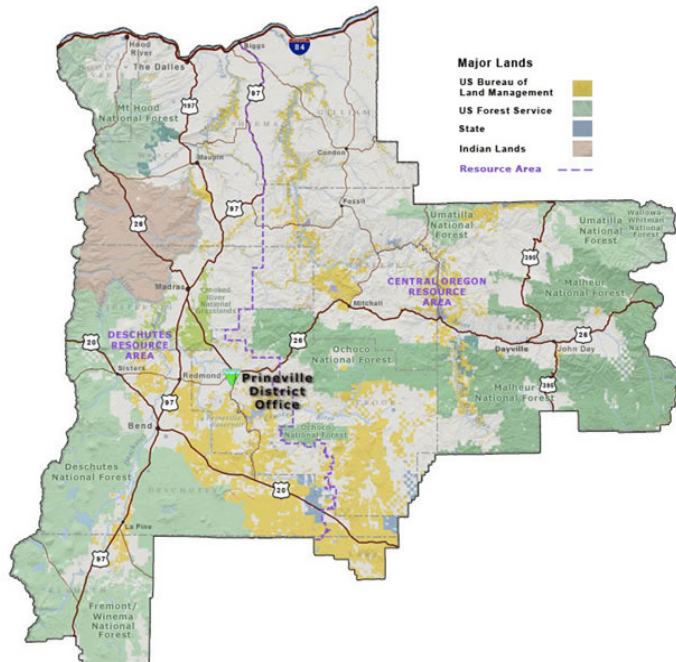


Figure 6. Prineville BLM

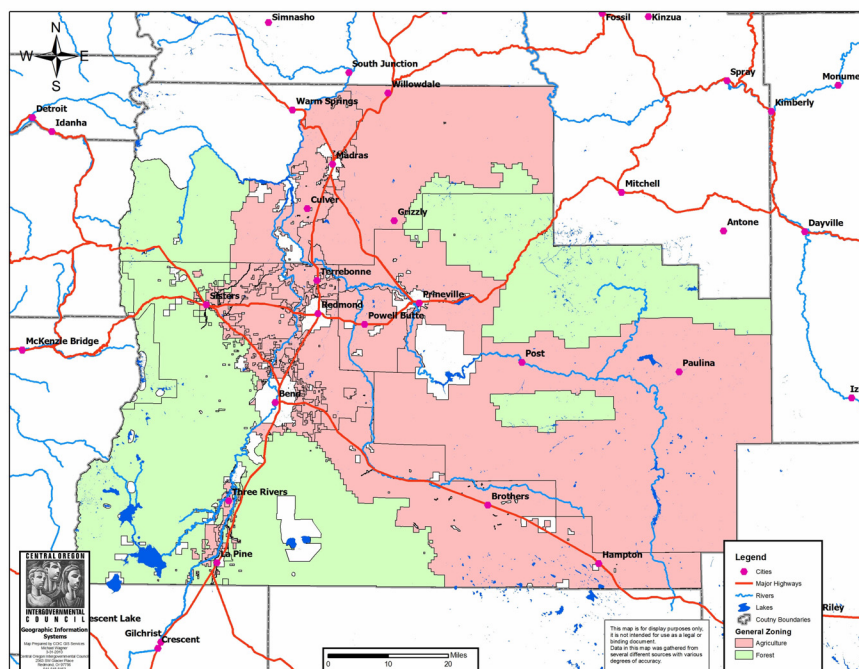


Source: Central Oregon Intergovernmental Council

Central Oregon Land Use

The primary land uses in Central Oregon are forests, agriculture and grazing. Taken together agriculture and grazing are the dominant land use when including private farmland and private/public rangeland (see Figure 7). In Central Oregon, over 1.6 million acres of private land use is dedicated to farming and livestock according to the 2007 National Agricultural Census. The proportion of farm area that is irrigated is roughly one-tenth, or 180,000 acres reflecting the predominance of dryland ranching as a land use in Crook and Jefferson counties. Central Oregon is the home of the family farm with over 92% of owners living on the farm. However, 60% of farm operators also work part-time off the farm and 40% effectively work full-time off the farm. Agriculture makes up around 10% of county income in Crook and Jefferson County but only 1% in Deschutes County. Jefferson County is home to large commercial farms, with irrigation largely for the purposes of growing crops. Crook County is home to both smaller irrigated parcels growing crops and very large ranches with irrigated areas in the valley bottoms. Deschutes County is largely home to lifestyle or hobby farming, with just a few areas of commercial farms remaining. Due to the relatively small scale of commercial farms (relative to other states), Central Oregon receives little in the way of farm subsidies from the government as noted in Table 3, below.

Figure 7. Central Oregon Land Use



Source: Central Oregon Intergovernmental Council

Table 3. Farmland in Central Oregon

	Crook	Deschutes	Jefferson	Oregon
Farmland (acres)	761,548	129,369	708,974	16,399,647
Average. size of farm (acres)	1,224	92	1,390	425
Government subsidies	\$264,000	\$135,000	\$1,455,000	\$76,491,000

Source: Agriculture Census 2007

3.1 Ecosystem Services and Central Oregon

This section provides a rapid assessment of potential risks and opportunities for ecosystem services provision in Central Oregon. First, a number of general land uses that provide similar types of ecosystem services are defined. Then the ecosystem services that these “Ecotypes” rely on or produce are identified. For this purpose the Dependence and Impact Assessment Tool developed by the World Resources Institute is adapted and applied. The results of the assessment are then used to analyze the potential for reducing risks and enhancing opportunities from improved ecosystem management of these lands.

Ecosystem Service Production Types (Ecotypes)

In order to examine the role and potential opportunity for ecosystem services provision in Central Oregon, it is first necessary to break the region into smaller, comparable production units. This avoids the problem of trying to identify ecosystem services across a diverse landscape and should help to disaggregate the problem of how to identify the potential benefits of changing land use or land use practices in terms of changes in ecosystem services. In the discussion below, Central Oregon lands are grouped into a number of ecosystem service production types, or Ecotypes.

As noted earlier, Central Oregon has a high proportion of its lands in public ownership. While ownership would not normally be a defining characteristic for Ecotypes, the public lands are grouped separately, as later sections of the paper are more narrowly focussed on private lands and the economic incentives for their sustainable management.

Public Forests and Rangeland

The Forest Service (USFS) and Bureau of Land Management (BLM), are the two primary agencies that manage public lands in the Deschutes Basin, although the counties and the Department of State Lands also have holdings in the area.

The Forest Service manages the Deschutes and Ochoco national forests and Crooked River National Grasslands in the Deschutes Basin. These lands include forest timberlands, forest non-timber products, forest recreation and rangeland/grazing and provide ecosystem services and goods available to the general public—some for free and others on a fee basis. The Forest Service is dedicated to multiple-use management for the sustained yield of renewable resources such as water, forage, wildlife, wood and recreation while ensuring the productivity of the land and protecting the quality of the environment. This includes providing the public access to public goods (both timber and non-timber) such as firewood, mushrooms, berries and cones; and services such as horseback riding, skiing, snowmobiling and biking.

The BLM manages livestock grazing, mostly cattle and sheep, with the goal of ensuring long-term health and productivity to create multiple environmental benefits that result from healthy watersheds. The BLM provides permits and leases to private producers that graze livestock for (generally) a 10-year period. In cooperation with adjacent private ranches, the BLM maintains open space for wildlife habitat and recreational opportunities for the public and grazing in general.

For both the Forest Service and the BLM, a grazing fee is set by Congress. The grazing fee cannot be less than \$1.35 per animal unit month (AUM) - the amount of forage needed to sustain one cow and her calf, one horse, or five sheep or goats for a month. In addition, any fee increase or decrease cannot exceed 25% of the previous year’s level. This figure is adjusted each year according to three factors: current private grazing land lease rates, beef cattle prices, and the cost of livestock production.

Timberlands

Forested timberland in Central Oregon is considered land containing timber value comprising species such as conifers, hardwoods, and/or Western Juniper (although there is debate among different organizations and landowners whether Western Juniper is actually marketable and therefore whether or not it is really “timberland”). Private landowners have been using existing markets for timber sales for years but are exploring the idea of combining markets with intentional sustainable land management practices to provide healthy watersheds, decreased soil erosion, and improved water quality and quantity with ecosystem service incentives. As a way to capture their efforts, landowners and technicians are developing metrics to quantify the services they provide. As an incentive, timberland owners can apply for Forest Stewardship Council (FSC) certification of wood. FSC certification is a value-added marketing tool that incorporates social and environmental values in the production chain.

As with many areas of the United States, privately owned timberlands also can have potential for real estate or resort development. With a large number of resorts, Central Oregon’s private timberlands certainly have the potential for a change in zoning to rural residential or destination resort status. These issues are of interest and concern to many stakeholders in the region and were the subject of debate and legislation in the last few sessions of the state legislature.

Farmland/Irrigated Agriculture

A majority of the rural, privately owned land in Central Oregon is zoned “agriculture”. As reported earlier in Table 3 the USDA suggests there may be about 1.6 million acres of “farmland” in the tri-county area. This classification, Exclusive Farm Use (EFU) zoning, includes various land management practices but is not limited to farming, ranching, grazing, and timber production. EFU zoning pertains to farm-related activities with conditional non-farm uses, medium lot sizes, and dimensional standards for development. Farmland is considered land used for agricultural production for small or conventional cultivation. In the high desert of Central Oregon, rain fed “farming” is not really practical and, indeed, as mentioned above, there are some 160,000 acres of irrigated land in the area. Of this land a significant portion is devoted to pasture and livestock and thus might be considered irrigated ranchlands. However, for the purposes of this paper it is simplest to group the roughly 10% of agricultural lands in Central Oregon as irrigated agriculture and treat it separately from the other 90% which are regarded largely as unirrigated ranchlands.

A recent shift in agricultural practices on irrigated land is from commercial commodity farming to smaller units that either engage in “hobby” farming or speciality crop farming, especially in Deschutes County. Hobby farms tend to be managed for lifestyle and enjoyment. For example, Deschutes County has one of the highest horse populations of counties around the state. These operations typically have limited or no gross incomes as irrigated lands are used for owners’ production of pasture and hay. Such farms do contribute to the economy by purchasing general farm production inputs in terms of goods (e.g. fences, buildings, tack and gear) and services (farriers, veterinarians, etc).

Another growing trend is the interest in growing local food. This has been influenced by various factors including general consumer education about the benefits of eating locally, increased interest in growing and selling specialty crops through direct markets by a younger generation farmers, and increased accessibility to technical trainings and workshops. With this shift in land management, producers are seeking new and exciting ways to add value to their crops through labels such as “sustainable” or “local” (which provides a price premium) or organic certification. Farmers also work together with public agencies and organizations to apply for grants for the development of cooperatives, better distribution and processing centers, research projects, and local networking. Low interest loan programs are available through state and federal programs to increase farmer retention.

Most farmland incentives focus on the preservation and conservation of farmland and riparian zones. Thousands of farmers throughout the nation, and many in Central Oregon, currently participate in the federal Conservation Reserve Program (CRP) or Conservation Reserve Enhancement Program (CREP). These voluntary programs pay farmers to manage their lands in ways that reduce soil erosion and runoff while increasing the provision of environmental services including wildlife habitat. As a way to increase their cash flow, landowners have tried to combine these cost share programs with the benefits offered by other non-profit organizations that are simultaneously conserving riparian zones and placing the land in permanent versus short-term easements.

Ranchland

Ranchland is considered an agricultural use and can include rangeland, grassland, and pasture land primarily used for livestock grazing. Because of the vastness of the non-irrigated rangeland in Central Oregon – potentially over 1.4 million acres as previously described – many producers use the value-added label or certification of “free range” or “sustainable” on their meat products as it allows a premium to be paid on their product and does not necessarily change land management practices. The most common cost share program for this type of land use is the federal Natural Resource Conservation Service (NRCS) Farm and Ranch Lands Protection Program. This is a voluntary program that helps farmers and ranchers keep their existing land in agricultural use through permanent conservation easements.

Riparian areas

Riparian areas, including floodplains, are not a significant feature of the landscape over the western portion of Central Oregon. This is due to the Deschutes formation – young, volcanic soils that are highly permeable mean that much of the limited precipitation infiltrates quickly resulting in limited run-off and few perennial streams. To the east, mainly in Crook County, the older John Day Formation produces “flashy” systems and a much more dense hydrological drainage network, including larger floodplains in and below the city of Prineville on the Crooked River. Nevertheless, these riparian areas are of critical importance for aquatic habitat, water quality management and other ecological functions. A fair number of these areas have been adversely affected by conversion to agricultural use, channelization and straightening of waterways, or geomorphological adaptations to changes in the flow regimes due to diversion and storage of irrigation water. Others, particularly those cut into canyon areas, such as in the Deschutes and Crooked Rivers above the confluence at Lake Billy Chinook, and in the relatively untouched Metolius drainage, remain in relatively good ecological condition.

Urban Areas

Central Oregon has gone through periods of explosive growth, notably in the 1970s and from 1990 onward. Averaged over the last century, Central Oregon’s population has grown at a rate of 44% every decade (Aylward 2006). As of 2004, the population of Central Oregon totaled 176,000, 57% of which live in incorporated areas. Since 2000, Central Oregon has continued to grow rapidly, recording a 20% increase in population in the last five years. Of this increase 27,000 is in incorporated areas and 5,000 in unincorporated areas. The bulk of the population gain in Central Oregon has been in Deschutes County. During the 1990s the population of Deschutes County increased by 50% from 75,000 to 115,000. For Bend and Redmond, the two largest population centers, growth rates before the economic downturn oscillated between 4 and 11%. While official population forecasts suggests a slowdown in these rates, there is little in the last 15 years’ experience or current trends to suggest that rates of growth in both urban and rural areas will not continue. In fact, future population forecasts suggest a continuation of the 44% per decade increase in population over the next 20 years. Generally speaking, urban areas rely on groundwater for their water supply. Bend is the exception, drawing a portion of its water supply from the Bridge Creek Catchment on Forest Service land.

Destination Resorts

A relatively unique feature of the Central Oregon landscape is the large number of destination resorts. Most of these comprise large, grouped rural residential developments, typically with golf courses and in some cases associated commercial development and managed common areas that may involve irrigated agriculture.

Ecosystem Services Scoping Assessment

The point of departure used here for conducting a scoping assessment for ecosystem services is the Dependence and Impact Assessment Tool developed by the World Resources Institute for use in conjunction with its Corporate Ecosystem Service Review (Hanson et al. 2008). The tool was developed in collaboration with the World Business Council for Sustainable Development (WBCSD), the Meridian Institute, and a number of WBCSD corporate partners. The primary intent of the tool is to help companies understand the business risks and opportunities arising from ecosystem change. The tool is available free and online at <http://www.wri.org/project/ecosystem-services-review/tools>. In this section the tool is presented, modified for use in Central Oregon, and applied to three of the ecotypes defined above.

The Dependence and Impact Assessment Tool

The tool is a fairly simple checklist approach that involves assessing the dependence of a company's business operations on ecosystem services and the company's impacts on ecosystem services. A summary of the methodology prepared by the authors is presented in Figure 8. The tool allows the user to step through a fairly subjective evaluation of the dependence and impact of the business activity for each ecosystem service. The outcome is a summary slide that provides a visual classification of each service on a simple low, medium, or high dependence (or impact). This provides fodder for discussion and a way to prioritize the top four or five ecosystem services that may merit further investigation and research. As such the tool provides a way of scoping for potential risks and opportunities associated with a business activity, with respect to ecosystem services. For the purpose of this paper, this method can be applied to the Ecotypes listed above in order to quickly identify the major dependencies and impacts.

One complicating factor for the purposes of this paper is that the tool was developed as a product related to the follow-up and implementation of the Millennium Ecosystem Assessment. The tool thus follows the typology of ecosystem services elaborated in the MA (as described in Appendix A). Figure 8 provides the full list of ecosystem services included with the tool. The tool includes the Provisioning Services that are dismissed in Appendix A as being largely beside the point when it comes to introducing ecosystem services as a new term in the environmental lexicon. Further, the tool actually leaves out the Supporting Services that, along with Regulating Services, form the core of what this paper finds useful and new in defining ecosystem services. The rationale of the authors for leaving out Supporting Services was that in most of their field trials of the tool the companies chose to exclude these because they are:

so basic and fundamental that they manifest themselves in many of the provisioning, regulating, and cultural services. "Primary production," for example, is the foundation of timber, other fibers, crops, and biomass fuel. Considering this supporting service could lead to "double counting" or "double consideration" of services." (Hanson et al. 2008: 20)

Figure 8. Summary of Methodology: the Dependence and Impact Assessment Tool

Corporate Ecosystem Services Review: Summary of Methodology						
Step		1. Select the scope	2. Identify priority ecosystem services	3. Analyze trends in priority services	4. Identify business risks and opportunities	5. Develop strategies
Activity		Choose boundary within which to conduct the ESR (a specific business unit, product, market, landholdings, major customer, supplier, etc.)	Systematically evaluate degree of company's dependence and impact on more than 20 ecosystem services. Determine highest "priority" ecosystem services—those most relevant to business performance	Research and evaluate conditions and trends in the priority ecosystem services, as well as the drivers of these trends	Identify and evaluate business risks and opportunities that might arise due to the trends in priority ecosystem services	Outline and prioritize strategies for managing the risks and opportunities
Who is involved	• Executive managers	✓				✓
	• Manager(s) from selected scope	✓	✓		✓	✓
	• Analysts		✓	✓	✓	✓
	• Consultants (optional)		✓	✓	✓	✓
Sources of input and information	• In-house business managers and analysts		✓	✓	✓	✓
	• Existing and new in-house analyses		✓	✓	✓	
	• Local stakeholders		✓			
	• Experts from universities and research institutions			✓		
	• Millennium Ecosystem Assessment publications and experts			✓		
	• Nongovernmental organizations			✓	✓	✓
	• Industry associations			✓	✓	✓
	• Published research		✓	✓	✓	
	• Other resources and tools*		✓	✓	✓	
	End product	Boundary for ESR analysis	List of 5-7 "priority" ecosystem services	Short paper or set of data that summarizes trends for each priority ecosystem service	List and description of possible business risks and opportunities	Prioritized set of strategies
Estimated time**		1-2 weeks	2-3 weeks	4-6 weeks	1-2 weeks	2-3 weeks
For details see:		pages 13-14	14-20	20-23	24-30	30-32

* See Chapter 18 for examples and details.

** Estimates based on road tests and reflect one full-time equivalent. Time required to conduct an ESR will vary based on factors including the scope selected, availability of information, and number of staff allocated to gather information and conduct research and interviews.

For more information, see Hansen, C. et al. 2008. The Corporate Ecosystem Services Review. Washington, DC: World Resources Institute. Available at: www.wri.org/ecosystemssr



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The authors' intuition here mirrors that expressed in Appendix A with respect to the overlap in values between ecosystem services and ecosystem goods, and the potential for double counting of ecosystem benefits. Unfortunately, choosing to focus on Provisioning Services and not Supporting Services actually runs counter to the main point of recognizing ecosystem services. An example is a mangrove forest that provides habitat for fish fry that are later harvested at sea. The whole purpose of recognizing the indirect ecological function of the mangrove in fish production is to point out that the mangrove has value beyond wood that can be harvested or an area that can be converted to shrimp farms. Simply focusing on the value of the mangrove for wood and the sea for fish – the provisioning services – means missing the value of the mangrove in fish production – the supporting service. It is precisely the idea that the function of one ecosystem contributes to the value in another ecosystem that underpins the value of this concept of ecosystem services. What this discussion – and the companies reluctance to include the circular nature of onsite Supporting Services that support onsite Provisioning Services – reveals is the tricky nature of identifying supporting services that cross ecosystem boundaries and, thus, are worth including in just a diagnostic.

Table 4. Ecosystem Services Listed in the Dependence and Impact Assessment Tool

Provisioning Services	
Food	
Crops	Cultivated plants or agricultural produce harvested by people for human or animal consumption as food. Examples: grains, vegetables, fruit
Livestock	Animals raised for domestic or commercial consumption or use. Examples: chicken, pigs, cattle
Capture fisheries	Wild fish captured through trawling and other non-farming methods. Examples: cod, crabs, tuna
Aquaculture	Fish, shellfish, and/or plants that are bred and reared in ponds, enclosures, and other forms of fresh- or salt-water confinement for purposes of harvesting. Examples: shrimp, oysters, salmon
Wild foods	Edible plant and animal species gathered or captured in the wild. Examples: fruit and nuts, fungi, bushmeat
Biological Raw Materials	
Timber and other wood fiber	Products made from trees harvested from natural forest ecosystems, plantations, or nonforested lands. Examples: industrial roundwood, wood pulp, paper
Fibers and resins	Nonwood and nonfuel fibers and resins extracted from the natural environment. Examples: cotton, hemp, and silk, twine and rope, natural rubber
Animal Skins	Processed skins of cattle, deer, pig, snakes, sting rays, or other animals. Examples: leather, rawhide, and cordwain
Sand	Sand formed from coral and shells. Examples: White sand from coral
Ornamental resources	Ecosystem-derived products that serve aesthetic purposes. Examples: tagua nut, wild flowers, coral jewelry
Other	
Biomass fuel	Biological material derived from living or recently living organisms—both plant and animal—that serves as a source of energy. Examples: fuelwood, charcoal, grain for ethanol production, dung
Freshwater	Inland bodies of water, groundwater, rainwater, and surface waters for household, industrial, and agricultural uses. Examples: freshwater for drinking, cleaning, cooling, industrial processes, electricity generation, or mode of transportation
Genetic resources	Genes and genetic information used for animal breeding, plant improvement, and biotechnology. Example: genes used to increase crop resistance to disease
Biochemicals, natural medicines, and pharmaceuticals	Medicines, biocides, food additives, and other biological materials derived from ecosystems for commercial or domestic use. Examples: echinacea, ginseng, garlic; paclitaxel as basis for cancer drugs; tree extracts used for pest control
Regulating Services	
Air quality regulation	Influence ecosystems have on air quality by emitting chemicals to the atmosphere (i.e., serving as a “source”) or extracting chemicals from the atmosphere (i.e., serving as a “sink”). Examples: lakes serve as a sink for industrial emissions of sulfur compounds; vegetation fires emit particulates, ground-level ozone, and volatile organic compounds
Global climate regulation	Influence ecosystems have on the global climate by emitting greenhouse gases or aerosols to the atmosphere or by absorbing greenhouse gases or aerosols from the

	atmosphere. Examples: forests capture and store carbon dioxide; cattle and rice paddies emit methane
Regional/local climate regulation	Influence ecosystems have on local or regional temperature, precipitation, and other climatic factors. Example: forests can impact regional rainfall levels
Water regulation	Influence ecosystems have on the timing and magnitude of water runoff, flooding, and aquifer recharge, particularly in terms of the water storage potential of the ecosystem or landscape. Examples: permeable soil facilitates aquifer recharge; river floodplains and wetlands retain water — which can decrease flooding during runoff peaks — reducing the need for engineered flood control infrastructure
Erosion regulation	Role vegetative cover plays in soil retention. Examples: vegetation such as grass and trees prevents soil loss due to wind and rain; forests on slopes hold soil in place, thereby preventing landslides
Water purification and Waste treatment	Role ecosystems play in the filtration and decomposition of organic wastes and pollutants in water; assimilation and detoxification of compounds through soil and subsoil processes. Examples: wetlands remove harmful pollutants from water by trapping metals and organic materials; soil microbes degrade organic waste rendering it less harmful
Disease regulation	Influence ecosystems have on the incidence and abundance of human pathogens. Example: intact forests reduce the occurrence of standing water — a breeding area for mosquitoes — and thereby can reduce the prevalence of malaria
Soil quality regulation	Role ecosystems play in sustaining soil's biological activity, diversity and productivity; in regulating and partitioning water and solute flow; and, in storing and recycling nutrients and gases. Example: some organisms aid in decomposition of organic matter, increasing soil nutrient levels; some organisms aerate soil, improve soil chemistry, and increase moisture retention; animal waste fertilizes soil
Pest regulation	Influence ecosystems have on the prevalence of crop and livestock pests and diseases. Example: predators from nearby forests — such as bats, toads, snakes — consume crop pests
Pollination	Role ecosystems play in transferring pollen from male to female flower parts. Example: bees from nearby forests pollinate crops
Natural hazard regulation	Capacity for ecosystems to reduce the damage caused by natural disasters such as hurricanes and to maintain natural fire frequency and intensity. Examples: mangrove forests and coral reefs protect coastlines from storm surges; biological decomposition processes reduce potential fuel for wildfires
Cultural Services	
Recreation and ecotourism	Recreational pleasure people derive from natural or cultivated ecosystems. Examples: hiking, camping, bird watching, scuba diving, going on safari
Ethical values	Spiritual, religious, aesthetic, intrinsic, “existence” or other values people attach to ecosystems, landscapes, or species. Examples: spiritual fulfillment derived from sacred lands and rivers; belief that all species are worth protecting regardless of their utility to people—“biodiversity for biodiversity's sake”

Ecosystem Services in Central Oregon

For the purpose of this scoping exercise, the process employs the list of services as provided in the tool. A number of these services do not apply and thus naturally show up as of no consequence in the assessment. Likewise, in going through the assessment there are some services that occur in Central Oregon that were not included on the list. These include not just some supporting services but a number of other regulating and cultural services that are of particular relevance in the high desert of Central

Oregon. These are briefly explained below as they are added to the tool under the “Other” category of services. In some cases the elaboration of these services is awkward as a lack of sustainable ecosystem management has generated a number of risks and, thus, the service is phrased as the “avoidance” of a given risk or event.

Fish and Wildlife Habitat. Central Oregon is home to many different species of migratory birds, ungulates, fish species and other wildlife. The land, water and air resources of the region provide habitat in which fish and wildlife carry out the various phases of their lifecycle. Changes in the management of these resources alters primary productivity of the system but also changes habitat availability and quality with consequent effects for fish and wildlife populations. Habitat can therefore be considered a Supporting Service.

Avoidance of Invasive and Noxious Species. Invasive and noxious species, particularly weeds, in Central Oregon are a major concern for private and public landowners. These weeds can overrun native vegetation, destroy natural habitats, and among other things, raise water usage rates (e.g. Western Juniper). In an effort to control these weeds county, state, and federal governments and non-profits collaborate to eradicate weeds. The Oregon Weed Law (ORS 570.500-600) gives governing agencies the authority for enforcement and compliance through the County Weed Districts. Though these agencies do not typically play the enforcer role, they do work with communities to educate and promote weed control techniques. The costs and benefit of invasive weed eradication is both financial and environmental. Not only are weeds a nuisance, but as an invader on farmlands they can destroy and cross contaminate crops. Frequent pesticide and herbicide usage damages soils, forage and water. In an effort to combat this problem, various programs focus on weed eradication in relation to goals included in other programs and organizations such as the Environmental Quality Incentive Program, Wildlife Habitat Incentive Program, and Oregon Watershed Enhancement Board. As invasive and noxious species are naturally regulated in an intact ecosystem, the avoidance of these species can be considered a Regulating Service

Biodiversity. Of particular interest to public policy are species, ecosystems or genetic stocks that are threatened or endangered. Federal and State policies drive the protection of particular species and this affects land and water management practices. In Central Oregon there are a number of species of concern. For the purposes of this exercise salmonid species, sage grouse and the spotted owl are singled out as species that are either in or being considered for federal protection and therefore affect land and water management practices at the landscape scale. Respectively, regulations affect or may affect water quantity and water quality of mainstem rivers (Crooked, Deschutes and Metolius) and their tributaries, land use practices on rangeland, and timber harvesting in upland forests.

Natural hazard regulation is one of the Regulatory Services. In the Central Oregon context it is particularly important to highlight that the primary natural hazard is fire (hurricanes, flooding, and earthquakes are generally regarded as of little risk in the area)

Natural Hazard Regulation – Fire. Eastern and Central Oregon are very susceptible to fire risk and fire destruction. In an effort to collaborate and provide education, The Fire Learning Network and the Central Oregon Partnerships for Wildfire Risk Reduction (COPWRR) work with community partners (public agencies, forest product businesses, community groups, and non-profits) to reduce wildfire risks and restore forest ecosystems. Public agencies and local fire districts jointly work on the Community Wildfire Protection Plan, which enables communities to plan how to reduce wildfire risk. Similar to the invasive weed issue, wildfire risk reduction projects can be coordinated through other programs that seek to reduce wildfire risk on private property and subsequently provide beneficial land management opportunities. In dry rangeland, Western Juniper sucks up precious water resources and contributes to high fuel ladders. Through fuels reduction programs, juniper treatments are available to reduce wildfire risk and allow native vegetation and wildlife to return (including the sensitive species, Sage Grouse).

Agri-Tourism. Tourism brings many travelers to Central Oregon. While the major draw is ecotourism, agri-tourism is a way to draw these crowds to rural areas and provide additional revenues for local economies. Agri-tourism enterprises offer a wide range of benefits and activities. Farmers markets and farm-stands draw crowds of people interested in local foods and artisans; animal farms offer sightseeing opportunities to see livestock such as llamas, goats, lambs or bison; farms and gardens provide visitors a chance to see how their food is grown; and farm stays offer visitors the opportunity to work and stay overnight on a working farm. Other opportunities include hunting and fishing, horse wrangling and other recreational activities. Not only do these ventures provide additional income to farmers and ranchers, they also provide an economic development opportunity for the cities and counties to highlight their areas and draw more people to the urban attractions as well.

Methodological Issues in Applying the Assessment Tool

Some methodological issues are best made explicit before presenting the results. First, in the identification of potential dependencies and impacts, a contrast needs to be made between current land and water use/practices and some other land use or management practice. For example, a degraded forest area offers a given level of erosion control services. In specifying whether the impact of the forest on erosion control is positive or negative, it is necessary to first decide whether the existing land use is being contrasted with pristine, intact forest or deforestation and conversion to agriculture.

If the comparison is with agriculture, then erosion control under current conditions has a positive impact. If the comparison is with a restored and intact forest, then the impact would be negative, i.e. current conditions produce less erosion control. Similarly the “distance” between the current condition and the alternative land use or management practice will determine whether the impact is small or large. The impact on erosion control of forest restoration may provide a relatively small improvement, while deforestation and conversion may result in a large loss of services. In the assessment below these comparisons are made explicit.

Given that the objective of this effort is to identify improvements in ecosystem services that may require changes in incentives and that may lend themselves to the use of ecosystem credit markets, the implicit comparison is made with the appropriate form of sustainable ecological management. So, for example, the impact of a given ecotype is evaluated in terms of how the current conditions fare compared to sustainable ecosystem management. Historically, ecosystem alteration and simplification is a by-product of the drive to increase core Provisioning Services that meet basic human needs. Thus, it is expected that most ecotypes will show positive impacts for Provisioning Services and negative impacts on Regulating, Supporting, and Cultural Services. In this manner the assessment should uncover those services that will most benefit from investment in ecosystem restoration or protection activities (i.e. turning minuses into pluses in the assessment tables).

Second, the scope of the dependency assessment requires clarification and is best illustrated with an example. The Ochoco and Deschutes national forests are functioning, if degraded, ecosystems. They are obviously dependent on internal ecological functioning – primary productivity is occurring, nutrients are being cycled, water is flowing through the system, predator-prey relationships lead to pest control, etc. It is therefore clear that the ecosystem health of the forest is dependent on ecosystem services and may be at risk if these services are at risk. When it comes to incentives for management, this information is neither new nor terribly actionable information. Presumably, forest managers are aware of these facts and seek to integrate them into their management plans as a matter of course. Whether they do this well or not will matter for the forest but will be of broader consequence largely in terms of the impacts on ecosystem services that are consumed by the public in the forest and that may affect communities around the forest (or the global community as in the case of climate regulation). If management produces positive impacts then the question becomes how to capitalize on this so that the benefits can be internalized through some

incentive mechanism. If the benefits cannot be captured in some way, there is likely to be less incentive to manage for these services. Therefore, in the dependency assessment what is most critical is an explanation of the external ecosystem services on which the forest depends: services over which the forest managers have no control and which, if altered in some way, would put the forest at risk. For this reason, in the dependency assessment the emphases are on off-site ecosystem services rather than on-site ecosystem services.

Assessment Results

For the purpose of testing, the assessment tool is applied to two of the ecotypes: irrigated farmland and public forests. These two ecotypes cover a large proportion of Central Oregon and, outside of urban areas, represent the ecotypes that are arguably of most consequence for ecosystem services. Forest management and land/water management have long been major issues in the region as they intersect in irrigated agriculture have taken on increased significance over the last few decades. These two ecotypes are likely starting places for examining existing and potential marketplace opportunities for ecosystem services. Furthermore, they serve to assess the assessment tools' possible utility in scoping the potential for ecosystem service improvement and identifying potential incentive mechanisms for improving ecosystem management.

Irrigated Farmland. Current land and water uses to generate irrigated farmland are contrasted with hypothetical conditions of the land in its natural state and the water not diverted, pumped, or stored for use in irrigation. Thus the assessment is of a change in land and water use. There are also incremental changes in land and water use practices that could move management in the direction of sustainable ecosystem management. These changes can be inferred from the direction of dependencies and impacts identified by analyzing land and water use change.

The assessment suggests that irrigated farmland is not particularly dependent on a large number of ecosystem services. Freshwater is singled out as being of particular importance as there are no ready substitutes. When irrigated land in the high desert is no longer irrigated, its ability to supply the Provisioning Services of crops and livestock is drastically impaired. Farmland also depends on a series of inputs that can come from a number of ecosystems services including global climate regulation, water regulation, soil quality, pest control and pollination. In some cases farmland does not actually depend on these, but the ecosystem services are potential substitutes for services provided through human action. For example, genetic resources, soil quality, pest control and pollination are currently achieved through the purchase of seed, fertilizers, pesticides and pollination services that are commercially available. The ecosystem services literatures raises questions about the long term sustainability of these activities when they are no longer produced by or connected to ecosystems but are instead produced from fossil fuels and existing genetic stocks by human, technological and physical capital. However, it is not clear at this point that farmers (or society more broadly) would be better off by farmers switching over to fully "natural" or "ecosystem" provision of these services.

With regard to water regulation, Central Oregon ecosystems do regulate water flow to streams and rivers and hence to farms. However, dams on the Deschutes and Crooked Rivers are not just a substitute for that naturally provided service, but actually are vastly more effective at regulating water supply for irrigation. As far as global climate regulation it is expected that rates of photosynthesis and growth rates of plant will change – some increasing and some decreasing – due directly to changes in carbon concentration and indirectly to changing rainfall, snowpack and water supply. However, it is assumed that through the ability to switch crops farmers will have the ability to adapt to and mitigate any effects as they occur. In sum, the finding of the dependency assessment is that in terms of ecosystem services, irrigated farmland relies heavily on freshwater supply and is only marginally exposed to risk from a number of other Provisioning and Regulatory Services.

Public Forestland. With regard to public forests the assessment was conducted by comparing current conditions to improved ecosystem management, i.e. more similar to sustainable forest management than the current degraded state of much of the public forestlands. It is important to note that sustainable in this context does not rule out the extraction of timber and non-timber products; however, it implies that these are conducted in a manner that is sensitive to their ecological impacts.

The dependence of the forests on ecosystem services is limited as these are very large ecosystems covering essentially from the headwaters of the basin to a fair distance downstream. The two risks from outside their boundaries that may affect these forests are global climate regulation and natural hazard regulation, particularly fire. In the case of climate change, the potential for changes in temperature, precipitation and snowpack to affect forest health is well documented. For instance, the role of changing climate in promoting the spread of disease may have far-reaching consequences. In the Deschutes National Forest, for example, pine beetles are increasingly affecting forest stands. In the case of fire there is the risk that fire from adjoining private lands may spread to public forests. There are, however, a number of ways in which this problem can be avoided, and the emphasis (as discussed below) is more on the risk of fire within the public forests started by human activity or lightning.

Sustainable ecosystem management can be expected to enhance and secure the provision of ecosystem goods and services from these forests. It is well documented that such large public forests provide a wide range of goods and services of value to local economies as well as regional and global economies. In

Table 5. Assessment for Irrigated Farmland

Ecosystem services	Dependence	Impact
Provisioning		
Crops		■ +
Livestock		■ +
Capture fisheries		● -
Aquaculture		
Wild foods		
Timber and other wood fibers		
Fibers and resins		
Animal skins		☺ +
Sand		
Ornamental resources		
Biomass fuel		
Freshwater	●	■ -
Genetic resources	☺	
Biochemicals, natural medicines, and pharmaceuticals		
Regulating		
Air quality regulation		
Global climate regulation	☺	☺ -
Regional/local climate regulation		
Water regulation	☺	■ -
Erosion regulation		
Water purification and waste treatment		☺ -
Disease regulation		
Soil quality regulation	☺	☺ -
Pest regulation	☺	? +/-
Pollination	☺	☺ -
Natural hazard regulation (esp. Fire)		☺ +
Cultural		
Recreation and ecotourism		☺ -
Ethical values		■ -
Other services identified by company		
Supporting: Fish Habitat		■ -
Supporting: Wildlife Habitat		☺ -
Regulating: Avoidance of Invasive and Noxious Species		■ +/-
Biodiversity-Salmon		■ -
Biodiversity-Sage Grouse		■ -
Biodiversity-Spotted Owl		
Cultural-Agro-Tourism		☺ +
Key ■ High + Positive impact ● Medium - Negative impact ☺ Low ? Don't know		

Central Oregon public forests supply timber, fuelwood, mushrooms, ornamental wood, hunting, skiing, snowmobiling, motorcycling, boating, swimming, hiking, climbing, ecotourism and spiritual values amongst others (see Table 6). At present, recreation and tourism are probably the most valuable uses. Historically, timber was the largest revenue source and the main Provisioning Service provided by the forest. However, environmental concerns and increased regulations (particularly the listing of the spotted owl) have greatly reduced timber's prominence in recent years. That said, somewhat paradoxically it may be that investing in better ecosystem management could lead to an increased and positive impact from timber. The forests are currently experiencing a range of difficulties and pressures that preclude historic timber sale levels. Taking steps to improve management might actually lead to increased possibilities for timber sales, particularly where this is undertaken on a longer term, sustainable basis. With regard to biomass, at present the forests are generating biomass fuel in the form of fuelwood through fuels reduction projects.

Again, to some extent past management deficiencies have led to these positive impacts. Thus, it is unclear how better management would affect biomass fuels.

The impact of current management on Regulatory Services has largely been negative and might be reversed by improved management. Due to specific factors a number of the regulatory and supporting services typically associated with forests (or watershed services) are of lesser consequence. With regard to water regulation and erosion control the Deschutes National Forest is situated on young volcanic soils with little surface runoff. As a result erosion and overland transport is limited and of minor consequence to streams and rivers (of which there are few), their habitat and species. Instead water system

Table 6. Assessment for Public Forests

Ecosystem services	Dependence	Impact
Provisioning		
Crops		
Livestock		
Capture fisheries		○ -
Aquaculture		
Wild foods		○ -
Timber and other wood fibers		● +/-
Fibers and resins		
Animal skins		
Sand		
Ornamental resources		○ -
Biomass fuel		● +/-
Freshwater		○ -
Genetic resources		
Biochemicals, natural medicines, and pharmaceuticals		
Regulating		
Air quality regulation		● -
Global climate regulation	●	● -
Regional/local climate regulation		
Water regulation		○ -
Erosion regulation		○ -
Water purification and waste treatment		
Disease regulation		
Soil quality regulation		○ -
Pest regulation		
Pollination		
Natural hazard regulation (esp. Fire)	○	● -
Cultural		
Recreation and ecotourism		○ -
Ethical values		○ -
Other services identified by company		
Supporting: Fish Habitat		○ -
Supporting: Wildlife Habitat		○ -
Regulating: Avoidance of Invasive and Noxious Species		○ -
Biodiversity-Salmon		○ -
Biodiversity-Sage Grouse		
Biodiversity-Spotted Owl		● -
Cultural-Agro-Tourism		
Key ● High + Positive impact ○ Medium - Negative impact Low ? Don't know		

operations in the forest are the primary culprits in generating sediment, with seasonal increases and decreases of reservoir releases. The “purification” function of the forest is of little consequence as precipitation is received in a “pure” state and rapidly percolates through to groundwater (cleansing any contaminants introduced by water exposure to the forest ecosystem). The primary Regulatory Services of consequence relate to natural hazards and fire. In the case of the Deschutes and Ochoco National Forests years of fire suppression and clearcut logging have degraded the ecological function of the forest and left the forest extremely vulnerable to fire. Fire in turn has negative consequences for the release of carbon and for global climate regulation. Further, fire would put at risk the multitude of recreational and tourism benefits currently enjoyed by locals and visitors to the area. Improving forest health is therefore the most urgent ecological and economic issue in the forest.

Finally, it is important to note that the route whereby improved ecological management leads to economic benefits is indirect, passing through the natural hazards reduction services. In other words, it is not expected that improved management would increase the benefits currently realized by visitors to the forest. The forest is diverse and many areas of these forests are in good condition. Those that seek a pristine, wilderness experience can find it. However, for the majority of visitors increased forest health would probably not affect their enjoyment of their experience in the forest in a significant way. The Forest Service is therefore faced with the difficult task of finding funding to improve management and avoid the risk of fire and its potential consequences. This is a much harder task than marketing timber.

This section has sought to define a limited number of ecotypes that divide the Central Oregon landscape into areas that face similar risks and opportunities. To illustrate these, an existing ecosystem services assessment tool was modified to the local context and used to scope out the potential dependencies and impacts associated with two of these ecotypes: irrigated farmland and public forests. Future work could expand the diversity of ecotypes, apply the assessment tool to more of these ecotypes, and undertake this assessment in a participatory format with stakeholders. In this manner the consequence of the concept of ecosystem services for management of Central Oregon ecosystems might be better understood. Ultimately, such work can help identify opportunities to strengthen and deploy incentive mechanisms to effect on the ground change in resource use and management.

3.2 The Ecosystem Marketplace in Central Oregon

Whether public or private, resource managers are faced with budget constraints and limited time to assess and plan how to manage the resources at their disposal in the face of constantly changing political and market conditions. Identifying the potential to improve ecosystem productivity and realize increased economic benefits from ecosystem management is the first step. The institutional arrangements and incentive mechanisms must be in place to guide decisions towards more rewarding and sustainable management. As discussed in Section 4 there is a range of incentive mechanisms that have been developed and used to promote sustainable ecosystem management. This section discusses the various marketplace tools currently in place in Central Oregon and locates them according to the framework provided in Table 1 (see page 21). Identifying current approaches provides the basis for reflection (in the next section) on what additional tools, including ecosystem markets, might be used to address the needs of each ecotype.

3.2.1 Land Management Incentive Programs

The main land management incentive programs in Central Oregon are subsidy programs in the form of grant, loan, and tax credit programs. Government cost share programs provide producers with financial and technical assistance for the enhancement of natural resources. Low interest loan programs are available through state and federal programs and provide gap financing for agricultural producers and rural businesses. Federal and State governments provide tax credits for renewable energy and energy

efficiency projects. As an example of such a project, a land manager will build a fence around a stream bank to divert cattle and instead provide a solar pump and trough for water access. A cost share program will partially pay for the capital costs for implementation, while the project helps to provide clean water for downstream users. The majority of these programs are subsidies provided by the U.S. Department of Agriculture and delivered through the Natural Resource Conservation Service (NRCS) and Farm Service Agency (FSA).

Non-profit organizations are also important players in Central Oregon in obtaining public (federal and state funds) and private grants and delivering various projects associated with riparian, wetland and flood restoration, wildlife habitat improvement, value-added programs for producers, and sustainable forest management. The watershed councils, the Deschutes Land Trust, and soil and water conservation districts are examples of these organizations.

Also prevalent are voluntary product certification programs such as organic agriculture labels, sustainable forestry labels, and value-added labels such as grass fed, free-range, or sustainably harvested. These markets provide producers with incentives to manage their lands or animals with sustainable practices by

Table 7. Land Management Incentive Programs in Central Oregon by Ecotype

Incentive Programs		Forest	Ranch	Farm	Riparian	Incentive Mechanism
Grants	Organizational grant programs	x	x	x	x	Subsidy
CT	Climate Trust of Oregon	x	x	x	x	Payment in Lieu
AMA	Agricultural Management Assistance		x	x		Subsidy
BCAP	Biomass Crop Assistance Program	x	x	x		Subsidy
CREP	Conservation Reserve Enhancement Program		x	x	x	Subsidy
CRP	Conservation Reserve Program		x	x	x	Subsidy
CSP(1)	Conservation Security Program		x	x	x	Subsidy
CSP(2)	Conservation Stewardship Program	x	x	x	x	Subsidy
EQIP	Environmental Quality Incentives Program		x	x	x	Subsidy
EQIP-OPI	Organic Program Initiative		x	x		Subsidy
FRPP	Farm and Ranch Lands Protection Program	x	x	x		Subsidy
FLEP	Forest Land Enhancement Program	x				Subsidy
GRP	Grassland Reserve Program		x			Subsidy
HFRP	Healthy Forests Reserve Program	x				Subsidy
OCSRP	Organic Cost Share Reimbursement Program		x	x		Subsidy
SLBFRA	Socially Disadvantaged, Beginning and Limited Resource Farmer Assistance Program		x	x		Subsidy
WHIP	Wildlife Habitat Incentive Program	x	x	x	x	Subsidy
WRP	Wetland Reserve Program	x	x	x		Subsidy
Loans	State and Federal Loan Programs		x	x		Loan Subsidy
Tax	State and Federal Tax Credits	x	x	x		Tax Credit
FSC	Forest Stewardship Council Certification	x				Certification
SFI	Sustainable Forestry Initiative	x				Certification

providing market access or price premiums. Examples include Oregon Country Beef; the USDA organic standard; and Oregon Tilth, Forest Stewardship Council and Salmon Safe certifications.

Table 7 presents a matrix of the available incentive programs in Central Oregon in relation to the ecosystem types: forestland, ranchland, farmland and riparian zones as well as grant, loan and tax incentives programs. The incentive mechanisms employed are based on the categorizations in Table 1 (see page 21). This list is not meant to be exhaustive, but rather to provide an exploration of the program purpose, administrator, seller, and the incentive. This information was gathered through agency websites and interviews with agency members and individual landowners. Major features of the individual programs are briefly explained in the inventory that makes up the next section.

Land Management Incentive Programs: Inventory

Subsidy: Organizational Grant Programs

Deschutes Land Trust (DLT)

The DLT offers services to acquire fee title to lands and conservation easements to protect land from development and achieve land and water restoration objectives. The Trust uses a range of government and philanthropic funds to accomplish its mission.

Intermountain West Joint Venture (IWJV)

The IWJV functions to support strategic and partnership-based bird conservation. The IWJV is committed to: 1) biological planning/conservation design (determining what needs to be done and where to maintain bird populations at desired levels), 2) habitat delivery (assisting partners with on-the-ground habitat conservation), and 3) monitoring/evaluation/ applied research (supporting key monitoring programs and assumption-driven research).

National Fish and Wildlife Foundation (NFWF)

NFWF provides funding on a competitive basis to projects that sustain restore and enhance the nation's fish, wildlife, plants and their habitats through its *Keystone Initiative Grants* and other *Special Grant Programs*.

National Forest Foundation (NFF) Capacity Building Program

The National Forest Foundation (NFF) supports citizen engagement in the stewardship of national forests and grasslands by providing funding and resources to meet the needs of collaborative efforts at various stages of growth and capacity, from start-up to sustainable organization.

Oregon Department of Fish and Wildlife Access and Habitat (A&H) Program

To qualify for A&H funding, a project must improve wildlife habitat, increase public hunting access to private land or solve a wildlife damage issue. Projects may be on private or public lands, though preference is given to projects on private lands.

Oregon Hunters Association

Provides grants for projects in Oregon that fall within the parameters of the OHA mission "to provide an abundant huntable wildlife resource in Oregon for present and future generations, enhancement of wildlife habitat and protection of hunter's rights".

Oregon Watershed Enhancement Board (OWEB) - Small and large grant program

OWEB provides grants for watershed restoration, acquisition, technical assistance, monitoring, assessment and regional education.

Partners for Fish and Wildlife

Provides technical and financial assistance to private landowners and Native American Tribes interested in voluntarily restoring or improving native habitats for fish and wildlife on their lands.

Sustainable Agriculture Research and Education Program (SARE)

SARE works to increase knowledge about, and help farmers and ranchers adopt, practices that are profitable, environmentally sound, and good to communities. Research and education grants fund projects that usually involve scientists, producers and others in an interdisciplinary approach; and producer grants go to farmers and ranchers who test innovative ideas and share the results with their neighbors.

USDA Rural Development Value Added Producer Grant (VAPG)

Farmers, ranchers, foresters & fishermen may receive USDA Rural Development matching grants for either planning or working capital purposes to implement value-added ventures – e.g., for marketing or processing projects that will add value to the commodities they produce or for on-farm renewable energy generation projects. The goal of the program is to generate new products, expand market opportunities, and increase producers' shares of revenue from the commodities they produce.

USDA Rural Development Rural Business Enterprise Grant (RBEG)

The RBEG program provides grant funds for precisely targeted technical assistance, training, and other activities that support the development of private, for-profit, small business enterprises in rural areas.

Upper Deschutes Watershed Council (UDWC)

The UDWC engages in a range of ecosystem restoration projects in upland and riparian areas. Funds are sought widely from government and private sources, though the UDWC receives core support from OWEB funds.

Subsidy: Directed Government Subsidy Programs**Agricultural Management Assistance (AMA) Program**

Purpose: To provide cost share assistance to agricultural producers to voluntarily address issues such as water management, water quality, and erosion control by incorporating conservation into their farming operations. Producers may construct or improve water management structures or irrigation structures; plant trees for windbreaks or to improve water quality; and mitigate risk through production diversification or resource conservation practices, including soil erosion control, integrated pest management, or transition to organic farming

Buyer/Administrator: Natural Resource Conservation Service (NRCS)

Seller: Agricultural producer

Intermediary: NA

Results: The total AMA payments shall not exceed \$50,000 per participant for any fiscal year.

Biomass Crop Assistance Program (BCAP)

Purpose: To provide financial assistance to producers or entities that deliver eligible biomass material to designated biomass conversion facilities for use as heat, power, biobased products or biofuels. Initial assistance will be for the Collection, Harvest, Storage and Transportation (CHST) costs associated with the delivery of eligible materials.

Buyer/Administrator: NRCS

Seller: Materials, pre-commercial thinnings, or invasive species from National Forest System land and Bureau of Land Management land, and any organic matter that is available on a renewable or recurring basis from non-Federal land or land belonging to an Indian or Indian tribe.

Intermediary: Farm Service Agency (FSA)

Results: \$1 for each \$1 per dry ton paid by the CHST qualified Biomass Conversion Facility to the eligible material owners, limited to a maximum of \$45 per dry ton and limited to a 2-year payment duration.

Conservation Reserve Enhancement Program (CREP)

Purpose: Voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water.

Buyer/Administrator: Farm Service Agency (FSA)

Seller: Any qualified agricultural landowner

Intermediary: The FSA uses Conservation Reserve Program (CRP) funding to pay a percentage of the program's cost, while state, tribal governments or other non-federal sources provide the balance of the funds. States and private groups involved in the effort may also provide technical support and other in-kind services.

Results: Annual conservation payment for contract period (10 – 15 years); reimbursement for up to 75% of the eligible costs of restoration practices.

Conservation Reserve Program (CRP)

Purpose: To provide technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and- ranchers in complying with Federal, State, and tribal environmental laws, and encourages environmental enhancement.

Buyer/Administrator: NRCS

Seller: Private landowner

Intermediary: FSA

Results: FSA provides annual rental payments, including certain incentive payments, and cost-share assistance.

Conservation Security Program (CSP1)

Purpose: To provide financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on Tribal and private working lands. Working lands include cropland, grassland, prairie land, improved pasture, and range land, as well as forested land that is an incidental part of an agriculture operation.

Buyer/Administrator: NRCS

Seller: Private landowners or Tribal land and the majority of the land must be located within one of the selected watersheds.

Intermediary: NA

Results: Tier I: contracts are for 5 years, maximum payment of \$20,000 annually; Tier II: 5-10 years, maximum payment of \$35,000 annually; and Tier III: 5-10 years, maximum payment for \$45,000 annually.

Conservation Stewardship Program (CSP2)

Purpose: To provide financial and technical assistance to eligible producers to conserve and enhance soil, water, air, and related natural resources on their land.

Buyer/Administrator: NRCS

Seller: Eligible lands include cropland, grassland, prairie land, improved pastureland, rangeland, nonindustrial private forest lands, agricultural land under the jurisdiction of an Indian tribe, and other private agricultural land (including cropped woodland, marshes, and agricultural land used for the production of livestock) on which resource concerns related to agricultural production could be addressed.

Intermediary: NA

Results: Two types of payments: annual payment for installing new conservation activities and maintaining existing activities. A supplemental payment may be earned by participants receiving annual payments who also adopt resource-conserving crop rotation practices. These are 5-year contracts, which may not exceed \$40,000 in any year and \$200,000 during any 5-year period over the term of the initial contract.

Environmental Quality Incentives Program (EQIP)

Purpose: To provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals and offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

Buyer/Administrator: NRCS

Seller: Private landowner

Intermediary: NA

Results: A minimum of 1 year – payments up to 75% of incurred costs and income forgone as a result of certain conservation practices and activities

Farm and Ranch Lands Protection Program (FRPP)

Purpose: To provide matching funds to help purchase development rights to keep productive farm and ranchland in agricultural uses.

Buyer/Administrator: NRCS

Seller: Farmland must be part of a pending offer from a State, tribe, or local farmland protection program; be privately owned; have a conservation plan for highly erodible land; be large enough to sustain agricultural production; be accessible to markets for what the land produces; have adequate infrastructure and agricultural support services; and have surrounding parcels of land that can support long-term agricultural production

Intermediary: NA

Results: The FRPP share of the easement cost must not exceed 50% of the appraised fair market value of the conservation easement. As a minimum, a cooperating entity must provide, in cash, 25 percent of the appraised fair market value or 50 percent of the purchase price of the conservation easement.

Forest Land Enhancement Program (FLEP)

Purpose: The Forest Land Enhancement Program (FLEP) replaces the Stewardship Incentives Program (SIP) and the Forestry Incentives Program (FIP) and is optional in each state in the nation through the USFS. It is a voluntary program for non-industrial private forest (NIPF) landowners. It provides for technical, educational, and cost-share assistance to promote sustainability of the NIPF forests.

Buyer/Administrator: State Forester

Seller: FLEP is available for all non industry private forest land owners.

Intermediary: Oregon Department of Forestry

Results: The cost-share practices are limited to the treatment of 1,000 acres per year with an aggregate payment not to exceed \$100,000 for the life of the current Farm Bill.

Grassland Reserve Program (GRP)

Purpose: A voluntary conservation program that emphasizes support for working grazing operations, enhancement of plant and animal biodiversity, and protection of grassland under threat of conversion to other uses.

Buyer/Administrator: NRCS

Seller: Privately owned grasslands; land that contains forbs (including improved rangeland and pastureland or shrubland) for which grazing is the predominant use; or land that is located in an area

that historically has been dominated by grassland, forbs, or shrubland that has the potential to serve as wildlife habitat of significant ecological value.

Intermediary: FSA

Results: \$50,000 annual payment limitation per person per year. Restoration payments are made after practice implementation, at 50% of the actual cost.

Healthy Forests Reserve Program (HFRP)

Purpose: To restore and enhance forest ecosystems to: 1) promote the recovery of threatened and endangered species, 2) improve biodiversity; and 3) enhance carbon sequestration.

Buyer/Administrator: NRCS

Seller: Land must be private land or Tribal lands which will restore, enhance, or measurably increase the likelihood of recovery of a threatened or endangered species, must improve biological diversity, or increase carbon sequestration.

Intermediary: NA

Results: This program offers three enrollment options: 1) a 10-year cost-share agreement for which the landowner may receive 50% of the average cost of the approved conservation practices; 2) a 30-year easement, for which the landowner may receive 75% of the easement value of the enrolled land plus 75% of the average cost of the approved conservation practices; or 3) An easement of not more than 99 years, for which landowners may receive 100% of the easement value of the enrolled land plus 100% of the average cost of the approved conservation practices. Note: In fiscal year 2010, only lands in Oregon's Lane, Coos, Douglas, Josephine, Curry and Jackson Counties are eligible

Organic Cost Share Reimbursement Program (OCSR)

Purpose: Designed to assist producers, handlers, and processors of agricultural products in obtaining certification under the national organic guidelines

Buyer/Administrator: Oregon Department of Agriculture (ODA)

Seller: Any qualified grower or processor obtaining organic certification or renewal of their organic certification.

Intermediary: NA

Results: Reimbursements are limited to 75 percent, with a maximum of \$750.

Organic Program Initiative (OPI) – subset of EQIP

Purpose: To provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

Buyer/Administrator: NRCS

Seller: Owners and operators of agricultural lands

Intermediary: NA

Results: Assistance is for conservation practices related to organic production and is limited to \$20,000 per year and \$80,000 during a six year period. Producers are required to develop and carry out an Organic System Plan (OSP) or carry out practices consistent with an OSP and must be pursuing an organic certification or in compliance with their organic certification.

Socially Disadvantaged, Beginning, and Limited Resource Farmers/Ranchers

Purpose: To provide for voluntary participation: offers incentives and focuses on equity in accessing U.S. Department of Agriculture (USDA) programs and services. Enhancements include streamlined delivery of technical and financial assistance; improved programs and services; and flexibility in decision making (with most decisions made at the Tribal, State, or local level).

Buyer/Administrator: NRCS

Seller: Beginning farmer or rancher (has not operated a farm or ranch, or who has operated a farm or ranch for not more than 10 consecutive years); socially disadvantaged (a socially disadvantaged group is a group whose members have been subject to racial or ethnic prejudice because of their identity as members of a group, without regard to their individual qualities); and limited resource farmer and rancher (direct or indirect gross farm sales not more than the current indexed value in each of the previous 2 years and total household income at or below the national poverty level for a family of four, or less than 50 percent of county median household income in each of the previous 2 years).

Intermediary: NA

Results: Five percent of available Environmental Quality Incentives Program (EQIP) funds to assist beginning farmers or ranchers and five percent to assist socially disadvantaged farmers or ranchers; and five percent of available Conservation Stewardship Program (CSP2) acres to assist beginning farmers or ranchers and 5 percent to assist socially disadvantaged farmers or ranchers.

Wetland Reserve Program (WRP)

Purpose: This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection and receive financial incentives to restore wetlands that have been drained for agriculture.

Buyer/Administrator: NRCS

Seller: Wetlands on private property

Intermediary: NA

Results: This program offers three enrollment options: 1) permanent easement; USDA pays 100% of the easement value and up to 100% of the restoration costs 2) a 30-year easement; USDA pays up to 75% of the easement value and up to 75% of the of the restoration costs; or 3) a Restoration Cost-Share agreement to restore or enhance wetland functions and values without placing an easement on the enrolled acres; USDA pays up to 75% of restoration costs.

Wildlife Habitat Incentives Program (WHIP)

Purpose: Provides technical assistance to establish and improve fish and wildlife habitat

Buyer/Administrator: NRCS

Seller: Private landowners

Intermediary: NA

Results: Up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. Generally lasts up to one year after the last conservation practice is implemented but not more than 10 years from the date the agreement is signed.

Payment in Lieu Programs

The Climate Trust Programs (CTP)

Purpose: The Climate Trust obtains funds from both regulatory programs and voluntary programs, including a state mandated payment in lieu for new fossil fuel plants sited in the state. Proceeds are used for a variety of programs that seek new projects which avoid, sequester or displace carbon dioxide emissions.

Buyer: Fossil Fuel plants sited in Oregon

Administrator: Climate Trust of Oregon

Seller: Landowners, business, non-profits and utilities

Results: The Climate Trust executed a reforestation program with the Deschutes River Conservancy, which included several projects in riparian and upland areas in Central Oregon

Loan Subsidies

There are no ecosystem service specific state and federal loan funds; however, some existing programs may be adapted to promote ecosystem management.

Tax Credits

There are no ecosystem service specific state and federal tax credits; however, some existing programs may be adapted to promote ecosystem management. For example state or federal tax credits (or deductions) exist for reforestation.

Voluntary Actions and Markets

Forest Stewardship Council (FSC) certification

Purpose: To provide a market-based, voluntary system for ensuring that wood products come from environmentally responsible, socially beneficial, and economically viable, well managed forests.

Buyer/Administrator: FSC

Seller: Woodlot landowner

Intermediary: FSC certifiable consultant

Results: Premium price paid on wood product

Sustainable Forestry Initiative (SFI)

Purpose: To provide market-based, voluntary system for ensuring sustainably harvested timber

Buyer/Administrator: SFI

Seller: Woodlot owner

Intermediary: SFI certifiable consultant

Results: Premium price paid on wood product

3.2.2 Water Management Incentive Programs

The State owns the waters of Oregon, granting permits and rights for its beneficial use. In many locations in Central Oregon, out-of-stream rights exceed stream flow, particularly during late summer months. As a result the ability of these waterways to support aquatic habitat, fish and wildlife is considerably reduced. The State of Oregon has established instream water rights in many of the critical rivers and streams in Central Oregon. These have recent and junior priority dates and thus effectively close off such water bodies from further permitting and appropriation. The Deschutes River Conservancy, the Oregon Water Trust (now The Freshwater Trust), the Upper Deschutes Watershed Council and the Deschutes Land Trust have partnered with irrigators and irrigation districts to temporarily lease and permanently transfer senior rights to instream use. These entities, and particularly the Deschutes River Conservancy, have developed a wide range of incentive mechanisms to fund these willing seller, willing buyer water right transactions with irrigators and irrigation districts (see Table 8). The Oregon Water Resources Department processes the resulting leases, transfers and allocations of conserved water. The State therefore now holds a growing number of senior instream rights on Whychus Creek, Tumalo Creek, Trout Creek and the Deschutes River.

Table 8. Water Management Incentive Programs in Central Oregon by Ecotype

Incentive Programs		Water Conservation	Water Rights Transactions	Incentive Mechanism
ISWRP	State Instream Water Rights Program		x	Public Ownership
DRC	DRC Federal Appropriations		x	Public Investment
Market-Based Incentives				
FSA	Farm Special Assessment		(disincentive)	Tax
CBWTP	Columbia Basin Water Transactions Program		x	Payment in Lieu
PRBWF	Pelton-Round Butte Water Fund		x	Payment in Lieu
AWEP	Agricultural Water Enhancement Program	x		Subsidy
CREP	Conservation Reserve Enhancement Program		x	Subsidy
EQIP	Environmental Quality Incentives Program	x		Subsidy
SWP	Water Smart/Water 2025	x	x	Subsidy
OWEB	Oregon Watershed Enhancement Board Challenge Grants		x	Subsidy
SWQLF	Water Quality Loan Fund	x		Subsidy
Regulated Markets				
ACP	DRC Acquisitions and Conservation Programs		x	Tradable Use Permits
GMP	Groundwater Mitigation Program		x	Tradable Offset Permits
Voluntary Measures				
BWP	Blue Water Program		x	Voluntary Offsets
NRDRF	North Rim Deschutes River Fund		x	Payments for Ecosystem Services
WRC	Water Restoration Certificates		x	Voluntary Offset Credits

Note: Water conservation is taken to mean investing in conservation measures without requiring a subsequent water rights transaction for the benefit of instream use. Many of the incentive mechanisms that provide for water rights transactions do so through purchase of allocations of conserved water that result from conservation projects – however, without the water rights transaction the conservation project would not be funded, as conservation alone does not necessarily restore habitat during critical periods.

Water Management Incentive Programs: Inventory

Public Ownership

Oregon Instream Water Rights Program (ISWRP)

Purpose: Program allows State to receive and manage junior and senior instream water rights provided voluntarily by water right holders or through other programs listed below

Buyer/Administrator: Oregon Water Resources Department

Seller: Irrigators and Irrigation Districts

Intermediary: Water right transaction experts including DRC and local attorneys

Results: Water protected instream in area streams and rivers

Public Investment

Deschutes River Conservancy Federal Appropriation (DRC)

Purpose: Appropriations allow DRC to fund a direct and challenge grant program for ecosystem restoration

Buyer: US taxpayer

Administrator: Bureau of Reclamation

Seller: Irrigators and Irrigation Districts

Intermediary: Deschutes River Conservancy

Results: Water protected instream in area streams and rivers; riparian restoration projects, etc

Market Based Instruments

Farm Special Assessment (FSA)

Purpose: Maintain open space, environmental quality and family farms through subsidizing farm use in Exclusive Farm Use zones

Buyer: State Taxpayers

Administrator: County Assessor

Recipient: Landowners

Results: Land in Central Oregon frozen in farm use due to threat of higher tax burden if it moves to other (including ecosystem) uses

Columbia Basin Water Transactions Program (CBWTP)

Purpose: Hydropower producer mitigates for impacts on endangered species through off-site (i.e. tributaries to the Columbia) flow acquisitions

Buyer: Bonneville Power Administration

Administrator: National Fish and Wildlife Foundation

Seller: Irrigators and Irrigation Districts

Intermediary: Deschutes River Conservancy is a qualified local entity in the CBWTP

Results: Large quantities of water moved to instream use in the form of leases, transfers, and conserved water

Pelton Round Butte Water Fund (PRBWF)

Purpose: Hydropower producer mitigates for impacts on endangered species through flow acquisitions in tributaries upstream of the dam complex in order to support separate salmonid reintroduction program.

Buyer: Portland General Electric and the Confederated Tribes of the Warm Springs Reservation

Seller: Irrigators and Irrigation Districts

Intermediary: Deschutes River Conservancy

Results: Water acquired for instream use in the form of leases, transfers, and conserved water in tributaries with potential salmonid habitat

Agricultural Water Enhancement Program (AWEP) – subset of EQIP

Purpose: Voluntary conservation initiative that provides financial and technical assistance to agricultural producers to implement agricultural water enhancement activities on agricultural land for the purposes of conserving surface and ground water and improving water quality.

Buyer/Administrator: NRCS

Seller: Owners and operators of agricultural lands

Results: Not yet applied in Central Oregon

Conservation Reserve Enhancement Program (CREP)

Purpose: Voluntary land retirement program (see above under land) that also includes an option to lease water to instream uses for land enrolled in the Program.

Buyer/Administrator: Farm Service Agency (FSA)

Seller: Any qualified agricultural landowner

Intermediary: Soil and water conservation districts and Deschutes River Conservancy

Results: Limited use in Central Oregon.

Environmental Quality Incentives Program (EQIP)

Purpose: To provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals and offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

Buyer/Administrator: NRCS

Seller: Private landowners

Intermediary: Irrigation districts, soil and water conservation districts and DRC help landowners obtain grants and help implement projects

Results: EQIP is used to fund piping and improvements on the portion of water delivery systems on landowners land (not canals and ditches with District easements)

Smart Water Program – formerly Water2025 (SWP)

Purpose: Challenge grant program for water conservation and water marketing/banking

Buyer: Federal Taxpayers

Administrator: Bureau of Reclamation

Seller: Irrigators and Irrigation Districts

Intermediary: Irrigation Districts and DRC

Results: Large quantities of water moved to instream use through district water conservation projects and the Deschutes Water Alliance Water Bank

Oregon Watershed Enhancement Board (OWEB)

Purpose: Hydropower producer mitigates for impacts on endangered species through off-site (i.e. tributaries to the Columbia) flow acquisitions

Buyer/Administrator: Bonneville Power Administration

Seller:

Intermediary: Deschutes River Conservancy is a qualified local entity in the CBWTP

Results: Large quantities of water moved to instream use in the form of leases, transfers, and conserved water.

State Water Quality Loan Fund (SWQLF)

Purpose: Provide low interest loans to water quality improvement projects

Buyer: State Taxpayers

Administrator: Department of Environmental Quality

Borrower: Irrigation Districts

Results: Loan funds used for large water conservation projects as a means to forward finance construction in advance of allocations of conserved water

Regulated Markets**Deschutes River Conservancy: Water Acquisitions and Conservation Programs (WACP)**

Purpose: The DRC Water Acquisitions and Conservation Programs uses a variety of funding sources to acquire existing senior water rights for instream use. Water rights are issued by the state based on

availability and beneficial use and can be leased, bought and sold, or gifted to instream use without loss of priority date. Water saved through conservation measures may be transferred to new instream uses.

Buyer: The Deschutes River Conservancy acts as buyer on behalf of various funding sources listed above

Administrator: The Oregon Water Resources Department processes and vets mitigation applications

Seller: Irrigators and Irrigation Districts

Results: Significant quantities of water restored to area streams and rivers

Groundwater Mitigation Program (GMP)

Purpose: Program allows new groundwater right applicants to offset the impact of their new use on the lower Deschutes (a Wild and Scenic River) by purchasing equivalent consumptive use units, typically provided by the DRC's Groundwater Mitigation Bank

Buyer/Administrator: New Groundwater Permittees

Administrator: The Oregon Water Resources Department processes and vets mitigation applications

Seller: Irrigators and Irrigation Districts

Intermediary: For leases the state-chartered groundwater mitigation bank run by the DRC, for transfers the Deschutes Water Alliance Water Bank

Results: A large number of leases and transfers have restored stream flow in Central Oregon streams and rivers while offsetting consumptive use impacts near Lake Billy Chinook

Voluntary Actions and Markets

Blue Water Program (BWP)

Purpose: Voluntary surcharge on water bills (municipal and irrigation generates funds for stream flow restoration

Buyer: Customers pay to offset their residential water use

Administrator: The utility collects the funds and passes them to the DRC

Seller: Irrigators are paid for leasing water to instream use

Intermediary: Deschutes River Conservancy executes the leasing program with collected funds

Results: Currently Avion Water and Swalley Irrigation District are participating in the program, which raises over \$10,000 a year for the DRC leasing program

Water Restoration Certificates (WRCs)

Purpose: Reduce residual water footprints through a certified flow restoration product

Buyer: Corporations, individuals and other groups

Administrator: Bonneville Environmental Foundation develops and executes the Program

Certifier: the National Fish and Wildlife Foundation certifies that the stream flow transactions generate environmental benefit

Seller: Irrigators and Irrigation districts

Intermediary: A variety of qualified local suppliers (water trusts and conservancies) provide the transactions that underpin the WRCs

Results: Program began in 2009 and is currently funding a substantial portion of the DRC instream water leases (as well as transactions in other parts of Oregon and in Montana)

North Rim Deschutes River Fund (NRDRF)

Purpose: In the exclusive North Rim development, overlooking the Deschutes River below Bend, 2% of lot sales goes into the North Rim Deschutes River Fund for use in restoring the river

Buyer: North Rim homeowners

Seller: Irrigators and irrigation districts

Intermediary: The DRC is one recipient of North Rim Funds

Results: In 2007 the first \$300,000 grant by the Fund went to the DRC to help fund piping of Swalley Irrigation District's main canal and an allocation of conserved water to permanent instream use in Deschutes

3.2.3 Energy Management Incentive Programs

A relatively new concept is emerging as an incentive for ecosystem services – renewable energy. Many rural producers are seeking a variety of subsidies and tax credits to install solar, wind, micro-hydro, and biomass projects that either replace fuel intensive pumps or systems or offset power costs. Oregon, in particular, provides a progressive state tax credit for renewable energy projects in conjunction with utility and the Energy Trust of Oregon incentives. By using a renewable energy source instead of petroleum products, producers are providing healthier ecosystems.

Table 9. Energy Management Incentive Programs in Central Oregon

Incentive Program		Energy Conservation, Efficiency, and Renewable Energy Generation	Incentive Mechanism
ETO	Energy Trust of Oregon	x	Subsidy
REAP	Renewable Energy for America	x	Loan Subsidy Grant Subsidy
GSL	GreenStreet Lending Program	x	Loan Subsidy
SELP	Oregon Small-Scale Energy Loan Program	x	Loan Subsidy
BETC	Business Energy Tax Credits	x	Tax Credit
CEC	Central Electric Cooperative	x	Subsidy
MEC	Midstate Electric Cooperative	x	Subsidy

Energy Management Incentive Programs: Inventory

Market-Based Incentives

Subsidy

Energy Trust of Oregon (ETO)

Purpose: Provides cash incentives to help offset the costs of energy efficiency upgrades to buildings and equipment for dairies, nurseries, commercial farms and other agricultural businesses.

Buyer/Administrator: Energy Trust of Oregon

Seller: customer of Portland General Electric, Pacific Power, and Cascade Natural Gas

Intermediary: NA

Results: Provides cash incentives for renewable energy and energy efficiency

Central Electric Cooperative (CEC)

CEC also offers incentives for agricultural producers for energy efficiency upgrades.

Midstate Electric Cooperative (MEC)

MEC encourages energy efficiency in the commercial and industrial sectors by giving its customers a choice of several different financial incentive programs.

USDA Rural Energy for America Program (REAP) Feasibility Grant Program

Purpose: To provide grants for energy audits and renewable energy development assistance. Eligible feasibility studies for renewable energy systems include projects that will produce energy from wind, solar, biomass, geothermal, hydro power and hydrogen-based sources. The energy to be produced includes, heat, electricity, or fuel

Buyer/Administrator: USDA

Seller: Rural small businesses & agricultural producers

Results: The grants are awarded on a competitive basis and can be up to 25% of total eligible project costs. Grants are limited to \$50,000 for renewable energy feasibility studies

USDA Rural Energy for America Program (REAP) Grants – renewable energy/energy efficiency

Purpose: To provide grants to purchase and install renewable energy generation systems

Buyer/Administrator: USDA

Seller: Rural small businesses & agricultural producers

Results: pays up to 25% of costs

USDA Rural Energy for America Program (REAP) “Combo” guaranteed loan + grant

The guaranteed loan may be combined with a REAP grant (for up to 25% of the project cost), but total REAP assistance cannot exceed 75% of the total project cost. (REAP grants are discussed in another information sheet.) An accompanying REAP guaranteed loan application may increase the likelihood of receiving a REAP grant.

USDA Rural Energy for America Program (REAP) Guaranteed Loan Program

Purpose: To supports “gap” financing for rural small businesses & agricultural producers to purchase and install or improve renewable energy systems (RES) and energy efficiency improvements (EEI).

Buyer/Administrator: USDA

Seller: rural small businesses & agricultural producers

Intermediary: The REAP guaranteed program is lender-driven. USDA guarantees the loan rather than lending directly. A commercial lender seeks the guarantee, and, if approved, it makes (and services) the loan.

Results: Finance up to 75% of total project costs for RES or EEI energy projects.

Type of Assistance: Federal guarantee for lenders on loans for eligible energy projects: 85% (maximum) guarantee on loans up to \$600,000; 80% (maximum) guarantee on loans from \$600,000-\$5 million ; 70% (maximum) guarantee on loans from \$5-10 million; and 60% (maximum) guarantee on loans from \$10-25 million

GreenStreet Lending Program (GSL)

Energy Trust of Oregon and Umpqua Bank have partnered to offer a loan to homeowners and small businesses for renewable energy and energy efficiency investments. These loans have no loan fees, no closing costs, and offer preferred rates to homeowners and small businesses interested in certain renewable energy and energy efficiency projects. To qualify for a loan, an individual or business must be a customer of PGE, Pacific Power, NW Natural or Cascade Natural Gas.

Oregon Small-Scale Energy Loan Program (SELP)

To promote energy conservation and renewable energy resource development for individuals, businesses, schools, cities, counties, special districts, state and federal agencies, public corporations, cooperatives, tribes, and non-profits.

Tax Credits

Oregon Business Energy Tax Credits (BETC)

For investments in energy conservation, recycling, renewable energy resources, sustainable buildings, and less-polluting transportation fuels. Any Oregon business may qualify, including, farms and businesses. The tax credit can cover costs directly related to the project, including equipment cost, engineering and design fees, materials, supplies and installation costs. Loan fees and permit costs also may be claimed. The BETC has been used in Central Oregon in conjunction with a number of irrigation district piping project in order to defray costs associated with new hydropower generating facilities located at the tail end of piped section of main canal.

3.3 Outreach and Scoping for Incentive Mechanisms

This scoping and outreach exercise examines a number of the incentive mechanisms in Central Oregon in greater depth. These include some of the principal incentive tools for each of the main ecosystem service units in Central Oregon, including farmland, ranchland, forests and riparian areas. The goal is to understand, from the perspective of public and non-profit agencies, what types of incentive mechanisms are available in Central Oregon, how these programs function, what program opportunities and barriers exist, and what types of incentives mechanisms (existing or not) might work for this ecotype. These objectives were achieved through professional experience, research and/or interviews involving the Deschutes National Forest and the Pacific Northwest Research Station (USFS), the Deschutes River Conservancy (DRC), the Central and Eastern Oregon Nature Conservancy (TNC), Oregon State University Extension Service in Crook County, and the Natural Resource Conservation Service's Deschutes Basin Team (NRCS). Each agency serves the greater public, but also has a particular focus area. To the extent possible, the perspective and information from each group is associated with specific Ecotypes identified earlier.

US Forest Service: Public Forestlands

The US Forest Service (USFS) manages the national forests for multiple purposes and to provide public goods for the benefit of all citizens. However, public agencies in general have a difficult time understanding how to market public goods or whether doing so is an option. Citizens enjoy the goods and service provided by public forests (as documented in Section 5) sometimes for free but normally through a simple permitting process and payment of associated fees. For example, visitors to the forest must buy a parking pass in certain areas, and people who wish to harvest fuelwood or cut a tree for holiday use must buy a permit. Generally, however, selling ecosystem services and goods is difficult because of problems with the concept of public agencies marketing public goods for economic purposes, the uncertainty in such markets, and regulations and policies at the national level.

Nationally, the USFS has embraced ecosystem services as a framework for describing the benefits that the forest provides for people. In general, the agency is working to advance market-based approaches to conservation and stewardship on private and community lands. By valuing these services, it will increase public awareness of the "importance of forests and grasslands to human well-being; provide an economic incentive for private landowners to own and sustainably manage their land; encourage ecological restoration; and inspire individual efforts to reduce consumption of natural resources and minimize human impact of ecosystems" (http://www.fs.fed.us/ecosystemservices/About_ES/faq.shtml).

As a pilot project, the Deschutes National Forest (DNF) and the USFS Pacific Northwest (PNW) Research Station have teamed up to demonstrate the development of ecosystem services as a concept which includes increasing the public's and forest service personnel's perceptions of ecosystem services and goods. The project comprises developing protocols for measuring and tracking changes in ecosystem services in both terrestrial and aquatic ecosystems involving services such as wildlife and water, and forest goods such as timber and mushrooms. In addition to assessing these services, the partners will be studying cultural services and conducting social, economic, and policy research. Objectives are to help

understand the effectiveness of policy and program options to influence land managers, the feasibility of market mechanisms, human values associated with nature, and valuation of ecosystem services.

As a method for integrating ecosystem service projects on national forest lands with those on private lands, the Forest Service districts are partnering with local non-profits and private landowners on projects outside of the forest boundaries. By using this approach, the DNF is able to create stakeholder buy-in for public land management. This is in contrast to previous ideals of how to manage public lands specifically for direct markets such as timber.

Given national forests' status as lands in public ownership, the prospects for engaging in ecosystem credit markets are slim. It can be difficult to define additionality when the public purse is already supposed to be providing funding for sustainable forest management. It is also generally understood that allowing public entities to sell such credits when the forest is to be well managed through the expenditure of public funds will create a moral hazard program. If the DNF could market carbon credits, legislators might continue to underfund ecosystem maintenance leading to a vicious cycle whereby the forest would become wholly dependent on such markets for funding. This would run counter to the legislated purpose of the national forest estate.

The DNF is exploring options in voluntary markets. As discussed in Section 5 it is clear that, regardless of legislative intent, forest maintenance activities are underfunded. As a consequence, forest health is suboptimal, leading to increased risk of fire with subsequent loss of carbon and a large number of ecosystem goods and services currently provided by the forest. It is therefore clear that voluntary donations, payments or other contributions that are expended on improving forest health will have a demonstrated benefit in terms of improving on-site ecosystem services and global climate regulation. At the same time it is worth noting that the prognosis from Section 5 suggests that efforts to develop payments for watershed services or water funds based on perceived generalities regarding forest/water/soil interactions would be misguided given the particular site conditions of the DNF.

The Nature Conservancy: Ranchland and Forage Reserves

The Nature Conservancy (TNC) owns private lands throughout the United States and manages its lands using different land management types in accordance with their mission to protect biodiversity. Although they do not directly engage in market development, they partner with other organizations and landowners to provide ecosystem service benefits. They accomplish this through research, experimental land management, and developing projects through local/state/federal grant and cost share programs and private membership.

As an example, TNC owns and manages a “forage preserve” with nearly 14,000 acres of land in Central Oregon between the Ochoco and Maury mountains. The landscape is high desert shrub steppe with some Ponderosa Pine but mainly Western Juniper and is a migratory corridor for elk, antelope and other wildlife. This preserve includes nearly 10,000 acres of public lands grazing allotments. Conservancy staff works with the Bureau of Land Management and the U.S. Forest Service to provide a “forage reserve” for private landowners.

By providing a forage reserve, the TNC allows ranchers and public land agencies to fallow USFS and BLM leased land and engaged in restoration and conservation by providing alternative, adjacent grazing land. This service supports sustainable land management by alternating land grazing, making it affordable for private landowners who could not otherwise move their cattle to a different grazing allotment. TNC offers this service at no additional cost to the landowner and as an incentive for the USFS or BLM to apply restoration practices on their lands.

OSU Extension Service: Ranchland, Juniper and Sage Grouse

The Oregon State University (OSU) Extension Service provides research-based knowledge and education to strengthen communities and economies. As part of this goal, the tri-county (Crook, Deschutes, and Jefferson) OSU Extension Service reaches out to agricultural producers and assists with a variety of programs including farming, forestry, wildfire resources, horticulture, forage, livestock and range management. Ecosystem Service projects are an integral part of OSU Extension Programs. Typical programs that Extension Agents assist with are the Natural Resource Conservation Service's and Farm Service Agency's EQIP, WHIP, CREP and CRP program and Oregon Watershed Enhancement Board's grant program.

As described by an OSU Extension agent, there is a new focus for Central Oregon and other regions throughout the US, which is the prioritization of the Sage Grouse under the WHIP program. This change increases money for projects focused on Sage Grouse but decreases funding for other programs. This focus will specifically help landowners with the treatment of Western Juniper for watershed restoration, wildfire risk reduction and habitat restoration. There is however, a flat rate for treatment that varies considerably depending on the type of land in question. For example, a landowner may have Western Juniper on a hillside with limited road access. The cost of treating this acreage, versus a flat parcel of land, is considerably more expensive. As part of the requirement for the WHIP program, Western Juniper trees cannot be taller than four feet. Because Western Juniper trees have very expansive branch systems, when the trees are felled the branches have to be 'limbed' in order for the subsequent vertical height to be less than four feet. This increases the cost per acre to upwards of \$200/acre. A difficulty of Western Juniper treatment under WHIP is that prescribed burn treatment is prohibited because it will disturb Sage Grouse habitat. This restricts the overall ability to provide continuous and long-term care to the land and thus requires increased treatment over a span of time. In the case of the NRCS programs, a five-year contract may not be a long enough period of time for Western Juniper treatment.

Another option for funding is the Oregon Watershed Enhancement Board (OWEB) small grant program or large grant program. An example project is the 2006 Crook County-Beaver Creek-South Fork Crooked River Weed Management project. Funds approved by OWEB were \$33,400 of a total project cost of \$352,000. This project involved a multi-year effort to treat seven weed species on 1,300 acres on property owned by 19 different parties within the Upper Crooked River Watershed. Project partners include the Crooked River Weed Management Area (the applicant), landowners, the Oregon State Weed Board, the U.S. Forest Service, the Crook County Soil and Water Conservation District, the Bureau of Land Management, the Crooked River Watershed Council and Crook County Weed Control. The project included sponsorship of two educational workshops on noxious weeds annually. The advantage of this program was that multiple landowners coordinated with local agencies to create a contiguous land management area using multiple resources. The disadvantage of this program is that cost share incentive programs and management plans may conflict with the goals of individual landowners.

A suggested idea for an alternative funding program is to form a fund, through the County or a public agency, to funnel monies from developers (resorts or commercial/residential development) to local natural resource enhancement projects. As an example, if a destination resort is located in Crook County, the County would be responsible for collecting a sum of money from the developer to mitigate for development. This money would be allocated to various projects based on an application process.

Another possibility may emerge if the sage grouse is eventually listed under the Endangered Species Act. This would open up the option of developing species conservation banks. These are sites that are protected as habitat for the species of concern. Funds for long-term management are endowed by the landowner and credits are then issued by the appropriate federal agency. These credits can then be sold as mitigation credits to developers who wish to undertake new projects that may affect the species of

concern. It currently appears that US Fish and Wildlife Service is not ready to list the sage grouse. In absence of a regulated market – but also in anticipation of one – it may be possible to develop a voluntary habitat offset program for the sage grouse, borrowing from existing federal rules to ensure that any banks so constituted could enter an eventual regulatory market.

Deschutes River Conservancy: Farmlands and Instream Habitat Restoration

The mission of the Deschutes River Conservancy (DRC) is to improve water quality and water quantity in the Deschutes Basin. The DRC is heavily invested in working with irrigators and irrigation districts in Central Oregon to acquire senior water rights to dedicate to instream use. In so doing the DRC has used public and private funds from the many sources explained in Section 6.2 to provide needed flow at various junctures and in various stream reaches.

The DRC was created in 1996 through an act of Congress. Created as a public non-profit corporation with a diverse board operating on a consensus basis, the DRC began receiving federal appropriations in 1998. These funds were used to run a challenge grant program for a large variety of projects that might meet the organization's mission. Early projects included riparian habitat restoration and re-engineering projects, irrigation district piping projects, and a variety of other projects including no-till farming, solar stockwater ponds, etc. Over time, other public grant sources were pursued for specific purposes. Oregon Watershed Enhancement Board state funds and federal funds re-granted by the National Fish and Wildlife Foundation were obtained to launch explicit water acquisition and marketing activities in 2002-2003. Similarly, an agreement with the Climate Trust allowed the DRC to match its appropriated funds for water quality with the Climate Trusts carbon offset funds into a riparian reforestation program. Other potential ventures including grass banking and wetland mitigation banks were explored and dropped as being of little potential. Smaller grants from local community-driven family foundations and regional philanthropic foundations were also sought and obtained to support these initial endeavors.

In 2003 the DRC became a qualified local entity under the Columbia Basin Water Transactions Program (CBWTP). Funds from Bonneville Power Administration are run through the CBWTP as a means of generating credit for BPA under the Biological Opinion for salmon in the Columbia Basin. The program is effectively an off-site mitigation program whereby funds generated by sale of main stem Columbia hydropower goes to fund increases in salmon and resident fisheries habitat in tributaries to the Columbia River. The DRC has used the CBWTP funds to support transaction costs and acquire water through leasing, transfer, exchange and conserved water. From 2003 through 2009 the DRC received \$4.4 million in programmatic and transaction funds from CBWTP, which it used to invest in transactions worth almost \$10 million. During this period the DRC also worked with other partners to develop additional large funding sources for instream flow restoration in Central Oregon, including:

- working with OWEB to fund large conservation projects and develop a Strategic Investment Program with basin partners;
- obtaining funds for projects from the Pelton Round Butte Water Fund;
- partnering with irrigation districts on challenge grant opportunities with the Bureau of Reclamation under the Water2025 and (now) Water Smart programs for water banking, water planning, and large water conservation projects; and
- partnering with irrigation districts on EQIP financing for on-farm water conservation projects.

In 2003 the DRC sought and was awarded a state charter to run a groundwater mitigation bank as part of the new Deschutes Groundwater Mitigation Program. The bank charter allowed the DRC to begin generating groundwater mitigation credits from instream water leases. These credits were then sold to new applicants for groundwater permits under the Program, which is effectively a regulatory market which links new groundwater permits to the retirement of existing surface water rights. Later in 2006 the DRC signed a water banking agreement with Swalley and Central Oregon Irrigation Districts. The bank

supplies permanent transfers and mitigation credits to the cities of Bend and Redmond, Avion Water and the Columbia Water Transactions Program. The permanent mitigation credits are also used to move customers of the DRC groundwater mitigation bank off of temporary credits and on to permanent credits, thereby retiring their obligation from the DRC bank. The Groundwater Mitigation Program has provided a steady source of financing for instream leases and transfers over the years. Perhaps most importantly the drive to use permanent transfers to generate permanent mitigation credits – as needed by the major water suppliers in the basin – helped to motivate the development of the DWA bank and permanent instream transfers of water rights.

In recent years the DRC has spent considerable time and effort developing a complementary set of voluntary funding sources. These consist of fairly traditional non-profit fundraising activities and a number of innovative financing schemes. In 2005 the DRC obtained program related investment funds from the Meyer Trust. These funds represented a no interest loan payable in two years. The funds were used to finance a number of conservation projects where buyer funds were not available until the final order on the allocation of conserved water. Upon receipt of buyer funds, the Meyer fund accounts were replenished and the funds revolved into new projects

In another novel effort, the DRC worked with Avion Water Company to develop the Blue Water Program. This program is a voluntary surcharge program on water bills. Avion (and now Swalley Irrigation District customers) are provided with marketing materials that specify a range of voluntary monthly additions to their water bill – much as with green power. Avion collects the funds and transfers them to the DRC under an agreement, which specifies that the DRC must use the funds to support its instream water leasing program. More recently, the DRC worked with Bonneville Environmental Foundation to be one of the first suppliers of Water Restoration Certificates (WRCs). The WRCs are certified water restoration credits placed on an ecosystem service registry and available to corporate and other buyers looking to reduce their water and environmental footprint. The DRC has long struggled to find a way to finance its annual water leasing efforts and the WRCs may prove to be a potential long-term, sustainable source of funds for the program.

In another initiative, a motivated DRC Board member established a river restoration fund at an exclusive development overlooking the Deschutes River. The North Rim Deschutes River Fund is funded through a 2% charge on lot sales in the development. Funds are allocated through a challenge grant process and the DRC obtained a large grant in 2006 for a large conservation project that would restore flows in the river below Bend. These flows pass below the North Rim development. This is an example of voluntary contractual arrangement in which the buyer of an ecosystem service, in this case the flow and instream habitat, directly pays for the provision of these services.

In sum, the DRC has engaged in a wide range of incentive mechanisms for water management, ranging from public subsidy to regulated markets and voluntary markets. In many ways each of these innovations have developed from the need to find funds to cover transaction costs and to acquire water as interest and capacity at the DRC has developed, and as it has developed new programs with its partners.

Natural Resource Conservation Service (NRCS): Farmland and Riparian

The goal of the Natural Resource Conservation Services' natural resources conservation programs is to help people reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. Public benefits include enhanced natural resources that help sustain agricultural productivity and environmental quality while supporting continued economic development, recreation, and scenic beauty.

Table 10. NRCS Conservation Programs by Land Management Type

	EQIP	AMA	WHIP	CSP	CRP	CBWI	WRP	AWEP	GRP*	HFRP
Water	X	X	X	X	X					
Wind	X		X	X						
Soil	X	X		X	X			X		
Farmland	X					X				
Grassland	X		X	X	X		X		X	
Wildlife	X		X	X			X		X	X
Forest	X		X	X						X
Air/Energy/Climate	X	X		X					X	X

*Managed by Farm Service Agency (FSA)

NRCS provides support for various programs (see Section 3.2) which receive funding through the 2008 Farm Bill. NRCS provides technical and financial support to producers and non-industrial private forest landowners to help implement their programs. New to the 2008 Farm Bill, and relevant to Central Oregon, are the Agricultural Water Enhancement Program (AWEP) the Cooperatives Conservation Partnership Initiative (CCPI), and the Environmental Quality Incentives Program (EQIP), Air Quality Initiative and funding set-aside for socially disadvantaged farmers and ranchers. All of the NRCS programs offer annual conservation payments or payments for long-term contracts and conservation easements. Table 10 shows the funding program by land management type.

Beyond financial benefits, the NRCS provides technical assistance through on-site assessments, site specific land management plans and engineering designs. A portion of the programs provide higher payments to historically underserved groups including limited resource, beginning and socially disadvantaged farmers/ranchers.

As beneficial as these programs are, they have their limitations. Funding is based on the Farm Bill which is subject to reauthorization and change every several years. Each state implements the NRCS programs, but the availability and priorities may vary. This can limit the accessibility for producers to these programs as well as the types of projects can be developed. For example, in fiscal year 2010, the Healthy Forests Reserve Program is only available in Lane, Coos, Douglas, Josephine, Curry and Jackson counties in Oregon. As another example, Basin Team Leaders and local work groups set regional priorities for particular programs. If a landowner applies for project funds but is unaware of the set priorities, the application can be rejected. Without transparent and accessible definition of these priorities, landowners are at a disadvantage. Project proposals that are eligible for funding are ranked by local leaders. The funds for these projects are obligated until the money runs out, which can be a discreet time period.

An identified limitation by both NRCS and local landowners is the matching of agency goals with landowner management objectives. The goal of NRCS is to provide technical planning by meeting the goals of the program whereas landowner needs may extend beyond these goals or may not meet the criteria. For example, NRCS is focused on resource conservation but not necessarily best management practices. If a landowner wants to improve irrigation practices, the objective may be to change out wheel lines for another type of irrigation equipment; however, NRCS is more concerned with the conservation of water, not upgrading of equipment.

Case Studies

The following case studies examine the role of specific incentive mechanisms and finance in conducting ecosystem restoration from the perspective of the landowner and agency. While ecosystem service credit

development and other innovative market-based approaches hold theoretical promise as an economic opportunity for rural landowners, there is often little empirical information on whether these projects are financially beneficial to landowners. Proponents hold that the projects are economically attractive but that institutional or policy barriers have impeded their development. Skeptics argue that the dearth of projects confirms marginal finances in these markets. The case studies examine the challenges and opportunities faced by landowners that are interested in participating in the provision of ecosystem services.

Markets for Western Juniper

The expansion of Western Juniper onto Central and Eastern Oregon ranchlands since settlement has caused concern among local communities. Juniper is well known for its prodigious consumption of water, sending tap roots deep below the surface and then, once water is found, putting energy and water into above-ground fiber growth. With an increase in the proliferation of Western Juniper, landowners may seek alternative market development opportunities rather than lumber production. However, it is important to be mindful that even on acreage where large size class trees are most plentiful, saw log quality material is only a small fraction of the total volume of juniper.

Market Development

The most promising economic markets for Western Juniper in the region are dimensional lumber, biomass heat and firewood. If and when businesses consider entering these markets, they need to take into consideration the end product and the availability, access, volume and type of wood.

Most suppliers in the region are cutting and harvesting by hand which limits the volume of material that can be supplied to sawmills; however some suppliers have considered increasing their production capabilities by purchasing or renting portable sawmills. To decrease the barrier to entry into this market and be cost effective, suppliers could work cooperatively, and if possible, purchase a portable saw mill together.

As a first step in entering this market, suppliers need to consult with wholesalers to determine the type of end product, dimensions and class size. The primary lumber companies accepting and marketing Western Juniper materials in the region are West Coast Juniper (Chiloquin) and In the Sticks (Dayville) with the most commonly produced products being decking, wall paneling, posts, flooring, landscape timbers, fencing and other dimensional lumber. The key challenges for local suppliers entering this market are providing enough volume on a consistent basis, high harvest and transportation costs and the type of processing (i.e. saw mill, kiln, type of saw, etc.).

Building the local market for Western Juniper fiber as a heating fuel will require shifting homes, large buildings, and industrial sites that currently use fossil fuels or electricity for thermal energy to wood-fueled stoves, furnaces, and boilers. Once demand for wood heating fuel and firewood has been established, contractors and other suppliers can equip themselves with firewood processors, chippers, and other equipment as needed. USDA Rural Development REAP, Oregon Business Energy Tax Credit, and State Energy Loan Program can assist with these equipment purchases.

As a means of recouping some of the costs of developing a business and extracting lumber from land treatment methods, suppliers could utilize the following grants and incentives: Rural Business Enterprise Grant (RBEG), Oregon Watershed Enhancement Board grant, NRCS Environmental Quality Incentives Program (EQIP) or Wildlife Habitat Incentives Program (WHIP).

Treatment Options

The restoration of Western Juniper woodland sites requires patience, time, and resources. Treatment methods and costs vary considerably and have specific advantages and disadvantages. When determining treatment options, especially cut and harvest, it is important to consider the project objectives as well as the topography, ecological conditions of the site, size of the area being treated, cost and resources, and social acceptability. The approximated costs are based on Oregon State University Extension Service research and pilot projects in Central Oregon focused on commercialization of forest products: Cut and leave (\$100-\$150/acre), lop and scatter (\$250-\$300/acre), cut and harvest (\$300-\$600, with some of the cost recouped through utilization), and prescribed burn (\$25-\$45).

Resources and Incentives

Many resources and incentives are available for organizations and individual landowners interested in land treatment, bio-energy and utilization enterprises, tax credits and state and federal loans. Land treatment payments focus on natural resource conservation, education, outreach, hazardous fuels reduction, enhanced forest health, and habitat and watershed restoration. These grants are provided through private and non-profit businesses, state, federal and local agencies and are offered to various types of organizations. The bio-energy and utilization opportunities focus on using renewable materials to generate electricity, feasibility studies, research, education, outreach, restoration, economic development and market development; the majority of this funding is through the U.S. Department of Agriculture. Lastly, the tax credits and loan program are focused on biofuels/biomass production and collectors and business energy and are provided through the state and federal government. Incentives programs can help to offset the cost of treatment and/or extraction and can also reduce the capital costs to invest in utilization equipment.

Incentives for Sustainable Ranching

Ranch A is located East of Prineville with a total of 12,000 acres. The ranch has eighty acres of crop and grazing land (grass, hay, alfalfa and triticale), and 2,000 acres of timber, farmland, rangeland and forested timberland. The remainder is non-irrigated, non-productive land. The ranch has 200 head of cattle (leased), 3 bands of feral horses, 500 head of elk (seasonally), and recreational elk and bird hunting. The current ranch managers are working with the landowner to develop a variety of projects using certification, incentives and grant programs.

For the ranch manager, participation in these the ecosystem service incentives programs was a ‘no-brainer’; however, it took a lot of dedication, time and determination. The three main financial incentive programs for this particular ranch were the Forest Stewardship Council certification, the Conservation Enhancement Reserve Program (CREP), and the Environmental Quality Incentives Program (EQIP). To date, the manager has not received any direct payments because of the lag in timing of these projects and application process. An explanation of the incentives program, the opportunities and the barriers are described from the landowner’s perspective.

Forest Stewardship Council (FSC) certification

The Forest Stewardship Council (FSC) certification (through the Northwest Natural Resource Group) for Western Juniper will provide a premium price for harvesting and selling to FSC certified distributors. The FSC certification is a market-based, voluntary system for ensuring that wood products come from well managed forests. Similar to organic certification for farmers and food processors, FSC provides consumers a way to support sustainable practices with their purchasing decisions. However, in order for a

FSC certified product to be marketed to a consumer, the product needs to be handled and distributed by FSC certified businesses. This is accomplished by a 'Chain of Custody' audit to ensure that certified and non-certified materials are kept separate and that FSC claims are legitimate. In order for the producer to claim the FSC certification benefit, the log must be tracked from the woods, through the manufacturing process and onto the retail shelf.

The FSC certification process has been streamlined for conifers and hardwoods but not for Western Juniper. Ranch A is one of the first woodlot owners in the Pacific Northwest to use this certification as a compensation method for harvesting Western Juniper. Because the ranch manager is one of the first to certify Western Juniper, the process is not simple. The ranch has provided the necessary documentation and fees to be certified, but actual certification has not yet been received, which means that the wood cannot be processed. As with other land management practices, an employee of the Northwest Natural Resource Group (NNRG) is assisting with a land management plan, which is different than other coniferous woodlots, to help keep track of the market practices and make sure that they meet all of the principles and criteria to be FSC certified. Another barrier is the cost of becoming certified. This cost can be very high for a small woodlot owner, especially considering that the market may not recognize the benefit of having FSC certified Western Juniper.

Conservation Reserve Enhancement Program

The Conservation Reserve Enhancement Program (CREP) is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water. Ranch A has enrolled five miles of a creek in the CREP program with the goal of excluding livestock from the riparian zone. This project will provide a better management tool for distributing cows throughout the land. Currently, one side of the stream is fenced and the other has a steep upland grade. The goal is to fence both sides of the stream, which will help to re-direct the cows uphill and out of the water. In lieu of not having access to the creek, the managers will provide a trough and solar pump system.

Environmental Quality Incentives Program

Ranch A would like to apply for the EQIP program to target Sage Grouse habitat and Western Juniper removal. In order to qualify for these programs, an eligibility form needs to be filled out and includes the principles listed in Figure 9. The highlighted sections may seem straight forward but for all intents and purposes, they are stumbling blocks. In order to be eligible a landowner has to provide records of income and taxes. The landowner also has to prove control of the land and be the applicant. However, if you are a manager with an absentee landowner this may prove to be difficult. The maximum period that you can have an EQIP contract is a six year period. This is for the term of the contract, but if the Farm Bill changes and the monies are not available the contract becomes obsolete. Moreover, there are priorities that are identified at

Figure 9. EQIP ELIGIBILITY PRINCIPLES

- **Proof that the land is working forest land or that at least \$1,000 of annual farm income**
- The applicant is interested in the operation associated with the land offered for enrollment.
- The applicant has **control of the land for the term of the proposed contract.** Applicants will be asked to show documentation (deed, lease or other evidence of land ownership/control).
- The applicant is in compliance with the provisions for protecting the interests of tenants and sharecroppers.
- The applicant is in compliance with the highly erodible land and wetland conservation compliance provisions.
- The applicant is within appropriate program payment limitations. The overall payment limitation for EQIP is \$300,000 over a **six-year period.**
- The applicant is in **compliance with Adjusted Gross Income (AGI) requirements**

the state level for EQIP funds. If your project does not fit into these priorities, it is likely that your application will be rejected. These priorities are not posted on the website; therefore, unless the manager is aware of these program objectives and has contacted NRCS, a producer would not know that an application would not be successful without meeting the state priorities.

The EQIP process, as identified by the ranch manager, has the following steps and associated difficulties:

1. Program Information – Where do you find information for the programs and who do you contact? How does a landowner know to ask what the priorities are for the region if that information isn't automatically provided?
2. Eligibility – This process may take some time including providing financial and tax information from the landowner, background check (including providing your social security number), and current land management practices.
3. Application Process – This process takes time and understanding of the current program and can take months to fill out, submit, and hear back. By the time that applicant is informed, a ranch manager or owner's financial stability or project objectives may have changed.
4. Payment – Money will be paid to the landowner contingent on the availability of funds.

Ranch A – Costs, Risks and Benefits

The benefits derived from these programs for Ranch A are plentiful. With a large amount of acreage and innovative ideas, the ranch manager is able to assess the overall goal and scope of projects while incorporating different management practices. This is an advantage as specific acreage can be set aside for productive use and other acreage for conservation efforts. In general, the costs and risks are mainly financial but also include forgone time spent on the scope, assessment, and implementation. Capital, opportunity and transaction costs vary depending on the structure of the project and type of incentive mechanism.

FSC Certification

The FSC certification process is financially more risky than the voluntary cost share programs offered by NRCS. In order to be FSC certified, a third party has to assess forest management practices keeping in mind the principles, criteria and regional U.S. standards. Certifiers evaluate the land management practices of the producer and the chain-of-custody tracking for mills, manufacturers and distributors for the landowner. This ensures that the standards for management includes environmental, social and economic issues, and traces the wood from the forest to the retailer. Because FSC certification has been typically catered to conifer and hardwood stands, FSC certification of Western Juniper has been a struggle.

FSC certification of Western Juniper is a new concept and therefore has significant costs and risks along with potential benefits. The indirect costs for the FSC certification include changes in land use practices, record keeping and time, while direct costs include capital, transaction and opportunity costs. Even though Ranch A was given a discount on the upfront costs of the certification, the programs are expensive and are tailored to more lucrative conifer and hardwood stands. These costs are often barriers to entry for landowners with less than a certain amount of acreage (even for conifer and hardwood stands).

The return on investment for this certification is not yet known and is dependent on the available markets. Transportation and extraction costs also make this program less viable as Western Juniper removal is difficult and markets are far away. As stated in Section 8.1, cut and harvest costs can vary from \$300-\$600 per acre, largely depending on the landscape and transportation costs (not including \$25-\$45/acre

for prescribed burn). The opportunity costs for timber stand management are low considering that there is no financial or other benefit to leaving stands intact.

The benefits of FSC certification are valuable if the market proves to be viable and can include increased timber prices, better environmentally managed forests, increased access to markets, and educational opportunities for Central and Eastern Oregon. If certification increases market development and decreased transportation costs due to an aggregation of materials, many land managers in Central and Eastern Oregon would benefit.

NRCS

The NRCS was formed out of the Soil and Conservation Service in 1935 as an effort to make soil and water conservation a focus of agricultural policy. From this point on, NRCS has provided price support and disaster payments, loans, and grants. The funding for these programs comes out of the Farm Bill – a statute that regulates farm production and prices. In 2010 the focus of NRCS programs include the soil erosion reduction, water supplies enhancement, water quality improvement, wildlife habitat expansion, and reduction of damages caused by floods and other natural disasters. The voluntary cost share programs provide subsidies for landowners to maintain or change management practices in coordination with NRCS principles and goals.

The benefits derived from these programs are ample and have been for a number of years. The subsidies increase farm income and support better land management practices. Capital costs are generally low as most producers do not need any equipment or materials. If they do, they costs are covered by the programs. The transaction and opportunity costs, however, can be high. The time it takes to find program information, determine eligibility, fill out applications and receive payments can take many months. Financial stability and projects change in a short period of time on ranches and farms and may affect the implementation or inclusion in these programs. A ranch manager may have already taken steps to accomplish the goals or no longer has the resources to engage in the project.

Two other concerns with these programs are the longevity and ownership. NRCS incentives are based on the current Farm Bill. If the Farm Bill changes, program structures and priorities may also change. A majority of the ranches in Central Oregon are managed by personnel rather than the owner. A ranch manager has limited ability to invest and apply for these incentives without the deed or lease. Once a manager can become qualified for these programs, the return on investment is good. Because these are cost share programs the amount of payment is a set price with consistent payments.

In general market incentives are limited but can provide much needed cash flow for agricultural producers. Compared to the Willamette Basin, the Deschutes Basin is limited in the number of incentive mechanisms and does not have any true payments for ecosystem services (PES). This is partially due to a large amount of public lands but also the expansive nature of agricultural lands. Producers make the most of the incentives that are available, but do so with several risks and costs. This is inevitable in any program, but could be mitigated with changes in policies and regulatory structures and a greater push for conservation and preservation of farmland in general.

Disincentives for Instream Flow and Habitat Restoration: Property Taxes

In the last few years the DRC has sought to finance a slate of large main canal piping projects with its irrigation district partners. These districts have raised substantial capital, largely through recovery funds allocated by Reclamation but assisted by funds DRC has obtained from the various sources previously mentioned. These projects, aided by the current reduction of in-migration and growth rates, have become a focus for the DRC efforts over the last three to four years. As these projects are completed and as

growth and development resume, the DRC is likely to focus more on financing issues associated with water banking and the resulting leases and transfers. These projects pose two types of financing problems. First is the conventional problem of financing mitigation credit generation in advance of credit sale. Second is the financing problem that the DRC faces with respect to landowners who wish to engage in aquatic ecosystems restoration but who face disincentives due to current state policies and rules with respect to property taxes. Recourse to the private sector through banks, loans and even private equity are all options that may serve to alleviate the DRC's finance shortage. As indicated above, the DRC is adept at navigating financial channels and negotiating with potential funders. What, however, of the landowner who is interested in participating in the DRC's efforts to lease and transfer water to support instream habitat and aquatic species? The boundaries of the problem and potential solutions are explored below.

Oregon is widely touted for its landmark land use planning statutes and its long commitment to containing urban growth and preserving open space and farmland. One financial instrument used to accomplish state land use goals is differential pricing for property taxes. Essentially, there are a series of special deferments that allow certain landowners to pay a much lower property tax rate. In the case of land zoned for Exclusive Farm Use, the Farm Special Assessment applies. The net effect of this property tax deferment is much lower taxes than if the property were not under the deferment. In Deschutes County for example, farm and forest properties pay less than 3% of the total tax bill despite making up the bulk of the land use. Commercial, industrial and residential properties pay about 80% of the tax bill, with recreational properties, utilities and others making up the difference.

In order to maintain the deferment under ORS 308A.056, the landowner must engage in agricultural production "for the primary purpose of obtaining a profit in money." In the Willamette, for example, irrigation assists in agricultural production but is not essential. By contrast, in Central Oregon irrigation is essential to agricultural production including pasture. The removal of irrigation would appear to signal the lack of intent to generate a gross profit. For this reason, removing irrigation water would seem to put the deferment at risk, even if technically speaking a few cattle put on the ground early in the season might pass as evidence of intent to profit from farm use.

An example is useful. In 2005-2006 a farmer in Deschutes County with 330 acres of farm ground and a recently built 3,000 square foot home had a total real market value for the property of \$1.2 million. Due to the deferment, the taxable assessed value for the property was \$172,000 with \$2,369 of assessed property tax. In the summer of 2006, due to a dispute with a neighbor, the fact that the farmer had leased the water rights to the DRC was brought to the attention of the County Assessor. The farmer was threatened with loss of the deferment if farming was not reinstated. Maintaining the deferment required breaking the instream lease, reseeding the pasture, applying the water, and moving cattle onto the property. This was the financial sensible course of action: when moved off deferment, a property is subject to ten years of back taxes at the higher rate. In this case, the farmer reported that he would be subject to a bill from the assessor for around \$50,000. Given that the DRC normally pays about \$23/acre for leased water, the financial disincentive to lease is clear.

This example illustrates the need to ensure that before incentives for ecosystem services provision are provided, it is useful to understand what financial disincentives may exist. To date this issue has not proven of major concern. County assessors do not seem to generally spend a lot of time trying to find water right lessors. Indeed, in Central Oregon there are many properties that probably have the deferment but are not actively farming for income, and not just because they are leasing their water rights. In addition, in the early years of the water banking programs, much of the water acquired for permanent transfer was water that had been displaced by urban development.

However, with the recession, the DWA Water Bank is quickly moving through the backlog of unwanted water, and future demand for water transfers for restoration and groundwater mitigation purposes will

come across this issue. Both the landowner and the DRC are put in a difficult position if a water purchase and transfer off the property will impose a large tax obligation on the landowner. Further, the presence or absence of water rights on the property is not directly related to whether or not the property will be subdivided or remain as open space (to the extent that much of the hobby farm landscape of Central Oregon can be considered open space). Thus, it seems inconsistent that in order to preserve one environmental amenity – open space – the provision of ecosystem services in aquatic ecosystem services should be subject to an explicit tax that discourages restoration activity.

One solution is to put the property under wildlife deferral. However, this program is managed by ODFW and is subject to fairly strict requirements and ODFW staff prefer that this program be applied only to properties making clear investments in wildlife habitat, such as with WHIP programs. The need for monitoring and management of the program is underfunded, and thus ODFW has limited capacity or interest in seeing this program applied to a large number of properties. Two other alternatives exist. One, much discussed in 2006, was simply to expand the exemption for the Farm Special Assessment, which provides for deferment while the landowner is entered in a farm program to include the State's Instream Leasing Program. This, however, would not resolve the issue for water transfers, which is likely to be the main issue. One option would be to expand the set of deferments to have an explicit Open Space Special Assessment. Indeed, if the goal is in fact open space and not just farms, then such a change would be quite appropriate. A number of other western states have such programs; and in these states, the disincentive to enter into transactions for instream flow is not present.

3.4 Conclusions

This part of the report took the concept of ecosystem services, narrowed its focus and then applied it to environmental management in Central Oregon. The emphasis was on understanding the set of current incentive mechanisms that apply to these services and on investigating how their further deployment and development was or was not limited by the availability of financing. In the process of undertaking this work the potential for applying a scoping level assessment tool such as the World Resource Institute's Dependence and Impact Assessment Tool to highlight the risks and opportunities provided by ecosystem services was demonstrated.

With regard to ecosystem services the report found, not surprisingly, that ecosystem management in the dry, interior Columbia Basin is likely to involve a different set of ecosystem services than in the wetter, temperate coastal region of the Pacific Northwest. For example, analysis of public forestland finds that the primary ecosystem service of concern is the reduction of natural hazards, particularly forest fire. The risk of these hazards is not to ecosystem services, per se, but rather to the consumptive use of these lands for timber and non-timber forest products, as well as the non-consumptive use for recreation, tourism, and other amenity values. Thus, the ecosystem benefits of primary concern are largely ecosystem goods that are allocated and priced by the Forest Service. Their value can be calculated relatively easily. However, ecosystem services in this case are not "supporting" these benefits in an input-output or production approach. Rather, the health of the ecosystem or lack thereof poses a definite but hard to calculate risk to the continuation of these benefits. In this manner ecosystem health can be considered as "regulating" ecosystem benefits. While increased investment in maintaining ecosystem integrity and forest health appears necessary, the problem may be that such investment simply enables current benefit levels to continue rather than increasing. In a sense such investment does however secure these benefits by reducing the threat that hazards such as fire represent to the full set of benefits in a particular area.

In the case of irrigated farmland, the provision of food and other goods of obvious market value depends largely on the provision of water to the land. This provision actually leads to the ecosystem "disservice" of dewatering creeks, streams and rivers with subsequent negative consequences for the ability of these inland freshwater systems to sustain fish and wildlife populations. As distinct from efforts to manage

water quality in wetter climes by altering land management practices, it is not always clear that this is a matter of water use practices as much as it is a question of land use. In the Deschutes example, efforts to reduce water use through conservation of agricultural water have led to the restoration of flow to area streams and support to ecosystem services. However, at some point these gains will be increasingly costly and it may simply be less expensive to retire irrigation rights. In other areas of the arid, interior Columbia where water loss may not be as much of a factor or where water is cascaded through a series of uses down to the bottom of a basin, conservation may not yield measurable water for instream flow and thus efforts to restore ecosystem services in streams and rivers will be at odds with irrigated farming.

In the wetter ecosystems of Western Oregon and Washington, farmlands are often touted for their provision of ecosystem services, however, in the interior Columbia Basin the contrast becomes starker and the need to be clear about what constitutes ecosystem services becomes more readily apparent. The analysis here suggests that using by a narrow definition of ecosystem services, irrigated farmland in Central Oregon actually provides far fewer ecosystem services than land restored to its natural state. In this case using an expansive definition of ecosystem services just creates confusion. Conflating goods like crops produced by humans with a range of human-made inputs, with ecosystem provision of instream habitat and fish and wildlife, all under the rubric of ecosystem services, obscures the fundamental trade-offs and choices that society must make in managing land, water and ecosystems.

With regard to the ecosystem marketplace, it is clear that there is no shortage of incentive mechanisms that come into play in Central Oregon as landowners seek to manage land, water and energy on their properties. Many of the federal programs for land management are of course similar to those in the rest of the state (and indeed the country). However, considerable innovation across a large range of marketplace mechanisms appears in efforts by the state and local non-profits to fund sustainable ecosystem management efforts in the region. Many of these efforts borrow from mechanisms developed elsewhere but adapt these to the ecosystem services and incentive problems found in Central Oregon.

It is also typically assumed that ecosystem service credit markets are less developed in Central Oregon than in the Willamette Valley. However, in part this may just be semantics. In the Willamette, much effort has gone into developing water quality “trading” – in effect regulatory programs that allow water quality obligations to be offset by ecosystem management. However, to date only a single regulated buyer, Clean Water Services, has entered into such a “trade.” Meanwhile, in the Deschutes Basin a regulated market for instream habitat has been created through the State’s Deschutes Groundwater Mitigation Program. A large number of private entities and municipal water purveyors have purchased mitigation credits from a number of suppliers under this program since it was launched in 2003. Each of these purchases has restored flow below Bend and Lake Billy Chinook, in addition to offsetting groundwater depletion below Lake Billy Chinook on the lower Deschutes River. Again, the semantics here is that somehow trading in water quality is construed as an ecosystem market, while trading in units of flow that represent instream habitat for fish has somehow been considered a matter of water or resource markets. In point of fact, both programs are designed to allow resource users and polluters to use the resource or pollute, but at the same time to fund transactions that aim to offset this use/pollution with corresponding investments in providing ecosystem services.

To the groundwater program’s advantage the currency for trade—water rights—were already in existence. This, of course, does not necessarily mean that the market was easy to develop. It does mean, however, that development of this regulated market required a different type of effort from that required to develop a water quality trading program in the Willamette, for example. One possibility then is that if ecosystem management in the interior Columbia Basin is a matter of trading (and retiring) resource use rights that are in turn linked to removing causes of ecosystem service degradation, then this may pose a different set of challenges to establishing new permits for environmental quality – such as water quality permits in the Willamette.

Again, the motivating factor in the development of the incentive mechanism is the set of ecosystem services that need to be internalized in order to provide value to society. With a different set of services it is not surprising that efforts in Central Oregon have produced programs that look different than those in the Willamette. However, the marketplace mechanisms that are deployed can be reduced to a recognizable set of tools that fit within the framework put forward in this paper.

With regard to marketplace development and financing, Central Oregon's status as a mature marketplace can be sustained by the degree to which different entities have defined objectives and possibilities and are currently searching for funds to realize these projects. For example, the innovation in finding new sources of financing for instream flow restoration project at the Deschutes River Conservancy suggest that potential projects are not in short supply but that funding is the limiting factor. Indeed, with regard to the Groundwater Mitigation Program the long start up phase of that program can be attributed to a lack of easy financing for the generation of permanent mitigation projects. In this case, the provision of credits was left to the "market". Some have insisted that had the state intervened to assist in financing early projects the program might have gotten off to a much easier start. By comparison, the federal programs that provide clear financing terms, including cost-share reimbursement for up-front costs, signing incentives and then rental payments each year seem to have little trouble attracting potential participants. In this regard, the Central Oregon case suggests that having the public sector take a more active role in financing emerging markets might be a proactive strategy for launching such markets.

3.5 References

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Appendices

A. Definitional Issues

The Economic Benefits of Ecosystems

The term “ecosystem services” suffers from a lack of precision and a number of competing definitions (Boyd and Banzhaf 2007). This is not new in the field of conservation, much the same has occurred with the term “biodiversity” as briefly summarized below. Likewise the use of the term “market” or “marketplace” at least when it is applied in conjunction with “ecosystem services” or “biodiversity” in public discourse may have a variety of meanings to different groups of people. Ultimately, however, to be useful, policy research must not only appeal to policy-makers – but be useful for those who carry out policy instructions on the ground. In the field of environmental policy, so-called “buzz-words” often bounce back and forth between academia and policy think tanks, but often fail to touch base with those that implement conservation projects and design and implement payment and market approaches. Maintaining some consistency in the meaning and use of key words between academia, policy-makers and implementing agencies is a tall order. The next two sections try to convey some of the ways that these words have been interpreted in different venues, identify the substantive differences, and suggest a working definition of ecosystem benefits and ecosystem services, as well as “ecosystem service markets” and the “ecosystem marketplace” so that the paper can clearly apply these in the context of a specific place, Central Oregon, which has its own set of ecosystems and ongoing conservation programs.

Ecosystem Services: the Crux of the Issue

The term ecosystem simply refers to any set of biological organism that have a coherent set of interactions with other organisms and the physical world around them, otherwise known as ecological relationships. These relationships produce a dizzying of organisms, populations, species and, ultimately, ecosystems (at many scales). Fish, timber and recreation are relatively well known products provided by ecosystems that humans use and enjoy. These particular products are tangible enough that people and groups in society can lay claim to them, harvest them, and market them to other people. The management of these products and their originating ecosystems is not always conducted well or smoothly, however the tools for managing these ecosystem products, or natural resources, are relatively well established and have been incorporated in to policy, law and regulations for most of human history.

The basic insight involved in coining the term “ecosystem services” was an effort to draw attention to the value to humans (and therefore the economy) of ecological functions rather than the products of such function per se. Many of these ecological functions only indirectly enter into human welfare and are typically neither well-understood nor well-integrated into decisions and policy regarding the fate of ecosystems. For example, even though fish may have a clear human use and market value, functions that support their life cycle may not be well-recognized or taken account of in their management. The ecological function of a tributary stream in providing spawning and rearing habitat for salmonids that are later harvested at sea or on their return migration may not be well understood. When the flow in the stream is diverted, the stream is dammed or channelized, or the riparian are is denuded of vegetation to allow grazing or farming, then the spawning and rearing functions are lost. As a consequence the salmonid population declines, and, at some distance to the tributary, indigenous, commercial and sport fishers experience reduced availability of fish, higher fishing effort, and lower harvest levels. This examples demonstrates why understanding the cause and effect involved in natural systems and the economic contribution that the indirect support and protection provided by natural ecosystems for economic activity and property may prove to be a very powerful argument in conserving these systems (Aylward and Barbier 1992).

Competing Notions of Ecosystem Services

Over time competing notions of what the term “ecosystem services” refers to have emerged. These can largely be segregated in terms of whether “ecosystem services” is viewed as the full set of benefits provided by ecosystems, or whether these services are construed as a subset of the full benefits that corresponds more to specific functions that are of particular economic significance but do not enter directly into human production or consumption – and therefore are not valued explicitly through markets. Daily (1997) provides an example of the latter, more circumscribed set of services, by specifying a list of functions that have economic value (i.e. ecosystem services) including:

- purification of air and water
- mitigation of floods and droughts
- detoxification and decomposition of wastes
- generation and renewal of soil and soil fertility
- pollination of crops and natural vegetation
- control of the vast majority of potential agricultural pests
- dispersal of seeds and translocation of nutrients
- maintenance of biodiversity, from which humanity has derived key elements of its agricultural, medicinal, and industrial enterprises
- protection from the sun’s harmful ultraviolet rays
- partial stabilization of climate
- moderation of temperature extremes and the force of winds and waves
- support of diverse human cultures
- providing aesthetic beauty and intellectual stimulation that lift the human spirit

This approach is distinct from that taken by the Millennium Ecosystem Assessment (MA). From 2001 to 2005, the MA assessed the consequences of ecosystem change for human well being, based on the participation of 1,360 experts worldwide. Ecosystem services are defined by the Millennium Assessment (MA) as the benefits provided by ecosystems, and grouped into four categories (Millennium Ecosystem Assessment 2005):

- provisioning services such as food, water, timber, fiber and genetic resources
- regulating services such as climate, water, erosion and natural hazard regulation
- cultural services such as recreation, aesthetic enjoyment and spiritual fulfillment
- supporting services such as soil formation, pollination and nutrient cycling

As noted by a team of ecologists and economists gathered by the National Academy of Science (NAS) the MA’s approach is derived from one put forward by de Groot (2002), which is based on a systematic typology of ecological function (and not ecosystem values).

The NAS in turn puts forward a framework in which the structure and function of ecosystems produce ecosystem goods and services, which in turn can be classed in terms of their economic values (see Figure A1). The MA

Figure A1. Economic Values of Ecosystems

- consumptive use values derived from harvesting or extracting a resource, like water harvesting
- non-consumptive and direct use values like recreation
- non-consumptive and indirect use values like habitat support
- non-use values like existence, species preservation and biodiversity

Note: non-use values are those resulting from knowing that something exists, regardless of whether or not it is used.

Source: National Research Council (2004:241)

and NAS approaches are effectively similar in that they consider the full suite of economic benefits associated with ecosystems (Boyd and Banzhaf 2007). The exception is that the NAS is more explicit that they are really talking about “goods and services” and not just “services”.

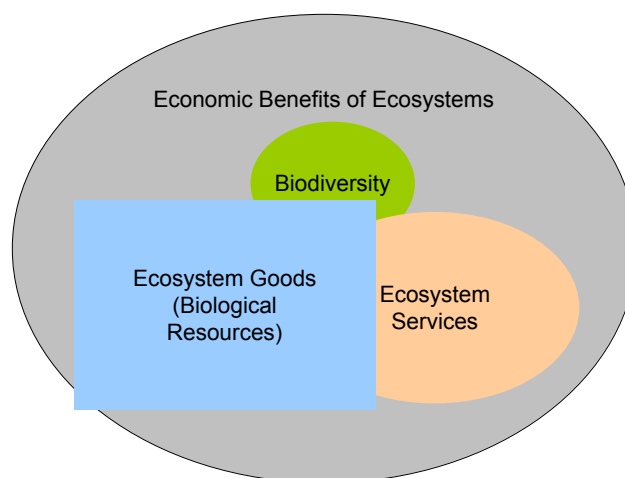
These two approaches to ecosystem services are not at odds they are simply pursuing different objectives. In the first case there is direct and focused intent on identifying ecosystem services as a “new” aspect of ecosystems that needs to be accounted for and integrated into policy and practice. In the second case, that of the MA, a more holistic approach is taken: one that includes these new ecosystem services along with all the other ecological functions and products previously recognized. Looking at the MA’s definition it is clear that most of Daily’s ecosystem services fit with in the supporting and regulating categories. Conversely, many of the provisioning and cultural services are the traditional domain of “natural resources” and natural resource management and reflect the direct use values of ecosystems. The MA’s definition is therefore simply a more expansive definition.

Ecosystems and Biodiversity: Putting it all Together

For the purpose of the project of which this paper is a part, the term ecosystem services is used to refer to those non-consumptive and indirect use values that are part and parcel of the total economic value of ecosystems, but not equal to all the benefits (in other words adopting the Daily approach). For this reason, the phrase “ecosystem goods and services” is used to refer to the totality of the ecosystem services as identified under the MA framework. The relationship between the two is shown in the Venn Diagram in Figure A2. Note that the portrayal of ecosystem goods and ecosystem services in the figure is not to scale. Indeed the scale is really not known. However, if ecosystem goods are taken as roughly the same as the biological component of natural resources then it is clear that in terms of economic value at least some portion of the value of ecosystem services is realized by society through the direct interaction with the resource (the timber, fish, livestock, etc). For this reason the ecosystem goods portion of the diagram is shown as sitting on top of the ecosystem services portion of the diagram. It is also worth noting that there are other natural resources like water and mineral resources that are not produced exclusively by ecosystems and therefore lie outside the diagram.

One of the main advantages of adopting the more restrictive definition of ecosystem services is that it avoids the potential trap – experienced by the MA – of confusing the fact that many of the provisioning services or goods we consume are in fact joint products of ecosystem services and conventional (human) goods and services (Boyd and Banzhaf 2007). More to the point, it enables attention to focus on how the value of these services that currently goes unnoticed and unincorporated in decision-making can be addressed through incentive or market-based mechanisms. If the portion of ecosystem services (in the diagram) that does not directly overlap with ecosystem goods is in fact quite large, this could prove an important force for conservation. This seems to have significant potential, particularly where the location of the ecological function that plays a regulatory or

Figure A2. Ecosystem Benefits and Ecosystem Services



supporting role occurs at a distance from the site where the resulting ecosystem good is withdrawn, collected or harvested.

Finally, a fundamental confusion over ecosystem services arises from the omission of the term biodiversity from the MA's ecosystem services definition. This is odd given that the MA was very much designed to do for biodiversity what the Intergovernmental Panel on Climate Change (IPCC) did for climate change: bring it into the public light. Following the MA, a number of views on this conundrum prevail (Aylward et al. 2009). This paper takes the view that biodiversity as an attribute of a given biological system, and not the flow or stock of such a system (Aylward and Barbier 1992). Such diversity may then occur at different scales. But biodiversity and ecosystem goods and services are construed as distinct concepts. So, in economic terms a highly biodiverse ecosystem – such as a tropic forest or a coral reef - may be valued by people purely for the continued existence of its attribute of species richness (i.e. a non-use or existence value), but this would be separate from and in addition to the use values of the forest for timber or tourism. However, ecosystem goods may also themselves be influenced by the level of diversity, such as when the diversity of coral species improves fish production. Likewise the support in the form of erosion control that the forest offers to the coral reef would be an additional ecosystem service provided by the forest. In these case the values of biodiversity, ecosystem service and ecosystem goods are all distinct concepts but are interrelated, as shown in Figure A2. If properly identified and accounted for in economic terms these values can be integrated into land use decision-making and might affect the choice to use the forest for timber, tourism or conversion to agriculture.

In conclusion, as shown in Figure A2, this paper considers the full set of ecosystem benefits to be the whole of the value of ecosystem goods and services, and biodiversity. However, the paper also seeks to follow the intuition that the concept of ecosystem services is valuable for ecosystem management, if applied narrowly. As suggested by Figure A2, accounting for each set of values independently and adding the values together may overstate the ecosystem benefits. Summing up sets of benefits that overlap can lead to the problem of “double-counting” (Aylward and Barbier 1992). Thus, a clear and consistent conceptualization of ecosystems and the contribution of their component parts to the economy are therefore essential in valuation efforts and remains a primary obstacle to accurate accounting given the inherent difficulty of this task.

B. The Ecosystem “Marketplace”

In this section the challenges and opportunities of using markets to manage ecosystems is explained and the set of incentive mechanisms available to confront these challenges is briefly elaborated. The term “marketplace” is adopted to reflect the full diversity of mechanisms that can be used to provide improved incentives for managing ecosystems sustainably.

Ecosystems, Public Goods and Market Failure

Traditional ecosystem goods (natural resources such as timber, fish and water) are not always exchanged in perfectly functioning markets, but generally they are treated as private goods that enter directly into human preferences. They therefore differ from indirect use values and existence values that arise from ecological function and biodiversity that are rarely marketed and are often considered as public goods. Although ecosystem goods are often bought and sold in markets, they do pose management and financing challenges. For example, fugitive resources like fish or wildlife are classic cases of common pool resources that require collective action in order to be well managed. A long history of responses and solutions to these challenges exists, effectively solving the problem of exclusion and enabling these goods to be traded in regulated markets.

This is not the case for ecosystem services and biodiversity. These have public good characteristics and, historically, have been provided directly by the public sector. Biodiversity set-asides in parks and reserves is one solution. Arguably the late rise of ecosystem services as a focus of conservation concern relates to their relative obscurity and hitherto the lack of explicit efforts to conserve and manage these services. Creation of a marketplace or credit markets (as discussed below) clearly poses new challenges in implementation. Whether or not the same incentive mechanisms and financing solutions applied to ecosystem goods, biodiversity and other types of goods and services in the economy will apply to ecosystem services is, therefore, one of the questions that needs to be asked and answered in developing such markets.

The public goods problem and market failure are underlying economic driving forces determining the availability of ecosystem services. In the absence of collective action to redress this issue, the market will not provide ecosystem services in a manner consistent with their true utility to society. As ecosystem services are one of the benefits provided by ecosystems, these ecosystems are undervalued by society. As a consequence, ecosystems are not managed for their natural attributes and are altered (or converted) to meet profitable and short-term human uses. Thus, the objective of efforts to develop alternative incentive mechanisms for providing ecosystem services is to conserve, manage and restore ecosystems (referred to jointly as ecosystem management from here on).

Due to the limited definition of ecosystem services employed here, and the presence of ecosystem goods and biodiversity as other benefits provided by ecosystems, there is now the potential to weigh all three types of benefits in determining optimal ecosystem management. That is, different levels of conservation, management and restoration of a given ecosystem may lead to tradeoffs in terms of the costs and benefits associated with ecosystem goods, ecosystem services and biodiversity.

For example, it may be possible (and desirable) to maximize ecosystem service provision through active management without restoring biodiversity. For instance, if a principal economic function of wetlands in a given geographic area is processing of nutrients and providing water quality, this may well be achieved by engineering a biological system that is equal to or lower in diversity than a “natural” wetland. Similarly, if provision of ecosystem services is particularly valuable in an area then it may be necessary to reduce the level of ecosystem goods that are harvested. So, if carbon is of great value, then optimal

ecosystem management may reduce the volume of timber harvested (or extend the rotation) in favor of sequestering carbon. Part of the benefit of creating markets for ecosystem services is, of course, to enable decisions that optimize across the different ecosystem benefit categories. However, it is important to recognize that even if ecosystem services can be pulled into the market system in this fashion, biodiversity will often still be left undervalued. This argues for paying due attention to the interrelationship between ecosystem services and biodiversity. Ideally, efforts to manage ecosystem services would be similarly beneficial for biodiversity. However, at least partly due to the conceptual confusion over biodiversity and ecosystem services (as referred to in the previous sub-section of this paper) the truth or falsity of this statement is not well established.

Fixing Market Failure: Incentive Mechanisms and the Ecosystem Marketplace

The application of market principles to ecosystem management, while an attractive proposition, suffers from a number of difficulties. Perhaps the first issue is the design of regulatory and voluntary mechanisms necessary to overcome the public goods problem and induce individuals, groups or society to invest in ecosystem management (Freeman and Kolstad 2007). There is a substantial amount of literature on this topic, so this paper does not dwell on it; rather it begins with the premise that this essential step can be achieved. In other words, market demand exists or consumer willingness to pay can be created through regulatory or voluntary programs; programs that seek to protect undervalued public goods such as ecosystem services and biodiversity.

Many terms are in use to convey this application of market principles and approaches to create incentives for ecosystem management, including “payments,” “markets” and “marketplace”. For the purposes of this paper, the difference between an ecosystem marketplace and a multi-credit ecosystem service market is defined as follows (Institute for Natural Resources 2008):

- **an ecosystem marketplace in broad terms is the suite of economic incentive mechanisms that can be employed to improve incentives for ecosystem conservation and restoration**
- ecosystem service markets, or more specifically multi-credit ecosystem service markets refers to a more limited set of regulatory and non-regulatory efforts to develop trading systems for credits that represent different ecosystem services

In terms of standard economic terminology, ecosystem service markets are an example of regulated markets, also called “cap and trade” systems (see Table A1, below). However, as shown in the table there is a wide range of incentive mechanisms available to alter behavior and maintain ecosystem services and protect biodiversity. The classic tool is simply that of collective action whereby government, on behalf of the people, takes ownership of the natural assets (such as parks and forests) and manages them on behalf of the public. Alternatively government can simply allocate money and invest directly in producing environmental benefit, even if it does not own the natural asset that is improved. In place of providing funding, government can also set standards that firms in the private sector must meet.

Such regulatory action is often called command and control by economists to reflect the rather inflexible nature of standard setting as a tool for achieving environmental benefit. Market-based incentives are a further set of tools, ones in which the government affects the costs and benefits of different production activities, but in a more subtle manner than with regulatory controls. Subsidies that promote clean production, sustainable agriculture and environmental protection are examples of well-established programs in many countries. In a developing country context these are often called payment for ecosystem services (PES), although when provided through large government programs and funded from the public purse they are in effect just a way to subsidize behavior that produces ecosystem benefits.

Similarly, taxes, fees and charges can also be employed by government to align behavior with the public good in these matters – in this case by raising the cost of unsustainable practices.

Table A1. Incentive Mechanisms

Category	Sub-Category	Generic Example
Public Ownership	Public Operation	National Forests
	Private Operation	Recreation Concessions
Public Investment	Appropriations	Pollution Control
Regulations (Command & Control)	Technology Standards	Fishing Gear Specifications
	Performance Standards	Emission Limits, Bans
Market-based Instruments	Taxes and Charges	Water Tariffs
		Environmental Tax / Payment in Lieu
		Environmental Charge
	Subsidies	Product Subsidies
		Direct Payments
		Tax Credits
		Subsidized Loans
Regulated Markets	Tradable Resource & Pollution Permits / Ecosystem Service Credit Systems	Tradable Pollutant Discharge Permits
		Surface Water Markets
		Groundwater Mitigation Programs
		Conserved Water
Voluntary Actions and Markets	Voluntary Offset Credits	Carbon Offset Credits
	Product Certification	Sustainable Timber Certification
	Contractual Arrangements	Payments for Ecosystem Services
	Philanthropy	Cash Donations to Environmental NGOs

Another way to affect behavior is to create regulated markets in which a cap is placed on pollution (or resource use), permits to pollute (or use the resource) are issued, and permittees are allowed to trade in the permits. Such systems create regulated markets that shift the incentives for pollution and resource use to coincide with the public good. While less well studied, it is also possible for such programs to be developed absent a regulatory cap. These so-called “voluntary” ecosystem service credit markets rely on the commitment of individuals, corporations or government to reduce their impact or limit their environmental footprint. The difference is that instead of merely donating funds to a good cause and taking credit (little “c”), in credit markets the purchaser actually acquires a Credit (big “C”) that certifies that the reduction in impact (or the restoration action) has taken place.

Along with markets, there are a number of other voluntary programs and actions that can help with efforts to restore and protect ecosystems. Product certification is led by the supplier (or seller of ecosystem services) and involves not only improving the environmental (or social) sustainability of production

processes, but the subsequent marketing of this information through certification (or eco-labeling) programs in order to attain a price premium or increased market share. Another option is for the producer and user of ecosystem services to enter into voluntary contractual arrangements in which payments are made by the user to the producer with respect to benefits generated. These are examples of “pure” payment for ecosystem service schemes in that the beneficiary from the services directly compensates the provider of the service (whereas a government direct payment scheme simply represents the public subsidizing general behavior). Finally, there is a wide range of ways that individuals, corporations and other groups can voluntarily contribute to conservation activities, typically through philanthropy or the donation of funds to non-profit organizations that engage in these activities.

As evidenced by the discussion that follows, in a particular locale it can be hard to focus simply on one or the other of these tools as in reality they are often layered in an ad hoc fashion one on top of the other by a host of competing governmental and non-governmental entities. A central issue driving the discussion is whether the existing set of marketplace tools internalizes the full range of ecosystem services and their values into private and public behavior. In other words, are there significant ecosystem services that are not covered by existing incentive mechanisms, and if so, what is the potential for ecosystem service markets and other tools to be applied to better managing and providing these services?