PAYMENT FOR WATERSHED ECOSYSTEM SERVICES:

EXPLAINING LANDOWNER WILLINGNESS TO PARTICIPATE IN WATERSHED CONSERVATION

LESSONS FOR THE DESIGN OF UTILITY-INITIATED WATERSHED PES PROGRAMS

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Abstract

Everyday millions of Americans enjoy clean safe drinking water from public water systems. Yet, human activity and development in sensitive watersheds pose significant threats to drinking water sources. This problem is compounded by the high cost of constructing new drinking water filtration plants. With cost ranging in the tens of millions to billions, municipalities and public utilities are searching for new ways to protect drinking water sources and avoid costly investments in filtration facilities. One alternative, seeks to eliminate the need for expensive water filtration plants by investing in watershed stewardship and conservation programs to protect ecosystems that benefit water quality.

Using survey data collected in 2012, this research examines that factors that influence landowner's "willingness to participate" in a payment of ecosystem services program to protect water quality in the McKenzie River watershed, Oregon. This paper builds on a growing body of research currently taking place in Oregon to investigate how public water districts/utilities and corporations might provide sufficient funding and incentives to pay for ecosystem services. This research provides basic lessons for public water providers and utilities interested in implementing PES programs in the future.

Introduction

Everyday millions of Americans enjoy clean safe drinking water from public water systems.[1] Yet, human activity and development in sensitive watersheds pose significant threats to drinking water sources (The Trust for Public Land 2004). This problem is compounded by the high cost of constructing new drinking water filtration plants. With cost ranging in the tens of millions to billions of dollars, municipalities and public utilities are searching for new ways to protect drinking water sources and minimize costly investments in filtration facilities. One alternative, seeks to eliminate the need for expensive water filtration plants by investing in watershed stewardship and conservation programs to protect ecosystems that provide services that benefit water quality.

Watersheds provide a wealth of ecosystem services that are important to quality of life. Forested watersheds provide clean air, clean water, and habitat for species as well as recreation and aesthetic value. Riparian areas, in particular, provide essential ecosystem services important to maintaining water quality. Riparian forest canopy helps regulate river temperatures while trees with deeper roots provide for erosion control and riverbank stabilization. Most importantly, native vegetation in riparian areas filters out pollutants from non-point sources.

Historically, the services provided by healthy forest and riparian ecosystems have not been not fully recognized in the marketplace. Failure to adequately account for the benefits provided by ecosystems carries with it significant risks of deterioration and potential loss of beneficial services (Goldmark 2012). In the absence of an ecosystem services marketplace, the costs of protecting or restoring ecosystems are externalized.

Economists have developed methods to measure the value of goods and services in the absence of a formal marketplace. One such method, contingent valuation (CV) or "stated-preference method", is a survey-based technique used to estimate respondent's preferences for non-market goods and services such as ecosystem services (Mitchell and Carson 1989). By asking questions such as "how much would you be willing to pay for clean water", economists can derive a value for the ecosystem services that provide clean water. Economists refer to this value as "willingness to pay" (King and Mazzotta 2000). Another important consideration in valuing ecosystem services is the measure of an individual's "willingness to participate" in a program to provide or protect ecosystem services.

The success of a program aimed at protecting watershed ecosystem services will depend, in large part on landowners' "willingness to participate"(WTP). This paper

[1] In the United States, more than 210.7 million people rely on surface water from rivers and streams for drinking water. These people are served by 11,976 public water systems, which rely on surface water to deliver drinking water. (U.S. Environmental Protection Agency (EPA) 2012)

examines non-industrial private landowners' "willingness to participate" in a payment for ecosystem services program in the McKenzie River watershed, Oregon. Using survey data collected in 2012, this paper attempts to explain the factors that influence landowner willingness to participate in riparian forest protection aimed at improving water quality. This paper builds on a growing body of research currently taking place in Oregon to investigate how public water districts/utilities and corporations might provide sufficient funding and incentives to pay for ecosystem services. Findings included in this paper are intended to provide basic lessons to public water providers and utilities interested in implementing PES programs in the future.

Policy Background: Drinking Water Source Protection

In 1974, Congress passed the federal Safe Drinking Water Act (SDWA) to ensure the health and safety of drinking water in the United States. The Safe Drinking Water Act authorizes the Environmental Protection Agency (EPA) to set national health-based standards for drinking water to protect against both man-made and natural-occurring containments. Under the SDWA, the EPA sets drinking water standards and states and localities are tasked with ensuring compliance to those standards.

At the state level, the Oregon Department of Environmental Quality (DEQ) oversees compliance of drinking water standards primarily through water quality monitoring. The DEQ also provides communities resources to improve impaired drinking water sources.

In 1996, the federal Safe Drinking Water Act was amended to include source water protection. Source water protection includes programs that protect drinking water sources as well as funding to mitigate threats to drinking water sources. At the local level, drinking water providers are responsible for compliance to EPA/DEQ water quality standards.

Regulatory vs. Incentive-based Approaches to Watershed Management

Under the federal Safe Drinking Water Act, local drinking water providers are required to monitor drinking water quality and address threats from non-point sources of pollution. To safeguarding drinking water sources, municipalities and public water utilities have two general policy approaches to watershed management: regulatory and incentive-based.

Historically, watershed management has focused on government regulation to achieve desired environmental and ecological outcomes. Regulatory policy typically seeks to minimize and/or prevent future harm through command and control policy directives, usually limiting the actions of one or more parties (Salzman and Thompson Jr. 2010). Government regulations aimed at protecting watersheds have traditionally assumed the form of land use restrictions limiting development through the establishment of riparian buffers, floodplain ordinances and wetland protection. Critics of government regulation often criticize such intervention as being inefficient and conducive to unintended

consequences. Some critics may also argue that such restrictions on private property are in effect a regulatory taking.

While successful in regulating discharges from industrial and municipal point sources, government regulation has had limited success addressing the negative impacts of development and associated nonpoint source pollution (Salzman and Thompson Jr. 2010). Regulatory efforts to limit development and protect water quality often prove contentious as landowners view restrictions on land use as hindering private property rights (The Eugene Register Guard 2012). When regulatory approaches create conflict, non-regulatory incentive-based approaches offer an attractive and potentially more feasible alternative.

Market-based policy provides incentive-based alternatives to government regulation through the application of user fees, taxes, subsidies, incentive programs and trading. Market-based policy is typically viewed as an attractive alternative to regulation because it creates price incentives that produce more economically efficient results and often drives innovation (Salzman and Thompson Jr. 2010). One such market-based policy is a payment for ecosystems services (PES) program.

Payments for Ecosystem Services Programs in Watershed Management

Payments for ecosystem services are a market-based approach that incentivizes landowners to practice good stewardship and/or land conservation. PES programs offer an attractive policy alternative to traditional command and control regulation that prohibits or restricts land use. Rather, market based programs such as payment for ecosystem services programs incentivize conservation and restoration activities that preserve ecosystems that benefit water quality.

Healthy watersheds and riparian forest provide a wealth of ecosystem services that directly benefit water quality. These services include absorbing excess nutrients, reducing soil erosion, filtering pollutants, and controlling the timing of water flows. As such, preserving watersheds and forested riparian buffers are among the most important components of local drinking water source protection (Mercer, Cooley and Hamilton 2011). Payment for ecosystem services programs that incentivize the conservation of forest and riparian ecosystems offer an avenue to achieving source water protection goals. One major limitation to the widespread implementation of PES programs is the undervaluation of ecosystem services in the marketplace.

Ecosystem services are often undervalued as they are rarely assigned a value in the marketplace (Robert Costanza 1997). In issues of protecting drinking water quality, the costs of protecting a watershed and the ecosystem services it provides, are externalized to landowners' whose land provides beneficial ecosystem services (McGrath and Greenwalt 2009). Downstream users who receive clean safe drinking water benefit from landowner stewardship at little or no additional cost. Payments for ecosystem

services programs offer a way to correct this through the creation of a marketplace by which ecosystem services are assigned a monetary value and are thus bought and sold.

Ecosystem services marketplaces remain a relatively new concept and assigning market values to the services provided by an ecosystem remains a difficult task. Ecosystem valuation studies often produce a broad range of values - which tends to vary by geographic location. For example, the value an individual or society places on a given ecosystem service is largely context-driven and is dependent upon other social and economic factors, such as opportunity cost and socio-demographics.

Public Utilities as Drivers of Payment for Ecosystem Services Programs

One of the earliest and perhaps most successful watershed PES programs is the New York City Watershed Program. Deteriorating water quality in the 1990's prompted the EPA to require New York City to take action. Faced with $6 to $8 billion in new filtration plant expenses, the City opted to invest $1 to $2 billion in protection and conservation of lands in the (Catskills Mountains) watershed (Mercer, Cooley and Hamilton 2011). The City used conservation easements, riparian restoration, and outright land purchases to protect close to 35% of the watershed (Stanton, et al. 2010). The success of New York City's Watershed Program illustrates the benefits of watershed conservation on drinking water quality and the substantial cost savings of a payment for ecosystem services approach.

The watershed protection strategy has also been adopted in other cities across the United States. Research collected by the Ecosystem Marketplace (a Forest Trends initiative) shows that several cities have avoided the need to build expensive new filtration plants by investing watershed protection. These cities include "Boston, MA, which invested roughly $121 million from 1985 to 2008; Portland, OR; Portland, ME; Seattle, WA, which invested some $38.7 million from 1992-2008; Syracuse, NY; and Auburn, ME. Santa Fe, NM and Denver, CO are the two latest municipalities utilizing a PES approach to pay for the better management of the forested areas that provide critical source drinking water for some 2.8 million customers in the two cities". (Mercer, Cooley and Hamilton 2011, p. 14)

Case Study: EWEB and the McKenzie River Watershed

Since 1911, the Eugene Water & Electric Board (EWEB) has relied solely on the McKenzie River to provide safe drinking water to Eugene residents. Today, EWEB serves nearly 200,000 drinking water customers in the Eugene area. The high quality of drinking water from the McKenzie River is considered some of the best in the nation. (Eugene Water & Electric Board (EWEB) 2012) (U.S. Geological Survey (USGS) 2013). Yet, the increasing conversion of forest to agriculture and private residential land is negatively impacting water quality in the McKenzie River. Since 1970, the number of residential properties in the watershed has doubled from 1,342 to 2,600 (Community Planning Workshop 2009).

The negative impact of development on water quality poses significant challenges to EWEB as a public drinking water provider. First, the utility has limited regulatory authority over development in the watershed. Because EWEB is not a regulatory agency, the utility must rely on Lane County to enforce riparian and floodplain ordinances. This has been challenging given Lane County's limited resources. The second challenge is financial. As illustrated in the New York Watershed Protection example, watershed protection can greatly decrease downstream management cost. For EWEB, the cost of building a new filtration plant is estimated to be between $60-$130 million (Morgenstern 2013). As illustrated, the costs associated with the construction of new water filtration plants are significantly more expensive than a proactive watershed conservation approach.

Acknowledging the need for watershed conservation, EWEB is developing a Voluntary Incentive Program[2]. The Voluntary Incentive Program is based on a payment for ecosystem services program and is aimed at preserving water quality through the protection of riparian areas along the McKenzie River. In this program landowners would enter into an agreement to protect and/or restore their riparian land in return for payment from those downstream that benefit. The users or "Buyers" of ecosystem services are the utility's drinking water customers and the "Sellers" are landowners with property providing beneficial ecosystem service.

The success of a payment for ecosystem services program will depend largely on landowners' "willingness to participate" in such a program. This paper argues that while there are some lessons that can be applied to other watersheds, the success of a payment for ecosystem services program requires significant understanding of the local community. This can be accomplished by studying landowners' willingness to participate in conservation programs.

[2] EWEB Voluntary Incentive Program webpage: http://www.eweb.org/sourceprotection/vip

Explaining Willingness to Participate in Watershed Conservation

Numerous factors influence a landowner's decision to participate in a conservation program. Review of the literature reveals three basic categories that influence landowner willingness to participate: economic, socio-demographic, and previous conservation experience. Within these categories there are a range of influencing factors. Based on the literature, the typical factors that influence participation include financial incentives, income, land value, tenure, age, political attitudes, environmental perceptions, previous experience with conservation practices, opportunity cost and future expectations, landowner attachment to the land, and the importance of conservation practices that make their property look well-managed. (Yu and Belcher 2011) (Kingsbury and Boggess 1999) (Ryan, Erickson and De Young 2003) (Welle and Hodgson 2008) (Farmer, et al. 2011).

Economic Factors: Income and Opportunity Cost

Income and opportunity cost are two economic factors that influence a landowner's WTP. Basic economic theory holds that income has a positive correlation to WTP (Carson, Flores and Meade 2001). Individuals earning a higher income benefit from lower opportunity cost and may be more likely to participate in a PES program.

Opportunity costs are an important economic factor influencing a landowner's willingness to participate in a PES program (Yu and Belcher 2011) (Kingsbury and Boggess 1999). If the opportunity costs of forgoing an activity are greater than the payments offered in a PES program then a landowner's willingness to participate is likely to be low. Agricultural rents provide a good example of this. If a landowner can earn higher rents per acre than payments offered in a PES program then the landowner is likely less willing to participate.

Future expectations, such as having a designated successor, often influence landowner's willingness to participate. This is particularly so in the suburban rural interface where landowners must decide between the high payoffs of development and the preservation of land (Lynch, Hardie and Parker 2001). When presented contract alternatives of 10, 20, and 30 years – landowners illustrated that they were less willing to participate as the contract horizon extended out into the future. This indicates that landowners place importance on flexibility and is consistent with previous research that found willingness to participate increased with flexibility (Purvis, et al. 1989) (Kingsbury and Boggess 1999).

While economic theory suggests a positive correlation between landowner willingness to participate and the level of payment, payments are rarely the sole driver influencing landowner participation (Yu and Belcher 2011) (Koontz 2001). As the literature points out, financial incentives provide varying degrees of influence on landowner willingness to participate in PES programs. While financial incentives are a significant factor, other factors such as landowner preferences, attitudes towards conservation, previous

experience with conservation programs and socio-demographic characteristics influence willingness to participate.

Socio-Demographics: Age, Education and Political Ideology

Socio-demographic characteristics such as age, education and political ideology influence landowner's willingness to participate in a PES program. Since each watershed is unique, the composition of socio-demographic characteristics will differ by location. When designing a PES program, understanding these characteristics and how they influence willingness to participate will help ensure the program's success.

Age is often cited as one factor that influences a landowner's willingness to participate in conservation programs (Carson, Flores and Meade 2001). In a University of Maryland study, older landowner's were found to be less willing to enter into an agreement to install streamside buffers than younger landowner's. The study found that for each addition year of age the probability of installing a buffer decreased by 4.8 to 6.7 percent (Lynch, Hardie and Parker 2001). As Lynch et al. point out "older landowners may want to sell the property to finance their retirement, want their children to have flexibility, or may think they will not benefit for the full length of the contract"(ibid., p. 19).

Education also influences a landowner's willingness to participate. Educated landowner's are more likely to be informed on environmental issues and thus more likely WTP. According to Lynch et al. "Higher education should decrease the transaction cost of learning about buffers and incentive programs. Therefore, respondents with higher educations are expected to be more willing to install buffers" (Lynch, Hardie and Parker 2001, p. 19).

Academic literature suggests that political ideology also influences WTP. In the last decade, the United States has seen an increased polarization between those who identify as liberal and those who identify as conservative. This divide exists, to some degree, in people's attitudes towards the environment. Research indicates that those who identify as liberal are more likely to support programs to protect the environment than those who identify as conservative (Neumayer 2004) (Curry, Ansolabehere and Herzog 2007) (Dunlap, et al. 2000). As a result, landowners with more liberal ideologies are more likely to participate in conservation programs than those identify as conservative.

Landowner Attitudes and Previous Experience with Conservation

Landowner attitudes and previous experience with conservation influence willingness to participate. Studies suggest that landowner's with previous conservation experience are more likely to participate in a conservation program. This may be the result of an individual landowner's personal attitude towards conservation and/or reflect a landowner's familiarity with established programs. According to Lynch et al. "landowners who have participated in a government program within the past five years,

such as Environmental Quality Improvement Program or Conservation Reserve Program, are expected to be more willing to participate in a buffer installation program" (Lynch, Hardie and Parker 2001, p.15).

In a separate study of landowners' willingness to adopt wetland and riparian conservation management on agriculture land in Canada, Jai Yu and Ken Belcher found that landowners with conservation experience in the last 10 years had a "positive and significant influence" on landowners' conservation adoption decisions. They argued that previous knowledge about wetland and riparian management allowed landowners "to better estimate the true cost of the conservation", and thus make a more informed conservation decision (Yu and Belcher 2011).

Methodology

This study evaluates landowner's in the McKenzie River watershed's willingness to participate in a conservation program to protect riparian ecosystem services. Because ecosystem services are not bought and sold in a formal marketplace, it is difficult to make assumptions regarding landowner willingness to participate. Thus, it becomes necessary to survey landowner's to determine willingness to participate and preferences for conservation programs.

Contingent Valuation: Stated Preferences for Conservation

In 2011, Oregon State University (OSU) and the University of Oregon (UO) received grant funding from the National Institute of Food and Agriculture (NIFA) to assess the feasibility of utility-initiated watershed payment for ecosystem services programs in Oregon. Part of this research was to assess landowner and ratepayer attitudes towards PES programs. To accomplish this, the Institute of Natural Resources (OSU), the Institute for a Sustainable Environment (UO) and the Community Planning Workshop (UO) conducted two surveys in the spring and summer of 2012 using the Dillman Tailored Design Method (Dillman, Smyth and Christian 2009).

The survey *Maintaining Water Quality in the McKenzie River Watershed: A Survey of Property Owners*, asked residents in the McKenzie Basin questions about previous experience with conservation programs, how they value and use the watershed, and their willingness to participate in a voluntary conservation programs. The survey sampled residents in the McKenzie River Watershed whose properties are within one mile of the McKenzie River and its tributaries. The sample size included 663 private non-industrial residents in the McKenzie River Watershed. 66 surveys were returned undeliverable leaving a total of 597 potential survey respondents. Of the 597 potential survey respondents, a total of 272 responses were received at a response rate of 45.5%. Five responses were received from the same address and were not used in the statistical study. Survey respondents consisted of residential, agriculture and forestry landowners. Data from the survey was complied, and a logistic regression analysis was completed to determine the correlations between landowner's willingness to participate and economic, socio-demographic, and attitudinal/previous conservation experience.

Logistic Regression: Evaluating Landowner Willingness to Participate

To determine a landowner's willingness to participate, it is beneficial to explore the correlation between survey respondents' willingness to participate and other influential factors such as economics, socio-demographics, and previous experience with conservation practice and programs. To measure the correlation between willingness to participate and economic, socio-demographic, and previous experience with conservation factors, logistic regression analysis was used to test the significance of these relationships.

Logistic regression analysis applies statistical methods to describe the relationship between dependent and independent variables. A number of different models were fit using logistic regression. To determine *goodness of fit* of the overall statistical models this study examines AIC to compare the relative predictive ability of one model to another. When comparing the AIC values between multiple models, the model with the lowest AIC value is considered best. Models with more independent variables typically have higher AIC values. Max-rescaled R-Square (a logistic derivation of the R^2 model fit statistic) is used to determine the models predictive capacity.

To measure the correlation between dependent and independent variables this study examines the significance of the maximum likelihood estimates for each independent variable. The significance of the correlation between dependent and independent variables is described in a rating system for P-values. P-values of .05 to 1 are considered not significant (ns). P-values showing a significant correlation are labeled somewhat significant (* for .05-.01), significant (** for .01-.001), and highly significant (*** for P-values less than .001). The more significant the correlation, the lower the P-value and the more stars assigned.

For correlations with significant P values, odds ratios (point estimates and 95% Wald confidence limits) were used to determine the increase in the likelihood of a survey respondent being willing to participate in the PES when an additional unit of the independent variable is added.

Dependent Variables: In-Principle Willingness to Accept Payment

Two dependent variables to are used to determine landowner willingness to participate: "in-principle willingness to accept payment" (IPWTP) and "in-principle willingness to accept a contract" (IPContract).

To determine "in-principle willingness to accept payment" survey respondents were asked to indicate, "at what price level they would be willing to participate in a voluntary incentive program" to protect streamside forestland. Prices were listed in dollars per acre and represent annual payment to landowners in increments of $25, $50, $100, $200, and $400. Respondents who indicated definitely yes or probably yes are considered "in-principle willing to participate". For the purpose of this study, those respondents who answered unsure, probably no or definitely no to any price level are considered not "in-principle willing to participate". Of the 267 valid survey responses, 97 respondents (36%) indicated that at some level of annual payment they would be "in-principle willing to participate".

While 36% of total respondents indicated that they would be "in-principle willing to participate", survey responses showed a great degree of uncertainty with roughly 40% of all respondents indicating they were unsure. Consistent with the basic economic theory, as price increased so did interest in program participation. At $25 per acre, only

7% of respondents answered definitely yes or probably yes. While at $400 per acre, the number of respondents answering definitely yes or probably yes jumped up to 36%.

Dependent Variables: In-Principle Willingness to Accept a Contract

To determine "in-principle willingness to accept a contract" (IPContract), survey respondents were asked "assuming adequate financial benefits - would you be willing to enter into: 10-year, 20-year, 30-year or permanent contract". Based on survey responses, interest decreased as contract length increased with 38% answering definitely yes or probably yes to a 10-year contract and only 13% answering definitely yes or probably yes to a 30-year or permanent contract. Respondents also indicated a greater degree of uncertainty with 32% to 37% answering unsure. Respondents indicating a willingness to accept any contract of 10-year, 20-year, 30-year or permanent contract are considered "in-principle willingness to accept a contract". Of the 267 valid survey responses, 104 respondents (39%) indicated "in-principle willingness to accept a contract"

Independent Variables

Three categories of independent variables are used to evaluate landowner willingness to participate: economic, socio-demographic, and experience with conservation.

Economic Factors: Income and Opportunity Cost

To measure the correlation between willingness to participate and economic variables, four models were created using household income, percentage of income from the land, and designated successor. Model A and Model B compare economic variables to IPWTP and Model E and Model F compare economic variables to IPContract. To measure opportunity costs, percentage of income from the land and designated successor are used.

Regression Analysis: In-Principle Willingness to Accept Payment

Model A (see Table 1) takes a holistic approach to evaluating landowner willingness to participate. In this model, "in-principle willingness to accept payment" (WTP) was compared against the entire range of economic, socio-demographic, and previous conservation experience variables. The inclusion of variables from each category gives Model A relatively strong predictive ability with an AIC of 252.869. Model A is also a reliable social predictor with a Max-rescaled R-Squared value of .2358 (24%).

Analysis of Model A reveals several independent variables showing significant correlations to IPWTP. Of the three economic variables included in Model A, designated successor was the only variable showing a significant (negative) correlation to IPWTP. Based on Model A, those who indicate having chosen a designated successor [0.437 (0.225 – 0.848)] are 57% less WTP.

Comparatively, Model B is more limited in scope and measures only the three economic variables against IPWTP. Because of the relatively few dependent variables used, Model B has a low Max-rescaled R-Squared value of .0326 (3%) and is a weak social predictor. However, consistent with Model A, designated successor was the only economic variable showing a somewhat significant (negative) correlation to IPWTP. Based on Model B, those who indicate having designated a successor [0.549 (0.311 – 0.968)] were 45% less WTP.

Consistent with the literature, having designated a successor demonstrates landowner's desire for flexibility as it relates to future expectations and opportunity cost. Of those who responded to the survey, 65% of respondents indicated having a designated successor to take over the management of the property. Based on Model A and Model B, landowners are 45-57% less willing to participate in a conservation program.

Regression Analysis: In-Principle Willingness to Accept a Contract

Model E and Model F (see Table 2) introduce "in-principle willingness to accept a contract" (IPContract) as the dependent variable to test the correlation between respondents who indicated they would be in-principle willing to accept a contract and economic and other independent variables.

Similar to Model A, Model E takes a holistic approach and includes economic, socio-demographic, and previous experience with conservation variables. Economic variables used in Model E did not show a significant correlation to IPContract.

Similar to Model B, Model F controls for economic variables and test household income, percentage of income from the land, and designated successor against IPContract. In this Model, household income is the only variable to show a significant correlation. At a value of (estimate -0.7839)(.0502), the extent at which this correlation is significant is questionable. If we choose to accept the correlation between household income and in-principle willingness to accept a contract as significant, the results of the Odds Ratio Estimates for income [1.237 (1.000 – 1.531)] indicate that for each categorical increase in household income, respondents are 24% more willing to enter into a contract.

The correlation between income and IPContract is illustrates the influence of opportunity cost on a landowner's decision to enter into a contract. Landowners who earn higher incomes tend to have lower opportunity cost associated with entering into a contract. This may be relevant as 34% of household's indicated earning an annual income of $100,000 or more with an additional 40% of households indicated earning between $50,000-$99,000 annually.

In all four models, the percentage of income from the land failed to show a significant correlation to overall willingness to participate. Not surprisingly, a relatively small percentage of surveyed landowners indicated earning a majority of household income from the land. Only 3% of respondents reported receiving 80-100% of their household

income from the land while only 10% of respondents receive 50% or more of their household income from the land.

Socio-Demographics: Age, Education, and Political Attitudes

Socio-demographic characteristics such as age, income, education and political ideology may influence landowner's willingness to participate in a PES program. To measure the correlation between willingness to participate and socio-demographic variables, four models were created. Model A and Model C compare socio-demographic variables to IPWTP, Model E and Model G compares socio-demographic variables to IPContract.

Of the three categories of independent variables (economic, socio-demographic, and conservation experience) identified in this study, the socio-demographic characteristics of age, education, and political attitudes showed the greatest correlation to "in-principle willingness to accept payment" and "in-principle willingness to accept a contract".

Regression Analysis: In-Principle Willingness to Accept Payment

Model A and Model C (see Table 1) measure the correlation between "in-principle willingness to accept payment" and socio-demographic variables. Model A measures WTP by comparing the entire range of economic, socio-demographic, and previous conservation experience variables.

Analysis of Model A reveals several significant correlations to IPWTP. Of the three socio-demographic variables included in Model A, age shows a significant negative correlation to IPWTP and education a significant positive correlation to IPWTP. Evaluating age and education further, Odds Ratio Estimates show that for every increase in one year of age [0.959 (0.931 – 0.988) respondents are 4% less WTP. For education, Odds Ratio Estimates show that for every increase in educational attainment (1.469 [1.143 – 1.890]) respondents are 47% more WTP

Controlling for socio-demographic variables, Model C compares IPWTP to political attitudes, age, and educational attainment. Because Model C uses fewer independent variables, it has slightly less predictive ability (AIC of 281.766) than Model A, yet still can be considered a fair social predictor [Max-rescaled R-Squared value of .1601 (16%)]. In Model C, all three independent variables showed a significant correlation to IPWTP.

Education showed a highly significant correlation to IPWTP. Evaluating the Odds Ratio Estimates for education [1.391 (1.136 – 1.705)] we find that for every increase in educational attainment respondents are 40% more WTP. This is consistent with the Odds Ratio Estimates for education in Model A. Given the significance of this correlation, and the confidence of the Odds Ratio Estimate, education has considerable influence on a landowner's willingness to participate. This may also be important as more than half (51%) of survey respondents indicate having attained at least a four-year degree. Of those respondents, 29% indicated having a graduate or professional degree.

Consistent with Model A, age shows a significant correlation to IPWTP. Of those who responded to the survey[3], more than half (56%) were 65 years of age or older, while only one percent of respondents were in the 25-34 age range. Odds Ratio Estimates for age [.965 (0.941-0.990)] show that for every year an individual grows older they become 3% less likely IPWTP. This is more or less consistent with the Lynch et al. study on landowner willingness to install riparian strips, which found that that landowners were 4.8-6.7% less likely with every year increase in age. These findings are most significant when viewing the difference in respondent's preferences in ten and twenty year increments.

Political attitudes also showed a somewhat significant inverse to IPWTP. Although not as significant as age nor education, political attitudes influence a landowner's willingness to participate. Of those who responded to the survey, close to half (49%) self identified as somewhat to very conservative, compared to only 31% who identified as somewhat or very liberal. An evaluation of Odds Ratio Estimate for political attitudes [.802 (0.648 – 0.992] indicating that the more conservative the respondent the less IPWTP. This indicates that for each increment change from liberal to conservative - a respondent is 20% less WTP. This is consistent with the body of literature pointing to a correlation between political attitudes and environmental attitudes. As hypothesized, those who identify as conservative are less likely to participate in a conservation program.

Regression Analysis: In-Principle Willingness to Accept a Contract

In Model E and Model G (see Table 2), examine the influence of socio-demographic variables (age, education, and political attitudes) on landowner's "in-principle willingness to accept a contract" (IPContract).

Similar to Model A, Model E takes a holistic approach and includes economic, socio-demographic, and previous experience with conservation variables. In model E, political attitudes (estimate -.3598)(.0042) and education (estimate 0.3278)(.0088) showed a significant correlation to IPContract. Further evaluation of Odds Ratio Estimates for political attitudes [0.698 (0.545 – 0.893)] shows that for each incremental change from liberal to conservative - a respondent is 30% less "in-principle willingness to accept a contract"

For education, Odds Ratio Estimates [1.388 (1.086 – 1.773)] indicate that for every increase in educational attainment, landowner's are 39% more willing to accept a contract (IPContract).

Education and political attitudes also show significant correlations to IPContract in Model G. Similar to Model C, Model G controls for economic and previous conservation

[3] The average age of survey respondents was 68 years old; the median age was 66 years.

variables. In Model G, political attitudes (estimate -.3741)(.0006) show a highly significant correlation to IPWTP while education (estimate .3298)(.0013) shows as a significant to highly significant correlation. Further evaluation of political attitudes in Model G [0.688 (0.555 – 0.853)] reveals an almost identical Odds Ratio Estimate as Model E [0.698 (0.545 – 0.893)], reinforcing the findings that for each incremental change from liberal to conservative - a respondent is ±30% less IPContract

For education, when controlling for socio-demographic variables, Odds Ratio Estimates are almost identical for education in IPContract and IPWTP [Model G [1.391 (1.138 – 1.700)] Model C [1.391 (1.136 -1.705)]. Examination of Odds Ratio Estimates for education in Model C, Model E and Model G all reveal that for every increase in educational attainment respondents are ±39% more IPContract and IPWTP.

In contrast to IPWTP, age did not show a significant correlation to a landowner's "in-principle willingness to accept a contract".

Previous Conservation Experience: Programs and Practices

A landowner's willingness to participate in a conservation program may be influenced by their previous experience with conservation. To test this hypothesis, four models were created to assess whether there is a significant correlation between previous conservation experience and future willingness to participate. To determine previous conservation experience – the McKenzie Landowner survey asked several questions related conservation practices and programs. More specifically, survey questions asked respondents to reveal previous experience with conservation easements and/or acquisitions, past participation in certification programs, their likelihood to enroll in a program in the next five years, and their level of interest in participating in a voluntary incentive program.

Based on survey responses, the following independent variables were created: any previous conservation experience, number of conservation practices a landowner has participated in, previous experience with a conservation program, and the number of conservation programs a landowner has participated in.

Model A and Model D compare previous experience with conservation variables to IPWTP, Model E and Model H compares previous experience with conservation variables to IPContract.

Regression Analysis: In-Principle Willingness to Accept Payment

Model A and Model D (see Table 1) measure the correlation between landowner's previous conservation experience and "in-principle willingness to accept payment".

Model A measures landowner willingness to participate by comparing the entire range of economic, socio-demographic, and previous conservation experience variables. Of

the four variables representing previous experience with conservation included in Model A, the number of conservation programs (estimate 1.0555)(.0357) was the only variable showing a somewhat significant correlation to IPWTP. Odds Ratio Estimates for the number of conservation programs [2.873 (1.073 -7.695)] indicates that for each additional conservation program a landowner has participated in, they are 281% more likely to IPWTP.

In Model D, "in-principle willingness to accept payment" (WTP) was compared against respondent's previous experience with conservation programs and practices. Controlling for economic, socio-demographic variables, Model D uses the following independent variables: landowners with any conservation experience, landowners with conservations program experience, and the number of conservation programs a landowner has participated in. Compared to Model A (AIC of 252.869), Model D (AIC of 323.679) uses fewer independent variables and has less predictive ability than Model A.

In Model D, two variables show a significant correlation to "in-principle willingness to accept payment" - landowners with previous conservation program experience and the number of programs that landowners have participated in. Experience with conservation programs (estimate -1.3653)(.0477) shows a somewhat significant correlation to IPWTP. Odds Ratio Estimates for experience with conservation programs [0.255 (0.066 – 0.986)] indicate that landowner's who have participated in a conservation program are 26% more IPWTP.

Similar to Model A, the number of conservation programs (estimate 1.026)(.0092) show a significant correlation to IPWTP. Examining further, Odds Ratio Estimates [2.792 (1.289 – 6.048) indicate that for each additional conservation program a landowner has experience with they are 280% more likely IPWTP. Model D shows that landowners with some previous conservation program experience are more willing to participate than those without.

Regression Analysis: In-Principle Willingness to Accept a Contract

In Model E and Model G (see Table 2), examine the influence of previous experience with conservation on landowner's "in-principle willingness to accept a contract" (IPContract).

Model E compares all economic, socio-demographic, and previous experience with conservation to IPContract. None of the variables in the previous experience with conservation category showed a significant correlation to IPContract.

Similar to Model D, Model H controls for economic and socio-demographic categories of variables and test any experience with conservation, previous experience with a conservation program, and the number of conservation programs a landowner has participated against IPContract. In Model H, both any conservation experience (estimate 1.1297)(.0181) and the number of conservation programs (estimate

.8435)(.0295) show a somewhat significant correlation to IPContract. Evaluating the Odds Ratio Estimate for any conservation experience [2.095 (1.213 -7.897)] indicates that landowner's with previous conservation experience are 210% more IPContract. Of the four models run testing any experience with conservation, Model H is the only model showing a significant correlation.

Model H, shows a correlation between the number of programs and IPContract. Using, Odds Ratio Estimates to evaluating the influence of the number of conservation programs [2.325 (1.088 – 4.968)] on IPContract, we find that for each additional conservation program, landowner's are 233% more IPContract.

Of the previous experience with conservation variables tested in the four models, the number of conservation programs shows significant correlations in three of the four models (both IPWTP models and one IPContract model). While showing a significant correlation to both IPWTP and IPContract, it is important to note that less than ten percent of survey respondents indicated having participated in federal (7%) or state (6%) conservation programs.

In summary, the logistic regression models suggest that economic, socio-demographic, and past experience variables are significant predictors of IPWTP and IPContract (Tables 1 and 2, respectively). The models indicate models that combine all variables provide a better model fit than models that only include a subset (i.e., Model A and Model E have the lowest AIC values and highest R2). Political ideology, age, designated successor, the number of programs a respondent had participated in the past were all consistently significant predictors of both IPWTP and IPContract

Table 1: Multivariate Regression Model Results – In-Principle Willingness to Accept Payment

P value = ns = .05 -1. * = < .05 ** = <.01 *** = < .001	Model A		Model B		Model C		Model D	
	Estimate	Odds Ratio	Estimate	Odds Ratio	Estimate	Odds Ratio	Estimate	Odds Ratio
Political	ns (-.1559)	0.856 (0.672 – 1.090)			* (-.2210)	0.802 (0.648 – 0.992)		
Age	** (-.0417)	0.959 (0.931 – 0.988)			** (-.0356)	0.965 (0.941 – 0.990)		
Education	** (.3849)	1.469 (1.143 – 1.890)			*** (.3303)	1.391 (1.136 – 1.705)		
Income	ns (-.1212)	0.886 (0.673 – 1.167)	ns (.0807)	1.084 (.0876 – 1.341)				
Income from Property	ns (-.0029)	0.997 (0.979 – 1.015)	ns (.0035)	1.004 (0.989 – 1.019)				
Designated Successor	* (-.8281)	0.437 (0.225 – 0.848)	* (-.6003)	0.549 (0.311 – 0.968)				
Any Conservation Experience	ns (.6271)	1.872 (0.590 – 5.939)					ns (.6665)	1.947 (0.828 – 4.583)
Experience with Conservation Programs	ns (-1.409)	0.244 (0.047 – 1.276)					* (-1.3653)	0.255 (0.066 – 0.986)
Number of Conservation Practices	ns (.0738)	1.077 (0.894 – 1.296)						
Number of Conservation Programs	* (1.055)	2.873 (1.073 -7.695)					** (1.0267)	2.792 (1.289 – 6.048)
Observations	200/267 (75%)		216/267 (81%)		226/267 (85%)		248/267 (93%)	
AIC	252.869		292.311		281.766		323.679	
R^2	.2358 (24%)		.0326 (3%)		.1601 (16%)		.0668 (7%)	

Table 2: Multivariate Regression Model Results – In-Principle Willingness to Accept a Contract

P value = ns = .05 -1. * = < .05 ** = <.01 *** = < .001	Model E		Model F		Model G		Model H	
	Estimate	Odds Ratio	Estimate	Odds Ratio	Estimate	Odds Ratio	Estimate	Odds Ratio
Political	** (-.3598)	0.698 (0.545 – 0.893)			*** (-.3741)	0.688 (0.555 – 0.853)		
Age	ns (-.0218)	0.978 (0.951 – 1.007)			ns (-.0229)	0.977 (0.954 – 1.001)		
Education	** (.3278)	1.388 (1.086 – 1.773)			*** (.3298)	1.391 (1.138 – 1.700)		
Income	ns (.0817)	1.085 (0.825 – 1.427)	* (.2127)	1.237 (1.000 – 1.531)				
Income from Property	ns (.0068)	1.007 (0.991 – 1.023)	ns (.0072)	1.007 (0.993 – 1.022)				
Designated Successor	ns (-.3883)	0.678 (0.353 – 1.305)	ns (-.2362)	0.790 (0.450 – 1.387)				
Any Conservation Experience	ns (.7979)	2.221 (0.662 – 7.456)					* (1.129)	2.095 (1.213 – 7.897)
Experience with Conservation Programs	ns (-.0944)	0.910 (0.196 – 4.227)					ns (-.8306)	0.436 (0.119 – 1.601)
Number of Conservation Practices	ns (1049)	1.111 (0.923 -1.336)						
Number of Conservation Programs	ns (.3950)	1.484 (0.612 – 3.603)					* (.8435)	2.325 (1.088 – 4.968)
Observations	203/267 (76%)		219/267 (82%)		229/267 (86%)		251/267 (94%)	
AIC	254.766		299.942		282.248		328.927	
R^2	.2582 (26%)		.0366 (4%)		.1917 (19%)		.0865 (9%)	

Summary of Significant Findings:

Economic Factors: Income and Opportunity Cost

Designated Successor:

- Respondents indicating having chosen a designated successor are 45-57% less IPWTP
- 65% of respondents indicated having a designated successor

Income:

- Minimal significance to WTP
- Positive correlation to IPContract (24%)
- No correlation to IPWTP

Percentage of Income from the Land:

- No significant correlation
- Less than 10% of respondents earn more than 50% of annual income from the land

Socio-Demographic

Education:

- Education was significant or highly significant in all 4 models
- For each level of education, respondents are ±40 more WTP

Political Attitudes:

- Political attitudes was significant in 3 of the 4 models
- Highly significant correlation to IPContract
- The more Conservative the less WTP (20-30% WTP)
- 49% Conservative, 31% Liberal

Age:

- Significant correlation to IPWTP
- No correlation to IPContract
- For every year older respondents are 3-4% less IPWTP

Previous Conservation Experience

Any Conservation Experience:

- Significant correlation to IPContract

Experience with Conservation Programs:

- Significant correlation to IPWTP

Number of Conservation Programs:

- Significant correlation in 3 of the 4 models
- For each conservation program, respondents are:
  - ± 130 more IPContract
  - more than 180% IPWTP

Discussion:

Healthy watersheds provide a wealth of ecosystem services that directly benefit water quality. Through conservation of forested riparian buffers, utilities can greatly reduce the need for expensive new filtration plants. Because each watershed is unique, utilities designing PES programs will benefit from having a firm understanding of the characteristics that influence landowner participation.

For utilities interested in designing a PES program, surveys are an important first step. Surveys help utilities gauge interest in stewardship initiatives and identify population characteristics, which inform the design of the program.

When designing a PES program, it is important that utilities understand the economic and socio-demographic characteristics that influence landowner willingness to participate. As this study highlights, certain characteristics such as political affiliation and education have highly significant correlations to WTP. Utilities will also benefit from identifying landowner's with previous conservation experience. As this study reveals, landowner's with previous conservation experience are considerably more WTP in future conservation programs.

Findings from this study confirm that economic, socio-demographic, and previous experience with conservation do influence landowner willingness to participate in a conservation program. However, not all variables evaluated in this study have equal influence on a landowner's decision to participate.

Regression analysis shows that all socio-demographic variables: age, education, and political attitudes have a significant influence on landowner WTP. In all four models, education showed a significant to highly significant correlation to WTP. Political attitudes also showed significant to highly significant correlation to WTP, particularly in a landowner's willingness to accept a contract. Age, on the other hand, proved significant only in influencing a landowner's willingness to accept payment.

Perhaps the most interesting finding is the influence of previous conservation experience on WTP. In three of the four models, the number of conservation programs a landowner has participated in showed a significant correlation to WTP, particularly, landowner's willingness to accept payment. For utilities interested in designing a PES program, targeting landowner's with previous conservation program experience may increase participation. Landowner's with previous experience with conservation programs indicated that for each additional program they have participated in they have over double the odds of being willing to participate in a future program. Utilities interested in designing PES programs may benefit from identifying and targeting landowners with previous conservation program experience.

Consistent with the literature, the influence of economic variables on WTP was significant, but not the sole driving factor behind landowner willingness to participate (Lynch, Hardie and Parker 2001). Of the three variables: income and designated successor were the only two variables with significant correlations. Designated successor showed a significant correlation to IPWTP, but did not show a correlation to IPContract. Landowner's indicated that they were 45-57% less willing to participate if a successor has been designated. This may reflect landowner's desire for flexibility. This is important for EWEB to consider in designing a PES program for the McKenzie Watershed, because 65% of respondents indicated having designated a successor.

The findings highlighted in this study provide basic lessons for utilities interested in designing a watershed PES program. For utilities interested in designing a PES program, it is important that the program be context driven. Because watersheds are both physically and demographically unique, utilities should use caution when replicating watershed PES programs from other locations. As highlighted in this study, understanding landowner's willingness to participate is important to the success of a PES program.

Considerations for EWEB:

- Education and political attitudes influence landowner willingness to participate
- Opportunity cost and future expectations influence landowner willingness to participate
- Landowners with a designated successor may be difficult to recruit
- Target landowners with previous conservation program experience
- Outreach and education are important for landowners to make informed decisions

Considerations for other utilities:

- Payment for ecosystem services programs are difficult to replicate and need to be tailored to the location and stakeholders
- Surveys are essential to understanding stakeholder perspectives
- Payment for ecosystem services programs need public support
- Education and outreach are necessary to illustrate the value of ecosystem services
- Landowner's and ratepayers need to see value in stewardship

Bibliography

1. Aylward, Bruce, Ray Hartwood, Katrina Van Dis, and Sally Duncan and Amy Ewing Sue Lurie. *Financing mechanisms that advance ecosystem service markets and promote rural sustainability.* Institute for Natural Resources, Corvallis: Oregon State University, 2010.
2. Carson, Richard T., N.E. Flores, and N.F. Meade. "Contingent Valuation: Controversies and Evidence." *Environmental and Resource Economics* 19 (2001): 173-210.
3. Community Planning Workshop. "EWEB Source Water Protection Project: Land Use Analysis." Planning, Public Policy and Management, University of Oregon, Eugene, Oregon, 2009.
4. Community Planning Workshop; Institute for a Sustainable Environment; Institute for Natural Resources. "An Evaluation of Utility Ratepayer and Landowner Perceptions of a Payment for Ecosystem Services Program in the McKenzie River Basin." NIFA grant, University of Oregon, Oregon State University, 2013.
5. Curry, Thomas E, Stephen Ansolabehere, and Howard Herzog. "A Survey of Public Attitudes towards Climate Change and Climate Mitigation Technologies in the United States." *Massachusetts Institute of Technology (MIT), Laboratory for Energy and the Environment*, 2007.
6. Dillman, Don, Jolene Smyth, and Leah Melani Christian. *Internet, Mail and Mixed-Mode Surveys: The Tailored Design Method.* Hoboken, New Jersey: John Wiley and Sons, Inc., 2009.
7. Dunlap, Riley E., Kent D Van Liere, Angela G. Mertig, and Robert Emmet Jones. "Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale." *Journal of Social Issues* 56, no. 3 (2000): 425-442.
8. Earth Economics. "Nature's Value in the McKenzie Watershed: A Rapid Ecosystem Service Valuation." 2012.
9. Eugene Water & Electric Board (EWEB). *EWEB Water Quality.* 2012. http://www.eweb.org/waterquality (accessed 02 2013).
10. Farmer, James R., Doug Knapp, Vicky J. Meretsky, Charles Chancellor, and Burnell C. Fischer. "Motivations Influencing the Adoption of Conservation Easements." *Journal of Conservation Biology*, no. 4 (2011): 827-834.
11. Forest Trends and the Katoomba Group. *Payment for Ecosystem Services Getting Started: A Primer.* Nairobi: Forest Trends, The Katoomba Group, and UNEP, 2008.
12. Goldmark, Peter. *Forest Watershed Ecosystems Services.* Washington State Department of Natural Resources. May 2012. http://www.dnr.wa.gov/publications/frc_watershed_ecosystem_services.pdf (accessed April 2013).
13. Hickson, Patricia. "Public Utility Districts and Payment for Watershed Services; Explaining Water Users' Willingness to Pay." Planning, Public Policy & Management, University of Oregon, Eugene, 2012.
14. King, Dennis M, and Marisa J. Mazzotta. *Ecosystem Valuation.* 2000. http://www.ecosystemvaluation.org/contingent_valuation.htm (accessed 2013).
15. Kingsbury, Leigh, and William Boggess. "An Economic Analysis of Riparian Landowners' Willingness to Participate in Oregon's Conservation Reserve Enhancement Program." *selected paper for the annual meeting of American Agriculture Economics Association.* Corvallis: Oregon State University, 1999.

16. Koontz, Tomas. "Money Talks? But to Whom? Financial Versus Nonmonetary Motivations in Land Use Decisions." *Society & Natural Resources: An International Journal* 14 (2001): 51-65.
17. Lynch, Lori, Ian Hardie, and Doug. Parker. "Analyzing Agricultural Landowners' Willingess to Install Streamside Buffers." Maryland: University of Maryland, January 2001.
18. McGrath, Deborah, and Travis Greenwalt. "Protecting the City's Water: Designing a Payment for Ecosystem Services Program." *Natural Resources & Environment* 24, no. 1 (Summer 2009).
19. Mercer, D. Evan, David Cooley, and Katherine Hamilton. *Taking Stock: Payments for Forest Ecosystem Services in the United States.* Forest Trends, 2011.
20. Mitchell, Robert C., and Richard T. Carson. *Using Surveys to Value Public Goods: The Contingent Valuation Method.* Washington, D.C. : Resources for the Future, 1989.
21. Morgenstern, Karl (EWEB). "Presentation of Source Water Protection Program." Eugene, Oregon, 2013.
22. Neumayer, Eric. "The Environment, Left-Wing Political Orientation and Ecological Economics." *Ecological Economics*, no. 51 (2004): 167-175.
23. Purvis, A, JP Hoehn, V.L. Sorenson, and F.L. Pierce. "Farmers' Response to a Filter Strip Program: Results from a Contingent Valuation Study." *Journal of Soil and Water Conservation* 44, no. 5 (1989): 501-504.
24. Robert Costanza, Ralph d'Arge, Rudolf de Groot, Stephen Farber, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V O'Neill, Jose Paruelo, Robert G Raskin, Paul Sutton, Marjan van den Belt. "The Value of the World's Ecosystem Services and Natural Capital." *Nature* 387 (1997): 253-260.
25. Ryan, Robert L., Donna L. Erickson, and Raymond De Young. "Farmers' Motivations for Adopting Conservation Practices along Riparian Zones in a Mid-Western Agricultural Watershed." *Journal of Environmental Planning and Management*, no. 46 (2003): 19-37.
26. Salzman, James, and Barton H Thompson Jr. *Environmental Law and Policy.* New York, NY: Foundation Press, 2010.
27. Stanton, Tracy, Marta Echavarria, Katherine Hamilton, and Caroline Ott. *State of Watershed Payments: An Emerging Marketplace.* Ecoystem Marketplace, 2010.
28. Terhi Majanen, Rachel Friedman, Jeffrey C. Milder. *Innovations in Market-Bsed Watershed Conservation in the United Sates: Payments for Watershed Serveces for Agricultural and Foreset Landowners.* EcoAgriculture Partners, Washington D.C.: Ecoagriculture Partners, 2011.
29. The Eugene Register Guard. *A River of Discontent - A Decision to Put New Riverside Developmnet Restrictions on a Fast Track Left Landonwers Feeling Sidelined.* Matt Cooper. November 14, 2012. http://projects.registerguard.com/csp/cms/sites/web/news/cityregion/25506961-46/county-board-property-owners-drinking.csp.
30. —. "Overflow Crowd Forces delay of Water Hearing - The Meeting of Two County boards on Proposed Property Regulations will be Held in a Larger Venue." Matt Cooper. October 27, 2010. http://projects.registerguard.com/csp/cms/sites/web/updates/25461733-55/hearing-county-public-board-drinking.csp.
31. The Institute for Natural Resources. *Policy cornerstones and action strategies for an integrated ecosystem in Oregon.* Oregon State University, Corvallis: Oregon State University, 2008.

32. The Trust for Public Land. "Protecting the Source: Land Conservation and the Future of America's Drinking Water." 2004.
33. U.S. Environmental Protection Agency (EPA). "A Review of Statewide Watershed Management Approaches." 2002, 4.
34. —. *Public Drinking Water Systems: Facts and Figures.* April 2012. http://water.epa.gov/infrastructure/drinkingwater/pws/factoids.cfm (accessed April 2013).
35. U.S. Geological Survey (USGS). *McKenzie River, Oregon, Source Water Quality Protection.* Jan. 9, 2013. http://or.water.usgs.gov/proj/EWEB/ (accessed April 17, 2013).
36. United Nations Economic Commission for Europe (UNECE). *Recommendations on Payments for Ecosystem Services in Integrated Water Resources Management.* United Nations, New York and Geneva: United Nations, 2007.
37. Welle, Patrick, and Jim Hodgson. *Property Owners' Willingness to Pay for Restoring Impaired Lakes: A Survey in Two Watersheds of the Upper Mississippi River Basin.* Minnesota Pollution Control Agency, 2008.
38. Yu, Jai, and Ken Belcher. "An Economic Analysis of Landowners' Willingess to Adopt Wetland and Riparian Conservation Management." *Canadian Journal of Agricultural Economics* 59 (2011): 207-222.