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Watershed Management and Private Lands:
Moving Beyond Financial Incentives to Encourage Land Stewardship

by

Matthew Thomas DeAngelo

A thesis submitted in partial fulfillment of the
requirements for the degree of

Master of Science
in
Environmental Science and Management

Thesis Committee:
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Portland State University
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ABSTRACT

Public water utilities are tasked with providing high quality, inexpensive water often sourced from watersheds representing a diverse mix of public and private land ownership. There is increasing recognition amongst water resource managers of the role that private landowners play in determining downstream water quality, but bringing together landowners with a wide variety of land management objectives under the umbrella of watershed stewardship has proven difficult. Recently, a large number of “Payment for Watershed Services” programs have aimed to engage private landowners in watershed stewardship initiatives by offering financial incentives for adopting watershed best management practices. However, a growing field of research suggests that financial incentives alone may be of limited utility to encourage widespread and long-standing behavior change, and instead understanding landowner attitudes and non-financial barriers to stewardship program enrollment has become a focus of research.

This research examines a population of rural landowners representing a diversity of agricultural, forestry, recreational, and investment objectives in the Clackamas River watershed, Oregon. I designed and distributed a mail and web-based survey instrument intended to measure land uses and land ownership objectives, attitudes towards watershed stewardship programs, barriers to enrollment in stewardship programs, and preferred incentives and goals that would promote enrollment. I received 281 valid responses for a response rate of 29%. I conducted two primary analyses: one focused on relating attitudes and barriers to intent to enroll in a watershed stewardship program, and one focused on identifying how diverse landowners differ according to factors influencing enrollment in stewardship programs. I found that landowners did not report financial considerations to

be a primary barrier to enrollment and expressed low interest in receiving financial incentives. Instead, landowners reported that primary barriers related to lack of trust, ecological understanding, and concerns that stewardship program enrollment would be incompatible with their land management objectives. I do not discount the potential utility of financial incentives under certain circumstances, but emphasize the importance of addressing these other considerations before incentives can make a meaningful impact.

I compared how barriers to enrollment were perceived by landowners with different land management objectives relating to production, investment, and conservation. I found that landowner attitudes were differentiated from one another primarily by their use of land for production purposes; however, I found a large amount of diversity between producers and non-producers in the degree to which they considered investment and conservation objectives in their land management, and these two variables added further explanatory power to understanding fine-scale differences in how landowner typologies relate to conservation programs.

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INTRODUCTION

Spurred by the 1996 Safe Drinking Water Act Amendments that required assessment of public drinking water sources, many public water utilities have established source watershed protection programs aimed at addressing upstream land uses to preserve downstream drinking water quality (Bennett et al. 2014). However, a substantial portion of drinking watersheds are in private ownership, and bringing together landowners with a diverse array of land management objectives under the umbrella of watershed stewardship has proven difficult. Private rural land uses may negatively impact water quality through storm water runoff laden with pesticides, excess nutrient loadings from fertilizers, and irrigation runoff that adds salts and other pollutants into water supplies (Halcrow et al. 1982). Land conversion and deforestation may remove bank-stabilizing riparian vegetation, leading to increased soil erosion and suspended sediment in the water column, and the loss of shade in riparian zones may cause thermal pollution by exposing waterways to excess sunlight (Karr & Schlosser 1978). The results can pose serious threats to aquatic life and can substantially increase the cost of treatment for downstream drinking water (Freeman 2008).

Despite the potential negative impacts of private rural land use, water resource managers increasingly recognize that many private landowners can and do act as watershed stewards through careful land management and protection of riparian zones (Ahnstrom 2008, Engel et al. 2008). As a result, a growing number of source watershed protection programs have utilized a “payment for watershed services” (PWS) framework to provide financial incentives to encourage or reward stewardship behaviors (Bennett et al. 2014). Such behaviors may include a variety of watershed-friendly land management practices,

including maintenance or creation of riparian forests, nutrient load offsets, or wildfire mitigation activities (Bennett et al. 2014).

Payment for Watershed Services is not a new idea. For decades, the US Department of Agriculture (USDA) has incentivized the use of riparian buffers through its Conservation Reserve Enhancement Program (CREP), and until 2014 promoted Wetlands Conservation through the Wetlands Reserve Program. Though not specifically focused on watersheds, funds from the Conservation Stewardship Program (CSP), the Conservation Reserve Program (CRP), and the Environmental Quality Incentives Program (EQIP) have all been leveraged to assist landowners in implementation of best watershed management practices (Wood 1999). More recently, PWS programs have been established by water utilities primarily structured around protecting drinking water to remain in compliance with federal regulations and to avoid the construction of expensive treatment plants (Bennett 2014). Lurie et al. (2013) argue that local water utilities can play a particularly effective role in promoting watershed stewardship because of their significant knowledge with the watershed's social and ecological context. Notable examples of municipal PWS programs include the New York City Source Watershed Protection Program (New York), the Eugene Water and Electric Board's Voluntary Incentives Program (Oregon), and the Raleigh Upper Neuse Clean Water Initiative (North Carolina).

Despite the frequent use of incentives to promote stewardship behaviors, many incentive programs have been unable to achieve widespread enrollment and have been critiqued for providing insufficient payments to adequately compensate farmers (Engel 2008). Furthermore, Pirard et al. (2010) noted that incentives may only lead to temporary behavior changes that may revert after payments have ended. While incentive programs

are intended to address financial barriers to land stewardship, they may not fully consider social factors, knowledge, and technological limitations (Ahnstrom 2008). Schneider and Ingram (1990) argue that knowledge of a population's motivations, attitudes, and barriers towards a given action is vital to designing effective programs. While PWS programs address financial barriers, a growing body of research suggests that non-financial factors such as attitude, personal values, sense of place, or social obligation may play a greater and more durable influence on landowner land stewardship decisions.

Research Overview

This research is guided by three primary objectives: (1) to evaluate the efficacy of financial incentives to promote enrollment in stewardship programs, (2) to gain insight into the relationship between attitude and land stewardship, and (3) to offer recommendations regarding how resource managers can effectively engage the landowner populace. Given the large number of water utilities applying a PWS framework, this research is centered around understanding enrollment in non-governmental stewardship programs. I evaluate these questions through two chapters; the first investigates the relationship between intent to enroll in stewardship programs and attitudes relating to financial and non-financial considerations. The second explores how diverse landowners perceive different barriers to enrollment and prefer different methods to engage with stewardship programs. Both of these chapters are geared towards providing policy-makers additional insight into the range of policy tools available to apply given a variety of situations.

The project focused on a specific group of rural landowners in the Clackamas River watershed, Oregon. While findings described in the following chapters provide further evidence regarding the diversity of attitudes and land management objectives represented

by landowners, these findings are intended to be applied primarily to source watershed protection of the Clackamas River watershed. If one conclusion can be readily made from this research, it is that understanding the social intricacies of place is absolutely vital to designing sustainable and equitable land stewardship programs.

Context

The Clackamas River is the center of a 243,000 hectare watershed characterized by a patchwork of agricultural, semi-urban, and forested lands. Eight separate drinking water utilities draw drinking water from the Clackamas River and supply water to over 300,000 customers in Washington and Clackamas counties. While the upper 72% of the watershed is publically owned land primarily in the Mount Hood National Forest, the downstream portion of the watershed is almost entirely in private agricultural, forestry, and residential ownership. As such, the watershed offers a complex system representative of a diverse range of landowners for which to explore these research questions.

In order to maintain water quality amidst increasing development pressure and production intensity, Clackamas County and the relevant water utilities have formed a consortium known as the Clackamas River Water Providers (CRWP) to implement source watershed protection measures (CRWP 2010). The CRWP have noted that the application of agri-chemicals poses a significant threat to drinking water quality; the United States Geologic Survey has identified over 1,200 known contaminants in the watershed (Carpenter 2008), and 17 potentially harmful pesticides have been detected at significant levels throughout the watershed (Schmidt 2012). Additionally, loss of riparian shade and excess thermal loads have been identified as priority issues in the watershed (CRWP 2010) and recently gained media attention due to record water temperatures recorded throughout

the basin (Roth 2015). In their 2010 Drinking Water Protection Plan, the CRWP outlined the need to work with both commercial and small acreage rural landowners in a program to promote watershed stewardship. This study is aimed at informing the creation of such a program by understanding attitudes and barriers to enrollment.

Survey Development and Implementation

The primary data used in this research were collected through a questionnaire-based survey of rural landowners in the Clackamas River watershed. The survey instrument was designed to measure attitudes and beliefs regarding watershed stewardship, to educate respondents on the range of features that watershed stewardship programs could take specific to the Clackamas River watershed, and to identify the diversity of land management objectives represented in the watershed. The survey was developed with assistance from the CRWP and was reviewed by resource managers familiar with the survey sample, including officials representing local water utilities, the Oregon Department of Agriculture, the United States Geological Survey, and the local Soil and Water Conservation District.

The questionnaire was administered via mail and web to a randomly selected group of 1,030 private rural landowners within the Clackamas River watershed. Landowners were considered eligible if their property was (1) outside of the Urban Growth Boundary; (2) at least 2 acres in size; (3) zoned as agricultural, rural, or forestry land; and (4) no more than 100 feet from a stream at the property border (Figure 0.1). Because nursery operations have been noted as a particular concern to water quality in the Clackamas River watershed (Schmidt 2012), any nursery operating within the watershed was considered eligible and was contacted to participate in the survey. To enhance response rate (Dillman 2000),

landowners were contacted four times from August to September, 2015, via the Dillman Tailored Design Method, which included an initial postcard, followed up by a first round of questionnaires, a reminder postcard, and a second wave of questionnaires for non-respondents.

Figure 0.1

The Clackamas River watershed in Oregon's Willamette River Basin. Eligible tax parcels refer to taxlot parcels outside of the urban growth boundary, greater than 2 acres in size, and within 100 feet of a waterbody at the property's edge.

CHAPTER ONE

Necessary but not sufficient: Attitudes as motivators and barriers to enrollment in watershed stewardship programs

In this chapter, I build on past literature by evaluating the relationship between attitudes, perceived barriers, and land management objectives relating to enrollment in watershed stewardship programs. I investigate this question through a survey of private rural residential, agricultural, and forestry landowners in the Clackamas River, OR, and I apply these findings to discuss policy recommendations to encourage watershed stewardship amongst landowners.

1. INTRODUCTION

Schneider and Ingram's well-cited paper "Behavioral Assumptions of Policy Tools" (1990) stresses that policy-makers may utilize a combination of authority, incentive, capacity-building, and symbolic tools dependent on local context. The authors argue that effective use of these tools begins with understanding the relevant population's motivations for and barriers to performing the desired action, and to recognize that behavior is influenced by an individual's longer-term objectives. Accordingly, PWS programs have been critiqued for assuming that landowners are limited only by financial considerations, and monetary incentives are sufficient to promote widespread and long-lasting behavior change (Engel et al. 2008, Pirard et al. 2010). Coupled with relatively low enrollment rates in similar programs like the Conservation Reserve Program (Stubbs 2014), these critiques have prompted a number of researchers to investigate the broader suite of attitudes, barriers, and non-financial objectives related to landowner stewardship behaviors (Ahnstrom 2008).

1.1 Attitudes as Motivators of Stewardship

Attitude refers to an individual's favorable or unfavorable appraisal of a behavior or object in question (Ajzen 1991) and has frequently been used to understand private landowner motivations for stewardship behaviors. Positive attitudes towards conservation have been linked with higher program enrollment rates (Ahnstrom 2008), the adoption of best management practices (Beedell and Rehman 2009, Baumgart-Getz et al. 2012), and increased success per unit of money invested (Coleman et al. 1992).

Many landowner studies have utilized Ajzen's (1991) Theory of Planned Behavior (TPB) as a useful framework for understanding how attitudes relate to the adoption of conservation behaviors (Beedell and Rehman 1999, Corbett 2002, Rosenberg and Margerum 2008, Ahnstrom 2008, Armstrong and Stedman 2012, Baumgart-Getz et al. 2012, Thompson et al. 2014). The TPB suggests that a behavior can be understood by examining three components of attitude: (1) beliefs about the outcome of the behavior, (2) perceived norms regarding the adoption of the behavior, and (3) the perceived behavioral control to complete the behavior (Ajzen 1991). Behavior itself is often measured as intent to perform an action. Though intent does not necessarily correspond directly to observable behavior, it offers a useful proxy when observed behavior data is not available. Measures for perceived behavioral control have had relatively low success at explaining stewardship behavior (e.g. Beedell and Rehman 1999, Corbett 2002), and some have gone so far as to question whether this concept offers a useful distinction from the other components of attitude (Trafimow and Duran 1998). Attitudes regarding behavioral outcomes and social/personal norms, on the other hand, offer more fruitful grounds on which to understand stewardship behaviors.

The landowner literature suggests beliefs regarding a behavior's outcome for both the environment and oneself influence stewardship behavior. Armstrong and Stedman (2008) noted the belief that implementation of riparian buffers would lead to improved watershed outcomes was a key predictor of rural landowner intent to perform that action, and Baumgart-Getz et al. (2012) reviewed a number of studies and noted that more general concepts of environmental attitude and awareness may also help predict behavior. Conversely, Woods et al. (2014) studied a group of producers and noted the importance of believing that watershed stewardship behaviors would provide personal financial benefit, whereas behaviors without a perceived personal benefit were perceived less favorably.

Behavioral alignment with social and moral norms is another important component relating to attitude. The perceived norms of neighbor actions (Fischer and Charnley 2012), the social norm regarding appearance of a property (Chin et al. 2008), and membership in social networks (Reimer and Prokopy 2014) have all been related with landowner stewardship action. Ryan (2009) found that moral norms of stewardship ethic and self-accountability for water quality were closely associated with stewardship activities of non-commercial riparian landowners.

Despite the large number of studies investigating the relationship between attitude and the decision *to adopt* stewardship practices, few look specifically at how landowner attitudes impact the decision *to enroll* in stewardship programs. Baumgart-Getz et al. (2012) analyzed 46 studies relating to farmer adoption of best management practices in the United States, and only two were specifically focused on factors influencing program enrollment. This is a significant gap given that stewardship programs are a necessary medium through which landowner behavior change is encouraged. Of the studies that do

focus on enrollment in stewardship programs, the vast majority are heavily focused on government-sponsored programs (e.g. Esseks and Kraft 1988, Napier et al. 1988, Corbett 2002, Song et al 2014, Reimer and Prokopy 2014). Because government skepticism tends to influence opinions in the United States (Steel et al. 1994), it is necessary to distinguish how attitudes relate to enrollment in the growing number of non-government programs sponsored by drinking water utilities.

1.2 Attitudes as Barriers to Stewardship

While many related studies have been framed around investigating how attitudes motivate stewardship, it appears that attitudes may also act as substantial barriers to enrollment in stewardship programs. Kahnemen and Tversky's (1979) Prospect Theory provides a strong rationale for consideration of barriers in attitudes modeling. Prospect theory suggests that individuals make decisions based on perceived losses or gains relative to their current position, and individuals are more sensitive to losses than they are to gains. This may suggest that negative attitudes regarding the outcomes of stewardship programs more have a more potent impact on intent than positive attitudes. As evidence of the importance of considering attitudes as barriers, landowners have reported support for environmental and water quality goals in a variety of contexts without correlating directly to stewardship behavior (e.g. Carr and Tait 1991, Ryan et al. 2003, Greiner et al. 2009). Evaluation of attitudes as barriers is particularly important given that negative attitudes have been shown to drive up transaction costs beyond the assessed value of the stewardship action in question (Grolleau and McCann 2012).

Practical considerations such as perception of financial limitations, knowledge barriers, and time constraints may partly explain low adoption of stewardship behaviors

(Williams 2002, Woods et al. 2014). However, less tangible attitudes relating to lack of trust in conservation agencies and concerns for loss of private property rights show much more distinct and consistent negative relationship with stewardship behavior in the literature (Greiner et al. 2009, Kallstrom and Ljung 2005, Armstrong and Stedman 2011). In particular, a lack of trust in government appears to be a particularly important barrier to stewardship (Rosenberg and Margerum 2008, Smith et al. 2013). More broadly, Ma et al. (2010) included a catch-all measure in the belief that programs are incompatible with land management goals, and found a significant negative relationship with stewardship behavior.

1.3 Land Management Objectives

A substantial amount of research suggests that attitudes towards stewardship are ultimately colored by a landowner's objectives for managing their land (Majumdar et al. 2008, Greiner et al. 2009). Due to the large footprint of agricultural lands in the United States, production-based objectives are particularly heavily represented in the literature. Commonly, producers have been classified as either profit-maximizers or land stewards, with the notion that these objectives are mutually exclusive (Thompson et al. 2014). While some evidence supports this dichotomy (e.g. Carr and Tait 1991, Ryan et al. 2003), many farmers express an interest in both profit-maximization *and* land stewardship, creating a sort of tension that can be difficult to resolve (Sullivan et al. 1996, Thompson et al. 2014). The complex relationship can be partly understood through a Dual Interest Theory framework, which suggests that intent to adopt conservation behaviors is driven by weighting the relative utility of profit objectives and other objectives (Sheeder and Lynne 2011). As described by Chouinard et al. (2008), “[Producers] may participate in these activities for

the social good or because they believe it is the 'right thing to do' even if it requires personal sacrifice."

While Dual Interest Theory has been less frequently applied to non-operator landowners, several studies have compared non-operator landowners with their operator counterparts and have come to seemingly contradictory conclusions that support application of this framework beyond the typical producer. Kaplowitz and Witter (2008) found that non-commercial landowners were generally more environmentally aware and more likely to implement riparian buffers on their property, whereas Armstrong and Stedman (2011) compared a similar population, and found that residential landowners were generally less willing to implement buffers due to aesthetic preferences. Such findings suggest that non-operator landowners are also characterized by diverse motivations. Despite the lack of consensus, it is clear that whether a landowner relies on their land for income or not plays an important distinction in how they engage with stewardship behaviors.

1.4 Research Questions and Hypotheses

While the existing literature has provided a wealth of evidence that attitudes and land management objectives influence the adoption of land stewardship practices, I aimed to investigate these concepts in conjunction with one another as part of a conceptual model to understand intent to enroll in stewardship programs. Based on my literature review, I compare the relationship between attitudes as motivators and barriers of intent to enroll in stewardship programs. Because of the low explanatory power associated with perceived behavioral control, I focus this study on attitudes relating to outcome evaluation and social and moral norms. I evaluate how production and environmental land management

objectives color intent to enroll, with the hypothesis that individuals interested primarily in profit will have more negative attitudes than individuals interested primarily in protecting the environment, and as a result will report a lower average intent to enroll (Figure 1.1).

I place this study in a broader context by discussing my findings in light of Schneider and Ingram's (1990) four classes of policy tools to address this population's attitudes, barriers, and land management objectives relating to land stewardship. I conclude with some broadly applicable considerations for application in source watershed stewardship programs.

2. METHODS

Related to this study, I asked respondents to express their agreement or disagreement to statements representing attitudes hypothesized to either motivate or to act as barriers to enrollment in stewardship programs. I measured all responses to these statements using variations of a 5 point Likert Scale (Likert 1932). Motivating attitudes were measured by asking respondents to rate degree of agreement or disagreement with (1) statements regarding interest in receiving incentives to enroll and (2) statements regarding belief in positive outcomes to both the environment and to self. Barrier attitudes were

Figure 1.1. A conceptual model of how land management objectives and attitude relate to intent to enroll in stewardship programs.

measured by asking respondents to rate degree of agreement with (1) statements regarding perceived barriers to enrollment in stewardship programs and (2) statements regarding belief in negative outcomes to both the environment and to self. Land management objectives were measured by asking respondents to rate the importance profit/production objectives and environmental objectives from “not at all important” to “very important.” Positive and negative outcome beliefs were measured utilizing a modified version of the Awareness of Consequences and Environmental Concern scale (Stern et al. 1994).

After respondents had completed a series of questions pertaining to potential program features, the survey asked, “Now that you know a little bit more about the potential features of a watershed conservation program in the Clackamas River watershed, how likely would you say you are to participate in such a program if the program was tailored to your responses above?” This question was designed to measure behavioral intent to participate in a stewardship program and was used as the dependent variable in my analyses.

2.3 Data Analysis

All analyses were performed in R Studio (Version 3.2.3). Because the population contained both rural residential and agricultural properties, I compared demographics and property characteristics from respondents to both the most recent National Agricultural Statistics Service Census of Agriculture (USDA 2012) for Clackamas County and the most recent American Community Survey (US Census Bureau 2009-2013) for census tracts represented in the study area.

I investigated polychoric correlations between variables (‘Psych’ R Package, Revelle 2015) in order to avoid potential issues with multi-collinearity. Polychoric

correlations are a modified version of the Pearson correlation coefficient used when an ordinal variable is theorized to represent an underlying normally distributed variable (see Drasgow 1988) as is the case with Likert-scale data. Highly correlated variables that held face validity were consolidated into single indices by taking the mean of component variables. All indices were evaluated for internal consistency using Chronbach's alpha (Chronbach 1951).

Though the independent variable – intent to enroll in a watershed stewardship program – was initially based on a 5-item Likert scale, I transformed this variable to a dichotomous scale represented by 1 (likely or very likely to enroll) or 0 (not sure, unlikely, or very unlikely to enroll). I chose this route because my question ultimately was to identify factors distinguishing the split between likely and unlikely participants, and logistic regression offered the most statistically robust and easily interpretable technique to accomplish this goal. Furthermore, logistic regression does not hold strict assumptions regarding normality and continuity of data, making it appropriate for use with Likert data.

To evaluate the effect of attitudes as both motivators and barriers to enrollment in stewardship programs, I created two separate logistic regression models – an “attitudes as motivators model” utilizing variables hypothesized to encourage enrollment intent, and an “attitudes as barriers model” utilizing variables hypothesized to discourage enrollment intent. I assessed model significance by performing a chi-square test against a null model and by calculating the Nagelkerke R^2 . I weighed variable importance by calculating the odds ratio for each variable, and I evaluated these models for issues with multi-collinearity by calculating the variance inflation factor (VIF). Typically, a $VIF > 2$ indicates potential multi-collinearity.

Following the creation of the initial two models, I performed a stepwise model reduction on each based on the Akaike Information Criterion (AIC), a measure of relative model quality (Akaike 1973). At each step in this iterative process, the variable most negatively influencing model quality as evaluated by AIC is dropped before the reduced set of variables is reevaluated. Following this reduction procedure, remaining variables from each model were put together into a combined model representing both motivator and barrier variables. Another stepwise AIC reduction was performed on the combined model to establish a final model representing the variables explaining the greatest amount of variance in the dataset.

To evaluate the hypothesized effect land management objective on attitude, I measured three variables representing profit/production and three variables representing environmental objectives. I consolidated these into variables into indices by taking the three-item mean and confirmed the validity of these indices by examining correlations between variables and calculating Chronbach's alpha. First, I checked if either of these variables related to intent to enroll on their own. Then, I weighed these two variables against one another by taking the difference between the two indices and creating a new variable termed "land management orientation." Theoretically, this variable represents individuals who consider environmental objectives more important than profit/production objectives by positive values and individuals with inverse objectives by negative values. Based on this variable, I split the sample into three classes of landowners: Profit/Production Oriented, Neutrally Oriented, and Environmentally Oriented. I then utilized the final attitudes model to evaluate how these groups differ in predicted enrollment intent. I compared how these groups differed relating to each variable represented in the combined

attitude model using a Tukey HSD test (Tukey 1949), and evaluated how this relates to intent to enroll by comparing differences in predicted intent to enroll as defined by the combined model.

3. RESULTS

Seventy-two surveys (6.5%) were returned as undeliverable, leading to an effective sample of 958. I received 279 valid responses – a 29% response rate. Compared with the reference data sources, the sample tended to be older (median age 63) and more educated (48% with a college degree). Property size, agricultural sales, gender, and income tended to fall within the range of values represented by the reference sources (Table 1.1).

Table 1.1

Summary of demographic and property characteristics of survey respondents.

Sample Size	281	Median Age (Years)	63
Median Property Size (Acres)	19.3	% Male	64.2%
% College Graduate	47.6%	% Conservative	48.1%
% Without Sales in 2014	58.8%	% Liberal	27.0%
% With Sales > \$1000 in 2014	31.9%	% Income > \$75K	56.5%

3.1 Data Summary

I was able to consolidate measured variables into simplified indices to reduce the total number of variables used in the attitudes modeling. Inter-variable correlations revealed two constructs within the measured attitude items: “Financial Incentives” (alpha = 0.92) represents four variables expressing interest in receiving monetary incentives, whereas “Social Barriers” (alpha = 0.71) represents three variables expressing the influence of one’s neighbors or community to prevent enrollment. The highest rated motivator attitudes were the beliefs that functioning stream ecosystems are important for a clean water supply (the Ecosystem Belief, mean = 4.35), that watershed conservation benefits

everyone in the watershed (the Universal Benefit Belief, mean = 3.75), and that watershed conservation is the right thing to do (the Moral Belief, mean = 3.72). Respondents frequently cited practical barriers to enrollment, including the perception of insufficient information (Informational Barriers, mean = 3.83), finances (Financial Barriers, mean = 3.23) and time (Time Barriers, mean = 3.12). Furthermore, many respondents reported less concrete concerns that enrollment could lead to regulatory implications (Regulatory Barriers, mean = 3.73) and they lacked trust in conservation agencies or organizations (Trust Barriers, mean = 3.32). Generally, individuals reported more positive attitudes towards watershed stewardship than they did negative attitudes, but they also were more likely to report perceived barriers compared with expressing an interest in receiving incentives to enroll (Table 1.2).

My analysis confirmed the existence of two distinct land management objectives: Profit/Production Objectives (alpha = 0.86) and Environmental Objectives (alpha = 0.82) (Table 1.2). Profit/Production Objectives represented three variables relating to the importance of producing farm or timber products, providing income, and managing a business through land production. Environmental Objectives represented three variables relating to the importance of protecting open space and aesthetic beauty, the health of waterways, and native wildlife and vegetation. Environmental Objectives (mean = 4.11) were reported much more frequently than Profit/Production Objectives (mean = 2.53).

Table 1.2

Summary of single-item and indexed variables representing attitudes as motivators, attitudes as barriers, and land management objectives. Bolded items were utilized in logistic regression. The groupings represent responses to the following questions: (Panel A) "Would the following increase your interest in working with a watershed conservation program?" (Panel B) "In general, do you agree or disagree with the following statements regarding watershed conservation in the Clackamas River watershed?" (Panel C) "To what extent do you agree or disagree with the following statements about why you might NOT participate in a watershed conservation program?" (4) "How important are the following factors when you are making decisions regarding your land?"

Panel A. Attitudes as Motivators: variables hypothesized to encourage intent to enroll		Mean	SD
¹ Interest in Incentives	Marketing: Improved marketing for products from my land (n=251)	2.67	1.30
	Technical Assistance: Staff to help you implement your project (n=252)	3.17	1.35
	Financial (alpha = 0.92) (n=256)	3.20	1.21
	Annual cash incentives for participating (n=255)	3.42	1.35
	Mean One-time cash bonus for signing up (n=254)	3.25	1.34
	A cash bonus for joint participation with neighbors (n=253)	3.07	1.33
	Discounts at local retailers (n=249)	3.03	1.36
² Outcome Beliefs	Universal Benefit: Watershed conservation benefits everyone (n=251)	3.75	1.12
	Moral: Watershed conservation is just the right thing to do (n=249)	3.88	1.01
	Public Health: The effects of water pollution on public health are worse than we realize (n=249)	3.72	1.10
	Responsibility: Pollution from my land harms people downstream (n=250)	2.62	1.50
	Degradation: Development threatens water quality (n=247)	3.62	1.19
	Ecosystem: Functioning ecosystems are important for clean water (n=248)	4.35	0.81
Panel B. Attitudes as Barriers: variables hypothesized to discourage intent to enroll		Mean	SD
³ Expressed Barriers	Time: I don't have time to participate in a program like this (n=247)	3.12	1.15
	Financial: My finances won't allow it (n=248)	3.23	1.10
	Informational: I don't know enough about these programs (n=248)	3.83	1.15
	Social (alpha = 0.71) (n=246)	2.63	0.87
	My neighbors or community would give me a hard time (n=244)	2.45	1.04
	No one in my community participates in these types of programs (n=244)	2.61	0.92
	I'm uncomfortable with the attention programs like these bring (n=246)	2.80	1.24
	Trust: I don't trust the organizations that run these programs (n=244)	3.32	1.20
² Outcome Beliefs	Regulatory: I'm concerned about legal or regulatory implications (n=244)	3.73	1.21
	Incompatible: Conservation programs are incompatible with my goals (n=263)	2.46	1.12
	Threat to livelihood: Watershed conservation will threaten my livelihood	2.40	1.15
	Restrictive: Watershed conservation might limit my personal freedoms (n=250)	3.25	1.25
⁴ Objectives	Denial: While some local areas may have seen declines in water quality, overall water quality in the watershed is not in decline (n=249)	2.86	1.03
	Panel C. Land Management Objectives: importance to land management decisions		Mean SD
	Profit / Production (alpha = 0.86) (n=262)	2.53	1.39
	Produce high quality farm or timber products for market (n=259)	2.75	1.70
	Provide income for me and my family (n=260)	2.53	1.50
	Grow/manage a business through my land's production (n=256)	2.25	1.46
	Environmental (alpha = 0.82) (n=267)	4.11	0.96
	Preserve open space or aesthetic beauty (n=262)	3.98	1.23
	Protect the health of waterways on or near my property (n=264)	4.21	1.05
	Protect local wildlife or native vegetation (n=266)	4.14	1.04

3.2 Logistic Regression Models

The attitudes as motivators model revealed three variables that held a significant positive relationship ($\alpha < 0.1$) with intent to participate: Technical Assistance Incentives ($p < 0.001$), the Universal Benefit Belief ($p = 0.034$), and the Ecosystem Belief ($p = 0.008$) (Table 1.3). Stepwise AIC reduction revealed no additional variables contributing to model quality. The Ecosystem Belief had the highest odds ratio (odds=2.557), indicating that the model was particularly sensitive to this variable. The model was highly significant when compared against the null model ($p < 0.001$, Nagelkerke $R^2 = 0.411$).

The attitudes as barriers model revealed three variables to hold a significant negative relationship ($\alpha < 0.1$) with intent: Trust Barriers ($p = 0.086$), the Incompatible Belief ($p < 0.001$), and the Threat to Livelihood Belief ($p = 0.061$) (Table 1.3). Stepwise AIC reduction suggested that Time Barriers ($p = 0.193$) and Social Barriers ($p = 0.112$) contribute to model quality, and so these variables were maintained for inclusion in the combined model. The Incompatible Belief had the lowest odds ratio (odds=0.498), indicating that intent seemed to be particularly sensitive to this variable. The model performed similarly to the encouraging factors model and was highly significant compared against the null ($p < 0.001$; Nagelkerke $R^2 = 0.369$).

Table 1.3

Logistic Regression model output comparing motivator, barrier, and combined models (*p < 0.1).

	Variable	β	S.E.	p-val	VIF	Odds Ratio	Contrib AIC?
Motivator Attitude Model	Marketing Incentives	-0.204	0.173	0.240	1.619	0.816	
	Technical Assistance	0.713	0.195	0.000*	1.579	2.040	✓
	Financial Incentives	0.214	0.198	0.279	1.490	1.238	
	Universal Benefit Belief	0.437	0.206	0.034*	1.379	1.548	✓
	Moral Belief	0.255	0.254	0.315	1.578	1.291	
	Public Health Belief	-0.152	0.210	0.467	1.507	0.859	
	Responsibility Belief	0.152	0.124	0.222	1.183	1.164	
	Degradation Belief	-0.252	0.186	0.174	1.428	0.777	
	Ecosystem Belief	0.988	0.371	0.008*	1.357	2.686	✓
	Variable	β	S.E.	p-val	VIF	Odds Ratio	Contrib AIC?
Barrier Attitude Model	Time Barriers	-0.251	0.193	0.193	1.439	0.778	✓
	Financial Barriers	-0.112	0.196	0.570	1.394	0.894	
	Social Barriers	-0.383	0.241	0.112	1.211	0.682	✓
	Trust Barriers	-0.282	0.164	0.086*	1.183	0.754	✓
	Informational Barriers	0.032	0.161	0.842	1.085	1.033	
	Incompatible Belief	-0.684	0.180	0.000*	1.135	0.505	✓
	Threat to livelihood Belief	-0.315	0.169	0.061*	1.167	0.729	✓
	Restrictive Belief	0.053	0.163	0.747	1.363	1.054	
	Denial Belief	-0.131	0.192	0.494	1.207	0.877	
	Variable	β	S.E.	p-val	VIF	Odds Ratio	Contrib AIC?
Combined Model	Time Barriers	-0.302	0.175	0.085*	1.039	0.740	✓
	Trust Barriers	-0.325	0.169	0.054*	1.090	0.723	✓
	Incompatible Belief	-0.425	0.192	0.027*	1.094	0.654	✓
	Threat to Livelihood Belief	-0.423	0.171	0.013*	1.080	0.655	✓
	Technical Assistance	0.638	0.173	0.000*	1.075	1.893	✓
	Ecosystem Belief	0.653	0.310	0.035*	1.087	1.922	✓
Model Comparison		n	df	p-val (χ^2)		Nagelkerke R ²	
Motivator Attitude		220	210	1.11E-12*		0.411	
Barrier Attitude Model		222	212	3.41E-11*		0.369	
Combined Attitude		217	210	2.20E-16*		0.476	

The combined attitude model contained six variables consisting of Time Barriers (p=0.085), Trust Barriers (p=0.054), the Incompatible Belief (p=0.084), the Threat to Livelihood Belief (p=0.013), Technical Assistance Incentives (p<0.001), and the Ecosystem Belief (p=0.035). This combined model was highly significant (p<0.001) and performed better than either the negative or positive models independently (Nagelkerke R²=0.476).

For these six variables, I developed partial regression probability curves that isolate the impact of each variable by outputting predicted probabilities for that variable while holding all other variables constant at their mean. Amongst the variables I found to significantly explain intent to enroll, each performed substantially better at explaining a *lack of intent* to enroll rather than intent to enroll; amongst respondents who reported negative attitudes, the model uniformly predicted an intent to enroll of near 0 (Figure 1.2). Likewise, the positive attitude variables never predicted a probability of enrollment greater than 50%, but not holding positive attitudes almost guaranteed a total lack of intent to enroll.

Figure 1.2
Partial regression curves for the six attitude variables represented in the combined model. Note that these represent the influence of each of these variables on intent to enroll with all other variables held constant at their mean.

3.3 Land Management Orientation

I classified 23 respondents as “Profit/Production” oriented (Land Management Orientation < 0), 83 respondents as “Neutral” (0 > Land Management Orientation < 2) and 103 respondents as “Environmental” (Land Management Orientation > 2) (Figure 1.3.1). Neutral individuals were classified as such because, despite having a slight edge

towards environmental objectives, they tended to fall in the middle of the respondent distribution and thus represented no strong land management orientation compared with the rest of the population.

Figure 1.3.2 shows the cumulative distribution of predicted enrollment probability for each of the three groups. The Tukey HSD test between groups showed a significant difference between the Environmental and Neutral groups ($p=0.011$) and between Environmental and Profit/Production groups ($p=0.001$). However, I did not detect a difference in predicted intent to enroll probability between the Neutral and Profit/Production groups ($p=0.210$). In general, I noted an increasing average predicted enrollment intent from profit/production to neutral to environmental groups, and this matched trends seen in the observed data.

Figure 1.3

(1) Kernel density distribution of Land Management Orientation, split by group. (2) Cumulative distribution curve of predicted probabilities as a function of attitude compared between land management orientation groups. Significant differences between groups (Tukey HSD $\alpha<0.05$) are indicated by associated letters A, B, and C.

Figure 1.4

Mean and standard error bars of combined model variables by land management orientation (n = 208). Significant differences between groups (Tukey HSD $\alpha < 0.1$) is indicated by associated letters A, B, and C.

When comparing differences between groups for each variable, I found that Profit/Production oriented landowners were the most likely ($\alpha < 0.1$) to perceive Trust Barriers and to report the Incompatible Belief, followed by Neutral respondents and Environmental respondents. I found similar relationships in the perception of Time Barriers and the Threat to Livelihood Belief. Environmentally oriented landowners were significantly more likely to hold the Ecosystem Belief compared with Profit/Production oriented landowners. I found no difference between groups in relation to interest in Technical Assistance Incentives (Figure 1.4).

4. DISCUSSION

Though response rate was lower than anticipated, it is not unprecedented for this population; a previous questionnaire of agricultural landowners in the watershed conducted by the Clackamas River Basin Council in 2013 used the same methods and reported a 20.3% response rate. I found strong support for my initial conceptual model that attitudes can act as both motivators and barriers to enrollment in watershed stewardship programs. Furthermore, my findings support the hypothesis that land management objectives color attitudes that are relevant to enrollment intent. However, the relationship between land management objective, attitude, and enrollment intent was more complicated than I anticipated.

Previous studies have noted a positive relationship between environmental objectives and stewardship practices (Greiner et al. 2009, Arbuckle et al. 2009). Though I found that many individuals reported a high importance of protecting the environment and local waterways through their land management, this did not correspond to intent to enroll in a watershed stewardship program. These findings indicate that respondents tended to consider protection of the environment to be a moral imperative to be completed by self-initiative, rather than through a formalized program to accomplish this goal. One respondent noted, “We have always maintained [our land] by ourselves without outside help or interference.” These findings suggest that a lack of intent to enroll does not indicate an aversion to stewardship, but it appears that attitudes may prevent enrollment in stewardship programs.

Likewise, I found no relationship between profit/production objectives and intent to enroll. McCann et al. (1997) reported a similar finding; they surveyed conventional and

organic farmers, and found no difference with regard to the percent of their incomes derived from farming. However, they did find a difference between environmental attitudes of conventional and organic farmers, suggesting that land management objectives may play an unresolved role in attitude. I examined this role by evaluating the relative importance of profit/production objectives and environmental objectives through the “land management orientation” index, and I found that when profit/production objectives took precedence over environmental objectives, attitudes were significantly more negative (Figure 1.4) and lead to a lower intent to enroll (Figure 1.3.2).

Carr and Tait (1991) surveyed farmers in the UK, and found that profit/production motives tended to take precedence over environmental motives. My findings suggest that relatively few respondents (n=23) reported profit/production motives to be substantially more important than environmental motives; however, individuals who reported similar influences of profit/production and environmental motives were less likely to report enrollment intent compared with purely environmentally motivated individuals. This indicates that environmental and profit/production motives on their own are not prerequisite or exclusive of enrollment in stewardship programs, but the relationship between these variables can help to explain differences in attitude. Profit/production objectives appear to moderate the influence of environmental considerations and lead to a lower predicted enrollment intent.

When I examined how attitudes relate to enrollment, I found that attitudes uniformly predict a *lack of enrollment intent* as opposed to intent; this suggests that attitudes are necessary, but not sufficient, conditions that must be addressed in order to ensure enrollment. The application of Prospect Theory (Kahneman and Tversky 1979) may

offer an additional explanation of the relationship between attitude and intent. While I initially proposed the use of Prospect Theory as rationale for including negative attitudes in the model, my findings suggest that negative attitudes not only play an important role in influencing decision making, but in fact individuals seem to avoid action based on negative attitudes, whereas positive attitudes seem to have a less clearly defined relationship with behavioral intent. Interestingly, Ljung et al. (2012) found a similar concept to be true regarding attitudes towards hunting: negative attitudes universally predicted a lack of intent to hunt, but positive attitudes had little relationship to the act of hunting itself. Heberlein (2012) explains this phenomenon can be observed because possessing positive attitudes towards an action does not necessarily correspond to possessing the means to complete that action.

It seems that holding each of the appropriate attitudes independent of one another is not enough, and as such program tools should aim to address these attitudes in conjunction with one another. In order to further elaborate which policy tools are likely to be useful in the context of these findings, I return to Schneider and Ingram's (1990) policy tools to help understand effective means of engaging this population in watershed stewardship.

Authority Tools prohibit or require action through enforceable regulation. Though I did not include regulatory concerns in the attitude model as this variable was unstable when included, respondents did tend to report this to be a significant barrier to enrollment. Regulatory tools have proven highly unpopular in similar contexts (Lurie et al. 2013), and Sullivan et al. (1996) reported lack of trust in the government to be a high concern amongst landowners. Despite informing respondents that the CRWP are not a regulatory body and

as such stewardship programs would not involve regulatory repercussions, there remained a high concern that enrollment would lead to regulatory implications.

The models showed a negative relationship between the enrollment and the perception that stewardship programs would threaten the respondent's livelihood, and I believe these concerns are primarily a concern for a loss of the lifestyle associated with using one's land for production values. Similar studies of farmers have found a relationship between the farming livelihood and lifestyle qualities such as independence (Sullivan et al. 1996) and closeness to nature (Schoon and Grotenhuis 2000). Kallstrom and Ljung (2005) found that when farmers felt that they had reduced control in decision making due to heightened regulation it threatened their ability to continue farming. As such, authority tools are likely a contentious method to encourage stewardship behavior, and stewardship programs should consider how to address this concern. For example, resource managers may work with federal and state regulators to institute a property rights assurances that participation will not lead to additional regulatory burden.

Incentive Tools assume individuals are utility maximizers, and attempt to encourage or discourage voluntary behavior with financial or other tangible benefits. While the PWS framework has attempted to encourage voluntary program participation through financial incentives, my findings support the growing field of research that imply the limited ability of PWS programs to fully account for landowner behavior. While financial barriers were somewhat widely reported, I did not find a significant relationship between enrollment intent and the perception of financial barriers or interest in receiving financial incentives to participate. This may support the notion that watershed stewardship programs have overemphasized financial payments to promote behavior, or it may indicate that

respondents currently believe that they will be sufficiently compensated for enrollment. My findings support those reported by Ma et al. (2010), who described a conceptual model in which PES payments were considered as one of many tools to encourage enrollment, and demonstrated that for some farmers, payments simply will not change enrollment decision.

My framing of financial considerations as a barrier may limit interpretation here. While financial barriers and assistance overcoming those barriers may not significantly improve enrollment, it is possible that financial incentives beyond covering basic stewardship costs could still improve enrollment. Reimer and Prokopy (2014) found that a “lack of perceived benefit” was a significant deterrent to participating; when financial incentives are sufficient to outweigh the perceived risks associated with program participation, it is possible that finances may act as motivators. However, large financial incentives require substantial capital investment, and my findings imply that other tools should be considered first as a means to alter attitude and to lower such high transaction costs.

Capacity Tools assume individuals will partake in an action given the removal of barriers, and as such these tools involve the provision of training and resources to enable individuals to perform an action. My results suggest two primary barriers that may be addressed through capacity tools: the belief that stewardship programs are “incompatible” with a landowner’s goals for his/her land and the belief that landowners did not have enough time to participate in such a program. Ma et al. (2010) reported a similar finding that perception of incompatibility amongst a strictly farm population was a key limitation to enrollment in stewardship programs. Individuals may be financially and technically

capable of participation, but if these programs are seen as an inconvenience, landowners have little rationale to join.

Interestingly, I found that individuals who were responsive to receiving technical assistance through a dedicated staff member who can help to implement program strategies were significantly more likely to participate. This makes sense – some individuals will not participate because they simply do not have the time to engage in an activity that is incompatible with their primary land management objectives. However, receiving technical assistance can help to overcome this hurdle.

Symbolic Tools assume individuals are motivated by internal judgments and beliefs, and as such these tools attempt to showcase how a given policy direction is consistent with an individual's attitudes. My study focused on the importance of attitudes and provides further empirical support for the utilization of symbolic policy tools to encourage behavior. Amongst attitudes, I found lack of belief that functioning stream ecosystems are important for clean water (the Ecosystem Belief) and a lack of trust in conservation agencies (Trust Barriers) to be important deterrents to enrollment.

While individuals widely reported the Ecosystem Belief, those that did not hold this belief were much less likely to enroll. This item is distinguished from other environmental attitude items in that it focused on the outcomes of protecting ecosystem health rather than the causes of ecosystem degradation. In another survey of rural landowners, Armstrong and Stedman (2011) found a similar relationship; they failed to detect a relationship between knowledge of water quality issues and intent to implement riparian buffers, but they identified a strong relationship with belief in positive outcomes of buffer implementation. This may suggest that, regardless of beliefs about the state of watershed

degradation, individuals must first believe that protecting environmental attributes of the watershed will lead to tangible improvements in water quality.

I found the perception of Trust Barriers to be a highly significant deterrent to enrollment intent. Smith et al. (2013) described the importance of trust between individuals and conservation agencies related to shared values and moral and technical competencies – the belief that agencies can make ethically grounded decisions based on the best available science. In one study, farmers reported lack of credibility of extension offices and NRCS programs – often citing that these programs were underfunded, behind the times, and too focused on expensive “special projects” (Woods et al. 2014). Another study noted that farmers frequently felt excluded from meaningful engagement with conservation programs and that the responsible agencies discounted farmer knowledge regarding the land (Harrison et al. 1998). Some studies have suggested that conservation program outcomes can be improved through social connections between individuals and other landowners (Armstrong and Stedman 2011), or with conservation organizations (Flitcroft et al. 2009, Muradian 2010). In these instances, conservation programs were successful because they established relationships and larger social norms within the community. As a result, I suggest that building trust between source water protection organizations and the local community is a vital first towards program success. An alternative route may include working through existing trusted organizations (such as local soil and water conservation districts, watershed councils, or producer organizations) within the community who have firmly established working relationships with landowners.

Surmounting initial barriers to enrollment will be difficult; respondents in the study were highly averse to program enrollment when negative outcomes were perceived, and

yet positive attitudes did not guarantee intent to enroll. To help overcome such aversion, Lurie et al. (2013) suggested that enrollment may be encouraged by offering short term contracts to allow landowners to participate on a trial basis, after which a more long-term contract may be signed. Such trial programs may offer a key window in which relationships can be built and the key attitudes of trust, ecological understanding, and perceptions of incompatibility can be addressed.

5. CONCLUSION

This study represents landowners in a unique social, ecological, and political landscape, and while my general critiques of PWS and emphasis on consideration of alternate policy tools may be broadly applicable, my results re-affirm the importance of community-based knowledge as a prerequisite to program success. There are likely few, if any, universally significant independent variables to explain stewardship program enrollment, and I join other authors who have called for the study of specific landowner populations rather than grouping all landowners together (Greiner et al. 2009, Woods et al. 2014). I suggest that stewardship programs should allow sufficient flexibility to adapt not only to the entire population, but when possible to each individual landowner's needs and objectives.

Studying the relationship between attitudes and stewardship program enrollment is crucial not only because watershed-scale stewardship actions are mediated through stewardship programs, but program enrollment has been linked with long term changes in attitude (Wilson and Hart 2001). Provided that these changes in attitude are positive, overcoming initial barriers to enrollment can be an important first step towards fostering a widespread culture of stewardship.

CHAPTER TWO

Stewardship Program Engagement with Diverse Landowners

In the previous chapter, I found evidence that land management objectives influence attitude and stewardship intent. In this chapter, I dive deeper into this concept by identifying distinct groupings of landowners dependent on their primary land management objectives and creating typologies based on these objectives. I discuss key divisions in perceived barriers to enrollment in stewardship programs between these typologies, as well as how these typologies differ in their preferred incentives and management actions relating to watershed stewardship.

1. INTRODUCTION

Watersheds often are comprised of a large number of landowners with diverse interests and objectives for their land. In these cases, private landowners are the necessary mediators by which downstream water quality is determined (Ahnstrom et al. 2008), and understanding these objectives is crucial to engage these landowners in watershed stewardship. In recent years, rising rates of exurban development have added additional complexity and challenges to these landscapes, replacing large swaths of agricultural and timber lands with amenity-driven rural landowners (Brown et al. 2005). These land use changes have had important consequences for the both the ecological functioning of rural landscapes as well as the dominant methods by which private lands are managed (Dale et al. 2005).

Despite the rising rates of complexity in land ownership, most federal conservation programs remain geared towards commercial agricultural and timber landowners. Many of these programs rely on the classic agricultural economics assumption that operator

landowners inherently make decisions based on the net profitability of these choices (Koontz 2001), and as such are structured around offering financial incentives to promote desired land management behaviors (e.g. Conservation Reserve Program, Environmental Quality Incentives Program). While I have previously argued that such programs are not a panacea for promoting stewardship amongst financially-motivated land operators, they may be particularly problematic as a means to encourage behavior amongst the growing numbers of landowners who do not rely on their land for financial gain (Koontz 2001).

As a first step towards designing and implementing conservation programs compatible with a wider array of land management objectives, researchers have begun to consider the inter-relationship between financial and non-financial objectives in describing distinct groupings of landowners. At the coarsest level, landowners may be characterized by their utilization of land or lack thereof for production and income – often manifested as a distinction between foresters (Majumdar et al. 2008) or farmers (Kaplowitz and Witter 2008) and non-operator landowners. This distinction offers an easily identifiable way of characterizing landowners based on external criteria, and such typologies can be somewhat easily distinguished using simple demographic and property characteristics (e.g. Majumdar et al. 2008, Nielsen-Pincus et al. 2015). Yet perhaps unsurprisingly, this simple dichotomy appears insufficient to explain adoption of stewardship behaviors; for example, past studies have found non-operator residential landowners to be both *more* (Kaplowitz and Witter 2008, Arbuckle et al. 2008) and *less* (Armstrong and Stedman 2011) likely to engage in stewardship behavior compared with their producer counterparts. While the inclusion of both producer and non-producer landowners in the land stewardship literature is an

important first step, it appears that such categories are somewhat fluid (Majumdar et al. 2008) and more fine-scale description of land management objectives is needed.

A brief (and by no means exhaustive) review of the literature highlights the increasing recognition of complexity associated with land ownership objectives. Kline et al. (2000) measured the pursuit of lifestyle amenities in addition to profit and production objectives to describe different types of landowners. Maybery et al. (2005) noted that many landowners were divided in their views of the environment, and considered environmental conservation as differentiating characteristic amongst landowners. More recently, Nielsen-Pincus et al. (2015) identified five key land management considerations that could be used to describe landowners in the wildland-urban interface: pursuit of natural/lifestyle amenities, forest/timber management, home and family, agricultural production, and development. Below, I explore in more detail the variety of objectives theorized to influence producer and non-producer engagement with land stewardship initiatives.

1.1. Producers

Due to the large footprint and historical dominance of agricultural and forestry land uses in the United States, adoption of stewardship practices amongst producer landowners is well represented in the literature. While both farmers and foresters have expressed general support for environmental outcomes in a variety of contexts, past research suggests that perceived barriers may inhibit stewardship behavior. Napier et al. (1998) utilized Rogers (1983) Diffusion model to explain participation in government sponsored soil erosion control problems, and suggested that four key attitudes must be present in order for a farmer to consider enrollment: the farmer must believe that (1) a problem exists, (2) the costs of enrollment are reasonable, (3) the desired practices are relevant to farm operations,

and (4) the benefits outweigh the costs. Fischer (2012) described similar set of conditions necessary for engaging commodity-driven non industrial private forestlands (NIPF) owners in stewardship initiatives, including perception of financial benefit, marketability, and compatibility with their values as family forest owners. Further evidence supports the notions that producer enrollment is ultimately dependent on whether such practices limit or enhance land productivity (Woods et al. 2014), and whether or not the farmer perceives a self-benefit to utilizing these practices (Reimer and Prokopy 2014). Additional barriers to enrollment may include perception of regulatory limitations (Reimer and Prokopy 2014) and risk (Greiner et al. 2009).

While the above literature provides a broad understanding of how producer attitudes relate to enrollment in stewardship programs, the question remains: how and why do producers differ in these key attitudes? Petrzalka et al. (1996) theorized that farmers can be split as “sustainable” or “conventional,” defined by a view of whether humans should dominate or harmonize with nature. Similarly, Sullivan et al. (1996) surveyed conventional and organic farmers, and found that farmers in both groups shared many perceived barriers and were not differentiated according to economic considerations, but were split by their views on nature. Maybery et al. (2005) equate conventional farmers with those who are driven primarily by economics, and sustainable farmers as those who are driven primarily by maintaining the farming lifestyle and closeness to nature. Greiner et al. (2009) surveyed ranchers in Australia and found that financial considerations did not appear to be an important predictor of stewardship behavior, and instead stewardship was differentiated primarily by level of interest in conservation and lifestyle objectives.

1.2 Non-Producers

The heavy focus on commercial producers fails to represent the growing presence of non-production oriented land management objectives represented within a typical watershed (Rosenberg and Margerum 2008), including small acreage hobby farmers, residential homeowners, and real estate investors. These groups may cumulatively have a large impact on the landscape; between 1950 and 2000, the amount of land in the United States populated at exurban densities increased five-fold, the majority of which has resulted as the result of conversion of agricultural and forestry lands (Brown et al. 2005). Kaplowitz and Witter (2008) compared non-commercial residential landowners to commercial producers, and found that non-commercial landowners were generally more accepting of their responsibility for watershed degradation and were more willing to place riparian buffers on their lands. Conversely, Armstrong and Stedman (2011) compared a similar population, and found that residential landowners were less willing to implement buffers due to aesthetic preferences. Such unclear relationships suggest that all non-operator homeowners cannot be classified into one category, and instead more fine-scale distinction of objectives may further elaborate stewardship behavior.

Pannell and Wilkinson (2009) investigated residential landholders, and described two major objectives: those driven by environmental objectives, and those driven by aesthetic objectives. Similarly, Ryan (2009) differentiated non-commercial riparian landowners by stewardship ethic, and suggested that stewardship related to perceptions of personal accountability for watershed degradation and feasibility of restoration to be key variables. Fischer (2012) split non-producer forest landowners objectives into three classes: amenity (residents driven by the rural lifestyle), recreation (absentee landowners who utilize the property as a second home), and passive (absentee landowners without a

clearly defined ownership objective). The authors found that absentee landowners were generally less likely to actively manage their land to minimize wildlife risk likely due to perceptions of “inconvenience” for their limited time on their property. Petrzalka et al. (2009) noted a similar relationship; absentee landowners tended to report a high interest in conservation but exhibited low enrollment rates in conservation programs.

1.3 Research framework

The primary objectives of this research were to (1) test whether production objectives influence perceived barriers and preferred methods of engagement with stewardship programs, (2) classify landowners according to the relative importance of production and less-easily identifiable land management objectives theorized to influence stewardship behavior, and (3) compare how these groups differ in the aforementioned perceived barriers and preferred methods of engagement. According to Nielsen-Pincus et al. (2015), an effective landowner classification system will produce classes that are “readily interpretable, represent distinct suites of landowner motivations, and link those motivations to preferred land management strategies,” and I take a similar approach in defining appropriate landowner classes. Based on my literature review, I expected landowner typologies to be defined primarily by use of land for production purposes, with further refinement by consideration of other objectives such as conservation, recreation, or investment considerations. In general, I expected producers to perceive greater financial barriers to enrollment and to be more interested in receiving financial incentives compared with non-producers.

Following determination of landowner typologies, I explore the distribution of landowners by comparing the makeup of four different sub-watersheds: the Clackamas

mainstem, Clear Creek, Deep Creek, and Eagle Creek. These four watersheds are characterized by similar sizes and land use makeup, and are difficult to distinguish from one another by simply looking at tax parcel data. However, I hypothesized that the distribution of landowner typologies may be different between subwatersheds and may help to target policy interventions.

2. METHODS

Amongst other things, the survey instrument was designed to measure land management objectives, property and demographic characteristics, perceived barriers to enrollment in stewardship programs, and preferred methods of engagement with stewardship programs. All analyses were performed in R Studio (Version 3.2.3).

2.1 Land Management Objectives

I asked respondents to rate the importance of various land management objectives on a 5 point Likert scale from “not at all important” to “very important.” These objectives included environmental, recreational, financial, and production oriented objectives. Though similar studies separate farmers and foresters (e.g. Nielsen-Pincus et al. 2015), I was interested in creating groups based on the more general relationship between land use for production or for lifestyle, and I did not attempt to differentiate these groups from one another.

To identify the underlying dimensions of land management objectives, I performed an exploratory factor analysis using polychoric correlations on land management objectives (‘Psych’ R Package, Revelle 2015) using varimax rotation. Polychoric correlations are a modified version of the Pearson correlation coefficient used when an ordinal variable is theorized to represent an underlying normally distributed variable (see

Drasgow 1988) as is the case with Likert-scale data. I identified three factors which I interpret to represent “Production” objectives (associated with the production and sale of farm and/or timber products), “investment” objectives (associated with maximizing return on investment or development potential), and “conservation” objectives (associated with the pursuit environmental and to a lesser extent recreational objectives) (Table 2.1).

2.2 Production Objective Regression Models

In order to test if production objectives on their own could help to explain differences in attitude, I performed an Ordinary Least Squares regression utilizing the factor score from production as a predictor of each of the eight listed variables independent of one another (Table 2.2, “coef” column). I considered production to be a significant predictor of attitude when $p < 0.05$.

Table 2.1

Univariate distributions and 3-factor solution for responses to: “How important are the following factors when you are making decisions regarding your land?” Percent important indicates percentage of respondents marking “important” or “very important.” (Factor loadings greater than 0.4 are bolded for emphasis).

Goals and Objectives	Percent Important	Mean ^A	SD	Rotated Factor Loadings		
				Product.	Conserv.	Invest.
Produce farm or timber products	38%	2.70	1.70	0.85	0	0.18
Provide income	27%	2.48	1.50	0.78	0.04	0.31
Run a business	20%	2.21	1.46	0.9	-0.01	0.3
Provide recreational opportunities	50%	3.43	1.34	0.11	0.44	0.2
Preserve open space	70%	3.97	1.23	-0.08	0.82	-0.05
Protect wildlife	75%	4.14	1.04	-0.05	0.89	-0.12
Protect local waterways	77%	4.21	1.05	0.04	0.79	0.1
Enhance investment potential	51%	3.40	1.40	0.3	0.13	0.67
Enhance development potential	21%	2.28	1.42	0.33	-0.05	0.72
Eigenvalue				2.37	2.31	1.25
% Variance explained				26%	26%	14%

^AResponses range from not at all important (1) to very important (5)

2.3 Landowner Typologies

I utilized the factor scores to perform a k-means cluster analysis to identify distinct groupings of landowners by land management objective. I used the R base function `kmeans()` to perform the cluster analysis using 10,000 iterations, which ultimately converged on a five cluster solution. I assigned each of the respondents to the appropriate cluster, and I calculated the mean of each measured land management objective for each landowner cluster (Figure 2.1) and compared them to one another to create descriptive landowner typologies.

2.4 Landowner and Property Characteristics

I queried socio-demographic characteristics of the respondents, including education, income, political ideology, value of agricultural sales, ownership tenure, and age. Using ESRI ArcGIS (version 10.2), I measured the total acreage owned by each landowner by calculating the sum total acreage of all tax parcels registered to that individual within the confines of the Clackamas River watershed. Additionally, I calculated

the total kilometers of streams on each landowner's property by overlaying tax parcels and streams identified in the USGS National Hydrography Dataset. Last, I defined four subwatersheds in which respondents were represented (Clackamas Mainstem, Deep Creek, Clear Creek, and Eagle Creek) and assigned each landowner to the watershed in which they had the greatest amount of property.

2.5 Barriers to Enrollment

I asked respondents to rate their level of agreement (from “strongly disagree” to “strongly agree” with four statements explicitly relating to reasons that would prevent them from enrolling in a watershed stewardship program. I chose these barriers to enrollment based on those shown to influence landowners in the literature: practical barriers such as financial limitations and time constraints (Williams 2002, Woods et al. 2014), and less tangible barriers relating to lack of trust (Rosenberg and Margerum 2008, Smith et al. 2013) and concerns for regulatory implications as a consequence of enrollment (Greiner et al. 2009, Kallstrom and Ljung 2005, Armstrong and Stedman 2011).

2.6 Preferred Methods of Engagement

I asked respondents to rate their likelihood of enrolling in a watershed stewardship program if (a) offered any of 6 different incentives and (b) the program involved working towards any of seven separate land management goals. I looked to reduce the number of variables represented by performing an exploratory factor analysis on each of these two groups, and creating indices by taking the mean of variables shown to represent an underlying data structure. I evaluated the internal consistency of these indices by calculating Chronbach's alpha. This analysis revealed two main types of incentives: “financial incentives” (alpha = 0.93) and “assistance implementing project” (alpha = 0.84);

and two types of land management goals: “agricultural reduction” ($\alpha = 0.89$) and “riparian habitat improvements” ($\alpha = 0.92$).

2.7 Within Group Comparisons

I tested both for significant differences among landowner typologies and between each group individually compared with all other groups combined (that is, whether each group tends to be significantly higher or lower than the mean of all other groups). For presence/absence (land use) and non-Likert ordinal (income, political tendency, and value of agricultural sales) data, I utilized a Chi-square test for goodness of fit. Because this test resulted in expected frequencies for some groups of less than 5, I utilized Monte Carlo p-value simulations with 2000 replicates to create more conservative and accurate representations of significance. I tested for differences in continuous data (age, ownership tenure, $\log(\text{property size})$, and $\log(\text{stream length on property})$) by running an analysis of variance test (ANOVA). For Likert scale ordinal data (barriers and preferred methods of engagement), I compared differences in means among groups by utilizing an ANOVA. I tested for differences between groups by utilizing a Mann-Whitney U test, a non-parametric test that holds no assumption of normality and performs with almost equal efficiency to the student's t-test.

3. RESULTS

Seventy-two surveys (6.5%) were returned as undeliverable, leading to an effective sample of 958. I received 268 responses with sufficient data to complete the cluster analysis, representing 28% of the sample. Because the population contained both rural residential and agricultural properties, I compared demographics and property characteristics from respondents to both the most recent National Agricultural Statistics

Service Census of Agriculture (USDA 2012) for Clackamas County and the most recent American Community Survey (US Census Bureau 2009-2013) for census tracts represented in the study area. Compared with these two data sources, the sample tended to be older (median age 63) and more educated (48% with a college degree). Property size, agricultural sales, gender, and income tended to fall within the range of values represented by the reference sources.

Goals relating to conservation were the top land management objectives and included “preserve open space” (mean = 3.97), “protect wildlife” (mean = 4.14), and “protect local waterways” (mean = 4.21). “Provide recreational opportunities” (mean = 3.43) and “enhance investment potential” (mean = 3.4) were also widely reported. production-oriented goals such as “produce farm or timber products” (mean = 2.70), “provide income” (mean = 2.48), and “run a business” (mean = 2.21) were less frequently reported, but had the highest standard deviations, reflecting the mixed sample of both producers and non-producers. “Enhance development potential” (mean = 2.28) was also infrequently reported (Table 2.1).

Respondents tended to agree that “regulatory barriers” (mean = 3.71) were the greatest obstacle to enrollment in stewardship programs, followed by “trust barriers” (mean = 3.31), “financial barriers” (mean = 3.20), and “time barriers” (mean = 3.1). Respondents were generally ambivalent regarding the potential to receive “financial incentives” (mean = 3.19), “assistance implementing project” (mean = 2.95), and to work towards “fertilizer/pesticide reduction” (mean = 3.13). Respondents tended to most agree that they would be interested in working towards “riparian habitat improvements” (mean = 3.72) (Table 2.2)

Table 2.2

Responses to A.) "To what extent do you agree or disagree with the following statements about why you might NOT participate in a watershed stewardship program?" B.) "Would the following increase your interest in working with a watershed stewardship program?" C.) "How likely would you be to work with a watershed stewardship program on the following goals?" α refers to Chronbach's alpha.

A. Barriers to enrollment: Strongly Disagree (1) to Strongly Agree (5)							
	Mean	Std.	n	Coef. ¹			
Regulatory Barriers	3.72	1.21	239	0.27***	I'm concerned about legal or regulatory implications		
Trust Barriers	3.31	1.21	239	0.28***	I don't trust the agencies or organizations that run these programs		
Time Barriers	3.11	1.15	242	0.21***	I don't have enough time to participate in a program like this		
Financial Barriers	3.21	1.10	243	0.13*	My finances won't allow it		
B. Likelihood of Accepting Incentives: Very Unlikely (1) to Very Likely (5)							
	Mean	Std.	n	Coef. ¹			
Financial Incentives	3.20	1.25	242	-0.01	Annual cash incentives for participating		
					One-time cash bonus for signing up		
					A cash bonus for joint participation with neighbors		
Assistance Implementing Project	2.95	1.15	239	0.12	Dedicated staff to help you implement your project		
					Educational/training opportunities		
					Zero-interest loans		
C. Likelihood of Pursuing Conservation Goals: Very Unlikely (1) to Very Likely (5)							
	Mean	Std.	n	Coef.			
Fertilizer/Pesticide Reduction	3.14	1.23	237	-0.15*	Reducing Fertilizer Use		
					Reducing Pesticide Use		
Riparian Habitat Improvements	3.72	1.04	237	-0.06	Restoring degraded stream and floodplain areas		
					Maintaining healthy streamside forests		
					Planting forests along streams that are not currently forested		
					Enhancing wildlife habitat		
					Controlling invasive species		

¹Coef. refers to linear regression coefficient of each variable as predicted by the "Production" factor scores. *significant relationship at the <0.1 level, **at the <0.05 level; ***at the <0.01 level

The factor scores for production objectives were negatively associated with the perception of all barriers, and were particularly strongly associated with the perception of Regulatory and Trust Barriers ($p < 0.01$). Furthermore, production objectives were weakly negatively associated with interest in pursuing fertilizer/pesticide reduction goals ($p < 0.1$) (Table 2.2).

4. LANDOWNER TYPOLOGIES

The cluster analysis revealed five distinct landowner typologies, named according to the importance each group placed on production, investment, and conservation objectives (Figure 2.1). Two typologies reported particularly low production scores and can be classified as non-producers: “Lifestyle Homeowners” ($n = 69$) and “Amenity Investors” ($n = 47$). Two typologies reported particularly high production scores and can be classified as producers: “Lifestyle Producers” ($n = 53$) and “High-value Producers” ($n = 46$). The two non-producer typologies and the two producer typologies tended to respond more similarly to one another compared with responses between producers and non-producers. A fifth group, “Disengaged Landholders” ($n = 53$), reported low scores for all three listed objectives and tended to be the most distinct group in terms of mean response. These differences in land management objectives translated into differences among groups regarding whether they tended to agree (>3), disagree (<3), or be neutral (~ 3) to each of the perceived barriers and preferred methods of program engagement (Figure 2.2). In the following sections, I describe each of these groups in more detail and attempt to interpret the diversity of responses exemplified.

Figure 2.1

Mean land management objectives and standard error bars compared between clusters. Primary factor loading indicates the top factor on which each variable loaded onto.

4.1 Non-Producer Typologies

Non-producer typologies tended to report low production (mean < 2) and high conservation scores (mean > 4), and tended to have smaller property sizes, report fewer agricultural or forestry land uses on their land, and report little to no agricultural sales from their property. Additionally, these two groups were the most likely typologies to reside on their property (>90%). These non-producer typologies tended to perceive fewer barriers to enrollment in stewardship programs and were generally more interested in working with a stewardship program on the listed land management strategies. They were the only two groups to not perceive time barriers to enrollment (mean < 3). However, Lifestyle Homeowners and Amenity Investors were differentiated by their views of their property as an investment; an objective which seems to weakly influence how these groups perceive barriers and prefer to engage in watershed stewardship programs.

Table 2.3

Land use, demographic, and parcel characteristics compared between landowner clusters. All data come from survey responses except for Property Size and Stream Length, which were calculated using ArcGIS.

	ALL	Landowner Clusters				
		LH	AI	LP	HP	DL
^ALand Use						
Primary Residence***	82%	94% [↑]	91% [↑]	81%	74%	68% [↓]
Agriculture***	39%	26% [↓]	9% [↓]	66% [↑]	65% [↑]	32%
Timber***	43%	28% [↓]	26% [↓]	62% [↑]	57% [↑]	47%
Pasture**	33%	35%	15% [↓]	43% [↑]	41%	28%
^AQualitative Respondent Characteristics						
Income > \$100K (n=220)	37%	33%	35%	37%	46%	35%
Liberal Political Tendency (n=230)***	27%	46% [↑]	20%	29%	20%	17% [↓]
Conservative Political Tendency (n=230)***	48%	32% [↓]	43%	51%	55%	65% [↑]
2014 Sales < \$50,000 (n=257)***	32%	22% [↓]	9% [↓]	62% [↑]	42%	29%
2014 Sales > \$50,000 (n=257)***	9%	2% [↓]	4%	6%	28% [↑]	10%
^BQuantitative Respondent Characteristics						
Age (mean years, n=241)	63.3	62.1	62.5	64.1	62.6	65.3
¹ Ownership Tenure (mean years, n=247)**	27.6	28.0	21.6 [↓]	33.7	30.7	34.4 [↑]
² Property Size (mean acres, n=266)***	27.0	14.0 [↓]	11.9 [↓]	40.7 [↑]	41.3 [↑]	31.7
Property Size (median acres, n=266)	12.4	8.6	6.1	24.1	22.3	18.4
^{2,3} Stream Length (mean km, n=266)***	1.0	0.9	0.8	1.3	1.4	1.4 [↑]
Stream Length (median km, n=266)	0.8	0.7	0.6	0.6	1.0	0.9

Notes: ¹Represents only ownership < 80 years to correct for outliers in data. ²Significance levels refer to test on log-transformed data to correct for non-normality. ³Significant levels refer to only properties with streams on site.

LH = Lifestyle Homeowners, **AI** = Amenity Investors, **LP** = Lifestyle Producers, **IP** = High-value Producers, **DL** = Disengaged Landholders

^A All tests in section run with chi square test using Monte Carlo p-value simulations (2000 replicates).

^B All tests in section run using ANOVA

*significant within group differences at the <0.1 level, **at the <0.05 level; ***at the <0.01 level

[↑]significantly higher at <0.05 level compared with all other groups combined

[↓]significantly lower at <0.05 level compared with all other groups combined

4.1.1 Lifestyle Homeowners (n = 69, 26%)

Lifestyle Homeowners were the largest and generally the most enthusiastic group about program enrollment, and they perceived significantly fewer trust barriers (mean = 2.84) and time barriers (mean = 2.81) than any other group. Additionally, this group is the only landowner cluster that tended to be more politically liberal (46%) than conservative (22%), a characteristic that firmly distinguishes them from Amenity Investors. While respondents in this group are classified as “non-producers,” there were some reported agricultural (26%), timber (28%), and pasture (35%) land uses, and 24% of this group

reported some (primarily low value) agricultural sales in 2014. Therefore, production is not excluded as a land use amongst these landowners, but it seems likely that production-oriented land uses are recreationally-driven.

4.1.2 Amenity Investors (n = 47, 18%)

Amenity Investors are characterized by somewhat higher recreational (~4) and investment land management objectives (3-4) compared with Lifestyle Homeowners. They responded similarly to Lifestyle Homeowners regarding perceived barriers and preferred methods of program engagement, but tended to report somewhat higher Trust Barriers (mean = 3.14) and a greater interest in receiving financial incentives (mean = 3.38). They were least likely landowner group to report agricultural (9%) or pasture (15%) land uses, and were also the least likely to report any agricultural sales (13%). However, approximately 26% of this group reported Timber as a land use of their property, indicating that a portion of this group may represent non-industrial private forestland owners (NIPF) who may not actively manage their land for timber, but instead reserve the potential for future timber harvest on their property. They had the shortest ownership tenure of any group (mean = 21.6 years).

4.2 Producer Typologies

The two producer typologies were differentiated from other typologies primarily by their high production scores and frequent agricultural and timber land uses. They tended to own the largest properties (median > 22 acres) and reported the highest frequency of agricultural sales (~70%). Both typologies tended to perceive more regulatory, trust, and time barriers to enrollment compared with non-producer typologies. Additionally, where non-producer typologies tended not to perceive financial barriers, producers weakly

reported the perception of financial barriers (Lifestyle Producers mean = 3.41; High-value Producers mean = 3.25). I did not detect a difference between interest in incentives between producer and non-producer typologies; however, producers tended to be less interested in the listed land management strategies compared with non-producers. The two classes of producers were split primarily by their consideration of investment potential in their land management.

Figure 2.2

A) Perceived barriers to enrollment in hypothetical watershed stewardship program among landowner typologies. Scale ranges from strongly disagree (1) to strongly agree (5). The center line indicates neither agree nor disagree (3).

B) Likelihood that listed incentives and goals would increase enrollment in hypothetical watershed stewardship program among landowner typologies. Scale ranges from very unlikely (1) to very likely (5). The center line indicates neither likely nor unlikely (3).

Significance levels on plot titles refer to results of ANOVA among all clusters for that variable. Significance levels on error bars within plots refer to results of Mann-Whitney U Test of that group compared with all other groups combined. To the right indicates significantly higher, whereas to the left indicates significantly lower.

*significant at the <0.1 level, **at the <0.05 level, ***at the <0.01 level

LH = Lifestyle Homeowners, AI = Amenity Investors, LP = Lifestyle Producers, HP = High-value Producers, DL = Disengaged Landholders

4.2.1 Lifestyle Producers (n = 53, 20%)

Lifestyle Producers are differentiated from High-value Producers by their low investment scores, marginally lower production scores, and marginally higher conservation scores. This group was the most likely group to report low-value agricultural sales (62% < \$50,000), and was highly unlikely to report high value agricultural sales (6% > \$50,000). They tended to be somewhat more interested in fertilizer/pesticide reduction (mean = 3.17) and substantially more interested in pursuing riparian habitat improvements (mean = 3.9) compared with High-value producers. These individuals appear to represent low-value producers who are motivated more by maintaining a rural lifestyle compared with maximizing returns through their land management.

4.2.2 High-value Producers (n = 46, 17%)

High-value Producers are characterized by high scores for all three objectives (mean > 4), and they were the most likely group to report high value agricultural sales (28% > \$50,000). They were most strongly differentiated from Lifestyle Producers by consideration of their property for development potential (>4), and were less strongly differentiated by a marginally higher investment score. They tended to be disinterested in fertilizer/pesticide reduction (mean = 2.91) and marginally interested in pursuing riparian habitat improvements (mean = 3.49). While this group values the recreational and conservation aspects of landownership, they emphasize strong monetary motivations, and their land management is likely to be ultimately influenced by whatever brings top dollar.

4.3 Disengaged Landholders (n = 53, 20%)

I identified one group – Disengaged Landholders – that was difficult to classify according to land management objective as they reported low scores for all three listed

objectives (mean scores < 3). Though this group reported low production scores, it was difficult to label them as “non-producers” because this group was somewhat likely to report agricultural (32%), timber (47%), and pasture (28%) land uses, and about half of this group (49%) reported agricultural sales. This group is difficult to identify according to readily available property or demographic characteristics, as they tended to fall somewhere between producers and non-producers in terms of income and property size, and were only marginally older than the other groups (mean age = 65.3 years, not significant). However, three characteristics indicate that this group represents a distinct subset of landowners: they were the least likely group to reside on their property (68%), tended to report significantly longer ownership tenures compared with other groups (mean = 34.4 years), and they were by far the most politically conservative group (mean = 65%).

4.4 Distribution of Landowner Typologies

I found no significant difference in the frequency of each cluster represented in each subwatershed, but I did find a significant difference in relative percentage of stream lengths represented between each watershed; Lifestyle Homeowners tend to dominate Eagle Creek (35% of streams) and Deep Creek (30% of streams), whereas Disengaged Landholders tend to dominate Clear Creek (35% of streams) and the Clackamas Mainstem (25% of streams) (Figure 2.3). The percentage of stream kilometers represented tended to be more even in the Clackamas Mainstem, which is geographically between Deep/Eagle Creek and Clear Creek, showing a general increase in representation of conservation scores from east to west across the watershed.

Figure 2.3

Proportion of stream length represented by each landowner cluster in each subwatershed (Chisq $p=0.0035$). Inset maps identify subwatershed boundaries within the Clackamas River watershed.

LH = Lifestyle Homeowners, **AI** = Amenity Investors, **LP** = Lifestyle Producers, **IP** = High-value Producers, **DL** = Disengaged Landholders

5. DISCUSSION

Landowners within the Clackamas River watershed demonstrated a diversity of objectives, and this diversity translated into differences in perceived barriers and preferred methods of engagement with stewardship programs. The relationship between land management objectives and land stewardship is not new; Kline et al. (2000), Majumdar et al. (2009), Fischer (2012), and others have come to similar conclusions. However, my research adds clarity to the relationship between land management objective and stewardship by (1) providing evidence that production objectives act as the dominant variable relating to one's interest in land stewardship, (2) suggesting that one's consideration of conservation and investment objectives moderate the influence of production considerations, and (3) identifying the importance of disengaged landowners as a small but potentially influential group who may require special policy interventions to engage in stewardship, or who may be difficult to engage at all.

5.1 Land Management Objective and Stewardship

As suggested by Koontz (2001), I expected that production objective would correspond with greater financial barriers and greater interest in receiving financial incentives. However, I found only marginal differences between producers and non-producers relating to interest in incentives and no differences relating to perceived financial barriers. Instead, producers differed from non-producers primarily in their greater perception of barriers relating to trust, regulatory concerns, and perceived lack of time. This may be explained by the fact that producers, regardless of ultimate financial motive, are fundamentally in the business of managing land, whereas watershed stewardship programs are in the business of changing land management behaviors. Therefore, enrollment in a watershed stewardship program represents more than a single act; instead, it represents a commitment to change long-standing behaviors.

Though few if any studies have compared perceptions of trust and concerns for regulation between producer and non-producer typologies, I detected strong differences between these groups in regards to these variables. The literature has mostly been silent on these concepts amongst non-producers, but various authors have long suggested that lack of trust and regulatory concerns can be important barriers amongst producers. Sullivan et al. (1996) emphasized a widely reported lack of trust in the government amongst a diverse group of farmers, and Harrison et al. (1998) emphasized that a common reason for lack of trust related to farmers feeling excluded from meaningful engagement with conservation programs. Kallstrom and Ljung (2005) found a widespread concern amongst farmers that heightened regulation would threaten their ability to continue farming. Similarly, Greiner et al. (2009) equated regulatory concerns as a primary risk factor for ranchers to engage

with conservation agencies. One respondent described that these concepts of trusts and concerns for regulation are in fact closely related; “As for trust in governmental organizations, mandates and burdens by the state legislature and appointed committees consisting of people who own no forest land and do not understand those who do, bothers me greatly.” A common underlying theme amongst all of these findings is that producers feel policy makers cannot be trusted to represent their unique goals and needs.

Contrary to suggestions that producers can be split into “sustainable” and “conventional” (Maybery et al. 2005) categories based on land management objective, my findings suggest that producers were perhaps more effectively differentiated according to consideration of their property’s investment potential. Lifestyle Producers” and “High-value Producers” reported only modest differences in conservation score, but were starkly differentiated in their investment scores. These differences translated into a greater interest in pursuing fertilizer/pesticide reduction goals and riparian habitat improvements amongst Lifestyle Producers. This may be due to the fact that riparian restoration activities and fertilizer/pesticide reduction may be associated with decreases in land productivity. While Lifestyle Producers may be more accepting of such strategies because such losses in productivity are unlikely to diminish their ability to continue their farming lifestyle, High-value Producers may be concerned by the potential loss in profitability.

Past studies have tended to consider non-producers to be motivated primarily by lifestyle objectives (Nielsen-Pincus et al. 2015, Fischer 2012); while I found this to be true for both Amenity Investors and Lifestyle Homeowners, the data suggest that non-producers may exhibit more diversity in objective than previously described as these groups were divided by their interest in utilizing their property for investment and development

purposes. However, this diversity did not translate into substantial differences in response, as these two groups reported only minor differences in perceptions of Trust Barriers. It is likely that further data relating to more investment-specific land use considerations are needed to help understand if and how these landowner groups differ.

5.2 The Special Case of Disengaged Landholders

Disengaged Landowners were difficult to describe and even more difficult to understand as they reported a wide diversity of land uses, were generally the most negative group, and yet were characterized by a general lack of strong land management objectives. This group may represent an important new grouping that is less easily characterized by the traditional concepts of land ownership objectives. It is possible that this group represents “non-cooperators,” individuals averse to stewardship programs in general who tend to disagree with all statements. Finley et al. (2006) observed a similar group of forest landowners in a survey of landowner interest in working with neighbors on stewardship objectives. Similarly, Kline et al. (2000) described a group of “passive [forestland] owners” who were motivated primarily by the gratification of property ownership but were not motivated to engage in active land management. Most likely, additional research is needed to accurately represent the land ownership objectives of this group; some potential land management objectives that we did not measure may include a high value of independence (Sullivan et al. 1996, Greiner et al. 2009) or pursuit of peace and quiet (Maybery et al. 2005, Nielsen-Pincus et al. 2015).

Notably, Disengaged Landholders were characterized by high rates of political conservatism (65%). This partly explains this group's lack of interest in enrollment; past decades have seen increasing polarization in political ideology regarding support for

environmental programs, with conservatives tending to lack support (Nielsen-Pincus et al. 2014). While political ideology may be an important consideration of this group, this variable may be difficult to consider when establishing initial relationships with landowners; therefore, it is important to consider more readily available demographic information.

There were two defining demographic features of this group that may help to explain the observed trends – they were the least likely group to reside on their property, and they were the group with the longest mean ownership tenure. The high rate of absentee landownership may partially explain the generally negative attitudes and high barriers perceived by this group; Creighton et al. (2002) suggested that lack of on-site residence of a similar population may have led to a diminished sense of place and subsequent lack of stewardship ethic. Bourassa (1991) described the concept of the non-resident as the “detached outsider” who is more concerned with visual aesthetics and less concerned about emotional or symbolic aspects of place.

This phenomenon is typically used to describe visitors and not landowners, and it does not fit well with my observation that Disengaged Landholders tended to report the longest ownership tenure of any group. This fact, coupled with the high rate of absentee landownership and the high average age of Disengaged Landholders, could indicate that many of these individuals are long-time landowners who are no longer able to reside on and/or actively manage their property, and instead they may be legacy landholders who are uninterested in actively pursuing any active management objectives on their property. This description certainly does not describe all landholders in this group, as this group represented a large range of demographic and parcel characteristics, and it appears likely

that a far greater combination of explanatory variables explain the trends observed in this group.

The very recognition of this group is particularly important as they were the dominant landowner type in two subwatersheds and tend to be highly negative and offer few signals for preferred methods of engagement, if any, with stewardship programs. They tended to be highly uninterested in receiving technical or educational assistance, and were close to neutral regarding interest in receiving financial incentives. This may correspond with findings from Fisher (2012), who noted that a group of absentee forestland owners tended to view fuel treatments as inconvenient. She suggests offering third party contractors to perform on-site work, which may decrease the burden associated with stewardship.

5.3 Landowner Targeting

Majumdar et al. (2009) and Nielsen-Pincus (2015) stress the importance of having information about landowner typology demographics, parcel characteristics, and location to help policy makers target policy interventions. My research further shows the practicality of this concept – to an extent. While I noted substantial differences in property characteristics between non-producers and producers/absentee landowners, I was unable to identify easily recognizable demographic and parcel characteristics between more specific landowner typologies. Such easily recognizable traits alone would be unable to identify the divide in attitude between Lifestyle Homeowners and Amenity Investors, as well as the divide between Lifestyle Producers and High-value Producers. However, this may suggest that a good starting place to discuss land stewardship may be to first gain an understanding of an individual's land management objectives.

Contrary to Nielsen-Pincus et al. (2015), I did not detect significant differences between landowner frequencies between different subwatersheds. However, I did find differences in the portion of stream that each landowner typology represented. This may be an even more important metric, as it suggests that Eagle Creek and Deep Creek may be particularly fruitful areas to focus on stream intervention due to the large portion of stream represented by Lifestyle Homeowners, whereas Clear Creek may be a less cost effective area for restoration due to the heavy presence of Disengaged Landowners.

Each of these sub-watersheds contain similar makeups of agricultural, forestry, and residential land uses, but face different water quality stressors. Data regarding landowner typologies can be coupled with existing information regarding concerns in the watershed to help policy makers to prioritize areas for intervention. The Clackamas sub-basin Total Maximum Daily Load (DEQ 2006) listed water quality standard exceedances for bacteria in the Clackamas Mainstem, Deep Creek, and Clear Creek watersheds, and exceedance for temperature in the Clackamas Mainstem and Eagle Creek watersheds. The current Clackamas Agricultural Water Quality Management Plan (ODA 2015) specified that Deep Creek is the top priority for agri-chemical reductions in the watershed, followed by Eagle and Clear Creeks. This suggests that watershed stewardship programs may want to start initiatives focused on riparian restoration and shade provisioning amongst the relatively liberal and engaged Lifestyle Homeowners in Eagle Creek; another initiative may focus on septic system upgrades amongst Lifestyle Homeowners to address bacterial loadings in Deep Creek; and a third initiative may focus on working with the relative high frequency of Lifestyle Producers in the Clackamas mainstem. While limiting program interventions to these areas are unlikely to achieve significant improvements in water quality, these

suggestions offer strong starting places by which to establish a reputation, build trust, and achieve early on the ground program successes.

5. CONCLUSION

My findings lead to four primary conclusions: (1) land management objectives may be closely related to engagement with stewardship programs; (2) production objectives act as a master variable that is moderated by conservation and investment objectives, (3) some landowners are more easily classified according to a general lack of interest as opposed to strong land management objective, and (4) financial incentives are of limited utility amongst all described landowner typologies.

1. As suggested by Nielsen-Pincus et al. (2015), I was able to detect 5 distinct landowner clusters with distinct motivations for land management that were readily interpretable and were able to be linked with differences in preferred land management strategies. However, my findings suggest that some diversity in land management objective is difficult to predict by simply observing demographic and land use characteristics. Further research (similar to Sullivan et al. 1996) is needed to examine whether differences in land management *objective* translates into on-the-ground conservation action.
2. Landowners differentiated by production objective (e.g. producers and non-producers) tended to be consistently different from one another in terms of mean response, whereas investment and conservation objectives provided less strong differentiations between groups. However, this divide in production consideration does not correspond to divide in perception of financial barriers or interest in

financial incentives (contrary Koontz 2001); instead, I found less tangible differences of opinion relating to lack of trust and concern for regulation.

3. Some landowners (e.g. disengaged landholders) are not easily classified according to traditional concepts of land ownership objective; additional research is needed to understand the objectives driving land ownership in this group.
4. Financial barriers were weakly perceived and financial incentives were weakly desired across all landowner typologies. This general lack of interest in the financial aspects of watershed stewardship supports critiques (Engel et al. 2008, Pirard et al. 2010) and findings (Greiner et al. 2009, Ma et al. 2010) regarding the limited utility of incentives to encourage widespread adoption of stewardship behavior.

In conclusion, I make the fairly obvious but important claim that the first consideration for engaging with landowners should be to understand their ultimate objectives for land ownership, as this may provide a tremendous amount of insight into their needs preferred methods of engagement. Identifying landowner typologies is an important exercise in demonstrating the diversity of objectives represented in a watershed, but applying these concepts require individual-scale attention, collaboration, and consideration.

FINAL THOUGHTS

I have spent the last two years pouring over journal articles, crunching numbers, and staring into space trying to make sense of a jumble of data. While navigating through the scholarship of it all, it can be difficult to forget that this research is not about “Amenity Investors,” or “Lifestyle Producers,” or even landowners at all. It is fundamentally about *people*, real people, who have their own unique stories and perspectives on land stewardship. If there is one thing that I have learned, it is people cannot be neatly classified, and behavior cannot be cleanly explained. The best that we can do is to try to acknowledge this diversity in the experience of land ownership so that, as policy makers and resource managers, we can better conserve the land and serve the people connected to it.

This work challenged me and my worldview. I am a longtime outdoorsman; a fisherman, a backpacker, a climber, a paddler. I am also a longtime environmentalist, and I thought my perspectives on what it meant to steward the land were set. I have enjoyed an occasional trip into the Clackamas River watershed to fish, or to hike along the Clackamas River trail, or to get away from the noise and people so inescapable at my home in Portland. My relationship with the Clackamas, and with nature in general, is one primarily of recreation. I head into rural places when I want to escape the city; I leave when I am finished. As a consequence, I have never come to know a piece of land, its changes with the season, and its connections to the surrounding landscape like the people who live on it. I don’t know what it’s like to rely on a piece of land for my livelihood or my lifestyle or my identity, and I don’t know what it’s like to have such an integral part of my self be subjected to regulation, non-profit intervention, and downstream interests. I have been humbled to hear from people who do. Almost all respondents reported high “conservation

objectives” for their land, and almost all demonstrated an understanding of the relationship between healthy ecosystems and clean water. But while these might be my *only* objectives, landowners must balance these objectives with sometimes conflicting values, and they are faced with hard choices about how to responsibly manage their land.

Policy makers have long addressed rural land management issues with an oversimplified notion that people are both limited by and motivated by money, and the payments for environmental services framework has partly grown out of this concept. Resounding throughout my work is a finding that finances are not a primary barrier to land stewardship in the Clackamas watershed, and accordingly financial incentives are not a panacea to accomplish water quality objectives. Instead, a common theme that emerged was that individuals were limited more by a lack of trust and a general feeling that stewardship initiatives were incompatible with their lifestyle. To say that money is not a concern would be foolish; money talks, and we all operate within the confines of what money allows. However, to say that money can be directly translated into stewardship outcomes would be downright wrong. Financial incentives are necessary to overcome those final hurdles to land stewardship, but what is really needed are human connections, common goals, and a more broad-scale understanding of the inter-connectedness of all who live, work, and rely on the Clackamas River watershed. These are the building blocks on which a culture of stewardship can be fostered.

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APPENDIX A. SURVEY MAILER MATERIALS

School of the Environment
Department of Environmental Science & Management
Natural Resources Management Lab

Post Office Box 751
Portland, Oregon 97207-0751
www.pdx.edu/esm

John Doe,

We are contacting you to ask for your help in a study on the land stewardship experiences and opinions amongst landowners in the Clackamas River watershed. This study is being conducted by Dr. Max Nielsen-Pincus and Matthew DeAngelo from the Portland State University Department of Environmental Science and Management in collaboration with the Clackamas River Water Providers (CRWP), a consortium of drinking water utilities operating in the Clackamas River watershed.

As part of this study, we request that you complete the enclosed questionnaire about your properties in the Clackamas River watershed and your perspective on different measures to maintain its environment. Participation in this study is an opportunity for you to voice your opinions about programs that promote watershed stewardship while supporting the needs of watershed landowners. This research will contribute to a growing body of work regarding the role that public utilities and the private sector can play in strengthening and supporting the environmental and economic benefits of local watersheds. **As a thank you for submitting your completed survey, you will be automatically entered into a drawing to receive a \$100 gift card.**

For convenience, we are also offering the questionnaire in a web-based form. If you would prefer to complete the questionnaire online, you may enter the link and four-digit passcode listed below:

<http://tinyurl.com/ClackamasWatershed>

Passcode: 1234

Please complete the questionnaire and mail it back to us in the enclosed postage-paid envelope, or complete the web version. **Your responses are entirely confidential, and your name will never be connected to your answers.** Your decision to take part in this study is completely voluntary, you may skip any questions you do not want to answer, and you have the right to end your participation at any time. When you complete and return the attached questionnaire, it means that you have read and understood this information, and you agree to take part in this study.

If you have questions or concerns about your participation in this study or about your rights as a research participant, please contact the Human Subjects Research Review Committee at:

PSU Office of Research Integrity
1600 SW 4th Ave., Market Center Building, Suite 620
Portland, OR 97201
503-725-2227 or 877-480-4400

Thank you very much for your time and support of this study. Sincerely,

Max Nielsen-Pincus

Max Nielsen-Pincus
Assistant Professor

Matt DeAngelo

Matt DeAngelo
M.S. Graduate Student
503-451-0394 / deangel2@pdx.edu

APPENDIX A. SURVEY MAILER MATERIALS

Farms, Forests, & Water

A SURVEY OF LANDOWNERS IN THE CLACKAMAS RIVER WATERSHED

As a landowner in the Clackamas River Watershed, you play an important role in a landscape **connected by the flow of water**, and your land provides a variety of benefits to downstream drinking water consumers, recreational users, and wildlife. There is growing interest amongst water resource managers in programs that protect watershed health by **working with landowners to restore or maintain their property in a way that benefits and preserves water quality and supply**. This survey is part of an effort to learn more about what kind of a program might be appropriate for improving and maintaining the health of the Clackamas River watershed.

Survey Instructions

- Please carefully read each question and make your responses clear
- Feel free to write in any additional comments anywhere on the survey
- Please mail your completed survey back in the prepaid envelope provided
- **All of your answers will be kept completely confidential**

Portland State
UNIVERSITY

**YOUR LAND IN
THE CLACKAMAS
RIVER WATERSHED**

*Please answer the following questions regarding your property to help
provide a more complete picture of current land uses in the watershed.*

1 How many years have you owned property in the Clackamas River watershed?

2 Of the land you own, do you rent or lease any of it to others?

- ☐ Yes
☐ No

What for?

3 Do any of the following options characterize the land uses of the property you own or lease in the Clackamas River watershed? (Check all that apply)

☐ My main residence	☐ Annual crops	☐ Hazelnuts or walnuts	☐ Recreation
☐ Ranching	☐ Fruit crops	☐ Timber	☐ Other (please specify)
☐ Dairy	☐ Vineyard	☐ Nursery	____
☐ Hay	☐ Grass seed	☐ Grass / Pasture	

4 How many livestock (including horses, cows, and chickens) do you keep at least part of the time on your properties in the Clackamas River watershed?

Cattle Horses Pigs/Hogs Chickens Other (specify)

5 What was the value of agricultural or forestry sales from your land in the watershed in 2014?

☐ \$0	☐ <\$1,000	☐ \$1,000 - \$9,999
☐ \$10,000 - \$49,999	☐ \$50,000 - \$99,999	☐ >\$100,000

6 How important are the following factors when you are making decisions regarding your land?

Select one response for each item	Not at all Important	Somewhat Important	Very Important
Produce high quality farm or timber products for market	☐	☐	☐
Grow/manage a business through my land's production	☐	☐	☐
Enhance my land's investment value	☐	☐	☐
Enhance my property's development potential	☐	☐	☐
Provide income for me and my family	☐	☐	☐
Provide a safe and comfortable home for me and my family	☐	☐	☐
Leave an asset for future generations of my family	☐	☐	☐
Provide recreational opportunities for me and my family	☐	☐	☐
Protect the health of waterways on or near my property	☐	☐	☐
Preserve open space or aesthetic beauty	☐	☐	☐
Protect local wildlife or native vegetation	☐	☐	☐

YOUR LAND MANAGEMENT EXPERIENCES

Reporting on your land management practices and experiences will help water resource managers more fully understand the role that landowners play in the watershed.

- 7 (a) Please check any of the practices utilized on your land in the boxes to the left.
(b) Then, regardless of whether or not you checked the box in part a, please indicate how much of an impact you think these practices have on river water quality.

(a) Check all practices that apply	(b)	Impact on Water Quality				
		Low		Moderate		High
☐ Use of synthetic fertilizers		☐	☐	☐	☐	☐
☐ Nutrient management plan		☐	☐	☐	☐	☐
☐ Broadcast pesticide application		☐	☐	☐	☐	☐
☐ Precision pesticide application		☐	☐	☐	☐	☐
☐ Integrated pest management		☐	☐	☐	☐	☐
☐ Organic farming		☐	☐	☐	☐	☐
☐ Storm water runoff control		☐	☐	☐	☐	☐
☐ High efficiency irrigation		☐	☐	☐	☐	☐
☐ Livestock exclusion zones around streams		☐	☐	☐	☐	☐
☐ Drainage tiles		☐	☐	☐	☐	☐
☐ Invasive species control		☐	☐	☐	☐	☐
☐ Land set aside for wildlife protection		☐	☐	☐	☐	☐

- 8 (a) Have you ever participated in any of the following voluntary conservation programs on any of the land you own? If so, please check the box on the left for all that apply.
(b) Then, for the boxes you checked, tell us whether your experience was positive or negative.

(a) Check all programs that apply	(b)	Very Negative		Neither positive nor negative		Very Positive
		☐	☐	☐	☐	☐
☐ A federal conservation program (e.g. CREP or EQIP)		☐	☐	☐	☐	☐
☐ A state of Oregon conservation program		☐	☐	☐	☐	☐
☐ A local conservation program (e.g. a watershed council or conservation district)		☐	☐	☐	☐	☐

- 9 Do any of the below statements about conservation real estate apply to you?

Select one response for each item	Yes	No
Some or all of my land is covered by a conservation easement held by a conservation organization or agency.	☐	☐
I have sold, donated, or otherwise transferred the title to land I previously owned to a conservation organization or agency.	☐	☐

- 10** Please report the degree to which you agree with the following opinions. In general, conservation programs are...

	← Agree	No Opinion	Agree →	
Beneficial to wildlife	☐	☐	☐	Harmful to wildlife
Beneficial to my land's productivity	☐	☐	☐	Harmful to my land's productivity
Good for my finances	☐	☐	☐	Bad for my finances
Rewarding to landowners	☐	☐	☐	Harmful to landowners
Compatible with goals for my land	☐	☐	☐	Incompatible with goals for my land
Flexible	☐	☐	☐	Inflexible
A good use of resources	☐	☐	☐	A waste of resources
Easy to enroll in	☐	☐	☐	Difficult to enroll in

**YOUR OPINIONS
ON WATERSHED
CONSERVATION**

Please take the opportunity to fill out the following information regarding what types of practices and features you would like to see in a watershed conservation program.

- 11** A watershed conservation program may be able to help you to accomplish some of the goals listed below while keeping your land in production. Assuming such a program is established in the Clackamas River watershed, how likely would you be to work with the program on any of the following goals?

Select one response for each item	Very Unlikely	Neither Likely nor Unlikely	Very Likely
Reducing fertilizer use	☐	☐	☐
Reducing pesticide use	☐	☐	☐
Improving irrigation efficiency	☐	☐	☐
Transitioning to organic production	☐	☐	☐
Improving storm water runoff control	☐	☐	☐
Adding livestock exclusion zones around streams	☐	☐	☐
Controlling invasive species	☐	☐	☐
Enhancing wildlife habitat	☐	☐	☐
Maintaining healthy streamside and floodplain forests	☐	☐	☐
Restoring degraded stream and floodplain areas	☐	☐	☐
Planting new forests along streams that are not currently forested	☐	☐	☐

12 Would the following increase your interest in working with a watershed conservation program?

Select one response for each item	Definitely Not		Not Sure		Definitely Yes
Annual cash incentives for participating	☐	☐	☐	☐	☐
One-time cash bonus for signing up	☐	☐	☐	☐	☐
A cash bonus for joint participation with neighbors	☐	☐	☐	☐	☐
Discounts at local retailers	☐	☐	☐	☐	☐
Improved marketing for products from my land	☐	☐	☐	☐	☐
Educational/training opportunities	☐	☐	☐	☐	☐
Zero-interest loans	☐	☐	☐	☐	☐
Dedicated staff to help you implement your project	☐	☐	☐	☐	☐

13 How likely would you be to enroll in a watershed conservation program if it required you to work with the following organizations to implement the program or project?

Select one response for each item	Very Unlikely		Not Sure		Very Likely
Natural Resources Conservation Services	☐	☐	☐	☐	☐
Clackamas Soil & Water Conservation District	☐	☐	☐	☐	☐
US Fish and Wildlife Service	☐	☐	☐	☐	☐
Clackamas Pesticide Stewardship Partnership	☐	☐	☐	☐	☐
Oregon Department of Environmental Quality	☐	☐	☐	☐	☐
Oregon Department of Agriculture	☐	☐	☐	☐	☐
Oregon Department of Fish and Wildlife	☐	☐	☐	☐	☐
Producer Organizations	☐	☐	☐	☐	☐
Clackamas River Basin Council	☐	☐	☐	☐	☐
Clackamas River Water Providers	☐	☐	☐	☐	☐
Other non-profit conservation organizations	☐	☐	☐	☐	☐

14 Would you be willing to agree to any of the following in a watershed conservation program?

Select one response for each item	Definitely Not		Not Sure		Definitely Yes
A 10 year contract	☐	☐	☐	☐	☐
A 20 year contract	☐	☐	☐	☐	☐
A deed restriction lasting the length of the contract	☐	☐	☐	☐	☐
Annual reporting to the project sponsor	☐	☐	☐	☐	☐
Specific management actions prior to enrollment	☐	☐	☐	☐	☐
Regular project maintenance and monitoring	☐	☐	☐	☐	☐

15 To what extent do you agree or disagree with the following statements about why you might NOT participate in a watershed conservation program?

Select one response for each item	Strongly Disagree	No Opinion	Strongly Agree
I still don't know enough about these programs	☐	☐	☐
I don't trust the organizations or agencies that run these programs	☐	☐	☐
I'm concerned about legal or regulatory implications	☐	☐	☐
My neighbors or community would give me a hard time	☐	☐	☐
No one else in my community participates in these types of programs	☐	☐	☐
I won't own the property long enough to make it worth my while	☐	☐	☐
I'm uncomfortable with the attention programs like these bring to me	☐	☐	☐
I don't have enough time to participate in a program like this	☐	☐	☐
My finances won't allow it	☐	☐	☐
Enrollment would make it harder to run my business	☐	☐	☐

16 In general, do you agree or disagree with the following statements regarding watershed conservation in the Clackamas River watershed?

Select one response for each item	Strongly Disagree	No Opinion	Strongly Agree
Watershed conservation benefits everyone in the watershed	☐	☐	☐
Watershed conservation is just the right thing to do	☐	☐	☐
The effects of water pollution on public health are worse than we realize	☐	☐	☐
Pollution generated on my land harms people downstream	☐	☐	☐
Development within the watershed threatens water quality	☐	☐	☐
Functioning stream ecosystems are important for a clean water supply	☐	☐	☐
Watershed conservation will threaten my livelihood	☐	☐	☐
Watershed conservation might limit my choice and personal freedoms	☐	☐	☐
While some local areas may have seen declines in water quality, overall water quality in the watershed is not in decline	☐	☐	☐
Claims regarding high pollution levels in the watershed are exaggerated	☐	☐	☐

17 Now that you know a little bit more about the potential features of a watershed conservation program in the Clackamas River watershed, how likely would you say you are to participate in such a program if the program was tailored to your responses above?

☐ Very Unlikely
 ☐ Unlikely
 ☐ Not Sure
 ☐ Likely
 ☐ Very Likely

VEGETATIVE BUFFERS ON YOUR LAND

An effective way to maintain water quality is to keep vegetated buffers around waterways. Please answer the following questions about the use of vegetated buffers on your land.

18 Does a stream, agricultural ditch, slough, or wetland exist anywhere on your property?

- ☐ Yes ☐ No (If no, skip to Question #23)

19 Do you currently have a vegetative buffer around streams or waterways on your property? (select all that apply)

- ☐ No
☐ Yes, I have riparian buffers (native trees, shrubs, and grasses alongside waterways)
☐ Yes, I have filter strips (non-harvested grasses alongside waterways)
☐ Yes, I have grassed waterways (strips of grass seeded within cropland to slow water flow)

Riparian buffer*

Filter strip*

Grassed waterway*

20 On average, about how wide is the vegetative buffer surrounding the waterways on your property?

- ☐ N/A ☐ 5 ft ☐ 10 ft ☐ 20 ft ☐ 35 ft ☐ 50 ft ☐ 100 ft or more

21 Do you currently receive any payments for maintaining a vegetative buffer around your streams (e.g. the federal Conservation Reserve Enhancement Program (CREP))?

- ☐ N/A
☐ Yes, I receive payments for my vegetative buffer in the amount of \$_____ per acre
☐ No, I do not currently receive payments for my vegetative buffer

22 A watershed conservation program may be able to pay you to place or keep land in buffers. What level of payment would motivate you to plant or maintain a buffer of at least 35 feet in width?

Select one response for each item	Definitely Not	Probably Not	Not Sure	Probably Yes	Definitely Yes
No payment required	☐	☐	☐	☐	☐
\$50 per acre / year	☐	☐	☐	☐	☐
\$100 per acre / year	☐	☐	☐	☐	☐
\$200 per acre / year	☐	☐	☐	☐	☐
\$400 per acre / year	☐	☐	☐	☐	☐
\$600 per acre / year	☐	☐	☐	☐	☐
\$800 per acre / year	☐	☐	☐	☐	☐

*Images courtesy of USDA NRCS

**FINALLY, PLEASE
TELL US A LITTLE
ABOUT YOURSELF**

Remember, your responses are entirely confidential. When you have finished the survey, don't forget to mail it back to us in the enclosed envelope.

23 What is your gender? ☐ Male ☐ Female

24 What year were you born?

25 What is the highest level of education that you have completed?

☐ Less than high school degree	☐ Associate's or other 2-year degree
☐ High school degree or equivalent	☐ Bachelor's degree (4 year)
☐ Some college, no degree	☐ Graduate or professional degree

26 What is your political tendency?

☐ Very Liberal	☐ Somewhat Conservative
☐ Somewhat Liberal	☐ Very Conservative
☐ Moderate	

27 Please estimate your total household income in 2014 before taxes. (Check one item only)

☐ Less than \$25,000	☐ \$75,000 - \$99,999
☐ \$25,000 - \$49,999	☐ \$100,000 - \$149,999
☐ \$50,000 - \$74,999	☐ \$150,000 or more

28 Approximately what percentage of your household's income is provided by your land in the Clackamas River watershed?

USE THE SPACE BELOW TO WRITE ANY ADDITIONAL COMMENTS

THANK YOU FOR YOUR TIME AND SUPPORT OF THIS STUDY!

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APPENDIX B. DATA SUMMARY REPORT

This report was prepared for the Clackamas River Water Providers and was submitted in January of 2015. It presents raw data and general trends noted in the survey, and is intended for use by practitioners as well as for distribution to the public.

The 2015 Clackamas River Watershed Survey:

Landowner perspectives on watershed conservation programs

PRELIMINARY DATA REPORT

Prepared by Matt DeAngelo, November 2015
Department of Environmental Science and Management
Portland State University

WITH SUPPORT FROM

The Edward D. and Olive C. Bushby Scholarship
The Nielsen-Pincus Natural Resources and Management Lab
The Clackamas River Water Providers

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Maksim Zemtsov, Research assistant
Elyse Cogburn, Research assistant

A special thanks to the 275 respondents who took the time to fill out the survey, provide comments, and contact us to provide insight into your responses. This effort is an attempt to understand how conservation programs can better serve you, and without your support, this survey effort would be impossible.

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1. USING THIS REPORT

This report presents a summary of data collected from a survey of rural landowners in the Clackamas River watershed, OR. The report begins with an executive summary, which outlines the purpose and methods of the survey. We highlight some key trends noted in the survey data, but we leave interpretation largely up to the reader. In the following sections, we graphically and numerically summarize responses to all questions to provide an overview of the data. In some instances, we have slightly modified the wording of survey questions for presentation clarity – to see question items and data in their raw form, please see the raw data summary in the final section of this report.

Any additional questions regarding the content of this report or methods of data collection may be directed to Matt DeAngelo (deangel2@pdx.edu).

2. EXECUTIVE SUMMARY

Between August and November of 2015, we conducted a survey of private forestry, agricultural, and residential landowners to investigate landowner interest in and preferences for watershed stewardship programs in the Clackamas River watershed, Oregon. The research involved a survey of private forestry, agricultural, and residential landowners with more than 2 acres of property in the Clackamas River watershed. This report presents a summary of findings from the survey.

Background

The Clackamas River is the center of a multi-use watershed characterized by a patchwork of agricultural, semi-urban, and public lands. Eight separate drinking water utilities pump drinking water from the Clackamas River and supply water to over 300,000 customers in Washington and Clackamas Counties. In 2005, an Intergovernmental Agreement for Joint Funding for Watershed Activities between these water utilities and Clackamas County Water Environment Services formalized collaboration for work on water quality and watershed related projects. In 2007, the Clackamas River Water Providers (CRWP) was formed as a central organization to implement these activities¹. In their 2010 Drinking Water Protection Plan, the CRWP outlined two primary goals for maintaining the Clackamas River as a high quality drinking water source:

- Identify, prevent, minimize and mitigate activities that have known or potentially harmful impacts on drinking water quality so that the Clackamas River can be preserved as a high quality drinking water source that meets human future needs and minimizes drinking water treatment costs.
- Promote public awareness and stewardship of healthy watershed ecology in collaboration with other stakeholders.

As one of several strategies to address these goals, the CRWP highlighted the need to work with commercial and small acreage rural landowners in a program to promote watershed stewardship. Key goals of a watershed stewardship program would include restoring or maintaining existing riparian zones and limiting inputs of nonpoint source pollutants² such as pesticides, fertilizers, and bacterial loadings into the water supply. This research project intended to reach out to private landowners to understand how to best work with this important population on watershed stewardship initiatives. The primary objectives of this research were to:

¹ The Clackamas River Water Providers (2010) Drinking Water Protection Plan for the Clackamas River

² Non-point Source Pollutant | a pollutant that cannot be attributed to a single source

- Determine the interest level of watershed landowners for participation in a watershed stewardship program;
- Evaluate potential features of a program that are likely to encourage enrollment;
- Identify key barriers to enrollment in watershed stewardship programs;
- Identify key differences between likely and unlikely program participants.

Most survey questions utilized a form of the Likert scale³ to inquire about current land management practices; perceived impact of land management on downstream water quality; perceptions of watershed stewardship programs; and overall interest in participation with a watershed stewardship program. The results of this survey are intended to provide practical insight into structuring a successful watershed stewardship program for the Clackamas River watershed.

Survey Sample

Landowners were considered eligible for the survey based on the following criteria:

- Property is outside of the Urban Growth Boundary
- Property is at least 2 acres in size
- Property has been zoned as agricultural, rural, or forestry land
- Property is within at least 100 feet from a stream
- Any nursery operating within the watershed, regardless of property size, was considered eligible

The survey was administered via mail and web to 1,031 landowners in the Clackamas River watershed. 72 surveys (6.5%) were returned as undeliverable, leading to an effective sample of 959. To enhance response rate, landowners were contacted four times from August to September via the Dillman Tailored Design Method, which included an initial postcard, followed up by a first round of surveys, a reminder postcard, and a second wave of surveys for non-respondents⁴. We received 275 valid responses – a 28.7% response rate (**Table 1**). Though response rate was lower than anticipated, it is not unprecedented for this population; a previous questionnaire of agricultural landowners in the watershed conducted by the Clackamas River Basin Council in 2013⁵ used the same methods and reported a 20.3% response rate.

³ Likert R (1932). A technique for the Measurement of Attitudes. Archives of Psychology 140:1-55

⁴ Dillman (2000). Mail and Internet Surveys – the Tailored Design Method (2nd ed.) New York: Wiley

⁵ Clackamas River Basin Council (2013). Organic and Sustainable Farming Certification Report

Table 1. Number of contacts and response rate of selected groups.

Group	No. Contacted	Response
Small acreage landowners (2-10 acres)	294	97 (32.7%)
Large acreage landowners (>10 acres)	585	165 (28.2%)
Nurseries	80	11 (13.8%)
Total	959	275 (28.7%)

Key Findings

A few key themes emerged common to most respondents. There was widespread agreement that functioning stream ecosystems are important for a clean water supply, and a majority of respondents stressed that they manage their land to protect environmental attributes such as open space, clean water, and wildlife. Respondents tended to agree that conservation programs can provide benefits to wildlife, and they expressed the highest interest in working with watershed stewardship programs to control invasive species on their property. Most respondents agreed that the best way to increase their interest in working with a watershed stewardship program would be to offer cash payments for watershed stewardship work, and to avoid long-term contracts and deed restrictions. However, we noted some key differences between respondents who stated that they would be likely to enroll in a watershed stewardship program, versus those who said they were unlikely to enroll.

Respondents who specified that they were likely to enroll in a watershed stewardship program...

1. *more frequently* expressed interest in working with a watershed stewardship program on riparian habitat and wildlife restoration goals.
2. *more frequently* expressed the belief that water pollution is bad for human health and perceived a relationship between land management practices and water quality. In particular, they *much more frequently* thought fertilizers, pesticides, and livestock impact water quality.
3. *more frequently* expressed belief that watershed stewardship programs have environmental and social benefits.

Respondents who specified that they were unlikely to enroll in a watershed stewardship program...

1. *more frequently* manage their land to enhance development potential or to manage a farm or timber business. Concurrently, they *less frequently* thought that conservation programs were compatible with their goals for their land.
2. *more frequently* perceived barriers to enrollment with a watershed stewardship program. In particular, they *much more frequently* expressed distrust in agencies or organizations that run these sorts of programs.
3. *more frequently* expressed concern that watershed conservation may lead to increased regulatory pressure.

The above trends suggest that, in general, respondents were concerned for water quality and expressed an interest in environmental stewardship, but they differed in their attitudes towards watershed stewardship programs. **While most respondents were motivated to protect water quality through their own initiative in land management, unlikely program participants did not see the benefit of working with a watershed stewardship program to accomplish these goals.** Additionally, a lack of trust in the organizations and agencies involved in conservation programs played a key role in differentiating likely and unlikely participants. This sentiment is perfectly summarized by the following comment provided by a respondent:

"I believe that water quality is important to me, my children, and society. However, I strongly distrust agencies, especially fanatical environmental agencies that do not take into account cold hard financial realities. So any program would require building trust."

3. DEMOGRAPHICS

In order to evaluate how well our sample represented our population of landowners, we collected basic demographic information and compared the demographics of our population to known demographics of the study area. Because our sample included a combination of residential landowners, small acreage farmers/foresters, and commercial producers, no single existing demographic data source adequately described our population. Therefore, we compared our sample to both known demographics of farmers in Clackamas County⁶ as well as known demographics of residents residing in the same census blocks as our sample⁷.

Gender | Question 23

64% of respondents were male and 36% were female (**Table 2**). These numbers fall roughly halfway between the proportions identified amongst Clackamas County farmers and census block residents, suggesting that our sample was a good representation of gender in our population.

Table 2. Gender of respondents (n=265) compared with county farmer and resident populations.

Gender	Sample	County Farmers	Census Block Residents
Male	64%	78%	51%
Female	36%	22%	49%

Age | Question 24

The mean age of respondents was 63 years, with 47% of respondents aged 65 and over. By comparison, 33% of farmers in Clackamas County and 22% of census block residents were aged 65 and older (**Table 3**). This indicates that our sample is possibly biased towards older residents, and thus may not be fully representative of our population of interest. However, it is important to note that statistics from county farms and census block residents include both individuals who lease and who own property, whereas our sample includes only individuals who own property. Therefore, it is possible that landowners in general tend to be older than the average farmer or resident.

Table 3. Age of respondents (n=248) compared with county farmer and resident populations.

Years	Sample	County Farmers	Census Block Residents
25 to 34	2%	3%	13%
35 to 44	3%	8%	16%
45 to 54	18%	23%	23%
55 to 64	30%	33%	26%
65 and over	47%	33%	22%

⁶ United States Department of Agriculture (2012) Census of Agriculture

⁷ United States Census Bureau (2009 – 2013) American Community Survey

Education | Question 25

Our sample was highly educated, with 48% having received a bachelor's degree or higher, and only 1% having not completed high school (**Table 4**). By comparison, 21% of census block residents have received a bachelor's degree or higher, and 9% have not completed high school. This may indicate a bias in our sample, or it may indicate that landowners in general tend to be more educated. Furthermore, the older age of our sample may have allowed for more time to complete advanced degrees. Educational attainment was not available for county farmers.

Table 4. Educational attainment of respondents (n=261) compared with county resident population.

Educational Attainment	Sample	Census Block Residents
Less than High School	1%	9%
High School Graduate or more	13%	32%
Some college or more	38%	38%
Bachelor's Degree or more	23%	14%
Graduate or Professional Degree	25%	7%

Income | Question 27

Our sample reported substantially higher annual household incomes than census block residents, with 37% reporting an income of at least \$100,000/year and only 5% reporting an income of less than \$25,000/year (**Table 5**). By comparison, 28% of census block residents reported an income of at least \$100,000/year and 15% reported an income of less than \$25,000/year. Household income was not available for county farmers.

Table 5. Household income of respondents (n=225) compared with county resident population.

Household Income	Sample	Census Block Residents
Less than 25K	5%	15%
25 to 50K	14%	20%
50 to 75K	25%	20%
75 to 100K	19%	17%
100 to 150K	17%	19%
150K or more	20%	9%

Political Tendency | Question 26

Our sample was substantially skewed towards conservative political tendencies, with 47% of respondents reporting their political tendency as either somewhat or very conservative (**Figure 1**). Conversely, 27% of respondents identified themselves as either somewhat or very liberal. By comparison, Clackamas County voters have favored democratic candidates in

the last two presidential elections⁸, but our sample represents a more rural population than Clackamas County as a whole, and rural voters tend to hold more conservative values⁹.

Figure 1. Political tendency of respondents (n=235).

Years Owning Property | Question 1

The mean number of years that respondents owned their current property was 29.9 years, compared with 21.5 years for Clackamas County farmers (**Table 6**). While this indicates that our sample may have owned property substantially longer than our population of interest, several respondents indicated property ownership for 70 up to 168 years. Presumably, these respondents answered for years of family ownership. However, when these responses were removed, the mean property ownership remained above the County average at 26.9 years.

Table 6. Years owning property of respondents (n=249) compared with county farmer population.

Years	Sample	County Farms
2 or less	1%	2%
2 to 4	6%	4%
4 to 10	7%	14%
10 or more	86%	79%

⁸ Clackamas County General Election Results

⁹ McKee (2008) Rural Voters and the Polarization of American Presidential Elections. Univ. of S. Florida Petersburg

4. PROPERTY CHARACTERISTICS

To ensure that our sample represented the wide diversity of property types within the Clackamas River watershed, we evaluated the land usage, property size, and land management practices utilized by our sample.

Land Usage | Question 3

A large majority of respondents (85%) considered their property in the Clackamas River watershed to be their primary residence (**Figure 2**). By comparison, 91% of Clackamas County farmers live on their farm properties¹⁰. Other important land uses include production of timber (44%), grass and pasturelands (34%), and production of hay (20%). All other land uses were reported by fewer than 20% of respondents.

Figure 2. Count of respondents (n=256) reporting listed land uses.

Property Size

Based on available tax lot data, we calculated the total number of acres within the watershed owned by each respondent (**Table 7**). The mean acreage owned by respondents was 105 acres, compared with an average farm size of 43 acres in Clackamas County as a whole. This difference in property size may be due to our exclusion of properties within the urban growth boundary, which are more restricted in size. Nonetheless, our sample may hold a significant bias towards large-acreage property owners.

Table 7. Total acreage owned by respondents (n=240) compared with county farmer population.

Acres	Sample	County Farms
1 to 9 acres	32%	38%
10 to 49 acres	43%	44%
50 to 179 acres	12%	15%
180 to 499 acres	8%	3%
500 to 999 acres	3%	1%
1000 or more acres	2%	<1%

¹⁰ United States Department of Agriculture (2012) Census of Agriculture

Agricultural and Forestry Sales | Question 5

We asked a question regarding the value of agricultural sales in 2014, and out of 254 respondents, 149 of them (59%) reported no agricultural sales. **Table 8** shows data only for the 105 respondents who reported agricultural sales in 2014. Respondents generally reported higher value agricultural sales than Clackamas County farmers in general did in 2012; 42% of respondents reported sales over \$10,000, whereas 28% of Clackamas County farmers reported similar sales. This difference could either be due to the different years of measurement, or our sample could be slightly biased towards higher value agricultural producers.

Table 8. Agricultural and/or forestry sales of respondents (n=105) compared with county farmers

Agricultural/Forestry Sales	Sample	County Farms
Less than \$1K	22%	28%
\$1K to \$10K	36%	45%
\$10K to \$50K	20%	17%
\$50K to \$100K	8%	4%
More than \$100K	14%	7%

Land Management Practices | Questions 7-9

In question 8, we asked respondents whether they utilized a variety of land management practices on their land. Out of the 199 respondents who marked at least one of the listed land management practices, 107 marked invasive species control and 83 marked the use of synthetic fertilizers. Only 22 respondents marked the use of an integrated pest management plan, and only 21 marked the use of broadcast pesticide application practices.

Figure 3. Count of respondents (n=199 marked at least 1) reporting listed land management practices.

We also asked respondents to report whether they had participated in past land stewardship or conservation programs (questions 8 and 9), and we found that very few respondents had past participation with such programs. 10 individuals reported participation in a federal program, 14 individuals reported participation in a state program, and 24 individuals reported

participation in other sorts of programs. Only 2 individuals marked that they had either enrolled or donated land to a conservation easement.

Vegetative Buffers | Question 20

We asked whether a stream, agricultural ditch, slough, or wetland exists anywhere on the respondent's property. Of the 255 who answered this question, 191 (75%) answered affirmatively. We then asked whether they had a vegetative buffer around their stream, and if so, to identify the type. Out of 180 respondents reporting some sort of buffer on their stream, 157 reported a riparian buffer, 28 reported having a filter strip, and 18 reported having grassed waterways. Last, we asked participants the average width of their vegetative buffer (**Figure 4**). 45% reported having a buffer of greater than 100 feet in width; 26% reported a buffer of 35 to 50 feet in width; and 29% reported having a buffer between 5 and 20 feet in width (Figure 3).

Figure 4. Average width of vegetative buffers surrounding streams (n=164).

5. RESPONDENT GROUPING

One of the driving objectives behind this research was to identify key differences between likely and unlikely watershed stewardship program participants. By understanding what differentiates a likely participant from an unlikely participant, water resource managers may target outreach efforts to address some of these key dividing issues, and watershed conservation programs may be designed to achieve higher enrollment.

In the 2015 Clackamas Landowner Survey, we asked a series of questions relating to a hypothetical watershed conservation program. Questions pertained to (1) factors influencing land management decisions, (2) perception of the relationship between land management and water quality, (3) attitudes towards conservation programs general, (4) attitudes towards potential features of watershed conservation programs, (5) perceived barriers to participation in watershed conservation programs, and (6) beliefs about the need for watershed conservation in the Clackamas River watershed. These questions were designed to showcase the broad array of forms a watershed conservation program could take. Following these questions, we asked,

“Now that you know a little bit more about the potential features of a watershed conservation program in the Clackamas River watershed, how likely would you say you are to participate in such a program if the program was tailored to your responses above?” (Question 17)

Figure 5. Respondents' (n=246) willingness to participate in a watershed conservation program.

In order to see differences between likely and unlikely participants, we split our sample into three groups – the **Yes Group** (those who answered “likely” or “very likely” to participate, n=74), the **No Group** (those who answered “unlikely” or “very unlikely” to participate, n=66), and the **Maybe Group** (those who answered that they were “not sure”, n=106). About 30% of respondents were placed in the Yes Group, 27% of respondents were placed in the No Group, and 43% of respondents were placed in the Maybe Group (**Figure 5**).

Demographic Comparison of Groups

We compared the demographics between these three groups, and found no substantial difference in property size, educational attainment, household income, location of residence, number of years owning property, value of agricultural sales, or size of vegetative buffer. The Yes Group tended to be younger (mean age 59) compared with the Maybe Group (mean age 62) and the No Group (mean age 69). This may indicate that age plays a significant role in determining an individual's

willingness to participate in watershed stewardship programs. **Figure 6** shows that the Yes and No Groups tended to be made up primarily of male respondents, whereas the Maybe Group tended to comprise primarily of female respondents.

Figure 6. Comparison of gender makeup between the No (n=65), Maybe (n=103), and Yes (n=73) Groups.

Figure 7. Comparison of political tendency between the No (n=61), Maybe (n=87), and Yes (n=66) Groups.

Figure 7 shows that 49% of the Yes Group identified themselves as liberal or very liberal, whereas only 18% of the No Group identified themselves as such. There was no substantial difference in the number of respondents considering themselves politically moderate.

For each section presented throughout this report, we evaluate responses of our entire sample, and then compare how responses differed between these three groups.

6. EXPERIENCES WITH LAND MANAGEMENT

The 2015 Clackamas Landowner survey included a series of questions relating to past and present experiences with land management. We asked about the importance of various factors influencing land management decisions, utilization of specific land management practices, past experience with conservation programs, and attitudes towards conservation programs. These questions are intended to help inform water resource managers by providing insight into the diverse suite of factors that a landowner in the Clackamas River watershed must consider when managing their land.

Factors Influencing Land Management | Question 6

We asked, *“How important are the following factors when making decisions regarding your land?”*

Figure 8. Influential factors for land management decisions among respondents (n = 250 to 260).

Figure 8 shows that the single most important factor influencing land management decisions amongst respondents was “to provide a safe and comfortable home for me and my family”, with 88% of respondents marking this item as important or very important. Environmental factors were also highly rated by a majority of respondents, with over 70% marking the protection of local waterways (78%), the protection of wildlife and native vegetation (75%), and the preservation of open space (71%) as important or very important. The production of farm or timber products, provision of income, enhancement of the property’s development potential and business considerations were ranked as the least important factors.

Box 1. Land production, business, and income considerations were generally not considered important factors in land management decisions. However, these factors were considered substantially more important by landowners with agricultural or forestry sales of greater than \$1000.

Table 9. Percentage of respondents who reported the item as an “important” or “very important” factor in making land management decisions. The column “Difference” indicates the difference between the Yes Group and the No Group.

n		No	Group Maybe	Yes	Difference
237	Preserve open space	60%	66%	88%	28%
239	Protect wildlife	65%	71%	92%	27%
237	Protect nearby waterways	68%	71%	93%	25%
235	Provide recreational opportunities	43%	46%	59%	16%
231	Provide a home	84%	88%	92%	8%
229	Enhance investment value	52%	45%	58%	6%
237	Leave an asset for my family	73%	65%	68%	-5%
233	Produce farm/timber products	41%	36%	35%	-6%
231	Provide income	34%	24%	28%	-6%
233	Manage a business	25%	18%	15%	-10%
235	Enhance development potential	30%	18%	16%	-14%

Table 9 shows that respondents in the Yes Group more frequently marked that environmental or recreational factors were important influences on their land management decisions. Compared with the No Group, the Yes Group marked “preserve open space” 28% more frequently, “protect wildlife” 27% more frequently, “protect nearby waterways” 25% more frequently, and “provide recreational opportunities” 16% more frequently. Conversely, respondents in the Yes Group less frequently marked practical considerations

as important influences on their land management decisions. Compared with the No Group, the Yes Group marked “enhance development potential” 14% less frequently and “manage a business” 10% less frequently. Respondents in the No and Maybe Groups most often marked “provide a home,” whereas respondents in the Yes Group most often marked “protect nearby waterways.” Respondents in all three groups least often marked “manage a business.”

Perception of Water Quality Impacts | Question 7

We asked, *“Please indicate how much of an impact you think these practices have on river water quality.”*

Figure 9. Respondents' perceptions of water quality impacts ($n = 164$ to 217).

Figure 9 shows the impact that respondents perceive common land management practices to have on water quality. Note that the term *impact* was not defined as a positive or negative relationship to water quality; instead, this question was asked to gain insight into the degree with which landowners perceive a *relationship* between land management and water quality. Respondents perceived broadcast pesticide application to have the greatest impact on water quality, with 64% of respondents reporting this activity to have a moderately high to very high impact on water quality. Livestock exclusion zones around streams (58%), use of synthetic fertilizers (52%), and storm water runoff control (50%) were all reported as important or very important by more than half of respondents.

Table 10. Percentage of respondents who reported the item as having a “moderately high” or “high” impact on water quality. The column “Difference” indicates the difference between the Yes Group and the No Group.

n		No	Group Maybe	Yes	Difference
200	Synthetic fertilizers	27%	60%	64%	37%
166	Broadcast pesticide application	44%	64%	78%	34%
169	Livestock exclusion zones	41%	56%	75%	34%
151	Integrated pest management	18%	41%	47%	29%
166	Nutrient management plan	32%	41%	60%	28%
176	Precision pesticide application	23%	37%	47%	24%
182	Land for wildlife protection	35%	41%	59%	24%
154	Drainage tiles	20%	30%	36%	16%
175	Storm water runoff control	42%	49%	57%	15%
172	Organic farming	33%	37%	45%	12%
161	High efficiency irrigation	43%	41%	47%	4%
195	Invasive species control	54%	49%	49%	-5%

Table 10 shows that for nearly all items, respondents in the Yes Group more frequently perceived the listed land management actions as having a high impact on water quality. Compared with the No Group, the Yes Group marked “synthetic fertilizers” 37% more frequently, “broadcast pesticide application” 34% more frequently, “livestock exclusion zones” 34% more frequently, “integrated pest management” 29% more frequently, and “nutrient management plan” 28% more frequently. Respondents in the No Group most often marked “invasive species control,” whereas respondents in the Maybe and Yes Groups most often marked “broadcast pesticide application.” Conversely, respondents in all three groups least often marked “drainage tiles.”

Attitudes towards Conservation Programs | Question 10

We asked, *“Please report the degree to which you agree with the following opinions. In general, conservation programs are...”*

Figure 10 shows that, in general, respondents held either positive or neutral attitudes regarding conservation programs. In particular, respondents were highly positive regarding the benefits to wildlife, with 83% reporting that conservation programs had either positive or very positive impacts on wildlife. Respondents generally reported that conservation programs were a good use of resources (52%), rewarding to landowners (48%), compatible with goals for their land (46%) and beneficial to their lands productivity (46%). A majority of respondents expressed neutral attitudes regarding the impact of conservation programs on their finances, the flexibility of conservation programs, or the ease of enrollment in conservation programs.

Figure 10. Respondents' attitudes towards conservation programs (n = 255 to 259).

Table 11 shows that the Yes Group had more positive attitudes towards conservation programs. Compared with the No Group, the Yes Group marked “compatible with my goals” 45% more frequently, “beneficial for land productivity” 40% more frequently, “rewarding to landowners” 39% more frequently, and “a good use of resources” 39% more frequently. Respondents in all three groups most often marked “beneficial to wildlife.” Conversely, respondents in the No Group least often marked “good for my finances,” respondents in the Maybe Group least often marked “flexible,” and respondents in the Yes Group least often marked “easy to enroll in.”

Table 11. Percentage of respondents who reported a “positive” or “very positive” attitude regarding each statement about conservation programs. The column “Difference” indicates the difference between the Yes Group and the No Group.

n		No	Group Maybe	Yes	Difference
233	Compatible with my goals	28%	36%	73%	45%
233	Beneficial for land productivity	25%	46%	65%	40%
233	Rewarding to landowners	31%	43%	70%	39%
231	A good use of resources	34%	49%	73%	39%
233	Good for my finances	13%	21%	39%	26%
232	Beneficial to wildlife	71%	84%	93%	22%
233	Flexible	20%	14%	38%	18%
231	Easy to enroll in	18%	15%	29%	11%

7. PERSPECTIVES ON WATERSHED STEWARDSHIP

The 2015 Clackamas Landowner survey included a series of questions regarding preferences for a hypothetical watershed stewardship program. We asked about interest in achieving watershed stewardship goals, desired incentives for participation, interest in working with selected agencies and organizations, perceived barriers to participation, and beliefs regarding the need for watershed stewardship in the Clackamas River watershed.

Likelihood of working towards stewardship goals | Question 11

We asked, “How likely would you be to work with a watershed conservation program on any of the following goals?”

Figure 11. Respondents' likelihood of working towards conservation goals (n = 238 to 251).

Figure 11 shows that many respondents reported that they would be either likely or very likely to work towards habitat restoration goals such as controlling invasive species (68%), enhancing wildlife habitat (61%), maintaining healthy streamside forests (61%), restoring floodplains (52%), or planting new riparian forests (50%). Fewer respondents reported that they were likely or very likely to work towards more specific land management goals such as improving storm water runoff control (43%), reducing pesticide use (39%), improving irrigation efficiency (33%), adding livestock exclusion zones around streams (32%), reducing fertilizer use (31%), and transitioning to organic production (29%).

Table 12. Percentage of respondents who answered “likely” or “very likely” to work with a watershed conservation program on the listed goals. The column “Difference” indicates the difference between the Yes Group and the No Group.

n		No	Group Maybe	Yes	Difference
231	Planting new riparian forests	18%	47%	78%	60%
231	Restoring riparian forests	22%	51%	78%	56%
233	Maintaining riparian forests	31%	61%	85%	54%
234	Enhancing wildlife habitat	35%	66%	84%	49%
226	Reducing pesticide use	14%	33%	62%	48%
231	Improving storm water control	19%	38%	65%	46%
229	Reducing fertilizer use	7%	29%	51%	44%
223	Adding livestock exclusion zones	11%	26%	54%	43%
226	Improving irrigation efficiency	10%	27%	52%	42%
235	Controlling invasive species	48%	66%	88%	40%
226	Transitioning to organics	12%	22%	51%	39%

Table 12 shows that the Yes Group most frequently expressed interest in working towards all listed goals and expressed an exceptionally high interest in working towards environmental goals. Compared with the No Group, the Yes Group marked “planting new riparian forests” 60% more frequently, “restoring riparian forests” 56% more frequently, “maintaining riparian forests” 54% more frequently, and “enhancing wildlife habitat” 49% more frequently. Respondents in all three groups most often marked “controlling invasive species.” Conversely, respondents in the No Group least often marked “reducing fertilizer use,” whereas respondents in the Maybe and Yes Groups least often marked “transitioning to organics.”

Desired Incentives for Enrollment | Question 12

We asked, “*Would the following increase your interest in working with a watershed conservation program?*”

Figure 12 shows which incentives are most likely to increase respondent interest in watershed stewardship programs. The highest number of respondents marked “probably yes” or “definitely yes” for annual cash incentives (51%), a one-time cash bonus (45%) and dedicated staff to help implement projects (43%). Respondents expressed a moderate degree of interest in discounts at local retailers, a bonus for working with neighbors, and educational/training opportunities. Respondents expressed a high degree of uncertainty or disinterest in zero-interest loans or improved marketing opportunities.

Figure 12. Respondents' interest in various incentives for participation (n = 243 to 249).

Box 2. Respondents with sales over \$1000 in 2014 were much more likely to be interested in annual cash incentives, a one time cash bonus, and improved marketing opportunities for products from their land.

Table 13 shows that incentives will probably increase interest amongst respondents in the Yes Group. Compared with the No Group, the Yes marked “dedicated project staff” 49% more frequently, “annual cash incentives” 46% more frequently, “one-time cash bonus” 45% more frequently, and “educational/training opportunities” 44% more frequently. Respondents in all three groups most often marked “annual cash incentives.” Conversely, respondents in the No Group least often marked “educational/training opportunities,” whereas respondents in the Maybe and Yes Groups least often marked “improved marketing opportunities.”

Table 13. Percentage of respondents who answered “yes” or “definitely yes” to interest in incentives. The column “Difference” indicates the difference between the Yes Group and the No Group.

n		Group			Difference
		No	Maybe	Yes	
229	Dedicated project staff	20%	33%	69%	49%
233	Annual cash incentives	28%	47%	74%	46%
231	One-time cash bonus	23%	42%	68%	45%
229	Educational/training opportunities	10%	35%	54%	44%
230	A bonus for working with neighbors	18%	35%	55%	37%
227	Discounts at local retailers	20%	37%	54%	34%
231	Zero-interest loans	15%	26%	39%	24%
228	Improved marketing opportunities	14%	17%	31%	17%

Preferred Partner Organizations | Question 13

We asked, “How likely would you be to enroll in a watershed conservation program if it required you to work with the following organizations to implement the program or project?”

Figure 13. Respondents' preferred partner organizations (n = 245 to 251). Acronyms listed in Table 14.

Figure 13 shows respondents likelihood of working with potential partner organizations. Respondents generally expressed uncertainty, with at least 37% of respondents marking “Not Sure” for all items. However, the greatest number of respondents marked likely or very likely to work with Oregon Department of Fish and Wildlife (38%) and the US Fish and Wildlife Service (37%).

Table 14. Percentage of respondents who answered “likely” or “very likely” to work with the listed organizations. The column “Difference” indicates the difference between Group Yes and Group No.

n		Group			Difference
		No	Maybe	Yes	
234	CRBC (Clackamas River Basin Council)	8%	14%	56%	48%
231	NRCS (Natural Resources Conservation Services)	10%	16%	54%	44%
234	USFWS (US Fish and Wildlife Service)	19%	23%	63%	44%
234	ODFW (Oregon Dept. of Fish and Wildlife)	21%	22%	64%	43%
230	SWCD (Soil & Water Conservation District)	12%	19%	54%	42%
238	PSP (Clackamas Pesticide Stewardship Partnership)	8%	12%	49%	41%
229	Other non-profit conservation organizations	7%	8%	46%	39%
232	DEQ (Oregon Dept. of Environmental Quality)	10%	10%	48%	38%
232	CRWP (Clackamas River Water Providers)	11%	9%	46%	35%
234	ODA (Oregon Dept. of Agriculture)	18%	21%	50%	32%
232	Producer Organizations	13%	9%	32%	19%

Table 14 shows that for all organizations, respondents in the Yes Group expressed higher interest in working with the listed organizations. Notably, the Yes Group marked the Clackamas River Basin Council 48% more frequently. Respondents in all three groups most often marked the Oregon Department of Fish and Wildlife. Conversely, respondents in the No and Maybe Groups least often marked non-profits, whereas those in the Yes Group least often marked producer organizations.

Agreement to Contractual Features | Question 14

We asked, “Would you be willing to agree to any of the following in a watershed conservation program?”

Figure 14. Respondents' willingness to agree to contractual obligations (n = 248 to 251).

Figure 14 shows that respondents were generally uncertain or unwilling to commit to contractual obligations. In particular, 46% of respondents marked probably or definitely not to signing a 10 year contract, 56% to signing a 20 year contract, and 58% to signing a deed restriction.

Table 15. Percentage of respondents who answered “yes” or “definitely yes” to agreeing to the listed features. The column “Difference” indicates the difference between Group Yes and Group No.

n		Group			Difference
		No	Maybe	Yes	
234	Annual reporting requirements	3%	9%	45%	42%
234	Regular maintenance and monitoring	3%	10%	42%	39%
234	Management actions prior to enrollment	6%	7%	32%	26%
234	A 10 year contract	5%	3%	25%	20%
232	A deed restriction	3%	3%	13%	10%
234	A 20 year contract	6%	2%	11%	5%

Table 14 shows that the Yes Group was more willing to agree to contractual features than the No or Maybe Groups. Compared with the No Group, the Yes Group marked “annual reporting requirements” 42% more frequently and “regular maintenance and monitoring” 39% more frequently. Respondents in the Maybe Group most often marked “regular maintenance and monitoring,” whereas respondents in the Yes Group most often marked “annual reporting requirements.” Respondents in both groups least often marked “a 20 year contract.” Fewer than 6% of respondents in the No Group marked that they would be willing to agree to any of the listed items.

Barriers to Participation | Question 15

We asked, “To what extent do you agree or disagree with the following statements about why you might NOT participate in a watershed conservation program?”

Figure 15. Barriers to participation in watershed conservation programs (n = 238 to 242).

Figure 15 shows reasons why respondents would not participate in a watershed conservation program. The majority (64%) either agreed or strongly agreed that they did not have enough information; this is logical given that all

questions were pertaining to a hypothetical conservation program. 60% of respondents agreed that they were concerned about regulatory implications, and 49% noted a lack of trust of organizations that run conservation programs. Few people agreed that lack of neighbor support (9%) or community support (5%) would prevent them from participating.

Table 16. Percentage of respondents who answered “agree” or “strongly agree” to the listed barriers. The column “Difference” indicates the difference between Group Yes and Group No.

n		Group			Difference
		No	Maybe	Yes	
275	Lack of information	40%	70%	74%	34%
272	Concerns for regulation	53%	64%	60%	7%
272	Lack of neighbor support	10%	10%	7%	-3%
272	Lack of community support	7%	6%	3%	-4%
275	Insufficient finances	34%	38%	26%	-8%
272	Unlikely to own property much longer	22%	10%	12%	-10%
274	Discomfort with increased attention	30%	25%	14%	-16%
274	Insufficient time	43%	33%	26%	-17%
270	Concerns relating to business	31%	12%	12%	-19%
273	Lack of trust	48%	47%	23%	-25%

Table 16 shows that, in general, the Yes Group perceived fewer barriers. Compared with the No Group, the Yes Group marked “discomfort with increased attention” 16% less frequently, “insufficient time” 17% less frequently, “concerns relating to business” 19% less frequently, and “lack of trust” 25% less frequently. Respondents in the No Group most often marked “concern for regulations,” whereas respondents in the Maybe and Yes Groups most often marked “lack of information.” Conversely, respondents in all three groups least often marked “lack of community support.”

Beliefs about Watershed Conservation | Question 16

We asked, *“In general, do you agree or disagree with the following statements regarding watershed conservation in the Clackamas River watershed?”*

Figure 16 shows that many respondents either agreed or strongly agreed that functioning stream ecosystems are important for a clean water supply (88%), watershed conservation is the right thing to do (65%), watershed conservation benefits everyone in the watershed (62%), water pollution is detrimental to human health (59%), and development within the watershed threatens water quality (57%). Despite this recognition of the important of water quality, 45% of respondents agreed or strongly agreed that watershed conservation might limit their choice and personal freedoms. 48% of respondents disagreed that pollution from their property has impacts downstream.

Figure 16. Respondents' beliefs regarding watershed conservation (n = 240 to 245).

Table 17 shows that the Yes Group more frequently believed that watershed stewardship programs have environmental and societal benefits. Compared with the No Group, the Yes Group marked “conservation is the right thing to do” 52% more frequently, “conservation benefits everyone” 49% more frequently, mark “development threatens water quality” 35% more frequently, and “water pollution is bad for health” 34% more frequently. Additionally, the Yes Group was less likely to hold negative beliefs about watershed conservation. Compared with the No Group, the Yes Group marked “conservation threatens my livelihood” 20% less frequently, “conservation limits my freedoms” 22% less frequently, and “water quality is not in decline” 22% less frequently. Respondents in all three groups most often marked “healthy streams provide clean water.” The No Group least often marked “pollution here has impacts downstream,” whereas the Maybe and Yes Groups least often marked “conservation threatens my livelihood.”

Table 17. Percentage of respondents who answered “agree” or “strongly” to the listed beliefs. The column “Difference” indicates the difference between Group Yes and Group No.

n		Group			Difference
		No	Maybe	Yes	
236	Conservation is the right thing to do	37%	64%	89%	52%
237	Conservation benefits everyone	39%	60%	88%	49%
235	Development threatens water quality	39%	57%	74%	35%
237	Water pollution is bad for health	39%	60%	73%	34%
235	Healthy streams provide clean water	71%	87%	99%	28%
237	Pollution here has impacts downstream	23%	27%	48%	25%
236	Pollution levels are exaggerated	29%	16%	11%	-18%
233	Conservation threatens my livelihood	28%	11%	8%	-20%
237	Conservation limits my freedoms	60%	42%	38%	-22%
236	Water quality is not in decline	34%	21%	12%	-22%

Payments for Vegetative Buffers | Question 22

We asked, “A watershed conservation program may be able to pay you to place or keep land in buffers. What level of payment would motivate you to plant or maintain a buffer of at least 35 feet in width?”

Figure 17. Payments required to plant or maintain an acre of vegetative buffer (n = 131 to 149).

Figure 17 shows an expected trend; as payments for buffers increase, more landowners reported an interest in placing or maintaining vegetative buffers on their land. Only 15% of landowners would plant or maintain vegetative buffers for \$50 per acre/year, whereas 45% of landowners would plant or maintain a vegetative buffer for \$800 per acre/year. Interestingly, 28% of respondents reported that no payment is required to plant or maintain buffers; this is a greater portion than those who reported \$50 or \$100 per acre/year.

Table 18. Percentage of respondents who answered “probably yes” or “definitely yes” to the listed payments. The column “Difference” indicates the difference between Group Yes and Group No.

n		No	Group Maybe	Yes	Difference
146	No payment required	21%	17%	35%	14%
128	\$50 per acre / year	0%	11%	29%	29%
129	\$100 per acre / year	0%	22%	37%	37%
131	\$200 per acre / year	8%	22%	49%	41%
131	\$400 per acre / year	17%	27%	56%	39%
132	\$600 per acre / year	28%	30%	60%	32%
135	\$800 per acre / year	27%	37%	60%	33%

Table 18 shows that the Yes Group was more willing to enroll at lower levels of payment than the No Group. Note that the drop in respondents between “No payment required” and “\$50 per acre / year” was particularly pronounced amongst respondents in the No Group. This may indicate that these respondents are particularly unwilling to accept payment for watershed stewardship work.

8. Raw Data Summary

Q6) How important are the following factors when you are making decisions regarding your land?

n		Not at all	Slightly	Somewhat	Important	Very
260	Provide a safe and comfortable home for me and my family	6.9%	2.7%	2.3%	8.8%	79.2%
258	Protect the health of waterways on or near my property	3.1%	3.9%	15.5%	24%	53.5%
260	Protect local wildlife or native vegetation	2.7%	5%	17.3%	25.8%	49.2%
256	Preserve open space or aesthetic beauty	6.6%	5.1%	16.8%	23.4%	48%
257	Leave an asset for future generations of my family	7.8%	6.6%	18.7%	19.8%	47.1%
254	Enhance my land's investment value	13.8%	9.4%	25.2%	22%	29.5%
256	Provide recreational opportunities for me and my family	13.3%	8.2%	28.9%	20.7%	28.9%
253	Produce high quality farm or timber products for market	41.1%	8.3%	12.3%	11.5%	26.9%
254	Provide income for me and my family	37.8%	15.7%	18.5%	10.2%	17.7%
251	Enhance my property's development potential	43.4%	15.5%	19.9%	9.6%	11.6%
250	Grow/manage a business through my land's production	47.6%	14.8%	17.2%	6.8%	13.6%

Q7) Please indicate how much of an impact you think these practices have on river water quality.

n		Low	Low/Mod	Moderate	Mod/High	High
180	Broadcast pesticide application	13.9%	6.7%	15.6%	17.8%	46.1%
184	Livestock exclusion zones around streams	16.8%	5.4%	20.1%	18.5%	39.1%
217	Use of synthetic fertilizers	23.5%	9.2%	15.7%	18.4%	33.2%
190	Storm water runoff control	17.9%	11.1%	21.1%	21.1%	28.9%
213	Invasive species control	15%	9.9%	25.8%	19.7%	29.6%
196	Land set aside for wildlife protection	20.4%	9.7%	25%	16.3%	28.6%
175	High efficiency irrigation	20%	11.4%	24%	17.1%	27.4%
179	Nutrient management plan	20.7%	8.9%	26.3%	19%	25.1%
190	Organic farming	34.2%	13.7%	14.2%	11.6%	26.3%
164	Integrated pest management	18.9%	13.4%	30.5%	16.5%	20.7%
193	Precision pesticide application	21.2%	15.5%	28%	13.5%	21.8%
169	Drainage tiles	21.9%	11.2%	36.7%	13%	17.2%

Q10) Please report the degree to which you agree with the following opinions. In general, conservation programs are...

n		←Agree		Neutral		Agree→	
259	Beneficial to wildlife	1.5%	2.7%	12%	20.8%	62.9%	Harmful to wildlife
256	A good use of resources	4.7%	6.6%	36.7%	27.7%	24.2%	A waste of resources
257	Rewarding to landowners	5.8%	10.1%	36.6%	21.4%	26.1%	Harmful to landowners
257	Compatible with goals for my land	4.7%	9.3%	40.1%	19.5%	26.5%	Incompatible with goals for my land
257	Beneficial to my land's productivity	4.3%	9.3%	40.5%	20.2%	25.7%	Harmful to my land's productivity
257	Good for my finances	6.2%	12.8%	56.4%	12.1%	12.5%	Bad for my finances
257	Flexible	10.5%	14.8%	51.8%	12.8%	10.1%	Inflexible
255	Easy to enroll in	3.9%	4.7%	71.8%	8.6%	11%	Difficult to enroll in

8. Raw Data Summary

Q11) How likely would you be to work with a watershed conservation program on any of the following goals?

n		Very Unlikely	Unlikely	Neither Likely nor Unlikely	Likely	Very Likely
251	Controlling invasive species	6%	4.4%	21.5%	23.5%	44.6%
250	Enhancing wildlife habitat	5.6%	6%	25.2%	26%	37.2%
246	Maintaining healthy streamside and floodplain forests	6.9%	5.7%	26.8%	24%	36.6%
246	Restoring degraded stream and floodplain areas	8.5%	3.3%	35.8%	24.4%	28%
246	Planting new forests along streams that are not currently forested	10.2%	3.7%	36.6%	19.5%	30.1%
247	Improving storm water runoff control	11.3%	4.9%	40.5%	20.6%	22.7%
241	Reducing pesticide use	12.4%	4.6%	44%	15.8%	23.2%
240	Improving irrigation efficiency	12.1%	3.8%	51.3%	12.9%	20%
238	Adding livestock exclusion zones around streams	16.8%	6.3%	45.4%	11.3%	20.2%
245	Reducing fertilizer use	21.6%	4.5%	42.4%	11.4%	20%
240	Transitioning to organic production	21.7%	4.6%	44.6%	10.8%	18.3%

Q12) Would the following increase your interest in working with a watershed conservation program?

n		Definitely Not	Probably Not	Not Sure	Probably Yes	Definitely Yes
249	Annual cash incentives for participating	15.3%	5.6%	28.5%	23.3%	27.3%
248	One-time cash bonus for signing up	17.7%	7.3%	29.8%	24.2%	21%
246	Dedicated staff to help you implement your project	18.3%	8.9%	30.1%	22.4%	20.3%
243	Discounts at local retailers	20.2%	11.1%	31.7%	18.9%	18.1%
247	A cash bonus for joint participation with neighbors	19%	10.9%	33.2%	18.6%	18.2%
246	Educational/training opportunities	16.3%	13%	34.6%	19.5%	16.7%
248	Zero-interest loans	27%	10.5%	33.5%	15.7%	13.3%
245	Improved marketing for products from my land	27.3%	13.1%	37.1%	10.6%	11.8%

Q13) How likely would you be to enroll in a watershed conservation program if it required you to work with the following organizations to implement the program or project?

n		Very Unlikely	Unlikely	Not Sure	Likely	Very Likely
251	Oregon Department of Fish and Wildlife	18.3%	6.4%	37.5%	17.1%	20.7%
250	US Fish and Wildlife Service	19.2%	6%	37.6%	16.8%	20.4%
247	Clackamas Soil & Water Conservation District	20.6%	4.5%	41.3%	17.8%	15.8%
251	Oregon Department of Agriculture	16.7%	6%	45.8%	17.1%	14.3%
248	Natural Resources Conservation Services	20.6%	6%	45.2%	11.3%	16.9%
251	Clackamas River Basin Council	20.3%	7.6%	46.2%	13.1%	12.7%
249	Oregon Department of Environmental Quality	26.9%	8%	42.6%	11.2%	11.2%
245	Clackamas Pesticide Stewardship Partnership	22.4%	4.5%	50.6%	11.8%	10.6%
249	Clackamas River Water Providers	21.7%	8%	48.2%	12.4%	9.6%
246	Other non-profit conservation organizations	21.5%	7.3%	51.2%	11%	8.9%
248	Producer Organizations	22.2%	7.7%	51.6%	10.5%	8.1%

8. Raw Data Summary

Q14) Would you be willing to agree to any of the following in a watershed conservation program?

n		Definitely Not	Probably Not	Not Sure	Probably Yes	Definitely Yes
251	Regular project maintenance and monitoring	31.1%	10.4%	39%	14.7%	4.8%
250	Annual reporting to the project sponsor	33.6%	10%	37.2%	12.4%	6.8%
250	Specific management actions prior to enrollment	32%	8.4%	44%	11.2%	4.4%
250	A 10 year contract	35.6%	11.6%	41.2%	6.8%	4.8%
251	A 20 year contract	44.2%	11.6%	37.8%	3.6%	2.8%
248	A deed restriction lasting the length of the contract	48%	10.1%	35.9%	4.4%	1.6%

Q15) To what extent do you agree or disagree with the following statements about why you might NOT participate in a watershed conservation program.

n		Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
241	I still don't know enough about these programs	5.8%	5%	25.7%	27%	36.5%
238	I'm concerned about legal or regulatory implications	8.8%	3.8%	27.7%	26.1%	33.6%
238	I don't trust the organizations or agencies that run these programs	10.9%	8%	41.6%	18.9%	20.6%
242	My finances won't allow it	9.5%	7%	49.6%	18.6%	15.3%
241	I don't have enough time to participate in a program like this	12.4%	10.4%	44.4%	19.9%	12.9%
240	I'm uncomfortable with the attention programs like these bring to me	21.3%	12.5%	44.2%	9.6%	12.5%
236	Enrollment would make it harder to run my business	22.5%	7.2%	53.8%	9.7%	6.8%
238	I won't own the property long enough to make it worth my while	31.9%	16%	38.7%	7.6%	5.9%
238	My neighbors or community would give me a hard time	27.3%	13.4%	50.4%	5.9%	2.9%
238	No one else in my community participates in these types of programs	19.3%	9.2%	66.4%	2.5%	2.5%

Q16) In general, do you agree or disagree with the following statements regarding watershed conservation in the Clackamas River watershed?

n		Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
242	Functioning stream ecosystems are important for a clean water supply	0.4%	2.1%	10.7%	34.3%	52.5%
243	Watershed conservation is just the right thing to do	1.6%	7%	26.3%	31.7%	33.3%
245	Watershed conservation benefits everyone in the watershed	4.9%	7.8%	24.9%	31.8%	30.6%
244	The effects of water pollution on public health are worse than we realize	3.3%	8.6%	29.1%	29.5%	29.5%
241	Development within the watershed threatens water quality	6.6%	10%	26.1%	28.2%	29%
244	Watershed conservation might limit my choice and personal freedoms	13.9%	10.7%	30.3%	28.3%	16.8%
244	Pollution generated on my land harms people downstream	36.9%	10.7%	19.7%	17.6%	15.2%
243	While some local areas may have seen declines in water quality, overall water quality in the watershed is not in decline	13.6%	14.4%	50.6%	15.6%	5.8%
243	Claims regarding high pollution levels in the watershed are exaggerated	17.7%	16%	48.6%	11.5%	6.2%
240	Watershed conservation will threaten my livelihood	30%	19.2%	36.3%	10%	4.6%

8. Raw Data Summary

Q22) A watershed conservation program may be able to pay you to place or keep land in buffers. What level of payment would motivate you to plant or maintain a buffer of at least 35 feet in width?

n		Definitely Not	Probably Not	Not Sure	Probably Yes	Definitely Yes
149	No payment required	20.8%	11.4%	43.6%	10.7%	13.4%
131	\$50 per acre / year	21.4%	14.5%	48.9%	8.4%	6.9%
132	\$100 per acre / year	15.9%	15.2%	46.2%	10.6%	12.1%
134	\$200 per acre / year	14.9%	11.2%	45.5%	12.7%	15.7%
134	\$400 per acre / year	14.2%	9.7%	41.8%	11.9%	22.4%
135	\$600 per acre / year	13.3%	6.7%	40.7%	15.6%	23.7%
138	\$800 per acre / year	10.9%	5.8%	38.4%	12.3%	32.6%

APPENDIX C. INTERNAL REVIEW BOARD HUMAN SUBJECTS APPROVAL

Post Office Box 751
Portland, Oregon 97207-0751
503-725-2227 tel
503-725-8170 fax
Human Subjects Research Review Committee
hsrrc@lists.pdx.edu

Date: June 12, 2015

To: Max Nielson-Pincus / Matthew DeAngelo

From: Karen Cellarius, HSRRC Chair

A handwritten signature in black ink that reads 'Karen Cellarius'.

Re: HSRRC approval for your project titled, "Clackamas River Source Water Protection Research"
HSRRC Proposal # 153464

Approval-Expiration: June 12, 2015 – June 11, 2016

Review Type: Expedited, Category 7

In accordance with your request, the PSU Human Subjects Research Review Committee has reviewed your request for approval of the project referenced above for compliance with PSU and DHHS policies and regulations covering the protection of human subjects. The Committee is satisfied that your provisions for protecting the rights and welfare of all subjects participating in the research are adequate, and your project is approved. Please note the following requirements:

Approval: You are approved to conduct this research study only during the period of approval cited above; and the research must be conducted according to the plans and protocol submitted (approved copy enclosed).

Consent: Signed consent is waived from all participants in this study. A written consent statement is required.

Changes to Protocol: Any changes in the proposed study, whether to procedures, survey instruments, consent forms or cover letters, must be outlined and submitted to the Committee immediately. The proposed changes cannot be implemented before they have been reviewed and approved by the Committee.

Continuing Review: **This approval will expire on 06/11/2016.** It is the investigator's responsibility to ensure that a *Continuing Review Report* on the status of the project is submitted to the HSRRC two months before the expiration date, and that approval of the study is kept current. The IRB offices does not send out notifications of expiration dates. The *Continuing Review Report* is available at www.rsp.pdx.edu/compliance_human.php and in the Office of Research and Strategic Partnerships (RSP).

Adverse Reactions and/or Unanticipated Problems: If any adverse reactions or unanticipated problems occur as a result of this study, you are required to notify the Committee immediately. If the issue is serious, approval may be withdrawn pending an investigation by the Committee.

Completion of Study: Please notify the Committee as soon as your research has been completed. Study records, including protocols and signed consent forms for each participant, must be kept by the investigator in a secure location for three years following completion of the study (or per any requirements specified by the project's funding agency).

If you have questions or concerns, please contact the Office of Research Integrity in the PSU RSP at 503-725-2227.