Scaling Up Payments for Watershed Services

Recommendations for Increasing Participation in Watershed Conservation Among Non-Industrial Private Forest Landowners in the Sebago Lake Watershed, Maine

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Abstract

Payments for Watershed Services (PWS) programs are receiving attention throughout the U.S. as a policy option to secure water quality in a cost effective manner. PWS programs face many challenges in implementation; prominent among them is designing a program that generates interest and participation among the suppliers of water quality, upstream private landowners. This report seeks to inform the development of a PWS program in Southeast Maine by examining the system of incentives needed to encourage private forest owners to adopt conservation best management practices that enhance water quality downstream. While focused on the Sebago Lake watershed, which provides drinking water for the Greater Portland area, this project approaches the localized study as a specific case to identify biophysical, institutional, economic and social factors that favor or limit the scaling up of PWS schemes. This analysis combines a systematic review of literature on landowner preferences to existing incentive programs, interviews with program administrators from PWS schemes throughout the U.S., and interviews with key stakeholders in Southeast Maine. This report provides a set of recommendations organized around: segmentation of landowners; targeting and positioning PWS programs; selecting attractive program attributes; and leveraging effective outreach channels and tactics. Key recommendations include: co-create program attributes with landowners; encourage peer to peer communication to build support and awareness; provide a portfolio of financial and non-financial incentives to increase interest; and partner with existing conservation organizations to add capabilities and resources.

Key Words: Payments for Watershed Services, Conservation, Incentive Design, Landowner Engagement, Non-Industrial Private Forest Landowners

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List of Acronyms

ACF	Association of Consulting Foresters
APCW	Ability to Produce Clean Water
BMP	Best Management Practice(s)
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CWA	Clean Water Act
DEP	(Maine) Department of Environmental Protection
EPA	(United States) Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FAD	Filtration Avoidance Determination
FFO	Family Forestland Owners
FIA	Forest Inventory Analysis
FLEP	Forest Land Enhancement Program
FLP	Forest Legacy Program
FSP	Forest Stewardship Program
GIS	Geographic Information Systems
GPCOG	Greater Portland Council of Governments
HFRP	Healthy Forests Reserve Programs
HUC	Hydrologic Unit Code
IRB	Institutional Review Board
LIP	Landowner Incentive Program
LURC	Land use Regulation Commission
NGO	Non-Government Organization
NIPF	Non-Industrial Private Forest
NRCM	Natural Resources Council of Maine
NRCS	Natural Resources Conservation Services
NTFP	Non-Timber Forest Product
NWOS	National Woodland Owners Survey
PES	Payments for Ecosystem Services
PWD	Portland Water District
PWS	Payments for Watershed Services
SFFI	Sustaining Family Forests Initiative
SDWA	Safe Drinking Water Act
SWOAM	Small Woodland Owners Association of Maine
USDA	United States Department of Agriculture
USFS	United States Forest Service
WHIP	Wildlife Habitat Incentives Program
WRI	World Resources Institute
WRP	Wetlands Reserve Program
WTA	Willingness to Accept

Executive Summary

Project Overview

This report presents the results of a Master's Project examining strategies for increasing landowner engagement and participation in a Payment for Watershed Services market in the Sebago Lake watershed in Maine. The actions of landowners in the Sebago Lake watershed impact the water quality in Sebago Lake, which is where the Portland Water District, the local water utility, draws 100% of the municipal water for the 200,000 residents of Greater Portland, ME. Due to the high water quality in Sebago Lake, the Portland Water District currently holds a filtration avoidance determination awarded by the Environmental Protection Agency. This filtration avoidance determination allows the Portland Water District to avoid significant costs associated with building and operating mechanical and chemical water filtration facilities. A project being undertaken by World Resource Institute, Manomet Center for Conservation Sciences, and their partners proposes to implement a market that would direct payments from the Portland Water District to the landowners in the upper watershed. Payments would incentivize a set of conservation best management practices, such as culvert upgrades, riparian buffers, and conservation easements, which would act to protect the water quality in Sebago Lake and ensure the filtration avoidance determination is maintained.

Payment for Watershed Services is a subset of the conceptual model of Payments for Ecosystem Services. These models view the environment as a stock of natural capital that provides flows of services that are of economic benefit to humans. Payment models that transfer payments from those who benefit from a service (buyers) to those who provide it (sellers) are becoming a popular policy tool for the protection of ecosystems. However, these models are still at a nascent stage. Little is known about how best to implement them, whether or not they are an effective and efficient allocation of resources to conserve the environment, and how landowners will respond to this new paradigm in the long term.

Our Approach

This report takes a systematic approach of exploring all factors that influence the levels of engagement with and participation among landowners in Payment for Watershed Services programs. We identify four distinct categories of influencing factors; biophysical, institutional, economic and social. This project has a particular emphasis on addressing the social factors, so the bulk of analysis and recommendations are in this area.

PWS Decision Making Framework

Prior to engaging landowners, an assessment of whether or not the conditions are appropriate for a Payment for Watershed Services program should be conducted. We provide a checklist of conditions that a program administrator can evaluate. These include the ability to enter into voluntary transactions, the presence of willing buyers and sellers of a defined ecosystem service that can be guaranteed by the sellers, and an ability to incentivize behavior that produces service levels above those currently promoted by existing incentives or compelled by existing regulation.

Biophysical

The biophysical analysis looks at the hydrology of the Sebago Lake watershed, the importance of forest cover to the maintenance of surface water quality, the current development threats in the region, and the uncertainty of climate change impacts. We conclude that in the short term, there is not sufficient evidence to suggest that development in the upper watershed poses a significant threat to water quality degradation at Portland Water District's intake pipes in Sebago Lake. Until this threat is intensified, the Portland Water District is not likely to be a willing buyer because they can more effectively maintain water quality by focusing on water quality threats closer to the lakeshore. However, biophysical conditions can change, and if they do, Payments for Watershed Services may become a viable option. Climate change is expected to impact the hydrogeology in the region and could increase the threat of water quality degradation in the future.

Institutional

For a voluntary system such as this to endure, it must be placed within an institutional framework that can support it. The landscape of institutions involved in conservation programs is typically complex and we therefore present a stakeholder engagement tool to help prioritize those institutions that heavily influence or are impacted by new programs. This analysis tool can be used to identify which organizations are most critical to a project's success, and help inform the specific outreach and engagement strategies with those individual organizations.

Economic

We examined all current federal economic incentive programs designed to engaging private landowners in conservation activities. From a landowner perspective, involvement with a federal economic incentive program or a Payment for Watershed Services program are often very similar, as both types of incentive programs ask landowners to engage in similar conservation best management practices. As a result, federal incentive programs serve as a valuable proxy and provide many lessons learned for Payment for Watershed Services programs.

Social

We provide an analysis of how forest landowners can be segmented based on demographic and psychographic characteristics, the trends within these segments, how to target landowners and position conservation programs based on the factors that influence interest and participation, and how to deliver these outreach messages using the channels that most effectively engage them. Rather than providing specific actions tailored to the Sebago Lake watershed, we present generalizable recommendations within a framework that can be applied to other locations and conservation mechanisms. Therefore, the outreach approach and strategies presented in this report use Sebago Lake as a case study but can be applied to the local conditions in any area considering implementing a Payment for Watershed Services program.

A summary of our recommendations follows. We hope this report and the recommendations contained herein provide a useful starting point for payment for ecosystem services practitioners aiming to improve landowner engagement and outreach, and prompt creative solutions to ecosystem conservation in the Sebago Lake watershed and beyond.

Recommendations Summary

This section summarizes the recommendations made throughout this document. Recommendations are more fully detailed in the relevant report section along with supporting observations and interpretations.

Segmentation

- *Gather data specific to the Sebago Lake watershed*: A significant challenge in generating segmentation insights is the variability of landowner attitudes and characteristics across regions, and the challenge in comparing across markets.
- *Segment landowners based on inter-generational characteristics*: Significant changes to existing segmentation, land use decision-making and parcelization are likely to occur as a result of a large transfer of land from current owners to the next generation. Segmentation of landowners should reflect these variations from existing segment characteristics.
- *Identify early adopters with a high propensity to engage and contribute*: Landowners that have higher incomes, higher levels of education, greater awareness of conservation practices and environmental issues or existing participation in conservation programs are more likely to participate and to act as effective advocates among their peers.

Targeting & Positioning

- *Build up awareness, interest and participation in distinct stages*: Messaging should be designed to create an escalating level of commitment to conservation in three stages; education, interest generation, and encouraging participation in specific programs through co-creation of program parameters.

- *Bring landowners together with the buyer to discuss program design*: Trust between landowners and the institutions they interact with is a key component of a functioning conservation program. By bringing landowners together with the 'buyer' of the conservation outcomes desired by the program this trust relationship can be enhanced and opportunities for integrative bargaining may emerge.

- *Be considerate of consultant landowners' time*: Many of the practitioners we spoke with emphasized the importance of respecting the time constraints of those early adopter landowners involved in design or development of the pilot program. It may be helpful to provide financial incentives for this participation in order to promote engagement.

- *Prioritize influential landowners, not just parcels that are important biophysically*: While there are regions of the watershed that are important from a biophysical perspective, it is important that program priorities also take into account social status and the importance of individual landowners as influencers within the community. For a pilot program it is not necessary that the highest priority parcels are all enrolled, but it is important for as many of the influential landowners as possible to be enrolled.

Scheme Attributes & Administration

- *Provide a portfolio of incentive options or flexible menu of options to expand participation*: Landowner preferences are as varied as the reasons for owning land and a combination of incentive types including conservation easements, technical assistance, educational assistance, etc., is recommended in order to engage the maximum number of landowners and to make optimal investments in the desired behavior change.

- *Partner to add capabilities and resources*: Partnering with existing organizations that provide in-kind incentives such as technical assistance will be an efficient way to build capabilities and bring additional resources to play when introducing a new conservation program.

- *Address landowner concerns about government regulation*: One of the most common concerns landowners have with respect to federal conservation programs is the requirement to allow access to their land by federal agencies for monitoring and evaluation associated with

the program. By being explicit about who is allowed access to the land and for what reasons, program administrators can potentially alleviate some of these concerns.

- *Administer the program via an intermediary organization to mitigate mistrust*: In order to ensure that landowners have trust in the institutions that are managing the program, it can be beneficial to administer it through an intermediary organization that prevents landowners from having to interact directly with government agencies or a buyer of the ecosystem service.

- *Consider creating a dedicated stand-alone institution if critical mass is needed*: Reaching scale will require coordination of effort among many organizations as well as managing interactions with many landowners. Creating a standalone institution will help to coordinate this activity at an efficient scale.

- *Create streamlined application processes and eligibility criteria to reduce transaction costs*: Programs that decouple the application process and eligibility criteria from existing federal programs tend to be more streamlined and as such more successful in promoting participation. This reduces transaction costs for the program as well as reducing barriers to entry for the landowner.

Outreach Channels & Tactics

- *Identify quick wins by sourcing participants through partners that landowners trust*: Finding the initial innovators and early adopters is a critical component of program design and piloting. Some program administrators that were interviewed noted that asking partner organizations for the names of influential landowners already engaged in conservation programs was one of the most effective ways to identify members of these groups.

- *Supplement this with broad outreach tactics, tailoring the message later*: Initial outreach should happen through broad outreach tactics such as holding informational workshops, attending fairs or producing educational material that drives interest in conservation and conservation practices, and raises awareness of environmental issues among the general landowner population.

- *Experiment with encouraging landowner-to-landowner referrals*: While some practitioners have questioned the effectiveness of incentivizing landowner-to-landowner referrals this has not been formally tested through experimentation during a pilot program. This may prove to be a powerful tool and should be empirically tested as part of a pilot.

- *Provide tools that enable peer-to-peer influence*: Providing an online platform that engages landowners in sharing their successes and creates a two way conversation will help outreach efforts both for landowners who are resident in the watershed as well as absentee landowners. With prevalence of absentee landowners set to increase, digital channels will become more important in keeping landowners engaged.

Introduction and Background

Sebago Lake provides the water supply to the 200,000 people in Portland and the surrounding communities. The Sebago Lake watershed covers approximately 361 square miles in Southwestern Maine, and the Portland Water District (PWD) estimates that it is approximately 80% forested (Portland Water District). This forest cover is an important contributor to the ecosystem services provided by the watershed, particularly the maintenance of water quality. For example, the Crooked River supplies 40% of the water to Sebago Lake and is rated the highest level of water quality, 'AA', by the Maine Department of Environmental Protection (DEP) under the Clean Water Act (CWA). The other tributaries that supply Sebago Lake are rated 'B' (Maine Revised Statutes. Title 38. Chapter 3. Subchapter 1. Article 4-A.).

The Environmental Protection Agency (EPA) issued a Filtration Avoidance Determination (FAD) indicating that the water quality is of a high enough standard that PWD can avoid some filtration and purification through mechanical and chemical means. The FAD is made on the basis of multiple criteria including maximum limits for fecal coliform and turbidity as indicators of source water quality, as well the presence of a watershed control program to "minimize microbial contamination of the source water." (U.S. Environmental Protection Agency, 2010). The FAD is of considerable financial value to the PWD because it can avoid the costs of building, operating, and maintaining additional filtration technology. Therefore any activities in the watershed that threaten to diminish the water quality below the standards necessary to maintain a FAD are of financial concern to the PWD and its downstream customers.

Potential threats to water quality include development pressure, forest fragmentation and forest parcelization. The Presumpscot Watershed, which encompasses the Sebago Lake watershed, has been ranked highly among watersheds that provide essential filtration services to public water sources, and are facing development pressures. These pressures may result in forest fragmentation or parcelization which can potentially contribute to sedimentation in tributaries, the rise of invasive species, loss of biodiversity, decline in carbon sequestration and other ecosystem services, and other harmful effects related to climate change.

Our project serves the World Resources Institute (WRI) and their partner Manomet Center for Conservation Sciences (Manomet) in their efforts to develop a Payment for Watershed Services (PWS) program to mitigate the threats of water quality degradation in the most cost effective manner. A PWS program is a subset of Payment for Ecosystem Services (PES). PES schemes "compensate

individuals or communities for undertaking actions that increase the provision of ecosystem services such as water purification, flood mitigation, or carbon sequestration" (Jack, Kousky, & Katharine, 2008).

The work of WRI and Manomet includes:

- **Supply side analysis:** Examines the system of incentives and outreach methods required to engage private landowners to participate in conservation best management practices (BMPs) that will protect the natural filtration qualities of the watershed.
- **Demand side analysis (beneficiary analysis):** Examines the business case for PWS in the Sebago Watershed by comparing the costs of green infrastructure to gray infrastructure for the PWD. Green infrastructure is the set of conservation BMPs landowners would be incentivized to participate in, while gray infrastructure is the physical or chemical treatment plants necessary to filter the water.
- **Policy analysis:** Examines the local, state and federal legislation that governs the creation and operation of a market for ecosystem services and examines education and outreach strategies to communicate with landowners.

Problem Statement

The Master's Project team will assist WRI and its partners with the supply-side analysis, which will inform the design of an incentive-based PWS methodology for the Sebago Lake watershed. The team will use a combination of prior data gathering work by WRI and its partners, previously gathered survey data, and other secondary research to inform this analysis.

Project Scope

The objective of this report is to examine the system of incentives necessary to engage landowners in conservation BMPs that can ensure ongoing provision of water quality, and to identify successful implementation strategies. The project can be divided into the following deliverables:

- Develop a checklist of key conditions necessary for any PWS program to be successful.
- **Segmentation of Landowners**: Provide a synthesis of national and regional demographic and landowner attitude studies in order to provide an understanding of the demographics and psychographics of non-industrial private forest (NIPF) landowners in Maine and important differences among NIPF landowners.

- **Targeting & Positioning**: An overview of which segments of NIPF landowners should be targeted and when to generate interest and participation in a PWS program.
- **Scheme Attributes & Administration**: Understand a set of landowner preferences related to different scheme attributes including different types of incentives (financial, technical assistance, cost-sharing, etc.), program administrators, and other commitment concerns.
- **Outreach Channels & Tactics**: Develop strategies to most effectively and efficiently reach landowners to communicate and engage landowners in PWS.
- **Institutional Analysis**: Create a report section detailing institutions already in existence that may influence suppliers of watershed services in the Sebago Watershed.

Challenges

The primary challenges we encountered in the course of this project revolve around three enduring themes:

1. The complexity and nuance of social and natural systems
2. Segmentation (identifying who to communicate to and how to deliver a message that will resonate) - the challenges in communicating complex ideas to large and disparate audiences
3. The emerging nature of PES markets

A market is premised on willing buyers and sellers trading goods and services in exchange for other items of value. In the case of a PWS market this means providing clean water as a service through the implementation of Best Management Practices (BMPs), in return for payments or other in-kind compensation. However, the future availability and value of these land and water resources are subject to change and understanding this requires at least a basic understanding of complex contributing factors. These factors include contamination pathways and attenuation of pollutants in municipal water sources, as well as a broad view of landscape scale changes and the relationship between land use and the environmental services on which we all depend.

These concepts are difficult to conceptualize, and even more difficult to discuss among broad audiences. Effective communication with stakeholders posed significant challenges throughout the process. For example, early on it was recognized that outreach and communication with landowners was complicated by that fact that many forestland owners did not see themselves as such. One forester reported that many landowners in the Sebago Lake watershed did not identify as forestland owners, but were more responsive to other terminology. The same forester reported that in one

instance, a landowner who did not identify as a forestland owner in fact owned a few thousand acres of woodland and was more responsive to a question framed around whether or not there were trees on their property. There is a considerable and growing body of research that is discussed in more detail below on small forestland owners, their attitudes and values, and effective communication with segments of that population. However, the complexities of the social and ecological issues involved in PES markets are compounded by local and regional nuances, rendering stakeholder engagement a long-term process. While this analysis addresses strategies for engagement and effective communication, those strategies will be most effectively implemented by partners on the ground that build on existing relationships and social capital.

Lastly, PES is an emerging tool to address social and ecological issues through market-based mechanisms. The fact that there is limited data available about proven strategies for establishing watershed service markets indicates that this research is both timely and relevant. However, it has posed a considerable challenge throughout each phase of the project. The social importance of and challenges inherent to implementing self-sustaining PES markets are the subject of attention in a section of this report.

Local and Generalizable

In order to meaningfully address these challenges and maximize the social utility of our research, this report examines the incentives for ensuring ongoing provision of water quality in the context of the Sebago Lake watershed. However, our intention is that the recommendations contained herein will be more broadly applicable to scholars and conservation practitioners interested in PES markets. In light of our attention to and emphasis on local and regional nuances, we expect that the conclusions drawn from the research will lend themselves to scaling up Payments for Watershed Services.

PWS Decision Making and Design Components

Defining PWS

PWS is a voluntary system of payments that accrue to a landowner in return for the guaranteed provision of a predefined set of watershed services, typically those relating to water quality or quantity provision. A PWS scheme is a market-based mechanism whereby payments are transferred from willing buyers downstream to a set of willing suppliers (landowners) upstream in order to secure benefits that would otherwise not be guaranteed. As a subset of the wider concept of Payment for Ecosystem Services (PES), PWS is typically described as a scheme that has the following characteristics (Wunder, 2005):

1. Voluntary system of transactions
2. A well-defined ecosystem service (water quality, carbon sequestration etc.)
3. A willing buyer
4. A willing seller
5. The ability for the provider to secure the provision of the ecosystem service (often termed *conditionality)*
6. The provision of a service that would not otherwise be provided through legal or regulatory means (often termed *additionality*) (ten Brink, 2009)

Overview

The questions in this section are intended to aid practitioners in making important decisions related to the design and introduction of a PWS scheme, including whether that scheme is the most effective use of conservation capital, as outlined in the introductory section. The questions below are designed to identify areas of opportunity or challenge with respect to the introduction of a PWS scheme, but most importantly to identify areas where there may be information gaps that will influence the effectiveness of the scheme.

The following section gathers together decision-making criteria from a number of sources (Parties to the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, 2007) and organizes them according to the six characteristics and highlights some areas for further investigation specifically related to the Sebago Lake watershed.

Decision Making Criteria

Voluntary System of Transactions

Does the ownership status of the watershed or land area supplying the ecosystem service allow the voluntary enrollment of land stewards in a market-based system of transactions?

Landowners must be able to voluntarily enroll their land in the PWS scheme and be free of restrictions on the implementation of BMPs that are required as part of the scheme. This can be a significant challenge in informal economies (Greiber, 2009). However, even when clear land title exists, lands that have restrictive easements, that are part of lease or rental agreements or that are part of other conservation programs may not be suitable for enrollment in a PWS scheme.

Sebago specific: we examine the broad land ownership patterns in Maine; however, a detailed analysis of land ownership in the Sebago Lake watershed based on tax records would be beneficial prior to implementation. In addition, buyers must enter into the transaction voluntarily. In practice this is not always the case and it may be that water rate payers in the Greater Portland area are compelled to enter into these transactions through rate increases rather than through optional surcharges.

A Well Defined Ecosystem Service

Can the service being provided be measured and/or monitored? Is there agreement regarding which measurements constitute the provision/non-provision of the service?

The ability to define the ecosystem service of interest, measure and monitor it and understand what constitutes provision of the service is crucial to a PWS scheme. This is the point where the exchange of conservation capital for environmental impact occurs and being able to demonstrate a causal link between BMPs undertaken on the land, and verifiable impacts on the quality or quantity of a given ecosystem service is required for the scheme to function. A buyer will not dedicate capital to incentivize landowners if they are not certain those landowners can provide the desired service. Vice versa, if landowners do not see the causal link between participating in conservation actions and providing an environmental good, they are less likely to be motivated to participate.

Sebago specific: A key challenge in the Sebago Lake watershed is, therefore, the difficulty with which land use decisions in the upper watershed produce demonstrable changes in water quality at PWD's intake pipes. Based on conversations with the Maine DEP, the volume of water in the lake and the location of the PWD intake pipes substantially attenuate the impact of contaminants that enter

the lake from the upper watershed. Contaminant loadings have taken decades to register as changes in water quality.

A Willing Buyer

Does the provision of the service provide tangible benefits to a group of users that is distinct from the suppliers of the service? Are buyers willing to pay to secure the provision of the service? Is ongoing provision of the ecosystem service the most cost effective option?

The demand for the environmental service is a key component to a successful PWS program. Buyers must be willing to pay for the ongoing provision of the service at a level that at least matches the supplier's marginal cost in continuing to provide that service.

Sebago specific: In the Sebago Lake watershed, the Portland Water District aggregates the willing buyers, who are its customers. Via the PWD, buyers would be willing to spend any amount that is less than the equivalent investment that would be needed to fund the construction of 'gray' infrastructure to replicate the water quality services provided by the upper watershed. In some cases buyers may be willing to pay more than the equivalent amount if they receive additional utility from water quality that is provided by natural ecosystems rather than built infrastructure (e.g. breweries may consider naturally filtered water to be more valuable than mechanically filtered water, even though they may meet identical water quality standards). Ancillary benefits from preserving water quality, such as improved fishing, recreational opportunities, and wildlife habitat may also increase buyers' willingness to pay above and the costs of gray infrastructure.

A Willing Seller

Are the suppliers of the service willing to undertake management practices to ensure the provision of the service in return for financial rewards? Can a price be articulated that the sellers consider sufficient compensation?

In addition to having buyers who are willing to pay for the provision of a service, sellers must be willing to provide the service, and must be willing to do so at a price that is less than the cost of the 'gray' infrastructure alternative (Greiber, 2009, p. 21). For landowners who view their land as an economic asset, this payment must be at least the same as the income forgone by having restrictions on their land, or the cost of implementing BMPs. For those landowners who do not view their land as an economic asset, and instead own land for its intrinsic value, the payment required to incentivize behavior change may be lower.

Sebago specific: In the segmentation section of the report, we explore the different demographics, behaviors, attitudes, and aspirations that influence landowner participation in PWS schemes and that ultimately influence the price at which they would be willing to accept restrictions on their land as a result of conservation measures.

Conditionality

Does the provider have control over whether the service is provided or not? Can a causal (or correlative) link be made between provider actions and service provision? Are there factors beyond the control of the service providers that materially alter the provider's ability to secure the service?

It is essential for the development of a PWS scheme that the supplier of the service can guarantee the provision of that service. It must be proven that by participating in BMPs a landowner can have an impact on the ultimate service of interest, no matter how large or small the incremental impact. If it cannot be proven that every landowner who is enrolled in a scheme contributes to the provision of a service through their actions, or if there are things outside of the landowner's control that alter their ability to provide the service, PWS may not be the appropriate solution. Many schemes accept that certain BMPs, such as a riparian buffer, have a predetermined impact on water quality based on a scientific consensus of the impacts and do not require monitoring for every landowner. Examples where landowners do not have control of the provisioning water quality would be when downstream impacts that are closer to the point of withdrawal and are not controlled by the program and act to deteriorate water quality.

Sebago specific: A Conservation Priority Index was developed for a main tributary of Sebago Lake, the Crooked River Watershed, which prioritized land parcels based on their ability to impact water quality downstream based on several attributes including proximity to streams, soil type, and slope of land.

Additionality

Absent the actions of the service provider, are there any other mechanisms that would ensure the provision of the service? Do providers exist outside of the bounds of the scheme that contribute to the provision of the service that are not being accounted for?

In order for a PWS scheme to be an effective use of conservation funding, it must deliver environmental outcomes above and beyond that which otherwise would be secured by existing programs, regulations or norms. Payments to engage in BMPs that are compelled or incentivized by

other programs are not an efficient allocation of limited resources and as such, special attention should be paid to existing controls.

Sebago specific: The Crooked River, which provides over 40% of the water to Sebago Lake, is rated the highest level of water quality, 'AA' by the Maine DEP. Rivers with 'AA' ratings have additional legal protection which requires any discharge into the river is required to be water of a quality that is at least as good as that already in the river. This places significant restrictions on sources of contamination and is a regulatory tool, which, if effectively enforced, would compel behavior that is consistent with maintaining service provision without the need for additional expenditure on incentives.

PWS Design Components

In order to effectively design a PWS scheme that provides appropriate financing and successfully secures the provision of an ecosystem service in a sustainable manner, there are four major areas that should be considered: biophysical; institutional; economic; and social.

Biophysical

The biophysical attributes and characteristics of the system (watershed, river, forest etc.) form the 'underlying asset' for any financial instrument. The scarcity of natural resources or the ecosystem services they provide will drive pricing of the instrument. Ultimately, the rate of change of the system should drive transaction frequency, with short-term operational payments being more suitable for a system that responds quickly to land use changes, and longer-term investments being more suitable for systems that are resilient and which may not show the effects of change for a significant period of time or until a certain level of scale is reached. However, given the lack of clarity surrounding the causal link between land use decisions and service provision, input based proxies such as the type of BMPs being implemented will be more influential when determining the frequency of payouts until such time as the causal relationship is better understood (Jack, Kousky, & Sims, 2008). One of the key areas for further research within the PWS field is to better understand these relationships between changing land use decisions and environmental outcomes (Ferraro, 2011).

Institutional

In order to be effective, a PWS scheme must incentivize the owners of a critical mass of the land within the watershed to change their behaviors in such a way as to ensure the ongoing provision of the desired service at a level of quality that meets the buyers' demands. This will require a system of governance or rules that are negotiated between landowners and beneficiaries. In order for this system to endure, and for disputes to be resolved, the appropriate institutions representing each class of

stakeholders, as well as independent institutions representing the interests of the commons, must exist and interact effectively.

Economic

Finally, there are economic factors that will influence the design of the PWS scheme. These include the current state of economic activity in the region and the projected economic growth patterns in the region. The cost of incentivizing landowners to partake in any given BMP has multiple components, and any payment scheme will need to compensate landowners such that the value of this compensation (financial or otherwise) is at least minimally greater than the sum of these costs. Where land use decisions are operational in nature (e.g. cut down more trees rather than less) then payments or in kind incentives may be appropriate, whereas if decisions are capital in nature (sell land or keep it) then payments may need to be more capital in nature, such as the purchase of a conservation easement or outright acquisition.

Sidebar: The Nature of Value and the Value of Nature

Many economic resources can have an economic value expressed as price. This price condenses a lot of information about what we value and how much we are willing to trade for that resource. The Payment for Ecosystem Services paradigm attempts to increase the price paid for natural resources such that more of the services we value that are provided by that resource are represented in its price.

When we consider the costs, productivity or value of land to a landowner, we need to consider all of the forms of value, including non-financial sources. Studies such as (Parkhurst, Shogren, Bastian, Kivi, Donner, & Smith, 2002) (Parkhurst & Shogren, 2007) (Matta, Alavalapati, & Stainback, 2009) (Matta, Alavalapati, & Tanner, 2007) (Matta, Alavalapati, & Mercer, 2009) (Kline, Alig, & Johnson, 2000) and (Horne, 2004) provide some methodologies for measuring this value, however, this is subject to significant local variation that makes comparison between regions difficult.

Common sources of non-financial value are:

- *Aesthetic or recreational value:* spiritual or emotional value associated with recreational aspects of nature

- *Hedonic value:* appreciation in value of an assets that can be financially valued due to the existence of an asset that cannot be valued financially (such as clean air or aesthetic views)

- *Option value:* the value of the option to benefit from an ecosystem in the future (financially, aesthetically, recreationally)

- *'Non-use' value:* the value of knowing a particular ecosystem exists even if you don't directly benefit from it

In order to fully understand the costs and benefits to landowners that must be incorporated into PWS incentive schemes, a local understanding of these values is required. Since no markets exist for these sources of value, *stated preference* methodologies are used to determine willingness to accept approaches that maintain these sources of value (Horne, 2004)

Social

The fact that there is a need for PWS schemes at all is primarily a social problem, in that the costs and benefits provided by natural resources in situ are unequally divided between current members of society. The costs of service provision typically accrue to upstream landowners, and downstream users enjoy the benefits. Understanding the motivations and interests of landowners, and appealing to these with the right message, to the right person at the right time through a structured marketing process of segmentation, targeting and positioning, will be an important part of maximizing the effectiveness of landowner outreach efforts. In addition to known landowner segments, social trends such as urbanization and increased fragmentation of ownership (Acheson & Doak, 2009) (Tyrell & Dunning, 2000) (Stein, et al., 2005) will have a significant impact on the effectiveness of incentive schemes over time as will the transfer of land between generations (Mater, 2005).

Biophysical Context & Climate Change in Sebago Lake Watershed

The Crooked River watershed in southeastern Maine supplies over 40% of the surface inflow to Sebago Lake, which is the reservoir for the PWD. The Crooked River's total drainage basin covers approximately 361 square miles and is predominantly forested (Portland Water District). The Presumpscot Watershed encompasses both the Crooked River and Sebago Lake, which is drained by the Presumpscot River flowing from the southern end of the lake to the Atlantic Ocean (See Figure 1). Land use management in the watershed basin is critical to the quality of water in Sebago Lake because any contaminant collected by runoff from the landscape ultimately flows to the Lake.

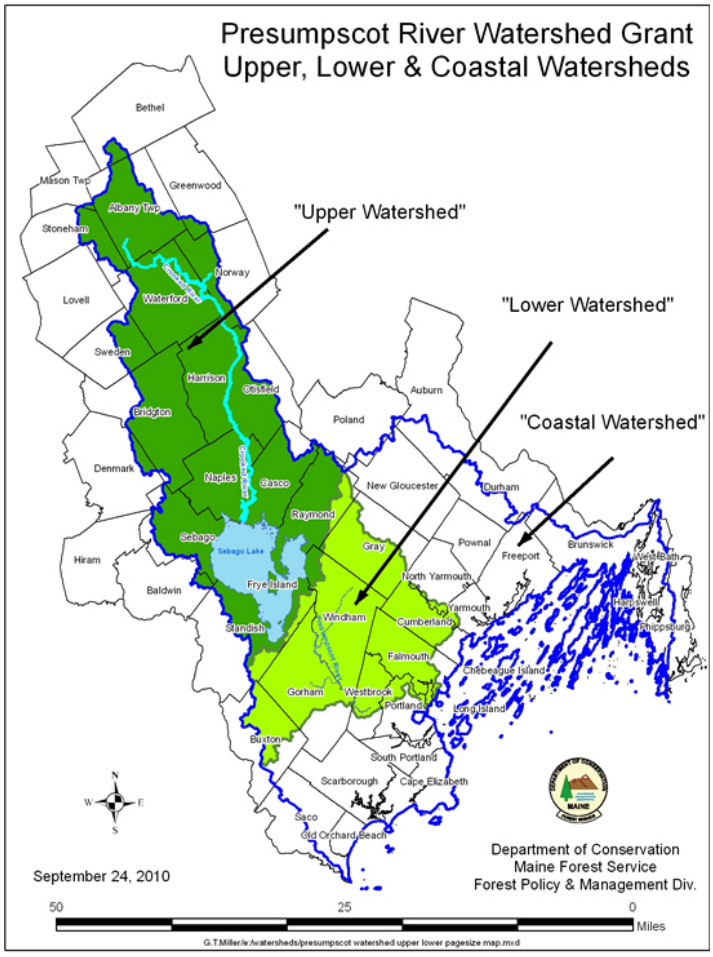


Figure 1: Presumpscot River Watershed Grant: Upper, Lower & Coastal Watersheds (www.maine.gov)

Sebago Lake is approximately 12 miles long with 105 miles of shoreline, containing 995 billion gallons of water. It draws water from its 361 square mile watershed. Water that enters the lake from the Crooked River and other tributaries in the north has a residence time of 7 years from its date of entry to exit the lake at the southern end where it is withdrawn by the PWD (Portland Water District) and it take 15 years for the entire contents of the lake to turn over (Maine Department of Environmental Protection, 2011). According to PWD's 2012 State of the Lake Report, the water quality of Sebago Lake is quite high. However, present land use changes may have implications on the future quality of water in Sebago Lake.

The PWD monitors the lake and surrounding watershed areas for dissolved oxygen, total phosphorous, chlorophyll-*a,* fecal coliform bacteria, MTBE, turbidity, conductivity, and water transparency, among other contaminants (Portland Water District). These parameters are important indicators of overall health of the lake and for maintaining the FAD. State standards require stable or decreasing trophic conditions, so indicators of increasing trophic conditions that reduce clarity may be indicative of conditions that could jeopardize the FAD (Maine Department of Environmental Protection, 2011). For example, Figure 2 shows 2006 monitoring data that suggested an increasing trophic state, which may indicate a continuation of a pattern of chlorophyll-*a* and phosphorus increases observable since the 1990s (Portland Water District). This data is particularly significant in the context of a broader trend toward increased phosphorous, as shown in Figure 3.

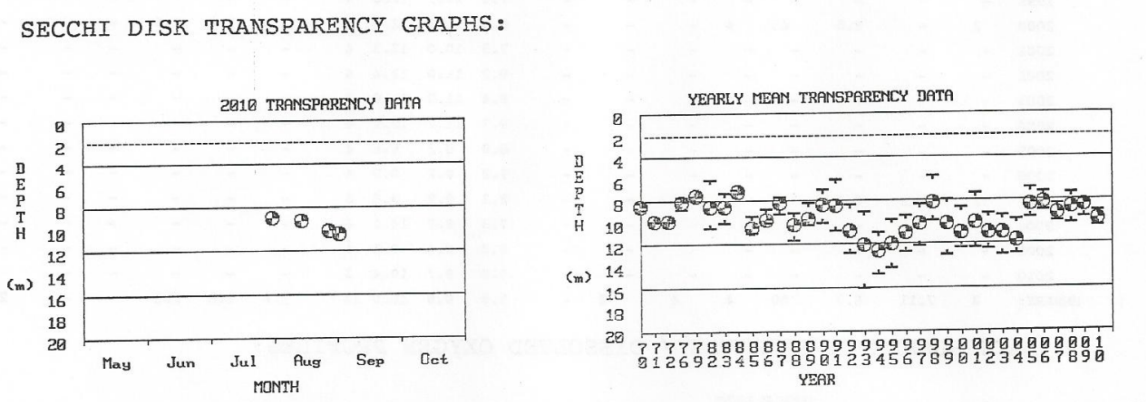


Figure 2: Secchi Disk Transparency Graphs (Maine Department of Environmental Protection, 2011)

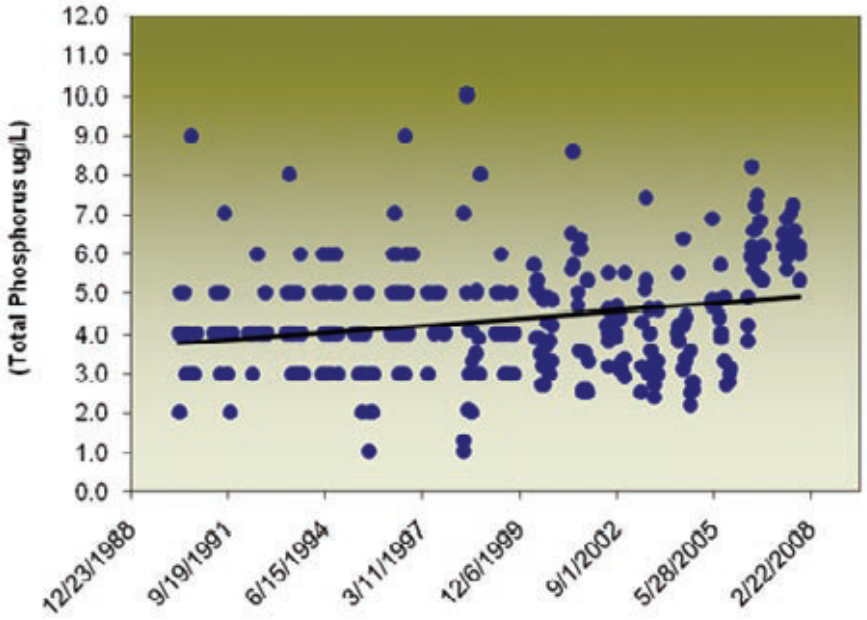


Figure 3: Sebago Lake Deep Basin Total Phosphorus Measurements (Portland Water District, 2008)

The emergence of this broader trend may be driving some of the concern surrounding the development pressures in the Sebago Lake watershed. However, it is unclear from the data to what extent development pressures are contributing to increased phosphorus loading. For example, Maine DEP officials offered several plausible explanations for the trend line, such as a step change resulting in a new equilibrium or hydrological effects due to increasingly erratic rainfall as a consequence of climate change (Maine Department of Environmental Protection, 2011). Additionally, lag time for impacts to the upstream watershed on the lake is approximately 25 years, so the upward trend shown in Figure 3 beginning in the late 1980's may be associated with a development boom in the 1960s-70s. While events in the upper watershed may impact future trophic conditions, changes shown above may be more directly attributable to climate change or an alternative phenomenon that has a more direct impact on the lake (Maine Department of Environmental Protection, 2011).

Land Uses within the Watershed

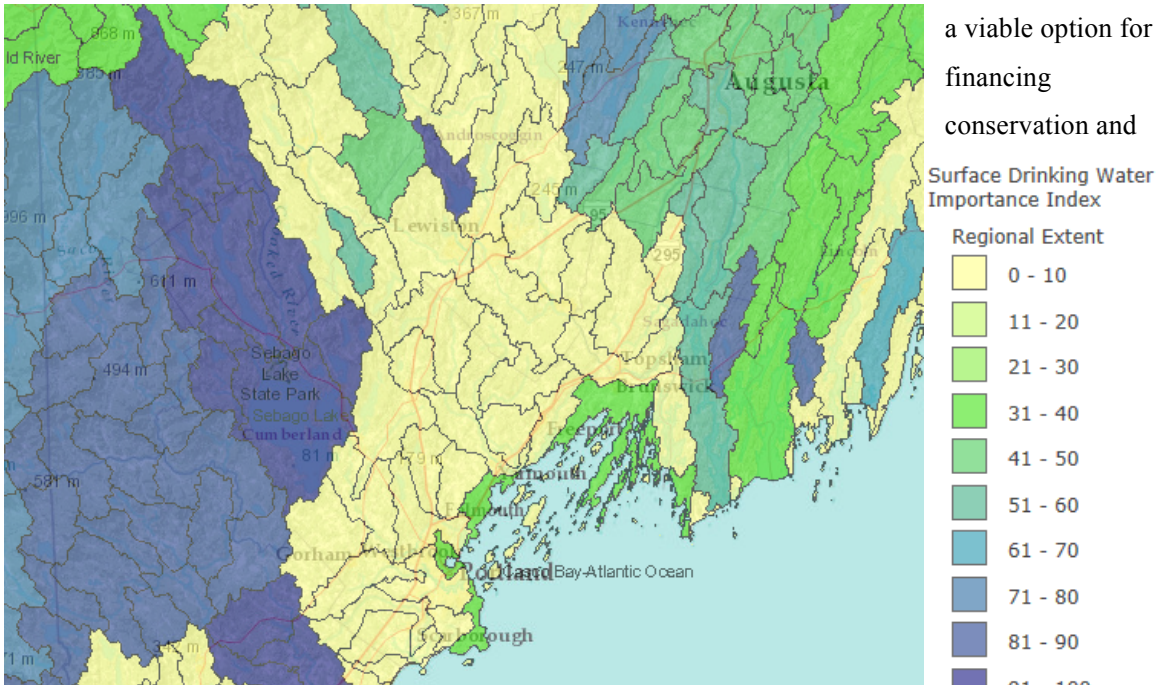
Different types of land use and land cover within the Sebago Lake watershed have a significant impact on the quality of water in the lake, and are associated with different BMPs that can be implemented to improve water quality for different types of land use or land cover. Table 1below describes land use and land cover types within the watershed and the proportion of the watershed each type occupies. It is significant that 81.5% of the watershed consists of undeveloped vegetated areas, because these areas play an important role in preserving to water quality.

Table 1: Land Use/Land Cover in Sebago Lake Watershed (Portland Water District)

Land Use/Land Cover	Percent Watershed
Residential	6.9%
Agriculture	2.2%
Commercial/Retail	0.2%
Timber Operations	2.5%
Undeveloped Vegetated Areas (forests/fallow fields)	81.5%
Other Uses	2.2%

According to a 2009 United States Department of Agriculture (USDA) Forest Service report, the Presumpscot River watershed ranks first among all watersheds in the Northeast and Midwest study area in terms of "development pressure on private forests important for drinking water supply" (Barnes, Todd, Rebecca, & Barten, 2009). This ranking is based on an aggregate score across four indices: 1) the ability to produce clean drinking water (APCW); 2) the importance of forests to drinking water; 3) dependence on unprotected forestland for drinking water supply; and 4) development threat of forests important to the supply of drinking water (Barnes, Todd, Rebecca, & Barten, 2009). Presumpscot, like many watersheds in Maine, ranked high on the APCW index based on a composite of six biophysical characteristics including: forest land, agricultural land, riparian forest cover, road density, soil erodibility, and housing density. The maps in this section are generated through the USDA Forest Service *Forest to Faucets* project, which provides online Geographic Information Systems (GIS) maps of the continental U.S. areas that are determined to be the most important to surface drinking water.

Figure 4 shows the importance of surface drinking water resources to the ongoing provision of drinking water quality. One of the primary objectives of the Forest to Faucets project is to identify areas for protecting surface drinking water quality, and to identify areas where a PWS scheme may be a viable option for financing conservation and



land management on private forestland (US Forest Service Forests To Faucets, 2011). As shown in the map, Sebago Lake is a critical resource to the drinking water supply. It is worth noting that the land adjacent to the west and southwest areas of the lake are relatively more important to water quality than other areas of the watershed. In particular, the areas surrounding Portland, where much of the growth and development are concentrated, does not rank as critical factor in preserving surface water quality.

Figure 4: Index of Surface Drinking Water Importance (US Forest Service Forests To Faucets)

The second index measured in the Forests to Faucets report is the importance of forest areas to surface drinking water supplies, shown in Figure 5. The watershed has relatively high ratio of water consumers to watershed area, indicating that a large downstream population is dependent on effective management of a large forested area.

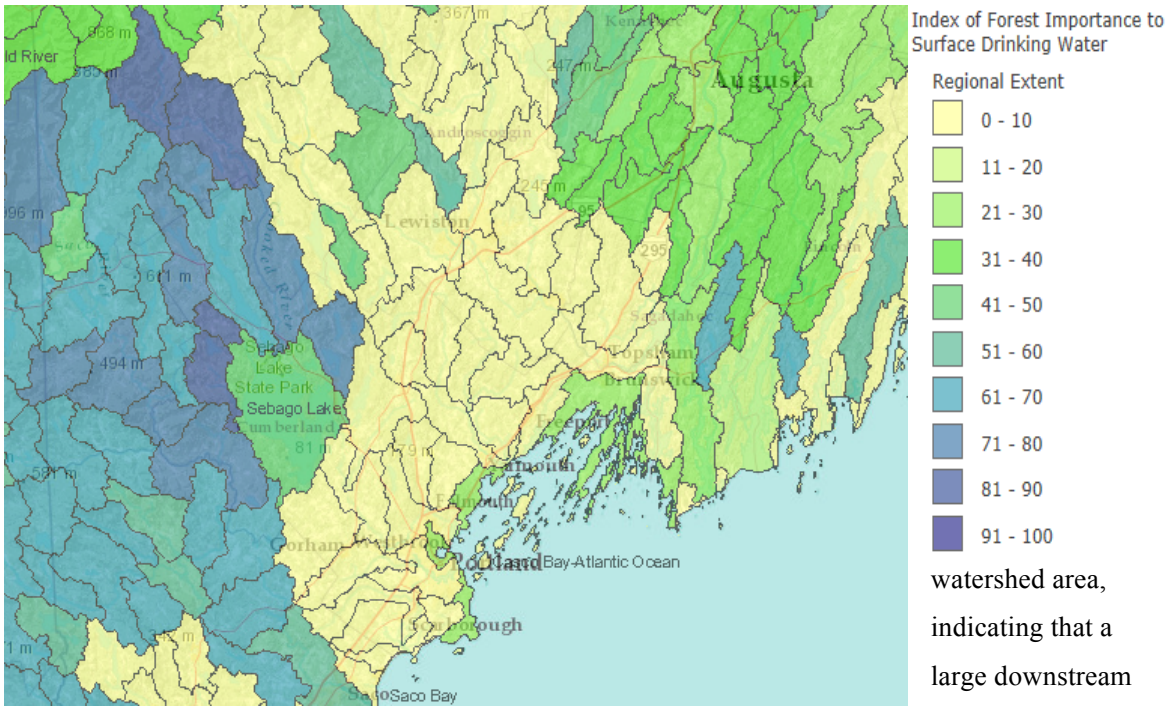


Figure 5: Index of Forest Importance to Drinking Water (US Forest Service Forests To Faucets)

The final index considers the threat of forest conversion or need for effective management to sustain forest conditions to protect drinking water supply (Barnes, Todd, Rebecca, & Barten, 2009). Figure 6 shows the development threat of forests important to the ongoing supply of surface drinking water. Although forests of the watershed appear threatened to the extent that water quality may be degraded in the absence of effective land management, it is important to note that the development pressure appears to be concentrated on the western lakeshore, and not in other parts of the watershed. The northern and southern edges of the drainage basin are characterized by different social trends and dynamics. Therefore, forest cover in the northern end of the watershed faces relatively little development pressure. Thus, the implication for water quality in Sebago Lake as indicated by the Forests to Faucets project may be greater than it would have been if the data being used was downscaled from the eight-digit Hydrologic Unit Code (HUC), which the project is based on to the twelve-digit HUC code scale used on the maps in Figure 4, Figure 5, and Figure 6.

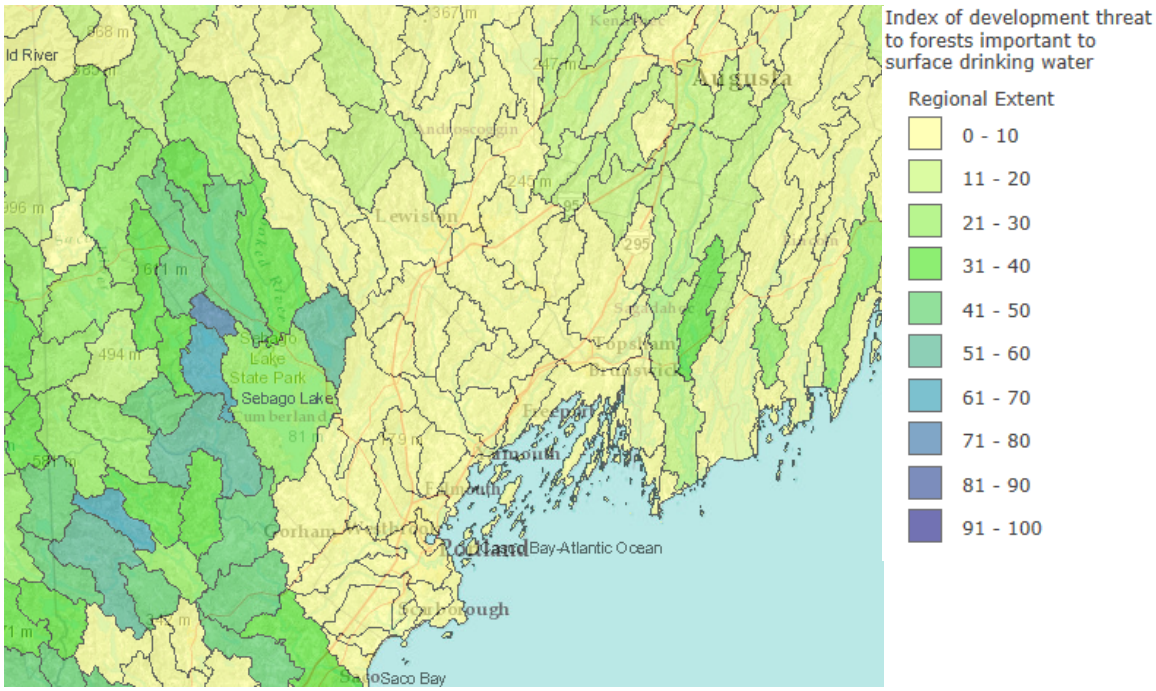


Figure 6: Index of Development Threat to Forests Important to Surface Drinking Water (US Forest Service Forests To Faucets)

Climate Change

Global climate change is widely recognized as a factor that will significantly impact future freshwater resources and resource management, although the degree of impact remains to be seen. According to the Union of Concerned Scientists, the climate of Maine is changing as summers become longer and hotter, spring arrives earlier, and winters become warmer with less snowfall (Union of Concerned Scientists, 2007). Climate Change will likely result in increased winter precipitation, short-term summer droughts, reduced ice cover on Sebago Lake, and shifting characteristics of Maine's growing conditions and ecosystems. Water resource projects need to be resilient or adaptive to unavoidable impacts of climate change. Water resource planning will necessarily involve climate risk assessment, evaluation and implementation of strategies to address risks, and monitoring and updating management strategies as needed (Department of Water Resources, 2011).

Future winter and spring precipitation is expected to increase by 10-15% throughout the Northeast over the coming century (Hayhoe, 2007). Higher precipitation will result in increased flooding and higher peak flows during spring which will require adjustments to BMP implementation. In order to be effective against increased flow, strips of vegetative buffer along streams will require widening or planting with different types of vegetation in order to be effective against enhanced storm events and erosion caused by increased runoff. Vegetative buffers will become increasingly important as a BMP because they serve as floodplains and help to reduce the flashiness of rivers by retaining water and slowing flows during high flow events (Bayley, 2005). Similarly, high flow events will require larger culverts to handle increased runoff.

Precipitation is expected to increase in the winter and spring, and is expected to remain constant or reduce slightly during the summer and fall seasons (Hayhoe, 2007). Increases in the frequency or intensity of storm events may increase surface water turbidity, while lowered summertime precipitation may simultaneously result in increased surface water contaminant concentration (Department of Water Resources, 2011).When this scenario is paired with anticipated increases in average temperatures, evaporation and evapotranspiration are expected to increase with the likely result being a concentration of turbidity and other pollutants due to reduced water quantity. This may additionally result in an increase in short-term summer droughts, which would be an issue to which water managers would need to adapt (National Research Council of the National Academies, 2010). Longer summers and shorter winters will result in less time with ice cover on lakes, leading to increased evaporation from Sebago Lake and increased overall temperatures of the lake (Rahel, 2008).

Change to the hydrological cycle will drive broader ecological changes. For example, many species depend on specific ecological conditions and seasonal cues for survival and reproduction. Shifting conditions will increase susceptibility to invasive species and diseases, with potentially harmful impacts to aquatic and terrestrial ecosystems (Bayley, 2005). Increased temperatures may also exacerbate dissolved oxygen deficiencies in water bodies, increasing algal blooms and stressing aquatic ecosystems (Department of Water Resources, 2011). PWS may play an important role in limiting vulnerability to or mitigating the effects of global climate change.

Increased average temperatures will also impact terrestrial ecosystems. Timber stands will be more susceptible to diseases and pests, and ultimately the character of northern forests will change over time as dominant species give way to successors more suited to shifting climatic conditions (Union of Concerned Scientists, 2007). The transitional period may intensify aquatic stressors as dying trees will not be immediately replaced with mature successors, and previously forested terrain will be susceptible to erosion, potentially increasing both turbidity and contaminants that are ultimately concentrate in Sebago Lake (Chiang, 2008).

The harmful effects of climate change highlight the importance of carefully managing natural resources order to limit its impacts and reduce vulnerability. As such, BMPs are increasingly important for maintaining water quality. Additionally, when land management practices anticipate shifts in precipitation patterns, early implementers of BMPs can ensure that the species on their lands are resilient to change. Implementing BMPs may also have ancillary benefits in limiting the impacts of climate change through carbon sequestration. In tandem, climate adaptation and BMP implementation will result in more effective land management strategies. Therefore, PWS may be an important tool for engaging stakeholders concerned with how land management decisions can respond to the effects of or limit vulnerability to climate change.

Social and Institutional Context of Sebago Lake Watershed

Maine is in a state of critical transition. The southern part of the state is the locus of growth and accompanying shifts in demographic and landscape patterns. Maine is historically a rural and sparsely populated state which, according to many inhabitants, is precisely the reason they choose to live there. Over the past several decades, however, southern Maine has begun to exhibit development patterns that may transform the social and physical character of the state. Embedded in these shifts are threats to the traditional social and ecological environments; however, these patterns of change also present new opportunities to define and exhibit the characteristics that make Maine a unique place. This section will identify:

- Drivers of changing land use patterns in Maine and particularly the Sebago Lake watershed
- The implications of those patterns to the social character of the state
- The scales and institutions of government that will devise and implement policy that is reflective of social change
- Potential buyer and seller institutions

Drivers of Land Use Change

The population of Maine is increasing significantly after the slow growth of the 1990s. As shown in Figure 7 the population increased throughout the state from 2000-2005, with the Southern region incurring the greatest increases in population. This growth is driven by migration within Maine as well as an influx of migrants from the Northeast (Brookings Institution Metropolitan Policy Program, 2006). This influx of population is driving new social and economic trends including the ex-urbanization of Maine's rural landscape and economic diversification.

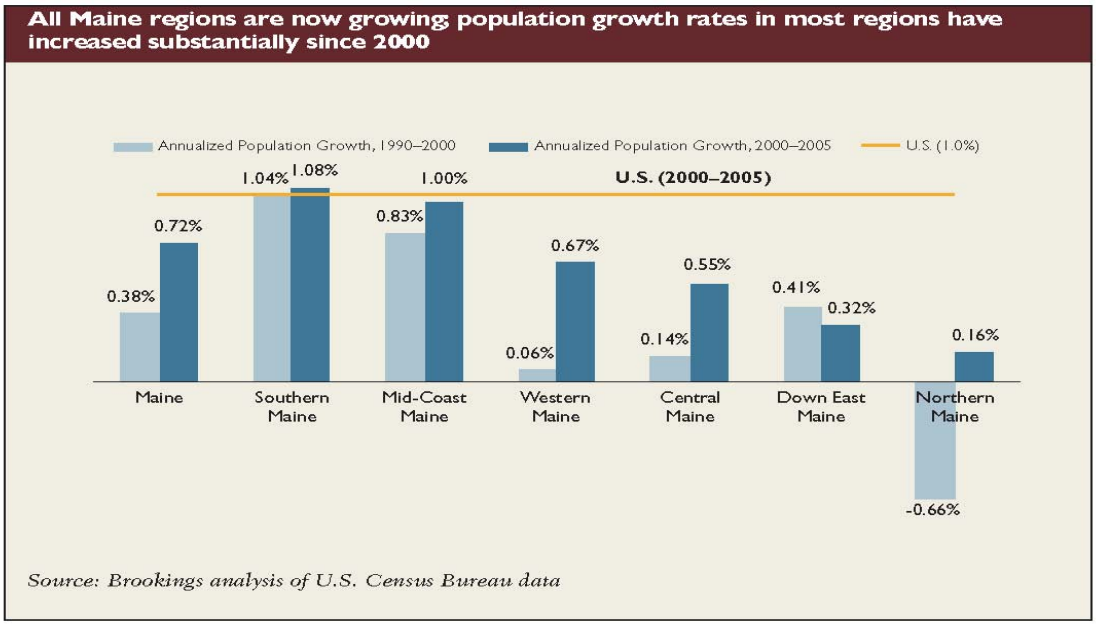


Figure 7: Population Growth in Main (Brookings Institution Metropolitan Policy Program, 2006)

Social and Economic Implications

Many residents report the rural character of Maine's towns among the primary reasons they chose to live there. However, the mass appeal of that character threatens its survival with continued development leading to more impervious surfaces, increased housing density and decreased forest parcel sizes. The social implications of these trends include decreased recreational opportunities and degraded scenic quality. Economic implications include increasing price levels for forest based products, and increased property values due to increasing demand for private, wooded, and rural properties (Stein, et al., 2005) For example, Figure 8 illustrates the pattern of suburban and exurban growth in rural areas that has characterized much of Maine's development throughout the early part of the twenty first century.

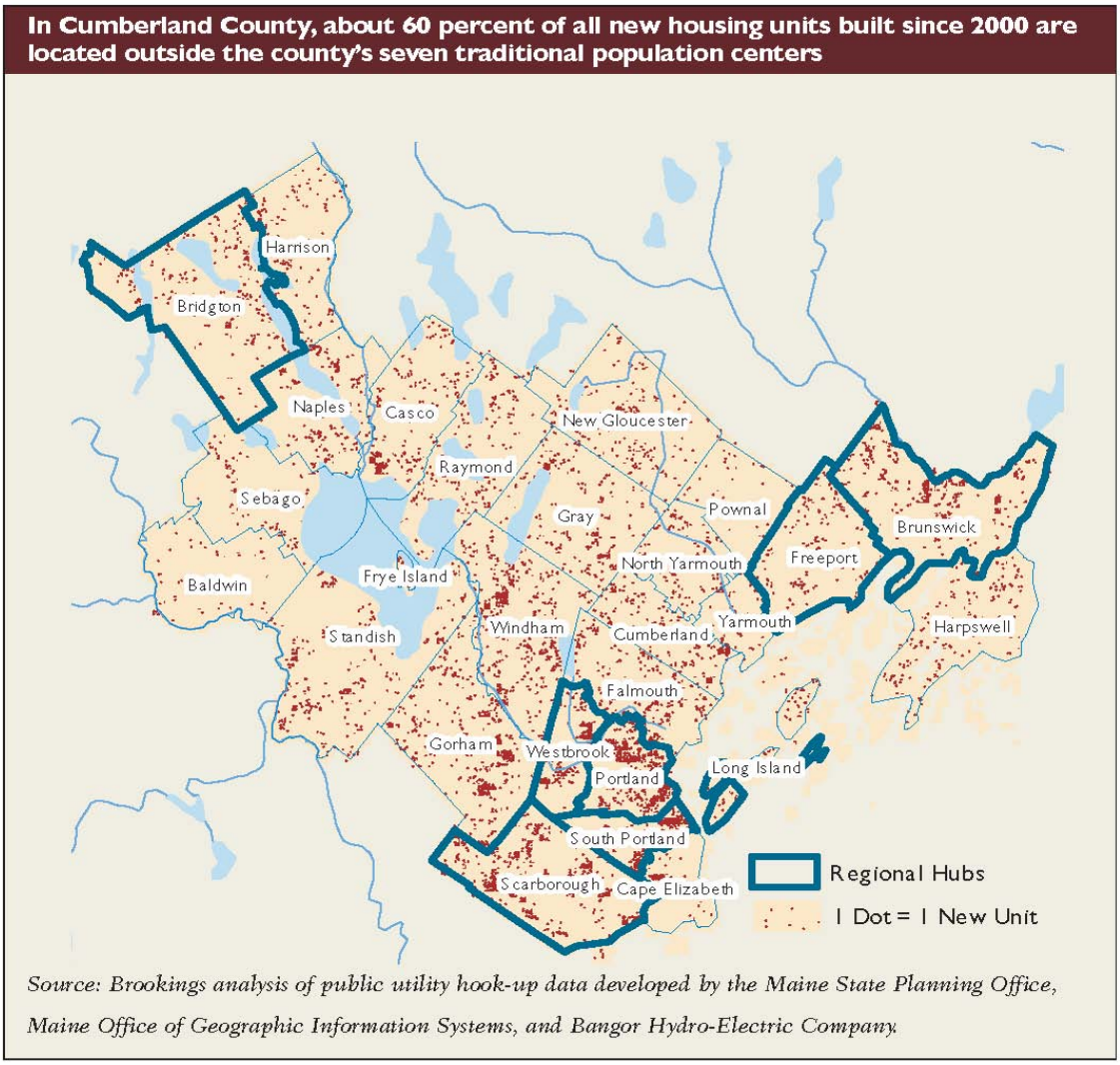


Figure 8: Cumberland County New Housing Units, 2000-2005 (Brookings Institution Metropolitan Policy Program, 2006)

As the population of Maine increases, the price of houses has appreciated significantly. From 2000-2005, the statewide median sales price increased 48%, as compared to 39% nationally (Brookings Institution Metropolitan Policy Program, 2006). Population gains, however, are not distributed evenly among age cohorts (See Table 2). Despite an overall increase of residents, Maine continues to lose younger residents as it attracts older baby boomers and retirees. Maine's popularity as a retirement destination, combined with its aging workforce and disproportionately senior population will likely exacerbate social and economic pressures resulting from an aging workforce and increasing demands on the health and social services the state provides.

Table 2: U.S. Census Data 2010 (U.S. Census Bureau, 2012)

	U.S.	Maine	Cumberland County	Oxford County
Percent persons under 18 years	24.0	20.7%	20.9%	21.3%
Percent persons 65 years and over	13.0%	15.9%	14.3%	17.0%

Governance in Maine

Emerging and accelerating social and ecological pressures will place increasing demands on government institutions to mitigate negative impacts and implement policy solutions. At the state level, government is divided among three co-equal branches: executive, judicial, and legislative. The Executive branch is home to many departments responsible for issues of economic development and environmental and social protection, including the Departments of Agriculture, Conservation, Economic and Community Development, Environmental Protection, Inland Fisheries and Wildlife, Marine Resources and the State Planning Office (Maine.gov, 2002). Federal and state regulations and policies that may impact a PWS market in Maine are summarized in Appendix 5.

At the municipal level, government interfaces directly with citizens to provide essential services broadly utilized on a daily basis, including road construction and maintenance, solid waste disposal, water utilities and treatment, land use planning and emergency service (Maine.gov, 2010). Generally, municipal government in Maine takes one of two forms: direct or representational. The direct form of government relies on the town meeting as its legislative body, whereas the representational form involves a city or town council (Maine Municipal Association, 2010). Municipal government in Maine is governed according to "home rule authority," a statutory provision that allows municipalities to govern themselves in any way that does not conflict with federal or state law (Maine Municipal Association, 2010). This feature of government in Maine sets the state apart from many other states where the powers of local government are much more limited. Thus, municipal governments are relatively strong compared to the counties in which they are situated. In Table 3

below, municipalities are categorized into three tiers based on the approximate proportion of town area within the Sebago Lake watershed. We used this simple sorting scheme to prioritize our investigation of municipal land use ordinances.

Table 3: Categorization of municipalities (county in parentheses) based on approximate proportion of area within the Sebago Lake watershed

Tier 1: More than half	Tier 2: One quarter to one half	Tier 3: Less than a quarter
Harrison (Cumberland)	Standish (Cumberland)	Windham (Cumberland)
Naples (Cumberland)	Norway (Oxford)	Bethel (Oxford)
Frye Island (Cumberland)	Stoneham (Oxford)	Denmark (Oxford)
Bridgton (Cumberland)	Sweden (Oxford)	Greenwood (Oxford)
Sebago (Cumberland)		Baldwin (Cumberland)
Casco (Cumberland)		Gray (Cumberland)
Raymond (Cumberland)		Hiram (Oxford)
Waterford (Oxford)		Lovell (Oxford)
Albany Twp (Unorganized – South Oxford)		Mason Twp (Unorganized – South Oxford)
Otisfield (Oxford)		Poland (Androscoggin)

Potential PWS Sellers/Suppliers

Forest land ownership in the watershed is privately held and fragmented

In terms of potential sellers/suppliers of watershed services, 96% of land in the Sebago Lake watershed is under private ownership (The University of Maine). The watershed contains more than 7000 different land parcels or tracts of land with different owners (American Forest Foundation: Project Learning Tree). In particular, forested land in the Sebago Lake watershed is held predominantly by NIPF landowners. These ownership patterns contrast somewhat those of the Northern part of the state, where there is greater public and industrial ownership of forest land. However, in comparison to other states, Maine as a whole has a very low proportion of public land ownership (See Table 4).

Table 4: Land ownership in Maine

	Area (thousands of acres)	% of State's Total Area	State Rank
Owned by State and Federal Government	1,059	5.36%	37/50
Owned by State	889	4.50%	23/50
Owned by Federal Government	170	0.86%	45/50

Total Area = 19,754 (thousand acres) Source: Natural Resources Council of Maine (Maine)

There are few formal institutions dedicated to potential sellers/supplies

In addition to this fragmentation of the seller/supplier base, our research and interviews suggest that many NIPF landowners highly value their privacy and may not even think of themselves as a "forest owner." Thus, there are few formal organizations or touch points around with which potential sellers/suppliers identify and congregate.

The notable exception is the Small Woodland Owners Association of Maine (SWOAM). This mostly volunteer organization was formed to provide "a voice and resource" to Maine's small woodland owners—the 120,000 people with 10 to 1000 acres of forest land who, according to SWOAM, collectively own approximately one third (5.5 million acres) of Maine's forest land (Small Woodland Owners Association of Maine). SWOAM also has a small land trust with the goal of "protecting productive forestland and encouraging multiple use management" (Small Woodland Owners Association of Maine). Yet, with a statewide active membership of 2,750, SWOAM is only reaching 2.5% of its target demographic. The Sebago Lake watershed corresponds to two of SWOAM's nine regional chapters: Western Maine (areas in Oxford County) and Southern Maine (areas in Cumberland County).

Municipalities and outdoor/recreational groups may be effective indirect touch points

In the absence of major seller/supplier institutions, identifying and connecting with NIPF landowners will be more circuitous. Our interviews suggest that municipalities may be effective institutions through which to indirectly approach local NIPF landowners. In addition to municipalities, outdoor and recreational groups such as the Maine Snowmobile Association and the Sportsmen's Alliance of Maine may share forest conservation objectives and have some NIPF landowners as members, providing additional indirect touch points.

Potential PWS Buyers/Beneficiaries

Unlike the fragmented landowners discussed above, potential PWS buyers/beneficiaries are concentrated through formal organizations. Most importantly, the Portland Water District aggregates many downstream end consumers (i.e., rate payers). However there are also several large businesses (namely bottled water, brewery, semiconductor companies) that depend on high water quality and may be motivated to serve as secondary buyers. Finally, many organizations and individuals derive ancillary benefits (e.g., fishing and recreation) from watershed conservation and could be a tertiary source of funds. Given the scope of this report, we will briefly touch on the PWD but not discuss these latter two categories of potential buyers.

Portland Water District

PWD is a quasi-municipal utility that provides water, wastewater, and environmental services to around 200,000 residents of 11 communities[1] in the Greater Portland area (Portland Water District). Sebago Lake supplies the water for over 99% of customers with the balance provided by a small well in Standish (Portland Water District, 2011). Yet, as shown in Figure 9, most of the PWD's service area is outside the boundaries of the Sebago Lake watershed, meaning that few ratepayers have direct influence over the quality of their water.

The PWD has an annual budget of around $37 million and articulates six strategic goals: Public Health; Public Safety; Environment; Reliability; Affordability; Employees and Work Environment. Looking first at **affordability**, PWD water rates are around 0.5% of median income in comparison to a 2% national standard for utility bills. Moreover, the PWD prefers to increase rates in small increments each year and has kept increases below the long-term inflation rate over the past decade.

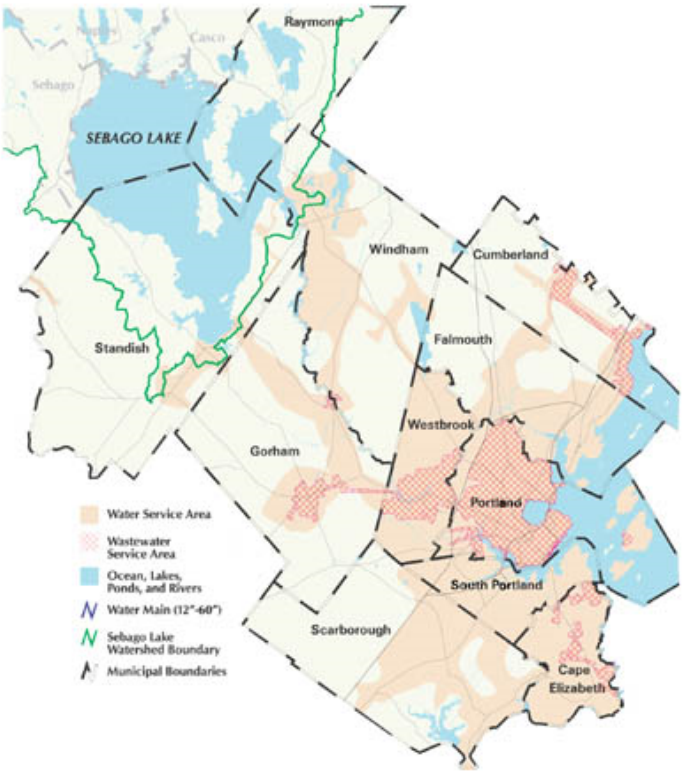


Figure 9: Portland Water District Service Area (Source: www.pwd.org)

The **environment** goal to "promote the sustainability of natural resources" mostly deals with wastewater treatment, as regulated by the CWA and administered by the Maine DEP.

Regarding **public health**, the PWD is subject to Safe Drinking Water Act (SDWA) regulations. It holds its FAD, originally granted by the EPA in 1993, due to its high source water quality and watershed control program. For disinfection, the PWD employs an ozone treatment process and, to comply with the Long Term 2 Enhanced Surface Water Treatment Rule (EPA), is piloting an

[1] Portland, South Portland, Cape Elizabeth, Scarborough, Westbrook, Falmouth, Cumberland, Windham,

ultraviolet treatment system as a second process. Full-scale implementation of the UV system is expected to cost $10-12 million and be completed by 2014.[2]

As shown in Figure 10 below, were the PWD to lose its FAD, the cost of constructing a filtration plant could exceed $140 million (Gray & Talberth, 2012). From an avoided cost perspective then, its incentives are clearly aligned with protecting the Sebago Lake watershed and it has already been investing in this area. In 2011, the PWD planned to spend nearly $1 million for watershed protection through the Environmental Services department (Portland Water District).

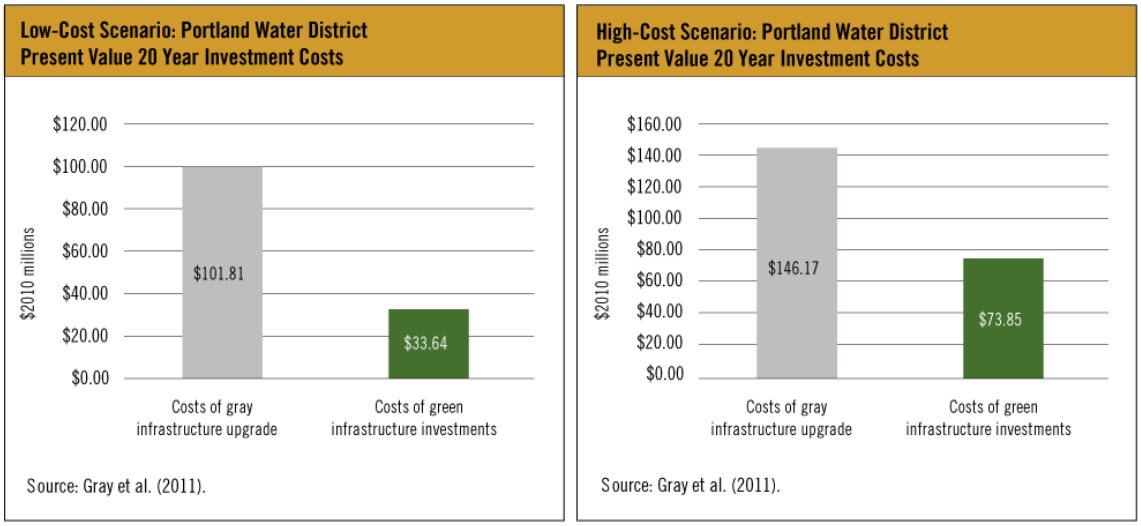


Figure 10: Green vs. Gray Cost Benefit Analysis million (Gray & Talberth, 2012)

[2] The EPA agreed to extend its 2012 deadline by two years.

Methodology

This research project was completed in three distinct phases using a combination of primary and secondary research methods. Prior to the beginning of Phase 1 we worked substantially with WRI and Manomet to establish an appropriate scope for the project. Out of this preliminary scoping it was decided that the team would focus on the supply side of the PWS scheme and research recommendations for increasing landowner outreach and engagement.

Table 5: Project Methodology

	Phase I: Analyze Secondary Research	Phase II: Conduct Preliminary Interviews	Phase III: Validate Hypotheses	Phase IV: Deliver Final Recommendations
Objectives	***Understand PWS landscape nationally and specific context in Sebago and Maine as a whole.***	***Understand Maine institutional dynamics and role of existing conservation organizations***	***Validate key hypotheses***	***Produce and present final recommendations and deliverables***
Activities	**Literature Review** **Client Meetings**	**Conduct preliminary meetings with Maine organizations** **Establish initial hypotheses**	**Case study interviews** **Institutional Analysis** **Additional secondary research** **Establish key recommendations**	**Finalize actionable recommendations** **Incorporate feedback from interim client presentation** **Present recommendations to SNRE Masters Project Symposium** **Present recommendations to client**

Background and Secondary Research via Literature Review

In order to understand the landscape of Payment for Watershed Services nationally, and in the Sebago Lake watershed specifically, we undertook an extensive period of literature review using materials provided by WRI and Manomet, as well as utilizing library resources available at the University of Michigan including ISI Web of Science. Different search terms were combined to address our different research priorities:

- **PWS Conditions for Success**: "payment for ecosystem services" + "pre-requisites" + "decision-making" + "design principles" + "methodology"
- **Climate Change**: University of Michigan Professors and topical experts Mike Wiley and Don Scavia provided references to relevant documents
- **Segmentation of Landowners**: "NIPF" + "Maine" + "family" + "forestland" + "owners" + "landowners" + "parcelization" + "fragmentation" + "land use" + "land cover" +
- **Targeting & Positioning**: "payment for ecosystem services" + "participation" + "attitudes" + "barriers"
- **Scheme Attributes & Administration**: "NIPF" + "attitudes" + "federal incentives" + "financial incentives" + "payment" + "PES"
- **Outreach Channels & Tactics**: "Landowner outreach" + "Landowner education" + "Landowner communication"

Additional resources were identified through the analysis of bibliographies. In total we reviewed more than 200 documents from these sources, as well as multiple relevant websites and internal project documents. Based on this literature review we established key hypotheses and a data gathering approach for the primary research phase.

Primary Research on Site

In order to better understand the institutional environment, and the specific challenges and opportunities being faced by conservation organizations in the Sebago Lake watershed, the team traveled to Maine in order to conduct in person interviews with relevant actors having a substantial relationship with land use management, drinking water quality and forestry, and direct interactions with landowners including:

- Cumberland County Soil & Water
- Grow Smart Maine
- Maine Forest Service
- Loon Echo Land Trust
- Department of Environmental Protection – Watershed Assessment and Planning
- Maine State Planning Office
- Manomet Center for Conservation Sciences
- Western Foothills Land Trust
- Portland Water District
- Maine Drinking Water Program, Department of Health and Human Services
- Small Woodland Owners Association of Maine

As a result of these interviews the team established key hypotheses to further evaluate using case study interviews and additional secondary research.

Case Study Interviews

Goals

To supplement our literature reviews, site visit, local contact interviews, and institutional analysis, we investigated how other PWS or PWS-like programs approached the design of institutions to administer programs and how they approached landowner outreach and engagement. Although some of the most innovative PWS schemes are being developed outside of the United States, we decided to look only at domestic programs due to concerns about interview logistics, language barriers, and generalizability of findings.

Approach

We sought to build on existing efforts that identified and summarized other PWS or PWS-like programs. To that end, we started with the **Conservation Registry** database (http://www.conservationregistry.org/). As suggested by its name, the registry is "an online, centralized database that records, tracks and maps on-the-ground conservation projects." (About the Conservation Registry) In addition to centralizing records for thousands of conservation projects, the primary advantages of using the registry are that it 1) provides data in a consistent format and 2) allows for easily replicable search processes.

Though the registry relies on voluntary updates, most of the PWS project listings were compiled during 2011 in parallel with the publication of *Innovations in Market-Based Watershed Conservation in the United States: Payments for Watershed Services for Agricultural and Forest Landowners*. (Majanen, Friedman, & Milder, 2011) This report reviewed innovative PWS programs in the United States and summarized key data about them, including geographic distribution, buyer, seller, focal service (e.g., water quality), BMPs funded, etc.

It is important to recognize that these authors focused on a subset of PWS programs in the United States, excluding "PWS mechanisms that are already well-known or well-documented, such as Farm Bill programs, water quality trading programs, mitigation banking, tax incentives, and cost-share programs." (Majanen, Friedman, & Milder, 2011) Their research also found that there were no other "existing repositories, networks, or clearinghouses" on this segment of PWS. (Majanen, Friedman, & Milder, 2011) Their criteria for inclusion resulted in 140 Tier 1 projects, which was narrowed to 32 Tier 2 projects that focus on emerging and innovative models. This criterion overlaps well with our own interests (given the potential project in Sebago) so we were comfortable using those schemes as a starting point.

Table 6: Conservation Registry Search Terms

Phrase	Keyword Results	Search Results
PWS	31	32
Payment for Watershed Services	31	39
Payments for Watershed Services	31	36
Public Payment for Ecosystem Services	7	17
Ecosystem Services	31	53

We built on the 32 Tier 2 projects by searching and browsing the entire registry based upon the keywords in Table 6 to identify any other projects with high levels of overlap with our own research objectives in Sebago Lake. The 31 projects for PWS are the same Tier 2 projects discussed above with the exclusion of the "Upper Connecticut River Watershed Reverse Auction," which is reviewed in the report but was not found in the database.

After filtering out duplicate listings, we found four additional projects for inclusion, resulting in a starting list of 35 schemes. Next, we applied a set of filters and rating criteria to narrow this list to a more manageable number of programs. The first screen was whether private landowners are the targeted sellers in the program. This eliminated programs such as the Santa Fe Watershed Management Project and Denver Water Forest to Faucet Partnership, both of which focused on U.S. Forest Service (public) lands.

Next, we rated programs along the following five dimensions of similarity to Sebago. There are many other possibilities but these serve as a reasonable starting point.

- Type of Private Landowner (Mostly Forest, Mix of Forest/Farm, Mostly Farm, etc.)
- Focus on Water Quality (Primary, Partial, Minimal)
- Stage of Program (Active, Pilot, Planning, etc.)
- Inclusion of (at least some) payments that do **not** go towards land or easement acquisition
- Located in the Northeast

We scored the programs according to the values in Appendix 2, summing across to get to a final indicator of relevance (note: the spreadsheet is set up for easy rescoring so that it can be applied to other potential program sites). As shown in Appendix 2, using a cutoff score of 6 yielded 11 candidate programs. We added 3 additional programs (not counting a precursor program to one of the 11) from the next level down based on an assessment of relevance for a total of 14 programs.

(Note: we are including the spreadsheet used for the calculations. It is set up for easy rescoring so that it can be applied to other potential program sites with different characteristics than Sebago.)

We invited representatives of these 14 programs to participate in a loosely structured phone interview around four main topics:

- Program administration
- Landowner involvement in program design, namely the selection of the financial incentive
- Targeting of outreach
- Barriers/concerns of landowners

We had a set of general questions to guide the interview but tailored the particular questions in each interview based on the background information we were able to find online and how the conservation evolved (See Appendix 1).

Response Rate

Of the 14 organizations we contacted, we ultimately conducted interviews with individuals from nine of them (two declined, and three did not respond to the invitation). We conducted interviews with two additional individuals based on the recommendation of other interviewees. Appendix 3 lists the interviewees and Appendix 4 summarizes responses anonymously.

Challenges

We recognize several key challenges in looking across the existing landscape of PWS programs.

- **Complexity**: some PWS schemes have multiple partners and use multiple approaches, which are difficult to disaggregate.
- **Interconnectedness**: many PWS schemes grew out of or are offered alongside existing non-PWS watershed work with similar objectives, making it is especially difficult to identify where PWS-specific actions or outcomes begin and end.
- **Immaturity**: there are few PWS schemes and many are young, opportunistic, and experimental, making it hard to claim best practices yet. The definition of PWS incorporates a wide spectrum of scheme designs but few have gone beyond the planning or pilot phases and tried to scale up. The New York City watershed program is the notable exception, having started in 1997 and today including 93% of landowners in the watershed. In some cases, ambitions for markets and other innovative scheme designs are being scaled back or have yet

to be realized. Other programs are adding PWS opportunistically as just another tool in their toolbox to continue their organization's mission. The phrase "accidental PWS" was used to characterize one program's somewhat natural evolution out of existing efforts.

- **Idiosyncrasy**: PWS schemes differ across many dimensions, making comparison and generalization between them difficult. Some are driven by the buyer's desire to avoid gray infrastructure costs in the future, while others provide ongoing benefits. Some have a competitive application process given limited funds while others are struggling to attract participants. Some work with farmers in the Midwest, ranchers in the South, or forest owners in the Northeast.

Institutional & Stakeholder Analysis

Goals

In considering the feasibility of a Payment for Watershed Services scheme, it is critical to understand the institutional context (i.e., how potential buyers, sellers, and intermediaries are organized) in which the scheme will have to operate. (Smith M. , de Groot, Perrot-Maître, & Bergkamp, 2008) We apply a broad definition of institution here, referring to both informal social structures and formal organizations (in the private, public, or social sectors) that influence behavior through rules, conventions, norms, and incentives. The goal of this analysis is to provide a baseline understanding of the local reality from which we can identify possible gaps and/or areas of conflict, complementarity, and redundancy between PWS and existing conservation approaches.

Potential buyer and seller institutions have been discussed above and so our focus here is on the range of intermediary institutions that can influence the decisions of the potential sellers and buyers. This landscape is important to understand since existing relationships may be enhanced or displaced by a PWS scheme.

As a natural extension of the institutional assessment, a stakeholder analysis seeks to characterize the interest and influence of specific individuals, groups, and institutions on the proposed PWS scheme. Together with the institutional analysis, this provides insights about who to engage, when to engage them, and what competes for their attention.

Approach

In Appendix 7, potential intermediary institutions are categorized according to four types of influence. Other than some demand-side regulatory drivers (e.g., Surface Water Drinking Act), our emphasis here is on the influencing of sellers/suppliers rather than buyers/beneficiaries.

- **Regulatory/Policy**: includes rulemaking, implementation and enforcement activities.
- **Financial Incentives**: includes financial payments of various types to encourage specific behaviors (See Appendix 8).
- **Technical Assistance**: includes services, resources, and training to increase understanding of and implement practices based on relevant science and policy.
- **Advocacy/Outreach/Engagement**: Includes political advocacy, one-way dissemination of information (i.e., outreach), two-way information exchange and collaboration (i.e., engagement), and related activities.

This table becomes the primary input into the Stakeholder Analysis. There are a variety of methodologies in use and we opted for an adaptation of one described in the Handbook of Strategic Planning. (Gardner, Rachlin, & Sweeney, 1986) We rate each of the potential groups of buyers, sellers, and intermediaries on a scale from 1 (low) to 5 (high) along two dimensions:

- **Influence**: refers to the capacity of the party to affect the PWS scheme. High influence ratings suggest that these stakeholders should be involved or consulted with to ensure that they support or at least don't actively work against the scheme.
- **Impact (sometimes called interest)**: refers to the potential of the PWS scheme to affect them. High impact ratings suggest that these stakeholders should be involved or kept in the loop so that the implications of the scheme are understood and so that they are not taken by surprise.

Using these two dimensions we can divide the chart into four quadrants and map the various stakeholder groups as shown in Figure 11:

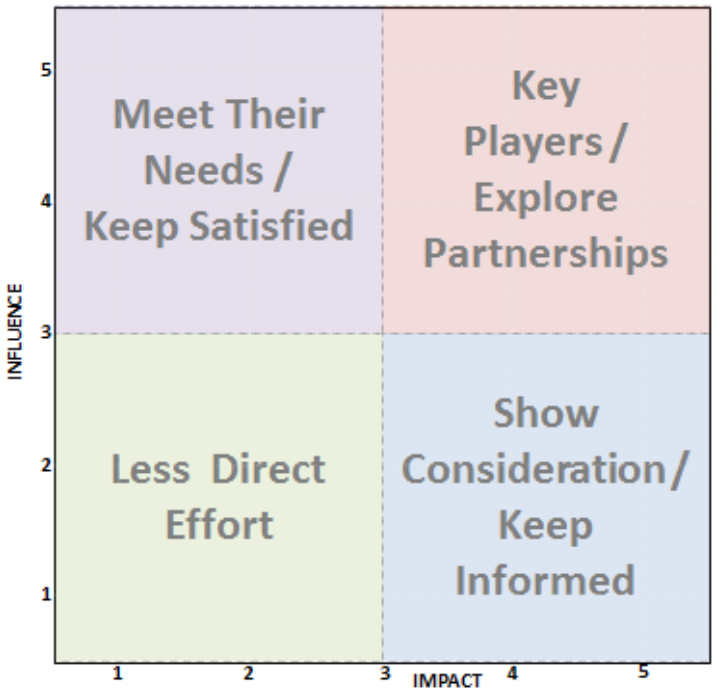


Figure 11: Stakeholder Map Quadrants

Stakeholder Mapping

The results of the stakeholder analysis and the outreach and engagement implications for each of the quadrants are illustrated in and Figure 12 and discussed in Table 7 below. While difficult to assess definitively from an outsider perspective, the tool can be easily adapted and updated going forward.

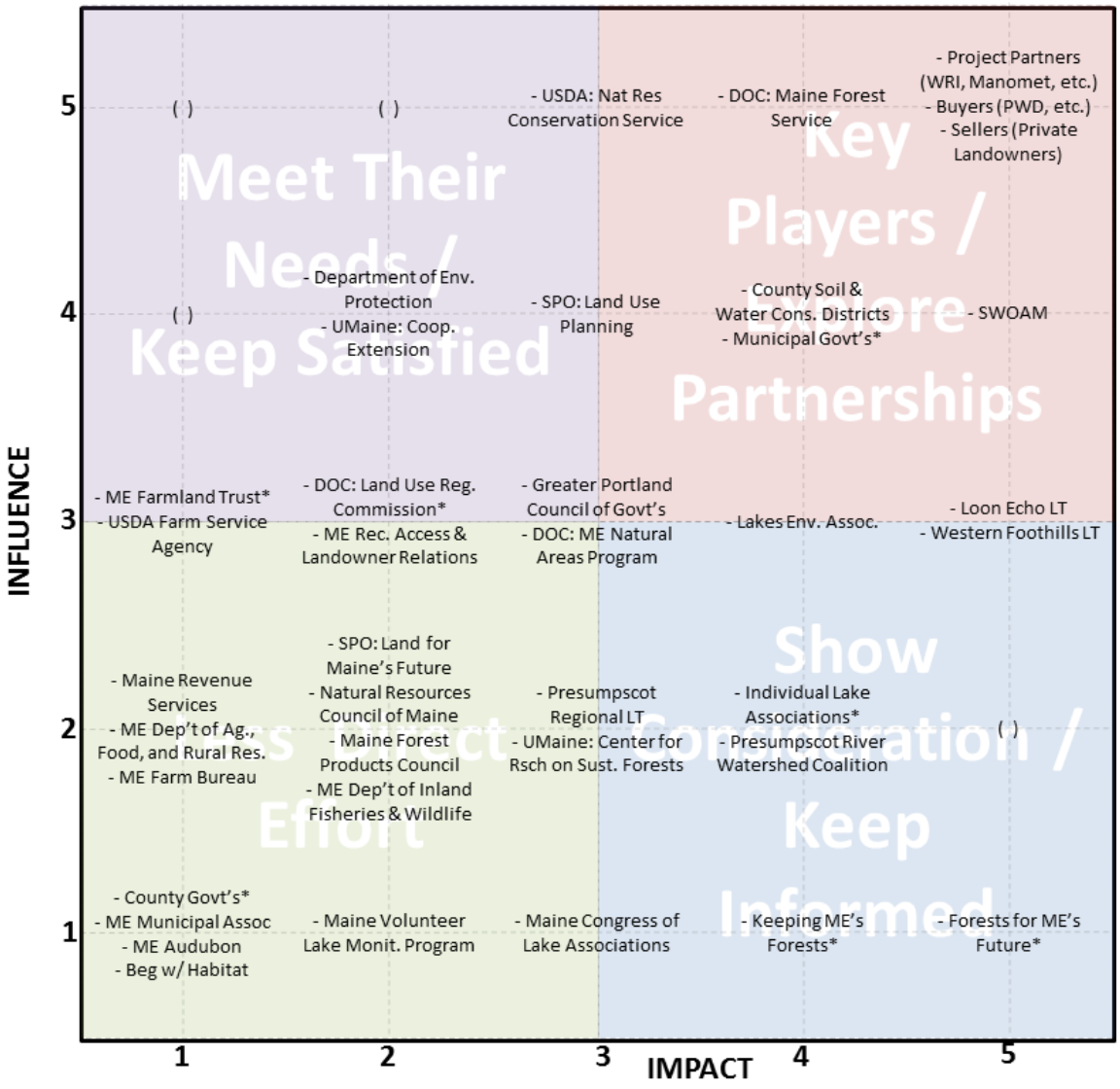


Figure 12: Stakeholder Mapping Illustration

Table 7: Stakeholder Mapping Results

QUADRANT	IMPLICATIONS	SELECTED EXAMPLES
Key Players / Explore Partnerships	These stakeholder groups are most critical to the success of the program and thus should be managed most closely. If outreach resources are limited, they should be focused here.	• Buyers (e.g., PWD) • Sellers (private landowners) • Project Partners (WRI, Manomet, etc.) • Small Woodland Owners Association of Maine (SWOAM) • Maine Forest Service • Soil & Water Conservation Districts • Municipal Governments
Meet Their Needs / Keep Satisfied	Though these stakeholder groups are less likely to be project partners, they have the power over the program's success. It is important to at least consult with them but, in some cases, it may be desirable to increase their interest level and make them key players.	• Natural Resources Conservation Service • Land Use Planning • Maine DEP • University of Maine Cooperative Extension
Show Consideration / Keep Informed	While these stakeholder groups may have less formal influence they can still be ambassadors of goodwill. One should keep them up-to-date about their specific areas of interest.	• Loon Echo and Western Foothills Land Trusts • Lakes Environmental Association • Forests for Maine's Future • Keeping Maine's Forests
Less Direct Effort	These are the stakeholder groups to whom one should communicate more generally to conserve outreach resources.	• County Governments • Natural Resources Council of Maine • Department of Inland Fisheries & Wildlife • Maine Forest Products Council

Findings & Recommendations

Our primary objectives in this research is to provide recommendations that would enhance landowner outreach as part of a PWS program within the Sebago Lake watershed, but that are easily generalizable to other locations or conservation programs. These recommendations have been developed using the three core marketing principles of Segmentation, Targeting and Positioning. This results in additional recommendations related to Scheme Attributes & Administration and Outreach Channels & Tactics (or Product and Channels in marketing terminology). This framework answers the following key marketing questions:

- What is our market?
- Whom do we target?
- What do they want?
- How do we reach them?

Segmentation: Observations

The past several decades have witnessed rapid changes in the spatial and ecological characteristics of U.S. forestland, driven by broad social and demographic shifts. For example, in the period following the Second World War, economic prosperity and a growing population transformed the landscape in many parts of the country from rural to suburban, characterized by the spread of populations outward from urban centers and the claim of rural land through low-density development. Parts of Maine and the Sebago Lake watershed in particular are a microcosm of such change, and will be the subject of this analysis. In many areas this trend has intensified over time and drives landscape-scale change toward fragmentation and parcelization of forestland. These concepts loom large throughout the literature on forest health and management, and as such, highlight the importance of the question - who owns forestland, and why?

Landowners cite a variety of reasons for ownership and rely on a variety of management techniques that have significant impacts to soil, air and water resources. In a 2005 study conducted for the National Commission on Science for Sustainable Forestry, Hagan et al. identified several categories of forestland owners in order to better understand the implications on ownership changes to biodiversity in the Northern Forest Region. Examples of owners include: developers, contractors, government entities, financial investors (e.g. Timber Investment Management Organization, or TIMO), industry, smaller family run companies that acquire land for investment purposes, non-profits, real-estate investment trusts (tax designations for real-estate investments that alleviate tax burdens), and tribal entities. (Hagan, Irland, & Whitman, 2005) In the context of the Sebago Lake watershed, this analysis is primarily concerned with owners of smaller parcels of land managed for a variety of reasons including: timber, non-timber forest products and agriculture. Though the subsequent discussion focuses predominantly on owners of small forestland parcels, much of the literature informing this analysis is concerned with agricultural land uses. Additionally while the proportion of agricultural land in the watershed is relatively low, management practices techniques on those parcels play an important role in preserving the quality of water in the watershed. Although this examination is conducted with a focus on the Sebago Lake watershed, the findings and recommendations are designed to be scaled up or adapted to apply more broadly to farmers, ranchers, and other stakeholders that may be targeted for engagement in conservation programs.

Subsequent analysis will focus on the role of landowners in forest stewardship and identify emerging trends in demographics, land use patterns, and ecological implications to forest health. To achieve this, findings from an extensive review of existing literature will be synthesized and presented according to the following objectives:

1. An identification of trends in family forest ownership and categorization of family forest owners according their motivations and attitudes
2. An overview of anticipated shifts in the demographic and attitudinal characteristics of family forestland owners in the near to medium-term future
3. A discussion of landowner characteristics and trends particular to Maine and the Sebago Lake watershed
4. A synthesis of these findings and their implications for effectively differentiating between landowners based on motivations and attitudes

Land Ownership Patterns

Scaling up from the localized forest ownership types listed above, forests can be publically owned at any level of government, or privately held by a range of owners including corporations or other institutions, tribes, trusts, family partnerships, families, estates or individuals. Private forestland owners can be further categorized based on their role in the forest products industry, paper and wood processing. In this sense, industrial private forest owners are limited to private entities that own both the forestland and mills for processing forest products. NIPF landowners, on the other hand, include all those who claim legitimate property rights to forestland that do not own processing facilities (Best & Wayburn, 2001). There is great diversity in the size and scale of ownership among both industrial and non-industrial private owners. For example, industrial owners may be large corporations that own millions of acres, or a local mill that owns a small parcel of forestland; NIPF landowners may be corporations or other institutional owners that hold thousand acre tracts, or an individual who owns five acres of forestland (Best & Wayburn, 2001). In order to link ownership patterns to the landscape changes described above, it is helpful to sub-categorize family forestland owners (FFOs) as a subset of the NIPF landowner category: as trusts, family partnerships, families, estates or individuals that own forestland (Butler B. , 2008). These forestland owners are a diverse mix of individuals representing a spectrum of interests and values. As such, and due to their prevalence among NIPF landowners in the Sebago Lake watershed, family forestland owners are the focus of this analysis.

In order to better understand the relationship between the demographic and ecological changes that have occurred, and those likely to occur, it is important to understand who family forestland owners are, why they choose to own forestland, and what factors influence their land management practices. The authoritative source of information about family forestland owners is the National Woodland Owners Survey (NWOS) administered by the USDA Forest Service, Forest Inventory and Analysis (FIA) Program. The first national surveys were conducted in 1978 and 1993, and in 2002, the Forest

Service began administering surveys on an annual basis (Butler & Leatherberry, 2004). The NWOS (USDA Forest Service, 2008) asks questions pertaining to:

1. General woodland characteristics
2. Reasons for owning woodland
3. How woodland is used
4. If and how woodland is managed
5. How owners learn about their land
6. Landowner concerns about their land
7. Intended future uses
8. General demographic information

The most recent survey data report, by Brett Butler of the U.S. Forest Service, is available for the period 2002-2006, and builds on previous reports in 1982 and 1994. However, the most recent version does not lend itself to direct comparison with prior reports due to different methodological approaches (USDA Forest Service, 2009).

One of the themes to consistently emerge from the NWOS survey is that family forestland owners cite various reasons for owning forestland that may include multiple simultaneous objectives, with only a small minority citing timberland as their primary objective of land ownership. This held true in the NWOS surveys completed in 1994 (Birch, 1996) and 2006 (Butler B. J., 2008). Butler's most recent report identifies the primary reasons in order of ranking as: beauty/scenery; to pass onto heirs; privacy; nature protection; or part of a home or cabin (See Figure 13) (Butler B. J., 2008). Additionally, while 41% of landowners in the South identified timber production as an important reason for ownership the figures were 22% and 18%, respectively, for the North and West (Butler & Leatherberry, 2004).

The USDA Forest Service estimates there are approximately 749 million acres of forestland in the United States (Smith, Miles, & Pugh, 2004). Nationally, 10.4 million family forestland owners hold 264 million acres or 35% of all U.S. forestland, and comprise 92% of private forest ownership (Butler B. J., 2008). Private ownership is predominant in the Eastern U.S., where 83% of forestland is privately owned (See Figure 14 (Butler B. J., 2008) (Butler & Leatherberry, 2004)). Thus, private landowners are a vital link between the public-at-large and the ecological and social benefits provided by forestland.

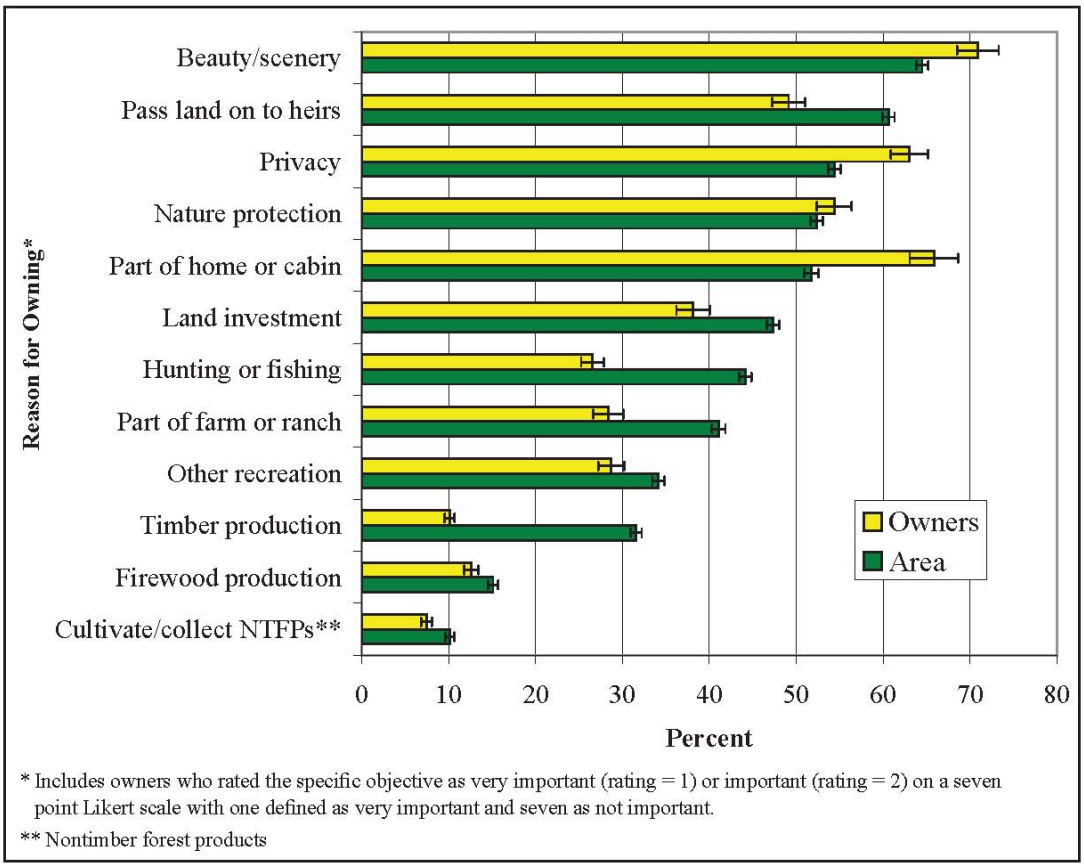


Figure 13: Reasons for family forest ownership, 2006 (Butler B. J., 2008)

Land Ownership Trends

Because of the broad range of interests and values held by family forestland owners, identifying ownership trends is useful to better understand the motivations and attitudes underlying management decisions. The following patterns emerge from complex social and economic drivers that have significant implications to forest health and management:

1. A trend toward more owners of smaller forest parcels
2. More affluent owners
3. A trend toward older owners

The last item may accelerate the first two, and as such will be the subject of particular focus in a following section on intergenerational forestland transfer. This discussion is not intended to be exhaustive of all ownership trends among FFOs; rather, these patterns are relevant to both the national and watershed scales that are the subject of this analysis.

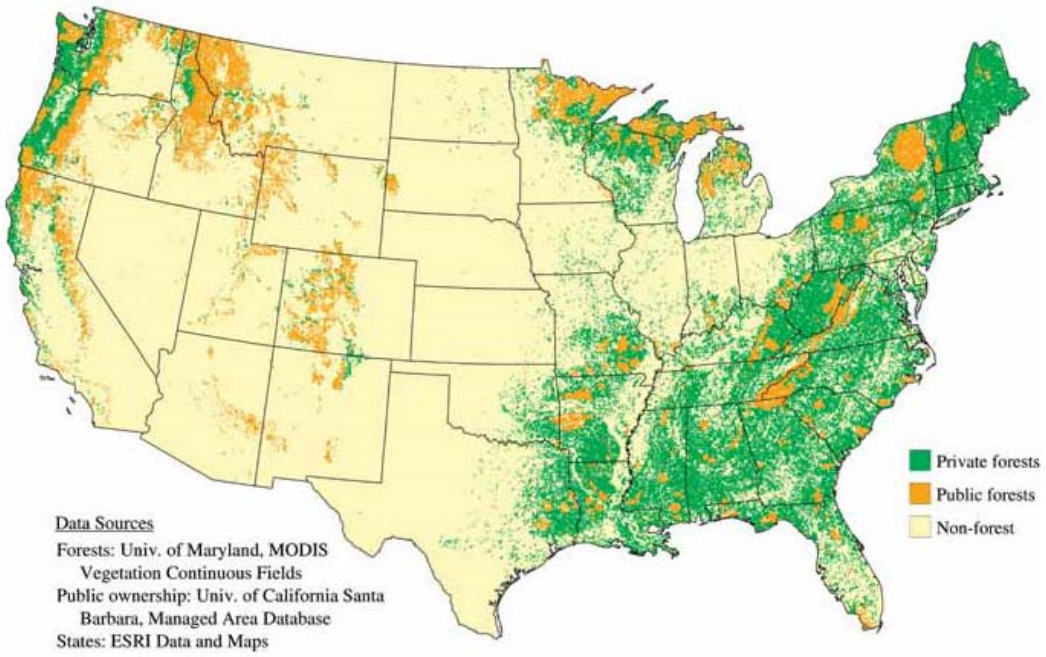


Figure 14: U.S. Public and Private Forest Ownership, 2003 (Butler & Leatherberry, America's Family Forest Owners, 2004)

An increasing number of forestland owners are tending to hold smaller parcels that may significantly impact forest health and management. Fragmentation, or a reduction in contiguous forest through land use change, threatens ecosystem health and the public benefits associated with large tracts of forestland. Parcelization, or increasing units of ownership within a tract of forestland will be at least as impactful to ecosystem health and management if not more so. A larger and more diverse group of owners creates challenges in terms of effective communication and education about management techniques, increased costs associated with managing more and smaller parcels, and an increase in the likelihood of forest fragmentation.

Between 1978 and 1994, the number of owners holding parcels between 10-500 acres doubled from two to four million with most growth occurring among owners holding 10-40 acres of land. In 2000, projections indicated that by 2010, the number of owners in the category will have grown to 6 million (Tyrell & Dunning, 2000). By 2006, the national average parcel size was 25 acres, and most FFOs hold fewer than 10 acres of land (Figure 15) (Butler B. J., 2008). Other projections in 2000 indicated that by 2010, 150 million acres, or approximately 20% of U.S. forestland would be held in ownership units of less than 100 acres, and the average parcel size would have dropped to 17 acres (Sampson & DeCoster, 2000). The 2006 NWOS data indicates that landowners commonly cite multiple reasons for, and benefits to landownership, including: aesthetics, privacy, family legacy, recreation,

investment, conservation, timber production, and other non-timber forest products (NTFPs), to list only a few (Butler B. J., 2008). This extensive but not exhaustive list indicates that forestlands provide a breadth of goods and services each with an underlying economic value. Because the markets for many of these NTFP goods and services are not well developed, the costs of obtaining them through market-based transactions are higher than the costs of obtaining them through forestland ownership (Zhang, Zhang, & Schelhas, 2005). Thus, as long as the utility derived from NTFPs and amenity values is greater than the value of timber production foregone, more individuals and family units will choose to own forestland and the trend toward more owners of smaller parcels will accelerate.

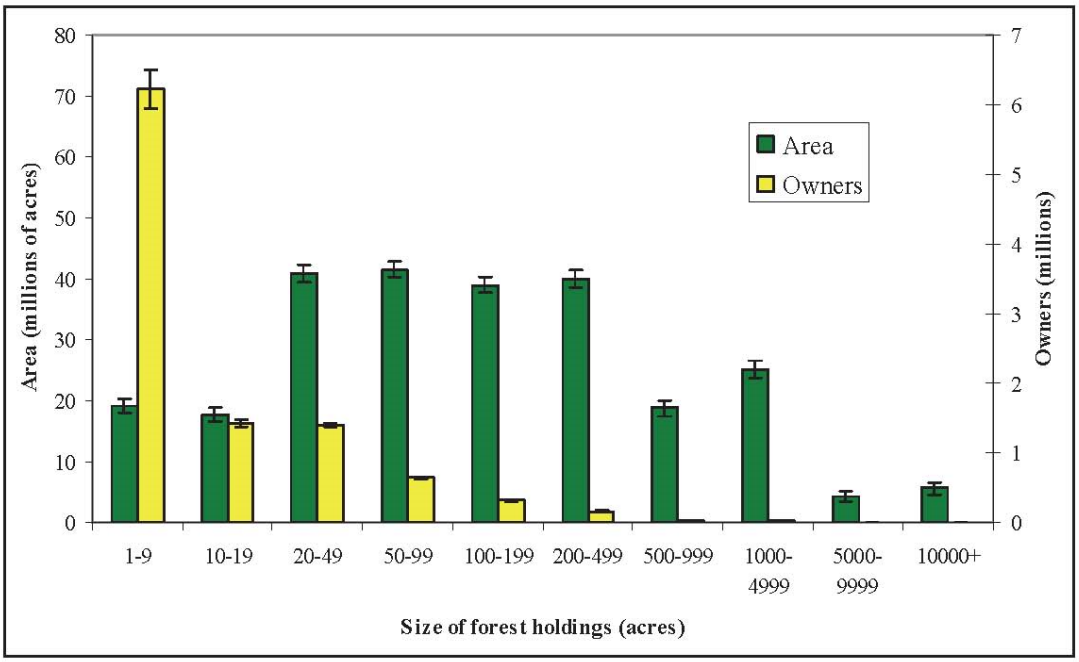


Figure 15: U.S. Public Family forestland Owners' Parcel Sizes, 2006 (Butler B. J., 2008)

As the perceived benefits of forestland ownership have become attractive commodities (e.g., privacy, aesthetics) FFOs have also grown more affluent. In part, this may be the result of suburbanization as urbanites searching for a higher quality of life relocate to rural areas near or accessible to urban centers (Egan & Luloff, 2000). Low-density development in once-rural areas has changed the demographic profile of family forest owners. Between 1978 and 1994, the amount of forestland owned by farmers and blue-collar workers dropped from 90 million to 60 million acres; over the same period, the amount of forestland owned by white-collar workers increased from 49 million to 68 million acres (Best & Wayburn, 2001). The profile of a twenty-first century family forestland owner is predominantly white-collar and professional. According to Butler's report on the 2006 NWOS data,

working FFOs are most commonly professionals, officials and managers, and craft workers. Eighteen percent of landowners holding 27% of family forestland have annual household incomes equal to or greater than $100,000, as compared to just 12% of the general population (Butler B. J., 2008). As family forestland owners become increasingly urban in their lifestyles, they are less inclined to identify forestry as relevant to their ownership objectives (Sampson & DeCoster, 2000).

The final trend under discussion here is one that has been the subject of much literature and analysis – the ageing of family forest owners. In an introductory chapter to their book 'America's Private Forests,' Best and Wayburn noted that in 1978, 19% of NIPF land was held by owners of 65 years of age or more. By 1994 this figure had grown to 24%. Over the same period the amount of forestland owned by retirees increased from 47 million to 77 million acres (Best & Wayburn, 2001). By the year 2000 it was estimated that forestland owners of 65 or more years of age own 90 million acres of private forestland (Tyrell & Dunning, 2000). According to Butler's report on the 2006 NWOS data, 49% of FFOs, owning 52% of family forestland, are retirees. Nineteen percent of FFOs, owning 24% of family forestland, are 65-74 years of age; an additional 15% of FFOs, owning 20% of family forestland, are 75 or more years of age (Butler B. J., 2008). It should be noted that the figures offered by Best and Wayburn, and Butler, respectively, do not lend themselves to direct comparison, but are presented here to illustrate the intensification of this trend among family forestland owners. This trend is reaching the point at which a massive land transfer will occur among generations over the next two decades, creating new audiences for forestry and conservation programs.

Landowner Segmentation

The ownership patterns described above are necessary for an understanding of family forest owners' motivations and values. To advance this understanding, and to create effective messages and identify outreach and engagement opportunities, it is useful to categorize landowners according to shared characteristics. This synthesis draws on the work of the Sustaining Family Forests Initiative (SFFI), a collaborative organization building knowledge about family forest owners in the U.S., including representatives from government agencies, industry, conservation organizations, landowner groups, certification systems and universities (The Sustaining Family Forests Initiative, 2011). The following profiles are derived from a report by SFFI members and prepared by Roper Public Affairs and Media based on NWOS respondents holding between 10-999 acres of land (GFK, Roper Public Affairs, 2006).

- ***Woodland Retreat Owners*** **–** This is the largest of the four groups, representing 40% of FFOs, owning approximately 30% of family forestland. Their ownership is motivated by non-

timber amenities including aesthetic value, conservation, privacy, and legacy. They are likely to own smaller parcels, to have purchased their own land, to have owned it for relatively short periods of time, and live on their woodlands (GFK, Roper Public Affairs). It is likely that members of this group owned their land for the shortest period of time and are the least likely to have sought or received professional information or advice about their land (GFK, Roper Public Affairs, 2006).

- ***Working the Land Owners*** – This group represents 22% of FFOs, owning 25% of family forestland. Their ownership is motivated by the multiple benefits forests provide, including aesthetic, recreational and financial. They are the youngest, the most likely to have purchased their own land, and the most likely to have a residence within one mile of their land (GFK, Roper Public Affairs, 2006). This group tends to have lower average incomes and education levels (Butler, Tyrell, Feinberg, VanManen, Wiseman, & Wallinger, 2007).
- ***Supplemental Income Owners*** – This group represents 15% of FFOs, owning the largest plots with 22% of family forestland (Butler, Tyrell, Feinberg, VanManen, Wiseman, & Wallinger, 2007). They are among the most likely to indicate financial motivations as their primary ownership objectives, including timber production and land investment (Butler, Tyrell, Feinberg, VanManen, Wiseman, & Wallinger, 2007). They are the most likely to have inherited their land (GFK, Roper Public Affairs) and the most likely to be planning a transfer to their own heirs (Majumdar, Laband, Teeter, & Butler, 2009). Legacy is very important to them. They are also the most active managers, and most likely to have harvested trees and participate in cost-share, certification, or conservation easements (Butler, Tyrell, Feinberg, VanManen, Wiseman, & Wallinger, 2007).
- ***Ready to Sell/Uninvolved Owners*** – This group represents 23% of FFOs who own 23% of family forestland (Butler, Tyrell, Feinberg, VanManen, Wiseman, & Wallinger, 2007). These owners are the least engaged and less likely to identify important reasons for owning their land, or to have concerns about its health or restrictions on its use. They are least likely to have a residence within one mile of their land. They are motivated by legacy and investment purposes (GFK, Roper Public Affairs, 2006).

Family Forestland Owners: The Next Generation

An accurate assessment of landowner needs and motivations requires an understanding of their attitudes toward the land. Given the predominance of family forestland owners of 65 or more years of age, generational differences will likely impact the health and management of, and public benefits from, millions of acres of family forestland. Over the next two decades, the largest intergenerational

transfer of family forestland in the nation's history is expected to occur (The Pinchot Institute for Conservation, 2005). However, compared with the current generation of family forest owners, relatively little attention has focused on the attitudes of the next generation and their anticipated impact on family forestland. One study conducted by Catherine Mater and the Pinchot Institute conducted three hundred in-depth interviews from six national regions in 25 states representing 200 families owning almost three hundred thousand acres of forestland (See Table 8 for an overview of this sample population) (Mater, 2005). The emergent general profile suggests that the vast area of forestland under their ownership will face significant challenges to ecosystem health and effective management while owners face intensifying pressure to parcelize and convert their land.

Table 8: Demographic Summary of Catherine Matar Study Sample (Mater)

Region (n=300)		**Gender**		**Age**		**Acres Owned**	
North East	99	Male	62%	<20	10%	<10	2%
North Central	34	Female	38%	20-40	50%	10-49	15%
South East	49			41-60	35%	50-99	17%
South Central	33			>60	5%	100-499	44%
Intermountain	15					500-999	6%
Pacific	70					≥1000	15%
Total	**300**	**Total**	**100%**	**Total**	**100%**	**Total**	**100%**

The next generation of landowners is likely to be more remote from their land and less dependent on it for their livelihood. A 52% majority are absentee owners that live out of state or not near their family's land, and 53% were not raised on their family's land (Mater). In regards to future occupancy of forestland, 40% indicate they do *not* intend to live on their forestland, and an additional 44% were unsure (Mater, 2005).

While most offspring express a desire to inherit their family forestland, most also lack the knowledge and experience to manage it, as well as the desire to increase their current level of involvement. Irrespective of demographics, 87% of offspring wish to own their family's land in the future; however, while many FFOs have discussed future plans with their offspring, 56% of all offspring have not been involved in management of their forestland; among the minority who have had prior involvement, 60% did not become involved until adulthood (Mater, 2005). Less than half of FFO offspring wish to be more involved in the current management of their family forestland and many express no interest in even becoming more informed about its present management (The Pinchot Institute for Conservation, 2005). In fact, some interview subjects did not know that their family owned forestland; many had to confirm the amount of acreage owned with their parents, and 20% did

not know whether their family owned contiguous forest or scattered parcels (Mater, 2005). Reasons commonly cited among offspring for their lack of involvement include: it is not their land; they do not live close enough to manage it; their parents are the decision-makers; they lack the knowledge to manage; they wish to manage but have not pursued it; or they do not know how to broach the subject with their parents (Mater, 2005). The lack of knowledge and experience, combined with high levels of absentee ownership are likely to increase the pressures of ownership and likelihood of parcelization or land conversion.

In order to better understand how the future of family forestland ownership compares to the present, it helps to have a sense of how heirs plan to use their land and what concerns they hold toward ownership. For example, financial concerns appear to weigh more heavily on FFO offspring than on current owners. While most offspring did not identify income generation as the reason their parents own forestland, 60% overall wish to generate income from the land, primarily from timber products (though there are demographic differences as women and younger people were less likely to indicate that desire) (Mater, 2005). While the parent generation of FFOs did not identify taxes as a significant challenge to ownership, nearly half of their offspring did (49% female, 50% male). Additionally, subjects ranked a need for cash, taxes, and medical expenses as the primary drivers of land sale, parcelization, subdivision, or conversion (Mater, 2005). Most FFO heirs exhibit an awareness of land use changes that threaten forestland, and recognize the natural character of their land as one of its most important attributes; while they express an intent to maintain the land as forest, however, needs for cash to cover unanticipated emergencies such as medical expenses, job loss, or tax bills may prevail upon them to parcelize or convert their land (The Pinchot Institute for Conservation, 2005).

The acceleration of the intergenerational transfer of forestland will change the demographics of family forestland owners in new and profound ways, and may drive shifts in the attitudes and values drive land management decisions. In a study conducted in the southeastern states, Terrant et al. found that age influenced environmental attitudes. Here, the youngest generation was more likely to value non-timber amenity values over its production as compared to the oldest generation. The authors conclude that this indicates a broad shift in environmental values away from a commodity-centered approach and toward a more “biocentric” approach that recognizes multiple amenity values and benefits to humans and non-human communities. (Terrant, Porter, & Cordell, 2002) It is clear that a deeper understanding of the challenges and pressures facing the future generations helps to target outreach recipients more efficiently, design and implement more effective incentives, and create innovative solutions that respond uniquely to those drivers of forest fragmentation.

Family Forestland Owners of Maine and the Sebago Lake Watershed

The State of Maine has nearly eighteen million acres of forestland (Smith, Miles, & Pugh, 2004). Statewide, 120 Statewide, 120 thousand family forestland owners hold 5.7 million acres, nearly one third of all private forestland private forestland (Meyer, 2011). The vast majority of family forestland is held in the southern and central area of central area of the state (See

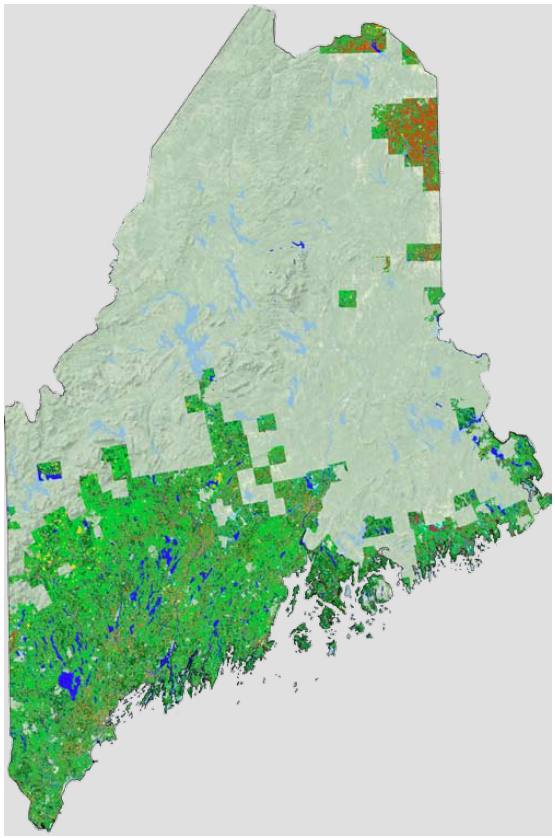


Figure 16). Additionally, Maine holds the highest percentage of forestland cover of any U.S. state, 88% of which is under private ownership (Acheson & Doak, 2009). As elsewhere, and arguably to an even greater extent, family forestland owners in Maine play a critical role as land stewards linking the public to the social and environmental benefits forests provide.

The social and ecological phenomena driving broader trends in family forestland ownership exist in Maine and the Sebago Lake watershed, though localized factors create a unique ownership profile. Despite abundant forest resources, rapid suburbanization has high ecological and financial costs. Additionally, though since 1990 net loss of forestland has generally been offset by land converting back to forestland, the near future will

Figure 16: Family Forest Ownership in Maine (Meyer, 2011)

likely witness a net decline in forestland as a result of urban sprawl (Acheson & Doak, 2009). During the 1980s, Maine lost approximately nine thousand acres annually to development; that figure is now thirty-five thousand acres annually (Acheson & Doak, 2009). As elsewhere, forest loss is the result of fragmentation and parcelization, with significant impacts to ecosystems, biodiversity and the public benefits associated with forestland.

In order to understand how demographic and ecological patterns in Maine and the Sebago Lake watershed fit into the broader national context, and how localized interests and values of family forestland owners impact management decisions, this discussion will synthesize the results of existing

literature and statewide or localized survey data. Maine is a microcosm of national family forest owners several important ways. For example, as Butler found through the NWOS, a study conducted in Kennebec County, Maine, found that owners cited predominantly non-economic reasons for forestland ownership. The top reasons cited by respondents are: part of primary home (62.3% of respondents); beauty or scenery (60.3%); and for privacy (60.9%); only 15.5% of respondents own forestland for the production of timber products (Quartuch, Leahy, & Bell, 2012). Additionally, Maine exhibits the family forestland ownership patterns and trends identified as nationally salient:

1. Parcelization of forestland is accelerating
2. Owners tend to be more affluent than the general population
3. Owners are aging (Acheson & Doak) (Meyer)

However, several attributes of family forestland owners in Maine lend perspective to the attitudes and concerns that locally characterize land ownership and management, and may impact future land use. The Kennebec County survey found that landowners engender a strong stewardship ethic. Respondents indicated that they agreed or strongly agreed that they had a responsibility to the needs of animals, plants, the land, and future generations; however, there were relatively low levels of agreement about their responsibility to meet the needs of their neighbors, community or society (Quartuch, Leahy, & Bell, 2012). Additionally, nearly 68% of owners indicated it is highly unlikely that they will develop their land in the next five years. The University of Maine's Center for Research on Sustainable Forestry identified high property taxes, misuse of land, and keeping land intact for heirs as the primary concerns of family forestland owners in Maine (Meyer, 2011). This indicates a departure from the national profile of family forestland owners, where taxes were not among the primary concerns identified (Butler B. J., 2008).

Both the stewardship ethics and taxation concerns have direct implication to intergenerational transfer issues within the state and Sebago Lake watershed. Acheson and Doak found that nearly 80% of landowners in Maine want to pass their land onto heirs or a conservation organization; however many owners resort to selling as a result of financial hardship (Acheson & Doak). However, among those who indicated that legacy land transfer was important to them, 23.1% anticipate that their heirs will build houses (12.9%), or sell the land (10.2%) (Acheson & Doak, 2009). Additionally, while 69.4% of owners indicated a desire for the land to be kept as family forestland, 90.4% indicated they do not have a legal document to ensure their desires would be met, and 74.5% of them did not intend to obtain such a legal document; an additional 13.8% indicated plans to sell or develop their land

(Acheson & Doak, 2009). Taken together with the nationally aggregated data, this suggests that Maine's forests will decline in area as parcelization and fragmentation accelerate.

Landowner Segmentation and PES

What makes the diversity among the segments of NIPF landowners interesting in the context of PES, is the role individual of characteristics in influencing the propensity of individual landowners to participate in a PES scheme that may require restrictions on activities undertaken on the land, or additional investments in BMPs.

Where conservation programs require the implementation of BMPs, many studies highlight the level of engagement with the land as a significant factor in participation. Erickson et al. highlight the distinction between non-farmers, part-time farmers and full-time farmers when discussing attitudes towards retaining woodlots on farmland (Erickson, Ryan, & De Young, 2002). While all three groups rank aesthetic and environmental motivations above economic motivations for retaining and protecting their woodland, non-farmers were more likely to practice hands-off management of their woodland. The authors suggest that greater education of non-farmers through management assistance programs could increase opportunities for active management, even when the programs are designed to enhance non-economic outcomes such as aesthetics or recreation.

Matta et al. explore landowner characteristics that impact interest in biodiversity conservation measures beyond BMPs. This study suggests that younger forest owners, with higher incomes, higher levels of education and those who have been on the land longer may be more willing to adopt conservation practices (Matta, Alavalapati, & Mercer, 2009). Additionally, proximity to cities, whether the owner resides on the property and whether s/he is a member of a forestry or conservation organization have a positive influence on interest in these programs. The authors conclude that "target specific outreach actions are required" to effectively promote biodiversity practices (Matta, Alavalapati, & Mercer, 2009).

Additionally, Kramer et al. found that current participation in a conservation program, and having off-farm employment are positive and statistically significant influencers of respondents' willingness to enroll in PES programs. The authors also found evidence supporting the view that, in addition to payment levels, higher levels of education, and support for wildlife protection were significant as influencers of interest in participation (Kramer & Jenkins, 2009). While this study found landowners with larger proportions of natural forest on their land less likely to enroll in habitat conservation based PES programs, the authors speculate this to be related to these landowners' view that they were already contributing enough to habitat conservation. The survey also found that age and household

income were positive, statistically significant influencers on selecting the status quo. While this is consistent with other studies that suggest older respondents are less likely to participate, it is inconsistent with studies that positively correlate income level with participation (Kramer & Jenkins, 2009). This suggests that while the there are some generalizations that can be applied with respect to attitudes toward PES, local variations may be significant and dependent on local culture, history and specific socio-economic conditions.

Segmentation: Recommendations

Gather data specific to the Sebago Lake (or other target) Watershed

For our purpose, it is necessary to understand how the national data applies more specifically to a localized population. Although the literature identifies some commonalities, trends, and segments, there is significant variation within and across watersheds. Attitudes and values are difficult to assess using proxy data. Thus there is not a one-size-fits-all template and one should take care not to prejudge or over-generalize based on these findings. Without data identifying specific issues of local concern, it is difficult to identify or approximate attitudinal segments of landowners in the Sebago Lake watershed.

Moreover, our case study interviews suggest that one of the most powerful ways to build relationships and trust early on is to spend time on mutual education. A first step is to gain understanding about the motivations, attitudes, and social values of landowners in the watershed. What are their short and long term needs, and desires for their property? What do they worry about? Shifting demographics, such as those driven by the intergenerational land transfer can create social tensions and dynamics in value systems to which the scheme will need to adapt.

Such inquiries can be made through surveys, interviews, focus groups, town hall meetings or other community forums. We recommend that a trusted third party (private consultant, researcher, unaffiliated nonprofit, etc.) be engaged to help assess attitudes, behaviors, social values and community priorities in the watershed, as well as any discrepancies in the national profile of family forest owners. The Trust for Public Land's Greenprint process, applied by Loon Echo Land Trust in partnership with Bridgton, Casco, Denmark, Harrison, Naples, Raymond and Sebago an example of this approach.

Segment landowners based on generational characteristics

The analysis above suggests that generational attitudes may be changing in a way that would be more favorable to management practices that preserve overall forest health while taking advantage of new financial incentives, such as ecosystem service markets. This presents two dimensions for segmentation, firstly on the basis of age, and secondly on the basis of land acquisition method. For example, messaging directed toward younger NIPF landowners may emphasize non-timber amenity values of forestland, and the role of PWS in conservation. Additionally Majumdar et al. found significant differences in the motivations and behavior of inheritors versus purchasers of forestland. While inheritors are more likely to value timber production and other NTFPs, first-generation owners placed greater value on non-timber forest amenities (Majumdar, Laband, Teeter, & Butler, 2009).

This suggests that program administrators may wish to develop outreach strategies based on the method of land acquisition.

Identify early adopters with a high propensity to engage and contribute

As discussed above, the following factors can be used to help identify early adopters:

- Income
- Education
- Awareness of Conservation/Environmental Issues
- Engagement in Active Management Practices

In the absence of survey data, work through existing relationships and draw on the social capital of reputable local organizations to ascertain social values associated with particular landowners to assess the level of interest and engagement. Identifying landowners that are potentially interested, or willing to participate in a PWS program, will conserve limited outreach resources later.

Targeting & Positioning: Observations

While individual landowner decisions to enroll in a PES scheme are complex and dependent on individual circumstances, many studies have been conducted on factors that influence landowner participation in PES schemes or in conservation programs more generally. Participation in these schemes is influenced not just by landowner characteristics, but by program attributes and the institutional environment in which programs operate (Matta, Alavalapati, & Mercer, 2009). In the previous section we looked at the types of landowners most likely to participate in PES programs. This section will discuss general PES program attributes that are likely to be positively received by landowners and the barriers that they perceive to participation. Analysis will rely on a review the existing literature examining these questions in the broader context of PES and provide some context for the application of these insights to the forest landowners in the Sebago Lake watershed.

Understanding how individual landowners engage in a new conservation program is an application of the Diffusion of Innovation theory (Rogers, 1962). Rogers describes a five-stage process by which individuals make decisions regarding new innovations:

1. Knowledge of the innovation
2. Persuasion
3. Decision to accept or reject
4. Implementation
5. Confirmation (reinforcement from others)

The first three of these steps constitute the landowner outreach process for new conservation programs.

Knowledge of the Innovation

Knowledge is a consistent theme throughout the literature and Valdivia et al. identify knowledge of the practice as the most important factors in the incorporation of both riparian buffers and agroforestry among farmers in northeast and southeast Missouri. Where riparian buffers were concerned, awareness of environmental problems (in this instance bank erosion) was the second most important factor (Valdivia & Poulos, 2008). With respect to agroforestry, participation in informal groups and the perception that trees are important to future generations were the second and third most important factors respectively.

Kramer et al. also highlight some important insights with respect to terminology. When asked about ecosystem services, respondents were much less familiar with this terminology than with phrases describing the actual services themselves such as "water quality" or "wildlife habitat" where there may be familiarity through previous conservation programs. Terminology such as "carbon storage" was relatively unknown. This uncertainty contributed to 30% of respondents declaring in the survey that they didn't know if they would be interested in a PES scheme or not.

Persuasion

Erickson et al. surveyed farmers in Michigan to understand the reasons for retaining or preserving woodlots on their land. Among all categories of farmers (full-time, part-time and non-farmers), it was found that aesthetic and environmental factors were more important than economic factors in motivating conservation (Erickson, Ryan, & De Young, 2002). While this was expected for non-farmers, it was not expected for full-time farmers who treated their land more as a commercial venture.

In a study to assess landowner attitudes toward conservation programs in North Carolina, Kramer et al. found that 50% of survey respondents who had participated in previous conservation programs liked the fact that the program "promotes wildlife", and 49% of respondents liked the fact that the program "promotes soil conservation", while just 46% cited increased income (Kramer & Jenkins, 2009). This is consistent with the finding that aesthetics and environmental issues are prioritized above economic issues when it comes to generating interest in these programs.

Decision to Accept or Reject

Persuading landowners of the various merits of a conservation program is necessary but not sufficient to generate actual participation. Decision-making is the process of taking into account the tradeoffs and payoffs of taking a particular course of action and is often highly dependent on the policy and economic attributes of the program itself. Valdivia et al. point out in their conclusion that while economic considerations were of low priority for generating interest in riparian buffers and agroforestry, the actual degree of participation was dependent on cost-sharing (Valdivia & Poulos, 2008).

Policy Attributes

Kramer et al. found two distinct barriers to participation when surveying potential participants in a habitat conservation program for the red wolf in North Carolina. Landowners tend to be heavily influenced by program attributes that impact their ability to maintain control over their land while it is enrolled in a PES program (Kramer & Jenkins, 2009). Kramer et al. note that landowners are more

likely to enroll in programs with shorter contract lengths and where they retain the ability to harvest timber or use the land for recreation. This is consistent with expectations based on previous studies (Schnepf, 1994), which found that long or permanent enrollment terms were barriers to participation.

Landowners responding to this survey were also generally more likely to participate in a program when it was administered by the state government, rather than by the federal agency, private companies or a non-government organization (NGO). While mistrust of federal government and potential restrictions on private property is expected, the authors speculate that there may also be mistrust or simply unfamiliarity with both private companies and conservation NGOs and the role that they play in PES programs.

Economic Attributes

The study by Kramer et al. found payment levels to be the only positive attribute that had a statistically significant influence on willingness to participate in a PES program (Kramer & Jenkins, 2009). This is to be expected since conservation programs typically consist of imposing restrictions on the commercial activities that can be undertaken on the land, or involve additional investments in best management practices. While some of these practices may have long run commercial benefits, they typically require investment in the short run and therefore, landowners are highly sensitive to the economic support provided by PES programs as an influencer of participation.

Kramer et al. found the mean Willingness To Accept (WTA) for wildlife conservation programs was $36 per acre per year. The study also suggests a mean WTA specifically for red wolf habitat, which is much higher, but relates to strong negative feelings about the reintroduction of the red wolf to a specific area of North Carolina and shouldn't be considered indicative of similar PES programs. The study also calculates the ‘cost’ of sub-optimal policy attributes. While there is an additional cost of $7.41 per acre per additional contract year, the cost of administration by a conservation organization is an additional $31.55 per acre per year. The authors speculate that this additional cost, which almost doubles the WTA, may be related to previous positive experiences with state level conservation programs. While this will vary with location, it underscores the importance of designing program attributes to be as familiar as possible to landowners, and to align in so far as is possible with previous or existing conservation programs in order to remove uncertainty associated with new program structures and organizations.

Targeting & Positioning: Recommendations

Build up awareness, interest and participation in distinct stages

The distinction between factors that generate interest in PES programs and those that influence actual participation suggests that landowner outreach should be conducted in distinct stages including: general education of the landowner population with respect to conservation measures environmental threats and BMPs; promotion of issues and benefits that generate interest in conservation measures; and recruitment campaigns that address the most important program features.

Stage 1: Educate Non-Engaged Landowners:

- Increase Awareness of Conservation/Environmental Issues
- Increase Awareness of Best Management Practices

Stage 2: Communicate Wider Benefits of the Program to Generate Interest:

- Aesthetic benefits
- Environmental benefits (for example the benefits of riparian buffers should be articulated in terms of creating wildlife habitat and supporting the river ecosystem)
- Ecosystem service provision benefits
- Economic benefits

Stage 3: Co-create Program Features with Landowners to Maximize Engagement and Participation:

- Contract length and restrictions on land use during enrollment
- Institutional administration
- Economic compensation

Bring landowners together with the buyer to discuss program design

A consistent theme across our interviews was the critical importance of relationship building and trust. This process takes time, especially when seeking to influence longstanding behaviors or mindsets, and should ideally start during the scheme design phase.

Instead of assuming one has all the answers and presenting a *fait accompli* to landowners and asking for their sign-off, a more participatory approach may foster a sense of ownership that can pay dividends later when scaling up the scheme. In the widely cited New York City watershed program, many of the early innovations came from the landowners themselves. Overall, the process should convey sincere engagement, humility, and mutual respect rather than an obligatory and perfunctory stakeholder engagement process. Having the buyer engaged from the outset will also reduce the risk that the scheme ends when pilot grant funding is no longer available.

The parties can build on the foundation of understanding from the segmentation research by sharing needs and concerns (e.g., required scale and risk tolerance for the buyer) discussing objectives transparently, looking for common ground, and exploring a range of potential solutions. Such two-way dialogue can help surface faulty assumptions or disconnects between perceptions and reality. Community buildings that are generally perceived as neutral territory (town halls, granges, civic organizations) are ideal locations for these initial meetings. As time goes and the scheme evolves, it will be important to keep these parties informed so that everyone's understanding evolves together.

It can be valuable here to explicitly ask landowners what risks they perceive, why they might hesitate to get involved with a PWS program and what types of incentives would be most attractive to them. This does not mean that landowners need to have a vote on every aspect of program design. In fact, in most schemes we investigated, landowners did not significantly influence the choice or terms of the financial incentive.

Sidebar: Farmers as Producers of Clean Water. Cullers Run Watershed, West Virginia.

This project demonstrates the potential power of landowner involvement in program design and administration. While participating farmers, as a group, did not have a say in the formula used to determine payments for water quality outcomes from reducing nutrient runoff, they were empowered to 1) allocate the funds to projects and 2) oversee data collection. With their incentives aligned (higher water quality = higher payments), the farmers requested "extensive sampling [that] led to the discovery of nitrogen rich groundwater following a concentrated flow path that flowed into Cullers Run." (Farmers as Producers of Clean Water) Though it was located on the land of a non-participating farmer, the group used a significant portion of their funds to construct a wetland treatment solution at the site. The high level of farmer involved was critical to identifying and mitigating this problem.

Be considerate of consultant landowners' time

Our interviews suggested that landowners actively working the land (forestry, agriculture, ranching) are particularly busy. Their time should be respected and program administrators should take measure to avoid participation burn out. Particularly for influential community leaders, one may wish to consider going to them and meeting in their homes to reduce the burden on their time. Depending on the level of involvement requested of landowners and the nature of their schedules, it may be helpful or necessary to compensate them financially or offer them formal recognition for participating in certain design activities (attending meetings, reading documents, responding to proposals, etc.).

Prioritize influential landowners, not just parcels that are important biophysically

In the pilot phase (see below), it is particularly important to include landowners who are influential in the community and/or who may become advocates or champions of the program. One way to operationalize this is to add layers for social values and indicators of social influence to the GIS prioritizations that typically focus on biophysical parameters for maximizing water quality outcomes.

Such data can come from the segmentation research described earlier and from project partners, community leaders, and other landowners. In addition, PWS schemes that use an application process to help allocate funds can add questions to the application that are designed to understand influence. Ultimately however, relationships, connections, and networks are particularly hard to observe so influence is hard to predict in advance, which is why the broad outreach strategies above are helpful to bring in a more diverse range of potential participants.

Scheme Attributes & Administration: Observations

This section seeks to identify lessons learned and keys to success from the history of federal and state incentives programs that focus on incentivizing landowners to participate in conservation or stewardship activities. PES programs are only beginning to be implemented in the U.S., so examining other types of incentives aimed at achieving similar goals serves as a valuable proxy to understand likely attitudes toward these programs. A multitude of federal and state incentive programs have been in place for decades.

Incentive programs differ in the ways they influence the likelihood of landowner participation. Key variables include:

- Type of incentive including tax credits, direct financial payment, technical assistance, educational assistance, cost-sharing, and certification;
- Type of landowner receiving the incentive such as NIPF landowners or agricultural landowners;
- Regional differences potentially including economic, environmental and cultural factors; and
- Management objectives, such as preserving water quality or protecting habitat for a particular species.

Given the differences across incentive types, the methodology applied here prioritized case studies based on national survey data, or those including variables most similar to those that exist in Maine. There is not a clear solution to landowner engagement in the scientific literature. While there are examples of successful programs and outreach efforts, engaging a high percentage of the 11 million private landowners, 92% of whom are family forest owners, has proved challenging (Butler B. , 2008). For example, among family forest owners as of 2010, "less than 6% have participated in a cost share, less than 1% have certified their land, and less than 2% have an easement" (Ma, Butler, Kittredge, & Catanzaro, 2012).

Despite these challenges, a valuable set of lessons learned can be gleaned from the literature.

Sidebar: Explanation of types of assistance (Kilgore & Blinn, 2004):

- **Tax credits** – reduction in tax burden conditional on participating in specific practices or activities, or conditional on agreeing not to participate in specific forms of development
- **Direct financial payments** – cash payment for participating in specific practices or activities

- **Technical assistance** – professional advice on technical components of specific practices
- **Educational assistance** – providing technical or non-technical information about specific practices or activities. This generally involves less personal interaction than technical assistance
- **Cost share** – payment for a share of the costs necessary to implement a best management practice or conservation activity
- **Grants** – provide a specific amount of financial assistance to participate in specific activities
- **Certification** – granting a label for participating in a specific set of activities which can yield a higher market price or provide access to new markets

Common Federal Incentives and Lessons Learned:

In a nationwide survey conducted by Jacobson et al., state foresters were asked to rate federal incentive programs available to landowners according to their appeal and level of awareness among landowners, as well as their effectiveness in achieving conservation goals (Jacobson, Greene, Straka, Daniels, & Kilgore, 2009). The survey asked state foresters to identify incentive programs available to landowners in their state. The results collected from 20 northern states included: FSP, CRP, EQIP, FLEP, FLP, WHIP, and WRP (See Appendix9 for further details on these programs). The general trends in the North were:

- FLP was rated as the most effective in protecting environmental resources. This program is designed to assist states forest conservation plans by providing resources to purchase easements.
- FSP and FLEP were rated as having the most appeal to landowners.
- EQIP was rated as having the least appeal despite offering a similar package of incentives to FLEP. Both included technical assistance, educational assistance, and cost-sharing as the main forms of incentives. EQIP focused on agricultural landowners whereas FLEP focused on forestland owners and had more flexibility in adapting to states' needs. FLEP has since been discontinued.
- Awareness and appeal are mediocre for all programs, but were positively correlated with level of funding provided and whether the program had a cost-sharing component.

Despite incentive programs that share objectives with a majority of landowners, the program objectives are not always perceived as congruous (Greene, Kilgore, Daniels, Jacobson, & Straka,

2005). This implies that there is a breakdown in communication that may limit additional participation. Possible actions to overcome this are to provide consultation with a forester who can discuss landowner objectives and identify where they overlap with program objectives, and to provide a management plan with specific actions that align with land management objectives.

Effectiveness of Different Policy Tools

Based on a survey of program administrators in every state, technical assistance was rated as the most effective tool in encouraging widespread and consistent adoption of BMPs. Cost-sharing was rated the next most effective tool, followed by educational assistance (Kilgore & Blinn, 2004). These results were aggregated across three regions and the North region rated cost-sharing as most effective. Across all regions included in the study, technical assistance was rated highest in terms of efficiency of program dollars spent, followed by educational assistance.

In addition to federal incentives, most states offer their own financial incentive systems. Program administrators identified cost-sharing programs as more effective than state tax sharing programs with regard to encouraging sustainable forestry and achieving landowner objectives (Kilgore, Greene, Jacobson, Straka, & Daniels, 2007).

A major theme that emerges from surveys of landowners who have decided to participate in federal or state incentives is that technical assistance is the most desired form of assistance across regions and demographics of landowners (Jacobson, Greene, Straka, Daniels, & Kilgore, 2009).

A meta-analysis using the vote counting method focused on the impacts of: market variables, policy variables, owner characteristics, and plot resources conditions to explain NIPF landowner decisions to harvest timber, reforest, or make timber stand improvements (TSI). Studies included in the meta-analysis come predominantly from the Southern U.S. (Beach, Pattanayak, Yang, Murray, & Abt, 2003). The analysis found that market drivers had the least statistically significant effects (73% of studies) compared to policy drivers (87%), plot/resource conditions (79%) and owner characteristics (77%).

Key findings include that government cost-sharing and technical assistance were found to have the greatest impact on reforestation decisions. Policy drivers were found to be weak for impacting harvest decisions, but had more effect on reforestation, which is generally their intended purpose.

Given the wide variety of policy tools, researchers found that no policy is singularly effective in achieving land management objectives, and almost all states implement a variety of tools to accomplish their goals (Kilgore & Blinn, 2004).

Understanding Tax Incentives as a Policy Option:

The financial attractiveness of tax policies varies according to the local economic conditions. Rising property taxes can be an important factor in landowner decisions about whether to sell their land (Butler, et al., 2010). A study in Massachusetts found that with rising property values and subsequent rising tax values, revenue from timber sales was less than increasing tax dollars, so incentives tied to sustainable forestry practices will likely not be sufficient to positively impact landowners' financial outcome. This study found that incentives tied to taxes are the most impactful given conditions of rising property tax values. Across the spectrum of incentives that provide tax relief, conservation easements provide the greatest amount of relief, indicating that an easement would have the most financial value to a landowner (D'Amato, Catanzaro, Damery, Kittredge, & Ferrare, 2010).

One of the reasons so few landowners participate in incentive programs or have a management plan is because they value aesthetics and may prefer to do nothing with their land and let it exist in a natural state. This type of owner may be more inclined to place an easement on their property because they could still be financially incentivized to conserve due to the ecosystem service benefits provided from keeping forest land intact (D'Amato, Catanzaro, Damery, Kittredge, & Ferrare, 2010).

As PES models are relatively new, the impacts of current tax policies and opportunities for new tax incentives are largely unexplored. Butler et al. provides a number of suggestions on how to leverage tax policies to promote participation in conservation programs such as PES, including the suggestion that income earned from PES could be exempted from taxable income (Butler, et al., 2010).

Landowner concerns around existing financial incentives:

Landowners have identified various concerns that limit the rates of participation and levels of satisfaction with existing options. Concerns include additional government scrutiny or restrictions on land that could result from participating in a specific incentive program and having to incur a financial burden through implementing BMPs. A significant barrier is a lack of awareness or understanding about how participating fully aligns with management objectives (Kilgore, Snyder, Taff, & Schertz, 2008).

Additional concerns identified by landowners include inconsistent implementation and administration, slow and bureaucratic processes to enroll in programs, lack of available funding, and

long wait times to receive assistance from a forester (Jacobson, Greene, Straka, Daniels, & Kilgore, 2009).

Suggested Improvements to Existing Financial Incentives

According to the forestry professionals surveyed in the Jacobson et al. study, the main themes that emerged around opportunities to increase participation and improve the delivery of services to forest owners include:

- Developing a single agency in each state to serve as the main contact point for all incentive programs
- Targeting programmatic resources to the most environmentally sensitive lands
- Providing enough flexibility in federal incentives to adapt to regional concerns and issues
- Improving coordination between programs, such as requiring a written management plan for all programs (Jacobson, Greene, Straka, Daniels, & Kilgore, 2009)

Additional suggestions in the literature include:

- Focusing on shared goals of increased income for landowners, sustainable use of resources, and economic development (Smith M. , de Groot, Perrot-Maite, & Bergkamp, 2008).
- Prestige, group belonging, and environmental awareness can all have added impacts on landowner participation (Smith M. , de Groot, Perrot-Maite, & Bergkamp, 2008). There is not significant literature on these topics, especially prestige and group belonging, but examples from case studies demonstrate the role they can play. For example, group belonging can put positive peer pressure on landowners to participate when groups of landowners are allowed to take ownership for the incentive structure, or landowners can use their existing social structures to exert influence.

Scheme Attributes & Administration: Recommendations

Provide a portfolio of incentive types or flexible menu of options to expand participation

The many types of incentives available described below can act as complementary tools rather than as trade-offs when encouraging landowners to participate in PWS. Needs, risk tolerance, and preferences will vary significantly among individual landowners and one way to increase participation is to offer a menu of options, or scales of involvement. For example, helping to fund conservation easements is expensive for the buyer but may be an ideal choice for a landowner on a critical stretch of river who

is working on his or her will. Similarly, term easements, while potentially less appealing to land trusts, may turn out to be a mutually appealing option for some buyers and sellers. Other landowners may want to keep their short-term options more open and retain the ability to adapt to changing conditions (market or biophysical) so BMP funding or shorter-term and less-rigid rental payments may be more attractive (and less costly up front for the buyer).

Many of the PWS schemes we investigated simultaneously use multiple approaches to watershed conservation and preservation. While not all incentives are necessary in every watershed, given the conditions in Maine, we recommend using the following incentives:

- Technical assistance – Technical assistance has been repeatedly cited in the literature as the most consistent incentive at gaining landowner participation. Technical experts can help each individual landowner understand how their management objectives align with a set of BMP's or related conservation actions. In the Sebago Lake watershed, technical experts can be found by partnering with local conservation districts, the local forest service, the Forest Guild, or the Association of Consulting Foresters (ACF). A Kennebec County survey shows cooperative extensions and private consultants are the most trusted sources of information, contracting technical experts to be private contractors for the PWS program may appear most trustworthy (See Appendix 6).
- Cost sharing – Cost-sharing is necessary to reduce the financial burden on landowners when implementing BMP's. The Cumberland County Soil and Water Conservation District found success in a local cost-sharing program that allowed landowners to contribute their share using non-cash contributions, such as supplying equipment. Funding for cost-sharing programs can be obtained by partnering with existing federal incentives, such as EQIP and CRP. However, district foresters in the Sebago Lake watershed have noticed resistance among many landowners to participate in federal cost shares due to general mistrust and suspicion of federal oversight (Canfield & Doran, 2011). Other local cost-sharing programs that did not depend on federal incentives, such as steel skitter bridge sharing program used in harvesting wood, was widely successful. Funding cost-shares from non-federal sources will lead to greater levels of participation among landowners.
- Educational Assistance – Educational assistance increases the awareness and interest levels among landowners. Create an educational campaign, using a variety of channels that focus on the benefits of the program to landowners and encourages landowners to follow-up with an outreach coordinator or technical expert. PWS can be a difficult concept to explain, and

landowners have a variety of reasons for participating. The messaging should be shared with a select group of trusted landowners who can provide feedback on how it is likely to be perceived in the local area. Based on the survey results in Kennebec County, Maine, local landowner are likely to agree with messaging that focuses on the protection of habitat and ensuring that land remains forested for privacy protection. Messaging should also explain the financial attractiveness of program offerings.

- Tax Incentives – Given intergenerational concerns prevalent in Maine, conservation easements are a tool to ensure the long term protection of the land. Partnering with land trusts by providing the upfront costs, such as legal fees and the services of a technical expert to create a management plan decrease the burden on landowners for participating and allow land trusts to bring more acreage under protection. This form of partnership is successful in several other PWS programs in the US.
- Financial Incentives – Combining a financial payment with a package of other incentives increases the attractiveness of participating for landowners.

Another component of flexibility to consider, given the importance of landowner referrals (discussed later), is that early adopters should generally not be locked in to a lower price, more restrictive contract, or otherwise penalized relative to later adopters. While some form of price discrimination might eventually make strategic sense, the impact on referrals should be carefully weighed.

Partner to add capabilities and resources

Especially in the early stages of a PWS scheme, partnerships can extend its reach in a cost-effective way. Across the schemes we investigated, and consistent with our own institutional analysis in Maine, Soil & Water Conservation Districts, the Maine State Forest Service, Natural Resource Conservation Services (NRCS) field offices, Land Trusts, local cooperative extension agents, and the research community are viable partners. Collectively these institutions can provide technical expertise, assistance and access to landowners and access to additional funding sources.

Additionally, while landowner interests should be understood in the scheme design phase, this does not mean that landowners necessarily need to be a formal partner or have an official seat on the advisory board. Ultimately, PWS is voluntary program and they can vote with their feet. In many cases, landowner organizations or institutions may not be formal or developed enough to justify a seat at the table or voice in every issue. In these situations, the partners listed above can be leaned on to help provide a landowner perspective.

Address Landowner Concerns about Government Restrictions

Landowners care about who is trying to motivate the change. While trusted organizations vary greatly among individual landowners, a common theme throughout the literature and the interviews is a strong mistrust of federal government and regulatory public agencies by farm and forestland owners. This is not to say that all public organizations are distrusted. For example, Soil and Water Conservation Districts and Cooperative Extensions are highly effective in working with landowners on a volunteer basis.

Nevertheless, this lack of trust can overcome the financial incentive to participate and should be addressed through a holistic set of actions. In addition to co-creating the program design with landowners (discussed above), concerns about government restrictions can be addressed by explicitly stating the privacy protection landowners will receive from the program in education materials, contracts, and direct communication. This communication will be greatly supported if a group of local landowners are engaged and can vouch for the program among their peers. Providing cost-sharing from non-federal or state sources can also help alleviate concerns about government oversight and restrictions on the land.

Administer the program via an intermediary organization to mitigate mistrust

Having a non-regulatory intermediary organization administer aspects o the program can provide insulation and mitigate some of the mistrust if a buyer or funder is a regulator or the federal government. This is especially the case if the public agency has had enforcement responsibilities, taxing authority, or an otherwise adversarial relationship with landowners. Several interviewees shared that, in some cases, a negative experience a generation or two ago (e.g., a penalty or taking by eminent domain) can still effect perceptions.

Similarly, conservation organizations and other types of groups may carry some baggage with particular landowners. There is not a one-size-fits-all solution to this situation and it is unclear whether having a broad range of partners increases (i.e. the probability of including a trusted organization is higher) or decreases (i.e., the probability of including a distrusted organization is higher) the likelihood of participation.

Consider creating a dedicated stand-alone institution if critical mass is needed

A loose affiliation of partners may work for pilot programs and PWS programs that simply seek to extend existing watershed conservation and restoration efforts. However, economies of scale suggest that PWS programs that need to get to a critical mass in order to preclude a major investment in gray

infrastructure will likely benefit from creating a new institution to administer the program. Of the schemes we investigated, only the New York City watershed program created an entirely new institution for program administration (the Watershed Agricultural Council). The Common Waters Fund has dedicated staff and may become a standalone institution eventually but it is currently facilitated by the Pinchot Institute for Conservation.

An alternative administration model is for the buyer to bring program administration in-house. However, the existing structures and established procedures of the buyer can, according to one interviewee, make integration feel like fitting a square peg into a round hole. Moreover, this may result in the loss of intermediary advantages discussed above.

Reduce transaction costs

Many of the PWS schemes we have investigated appear to have high transaction costs that will need to be reduced on a per-participant basis over time. Moreover, in federal incentive programs, transaction costs such as lengthy wait times, strict eligibility requirements, and large amounts of paperwork have been identified as a major concern for landowners. Thus, it may be helpful to eliminate certain eligibility criteria, streamline applications, and relax monitoring protocols to reach a critical mass of participants more quickly and cost-effectively.

One method of reducing transaction costs is to avoid piggybacking on federal incentive programs. This will allow more flexibility in determining participants and in creating streamlined application processes for administering paperwork and enrolling participants. Other PWS programs that have not adopted federal incentive processes but created new processes and eligibility requirements instead have had the most success in reducing these transaction costs.

The trade-off is that piggybacking on federal incentive programs saves resources and provides more funding for conservation activities, which could be used to increase the level of financial incentive. Many of the PWS schemes investigated here have piggybacked to some extent on these programs, typically EQIP or CRP/CREP. In addition to funds, EQIP offers a defined set of eligibility criteria and CRP/CREP offers an established structure for making long-term rental payments that don't have to be created from scratch.

Finally, having a private intermediary organization instead of a public agency administering the scheme (as previously suggested) may help reduce costs if they have fewer restrictions or simpler systems of accountability. Regardless, to achieve a reduction in transaction costs while offering a

menu of options (as recommended above), it may be necessary to standardize choices within each of the option types.

Outreach Channels & Tactics: Observations

In addition to considering the message being presented to different segments of landowners, it is necessary to identify the best mechanisms through which landowners can be reached. Outreach channels may significantly impact the level of landowner participation in a given program or practice. The challenge lies in finding ways to engage landowners who may possess different levels of knowledge, attitudes, or beliefs about how their land can be most effectively managed. Overall, organizations that are working to engage landowners often express concern that their efforts are only reaching the segment of landowners that are already involved in sustainable land use planning (Ma, 2011). Therefore, if a program wishes to reach beyond the "low hanging fruit" of involved landowners, then the focus must be on strategies to tailor messages to resonate with landowners who are not actively involved in land management. Existing literature discusses various channels to reach landowners, although none emerge as singularly effective. It is particularly difficult to reach uninvolved landowners, since members of this group are less likely to respond to any surveys on the topic. Therefore, any survey data collected about the effectiveness of outreach efforts is likely to be biased by self-selecting participants (Ryan, 2008).

Primary modes of communication with landowners include: pamphlets and other mailed materials, books, websites, emails, articles and advertisements in local newspapers, informal communication with peers, local seminars, networking events, demonstrations, and event exhibitions (Wingspread, 2006). These various methods have been met with mixed results, and it appears that each is somewhat successful some of the time. Ferranto et al. suggested that a combination of outreach methods is likely to be the most effective. Although this approach would require additional resources, it will likely maximize outreach efforts (Ferranto, Huntsinger, Stewart, Getz, Nakamura, & Kelly, 2012). An additional benefit to utilizing multiple outreach channels is that the approach increases the likelihood that a landowner will receive the message from multiple sources. Repetition of the message is likely to enhance its effectiveness.

It is worth noting that there is not a strong consensus on the effectiveness of the Internet as an outreach tool. Some landowners may not use the internet frequently if at all, may not take the time to review information found online or in emails, or may not perceive the information as reliable. However, it may be an effective tool to reach absentee landowners, which is a segment of particular concern in the Sebago Lake watershed (Ferranto, Huntsinger, Stewart, Getz, Nakamura, & Kelly, 2012). It is also important to note that Internet use is increasing over time, so program administrators should not be a deterred from leveraging online resources to encourage landowner involvement in a PWS market in the future.

Social capital (e.g. peer to peer networks) is the outreach channel most widely agreed to be effective (Warziniack, Shogren, & Parkhurst, 2007; Kittredge, 2009). This is largely due to the importance of information from trustworthy sources and the fact that people tend to trust others who they know personally to greater degrees than impersonal advertisements (Ma, 2011). However, social capital is difficult to leverage as its effects are less visible and more difficult to facilitate. Suggestions for building social capital include networking events for landowners, and engaging community leaders in land management practices that others will observe and may emulate (Wingspread, 2006). It is unlikely however, that social capital will be effective in influencing the behavior of absentee landowners who are less likely to be building relationships with other landowners (Warziniack, Shogren, & Parkhurst, 2007).

The effectiveness of social capital and peer to peer networks are derived from active engagement. Landowners prefer direct personal contact to mass media as a source of information (Wright & Shindler, 2001; McCaffrey, 2004; Ryan, 2008; Shindler, Toman, & McCaffrey, 2009). This suggests that the best way to engage a landowner is through personal contact with a trustworthy source, thus providing a personalized and engaging instruction or exchange of information.

The effectiveness of outreach is limited by whether or not landowners adopt behaviors in responsive to new information. According to Ferranto et al., landowners ascribe the greatest value to advice or information from private consultants, industry associations, and advisory organizations (Ferranto, Huntsinger, Stewart, Getz, Nakamura, & Kelly, 2012). Information from government agencies or environmental organizations is not widely perceived as reliable among landowners. Therefore, the source of information may be equally important to the channel through which it is delivered.

Outreach Channels & Tactics: Recommendations

Identify quick wins by sourcing participants through partners that landowners trust

Many of the partners discussed above (e.g., county foresters, NRCS conservationists, land trust staff, etc.) have previously worked with local landowners and have a sense of landowners who may be interested in project funding or other benefits of a PWS scheme. Personalized outreach is an effective starting point. In one interview a program administrator who reported asking for 5-10 names from each of these partners also reported a greater return on investment than did their previous GIS-based targeting and mass marketing style approach (in terms of generating initial participation). In a separate interview, another program administrator emphasized that accessing an existing pool of interest is a much simpler task than trying to build it on one's own. Focusing these efforts through

other organizations that are locally perceived as trustworthy may be beneficial in terms of overcoming perception and trust barriers that unknown or new organizations may experience (See Appendix 6).

Supplement this with broad outreach tactics, tailoring the message later

In part to reduce bias and make the sample of participants more representative, we recommend conducting several broad outreach strategies in parallel with soliciting suggestions from partners. Tactics could include distributing information at community gathering points (e.g., post offices and grocery stores), holding evening workshops, passing information through civic group channels, emailing information (to reach absentee landowners), etc. These efforts should focus on building initial awareness. It does not appear worthwhile to customize the message too specifically to subgroups of landowners very early in the process. Once individuals express interest, the message can be tailored to their motivations and interests to increase the likelihood of participation.

Experiment with encouraging landowner-to-landowner referrals

Across other PWS programs and federal financial incentive programs, one of the most powerful mechanisms for expanding participation is landowner-to-landowner referral. There is a credibility and trust to this communication that can't be matched by scheme representatives or partners. Many PWS schemes we investigated have had positive experiences with neighbor-to-neighbor conversations. Although some people will not like contacting or being contacted by their neighbors, none of our interviews suggested this had yet been a common or significant problem. In most cases these landowner referrals have happened naturally, although to a limited extent. Again, the New York City watershed program is an exception: there was an 85% threshold of farmers that needed to participate for the program to go forwards and participation is now at 93% (History). It is not clear how much the potential of stronger regulation galvanized the farmers to promote the program to each other.

Our interviews provided less clarity about whether more actively encouraging landowner referrals would be helpful in expanding participation or whether this would significantly undermine the credibility of the communication. Most programs have not formally encouraged or requested that participating landowners promote the program to other eligible landowners and responses were split fairly evenly as to whether this would be helpful or not. Similarly, none of the schemes we investigated have yet offered a financial payment to landowners for successfully recruiting other eligible landowners to participate in the program and responses, though split, tended to view this as more unhelpful than helpful.

Nevertheless, based on the potential gains from landowner referrals and the lack of explicit testing, we recommend active experimentation with more actively encouraging landowner referrals. In the pilot stage, such intra-group communication could be a condition of participating, but this requirement may not be feasible when trying to attract a critical mass of participants. Instead, the incentive could be a modest bonus financial payment. A landowner can also help spread the word by sharing their story through testimonials in various media (print, broadcast, etc.). This broader awareness raising may be exciting to certain landowners and could be encouraged or incentivized as an alternative to direct referrals.

Provide tools that enable peer-to-peer influence

While traditional methods of outreach such as articles and/or advertisements in local newspapers and publications, printed materials sent in the mail, workshops, etc. should be used as a component of outreach, it is important to go beyond these methods in order to maximize reach. As growth in both Internet and Social Network use increases, these tools could serve as a valuable way to increase landowner participation in a PWS market, especially among absentee landowners. An online engagement platform could double as a forum for landowners to network and communicate about any concerns that they might have about the program, and to communicate their success stories. This addresses the fifth element of (Rogers, 1962) innovation decision-making stages outlined above, where the implementer seeks confirmation that their decision to enroll in a program was correct. This could strengthen networks that already exist by providing a place for informal communication between events and it may be a way to further engage absentee landowners. The advantage that this approach would have over traditional networking and peer-to-peer sharing of information is that PWS professionals would be able to monitor the site to ensure that information being exchanged is accurate. This could also lend credibility to the forum for those who trust professionals more than peers, although it would be important that it is explicit that the role professionals fill on the site is purely advisory so as to avoid any concerns that the program administrators are using the site as a tool to monitor performance or compliance.

One must recognize however, that this can be a double-edged sword and if landowners are not happy with the program, they may now have a wider audience to whom to air their grievances.

Implementation Approach

Implementation of any innovation needs to invest in the right people at the right time to maintain the momentum to reach scale at the least cost. (Rogers, 1962) defined the following groups of individuals important to the diffusion of an innovation throughout society:

1. **Innovators**: Those who are willing to experiment and who view early involvement in an innovation as a source of value.
2. **Early Adopters**: Those who are willing to try something new but not risk wasting their time with an unproven approach or technology.
3. **Early Majority**: Those who will quickly adopt a technology or approach once it has proven successful. Prior to this they will remain skeptical.
4. **Late Majority**: Those who continue to be skeptical even after the tipping point is reached and require greater coercion to adopt. They may only be influenced when society makes it inconvenient to continue to resist.
5. **Laggards**: Those who remain skeptical and who may even perceive some additional value from being outside the adoption of the innovation.

The early adopters and innovators constitute about 16% of the total population, which is known as the tipping point (Rogers, 1962). Typically, innovations that achieve this level of uptake will experience accelerated growth thereafter.

Effectively recruiting landowners into a conservation scheme will require identifying and investing in the right group at the right time. Investments made in early adopters before the innovation has been tested may only serve to alienate this group. Likewise, continuing to invest in the early adopters after reaching the tipping point is unlikely to generate the level of returns needed to justify the investment.

Implementation Phases

While individual landowners will make decisions based on Educate, Communicate, Co-Create model above, this outreach activity will occur within the context of a larger conservation program implementation. In order to take advantage of the societal groups outlined by (Rogers, 1962) above we recommend that the project follow three distinct phases as demonstrated in Figure 17:

- **Design**: This phase engages innovative landowners identified through partner organizations that are already involved in conservation programs or otherwise predisposed to engage in co-

creating program design features. This phase also gathers together partner organizations with the resources and capacity to help provide a portfolio of conservation services to landowners.

- **Pilot**: This phase is intended to allow the program to be fully functional, but should be designed to test specific hypotheses over a defined time period. In order for a pilot to be successful, it must produce information that informs the scale up of the model. Whether that information occurs as a result of the 'success' or 'failure' of the pilot is irrelevant, any pilot that provides answers to the hypotheses posed at the outset should be considered successful. The key to successful piloting is to have an experimental approach, rigorously evaluate the outcomes and iterate until there is confidence that the parameters of the business model are understood well enough to justify investment in scaling. By the end of the pilot phase enrollment should have reached the tipping point identified earlier of 16% of the target population. If this isn't the case, there may be further opportunities to refine the outreach strategies.
- **Scale**: Scaling up is intended to bring the resources on board to replicate the business model refined in the pilot to a point where it is capable of addressing the entire target market. At this point we recommend that a standalone intermediary organization be responsible for coordinating the efforts of the organizations involved in the program, as outlined in the recommendations above.

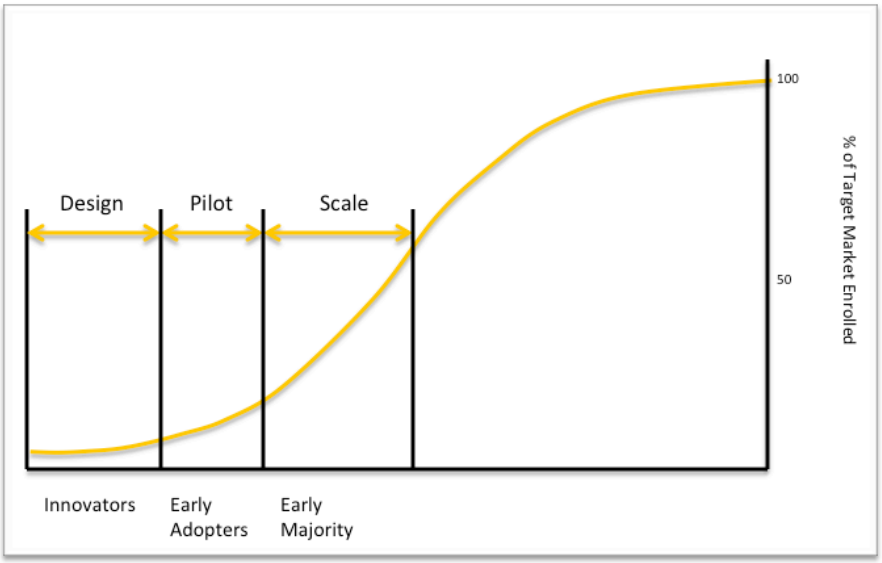


Figure 17: Diffusion of Innovation Curve. Adapted from (Rogers, 1962)

Conclusions

In this report we have examined the supply side of the PWS model, developing recommendations to improve landowner outreach that are generalizable to any location, while using the context of Sebago Lake as a case study. Based on a systematic approach at developing outreach and engagement strategies, we have also examined the biophysical, social, economic, and institutional factors that will impact the success of a PWS model and the potential to reach scale.

Our biophysical analysis examines the nature of the environmental threat to water quality in the Sebago Lake watershed. In order to mobilize the appropriate response among landowners it is vital to articulate both the environmental threat being addressed and the means by which landowners can contribute to its mitigation. As demonstrated in the Biophysical section, surface water is a critical component to drinking water in the Sebago Lake watershed and forests are an important contributor to drinking water quality in this area. However, conversations with the DEP in Maine, and with PWD suggested that the actual threat to these forests is not particularly imminent. This is reflected in the latest *Forests to Faucets* data, which disaggregates the sub-watersheds and allows areas where development is occurring, such as the Lower Presumpscot Watershed to be differentiated from those areas that are important for drinking water supplies, such as the Upper Presumpscot Watershed. Therefore, both of these sources indicate that the environmental threat in the Upper Sebago Watershed is not particularly pressing when low development density in the upper watershed, existing conservation activities in the area, and the overall resilience of the system are considered together. Of more concern for drinking water quality in the area is activity that takes place closer to PWD's intake station on the lakeshore. The *Forests to Faucets* data shows greater threats to drinking water quality immediately surrounding the lake, which is consistent with the primary data that has been collected. Investing available conservation funds in improving management of storm water and private septic systems, especially in anticipation of increasingly erratic rainfall due to climate change, would seem to be a more immediate priority than investing in a PWS scheme in the upper watershed and the optimal allocation of scarce resources.

Establishing a strong link between land use decisions and environmental outcomes is of critical importance in generating awareness and interest in conservation programs. It is also an important step in creating testable hypotheses for a pilot program that demonstrates an ecological return on investment and a measurable impact on ecosystem service provision outcomes. If PWS is to mature and become an effective and efficient tool for allocating conservation capital, more rigorous experimentation and sharing of results is required. Many pilot programs use PWS as an additional

tool in a conservation toolbox, or are participating in a form of "accidental PWS." Case studies that are available tend to produce valuable anecdotes but as a whole, many projects are being implemented independently without a mechanism for sharing lessons learned. Increasing communication and sharing between programs attempting to implement PWS would hasten the evolution of the field and provide investors with the confidence that PES is the optimal use of their financing.

Where possible we have tried to make our recommendations generalizable and highlighted where further information is required to apply these recommendations directly to conservation programs in the Sebago Lake watershed. Without actual landowner level surveys, a key unknown is how the population in the region deviates from national and regional data. The first step in making our recommendations actionable is to supplement them with local preferences with respect to the attitudes of landowners towards conservation, their motivations and priorities for owning land, their willingness to accept restrictions on the use of their land or implementation of BMPs, and their views on agreeable program administration institutions.

The recommendations in the Findings and Recommendations section follow established marketing principles of segmentation, targeting and positioning, as well as elements of cause-based marketing and social marketing. We are confident that these principles can be successfully applied in the Sebago Lake watershed to enhance engagement and participation in current and future conservation programs and will produce insights that lead to more effective deployment of conservation financing regardless if it comes in the form of PWS or more traditional incentive programs.

Conservation is a complex undertaking and with numerous stakeholders and types of organizations involved. Understanding how these organizations complement and compete with each other, their role in advocating and implementing conservation, and the potential for collaboration between organizations is a pre-requisite for any successful conservation project. In the Stakeholder Mapping section we have demonstrated an approach to understanding these relationships in the Sebago Lake watershed that is broadly applicable to many environmental policy or planning scenarios. The specific results produced by this approach represent a prioritization framework that will vary by location and by environmental issue. This prioritization should be followed by a deeper analysis of those organizations identified as priority targets to understand their motivations and interests with respect to the specific conservation project being considered.

While we do not believe that a PWS market targeting the Upper Sebago Lake watershed is the optimal use of conservation capital to maintain drinking water quality in the Greater Portland area, there is an opportunity to engage the residents of Portland in the protection of their water by funding conservation projects in high priority areas on the Sebago lakeshore. The green versus gray analysis undertaken by WRI demonstrates the cost effectiveness of investing in green infrastructure as opposed to building a mechanical or chemical water filtration capability in the future. Additional financing raised from PWD's customer base would constitute an important source of conservation capital as alternative public sources come under increasing pressure from budget cuts.

Appendices

Appendix 1: Case Study Interview List of Questions

The following is a list of questions we sought to address during case study interviews. Questions found in advance of the call through online research were not asked to allow more time for other questions. Some questions were adapted based on how each conversation evolved.

Open-Ended Questions (with potential follow-ups)

1. Please briefly describe the administrative organization of the PWS program.
    - Was a new organization created to administer the program?
    - Are private landowners part of the administrative structure or steering committee?
    - Who are your key partners?

2. In designing the PWS program, to what extent did you involve private landowners? What were the pros and/or cons of this involvement?
    - Did the landowners directly influence the choice of financial incentive?
        - If so, what were their preferences?
        - (What is the financial incentive and how has that been received?)
    - Did the landowners directly influence the choice of monitoring/verification protocols?
        - If so, what were their preferences?

3. To what extent has your outreach been targeted at a subset of private landowners rather than at all eligible private landowners? What were the pros and/or cons of this approach?
    - If segmented, was it useful?
    - How did you decide whom to target?
    - How did you identify and make contact with them?
        - Did they already belong to certain organizations?
    - What organization has primarily conducted this outreach?
        - What allows them to engage effectively with landowners?

4. In general, what have been the primary concerns or barriers to participation for landowners? How have you addressed these?
    - Has the PWS program been an easy sell or a hard sell?

5. With the remaining time, what are the most important lessons learned about working with landowners?

Additional:

- What is your sense of the pros and cons of incentivizing others to participate?
- How is PWS different for landowners than typical watershed restoration efforts?

Appendix 2: PWS Scheme Classification and Scoring

Type of Private Landowner	
Mix of Forest/Farm	2
Mostly Farm	1
Mostly Forest	3
Mostly Urban/Suburban	0
N/A	0
Various	0
Focus on Water Quality	
Minimal	0
N/A	0
Partial	1
Primary	2
Stage of Program	
Active	2
Completed	0
Demonstration	-1
Initiating	0
N/A	-1
Pilot	1
Planning	-1
Includes Payments without Acquisition	
No	0
N/A	0
Yes	2
Located in Northeast	
No	0
Yes	1

Appendix 3: PWS Scheme Ratings

Conservation Registry Project Name	States	Search Term	Priv LO's?	Priv LO Type	H2O Quality	Stage	Pmts w/o Acq	In NE?	Sum	Invited?	Interviewed?	Primary Contact Name
Crooked River/Portland Water District Payment for Ecosystem	ME	PWS	Yes	Mostly Forest	Primary	Planning	Yes	Yes	7	N/A	N/A	N/A (Basis of Comparison)
Common Waters Healthy Forests, Healthy Watersheds Initiativ	NY, PA	PWS	Yes	Mostly Forest	Primary	Active	Yes	Yes	10	Yes	Yes	Stephanie Pendergrass
Upper Neuse Clean Water Initiative	NC	PWS	Yes	Mostly Forest	Primary	Active	Yes	No	9	Yes	Yes	Lisa Creasman
New York City Source Water Protection	NY	PWS	Yes	Mix of Forest/Farm	Primary	Active	Yes	Yes	9	Yes	Yes	Tara Collins
Virginia's Forests to Faucets Initiative	VA	PWS	Yes	Mostly Forest	Primary	Pilot	Yes	No	8	Yes	Yes	David Powell
Landscape Auction [+Trees for Streams Program]	VT	PWS	Yes	Mix of Forest/Farm	Partial	Active	Yes	Yes	8	Yes	Yes	Mary Russ
Dispersed Water Management Northern Everglades and Estuar	FL	PWS	Yes	Mostly Farm	Primary	Active	Yes	No	7	Yes	Yes	Sarah Lynch
Florida Ranchlands Environmental Services Project (FRESP)	FL	PWS	Yes	Mostly Farm	Primary	Completed	Yes	No	5	Yes	Yes	See other
Performance-Based Incentives for Agricultural Pollution Contr	IA, VT	PWS	Yes	Mostly Farm	Primary	Pilot	Yes	Yes	7	Yes	No	Dr. Jonathan Winsten
Performance-Based Incentives for Agricultural Pollution Contr	IA	PWS	Yes	Mostly Farm	Primary	Pilot	Yes	No	6	Yes	No	See other
Deschutes River Streamflow Rights Project	OR	PWS	Yes	Mostly Farm	Partial	Active	Yes	No	6	Yes	No	Gen Hubert
Upper Salt Fork Watershed	IL	PWS	Yes	Mostly Farm	Primary	Pilot	Yes	No	6	Yes	Yes	Bruce Stikkers
Sauk River Watershed Ecosystem Services Market	MN	PWS	Yes	Mostly Farm	Primary	Pilot	Yes	No	6	Yes	No	Dennis Fuch
Cullers Run Watershed Project	WV	PWS	Yes	Mostly Farm	Primary	Completed	Yes	No	5	Yes	Yes	Dr. Alan Collins
Flint River Basin	GA	PWS	Yes	Mostly Farm	Minimal	Active	Yes	No	5	Yes	No	David Reckford
Thermal Loading Offsets	OR	PWS	Yes	Mostly Farm	Minimal	Active	Yes	No	5	Yes	Yes	Kendra Smith
Great Miami (Ohio) River Watershed Water Quality Credit Trad	OH	PPES	Yes	Mostly Farm	Primary	Initiating	Yes	No	5	No	N/A	N/A
Conestoga Watershed Reverse Auction	PA	PPES	Yes	Mostly Farm	Primary	Demonstration	Yes	Yes	5	No	N/A	N/A
Mokelumne Watershed Project	CA	PWS	Yes	Mostly Forest	Partial	Planning	Yes	No	5	No	N/A	N/A
City of Tulsa Source Water Protection	OK	PWS	Yes	Mostly Farm	Primary	Active	No	No	5	No	N/A	N/A
Montana Water Project	MT	PWS	Yes	Mostly Farm	Minimal	Active	Yes	No	5	No	N/A	N/A
Water Restoration Certificates	OR, MT	PWS	No	N/A	Minimal	Active	Yes	No	N/A	N/A	N/A	Todd Reeve
Santa Fe Watershed Management Project	NM	PWS	No	N/A	Yes	Active	N/A	No	N/A	N/A	N/A	N/A
Denver Water Forest to Faucet Partnership	CO	PWS	No	N/A	Primary	Active	N/A	No	N/A	N/A	N/A	N/A
Mountain Island Lake Initiative	NC	PPES	Yes	Various	Primary	Active	No	No	4	N/A	N/A	N/A
Salmon-Safe Farm Certification Program	WA	PWS	Yes	Mostly Farm	Partial	Active	No	No	4	N/A	N/A	N/A
Ecological Commodity Pay Package	MN	PWS	Yes	Mostly Farm	Primary	Pilot	N/A	No	4	N/A	N/A	N/A
Agricultural Water Enhancement Program, CO	KS	PPES	Yes	Mostly Farm	Minimal	Active	No	No	3	N/A	N/A	N/A
Republican River Project	CO	PWS	Yes	Mostly Farm	Minimal	Completed	Yes	No	3	N/A	N/A	N/A
Water and Wine	CA	PWS	Yes	Mostly Farm	Minimal	Active	No	No	3	N/A	N/A	N/A
San Antonio Source Water Protection Program	TX	PWS	Yes	Mostly Farm	Minimal	Active	No	No	3	N/A	N/A	N/A
Contra Costa Water District, CA	CA	PPES	Yes	Mostly Farm	Partial	Completed	No	No	2	N/A	N/A	N/A
Phosphorous Reductions Incentives Program	WI	PWS	Yes	Mostly Farm	Primary	Planning	N/A	No	2	N/A	N/A	N/A
Conserve to Enhance	AZ	PWS	Yes	Mostly Urban/Subur	Minimal	Pilot	No	No	1	N/A	N/A	N/A
Entiat River Habitat Farming	WA	PWS	Yes	Mostly Farm	Minimal	Planning	N/A	No	0	N/A	N/A	N/A
Colorado River Water Bank	CO	PWS	Yes	Mostly Farm	Minimal	Planning	N/A	No	0	N/A	N/A	N/A

Appendix 4: Summary of Notes from Case Study Interviews

The following notes highlight the lessons learned, best practices, and specific actions taken by t nine different programs interviewed. The notes have been categorized according to the major th of our report. Efforts were made to remove specific information that could link a note to a partic PWS scheme.

Segmenting
The type of landowners varies greatly even within a watershed, which can have differences in motivations for owning land and likely preference toward different incentives.
The social side is just as complex as the ecology in each watershed. Need to really understand unique needs of each area or could experience backlash.
Economic incentives matter, but other factors, like people's connection to the land, might supersede economics.

Targeting and Positioning	
Discuss program design with landowners	Landowners weren't previously organized, but reached out through many channels such as letters, county assessor's office, and local cl and organizations to invite landowners to participate in designing t program.
	Caucused with local landowners and key stakeholders in area to determine how to address conservation challenges, what their prio were, and developed a strategy around that input. Found shared interests, including protecting water quality for fishing. Had a lot of conversations to listen and understand what people care about and want first.
Prioritize influential landowners	Picked ten farms to run the pilot that were selected because they v willing to work with the buyer, try new things on their land, and to voice for the program amongst other landowners.
Scaling up	The buyer required 85% participation among landowners in an all o nothing proposition. This put pressure on landowners who wanted participate to encourage their neighbors to do so as well. When pro reached scale, there are staff constraints in maintaining relationshi with all existing participants which can limit ability to enroll new participants and maintain good relationships.
	Developed a map of prioritized land. As more people became inter revised the payments to focus on lands that were higher conservat priorities.
Barriers to Targeting and Positioning	
	Time is very limited for landowners, so it is difficult to get them eng and important to not burn them out in the process.

	It is unclear what level of critical mass is needed or how many acres of top priority land need to be put into conservation in order to achieve conservation goals.
	It is a challenge to avoid creating an expectation of payment for activities people would do for free. At one point increased payments and early adopters felt cheated.
	Big issue is engaging the next generation of landowners due to the generational gap between current landowners who have worked land for generations and their heirs who in many cases have professional careers and live elsewhere.

Scheme Attributes and Administration	
Leveraging partnerships	Drumming up all the interest on your own is monumental task, so partnering with others who have already generated interest in similar activities is great opportunity. Partnered with land trusts that had pent up demand.
	Project funding was used to overcome upfront costs of easements like lawyer fees and survey of the land, which allowed land trusts to complete many more deals.
	Partnerships were formed with many organizations to gain new funding sources including federal programs EQIP and CRP, as well as state funding.
Landowner involvement in program design	Landowners were asked to determine the BMP's that worked best to minimize their risk. Having the buyers and sellers working together allowed for understanding unique needs and areas of joint gains. This led to new forms of measurement and new market drivers that worked better for everyone.
	Landowners were asked to help determine which practices and monitoring protocols would be best suited to use the available money. In terms of monitoring, landowners drafted the contract and included being present when monitoring was conducted and restrictions on sharing of data. This allowed landowners to feel more comfortable with monitoring, and they proactively identified high risk areas for extra monitoring, found sources of high pollution, and engaged new landowners whose lands were found to be ecologically important.
	Project funding paid for landowners to participate in meetings, read preparation material, and have input into the program design.
Reduce transaction costs	Developed a new application process that landowners say is easier than federal application processes.
	The program deliberately reduced the number of rules to participate and had a transparent formula for how money was distributed among landowners.

	Used EQIP funding criteria because already developed and established, and could tie in with other government programs. Drawback is that perceived federal oversight can be a turnoff to many landowners.
Market orientation	Attempted to create market, but have fallen back on using more traditional strategies and funding good projects.
Non-water quality incentives	There are opportunities to offer forms of assistance that are important to landowners and can encourage their participation, but may not directly help with water quality. For example, educational programs on calf-health or farming techniques. The bottom up approach is critical to get ownership from landowners as the program evolves.
Barriers to effective scheme attributes and administration	
	Landowners are weary of government oversight and restrictions on their land. They may believe strings are attached if using government funding or application processes.
	Landowners are reluctant to try new or different practices on their land. They don't want to be a guinea pig or may have been doing practices for generations and don't see a need to change.
	A challenge in the program has been the transaction costs necessary for landowners to participate. A state agency is providing funding, so there are certain eligibility requirements and process requirements. Landowners need to submit a proposal which is not guaranteed to be accepted. The time and money it takes to do that is a huge challenge for landowners. Adapting PES to current systems is "like a square peg in a round hole."
	Challenge with partnering with CRP is the restrictions on the 20-year contract.
	EQIP eligibility excludes many landowners.

Outreach Channels and Tactics

Source participants from partners	Initially identified the most ecologically important lands and reached out to landowners inviting them to workshops with food. Nobody came. Then worked with partners who referred landowners which worked much better. There is low-hanging fruit in working with land trusts, foresters, or other organizations that have already cultivated relationships with landowners but haven't had the programmatic resources to serve them yet.
	Targeted those they knew first, from participation in past programs or other connections.
Peer to peer strategies	Once a group of landowners is on board, they are better suited to deliver the message because they have the most credibility among their peers.
	Leverage well connected landowners and local extension agents with connections to the landowners. A well connected landowner who knew his property had a high impact on water quality stepped up his level of involvement which encouraged others. He was an informal leader for the

	project.
	Marketed successful project for one landowner to others to increase appeal. Genuine interest and energy from landowner helped bring others on board. Found landowners can be the strongest partners in raising awareness and interest.
	Found landowners were influential in engaging their neighbors. CREP provided a bonus to landowners who signed up two other people which helped incentivize this activity.
	Began by using every possible means to get the word out to all landowners in area: built website, developed articles and reached out to local and national media outlets, contacted local civic groups like rotary club and master gardeners, provided evening workshops with free food to landowners, posted fliers at community meeting places. All of this effort was to create initial awareness and interest leading a landowner to call the program outreach coordinator and have a personal conversation.
	Many partners are involved in outreach. Local Conservation Districts serve as key touch point with landowners. Landowner organizations are just starting to form but are not developed enough to have a formal seat at the table.
Effective messaging	The messaging needs to focus on the landowner needs and concerns. For example, no cost to participation, administered by locals, and an attractive incentive package.
Barriers to Outreach	
	There is a lot of mistrust in government oversight, which was limiting because the buyer in the program had regulatory power and had a history of giving violations and did not have a good reputation with community.
	Explaining how a PWS market works is complicated and difficult to explain to landowners. Our program initially tried this but had to back off.

Federal Regulations and Policy

FEDERAL REGULATIONS

Clean Water Act, Title 33 U.S.C. § 1251 et seq.	The Clean Water Act (CWA), officially entitled the Federal Water Pollution Control Act, regulates the quality of domestic surface waters as well as the discharge of pollutants to those waters. The goal of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 U.S.C §1251(a)) To achieve this, the CWA requires states to establish water quality standards (WQS) and monitor water bodies to ensure that standards are met. Unmet standards indicate that a waterbody is impaired and it is added to a list of "threatened and impaired waters" pursuant to §303(d) of the CWA. (VLS-LUI Memo) States with waters included on a 303(d) lists are required to rank the waterbodies on the list and determine total maximum daily loads (TMDLs), or the maximum amount of a pollutant that the waterbody can receive while meeting the WQS. (United States Environmental Protection Agency) TMDL compliance is achieved through a statutorily mandated Continual Planning Process which provides for implementation of new or revised WQS including compliance schedules. (VLS-LUI Memo) The CWA also prohibited the discharge of pollutants from any point source to navigable waters without first obtaining a permit under the National Pollutant Discharge Elimination System (NPDES) (United States Environmental Protection Agency), which are allocated in accordance with TMDL criteria. (VLS-LUI Memo) Maine presently administers the NPDES program under authorization from the U.S. EPA. Although the Crooked River is under greater threat from non-point source (NPS) pollution from runoff, the regulatory framework established by the NPDES is highly relevant to managing water quality by reducing allocations available to point sources and incentivizing payment for best management practices that will reduce downstream pollution.
Safe Drinking Water Act and Filtration Avoidance, Titles 42 U.S.C. §300f et seq. & 42 U.S.C. § 300g-1	The Safe Drinking Water Act (SDWA) was enacted to protect the quality of drinking water in the United States and applies to all waters designated or potentially designated for drinking including surface and subsurface waters. In 2002, the EPA finalized the Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) to improve control of microbial pathogens which "require[s] systems to meet strengthened filtration requirements to public water systems that use surface water or ground water under the direct influence of surface water and serve fewer than 10,000 persons" (United States Environmental Protection Agency, 2002). This requirement may be waived for suppliers able to demonstrate an effective watershed

Enhanced Surface Water Treatment Rule (LT2ESWTR) to reduce disease incidence associated with *Cryptosporidium* and *Giardia.* (United States Environmental Protection Agency) LT2ESWTR requires all public water systems using surface water to monitor their sources to determine appropriate treatment. (United States Environmental Protection Agency) The EPA cited surveys showing that *Cryptosporidium* was present in unfiltered water and could be passed to consumers; because unfiltered systems are subject to higher risk of contamination, they are required to demonstrate comparable results which can be achieved through technologies such as UV and ozone. (United States Environmental Protection Agency) The availability of avoidance waivers may contribute to the emergence of conditions suitable for watershed service markets where the cost of maintaining water quality at the source is less than the cost of filtration.

FEDERAL POLICY

U.S. EPA Office of Water, Water Quality Trading Policy

The USEPA Office of Water (USEPA OW) believes that market based water quality trading programs may achieve water quality management goals more efficiently than more traditional regulatory approaches may achieve. (United States Environmental Protection Agency, 2003) Consequently, the Agency established the Water Quality Trading Policy to encourage states and tribes to develop and implement markets trading nutrients, sediments and other pollutants where opportunities exist to improve water quality at a reduced cost; more specifically, the policy is intended to implement TMDLs , reduce CWA compliance costs, and create incentives for voluntary reductions of pollutants (United States Environmental Protection Agency, 2003). The U.S. EPA "supports implementation of water quality trading by states, interstate agencies and tribes where trading:

A. Achieves early reductions and progress towards water quality standards pending development of TMDLs for impaired waters.
B. Reduces the cost of implementing TMDLs through greater efficiency and flexible approaches.
C. Establishes economic incentives for voluntary pollutant reductions from point and nonpoint sources within a watershed.
D. Reduces the cost of compliance with water quality-based requirements.
E. Offsets new or increased discharges resulting from growth in order to maintain levels of water quality that support all designated uses.
F. Achieves greater environmental benefits than those under existing regulatory programs. EPA supports the creation of water quality trading credits in ways that achieve ancillary environmental benefits beyond the required reductions in specific pollutant loads, such as the creation and

restoration of wetlands, floodplains and wildlife and/or waterfowl habitat.

G. Secures long-term improvements in water quality through the purchase and retirement of credits by any entity.
H. Combines ecological services to achieve multiple environmental and economic benefits, such as wetland restoration or the implementation of management practices that improve water quality and habitat." (United States Environmental Protection Agency, 2003)

The establishment of water quality trading markets is an expressed joint objective of the U.S. Department of Agriculture, Natural Resources Conservation Service (USDA NRCS) and the USEPA Office of Water (EPA OW), which entered into a partnership to collaborate on market establishment in 2006. (USDA and USEPA, 2012) Many of the non-point sources of pollution identified by the EPA OW are pervasive in Maine and increasingly prevalent in the upper watershed area, including urban and agricultural runoff and resulting nutrient loading as well as increasing population growth and development that increase runoff and decrease forest areas that limit nutrient and suspended solid loading to riparian systems. While there is no TMDL presently established for the Crooked River, although one was established in 1998 for the Presumpscot River that drains from Lake Sebago. (Murphy, 1998)

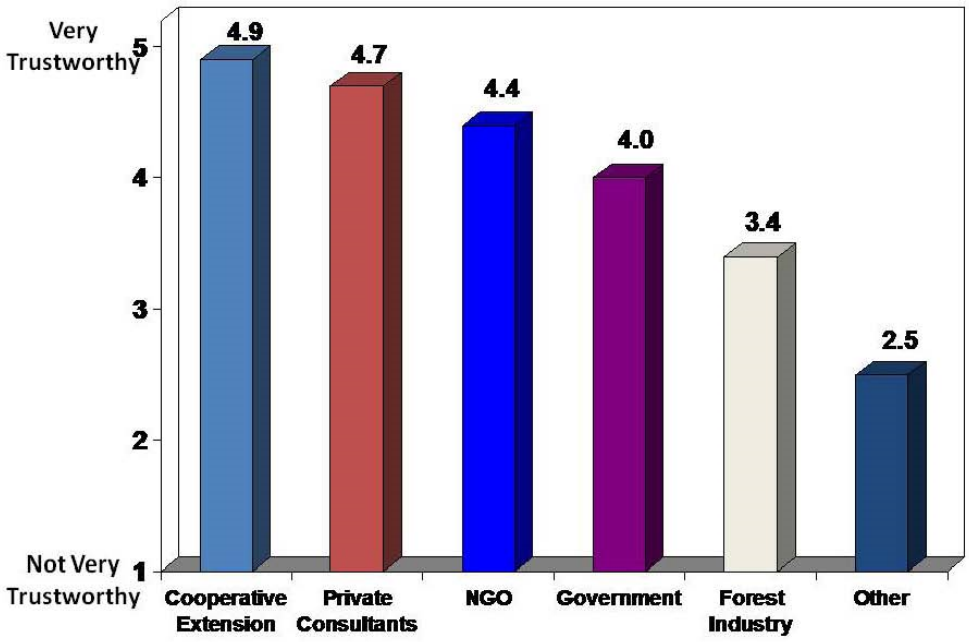
State Regulations	
Natural Resources Protection Act, 38 M.R.S.A. §§ 480-A to 480-HH	The Natural Resources Protection Act (NRPA) finds that Maine's "rivers and streams, great ponds, fragile mountain areas, freshwater wetlands, significant wildlife habitat, coastal wetlands and coastal sand dunes systems are resources are resources of state significance. These resources have great scenic beauty and unique characteristics, unsurpassed recreational, cultural, historical and environmental value to the present and future citizens of the State and that uses are causing the rapid degradation, and in some cases, the destruction of these critical resources, producing significant adverse economic and environmental impacts and threatening the health, safety and general welfare of citizens of the State." (38 M.R.S.A. § 480-A) The primary components of the law focus on "protected natural resources," meaning "coastal sand dune systems, costal wetland, significant wildlife habitats , fragile mountain areas, freshwater wetlands, community public water systems primary protection areas, great ponds or rivers, and streams or brooks." (38 M.R.S.A. § 480-B.8) NRPA requires permits to be obtained for any activities located in, on or over protected natural resources, or that is adjacent to: A) "a costal wetland, great pond, river, stream or brook or significant wildlife habitat contained within a freshwater wetland;" or B) freshwater wetlands that meet certain conditions. (38 M.R.S.A. §§ 480-C.1) Activities that require permits include: "dredging, bulldozing, removing or displacing soil, sand, vegetation or other materials; draining or

	otherwise dewatering; filling, including adding sand or other material to a sand dune; or any construction, repair or alteration of any permanent structure. (38 M.R.S.A. § 480-C.2) Certain activities are exempt from the permit requirements. Notably, permits are not required "for the repair and maintenance of an existing road or culvert or for the replacement of an existing culvert, as long as the replacement culvert is: not more than 25% longer than the culvert being replaced; and not longer than 75 feet." (38 M.R.S.A. § 480-Q.2-A)
Mandatory Shoreland Zoning Act, 38 M.R.S.A. §§ 435-449	The Mandatory Shoreland Zoning Act (MSZA) declares it to be "in the public interest that shoreland areas be subject to zoning and land use controls." (38 M.R.S.A. § 435) These controls apply to all land areas within 250 feet of ponds, certain freshwater wetlands, coastal wetlands and tidal waters, rivers with watersheds that drain at least 25 square miles, and all land areas within 75 feet of certain streams. (Maine Department of Environmental Protection, 2003) The purposes of land use controls are to: "further the maintenance of safe and healthful conditions; to prevent and control water pollution; to protect fish spawning, grounds aquatic life, bird and other wildlife habitat; to protect buildings and lands form flooding and accelerated erosion; to protect archeological and historic resources; to protect commercial fishing and maritime industries; to protect freshwater and coastal wetlands; to control building sites, placement of structures and land uses; to conserve natural beauty and open space; and to anticipate and respond to the impacts of development in shoreland areas." (38 M.R.S.A. § 435). The MSZA is implemented, administered and enforced at the municipal level, as it requires municipalities to "adopt zoning and land use control ordinances" and to appoint a code enforcement office to enforce the ordinances. (38 M.R.S.A. §§ 438-A to 441)
Growth Management Act, 30-A M.R.S.A. §§4301 et. seq.	The Growth Management Act (GMA) was enacted to: establish comprehensive planning and land-use management; encourage municipalities to plan and manage for future development; encourage local land use ordinances based on comprehensive plans; incorporate regional considerations into land use planning; provide for state regulation of development proposals that impact natural resources or other interests vital to the state; encourage citizen involvement in municipal planning; and encourage the encourage the implementation of municipal growth management programs. (30-A M.R.S.A §4312, sub-2). The goals of the GMA are to: encourage orderly growth and development in appropriate areas; to plan for and develop public facilities and services to accommodate growth and development; to promote and economic climate that increase job opportunities; to protect the State's water resources; to protect the State's other critical resources; to protect the States marine resources and infrastructure; to safeguard the State's agricultural and forest resources from development; to preserve the State's historic and archeological resources; and to promote and protect outdoor recreation opportunities for all citizens. (30-

	A M.R.S.A §4312, sub-3) The GMA requires municipalities to adopt or amend municipal comprehensive plans in order to substantiate rate of growth, impact fee, and zoning ordinances. (30-A M.R.S.A §4314) Under GMA, the State may only make growth-related capital investments within areas that have been designated as local growth areas in an adopted comprehensive plan, or within public sewer districts, a census-designated place, or an urban compact area. (30-A M.R.S.A §4349-A.1) Additionally, the State is required to give preference for other state grants and investments related to: land acquisition for conservation, resource protection or recreation; programs intended to accommodate growth or development; or improvement or construction of municipal facilities, to municipalities whose comprehensive plans are consistent with the GMA. (30-A M.R.S.A §4349-A.3-A)
Site Location of Development Law, 38 M.R.S.A. §§481-490	The purpose of the Site Location of Development Law (Site Law) is to insure that developments will be constructed and operated in such a way to minimize adverse impacts to the natural environment and to protect the health, safety and welfare of the people of Maine. (38 M.R.S.A. §481). The Site Law applies to: land or water areas in excess of 20 acres; mining or advanced exploration activity (e.g. oil and gas); a structure; a subdivision; or an oil terminal facility. (38 M.R.S.A. §482) In this sense, subdivisions refer to a parcel of land divided into 5 or more lots to be sold during a 5 year period if the aggregate parcel size is greater than 20 acres. Structure refers to buildings, parking lots, roads, paved areas and wharves. (38 M.R.S.A. §482) The Site Law requires persons proposing development of such sites to obtain a permit from the State in order to ensure that certain financial and environmental standards are met, specifically: no adverse environmental impacts to: existing uses, scenic character, air quality, water quality, and noise; stormwater management, and erosion and sedimentation control; groundwater; infrastructure; and flooding. (38 M.R.S.A. §484)
Erosion and Sedimentation Control Law, 38 M.R.S.A. §420-C	The Erosion and Sedimentation Control Law (ESCL) requires any person engaging in an activity "that involves filling, displacing or exposing soil or other earthen materials shall take measures to prevent unreasonable erosion of soil or sediment beyond the project site or into a protected natural resource." (38 M.R.S.A. §420-C) The ESCL requires erosion control measures to be in place before the activity begins, and to be maintained until the site is permanently stabilized. Agricultural fields are exempt from the law, and forest management activities conducted in accordance with the standards established by the Maine Land Use Regulatory commission are deemed to comply with this law. (38 M.R.S.A. §420-C) No permits are required.
Stormwater Management Law, 38 M.R.S.A. §420-D	The Stormwater Management Law (SML) establishes standards that must be met in order for a person to construct a project that involves one acre or more of disturbed area, and to apply to the Department of

Environmental Protection (DEP) for a permit before undertaking such an activity. (38 M.R.S.A. §420-D) SML also requires the DEP to establish a list of watersheds and waterbodies most at risk from new development, and to review and update the list as necessary. The SML further requires the DEP to establish a list of degraded, sensitive or threatened regions or watersheds, including those that: have been degraded due to past or foreseeable levels of development; and are not classified as "most at risk." (38 M.R.S.A. §420-D)

Appendix 6: Trust in Knowledge of FFO Issues by Organization (on 1-5 Likert Scale)



Source: (Meyer, 2011)

Appendix 7: Categorization of Potential Intermediary Institutions

Note: This table is intended to capture the intermediary institutions that most influence private landowners in the Sebago Lake watershed. It is not exhaustive, it does not include individual or institutional buyers or sellers, and it does not include project clients.

Definitions:

- **Regulatory/Policy** <RP>: includes rulemaking, implementation and enforcement activities.
- **Financial Incentives** <FI>: includes financial payments of various types to encourage specific behaviors.
- **Technical Assistance** <TA>: includes services, resources, and training to increase understanding of and implement practices based on relevant science and policy.
- **Advocacy/Outreach/Engagement** <AOE>: Includes political advocacy, one-way dissemination of information (i.e., outreach), two-way information exchange and collaboration (i.e., engagement), and related activities.

Institution	Regulatory/ Policy <RP>	Financial Incentives <FI>	Technical Assistance <TA>	Advocacy/Outreach/ Engagement <AOE>	Details synthesized from website
GOVERNMENTAL					
Individual Municipalities	X				• <RP> Develops land use ordinances through Comprehensive Plans. Home rule authority in Maine gives municipalities additional influence.
Cumberland County Government					Limited involvement
Oxford County Government					Limited involvement
Cumberland County Soil and Water Conservation District		~	X		• <FI> Provides some cost share to landowners in collaboration with project partners. • <TA> Provides (non-regulatory, non-enforcement) technical assistance to landowners, private road associations, and municipalities for erosion control and conservation needs. Serves as a resource for conservation information, services and products about soil and water pollution, land development, wildlife habitat and flood mitigation.
Oxford County Soil and Water Conservation District			X		• <TA> Assists local efforts to maintain or improve soil and water quality in similar ways as Cumberland County SWCD.
Maine State Planning Office (SPO)	See ↓	See ↓	See ↓	See ↓	• <RP> Advises governor/legislature on economic development & natural resource conservation • <FI>/<TA> Various [to towns/regions]
➢ SPO: Land Use Planning	X	~	X	X	• <RP> Reviews local comprehensive plans and growth management programs for compliance with **Planning and Land Use Regulation Act**. Reviews land use ordinances for consistency with local plans. • <FI> **Community Planning & Investment Program** grants discontinued due to budget cuts • <TA> Publications, presentations, and workshops to communities; some data for town plans • <AOE> Advocates for Smart Growth and Growth Management at state and federal levels

Institution	Regulatory/ Policy <RP>	Financial Incentives <FI>	Technical Assistance <TA>	Advocacy/Outreach/ Engagement <AOE>	Details synthesized from website
➢ SPO: Land for Maine's Future (LMF)		X			• <FI> Land acquisition and conservation easement purchase via voter-approved bonds with matching from nonprofits, foundations, landowners, and federal agencies. Coalition of more than 275 supporting organizations.
Maine Department of Environmental Protection (DEP)	X	X	X	X	* Under possible reorganization • <RP> Serves as main link to federal government on environmental issues; administers some federal programs; implements environmental laws and programs (e.g., water quality programs under the **Clean Water Act**); conducts monitoring and assessment (including volunteer river monitoring program); makes recommendations to Legislature; issues licenses and permits (e.g., under the **Site Location Law**, **Natural Resources Protection Act** and the **Stormwater Management Law**); initiates enforcement actions. • <FI> **Watershed Protection Grant Program** provides up to $1000 and classroom support for service learning projects that protect water quality and educate public about land use impacts • <TA> Offers technical assistance to local groups for surveying pollution sources, developing watershed management plans, etc. • <AOE> Runs **LakeSmart** awards program for homeowners through lake associations and local soil and water conservation districts
Maine Department of Conservation (DOC)	See ↓	See ↓	See ↓	See ↓	Promotes stewardship and ensures responsible balanced use of Maine's land, forest, water, and mineral resources
➢ DOC: Land Use Regulation Commission (LURC)	X				* Under possible reform • <RP> Planning and zoning authority for townships, plantations and unorganized areas
➢ DOC: Maine Forest Service (MFS)	X	X	X	X	• <RP> Implements **Forest Practices Act**; provides enforcement; protects forest resources • <FI> Offers **Maine Forestry Direct Link Loan Program** to loggers with DEP and Maine Municipal Bond Bank; offers **Maine Forest Stewardship Program** and **WoodsWISE Incentives Program** (both of which use federal funds through FSP, FLP, etc.) to woodland owners; helps administer **Tree Growth Tax Law** with Revenue Services. • <TA> Provides technical assistance to public, forest landowners, forest products processors and marketers, municipalities, etc.; provides educational workshops, field demonstrations, media presentations, and one-on-one woodland owner contact (walking property, answering questions, suggesting activities and resources) • <AOE> Advocates for sound long term management of Maine's forest resources

➢ DOC: Maine Natural Areas Program (MNAP)		X	X	X	Within the Bureau of Geology and Natural Areas. Uses Focus Areas from BwH. • <FI> Facilitates outreach for the USFW S **Landowner Incentive Program** (LIP) with MDIFW. • <TA> Reviews Farm Bill projects for NRCS with MDIFW. Working with MFS, offers property and management plan reviews, field surveys, etc. to forest industry and landowners. • <AOE> Maintains data management system of natural features of Maine for use by state agencies, town planners, land trusts, etc. With landowner permission, inventories lands that support rare and/or outstanding communities and ecosystems.
Beginning with Habitat (BwH)			X		Voluntary, non-regulatory program. Collaboration of federal (USFWS…), state (MDIFW, MNAP, SPO…), and local agencies and NGOs (TNC, Audubon, MCHT…). • <TA> Integrates habitat information from multiple sources and makes it accessible to towns, land trusts, conservation organizations and others to use proactively. Develops Focus Areas: natural areas of *statewide* ecological significance.
Maine Recreational Access and Landowner Relations Program				X	• <AOE> Promotes cooperation between landowners and recreational land-users through education and outreach.
Maine Revenue Services		X			• <FI> Property Tax: **Maine Tree Growth Tax Law**; **Farm & Open Space Tax Law**
Maine Department of Agriculture, Food and Rural Resources	X	X	X		• <RP> Oversees Nutrient Management Law and Program • <FI> Offers Maine **Agricultural Sustainable Water Source Development Grant Program** (cost share) • <TA> Assists owners and land trusts with application to farmland property tax, Land for Maine's Future, and USDA Farm and Ranch Lands Protection programs.
Maine Department of Inland Fisheries and Wildlife (MDIFW)		X			Administers fish and wildlife conservation programs (game and non-game), including endangered species restoration; runs education programs; regulates recreational vehicles. • <FI> Facilitates outreach for the USFW S **Landowner Incentive Program (LIP)** with MNAP.
University of Maine (UMaine)	See ↓	See ↓	See ↓	See ↓	
➢ UMaine: Cooperative Extension			X	X	• <TA>/<AOE> Provides applied research and educational programs (e.g., related to water quality and natural resources) to agricultural producers, small businesses, municipalities, and the general public through county-based offices. Programs include Watershed Stewards and Lake*A*Syst (to help people understand how activities affect lake water quality).
➢ UMaine: Center for Research on Sustainable Forests (CRSF)				X	• <AOE> Conducts interdisciplinary research and informs stakeholders about the management and sustainability of northern forest ecosystems and Maine's forest-based economy. Includes the **Cooperative Forestry Research Unit (CFRU)** and the **Family Forest Program**.
USDA Natural Resources Conservation Service (NRCS) - Maine		X	X		• <TA> Provides technical assistance to address natural resource conservation issues on private land in partnership with Soil and Water Conservation Districts, Resource Conservation and Development Councils, farmers, landowners, government agencies and communities. • <FI> At the federal level, offers various financial incentives including EQIP, HFRP; WHIP, and WRP.
USDA Farm Service Agency (FSA) - Maine		X	X		• Serves farmers, ranchers, and agricultural partners by delivering effective, efficient agricultural programs. • <TA>/<FI> At the federal level, offers CRP/CREP financial incentive programs.

NON-GOVERNMENTAL					
Greater Portland Council of Governments (GPCOG)	X		X		• <RP> Currently developing regional comprehensive plan for Sebago Lake watershed area that is consistent with the **Growth Management Act** (with support from SPO). • <TA> Provides to member municipalities in land use planning activities, GIS, etc.
Maine Forest Products Council (MFPC)				X	• <AOE> Works with policy makers to enhance business climate for members (landowners, loggers, paper mills); outreach to public
Forest for Maine's Future (FMF)				X	• <AOE> Educates public and promotes sustainable forestry through newsletter. A partnership between Maine Tree Foundation, SWOAM, MFS, and the Center for Research on Sustainable Forests at UMaine.
Maine TREE Foundation				X	• <AOE> Educates and advocates for sustainable use of the forest through education programs for schools, government, media, and the general public (e.g., LEAF, the AFF's Project Learning Tree, and Maine Tree Farm Committee, part of the American Tree Farm System).
American Forest Foundation (AFF)				X	• <AOE> Promotes stewardship and protection of forest heritage through advocacy, environmental education (e.g., Project Learning Tree), and hands on support for family forest owners (including the American Tree Farm System).
Keeping Maine's Forests (KMF)				X	• <AOE> Informal collaboration concerned with the future of Maine's forests, especially the North Woods; produces reports and has implementation committee with diverse members.
Maine Farmland Trust (MFT)		X	X	X	• <FI> Offers **Farmland Conservation Grants to** land trusts to protect active farmland through conservation easements and fee acquisition. • <TA> Provides to farmland projects in partnership with land trusts and other organizations. • <AOE> Offers Maine FarmLink program that links farmland seekers with farmland owners.
Maine Municipal Association (MMA)				X	• <AOE> Advocates on behalf of municipal government interests at state and federal levels. Provides educational services and professional legal and personnel advisory services to municipalities and other local governmental entities.
Lakes Environmental Association (LEA)			X	X	Serves Lakes region, mainly Bridgton, Harrison, Denmark, Naples, Waterford, and Sweden. • <TA> Offers technical assistance (e.g., Clean Lake Check-Up service, mapping) to landowners, contractors and municipalities. Monitors water quality. • <AOE> Educates public about watershed protection. Partners in conservation and recreation.
Maine Congress of Lake Associations (Maine COLA)				X	• <AOE> Provides technical knowledge to statewide network of member associations; monitors, supports, and advocates for legislation and administrative actions which promote sound lake management.
Individual Lake Associations (e.g., Little Sebago Lake Association)				X	• <AOE> Seeks to protect and preserve a lake's water quality and surrounding ecosystem.
Maine Volunteer Lake Monitoring Program (VLMP)				X	• <AOE> Nationally recognized organization that trains volunteers to gather scientific information about lake health. Primary provider of lake data for State of Maine.
Maine Audubon				X	• <AOE> Promotes conservation and enhancement of wildlife habitat and ecosystems through the promotion of individual understanding and actions. Partners with many other programs.
Natural Resources Council of Maine (NRCM)				X	• <AOE> Advocates for improving quality of Maine's rivers; reducing toxic chemicals; decreasing air and global warming pollution, and conserving Maine lands.
Loon Echo Land Trust (LELT)		X		X	• <FI>/<AOE> Loon Echo Land Trust protects land in the northern Sebago Lake region of Maine to conserve its natural resources and character for future generations. Current partnerships include the Lake Region Greenprint and The Crooked River Initiative.

Western Foothills Land Trust (WFLT)		X		X	• <FI>/<AOE> Protects land by advocating locally for open space and resource protection, stewarding lands held in fee-ownership, and assisting landowners as a legal holder of donated or purchased conservation easements.
Presumpscot Regional Land Trust		X		X	• <FI>/<AOE> Uses easements or ownership to acquire significant interests in outstanding lands in the Presumpscot River watershed and western shore area of Sebago Lake.
Threshold To Maine Resource Conservation and Development (RC&D) Area, Inc.			X		• <TA> Provides technical assistance to promote social improvement, economic development, and environmental protection, helping individuals and communities pursue natural resource based opportunities.
Maine Farm Bureau				X	• <AOE> Lobbies for issues important to agriculture, landowners and the rural way of life.
Presumpscot River Watershed Coalition				X	• <AOE> Formed to implement the Presumpscot River Management Plan and serve as a center for discussion and collaboration toward a healthy Presumpscot River watershed. Members include citizens, municipalities, non-governmental organizations, and representatives of state and federal agencies. • Related organizations include: Friends of the Presumpscot River and Presumpscot River Watch
Maine Coast Heritage Trust (MCHT) / Maine Land Trust Network (MLTN)			X	X	• <TA>/<AOE> Provides programs, services, and resources that build the capacity and sustainability of land conservation organizations throughout the state.
Other Land Trusts and supporting organizations		X		X	• In the **Uplands Headwaters Alliance** (Upper Saco Valley Land Trust, Greater Lovell Land Trust); lower Presumpscot River watershed (e.g., Windham Land Trust); adjacent watersheds (e.g., Mahoosuc Land Trust, Royal River Conservation Trust); statewide (e.g., Forestry Society of Maine); or regional (e.g., Northeast Wilderness Trust). • The **Land Trust Alliance** promotes voluntary private land conservation, supports land trusts, and advocates for increased land conservation funding and improved tax incentives.
The Nature Conservancy – Maine		X		X	• <FI>/<AOE> Protects and conserves land in partnership with local governments, nonprofits, and businesses.
Trust for Public Land – Maine				X	• <AOE> Helps communities plan for growth, raise funds, and acquire land. Partners with government agencies, local land trusts, and other nonprofits. Advocates for conservation. Partner on Lake Region Greenprint.

Appendix 8: Existing Federal Financial Incentive Programs Available to NIPF Landowners in Maine

Incentive Program	Administration & Authorization	Description edited from Program Website	Eligibility	Maine Specifics
Conservation Reserve Program (CRP)	USDA Farm Service Agency (FSA) [Food Security Act of 1985]	Voluntary program providing agricultural landowners with annual rental payments and cost-share assistance (through 10-15 year contracts) to establish resource conserving covers on eligible farmland. The Environmental Benefits Index (EBI), used to rank offers, includes water quality benefits from reduced erosion/runoff. • Financial Assistance: Annual rental payments based on agriculture rental value of the land. Cost-share assistance up to 50% for approved conservation practices. Some maintenance incentive payments	**Landowners**: operated land for 12+ months. **Land**: commodity cropland or marginal pastureland suitable for use as a riparian buffer or for similar water quality purposes.	Technical support provided by various parties, including state forestry agencies and local soil and water conservation districts]
Environmental Quality Incentives Program (EQIP)	USDA: Natural Resources Conservation Service (NRCS) [Reauthorized in 2008 Farm Bill]	Voluntary program supporting production agriculture and environmental quality as compatible goals. Provides financial and technical assistance to agricultural and forest producers, through contracts up to 10 years, to help plan and implement conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air and related resources. • Financial Assistance: Fixed payment rate based on average cost of practice implementation • Technical Assistance: Technical Service Providers can help with some activities and development of conservation plans.	Persons engaged in livestock, crop or forest production on eligible land (includes cropland, pastureland, private non-industrial forestland, etc.)	Applications ranked at each of Maine's 15 USDA service centers, with the most environmentally beneficial projects receiving funding.

Incentive Program	Administration & Authorization	Description edited from Program Website	Eligibility	Maine Specifics
Forest Stewardship Program (FSP)	USDA Forest Service [Cooperative Forestry Assistance Act of 1978]	Voluntary program providing technical assistance, through State forestry agency partners, to nonindustrial private forest (NIPF) owners to encourage and enable active long-term forest management, primarily through the development of multi-resource management plans. While the FSP is not itself a cost share program, such financial assistance is often available through other Federal or State programs upon completion of the stewardship plan.	Non-industrial private forest landowners who are committed to the active management and stewardship of their forested properties for at least ten years	Since 1991, the Maine Forest Service has helped more than 5,000 Maine woodland owners develop and implement management plans. FSP is implemented in part through WoodsWISE which provides educational outreach to help landowners develop forest management plans.
Forest Land Enhancement Program (FLEP)	USDA Forest Service [2002 Farm Bill and Cooperative Forestry Assistance Act, as amended in 2002]	Provides cost-share funding to implement management plans (esp. those created through FSP) as well as follow-up technical assistance to help achieve long-term forest management objectives. FLEP was intended to recombine elements of the previous Forestry Incentives Program (FIP) and Stewardship Incentives Programs (SIP).	FLEP is intended for all NIPF landowners. A management plan is required and maximum acreage per landowner is 1,000, but special requests can be made to enroll up to 5,000 acres.	This program has been discontinued as of 2007
Forest Legacy Program (FLP)	USDA Forest Service Cooperative Forestry Assistance Act 1978 with amendments in 1990 and 1996 Farm Bills	Voluntary program designed to support State efforts to protect environmentally sensitive forest lands through acquisition of partial interests in privately owned forest lands. This is achieved primarily via conservation easements that restrict development and require sustainable forestry practices. • Financial Assistance: Up to 75% from the federal government; >25% from State, local, or private sources. Landowners may also benefit from reduced taxes resulting from limitations on land use.	Private forest landowners who prepare a multiple resource management plan as part of the conservation easement acquisition.	Almost 700,000 acres acquired in Maine through FLP. FLP partners with the Maine bureau of parks and lands in addition to local land trusts.

Incentive Program	Administration & Authorization	Description edited from Program Website	Eligibility	Maine Specifics
Landowner Incentive Program (LIP)	DOI – US Fish and Wildlife Service [The Department of the Interior, Environment, and Related Agencies Appropriations Act, 2006]	Provides federal grant funds to states (who in turn provide financial and technical assistance to landowners) for the protection and restoration of habitats on private lands that benefit federally listed, proposed, candidate, or other at-risk species. • Financial Assistance: Up to 75% of project costs from federal government.	As the funding supplement state programs, states are entirely responsible for submitting applications and ensuring their programs which the funds are supplementing meet the same objectives as LIP	The Maine Natural Areas Program (MNAP) and Maine Department of Inland Fisheries and Wildlife (MDIFW) established the LIP in Maine and identified focus areas.
Wetlands Reserve Program (WRP)	USDA: Natural Resources Conservation Service (NRCS) [2008 Farm Bill]	Voluntary program providing technical and financial support to help landowners protect, restore, and enhance wetlands on their property in exchange for retiring eligible land from agriculture. • Financial Assistance: Up to 100% (permanent easement) or 75% (30-year easement) of easement value and restoration costs. Alternatively offers a restoration cost-share agreement option (non-easement) paying up to 75% of restoration costs.	**Land**: Wetland or former wetland that is kept mowed or cultivated for agricultural purposes, and forest lands where the wetland hydrology has been altered significantly.	$1,000,000 in funding in 2010

Incentive Program	Administration & Authorization	Description edited from Program Website	Eligibility	Maine Specifics
Wildlife Habitat Incentive Program (WHIP)	USDA: Natural Resources Conservation Service (NRCS) [Reauthorized by Food, Conservation, and Energy Act of 2008]	Voluntary program providing technical and financial assistance, through agreements lasting 1-10 years, to landowners for developing, improving or managing wildlife habitat or for restoring natural ecosystems on eligible land. • Financial Assistance: Up to 75% cost-share.	Mostly privately-owned agricultural land and nonindustrial private forest land not already enrolled in the CRP, WRP, or various other programs.	The Maine NRCS Fish and Wildlife Action Plan delineates priority habitats & species. WHIP funds are also available to assist Maine forest land owners with planning and management under the New England-New York Forestry Initiative (intended to improve wildlife habitat, forest health and productivity, and water quality).
Healthy Forests Reserve Program (HFRP)	USDA: Natural Resources Conservation Service (NRCS) [Healthy Forests Restoration Act of 2003; amended in 2008 Farm Bill]	Similar to the WRP, a voluntary program for assisting landowners in restoring and enhancing forest ecosystems to: 1) promote the recovery of threatened and endangered species, 2) improve biodiversity, and 3) enhance carbon sequestration. • Financial Assistance (three possibilities): a 10-year cost-share agreement (up to 50%); a 30-year easement (up to 75% of easement value and practice costs); a permanent easement (up to 100% of easement value and practice costs)	Private land that can impact the three objectives listed at left.	Previously, the focus in Maine has been on habitat of the Canada lynx.

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