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A Case Study in Wetlands Conservation:  
*Identifying Best Management Practices for Landowner Stewardship*

Allison M. Bredbenner

A thesis submitted to the Graduate Faculty of

JAMES MADISON UNIVERSITY

In

Partial Fulfillment of the Requirements

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Masters of Science

ISAT

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## Abstract

This research explores wetlands conservation techniques employed by private landowners owning 1,000 or more acres who were recipients of an Environmental Law Institute National Wetlands Award. Study of private landowner stewardship is timely and important because in the United States, 75 percent of all wetlands are under private ownership. Given that wetlands provide a suite of valuable ecosystem services such as water filtration, flood abatement, and carbon storage, their conservation is critical to a healthy environment and productive economy. To accomplish this research, landowner files were processed into a digital archive and sub-categorized for research purposes. Telephone interviews were conducted with a study group of seven landowners. Interview results were studied with archival resources, and a comprehensive profile was generated for each individual. Standard case study methodology was employed to interpret and analyze the emergent results. Key findings of this research include the presence of a shared land ethic between land owners. That land ethic is an individualized sentiment, though landowners expressed similarity through a desire to share conservation success with others. Additionally, the majority of landowners reported using a suite of best management practices. These are grouped according to wildlife and wildlife habitat, wetland hydrology, technical assistance and conservation partnerships, and conservation management techniques. Other key findings include a set of site-specific techniques employed by a smaller subset of the study group. Landowners collectively reported other best practices, including participating in community outreach. Also uncovered during analysis was the range of historical factors that influence land management approach, such as agricultural drainage policies. In its entirety, this research seeks to provide a reference guide for both landowners and policy makers, presenting the best management practices for conserving wetlands on private lands.



## **Chapter 1: Introduction**

The focus of this thesis is on private landowner stewardship of wetlands because “**75 percent of remaining United States wetlands are located on private lands**” (Copeland, 2010, Summary section, para. 3). To that end, this research explores wetlands conservation techniques employed by private landowners owning 1,000 or more acres who were also recipients of an Environmental Law Institute National Wetlands Award. Based in Washington, D.C., the Environmental Law Institute is a non-partisan, nonprofit organization, and each year they bestow several National Wetland Awards. The awards are divided between six categories, and the category Landowner Stewardship forms the base of this research.

Award winners from the Landowner Stewardship category are analyzed using comprehensive case study methodologies. The resulting evidence distills a suite of best management practices for successful stewardship, wetlands restoration, and conservation. Additionally, this study examines the trends, differences, and cross-cutting characteristics displayed by landowners.

Wetlands form the interface between the terrestrial and aquatic spheres. They may be inland or coastal, fresh or brackish, host a variety of species, and they provide a collection of valuable ecosystem services, each of which will be addressed in full detail. In the United States (U.S.) specifically, significant tracts of wetlands were lost in the mid-twentieth century due to short-sighted government agricultural policies. It is hoped that the results of this research will provide expertise and informed guidance, for extrapolation, to additional private landowners of large-scale properties who may wish to restore degraded wetlands. It is this combined significance to the environment and specific need in the United States for wetlands restoration that renders this a subject worthy of rigorous and extensive research.

### **1.1 Wetlands and their Ecological Role**

Defined by the United States Environmental Protection Agency (EPA), wetlands are

*“those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.”* (Code of Federal Regulations, 1980, Record 40, Chapter 1, p. 256)

Wetlands link the terrestrial and the aquatic – a unique environment in which water covers the soil for varying, if not all, seasons of the year, including the growing season. This dual nature of wetlands supports aquatic and land-based species of flora and fauna.

Wetlands are present in all climates except the Antarctic, and they fall into two overarching categories: coastal and inland. Wetlands are characterized according to *“soils, topography, climate, hydrology, water chemistry, [and] vegetation”* (EPA, n.d. Wetlands Definition section, para. 1). Coastal wetlands are an important component of estuary systems and are distinguished by a constant mix of fresh and salt water. Varying water levels due to tidal fluctuations and changing saline levels within estuarine environments necessitate vegetation that is specifically adapted to such conditions. A prime example of the type of halophytic growth well-suited to estuaries is the mangrove ecosystem – trees and aquatic vegetation that supports life for a variety of species, ranging from shellfish to birds to crocodiles. Inland, or non-tidal, wetlands are classified in four general categories. (1) Marshes, shallow water bodies which harbor *“soft-stemmed vegetation”* (EPA, n.d., Marshes section, para. 1) are *“the most prevalent and widely distributed wetlands in North America”* (EPA, n.d., Marshes section, para. 3). They are typically found along the peripheral areas of inland lakes and rivers. Examples of inland non-coastal marshes include vernal pools, small, seasonal wetlands that provide *“critical spawning areas for...amphibians”* (EPA, n.d., Vernal Pools section, para. 3) and prairie potholes, depressional wetlands that are seasonally or permanently filled with rain and snowmelt. (2) Swamps, more expansive and deeper than marshes, providing home to woody plant species and found in particularly low-lying areas near rivers or coasts. (3,4) Bogs and fens – two freshwater

wetlands typified by peat moss deposits topped with evergreen trees and shrubs or reeds and grasses, respectively. Inland wetlands may also be found along flood plains, adjacent to riparian systems, within landscape depressions where ground water meets the soil, or in regions where heavy rainfall saturates the soil. Wetlands are often seasonal, experiencing alternating dry and flooded periods (EPA, 2001c).

Wetlands are included within the larger watershed of a region and provide a vast array of ecosystem services, rendering them a habitat worthy of attention and protection. Such services include sheltering biodiversity, providing waterfowl habitat, water filtration, creating a carbon sink, erosion prevention, flood management, and inherently qualitative features. Each of these ecosystem services and their significance in terms of cost-savings, added value, or restored habitat and watershed health is explained below:

#### Biodiversity

Given their attributes of primary productivity, shallow waters, and high nutrient content, wetlands abound with biodiversity. Their waters provide shelter from prey, year-round habitat to certain fauna, and serve as hatcheries for aquatic and amphibious species. Wetlands also contribute to a larger food web. Decayed organic plant matter provides nourishment to microorganisms and shellfish, which in turn feed small fish that are eaten by larger fish and birds. Wetlands are also an important feature along the migratory paths of many waterfowl species that utilize wetlands for resting stopovers. Despite covering a surface area of only five percent of the total land in the 48 contiguous states, wetlands provide habitat for 31 percent of the nation's plant species. Wetlands also serve an important role in the productivity of commercial fisheries, as fish species typically spend a portion of their life cycle (during breeding or nursery stages) sheltered in wetlands (EPA, 2001a, EPA, 2004a).

#### Water Filtration

Intact wetlands also provide crucial water filtration services. As water creeps through the wetland environment, excessive sedimentation and nonpoint source pollutants filter from the

water. These materials are absorbed by plant roots and soils, leaving the water free from contaminants. This results in improved water quality levels that promote healthy species development. Better water quality also yields water that is safe for consumption and recreational uses. Wetlands also trap and then slowly release surface water, aiding in freshwater aquifer recharge. By storing surface water, wetlands also maintain water supply during seasonally dry periods (EPA, 2001a, EPA, 2004a, EPA, 2006a).

### Carbon Sink

The Intergovernmental Panel on Climate Change reports that wetlands are essential in a carbon management plan. This is due to the critical service provided by wetlands in the context of carbon. Wetlands sequester carbon naturally. For example, inland wetlands such as bogs and fens in particular, store comparatively large amounts of carbon in their peat deposits. Tidal wetland systems are also significant stores of carbon. By keeping these resources – and others that bear heavy vegetation – intact, wetlands are part of a larger climate change mitigation strategy. Heavily wooded wetlands, such as swamps, may however, provide a source of timber, as long as it is harvested according to the natural rates of regeneration (Intergovernmental Panel on Climate Change, 2000).

### Erosion Prevention

Wetlands are often located near riparian, lake or coastal zones. This unique orientation enables wetlands to reduce or prevent erosion. A wetland's ability to reduce erosion is attributed to its root system that helps stabilize sediment. That stabilization effect mitigates the otherwise damaging impact of flooding or highly charged riparian currents. Wetlands are particularly valuable in coastal areas where wave, wind and extreme weather action threaten heightened erosion. In those conditions, wetland trees absorb and disperse wave energy. By slowing wave energy, coastal wetlands help protect on-land infrastructure from damage (EPA, 2008b).

### Flood Management

Protection from storm surges and flood damage are also quintessential features of wetlands services. Woody vegetation and plant matter works to slow down and also capture storm water or river overflow. In such conditions, flood levels are lowered and rushing flood waters reduce in speed. Every acre of wetlands has the capacity to retain one million gallons of storm/flood water. The retardation effect on surging waters as they pass through wetlands also reduces water logging of crops. This flood abatement typically yields cost-savings for communities who would otherwise risk paying high premiums for flood insurance or for damages to property caused by flooding (EPA, 2001a, EPA, 2006b).

### Qualitative Features

Additionally, wetlands provide a suite of qualitative benefits connected to education and research, landscape aesthetics, and inherent cultural value. The recreation benefits offered by wetlands are extensive. For example, wetlands may be used for hunting, wildlife viewing, boating, and recreational fishing. Wetlands also provide an outlet for people to connect with nature. Many of these ecosystem services can be and are valued in terms of their monetary worth to a community or region. For example, a wetland that is open for recreational visits may collect a certain level of entry fees each year (EPA, 2006).

Given their significance in terms of providing ecosystem services, ensuring water quality, and sheltering an abundance of wildlife, wetlands remain into perpetuity a natural resource meriting thoughtful conservation strategies.

### **1.2 Wetlands, their Threats and Conservation Status**

In spite of the array of benefits and services derived from wetlands, these ecosystems experience immense pressures due to human impact. In the United States wetlands cover approximately 110 million acres. According to the most recently available statistics from the United States Fish and Wildlife Service (USFWS), wetlands in the coterminous United States are being lost at a rate of approximately 100,000 acres annually (USFWS, 2011). This includes the particularly vulnerable Mississippi Delta area, which suffers losses estimated at 50 acres per day

(Union of Concerned Scientists, 2009). Given the high worth of wetlands, this is an unsustainable loss.

Urbanization is another significant pressure to wetlands. In the wake of development, wetlands may be lost all together or fragmented to such a degree that their ecosystem services are sacrificed. Increased impervious surface in nearby areas increases the amount of runoff entering wetland areas. Draining wetlands for farmland conversion, dredging them to perform stream/river modification, or redirecting their flows are part of the range of hydrologic modification activities that humans engage in that are deteriorating wetlands. Other factors driven by human impact, such as the introduction of invasive species, animal grazing, or peat extraction, also threaten wetland loss (EPA, 2001b).

Nonpoint source pollution carried as runoff, is arguably one of the most significant threats to wetlands in the United States. Concentrated levels of sediment, nitrates, and phosphorous from agricultural activities (mainly fertilization and pesticide use) enter wetlands causing algal blooms to form and absorb dissolved oxygen present in the water body. Hypoxia, a “*condition in which dissolved oxygen is below the level necessary to sustain most animal life*” (EPA, 2002, p. 1) follows, and the loss of life is destructive to the wetland itself and possibly also to the greater watershed ecosystem. In the United States, the Chesapeake Bay, the Louisiana coast and the area near Long Island Sound experience significant effects of hypoxia (EPA, 2002). Air pollution is also a concern for wetlands located in high automobile traffic areas and for those situated near factories. Recreational or commercial boating also poses a pollution-related threat to wetlands. Nearby landfills that are leaking or poorly managed may also contribute to wetlands degradation (EPA, 2001b).

The conservation of wetlands involves an integrated plan that keeps wetlands free from excess pollution and runoff and intact to such a degree that they are biologically productive and provide a range of functions to the greater ecosystem and community. Wetlands restoration however, is potentially a much more scientific, integrated and complex approach that brings

functionality back to a wetland. When significant modifications such as earthen removal and grading have been made to wetlands, or when severe degradation has occurred, restoration projects require advance and ongoing planning and the commitment on the part of different stakeholders to a lengthy, scientifically complex and potentially expensive process. In order to execute such plans, restoration scientists must have a clear understanding of the quality of the wetland prior to its loss as well as the hydrological characteristics that must be replicated and the flora and fauna to be re-introduced to the wetland ecosystem (EPA, 2001d).

Conservation measures taken in favor of wetlands protection are a critical component of United States environmental policy. Their annual rate of loss is wholly unsustainable, and measures ought to be taken in support of further educating the public and advocating for wetlands conservation throughout the fifty states.

### **1.3 The Environmental Law Institute and its National Wetland Awards**

The U.S.-based Environmental Law Institute's annual National Wetland Awards series provides the foundation for this research. The Environmental Law Institute (ELI) is a nonpartisan, nonprofit organization established in 1969 that shapes environmental law and policy in the United States and internationally by working towards a "*healthy environment, prosperous economies and vibrant communities founded on the rule of law*" (ELI, n.d., Overview section, para. 1). Their work advances innovative and just policy solutions that leaders use in support of making environmental, social and economic progress.

Work at ELI is carried out via research and analysis of pressing environmental problems. That work is disseminated to the public via their multiple publications, including the National Wetlands Newsletter. Other focus areas at ELI include research on good governance in environmental management and education programs for public officials, attorneys, and the general citizenry. Their work is divided amongst six program areas: Freshwater and Oceans, Land and Biodiversity, Governance, International Programs, Climate and Energy, and Research Reporting.

To date, ELI has trained 50,000 attorneys and 1,000 judges across 16 countries, and mobilized grassroots activism in support of local environmental protections. Their advocacy work also strengthens the legal frameworks that foster sound environmental management. ELI works with public and private citizens in a continuous effort to provide better environmental policy options to legislators. ELI also serves as an important forum for educated debate of timely environmental issues (ELI, n.d.).

Since 1989, the National Wetland Awards (NWA) have been honoring and celebrating the contributions made by individuals and organizations to the cause of wetlands in the United States. The awards are facilitated by ELI and supported by different government agencies including EPA, United States Forest Service, and Natural Resources Conservation Service. Awards are judged by a select panel of wetlands experts from the public and private sectors and awardees are honored each spring at a ceremony held in Washington, D.C. NWA are given in six categories and winners are judged according to their respective achievements and measures of success (i.e. legislation passed, acres of wetlands protected). The categories include Conservation and Restoration, focusing on sound management to protect and rehabilitate wetlands; Education and Outreach, awarding excellence in wetlands education; Science Research, celebrating innovative research in wetlands restoration techniques; State, Tribal and Local Program Development, awarding those who have contributed to wetlands via the development of an outstanding wetlands program, i.e. a regulatory tool set for wetlands management; Wetlands Community Leader, covering the involvement of local communities in grassroots advocacy for wetlands protection. The base of this research is the category Landowner Stewardship, which recognizes private landowners for their voluntary wetland conservation efforts (NWA, n.d.).

Further, the NWA serve two distinct purposes. First, they honor the enduring commitment and contribution by an individual or individuals to the cause of wetlands and their importance in a healthy, productive environment. Through their exemplary commitment to wetlands, award winners and nominees help secure protection for wetland areas, secure funding



for conservation, and advocate for better legislation governing wetlands. Additionally, the NWA provide a special forum for educated wetlands discussion, garner national attention towards wetlands, and provide a networking platform for further advancement in wetlands management (NWA, n.d.).

#### **1.4 Wetlands Regulation**

Wetlands in the United States are regulated by the Clean Water Act (CWA), Section 404 specifically. Under this legislation, wetlands are protected against loss or degradation due to the prohibition of “*discharge of dredged or fill materials*” (EPA, 2004b, p. 1) into wetland areas. In this manner, regulated activities include “*fill for development, water resource projects (such as dams or levees), infrastructure development...and mining projects*” (EPA, 2004b, p. 1). Permitting is executed by either the United States Army Corps of Engineers or USFWS. Decisions for permits are rendered based on situation circumstances, environmental considerations, acting in the public’s best interest, and the consideration of alternative sites for development or landscape modification. Permits are awarded to projects whose administrators agree to avoid or minimize damage and environmental impact to wetlands or in the case of unavoidable loss, pay for the damages (EPA, 2004b.). Avoidance includes seeking out alternative development plans that would circumvent damage or degradation of wetlands. However, when no feasible development alternative exists, necessary measures must be taken to implement development projects in the least damaging manner possible. Finally, when harm to wetlands or loss of wetlands is essentially unavoidable, developers must adhere to the no net loss policy by providing wetlands compensation. That mode of compensation is commonly referred to as mitigation banking. This is carried out by constructing artificial wetlands or paying for the restoration of wetlands located elsewhere (EPA, 2008a).

While all wetlands in the United States are guaranteed protection under section 404 of the CWA, designating an area as a wetland is left to the U.S. Army Corps of Engineers (USACE). In partnership with EPA, in 1987 USACE published the *Corps of Engineers Wetlands Delineation*

*Manual*. This is an in-depth, region-specific guide. According to the guide, wetlands are classified by a set of defining traits: soils, vegetation, and hydrology. An area must meet the requirements set forth in the manual for each of the three traits in order to be designated as a wetland and enjoy all the protections therein (EPA, 2004b). The role of individual states is also critically important to wetlands regulation and conservation. Section 401 of the CWA provides that states have the authority “*to review and approve, condition, or deny all Federal permits or licenses that might [impact]...wetlands*” (EPA, n.d., 401 Certification section, para. 1).

### **1.5 Scope of Research**

National Wetland Awards are given to private individuals who voluntarily participate in restoration or conservation of wetlands, or who go above and beyond efforts to minimize impact to wetlands. After review of award winners in the Landowner Stewardship category from 1991 to present, a segment of large-scale landowners (qualifying as such for stewarding 1,000+ acres) has been identified as the subjects for research. This research distills the best techniques for other landowners to implement in conservation plans. Given that “*75 percent of remaining United States wetlands are located on private lands*” (Copeland, 2010, Summary section, para. 3), it is crucial that landowners implement best practices in conservation. Thus, this research is both timely and useful.

### **1.6 Methodology**

The methodology for this thesis encompasses standard case study techniques, as described by Robert Yin (1984). Case study documents were thoroughly reviewed, including nomination materials from ELI and publicly available documentation about landowners and their respective properties (e.g., materials available from the Internet, news media, and public land survey documents). Information was also obtained by individual telephone interviews with landowners. Both the case study resources and the interview results were synthesized and analyzed to distill the best management practices for landowner stewardship of wetlands.

### **1.7 Findings**

The findings of this thesis reveal that landowners fall into a natural set of classifications – multi-generational versus first-time owners, self-financed versus financed through cost-share, and use or not of conservation easement. These categories help showcase how a landowner went about implementing a conservation plan, and they also help explain what shapes and drives a landowner’s management approach. While landowners did fall into these different arrays, the undercurrent between all landowners is the presence of a land ethic. While that ethic is somewhat different for everyone, there is the common characteristic of the desire to share conservation success with others. During telephone interviews, landowners repeatedly conveyed this strong sense of ensuring that land is in sound environmental condition and that others (whether they are future generations, fellow landowners, or recreational and educational users) may access and benefit from it. This research also uncovers the multitude of best management practices that landowners implement when carrying out restoration or conservation of wetlands. These include developing land for wildlife and its habitat, making improvements to wetland hydrology, seeking out technical assistance and conservation partnerships, and conservation management techniques. Research shows that in addition to practices implemented by all or most landowners, there is also a set of site-specific tools that landowners use to successfully restore and conserve wetlands. When viewed as a comprehensive group of factors, all of the above help explain what is required for successful wetlands conservation on private lands.

### **1.8 Overview of Thesis**

The thesis is organized into five chapters. The next chapter is Chapter II, Literature Review, and is a survey of different barriers to or incentives for adopting stewardship practices, as well as a review of existing successful practices for landowner stewardship and resource conservation. Chapter III, Methodology, provides insight into the case study approach and the structure and methods for primary research, such as telephone interviews with landowners and study of documentation for each award winner. Brief background information on each landowner

is also included.<sup>1</sup> Chapter IV, Findings and Analysis, presents the multitude of detail that emerged during landowner interviews and study of archival resources and provides interpretation and analysis of trends, commonalities, and differences in landowner behavior. Also included in Chapter IV is a list of best management practices for wetlands conservation on private land. This thesis ends with Chapter V, Conclusions, which reviews key findings, addresses challenges, and offers ideas for expanding the scope of this research.

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<sup>1</sup> Please note that this background information is also publicly available and is not in violation of landowner confidentiality agreements.

## **Chapter 2. Literature Review**

### **2.1 Discussion of Federal and State Regulatory Frameworks for Wetlands & Relevant Limitations on Landowners**

In the United States, wetlands are regulated by the federal government's EPA via the Clean Water Act. They are defined as

*“areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.”* (EPA, n.d., Wetlands section, para. 1)

The following is an expanded examination of the specific legislation assigned to wetlands and the relevant limitations on landowners.

The key piece of legislation regulating wetlands resides in section 404 of the CWA, which stipulates that no *“discharge of dredged or fill material into waters may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment or (2) the nation's waters would be significantly degraded”* (EPA, 2004b, p. 1). In practice, this legislation stipulates that existing wetlands may not be filled to make way for development projects, including *“water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects”* (EPA, 2004b, p. 1). The aforementioned activities are only allowed with the granting of a permit, when regulators have determined that a developer or landowner has *“taken steps to avoid wetland impacts; minimized potential impact on wetlands; provided compensation for any remaining unavoidable impacts”* (EPA, 2004b, p. 1). This compensation policy is carried out through mitigation activities known as wetlands banking. Wetland banking occurs when wetland loss is compensated for by a landowner or developer by ensuring that a wetland of comparable functionality is constructed elsewhere or a degraded wetland be restored to its original value and capabilities (EPA, 2008a).

The Army Corps of Engineers reviews and grants permits for wetlands alteration projects and is the enforcement agency for CWA compliance with regard to wetlands. The EPA's role is to oversee this process, provide guidance as needed and requested, deliver rulings for cases occurring on State and Tribal lands, determine "*geographic jurisdiction and applicability of exemptions*" and to "*develop and interpret policy*" (EPA, 2004b, p. 1).

In order to regulate wetlands, potential areas must first be designated as such a resource. To this end, the USACE developed a protocol for identifying and qualifying areas as wetlands: the *Corps of Engineers Wetlands Delineation Manual* – the predominant guide for qualifying wetlands as such according to specific "*soils, vegetation, and hydrolog[ical]*" (EPA, 2004b, p. 2) properties. When an area under consideration meets the necessary requirements for each of the three categories, it is named a wetland and granted all the associated protections.

The permitting process for authorizing alteration to wetlands is divided into two categories: *individual permit* and *general permit*. Activities that fall under the criteria for individual permit are characterized by significant impact to or loss of wetlands, whereas general permits are appropriate when "*discharges will have only minimal adverse effects*", i.e. "*minor road activities, utility line backfill, and bedding activities*" (EPA, 2004b, p. 1). When these low-impact projects are present for review, applicants may expect little-to-no bureaucratic delay. The USFWS also plays a decision making role during the permitting process, providing guidance on any expected "*impacts on fish and wildlife of all new... Federally permitted projects*" (EPA, 2004b, p. 2). In that capacity, USFWS holds the authority and responsibility to weigh in on the authorization of wetland alteration projects relative to their impact on wetland fauna.

As an additional mode of regulation, wetlands are protected according to the Ramsar Convention. Named for the city of Ramsar, Iran, the treaty is formally known as the Convention on Wetlands of International Importance. The United States is a party to the Ramsar Convention, and thus its wetlands are granted international rights and protections. Under this convention, 1,646,745 hectares of wetlands found on US territory are protected (Ramsar Convention, n.d.).

The CWA was passed by Congress in 1972, and the United States ratified the Ramsar Convention in 1987. Researchers Geslo *et al.* (2008) suggest that prior to the passing of these legislative acts, wetlands may not have enjoyed government protections due to the fact that they were valued in “*non-market gains*” (p. 172), meaning their true worth (aside from crude land price) was overlooked until the introduction of accounting for ecosystem services sparked a change in the perception of wetlands value. These researchers support their claim on the notion that in terms of wetlands conservation, “*since the early 1990s, the goal of federal wetlands policy has been one of no net loss, with losses offset through restoration and creation of new wetland areas*” (p. 172).

The ‘no net loss’ policy of the Federal government was born out of a gradual, iterative shift in thinking that is typical of the policy-making process. In the early nineteen nineties, first under the George H.W. Bush administration and continued under President William Clinton, the no net loss policy set out to steward wetlands through the conservation of existing wetlands, the restoration of degraded or lost wetlands, and mitigation banking for permitted, unavoidable wetland losses. The policy met some criticism, given the argument that wetlands conservation is more economically feasible than costly wetlands restoration projects. However, experts at the United States Department of Agriculture (USDA) cite White House policy that “*conservation alone will not be enough*” (USDA, 1998, p. 31), given the extensive losses incurred under past conversion policies. The no net loss policy embodies the stance that restoration must take place in order to restore lost ecosystem services in degraded watersheds.

The role of states is critically important to wetlands regulation and conservation. Section 401 of the CWA provides that states have the “*authority to review and approve, condition, or deny any federal permits or licenses that might impact state water quality standards*” (ELI, 2008, p. 6). It is the stance of the Environmental Law Institute that Section 401 is the “*sole regulatory mechanism by which states regulate wetlands*” (ELI, 2008, p. 12). States may also enact supplementary permitting processes to what the federal government has already enacted under

Section 404, as well as apply for authority to manage the permitting process typically designated to the USACE under Section 404. Recently available data indicates that 22 states hold this authority (ELI, 2008). It bears mention that local governments within states also play a key role. For example, King County, Washington has implemented a 10-year, comprehensive ecosystem-based management plan for protecting salmon habitat. Given that wetlands form part of that salmon habitat, significant conservation benefits are being achieved (Forum of Local Governments, 2005).

In an effort to provide states with the appropriate framework, the EPA has outlined six prongs to an effective state wetlands management program: *“regulation, water quality standards, monitoring and assessment, restoration programs and activities, public-private partnerships and coordination among state and federal agencies”* (ELI, 2008, p. 6-7). Included in the set of regulatory tools available to states is the application of water quality standards. Here, states may exercise jurisdiction over wetlands (on private and public lands) by applying water quality standards to those resources. Other examples of the ways in which states regulate their wetlands include a species-related approach, whereby wetlands are preserved for their habitat-providing properties. States may also draw upon the activism and knowledge of universities, the general citizenry and nonprofit organizations to aid in wetlands conservation via assessment and monitoring programs (ELI, 2008).

According to research by the ELI, 23 states *“operate a formal state program for partnering with private landowners on restoration or conservation and 37 states report that they conduct outreach and/or provide technical assistance to private landowners”* (ELI, 2008, p. 52). Of these states, there are 12<sup>2</sup> in which ELI distributed NWA for Landowner Stewardship. Only four states<sup>3</sup> where Landowner Stewardship winners reside are not represented in the cluster of states offering conservation assistance to private landowners. That ratio, 12:4, suggests a positive

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<sup>2</sup> Note that these 12 states are based on the original population of 24 landowners and not the 10-person study population.

<sup>3</sup> These states are Arizona, Iowa, Maine, and New York.



relationship between state-administered support programs and successful wetlands conservation on private land.

The ELI reports that non-regulatory elements are highly important in a comprehensive plan to protect wetlands. One example of such a measure is wetlands restoration activity not mandated to replace the permitted loss of existing wetlands. This would be the net-gain approach to increasing wetland acreage. It is also important to note the role that states play in terms of “*filling gaps in federal protection*” (ELI, 2008, p. 61), whereby states possess ownership over the on-the-ground information concerning soil quality, hydrology, and biodiversity of wetlands. Thus, it is highly logical that states, more so than the federal government, enact stringent, detailed permitting processes for safeguarding their wetland resources.

Via these federal and state regulatory frameworks, wetlands are in principle conserved. Yet conservation is not executed without impact to private individuals when wetlands are located on non-public lands. The implication for landowners is that when they endeavor to alter, degrade or convert their wetlands to agriculture, they are required to obtain the appropriate permits and authorizations. However, this leaves the management of existing wetlands to the discretion of the landowner, provided the wetland is at most minimally impacted through the landowner’s activity. Thus, government regulations for wetlands focus primarily on what landowners can and cannot do in terms of wetlands degradation. Wetlands quality, function, and ecological integrity are protected through the various government regulations for pollution prevention and control impacting all lands – both public and private. Government programs that incentivize private landowners to convert agricultural land back to wetlands are explored in the following section.

## **2.2 Federal and State Programs for Landowner Participation in Wetlands Stewardship**

Government regulations provide the structural framework for successful wetlands conservation, but it is the array of specific mechanisms that actually enable landowners to carry out wetlands stewardship. What follows is an examination of the different programs and methods utilized by the government and conservation agencies to incentivize landowner conservation.

Stewardship and conservation programs occur in two primary categories. Conservation easements are the first – legal instruments that grant management authority to an entity in exchange for payment to the landowner. Easements are typically built upon terms that outline an owner's permitted land use. The second is cost-share agreements, wherein a payment or portion thereof is provided to a landowner to implement agreed-upon conservation or restoration projects. These mechanisms are administered through different arms of the United States Federal government, though they are implemented at the state and local level and aim to incorporate on-the-ground expertise into work plans. Programs relevant to wetlands conservation are described below.

The United States Department of Agriculture houses two specialized agencies related to land and resource conservation. (1) The Farm Service Agency is concerned with various types of agricultural programs, beyond those that are mainly conservation-focused. This agency offers the Conservation Reserve Program (CRP), an easement plan with terms ranging from 10 to 15 years. Landowners receive rental payments for conservation and are also eligible to receive cost-share payments. Also offered by the Farm Service Agency is the Conservation Reserve Enhancement Program (CREP). This model also provides landowners rental payments. However, CREP is not an easement program. The key difference is that this program pulls land completely out of production and targets vulnerable tracts that have escalated conservation priorities (Farm Service Agency, n.d.).

Although the Conservation Reserve Enhancement Program and CRP are rooted in financial incentives for landowners, researchers Kingsbury *et al.* (1999) found that participation in the former was really based on the relationship between financial payment and opportunity cost. Landowners need to be impressed by a high-enough financial payment, one that offsets financial losses from taking land out of production or decreasing production in favor of conservation or restoration. Their research also showed that Conservation Reserve Enhancement

Program enrollment rates were higher when an element of planned flexibility for future land use was incorporated to appease the landowner.

The USDA offers an additional easement option implemented through an agency called the Natural Resources Conservation Service (NRCS). This agency is concerned with at-large environmental protection and stewardship and is highly active in the private landowner sector. The Natural Resources Conservation Service has a state and local presence, and these professionals provide landowners with technical guidance and support (NRCS, n.d.). Easements offered via the NRCS are part of the Wetlands Reserve Program (WRP).

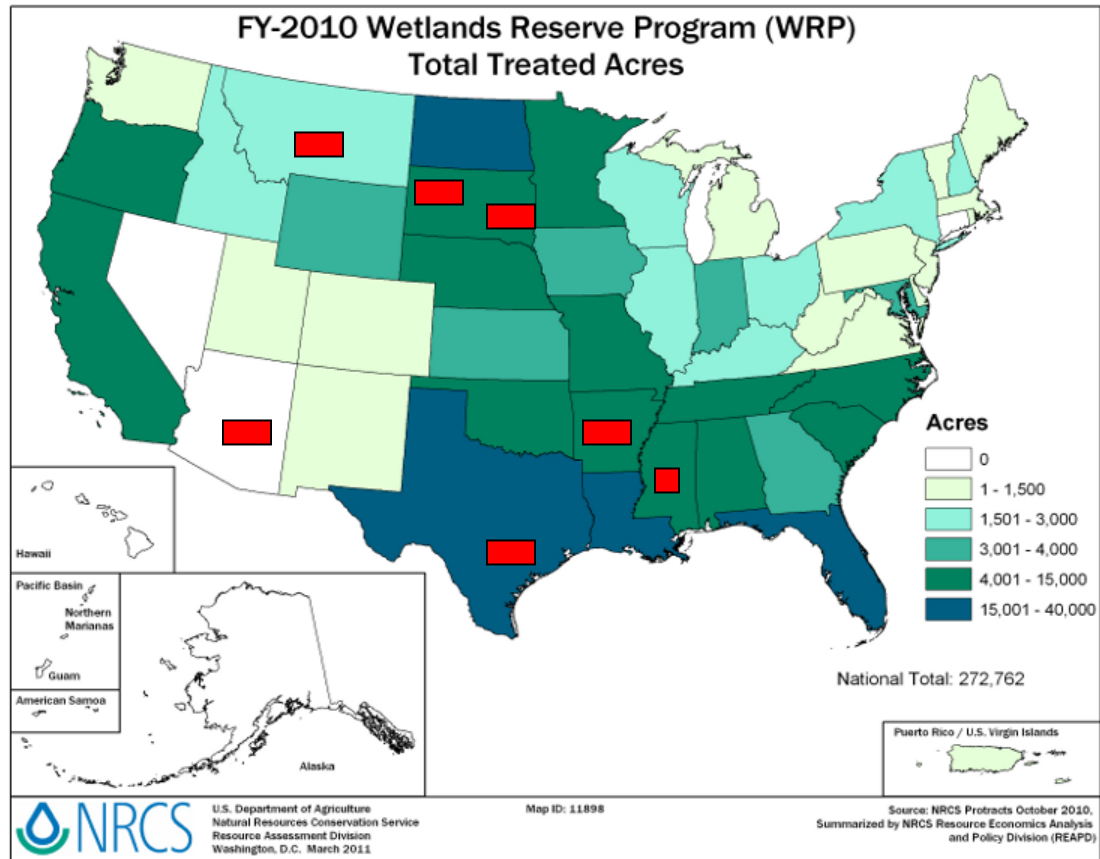
*WRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. [NRCS] provides technical and financial support to help landowners with wetlands restoration efforts...This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.*

(NRCS, n.d., Wetlands Reserve Program section, para. 1).

The easement offered by WRP is similar to the Conservation Reserve Program easement, though differs in that it targets wetlands specifically.

Under the WRP, there are three discrete easement options: permanent, in which the USDA manages the land in perpetuity in exchange for providing up-to the full cost to the landowner; a 30-year easement for management of the property in exchange for up to 75 percent of the cost; and third, a restoration cost-share, in which there is a formal agreement (though it is not in easement form) for the landowner to receive up to 75 percent of wetlands restoration and/or conservation costs (NRCS, 2008). Figure 1 displays the most recently available data on enrolled acres in the WRP; note that the total is 272,762 acres.

Figure 1. National Wetland Award Winners featured in this study are designated on the map below with a shaded box placed within the state boundaries where their property is located.



WRP restoration activities are carried out by “*plugging ditches, breaking tiles, installing water control features, excavating meander swales, planting trees and suitable plants*” (Rewa, 2005, p. 135). Restoration techniques help in a variety of ways, including encouraging the return of ducks and other waterfowl. The reputable conservation agency Ducks Unlimited reported that in the critical prairie pothole region of North America, over 10 million ducks have returned to areas under conservation (Ducks Unlimited, n.d.). These and other restoration techniques are described later in this chapter.

According to Rissman (2010), conservation easements that restrict harmful development or degradation to land are successful because they are voluntary – they allow landowners to retain their work on and ownership of the land in exchange for payment, versus being a conscribed command and control policy. Rissman continues his discussion of easements in terms of the challenges associated with imposing development restrictions at the start of a multi-decade

agreement unto a dynamic and complex ecosystem. He suggests that to avoid disenfranchisement of landowners and to accommodate future needs of the landowner and landscape ecology, it is important that the terms be specifically tailored, individually negotiated with full landowner participation, and drafted by a multi-disciplinary team of experts that understand how to apply adaptive management in order to meet the needs of dynamic systems. Rissman suggests this can be accomplished via ongoing administrative review of easement terms relative to environmental conditions, the use of best management practices for management and conservation, and ongoing consultation with the easement holder.

NRCS also administers programs that are specifically cost-share agreements. One such program is the Wildlife Habitat Incentive Program that provides landowners up to 75 percent of project cost and technical assistance as needed. This agreement is offered at a maximum of ten years. Otherwise known as WHIP, this program's mandate is to "*establish and improve fish and wildlife habitat*" (NRCS, n.d., WHIP section, para. 2). Given that wetlands provide critical habitat for many species, WHIP is an appropriate cost-share tool available to landowners. An additional NRCS cost-share program is the Environmental Quality Incentive Program. This program targets agricultural properties experiencing issues related to soil and water quality and nutrient management. Here, terms are offered also at a maximum of ten years (NRCS, n.d.). In their work, researchers Berkland *et al.* (2005) note that the Environmental Quality Incentive Program helps facilitate public/private partnerships between landowners and the federal government.

The Department of Interior is another Federal body that plays a role in enabling landowner stewardship over natural resources. This department does this through its bureau the United States Fish and Wildlife Service, whose mission is to "*conserve, protect and enhance fish, wildlife and plants and their habitats*" (USFWS, n.d., About section, para. 1). The Service provides to the public an index of wetlands in the United States as well as an extensive series of mapping tools and data for use in wetlands conservation and management planning. In terms of providing assistance to private landowners, USFWS has carved the United States into eight

regions, each of which is administered by a Regional Coordinator. Within each region, landowners may obtain information about this bureau's predominant landowner incentive program, Partners for Fish and Wildlife. This is a cost-share program that provides landowners half of project cost(s). Landowners are also eligible to receive technical guidance, engineering consultation, permitting and regulatory assistance, and biological expertise on habitat restoration plans. Partners for Wildlife may also provide landowners with materials and labor, as needed. The purpose of the program is to create partnerships between the federal government, conservation organizations, and private individuals who all share a common conservation goal (USFWS, n.d.).

The multiple government programs and conservation easement tools differ from one another only in small ways. Yet it is the comprehensive set of these programs, based on the provision of financial (via cash payment or tax incentive) and technical assistance that promote voluntary agreements from private landowners in support of resource stewardship. Research also suggests that such participation in these agreements will increase when the principles of adaptive management are included in the terms of easements and similar agreements. For reference, an organizational chart of the aforementioned agencies and their respective programs is included in Appendix A.

### **2.3 Restoration Techniques**

Ecological improvements to wetlands take one of three forms. (1) Enhancement to wetlands is achieved when a wetland's functions are amplified against their original capacity. Caution is given however, that enhancing one wetland function typically diminishes another. For example, water added to a wetland provides increased fish habitat but may negatively impact that wetland's ability to retain flood water. (2) Creation of wetlands involves excavating land or trapping water to form a wetland where there was none originally. (3) Restoration returns a combination of vegetation and soil and hydrological conditions to a drained or degraded wetland (EPA, 2003). Following are descriptions of restoration techniques.

### Tile Removal, Ditch Plugs and Water Storage, and Water Control Features.

Agricultural tiles are pipes that are submerged in order to enable wetland drainage. They are often made of plastic. When removing tiles, suitable machinery is used to break apart and then remove tile remnants. The outlet pipe of a tile is then capped with either concrete or clay, to prevent further seepage. Contingent on the scale of restoration work required, ditches are plugged with pervious materials that allow rehydration of soils and eventual wetlands recharge. Plugs may be supplemented with water impoundment features, such as dams, dikes, berms, or levees. These structures may be built out of rocks, in rock and wire baskets known as gabions, woody materials, or with the use of soils. Water control structures may be used to manipulate or regulate the flow and level of water in a restored wetland. Emergency spillways may also be built at a restored wetland. These spillways provide catchment for water during extreme flood events (Sargent *et al.*, 1999).

### Flora and Fauna

Wetlands may also be restored with the addition and/or removal of flora and fauna. Non-native trees and other vegetation may be physically removed and native or wetland-suited species may be planted in their stead. Often, previously excavated and stockpiled soil is already seeded with native grasses and vegetation and should be used, when available, in restoration work. Fauna may also be physically removed. For example, removing non-native fish and constructing fencing to restrict the entrance of pests or predators are appropriate techniques. Native fauna, such as waterfowl, can be attracted to a restored wetland site with the construction of nesting boxes (Zedler *et al.*, 2005).

These main types of restoration techniques fall under two classifications: passive and active. The passive approach limits activity to just that which is necessary to “*re-establish wetland processes*” (EPA, 2003, p. 8). This may include removing the tiles that initially caused the wetland to be drained. Alternatively, the active approach is the explicit manipulation of wetland functions. This approach is executed when there are no feasible options for restoring a

severely degraded wetland. Examples include re-contouring wetland boundaries or using control structures to artificially manipulate water levels. The shared characteristic between both approaches is that of adaptive management. With this principle, landowners may incorporate new information throughout the course of restoration work (EPA, 2003). Landowners in this thesis reported a mix of passive and active restoration techniques.

## **2.4 Review of the Literature for Incentives and Obstacles to Landowner Wetlands**

### **Stewardship**

A thorough survey of the literature has been conducted in order to identify the most common incentives and obstacles to private landowner adoption of environmental stewardship, with specific attention paid to wetlands when possible. Note however, that other natural resources are included as a means of uncovering trends and behaviors among all landowners exercising ownership over a natural resource.

The literature suggests numerous factors that motivate landowners towards stewardship. These factors appear to be split into two categories: financial compensation for their action and intrinsic motivation. The literature does, however, indicate that the presence of a land ethic is the necessary condition for engaging private landowners in wetlands conservation. In addition to a land ethic, the literature reveals that landowners cope with a persistent struggle between property rights and the desire for government assistance, as well as multiple single variables influencing, to a somewhat lesser degree, landowner stewardship.

### Financial Incentives

Financial tools are used to incentivize landowners, but the issue of money and landowner conservation can also be a difficult challenge. Landowners oftentimes are forced to weigh the long-term profit and loss margins of taking land out of production in exchange for an up-front agreed-upon market value. Given the economic complexities of property and commodity value fluctuations over long periods of time, the decision to put land into a conservation program, particularly for a farmer who relies on that land for income (versus a highly wealthy landowner)



is not made lightly. In a study focusing on wetlands in Louisiana, Seidemann *et al.* (2002) suggest that when financial incentives such as tax breaks and subsidies are used to entice landowners to keep all or part of their land out of production, the willingness levels are increased. The writers continue by putting forth the notion even with financial incentives available, the money from private developers to buy out privately held wetlands can become more attractive than the satisfaction of “*preserving the natural resources provided by intact wetlands*” (Seidemann, *et al.*, 2002, p. 2). While this might be short-sighted given the array of valuable benefits provided by wetlands, landowners nevertheless face difficult financial decisions.

During a study of 1,173 participants in the Conservation Reserve Program, Esseks (1986) identified inadequate payment as a top reason for unwillingness to participate in conservation programs. Furthermore, in discussion of a landowner conservation program for the prairie pothole wetlands of North Dakota’s Red River basin, Clancy *et al.* (2007) point out that “*economics drive their land use and [conservation] programs often do not cover the cost of taking land out of production*” (p. 13). As one might surmise, many landowners are forced to choose between “*short-term profitability [and] long-term sustainability*” (Lovell *et al.*, 2006, p. 254). Financial incentive tools used to aid in this difficult decision making process might include above-cost rents or environmental service markets such as payments via wetlands mitigation banks (Fischer *et al.*, 2008).

In contrast, during a case study of Indiana landowners, Raymond *et al.* (2008) suggest that financial incentives can be costly in the figurative sense and potentially unnecessary, suggesting that government is rewarding landowners for practices they should be doing anyways.

#### Landowner Preference for Stewardship

While economic concerns are quite significant, they are by no means the only indicator of participation. This principle is acknowledged by social scientists with the Soil Conservation

Service<sup>4</sup>: “*sociological factors...for some ranchers...even outweigh economic considerations*” (Clearfield and Osgood, 1986, p. 1). After an extensive survey of literature on landowner conservation participation factors, it appears that what might be an even greater feature in the decision making process is landowner values for stewardship. Clancy and his co-authors found that:

*Generally speaking, farmers and ranchers have many concerns and conflicting ideas regarding water storage and conservation practices. They struggle daily with issues related to farm income, soil salinization, wetland designations and regulations, drainage, and private property rights. Many private landowners become indignant at the suggestion that they are not producing the best care for the landscapes under their management. Because of this, they harbor anti-wetland views and animosity towards environmental groups and government agencies that sponsor resource conservation. Others believe that wetland drainage has no impact on flooding or are apathetic about the need to store water.* (Clancy *et al.*, 2007, p. 13)

This passage reflects the commonalities uncovered in the literature, that a significant motivator for private landowners is their affection for the lands under their care. Wallace *et al.* (2008) identify in their study of conservation program participants that the protection of “*open space, wildlife habitat, and scenic views*” (p. 291) yielded the highest interest and participation among private landowners. Research also suggests that “*ranchers who have a strong conservation ethic<sup>5</sup>...may be willing to accept reduced profits in return for the feeling that they have contributed to the welfare of future generations*” (Clearfield and Osgood, 1986, p. 1).

These findings are repeated throughout the literature: Kilgore *et al.* (2008) also find that landowners are driven to stewardship by desires to sustainably harvest the products on their land,

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<sup>4</sup> Predecessor to the NRCS, the Soil Conservation Service was established in 1935. In an effort to better encapsulate the breadth of conservation programs, the agency’s moniker was changed to the Natural Resources Conservation Service (NRCS, n.d.).

<sup>5</sup> Clearfield and Osgood define conservation ethic as being “*concerned with preserving the land for future generations*” (Clearfield and Osgood, 1986, p. 17).

to shelter wildlife, to improve water quality for their community, and to enjoy recreational activities within the conserved landscape. Surveys of landowners in Oregon's Willamette Valley found that family history, habitat, legacy and aesthetic landscape were valued over any other incentive. The same research also showed that although the landowners found the cost of conservation high, they still sought to do it – while some indicated that the cost of conservation ought to be undertaken by society, given that the benefits for resource conservation on private land often yields benefits to a full community. This research concluded that landowners “*perceived themselves as stewards of an ecological and cultural legacy*” (Fischer *et al.*, 2008, p. 277).

Preceding research conducted by Elconin and Luzadis (2004) found that inter-generational easement donations and the desire to preserve landscapes and protect them from development were more motivating than economic gain. They also suggested that easements were an effective way of allowing landowners to ensure that their property can continue to be managed in accordance with their stewardship values.

This literature is further supported by research carried out by the Natural Resources Conservation Service that a “*desire to pass farm to children, stewardship attitude, [and] has a conservation plan*” are indicators that likely influence landowner “*adoption of conservation practices*” (NRCS, 2004, p. 4).

#### Property Rights and a Collaborative Approach

In their work about incentivizing private forest landowners, Roberts *et al.* (1998) cite property rights as a barrier to conservation participation, due to landowner tendencies towards squeamishness of relegating their property rights in favor of ecosystem management. Seidemann *et al.* (2002) cite similar findings in their work on the Louisiana wetlands: “*Indeed, federal wetlands protection is often seen by private landowners as a substantial encroachment on their property rights*” (p. 2). This sentiment might be mitigated if, according to Fischer *et al.* (2008),

policy makers provide alternate land-use scenarios in easement agreement terms, i.e. collecting fees for tourism or recreation activities.

Revisiting the case study by Raymond *et al.* (2008) on Indiana landowners brings to light the fact that policy makers often want to impose strict development and other restrictions that protect biodiversity on private lands. Brook *et al.*, suggest that view however neglects “*the values and beliefs of private landowners regarding species conservation and private property*” and that “*too often [information] on landowner beliefs comes from anecdote...rather than detailed research*” (as cited in Raymond *et al.*, 2008, p. 484). The theory behind this study is that landowner beliefs provide “*the potential for better species conservation through cooperation and incentives*” (p. 484) versus command and control policies and that, as noted by Ostrom and Farrier, “*a lack of flexible sanctions makes rule enforcement challenging*” (as cited in Raymond *et al.*, 2008, p. 485). In this article, it is suggested that the Endangered Species Act no-take provision can have the perverse effect of landowners destroying or fragmenting wildlife habitat before a species has the opportunity to arrive and nest, etc. This research underscores the idea that property rights are deeply ingrained in the United States and a collaborative, and not strictly top-down, approach is more enticing for landowners to engage in conservation programs. Such an approach does require a greater understanding of landowners’ perceptions, values, priorities, and beliefs. Dietz *et al.* say that “*there is general agreement that personal environmental values are significantly related to individual behavior*” and Kraus notes that “*landowner attitudes generally predict behavior*” (as cited in Raymond *et al.*, 2008, p. 486).

In terms of a collaborative approach to incentivizing and reducing the prevalence of shunned landowners, Roberts *et al.* (1998) recommend that the professional cohort, regardless of the resource being managed, should embrace full ecosystem management principles in order to legitimize said principles and propagate the associated behaviors through the landowner community. Early landowner involvement and advertising conservation incentive programs are also recommended tools for program participation (Brown *et al.*, 2001). That same body of

research, which examined the lessons learned from a landowner stewardship participation program in Texas, cites that policy makers being flexible to landowners' needs create favorable conditions for conservation participation. Aslan *et al.* suggest that policy makers would benefit from understanding that certain features of conservation programs actually align with landowner goals, such as preventing the occurrence of invasive species (Aslan *et al.*, 2009). That finding is supported by the stance of the NRCS in its report *Adoption of Conservation Buffers: Barriers and Strategies* (2002), wherein the agency advises its field staff to make concerted efforts towards understanding a landowner's interests and priorities before engaging them in the development of a conservation plan.

Building on the idea of collaboration between regulators and landowners, is the notion of spatial interdependence and partnership between landowners themselves. In their study of privately held forest lands, Vokoun *et al.* (2010) examined what influenced individual landowners to work together to preserve adjacent parcels of land that yielded (in this case of wooded lands) those benefits not linked to timber production. This case study suggests that there exists a certain level of utility from an interlinked landscape, i.e. wildlife migratory corridors, increased land area containing improved water quality, and food resources. These researchers emphasize the importance of education and how if landowners are cognizant of the presence of economies of scale, then they might be more inclined to engage in conservation and stewardship.

#### Education and Technical Assistance

Education is also an integral incentive for stewardship participation. Research shows that complex easement legalities present a challenge to landowners. Additionally, there is a certain level of expertise required to implement difficult restoration projects. The absence of that know-how poses significant barriers for landowner adoption of conservation and restoration practices (Valdivia, C. & Poulos, C. 2009, Brown, *et al.* 2001, Fischer *et al.* 2008). This notion is supported by researchers Kaetzal *et al.* (2009) in their study of landowners' willingness to participate in formal conservation programs.

### Land Characteristics.

According to Suter, Poe, and Bills (2008), geographic areas with higher levels of development pressure or vast acreage of crop production may prove more difficult to enroll in conservation easements. Further, a study carried out on 1,462 woodland landowners in Tennessee revealed a positive relationship exists “*between the amount of land owned and...the probability of enrollment*” [in conservation programs] (Kaetzel *et al.*, 2009, p. 6-7) given that “*large areas of land are more likely to be enrolled in diverse conservation assistance programs... larger tracts of land increase the landowner’s management options*”, Bell *et al.*, Nagubadi *et al.*, Thacher *et al.*, and Gan *et al.* (as cited in Kaetzel *et al.*, 2009, p. 6). The same research also showed that those landowners who had made significant, long-term investments were more likely to participate in conservation. This study concluded that:

*It will be important to target landowners with large tracts of land, increased tenure, and who own their land as a long-term financial investment with information on conservation assistance programs to protect land from urban sprawl and fragmentation. (Kaetzel et al., 2009, p.8)*

The NRCS also suggests that a landowner managing “*large-scale operations*” (NRCS, 2004, p. 4) is a likely indicator of stewardship.

### Role of Women and Spouse Partnerships

A study conducted on the adoption of conservation practices by landowners in Oregon posited that “*open-mindedness and nurturing are characteristics identified with women that contribute to environmental beliefs*” (Habron, 2004, p. 109). The same study cites the significance of spouse partnerships in that “*sharing management decisions with a spouse increase the probability of adopting... ecological practices*” (p. 111). This is a minor but especially key finding, given that several of the ranch properties that received awards from the ELI are owned and managed by a spousal partnership.

The literature unveiled many interesting and relevant pieces of data on highly specific behaviors or characteristics that can be utilized by regulators in order to better target individuals for enrollment in easement and other resource conservation programs. In response to these findings, Table 1 below is an excerpt of approaches recommended by the USDA for mitigating barriers and obstacles to landowner participation in the Wetlands Reserve Program (NRCS, 2007).<sup>6</sup>

Table 1. WRP Barriers and Strategies

<i>Barriers</i>	<i>Strategies</i>
Lack of understanding of easement concept	Develop educational/informational materials about easement terms
Perception that WRP is concerned with preservation, versus conservation	Convey information about appropriate economic opportunities associated with wetlands
Limited knowledge on ecosystem value of wetlands	Use familiar terms (i.e. marsh or bog) and convey information on properties such as water storage

## 2.5 Identifying the Requisite Conditions for Landowner Wetlands Stewardship

The literature suggests that while the primary motivators for voluntary landowner stewardship may be personal values and economics, the recipe for adoption is by no means as cut and dry as a “*one-shoe-fits-all*” policy (Daley *et al.*, 2004, p. 217).

Returning to the study of prairie pothole wetlands in North Dakota’s Red River basin, research indicates that in order to maintain a balance between profitability and ecological wetlands management, farmers need a team of advisors including agro-economists, soil and hydrology experts, and conservation planners. This study also suggests that the use of small grants for one-off projects might be an appropriate approach, thereby allowing landowners to test various conservation management strategies prior to engaging in a full, long-term commitment to a single approach (Clancy *et al.*, 2007).

<sup>6</sup> Note that this table is adapted from a longer list of barriers and strategies, prepared by NRCS on the issue of mitigating landowner aversion to the 1996 Farm Bill (NRCS, 2007).

P. Walker notes that “*collaborative, community-based natural resource management programs have become...dominant*” (Walker, 2006, p. 131). Walker goes on to suggest that “*rural people tend to resist policies designed by distant bureaucrats in big cities*” (2006, p. 132). This finding underscores the trends identified in the literature that point towards the significant role that local and state funding programs play in wetlands conservation on private lands.

Further research carried out on American ranchers showed that, according to Huntsinger *et al.*, and Jackson-Smith *et al.*, they “*are known to be quite protective of private property rights, hostile to regulation and very attached to the idea that they can do what they like with their own land* (as cited in Brunson *et al*, 2008, p. 143). In that examination of rancher behaviors and motivations, researchers suggest that the “*possibility of marketing ecosystem services*” (Brunson *et. al*, 2008, p. 142) to ranchers holds promise, where options including carbon sequestration or banking provide income-earning alternatives. Additional survey on a rancher cohort in Utah found that ranchers adopted “*practices to improve profitability and conserve natural resources, and they often emphasized the link between those goals*” (Didier *et al.*, 2004, p. 333). Interestingly, the same authors found that ranchers who belong to multi-generational ranching families were more inclined towards conservation, so their land may remain within their family long-term.

In terms of motivating and engaging landowners, D.E. Benson suggests that “*face-to-face assistance...will help to move landowners...into action*” (Benson, 2011, p. 119) via a vis publicly available promotional and training materials for conservation stewardship programs. Benson (2011) also suggests that landowners require assistance during the learning and decision making process.

Shultz went on to say that landowners participating in the WRP are, according to Despain, “*concerned about whether easement offers have adequately compensated them for foregone agricultural income, as well as transparency of the bidding decision process, [and] permitted uses of easement wetlands*” (as cited in Shultz, 2005, p. 261). This further indicates that



landowners are driven by numerous factors of varying importance. Study of stream management issues and landowner stewardship called out the first step in landowner participation as identifying “*landowners’ attitudes and values*” (Schrader, 1993, p. 206). Another interesting body of work, carried out via survey on landowners in an Ohio watershed found that residents highly valued the aesthetic and recreational worth of their wetlands. They were however, apprehensive and uncomfortable with conservation and protected areas when the cost came at personal expense (Napier, *et al.*, 1995). This study reinforces other research that people are highly conflicted when it comes to environmental management and funding.

Perhaps the most interesting conclusions with regard to enticing landowner participation in wetlands and other forms of environmental stewardship is described by authors Fischer *et al.* in their survey of Oregon forest landowners:

*They framed their conservation motivations in terms of moral duty but relied on justifications of tangible rewards when setting conservation goals. They recognized the intrinsic ecological and cultural value of oak but rationalized management decisions in a utilitarian manner. At the same time that they wanted to be compensated by society with financial rewards and regulatory relief, they wanted autonomy and independence from government oversight. These contradictions reflect the rich and complex worldviews of owners and the multitude of forces that drive their management decisions.* (Fischer *et al.*, 2008, p. 280)

Research suggests that a range of factors influences landowner behavior and their decision to do conservation. The most significant are personal ties to a landscape and financial incentives. Other drivers may include land size, ownership rights, the availability of technical assistance, and stakeholder participation. The weight of individual parts will likely be conditional to landowner needs and preferences and also to ecological conditions of the wetlands under consideration. Any successful approach for encouraging landowner stewardship will be a strategic blend of these influential factors.

## Chapter 3. Methodology

The purpose of this thesis is to distill – from a wide range of techniques and conservation methods practiced by ELI award winners – the best management practices for private landowners wishing to carry out wetlands restoration and conservation. This thesis will be built on case study research of individual private landowners in order to understand what makes them successful in wetlands conservation and stewardship. It makes use of archival resources and semi-structured telephone interviews with award winners.

### 3.1 The Study Population

The research population is comprised of individual recipients of the Environmental Law Institute's National Wetland Awards who are winners of the landowner stewardship award. The category Landowner Stewardship, as defined by ELI, is presented to:

*A private landowner, who, while using his or her private land for farming, forestry activities, ranching, or development, voluntarily helps restore, protect, or minimize impacts to wetlands. For example, a farmer involved in wetland restoration or conservation on his or her land or enlisting nearby landowners in such efforts, or a residential developer who provides significant protection or restoration of wetlands associated with a subdivision. (NWA, n.d., Nominations section, para. 4)*

Nominations are made by individuals who are intimately knowledgeable about the nominee's wetland stewardship activities. The nomination process itself involves submitting a dossier of information, including a complete nomination form that outlines the qualifying wetlands projects, letters of recommendation, resumes, and relevant media in support of a nominee. Individuals who have excelled in landowner stewardship for their privately owned wetlands are selected as winners, and are recognized by the ELI in a ceremony held each spring in Washington, DC.

Decisions for winners are made by a specifically chosen, cross-disciplinary 12-18 member panel. Panel members include representatives from the private sector, from conservation

organizations, and from state and local government. NWA partner agencies also send an individual to participate in the selection panel. These partner agencies include EPA, USACE, USFWS, United States Forest Service, Natural Resources Conservation Service, Federal Highway Administration, and National Oceanic and Atmospheric Administration. Members of this selection panel are chosen in a strategic manner that allows for wide representation of the nationwide community of wetlands experts. It should be noted that while the ELI is the coordinating organization for the NWA program, they do not cast a vote when selecting award winners (NWA, n.d.).

The selection panel reviews nomination materials for private landowners throughout the United States and votes on the individual who has made the most significant and outstanding stewardship effort, resulting in created or restored wetlands and the multitude of related benefits such as improved water quality and creation or expansion of wildlife habitat and migratory corridors.

Twenty-four awards have been granted in the Landowner Stewardship award category since 1991 (Table 2). For the purposes of this thesis, large-scale landowners (those individuals owning 1,000 acres or more) were selected for study; the rationale is multi-fold. Given the time constraints of this thesis it was not feasible to contact and interview the full set of 24 landowners. Thus characterizing and sub-grouping enabled the research to be completed on deadline. The initial characterization of the full population revealed a clear distinction between landowners owning 1,000 or more acres and those owning less. After reading through the materials for the latter, it was determined that many of the stewardship projects were quite similar in nature and involved only limited input from outside partnerships. The large-scale landowners group presented a more diverse range of stewardship projects and included the involvement of many outside conservation partners.

Based on this perception of the two groups, the large-scale landowner group (herein after referred to as ‘landowners’) was selected for research due to the potential to uncover a broader

and more complex range of information that better informs the distillation of best management practices. Ten individuals of the population of 24 award winners met the criteria for a large landowner. Table 2 lists all the award winners; those individuals who were included as the population in this study are in shaded rows.

Table 2. ELI Landowner Stewardship Award Winners, 1991 to the Present (NWA, 1991-2011).<sup>7</sup>

Year	Name	Notes	State
1991	Ray McCormick	Ray McCormick developed 112 acres of his private farm into wetlands through a controlled seasonal flood that yielded wetland and duck/goose grazing zones	IN
1994	Thomas Dick	Advocated PA wetland restoration, restored 80+ acres on 170-acre farm, now educational tool	PA
1995	Sam and Vicki Sebastiani	Restore 90 acres on personal property, sharp increase in bird counts on the marsh	CA
1995	Dennis and Jeanie Fagerland	Restored 120 acres on personal farm, planted grass on crop lands to protect wetlands- reducing sediment in nearby lake, rotating grazing system	SD
1996	Don and Debbi Koeberlein	Restored wetlands on personal property and encouraged others to do the same, advocate for wetlands in the area, maintain 110 acres wildlife preserve	IL
1996	J. B. (Bunker) Sand	Restored 1,000+, encourages grad students to use in research pursuits	TX
1997	Brian O'Connor Dunn	Restored/enhanced wetlands on The Fennessey Ranch as part of the Texas Prairie Wetlands Project, developed ecotourism	TX
1997	James P. Siepmann	Developed housing areas that preserve natural setting: The Preserve at Hunters Lake	WI
1998	Kimberly de Castro	50 acres of wetland/land restoration including extensive planting, invites students to visit wetlands, enlist other landowners to create wildlife spaces	NM
1998	Robin W. Green	Housing project preserving/restoring wetlands	OH
1999	Gary Donovan	Project SHARE, leadership in management of all private riparian areas, numerous wetland projects	ME
1999	Norman Haigh	Farm development with wildlife considerations: now conservation showplaces, plant/restore 1,000+ acres	MS
2000	Raymond Beck	Restored/enhanced five wetland sites, hatches wood ducks, extensive work with waterfowl nest boxes	OK
2001	Ken Brunswick	Restore personally-owned wetlands, regional wetland restoration advocate (speaker), volunteer to restore 428 acres (Loblolly Marsh Wetland Preserve)	IN
2001	Mike & Cathy McNeil	Found Rock Creek Heritage Project, conserve/enhance personal ranchland, advocate for land conservation in	CO

<sup>7</sup> Note that the information in this table is publicly available from the Environmental Law Institute.

		surrounding area	
2002	Jim King	Conservation near Tijuana River estuary, tidal wetland restoration projects (approx. 220 acres)	CA
2002	Clarence Mortenson	Restoration of personal property: dams built, water table restored, plant and animal life revitalized	SD
2004	Jack Branning	Restore personal property, 3,498 acres	MI
2005	Neil Bien	Restore/preserve personal property (approx. 2,300 acres)	SD
2006	Higel Family	Family that sold portion of property to CO Division of Wildlife for protection; located in waterfowl/wildlife habitat along Rio Grande river in CO; successful model of agriculture/grazing in same habitat as wetlands conservation	CO
2007	Terry and Mark Brockway	Restore personal property (1,600 acres)	IA
2008	Valer & Josiah Austin	Sonoran Desert: restore watershed, promote biodiversity; restored 40+ miles of property	AZ
2010	Andrew Laszlo & Family	Worked with public and private partners to create one of the largest voluntary wetlands conservation project in Montana	MT
2011	Scott House	Restored wetlands on 1,260 acres of riparian/ranch land	AR

The following is a brief description of the 10 selected landowners (NWA, 1991-2011).

Brien Dunn, is the owner and former-operator of Fennessey Ranch, located in the coastal town of Bayside, Texas. Fennessey Ranch has been in the Dunn family for the past 175 years and formed part of the 1834 land grant between Mexico and the United States. Over multiple decades, Mr. Dunn forged conservation partnerships that resulted in the restoration of 950 acres of wetlands. The property is known within the local area as a conservation model and is frequently used for recreation, education, and research.

Norman Haigh, of Louisiana, is a trained hydrologist who acquired a 2,700 acre dilapidated farm. Working through conservation partnerships, Mr. Haigh carried out restoration works that included construction of water control structures that improve water quality and enable nesting area and habitat for waterfowl, and the planting of grasses to reduce siltation on the property. As a result of the restoration efforts and construction, at least 1,000 acres of the property have been rehabilitated to functioning wetlands.

Clarence Mortenson, has been implementing wetlands restoration techniques and rehabilitating the natural hydrological conditions to his South Dakota ranch since 1950. These techniques, that still include rotational cattle grazing, have resulted in dramatic increases of vegetation as well as the return of waterfowl and wildlife. The property also provides an important stopover for neotropical migratory birds.

Jack Branning, of Mississippi, owned a farm that was originally cleared and converted for crop production. Working with conservation partners, the wetlands loss was reversed and the lands were restored as seasonal wetlands. Today the property's 2,000+ acres of wetlands attract ducks and other waterfowl and serve as an important fish habitat.

Neil Bien, a cattle rancher from South Dakota, has restored 120 acres each of 15 individual wetland sites on his property. Strategic restoration works of the native prairie areas of the ranch were applied in efforts to manage the entire property according to holistic methods.

The Higel Family, private landowners from Colorado, has worked with conservation partners to protect over 1,500 acres of wetland and related habitat. The family has employed a carefully managed grazing plan that allows for cattle grazing on the property in such a manner that does not degrade the wetland functionality. The land provides habitat to an abundance of waterfowl and aquatic species.

Terry and Mark Brockway, of Iowa, purchased a 1,540 tract of bottomland, riparian backwater habitat with the intention of restoring it to its original wetland functionality. The entire property went under restoration works, including riparian plantings and controlled burns. This property is used as a model for other landowners in the community and also provides an important stopover for migratory bird species.

Valer and Josiah Austin, of Arizona, are ranch owners who have restored and conserved over 40 miles of riparian, wetlands habitat, including property along the U.S. and Mexico border. This comprehensive project implements management techniques for wetlands protection, including restoring and protecting a migratory corridor between the United States and Mexico.

The Laszlo Family, working on lands in Montana, partnered with conservation organizations to initially restore a 510 acre area of the O'Dell Creek Headwaters, which feed into the Missouri River and surrounding watershed. The area also encompasses a 35,000-foot tract of restored riparian habitat. The ranch is open to those who wish to learn about range management and wetlands restoration. Restoration work on this property is ongoing.

Scott House, of Arkansas, began restoration works with a first 203 acres that grew to 1,260 acres (at time of award) of restored wetland and riparian habitat. Working with conservation partners, Mr. House developed the property as an expansive wildlife habitat that currently attracts numerous waterfowl and migratory birds. The property is an actively-used education center.

### **3.2 Archival Resources**

The ELI provided complete archival award files for each of the landowners in this study. These archival resources include:

- Nomination materials. Nomination materials are submitted by the award winner's nominator, an associate or colleague within the community who is aware of the individual's environmental stewardship. Nominators provide answers to an ELI survey about the individual and their wetland stewardship activities (a sample questionnaire is included in Appendix B). Other materials in the nomination file may include letters of recommendation from members of the community and any news articles written about the individual.
- Press materials. ELI also provided, as available, news articles written about award winners as well as press written about the award ceremony.
- Press releases. ELI additionally provided press releases for each year's award ceremony and each year's award winners. The latter provided succinct biographical and project information.

Each hard copy file was read in full to familiarize the researcher with individual award winners and his or her wetland stewardship activities.

### **3.3 Interview Protocol**

A literature review was done to better understand the many dynamics and factors that influence landowner behavior. Incentives and barriers to landowner stewardship were also studied. The review included landowner behavior for the stewardship of multiple natural resources (for example, forestry, rivers, plains areas) in an attempt to find cross-cutting trends between environmental stewards. The literature also included a review of the regulatory framework that guides and aids environmental stewardship. This included a review of easement initiatives such as the Wetlands Reserve Program and the Conservation Reserve Program. Also included in the regulatory framework survey were studies of federal wetlands legislation and the role of states in wetlands regulation and protection.

The purpose of the literature review was to build a knowledge base about the myriad legal issues and incentives and obstacles facing private landowners wishing to carry-out stewardship projects. This understanding helped inform the study of the landowner group by making the researcher well-versed in the different aspects of the landowners projects, for example their conservation partners. It also helped the researcher to better understand the perspective of each landowner because the researcher was now adequately fluent in the factors that might motivate or influence landowners. The literature review also helped inform the questions of the interview protocol.

Based on the literature review, an interview protocol was developed. The protocol was developed with the aid of McDonell's Interviewing Practices for Technical Writers (1991), which outlines methodology for interview scheduling, sequencing and includes instruction for creating appropriate questions, including types open-and closed-ended, direct, and primary and secondary. The interview protocol resulted in 12 questions designed to encompass broad and specific details about the landowner's wetlands stewardship work. To accomplish this, the protocol begins with



an inquiry into the history of the project and moves on to pressing for specific details on how conservation or restoration of wetlands was physically carried out and financed. The interview protocol is designed to obtain information on the specifics of stewardship activities, how the property evolved through time, and an understanding of the motivational factors for each landowner as well as the most critical pieces of information: what landowners did that made their project successful. Below is the interview protocol:

1. Do you know the history of your property? How long have you lived there?
2. Why did you decide to do wetlands conservation on your land?
3. What is the status of the project now compared to when you won the National Wetlands Award?
4. How are your wetlands managed? Has that changed over time?
5. How was your wetlands conservation plan developed, and who helped with the conservation work?
6. How did this project progress over time?
7. What were the lessons learned from this conservation project?
8. What were the key obstacles that you confronted, and how did you deal with these?
9. What do you think are the requirements for a successful private wetlands project?
10. What is the advice you have for other landowners wishing to do wetlands stewardship?
11. How has having the wetlands affected your farm or ranch operations?
12. What were your motivations/goals for wetlands stewardship?

### **3.4 Interview Method**

U.S. laws on human subjects research require that the interview methodology and data storage for this project be approved by James Madison University's Institutional Review Board (IRB) for Human Subjects Research. The IRB research protocol was submitted for evaluation on September 7, 2011 and approved on September 8, 2011 (JMU IRB report number 12-0077). The full text of the approved IRB application may be found in Appendix C.

After IRB approval was given, first contact was made with landowners via telephone calls. During these five-to-ten minute phone calls, the researcher followed the approved IRB script (see Appendix C) to make an introductory acquaintance with the landowner, explain the purpose of the research, request for participation in the study, and to set-up a time for a 30-40 minute phone interview. It was also explained to landowners that the researcher would be sending them the informed consent form for review along with the interview protocol (also included in Appendix C). Landowners received the consent form either by email or overnight Federal Express, per their preference.

Of the 10 landowners in the research population, successful contact was made with eight landowners; the remaining two were unreachable. For the group of eight landowners who were contacted, seven agreed to participate in the study and telephone interview, and the eighth was unable due to scheduling conflicts.

Each interview lasted between 30 and 40 minutes and was an informal, open dialogue in which the researcher engaged the landowner in questions about their property and allowed the landowner to discuss information at their own pace and of their own choosing. All calls were amicable and successfully conveyed rich information about the landowner's property and wetland work. Hand-written interview notes were digitized and also put into a pattern matching analytical matrix. Participants also received a thank you correspondence by mail. The interviews took place between 13 September and 4 October 2011.

### **3.5 Compilation of the Case Studies**

Case study methodologies for discovery and analysis were chosen for this thesis with the aim that results will, according to Yin (1984), fill the need to understand dynamic social trends. Here, that social complexity is the range of conservation work electively undertaken by private landowners. By using case study analysis, results are expected to aid in generalizing the landowner study group. Forming the body of case study evidence are archival records and case study notes obtained during telephone interviews.



Results emerging from the case study analysis are presented in the next chapter.

## Chapter 4. Findings and Analysis

### 4.1 Landowner Histories and Motivations for Wetlands Conservation

The survey of literature on what best motivates landowners to participate in environmental stewardship indicates that an environmental or land ethic is a **necessary condition** for stewardship. Analysis of findings begins with the following exploration of personal histories as they relate to the study group and their attitudes toward the land.

During telephone interviews, the first questions posed to landowners were:

*Do you know the history of your property? How long have you lived there?*

These questions revealed that of the seven landowners, four are multi-generational landowners and three purchased the land from its prior owner. Of the four multi-generational landowners, the following details emerged:

- Origination of family ownership ranges from 1834 to the 1930s;
- Landowners are either fourth, third, or second generation owners;
- Two landowners' families received their land through the Homestead Act;<sup>8</sup>
- Two landowners are still involved in the hands-on farming operations; and two landowners have family members and/or trusted friends running operations.

Within the set of three landowners who are the first in their family to own their property, one has owned the land for 31 years, and the other two have each owned their land for 14 years.

Even though the landowners had different family histories with respect to their property, a strongly-held land ethic was discussed by the majority of landowners, regardless of tenure of

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<sup>8</sup> The Homestead Act of 1862 allowed U.S. citizens to apply for ownership rights of an undeveloped parcel of federal land, typically in the western region of the country. New landowners were granted a period of five years during which they were required to develop the land for high agricultural productivity. While the Act is credited with empowering poverty-stricken families with landownership it was also fraught with unforeseen externalities, namely environmental damages. For example, farming homesteaded land proved extremely challenging in frontier states such as North and South Dakota where severe climatic conditions, i.e. drought, rendered farming difficult and resulted in certain modes of environmental degradation including loss of trees and vegetation, increased erosion, and loss of wetlands (National Archives, n.d.).

land ownership. Evidence for this finding emerged during interviews when landowners were asked the following question:

*What were your motivations/goals for wetlands stewardship?*

Interviewees responded with the following commentary on their personal land ethics:<sup>9</sup>

*“A self-satisfaction thing.”*

*“To benefit wildlife, it makes you feel good.”*

*“To create long-lasting effects for the entire region.”*

*“The beauty of land and wildlife, we appreciate those for [their] aesthetic value and benefit.”*

*“It’s got to be in your soul.”*

*“[I] have a love for this.”*

*“You have to want to do it.”*

Landowners went on to describe their goals for wetlands conservation in terms of trying to create wildlife habitat, establish migratory corridors, to show others that conservation can be accomplished, and having a responsibility for the long-term environmental health of the land. Several of the landowners also referenced the literature *A Sand County Almanac* by Aldo Leopold and *Holistic Management* by Allan Savory – works on sustainable land management that are reasonably well-known within the landowner community. Regarding the impact of these works on their stewardship and land management approach, one landowner indicated that Leopold’s guidance “*just makes total sense*”. Another landowner highly regarded Savory’s principles of holistic management and even cited them as a primary influence for undertaking wetlands conservation.

Another question asked of landowners was:

*Why did you decide to do wetlands conservation on your land?*

Overwhelmingly, landowners cited the need to restore wetlands that had been lost or severely degraded by USDA policies from 1936 to the early 1960s, in which cost-share

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<sup>9</sup> Note that all landowner quotes are confidential.

arrangements were provided to farmers and ranchers who drained wetlands on their property and converted the acreage into productive farmland (USDA, 1998).<sup>10</sup> Landowners who did not explicitly reference USDA-incentivized land degradation discussed the need for wetlands conservation to reverse the impact of poor farming techniques, such as over-grazing and the absence of crop rotation, and in one case conversion for natural resource extraction.

The slightly nuanced drivers for carrying out wetlands conservation (i.e. impacts from farming or those directly traced to USDA conversion policies) do not reveal any significant differences between landowners who are multi-generational or first-time owners. Landowners in both categories were impacted by historical land use trends.

Research of this study group specifically, reveals a link between individuals with a family history of farming and land ownership and a land ethic driving them to be good stewards of a valued family resource. Non-multi-generational landowners also discussed the idea of land ethic. However, these results did not yield distinct commonalities. For example, one individual defined land ethic as the need to restore degraded land and become a model of sustainability for other land stewards. A second landowner conveyed land ethic in terms of deriving self-satisfaction from developing the property for wildlife. Yet another landowner defined an ethic as the vehicle for providing nature to future generations, *“I did it for me and future generations of my family”*. While each ethic is individualized, the cross-cutting theme here is that non-multi-generational landowners desired to restore property so that someone (be it themselves, other landowners, or future generations) would benefit from such work. This is similar to the ethic expressed by multi-generational landowners who desire to keep properties within their families’ future generations.

#### **4.2 Use of Conservation Easements and Cost-Share Arrangements**

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<sup>10</sup> Since the 1970s however, this policy has been reversed with a policy that prevents net loss of wetlands via wetlands conservation and mitigation banking (USDA, 1998).

Conservation easements and cost-share are policy tools available to landowners. This section discusses best management practices as they relate to the adoption and implementation of these two predominant policy tools.

### **Conservation Easements**

Conservation easements are a policy mechanism that protects environmental landscapes in perpetuity or for a fixed amount of time. They represent an exchange of property rights between private landowners and government entities or conservation partners. These legally binding agreements are based on a set of agreed-upon terms that delineate permitted land use such as passing on property to future generations, extracting natural resources, or hunting. In exchange for surrendering complete discretion over their land, landowners receive (1) the assurance that their property will not be further developed or impacted by environmental degradation, and (2) financial incentives and property tax reductions (The Nature Conservancy, n.d., Land Trust Alliance, n.d.).

Five of the seven landowners entered into easement agreements, either through CRP, CREP, or WRP or in partnership with a nonprofit institution. Each of these landowners opted to only use one form of easement, with the exception of one individual. That landowner has enrolled the property in three different easement programs, two that are fixed-term and one that is in perpetuity. This was explained by the need to strike a balance between obtaining short-term funding via fixed easement arrangements and guaranteeing permanent protection that would benefit “*future generations*”.

These five landowners described their personal motivations for using conservation easements. Reasons included personal ties (inherent, emotional connections) to the land, a desire to keep family lands protected (as one landowner said, “*I did it for...future generations*”), increased property value, and a response to economic pressures to diversify revenue streams. Landowners also detailed their personal enjoyment of observing protected wildlife, and one



landowner noted that, “*a great boon to any farm is to have good wildlife*”. The two landowners who did not enter their property into easement did not provide a direct explanation.

### **Cost-Share Programs**

Cost-share is a method by which private landowners may offset the personal financial expense of wetlands restoration. Depending on the partnering agency, landowners typically receive fifty percent or more of the cost of work. The government programs that provide conservation easements also offer a variety of cost-share programs. Other funding entities may include private companies, nonprofit organizations, or individuals capable of making matching fund contributions.

Within the study group, five landowners (note that this is a different mix of landowners than the five who use easements) used cost-share programs to finance wetlands restoration projects. Cost-share came from the U.S. Fish and Wildlife Service’s Partners for Wildlife program and the Natural Resources Conservation Service’s Conservation Reserve Program. These financing options ranged from 50 percent to 90 percent of restoration expense; examples of restoration works covered include the construction of large-scale dams, building fences, and building water control structures.

To summarize, all of the landowners but one used some combination of conservation easements and/or cost-share arrangements. One landowner did not use any government financial assistance at all, but did use technical guidance from government agencies. The reason for this was not explored with the landowner.

### **4.3 Best Management Conservation Practices Implemented by All or Most Landowners**

The following section discusses best management conservation practices implemented by all or a majority of the seven-landowner study group. These represent a suite of qualitative practices, such as entering into partnerships, as well as the actual physical techniques for restoration. Restoration techniques are applicable when wetlands have been degraded beyond their original ecological functionality. Alternatively, conservation may be employed to protect

intact functions. Examples of conservation methods include designating protected areas and managed cattle grazing.

Table 4 lists the best management practices that emerged through case study analysis. Of the best management practices listed in Table 4, four thematic sets of activity emerged: Wildlife and Wildlife Habitat, Wetland Hydrology, Technical Assistance and Conservation Partnerships, and Conservation Management.

Table 4. Best Management Practices Implemented by All or Most Landowners

<b>1. Wildlife and Wildlife Habitat</b>
<ul style="list-style-type: none"> <li>▪ Built nesting structures to attract waterfowl</li> <li>▪ Reintroduced native fish</li> <li>▪ Planted riparian trees</li> <li>▪ Planted native riparian grasses</li> </ul>
<b>2. Wetland Hydrology</b>
<ul style="list-style-type: none"> <li>▪ Built large and small dams to restore or create wetlands</li> <li>▪ Plugged drained wetlands with pervious silt, gravel, and clay materials</li> <li>▪ Allowed newly restored/created wetlands to recharge naturally by rainfall and snowmelt</li> <li>▪ Built levees</li> <li>▪ Planted riparian trees</li> <li>▪ Planted native riparian grasses<sup>11</sup></li> </ul>
<b>3. Technical Assistance and Conservation Partnerships</b>
<ul style="list-style-type: none"> <li>▪ Consulted with engineers and technical experts on large-scale construction projects</li> <li>▪ Worked with conservation organizations (FWS, NRCS, and local groups) for financial and technical support and also for consultation on permitting processes when necessary</li> <li>▪ Consulted with biologists</li> </ul>
<b>4. Conservation Management</b>
<ul style="list-style-type: none"> <li>▪ Implemented managed, rotational grazing</li> <li>▪ Self-developed a conservation plan</li> </ul>

### 1. Wildlife and Wildlife Habitat

The first thematic classification of best management practices common between interviewees is the explicit development of ranchland as a habitat for wildlife. Interviewees revealed that “*developing the land for wildlife*” includes an array of activities such as constructing nesting structures to attract ducks, waterfowl, and migratory birds, and restoring native fish to

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<sup>11</sup> Note that the planting of riparian trees and grasses is included in two categories because two discrete ecological functions are being met.

wetlands. Planting of riparian trees, grasses and other wetland-suited vegetation is also included in this suite of techniques because they have the added benefit of providing wildlife habitat. As a result of implementing this practice, landowners reported seeing the following wildlife: migratory birds, deer, pheasants, grouse, wild turkey, birds of prey, owls, wading and songbirds, bats, wild boar, cougar, and coyote.

## **2. Wetland Hydrology**

The single most utilized best management practice was the use of pervious materials to build dams that (a) restore wetland catchment functions, while (b) simultaneously rehydrating soils. Landowners used clay, silt, rocks, or previously excavated streambed material to plug drainage sites on formerly intact wetlands, and then allowed barren wetland cavities to naturally replenish with rainfall and snowmelt. This technique created the proper hydrologic conditions for growth of native grasses and trees.

Several landowners indicated that sealing drainages smaller in size and shallower in depth was “*pretty easy*” and did not necessitate the help of outside technicians. However, landowners reported drawing upon the help of engineers and restoration technicians during the construction of larger dam projects for which guidance was needed on technical specifications, such as equipping dams to hold against various levels of water pressure or when dam construction was too complex and large in scope to be carried out by an individual with limited equipment.

Other techniques to improve wetland hydrological conditions were also used. One example is the construction of levees and water control boxes that allow manipulation of water levels. Landowners reported that controlling water levels helped create optimal conditions for vegetation growth. A second technique is the planting of riparian trees in the edge habitat that surrounds wetlands. This was done to create protective buffer zones and provide additional avian habitat. Planting native grasses in wetland areas is a third technique and improves a wetland’s water purification ability while also providing wildlife habitat.

## **3. Technical Assistance and Conservation Partnerships**

Landowners in this study worked with an extensive network of conservation partners and related professionals. These partners include engineers and restoration technicians, biologists, local soil/water conservation boards, and academic researchers who shared knowledge about a range of management techniques. However, overwhelmingly, the most frequently cited partnerships were with local representatives from USFWS, NRCS, The Nature Conservancy, and Ducks Unlimited. All landowners lauded the importance of seeking out and taking advantage of partnerships with these organizations. Following is first-hand commentary from landowners on their experiences working with conservation partners.

*“[US]FWS is pretty terrific.”*

*“Partnering with CRP is a no-brainer.”*

*“NRCS was a critical partner.”*

*“[US]FWS was very supportive, they understand the process; they are our star hero.”*

This landowner feedback corroborates the finding presented in Chapter II that there exists a positive relationship between state-assistance programs and successful landowner stewardship of wetlands.

Given the uniformity of landowners’ practices and opinions, it is clear that partnering with conservation professionals is the key best management practice for effectively stewarding land and meeting wetlands conservation goals (in addition to the physical restoration techniques). Further, it is no coincidence that of the states identified by the Environmental Law Institute as providing some form of state-run assistance program(s) to private landowners wishing to do restoration or conservation, there are 12 in which Landowner Stewardship winners reside.<sup>12</sup>

#### **4. Conservation Management**

Landowners were asked how their wetlands conservation plan was developed, and who helped with the conservation work. The majority of landowners reported self-designing their

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<sup>12</sup> Note that these 12 states are based on the original population of 24 landowners and not the 10-person study population.

restoration plans with the assistance of USFWS and Natural Resources Conservation Service technical expertise on matters of construction, species management, and building dams equipped to certain levels of water pressure. Other landowners indicated that they used a “*trial and error*” method in terms of planting and range management. Some described failed attempts at tree planting that were superseded by improving soil hydration and eventually, the return of native riparian trees and grasses. A majority of landowners also reported implementing strategically managed grazing techniques, including reducing pasture size, rotating cattle on a seven-to-ten day basis, and limiting grazing on vulnerable land parcels. When asked how long they let the land rest, landowners reported that there was no prescribed interval but rather an adaptive rest plan based on weather, seasonality, and the vulnerability of the land.

#### **4.4 Site-specific Techniques**

The interviews also revealed multiple techniques that were practiced by only one or very few of the study group. These practices appeared to be tailored specifically to the unique site features and conditions of a particular property, such as topography, climate, and the level of wetland degradation (Table 5). For example, a landowner with property on expansive, flat lands with heavily eroded soils sought out a different construction method for dams than did a landowner whose property was more suited to levee water control features. Site conditions such as this are what determine the different restoration techniques.

Specific examples of these individualized techniques are represented in the following set of best management practices:

- Constructing two types of dams (small and large) with the use of specially-designed gabions (wire baskets filled with rocks) to hold place in loose, eroded soil (practiced by one landowner);
- Use of controlled burns to remove overgrowth of non-native vegetation (practiced by one landowner);

- Re-purposing naturally occurring contours into water catchments (practiced by three landowners);
- Use of irrigation pumps (practiced by two landowners);
- Re-introducing endangered species (practiced by one landowner); and
- Use of private wetlands mitigation banking (practiced by one landowner).

Table 5. **Best Management Practices Implemented on a Site-Specific Basis**

Built additional wetlands
Collected baseline data for monitoring purposes
Outreach activities for private and grant funding
Partnered with private companies
Successfully encouraged neighbors to also participate in conservation
Constructed water-level monitoring wells
Removed non-native fish
Used controlled burns to remove non-native vegetation
Reintroduced endangered species
Used irrigation pumps to manage wetland levels
Used naturally-occurring contour ditches for water catchment

#### 4.5 Impacts of Wetlands Conservation on Operations

In order to gain an understanding for the impact of wetlands conservation on farm or ranch operations, landowners were asked:

*How has having the wetlands affected your farm or ranch operations?*

The most notable difference is for landowners who put their property into easement and simultaneously out of agricultural production. Several landowners reported successfully diversifying their farm revenue by expanding operations to include wildlife recreation, ecotourism, hunting, wildlife photography, and birding. Repeatedly, landowners raved about the abundance of wildlife now present on restored wetland habitat. Among that abundant wildlife are migratory bird species and the endangered jaguar. Landowners who retain a measure of agricultural production discussed the improved soil conditions of their farm land and the accompanying crop productivity.<sup>13</sup>

<sup>13</sup> Specific information on the quality of cattle pastures was not provided.

#### **4.6 Community Outreach**

Another similarity between all landowners is participation in community outreach and the notion of making nature accessible to others. Landowners reported opening their properties for educational tours, research, ecotourism, and recreation. At least one landowner reported opening their restored property for controlled, recreational waterfowl hunting. No individual landowner, however, reported using the property for personal hunting activities, nor was hunting cited as a motivation for wetlands conservation. During interviews, landowners also repeatedly discussed the importance of sharing their lessons learned with other landowners. Please see Appendix D for a news article detailing the outreach efforts exemplified by 2011 award winner Scott House.

#### **4.7 Landowner Perceptions of Barriers and Opportunities for Conservation**

The literature suggests that there is a common lack of understanding among landowners (not just those owning wetlands) about conservation easement programs, and perhaps even a misconception that easement and other land use arrangements significantly restrict what landowners may do with their property. There is also a perception by landowners of government over-regulation that presents a real challenge to policy makers (The Nature Conservancy, n.d.). The literature also yielded a cache of opportunities available to policy makers and conservation partners for enticing landowners to adopt conservation practices.

Landowners were asked:

*“What were the key obstacles that you confronted, and how did you deal with these?”*

One landowner reported that far-away federal-level agencies had a lack of knowledge about local hydrological science and no understanding of the connectivity between surface and groundwater systems. This comment was followed by another stating that the local and state representatives of government agencies (i.e. local NRCS) were better equipped to advise on technical issues.

Another obstacle cited by multiple landowners is the lack of time they were able to devote to restoration projects. One landowner said, *“time is an issue because a farmer typically*

*already has a full workload*". Several landowners also noted that restoration can be "*a long trial and error process*". Severe weather was also cited as an obstacle.

Multiple landowners indicated that given high costs, financing restoration projects was a recurring challenge, hence the need to participate in cost-share agreements. Additionally, multiple landowners reported difficulties in facilitating communication between various conservation partners. However, landowners also reported that conservation partners were valuable in guiding them through regulatory processes. This mix of responses indicates that while partnering with conservation organizations is a best management practice, dealing with multiple layers of bureaucracy might at times present a challenge to landowners.

Landowners were also asked:

*What do you think are the requirements for a successful private wetlands project? What were the lessons learned?*

Perseverance, patience, good communication, and the ability to devote time to projects were listed repeatedly by landowners as part of the mix for successful wetlands conservation. Another common feature listed by multiple landowners is a basic understanding of natural processes, including "*water and its properties*" and an understanding of the tools that will be used throughout the work. Another landowner stated that people need "*to have an understanding about the topography of the land, how and where the water flows, and [to] learn animal grazing patterns*".

Landowner responses throughout this study reflect the most dominant feature of the literature, that a land ethic is a necessary condition for stewardship and conservation. They also correspond to the literature that suggests landowners should make use of the available support programs provided by conservation partners.

#### **4.8 Landowner Advice to Others**

Landowners were asked to give advice to other landowners wishing to do wetlands stewardship. Their actual responses say it best:



*“It takes a lot of good work and talented people.”*

*“You need to get an understanding of the land and what it’s being developed for.”*

*“Work with local and county conservation partners.”*

*“Don’t be deterred by setbacks, identify clearly what ones goals are, realize it takes time to do and the results take time to develop. Proceed on faith not fear of something new. Be a leader for positive change and do not worry about what others will think of doing something different than standard operating procedure, find ways to make it work with all the other elements of a farm, ranch or large property, realize that one has to compromise. Think of the big picture.”*

*“Work with the partners out there to get ideas, money, recommendations, and engineering help.”*

Additional advice included being aware of the time requirements, being willing to put in all necessary effort, and working closely with conservation partners, including scientists and researchers.

#### **4.9 Summary**

This analysis has identified a variety of best management practices, including those that can be applied generally and those that are site specific. The analysis also supports the general findings in the literature about the landowner characteristics that encourage conservation practices. While the literature indicated that the necessary condition for environmental stewardship is an inherent land ethic, this research helps fill a knowledge gap about the conservation practices that landowners possessing a land ethic may actually implement for successful wetlands conservation.

As discussed in this analysis, there are two types of landowners in this study – those whose families already owned their property and those who have purchased their property from a prior owner. Cost-share arrangements and easements were used by all but one landowner.

Insights from this analysis suggest that multi-generational landowners are likely to have a conservation ethic, but that a land ethic can be present even by land owners with new farms. This

research also finds that easement and cost-share programs are a best management practice that can be strongly recommended to a larger population of landowners wishing to do conservation.

Given the vast acreage lost to agricultural conversion during the mid-twentieth century, there still exists a considerable amount of privately held land suitable for wetlands restoration.

The research findings from this study can help the ELI develop appropriate programs and outreach materials for supporting private wetlands conservation throughout the United States.

## Chapter 5: Conclusion

### 5.1 Review of Significant Findings

This thesis is guided by the finding that a land ethic is a necessary condition for environmental stewardship, and in this context, wetlands restoration and conservation. That land ethic presented itself as the backbone supporting many of the key findings emerging from this study. While researchers may define land ethic as being “*concerned with preserving the land for future generations*” (Clearfield and Osgood, 1986, p. 17), a different reality emerges from this study group. Discussions with landowners revealed that land ethics are personal, subtle, and take on different meanings for different individuals. Some multi-generational landowners are influenced by their family’s historical ties to land, articulated by one who said the property was “*a place that I loved...and really need to take care of*” and another who said the “*family is responsible for the good and the bad that happens on the land*”. Other landowners tied their ethic to passing on the land to future generations regardless of whether they were multi-generational owners, “*I did it for me and future generations of my family*”. Obtaining “*self-satisfaction*” from having abundant wildlife was given by one landowner as being influential in developing values about land. Multiple landowners described their land ethic as being influenced by sharing their restoration successes with others, including fellow landowners, the public, and researchers.

While land ethic definitions are individualized, one landowner summarized the sentiment conveyed by the majority of individuals that “*it’s got to be in your soul*”. Given that expression, these interviews suggest two strong commonalities in what helps formulate the land ethics held by this group. The first is a personal value for the natural world, a feeling articulated by most landowners. The second has to do with sharing successful conservation with others. Every landowner described some form of enabling others to benefit from their conservation work. For example, one landowner described an ethic as “*being a model of sustainability for other landowners*”. Others desire to leave healthy land for future generations. Some landowners waxed passionately about engaging with the community, so that “*kids would have ownership in nature*”.

Thus, this research suggests that these landowners' ethic is built on sharing the natural world with others.

Another set of findings emerged regarding the use of cost-share arrangements to finance restoration and conservation management plans. Five of the seven landowners reported seeking out and taking advantage of cost-share programs either through government or private partnerships. When this finding is coupled with another key finding that all landowners worked with conservation partners (either specifically conservation agencies such as local chapters of USFWS and NRCS or academics and scientists), it becomes clear that perhaps the most significant takeaway in terms of best management practices is that private landowners should forge partnerships with other conservation stakeholders in order to foster exchange of scientific, technical and regulatory knowledge and when needed, tap into the potential for financing partnerships. Restoration and ongoing conservation of wetlands on ranch properties spanning 1,000+ acres is a vast responsibility necessitating specific knowledge, experience, and tools; landowners will do well to work with colleagues who share their conservation goals.

Further key findings pertain to the restoration of hydrological conditions where historical land use linked to misguided government policies drives the specific modes landowners choose for wetlands restoration. Pursuant to this, using pervious materials to block formerly drained wetlands and constructing medium-to-large dams are evidenced as best management practices for returning wetlands to former ecological value. Developing the land for wildlife using such methods as constructing waterfowl nesting boxes, returning native fish, and planting riparian grasses that provide habitat and practicing range management that protects the greater watershed with tree plantings and rotational grazing also presented themselves among the most commonly-used best management practices for wetlands conservation.

## **5.2 Areas for Research Enhancement**

While this study yields useful and informative results about private landowner conservation, there are limitations to the study.

Time was a constraint. Given the limited research period, an explicit research design decision was made to characterize and divide the initial 24-landowner population into a manageable group of landowners operating within a similar framework, in this case ranch or farm size.

Interviews with this group of seven landowners were logistically complicated. For example, introductory phone calls were made that framed the conversation and requested an appointment for telephone interview. Telephone interviews were then held and analysis of findings ensued. However, even though the researcher carefully prepared an interview protocol to address multiple layers of information, further queries arose during the analysis stage, some as a result of findings. Put rather plainly, questions led to answers and when analyzed, those answers led to additional questions. Also given the less-personal dynamic of phone interviews (compared to in-person interviews), certain questions did not arise until after conversations concluded. With the deadline constraints of this research, it was not necessarily feasible to re-contact all landowners again with follow-up questions. While it may seem a simple enough measure to make a phone call, many landowners were found to have multiple farm management or work commitments, lived between two areas and thus unavailable, or were simply experiencing personal issues that prevented them from setting aside the time needed for follow-up interviews within the time frame needed to include these would-be additional results in analysis. Simply making contact with landowners proved challenging at times, resulting in a phone-and-message-and-return-call scenario lasting upwards of one week before actually conversing with landowners to then set aside a future time for a longer conversation. Thus, while it may initially appear an accomplishable-enough task to make contact with landowners via telephone, in practice, it was in some cases a two-week period between first contact and interview date. To this end, the timing

needed to carry out a second round of interviews with all landowners did not line up with research deadlines.<sup>14</sup>

Additionally, were there financial resources available, site visits to ranch and farm properties would have better informed this research. Much of this study discusses the physical and technical aspects of wetlands restoration. While the researcher did engage the landowners in explanatory, detailed discussion about restoration techniques, it would have been better if restoration projects could have been witnessed firsthand, to enable a better understanding of the engineering that took place as well as the scale of projects, both large and small. Visualization of properties was explored using Google Earth and other imagery but was not available for each case.

### **5.3 Recommendations for Future Research**

This work represents nearly seven months of combined part-and full-time intensive research. As such, it aims to present a comprehensive case study about private landowners of large-scale properties and the myriad detail surrounding their collective contribution to environmental conservation. However, using retrospection, there are identified areas for future or expanded research.

Environmental Law Institute award winners formed the base of this study. There are however, other environmental awards that recognize landowners for wetlands conservation. Examples include Ducks Unlimited's Wetland Conservation Achievement Award, the Department of the Interior's Partners in Conservation Award, and the National Oceanic and Atmospheric Administration's Excellence in Restoration Award. Perhaps other exemplary landowners would be appropriate for inclusion in future studies. An expanded research group, greater than seven individuals, holds the potential to yield statistically significant results better suited to broad generalization.

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<sup>14</sup> Note that the researcher did attempt to make follow-up calls, but for reasons specified above, was not able to contact the full study group.

Also, given that wetlands best management practices are linked to the terrestrial and climactic properties of landscape, it might be beneficial to include properties from elsewhere in North America, particularly Canada. There is the potential for additional research discovery were this study expanded in an international context.

While this study purposefully focuses on private landowners with holdings of 1,000 or more acres, there is the opportunity for study of small scale landowners, namely those who hold 999 or less acres. This research might initially be two-fold: (A), to investigate whether any of the best management practices implemented by either group are cross-cutting, or (B), to provide the small-scale private landowner community with the same framework of best management practices to be generalized for the greater population of small-scale landowners.

Further, note that the ELI has six individual national wetland awards categories. While these range a spectrum from education to scientific contributions, the award winners herein have still acted in an outstanding fashion that warrants study to determine if there are lessons learned that are appropriate for the conservation-minded community. A case study seeking out best practices could plausibly be carried out on individuals in each of ELI's NWA categories, to better inform additional landowners throughout the United States on multiple modes of contribution to wetlands stewardship.

#### **5.4 Research Implementation**

It is hoped that the findings presented herein will be made publicly available to landowners. Given that the resulting best management practices are presented in such a way that those techniques may be generalized for a larger population seeking to do wetlands conservation and also include a variety of site-specific techniques, it is hoped that this research will provide an instructional source of reference material for private landowners. Further, this research may potentially prove useful for conservation partners wishing to better understand the dynamics driving private landowner behavior.

#### **5.5 Conclusions**

This research is an exploration into the nexus of land ethic and the traits and historical factors that shape landscape management approaches. When that land ethic flourishes, it results in a suite of best management practices for private landowner conservation of wetlands. Does this research provide that best management practices can be replicated on other properties? Yes, as evidenced by review of case study documentation and interviews with landowners.

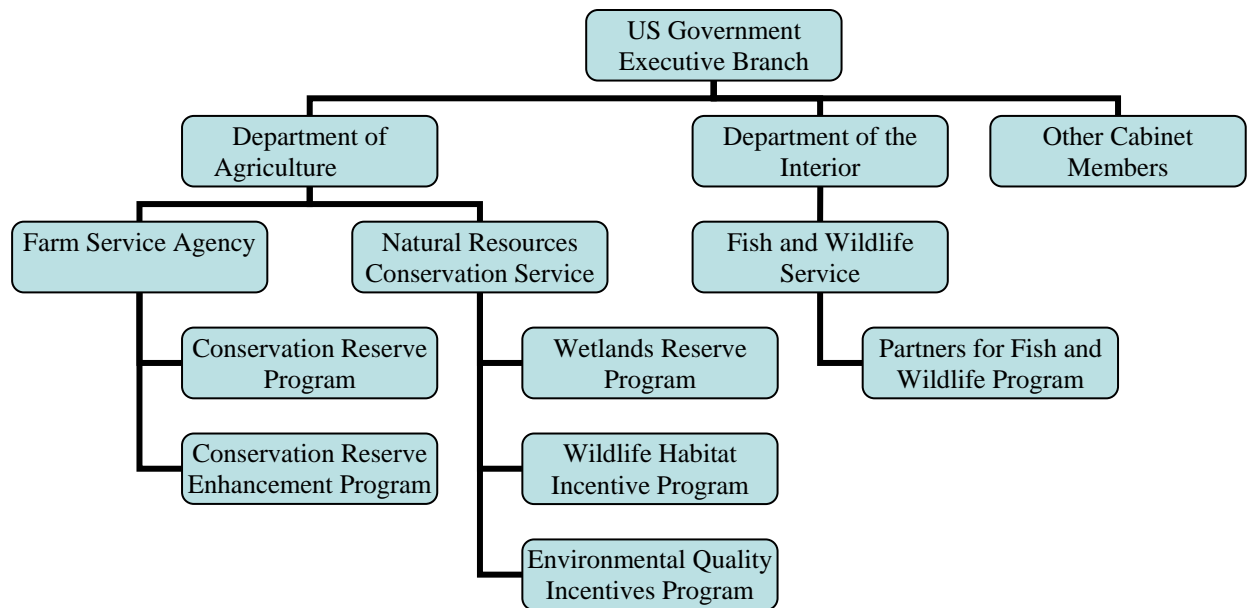
*When the land does well for its owner, and the owner does well by his land – when both end up better by reason of their partnership – then we have conservation.*

Aldo Leopold



## Appendix A

Organizational Chart: Featuring United States Government agencies and their respective landowner incentive programs.



## Appendix B

## Sample ELI National Wetland Award Nomination Form

The following text was obtained from the Environmental Law Institute.

**2012 NATIONAL WETLANDS AWARDS NOMINATION FORM**

**Before filling out this form, please review the eligibility requirements and instructions above.**

**I. CONTACT INFORMATION**

Please complete all fields in the table below.

NOMINEE (ENTER TEXT ABOVE)	NOMINATOR
AFFILIATION	AFFILIATION
MAILING ADDRESS	MAILING ADDRESS
CITY, STATE, ZIP	CITY, STATE, ZIP
TELEPHONE	TELEPHONE
FAX	FAX
E-MAIL	E-MAIL

**II. NOMINATION CATEGORY**

Please list the nomination category that best describes the nominee's work (see above for a listing and description of the six categories). List only **ONE** nomination category.

(ENTER TEXT ABOVE)

**III. NOMINATION QUESTIONS**

Please answer the following questions about the nominee and include them on this form.

1. Please provide a summary of the nominee's accomplishments in no more than 150 words. The summary should explain the nominee's accomplishments and why those accomplishments are significant. The summary will be published in the ceremony program, which is included in the *National Wetlands Newsletter*.

2. Describe the projects and/or activities that the nominee has been involved in. In your description, please include: (1) where the projects and/or activities took (or are taking) place; (2) what types of wetlands were (or are being) affected; (3) when the projects and/or activities began; and (4) what stage the projects/activities are at currently.
3. What was the nominee's contribution to the projects and/or activities, and what effect have the projects and/or activities had at the local, state, or national level? If appropriate, who were the intended audiences or beneficiaries? What effect will the wetlands-related projects and/or activities have?
4. What agencies, organizations, and individuals were involved in the nominee's projects and/or activities?
5. Does the nominee receive a salary or payments for the activities for which he or she is being nominated (e.g., work done as an employee or enrolled land in the Wetlands Reserve Program). If the nominee has gone beyond expectations, please explain how.
6. How did you learn about the 2011 National Wetlands Awards?

#### **IV. ADDITIONAL MATERIALS**

Please insert or attach additional materials. These could include letters of support, related articles, and press coverage, as part of the nomination package. Brief written descriptions, resumes, or bibliographies should be submitted in lieu of video or audio recordings, books, posters, lengthy articles, or similar

## Appendix C

Approved IRB Application

<i>Expedited</i>	<p><i>James Madison University</i></p> <p><b>HUMAN RESEARCH REVIEW REQUEST</b></p>	<i>Expedited</i>
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<p><b>Investigators:</b> This form is required for Expedited review for all JMU research involving human subjects. If you are eligible for an exemption request, please use the alternate forms at:  <a href="http://www.jmu.edu/sponsprog/irb/irbExemptionRequest.doc">http://www.jmu.edu/sponsprog/irb/irbExemptionRequest.doc</a>  <a href="http://www.jmu.edu/sponsprog/irb/irbFullBoardRequest.doc">http://www.jmu.edu/sponsprog/irb/irbFullBoardRequest.doc</a></p>	<p><b>FOR IRB USE ONLY:</b></p> <p>Protocol Number: IRB- _____  Received: _____</p> <p style="text-align: right;">1<sup>st</sup> Review: _____  2<sup>nd</sup> Review: _____  3<sup>rd</sup> Review: _____</p> <p><input type="checkbox"/> <b>Approved</b> <span style="float: right;">Date: _____</span></p> <p><input type="checkbox"/> <b>Disapproved</b> <span style="float: right;">Date: _____</span></p> <p><input type="checkbox"/> <b>Exempt</b> <span style="float: right;">Date: _____</span></p>
---	--

<b>External Funding:</b>	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	If YES,	Sponsor(s): _____
<b>Project Title:</b>	A Case Study in Wetlands Conservation: Identifying Best Management Practices for Landowner Stewardship		
<b>Project Dates:</b> <small>(Not to exceed 1 yr minus 1 day)</small>	From: 09/07/11	To: 10/10/11	<b>Minimum Number of Participants</b> <span style="float: right;">1</span>
			<b>Maximum Number of Participants</b> <span style="float: right;">11</span>
<b>Responsible Researcher(s):</b>	Allison Bredbenner		<b>Department:</b> ISAT
<b>E-mail:</b>	bredbeam@dukes.jmu.edu		<b>Address</b> 2003 Jonathan Drive, Sterling VA 20164
<b>Telephone:</b>	703 405 0543		<b>(MSC):</b> _____
<b>Please select:</b>	Visiting <input type="checkbox"/> Faculty	Adjunct <input type="checkbox"/> Faculty	Research <input type="checkbox"/> Associate
			Administrator/ <input type="checkbox"/> Staff Member
			Undergrad <input type="checkbox"/> Student
			Graduate <input checked="" type="checkbox"/> Student
<small>(if Applicable):</small>			
<b>Research Advisor:</b>	Dr. Maria Papadakis		<b>Department:</b> ISAT
<b>E-mail:</b>	papadamc@jmu.edu		<b>Address</b> _____
<b>Telephone:</b>	540-568-8142		<b>(MSC):</b> 4310

**Investigator: Please respond to the questions below. The IRB will utilize your responses to evaluate your protocol submission.**

1.  **YES**  **NO** Does the James Madison University Institutional Review Board define the project as **research**?

The James Madison University IRB defines "research" as a "systematic investigation designed to develop or contribute to *generalizable knowledge*." All research involving human participants conducted by James Madison University faculty, staff, and students is subject to IRB review.

2.  **YES**  **NO** Are the human participants in your study **living** individuals?

"Individuals whose physiologic or behavioral characteristics and responses are the object of study in a research project. Under the federal regulations, human subjects are defined as: living individual(s) about whom an investigator conducting research obtains:

(1) data through intervention or interaction with the individual; or (2) identifiable private information."

3.  **YES**  **NO** Will you obtain data through **intervention** or **interaction** with these individuals?

"Intervention" includes both physical procedures by which data are gathered (e.g., measurement of heart rate or venipuncture) and manipulations of the participant or the participant's environment that are performed for research purposes. "Interaction" includes communication or interpersonal contact between the investigator and participant (e.g., surveying or interviewing).

4.  **YES**  **NO** Will you obtain **identifiable private information** about these individuals?

"Private information" includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, or information provided for specific purposes which the individual can reasonably expect will not be made public (e.g., a medical record or student record). "Identifiable" means that the identity of the participant may be ascertained by the investigator or associated with the information (e.g., by name, code number, pattern of answers, etc.).

5.  **YES**  **NO** Does the study present **more than minimal risk** to the participants?

"Minimal risk" means that the risks of harm or discomfort anticipated in the proposed research are not greater, considering probability and magnitude, than those ordinarily encountered in daily life or during performance of routine physical or psychological examinations or tests. Note that the concept of risk goes beyond physical risk and includes psychological, emotional, or behavioral risk as well as risks to employability, economic well being, social standing, and risks of civil and criminal liability.

### **CERTIFICATIONS:**

For James Madison University to obtain a Federal Wide Assurance (FWA) with the Office of Human Research Protection (OHRP), U.S. Department of Health & Human Services, **all** research staff working with human participants must sign this form and receive training in ethical guidelines and regulations. "Research staff" is defined as persons who have direct and substantive involvement in proposing, performing, reviewing, or reporting research and includes students fulfilling these roles as well as their faculty advisors. The Office of Sponsored Programs maintains a roster of all researchers who have completed training within the past three years.

**Test module** at OSP website

<http://www.jmu.edu/sponsprog/irb/irbtraining.html>

Name of Researcher(s)	Training Completion Date
Allison Bredbenner	July 27, 2011
Maria Papadakis	1 September 2011

For additional training interests visit the National Institutes of Health Web Tutorial at:  
<http://cme.nci.nih.gov/>

By signing below, the Responsible Researcher(s), and the Faculty Advisor (if applicable), certifies that he/she is familiar with the ethical guidelines and regulations regarding the protection of human research participants from research risks. In addition, he/she agrees to abide by all sponsor and university policies and procedures in conducting the research. He/she further certifies that he/she has completed training regarding human participant research ethics within the last three years.

<b>Allison Bredbenner</b>	<b>2 September 2011</b>
Principal Investigator Signature	Date
_____	_____
Principal Investigator Signature	Date
_____	_____
Principal Investigator Signature	Date
_____	_____
Principal Investigator Signature	Date
_____	_____

_____ <b>Maria Papadakis</b> _____	_____ <b>September 6,</b>
<b>2011</b> _____	_____
Faculty Advisor Signature	Date

Submit an electronic version of your **ENTIRE** protocol to [jmu\\_grants@jmu.edu](mailto:jmu_grants@jmu.edu).  
 Provide a **SIGNED** hard copy of the Research Review Request Form to:  
 Office of Sponsored Programs, MSC 5728, James Madison Administrative Complex, Bldg #6,  
 Suite 26

**Purpose and Objectives:**

The research is part of a Master's thesis in Integrated Science and Technology. The thesis is a study of the wetlands conservation practices undertaken by private landowners who have received a National Wetlands Award from the Environmental Law Institute.

The study group are all National Wetlands Awards award recipients. Each year the Environmental Law Institute sponsors the National Wetland Awards, which honors individuals and organizations for their contribution to wetlands conservation. There are six categories of awards given each year. My research focuses solely on awards given to individuals in the Landowner Stewardship category. In this category, private individuals are recognized for voluntarily electing to manage the wetlands on their property in an environmentally responsible way, whether the means includes wetlands banking, wetlands restoration, or conservation of existing wetlands.

This study will be looking at award winners from 1991 to present who are also large landowners (more than 1,000 acres). The research objective for this thesis is to identify the best

management practices for private, large landowner stewardship of wetlands. By interviewing landowners with respect to the details of their wetlands projects, I will be able to identify common factors among landowners that can then be distilled into a set of best management practices for guiding similar landowners wishing to conserve wetlands on their property.

Procedures/Research Design/Methodology/Timeframe:

This is a time sensitive project. I am a student in the ISAT Malta program, and due to the immersion nature of our program we must complete our thesis by November 1. I need to complete these interviews by October 10 to meet program deadlines.

The National Wetlands Award winners are publicly known, and are the focus of national, state, and local media coverage each year. A body of public information already exists about the award-winning landowners and their projects. There are 11 award winners who fit within the scope of this research and who will be contacted as possible participants in this study. All participants will be at least 18 years of age.

This thesis will apply strategies set forth by McDowell<sup>15</sup> for interviewing. Interviews will be conducted with the study participants over the telephone. A semi-structured, informal, and open-ended interview protocol will be used regarding the history, progression, management, and current status of their respective wetland projects. There is minimal risk anticipated for research participants, and every interview will be carried out via a comfortable, friendly dialogue. The interview itself will (a) solicit information that is not “human subjects” (e.g., species that visit local wetlands), (b) validate publicly-available information about the award-winning project, (c) inquire about personally identifiable information, and (d) request that non-sensitive quotes or observations be available for attribution.

Research participants will be contacted by phone prior to the interview and asked about their willingness to participate in the research project. (See recruitment transcript at the end of this document.) If they are potentially willing, they will be given the written consent form prior to the interview by email, US postal mail, or FAX. Upon confirmation that a participant is willing to be interviewed, an interview appointment will be set up, and the interview conducted. (See protocol attached at the end of this document.) Participants will be asked to confirm their consent verbally at the beginning of the interview. (See verbal consent transcript at the end of this document.) The interviews should take approximately 30 minutes. Interviews will take place during the month of September 2011, pending IRB approval.

Participants will be asked for their permission to record the interview for ease of note-taking, although recording is not necessary and the interview can be conducted without it. The interview will be conducted with voice-over-internet protocol (VoIP, e.g., Skype) and a freestanding microphone to enable recording with a digital recorder (if consented to by the participant). Participation is voluntary. Participants can withdraw at any time without consequences of any kind.

Data Analysis:

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<sup>15</sup> McDowell, Earl. Interviewing Practices for Technical Writers. (New York: Baywood Publishing Company, 1991).

I will conduct content analysis of the interview information and aggregate/distill the information through standard case study analysis.<sup>16</sup> Patterns and factors common to the participants will be identified and discussed as potential best management practices for private landowner wetlands conservation and stewardship.

Potential risks to interview subjects include professional or social difficulties through the mishandling of personal information. I will work to ensure maximum confidentiality of the records of interview participants, and to avoid breaches of privacy through the deductive disclosure of identity in the written work. Personally identifiable information about participants will not be discussed with anyone who is not a researcher on this project, will not be discussed in public settings, and will not be presented in the written work. Consent forms will be stored in a locked file in a locked laboratory under the direction of my thesis advisor. All notes that are recorded on a laptop will be secured with a password. Audio recordings will be secured by password on a laptop, then deleted once transcribed. The confidentiality of interview participants will be preserved through the following methods:

- The participant's name will not be recorded on the audio file.
- No direct identifiers, such as position titles, names, and contact information, will be reported in research results.
- Aggregated information that derives from personally identifiable information will be reviewed and edited carefully to prevent deductive disclosure of identity.
- Interview files will be preserved only so long as research requires and after this time will be disposed of.
- No persons outside of the researcher and the faculty advisor will have access to or will be involved in the processing of interview recordings.

Reporting Procedures:

The intended audience at the conclusion of this research is the scholarly, policy, and practitioner community involved in wetlands conservation and stewardship. Findings will be available in the public domain as a completed Master's thesis. Articles, book chapters, and other scholarly works are also possible. Final results will be made available to participants upon request.

**Experience of the researcher (and advisor, *if student*):**

Allison Bredbenner (the researcher, and a student) has held past professional positions at The Specialized Group (a consulting firm in Tokyo, Japan) and Craver, Mathews, Smith & Company (a consulting firm in Reston, VA) in which in-person and telephone interviews were part of her duties. As a recruiter and later as a copy writer at these firms, she learned and applied interview skills that I expect will aid her research.

Dr. Maria Papadakis (faculty advisor) is a PhD social scientist on the faculty in Integrated Science and Technology. Her research record includes a significant amount of survey and interview research in both academia and the federal government, and has included research content that involving personally identifiable information.

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<sup>16</sup> **SEE, FOR EXAMPLE, ROBERT YIN , CASE STUDY RESEARCH: DESIGN AND METHODS, THIRD EDITION (CA: SAGE PUBLISHERS, 2003).**



Additional Attachments as applicable:

- A. Recruitment telephone script
- B. Written consent form
- C. Verbal consent telephone script
- D. Interview protocol

#### Attachment A. Recruitment Telephone Script

Note: Study participants will first be contacted by telephone to briefly describe the project and see if they are potentially willing to be interviewed (see script below). If participants are not home, a brief message will be left on voicemail identifying the researcher and her desire to interview the individual as part of a study on National Wetlands Award winners. Her phone number will also be left on the voicemail.

Once potential participants have indicated their interest, they will be provided with the written informed consent statement (see Attachment B) through the medium that they prefer [email, FAX, postal mail]. A follow-up phone call will confirm receipt of the informed consent statement, answer questions about it, and set up the interview appointment.

At the time of the official interview, the researcher will formally obtain the informed consent of the participant through verbal consent (see script, Attachment C).

\* Recruitment Phone Script: Hello, my name is Allison Bredbenner, and I am a graduate student at James Madison University in Harrisonburg, Virginia. I am conducting research for my Masters thesis on the Environmental Law Institute's National Wetlands Award winners. I am focusing specifically on large landowners who won in the Landowner Stewardship category, and my goal is to identify and develop best management practices for private landowner stewardship and wetlands conservation. To carry out this research, I would like to interview you sometime in the next 2-3 weeks about your award-winning project. It would take about 30 minutes of your time.

If you think you are willing to be interviewed, I would like to send you a list of my questions as well as a consent form for the interview. I'll give you time to look over the questions and the consent form, then I will follow up again with another phone call to confirm your participation and set up an interview time. Can you tell me how you would like for me to send you this information (email, FAX, postal mail)?

Thank you very much for your time.

Attachment B. Written Consent Form (On JMU Letterhead)

[Name and address of participant]

Dear [Name of Participant]:

You are being asked to participate in a research study conducted by Allison Bredbenner from James Madison University because you are a past winner of a National Wetlands Award. The purpose of this study is to identify best management practices for private landowner wetlands conservation and stewardship. This study will contribute to the researcher's completion of her master's thesis.

If you decide to participate in this research study, you will be asked to verbally agree to this consent form once all of your questions have been answered to your satisfaction. This research consists of an interview that will be conducted with about 10 other National Wetlands Award winners. You will be asked to provide answers to questions related to wetlands conservation on your property, and these questions will be given to you ahead of time to review. If you agree, the interview will be recorded to make note-taking easier for the researcher. The recording will be deleted once the interview has been transcribed.

Participation in this study will take about 30 minutes of your time. The potential benefits from your participation in this study include the potential for you to personally learn additional wetlands conservation techniques, and to encourage private wetlands conservation throughout the United States. If you'd like, you will be given a summary of the key findings from this research.

Most of the information that we will ask about is not of a private nature, and the researcher does not perceive more than minimal risks from your involvement in this study. Any of your responses that reflect private, personally identifiable information will be stored in a secure location accessible only to the researcher or her advisor. Individual confidential responses will be aggregated in a way that they represent generalizations from all responses, and in a way that your identity cannot be deduced. The researcher may ask you for permission to quote you by name in her master's thesis or published works (which you may decline without consequences of any kind), and you are welcome to provide comments and insights that you would like to be quoted on.

The results of this research will be presented as a master's thesis and possibly in scholarly publications and presentations. The researcher retains the right to use and publish non-private, non-identifiable data. At the end of this study, the research notes will be saved for two years by the researcher's advisor at James Madison University, at which point they will be destroyed.

Your participation is entirely voluntary. You are free to choose not to participate. Should you choose to participate, you can withdraw at any time without consequences of any kind.

If you have questions or concerns during your participation in this study, or if you would like to receive a copy of the research results, please contact the researcher or the researcher's thesis advisor:

Allison Bredbenner

Dr. Maria Papadakis

Department of Integrated Science & Technology Department of Integrated Science &  
Technology

James Madison University  
bredbeam@dukes.jmu.edu

James Madison University  
Telephone: (540) 568-8142  
papadamc@jmu.edu

If you have questions or concerns about your rights as a research participant, please contact:

Dr. David Cockley  
Chair, Institutional Review Board  
James Madison University  
(540) 568-2834  
cocklede@jmu.edu

**THANK YOU FOR YOUR CONSIDERATION.**

[Signature here.]

Allison Bredbenner

Attachment C. Verbal Consent Telephone Transcript

[Note: because of the time-sensitive nature of this research, participants are given the full written consent document ahead of time by email, FAX, or US postal mail. However, obtaining signed written consent is logistically impracticable. Participants will be asked for their verbal consent at the beginning of the interview.]

Hello [name of participant], this is Allison Bredbenner from James Madison University. Thank you for speaking with me about my masters research on private landowner wetlands conservation. Before we get started, I would like to confirm that you received and reviewed the written copy of the informed consent statement I sent you? Do you have any questions about the informed consent statement that I can answer for you?

Will you confirm that you are at least 18 years old and that you agree to participate in the interview?<sup>17</sup> Thank you so much for your time. Please feel free to ask questions at any time, to decline to answer any of my questions, or to stop the interview. There are no consequences for doing this.

Also, would it be alright if I recorded our interview? This will help with my note taking and shorten the amount of time it takes for the interview. Once I have transcribed the recording into my notes, the file will be destroyed.

Thank you. I'll get started with the interview questions now.

\*\*\*\*\*

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<sup>17</sup> If no, then « thank you so much for your time. I won't trouble you any more. Good-bye. »

I attest that the aforementioned written consent has been orally presented to the human subject and the human subject provided me with an oral assurance of their willingness to participate in the research.

---

Interviewer's Name (Printed)

---

Interviewer's signature

---

Date

#### Attachment D. Interview Protocol

This project will use a semi-structured, informal, open-ended interview protocol. Interview questions will include or be similar to those below:

1. Do you know the history of your property? How long have you lived there?
2. Why did you decide to do wetlands conservation on your land?
3. What is the status of the project now compared to when you won the National Wetlands Award?
4. How are your wetlands managed? Has that changed over time?
5. How was your wetlands conservation plan developed, and who helped with the conservation work?
6. How did this project progress over time?
7. What were the lessons learned from this conservation project?
8. What were the key obstacles that you confronted, and how did you deal with these?
9. What do you think are the requirements for a successful private wetlands project?
10. What is the advice you have for other landowners wishing to do wetlands stewardship?
11. How has having the wetlands affected your farm or ranch operations?
12. What were your motivations/goals for wetlands stewardship?

Appendix D

Media

Article featuring 2011 winner Scott House.

# 'Field' trip gives students hands-on opportunities

BY SHERRY F. PRUITT  
SUNSHINE WRITER

**JONESBORO** — Seventy-seven Harrisburg Middle School students took a "field" trip Wednesday, during which they experienced hands-on radiotelemetry, aquatic insect sampling, a snake and salamander exhibition and craft building.

Under the direction of Kevin Keen, a National Science Foundation GK-12 fellow who teaches one day a week at the middle school, two school buses took the youngsters to the Bearitage Learning and Research Facility at Bearitage Farms near Cherry Valley.

The Bearitage Wetland Research and Education Farm and wetland complex is owned and managed by Scott House, and Arkansas State University operates the field station on the property, said Keen, a Marmaduke native.

The National Science Foundation funded the project for the fifth-grade students, who spent the day rotating through four stations. The program is in the third year of a 5-year funding cycle.

Two stations were located at a building on the grounds of the research facility for outdoor science education, while another two are across the Lanquille River, situated among fields, woods and a small pond.

Some of the six GK-12 fellows and two volunteers scooped sediment from the bottom of the pond, strained most of the water and poured the remains onto a flat tray so the youngsters could find tiny bugs, insects, eggs and other minute life forms.

"I found something! What is that nasty thing moving?" asked student Maddy Webb.

Once they found an egg, an insect or whatever, the students used magnifying glasses to determine what they found, based on diagrams with the official names, a description and in image of the life form.

"I found something gross, and I was about to cream," student Lili Ana Velasquez said.

"I found an unidentified floating object," student Trevor Paulsen said.

Amanda White, a biology major of Marion, is usually working on her thesis in entomology, but Wednesday she was kneeling in the pond straining muck for students to study on a quest for tiny nutritious creatures.

One group found three baby mayflies (ephemeroptera), two beetles (coleoptera) and two flies (diptera), White said.

Student Emily Newcomb said she found a frog's egg, and White threw a half inch long back into the pond.

Some of the groups found tiny transparent freshwater shrimp that were camouflaged in water and muck until they flipped and flopped, exposing themselves.

"We get to be like scientists," Velasquez said. "This is better than reading," student Natalie Johns said.

Johns said one of the stations focused on snakes and salamanders in the field station. Velasquez said the snakes were pets belonging to one of the ASU students. They hid under the sand, and when the owner pulled them out, the girls screamed.



Harrisburg Middle School fifth-graders learn about nature in hands-on activities during a field trip Wednesday.

Owned farm near Cherry Valley, Pictured from left are Emily Newcomb, Natalie Johns and Lili Ana Velasquez.

White talked to the youngsters about blood-worms, saying she raises them in a lab at Arkansas State. They're called blood-worms because they have red heads, White said.

At one station students hit bird houses with materials donated by The Home Depot. Teresa Sanders is in her second year as a mentor teacher for the GK-12 program.

"This is important to expose children to hands-on experiences they couldn't get in the classroom or from a book," she said. "I find it rewarding, and it brings new ideas into the classroom."

sherry@jonesboro.com

## Glossary of Acronyms

**CRP**, Conservation Reserve Program

**CREP**, Conservation Reserve Enhancement Program

**CWA**, Clean Water Act

**ELI**, Environmental Law Institute

**EPA**, Environmental Protection Agency

**IRB**, Institutional Review Board

**NRCS**, Natural Resources Conservation Service

**NWA**, National Wetlands Awards

**U.S.**, United States

**USACE**, United States Army Corps of Engineers

**USDA**, United States Department of Agriculture

**USFWS**, United States Fish and Wildlife Service

**WHIP**, Wildlife Habitat Incentives Program

**WRP**, Wetlands Reserve Program

## References

- Aslan, C. E., Hufford, M. B., Epanchin-Niell, R., Port, J. D., Sexton, J. P., & Waring, T. M. (2009). Practical challenges in private stewardship of rangeland ecosystems: Yellow starthistle control in Sierra Nevadan foothills. *Rangeland Ecology & Management*, 62(1), 28-37.  
doi:10.2111/07-123
- Benson, D. E. (2001). Wildlife stewardship and recreation on private lands: What now? Proceedings from *Wildlife Management Institute Transactions of the Sixty-Sixth North American Wildlife and Natural Resources Conference*. Washington, DC.
- Berkland, M. W., & Rewa, C. A. (2005). Environmental quality incentives program contributions to fish and wildlife conservation. *Fish and Wildlife Benefits of Farm Bill Programs: 2000-2005 Update*. Bethesda, MD.
- Brown, K. L., & Graham, G. L. (2001). The landowner incentive programs: Lessons learned and preliminary results. Proceedings from *Wildlife Management Institute Transactions of the Sixty-Sixth North American Wildlife and Natural Resources Conference*, Washington, DC.
- Brunson, M. W. & Huntsinger, L. (2008). Ranching as A conservation strategy: Can old ranchers save the new west. *Rangeland Ecology & Management.*, 61 (2), 137-147. Retrieved from [www.srmjournals.org](http://www.srmjournals.org)
- Clancy, S., & Jacobson, B. (2007). A new conservation education delivery system. *Renewable Agriculture and Food Systems*, 22(1), 11-19. Retrieved from <http://journals.cambridge.org>
- Clearfield, Frank & Osgood, Barbara. Soil Conservation Service. (1986). *Sociological Aspects of the Adoption of Conservation Practices*. Washington, DC.

Code of Federal Regulations. (1980). United States Government. Retrieved from <http://www.gpoaccess.gov/cfr/index.html>

Copeland, Claudia. Congressional Research Service. (2010). *Wetlands: An Overview of Issues* (7-5700). Washington, DC.

Daley, S. S., Cobb, D. T., Bromley, P. T., & Sorenson, C. E. (2004). Landowner attitudes regarding wildlife management on private land in North Carolina. *Wildlife Society Bulletin*, 32(1), 209-219. doi:10.2193/0091-7648(2004)32[209:LARWMO]2.0.CO;2

Didier, E. A., & Brunson, M. W. (2004). Adoption of range management innovations by Utah ranchers. *Journal of Range Management*, 57(4), 330-336. Retrieved from <https://uair.arizona.edu/journals?r=http://jrm.library.arizona.edu/>

Ducks Unlimited. (n.d.). Retrieved from <http://www.ducks.org/>

Elconin, P., & Luzadis, V. A. (1998). Landowner satisfaction with conservation easements. *Wild Earth*, 8(2), 49-51. Journal unavailable online.

Environmental Law Institute. (n.d.). Retrieved from [www.eli.org](http://www.eli.org)

Environmental Law Institute. (2008). *State Wetland Protection: Status, Trends, and Model Approaches*. Washington, DC: Roxanne Thomas.

Environmental Protection Agency. (n.d.). Retrieved from [www.epa.gov](http://www.epa.gov)

Environmental Protection Agency. (2001a). *Functions and Values of Wetlands* (Publication Record EPA-843-F-01-002c). Washington, DC.



Environmental Protection Agency. (2001b). *Threats to Wetlands* (Publication Record EPA843-F-01-002d). Washington, DC.

Environmental Protection Agency. (2001c). *Types of Wetlands* (Publication Record EPA-843-F-01-002b). Washington, DC.

Environmental Protection Agency. (2001d). *Wetlands Restoration* (Publication Record EPA-843-F-01-002e). Washington, DC.

Environmental Protection Agency. (2002). *Hypoxia and Wetland Restoration* (Publication Record EPA843-F-02-002). Washington, DC.

Environmental Protection Agency. (2003). *An Introduction and User's Guide to Wetland Restoration, Creation, and Enhancement*. Washington, DC.

Environmental Protection Agency. (2004a). *Wetlands Overview* (Publication Record EPA-843-F-04-011a). Washington, DC.

Environmental Protection Agency. (2004b). *Wetland Regulatory Authority* (Publication Record EPA843-F-04-001). Washington, DC.

Environmental Protection Agency. (2006a). *Economic Benefits of Wetlands* (Publication Record EPA-843-F-06-004). Washington, DC.

Environmental Protection Agency. (2006b). *Wetlands: Protecting Life and Property from Flooding* (Publication Record EPA8343-F-06-001). Washington, DC.

Environmental Protection Agency. (2008a). *Wetlands Compensatory Mitigation* (Publication Record EPA-843-F-08-002). Washington, DC.

Environmental Protection Agency. (2008b). *Wetlands Functions and Values*. Retrieved from <http://www.epa.gov/owow/watershed/wacademy/acad2000/wetlands/>

Esseks, J. D., & Kraft, S. E. (1986). Landowner views of obstacles to wider participation in the conservation reserve program. *Journal of Soil and Water Conservation*, 41(6), 410-414. Retrieved from [www.jswconline.org](http://www.jswconline.org)

Farm Service Agency. (n.d.) Retrieved from <http://www.fsa.usda.gov>

Fischer, A., & Bliss, J. C. (2008). Behavioral assumptions of conservation policy: Conserving oak habitat on family-forest land in the Willamette Valley, Oregon. *Conservation Biology*, 22(2), 275-283. doi:10.1111/j.1523-1739.2007.00873.x

Forum of Local Governments. (2005). *Green/Duwamish and Central Puget Sound Watershed Salmon Habitat Plan*. Seattle, WA.

Gelso, B. R., Fox, J. A., & Peterson, J. M. (2008). Farmers' perceived costs of wetlands: Effects of wetland size, hydration, and dispersion. *American Journal of Agricultural Economics*, 90(1), 172-185. Retrieved from <http://www.aaea.org/publications/ajae/>

Habron, G. B. (2004). Adoption of conservation practices by agricultural landowners in three Oregon watersheds. *Journal of Soil and Water Conservation*, 59(3), 109-113. Retrieved from [www.jswconline.org](http://www.jswconline.org)

Intergovernmental Panel on Climate Change. (2000). *Land Use, Land-Use Change and Forestry*. Cambridge, United Kingdom.

Kaetzl, B. R., Hodges, D. G., Houston, D., & Fly, J. M. (2009). Predicting the probability of landowner participation in conservation assistance programs: A case study of the northern

Cumberland plateau of Tennessee. *Southern Journal of Applied Forestry*, 33(1), 5-8. Retrieved from <http://www.safnet.org/publications/southern/index.cfm>

Kilgore, M. A., Snyder, S. A., Schertz, J., & Taff, S. J. (2008). What does it take to get family forest owners to enroll in a forest stewardship-type program. *Forest Policy and Economics*, 10(7-8), 507-514. Retrieved from <http://www.sciencedirect.com/science/journal/13899341>

Kingsbury, L., & Boggess, W. American Agricultural Economics Association. (1999). *Economic analysis of riparian landowner's willingness to participate in Oregon's conservation reserve enhancement program*. Milwaukee, Wisconsin.

Land Trust Alliance. (n.d.). Retrieved from [www.landtrustalliance.org](http://www.landtrustalliance.org)

Lovell, S. T., & Sullivan, W. C. (2006). Environmental benefits of conservation buffers in the United States: Evidence, promise, and open questions. *Agriculture Ecosystems & Environment*, 112(4), 249-260. Retrieved from <http://www.sciencedirect.com/science/journal/01678809>

McDonnell, Earl. (1991) *Interviewing Practices for Technical Writers*. Amityville, New York: Baywood Publishing Company.

Napier, T. L., McCarter, S. E., & McCarter, J. R. (1995). Willingness of Ohio land owner-operators to participate in a wetlands trading system. *Journal of Soil and Water Conservation*, 50(6), 648-656. Retrieved from [www.jswconline.org](http://www.jswconline.org)

National Archives. (n.d.). Retrieved from [www.archives.gov](http://www.archives.gov)

Natural Resources Conservation Service. (n.d.). Retrieved from [www.nrcs.usda.gov](http://www.nrcs.usda.gov)

Natural Resources Conservation Service. (2002). *Adoption of Conservation Buffers: Barriers and Strategies*. Washington, DC.

Natural Resources Conservation Service. (2004). *Guide for Estimating Participation in Conservation Programs and Projects* (Publication Series Record 1801). Washington, DC.

Natural Resources Conservation Service. (2007). *Conservation of the Farm Bill: Social Factors Influencing Implementation of Programs*. Washington, DC.

Natural Resources Conservation Service. (2008). *At a Glance: Wetlands Reserve Program*. Washington, DC.

National Wetland Awards. (n.d.). Retrieved from <http://www.nationalwetlandsawards.org/>

National Wetland Awards. (1991-2011). Retrieved from <http://nationalwetlandsawards.org/pastwinners.htm>

Ramsar Convention. (n.d.). Retrieved from [www.ramsar.org](http://www.ramsar.org)

Raymond, L., & Olive, A. (2008). Landowner beliefs regarding biodiversity protection on private property: An Indiana case study. *Society & Natural Resources*, 21(6), 483-497. Retrieved from <http://www.tandf.co.uk/journals/tf/08941920.html>

Rewa, C. A. (2005). Wildlife benefits of the wetlands reserve program. *Fish and Wildlife Benefits of Farm Bill Programs: 2000-2005 Update*. Bethesda, MD.

Rissman, A. R. (2010). Designing perpetual conservation agreements for land management. *Rangeland Ecology and Management*, 63(2), 167-175. Retrieved from <http://www.srmjournals.org/>

Roberts, S. D., & Parker, G. R. (1998). Ecosystem management: Opportunities for private landowners in the central hardwood region. *Northern Journal of Applied Forestry*, 15(1), 43-48. Retrieved from <http://www.safnet.org/publications/northern/index.cfm>

Sargent, M.S. & Carter, K.S. (1999). *Managing Michigan Wildlife: A Landowners Guide*. Michigan United Conservation Clubs. East Lansing, MI. Retrieved from [http://www.dnr.state.mi.us/publications/pdfs/huntingwildlifehabitat/landowners\\_guide/habitat\\_mgmt/Wetland/Wetland\\_Restoration\\_Techniques.htm](http://www.dnr.state.mi.us/publications/pdfs/huntingwildlifehabitat/landowners_guide/habitat_mgmt/Wetland/Wetland_Restoration_Techniques.htm)

Schrader, C. C. (1993). Wetland conservation techniques on private lands: Landowner perceptions of streamland management. Proceedings from *Hillsborough Community College 20th Annual Conference on Wetlands Restoration and Creation*. Tampa, FL.

Seidemann, R. M., & Susman, C. D. (2002). Wetlands conservation in Louisiana: Voluntary incentives and other alternatives. *Journal of Environmental Law and Litigation*, 17(2), 441-457. Retrieved from <http://www.law.uoregon.edu/org/jell/>

Shultz, S. D. (2005). Evaluating the acceptance of wetland easement conservation offers. *Review of Agricultural Economics*, 27(2), 259-272. doi:10.1111/j.1467-9353.2005.00225.x

Suter, J. F., Poe, G. L., & Bills, N. L. (2008). Do landowners respond to land retirement incentives? Evidence from the conservation reserve enhancement program. *Land Economics*, 84(1), 17-30. Retrieved from <http://le.uwpress.org/>

The Nature Conservancy. (n.d.). Retrieved from [www.nature.org](http://www.nature.org)

Union of Concerned Scientists. (2009). Retrieved from <http://www.ucsusa.org/gulf/gcplacesmis.html>

United States Department of Agriculture. (n.d.). Retrieved from [www.usda.gov](http://www.usda.gov)

United States Department of Agriculture. (1998). *Wetlands and Agriculture: Private Interests with Public Benefits*. (Economic Research Service, Agricultural Economic Report Number 765). Washington, DC.

United States Fish and Wildlife Service. (n.d.). Retrieved from [www.fws.gov](http://www.fws.gov)

United States Fish and Wildlife Service. (2011). *Status and Trends of Wetlands in the Conterminous United States 2004 to 2009*. Washington, DC.

Valdivia, C., & Poulos, C. (2009). Factors affecting farm operators' interest in incorporating riparian buffers and forest farming practices in northeast and southeast Missouri. *Agroforestry Systems*, 75(1), 61-71. Retrieved from <http://www.springer.com/life+sciences/forestry/journal/10457>

Vokoun, M., Amacher, G. S., Sullivan, J., & Wear, D. (2010). Examining incentives for adjacent non-industrial private forest landowners to cooperate. *Forest Policy and Economics*, 12(2), 104-110. Retrieved from <http://www.sciencedirect.com/science/journal/13899341>

Walker, P. A. (2006). How the west was one: American environmentalists, farmers and ranchers learn to say 'howdy, partner'. *Outlook on Agriculture*, 35(2), 129-135. Retrieved from <http://www.ippublishing.com/oa.htm>

Wetlands Watch. (n.d.). Retrieved from [www.wetlandswatch.org](http://www.wetlandswatch.org)

Yin, Robert. (1984). *Case Study Research: Designs and Methods*. Beverly Hills, California: Sage Publications.

Zedler, Joy B. & Kercher, Suzanne. (2005). Wetland Resources: Status, Trends, Ecosystem Services, and Restorability. *Annual Review Environmental Resources*, 30, 39-74. doi: 10.1146/annurev.energy.30.050504.144248