

Expanding Protection of Ecosystem Services on Agricultural Lands in the U.S.

U.S. Farm Bill and Regulation Considerations

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Abstract

Ecosystem services that people depend upon for their well-being are being lost at an alarming rate. These services include the provisioning of natural resources, food, medicine, flood protection, climate regulation, water purification, and biodiversity retention. In the U.S., the main threat to these services comes from the rapid pace of land conversion. In just a twenty-year period, an area the size of the State of Illinois of farmland, wildlife habitat and open space was converted to urban, suburban or industrialized uses. The majority of land in the U.S. is privately owned and maintained in some form of agriculture. These lands, whether used for cattle grazing, crop production, or timber production, are essential to providing the ecosystem services people depend on for the basic necessities of life.

This thesis author examined what can be done to expand the protection of ecosystem services on agricultural lands to provide for the well-being of the nation, while maintaining an economically viable agricultural industry. It provides options for 1) improving existing conservation programs, 2) increasing landowner participation in conservation programs, and 3) increasing the use of better environmental practices on agricultural lands, regardless of program participation.

The methods used for formulating these options began with an extensive literature review of existing U.S. policies and conservation programs affecting land stewardship on agricultural lands. This was followed by a review of the EU policies and a case study of the UK's Environmental Stewardship Program, to look for potentially transferable agricultural environmental plan options. Additionally, extensive interviews were conducted with USDA program managers, state conservationists, other agency officials, landowners, and environmental consultants to determine the daily functioning logistics of the current programs and regulations.

Findings from this research show that current conservation programs are effective in reducing impacts and are even improving ecosystem services; but their reach is limited, applications can be cumbersome, landowner understanding and acceptance is highly variable, and implementation could be more effective. This thesis author concluded that combining and streamlining current conservation programs has the potential for large cost savings while simultaneously making the programs easier for landowners to comprehend. This should result in both increased desire on the part of landowners to enroll, and increased capacity for enrollment. An increase in cross-compliance requirements or shifting funds from commodity support payments to conservation payments would provide even greater capacity, while still providing income support to the agricultural sector. Finally, consideration should be given to fining landowners who cause excessive ecosystem damage. These fines that would attempt to equalize the 'market price' with the 'real price'. This would be a revenue neutral program where the funds received from these measures would be allocated to the conservation programs. Ideally, costs of these measures would be sufficiently high to encourage investment in better conservation practices.

Keywords: ecosystem services, agriculture, farm bills, conservation programs, environmental policies

Executive Summary

Ecosystem services that people depend upon for their well-being are being lost at an alarming rate. Ecosystem services are defined as “services provided by the natural environment that benefit people (DEFRA, 2007).” Examples of these services include products such as food, timber, plant-derived medications and fuel, as well as less obvious services such as air and water purification, climate regulation, flood protection, recreation opportunities and biodiversity retention. These services are crucial to human well-being, as most cannot be artificially reproduced.

The core of the problem is that unless ecosystem services are tradable commodities belonging to individuals, such as timber rights, economic markets do not have incentives to conserve them. Since a large portion of ecosystem services do not fall within the category, too little is being done to protect these services within the free market. There are many policies and programs in place that have slowed or reversed degradation of ecosystems and their services that are not protected by the market. Despite the significant benefits these policies have produced, these improvements cannot keep pace with the ever increasing demands for ecosystem services.

In the U.S., the main threat to these services comes from the rapid pace of land conversion. Never before in the nation’s history has the U.S. experienced the developmental pressure it is under today. The National Resource Inventory shows that the loss of farmland, wildlife habitat and open space has accelerated over the past two decades. Between 1982 and 2001, approximately 14 million hectares (34 million acres) were converted to urban, suburban or industrialized uses. That is an area equivalent to the size of the state of Illinois (USDA, 2011a). The U.S. has lost over 50 percent of its wetlands, with some states having lost over 90 percent of these valuable systems (NRCS, 2011d). These losses are due not only to population growth, but also to urban sprawl.

The majority of land in the U.S. is privately owned and maintained in some form of agriculture. These lands, whether used for cattle grazing, crop production, or timber production, are essential to providing the ecosystem services people depend. The U.S. is one of the largest agricultural commodity producers in the world. In 2008, the value of agricultural production in the U.S. was \$365 billion, with agricultural exports totaling \$115 billion. Farming is considered to be a critical component of the food and fiber system, which in 2002 employed 24 million people and contributed \$1240 billion (12.3%) to the GDP in the U.S. Despite this, there has been a continual decline in the number of farms and farmland acreage across the U.S. Additionally, there has been a shift from smaller family-owned farms to larger commercial scale farming operations (OECD, 2011). This conversion may result in a decreased land stewardship ethic since the industrial farmers may have less pride of ownership and an increased profit motive.

This thesis author examined what can be done to expand the protection of ecosystem services on agricultural lands to provide for the well-being of the nation, while maintaining an economically viable agricultural industry. It provides options for 1) improving existing conservation programs, 2) increasing landowner participation in conservation programs, and 3) increasing the use of better environmental practices on agricultural lands, regardless of program participation.

The methods used for formulating these options began with an extensive literature review of existing U.S. policies and conservation programs affecting land stewardship on agricultural lands. This was followed by a review of the EU policies and a case study of the UK’s Environmental Stewardship Program, to look for potentially transferable agricultural

environmental plan options. Additionally, extensive interviews were conducted with USDA program managers, state conservationists, other agency officials, landowners, and environmental consultants to determine the daily functioning logistics of the current programs and regulations.

Most regulatory instruments affecting agriculture were established in the 1970s; these included the Clean Air Act, the Clean Water Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Endangered Species Act. Cross-compliance measures began in 1985, making eligibility for agricultural income support subject to compliance with some level of environmental standards. Much of the ecosystem services protection today results from voluntary participation in agricultural conservation programs. The scope of issues addressed under these programs include erosion, wildlife habitat, water quality, air quality, biodiversity, carbon sequestration and an array of other concerns. Assistance can include cost-share, technical assistance, grants, loans, tax rebates, conservation easements, and rental payments. The majority of conservation programs are funded under the U.S. Farm Bills. This table provides an overview of the eight largest programs and their funding levels.

Program Name & Acronym	Basic Program Description	5-year Budget Under 2008 Farm Bill (USD million)
Conservation Reserve Program (CRP)	Largest land retirement program – Acreage based annual rental payments for taking lands out of agricultural production for 10-15 years. Cost-share up to 50% for required planting of cover, plus maintenance incentive payment.	10 934
Wetland Reserve Program (WRP)	Land retirement program - Long-term (30-year) and permanent conservation easement program retiring farmable wetlands from agricultural production. Covers 75-100% of restoration costs. 10-year restoration cost-share agreements, without an easement, are also available.	2 096
Environmental Quality Improvement Program (EQIP)	Working lands / Stewardship program – Cost-share of up to 75% (90% for ‘disadvantaged producers’) for adoption of environmentally friendly farming practices.	7 325
Conservation Stewardship Program (CSP)	Working lands / Stewardship program – Conservation performance based payment for installing & maintaining conservation activities under a 5-year contract period.	3 792
Wildlife Habitat Incentive Program (WHIP)	Working lands / Stewardship program – Cost-share for the creation of wildlife habitat. Funding levels vary, but greater for agreements lasting at least 15 years. Lands enrolled under CRP and WRP not eligible.	425
Farm and Ranch Protection Program (FRPP)	Agricultural lands preservation program – Conservation easements purchasing the development rights of the land, but leaving the rights to work/farm the land. No additional funding for environmental improvements.	743
Grassland Reserve Program (GRP)	Agricultural lands preservation program – Permanent or 10,15, or 20-year rental agreements limiting land use to grazing, plus optional restoration cost-share of up to 50%.	240
Conservation Technical Assistance (CTA)	Technical assistance program – No financial funding provided but free assistance in the development of conservation plans making landowner eligible for conservation programs.	3 150

Findings from this research show that current conservation programs are effective in reducing impacts to and even improving ecosystem services, but their reach is limited, applications can be cumbersome, landowner understanding and acceptance is highly variable, and implementation could be more effective. The regulatory effectiveness of the Clean Water Act has been reduced over the years due to legal challenges, and the effectiveness of programs such as Swampbuster has been reduced. State protection of ecosystem services through regulations varies greatly, with some states having rather high standards, while others have none at all or default to federal standards.

Reforms to the EU Common Agriculture Policy (CAP) are headed away from standard farm subsidies in favor of payments for environmental services (PES). The U.S. has also been reducing commodity payments and increasing funding for conservation over the course of the last few farm bills, but it should go further.

The UK has an environmental stewardship program that is working well and has features that may be transferable to the U.S. The UK has one clearly understandable program that addresses a broad range of concerns and is open to everyone wishing to apply. This approach has led to high uptake, with 70 percent of agricultural landowners participating. To encourage larger operations to participate, they have reduced standard subsidies, increased cross-compliance measures, and increased conservation program incentives. To increase environmental performance across the board, cross-compliance measures also apply to anyone receiving financial assistance under the environmental stewardship program. Funding will only be provided for services provided above the basic level of cross-compliance. The broader participation in the program has increased the environmental educational level of landowners in the UK. Through a simplification of their entire system, the UK's Environmental Stewardship program reduced the administrative costs to 6-10% of its budget, whereas they were approximately 28% of the budget for the previous programme. This was done while keeping a high level of technical assistance. Efforts for simplification were in the areas of the application process, in reenrollment and based upon the creation of one comprehensive handbook of options that was easy for landowners to understand.

This thesis author concluded that combining and streamlining current U.S. conservation programs has the potential for large cost savings while simultaneously making the programs easier for landowners to comprehend. This should increase enrollment desire and enrollment capacity. Combined programs should focus on long-term protection of resources, developing conservation plans that take an 'ecosystem approach,' and basing payments on environmental performance. Having fewer programs would improve management control abilities. It would greatly reduce the likelihood of duplicate payments. It would also make it easier to have fewer funding sources, thereby, increasing efficiency through simplification. It is an opportunity to revisit how to allocate funds and to help ensure that they are linked to long-term performance measures, resolving the issue of outdated formula data for individual programs.

A number of options were identified that may accomplish increased ecosystem service protection. One important element is to provide adequate staffing of technical assistance to reduce landowner frustration and to increase the proper implementation of conservation plans. Expanding the size of conservation programs so more lands can be enrolled, would have the largest impact. This would require additional funding. This funding can come from an increase in the budget under the Farm Bills for these programs; an increase in efficiency through combining and streamlining of programs; a shift of funds from commodity support payment to conservation or stewardship payment; a targeting of expiring CRP lands for acquisition; and/or a taxing or fining landowners causing excessive environmental damage on agricultural lands. Another option for increasing ecosystem protection is to increase cross-

compliance obligations. Mandating conservation plans for all large agricultural operations is another method.

Ideally, participation in the easement programs should be available to any landowner, that would like to participate, regardless of income. Current funding levels would preclude this, but the hope is that increased program effectiveness will also result in increased political support and funding of conservation programs in the U.S., as it has in the U.K. Additionally, if a number of the proposed options for funding increases are implemented, the likelihood of expanding participation to all willing landowners increases. Such broad participation would also eliminate the need for expensive targeting schemes, criteria, and application ranking methods, adding to funds available for conservation.

Table of Contents

LIST OF FIGURES	II
LIST OF TABLES	III
ABBREVIATIONS	IV
1 INTRODUCTION	1
1.1 BACKGROUND AND PROBLEM DEFINITION	1
1.2 RESEARCH QUESTION.....	3
1.3 INTENDED OUTCOMES.....	3
1.4 TARGET AUDIENCE.....	3
1.5 SCOPE AND LIMITATIONS	3
1.6 METHODOLOGY	4
1.6.1 <i>Theoretical and Analytical Framework</i>	5
1.7 STRUCTURAL OUTLINE.....	8
2 ECOSYSTEM SERVICES AND AGRICULTURAL LANDS	9
2.1 CLASSIFYING ECONOMIC VALUE OF AGRICULTURAL LANDS	10
2.2 MEASURING THE VALUE OF ECOSYSTEM SERVICES.....	10
2.2.1 <i>Valuation Methods</i>	10
2.3 ECOSYSTEM SERVICES PROVIDED BY AGRICULTURAL LANDS	11
2.3.1 <i>Provisioning Services</i>	12
2.3.2 <i>Regulating Services</i>	12
2.3.3 <i>Habitat or Support Services</i>	12
2.3.4 <i>Cultural Services</i>	12
3 ECOSYSTEM SERVICE VALUES	13
3.1 ECOSYSTEM SERVICE VALUE CASE STUDIES	13
3.2 FLORIDA AS A CASE STUDY.....	14
3.2.1 <i>Types of Agricultural Lands in Florida</i>	15
3.2.2 <i>Determined Values of Selected Florida Ecosystem Services</i>	19
3.2.3 <i>Analysis of Florida Case Study</i>	23
4 CURRENT SITUATION IN THE U.S.	24
4.1 OVERVIEW OF EXISTING FEDERAL CONSERVATION PROGRAMS.....	24
4.1.1 <i>Conservation Reserve Program</i>	25
4.1.2 <i>Wetland Reserve Program (WRP)</i>	26
4.1.3 <i>Environmental Quality Incentive Program</i>	28
4.1.4 <i>Conservation Stewardship Program</i>	29
4.1.5 <i>Wildlife Habitat Incentive Program</i>	30
4.1.6 <i>Farm and Ranch Protection Program</i>	30
4.1.7 <i>Grassland Reserve Program</i>	31
4.1.8 <i>Conservation Technical Assistance</i>	32
4.1.9 <i>Additional Programs</i>	32
5 EFFECTIVENESS OF U.S. CONSERVATION PROGRAMS	34
5.1 PROVEN SUCCESS OF FEDERAL CONSERVATION PROGRAMS.....	35
5.2 IMPROVING EFFECTIVENESS OF CONSERVATION PROGRAMS	36
5.2.1 <i>Improved Management Control</i>	37
5.2.2 <i>Conservation Program Design Considerations</i>	38
5.3 REAL WORLD VIEWS OF CONSERVATION PROGRAMS.....	40
5.3.1 <i>Funding and Technical Assistance Issues</i>	40
5.3.2 <i>Landowner Enrollment, Satisfaction, and Knowledge Levels</i>	42
5.3.3 <i>Views on Farm Bill Changes</i>	44

6	COMPARISON OF U.S. AND EU AGRICULTURAL CONSERVATION PROGRAMS.....	47
6.1	UK ENVIRONMENTAL STEWARDSHIP PROGRAM: A CASE STUDY	48
6.1.1	<i>Description of Environmental Stewardship</i>	50
6.1.2	<i>Cross Compliance of Environmental Stewardship Agreement</i>	52
6.1.3	<i>Effectiveness of Environmental Stewardship</i>	52
6.1.4	<i>Analysis of UK Case</i>	53
6.2	CHANGES AND TRENDS IN U.S. CONSERVATION PROGRAMS.....	54
7	DISCUSSION	57
7.1	THE UTOPIA.....	57
7.2	APPLYING THE FRAMEWORK.....	58
7.3	THE RIGHT PATH?	59
7.4	TRANSFERABILITY OF THE EU PHILOSOPHY AND THE UK ENVIRONMENTAL STEWARDSHIP PROGRAM.....	59
7.5	COMBINING PROGRAMS.....	60
7.5.1	<i>Option One</i>	61
7.5.2	<i>Option Two</i>	62
7.5.3	<i>Considerations</i>	63
7.5.4	<i>Maximize the Effectiveness of Combined Programs</i>	64
7.6	EXPANDING CONSERVATION - GENERATE MORE FUNDING AND REACHING MORE LANDOWNERS.....	65
8	CONCLUSIONS	68
8.1	FURTHER RESEARCH RECOMMENDATIONS.....	70
	BIBLIOGRAPHY	71
	APPENDIX 1 – ECOSYSTEM SERVICES BY CATEGORY	80
	APPENDIX 2 – INTERVIEW QUESTIONS.....	81
	APPENDIX 3 – THE COST OF LAND CONVERSION	88
	APPENDIX 4 – KEY CONSERVATION PROVISIONS OF THE 2008 FARM BILL	89
	APPENDIX 5 –SJRWMD & NRCS PARTNERSHIP PROJECTS	90
	APPENDIX 6 – SJRWMD LAND TRANSACTIONS FUNDED IN PART WITH WRP AND FRPP FUNDS.....	91

List of Figures

Figure 1-1	Millennium Ecosystem Assessment Conceptual Framework.....	8
Figure 2-1	Methods for the Evaluation of Ecosystem Services	11
Figure 3-1	Florida Development Prediction	14
Figure 3-3	Whooping Cranes, Gopher Tortoise, Burrowing Owl and Bobcat on Rangelands	16
Figure 3-2	Typical Florida Cattle Grazing Lands	16
Figure 3-4	Corn Mazes from Long and Scott Farms.....	18
Figure 3-5	Manatees at Blue Spring State Park.....	22
Figure 6-1	Comparison of EU and U.S. Agri-environmental Program Funding Levels.....	47

Figure 7-1 Funding Allocation Comparison between 2002 and 2008 Farm Bill..... 55
Figure 7-2 Program Funding Level Changes between 2002 and 2008 Farm Bills 56

List of Tables

Table 2-1 Ecosystem Services 9
Table 3-1 Implied Values of Select Florida Species (in 2011 U.S. Dollars) 21
Table 4-1 CSP Payment Rates (2011 U.S. Dollars)..... 29
Table 5-1 Overview of Main U.S. Agri-environmental Conservation Programs 34
Table 6-1 Environmental Stewardship Levels Available..... 51
Table 6-2 Major Conservation Program Funding under 2002 and 2008 Farm Bills 55

Abbreviations

AWEP	The Agriculture Water Enhancement Program
BAT	Best Available Technology
CAP	EU Common Agriculture Policy
CCPI	Cooperative Conservation Partnership Initiative
CEAP	Conservation Effects Assessment Project
CERP	Conservation Easement Reserve Program
CFAP	Conservation Financial Assistance Program
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSP	Conservation Stewardship Program
CSS	Countryside Stewardship Scheme
CTA	Conservation Technical Assistance
DEFRA	Department for Environmental Food and Rural Affairs
EBI	Environmental Benefits Index
ELS	Entry Level Stewardship
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
ES	UK's Environmental Stewardship Program
ESA	Environmentally Sensitive Areas
EU	European Union
FDOT	Florida Department of Transportation
FPP	Farmland Preservation Program
FSA	Farm Service Agency
FSP	Forest Stewardship Program
FWC	Florida Fish and Wildlife Conservation Commission
FWP	Farmable Wetlands Program
GAO	The United States Government Accountability Office
GDP	Gross Domestic Product
GRP	Grassland Reserve Program
ha	Hectare
HLS	Higher Level Stewardship
IRS	Internal Revenue Service
MA	Millennium Ecosystem Assessment
NGO	Non-governmental Organization
NRCS	Natural Resource Conservation Service
OECD	Organization for Economic Cooperation and Development
OELS	Organic Entry Level Stewardship
PES	Payment For Environmental Services
SJRWMD	St. Johns River Water Management District
U.S.	United States of America
UELS	Uplands Entry Level Stewardship
UMAM	Uniform Mitigation Assessment Methodology

UN	United Nations
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Services
WHIP	Wildlife Habitat Incentive Program
WREP	Wetland Reserve Enhancement Program
WRP	Wetland Reserve Program

1 Introduction

1.1 Background and Problem Definition

There is a growing dilemma in the United States of America (U.S.) today causing the ecosystem services the nation depends on to become depleted at an alarming rate. Ecosystem services are defined as “services provided by the natural environment that benefit people (DEFRA, 2007).” Examples of these services include products such as food, timber, plant-derived medications and fuel, as well as less obvious services such as air and water purification, climate regulation, flood protection, recreation opportunities and biodiversity retention (Costanza et al., 1997; DEFRA, 2007; TEEB, 2010). These services are crucial to human well-being. Most cannot be artificially reproduced and the few that can are extremely costly.

Humans depend on ecosystem services to provide us with the basic necessities of life - food, water and shelter. Additionally, we are all in need of clean air to breathe and protection from events such as flooding and extreme climate change. Our crops need insects to pollinate them and renewed soil fertility to feed them. We are dependent on nature’s natural decomposition abilities to take care of our waste. Natural resources go into all the products we produce and hence impact our entire world economy (TEEB, 2010).

The dilemma is based on how to choose, or strike a balance between, the implicit benefits of ecosystems services that are not clearly visible, and the explicit costs required to prevent their deterioration. The value of these services may not be translatable into financial form, but rather in ‘well-being effect,’ such as the ability to breath clean air. In other cases, there is clear monetary value, such as in flood protection, but it may not be recognized until after a flooding event has occurred. One example is the free ecosystem service of pollination by bees; this was not recognized until there were massive crop failures. The estimated cost to farmer’s worldwide due to loss of bees was \$190 billion¹ (US dollars) in 2007. The core of the problem is that unless ecosystem services are tradable commodities belonging to individuals, such as timber rights, economic markets do not have incentives to conserve them. Since a large portion of ecosystem services do not fall within the category, too little is being done to protect these services within the free market (TEEB, 2010).

Ecosystems are defined as biological environments consisting of a dynamic complex of living organisms (plants, animals and microorganisms) and their interactions with their non-living physical surroundings such as the air, soil, water, and sunlight (Campbell, 2009; Millennium Ecosystem Assessment, 2005). Hence, our ecosystem services come from the land, sea, atmosphere and all the living and non-living components of those areas. Productive ecosystems provide resources that can be used as insurance in the face of the increasingly frequent natural disasters and social upheavals we are seeing today. However, poorly managed ecosystems can exacerbate these problems by increasing risks of water shortages, floods, disease, crop failure, drought and poverty (Chopra, Leemans, Kumar, & Simons, 2005).

There have been, and still are, many policies in place that have slowed or reversed degradation of ecosystems and their services that are not protected by the market. Despite the significant benefits these policies have produced, these improvements cannot keep pace with the ever increasing demands for ecosystem services. This pressure will certainly continue to increase as the world population continues to grow. By 2050, there will be an additional 3 billion people on Earth, and the economy is projected to have quadrupled. Additionally, the more affluent

¹ The sign “\$” refers to U.S. dollars. U.S. dollars may also be referred to as USD in tables and figures.

countries, including the U.S., are continually increasing their per capita consumption rate, compounding the effect of population growth in these areas (Chopra, et al., 2005).

The U.S. is just short of a billion hectares (2.3 billion acres) in size (USDA, 2009). As compared to countries such as Germany and Denmark, that have little land and many people, that amount of land mass should provide ample ecosystem services to support the 300 million people within the U.S. (U.S. Census Bureau, 2010b). However, the U.S. is also one of the leading consumers in the world. The per capita consumption rate of natural resources within the U.S. is far greater than that of most other nations (Berlik, Kittredge, & Foster, 2002). Along with these high consumption rates come faster ecosystem degradation rates. According to Chopra et al. (2005), "The demand for ecosystem services is now so great that tradeoffs have become the rule (p. 26)." For example, the U.S. can increase food production by converting a forest to cropland, but in turn will decrease the services of clean water, timber, ecotourism, flood regulation and drought control. Alternatively, production rates on already existing agricultural lands can be increased by adding fertilizer and using pesticides, at the cost of nearby lake health and a decrease in insect biodiversity and pollination abilities (Chopra, et al., 2005).

The majority of the land (61%) in the United States is privately owned. Another 28% of the land is owned by the Federal government, with the remaining 11 percent belonging to State, local governments and Indian reservations. Almost all cropland, three-fifths of pasture and over half the forestlands are privately owned (Eno, Dyche, & Mass, 2006). Therefore, in order to address the issue of ecosystem service loss, it is necessary to address conservation practice on private lands.

Most private lands in the United States are used for some form of agriculture. Approximately 41 %, or 373 million hectares (922 million acres) of the total land mass of the U.S., is currently considered to be agricultural, with uses ranging from crop production, to cattle ranching, to timber production (USDA, 2009). Much of this land is degraded and some agricultural practices are harmful to the environment, detracting from their contribution to ecosystem services. Additionally, there has been a shift from subsistence farming to large scale intensive production, much of which is monoculture in nature, reducing biodiversity and increasing risks of large scale crop failures (Caldwell, 2001; Papendick, Elliott, & Dahlgren, 1986). Other agricultural lands are being converted to urban housing and losing nearly all of their environmental services. Of great significance is the fact that a disproportionate amount of high quality farmland is being converted to urban uses. As prime farmland is lost to development, less suitable arid lands are becoming farmed, leading to higher erosion rates and greater fertilization and irrigation needs (Heller & Keoleian, 2003).

The U.S. has strong private property rights that the citizens of the U.S. hold dear. There are a multitude of regulations in place to deal with some of the greatest abuses on these lands, but they are not always effective and there cannot be regulations in place for all elements of land management. To get at issues not sufficiently covered by regulations, a multitude of incentive and educational programs have also been developed (Private Landowner Network, 2011). Although there has been measurable success with many of these programs, there are many environmental issues that are still not being addressed and there is insufficient incentives to promote the level of environmental service retention the country needs (Cowan, 2010).

To quote the father of wildlife management, Aldo Leopold (1949), "*We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.*" You will find several quotes from Aldo Leopold throughout this paper, for he was a man ahead of his time when it comes to conservation minded thinking in relation to farmlands. He summed up the problems this paper is addressing when he stated, "*The crux of the problem is that every landowner is the custodian of two interests, not always identical, the public and his own. What we need is a positive inducement or reward for the landowner who respects both*

interests in his actual land practice. All conservation problems-erosion, forestry, game, wild flowers, landscapes-ultimately boil down to this (Leopold, 1934b)."

This paper will focus on what can be done to retain, restore and/or enhance ecosystem services found on agricultural lands in the U.S. through stronger, more effective incentive programs for private landowners.

1.2 Research Question

Good elements of ecosystem service protection on agricultural lands do exist in the U.S., but the reach is not sufficiently broad. This thesis will attempt to answer the following question:

- In order to provide for the well-being of our nation, how can the U.S. expand protection of ecosystem services on agricultural lands while maintaining an economically viable agricultural industry?

More specifically, the author analyzed options for 1) improving existing conservation programs, 2) increasing landowner participation in conservation programs, and 3) increasing the use of better environmental practices on agricultural lands, regardless of program participation.

1.3 Intended Outcomes

- Outline alternatives for more effective conservation programs
- Examine the feasibility of developing just one program that still meets the goals of all the current federal conservation programs under the U.S. Farm Bill
- Determine if research supports the idea that combining and streamlining current programs and pooling funding would be more cost-effective, and easier for landowners to comprehend, thereby increasing enrollment and decreasing administrative costs
- Provide additional options for increasing ecosystem service protection on agricultural lands

1.4 Target Audience

This paper should be of special interest to policy makers and will be written mainly with them in mind. However, it may also be of interest to federal program coordinators with the opportunity to make changes within their programs. Further, interested parties would include landowners, non-governmental organizations (NGOs), and academic institutions interested in lobbying for, or the potential effects of, changes in agricultural environmental programs in the U.S.

1.5 Scope and Limitations

This thesis examined how to expand protection on agricultural lands in the U.S., but the scope goes beyond U.S. boundaries to examine if there are lessons the U.S. can learn from other countries that have developed methods for protecting ecosystem services. The thesis analyzed EU schemes and includes a case study from the UK. The paper is limited by the inability to look closely at ecosystem service losses and its implications within all areas of the U.S. Hence a case study of Florida was conducted, and it will have to be assumed that the situation is similar in the rest of the country.

Options for ecosystem service protection are limited to the measures that can be taken on the federal level of government. No attempt was made to address options for the 50 individual

states, most of which also have legislation or programs in place to address environmental concerns of agricultural lands. Similarly, this paper examined other regional municipalities or non-governmental organizations (NGOs) that may influence agricultural practice. It also does not examine measures that landowner organizations could voluntarily take. Within the federal government, focus is on the U.S. Farm Bill conservation programs, and to a lesser degree, possible regulatory fines. There are programs under other parts of the federal government, but they are rather small in comparison. These may be mentioned, but are not analyzed.

The issues covered by the Farm Bill are many, but this thesis author addressed the implications of it on conservation programs and to a lesser degree, the impacts of commodity payments (also known as farm subsidies). Funding constraints were addressed. Possible implications on farming levels were addressed to a limited extent. Issues of equity, market effects, and international trade effects are beyond the scope of this thesis. It is recognized that ecosystem services exist in all areas, but this thesis will only examine how they are affected on agricultural lands.

Limited access to landowner data resulted in a less than ideal rate of landowner interviews. Few programs managers wish to divulge contact information for individual landowners that had participated in conservation programs. This is understandable since personal contact information in the U.S. is a rather private matter and many landowners would not have taken kindly to having their personal information given to a stranger. The contacts made with landowners were primarily through personal connections and attendance at conferences. Interviews previously conducted by members of the media also provided insight into landowner opinions. The greatest insight was gained through the conservation program managers who work daily with these individuals.

The intended outcome is to outline alternatives for improvements and broader reach; it is beyond the scope of this paper to define all the details of proposed measures.

This thesis author examined how agricultural environmental (agri-environmental) programs can maximize environmental benefits with the limited funds available, without increasing burdens on landowners. Hence, environmental and farming implications, and funding constraints will be considered. However, it was beyond the scope of this thesis to examine the political feasibility of making the suggested improvements.

1.6 Methodology

The first phase of this thesis began with an extensive literature review of existing conditions of ecosystem services in the U.S., and outlining the main threats indentified to these services. To examine the problem of ecosystem service losses in greater detail, the State of Florida was used as a case study. Florida was chosen because the situation there is particularly bleak and a number of detailed studies have been conducted there to project what the future may look like if nothing is done to change the current path of development and ecosystem destruction. It was also helpful to examine a few state-level regulations to see how these differ from federal regulations, and regulations from other states.

This was followed by a review of literature pertaining to how these services are valued and why markets are not providing adequate protection of ecosystem services. Once it was clear that private agricultural lands had a significant role in ecosystem conservation, research was conducted on U.S. policies, regulations and conservation programs affecting land stewardship and conservation practices on agricultural lands in the U.S.

A case study was desired to assist in providing alternative strategies for the U.S., as well as for contrast and comparison. The UK Environmental Stewardship Program (ES) was chosen as a study case for a number of reasons, which are highlighted here but are more fully elaborated upon in Chapter 6. Much of the UK Environmental Stewardship program takes place in England, where 70% of the nation is in farmlands. The UK takes its stewardship very seriously, and it just published the UK National Ecosystem Assessment in June 2011 that outlines both the monetary and non-monetary values of their ecosystem service values. Another reason for selecting the UK as a case study was because they use the Millennium Ecosystem Assessment Conceptual Framework for valuing ecosystem services for consideration in policy decisions, and that same framework will be used in this thesis. Finally, the UK agricultural lands suffer from many of the same problems U.S. lands face.

Since the UK falls within the EU and is therefore affected by EU policies, a literature review of EU policies and farm subsidies was also conducted.

Extensive interviews were conducted with USDA program managers, state conservationists, other agency officials, NGO representatives, landowners, and environmental consultants to determine the daily functioning logistics of the current programs and regulations. Although interview questions were prepared in advance for each separate interview (see Appendix 2 for sample interview questions), the interviews were loosely structured to allow for broad conversations that could branch out to reveal areas of concern not previously covered. This often led to additional research needs and restructuring of questions for later interviews, as well as the need for follow-up interviews with people that had already been contacted. Although an outsider's perspective is important in unbiased evaluations, interviews were extremely important in gathering an insider's perspectives into what changes would be feasible in the working context of the existing system.

Finally, the information gathered was reviewed in the context of the following framework.

1.6.1 Theoretical and Analytical Framework

Analysis was based primarily on the theories and assumptions within neoclassical environmental economics, but also addressed aspects of a more ecological economic framework. Further, the relationship between ecosystem services protection was assessed from the standpoint of its affect on human well-being, based on the Millennium Ecosystem Assessment (MA) Conceptual Framework.

1.6.1.1 Economic Framework Considerations

Whereas classical economics only considered the cost of production in determining value, neoclassical economics accounts for the marginal utility to people and the scarcity of the products. If there is no 'demand' by people, there is no marginal value, regardless of cost of production. As the 'supply' decreases, the value goes up, even if production costs remain unchanged. There are some key assumptions within neoclassical environmental economics that will be considered during the analysis. First, it is assumed that individuals are rational and will always base decisions on the logic dictated by the market. Secondly, it assumes that individuals will always act in their own self-interest. The theory suggests that the market will maximize social welfare based on the collective self-interest of individuals (Erickson, 1999; Medalye, 2010).

However, this 'free' market only functions for the overall well-being if all the costs of a product are fully considered in the pricing of the product. This is a fundamental principle, which was addressed by Pigou in the early 20th century, when he analyzed positive and negative externalities distorting resource allocation and thus the efficiency of 'free markets'. In

the case on ecosystem services, the market left to its own accord would not account for the true costs - or loss of true value – as the environmental externalities do not enter the process of production and consumption as price signals. This is considered a market failure and hence both theory and practice shows that market intervention is needed. Pigou suggested taxes representing the value of negative externalities, now referred to as Pigouvian taxes, could be used to increase the market price of these goods and services to represent the ‘true cost.’ Therefore, government intervention through regulations and/or market-based incentive programs is often needed to correct for these market failures. Taxation, fines or tradable permits may be used to reduce negative external effects (by increasing their costs), while payments for environmental services (PES) can be used to encourage positive external effects by increasing their value (Erickson, 1999; Jacobs, 1994; Medalye, 2010).

Critics of neoclassical economics argue that all behavior cannot be predicted based on the theories described above, because they do not account for the social spheres in which transactions occur, and one cannot remove all non-market traits of human behavior. Individuals often aggregate, creating groups that may not behave the same as any one rational individual within it, or even as the sum of all the individuals. Hence, collective societal behavior is not predicable through neoclassical economics (Medalye, 2010; The Left Anchor, 2010).

Within the ecological economic framework, human economics are viewed as a subsystem of their larger ecosystem. Within this ecosystem, the flow of raw materials becoming commodities and eventually waste, must remain within the regenerative capacity of the ecosystem. It must be sustainable. This framework looks not only at values to an individual, but to society as well. Needs of future generations should also be accounted for in the valuation, so that current practice of maximizing profits while minimizing costs does not deplete the abilities of future generations to provide for their needs. This framework leads to more system thinking, rather than the simplification of individual parts within the neoclassical way of thinking (Erickson, 1999).

These two theories are incorporated in this paper in determining how to regard the value of life (risk management) and in analyzing the methods used to develop values for non-market goods. The main rationale for these evaluations is to be better capable of comparing ecosystem services alongside traditional market goods, which should be especially useful for policy makers having to make decisions regarding the allocation of resources.

1.6.1.2 Millennium Ecosystem Assessment Conceptual Framework

Economic analysis plays a large role in determining the effectiveness of proposed policies and programs to protect and enhance ecosystem services in the U.S. However, policy makers must also consider the effects of these actions on overall human well-being. According to Chopra, et al. (2005), The Millennium Ecosystem Assessment (MA) Conceptual Framework offers policy makers a mechanism to:

- 1) Identify options that can better achieve core human development and sustainability goals. All countries and communities are grappling with the challenge of meeting growing demands for food, clean water, health, and employment.
- 2) Better understand the trade-offs involved – across sectors and stakeholders – in decisions concerning the environment.
- 3) Alien response options with the level of governance where they can be most effective. (p. 26)

The MA Conceptual Framework was developed as part of the Millennium Ecosystem Assessment called for by the United Nations (UN), which was initiated as a multi-national

effort in 2001. It recognized that human well-being is vitally dependent upon improving the management of ecosystems; but as human demands for the services of these systems are increasing, human actions are diminishing their capacity to provide them. The framework incorporates an understanding of the need for decision makers to balance economic growth and social progress with environmental conservation. Rather than dealing with environmental concerns on an issue-by-issue basis, this framework encompasses a system level approach. This type of approach is endorsed by the Convention on Biological Diversity, where it is termed an 'ecosystem approach' - integrating the management of land, water and living plants and animals. This will minimize the likelihood that improving one aspect of an ecosystem will be at the expense of another (i.e. increase crop output by adding fertilizer, which decrease fishing yields from a lake being polluted by that same fertilizer). The framework stresses the importance of proper scientific knowledge of the ecosystems that policy changes will affect, as well as a complete understanding of the human social consequences of such actions (Chopra, et al., 2005). As stated by the UN Secretary General, Kofi Annan (Chopra, et al., 2005), "*It is impossible to devise effective environmental policy unless it is based on sound scientific information.*"

In order to develop strategies for dealing with ecosystem service losses, it is imperative to understand the factors driving these changes. The MA framework takes into consideration both direct and indirect drivers of change, and recognizes that these can take place at local, regional, and global levels. An individual can make a decision on their land (a switch to organic farming for example) that affects ecosystem services on a local level. State elected officials may make zoning decisions, such as whether to allow development in a particular area, that affect ecosystem services on a more regional basis. International conventions such as the Kyoto Protocol, could affect policies impacting ecosystems across multiple nations. All of these actions are driven by a multitude of factors such as economic policies, property rights, lobbying tactics, market shifts, trade barriers and technology development. All of these drivers of change in turn will affect human well-being (Chopra, et al., 2005).

Chopra, et al (2005) explains human well-being in the following manner:

Human well-being has multiple constituents, including basic material for good life, freedom of choice and action, health, good social relationships, and security. Well-being is at the opposite end of a continuum from poverty, which has been defined as a pronounced deprivation of well-being. The constituents of well-being, as experienced and perceived by people, are situation-dependant, reflecting local geography, culture, and ecological circumstances. (p.27)

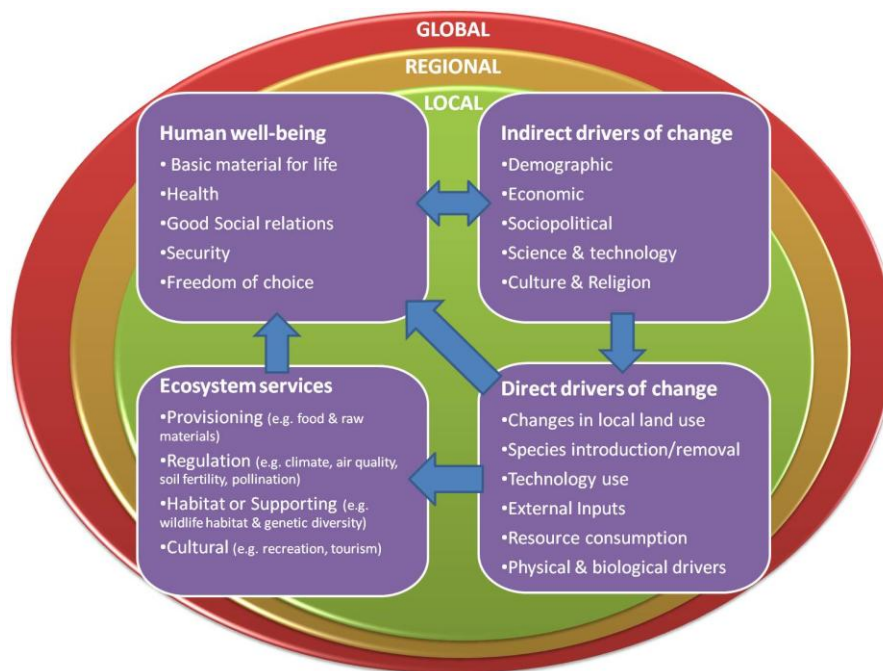
A final consideration within the MA framework is cross-scale interactions, both temporal and spatial. Ecosystem changes, such as soil erosion, have little impact over a week's time, but will be problematic for decades to come. Run-off from a farm may combine with run-off from other farms can destroy a fishery, but have no impact on the farms that cause the problem. All ecosystem services have their strongest consequences in a particular time and place. Hence, small changes done on a local scale may not be observed in that place or at the time that it is done, yet decision makers will have to consider when and where harm could come. This is problematic because people tend not to think beyond one or two generations, and some politicians may not think beyond their time in office and the problems that are currently visible within their jurisdictional boundaries (Chopra, et al., 2005).

Assessment tools available within the MA framework make use of both biophysical and socioeconomic indicators to combine data into policy-relevant measures. To fill data gaps, modeling can be used to simulate conditions based on known, similar circumstances in other areas. The MA uses scenarios to communicate pathways ecosystems may develop in the future. This information is then used to develop strategies and interventions to change unfavorable pathways. One strategic option is to incorporate the value of ecosystem services into decisions, since these services are often not properly valued within economic markets.

How to value these systems will be discussed in Chapter 2. Other options include creating markets and property rights for ecosystem services, educating the public about ecosystem service values, creating new laws and regulation, forming partnerships, or simply investing in ecosystem improvements (Chopra, et al., 2005).

The MA conceptual framework assesses the links between ecosystem services, human well-being, drivers of change, and cross-scale interaction. It then uses a variety of assessment tools to assist decision makers in the development of strategies and interventions that consider all of these aspects (Figure 1-1). This framework is used to assess the options policy that decision makers have for improving land stewardship on agricultural lands in the U.S., always bearing in mind the economic theories outlined above that will drive much of the system.

Figure 1-1 Millennium Ecosystem Assessment Conceptual Framework



Source: Adapted from (Chopra, et al., 2005) and (TEEB, 2010)

1.7 Structural Outline

The introductory chapter provides background information; explain what research question the thesis will be addressing; and how the study was developed. Chapter 2 explains how ecosystem services are categorized and assigned values. Chapter 3 uses case studies, in particular Florida, to see how ecosystem values are used in decision-making and where these values can be found within the agricultural sector. In Chapter 4 the current status of ecosystem service protection levels in the U.S. is described, providing an overview of regulations and programs. Chapter 5 looks at the effectiveness of these programs and how they function on a daily basis. Chapter 6 draws comparisons between EU and U.S. systems and provides a case study of the UK Environmental Stewardship Program. This chapter also analyzes trends in environmental agricultural policies in the U.S. Chapter 7 discusses how these trends can be steered towards better sustainability of ecosystem services and outlines future recommendations. Finally, Chapter 8 concludes by summarizing what has been learned, and provides the answers the question posed in Chapter 1 and suggests further research.

2 Ecosystem Services and Agricultural Lands

People frequently associate agricultural lands with environmental harm such as eutrophication and intense water use. It is true that some farming practices utilize a great deal of water for irrigation, and that the water that runs off these farms can be loaded with fertilizers, herbicides and pesticides. This in turn can cause water shortages and negatively affect the health of nearby water bodies, as well as losses in beneficial insects and plants. A large portion of agricultural lands are degraded by erosion, salinization, compaction, and nutrient depletion. Some pesticides used in agriculture, like DDT, have even been attributed to great health risks toward larger species, including humans (Chopra, et al., 2005; EPA, 2011).

However, farming and ranching practices in many parts of the world, and most certainly in the U.S., are being held to higher environmental standards. Furthermore, there are tremendous benefits to farming which may well offset the harm they may cause. The most obvious are ecosystem goods internalized by the industry, such as the food and raw products that agriculture provides us, as well as the millions of jobs the sector creates. Still, there are numerous external benefits - most of which go unrecognized. These benefits are the other ecosystem services that all other human activities, either in direct or indirect ways, are completely dependent upon. These services are rarely captured by the economic market, and hence are often not acknowledged or severely undervalued.

"Civilization has so cluttered this elemental man-earth relationship with gadgets and middlemen that awareness of it is growing dim. We fancy that industry supports us, forgetting what supports industry."
 – Aldo Leopold (1949)

These ecosystem services include water filtration and storage, biodiversity protection, and pollution abatement, to name just a few (see Table 2-1 for a more comprehensive list). Agricultural lands provide many of these services, especially when held to high environmental standards and when policies encouraging responsible land stewardship are in place.

Table 2-1 Ecosystem Services

Ecosystem Service	Examples
Gas regulation	CO ₂ /O ₂ Balance, O ₃ for UVB protection, and SO _x levels.
Climate regulation	Greenhouse gas regulation and DMS production affecting cloud formation.
Disturbance regulation	Storm protection, flood control, and drought recovery.
Water regulation	Provisioning of water for agriculture or industrial processes or transportation.
Water supply	Provisioning of water by watersheds, reservoirs and aquifers.
Erosion control	Prevention of loss of soil by wind and run-off.
Sediment retention	Storage of silt in lakes and wetlands.
Soil formation	Weathering of rock and the accumulation of organic materials.
Nutrient cycle	Nitrogen fixation, nitrogen and phosphorous nutrient cycles.
Waste treatment	Waste treatment, pollution control, and detoxification.
Pollination	Provisioning of pollinators for the reproduction of plants.
Biological control	Predatory control of prey species.
Refugia	Nurseries, habitat for migratory species, habitat for harvested game species.
Food production	Production of fish, game, crops, nuts, fruits, and vegetables.
Raw materials	Lumber, fuel, precious metals, and fodder.
Genetic resources	Medicine, genes for pest resistance, pets and horticultural plants.
Recreation	Eco-tourism, fishing, bird watching, and other forms of outdoor recreation.
Cultural	Aesthetic, artistic, educational, spiritual, and scientific values.

Source: Adapted from (Costanza, et al., 1997).

2.1 Classifying Economic Value of Agricultural Lands

In order to understand the full value of agricultural lands, one must consider all the products and services these lands offer. The vast majority of economic value analyses ignore most of the ecosystem service values. What is an ecosystem service? These are the services of natural systems that provide direct economic output and/or contribute to individuals' well-being; regardless of whether those values are captured by the market. Measures like Gross Domestic Product (GDP) only consider human produced goods and services exchanged on markets, failing to account for the value of the ecosystems upon which these goods and services fully depend. Economic values can be classified into 3 categories: direct values, indirect values, and non-use values (Kroeger, 2005).

Direct values refer to the direct utilization of a physical product of nature, such as timber, water and areas for recreation. Indirect values refer to service functions, such as the formation of soil, the hydrological cycle, and the provision of spawning and nursery grounds for fish. Non-use values refer to the values ecosystems have, even if they are not currently being utilized for any particular purpose (Kroeger, 2005). These can be further broken down to:

- 1) Option value – the value of knowing the option will be there to utilize the products or services in the future.
- 2) Existence value – the value attributed to simply knowing the systems or services exists.
- 3) Altruistic value – the value of knowing the system might provide products or services to someone else.
- 4) Bequest value – the value the systems may have to future generations.

The total value of an ecosystem is the sum total of direct, indirect and non-use values. One interesting study from the northeastern Florida looked at the values of all these three classifications across a four-county area. The results showed that the ecosystems' indirect use values were greater than the combined values of all the direct use and non-use values (Kroeger, 2005). This demonstrated the significance of these services and how important it is to account for these indirect ecosystem services.

2.2 Measuring the Value of Ecosystem Services

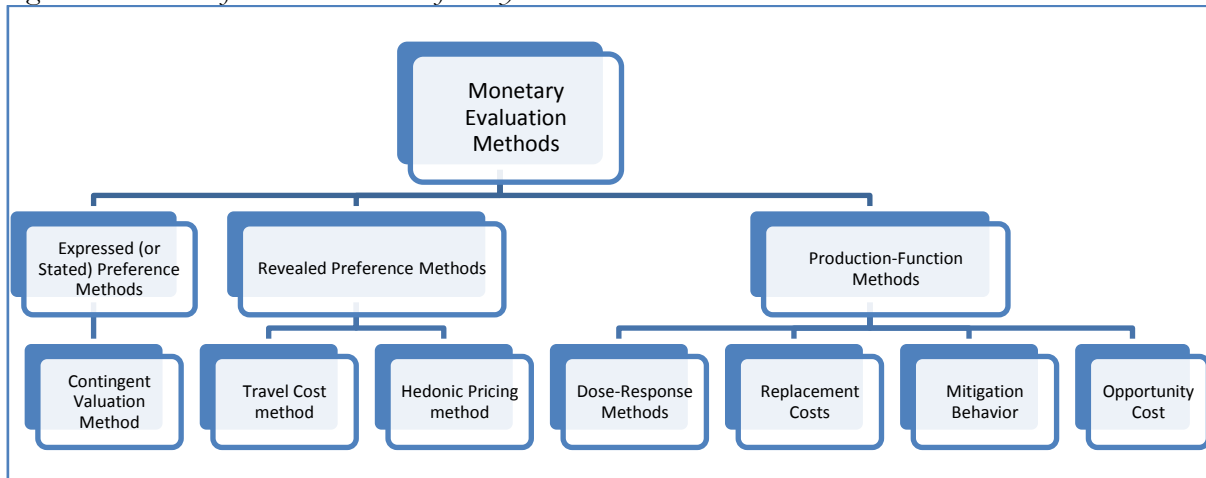
What is the proper way to measure the value of ecosystem services? This is a question that has been pondered in numerous studies (Chichilnisky & Heal, 1998; Costanza, et al., 1997; Hodges & Rahmani, 2010; TEEB, 2010). Many would argue that monetary values cannot be used, because many ecosystem services, such as biodiversity, cannot be quantified in monetary terms (some would call it priceless). There are many ecosystem services that would be difficult to value in monetary terms. However, for the purpose of comparing benefits of using limited resources for one purpose or another, it is helpful to decision makers to have some form of common base comparison. Values expressed in monetary terms serve this purpose, for those services that we can use some form of evaluation to approximate such values. For some people, money is the only value they understand, perhaps because it is more concrete than other forms of valuation. Herman Daly (1998) said it well, *“For those who only hear in dollars, let us scream now and then in dollars.”*

2.2.1 Valuation Methods

Various methods have been developed for determining market monetary value equivalents of ecosystem services. Such valuation methods are without doubt difficult and can be laden with uncertainties, but several have become “standard practice” and are fully accepted by researchers, as well as within most political circles. There are many classification models of how these methods are grouped. Figure 2-1 shows many of the most widely used methods

and places them in groups based on a composite of classifications proposed by a variety of economists (Hanley, Shogren, & White, 2001; Turner, Pearce, & Bateman, 1994).

Figure 2-1 Methods for the Evaluation of Ecosystem Services



Source: Adapted from (Hanley, et al., 2001) and (Turner, et al., 1994).

Expressed or stated preference methods rely on surveys designed to elicit what the public is willing to pay (WTP) for hypothetical changes in environmental quality, ecosystem services, or choices between environmental assets. The most common of these methods is the Contingent Valuation Method. Revealed preference methods try to infer value based on people’s actual behavior, such as spending money for travel specifically to partake in a nature based activity. Production-function methods use comparisons to market-valued goods or services which may perform similar functions, or they are valued as increasing the input to the production or reducing the output of the production of market-valued goods (Hanley, et al., 2001; Turner, et al., 1994).

No one valuation method can be used for all ecosystem services. To a large extent the methods are overlapping when it comes to valuation. Sometimes they measure values for different groups of people (e.g. the Travel Cost method will measure values for those who visit a wetland, while a Contingent Valuation method could measure values for others who do not visit the wetland, but still have values linked to biodiversity and other ecosystem services). Phone interviews and email correspondences with economists and communications departments within NGOs revealed that the valuation methods discussed in this paper are generally accepted and that reports using figures derived from these methods are not being challenged (Cheatum, 2011; Haney, 2011; Lazaroff, 2011). According to Dr. J. Christopher Haney (personal communication, March 10, 2011), these methods are “sufficiently mature to be widely accepted in certain public policy circles, and certainly in the research realm.” He also stated that any individuals that may oppose the values are likely “philosophically opposed to any monetizing of conservation value.” The valuation methods discussed are precisely those used by the EPA in their cost-benefit analyses addressed in the Right-to-Know Act.

2.3 Ecosystem Services Provided by Agricultural Lands

There are four basic categories of ecosystem services: provisioning services, regulating services, habitat or support services, and cultural services (TEEB, 2010). It is difficult to develop a comprehensive list of all the ecosystem services agricultural lands provide, but some of the most noteworthy (or well studied) are listed below. Also see Appendix 1 for additional ecosystem services and their classifications.

2.3.1 Provisioning Services

These services provide a direct, tangible material output. Most are usually captured, at least to some extent, by the market, even if all the externalities associated by their extraction and use are not covered. From agricultural lands, these would include things like wood products for building homes, drinking water, fuel for heating and energy, medicine, and perhaps most importantly, the foods we eat (TEEB, 2010).

2.3.2 Regulating Services

This is a broad category, covering all the regulatory services (such as regulating the quality of the air) that ecosystems provide for free, and hence they are rarely, if ever, covered by the market. A few of the regulatory services that agricultural lands can provide if managed with good environmental stewardship practices include (TEEB, 2010):

- 1) Wastewater Treatment – Pollutants and waste are decomposed in wetland systems found on agricultural lands and by the micro-organisms in the soil.
- 2) Local Climate Regulation – Vegetation provides shade and affects local parameters such as humidity and rainfall.
- 3) Air Quality Regulation – Vegetation removes pollutants from the surrounding air.
- 4) Carbon Sequestration – Vegetation absorbs carbon dioxide as it grows.
- 5) Flooding Buffer – Agricultural lands can absorb a great deal more water than rural areas with paved surfaces can, hence eliminating or reducing flooding.

Regulations enacted by people to conduct services such as cleaning up water, air and reducing flood have known economic cost and benefits. The value of regulatory services has been recognized formally by the U.S. government. Through the Regulatory Right-to-Know Act, the Office of Management and Budget published that Federal regulations, used in part to protect environmental quality, provided benefits between \$128 billion and \$616 billion over a 10 year period. The cost of these regulations to the government was between \$43 and \$55 billion. Specifically, Environmental Protection Agency (EPA) air pollution rules provided a rather large net benefit, producing 60-87% of the benefits, and only 58-64% of the costs (OMB, 2010).

2.3.3 Habitat or Support Services

Habitat and support services are the functions that keep living things within our ecosystem. Humans in turn reap many benefits from these species – from crop pollination by bees and wildlife viewing opportunities, to meat from wild game. Hence, these are underlying services that support many of the other services. Agricultural lands provide habitat for many common, as well as some highly endangered, species of plants and animals (Main et al., 2004; TEEB, 2010).

2.3.4 Cultural Services

These are aesthetic, spiritual and psychological benefits people derive from non-material ecosystem services. Agricultural lands provide this in a variety of ways. Many agricultural areas are open for recreation such as wildlife viewing and hiking. Some agricultural areas have flourishing tourism businesses integrated in their daily operations. The mental and physical health benefits of spending time in non-rural settings have become widely recognized. These areas also bring about aesthetic appreciation and inspire culture and art (TEEB, 2010).

3 Ecosystem Service Values

In *The Economics of Ecosystems and Biodiversity* (TEEB, 2008), the long run economic cost of biodiversity loss and ecosystem degradation in 2008 is estimated between \$2 trillion and \$4.5 trillion globally². At \$2 trillion, that is equal to the annual economic output of the UK. Another study puts the cost of damage done to ecosystem services by human activity at \$6.6 trillion (approximately 11% of the entire global economic output in 2008) (Anderson, 2010). What value is there in calculating these figures?

Ecosystem values are used in many European environmental programs. However, it seems less used in the U.S., but perhaps this trend is changing. According to Jill Austin (personal communication, March 10, 2011) with The Nature Conservancy, their report entitled *Economic Benefits of Land Conservation: A Case for Florida Forever*, was widely distributed, used, cited, and editorialized. There were no opponents that questioned the economic analyses now readily accepted, and it may have been instrumental in the Florida Forever Program getting \$15 million of funding for 2011 despite a lean budget year and a bad economy. To further explore how these ecosystem valuations are used, a few case studies will be briefly examined.

3.1 Ecosystem Service Value Case Studies

Case #1: When the EPA notified New York City that drinking water standards had fallen below acceptable levels, the city opted to restore the polluted Catskill Watershed rather than construct a water filtration plant. The restoration totaled \$1-\$1.5 billion, but the watershed provided the ecosystem service of a water purification that would otherwise have cost \$6-8 billion in construction, plus operating costs of \$300 million/year (Chichilnisky & Heal, 1998).

Case #2: An economic assessment of Florida's Indian River Lagoon project was conducted in 2007. The document included analysis of recreational use, real estate (hedonic), research, commercial fishing, non-use values and more. The study found that the 29 300 hectares (72 400 acres) of sea grass alone were worth \$329 million per year just for its support of recreation and commercial fishing. Overall, the existence of the lagoon provided residents and visitors \$3.7 billion in benefits in 2007, far outweighing the \$91 million spent on lagoon restoration, research and education (Hazen and Sawyer, 2008).

Case #3: Two major floods of the Mississippi River occurred in 1993 and 2008. The combined cost of these floods was estimated at over \$25 billion, making them the costliest natural disasters in U.S. history. After the 1993 flood, analysis revealed that the damage was the result of the degradation of the flood regulation services provided by the wetland ecosystems surrounding the river. Most of these wetlands had been drained and converted to cropland. This analysis led to the restoration of some portions of the original flood plain, and this is credited with significantly reducing the losses of the 2008 flood (which were approximately half those of 1993). Analysis further showed that if the ecosystem had remained intact, the entire flooding event could have been contained with no impact to society. A cost-benefit analysis of restoring all 728 000 hectares (1.8 million acres) of cropland within the 100-year flood zone back to wetlands was conducted. The annual benefit of the conversion was calculated at \$120.9 million, demonstrating that society would be better off if the croplands were restored back to wetlands (Landen Consulting, 2009).

Case #4: Even large private corporations are beginning to recognize the value of ecosystem services. Puma has become the world's first major corporation to report the costs of its

² This represents the net present value of ecosystem service losses from forest biomes in 2008 and continuing through the next 50 years, using a 1-4% discount rate.

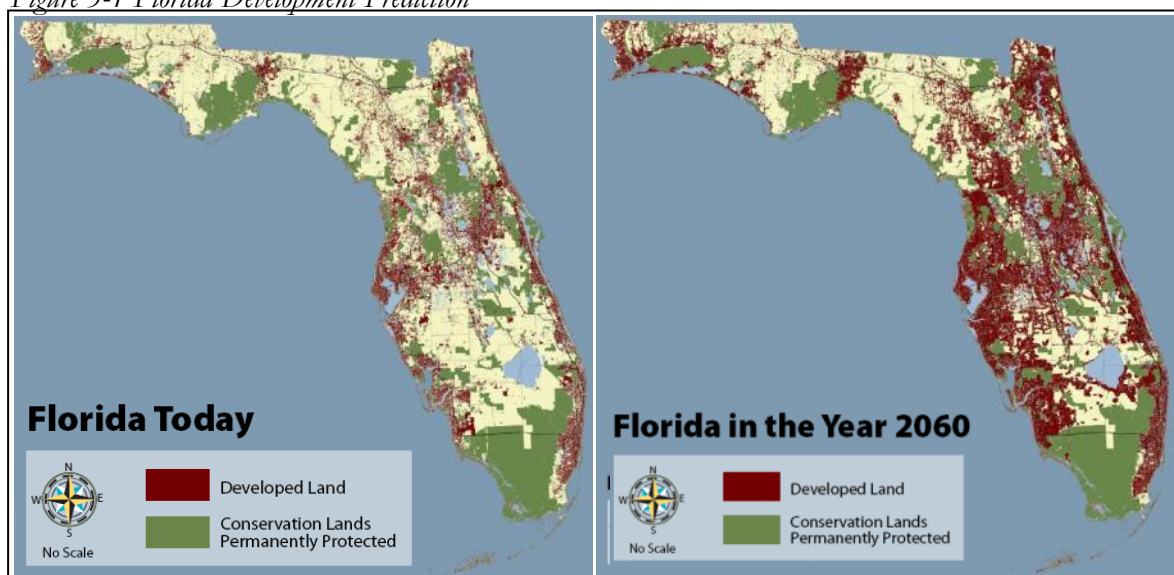
impacts on the environment, at least in terms of carbon output and water use. Puma reported in May 2011, that the combined cost of the carbon emitted and the water used by themselves and their suppliers was \$134.3 million. Driving this move in reflecting environmental impacts in reporting, is the idea that ecosystem services are not infinite. Therefore, these services should no longer be considered free with the understanding that there will be future impacts on financial returns. As resources become scarcer, businesses will have to pay more to protect or replace them, perhaps through market price increases, pollution taxes, carbon taxes or higher insurance premiums. Puma set a target of reducing its carbon emissions, water use, energy use and waste by 25% by 2015. Puma's chief executive, Jochen Zeitz, stated that "The business implications of failing to address nature in decision making is clear – since ecosystem services are vital to the performance of most companies, integrating the true cost for these services in the future could have significant impacts on corporate bottom lines (BBC News, 2011)."

3.2 Florida as a Case Study

To examine the problem of ecosystem service losses in greater detail, the State of Florida will be used as a case study. Florida was chosen because the situation there is particularly bleak and a number of detailed studies have been conducted to project what the future may look like if nothing is done to change the current path of development and ecosystem destruction.

With a population of over 18 million people, the state already struggles with water shortages and vanishing natural areas. Due to Florida's appealing climate, abundant economic and recreation opportunities, and no state income tax, 1000 people per day (365 000 people per year) move into Florida (U.S. Census Bureau, 2010a). By 2060, the population is projected to double to approximately 36 million people (Zwick & Carr, 2006). According to a report by the GeoPlan Center at the University of Florida, the urbanized land in Florida will also double by 2060 (Zwick & Carr, 2006). This means that approximately 2.8 million hectares (7 million acres) will be converted from rural to urban use within the next 48 years. This incredible landscape change means the loss of crucial watersheds, wildlife corridors, and natural systems (see Figure 3-1 below). The majority of undeveloped areas remaining are either protected as conservation areas owned by the state or federal government, or they are private agricultural lands. The government cannot afford to purchase and manage enough lands to safeguard sufficient ecosystem service to meet the growing demands of the states, and even if it could, doing so would be far less economical than simply maintaining private lands in agriculture.

Figure 3-1 Florida Development Prediction



Source (Zwick & Carr, 2006). Reprinted with written permission.

Development such as this is unsustainable and much work is being done to try and reshape Florida's future. There are still those, however, that believe fast development is the key to economic growth and hence one should not waste time generating long-term development management plans (see Appendix 3 for further discussion on this issue). For many agricultural landowners, there is more economic incentive to sell their lands to developers, than there is to stay in agriculture (Reed, 2007). This is precisely what economists would want to see happen in a 'free' market, but if, and only if, there are no market failures. In this case, the market exhibits failures by not accounting for the values of ecosystem services (Hanley, et al., 2001; The Left Anchor, 2010).

3.2.1 Types of Agricultural Lands in Florida

Of Florida's total 13.9 million hectares (34.5 million acres) of land, 4.1 million hectares (10.2 million acres), or approximately 1/3 of the state, is in some form of agriculture (Main, et al., 2004). The majority is used for cattle grazing, but there are also 280 different crops varieties grown in Florida, including various forms of citrus, sugarcane, and vegetables (NACAA, 2004). There is also a small poultry and egg production industry in Florida. Each type of land has its own unique set of benefits. The value of the ecosystem services of these agricultural lands is recognized at a state government level. The Florida Legislature passed the Agricultural Lands and Practices Act which offers great protection for these lands and the services they offer. The act uses strong language to demonstrate the importance placed on these lands, with statements such as "The Legislature finds ... that agricultural lands constitute unique and irreplaceable resources of statewide importance; that the continuation of agricultural activities preserves the landscape and environmental resources of the state, contributes to the increase of tourism, and furthers the economic self-sufficiency of the people of the state; and that the encouragement, development, and improvement of agriculture will result in a general benefit to the health, safety, and welfare of the people of the state (Agricultural Lands and Practices Act, 2009)." Due to the limitations of this study, only the major land use classification and the main benefits within those systems will be discussed.

3.2.1.1 Rangelands

A majority of agricultural lands in Florida are used for cattle production, or has a multi-purpose use including cattle production. Florida is the 12th largest cattle producing state in the U.S., with 1.74 million head of cattle (TNC, 2009). The cattle industry contributed over \$348 million to the Florida economy in 2003 (Main, et al., 2004).

Cattle grazing in Florida is rather different than what is seen in Europe and in many states within the U.S., for much of it is done in rather natural settings with minimal alterations to the landscape (see Figure 3-2 below). Grazing can be done on improved pastures, unimproved pastures, or on native range and the ecological benefits differ among them. On improved pastures, the ground is planted with a higher value forage grasses. These require more fertilizers, herbicides and pesticides than other types of pastures. Unimproved pastures have an introduced grass that is not managed for high production, hence do not require as much input of these products. Native pastures, as the name implies, are left as they were and the cattle rely on the native plant species for their forage. Generally, no fertilizer, herbicide, or pesticide products are used - unless exotic plants encroach on the area and herbicides are needed to remove them in order to regain the native forage (Main, et al., 2004). In general, the use of chemical products on grazing lands (also referred to as rangelands) is very low, especially in comparison to croplands and urban yards. In a survey conducted in 1996, it was found that of the grazing lands that did use herbicide (between 35 and 57% of grazing lands in different parts of the state used at least some), the application was limited to spot treatments of select problem weeds, amounting to a coverage of between 1 and 7% of the total lands being grazed.

Pesticide application is similar in nature, and fertilization is limited primarily to improved pastures (Main, et al., 2004).

Rangelands provide many ecosystem function services, in large part simply by conserving the lands in near native form or simply by keeping it open and undeveloped. The sections below will discuss just three of the most valued functions these lands provide. Many of the services discussed later under croplands, will also apply to rangelands so they will not be repeated here.

Figure 3-2 Typical Florida Cattle Grazing Lands



Source: Pictures from author's personal collection

3.2.1.1.1 Rangelands Provide Wildlife Habitat

The cattle production in Florida lends protection of some of Florida's most endangered and rarest wildlife species (Figure 3-3). By maintaining an open landscape, cattle grazing aids in the preservation of Florida panthers, red-cockaded woodpeckers, Florida scrub-jays, Audubon's crested caracaras, burrowing owls, Florida sandhill cranes and gopher tortoises (Main, et al., 2004; NACAA, 2004; TNC, 2009; USDA, 2007). The Florida panther is highly endangered, only 100 to 160 individuals remain in the wild (FWC, 2011). Over half of the habitat used by these cats is privately owned, primarily for cattle production (Main, et al., 2004). These lands are also home to more common species, such as turkey, deer, bobcats, and quail, often valued for hunting and wildlife viewing.

Figure 3-3 Whooping Cranes, Gopher Tortoise, Burrowing Owl and Bobcat on Rangelands



Source: Pictures by Danny Bales (personal friend of the author), used with written permission.

The three main causes for loss in wildlife biodiversity in the state of Florida are: 1) the loss of habitat, 2) the loss of connectivity of remaining fragmented habitat which allows for genetic exchange amongst populations, and 3) the degradation of the remaining habitat (Main, et al., 2004). Native vegetation found on most cattle grazing lands in Florida provides these habitats and vital connections. Preservation and good environmental stewardship of these areas is critical to the survival of these species.

3.2.1.1.2 Rangelands Protect Wetlands

Florida is suffering from a decline of over 50% of the wetlands found in the state prior to European settlement (Main, et al., 2004). Much of what remains inland can be found on lands grazed for cattle. These wetlands serve many important functions, which will be discussed in greater detail in Section 3.2.2.1. Wetlands control erosion, filter water, reduce potential flooding impacts, serve as a recharge point for the aquifers, and provide habitat for fish and

wildlife (U.S. EPA, 1999). Wetlands are natural sources of water for cattle, hence have not been removed and their quality has been protected to ensure the health of the herds.

The manure produced by cattle contains a great deal of phosphorous and can contribute to increased phosphorous levels in nearby water bodies, if herd sizes are not properly regulated. However, wetlands can tolerate a very high phosphorous load and hence act as a phosphorous sink protecting nearby open water bodies. These same wetlands can also act as nitrogen sinks, again purifying water before it enters lakes and rivers (Dunne et al., 2007).

3.2.1.1.3 Rangelands Recharge Aquifers and Prevent Flooding

In Florida, the residents depend on Florida's aquifers for nearly 100% of their drinking water. The aquifers are being depleted at an alarming rate. They cannot recharge as quickly as they need to, due in large part to the many paved surfaces across the state that do not allow the water to percolate down through the soil and into the aquifers. Much of the rainfall runs off streets straight into stormwater drains that eventually lead to rivers and lakes, bypassing the aquifers. Agricultural lands are vital to recharging the aquifers and assuring the protection of Florida's water supply. If these lands are lost to development, water shortage problems in Florida will escalate. Desalination measures or pipelines from other states are two methods proposed to solve this problem, but both are extremely expensive compared with simply maintaining non-developed lands. The absorption capabilities of rangelands that aid in the recharge of the aquifers also have the secondary effect of reducing, or preventing, local flooding. This offers protection to nearby residents and should be considered a service value comparable with that of fire protection by fire departments (Cervone, 2003; TNC, 2009).

If development continues with no further restrictions, i.e. business as usual, there will be but a fraction of these rangelands by 2060. The cattle business is very cyclical, there may be gains one year and losses the next. This uncertainty makes selling the land for a guaranteed profit more and more appealing. The Lykes Family's lands are located in Florida, most of it used to graze cattle. They own the largest contiguous private property in the U.S. and living on their lands are many imperiled species, including the endangered red-cockaded woodpecker. The Adams Ranch is also known for their wildlife and good environmental stewardship, having won several stewardship awards. However, they, like so many other ranch owners in Florida, are struggling. "If we go out of business, there will be roof tops here," stated a representative from Adams Ranch (NACAA, 2004). Predictions state that 2.8 million hectares (7 million acres) currently in some form of grazing, will be developed by 2060 (Zwick & Carr, 2006).

3.2.1.2 Croplands

The agricultural lands in Florida not being utilized by cattle are mainly in crop production. In some cases, the two are compatible and the lands serve both purposes. The main crops grown in Florida are citrus and sugar cane, but there are also fruits like strawberries and watermelons, and a variety of vegetables such as corn, carrots, and cabbage. There are also ferneries, plant nurseries and greenhouses that grow garden and house plants. Florida even has a limited amount of tree nut, tobacco, and cotton farming (Rahmani, Hodges, & Clouser, 2010).

The type of ecosystem services provided by croplands depends on the underlying conditions of the farm and the farming practices and land stewardship of the landowner or manager. Under the right conditions, croplands in Florida can provide ecosystem services that include carbon sequestration, biodiversity conservation, soil creation, purification of air, purification and recharge of water supply, flood protection, recreation and education (Bachev, 2010).

3.2.1.2.1 Carbon Sequestration in Croplands

Carbon sequestration in cropland soils is considered one way of offsetting carbon emissions from human activities (such as burning fossil fuels). By managing crop residues on the

landscape and reducing or eliminating the tilling of land, croplands can increase its ability to store carbon in the soil. Carbon can also be stored in the biomass of the plants themselves. In the case of citrus production, where only the fruits area harvested but the trees remain and continue growing, carbon sequestration is a natural by-product of the industry (Sandhua, Wrattena, Cullenb, & Case, 2008).

3.2.1.2.2 Soil Creation by Croplands

New soil is formed by the natural biota of the existing soil. Earthworms play the largest role in providing this service. Most farmers recognize the value of earthworms and are careful not to use pesticides that could be detrimental to their survival. If new soils are not created onsite at an equal pace with their use, farmers would need to purchase costly top soil or eventually abandon their farming operations (The Ecology Global Network 2011).

Soils also need to maintain a certain level of fertility so they can provide nutrients to crops growing on the land. Through a process called mineralization, invertebrates and micro-organisms in the soil can breakdown organic matter left in the soil, and hence release the bounded nutrients, such as nitrogen, found within plant residue. Growing legumes on the land in the restorative phase between crop rotations can assist with the fixation of nitrogen, to make it available to the next set of crops. Without these ecosystem services, farmers would be more dependent on expensive fertilizers for these services (Sandhua, et al., 2008).

3.2.1.2.3 Recreation and Education Offered by Croplands

Recreation opportunities in croplands include things like wildlife viewing when birds and other animals come to feed on the lands or seek shelter. Berry, nut and vegetable picking is enjoyed by many. Some places in Florida have annual harvest festivals. The Zellwood corn festivals are widely attended and one of the local growers, Long and Scotts Farms, even has elaborately designed corn mazes that attract visitors from far and wide (see Figure 3-4). Many areas offer hunting and fishing opportunities. At the same time, these lands provide an opportunity to educate our children about nature and about where their food comes from (Long and Scott Farms Inc., 2010; TNC, 2009).

Figure 3-4 Corn Mazes from Long and Scott Farms



Source: (Long and Scott Farms Inc., 2010). The first maze depicts the Statue of Liberty, the second is entitled “aMazing weather” after three hurricanes came through the area in 2004. Reproduced with written permission.

All of the ecosystem services discussed above are “free” services that nature can provide if the lands are managed properly. But that does not mean they do not have value. If not provided by natural means, farmers would have to buy some of these services, like fertilizer and top soil.

3.2.2 Determined Values of Selected Florida Ecosystem Services

There is an array of ecosystems services in Florida whose values have been determined using the methods discussed in Chapter 2. A small sample set of these will be discussed below.

3.2.2.1 Wetland Values

Wetlands are valued for services such as flood control, erosion control, water purification, and wildlife habitat provision. Wetland located in the vicinity of rivers and lakes, as well as heavy rain prone areas, act as ‘sponges’ that absorb excess water. As flood waters enter wetlands, they are slowed by wetland vegetation such as trees, bushes, grasses and reeds. By slowing the flow, the wetlands have more time to absorb the water. In these ways, wetlands provide a flood protection service to downstream areas (U.S. EPA, 1999). The average annual U.S. flood losses over the ten year period of 1994 to 2004 were approximately \$2.4 billion (NFIP, 2010). In Florida where hurricanes frequently release huge volumes of rain, insured flood losses alone totaled more than \$2.3 billion between 2002 and 2006 (NFIP, 2010).

Wetlands reduce erosion by similar means. During a storm event, rushing waters can wash away large amounts of soil, but the vegetation in wetlands again slows the rush of water. The vegetation also binds the soils with its roots and causes suspended sediment to settle to the bottom before washing into nearby water bodies. Wetlands have been shown to capture up to 70% of sediment from run-off (Ducks Unlimited, 2009). An estimated \$20 billion in economic losses are caused by erosion each year in the U.S. (Pimentel, 1995).

Wetlands are particularly good water filters. The organisms within wetland soils, as well as wetland plants, are able to filter a large variety of pollutants. Wetlands capture and assimilate up to 90% of bacteria, between 92% and 94% of nutrients such as phosphorous and nitrogen, various toxic materials, and even some metals (Ducks Unlimited, 2009; U.S. EPA, 1999). The case study from New York (see Section 3.1) illustrates the billions of dollars that can be saved by using wetlands instead of human built water treatment facilities to filter water (Chichilnisky & Heal, 1998). When water quality sank below required standards, a cost-benefit analysis done by the Vittel water bottling company in France demonstrated that it would be more economical to pay farmers to increase the ecosystem services of their lands (primarily water filtration abilities), than for the company to build a water treatment facility to filter its water. After the company instituted a Payment for Environmental Services (PES) system for farmers near its bottling facilities, their water once again met the required standards for bottling (Perrot-Maître, 2006).

Wetlands are also vital to Florida’s wildlife. Wetlands provide essential habitat for a variety of birds, mammals, reptiles, insects, amphibians, and fish. Many of these species (such as wood ducks) spend their entire lives in wetlands; others (such as green tree frogs) depend on them for a certain portion of their life-cycle; while still others (such as striped bass) utilize them for food, water, and shelter on a varied basis. The high rate of wetland loss is contributing to the threat of extinction of many species (U.S. EPA, 1999). The value of wetland biodiversity is impossible to determine. However, some attempts have been made to value individual species - especially endangered ones (see Section 3.2.2.2 below).

These are just a few of the benefits wetlands provide, so how do we value the wetland ecosystem as a whole, considering all of these various benefits? Using a replacement cost valuation method, one can look at the market to see what the current rate is for the mitigation of wetland impacts. When a development project will result in wetland impacts, the State of Florida requires that those impacts be mitigated (FDEP, 2010). Wetland mitigation in Florida can be handled in three different ways. The entity causing the impact can either find a wetland under conservation protection that is in need of restoration and pay for that to occur; they can attempt to artificially create a wetland with the same functions as the one being impacted; or

they can purchase credits at a mitigation bank that handles large scale wetland mitigation (FDEP, 2010).

The Florida Department of Transportation (FDOT) usually handles its impacts using one of the first two methods. According to personal correspondences with Lisa Grant (2011) in the Environmental Resource Permitting Department of the St. Johns River Water Management District (SJRWMD), FDOT is currently budgeting \$247 000 per hectare (\$100 000/acre) of wetland impact. Mitigation bank credits are purchased using the Uniform Mitigation Assessment Methodology (UMAM). According to correspondences with Michelle Reiber (2011) with SJRWMD and Alan Alshouse (2011) with PBS&J, the number of credits needed to mitigate each acre of impact depends on the individual level and type of impact. Costs vary depending on the location of the mitigation bank and availability of credits, but 2009 figures ranged from \$138 000 to \$346 000 per hectare (\$56 000 to \$140 000 per acre) (Alshouse, 2011; Reiber, 2011).

Ray Bunton (2011), Director of the Division of Land Acquisition with SJRWMD, was contacted to see how these values compare with current purchase prices of Florida wetlands. Sales prices in 2008 and 2009 ranged from \$4 200 to \$10 900 per hectare (\$1 705 to \$4 407 per acre) for properties that were entirely wetlands. For larger properties that contained an equal mix of wetlands and uplands, prices ranged from \$3 200 to \$4 700 per hectare (\$1 300 to \$1 900 per acre) (Bunton, 2011). According to these figures, the difference in price between purchasing a wetland with all its ecosystem services intact, versus the price of mitigating for the destruction of these services, is more than 30 fold (and as high as 100 fold). This clearly shows the value implied to ecosystem services, when the cost to mitigate wetlands far exceeds the cost of preserving them.

3.2.2.2 Endangered Species Values

When assessing the value of species, one is not really looking at the value of a “life” as is often implied. It is actually a risk assessment. What are we willing to pay to greatly reduce the risk of losing the life of a particular species? One of the problems when it comes to species protection is the favor generally given by the public to ‘charismatic megafauna.’ People are more willing to pay for the protection of a graceful, perhaps symbolic creature like the bald eagle, than to small, unappealing, or unknown creatures like a cave mold beetle or a Key Largo woodrat. This contingent valuation (i.e. relying on people’s opinions in determining value) in turn affects the decisions of policy makers and funding allocations (Coursey, 1998).

When Coursey (1998) evaluated the value of species listed as either threatened or endangered, based on people’s willingness to pay for their protection, and then looked at the same species’ values based on implicit values based on spending, there was a statistically significant correlation. In his report looking at 247 species from mammals, to birds, to crustaceans and even insects, expenditures on the conservation of these species totaled nearly \$85 million in the 1990 fiscal year. However, 8 of the 247 species received half of this funding. The range of implicit values for different endangered species in Florida varies greatly, from \$18 for Audubon’s crested caracara to over \$8.5 million for a single Florida Panther (see Table 3-1 below). Hedonic value of a human life in literature typically ranges from \$2-\$7 million. Hence, this valuation would suggest a Florida panther may have more or less the same risk value as a human³ (Coursey, 1998).

³ Note that this value is for the risk of reducing the loss of a statistical life, nor an identified person. In the case of an identified person, such as a child in danger, the ‘human value’ would be far greater than that of a ‘statistical value.’ Hence if a real human child was in need of an expensive life-saving procedure, there may be no limit to the amount of money that would be spent in an attempt to save him or her. The same cannot be said of a Florida Panther.

Table 3-1 Implied Values of Select Florida Species (in 2011 U.S. Dollars)

<i>Species Common Name</i>	<i>Implied Value</i>
Audubon's Crested Caracara	\$18
Wood Stork	\$74
Roseate Tern	\$236
Brown Pelican	\$410
Green sea turtle	\$835
Cave crayfish	\$1 246
Florida Grasshopper Sparrow	\$1 399
Loggerhead sea turtle	\$1 886
American crocodile	\$1 913
Bald Eagle	\$21 196
Florid Scrub-jay	\$41 058
Red-cockaded Woodpecker	\$125 084
Whooping Crane	\$579 256
Florida panther	\$8 574 815

Source: Adapted from (Coursey, 1998). Original amounts in 1990 USD, adjusted using (Halfbill, 2011).

Obviously there is a problem with basing conservation efforts of species on such valuations; many would say all species have an equal right to survival. However, with limited resources the opportunity costs of species protection (the cost of reduced resources for other causes) must be taken into account and hence some form of cost-benefit analysis is often required. President Clinton's Executive Order 12866 (September 1993) stated that "Each agency shall assess both the costs and benefits of the intended regulation and recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs." Hence, such comparisons are even required under the Endangered Species Act (Coursey, 1998; Shogren et al., 1999).

Another way to imply the value of endangered species is again to look at mitigation values. For species that cannot be relocated when development occurs, mitigation for the loss of the species habitat is required. For the Florida Scrub-Jay, mitigation costs approximately \$19 700 per hectare (\$8000/acre) and Sand Skink mitigation runs \$74 000 per hectare (\$30 000 per acre) (Alshouse, 2011). Gopher tortoises are required to be relocated to lands that have been placed under permanent conservation easements, so no loss of life is necessarily anticipated (although it is known that some do perish due to the stress of relocation, and due to the increased diseases transmitted between tortoises when placed in close proximity to each other during the relocation process). The cost of relocating these animals ranges on average from \$900-1000 per tortoise. This is in addition to the value of the lands that are receiving the tortoises and costs involved with the establishment and maintenance of conservation easement (Alshouse, 2011). Although the cost of mitigation does necessarily provide a true value of the species in question, it does imply that there is a value and the level of mitigation costs may suggest that the value of one species is greater or lesser than another.

The cost of species recovery programs range from \$50 000 to \$500 000 per species per year, or even upwards of a \$1 000 000 annually when captive breeding efforts are required (Shogren, et al., 1999). This is a tremendous amount of money, especially when we account for the large number of species that are currently imperiled. When we consider that most species are in jeopardy due to loss of habitat, clearly the most economical method of conservation is to maintain the lands we currently have that support these species and the ecosystems upon which they rely. Amongst these, would be Florida's agricultural lands.

3.2.2.3 Tourism and Outdoor Recreation Values

By far, the main economic engine in Florida is tourism. Florida's tourism is a \$65 billion annual industry, and that which attracts people to Florida is not just Disney World. In 2007, 80 million people visited Florida and 65 percent of them participated in nature-based activities. Wildlife viewing, nature hikes, swimming in Florida's clear springs, canoeing through the Everglades and lying out on the beaches are but a few of the outdoor activities Florida has to offer (TNC, 2009).

There are 160 state parks open to visitors in Florida (FDEP, 2011). Additionally, there are hundreds of additional state, municipal, private and federal lands open to outdoor recreation. In the 2007-2008 fiscal year, the state park system had a direct economic impact of more than \$1 billion (TNC, 2009). Many of the state parks are known for their incredibly beautiful springs, which draw tourists for swimming as well as viewing the unique wildlife that are dependent on the springs (Figure 3-5). One example of this is the endangered Florida manatee viewing at Blue Springs State Park. The park holds an annual Manatee Festival each winter when these gentle mammals enter the warm waters of Blue Springs. On average, the park receives an additional 90 000 visitors annually coming exclusively to see the manatees. This results in an economic impact of \$20 million (Yuskavitch, 2007).

Figure 3-5 Manatees at Blue Spring State Park



Source: Photo from author's personal collection.

Of even larger economic significance, is the coral reef related recreation (snorkeling, diving, etc.) that takes place in the Florida Keys. Approximately \$2.7 billion in retail sales, \$1.2 billion in wage income and 43 320 jobs are provided by this recreation. Of lesser significance on the grand scale, but significant to the little village of less than 900 people where it occurs, the Whooping Crane Festival in Necedah, Wisconsin (where the cranes start their migration route to Florida) brought in 4 000 visitors and \$42 610 in revenue in 2005 (Yuskavitch, 2007). Outdoor recreation, such as fishing, hunting, bird watching and horseback riding, are enjoyed by tourists, as well as Florida residents. In 2006, hunting, sport fishing, and wildlife viewing had an economic impact of \$13 billion (TNC, 2009).

It is important to make the connection between the springs (and manatees) that draw so many tourists to Florida and the lands that recharge the aquifers, because it is the aquifers that create the springs and support the manatees. The aquifers are limestone reservoirs that collect water that has percolated through various sand, rock and clay layers. Through this process, the water becomes purified. The water is under natural pressure in the aquifers and occasionally this pressure needs to be released. When this happens, the water bubbles up to the surface, forming springs. Florida has over 600 springs, including half of the first-magnitude springs in the U.S., discharging over 246 million liters (65 million gallons) of freshwater per day. This water creates great rivers, and is utilized by wildlife, for recreation, and nearly all the drinking water in Florida (TNC, 2009).

Just as we made the connection between the recharge areas and the springs, we must make the same connection in terms of wetland protection and the health of our coral reefs. Similarly, if not for the open agricultural lands that whooping cranes utilize, the state would suffer the

economic losses of this watchable wildlife. There are countless similar connections, but these are sufficient to emphasize how these tourism and recreation benefits to the state are dependent of other ecosystem services, many of which are provided by Florida agricultural lands.

In addition to supporting tourism and outdoor recreation on other areas, some agricultural lands have tourism businesses integrated in their daily operations, such as the Long and Scott Farms example discussed above. Private hunting and fishing leases are common on Florida's agricultural lands. A typical Florida hunting lease costs between \$2000 and \$4000 per person, with some going as high as \$8000. The number of leases available per property varies. Typically, lands can support 1 hunter per every 53 to 243 hectares (130 to 600 acres). Adding tourism and recreation to their lands has made it economically feasible for some landowners to retain their lands, despite times when crop yields were low or food prices had dropped below their cost of production (Alshouse, 2011).

Most of the discussion above has focused on very measurable dollar values. One can measure travel cost expenditures, spending on souvenirs, and park entrance fees. However, there are implicit values that are not captured in these figures, such as the appreciation and support for nature attained by those who spend time in it, the health benefits of relaxing outdoors, and the education value of a canoe trip through a swamp or river system – these values are hard, perhaps impossible to measure, but should nonetheless be considered when making decisions about the future of these lands.

3.2.3 Analysis of Florida Case Study

When analyzing what is happening in Florida using the neoclassical framework, one can predict that out of self interest, agricultural landowners will sell their lands unless they are provided incentives not to do so, or can find ways to garner additional financial gains from their lands. Farmers and ranchers have demonstrated this, by opposing zoning that limits their future land use strictly to agriculture, because they want to keep their option of selling their land to development (Future of Florida Agriculture Task Force, 2010). Their lands have great value, far greater than the selling prices, but this value cannot be fully realized in a free market without government interventions that will correct for the market failures.

Taking an ecological economic view, society should recognize the ecosystem service values of agricultural lands and implement PES programs for farmers to correct for market failures, while encouraging good land stewardship practices. Another strategy for adding land values to account for the positive externalities of agricultural lands, would be to increase the amount landowners are paid for putting conservation easements on their lands. These easements pay for the development right of the lands, without actually purchasing the lands. The agricultural activities performed on the property can continue, but no houses can ever be built. As is discussed in Appendix 3, society will benefit more from the services these lands provide, than the tax revenues development brings. Should these services be lost, economic growth will likely be hindered due to the enormous cost of trying to replace natural systems with artificial systems (wastewater treatment plants instead of natural wetlands for example). Additionally, many functions would be permanently lost because artificial systems have been shown to only provide a few select functions of the original ecosystem (Chichilnisky & Heal, 1998; Hazen and Sawyer, 2008; Landen Consulting, 2009). If the economic value of these services are not realized before the lands are developed, the State of Florida will lose some of the most cost effective methods it has for providing for the people of the state.

Ecological economics reasons, that well balanced ecosystems promotes well balanced economies and vice versa. If lands are over-exploited and development pushed beyond the ability of the land to provide the services we need (such as enough water), our economy will suffer along with the damaged ecosystems.

4 Current Situation in the U.S.

The United States is one of the largest agricultural commodity producers in the world. The consumption, export and import of agricultural goods by the U.S. have global economic implications. In 2008, the value of agricultural production in the U.S. was \$365 billion, with agricultural exports totaling \$115.4 billion. Farming is considered a critical component of the food and fiber system, which in 2002 employed 24 million people and contributed \$1 240 billion (12.3%) to the GDP in the U.S. Despite this, there has been a continual decline in the number of farms and farmland acreage across the U.S. Additionally, there has been a shift from smaller family-owned farms to larger commercial scale farming operations (OECD, 2011).

There are a number of reasons for these shifts. First, the U.S. agricultural sector receives relatively low governmental support compared to other developed countries. A report covering the period of 2007-2009, showed that producer support in the U.S. was the third lowest in the OECD area (34 member countries of the Organization for Economic Cooperation and Development). Another reason for the loss of agricultural lands is developmental pressure (OECD, 2011).

Never before in the nation's history has the U.S. experienced the developmental pressure it is under today. The National Resource Inventory shows that the loss of farmland, wildlife habitat and open space has accelerated over the past two decades. Between 1982 and 2001, approximately 14 million hectares (34 million acres) were converted to urban, suburban or industrialized uses. That is an area equivalent to the size of the state of Illinois. The U.S. has lost over 50 percent of its wetlands, with some states having lost over 90 percent of these valuable systems. These losses are due not only to population growth, but also to urban sprawl. Development of land is seven times that of current population growth, arising from the fact that U.S. citizens are taking up far more space and using more resources than in the past. It is also the result of increased income and inadequate land-use planning and land-use laws. Additionally, some decision makers feel that development is of economic benefit to their communities and hence encourage fast paced development -see Appendix 3 for why this may not be the case (Eno, et al., 2006; NRCS, 2011d; USDA, 2011a).

4.1 Overview of Existing Federal Conservation Programs

There are a number of federal programs designed to address the issue of land conservation and stewardship on agricultural lands in the U.S. The foundation for many of these programs began in the early 1930s, when the U.S. began assisting farmers with soil conservation. Early programs included the Agricultural Adjustment Act of 1936, followed by the Soil Bank which began in 1956. In 1985, the first voluntary agricultural conservation program still in existence today, the Conservation Reserve Program, was enacted, still focusing primarily on soil conservation (Claassen, Cattaneo, & Johansson, 2008).

Most programs used today are voluntary in nature, but cross-compliance and regulations are also utilized. Most regulatory instruments were established in the 1970s, beginning with the Clean Air Act and the Clean Water Act. In 1972, the Federal Insecticide, Fungicide, and Rodenticide Act banned many pesticides widely used in agriculture, and in 1973 the Endangered Species Act began protecting critical habitat for species facing the threat of extinction. Cross-compliance measures began in 1985. Through the Swampbuster and Sodbuster provisions to the 1985 Farm Bill, benefits such as income support payments, crop insurance and disaster payments become contingent on not violating certain wetland and highly erodible land conditions. The scope of modern agricultural conservation programs have

increased from just addressing soil concerns, to also considering wildlife habitat, water quality, air quality, biodiversity, carbon sequestration and an array of other concerns. The level of assistance offered varies by program and can include technical assistance, grants, loans, tax rebates, conservation easements, and rental payments (Claassen, et al., 2008; OECD, 2011).

The vast majority of the funding for these programs comes from the Food, Conservation, and Energy Acts, more commonly referred to as the U.S. Farm Bills. Farm Bills are the mechanism for providing income support to the U.S. agricultural sector. In 2007, 40 percent of all farms in the U.S. received some form of governmental payments. The bulk of the payments go to commercial size operations, but the environmental conservation payments get dispensed proportionally more to smaller farms. A new farm bill is typically passed every five years and changes impact not only agriculture, but also international trade, environmental protection, the economy of rural community, and even the level of debt the U.S. government carries. The budget for the 2008 Farm Bill, which will be valid through 2012, is \$288 billion dollars, of which approximately \$27 billion goes to conservation programs (USDA, 2011b).

The largest agri-environmental programs, those receiving the most funding and greatest participation, include the following and will be discussed in more detail below:

- 1) Conservation Reserve Program (CRP)
- 2) Environmental Quality Incentive Program (EQIP)
- 3) Conservation Stewardship Program (CSP)
- 4) Wildlife Habitat Incentive Program (WHIP)
- 5) Wetland Reserve Program (WRP)
- 6) Farm and Ranch Land Protection Program (FRPP)
- 7) Grassland Reserve Program (GRP)
- 8) Conservation Technical Assistance (CTA)

4.1.1 Conservation Reserve Program

The Conservation Reserve Program (CRP) is the largest land retirement program in the U.S. It was the first conservation program enacted by a Farm Bill, introduced in 1985. CRP was developed under the 1985 Farm Bill for the primary purpose of controlling soil erosion and also to help stabilize land prices and control excess agricultural production. Since its inception, the purpose has become broader. Today, the goals of CRP also include protecting the ability of the U.S. to produce food and fiber, reduction of sedimentation in streams and lakes, improvement of water quality, establishment of wildlife habitat, and enhancement of forest and wetland resources. Under this voluntary program, farmers can bid to take highly erodible or environmentally sensitive lands out of production for a set number of years (usually 10-15 years), in exchange for annual payments, known as rental payments. The program is administered by the Farm Service Agency (FSA) of the U.S. Department of Agriculture (USDA) and participants are selected based on the rankings their applications receive, using an index known as the Environmental Benefits Index (EBI). Land devoted to certain conservation practices are eligible for continuous sign-up under CRP without being subject to competitive bidding (Baylis, Rausser, & Simon, 2003; Private Landowner Network, 2011).

Rental rates paid to landowners for the retirement of their lands is based on the relative productivity of the soils within each county and the average agricultural rental value of the land. This is calculated in advance and landowners can choose to apply at the maximum CRP rate available for their area, or they can offer a lower rate to increase the likelihood of their application being accepted. The EBI scores are based on the environmental benefits per dollar, so lower rental rates will increase the application score for lands that offer the same level of environmental benefit upon being retired from farm production. The average rental

payments for general CRP sign-ups in 2010 was \$110.09 per hectare (\$44.57/acre) (Cowan, 2010; Private Landowner Network, 2011; USDA, 2011b).

Farmers are required to plant cover (grass, shrubs, and trees) that reduce soil erosion on the enrolled lands, improve water quality and enhance wildlife habitat. Cost-share assistance of up to 50 percent of the cost of planting this cover is available through CRP. In addition to regular rental rates and cost-share assistance, CRP also offers up to \$12.35 per hectare (\$5.00 per acre) per year in maintenance incentive payments to perform certain maintenance obligations. Certain continuous sign-up practices can also yield an additional 20 percent of the annual rental payment (USDA, 2011b).

The CRP program funding is also used under other smaller subprograms, such as the Conservation Reserve Enhancement Program (CREP) and the Farmable Wetlands Program (FWP). CREP is based on the same model as the larger CRP program, but funding from CRP is combined with additional funding from state, tribal, non-federal sources to address particular environmental issues within a project proposed by a state, tribe, local government, or local nongovernmental entity. In 2010, the average CREP rental payment was \$318.63 per hectare (\$129/acre). FWP reserves 405 000 hectares (1 million acres) for the enrollment of lands that have been farmed in partially drained wetland. The average rental payment under FWP was \$286.52 per hectare (\$116/acre). Other CRP subprograms that receive funding and may have reserved acreage include upland bird habitat buffers, bottomland hardwood tree areas, longleaf pine planting areas, non-floodplain and playa wetlands, floodplain wetlands, Prairie Pothole duck nesting habitat and state acres for wildlife enhancement. In 2010, the cost of CRP's rental, cost-share and incentive payments under all programs totaled an estimated \$1.9 billion (Cowan, 2010).

CRP has accomplished a great deal. Since its inception in 1985, millions of hectares of sensitive cropland have been converted to long-term grass and tree cover. As of July 2010, there were approximately 743 000 CRP contracts on over 400 000 farms, retiring 12.7 million hectares (31.3 million acres) of farmland. This means that nearly 19% of all agricultural landowners have some portion of their lands enrolled in CRP. Congress imposes an acreage cap on CRP of 12.9 million hectares (32 million acres). Hence there is not much remaining capacity for CRP enrollment, until the contracts on lands currently enrolled expire. The program reduces erosion, run-off and leaching, thereby protecting water quality in lakes, rivers, ponds and streams. The program also provides increased wildlife habitat and better air quality (Cowan, 2010; Private Landowner Network, 2011; USDA, 2011b).

4.1.2 Wetland Reserve Program (WRP)

Wetland Reserve Program (WRP) was introduced in the 1990 Farm Bill. The goals of WRP include improving water quality, preventing flooding, reducing soil erosion, recharge groundwater, and creating wildlife habitat. WRP is similar to CRP in that it is a voluntary program taking farmlands out of production, in this case farmed wetlands, and compensating the farmer for the loss of productive land. Wetlands, tropical forests and coral reefs are considered the most biologically productive ecosystems in the world. Wetlands are home to over one-third of the plant's species, and over half of North American bird species live or nest in wetlands, even though these wetlands only make up five percent on the land surface of the continental U.S. CRP has a provision for retiring farmed wetlands as well, by offering the landowner annual rental payments in exchange for taking the land out of production. WRP, however, does not offer rental payments; and, rather than being managed by the FSA, it is managed by the Natural Resource Conservation Service (NRCS) of the USDA (NRCS, 2011d; Private Landowner Network, 2011; USDA, 2008).

There are 3 enrollment options under WRP. First, the landowner can sell a permanent easement over their farmed wetland areas. The price paid for the easement can be the full agricultural value of the land, an established payment cap, or the amount for which the landowner offers to sell the land, whichever is less. In addition to the easement payment, the USDA will also pay for the full cost of restoring the wetlands. The second option is to enter into a 30-year easement. This option is the same as the one above, except the landowner is only paid for 75% of the value of the land and the USDA will only pay for 75% of the wetland restoration costs. The landowner is permitted to apply for grant programs or seek other forms of funding to cover the remaining restoration costs if they wish. The last option does not involve any easement at all. It is simply a restoration cost-share agreement, usually lasting 10 years, that reestablishes degraded or lost wetland habitat. Again the USDA will only pay for 75% of the restoration costs and there is no payment for the value of the land removed from farm production. Again, the landowner may choose to seek third party funding to cover the remaining 25% of the restoration costs (Private Landowner Network, 2011; USDA, 2008).

Just as with the CRP, Congress places a cap of 1.23 million hectares (3.041 million acres) of land that can be enrolled under this program, leaving some applications unfunded each year. Just as with CRP, there are subprograms as well. The primary one is the Wetland Reserve Enhancement Program (WREP) which, much like the CREP, leverages the financial resources of WRP with that of individual states, nongovernmental entities and tribes to carry out high priority wetland protection, restoration, and enhancement activities and improve wildlife. In 2011, WRP listed a “Special Wetlands Initiative” in The Red River Valley in Minnesota, North Dakota and South Dakota due to severe flooding issues in that region (NRCS, 2011c).

In 2010, agricultural landowners entered into 1 414 new WRP agreements (including subprograms agreements), totaling 110 074 hectares (272 000 acres) at a cost of almost \$593 million. The majority of the agreements, 951 of them, were for permanent easements. This was more than twice as many as the number of 30-year easements (totaling 428). There were only 31 restoration cost-share agreements, making it by far the least popular option. Overall, the number of agreements and amount of land removed from production increased from the 2009 levels, when only 1 109 agreements were entered into, protecting 72 607 hectares (179 417 acres). Subprogram projects do not account for a large portion of the total WRP budget. For 2011, only 5 WREP proposals, resulting in \$5.5 million in easement and restoration costs, were accepted. WRP funding in the amount of \$10 million will go to The Red River Valley Initiative (NRCS, 2011e).

Compared with CRP, the WRP program is a much smaller program. Whereas CRP spent \$1.9 billion in 2010 to remove lands from production, WRP only spent \$593 million. As of July 2010, CRP has removed 12.7 million hectares (31.3 million acres) of agricultural lands from production and gotten them planted with cover. As of 2010, there were approximately 1 million hectares (2.5 million acres) of land currently enrolled and being restored under WRP; although this program is 5 years younger than CRP, having been established in 1990. However, the value of each hectare of land enrolled in WRP may be higher, due to the very sensitive nature of wetland functions and their high environmental service values. Also, there are less administrative requirements for program administrators under WRP, as most easements are permanent or over the course of 30 years. However, the USDA does have to oversee the restoration they are funding under this program, just as CRP has to oversee its cost-share initiatives (NRCS, 2011e; USDA, 2008).

4.1.3 Environmental Quality Incentive Program

The Environmental Quality Incentive Program (EQIP), does not take farmlands out of production. Instead, it encourages farmers to adopt more environmentally friendly farming practices. EQIP was formed in 1996 by combining the Agricultural Conservation Program and a number of smaller programs. The program is administered by NRCS. It is not limited to croplands, as it also includes pasturelands used for livestock grazing, private non-industrial forestlands, and other farmlands. It is a cost-share program that helps fund activities with environmental benefits, such as the construction of manure storage facilities. EQIP provides both financial and technical assistance with the implementation of a conservation plan the landowner must produce to be eligible for the program. NRCS assists landowners in the development of the plan, which should address the protection and improvement of natural resources found on the land, specifically those that will improve air, water, plant, soil, and wildlife conditions. If the EQIP contract includes animal waste storage or treatment, the participant will have to include a comprehensive nutrient management plan. Forestlands require a forest management plan. EQIP payments can be as high as 75 percent of the incurred costs and forgone income of a particular action. Some groups, such as “disadvantaged producers” may receive payments up to 90 percent of the costs (Baylis, et al., 2003; Claassen, et al., 2008; NRCS, 2011c; Private Landowner Network, 2011).

Application selection criteria differ from state to state, based on that state’s priority resource concerns. The practices eligible for cost-share, eligibility criteria and the payment rates can also vary. Participants enter into a contract that can last for up to ten years. An individual farmer is limited to \$300,000 in payments during any 6-year period under EQIP, with a few exceptions (NRCS, 2011c).

As with CRP and WRP, there are several special initiatives under EQIP. These initiatives include (NRCS, 2011c):

- Agricultural Water Enhancement Program
- EQIP Conservation Activity Plans
- Colorado River Basin Salinity Project
- Conservation Innovation Grants
- Cooperative Conservation Partnership Initiative
- Organic Program Initiative

The Agriculture Water Enhancement Program (AWEP) is one of the larger initiatives, with \$73 million in funding for 2010 and \$74 million for 2011. Similar to initiatives under CRP and WRP, AWEP leverages funds within EQIP with those of states, tribes, local governments and the private sector. Projects funded must promote ground and surface water conservation, or improve water quality on agricultural areas (NRCS, 2011c).

Funding for EQIP is not nearly as high as CRP, but is greater than WRP. In 2010, EQIP funded 36 499 contracts, with a financial assistance obligation total of approximately \$839 million. Despite the high number of funded projects, there are generally more than 100 000 unfunded contracts each year (110 000 unfunded contracts in 2009, with an unfunded need on \$1.3 billion) (NRCS, 2011c).

4.1.4 Conservation Stewardship Program

The Conservation Stewardship Program (CSP) is a new program under the 2008 Farm Bill, taking the place of the Conservation Security Program listed in the 2002 Farm Bill. CSP is another program leaving lands in production, but encouraging better environmental stewardship. The program is unique in that it provides compensation based on performance, rather than offering per-acre rental payment like CRP or cost-share payments like EQIP. The payments are conservation performance based – the higher the performance, the higher the payment. According to Dave White, NRCS Chief, program developers worked hard to “streamline and simplify” this new program (NRCS, 2011c).

Contracts are for 5 years and approved applicants are paid annually for installing new conservation activities and maintaining existing ones. Each conservation activity is assigned a number of performance points. To calculate the payment, these points are multiplied by the number of acres upon which the activity will be taking place and by a predetermined payment rate for the type of land involved (see Table 4-1). Eligible lands are cropland, grassland, prairie land, improved pasture, rangeland, and nonindustrial private forest land. Supplemental payments are made to landowners that adopt resource-conserving crop rotation. Payments may not exceed \$40 000 in a year and may not exceed \$200 000 during the 5-year contract. (NRCS, 2009a, 2011a; Private Landowner Network, 2011).

Table 4-1 CSP Payment Rates (2011 U.S. Dollars)

LAND TYPE	ADDITIONAL ACTIVITY PAYMENT	EXISTING ACTIVITY PAYMENT
Cropland	\$0.1217/point	\$0.0411/point
Pasture/Cropland	\$0.0492/point	\$0.0444/point
Pasture	\$0.0492/point	\$0.0271/point
Rangeland	\$0.0200/point	\$0.0060/point
Forest land	\$0.0633/point	\$0.0049/point
Annual Land Use Payment = Land Use Acres X Performance Points X Payment Rate		
Supplemental Payment for Resource-Conservation Crop Rotation = \$12.00/acre		

Source: Adapted from (NRCS, 2011a)

Landowners can choose enhancements, enhancement bundles, or practices to earn points. Enhancements are individual conservation activities. CSP has a conservation activity list which offers 94 different enhancement options. Examples include the use of nitrogen stabilizers in fertilizer, incorporating native grasses into forage base, creating shallow water habitat, and creating riparian forest buffers. There are 20 enhancement bundles available under CSP. These bundles are a combination of at least 5 enhancements to produce a synergy of conservation performance improvements. Finally, there are 33 practices that can earn a landowner an even greater level of performance points. These conservation practices are designed to meet additional stewardship thresholds and include things like forest stand improvements, wildlife habitat management, irrigation water management, and prescribed burning (NRCS, 2011b).

Although funded on a federal level by the Farm Bill, CSP is administered to a large extent on the state level, much like EQIP. State Conservationists with local USDA Service Centers, along with a state technical committee and local working groups, determine specific concerns for each state. Applications are ranked according to these criteria and on-site inspections are conducted prior to contract approval. Funding obligations in 2010 amount to approximately \$320 million, which covers the treatment of over 10 million hectares (25 million acres) (NRCS, 2011c).

4.1.5 Wildlife Habitat Incentive Program

The Wildlife Habitat Incentive Program (WHIP) is a cost-share program designed specifically to promote the creation of high quality wildlife habitat on agricultural lands, including non-industrialized private forest land. The assistance can be used for upland, wetland, riparian and aquatic habitat creation. However, lands already enrolled under various other programs, such as CRP, WRP, and a few others, are not eligible for WHIP funding (NRCS, 2011c; Private Landowner Network, 2011).

Agreements are for a minimum of one year after the completion of the last conservation practice. Cost-share levels vary. However, a greater level of funding is available for long-term agreements lasting at least 15 years that protect and restore essential habitat. Essential habitat includes habitat for plants and animals that are particularly rare or unique, habitat designated as critical under law, and habitat in locations of protected 'at risk' species that can be improved with specific conservation practices. Funding for these long-term agreements can be as high as 90 percent of the cost to install the conservation measure. Criteria for evaluating applications are developed by each state, just as with CRP and EQIP, again through a NRCS State Conservationist and with the help of a state technical committee (NRCS, 2009a; Stoate et al., 2001).

The state criteria are guided by NRCS national priorities, stated as (NRCS, 2011b):

- Promote the restoration of declining or important native fish and wildlife habitats.
- Protect, restore, develop or enhance fish and wildlife habitat to benefit at-risk species
- Reduce the impacts of invasive species on fish and wildlife habitats; and
- Protect, restore, develop or enhance declining or important aquatic wildlife species' habitats
- Protect, restore, develop or enhance important migration and other movement corridors for wildlife.

In 2010, there were 4731 active or completed contracts under WHIP, covering approximately 405 000 hectares (1 million acres), with a financial assistance obligation of \$62.8 million. In 2009, financial assistance totaled \$57.8 million and enrolled more than 3000 contracts covering approximately 325 000 hectares (800 000 acres) into WHIP. Just over 2200 applications for funding requests of \$34.7 million were not funded in 2009. Funding for WHIP is \$85 million per year (including administration costs) under the 2008 Farm Bill. WHIP began in 1998 and by 2002 over 11 000 landowners had enrolled over 650 000 hectares (1.6 million acres) of land in the program. Species that are known to have benefitted from the program include the Grasshopper Sparrow, Quail, Short-eared Owl, Karner-blue butterfly, gopher tortoise, Eastern collard lizard, and the black bear (NRCS, 2011c; Private Landowner Network, 2011).

4.1.6 Farm and Ranch Protection Program

The intent of the Farm and Ranch Protection Program (FRPP) (formerly known as the Farmland Protection Program) is to keep agricultural lands from being developed into housing or industrial areas and losing most of their ecosystem services. As development pressures increase, it may be tempting for farmers to sell their lands and get a large payout, especially if agricultural or beef prices are low at the time or their crops are not doing well. FRPP provides matching funds to state, tribal or local governments to pay farmers and ranchers for the development rights of their properties. Thereby, the landowners receive large payments when they need it, yet are able to keep their farming and ranching operations. The landowners sell

permanent conservation easements over the land, but these easements do not come with the same restrictions that WRP easements do (i.e. taking the lands out of production) (NRCS, 2009b; Private Landowner Network, 2011).

The conservation easements are purchased by state, tribal or local governments through their conservation programs and funds from FRPP are provided to the landowner in the form of a grant that must be matched at 50% by non-NRCS funds. That match can be fully from state, tribal or local governments. It is acceptable for the landowner to donate up to 25% of the value of the easement and count that toward the required 50% match. Eligible lands include cropland, rangeland, grassland and pasture land (as well as forestland if it comprises less than 50% of the land) and the property must be threatened by development. Ranking of application is done on a state level, involving NRCS State Conservationist and a State Technical Committee. The demand for FRPP funding is extremely competitive, with applications far exceeding available amounts despite a 49% increase in funding for the program from the 2002 to the 2008 Farm Bill. Approximately \$140 million are available annually for FRPP (NRCS, 2009b; OECD, 2011; Private Landowner Network, 2011).

This program does not provide direct incentives to enhance habitat or convert to more environmentally friendly farming and ranching practices, but NRCS encourages landowners partaking in FRPP to also utilize other conservation programs, like CRP, WHIP, EQIP, WRP etc. One way of encouraging this is by requiring that any highly erodible land be covered under a conservation plan. Since the development of such a plan is a requirement of many of these other programs as well, having this plan in place will make it easier to apply for other conservation programs (NRCS, 2009b; Private Landowner Network, 2011).

4.1.7 Grassland Reserve Program

It is estimated that in the early 1800s, grasslands occupied about one-half of the landmass in the U.S. (approximately 405 million hectares or 1 billion acres). By 1997, only 216 million hectares (533 million acres) of grassland remained – nearly half the grasslands had been converted to cropland, urban development or other uses which generally offer less ecosystem services than grasslands. The Grassland Reserve Program (GRP) conserves grassland, including rangeland, pastureland, and shrubland, from conversion into other forms of use through permanent easements or rental agreements. If NRCS determines that there is a need, a restoration agreement can also be incorporated into the easements or rental agreements (NRCS, 2009c, 2010).

If landowners choose to enroll in the permanent easement option, they will receive the fair market value of the land, less the grazing value the owner will retain. The payment can be made in one lump sum, or paid out over 10 years. The land may never be developed or used for anything other than common grazing practices. Growing hay, mowing, and harvesting of seed are considered acceptable practices, as are prescribed burning, fire rehabilitation, the construction of firebreaks and fences. Under the rental agreement option, landowners can choose to enter into a 10, 15, or 20-year contract, during which time the same restrictions apply as under the permanent easement. The participant can receive annual payments up to 75 percent of the grazing value of the land. If restoration is required under either of these two options, an optional cost-share restoration agreement can be entered into, where the landowner can receive up to 50 percent of the restoration costs. The remaining costs can be covered with other grant funding and in-kind services (NRCS, 2009c; Private Landowner Network, 2011).

This program is managed jointly by NRCS and FSA, so applicants can apply through either agency. As with FRPP, the funding for easements can be provided to a state, tribe or local

government's approved easement program at a 50 percent match rate. Also similarly, ranking decisions are made on a state level, based on the guiding principles of GRP that state the criteria must emphasize support for grassland at greatest risk of conversion to uses other than grazing, plant and animal diversity and the leveraging of federal funds. It also states that priority should be given to lands that have expiring CRP contracts. Grazing management plans are required (NRCS, 2011b).

There were 140 permanent easements entered into GRP in 2010, covering approximately 25 000 hectares (62 000 acres) at a cost of \$52.3 million dollars. Unlike WRP where there were twice as many permanent easements than rental agreements, under GRP there were over three times as many rental agreements (424). These cover approximately 100 000 hectares (247 000 acres) at a cost of \$29.3 million. A total of more than \$81 million in funding was obligated in 2010 (Hall, 2011).

4.1.8 Conservation Technical Assistance

The Conservation Technical Assistance (CTA) program does not provide any funding to landowners, but it will provide the technical expertise to enhance conservation practices on land and also help a landowner qualify for other conservation programs that do include funding (such as those discussed above). CTA is available to anyone interested in protecting natural resources and there are conservationists stationed at local offices available in every county in the U.S. (NRCS, 2011b).

Some of the assistance provided includes (Private Landowner Network, 2011):

- Maintain and improve private lands and their management
- Implement better land management technologies
- Protect and improve water quality and quantity
- Maintain and improve wildlife and fish habitat
- Enhance recreational opportunities on their land
- Maintain and improve the aesthetic character of private land
- Explore opportunities to diversify agricultural operations and
- Develop and apply sustainable agricultural systems

Perhaps the most sought after assistance is with figuring out which programs the landowner qualifies for, what their choices are, and the development of the conservation plans required for most USDA conservation programs. The plans can also help landowners in their application for state, local and private funding support. "NRCS works to assist each client to achieve a sustainable system that contributes to healthy bottom lines as well as healthy ecosystems, landscapes, and watersheds (NRCS, 2011b)." In 2010, CTA spent approximately \$588 million on technical assistance to individuals, tribes, groups, organizations, business owners, and local governments. This included base allocations, special initiatives and items earmarks within the CTA program (NRCS, 2011c; Private Landowner Network, 2011).

4.1.9 Additional Programs

In addition to these large programs, their subprogram and initiatives, there are a number of smaller programs or initiatives. These are often designed to meet specific needs of a particular area of the country (e.g. the Chesapeake Bay Watershed Initiative and the Great Lakes Basin Program for Erosion and Sediment Control), specific causes (e.g. National Organic Certification Cost Share Program) or wildlife species (e.g. CP33 Habitat Buffer for Upland Birds). These programs may have their own funding, or pool sources from various other programs. There are programs specifically designed to connect various other programs for the

purpose of pooling funding or designating specifics for how some funds are spent, by whom they are spent, or how funding is prioritized. These programs include the Cooperative Conservation Partnership Initiative (CCIP) which enables the use of conservation programs (primarily EQIP, CSP and WHIP) along with resources from other partners to finance projects on agricultural lands. Other programs that combines funding include the Conservation Reserve Enhancement Program and Wetland Reserve Enhancement Program discussed above (Cowan, 2010; NRCS, 2011c; Private Landowner Network, 2011).

The Forest Stewardship Program (FSP) is another technical assistance program, similar to the much larger Conservation Technical Assistance program discussed above. There are over 350 million acres of nonindustrial private forestlands in the U.S. that can contribute to ecosystem services such as clean water, air, wildlife habitat and recreation if managed properly. FSP provides the expertise for multi-resource management of these lands and can assist land owners with applications for programs like the Healthy Forest Reserve Program (offers easements and cost-share agreements) and Forest Legacy Program (program administered by the USDA Forest Service offering joint state agreements including easements, cost-share plans and tax breaks). Grazing Lands Conservation Initiative is another technical assistance program designed to maintain and improve private grazing land management, productivity and health. It also assists landowners with applications for programs like the Grassland Reserve Program discussed above (NRCS, 2011c; Private Landowner Network, 2011).

The Agricultural Management Assistance Program has a mix of conservation goals that may overlap with other programs. This program offers financial assistance for the construction of irrigation structures, planting of windbreaks, implementation of integrated pest management and the transition to organic farming. There are programs that are only available during disasters, such as the Emergency Conservation Program. There is the Conservation Loan Program that offers low interest loans to fund the implementation of conservation practices (NRCS, 2011c; Private Landowner Network, 2011).

There are 9 key provisions under the 2008 Farm Bill that provide the various mechanisms for land conservation and stewardship programs. These are listed, along with the programs and functions they support, in Appendix 4. Many of these programs have been discussed above, but note that there are many more that have not (Claassen & Nickerson, 2008a).

The U.S. Fish and Wildlife Service (USFWS) provides funding for a multitude of grant programs to assist landowners in improving the environmental quality of their lands. These are not funded through the Farm Bill. Instead, they are funded by particular Acts or are part of the USFWS general budget. Many of these programs are specific to particular habitat or species' needs. Some examples of programs funded or managed by the USFWS include the Fish Passage Program, Neotropical Migratory Bird Conservation Act Grant Program, North American Wetlands Conservation Act Standard Grant Program, Partners For Fish and Wildlife Program, Private Stewardship Grant Program, and the U.S. Fish and Wildlife Service Coastal Program (Private Landowner Network, 2011).

With so many different programs at the federal level, many with multiple additional initiatives, plus a host of additional programs on state and local levels (i.e. Massachusetts Agricultural Environmental Enhancement Program), it may be difficult for a landowner to know what programs would be best suited for them and where to turn for assistance. In addition to specific programs, landowners need to be informed about specific clauses in various laws. For example, under the Endangered Species Act, there are tax breaks for landowners that assist in the population growth of rare species (Commonwealth of Massachusetts, 2011; Private Landowner Network, 2011).

5 Effectiveness of U.S. Conservation Programs

Agriculture is the largest user of land and water in the U.S., and as seen above, agri-environmental policies rely heavily of financial incentives and technical assistance to get landowners to voluntarily address conservation concerns on agricultural lands. This chapter will address how well these programs are performing and what improvements have been suggested. The eight main conservation programs discussed in Chapter 4 can be classified into four categories: land retirement programs (CRP and WRP), working lands or stewardship programs (EQIP, CSP, and WHIP), agricultural lands preservation programs (FRPP and GRP), and technical assistance programs (CTA). Table 5-1 will serve as quick reference for comparison of the main programs and their functions.

Table 5-1 Overview of Main U.S. Agri-environmental Conservation Programs

Program Name & Acronym	Basic Program Description	5-year Budget Under The 2008 Farm Bill (USD million)
Conservation Reserve Program (CRP)	Largest land retirement program – Acreage based annual rental payments for taking lands out of agricultural production for 10-15 years. Cost-share up to 50% for required planting of cover, plus maintenance incentive payment.	10 934
Wetland Reserve Program (WRP)	Land retirement program - Long-term (30-year) and permanent conservation easement program retiring farmable wetlands from agricultural production. Covers 75-100% of restoration costs. 10-year restoration cost-share agreements, without an easement, are also available.	2 096
Environmental Quality Improvement Program (EQIP)	Working lands / Stewardship program – Cost-share of up to 75% (90% for ‘disadvantaged producers’) for adoption of environmentally friendly farming practices.	7 325
Conservation Stewardship Program (CSP)	Working lands / Stewardship program – Conservation performance based payment for installing & maintaining conservation activities under a 5-year contract period.	3 792
Wildlife Habitat Incentive Program (WHIP)	Working lands / Stewardship program – Cost-share for the creation of wildlife habitat. Funding levels vary, but greater for agreements lasting at least 15 years. Lands enrolled under CRP and WRP not eligible.	425
Farm and Ranch Protection Program (FRPP)	Agricultural lands preservation program – Conservation easements purchasing the development rights of the land, but leaving the rights to work/farm the land. No additional funding for environmental improvements.	743
Grassland Reserve Program (GRP)	Agricultural lands preservation program – Permanent or 10, 15, or 20-year rental agreements limiting land use to grazing, plus optional restoration cost-share of up to 50%.	240
Conservation Technical Assistance (CTA)	Technical assistance program – No financial funding provided but free assistance in the development of conservation plans making landowner eligible for conservation programs.	3 150

Source: Created from data found in (NRCS, 2011c; Private Landowner Network, 2011).

5.1 Proven Success of Federal Conservation Programs

There is no shortage of literature on the successes federal conservation programs have had in increasing ecosystem services. The Black Bear Corridor Special Project is one of many projects benefiting from WRP. From the 1960s to the 1980s, thousands of acres of lower Mississippi River Valley bottomland hardwoods were converted to croplands, causing the loss of critical habitat for black bears, neotropical migratory birds and waterfowl. The project targeted acquisition and restoration of this habitat and has now enrolled over 86 000 hectares (213 000 acres) in WRP and restored over 59 000 hectares (145 000 acres). This has not only benefitted bears and birds, but local farmers as well. The lands converted were prone to frequent flooding that would destroy crops. Through WRP, landowners now receive an income from the lands without worry of flooding (Cooperative Conservation, 2011b).

Another success story comes at the confluence of the Yellowstone and Missouri Rivers. This area is inhabited by a large number of wildlife species and unique plants, and it is a historical and cultural site that was visited by the Lewis and Clark Expedition between 1804 and 1806. Through WRP, the land will be preserved in perpetuity and cost-share funds had restored depressional wetlands, seeded croplands to native grass, sealed abandoned wells, and removed abandoned buildings, foundations and equipment (Cooperative Conservation, 2011a).

A non-native plant known as salt cedar (*Tamarix* spp.) invaded the riverbanks in Texas. Due to the ability of each individual plant to transpire 757 liters (200 gallons) of water per day, the surface water levels and the fish, including the federally threatened Arkansas River Shiner, were jeopardized. Through the cooperation of landowners along the river and funding from EQIP in the amount of \$324 000, plus other matching funds, over 800 hectares (2000 acres) of salt cedar, more than 50% of the infected area, were treated in just the first year (Cooperative Conservation, 2011c).

A combination of four sources of USDA funding was used to combat nitrate problems in groundwater and freshwater springs in Florida. The Suwannee River Partnership was formed in 1999, mobilizing approximately 90 percent of dairy and poultry farms in Florida's Suwannee River Basin to participate in a voluntary conservation and nutrient management program to improve water quality in the Suwannee River and the dozens of springs that feed it. Over 12 000 hectares (30 000 acres) were enrolled in WRP and another 1400 hectares (3500 acres) under WHIP contracts. Through USDA's PL 566 Small Watershed Program, \$8.7 million went to the development of waste management systems on poultry, dairy and swine farms. Another \$15.5 million in EQIP funding was used to address health issues of confined livestock and to deal with soil erosion and water quality (Cooperative Conservation, 2011d).

These are but a few examples of individual projects yielding results on the landscape, but there are also a number of studies concluding the wide-scale success of these conservation programs. The Food and Agricultural Policy Research Institute at the University of Missouri (2007) produced a report on the water, air and soil carbon benefits of CRP. According to the report, soil and nutrient losses from enrolled croplands under CRP are almost entirely eliminated. Extrapolated across the nation, this results in saving of 29.9 tons of soil per hectare (12.1 tons per acre), 28.6 kilograms of nitrogen per hectare (25.6 pounds per acre), and 7.2 kilograms of phosphorus per hectare (6.4 pounds per acre). Additionally, organic carbon increases by 1.72 tons per field hectare (0.7 tons per acre) annually (FAPRI, 2007).

A recent report on the 20 year accomplishments of WRP summarized the vast wildlife, water quality and recharge, flood protection, and carbon benefits the program has accomplished, while at the same time offering farmers an alternative from the problems associated with frequently flooded cropland (NRCS, 2011d). The report stated that conservative estimates

place the amount of carbon sequestered on WRP easements at 1.2 billion pounds annually. “This equals the amount of carbon emissions from over 360 000 cars, enough to line cars up from New York to Los Angeles (NRCS, 2011d).”

Quantifying the benefits of these programs, especially in terms of monetary value, remains difficult. Even in the *Final Benefit-Cost Analysis for the Grassland Reserve Program* conducted by NRCS (2010), which find that GRP creates a positive net benefit, the results are not stated in terms of dollars. Rather, it provides percentages of increased or decreased benefits of various program scenario options and then lists the benefits the program is known to provide (2010):

Maintenance of ecological goods and services (such as those affecting ground water recharge, storm water management, carbon emissions and capture of carbon through agricultural systems, air quality, water quality, and biodiversity and habitat); social or human valued amenities (such as protecting cultural resources and community heritage, recreational opportunities, scenic vistas, and sound stewardship of the land); and economic values (such as a diverse local economy; agro-tourism; possibly fewer “inputs” used and less need for “restorative” conservation practices through the preservation of prime and State-wide important farmlands for agricultural use; a more sustainable development pattern; fewer losses from natural resources disasters by not putting people in harm’s way; and better stewardship ethic and practices by agricultural landowners). (p. 29)

The ability of these programs to protect ecosystem services on lands where they are implemented is clearly demonstrated. However, lands are still being lost to development and there are still agricultural lands where environmental issues are not being addressed. To date, funding within the Farm Bills has been increasing to help elevate these issues and to keep pace with increasing land prices, but funding increases may not continue in poor economic times. Hence, program effectiveness, efficiency and benefit-cost improvements remain important.

5.2 Improving Effectiveness of Conservation Programs

Improving the effectiveness of conservation programs that aid the prevention of ecosystem service loss is far more economical than repairing or mitigating for the damage once afflicted. According to Baylis et al (2003), “the net social value of the marginal federal program dollar targeted toward realizing the most promising positive agri-environmental externality in the United States far exceeds the net social value of the marginal program dollar that is currently being targeted at mitigating the least damaging negative externality.”

In 2003, the Conservation Effects Assessment Project (CEAP) was initiated to quantify the effectiveness of U.S. conservation programs. CEAP provides a scientific basis for national assessments, providing a methodology for estimating the environmental benefits and effects of conservation practices on agricultural lands. Research modeled based on these protocols have proven valuable not only in documenting effectiveness, but also in pinpointing where the programs are most efficient and how to target projects that provide the most environmental value for dollars spent (Karlen, 2008; Maresch, Waibridge, & Kugler, 2008).

An initiative called “Expect More,” was undertaken during the George W. Bush administration, which attempted to evaluate the effectiveness of all federal programs and rank them in one of the following categories: 1) Effective, 2) Moderately Effective, 3) Adequate, 4) Ineffective, or 5) Results not demonstrated. Of the 85 USDA programs assessed, only 8 were given an ‘effective’ rating, 33 were in the ‘moderately effective’ category, including CRP and EQIP, and 32 were in the ‘adequate’ category, including FRPP, WHIP and WRP. There were no programs classified as ‘ineffective’ but there were 12 that did not demonstrate results. This included the Conservation Security Program which was later replaced with the Conservation

Stewardship Program. Reports included point break downs, explanations for ranking and improvement plans. For example, WRP overall received better scores in most areas than CRP, but was ranked lower because the Council on Environmental Quality found considerable overlap with other conservation program – they identified 24 federal programs that restore, protect, and enhance wetland areas (U.S. Office of Budget and Management, 2008).

Program effectiveness is also brought into question when funding for one project is provided by multiple different USDA programs, such as in many of the success stories discussed above. Since these funds ultimately all come from the USDA, would it not be more effective to only have to review one application and administer funding source per project? Such overlap can even be seen within individual initiatives, such as the Chesapeake Bay Watershed Initiative, which uses funding from both EQIP and WHIP (Private Landowner Network, 2011).

A program's effectiveness can be greatly influenced by the level of technical assistance available for landowners. A proper level of technical assistance will help assure the improvements being funded are properly implemented and utilized, that easements restrictions are not violated, and that practices are not abandoned out of frustration due to lack of knowledge. Although technical assistance is seen as an additional 'cost' to programs, not all costs of program implementation reduce cost-effectiveness. In many cases, the value of these services may be greater than the financial assistance paid for 'practices' on the landscape (McCann, Colby, Easter, Kasterine, & Kuperan, 2005; OECD, 2007).

Additional concerns exist. Although CRP effectively conserves soil and nutrients on enrolled, estimate indicate that 51% of CRP land would be returned to crop production once CRP payment cease (Sullivan et al., 2004). Additionally, the possible effects of increased production on other lands due to vast acreage being enrolled in CRP (i.e. 'leakage') are not well studied.

5.2.1 Improved Management Control

It has been shown that improved management control can enhance effectiveness of agri-environmental conservation programs. In testimony before the subcommittee on Conservation, Credit, Energy, and Research, House Committee on Agriculture, the director of Natural Resources and Environment, Lisa Shames (2009), discussed the potential for duplicate payments between conservation programs, the optimization of environmental benefits through the allocation of funds to states, and USDA's management control over conservation program payments. The U.S. Government Accountability Office (GAO) found that overlap in the conservation programs' purposes and lack of cross-program accounting, lead to numerous instances of duplicate payments for the same conservation activities. The USDA identified 760 examples of potential duplicate payments from 2004-2008, totaling \$1 million. The USDA has updated its software in an attempt to avoid future duplicate payments (Shames, 2009).

GAO also identified problems with allocation of funding that was not optimizing environmental benefits and not always clearly linked to the program's purpose. The particular program in question was EQIP, where USDA did not have a documented rationale for how the 31 factors and weights used in funding allocation contributed to long-term performance measures. GAO found the formula in use to be outdated. Hence, the USDA updated guidance for this formula for fiscal year 2009 to begin to address some of these issues (Shames, 2009).

Lack of management control also led to issues of providing funding to individuals that exceed income eligibility caps. Federal farm program payments, including both income support payments (sometimes referred to as subsidies or commodity payment) and conservation program payments, are only available to individuals below certain income levels. GAO found that in a four year timeframe, 2003 to 2006, farm payments in the amount of \$49.4 million

were made to 2700 potentially ineligible individuals. The majority (50 percent) of these was direct and counter-cyclical commodity payments, but the second largest category (29 percent) was conservation payments under CRP. The USDA has begun working with the Internal Revenue Service (IRS) to develop a system for verify income eligibility (Shames, 2009).

5.2.2 Conservation Program Design Considerations

In 1990, environmental benefit-cost targeting was authorized by the U.S. Congress (Osborn, 1993). In 1996, the USDA was directed by Congress to maximize environmental benefits per dollar of expenditure in implementing EQIP (U.S. Congress, 1996). Subsequent benefit-cost analyses have been required for most agricultural conservation programs (Claassen, et al., 2008; NRCS, 2010). However, when designing a conservation program for agricultural lands, one must consider not only what will generate the best environmental results for the dollars spent, but also the effects on local economies, the effect on overall agricultural production, along with a multitude of other considerations. One issue that has been debated is whether such conservation programs should be part of farm income support systems or policies.

In the U.S., both farm income support payments (referred to as commodity payments) and conservation payments are under the Farm Bill. Approximately 40% of U.S. farms receive either or both of these forms of payments, but only 6% of farms receive both (Claassen & Morehart, 2006). This is because the commodity payments tend to favor large farming operations, whereas it is the smaller residential farms that tend to take part in the conservation programs (USDA, 2011a). This does not mean that large farming operations do not have environmental concerns. In fact they have many, and this is just a product of the programs' designs. In some cases there may be exclusions keeping a particular group from being eligible for commodity or conservation payments. In other cases it may simply be that they are not enticing enough. However, the lack of overlap limits the ability for cross-compliance measures and wider reaching results from either type of program (Claassen & Morehart, 2006).

If conservation programs and income support must be combined, then policymakers can either start on the commodity payment side and add compliance requirements; or, they can start on the conservation payment side and increase the level of payments to also support income. In most cases, there is some combination of these approaches. Currently, the U.S. does require compliance with wetland and soil conservation measures on lands receiving commodity payments that are in particularly sensitive areas (Swampbuster and Sodbuster provisions), but these measures could go further. However, if they go too far, then associated landowner costs may reduce the effectiveness of the income support. The payments received by small residential farmers from conservation programs in the U.S. is currently a considerable portion of these landowners' income (USDA, 2009). However, if these payments are raised too high, there is a risk that the additional income could be used to put additional lands into crop production, thereby eliminating the conservation benefits (Claassen & Morehart, 2006).

Targeting methods in place today have been shown to improve the performance and must therefore be considered in program design (Claassen, et al., 2008; Feather, Hellerstein, & Hansen, 1999). When there are more willing landowner applicants than budget and acreage limitations will allow, targeting is a means of choosing which applications to accept. One targeting mechanism is setting eligibility criteria. This can be used to target certain types of lands, such as those with highly erodible soils or in a particular watershed, but also the type of applicants (e.g. low income farmers). Incentives are another targeting mechanism. Different payment levels and costs associated with a particular program will incentivize, and therefore, target different landowners. Finally, targeting can be fine tuned via ranking mechanisms. Ranking is used to score applications based on program priorities (Hansen & Hellerstein, 2006). One study showed that targeting based on EBI may have increased the benefits of CRP

for freshwater recreation, wildlife viewing, and pheasant hunting from \$459 million to \$828 million (Feather, et al., 1999). A more complete analysis, showed \$1.12 billion in environmental benefits, but even this study omitted some potential benefits to groundwater quality, carbon sequestration and hunting (Claassen, et al., 2008; Sullivan, et al., 2004). Targeting relies on data, models, and the opinions of experts. Hansen and Hellerstein (2006) stated that although targeting has improved performance, even more gains could be achieved - while reducing costs - if investments were made in information infrastructure.

Whether to allow bidding is another consideration in program design. Bidding is a process where landowners compete for program participation by submitting contract offers or bids. They state what farm practices they are willing to commit, what resources issues this will address and for what price they are willing to do this. This allows program managers to determine where they will get the most value for each program dollar. A landowner can either 'bid for cost' or 'bid for benefit.' In a 'bid for cost', the landowner states he is willing to conduct a particular process for lower incentive payments than what is being offered. In a 'bid for benefit,' rather than offering his participation at a discounted rate, the farmer may offer the field with the highest environmental benefit versus another qualified field that has less ecosystem service potential. In CRP, bidding is accounted for in the EBI, as landowners can offer to enter lands under CRP at lowered payment rates. In EQIP, landowners were able to bid both for cost and benefit, until equity issue concerns arose in 2002. There was a concern that larger farms may be able to implement practices at a lower cost per acre than smaller farms. Concerns like this need to be addressed, but should not negate the use of this cost effective method of increasing environmental gains (Claassen, et al., 2008; Johansson, 2006).

One of the most important decisions in program design is whether the program should be used to retire lands from agricultural production, or whether it should incentivize stewardship on working lands. Land retirement programs generally receive more environmental benefit per acre than working lands programs. However, working lands programs can often attain more environmental benefit per program dollar. Hence, land retirement programs seem best suited for areas where the environmental costs are high relative to the value of the agricultural production. These would be lands that have low crop productivity levels or exceptionally high ecological service values in a more natural state. In addition to getting more environmental benefits per acre, land retirement programs generally require less monitoring and enforcement than other programs. However, the overall program costs for land retirement programs are rather high, as they may reflect up to the full agricultural value of the lands. Additionally, these lands may require restoration, and if not placed in a permanent conservation easement, may one day be returned to production. One last potential drawback is that taking some lands out of production may induce additional production on other lands (i.e. cause 'leakage'), offsetting some of the benefits of the retired lands. The trend in the U.S. has been to increase funding for working lands programs on lands where environmental concerns can best be addressed through better agricultural practices. These are generally lands where such improvements would offer a better cost-benefit ratio and the productivity of the lands provide substantial public benefit. Working lands programs, however, are more time consuming for farmers and program managers, and they require more technical support (Aillery, 2006; FAPRI, 2007).

One final design consideration is whether the program should reward particular farm practices, such as the use of best available technologies, or if it should focus on environmental performance. Is it the 'action' or the 'result' that payments should be based? To date, the only program that attempts to pay based on environmental performance is the CSP (see Table 5-1). Research shows that "for any given program budget, a performance-based payment program achieves much greater environmental gain than a practice-based program (Weinberg & Claassen, 2006)." The flexibility of a program based on environmental performance allows for

landowners to come up with new ideas and cost-effective techniques, and tailor practices to the needs of their lands. It seems obvious that the end result is more important than the method used, but the problem comes in measuring environmental performance. Measuring the level of soil erosion reduction and water quality improvement, for example, can be difficult and time consuming. A number of indices have been developed to measure performance and more are being developed, but the difficulty in linking on-site practices with environmental outcomes remains an impediment. Increased information and modeling is required for these types of payments and these costs may significantly increase the overall program cost, reducing the net benefit (Claassen, et al., 2008; Weinberg & Claassen, 2006).

Once program designers have decided which landowners to target; whether to allow bidding; and whether to reward practices or performance, now they will need to decide whether payments should be allowed for maintenance of good practices or only for new improvements. According to Weinberg and Claassen (2006), “simulation results show that ‘improved performance’ policy could provide much larger environmental benefit than a ‘good performance’ program for the same level of expenditure.” A ‘good performance’ program would include payments for improvements made previously that are now being maintained, whereas an ‘improved performance’ program would only pay for continual improvements. Maintenance payments seem logical because one would not want to lose improvements that were made, but it is possible that these improvements benefit the landowner as well, and hence would not be neglected if payments stopped. However, it may not be equitable to pay one landowner for adopting a practice that improves environmental conditions and not pay another owner who has been using the same practice for years. Another problem is the lack of information. The USDA would need to know which practices are currently in use on all lands in order to know what improvements have already been made (Weinberg & Claassen, 2006).

All of these issues need to be considered when developing a conservation program, and Congress dictates that it must be done with the use of a streamlined application process that ensures that all information collected about landowners is necessary and not available from other sources (Claassen & Nickerson, 2008a).

5.3 Real World Views of Conservation Programs

In order to determine how these programs function separately and together in daily situations, interviews were conducted with USDA program managers, state conservationists, NGO representatives, participating landowners, their environmental consultants, and state agency officials who frequently pool funding from state and federal sources to establish conservation easements. Additional opinions were gathered from interviews conducted by the media. A complete list of individuals interviewed can be found after the Bibliography.

5.3.1 Funding and Technical Assistance Issues

Applications for all the major conservation programs exceed capacity. Mark Rose, team leader for EQIP, stated that EQIP meets the conservation needs on the lands where it is implemented, but far more funding is needed (personal communication, August 17, 2011). Under the 2008 Farm Bill, funding for EQIP increased from \$1.2 billion to \$1.75 billion, but Tim Beard with the NRCS financial assistance division said “that’s still not enough” (Smith, 2009). In 2009, EQIP funded approximately 32 000 applications, obligating \$731 million in financial assistance to landowners. However, there remained 110 000 unfunded applications, with an unfunded need on \$1.3 billion (NRCS, 2011c). According to Rose, additional funding is not only needed to be able to fund more environmental quality enhancement projects, but also to provide more technical assistance to the people who have received funding. He states that unfortunately, not all projects that are selected for funding get implemented, because they

lack enough “boots on the ground” to support the landowners with the execution of their conservation plans. This happens more regularly than Rose would like to see. Even though the allocated EQIP funds are returned, a great deal of time and resources are lost. No potential environmental benefits can result if a conservation plan is not implemented. This may also discourage landowners from attempting future conservation enhancements. “We know what practices work and where they are implemented, they get the job done. We just need to implement them in more places and that means we need more funding” said Rose.

The CTA program manager, Dan Lawson, stated that after CTA lost 24% of its budget, and hence a great number of staff positions, a very small portion of time remains for working with landowners on their projects – 80 to 90% is spent getting funds allocated (personal communication, August 18, 2011). Lawson fears dollars spent on some cost-share projects may not be doing as much as they could, because of an inability to provide the much needed technical assistance and project follow-up. Mark Asleson, regional coordinator with FWC for the Land Owner Assistance Program, stated that the NRCS has gotten many new programs over the years without any increase in technical assistance funding (personal communication, September 2, 2011). This means staff is always “working from behind,” Asleson said, “They can never get ahead in the game because there is a constant push to get the money out the door.” Asleson would prefer to see conservation planning in the forefront so limited dollars could be more wisely utilized; pressure to obligate funds quickly decreases efficiency.

In 2009 when the CSP was new (created by the 2008 Farm Bill), a high application rate was not expected since the program was not well known. However, CSP received 21 000 applications. This would have covered 13.3 million hectares (33 million acres), but Congress had capped enrollment at 5.1 million hectares (12.7 million acres) annually, so less than half of the applications were funded (Carter, 2009). “This incredible response shows that conservation-minded producers and landowners want to attain higher levels of conservation stewardship,” stated Dave White, head of the USDA’s NRCS (Carter, 2009). The CSP team leader, Jeffrey White, said that “we are not even close to accomplishing all our goals or reaching all landowners” (personal communication, August 26, 2011). He says it is naïve to think they ever can, but feels there is an opportunity to promote the programs further, especially to parts regions that have little participation in voluntary conservation programs.

Mike Hinton, WRP program manager in North Carolina, said that although WRP has nearly met its acreage cap of enrollment and had enough funding to pay for those easements, there are insufficient funds to handle the restoration efforts effectively (personal communication, August 22, 2011). He said funding may be there for the trees that need to be planted, or the ditches that need to be plugged, but not for the technical assistance necessary to assure proper restoration plans are implemented and that proper follow-up assistance can take place. Although compliance issues have not been frequent on WRP easements, there are even fewer such issues if staff can maintain close contact with landowners. Currently WRP staff is only required to visit sites once every three years. Also, Hinton says more monitoring of restoration effectiveness is needed, but again, technical assistance funds to do this are not sufficient.

Multiple program managers interviewed mentioned that another funding problem is the way it is budgeted, distributed, and tracked within the various programs. The total funds allocated are often placed in different State accounts, subprograms, initiatives, and/or budget codes. There are often criteria for determining how much funding each state should get from each conservation program, and the Farm Bill often dictates that a certain amount of funding be earmarked for special categories (e.g. ‘disadvantaged farmers,’ ‘highly erodible lands’ or continuous sign-up program portions) and a certain percentage be used for each of the special initiatives. Rose stated that in the case of EQIP, a single state may actually end up with

“hundreds of individual pools of funding.” He stated that it creates the internal challenge of tracking it all and figuring out how much has been used. At the end of the fiscal year, unspent dollars remaining in the various ‘pools of funding’ must be shifted to other ‘pools’ where they can still be utilized. What this ultimately leads to is a great deal of resources utilized simply to categorize, recategorize, track and generate reports on the money.

5.3.2 Landowner Enrollment, Satisfaction, and Knowledge Levels

Even if funding were fully adequate and easily managed, conservation programs cannot be successful if landowners are unwilling to participate or fully implement their obligations. If landowners are overly frustrated at the application processes, program requirements, lack of technical assistance, or other aspects, the effectiveness of the programs will diminish. Clay Pope, a former Oklahoma state representative whose family owns a 1450-hectare (3600-acre) farm, told *The Journal Record* (2009) that the application process was long. Pope, along with his father and brother, all applied for CSP. “Once you have answered the 18-page questionnaire, there’s a three-hour interview. And there will be periodic checkups (Carter, 2009).” Pope was glad to find out that applications not accepted in the first round, would be considered again in the next round without having to reapply (Carter, 2009). Lu Ann Wilson (personal communication, August 22, 2011) works for an agency that combines funding from federal, state, and local sources to establish conservation easements. She handles as much of the paperwork as possible to keep landowners from becoming frustrated, but stated that deals are sometimes threatened because of delays for the federal portion of the easement payment. Some landowners cannot continue to wait for funding that is delayed and may have to go back to farming in order to stay financially secure. Hinton stated that frustration often results from a lack of good upfront information. He said that if landowners know what to expect, what the limitations will be, and what the timeline for each step will be, then there is less frustration.

It is not always clear to landowners whom to contact for information. One point of confusion is in knowing the responsibilities of FSA and NRCS. Patricia Engler, program manager for CRP, stated that although NRCS handles site plan reviews and technical assistance for CRP, FSA still administers the program (personal communication, August 17, 2011). She stated that FSA is mostly only involved with financial assistance programs, not easement programs, but for some reason, they are still involved with CRP. According to Hinton, FSA is not involved with WRP, except for landowner income verification, which FSA handles for all programs. Hinton explained that USDA and one or more partners combine funding for easements under FRPP, and it is one of the collaborating partners that will ultimately hold the easement and take responsibility for oversight of the project. In the case of GRP, Hinton stated the program is managed jointly by NRCS and FSA, so applicants can apply through either agency, and there may also be partners, but in this case NRCS remains the entity responsible for oversight and assistance. These inconsistencies at times also confuse USDA staff, and some admitted that they do not understand the rationale for setting it up the way it is.

All program managers interviewed agree that landowners sometimes get frustrated. The reasons for frustrations include disagreements or misunderstanding of eligibility criteria; length of applications; the time it takes to gather all the required information; lack of assistance in implementing conservation plans; and, confusion regarding what entity to contact. Having conservation programs managed at state levels is usually beneficial, because individual state managers would likely know better the needs of their state. However, this may lead to frustrations over inconsistencies across state lines, such as different payment schedules. Alan Alshouse, private environmental consultant, stated that he is often hired to help landowners through the confusing process and cumbersome paperwork (personal communication, August 22, 2011). Alshouse said that 5 to 10 percent of his business comes from being hired “to do all the legwork” of applying for and implementing conservation programs.

Some program managers mentioned that part of landowners' frustrations and confusion might be because there are too many options available to them, and that it may be beneficial to limit their choices. According to other state and federal managers, the federal government could combine similar programs, increasing the funding and staff availability within a joint program. What makes this option especially interesting is that many projects currently get funding from multiple, similar USDA programs anyway, so having the programs split just adds to everyone's workload and confusion in dealing with multiple applications for the same project. If funding from all sources does not go through, sometimes the entire project is cancelled and all the time put into it is lost. Albert Cerna, national program manager for WHIP, stated that EQIP is similar enough to WHIP that it could be adjusted to absorb WHIP if the same services could be offered (personal communication, September 6, 2011). Asleson stated that the USDA is a large agency with many programs. This may make it challenging to administer, and can make it difficult to be aware of conflicts. As an example, Asleson mentioned that WRP pays landowners to get rid of Limpograss (*Hemarthria altissima*), a Class II exotic plant species. However, one of the other programs promoted it as a forage grass and cover crop. Some landowners have been frustrated by different NRCS programs, or another agency such as the U.S. Forest Service (which like NRCS is administered by the USDA), developing conflicting conservation plans for their lands due to lack of coordination. Fewer programs could make oversight easier and provide landowners with one concise plan, rather than having to deal with multiple plans for a single site with potentially conflicting objectives.

There is also a concern that landowners may stop applying for programs simply due to a "fatigue factor." This may especially be the case if their lands contain multiple conservation elements that require multiple, different applications to different programs, or in cases where unselected applications cannot be deferred to the next year and only a small percentage of applications receive funding. Lawson stated that some landowners drop out of the process because they may have to wait up to 6 months before they can even begin the planning process with a CTA staff member. He stated that CTA offices that had 5 to 10 staff members before budget cuts are now running with a staff of only 2 or 3 people.

Reasons for conservation program enrollment are many. Agriculture Secretary Dan Glickman said that WHIP uses "a voluntary incentive based approach which operates from a fundamental belief that given the proper technical and financial resources, farmers want to do right by the land" (USDA, 1998). Steve Rockwood, wetland habitat specialist with FWC, said some want to preserve the land and keep it in the family (personal communication, September 2, 2011). Engler stated that CRP appeals to absentee landowners, because finding a renter may be difficult and some worry that a renter may not take proper care of the land. Engler stated that receiving rental payments through CRP is safer and the program is rather generous. If enrolled multiple times, CRP may pay for the full value of the property, sometimes more than the value depending on the length of enrollment. Landowners whose crops are frequently lost due to flooding find WRP to be a nice option for guaranteed payments, versus risking additional years of crop failure. Some landowners are planning to make improvements regardless of financial incentives, but call to see if they qualify for anything that could offset their costs. Some landowners that do qualify still choose not to partake, because they feel the application process is intrusive, lack patience for bureaucracy, or mistrust government. They do not wish to have agencies involved in their personal affairs or on their lands.

Landowner opinions on the responsibility for things like wildlife management on private lands vary. In a survey on landowner attitudes, one landowner said "We don't have a responsibility to the state, we have a responsibility to the wildlife" while another landowner asked the same questions replied, "I'm not going to spend any large amount of money to establish it for the good of the public. I guess the way I should state it is that I try to protect what I've got. But I

haven't spent a whole lot of money to make it better (Daley, 2002)." Knowledge levels of environmentally sound farming practices and of the programs available to assist them vary widely among landowners. Young or new farmers require a great deal of technical assistance. "Few farmers are familiar with all the specifics," says Engler, "but those that have been around a while at least know there is potential funding for conservation, so they usually call and start asking questions." Alshouse said many of the landowners he works with know nothing about the programs until he brings them to their attention.

It appears that conservation program staff deals far more with small landowners than large landowners. This is due in part because many large landowners are above the income eligibility criteria for financial assistance programs. However, technical assistance such as how to improve irrigation efficiency, conduct proper seeding, rotation farming techniques, erosion control, etc. is available for any interested landowner, regardless of income. Nonetheless, it does not appear to be heavily utilized by the larger landowners. Alshouse states that sometimes local NRCS offices are reluctant to provide funding for larger projects or larger landowners, even when they qualify, because they wish to spread the money around and are only allocated a certain amount of funding per county. Alshouse states that other offices recognize that larger landowners have more resources to help assure the projects get implemented as intended. This can also reduce compliance issues, but these benefits go unrecognized in other regions. Ray Bunton, director of real estate services with SJRWMD, stated that budget cuts have caused frequent staff turnover in local NRCS offices and the remaining staff now seem overwhelmed (personal communication, August 22, 2011). There is a clear emphasis to reach out to small, disadvantages or new farmers. This may mean that environmental issues are not well addressed on larger, more intense agricultural operations.

Once through the process of becoming enrolled in conservation programs and implementing the work, landowners seem happy with the results. "I look at wetland restoration efforts and the WRP program as a tool that individuals can look at. If it fits their economic situation, it can provide them greater stability. In addition, if you enjoy wildlife, there are huge aesthetic benefits" said Mark Knaupp, a land owner in Oregon with a 129 hectare (320 acre) WRP permanent easement (NRCS, 2011d). Another pleased landowner is Don Cox of Nebraska, who also has a permanent WPR easement. He states that "the goals of the Wetland Reserve Program met our goals perfectly. We wanted to create the best wetland out there, and the Wetland Reserve Program provided us the technical and financial assistance to make that happen (NRCS, 2011d)." The Mathewson family has a small farming and cattle operation in Nebraska where they have been using EQIP funding to improve ecosystems services on the property. This year, the family is the recipient of the 2011 Leopold Conservation Award, which recognizes individuals who demonstrate extraordinary natural resource conservation and land management. "The cost share assistance provided by NRCS programs has helped us make a better profit and a better place for wildlife," said Randy Mathewson (Hothan, 2011).

5.3.3 Views on Farm Bill Changes

There is full agreement that the expansion of the Farm Bill over time to address a broader range of environmental concerns on agricultural lands, and a broader assortment of landowners; and, provide a higher level of funding overall is very positive. Hinton has worked for NRCS for over 32 years and has seen these changes first hand. At first the focus was very narrow, mainly soil erosion issues, "now there is even a focus on water and energy efficiency, a far greater assortment of best management practices, and even support for organic farming."

Eligibility changes in the 2008 Farm Bill affected the ways state agencies can partner with the USDA. According to Gian Basili, SJRWMD assistant department director, SJRWMD use to be one of the 'go to' agencies when WRP needed a partner for the funding of large easements

over wetlands in Florida (personal communication, August 27, 2011). Basili stated that there have been positive trends in waterfowl and wading birds populations throughout the U.S. in part due to WRP. However, the large projects SJRWMD and the USDA co-funded in the past that helped protect wildlife, water quality and other natural resources are now harder to put together (see Appendix 5 & 6). Robert Christianson, department director with SJRWMD, explained that from the inception of WRP, states were eligible landowners and hence could purchase lands and then regain some of their investments through USDA easements (personal communication, September 6, 2011). This would then free up funds for states to protect additional lands. In 2008, states became ineligible. Wilson explained that many landowners still wish to sell their lands to the state, but now they first have to get a USDA easement on their own, and then the state will purchase the land for its remaining value. For landowners, the end financial result is the same, but now it is a slower, more cumbersome process that may make selling to a developer more appealing.

Albert Cerna would also like to see some of the changes to the eligibility criteria created in 2008 reversed. Cerna said WHIP previously funded important fish passage projects in public waterways, but now that only private lands are eligible, there are far less passage project possibilities. There are still a few privately held areas where fish ladders and dam removal projects can occur, but overall, there is less benefit to the resource, and the people that benefit from them, by having these restrictions. “Wildlife doesn’t care who owns the land,” said Cerna. He discussed another limitation imposed on WHIP - the \$50 000 annual payment limitation. This meant that larger worthwhile projects were no longer eligible for funding. Cerna also mentioned the importance of keeping programs flexible. During the 2010 BP oil spill in the Gulf of Mexico, WHIP made changes to its priorities to increase funding for habitat in 7 states with migratory bird flyway routes leading towards the Gulf. The idea was that better habitat would provide better staging areas for migratory birds and slow their migration toward the areas impacted by the oil. This allowed more time for oil clean-up efforts to make the areas safer for the birds. Such program flexibility and vital program services must be maintained when considering eligibility changes or the merging of programs.

Scott Yaich, director of conservation operations with the NGO Ducks Unlimited, would like to see the Sodbuster and Swampbuster provisions re-emerge and strengthen in the new farm bill (personal communication, August 31, 2011). When introduced in the 1985 Farm Bill, the Sodbuster provision stated that farmers cultivating highly erodible lands had to adopt a basic conservation system that reduced erosion to the soil loss tolerance, or T value, for the soil in order to obtain USDA program benefits such as commodity support payments, crop insurance, and disaster payments. The Swampbuster provision would withhold these same benefits from persons who plants crops in converted wetlands or who convert wetlands for crop production. Both of these provisions were effective in ecosystem protection (Claassen, 2006). However, in 1996, these provisions were weakened by the decoupling of commodity support payments. Now, crop insurance and disaster payments are independent of these provisions. Yaich said that crop insurance and disaster payments are actually incentives for landowners to farm marginal lands, because these programs assume a large portion of the risk. When crop prices are high and risks are low, farmers have high incentive to farm all areas, even those that may be prone to flooding or crop failure. Yaich stated that commodity payments may still be lost, but many do not receive these anyway and with the current emphasis on ethanol production driving crop prices higher, landowners do not need them. Yaich added that this is particularly devastating for the millions of small wetlands of the prairie pothole region of the northern U.S. that are no longer protected under the Clean Water Act and lack state protection. Of the 20 million or more potholes that once existed, only 7 million remain; 95% have been lost in Minnesota and Iowa (Yaich, 2007). Yaich fears that if the government does not strengthen Swampbuter, the pothole region may no longer have any of

the pothole wetlands that provide flood protection to area residents, critical habitat for wildlife, water purification and numerous other wetland service functions. Likewise, the government needs to strengthen the Sodbuster provision to protect remaining native prairie and grasslands from landowners converting these habitats to cropland, as well as protect the small wetlands embedded within these areas.

Sometimes the environmental benefits gained through conservation programs are later lost. This can occur when landowners do not complete projects properly due to a lack of technical assistance, but there are other reasons as well. Hinton recalled an episode when a landowner withdrew from a FRPP agreement just before signing it because corn prices rose and the landowner decided to go back to farming. Landowners that are paid well for removing lands from production under CRP will frequently begin farming them again once their contract expires. Alshouse mentions that this is a big win for landowners, but not so beneficial for the taxpayers. CRP even offers financial incentives to landowners of expiring CRP contracts to turn the land over to beginning farmers through a 'Transition Option.' Although encouraging new people to enter farming may be a good idea, using lands that were retired for environmentally sensitive reasons may not be the best mechanism for doing so. Program managers would prefer to see these lands permanently protected. According to Steve Parkin, easement program team leader with the USDA, "permanent easement programs cost more upfront than rental agreements but could be a better long-term investment (personal communication, August 18, 2011)." Parkin stated that in 2010, the average permanent WRP easement cost was just over \$4700/hectare (\$1900/acre) (easement cost only) which over 99 years is less than \$50/hectare (\$20/acre). CRP rental payments average more than \$123/hectare (\$50/acre) annually and can be returned to farming after contracts expire.

Another change that may benefit conservation is more flexibility in making easement modifications. Christianson recalled a situation where a powerline needed to be extended, but the FRPP easement on the land would not permit such a change without an act of Congress. FRPP easements already allow farming to continue, so extending an easement on part of the land rather than farming that portion may actually have provided additional ecosystem services. Others mentioned the possible benefit of adding wind farms to some existing easements, where compatible with established conservation plans and other land uses. Scotland Talley, conservation biologist with FWC, would like the word "wildlife" replaced in legislation with "priority wildlife species habitat" to assure funding is not allocated to common species such as deer, but rather prioritized through State Wildlife Action Plans (personal communication, August 26, 2011). Rockwood stated that some programs still provide funding to millionaires, via income cap waivers. Some feel income should not be a consideration in program eligibility, others feel they are justified and that income waivers should be eliminated.

Streamlining applications and making them less intrusive is another change many would like to see. Not only would this reduce paperwork for landowners, CTA staff, and application reviewers, but it may also make programs more appealing to landowners. Alson said Florida State financial assistance applications are only 1 page in length; require no financial information, not even the landowner's social security number. Applications are based solely on the merits of the proposed project; there are no income eligibility criteria.

One thing was clear; everyone realizes that the fate of ecosystem services lies in the hands of the landowners. "People on the land make the difference," said Parkin, "One of the desired outcomes of the NRCS planning process we used to implement conservation programs is a producer who can properly inventory resource conditions and implement needed conservation systems on their own. We hope the financial and technical assistance NRCS provides helps *Producers* become better *Conservationists*."

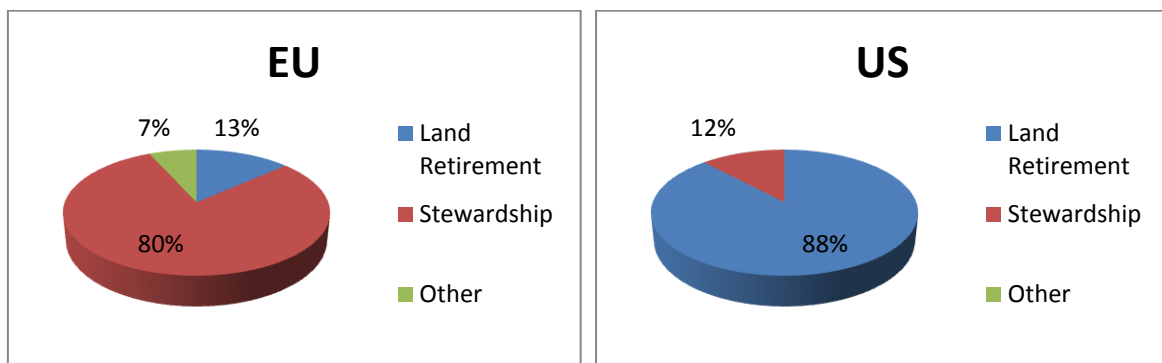
6 Comparison of U.S. and EU Agricultural Conservation Programs

There are clear differences in the historical approach the U.S. and the European Union (EU) have taken to agri-environmental programs. The differences lay in what is deemed to be the underlying cause of environmental harm. In the U.S., expansion of agriculture onto more land is usually seen as environmentally harmful, and hence policies tend to favor removing land from agricultural use in favor of putting that land into a ‘conservation state’ where little human use is permitted. This is primarily because expansion of agriculture in the U.S. generally meant beginning to farm on lands that were less suitable for farming, as the best lands were already in use. This would include more erodible land, or farmland that was created by draining wetlands. Expansion also means conversion of wilderness areas, areas upon which U.S. citizens tend to place a great value (Baylis, et al., 2003).

In the EU, however, expanding agricultural activity is viewed as having the potential to actually benefit the environment, as long as it is done in an environmentally friendly manner. Europeans view the natural environment as being shaped, at least in part, by generations of farming. Because much of the land in the EU has been in some form of agriculture for thousands of years, generally they are not converting wilderness areas to farmland, rather farming the same lands repeatedly or farming old pasture lands that would otherwise lay fallow or be developed into housing areas. Hence, EU programs do not promote retiring farmland, but rather promote farming practices deemed environmentally friendly, such as organic farming (Baylis, et al., 2003).

This difference in views is clearly demonstrated when comparing the funding levels for land retirement programs, versus land stewardship programs (also referred to as working lands programs) within the U.S. and EU. In Figure 6-1 below, funding percentage levels for the largest of these types of programs are compared.

Figure 6-1 Comparison of EU and U.S. Agri-environmental Program Funding Levels



SOURCE: Adapted from (Baylis, et al., 2003), based primarily on figures for programs funded under the EU Common Agriculture Policy (CAP) and the U.S. Farm Bill.

The agri-environmental policies that emerge within the U.S. and the EU are driven by these underlying mindsets. Hence, in the U.S. the policy focus tends to be reducing the negative externalities of agriculture - erosion and water pollution for example. In the EU, the focus is more on maximizing the positive externalities by expanding environmental friendly agricultural practices that lead to more ecosystem services. Of course there are cases in the U.S. where positive externalities are encouraged and cases in the EU where negative externalities are addressed, but they are not the primary focus. When the EU addresses

negative externalities, it is usually those that result from intensification. Intensification is the result of trying to raise more livestock or grow more crops on the same amount of land. More livestock in a smaller space means a greater concentration of manure, more compaction of the soil in one area and the need for more supplemental food transport. More crops from the same area of land, means more reliance on fertilizers, pesticides, herbicides and irrigation. Intensification also results in a reduction in biodiversity. These practices are discouraged under the EU system. In the U.S., the focus is on reducing the amount of land, hence intensification is not discouraged. However, the negative externalities of such operations are either regulated or their reduction is encouraged (Baylis, et al., 2003; Heller & Keoleian, 2003).

Another key difference in EU and U.S. agri-environmental programs is in their degree of focus. EU programs are broad in nature – objectives include protecting biodiversity, keeping farmlands from becoming abandoned, and preserving broadly defined features of the landscape. The U.S. has very measurable objectives including the improvement of soil resources and water quality, as well as the preservation of habitat for specific species. As discussed earlier, one of the largest U.S. programs, the Conservation Reserve Program, assigns an EBI score for the measurable contributions each land parcel provides toward these types of objectives and weighs that against other lands in determining funding (Baylis, et al., 2003).

Since 1992, all EU Member States have been required to establish a land stewardship program. The particulars of such programs, however, vary greatly from country to country. Initially, such programs were designed to limit harm from intensification through the use of ‘payments based on input constraints’, such as paying a farmer to reduce the use of fertilizer. With time, objectives have shifted away from input constraints, placing greater emphasis on providing incentives for environmental enhancements (Matthews, 2010). The UK Environmental Stewardship Program is well established and has been very successful in getting landowners to participate in the program and has shown to be improving conditions on the landscape (Askew, Searle, & Moore, 2007). The following section will examine the particulars of this program and what makes it successful. In Chapter 7, the applicability and transferability of EU - and in particular UK - program and policy measures to the U.S. will be discussed.

6.1 UK Environmental Stewardship Program: A Case Study

The UK Environmental Stewardship Program was chosen as a study case for a number of reasons. First, the UK has considerable experience with agriculture and land stewardship issues. The first farmlands in the UK appeared around 4000 B.C. and the countryside has been in a constant state of change for the past 6000 years (Living Countryside, 2011). Environmental Stewardship (ES) is the latest of several agri-environmental schemes (AES) used in the UK to battle environmental concerns on agricultural lands (Dobbs & Pretty, 2008). Each program was developed from the lessons learned from the preceding program(s) and the UK continually amends its current ES program to meet the ever changing needs of the environment and UK landowners. Another reason for selecting the UK Environmental Stewardship program for this study case is that much of the program takes place in England, where 70% of the nation is in farmlands (Watson & Albon, 2011). With such a large portion of the land in agriculture, England may well be a leading expert when it comes to dealing with farmland issues. As a comparison, only 40% of the U.S. is classified as farmland (USDA, 2009). The UK takes its stewardship very serious. The UK National Ecosystem Assessment published in June 2011 outlines both the monetary and non-monetary values of the UK’s ecosystem service values. The research demonstrates that UK’s ecosystem services are worth billions of GB pounds (£) to the UK economy and strengthens arguments for enhancing the environment. This report will be used by decision makers to direct future policy (DEFRA, 2011). The UK is also working on a national plan to address the loss of biodiversity. The fact that the UK also uses the Millennium Ecosystem Assessment Conceptual Framework for

valuing ecosystem services for consideration in policy decisions, was another reason for choosing them as a case study (Watson & Albon, 2011). Finally, the UK suffers from many of the same problems U.S. agricultural lands face (Stoate, et al., 2001).

The United Kingdom suffers from losses of biodiversity, and ecological degradation of soil, water and air (Stoate, et al., 2001). Impacts in biodiversity are most notable in loss of bird abundance. “The barn owl, *Tyto alba*, has been in decline throughout much of its range largely as a consequence of loss of foraging habitat resulting from agricultural intensification (Askew, et al., 2007).” Impacts of farming are seldom limited to onsite consequences; the deterioration of natural systems is often felt outside the area in which they originated (Davey Catherine et al., 2010). Such externalities are increasingly regarded as unacceptable on both economic and ethical grounds, and in the UK alone, these costs to the community have been estimated at £2343 million (\$3814 million) per year (Davey Catherine, et al., 2010; Pretty et al., 2000).

Environmental Stewardship (ES) is a voluntary incentive program that offers payments to farmers, land managers and tenants in England for effective land management that protects the environment and wildlife (DEFRA, 2010; Natural England, 2009b). In return for looking after wildlife, landscapes, historic features and natural resources (soils and water), as well as providing public access, ES provides farmers and land managers with a financial incentive that supports and rewards them for this work (Natural England, 2010a). ES began in 2005 and is managed for the Department for Environmental Food and Rural Affairs (DEFRA) by Natural England and is part of the Rural Development Programme for England (DEFRA, 2010). It builds on two previous schemes that were very successful, the Countryside Stewardship Scheme (CSS) and Environmentally Sensitive Areas (ESA) (DEFRA, 2010; Dobbs & Pretty, 2008).

According to DEFRA (2010), the ES scheme’s primary objectives are to:

- Conserve wildlife (biodiversity)
- Maintain and enhance landscape quality and character
- Protect the historic environment
- Protect natural resources (water and soil)
- Promote public access and understanding of the countryside

“There are also secondary objectives for genetic conservation (rare breeds), flood risk management, and an overarching objective to contribute to climate change adaptation and mitigation (DEFRA, 2010).”

The ES scheme does not penalize farmers and land managers for environmental harm in the manner consistent with the polluter pays principle, rather it provides monetary incentives to improve farming and land management practices for the benefit of the environment. This economic instrument is based on Payment for Environmental Services (PES) (Dobbs & Pretty, 2008). Based on the success of the two previous agri-environmental schemes, it was expected that ES would have a good uptake and continue to improve land management practices (Dobbs & Pretty, 2008). It is theorized that through some required cross-compliance measures and incentive programs such as ES, in time, land managers’ attitudes toward environmental stewardship will change and many of the efforts now encouraged through financial incentives, will simply become the commonly accepted methods of caring for land (B. B. Davies & Hodge, 2006; Geoff & Kaley, 2001).

Although a full cost-benefit analysis of the entire program could not be found, there is a forthcoming publication that will try to estimate all the benefits of the program entitled

“Estimating the Non-market Benefits of Environmental Stewardship.” It is funded by DEFRA, and is being conducted by Willis et al. Even without all the numbers, the benefits of the program certainly seem to outweigh the costs. Each year, approximately £400 million (\$651 million) is paid to England’s landowners through the three schemes (ES, CSS, and ESA) currently in use (Dedham Vale, 2010). As stated above, the cost of environmental externalities in the UK is estimated at £2343 million (\$3814 million) per year (Pretty, et al., 2000). “The economic value that people place on the environmental improvements associated with AES is significant. Studies of early AES showed the average net benefit per £1 million of expenditure was £25 million (Natural England, 2009a).” There is evidence of the schemes improving natural resources (see Section 6.1.3 below), and the UK government and the EU (which co-fund these programs) have both found it economically beneficial and have, therefore, increased the funding allocated to these programs. The funding for the Higher Level Stewardship (HLS) category within the ES program (discussed in greater detail below) will be increased by more than 80% from 2010 to 2014 (DEFRA, 2010).

“In 2000, the UK Government adopted a Public Service Agreement target to reverse farmland bird declines in England by 2020 (Davey Catherine, et al., 2010).” The previous schemes, and ES in particular, are the primary mechanisms being used to reverse the decline in farmland birds (Davey Catherine, et al., 2010).

6.1.1 Description of Environmental Stewardship

Environmental Stewardship was formally launched on 18 March 2005, although the first agreements did not start until 1 August 2005. This scheme replaces the older Countryside Stewardship and Environmentally Sensitive Area schemes, phasing them out as those agreements expire and are renewed under the new ES standards (Natural England, 2009b). ES is composed of multiple tiers with different requirements, managing options and funding.

DEFRA (2010) lists four Environmental Stewardship levels:

- Entry Level Stewardship: Whole farm agreements open to all farmers and land managers who farm conventionally for simple yet environmentally effective land management.
- Organic Entry Level Stewardship: Similar to ELS, but offering higher payments for the greater environmental benefits associated with organic farming and the costs of meeting annual organic registration requirements.
- Uplands Entry Level Stewardship: A new uplands strand of ELS, launched in February 2010 with the first agreements starting from 1 July 2010, available to farmers in England’s Severely Disadvantaged Areas.
- Higher Level Stewardship: An environmentally targeted, competitive scheme with 10-year tailored agreements of high environmental value involving complex and specialized land management.

6.1.1.1 Entry Level Stewardship

Entry Level Stewardship (ELS) is open to all types of farming. ELS requires a basic level of environmental management where the landowner can choose from more than 80 options for improving their lands for the environment and wildlife. Each option has point values and a total of 30 points per 1 hectare (2.47 acres) is required. The management options include things like unfertilized cereal headlands, hedgerow management, ditch management, earth bank management, stone wall maintenance, low input grassland, wild bird seed mixtures, scrub management, buffer strips, maintenance of traditional farm buildings and much more. Participants receive a payment for the land entered into ELS at a standard rate of £30 per

hectare (\$48.8 per hectare or \$19.76 per acre) per year. Agreements last for 5 years (Natural England, 2010a).

6.1.1.2 Organic Entry Level Stewardship

Organic Entry Level Stewardship (OELS) is open to all farmers who manage all or part of their land organically. The land must be registered with an approved Organic Inspection Body. If a farmer has a mix of organic and conventional land, he can apply for OELS on the organic land and ELS on the remainder. The options and requirements are similar to those of ELS, except 60 points per ha are needed. Participants will, however, receive 30 points per hectare for entering organic land into the scheme, to reflect the inherent environmental benefits delivered through organic farming. The standard payment rate is £60 per hectare (\$39.51 per acre) per year and the agreements last 5 years (Natural England, 2010c).

6.1.1.3 Higher Level Stewardship

Higher Level Stewardship (HLS) aims to deliver significant environmental benefits in high priority situations and areas. It involves more complex environmental management, so participants receive support from Natural England advisors. HLS is usually combined with ELS or OELS options. There are over 90 management options to choose from based on critical needs of each region. Payment is based on the options chosen, but is generally around 120% of the participant’s calculated foregone income (hence profitable). HLS differs from ELS and OELS in that it can contribute to a wide range of capital works such as restoration. HLS is discretionary, so there is no guaranteed acceptance. Agreements chosen are those that are likely to achieve maximum environmental benefit and represent good value for the money. Agreements typically last for 10 years, but some can go to 20 years (Natural England, 2010b).

6.1.1.4 Uplands Entry Level Stewardship

Uplands Entry Level Stewardship (UELS) is the latest level of ES, launched in February 2010, to support hill farmers. It is open to all farmers with land in Severely Disadvantaged Areas (SDA), regardless of the size of holding and includes those farming organically. Again it is similar to ELS in that there are over 80 management options to choose from and that acceptance is automatic as long as you fulfill your point target requirements. The points required are based on the size of the farm and the land type. The standard payment rate is £62 per hectare (\$40.85 per acre) per year and agreements last for 5 years. Some capital improvements are covered under UEELS (Natural England, 2010d). The four levels within the ES program are summarized in Table 6-1 below.

Table 6-1 Environmental Stewardship Levels Available

	ELS	OELS	HLS	UELS
Level	Basic level within ES	An organic version of ELS	More demanding level for higher priority areas	Similar to ELS, available to farmers in Severely Disadvantaged Areas
Eligibility	Open to all farmer	Open to farmers with organic land, land being converted, or land combining organic & conventional farming	Negotiated with farmers within and outside target areas, using target themes	Open to all farmers in Severely Disadvantaged Areas
Period	5 years	5years	10 years, some longer	5 years
Standard Payment	£30/ha per year	£60/ha per year	Varies per individual agreement	£62/ha per year

Source: Adapted from (Natural England, 2010a)

6.1.2 Cross Compliance of Environmental Stewardship Agreement

Reforms in 2003 to EU's agricultural subsidies system, part of the Common Agricultural Policy (CAP), incorporated some cross-compliance measures for farmers. CAP applied the Polluter Pays Principle and stated that in order to receive subsidies, farmers had to meet some basic environmental standards without compensation. The reform held landowners accountable for bearing the environmental compliance costs up to a reference level of good agricultural practice, but allows for environmental services going beyond this to be purchased through agri-environmental schemes (B. B. Davies & Hodge, 2006).

These same cross-compliance measures apply to Environmental Stewardship agreements, regardless of whether the farmer or landowner receives subsidies. A proportion of agreement holders are inspected annually to check for compliance with the cross-compliance standards. If any non-compliance is found, payments are often reduced for any existing agri-environmental schemes, as well as for any subsidies (Natural England, 2010a).

6.1.3 Effectiveness of Environmental Stewardship

Environmental Stewardship has the benefit of having learned from the previous schemes – as well as from findings from research, monitoring and evaluation of those schemes and, therefore, has good uptake and acceptability among the public. This in turn leads to strong political support and good funding. According to DEFRA (2010), “nearly 6.5 million hectares [16 million acres] (nearly 70% of England's farmland) are in agri-environment schemes.” “Eighty-four percent of the area of habitats identified as a national priority for protection and restoration (Biodiversity Action Plan priority habitat) eligible for AES [agri-environmental schemes] is under agreement (Natural England, 2009a).” Feedback from participants in ES indicates that the application process is fairly easy and the rewards are worth the effort. It is a transparent process and is more flexible in its application than previous schemes. (Natural England, 2009b).

A number of evaluations of the various agri-environmental schemes in England have been performed (ADAS, 2009; Carey, Manchester, & Firbank, 2005; Carey et al., 2003; Dobbs & Pretty, 2008; Franks & Mc Gloin, 2007; Natural England, 2009a; P.Carey et al., 2002). The Environmental Stewardship program is still too young (began in 2005) to determine how significant its impacts on environmental conservation are, but based on reviews of the preceding programs upon which ES was founded, the outlook is very good. Carey, et al. (2003) reviewed the Countryside Scheme and concluded that “in the majority of cases the CSS agreements should maintain or enhance the environment in terms of ecology, landscape, and landscape history and increase public enjoyment of the countryside.” A study of farmland birds showed that “breeding populations of certain nationally scarce farmland birds significantly increased; for example curlew pairs by 130% (1992–2003) (Natural England, 2009a).” Other birds, such as barn owls, and many species of butterflies have also been shown to increase due to AES measures (Askew, et al., 2007; Field, Gardiner, Mason, & Hill, 2005). There is also a known impact on greenhouse gas emissions. “AES currently delivers greenhouse gas savings of 3.46 million tonnes of CO₂ equivalent per year. This is an 11% reduction from the agriculture, forestry and land management sector in England (Natural England, 2009a).”

In an evaluation of the management plan options available under ES, ADAS (2009) found that among farmers who choose to write a Crop Protection Management Plan, 76% gained a greater understanding of point sources and diffuse (non-point source) water pollution from agriculture, and 68% gained better understanding of the management and disposal of empty pesticide containers. Those that wrote Manure Management Plans recorded improvements in

field application rates and manure spread or stored within 10 meters of a watercourse. These are just a few of the noted improvements, and there were also improvements demonstrated with the creation of Soil Management Plans and Nutrient Management Plans (ADAS, 2009).

A final effect of ES is its impact on the economy and jobs. “AES support jobs and generate spending in the local economy. Results from research indicate that existing annual AES spending generates further annual spending in the economy of between £178 million (\$289 million) and £847 million (\$1379 million), and sustains between 1 800 and 15 000 jobs (Natural England, 2009a).”

6.1.4 Analysis of UK Case

One potential problem with agri-environmental schemes is the potential for ‘leakage’ from one area to another area, if all areas are not covered under the AES. In other words, if a farm has to limit its production in one area of the farm to meet the demands of an AES, it might increase them on another area (Dobbs & Pretty, 2008). This was sometimes the case under CSS and ESA schemes, but has not been the case with the new ES because it takes a “whole farm” approach and does not allow for such shifting. However, there is no measure in place to stop a farm not under an AES from trying to make up for the shortage of production of a nearby farm enrolled in an AES. This might be a problem in countries dealing with food shortage issues, or if there are crop problems in the future, but to date in the UK there has not been any evidence of this type of leakage (Dobbs & Pretty, 2008).

Another potential issue is the distributional effects of the money and how large farms versus small farms benefit from the schemes. Under the old ESA scheme, larger farms sometimes benefitted more than smaller farms because they would have large tracks of particular habitat types targeted by the ESA program. This resulted in larger incomes for the larger farms, which consequently sometimes lead to large farms buying up the smaller family-owned type of farms. This in turn could lead to more monoculture type of farming, lowering biodiversity, which is counter to the goals of scheme (Dobbs & Pretty, 2008). This has been addressed to some degree in the new ES scheme. In the Upland Entry Level Stewardship, payments are made to land managers in Severely Disadvantaged Areas (SDA) regardless of farm size and the standard payment rates are more than twice that of regular ELS agreements. It was found that although larger farms may get more money overall from ES than smaller farms, the relative income for smaller farms increased more than that of large farms (Dobbs & Pretty, 2008).

ES has proven to be more economically efficient than previous schemes. The administrative costs of the CSS were nearly 28% of the total cost of the program. The administrative costs for ES are estimated at around 6-10% of the total program costs (I. Davies & Riley, 2004). These savings were possible despite maintaining a high level of technical assistance. This can be attributed to the simplification of the system – easier application process, simpler reenrollment and a diverse handbook of management options for landowners.

Governments can also choose how to deal with non-compliance. In the case of the cross-compliance measures associated with the CAP subsidies, payments to farmers can be reduced. However, when compliance with the voluntary ES measures are short of the agreement targets, generally they were minor and dealt with informally so as not to jeopardize future relations. Compliance inspections of 5-10% of ES agreements annually found very few compliance issues, concluding that the incentives were high enough to encourage compliance without the threat of serious sanctions (Dobbs & Pretty, 2008).

Agri-environmental schemes have shown that they have the ability to deliver environmental benefits in a number of ways: “they can halt the loss and deterioration of priority habitats,

help to create new habitats, protect historic environments, enhance landscape character and connect people to the natural environment through farm visits etc. In addition, these schemes can help the rural industry become more environmentally sustainable by reducing greenhouse gas emissions and by protecting soil and water quality (Dedham Vale, 2010).” There is value in a program that can accomplish these measures without causing a burden on the people who provide a nation its food needs.

One final point of discussion were the problems seen under both the ESA program and the CSS in enrolling farmers in intensive farming areas and in higher payment tiers that required substantial changes in land management practices. “The high crop and livestock-related payments received by farmers under the EU’s Common Agricultural Policy (CAP) contributed to the disincentives to participate, especially in higher tiers (Dobbs & Pretty, 2008).” This was addressed after the 2003 CAP reforms, by including cross-compliance measures, lowering subsidies and providing higher financial incentives in ES. Further reforms promise to continue shifting funds from historic subsidy programs to environmental stewardship programs. There has also been specific targeting of those types of farms to encourage participation.

There are certain lessons the U.S. can take from the UK’s successful program, but not all aspects are applicable to the U.S. cultural and political environment. In Chapter 7, potentially transferable aspects will be examined to see if the U.S. could benefit from modeling any of its programs after the UK’s land stewardship program.

6.2 Changes and Trends in U.S. Conservation Programs

Policy makers in the U.S. recognize that agricultural lands provide many valuable ecosystem services, but also that some farming practices, such as the excessive use of fertilizers, are harmful to the environment. Therefore, there has been a growing trend to provide more funding for agri-environmental policies and programs that reduce environmental harm and incentivize environmental enhancements. In 1996, USDA conservation program funding was approximately \$2.6 billion annually. In 2011, these programs are receiving nearly \$6 billion annually. The initial focus of these programs was to address soil erosion, water conservation, and pollution issues associated with crop and livestock production. Until 2002, the majority of the funding went into land retirement programs designed to address these issues. However, the 2002 Farm Bill added more funding for other conservation programs, such as land stewardship and habitat creation programs, and more attention is now being given to issues like wetland restoration, wildlife habitat, farmland protection, and much more. As a matter of fact, in the 2002 Farm Bill, EQIP – a working lands program – became the second highest funded conservation program. In the 2008 Farm Bill, this trend was continued and with substantial shifts seen in funding priorities (Claassen, 2009; Claassen, et al., 2008; OECD, 2011).

When comparing the 2002 Farm Bill with the 2008 Farm Bill, there are some noticeable differences. First, conservation as a whole is becoming a higher priority. This is noted by the 11 percent increase (\$2.7 billion) in overall funding for conservation programs in the 2008 Farm Bill (Table 6-2). Additionally, it should be noted that wetlands are recognized as being increasingly important. While the CRP lost 2 percent of its funding and had its cap reduced from 19.9 million hectares (39.2 million acres) to 13 million hectares (32 million acres), the WRP gained 230 percent and had a cap increase from approximately 921 000 hectares (2.3 million acres) to 1.2 million hectares (3 million acres). Additionally, the Farmable Wetland Subprogram under CRP was expanded (Claassen & Nickerson, 2008a; OECD, 2011).

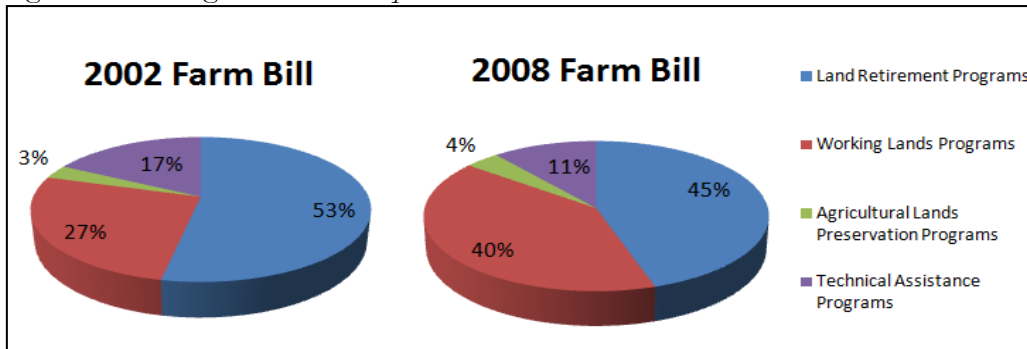
Table 6-2 Major Conservation Program Funding under 2002 and 2008 Farm Bills

Conservation Program	2002 Farm Bill (USD million)	2008 Farm Bill (USD million)	Change in Funding (%)
Land Retirement Programs	12 725	13 030	2
CRP	11 165	10 934	-2
WRP	636	2 096	230
Working Lands / Stewardship Programs	6 344	11 727	85
EQIP	4 919	7 325	49
CSP	882	3 792	330
WHIP	213	425	100
Agricultural Lands Preservation Programs	729	1 050	44
FRPP	499	743	49
GRP	254	240	-6
Technical Assistance Programs	4 143	3 150	-24
CTA	4 143	3 150	-24
TOTAL	23 941	26 641	11

Source: Adapted from (OECD, 2011)

A shift in views seems apparent when comparing funding levels for working lands programs with those of land retirement programs. While land retirement programs saw a mere 2 percent increase, working lands programs gained an 85 percent increase in funding from 2002 to 2008, giving these programs a much greater share of the overall funding than they previously had (see Figure 6-2). Funding increase for CSP was the most dramatic, with an increase of 330%. Perhaps this is an indication of a trend similar to that in Europe, placing more emphasize on improving practices on the land, instead of removing the land from production. A last note of interest, is that technical assistance lost 24 percent of its funding, perhaps due to the vast amount of information now available to agricultural landowners online (OECD, 2011).

Figure 6-2 Funding Allocation Comparison between 2002 and 2008 Farm Bill

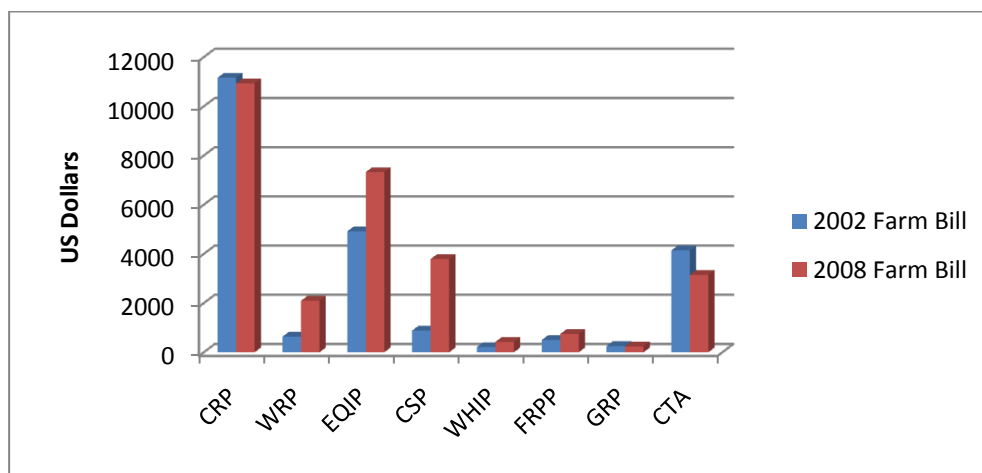


Source: Created from data found in (OECD, 2011)

There are also changes seen within the individual program goals and directives that could signal a focus shift within the U.S. government. EQIP received more funding in 2008 (Figure 6-3), but also more responsibilities. In the 2008 Farm Bill there is now an emphasis on organic farming practices and energy conservation practices that were not in the 2002 bill, as well as a new Agricultural Water Enhancement Program. The CRP contract can now be amended to allow for biofuel production, wind turbines and grazing under certain conditions. The 2008 Farm Bill also added ranking criteria regarding how comprehensively the project addresses resource issues, and whether it improves or completes conservation systems. The purpose of FRPP was changed from “protecting topsoil” to “protecting agricultural use and related conservation values of the land (Private Landowner Network, 2011).” Also, there is a continued shift for more programs to be managed at a state level, but with guidelines for

ranking procedures being provided at the federal level (Claassen & Nickerson, 2008a, 2008b; Private Landowner Network, 2011).

Figure 6-3 Program Funding Level Changes between 2002 and 2008 Farm Bills



Source: Created from data found in (OECD, 2011)

An interesting addition to the 2008 Farm Bill was a directive requiring the establishment of guidelines for measuring environmental services for conservation activities, specifically (Claassen & Nickerson, 2008a):

- procedure for measuring environmental services benefits;
- protocol to report these benefits;
- registry to collect, record, and maintain information on benefits measured.

Monitoring of compliance and performance of USDA conservation programs was also added, as was a directive to give priority to establishing guidelines for participation in carbon markets. One other addition that was new in 2008, was a program called the Voluntary Public Access and Habitat Incentive Program. This program provides funding and promotes public access on private lands, similar to the UK ES program, for the enjoyment of wildlife dependant recreation, including hunting and fishing. In some countries in Europe, Sweden for example, there is a basic right stating that anyone may access private lands for some types of recreation, but in the U.S., private property rights are very strong and these activities are usually not promoted on a federal level. A final new addition was a directive to streamline the application process for conservation programs, including reviewing all forms and processes to reduce complexity and redundancy, and to assure requested information was not already available from another source. Information technology should be utilized to minimize data input requirements (Claassen & Nickerson, 2008a).

7 Discussion

7.1 The Utopia

A Utopia is an ideal society possessing a perfect social, legal and political system (Stein, 1988). The ultimate Utopia in this case would be a situation where all landowners were able to manage their lands to the maximum mutual benefit of society and their own personal needs without the interference of government. This requires a strong land ethic on the part of the landowner, and high level of understanding of all the elements of land management. There are landowners in the U.S. who can, and do, become such true stewards of the land. Usually they are individuals who have grown up close to the land and have taken the time to educate themselves on a broad range of conservation issues.

However, not all agriculture landowners come from such a background, nor do they aspire to reach that level. Some come from traditional agricultural families that simply have always done things one particular way, with little thought to trying more environmental friendly practices, or the benefits of adding wildlife habitat, or the consequences of the fertilizers they use on the lake down the hill. Their intention is not to inflict harm; they simply lack the understanding of how their parcel of land fits into the bigger picture. There are new people entering this lifestyle every year who do not come from an agricultural background at all. Many will decide to purchase a farm later in life, after city life has become too stressful and they long for a change. Perhaps they spent most of their lives, until then as a dentist, plumber or lawyer. Still others have all the right intentions and the knowledge level to implement them, but do not have the finances that would allow them to make those changes.

For these reasons, a true Utopia of no interference is too much to strive towards. Instead, a Utopian system must be contemplated that would ideally balance destructive private land-use with due care to losses of environmental services. In an ideal world, the cost of resources and services would be fully encompassing of all negative externalities. In most European societies, the idea of 'Pigouvian taxes' is an acceptable method of bringing prices of products and services closer to their 'true cost.' This philosophy also includes a reciprocal perspective when it comes to positive externalities. The market should reward private land-use for such externalities through PES (Payments for Environmental Services). A Utopian society would always favor the 'Polluter Pay Principle' over the 'Victim Pay Principle.'

There are many considerations in developing such a system. First, prevention is usually far better than cure. Secondly, incentives are more promising than penalties, because penalties are ex post, or after-the-fact (i.e. damage already inflicted). In particular, few will protect that which they do not own, such as a lake or the air, without incentives⁴. Lastly, single-track measures dealing with single aspects are not sufficient.

There cannot be the disconnection so frequently seen today. Wetlands are under one program, uplands under another, endangered species under a third, clean air in yet another, and so on. In Utopia, one simply protects 'ecosystems' - keeping entire systems intact as nature intended, even if we do not understand their full purpose and usefulness to human well-being.

To attempt to write regulations or incentives for every potential aspect that may warrant protection on the land would be impossible. Even if it could be done, administering it would

⁴ "The Tragedy of the Commons," written by Garrett Hardin, describes this dilemma arising from the situation in which multiple individuals, acting in their own self-interest, will ultimately deplete a shared limited resource, even when it is clear that it will harm everyone in the long-term (Hardin, 1968).

take tremendous resources and trying to enforce compliance would be nearly impossible. Leopold (1934a) suggested the ideal legislation would simply read, “Has the public interest in all its resources been protected?” This of course means that someone with vast knowledge would have to determine what those resources were on each land, and if indeed they had been adequately protected. Incentives would then be based on how well this single criterion had been met. Finding enough ecologists with sufficient knowledge of forestry, range management, hydrology, wildlife ecology, agricultural practices, fisheries, soil conservation, etc. to evaluate these lands would be a challenge. However, it is far more possible than building legislation that covers all possible resources found on all the lands in the U.S.

In a perfect system, there would be no exclusions or limitations when it comes to income caps and acreage caps. This, however, does not imply ‘no funding limits’. First of all, it is not a matter of avoiding all ‘destructive private land-use’. It is instead a matter of an appropriate balancing of land uses, a balance between private benefits and opportunity costs from a societal perspective. Secondly, tax revenues vs. payments for environmental services are also a matter of an appropriate balancing.

7.2 Applying the Framework

A complete Utopia will never be achieved but we can strive to head in that direction. Economic theory states that value of resources utility of ecosystem services by people, as well as their scarcity will dictate their marginal value. This means that the ongoing loss of crucial watersheds and natural systems (see Figure 3-1) will gradually make the remaining lands more worthwhile to protect. However, without the ability to assign incentives to give appropriate consideration to ecosystem services, their values will not be properly taken into consideration on ‘free markets’. This is because rational people will act in their own self-interest, and that does not include spending money on resource protection that does not have a personal benefit or economic return on investment. Hence, there is a ‘market failure’ to protect these resources. This failure requires intervention in the market. This intervention can come in the form of regulation or incentives, both of which are present in the U.S. to some extent. Regulations include the Clean Water Act, the Clean Air Act, the Endangered Species Act and cross-compliance measure to name just a few. These are typically used to reduce negative externalities. Incentives usually come in the form of financial incentive programs, which sometimes include PES. These are usually aimed at increasing positive externalities. "Conservation will ultimately boil down to rewarding the private landowner who conserves the public interest (Leopold, 1934a)."

“Ecosystem services contribute to economic welfare in two ways – through contribution to the generation of income and wellbeing and through the prevention of damage that will inflict costs on society (DEFRA 2007).” However, we do not see the full scope of economic consideration applied in the U.S. system today. For example, the well-being of people over time requires that flows of raw material becoming waste within an ecosystem should not exceed the regenerative capacity of that ecosystem, yet this is often the case. Further, the needs of future generations must be accounted for in valuations of resources so as to assure we do not deplete the ability of future generations to meet their needs.

Such concerns can be addressed by policy makers by implementing the concepts stressed under the MA Framework. Policy makers must think beyond the present, even beyond the current generation, and look at developing sustainable long-term approaches to meeting the growing food, water, health and financial needs. This will mean letting go of single or limit-goal oriented programs, in favor of adopting an ‘ecosystem approach’ to the conservation of ecosystem services on agricultural lands. This will minimize the likelihood of improving one aspect of the ecosystem at the expense of another. The social and environmental

consequences of plans developed, combined, eliminated or changed in anyway must be considered on local, regional and global scales. There must be an understanding of the drivers of change and how these changes interact on temporal and spatial scales. The MA framework stresses the need for decision makers to recognize that human well-being depends on protecting all the pieces, not just soil issues on one farm and wildlife habitat on another.

"The last word in ignorance is the man who says of an animal or plant, 'What good is it?' If the land mechanism as a whole is good, then every part is good, whether we understand it or not. If the biota, in the course of eons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering" (Leopold, 1953).

7.3 The Right Path?

Are trends under the U.S. Farm Bills leading us towards Utopia? The trends are positive. There are incentive programs now in place to address far more concerns than in the past and funding has increased for most programs. However, the way in which programs have developed over time is not ideal. As needs were recognized, programs were developed to address them. For example, CRP was developed initially to address soil loss and erosion issues. As additional concerns were recognized, additional programs were developed. Occasionally, newly recognized problems were addressed through the addition of subprograms or special initiatives to existing programs. Each program and its sub-components did things a little different than other programs. The scope of all the programs evolved with time to encompass more than what they were initially created to address. Decisions were made that lead to some programs being managed by NRCS, while others were managed by FSA. Now there is a system in place with a large number of programs, sub-programs and initiatives – all operating in different manners with different forms of incentives - many addressing the same, similar or overlapping issues.

This manner of program development has lead to a complex system with many difficult management implications. Alternatively, had attempts been made to continually update one or two existing programs to address changing or newly recognized needs, things may have remained simpler. With only a few programs, management control may have been easier and updating the programs when new knowledge or research showed more efficient ways of structuring and implementing conservation programs may have been less difficult.

Nonetheless, progress is still being made. However, the path to a more ideal state cannot happen under the current system, because it fails to protect 'every cog and wheel.' This is because the current collection of programs does not yet practice 'ecosystem approach' based management of agricultural resources. Lastly, the current system only reaches a subset of landowners. If only 40% of farms get government assistance, and only 6% in the form of both conservation payments and income support – and these are mainly small residential farms – how do we protect and enhance the environmental services found on the rest of the farm, in particular the large agricultural farms? There is little incentive to prevent ecosystem service losses on larger commercial scale farms under the current system.

7.4 Transferability of the EU philosophy and the UK Environmental Stewardship Program

Recent trends in the U.S. seem to lean towards a system with some similarities to the EU. For example, instead of just focusing on negative externalities such as erosion and water pollution, the U.S. now has incentives in place to promote positive externalities like the creation of wildlife habitat and organic farming. CAP reforms in the EU are heading away from standard farm subsidies in favor of payments for environmental services. Although the U.S. has also

made efforts to reduce some subsidies and to increase funding for conservation programs, a true shift in funding has not yet occurred.

One EU trend that the U.S. is certainly not following is the use of broad objectives (e.g. protecting biodiversity and natural resources). There is still a strong focus on accountability and detailed measuring of very specific objectives in the U.S. This can be useful in assessing effectiveness of program dollars and in the selection of applications when there are limited funds. However, the use of indices like the EBI, countless levels of criteria, and lengthy applications can also greatly add to the administrative burden of programs.

The UK has an environmental stewardship program that is working very well. It is the latest in a long line of programs, all having been developed and refined from previous programs. There are many transferable application possibilities. For example, the UK use one clearly understandable program that addresses a broad range of concerns and is open to everyone wishing to apply. No one wishing to work to accumulate the necessary points of the basic level of stewardship is turned down; there is some level of funding for all efforts regardless of the income of the landowner or the size of the operation. Higher levels of stewardship are more selective and tend to favor more environmentally sensitive lands and 'disadvantaged' or low income farmers.

This approach has led to high uptake, with 70 percent of agricultural landowners participating. To encourage larger operations to participate, the UK have reduced standard subsidies, increased cross-compliance measures, and increased conservation program incentives. To increase environmental performance across the board, cross-compliance measures also apply to anyone receiving financial assistance under the environmental stewardship program. Funding will only be provided for services provided above the basic level of cross-compliance. The broader participation in ES has been shown to increase the environmental education level of landowners in the UK. As Baba Dioum (1968) stated in his speech to the general assembly of the International Union for Conservation of Nature, "In the end we will conserve only what we love. We will love only what we understand. We will understand only what we are taught." This should result in better environmental practices even when not providing payments for their implementation, perhaps bringing them closer to a situation where practices being incentivized today will one day become the commonly accepted methods of caring for land.

There is one final lesson that may be transferrable from the UK to the U.S. Through a simplification of their entire system, the UK's Environmental Stewardship reduced its administrative costs to 6-10% of its budget, whereas the previous program was at 22% of its budget. This was done while keeping a high level of technical assistance. Efforts for simplification were in the areas of the application process, reenrollment and the creation of one comprehensive handbook of options that was easy for landowners to understand.

7.5 Combining Programs

UK attempts to meet all ecosystem service needs under one program, but the UK Stewardship Program may not address all the multitude of issues the federal U.S. programs address. Implementation is broad scale and individual aspects are not as micromanaged. However, the program gets wide participations because it is easy for landowners to understand and has funding available to meet the demand, lessening farmer's frustrations over having applications denied. Based on the proven success of existing agricultural conservation programs in the U.S., it would be unwise to make drastic changes to these programs. However, combining certain categories of programs, while maintaining their respective objectives and best functioning aspects, may yield great benefits. Just as the Agricultural Conservation Program

and a number of smaller programs were successfully combined in 1996 to form EQIP, other similar programs could benefit from being combined under a single program.

The focus of combined programs should be on the largest USDA programs (those discussed above) since these have larger impacts than smaller programs found under both the USDA and other entities, such as the USFWS. Restructuring within the same department of the U.S. government is also far simpler than attempting to do this across multiple sectors. There are a number of ways these programs can be combined; two options will be explored.

7.5.1 Option One

The first proposed option involves the combining of the four largest easement programs into one joint easement program. That would include CRP, WRP, FRPP, and GRP, and for the purpose of further discussion will hence forth be referred to as the combined Conservation Easement Reserve Program (CERP). CERP would receive all the funding currently allocated for all four programs. The three largest financial assistance programs, EQIP, CSP, and WHIP would then be combined into a second program, hereby identified as the Conservation Financial Assistance Program (CFAP), receiving all the funding of those programs. Keeping in mind all the conservation program design criteria discussed in Section 5.2.2, these two new programs will be designed to maximize effectiveness of program dollars, using strategies already in place under at least one of the merging programs. The most beneficial measures will not be bypassed due to potential equality issues or other concerns (such as lack of data); rather these concerns will be addressed with subsequent guidance or directives. Hence, bidding will be allowed; payments will be based on environmental performance; new conservation measures will get a higher level of funding than existing ones; lands least suitable for farming will be targeted for complete land retirement; only long-term easements will be used; and comprehensive indexes will be used for ranking applications.

Under CERP, to protect the government's (and thereby the tax-payers') investment in the land, all easements will be permanent or 30 years. Easement obligations should be designed to assure lands where investments in ecosystem services are made, do not revert back to less desirable environmental conditions. In order to spread out the cost so more lands can be enrolled at one time, payments for the easements will be made over the course of a 10-year period. There will be no rental payments. The maximum value paid for permanent conservation easement would be the full agricultural value of the land, minus the value of any rights retained (such as grazing or farming) but landowners can bid lower amounts (i.e. 'bid for cost'). For 30-year easements, the maximum would be 75 percent of the agricultural value of the land minus retained rights, bidding also permitted. Any restoration USDA deems necessary will be required and shall be covered at 100% for permanent easements and 75% on 30-year easements. All lands under CERP will be required to develop, implement and maintain a basic conservation plan that meets preset minimum standards, without additional funding. Landowners can bid to provide additional benefits under this plan, such as planting of additional wildlife habitat, at no additional funding (i.e. 'bid for benefit'). Whatever plan the landowner enters into the easement, that plan will become a fixed baseline. The obligations of this baseline would be incorporated into the easement, transferring to future landowners if the property is sold while under the easement.

CFAP, the second combined program under this proposed option, would base all financial assistance payments on environmental performance, in a manner similar to the current CST. This has proven to be the most effective base for payments, but it means additional investments will need to be made in determining how to measure these performances; and, in the development of point values that include performance values for practices previously found under EQIP and WHIP. As under CSP currently, higher payments will be made for

new and increased levels of stewardship. Landowners already using favorable conservation practices deemed at risk of being lost if not funded will also receive maintenance payments, but at a much lower rate. Again, this requires investment in data gathering, to determine what practices are already in place. If landowners participating in CERF wish to do more than their baseline plans require, they would be eligible to apply for funding under the new CFAP program. Lands under easement through CERF would get priority funding status under CFAP, since investments made on these lands have more protection than those not covered by easements.

CTA would remain in its current role, as the starting point for entrance into conservation programs. CTA will begin by determining which lands are least suitable for agricultural production, steering these lands to protection under full conservation easement with no retained farming rights. Lands suitable for grazing with no or limited environmental harm would receive easements with similar restrictions to the current GRP. Lands suitable for farming will be encouraged to enter into easements resembling those of FRPP, but if landowners do wish to give up their future development rights, CTA will steer them towards CFAP instead.

7.5.2 Option Two

To attempt to achieve all that is accomplished by the numerous USDA federal programs available in the U.S. today under just one program, plus take a more holistic ‘ecosystem approach,’ would be ambitious but it may be possible. Under this proposal, a stronger stance is taken, perhaps moving closer towards a Utopia, or at least a program with a broader, more sustainable approach as described by the objectives of the MA Conceptual Framework.

Considering the high demand for conservation program assistance, the USDA can afford to be very selective about who receives funding. Under this proposal, all landowners wishing to obtain funding assistance **MUST** enter their lands into a 30-year or permanent conservation easement of some sort. This not only assures that financial investments made by the USDA to protect and enhance the ecosystem services of these lands are better protected, but it also provides better long-term assurance that the U.S. can meet its food demands in the future, as none of these lands can be converted to development. This is an important step towards sustainability, but human well-being can be further enhanced by requiring that landowners address a larger portion of the needs of their lands, not just one element (e.g. better manure handling).

The basic structure of this combined program option would be similar to that of option one; easements set up under a combined program like CERP and financial assistance available through one combined program like CFAP. Funding levels and the payment levels described for easements and restoration remains the same as well. The differences would be that 1) in order to qualify for CFAP, lands must first be enrolled in CERP, 2) all the smaller agri-environmental conservation programs found within the USDA would also be incorporated into these 2 programs and their funding added to the two new programs (perhaps with the exception of loan and emergency programs), and 3) conservation plans must address at least a portion of all categories of concerns on the land (to be further described below).

In practice it would work like this: When a landowner contacts CTA, a conservationist would evaluate their land; steer him toward the most appropriate easement option for his land and his personal needs; create a baseline conservation plan; and determine restoration needs - just as described above. However, to be eligible for financial assistance for other improvements through CFAP, a comprehensive ecosystem enhancement plan would need to be written (CTA conservationist would again assist the landowner with the drafting of the plan). There

would be preset categories for each type of land - cropland, pasturelands, forested lands, rangelands, etc. - to address areas of concern common to those land types in the local area. As is the case under the UK's environmental stewardship, these categories would be broad. Examples may include flood reduction, protection of natural resources, climate change adaptations, or protection of biodiversity. The enhancement plan would need to accumulate a certain number of points in each of these categories, to be considered for funding. In other words, the landowner cannot choose to address water quality issues only, if the needs of the land or local area also dictate that water quantity, wildlife habitat, air quality concerns also exist. A skilled CTA conservationist, (perhaps with the assistance of specialists) would look at all the ecosystem service needs of the land. The landowner must then choose to address some aspects in all categories where there is an indicated need or ability to improve. If the landowner's application for this individualized comprehensive plan is approved for funding, then funding will be provided for all the increased environmental performance levels.

Since this second option includes all the smaller programs as well, it is important that the goals and objectives of all the individual programs must be maintained. This can be assured through proper design of selection and ranking criteria and assuring that environmental performance within CFAP measures include elements of all combined plans. In essence, create a large menu of options for landowners to choose from when enhancing their site, so that they can tailor the plan to their needs. This should include local critical elements with a special focuses on endangered, declining, or rare, habitats, plants and animals. Perhaps there should even be an option for writing in additional concerns that may not be covered in the preset universal options. Such flexibility may be essential to an 'ecosystem approach.'

This type of a program may seem cumbersome on the part of the landowner. But the landowner will benefit financially from easement payments, and the increased land value likely produced by restoration, and by addressing a multitude of ecosystem service needs. Efficiency improvements in areas such as water and fertilizer use will also lead to cost reductions. Increased wildlife habitat may increase hunting opportunities. Fishing opportunities may increase where water bodies are involved. If landowners do not wish to dedicate, or do not have the time to conduct the initial implementation of the enhancement plans, fund should be sufficient to hire an environmental consultant or engineer to handle it for them. This again adds to human well-being through the creation of jobs.

7.5.3 Considerations

A change from the current system straight to the system outlined under the second option would probably be too disruptive. Any changes made under the Farm Bill need to be with adequate adjustment time. The goal can be move towards Option One, and if that is successful, then perhaps look at taking it further towards Option Two. Perhaps start by just combining CRP and WRP, phasing out rental payments in favor of long-term easements. EQIP and WHIP are both similar cost-share programs that may be fairly easy to combine at first. This could be a first step while accumulating the data that will be needed in the future to transition to all performance based payments.

As with all programs, proper adjustment time is needed prior to making evaluations, but evaluations will be critical in determining the effectiveness of progressive changes. Economic theory dictates that people are rational, will act in their own self-interest and that without demand there is no value. Although this does not hold true 100 percent of the time in reality, these are still guiding principles to be considered in evaluation programs. As long as demand for the programs remains high, effective long-term environmental benefits can be attained. If enrollment drops below desired levels, then the funding levels for various performance levels may need to be increased or obligations reduced.

One element that cannot be overlooked in the development of newly combined programs is the subprograms and special initiatives currently found under various programs. These were created for specific purposes, such as addressing particular local concerns (e.g. Chesapeake Bay Initiative), enhancing the ability to address issues across multiple properties or combine funding with non-federal sources, or encourage organic farming. Other elements such as assuring assistance to ‘disadvantaged farmers’ or encouraging new people to enter into farming will also need to be addressed. The details of complete program development and specifics to address issues like this are beyond the scope of this paper. However, one method may involve creating more payment rate categories or increasing ranking scores for certain categories. Under CSP, payment rates per activity points are based on land type (see Table 4-1). If the new combined CFAP program is based on this model, perhaps in addition to the existing land types, there can also be categories for special wetland basins or other areas of concern that will pay slightly higher than other areas to encourage more participation. Payment rates may also be a little higher for ‘disadvantaged’ or new farmers. Projects in these areas or people fitting special categories may also receive greater points in the ranking process. Better outreach may also play an important part in filling these categories.

It is crucial to the success of these combined program options that conservation technical assistance be well funded. Under either of the two options, CTA offices will likely experience a greater demand for their services, particularly during the transition period to new programs. The program specifics will need to be made clear to all applicants, and it will take more time to fill out applications at first before everyone is familiar with the procedures. Assurances will also be needed that there will be sufficient technical assistance at each program level as well, to assist with implementation on the ground. This will help assure funded elements get implemented properly. As stated above, it must be recognized that not all costs decrease cost-effectiveness, and this likely is the case for technical assistance under these programs.

It has also been shown that there are substantial transaction costs in the first years of developing and implementing new conservation programs, relative to ongoing costs that occur once the programs are well established (OECD, 2007). This comes from the staff time needed to develop targeting and ranking objectives, rewrite rules, etc., but also from the increased level of data these programs will need to have available. This will need to be considered in the budgeting process.

7.5.4 Maximize the Effectiveness of Combined Programs

Each of the seven USDA conservation programs proposed for merging, as well as additional smaller programs, currently have specific selection criteria, targeting methods, eligibility, bidding options, etc. that have been refined over the years to increase the effectiveness of their program dollars. No one set of existing criteria designed for any of these individual programs will work for a combined program, so a new set will have to be developed. Care must be taken in this process not to lose the lessons learned over the years of developing the current individual program criteria. As challenging as this may be, it is also an opportunity to closely examine the program design specifications and select the best performing combinations available. It is also a necessary process, per the mandate by Congress to maximize environmental benefits per dollar of expenditure in implementing new conservation programs.

Budgeting and financial tracking are made difficult by the numerous allocations found under the current system (see Section 5.3). Managing different pools of money takes a great deal of staff time. These allocations can also lead to disparities in payment levels for the same activities on lands adjacent or close to each other, but falling under different political boundaries, such as state or county line. Under combined programs, ideally there would be no

subprograms or initiatives that create the need for some of these pools. The practice of dividing funds between states is done to assure a more equitable distribution of resources. This may still be required, and it makes it easier for state managers to manage programs on state levels since they will know upfront how much funding they have. However, payment schedules should be monitored on a federal level to assure equal pay for equal environmental performance. Also, partitioning all other funds into specific pools should be minimized. Removal of acreage caps for different portions of programs should also be considered. Rather than earmarking a certain portion of funds for specific categories (requiring numerous budget codes or accounts), consideration should be made to create alternative methods for getting these categories filled, such as ranking applications within these categories higher or offering higher payments (as discussed in the previous section). This may not result in exact predictions of how much funding will go to each of these categories, but it will be far more efficient. Efficiency will equate to an overall increase of project funding, and the beneficiaries of that increase should include these special categories, even without such close control.

The application process should be simplified and streamlined as much as possible. Review of applications is incredibly time consuming for staff (requiring resources that could be put to better use) and filling out long difficult applications is a disincentive to landowners to participate in the programs. Having fewer programs will reduce the number of applications, and it will eliminate the need for landowners to apply to several funding sources for one project. It is difficult to simplify the application and still obtain sufficient information to assure funding of the most beneficial projects. But other programs, both within the U.S. and abroad have managed to do so by relying on information already available, and investing in software to pull that information together. For example, by gathering landowner income information electronically from the IRS rather than from the applicant, efficiency is increased while simultaneously reducing the likelihood of payments being made to ineligible applicants. This will also assure that the program fulfills the directive in the 2008 Farm Bill, discussed in Chapter 5, to streamline the application process for conservation programs, to reduce complexity and redundancy and to assure requested information was not already available from another source.

Ideally, participation in the new CERF easement program should be available to any landowner, regardless of income, that would like to participate. Current funding levels would preclude this, but further research should be conducted to determine the level of funding needed to make this possible; keeping in mind that offering such open enrollment would eliminate the need for complex targeting schemes, criteria, and application ranking methods, which would free up substantial amounts of funding.

The exercise of redeveloping program design specifications should yield extensive benefits, since many of the programs are not currently utilizing methods that research has shown to maximizing environmental returns.

7.6 Expanding Conservation - Generate More Funding and Reaching More Landowners

By combining programs and maximizing their effectiveness, more money currently needed for administrative costs should be freed up for use on the ground and for technical assistance. However, this alone will not meet the full needs of ecosystem service retention and restoration in the U.S. and halt the mounting pressure of development. Regardless of whether policy makers choose to combine programs, conservation programs need to be expanded. This means programs will need substantially more funding and the government will need to engage more landowners in conservation participation. Policy and decision makers will hopefully

recognize this need and continue to increase funding for these programs in subsequent Farm Bills, but additional measures should be considered to generate funding for these programs and reach more landowners.

One consideration in program development discussed in Section 5.2.2 was whether farm income support payments (commodity payments) and conservation payments should fall under the same policy. There are clear conflicts between these two forms of support. However, if they belong under the same policy, then the answer may be to continue to move away from the subsidizing of farming altogether, and shift that funding to conservation programs. With enough funding and proper program design, conservation programs can act both as an income support mechanism and environmental enhancement mechanism. This may also help with the disparity of participation within the two systems, namely that commodity payments tend to favor large farming operations, whereas it is the conservation programs that generally favor smaller operations. This shift and combination of funding may well provide enough funding to allow a much greater portion of landowners (greater than the 40% currently receiving either or both payments) to partake and be paid for the environmental services their lands provide (PES approach). This shift from commodity payments to stewardship payments will be more feasible under the new combined programs proposed, since they have a more long-term outlook. Current programs provide many options for short-term rental payments or short-term funding for transition to more environmentally friendly practices. The new options provide payment for long-term easements, plus payments for long-term management. This may well be able to take the place of commodity payments. The potential increased enrollment would provide additional ecosystem service benefits for all of society, whereas income support payments primarily benefit the individuals receiving them.

Another method for increasing the availability of funds for conservation programs, while providing an income to farmers and protecting ecosystem services is to target expiring CRP lands for acquisition by state and federal land conservation acquisition programs that are already funded to locate and acquire such lands. If crop production was to resume on these lands after the expiration of CRP (as 51% likely will), the investment USDA made in these lands is lost. However, if they are constantly reenrollment, in time the USDA will likely end up paying many times the full value of the land. Instead, if these lands are purchased, both of these situations are averted. Priority for such acquisitions should be given to lands located adjacent to already existing state and national parks that can be expanded and, therefore, managed within an existing framework (utilizing the same staff, infrastructure, and management plans). Not enrolling these lands back into CRP and paying high rental rates, frees up funds for more effective resource protection. Of course in the creation of the newly combined programs proposed, program design (mainly through the use of permanent easements) should assure that even without the use of rental payments or acquisition, lands where government investments in ecosystem services are made, do not revert back to less desirable environmental conditions.

With expanded funding, the programs can reach more landowners. However, funding levels will not likely reach a level where all landowners can have financial incentives available to enhance ecosystem services on their lands. One way to incentivize more landowners to begin practicing at least a basic level of conservation, is to either give preference or require that all applicants applying for easements and/or financial assistance already have an implemented basic level conservation plan in place (similar to the cross-compliance measures in the UK that are applicable both to those receiving subsidies and those receiving financial assistance for ES). This can be done instead of requiring a conservation plan be created when lands are encumbered in a conservation easement. This would expand the use of conservation plans in two ways. First, it would be in place on all lands where landowners hope to receive assistance,

regardless of whether they actually do. Secondly, it would not just apply to lands with conservation easements, but also to those landowners wishing to attain financial assistance. CTA would assist with these plans in the same manner as they do now, regardless of other program involvement. This assistance is available to all landowners, regardless of farm size or income status.

Conservation programs do not reach many of the large operations due to income caps. This cap may need to be raised if income support payments are joined with conservation program payments in order to continue to reach more landowners. The reason for the caps is based on the idea that the conservation programs should first and foremost assist landowners that would not otherwise be able to implement conservation practices on their lands, and to a lesser degree, offer a form of income support (primarily the case with rental and easement payments). In an ideal world, those that can afford to implement better practices will do so, on their own. Many landowners do have a great deal of land ethics and will do exactly that. However, some will need incentives. Some progress could be made by increasing cross-compliance requirements for income support payments (as in the EU) as many larger farms and ranches still qualify for these, even if they do not qualify for conservation programs. But again it leaves out the highest income landowners. Also, this method would not work if funds are shifted solely to conservation programs and income eligibility requirements not changed.

So what incentive can be used to encourage large farming operations to adopt environmentally sound conservation practices on their lands, when most of these landowners exceed the income eligibility caps for federal program payments? One option is to require basic level conservation plans to be implemented on all agricultural lands, where the landowners obtain an income above the federal income cap. The problem here is that it may be seen as inequitable, requiring something of larger farms that is not required on smaller ones. However, requiring it across the board could create a financial hardship for lower income landowners.

Another option would be based on the Polluter Pay Principle. Agricultural lands that cause excessive environmental damage would be subject to Pigouvian taxes or fines that would attempt to equalize the 'market price' with the 'real price'. This would be a revenue neutral program where the funds received from these measures would be allocated to the conservation programs. Ideally, costs of these measures would be sufficiently high to encourage investment in better conservation practices. Lower income landowners could apply to the conservation programs to help finance the implementation of better practices. If people are completely logical, economic theory would dictate that everyone will invest in better practices rather than pay fines or taxes. Nevertheless, some will choose to simply pay to make the problem go away. However, their damage, in theory, should be offset by providing funds to conservation programs that improve practices on other lands. In essence it is a form of mitigation, similar to those currently required for filling wetlands in some areas and destroying endangered species habitat. If it is easier politically to implement such measures as 'mitigation requirements,' than as a 'taxing regulation' it would essentially accomplish the same outcome.

It should be recognized that these large operations are important employers in their areas and provide assurance of food availability for the country; hence care should be taken not to hurt their financial viability. However, just as all businesses and individuals do, they also have a responsibility not to burden society with externalities arising from their practices, such as degradation of ecosystem services. Regulations, taxes and fines have historically been unpopular in the U.S., but changing environmental views will perhaps make such measures more acceptable one day as we look to improve our well-being and that of future generations.

8 Conclusions

Ultimately, the desired outcome of effective agricultural land conservation and stewardship is to increase the overall well-being. This means that we have to prevent destructive private land-use when public losses of environmental services outweigh private benefits. Instead we have to encourage uses that combine the interests of the private and the public to the greatest extent possible. A Utopia may never be reached, but it is within reason to assume the current situation can be improved. For this to be possible, it is critical that funding for conservation programs under the U.S. Farm Bill be increased from the levels found in the 2008 Farm Bill.

This thesis was intended to answer the following question:

- In order to provide for the well-being of our nation, how can the U.S. expand protection of ecosystem services on agricultural lands while maintaining an economically viable agricultural industry?

The answer ultimately lies in the proper development of an agri-environmental scheme that incorporates all the desired elements of the current programs; is easy for the landowner to understand and participate; achieves long-term benefits; continues to operate primarily on the basis of financial assistance that can also supplement landowner incomes; takes an ecosystem approach that integrates desired conservation elements; and, is both effective and efficient. This scheme needs to be tailored to the ecosystem services needs of the local community, yet also accounts for the needs of the nation and the world.

One of the intended outcomes of this thesis author was to outline alternatives for more effective conservation programs. Two options to that end were offered. Both options involved the combining of existing programs. The first option proposed the combination of the four largest easement programs into one program, and the combination of the three largest financial assistance programs (also known as working lands or stewardship programs) into a second program. It called for the elimination of short-term rental agreements in favor of long-term easements. It also called for all financial assistance payments to be based on environmental performance. Preference for financial assistance would be given to landowners also enrolling their lands in a conservation easement.

The second option was more ambitious and took an ecosystem approach. It involved combining the same programs listed in the first option, plus all other USDA conservation programs. It requires all landowners seeking assistance to enroll their lands in some form of easement. In addition to requiring a basic baseline conservation plan on the lands, if financial assistance for measures above this baseline were being requested, a comprehensive enhancement plan addressing some portion of all categories of concern on the land would be required.

It would be advisable to have any version of a combined program alternative reviewed by the current program managers to assure no critical elements of the individual programs are lost. However, great effort must be made to include all these elements without adding to the overall complexity to the combined program.

The second intended outcome was to examine the feasibility of developing a single program that meets the goals of all the current federal conservation programs under the U.S. Farm Bill. The second option outlined is basically one program arranged on two levels. However, making such a drastic change would need to be done cautiously with a great deal of monitoring to assure the effectiveness of previously successful programs are not lost.

The third intended outcome was to determine if research supports the idea that combining and streamlining current programs and pooling funding would be more cost-effective, and easier for landowners to comprehend, thereby increasing enrollment and decreasing administrative costs. The UK case study revealed that one concise program can achieve greater participation rates and that streamlining, especially of the application and selection process, can greatly reduce administrative costs. One program would certainly be easier for landowners to obtain information and begin to understand, than the array of programs and their complex rules that are present today. Cost effectiveness can help in a number of ways. First, it can assure adequate staffing of technical assistance to reduce landowner frustration, with the added benefit of increasing correct implementation of conservation plans. Secondly, if the overall funding base can be increased, it may also allow for higher application acceptance rates.

Combined programs may also offer improved management control. It would greatly reduce the likelihood of duplicate payments. It would also make it easier to have less pools of funding, increasing efficiency through simplification. It is an opportunity to revisit how to allocate funds and assure they are linked to long-term performance measures, resolving the issue of outdated formula data for individual programs.

In addition to program streamlining, the application process should also be streamlined. An effort should be made to remove the requirement for information that is considered too invasive or personal, to again increase enrollment.

The final intended outcome of this thesis was to provide additional options for increasing ecosystem service protection on agricultural lands. A number of options were identified that may accomplish increased ecosystem service protection. Expanding the size of conservation programs so more lands could be enrolled would be one option. This would require additional funding. This thesis has demonstrated the value of ecosystem services, both in monetary terms, as well as in terms of human wellbeing. Funding increases can be justified, as the cost of restoration and/or ecosystem service replacement has been shown to be far greater than upfront protection. This funding can come from an increase in the budget under the Farm Bills for these programs; an increase in efficiency through combining and streamlining of programs; a shift of funds from commodity support payment to conservation or stewardship payment; a targeting of expiring CRP lands for acquisition; and/or a taxing or fining landowners causing excessive environmental damage on agricultural lands. Another option for increasing ecosystem protection is to increase cross-compliance obligations. Mandating conservation plans for all large agricultural operations is another method.

Ideally, participation in the easement programs should be available to any landowner, regardless of income, that would like to participate. Current funding levels would preclude this, but the hope is that increased program effectiveness will also result in increased political support and funding of conservation programs in the U.S., as it has in the U.K. Additionally, if a number of the proposed options for funding increases are implemented, the likelihood of expanding participation to all willing landowners increases. Such broad participation would also eliminate the need for expensive targeting schemes, criteria, and application ranking methods, adding to funds available for conservation.

This thesis has suggested improvements to existing conservation program schemes, and provided options for increasing landowner participation in conservation programs and increasing the use of better environmental practices on agricultural lands, regardless of program participation. However, before any of this can take place, resistance to change must be overcome. Perhaps a program based on a broader ecosystem approach will cause

landowners to look at their lands differently. Perhaps instead of seeing what the land is, they will envision what it could become. Many landowners already have a good land ethic and are conservation minded, but with the right tools, education and finance at their disposal, perhaps more **Producers** can become **Conservationists**.

8.1 Further Research Recommendations

Further research is needed to determine the feasibility and potential outcomes of removing all farm subsidies, and shifting the current funding for income support payments over to conservation payments.

Further research is required to address the issue of how to incentivize larger agricultural operations that cause environmental harm, to adopt better land stewardship practices, if taxes, fines or mitigation requirements are not implemented.

If fines or mitigations are to be considered, a study is required to determine what level of fines or mitigation might be appropriate for large agricultural operations inflicting excessive environmental harm. These fines or mitigation requirements should be sufficiently high to discourage environmentally harmful practices in favor of investing in better farming practices, but should not be so high that they potentially cripple the operation financially while making those investments. Equality issues may evolve – can requirements be placed on large farms that are not applicable to smaller farms? Should they be required on all farms, but the difference being that those with incomes below a particular level can receive funding for their needed farm practice adjustments? Additionally, what level of damage will be considered ‘excessive’ and qualify for fines. How would such requirements be implemented and how would compliance be handled without costing more than the fines collected?

Research should be conducted to determine the level of funding needed to make entrance into the proposed new CERF easement program available to any landowner, regardless of income, that would like to participate. Calculations should account for the fact that such a proposal would eliminate the need for complex targeting schemes, criteria, and application ranking methods, freeing up substantial amounts of funding.

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Appendix 1 – Ecosystem Services by Category

PROVISIONING SERVICES
Food
Raw materials
Fresh water
Medical resources

REGULATION SERVICES
Local climate and air quality regulation
Carbon sequestration and storage
Moderation of extreme events
Waste water treatment
Erosion prevention and maintenance of soil fertility
Pollination
Biological control

HABITAT OR SUPPORT SERVICES
Habitat for species
Maintenance of genetic diversity

CULTURAL SERVICES
Recreation and mental and physical health
Tourism
Aesthetic appreciation and inspiration for culture, art and design
Spiritual experience and sense of place

Source: Adapted from (TEEB, 2010)

Appendix 2 – Interview Questions

Sample Set of Questions for Program Mangers:

CRP Program

1. Can you tell me what your title is (if not already known, if so verify it) and what your principle duties are within CRP?
 - a. How long have you served in that role?
 - b. What are your overall number of years with CRP?
2. Do you work on any of the other federal conservation programs, or exclusively with CRP?
3. The last general sign-up was in late spring, early summer of 2010, the first since 2006. Why the 4 year gap?
 - a. Is it normal to have gaps like this?
 - b. What determines when the next general sign-up is held?
4. What percentage of applicants each year (or round) are generally accepted into CRP?
 - a. Of those not selected, what percentage fail to meet minimum qualifications, and what percentage are due to funding or cap limitations (or falling below the EBI cut-off)?
 - b. The cut off score for the EBI was set at 200, what was that based on?
5. During this last round, 4.8 million acres were offered up to the program, but only 4.2 million acres were accepted. With current enrollment now at 31.3 million acres and the cap at 32 million, there appears to be room for that .5 million that were not accepted, is the extra 723,000 acres of capacity being held aside for a specific purpose?
6. I assume ‘acreage reserves’ for programs like the Farmable Wetlands Program (1 million acres), are counted toward the total CRP program cap and are not in addition to this cap, is that correct?
 - a. If so, does having individual ‘reserved acreages’ make it difficult to ever fully meet the cap since much of the acreage must fill specific criteria?
7. Please explain the ‘transition option,’ it seems as if it is encouraging putting lands back into productions? Am I misunderstanding this, or missing the rationale?
8. How successful do you feel CRP is in meeting the conservation needs on agricultural lands (is the program enrolling a sufficient amount of land, are the lands cared for as intended, are environmental services adequately protected under this system, etc)?
9. How is effectiveness of the program measured?
10. Is there documentation of the success or research showing that the program is achieving its goals (have found some, but feel free to point me to specific publications)?
11. What would make the program even better?
12. Do you speak directly with landowners at all?
13. Do you find that most landowners are fairly well versed in what program options they have (including CRP), or are they surprised at how many programs are out there to help fund conservation practices?
14. Do landowners ever seem overwhelmed at all their choices or seem to have trouble keeping them straight?
15. Is CRP at all confusing to landowners?

16. Do landowners ever seem frustrated with the application process or requirements of CRP?
17. Do you know if landowners ever hire environmental consultants to handle their applications, plans or program requirements?
18. If you had the opportunity to make some improvements to CRP to make it easier for landowners to understand the program or apply to the program - what changes would you make?
19. Do you ever hear or get the sense that landowners feel like they have 'done their part' if they enroll some lands in CRP, and therefore may not be interested in other conservation programs that may allow cross-over with CRP or could be applied to remaining lands?
20. Do you think the application process and the fact that not all applications are accepted may discourage landowners from reapplying or applying for more than one program (or perhaps cause the opposite, put in multiple applications in hopes of getting accepted into one)?
21. Do you feel that the money landowners receive from CRP is sufficiently high that they may not be incentivized to apply for other programs that allow for overlap with CRP or that they could use on remaining lands?
22. Do you ever hear that landowners prefer CRP because it is less work than some of the working lands programs?
23. Do you ever get the sense these programs may be working against each other?
24. Do you think there would be a benefit to having a stronger link between land retirement programs like CRP and WRP and environmental improvement programs like EQIP?
25. I understand that CRP requires less administration for USDA than working lands programs. How much administration goes into CRP and what administrative functions/obligation does the program have (application review and selection; cost-share oversight; compliance; etc.)?
 - a. Is any technical assistance provided, or is that handled by the CTA program?
26. What portion of your overall funding goes to administration costs (or can you provide a dollar amount for administrative operations)?
27. How many staff members does it take to run CRP (how many employees do you have)?
28. Do you know how this administrative funding level compares with WRP which has long-term or permanent easements (only need to review most applications once) but often large-scale restoration projects?
29. Do you see much overlap between CRP and WRP?
 - a. Do you have landowners with wetlands that wonder which program would be best for them? If so, what advice do you give them?
 - b. Is one or the other better for wetlands in the view of the USDA? If so, why (cost, long-term protection, etc.)?
30. Programs such as WRP and CRP are voluntary. Are there any regulations on a federal level that require things like wetland buffers or other measures to add protection to the environment on agricultural lands?
 - a. Why or why not are such measure considered?
31. Based on your knowledge, do you think the combination of conservation programs we have today is getting the job done?
32. If you could design the 'Utopia' of environmental protection programs for agricultural lands, what would that program look like?
33. I know some programs within the Farm Bill have been eliminated, like the Forest Land Enhancement Program; others changed like the Farmland Protection Program

- becoming the Farm and Ranch Lands Protection Program (also Conservation Security Program becoming Conservation Stewardship Program). I know the Farm Bill outlines these conservation programs, but who ultimately makes the decisions on program expansions, change, funding, continuation or elimination? Is there an advisory board that makes recommendations to changes in the Farm Bill?
- a. If so, who makes up this board and how do I contact them?
34. Can you put me in contact with any landowners that have participated in your program that may be willing to provide me with some feedback from their perspective?
- a. If you are not able to give out their contact information, can you ask them to contact me?
35. Is there an organized group of landowners that I may be able to contact (a Farmers' Association or Agricultural Landowner Organization)?
36. Do you have suggestions for others I should talk to (people familiar with multiple programs perhaps)?

Conservation Technical Assistance

1. Can you tell me what your title is (if not already known, if so verify it) and what your principle duties are within CTA?
 - a. How long have you serviced in that role?
 - b. Overall number of years with CTA?
2. Do you work on any of the other federal conservation programs, or exclusively with CTA?
3. In terms of conservation programs enrollment, is CTA generally a starting point for landowners and then staff at CTA direct them toward specific programs that may suit their needs OR do landowners generally come to you after they start the process of applying for a particular program and are then looking for assistance with conservation plan development or filling out applications?
4. Is CTA allowed to help direct landowners to particular programs or help landowners decide which programs may be best suited for their needs?
5. Do you find that most landowners are fairly well versed in what options they have, or are they surprised at how many programs are out there to help fund conservation practices?
6. Do landowners ever seem overwhelmed at all their choices?
7. Are the programs at all confusing to the landowners?
8. Do landowners ever seem frustrated with the application process or requirements of some of these programs?
9. Do you know if landowners ever hire environmental consultants to handle their applications, plans or program requirements? If so, do these consultants ever contact CTA for assistance?
10. If you had the opportunity to make some improvements to make it easier for CTA to advise landowners, for landowners to understand these programs or to streamline the application processes - what changes would you make?
11. In regard to improving environmental conditions on their lands, are most of the questions your offices field on a daily bases related to agricultural conservation programs, or do you also have a great deal of folks who are simply looking to make improvements on their own, without incentive programs or cost-share or grant funding?
 - a. What percentage of people do you contribute to both of these categories?
 - b. Are there other reason people contact CTA for such improvements?

12. Are CTA offices at all co-located with staff from other technical assistance programs, like the Forest Stewardship Program (FSP) or the Grazing Lands Initiative?
13. Are CTA offices staffed to also handle questions regarding multi-resource management of forested or grazing lands?
14. Can CTA offices help with applications or plans for programs like the Healthy Forest Reserve Program (or are these always turned over to FSP)?
15. Are there many large scale farming operations that contact CTA for assistance with environmental improvements (what percentage of contacts on this subject are large-scale farms versus smaller residential type farms)?
 - a. Why do you think it is so low or so high or equal?
16. Are you able to help large farms in the same way as small farms if they ask?
17. Can you put me in contact with any landowners that have worked with CTA that may be willing to provide me with some feedback from their perspective?
 - a. If not able to give out there contact information, can you ask them to contact me?
18. Is there an organized group of landowners that I may be able to contact (a Farmers' Association or Agricultural Landowner Organization or even a Facebook group perhaps – ran across one for the WRP)?
19. Funding for CTA decreased by 24% from the 2002 Farm Bill to the 2008 Farm Bill, as did funding for CRP & GRP, while most working lands programs (EQIP, WHIP & CSP) and FRPP saw an increase in funding. Why do you think CTA funding was reduced (much info now available online, technical assistance also found within other programs, other reasons)?
 - a. How has this affected how the program operates?
20. How successful do you feel CTA is in meeting the conservation knowledge needs of agricultural landowners?
21. How is effectiveness of the program measured?
22. Is there documentation of the success or research showing that the program is achieving its goals (I have read some, but feel free to point me to specific publications)?
23. What would make the program even better?
24. How many staff members does it take to run CTA (how many employees do you have)?
25. Based on your knowledge, do you think the combination of conservation programs we have today are getting the job done?
26. If you could design the 'Utopia' of environmental protection programs for agricultural lands, what would that program look like?
27. Suggestions for others I should talk to (folks familiar with multiple programs perhaps)?

Conservation Stewardship Program

1. Can you tell me what your title is (if not already known, if so verify it) and what your principle duties are within CSP?
 - a. How long have you serviced in that role?
2. How many years have you worked with CSP?
 - a. Were you there when the program was called the Conservation Security Program?
3. Do you work on any of the other federal conservation programs, or exclusively with CSP?

4. Funding for CSP increased a great deal from the 2002 Farm Bill to the 2008 Farm Bill (330%), as did funding for many of the working lands programs (EQIP & WHIP), but the acreage CAP for CRP was actually decreased. Why do you think CSP fared so well?
5. CSP is unique in that it attempts to base payment of actual environmental performance, which certainly seems like it is headed in the right direction. However, measuring such performance is very difficult, so in practice, is it not still based on the use of best available technologies or simply new practices versus the maintenance of existing ones?
6. Is there any incentive to develop better ways of doing things (innovation) – performance point levels and enhancement options seem set?
7. Are there any problems with determining which activities were already in practice?
8. How successful do you feel CSP is in meeting the conservation needs on agricultural lands (is the program enrolling a sufficient amount of land, are the lands cared for as it is intended, are environmental services adequately protected under this system, etc)?
9. How is effectiveness of the program measured?
10. This is a fairly new program, is there documentation of the success or research showing that the program is achieving its goals yet?
11. What would make the program even better?
12. How many more application do you receive annually than you are able to fund (or do you get more than you can fund – new program, perhaps not well understood or know yet)?
 - a. How time consuming is it to review all those application?
13. Do you think the application process and the fact that not all applications are accepted may discourage landowners from reapplying or applying for more than one program (or perhaps cause the opposite, put in multiple applications in hopes of getting accepted into one)?
14. Does CSP offer technical assistance as well?
 - a. If so, how does that technical assistance differ from what is provided by CTA program?
15. Do landowners ever seem frustrated with the application process or requirements of CSP?
16. Do you find that most landowners are fairly well versed in what federal conservation program options they have available (including CSP), or are they surprised at how many programs are out there to help fund conservation practices?
17. Do landowners ever seem overwhelmed at all their choices or seem to have trouble keeping them straight?
18. Is CSP at all confusing to landowners?
19. Do you know if landowners ever hire environmental consultants to handle their applications, plans or program requirements?
20. I have read that a great deal of effort went into simplifying and streamlining CSP, but now that the program has been in effect a few years, if you had the opportunity to make some additional improvements to CSP to make it easier for landowners to understand the program or apply to the program - what changes would you make?
21. Do you ever hear that landowners prefer CRP or WRP because it is less work than some of the working lands programs like CSP?
22. Do you ever get the sense these programs may be working against each other?
23. Do you think there would be a benefit to having a stronger link between land retirement programs like CRP and WRP and environmental improvement programs like CSP?

24. I understand that CSP requires more administration for USDA than land retirement programs. How much administration goes into CSP and what administrative functions/obligation does the program have (application review and selection; implementation oversight; compliance; site visits, etc.)?
25. What portion of your overall funding goes to administration costs (or provide an annual dollar amount)?
26. Are funds split into different accounts with set amounts allocated to ‘disadvantaged farmers’ or special initiatives?
 - a. If so, does this make it more difficult to manage your budget and/or add an administrative burden?
27. How many staff members does it take to run CSP (how many employees do you have)?
28. Do you think it is a benefit or a drawback to have much of the administration happen on a state level?
29. Based on your knowledge, do you think the combination of conservation programs we have today are getting the job done?
30. If you could design the ‘Utopia’ of environmental protection programs for agricultural lands, what would that program look like?
31. Can you put me in contact with any landowners that have participated in your program that may be willing to provide me with some feedback from their perspective?
 - a. If not able to give out their contact information, can you ask them to contact me?
32. Is there an organized group of landowners that I may be able to contact (a Farmers’ Association or Agricultural Landowner Organization)?
33. Suggestions for others I should talk to (folks familiar with multiple programs perhaps)?

Sample Set of Questions for Landowners:

1. What size farming operation do you operate?
2. Have you ever applied for any USDA conservation programs for agricultural lands (why or why not)?
 - a. If so, which ones?
3. Where are you successful in getting financial assistance?
4. Would you have taken these measures without this funding?
5. What made you choose that program over the other available options?
6. Were there any reporting or follow-up measures required by the program after you received funding?
7. Do you find the application process fairly easy, somewhat challenging, or rather complex?
8. Were you able to get assistance and support when you needed it during the application process or implementation process?
9. Do you feel that you know all your choices of conservation programs available to agriculture? What is your source of information about these programs – where do you find out about them, or who tells you about them?
10. Are financial assistance levels available in the various programs sufficient to make it worth your while to go through the application process and fulfill the requirements of the program plans?
11. Have you ever contacted a Conservation Technical Assistance Office for help?

12. Do you know of landowners that choose not to apply for any of the programs out there? Do you know why they choose not to apply?
13. How important is the financial assistance you get from agri-environmental programs to your farm's economic well-being?
14. Is it expensive to make the changes you need to do to qualify for some of these programs?
15. Have you ever hired an environmental consultant to help you with an application, conservation plan or the implementation requirements of a conservation program? Do you know anyone (else) who has?
16. If you could change anything about how these programs are run or set-up, what changes would you make?
17. Do you know any other farm or ranch owners/managers that may be willing to speak to me about this issue?
 - a. If not able to give out their contact information, can you ask them to contact me?
18. Is there an organized group of landowners that I may be able to contact (a Farmers' Association or Agricultural Landowner Organization or even a Facebook group perhaps – ran across one for the WRP)?
19. Suggestions for others I should talk to (folks familiar with multiple programs perhaps)?

Sample Set of Questions for Environmental Consultants:

1. How often do landowners ask you to help them with their conservation program applications, plans or fulfillment requirements?
2. Do you have any indication of what percentage of landowners try to fill out applications, write plans and conduct conservation program fulfillment requirements on their own versus hiring a contractor to do it for them?
3. Do the landowners frequently complain about the complexity or expense of these requirements?
4. How important are these programs to your business- is it a minor part or a considerable portion of your business?
5. Do landowners ever contact you for help in making environmental or conservation improvements on their lands that are not in some way funded by incentive programs, grants or in some economic way benefitting the landowner?
6. If so, what other reasons may they have for wanting to make changes (ever any true altruistic reasons)?
7. Do you know any other consultants that may be willing to speak to me about this issue?
8. Do you know any farm or ranch owners/managers that may be willing to speak to me about this issue?
 - a. If not able to give out their contact information, can you ask them to contact me?
9. Is there an organized group of landowners that I may be able to contact (a Farmers' Association or Agricultural Landowner Organization or even a Facebook group perhaps – ran across one for the WRP)?
10. Suggestions for others I should talk to (folks familiar with multiple programs perhaps)?

Appendix 3 – The Cost of Land Conversion

When discussed in terms of Gross Domestic Product (GDP), development seems to reap great economic benefits. But the GDP does not account for more than part of our well-being, only human produced goods and services traded on the market. The losses of ecosystem services discussed above should be taken into account when calculating the value of development. Neoclassical economics dictates that as these resources become even scarcer, their values will increase (Medalye, 2010).

There is also a misconception that residential and industrial development will lead to a better economic situation for the community in which it takes place, because the tax base will be higher. It is true that an acre of residential housing generates more tax revenue than an acre of grazing lands (IRS, 2011). However, one cannot just look at the income side of the equation; one must also consider the costs associated with those houses.

From an economic standpoint, the cost of allowing more residential development is enormous. As more agricultural land is converted to housing, more and bigger roads are needed, more schools and hospitals must be provided, as well as costly services like police and fire departments. Agricultural lands typically use \$0.40 worth of services for each dollar the landowners pay in taxes. As a comparison, average residential and industrial sectors use \$1.25 worth of services for each dollar they pay in taxes. From an ecosystem standpoint, more natural resources will be used and more pollution likely created. Development, particularly the scattered, unplanned development currently being seen in states such as Florida, often causes long commutes with traffic congestion, resulting in air and water pollution (American Farmland Trust, 2002; Main, et al., 2004).

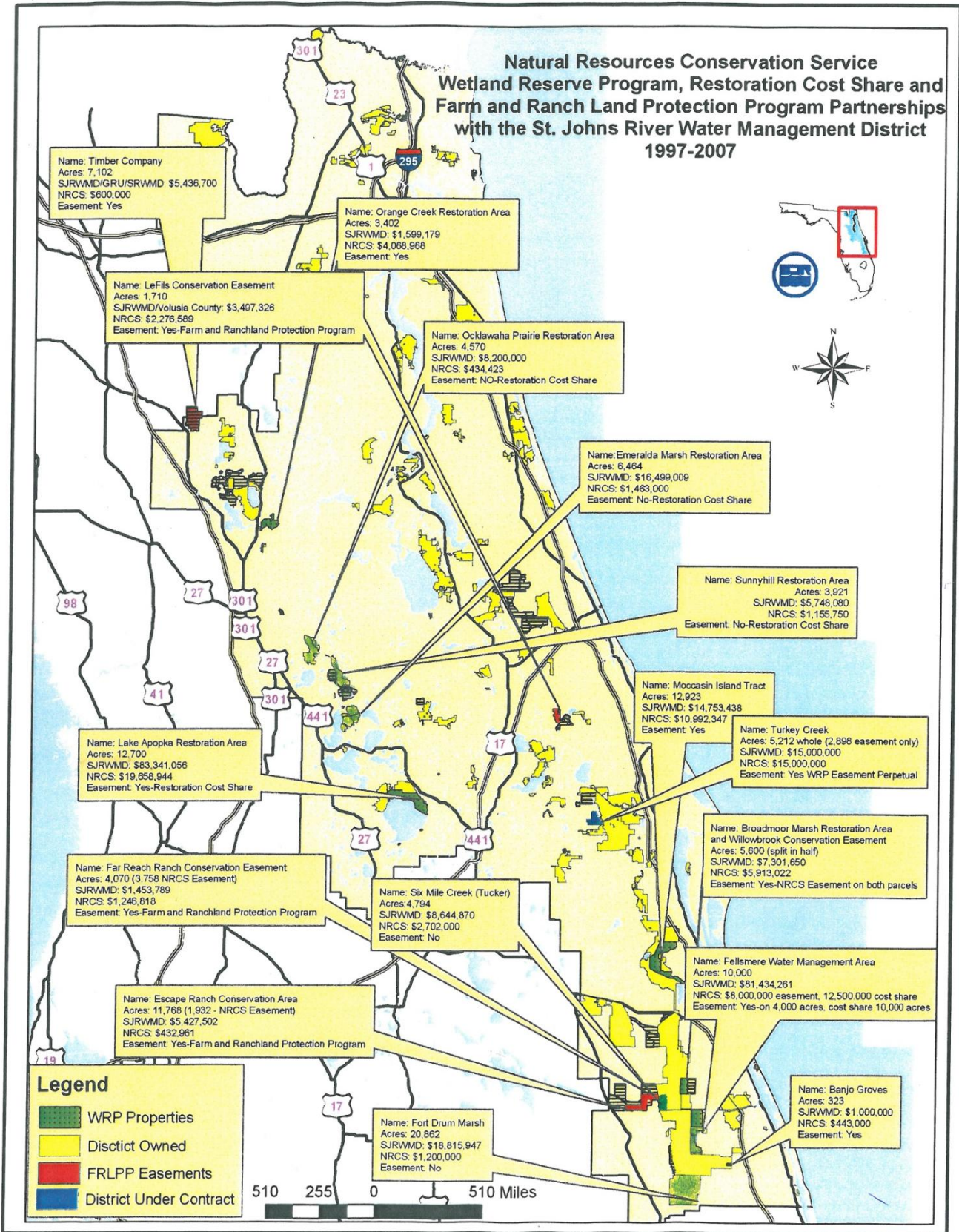
It is important for the general public, decision makers, and community planners to understand these relationships between residential and industrial growth, agricultural land use, and environmental ecosystem - especially in relation to their impacts on the local, state and federal economies. With the increasing recognition of the concerns brought about by development pressures and the true value of ecosystem service concerns, government programs to retain and restore crucial ecosystem services have developed.

Appendix 4 – Key Conservation Provisions of the 2008 Farm Bill

<p>Agricultural Land Preservation Programs</p> <ul style="list-style-type: none"> ➤ Farmland Protection Program ➤ Grassland Reserve program
<p>Compliance Mechanisms</p> <ul style="list-style-type: none"> ➤ Highly Erodible Land Conservation (Conservation Compliance/Sodbuster) ➤ Wetland Conservation (Swampbuster) ➤ Crop Insurance and Noninsured Disaster Program Ineligibility
<p>Conservation Reserve and Wetland Reserve Programs</p> <ul style="list-style-type: none"> ➤ Conservation Reserve Program ➤ Wetland Reserve Program
<p>Cross-Program Provisions</p> <ul style="list-style-type: none"> ➤ Regional Equity ➤ Partnership and Cooperation ➤ Voluntary Public Access and Habitat Incentive Program ➤ Conservation Access ➤ Incentives for Certain Farmers and Ranchers and Indian Tribes ➤ Acreage limitations ➤ Compliance and Performance ➤ Encouragement of Pollinator Habitat Development and Protection ➤ Adjusted Gross Income Limitations
<p>Market-Based Incentives for Conservation</p> <ul style="list-style-type: none"> ➤ Promotion of Conservation through Environmental Service Markets
<p>Miscellaneous Conservation Programs and Provisions</p> <ul style="list-style-type: none"> ➤ Agriculture Conservation Experience Service Program ➤ Amendments to Soil and Water Resource Conservation Act of 1977 ➤ Basin States Program
<p>Technical Assistance</p> <ul style="list-style-type: none"> ➤ Conservation Technical Assistance ➤ Delivery of Technical Assistance
<p>Watershed Programs</p> <ul style="list-style-type: none"> ➤ Chesapeake Bay Watershed Conservation Program ➤ Small Watershed Rehabilitation Program ➤ Resource Conservation and Development Program ➤ Great Lakes Basin Program for Erosion and Sediment Control ➤ Grassroot Source Water Protection Program ➤ Desert Terminal Lakes ➤ Conservation Corridor Demonstration Program
<p>Working Land Programs</p> <ul style="list-style-type: none"> ➤ Environmental Quality Incentive Program ➤ Conservation Stewardship Program ➤ Wildlife Habitat Incentive Program ➤ Conservation of Private Grazing Lands ➤ Agricultural Management Assistance Programs ➤ Emergency Conservation Program

Source: Adapted from (Claassen & Nickerson, 2008a)

Appendix 5 –SJRWMD & NRCS Partnership Projects



Source: Provided by SJRWMD 2011

Appendix 6 – SJRWMD Land Transactions funded in part with WRP and FRPP funds

Close Date	LA Number	Parcel Name	USDA Fund	USDA Amount \$	Acquisition Type	Total Acres	Total Purchase Price
12/24/1996	1995-069-P1	Escape Ranch Conservation Easement	FRPP	\$432,961.20	Less Than Fee – Cons.Easement	11,768.00	\$5,860,464.00
12/16/1999	1998-051-P1	GRU Wellfield-The Timber Company Cons.Easement	FRPP	\$494,400.00	Joint Less Than Fee	4,018.04	\$3,415,335.46
4/15/2004	1986-004-PA	Far Reach Ranch-Tucker-Cons.Easement-NRCS parcel	FRPP	\$1,246,818.20	Joint Less Than Fee	3,758.08	\$2,493,636.40
5/20/2004	2003-005-PA	LeFils Corporation - Conservation Easement A	FRPP	\$2,138,792.33	Joint Less Than Fee	1,267.44	\$3,208,207.50
5/20/2004	2003-005-PB	Lefils, Donald & Mary - Conservation Easement B	FRPP	\$137,783.56	Joint Less Than Fee	81.65	\$206,676.57
12/8/2010	2010-006-P1	BJ Bar Ranch Conservation Easement	FRPP	\$5,000,000.00	Less Than Fee – Cons.Easement	4,888.00	\$10,000,000.00
Federal-USDA Farm & Ranch Lands Protection Program Total Amount:				\$9,450,755.29			
4/18/1997	1996-083-P1	A. Duda & Sons	WRP	\$6,512,162.10	Fee	3,172.89	\$20,402,095.00
3/31/1998	1995-017-P1	Sartori - Willowbrook	WRP	\$4,200,000.00	Fee	2,800.00	\$11,500,000.00
4/17/1998	1996-103-P1	Orange Creek Muck Farm	WRP	\$3,650,400.00	Fee	3,418.97	\$5,249,579.00
9/14/1998	1996-084-P1	Beall, Clarence	WRP	\$620,980.00	Fee	310.49	\$1,372,252.00
9/14/1998	1996-085-P1	Clonts Farms	WRP	\$1,285,480.00	Fee	642.74	\$4,255,100.00
9/14/1998	1996-092-P1	Lust Farms, Inc.	WRP	\$3,015,028.00	Fee	1,504.51	\$9,292,624.00
9/14/1998	1996-095-P1	Stroup Farms, Inc.	WRP	\$828,860.00	Fee	414.43	\$2,231,050.49
9/14/1998	1996-097-P1	Zellwin Farms	WRP	\$3,553,780.00	Fee	5,163.02	\$32,978,672.34
10/6/1998	1996-086-P1	Crakes & Son, Inc.	WRP	\$1,017,680.00	Fee	508.84	\$2,729,788.53
10/6/1998	1996-090-P1	Long Farms, Inc.- NRCS-WRP parcel	WRP	\$1,624,506.00	Fee	1,016.58	\$9,085,785.00
7/29/1999	1998-044-P1	Duda - Cocoa (aka Moccasin Island)	WRP	\$10,000,000.00	Fee	12,922.94	\$24,753,438.96
7/1/2002	2001-058-PA	Fellsmere - Sun Ag - former NRCS_WRP parcel	WRP	\$8,000,000.00	Fee	3,890.71	\$9,104,261.40
12/8/2003	2003-021-P1	Lindsey - Banjo Groves	WRP	\$443,235.00	Fee	298.00	\$1,000,000.00
2/4/2008	1991-020-PB	Turkey Creek/Lee Ranch - East/NRCS C.E. Parcel	WRP	\$18,586,864.42	Fee	2,892.45	\$28,650,699.89
Federal-USDA Wetland Reserve Program Total Amount:				\$63,338,975.42			
Grand Total:				\$72,789,730.71		38,045.24	\$187,789,666.54

Source: Adopted from data provided by SJRWMD 2011