

EVALUATION OF THE LANDOWNER INCENTIVE PROGRAM IN TEXAS:

1997-2007

A Dissertation

by

ANNA CHRISTIEN STUART KNIPPS

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2011

Major Subject: Wildlife and Fisheries Sciences

Evaluation of the Landowner Incentive Program in Texas: 1997-2007

Copyright 2011 Anna Christien Stuart Knipps

EVALUATION OF THE LANDOWNER INCENTIVE PROGRAM IN TEXAS:

1997-2007

A Dissertation

by

ANNA CHRISTIEN STUART KNIPPS

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Approved by:

Chair of Committee,	Michael Morrison
Committee Members,	James Cathey
	Urs Kreuter
	Roel Lopez
Head of Department,	Thomas Lacher

December 2011

Major Subject: Wildlife and Fisheries Sciences

ABSTRACT

Evaluation of the Landowner Incentive Program in Texas: 1997-2007. (December 2011)

Anna Christien Stuart Knipps, B.S.; M.W.S., Texas A&M University

Chair of Advisory Committee: Dr. Michael Morrison

The Landowner Incentive Program (LIP) was developed by the Texas Parks and Wildlife Department in 1997 in response to controversy and conflict between wildlife conservation agencies and landowners. The incentive was meant to encourage voluntary enhancement or establishment of habitat for rare species in the state, by providing technical assistance and a 75% cost-share. To evaluate the program in its first decade of existence, I gathered feedback from stakeholders via interviews, a mail survey, and case studies of LIP projects that focused on the black-capped vireo. The stakeholders I identified as administrators of the program, field personnel who acted as liaisons between administrators and landowners, and the landowners themselves. I used a qualitative theme analysis for interviews and open-ended survey responses to capture salient topics from the various perspectives. I analyzed closed-ended mail survey responses with descriptive statistics and ANOVA. For the case studies, I conducted vireo and habitat surveys and report the results with descriptive statistics or anecdotes.

Stakeholders were generally pleased with the program in its first decade regarding rare species habitat improvements. Most of the 126 projects were completed and resulted in an increase of habitat for a variety of species across the state. The

funding sources changed over the decade, bringing with them new directives, but in general LIP investments benefitted rare and declining species, whether listed under the ESA or not. Relations between landowners and conservation agencies also seemed to be improved in some cases and to be created in others.

Every program has its difficulties to work through as it evolves, and LIP is no exception. The first 7 years of the program were state-administered and encountered a variety of modifications due to personnel changes and differing opinions on program priorities. In 2002, LIP became a national program, requiring Texas to compete for funds, and also federal clearance requirements that caused many administrative delays.

My recommendations for program improvement included improved monitoring of project outcome, immediate evaluation of participants, increased communication and cooperation among various agencies who work with landowners, and dedicated staff to assist all other stakeholders in the LIP process.

DEDICATION

For my son, Liam.

ACKNOWLEDGEMENTS

I would like to thank my advisor, Michael Morrison, for giving me the opportunity to obtain my master's degree and PhD at TAMU, and for getting me a terrific job to help get through it all. I want to thank my committee members, Dr. Cathey, Dr. Kreuter, and Dr. Lopez, for their guidance and support throughout the course of this research.

Thanks also go to my friends and colleagues and the department faculty and staff for making my time at Texas A&M University a great experience. I also want to extend my gratitude to the Texas Parks and Wildlife Department, especially Arlene Kalmbach, for their support and cooperation. The many administrators and biologists in the department were very cooperative and helpful. All of the landowners who completed their mail surveys deserve a special thank you, but especially the landowners who allowed me onto their property and granted interviews. I could not have done this project without their assistance and kindness.

Many thanks to the Tom Slick Memorial Fellowship for funding my final year.

My family has been so supportive during this time and I thank them so much. I couldn't have done this without Mom and Dad! Dr. Ellen was very helpful with the human dimensions aspect of my study and for moral support. Finally, big thanks to my son who suffered through 5 years of his young life with a mom in graduate school.

NOMENCLATURE

BCVI	Black-capped vireo
EDF	Environmental Defense Fund
LIP	Landowner Incentive Program
NRCS	Natural Resource Conservation Service
T&E	Threatened and Endangered
TPWD	Texas Parks and Wildlife Department
USFWS	United States Fish and Wildlife Service

TABLE OF CONTENTS

	Page
ABSTRACT	iii
DEDICATION	v
ACKNOWLEDGEMENTS	vi
NOMENCLATURE.....	vii
TABLE OF CONTENTS	viii
LIST OF FIGURES.....	x
LIST OF TABLES	xi
CHAPTER I INTRODUCTION	1
CHAPTER II STAKEHOLDER PERSPECTIVES.....	7
The Landowner Incentive Program.....	10
Methods.....	11
Results.....	13
Discussion	31
Conclusion	35
CHAPTER III LANDOWNER SURVEY	37
Study Area.....	38
Methods.....	39
Results.....	40
Discussion	52
CHAPTER IV BLACK-CAPPED VIREO CASE STUDIES	56
Study Area.....	59
Methods.....	60
Results.....	66
Discussion	79
Recommendations.....	89
CHAPTER V CONCLUSIONS AND RECOMMENDATIONS	92
Benefits Of The Program	93

	Page
Recommendations For Improvement.....	95
Limitations Of Study.....	100
LITERATURE CITED	105
APPENDIX A	115
APPENDIX B	116
APPENDIX C	126
VITA	130

LIST OF FIGURES

	Page
Figure 1. Percentage of survey respondents in each of 6 income categories.	41
Figure 2. Percent income respondents earned from property.....	42
Figure 3. Number of years respondents owned their property.	43
Figure 4. Major uses of respondents' properties.	44
Figure 5. Percentages of respondents who would have done their project without LIP reimbursement (0=I don't know, 1=strongly disagree, 4=neutral, 7=strongly agree).	46
Figure 6. Income categories (see Figure 1 for breakdown) for respondents who would or would not have done their LIP project without financial reimbursement. Respondents who were not sure or were neutral make up the remainder.....	47
Figure 7. Categories of percent income generated from property (0=0%, 1=1-25%, 2=26-50%, 3=51-75%, 4=76-99%, 5=100%) for respondents who would or would not have done their LIP project without financial reimbursement. Respondents who were not sure or were neutral make up the remainder.	48
Figure 8. Respondents assigning importance level of confidentiality for natural and cultural resources on their properties (0=Not important, 1=Slightly important, 2=Neither important nor unimportant, 3=Important, 4=Very important).....	49
Figure 9. Counties (in gray) with known black-capped vireo (<i>Vireo atricapilla</i>) populations in Texas as of 2006 (Wilkins et al. 2006) with my case study counties shown in black.	60
Figure 10. Relative investment of species-specific LIP projects conducted in Texas during 1997-2007 (data from a 2007 unpublished TPWD document).	62

LIST OF TABLES

	Page
Table 1. Conservation programs for private lands by administrating agency and year established.	9
Table 2. Examples of federal spending in Texas in fiscal year 2007.	22
Table 3. FY 2006 Landowner Incentive Program ranking sheet criteria.	24
Table 4. Mean responses to attitudinal and beliefs questions based on 7-point scale (0=I don't know, 1=strongly disagree, 4=neutral, 7=strongly agree).	50
Table 5. Correlations between project "Success" (defined in text) and various landowner characteristics (*=significant).	51
Table 6. Vegetative characteristics measured for each of 8 LIP properties in Texas in 2008 and 2009. The BCVI recovery plan (USFWS 1991) states that 35-55% heterogeneous cover is recommended.	68
Table 7. Number of cowbirds reported removed by landowners and agencies in the years following the LIP trapping projects (TPWD unpublished data: http://www.tpwd.state.tx.us/huntwild/wild/nuisance/cowbirds/trapping_program/index.phtml).	79

CHAPTER I

INTRODUCTION

The human population in Texas has grown from roughly 3 million in 1900 to about 25 million in 2010 (U.S. Census Bureau 2011). While most of this population growth has taken place in urban areas, some has resulted in expansion into rural areas. A larger rural population can result in partitioning of larger properties and creating a matrix of management ideals that can be discordant. In addition, current tax codes make inter-generational transfer of land ownership unaffordable for many heirs, causing many to turn to land subdivision or sale for development as a way to offset estate taxes (McCann 1999).

Development, division of larger land holdings, and clearing of native vegetation for pastures or crops all work toward reducing wildlife habitat. Degradation of habitat occurs when landscapes go too long without fire or other periodic disturbances, pastures are “improved”, which typically involves introducing exotic grasses, and contiguous habitat is interrupted by fragmented land uses. Wilcove et al. (1998) estimated that 85% of imperiled species were at risk because of habitat loss or degradation. That statistic includes many of the rare and declining species in Texas.

The US General Accounting Office estimated that in 1993 over 90% of threatened or endangered species had some or all of their habitat on non-federal land

This dissertation follows the style of Journal of Wildlife Management.

(GAO 1994), most of which was privately-owned. Texas is over 95% privately owned, so it stands to reason that most of the rare species in the state have much of their habitat on private lands. In Texas wildlife is owned by the state, yet government officials are not automatically granted access to private properties in order to monitor or manage the wildlife thereon. It is a conundrum managers have been trying to solve for decades with limited success.

The Endangered Species Act (ESA; 16 U.S.C. 1531 *et seq.* 1973) was established in 1973 as a last resort regulatory mechanism to protect species threatened with extinction. The passage of the law seemed to many landowners a death knell of landowner rights. Suddenly a simple act of clearing trees for a pasture could result in a heavy toll should a listed species be affected in the clearing process. In a state where many were already distrustful of government intervention, the ESA deepened the divide between government and private landowners. The effects of that rift are still being felt today, but wildlife managers are working hard at improving those relations to the point where management of wildlife on private lands can be a positive and cooperative experience.

The 2005 Texas Wildlife Action Plan calls for a concerted effort to monitor and protect habitats for rare and declining wildlife species in the state. Because private lands harbor a large percentage of the targeted habitat as well as an enormous potential for habitat restoration and improvement, a system must be in place to encourage cooperation between private landowners and wildlife agents. The regulatory mechanism of the ESA has tended to create conflict, resentment, mistrust, and therefore polarization between

landowners and government, making cooperation difficult or impossible, and has created perverse incentives for landowners who harbor endangered species on their property. Moreover, the ESA is targeted at species on the verge of extinction and fails to protect those species not yet listed but otherwise on a course for listing.

Wildlife managers use various methods to reach out to landowners to manage wildlife on their property. For example, many introduce the topic of diversity while working with a landowner on a wildlife management plan. In addition to dissemination of information, financial incentives can be an effective complement to regulation (Langpap 2006). Conservation incentives for management actions that benefit wildlife help to shift the financial burden of conservation from the private landowner, who might derive little benefit from the presence of rare species on his or her land, to the broader public, members of which derive great benefit from greater biodiversity (Sorice 2010).

Of course, many landowners strive for biodiversity conservation on their property as a personal choice. These individuals also benefit from conservation incentives because they can accomplish projects they wished to do anyway in a quicker time period and at less expense. Often technical guidance received from the wildlife manager is just as important as financial support. The financial incentive is sometimes an initial measure to help create a partnership between landowners and managers to accomplish wildlife conservation objectives. The more conservation measures that are implemented, the better the chances that rare and declining wildlife species avoid ESA listing and extinction.

There are a variety of incentive programs with various stipulations and terms. The Natural Resource Conservation Service, US Fish and Wildlife Service, non-governmental organizations, and state agencies all support incentive programs to help fund conservation initiatives. Tax breaks, mitigation techniques, regulation assurances, and cost-share agreements are tools for encouraging voluntary engagement in wildlife or natural resources conservation. The Texas Parks and Wildlife Department's version of a cost-share initiative is the Landowner Incentive Program (LIP). This program reimburses landowners 75% of project costs for management activities that help to restore or enhance habitat for rare species.

Initiated in 1997, LIP was a state-sponsored program with few restrictions. It was the state's attempt to improve relationships with landowners regarding wildlife management on private lands after some high profile battles involving the ESA. TPWD needed a new approach to encourage landowner cooperation and used LIP as a catalyst to that approach. The program was just gaining momentum in 2002, when then president George W. Bush created a federal LIP out of the Texas program. Federal programs come with their own set of restrictions, thus changing the dynamic of wildlife management on private lands once again, as I describe in the next chapter. There were 101 projects funded in Texas prior to the change in funding source, and 24 in the 5 years after the transition. LIP lost its federal status in 2008 and reverted back to a state program.

Government incentive programs are paid for by tax payers and compete with other programs for tax dollars. Therefore, having a clear and comprehensive

understanding of how well the program is doing is imperative. If the incentive program is effectively accomplishing conservation it should remain in the supporting agency's budget; if not, it might become non-viable. In addition, identifying and fortifying the successful aspects of the program can help keep it running smoothly and efficiently.

In this dissertation, it is my goal to illustrate how LIP has performed in the first decade of its existence from the perspective of various stakeholders. Specifically, I address the following questions: What components of the program were successful and which ones were not? How can various components of LIP be improved? How can ranking criteria be modified to enhance biological efficacy? Are the current emphases correctly prioritized? How can the administrators of the program most effectively monitor the outcomes and successes of each LIP project? How can LIP administrators catalyze conservation initiatives most efficiently? How can LIP be improved for the participants?

I identify the LIP stakeholders for this study as follows. First are the administrators and the biologists who were responsible for implementing the program. Their viewpoint revealed programmatic and undocumented detail about LIP, and information about landowners who were recruited to conserve habitat. I include some information from landowners in my discussion of administrator and biologist feedback where their comments were germane to the topic. Next I evaluate the landowner perspective. Specifically, I asked them to evaluate the ease of using the program and the sufficiency of the financial and technical support for covering their management actions. I also gathered demographic information on landowners who participated in LIP to

determine what types of landowners use the program and to identify factors that might have influenced their enrollment. Next I focus on the subset of LIP projects that targeted habitat improvement for the black-capped vireo (*Vireo atricapilla*), the top spending category of LIP projects during the evaluation period. I discuss the landowners themselves and their land management history, and then describe the specific LIP funded management actions implemented by each landowner, and how they affected the vireo habitat on their properties. Following the individual stakeholder perspectives, I end the dissertation with a synthesis of the evaluations and recommend ways to improve LIP for future administration.

Because LIP is only one tool in the conservation toolbox, I will also address the broader implications of incentive use in achieving effective management for rare wildlife species on private lands. In addition, I will discuss how various types of landowners use conservation incentives differently to meet their management goals, as this affects how agencies can target incentive programs.

CHAPTER II

STAKEHOLDER PERSPECTIVES

Conservation initiatives evolved in the latter part of the 20th century in response to an increasing human population and associated decrease in wildlife habitat (Bean and Wilcove 1997, Wilkins et al. 2000). The Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*) attempted to serve as a mechanism for protection against extinction of individual species, but did not specifically provide for long term, holistic conservation approaches for wildlife. In addition, many threatened or endangered (T&E) species existed largely on private lands (Scott et al. 2001), where federal agents have limited or no access. In 1994, the Government Accountability Office estimated that 609 of the 712 T&E species had some or all of their habitat on private lands (GAO 1994). The importance of private lands in wildlife habitat conservation was becoming increasingly evident, but prevention of deleterious actions or activities within endangered species habitat on private lands created perverse incentive structures that were inconsistent with the goals of the act. Additionally, litigations for ESA infringements are costly for all parties involved. Therefore, finding ways to engage private landowners in conservation cooperatively and willingly became an important challenge for wildlife agencies. The challenge became ever more important as human activities led to further reduction and fragmentation of wildlife habitat.

Cost-share programs, regulatory assurances, and conservation easements were established by several different agencies in the 1980s and 90s as catalysts to societal

management of public resources on private lands (Table 1). Since then the use of and attention to conservation incentives has been increasing (Stone 1995, George 2002, Wilcove and Lee 2003, Lewis et al. 2009, Wilkins 2009).

The various incentives are attempts to bridge gaps between a public who felt over-regulated and the governmental agencies charged with protecting rare species (Bean and Wilcove 1997). These programs attempted to serve as trust building tools between landowners and government. They also served to shift the financial burden from private landholders to the broader public. The fact that more incentive programs were being created across a range of agencies points to the rising popularity of such conservation initiatives. However, because limited public funds were being spent on many of these programs there was a concurrent need for accountability and efficiency assurance. There is a scarcity of public funds for conservation incentives and naturally taxpayers demand proof of program necessity and effectiveness, especially when the economy is in stress.

Table 1. Conservation programs for private lands by administrating agency and year established.

<u>Program</u>	<u>Agency</u>	<u>Year</u>
CRP	USDA FSA [†]	1985
EQIP	USDA NRCS	1985
WHIP		1996
Safe Harbor	USFWS/EDF	1995
HCP	USFWS	1982 [*]
Private Stewardship Grants	USFWS	2002-2007
RCS	USFWS	2008
LIP	State (TX)	1997
Conservation Easements	Land Trusts, TNC	Early 1980s
Wildlife Tax Valuation	TX legislature	1995

^{*} little used until 1992

[†] USDA=United States Department of Agriculture, FSA=Farm Service Agency, NRCS=Natural Resource Conservation Service, USFWS=United States Fish and Wildlife Service, EDF=Environmental Defense Fund, TNC=The Nature Conservancy, CRP=Conservation Reserve Program, EQIP=Environmental Quality Incentive Program, WHIP=Wildlife Habitat Incentive Program, HCP=Habitat Conservation Plans, RCS=Recovery Credit System, LIP=Landowner Incentive Program.

Ferraro and Pattanayak (2006, p. 482) called for evaluations of investments in conservation to answer the question, “Does the intervention work better than no intervention at all?” While evaluators cannot simultaneously study the same stakeholders with and without the incentive programs in place, we can study whether programs are accomplishing their stated goals and how outcomes are affected by exogenous influences, such as ecological dynamism and program staff changes. Another important aspect to evaluate is the adequacy of defined program goals (Kleiman et al. 2000). For example, is the goal simply treating the most acres, or making the most tangible difference biologically (i.e. recovery of T&E species)? Moreover, what are our metrics of success? I will attempt to answer these questions after a brief introduction to the focal program.

The Landowner Incentive Program

In an effort to encourage landowners to foster rare wildlife and their habitat, the Texas Parks and Wildlife Department (TPWD) launched the Landowner Incentive Program (LIP) in 1997. The Landowner Incentive Program provides technical and financial assistance for restoration or creation of habitat for declining wildlife species. In 2002, LIP became a federally administered program, maintaining the same goals as the state-administered program but offering additional incentives for private lands stewardship throughout the country. During its first decade, the focus of LIP projects shifted from endangered and threatened species to rare species that had not yet been listed (Chuck Kowaleski, LIP coordinator for TPWD 2002-2003, personal communication). Changes in focus were due in part to changing sources of funding for the program with different directives, as well as the need to dovetail with the state's Wildlife Action Plan (TPWD 2005). The action plan was developed in 2005 as an outline of steps necessary to conserve habitat for declining species before they are listed under the ESA.

The purpose of my study was to gather perspectives of LIP stakeholders to help answer the following questions: (1) How do stakeholders view the program (goals, successes)? (2) What methods do they believe are the best to achieve the goals of the program? (3) How did exogenous factors affect program success? (4) How do stakeholders think LIP could be improved? After a brief description of the survey methods I used to collect these data, I present the salient results of my conversations with stakeholders and responses to the subsequent mail survey, followed by a discussion

of how these results factor in to the future of LIP or other similar incentive programs.

Methods

I used a purposive (non-random) sample of LIP stakeholders (Weiss 1998). I identified stakeholders as administrators of the program from TPWD as well as from EDF and USFWS, regional and local biologists who worked with landowners on their LIP projects, and landowners who participated in LIP. Because of the broad array of individuals involved in the program during the decade-long period of evaluation decade, it is difficult to estimate the total number of potential stakeholders. Accordingly, I targeted those who had the greatest involvement in the program (i.e., the biologists I interviewed were responsible for 75% of all LIP projects and ranged from the panhandle to the piney woods to the coastal prairie to the hill country of Texas). In total I interviewed 25 stakeholders (5 administrators, 10 biologists, and 10 landowners with LIP projects that focused on the black-capped vireo [*Vireo atricapilla*]) and I polled 100 of all 117 LIP landowners via a mail survey. I chose this endangered species as the focus species for case studies because of a large regional concern for its conservation, and because of the relatively large number of LIP projects focused on enhancing its habitat in Texas.

I interviewed stakeholders from summer 2007 to fall 2010 using a naturalistic approach (Lincoln and Guba 1985). In naturalistic inquiry, interviews are conducted using a pre-determined interview protocol (Appendix A); however the interviews become more of an open-ended discussion of the topic rather than a formal question-

and-answer methodology. Interview protocols changed slightly during the course of the study in response to emerging hypotheses. For example, when I determined after 5 TPWD biologist interviews, that landowner participation in wildlife management associations was an important characteristic contributing to their participation in LIP, I created more interview questions surrounding this topic to more fully develop this new emphasis. I did not create new questions unless each of my previous interviewees had discussed the topic.

I used a qualitative thematic analysis to interpret interview transcript data (Boyatzis 1998). I manually unitized interview text and placed units into salient categories that I saw emerging from the data. Text units, such as a sentence or a paragraph, were the smallest amount of data that could stand alone and retain sufficient meaning to be placed within a category. I created categories I observed emerging from the data rather than setting them *a priori*, much like the description of working hypotheses described above. For example, challenges associated with the administrative shift from state to federal became a common thread of discussion and therefore its own category. Each section of results, therefore is its own theme illustrating my findings, using individual quotes to tell the story. Although interview questions changed slightly as more interviews were conducted, overall I asked stakeholders for input regarding the programmatic aspects of LIP (e.g., ease of use, potential redundancy with other programs) and successes of individual projects (Appendix A).

I used a modified Dillman (2000) method of mail survey administration for LIP participating landowners in the fall of 2009 to spring 2010. Out of a total of 117 surveys

sent, 17 were undeliverable. I received 52 of the remaining surveys for a response rate of 52%. As part of the mail survey, I asked a series of open-ended questions regarding landowner motivations for enrolling in LIP and their involvement with other programs, and I provided additional space for further comments (Appendix B). I discuss answers to close-ended questions in the next chapter. I chose to use open-ended questions for certain topics so as not to restrict responses to a priori choice options. Further, answers to open-ended questions often contributed to a more complete picture of the survey participant experience, which was important for this small sample of LIP participants (Salant and Dillman 1994).

I report response frequencies for certain questions. Some questions were not answered by every respondent, so in all cases I report the number of respondents as well. I do not reveal names of individual sources to protect their identity. All interview and survey activities were covered by protocol #2009-105 from the Office of Research Compliance, Internal Review Board at Texas A&M University.

Results

Evolution of the Landowner Incentive Program

LIP evolved out of a regulatory and a generally uncommunicative government-landowner atmosphere in Texas. One biologist stated, “back in the mid-90s there was a lot of controversy between private landowner and conservation groups about endangered species conservation and heads were butting on a regular basis”. One of the more publicized controversies was termed the “Warbler Wars”. An erroneous leak to the press

told of 33 counties being listed as critical habitat for the golden-cheeked warbler (*Dendroica chrysoparia*) under the Endangered Species Act. Critical habitat is a geographical area of habitat considered to be essential for the conservation of an endangered species. The designation “is a reminder to Federal agencies that they must make special efforts to protect the important characteristics of these areas” (USFWS 2010). Perhaps in light of the ambiguous language, landowners feared they would have their rights taken away if they had critical habitat designated in their area. Some landowners preempted the possible designation of such habitat. As one landowner said, “‘Back a few years ago when this came up, we just got bulldozers out and started wiping it out,’ [the landowner] says of warbler habitat” (Clayton 2007). “That was unfortunate... [the Fish and Wildlife Service] had an uphill battle with the PR campaign”, a USFWS representative said of the Warbler Wars. The same battle affected other governmental agencies by extension.

Repercussions of ESA legislation were perhaps of greatest concern to agriculturally oriented landowners. This is especially true in Texas, where a large percentage of land consists of grazing lands, farmlands, and forest lands. Wilkins et al. (2003) estimated the percentage of such working lands in 2003 covered 84% in Texas. As a result, endangered species regulation potentially affects an enormous number of agricultural landowners in the state. Without clear understanding of the extent to which the Endangered Species Act would affect land use activities, a great deal of mistrust by the landowners was directed at the governmental agencies charged with species protection. Some thought it an unfair burden on landowners to provide for species that

technically belong to the public. Federal and state agencies charged with species protection had to develop creative solutions that would work for everyone. A LIP administrator stated that, “the whole idea [of LIP] was to turn this thing around and to get people to stop thinking that endangered species were a negative thing on their properties...it was to open the gates again because they got slammed shut”.

Economics of land ownership

At the heart of the controversy was the extent to which the presence of endangered species on a property impacted the landowner’s activities and finances. In partial response to this, and to begin shifting the burden from landowners to society, LIP was initiated in 1997 with a small number of participants. One administrator of LIP said, “in the early years we didn’t care, we’d take anything—any rare species, no priorities”. Many, but not all participating landowners were agriculturally oriented. LIP also helped to support landowners who “kind of fall through the cracks”—those who were not considered “producers” by NRCS and therefore did not qualify for Farm Bill incentives but were perhaps were engaged in conservation projects to qualify for the Wildlife Tax Valuation, improvement of habitat for game, or had an inherent interest in rare species management on their land.

The Wildlife Tax Valuation (Texas Tax Code § 23.51) passed in 1995 in Texas, allowing landowners to transfer some or all of their property from agricultural use to wildlife management, while maintaining the same low tax valuation, given that a

management plan was in place with certain wildlife management activities undertaken on the property. As one biologist said, “That’s been huge because we come to a landowner and say we can help you design a songbird management program, we’ll help you do the work, we’ll design it, we’ll help pay for it, and all these things will help you to do your wildlife management plan so you can qualify for the wildlife tax valuation. It really opens the door to a lot of places”. A corroborating statement from a LIP landowner was, “The wildlife exemption was a great tool for wildlife preservation. It allowed a lot for your small landowners who did not want to raise cattle, (but) who were being forced to raise cattle to get an ag exemption, ... to get out of the cattle business”.

Indeed, there has been a slow shift from grazing to wildlife enterprises in part due to declining profit margins for livestock production (“the agriculture business is so full, [ranchers] just don’t have the money to spend on the things [they] need to do”, according to one agricultural LIP participant), but also because of the Wildlife Tax Valuation and the increasing earning potential from hunting leases. Establishing a wildlife management plan for hunting purposes opens the doors for conservation projects that benefit rare and game species simultaneously. The two can be “...very compatible. Habitat that’s good for the deer and turkey and quail is perfect for the vireo. Perfect.” A mail survey respondent said, “we have a wildlife exemption, no cattle, and our only income is derived from hunting. LIP aided our habitat improvement for game species”. Another landowner put it this way: “as the economy changes, hunting revenues exceed grazing revenues. So development for hunting is the wise thing to do”; and “the wildlife makes us a whole lot more money than the cattle do”. Reflecting these statements was

the fact that, 40 of 49 of the respondents to this particular question had some form of hunting on their properties, whether from leases or for personal recreation. While not a specific goal of LIP projects, improved habitat for game species in these cases helps to sell the management activity to a landowner.

In addition to hunting, many of the landowners that I interviewed had some combination of income-generating activities on their land to help offset the cost of ownership: cattle leasing, corporate entertaining, oil and gas extraction (“the only place to make money in owning land”), “recreational value”, and photo-tourism to name a few. However, property-related income generation was low with almost 2/3 of the survey respondents deriving 1/4 or less of their income from their properties, indicating substantial outside interests. Of the vireo habitat landowners I interviewed, several were wealthy professionals (4 lawyers, a finance businessman, an agricultural production company manager, an emergency physician/nurse couple, and a family doctor) or had a cooperative family ownership. Regardless of the type of landowner and other methods of financing their property, LIP helped landowners to reduce the financial burden of their conservation project and helped influence management practices. As one biologist said, “Technical assistance only goes so far. If you have money people will listen to you a little bit more”.

In answering the question, “Does the intervention work better than no intervention at all?” (Ferraro and Pattanayak 2006), a key to the success of LIP was whether the landowner would have implemented the conservation project without the financial assistance provided by the program. Of the mail survey respondents, 22 (44%)

said they would have done the project without LIP, 13 (26%) said they would not have done it, 10 (20%) were neutral on the subject, and 5 (10%) were not sure. In some cases, the landowner realized after enrolling in LIP that they couldn't afford to complete the project, especially when there were delays for reimbursement ("it was a little slow, as all government is, the funds come across a couple years down the road"). Those who indicated they would not have implemented the project without such funding said it would have been too expensive, while those who indicated they would have done so anyway said that it would have taken them a lot longer to achieve their conservation goals: "it would have taken me 20 years what it took me to achieve in 5"; "it was just enzymatic, it just helped the process go along quickly"; "I would have done the fencing without LIP but not for awhile. The LIP money was great".

LIP as a piece of the conservation puzzle

A key question for evaluation of any program is how do people get involved. Outreach and marketing are important aspects of any government program. Biologists mentioned several ways in which they disseminated information about LIP to landowners, especially in the early years of the program. Many used public meetings to announce the program, including meetings with landowner groups and associations, and professional meeting presentations; Farm Bureau meetings and USFWS classes; and NGO workshops. Others recommended the program to landowners with whom they were already working on management plans or general technical guidance. Brown and Graham (2001, p. 533) said, "one of the best methods of promotion (for LIP) has been

through agricultural oriented periodicals.” The most commonly mentioned form of advertising LIP, however, was word of mouth. In some cases a biologist would get a local agent from another agency to spread the word—someone who the landowners already trusted, and in others they learned about the program through neighbors who had had a successful program. “You have to start with that one rancher, and then everyone visits his ranch and they say, ‘yeah this looks nice, the government paid 75% of this and they’re not stopping you from doing your normal stuff, they’re not taking over your ranch’”. Some biologists even took landowners to someone else’s property to show them a successful project. One landowner mentioned his neighbors were interested in LIP based on his results, but that they lacked the time to start their own project.

One method of promoting the program received a less than glowing review. “They used multimedia methods to promote LIP, which is good, but it doesn’t get to the people that have the bigger holdings...it gets to the people that are more computer affluent...probably the ones that own the ranchettes”. However, with land ownership changes in places like the Hill Country (Wilkins et al. 2000) there is an increasingly computer-literate population to whom internet-based promotion of such programs may become more accessible.

Of the respondents to the mail survey, 23 (51%) heard about LIP from another agency they were working with, 12 (27%) from their TPWD biologists, 4 (9%) from magazines or county publications, 2 (4%) from neighbors, and 2 (4%) from other TPWD employees. The breakdown illustrates the importance of interagency cooperation in the expansion of conservation on private lands. Twenty-six of 50 (52%) respondents were

involved in other programs, 14 (28%) of which were EQIP. Others included Safe Harbor (3; 6%), Partners for Fish and Wildlife (1; 2%), and Coastal Prairie Conservation Initiatives (1; 2%).

Partnership was a common theme in discussions of LIP projects. Agencies mentioned in interviews and in the mail survey include EDF, USFWS, NRCS, Texas Wildlife Association, The Nature Conservancy, Farm Bureau, Texas Cattleman's Association, Texas Forest Service, and several private consulting firms. Representatives from different agencies can piece together a conservation picture on an individual property from different puzzle pieces of funding. When LIP was a state program, funds could be "piggybacked" with federal dollars to create a larger impact. State funds could also be used to leverage more federal money, "especially Partners" (the USFWS Partners for Fish and Wildlife program). However, once LIP became a federal program, using funds from other federal programs for the same practice was no longer permissible. Biologists had to get creative in the way they accessed funding for a particular property. "The field guys say, 'why don't we run this aspect of what the landowner wants to do through LIP? The part of their funding cycle is coming through, and then we'll do Partners for this part of the project'". One biologist who works regularly with endangered species said, "we use funds from different programs on different pastures and double the effect". A USFWS representative who works with LIP described the conservation challenge this way:

We all work for the American public. We all want the best deal we can get for a particular landowner, we all want as much conservation on that person's 100 acres as we can...we will unequivocally make the best recommendation for that land. That's our challenge to keep up with all these programs.

Managing multiple programs for similar goals was not just a challenge for the administrators, however. One biologist said, “it was hard to keep straight who was paying for what”. Landowners also confused which practice was paid for by which program. “We’ve done so many projects I’ve lost count. We’ve done projects with Fish and Wildlife, stuff with TPWD, and stuff with NRCS”. On one hand, the means (origin of funds) may not be as important as the ends (improved habitat) when dealing with conservation projects. A USFWS representative said:

From a PR perspective that’s an interesting point because I don’t think anyone wants the credit per se of a good restoration project that we funded, as long as it’s done, we’re happy with that. But the truth is, every year congress decides whether to fund us and... some days I have to go put on my full FWS uniform and let them know, ‘if you like this be sure to tell your congressman that you like this, and that’s what you want FWS to be doing’.

Doubtless the same could be said for the TPWD representatives. In a way, it is a competition for funds when you’re dealing with multiple federal programs, each contributing to conservation, albeit in slightly different ways. The Farm Bill programs are by far the most widely used and well-funded incentives, but can often be complementary to others. Table 2 lists some of the available incentive programs and their relative spending for USFWS and NRCS in Texas.

Table 2. Examples of federal spending in Texas in fiscal year 2007.

<u>Program</u>	<u>Amount spent (\$)</u>
Neotropical Grants	135,879
Landowner Incentive Program	180,000
State Wildlife Grants (C)	200,000
Endangered Species (Section 6)	515,749
State Wildlife Grants (A)	664,679
Endangered Species Title VIII	5,565,062
<u>Wildlife Restoration</u>	<u>15,042,941</u>
Total USFWS	22,304,311
WHIP	526,230
EQIP	89,124,483
<u>CRP</u>	<u>143,855,412</u>
<u>Total NRCS</u>	<u>233,506,125</u>

Despite the confusion involved with multiple-agency administration of conservation funding, the LIP project selection process rewards larger conservation operations that might be receiving multiple incentives. An even more impactful factor is the presence of non-federal cost share, as we will see in the discussion of the selection process, below.

Project selection process

LIP applications are submitted to TPWD staff, ranked using certain criteria (explained below), and then forwarded to an advisory committee with comments. The advisory committee evaluates each application thoroughly and then recommends to LIP staff, with or without amendments, which ones to fund. The advisory committee is comprised of conservation minded partners including biologists and administrators from different agencies (TPWD, USFWS, and NRCS), non-governmental organizations (ED, Audubon), university representatives, and private landowners. “Landowners were involved in the development of LIP from the very beginning” (Brown and Graham

2001). The final decision of which projects receive funding rests with TPWD staff, which includes LIP staff, the private lands coordinator, diversity specialists, and members of the nongame and Endangered Species branches of the department. A well-prepared application will go through quickly, but others may need input from specialists on the advisory committee before selection discussion. The broad diversity of advisory board members helps to bring a variety of perspectives to the process and also to have a built-in promotion mechanism. That is, board members can encourage field staff to mention LIP to landowners who might not know about the program.

Each project application that is submitted is ranked using certain criteria that the advisory board deemed the most important (Table 3). These criteria grant a fairly large weight to projects that are already being funded by other (non-federal) agencies, outweighing contributors to ecological project success like Proximity to Known Populations of Target Species and Landscape Scale and Context. Long Term Management Benefit is also on the lower end of the scale, at 6% of the total possible points. This criterion allocates points to landowners with conservation easements or other long term maintenance agreements. Exceptional Stewardship points are granted if the landowner agrees to annual population monitoring, if they establish photo monitoring points, or if they allow their site to be used as a demonstration area.

Table 3. FY 2006 Landowner Incentive Program ranking sheet criteria.

<u>Criterion</u>	<u>Maximum points</u>	<u>Percentage of total</u>
Nonfederal Cost Share (over and above required 25%)	75	30
Focus Species: Federal Candidate Species or State Threatened Species (not currently on federal list)	60	24
Focus Habitat: Texas Wildlife Action Plan	30	12
Cost of Restoration	25	10
Exceptional Stewardship	25	10
Long Term Management Benefit	15	6
Landscape Scale and Context	10	4
Proximity to Known Populations of Target Focus Species	10	4

During the years that LIP was federally administered (2002-2008), the ranking criteria changed little. One change between 2006 and 2010 was that the points available for Long Term Management Benefit doubled and the 30 potential points for Focus Habitat was eliminated. These changes, in effect, made the non-federal cost share even more important than the target wildlife; a benefit to administrators but not necessarily to the biological response.

In the early years of LIP, not all of the biologists were happy with the committee process. One biologist responsible for 25% of all projects said:

I would send in applications for...projects and I would get questions like, 'at some point are the people going to cut the trees?' and I'm like, 'yeah, they're going to cut some trees', and they'd say, 'but we can't do that' and I said, 'well if you tell them they can't cut the trees then I can just quit now' [laughs], so there have been some growing pains... We had all these people wanting to do things and [the LIP projects] all ended up being stacked up trying to go through this committee and all these variable ideas, backgrounds, knowledges, interests in the committee...I don't want to sound like a negative person but it seems like it would be easier to administer the program if we didn't have to go through the hoop of that committee.

Another TPWD biologist said, “I dressed up the grant to identify...whatever would influence the committee. It’s what you have to do to get the money. We really did believe these species would be benefitted by the project, it wasn’t just thrown out there in jest”. “Every year it seems we have a different LIP coordinator and then the committee meets every 6 months or a year and forget what they decided so in the field we always have some deviance of past activities...it just became a game”.

In general, projects selected for LIP funding are considered successful if they are completed. A LIP administrator said, “I think our selection process works. The cream rises to the top because it is a rather rigorous process. (However,) you still need to have evaluation because the project is still just on paper until it starts to get on the ground”. Participants must return reports on the project and the biologist must visit the site to make sure the work was done to facilitate reimbursement. The work was not always completed, however, and several projects were compromised by events such as fire and drought, and by administrative obstacles such as a tardy reimbursement process.

Obstacles

Many target species in LIP projects require active management of habitat. Very often in Texas, the management activity needed to maintain habitat is prescribed fire. One biologist said, “Data seem to indicate that warm season burns tend to be the primary thing attracting vireos to colonize new areas by far, it wasn’t even close”. Many of the landowners I spoke with had the desire to apply more intense burns, but the perceived risks often outweigh the benefits (Kreuter et al. 2008). Concern about development in

the area, neighbor's negative attitudes about fire, and reluctance to burn when fuel loads are high, prevent the "right" kind of burning treatment. Drought and burn bans also frequently preclude fires from being ignited. If a burn ban was in place in the LIP landowner's county during the entire contract period, that project is deemed unsuccessful, through no fault of the landowner or the administrators. Those landowners who were able to burn had to rely on others to assist. Some worked with private contractors, some were members of prescribed burn associations, and others relied on friends and family to provide assistance on burn days.

LIP has also been used to initiate brush control processes via mechanical means so regular burning can be implemented. However, even mechanical brush work can be difficult to achieve. "You have to be able to get on the land. We just went through 77 inches of rain in a 9 month period, nobody was getting on the land. We run into those kinds of delays all the time".

Whether a prescribed fire was completed or not, the active management of habitat requires repeated treatments. A USFWS representative said, "One of the criticisms of the conservation movement, and in Texas it's brush control, is that landowners have to come back every 10 years with their hands out...You'd have to burn every 3 years and defer grazing to keep the brush back and most people aren't willing to do that". However, once an initial treatment has been applied using LIP funds, the follow-up treatments are easier to accomplish. Due to lower costs of follow-up treatments, landowners are more able to commit to continued habitat management based on biologist's recommendations, even without financial assistance.

Of the mail survey respondents, the majority (23; 56%) had very positive feedback for LIP: from “everything went great” to “it was pretty painless”. Technical guidance was listed most often as the most user-friendly aspect of the program, with reporting and invoicing also being listed as satisfactory. Eleven (27%) respondents mentioned least-user-friendly aspects including: application process (6; 14.6%), invoicing (2; 5%), navigating the cost-sharing, “the process”, and one individual thought the board’s reluctance to approve him was political. Some issues with the application process and invoicing can be attributed to the frequent changes in LIP staff over the 10-year span, but also due to the new standards set when LIP became a federal program in 2003. As one biologist said,

Probably the biggest hindrance is that about 2 years ago we had shut down trying to get an agreement together with FWS on how to do this program. I think the big hold up there was the historic commission...it kind of just died on the vine because people can’t wait 2 years to do reforestation when they’re ready to do reforestation.

A major complaint of the switch to federal administration was the time-consuming paperwork, but the most commonly cited issue was the archaeological clearance.

Biologists stated the problem various ways: “The archaeological part makes you creative in doing projects”; “Staff and landowners were slowed by archaeology changes with federal funds. The archaeological clearance made small changes to a project way too difficult”; “Many landowners don’t want LIP because the archaeologist might find a cultural resource and keep them from” doing what they wanted; and “It became too cumbersome, folks backed out”.

Even though there were statements made by stakeholders about the early years of the program like “I used to think LIP was brother-in-law deals—bass fishing and tanks”, and “everyone had a different style, some kept immaculate records...and sometimes it was a black hole”, and “I heard a lot of stories on the early LIP and things I wouldn’t even consider trying to get away with people were getting away with”; stakeholders liked the freedom of the state run program: “When it was state run we were more creative and had more flexibility”; and “it was way easier with the state program—less paperwork, no feds”. Even the “feds” (a USFWS representative) liked LIP to be run by the state: “It would be great if LIP could be all state money...we could just not have to worry about lines in the sand quite as much”. There also seems to be a sense of pride in the fact that LIP originated in Texas (“In the early years it was *our* program”, said one LIP administrator) and a desire to keep the program in Texas.

Monitoring

Project completion is prerequisite to reimbursement of invoiced payments, but to determine true success of projects, effectiveness monitoring must be maintained to determine the effect of the project on the landscape, the target species, and the future conservation behavior of the landowner (Fernandez-Gimenez et al. 2008, DeLuca et al. 2010). Monitoring was not a priority in the early years, at least not enough to make it part of the projected cost. A TPWD biologist mentioned, “we have faith that the biological organisms will respond to these projects but we probably have very little data. Monitoring was not part of the activity; we just didn’t have the time. We’d have to

spend weeks out there to get a good cost estimate”, especially if the time and effort cost of monitoring were included in the total projected project cost. Monitoring has improved over the years, but agency personnel have duties outside of LIP precluding a focus on monitoring of past projects. Partnering agencies are often the ones who have the ability and motivation to get out to sites and monitor species responses to restoration projects, especially when the targets are threatened and endangered species. Partners for Fish and Wildlife and EDF have been keys to the success of some of these LIP projects.

Many criteria are important for determining the success of a project, depending upon the target species, the project undertaken, and any exogenous influences. In general, however, monitoring can reveal the response of vegetative components of habitat, and the potential use of the habitat by rare wildlife species. Certain LIP projects were granted extra points during the selection process for allowing photo-point surveys of the habitat. In situations where the landowner can perform these surveys, more data could be collected for time-constrained biologists.

Stakeholder feedback

Administrators of LIP were unanimous in their assessment that the program is a good idea and that it has progressed tremendously from its inception in 1997. “It’s a means by which Parks and Wildlife can put its money where its mouth is and fund some key projects that meet their stated objectives, wherever their highest priorities are they have some money to put towards it”. These objectives could not be met without the

willingness of the landowners, however. Determining what motivates landowners to enroll is important to improve outreach methods.

Mail survey respondents had a variety of motivations for enrolling in the program, often mentioning the cost-sharing, but also “improving” the land, and “restoring”, “rejuvenating”, “enhancing”, and “helping” wildlife habitat. Many wanted to make a “long term investment” and they had “concern” for rare species (all quotes from the open-ended survey questions). One response that gets to the heart of the matter: “To get help in making our acreage more appealing to me and the animals”.

When implementing a LIP project, the technical assistance could be just as important as the money; the educational component of the program gives justification for the use of public funds. One landowner who had implemented 2 different LIP projects said, “the purpose of this money needs to be how to teach the landowners to do things right and get them over the economic hump so they can afford to start doing things right. To me it is a two-fold job: one is the education, the other is an economic boost”. However, another landowner who was working with other conservation entities already knew what they had to do to establish habitat, so the technical assistance was less important than the funding. Other stakeholder thoughts include: “LIP is an incentive to do things right”; “we’re moving a lot of habitat in the right direction in the last 5 years”; “it’s one of the few times where I’ve experienced governmental programs actually helping wildlife”; and “all in all it’s a very good program”.

One thoughtful landowner expressed his appreciation for LIP this way: “the state gets its money from tax values. To some extent the reality is that the LIP money helps to

create more value which makes it a better place to live which means the state can collect more taxes. If this wasn't pretty then the land values wouldn't be as high as they are. So long term it's cost-effective". The landowner is referring to the rural and natural qualities of his area, as improved by his LIP projects, that contribute to a desirable location for new landowners.

Discussion

Despite its success, LIP was ultimately discontinued at the federal level in 2008, in part, because of its perceived duplication of other programs. "The President's Budget proposes to eliminate the Landowner Incentive Program in FY 2008...[because] the program is duplicative of other programs and does not obligate funds in a timely fashion" (USFWS 2007). The USFWS went on to say, "at-risk species will still benefit by shifting resources from this program to others that can demonstrate results such as the national Wildlife Refuge System, Partners for Fish and Wildlife and the North American Wetlands Conservation Act programs" (USFWS 2007, p. 3345). Nevertheless, LIP has so far continued to exist in Texas and is accordingly once more a state-administered program.

Based on my results and those of Lewis (2008), using multiple programs for similar conservation activities can facilitate the leveraging of funds for larger local impact. Landscape-scale projects can only be achieved with substantial external funding that is often not available in any one program. Additionally, availability of incentive programs from different agencies with different priorities helps to reach a wider clientele

(e.g., NRCS with cattle ranchers, Partners for Fish and Wildlife with non-agricultural landowners, and LIP for wildlife entrepreneurs).

As a stand-alone program, LIP had certain goals that we can evaluate through this evaluation. The first goal is the successful completion of projects. I have discussed reasons why certain projects were not completed, especially via “The Unpredictable Role of Nature” (Brown and Graham 2001). Incentive program administrators must ensure the greatest odds that a project will be completed, whether in the application review period or after a project is funded. Ecological success of projects is another important goal. Agencies are spending public funds on these activities so we should use the best science, choose the projects with the best potential, and follow through with participating landowners. Establishing a professional relationship with willing landowners in order to return in future years to check on project success will also contribute to another goal, long term commitment and maintenance. LIP funds should be used as seed monies to initiate projects, whose continuation is driven by the landowners themselves, using the tools they acquired in the process. Finally, the landowners should be satisfied with their experience with the program. They will then be more likely to spread the word and encourage friends and neighbors to submit applications also, and perhaps they will be more likely to continue on with conservation management practices.

Based on the preceding assessment and information about LIP, seven recommendations follow.

Recommendations

1) Monitoring. The importance of ecological success of LIP projects cannot be over-emphasized if the program is to continue. The program exists because of the needs of target wildlife and the societal goal to conserve it. We can determine whether the goals of the program have been achieved only through active monitoring of the site. How frequently and how many years post-project we monitor will depend on the target species and the objectives of the project. For example, a prescribed burn project to enhance vireo habitat would require annual visits to the site to determine suitability of the habitat, vireo presence or absence, population dynamics, or nesting success, depending upon the initial condition of the site.

2) Immediate evaluation. This evaluation showed that many of the participating landowners had moved away from the project land or otherwise no longer owned the property. Many potential respondents did not respond because their project had ended too long ago to remember it—up to 12 years in some cases. In addition, many individuals could not distinguish between LIP and other programs they participated in over the years. To remedy this problem an evaluative survey submitted together with the final reimbursement payments when management activities have recently taken place is recommended (see suggested survey in Appendix B). In cases where multiple programs were used simultaneously, questions regarding landowner awareness of the differences could be illuminating.

Stem et al. (2005, p. 303) stressed that monitoring and evaluation should be a part of a conservation project from the very beginning, “rather than tacked on as an afterthought”. Indicators of success should also be identified during project planning and initiation so success is clearly defined.

3) Streamline the application and reimbursement processes for faster selections and quicker repayment. Allow funds to be available for opportunistic conservation work (e.g., when a burn ban has finally lifted). Many complaints that participants had about the process revolved around lengthy time periods for approval or reimbursement.

4) Dedication of staff. Dedicated LIP staff in each region would help to supplement the work of biologists regarding outreach, application processing, project implementation, and monitoring; thereby facilitating recommendations 1 through 3 above.

5) State funded. LIP should remain state funded and administered, so moneys can be matched to federal programs, such as those USFWS determined were redundant with LIP. No longer redundant at the federal level, LIP should act as supplement to larger conservation projects.

6) Interagency engagement and partnership for technology transfer and cooperative action on lands with conservation-willing owners. With the preponderance of cooperative action on many LIP projects and the ensuing success, establishing a routine

training session in which individuals of various private lands partnering agencies share and transfer their knowledge and success stories could be beneficial to all.

7) Revisit ranking criteria. A portion of the Non-federal Cost Share points could be reallocated to encompass non-monetary aspects of a proposed project, as in the landowner's existing partnership with other agencies capable of future monitoring. Other possibilities include linkage with other conservation areas, target species-specific scale issues, and consolidation of neighboring properties. We must ask ourselves, for example, is a cheap project really better than a more expensive one that provides a travel corridor for a high priority species?

Conclusion

Texas is a large state that encompasses a great diversity of species. The state should fund its own program to serve as a key piece of the conservation strategy for the state. Biodiversity is an ecosystem service to benefit all Texans and is the state's legacy for future generations. With all that has been learned in the first decade of existence, LIP can continue to improve to become a model for state-sponsored ecosystem enhancement. There are incredible stories of conservation on private lands where LIP played a large role (see Chapter 4). These successes benefit not only the target wildlife species, but the landowner, the biologists, the partnering agencies, and the state as a whole. We have been challenged to maintain our great diversity of wildlife species, to keep species from being listed as endangered, and to restore populations of those species already listed.

The fact that this challenge is in a state with less than 5% public lands makes it imperative that funds are available to incentivize private landowners to maintain wildlife habitat on their lands.

CHAPTER III

LANDOWNER SURVEY

In the late 20th century, there were a number of highly publicized cases of endangered species regulation, such as the snail darter (*Percina tanasi*) in Tennessee, the northern spotted owl (*Strix occidentalis*) in the northwest, and the golden-cheeked warbler (*Dendroica chrysoparia*) in central Texas. The publicity drew criticism of the Endangered Species Act (ESA; 16 U.S.C. 1531 *et seq.* 1973) and created uncertainty and fear of future regulation, especially regarding management of threatened and endangered (T&E) species habitat on private land (Peterson and Horton 1995, Wilcove et al. 1996). Landowners felt forced to protect T&E habitat on their properties, and perceived that protection as a property rights infringement with detrimental implications for their activities on the land (Brook et al. 2003).

The Texas Parks and Wildlife Department (TPWD) created the Landowner Incentive Program (LIP, or “the program”) in 1997 to encourage voluntary participation in T&E habitat management, by providing technical assistance and by sharing 75% of the cost of habitat management activities. By taking a proactive approach to rare species management, TPWD hoped relations between the state agency and the private landowner could be strengthened in Texas.

The program began slowly with a small number of landowners interested in enhancing rare species habitat. The decade progressed and LIP grew as word spread about the benefits of program. Neighbors and friends of LIP participants saw that “the

government” was helping the landowner rather than discouraging them or taking their rights away (Brent Ortego, TPWD, personal communication). In 2002, just as the program was gaining popularity in Texas, the Bush administration transformed LIP into a federally-administered entity. Although TPWD still worked with the landowners on individual projects, the federal origin of funds modified the administration process. Suddenly Texas projects had to compete with others throughout the United States for monetary support, and individual projects needed clearance for several federal acts (e.g. archaeological resources). Following a transition year where no projects were funded and cultural resource clearances were assessed, Texas’ LIP began slowly growing again, though never approaching the number of projects seen in the state-administered program.

In 2007, TPWD enlisted Texas A&M University to evaluate the first decade of the program. To gain the perspectives of LIP participating landowners, I sent a mail questionnaire to those who enrolled during the first decade. My goal for this study was to determine what kinds of landowners participated, how participants felt about their LIP projects, and whether any particular characteristics contributed to a successful project.

Study Area

Individual LIP projects took place in 73 Texas counties between 1997 and 2007, encompassing over 200,000 acres (81,000 ha) throughout the state. Habitat projects ranged from short-grass prairies in the panhandle to the piney woods of east Texas,

coastal prairies of south Texas, and post oak savannahs of central Texas (see Appendix C for a listing of projects by county).

Methods

I attempted to survey all 117 participating LIP landowners in the fall of 2009 through spring 2010 via a mail questionnaire. I used a modified Dillman method (Dillman 2000) for survey administration, which entailed sending a pre-survey notice letter, followed a week later with an initial questionnaire mailing, a thank you/reminder card a week after the initial questionnaire, and a replacement questionnaire a week after that with a special plea for reluctant survey participants. I contacted non-respondents via the telephone, asking them first to please fill out their survey. If they indicated they were unable to do so, I then asked several key questions. If they did not respond or return my calls after 2 tries, I did not try calling again.

I developed the questionnaire using Salant and Dillman (1994) as a guide for effective questioning. I separated the questionnaire into 3 sections: project implementation evaluation, personal satisfaction, and background information (Appendix B). I attempted to determine whether LIP encouraged landowners to establish or protect wildlife habitat on their property, or if they would have done so without the incentive. The mail survey was approved by the Texas A&M University Internal Review Board (IRB) clearance for research on human subjects (protocol number 2009-0105).

I analyzed results of landowner questionnaires using descriptive statistics for categorical data, and Pearson's correlations for questions with a value range (Salant and Dillman 1994). I used linear regression (Cook and Weisberg 1982) for significant correlations to determine how much certain landowner characteristics contributed to success of the project. I used project completion, agreement with certain statements about the success of the project and personal goal achievement as a proxy for success. I ran all statistics using SPSS 14.0 (SPSS, Inc., Chicago, IL, USA). I report descriptive results as percentages of respondents, as not all respondents answered every question.

Results

Out of the original 117 surveys, 17 were undeliverable and I was unable to find a current address for the LIP participant. Of the remaining 100, I received 52 completed surveys, for a response rate of 52%. I successfully contacted 2 participants by telephone. Other non-respondents had defunct telephone numbers or did not return my calls. The significant time lapse between some of the LIP projects and the time of my study made contacting landowners quite a challenge.

On average, respondents were 62 years old (range 26 to 81, median 60). They were 96% Caucasian (2 selected American Indian as their race, and one wrote in "American"), 90% native Texans, and 92% had 3 or more generations of their family from Texas. Most respondents (65%) had an income of less than \$100,000 (Figure 1), and 74% derived a quarter or less of their income from their property (Figure 2).

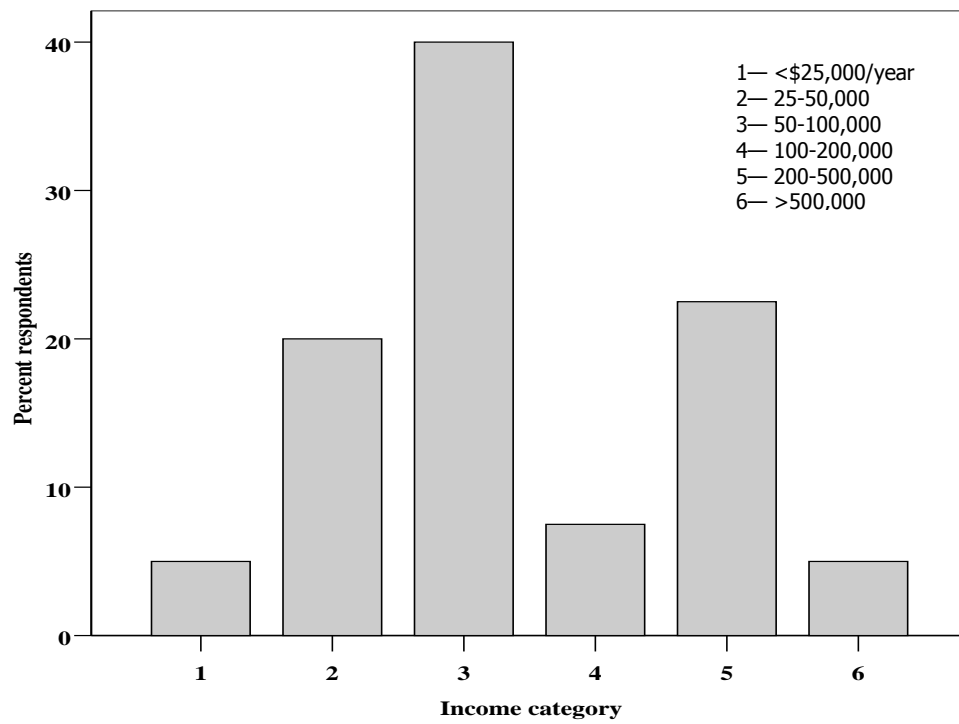


Figure 1. Percentage of survey respondents in each of 6 income categories.

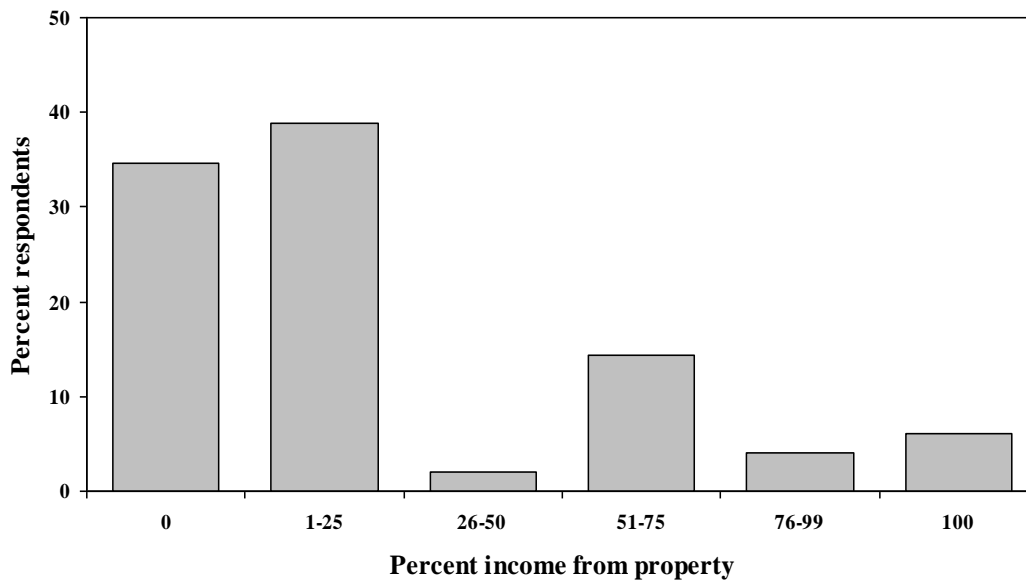


Figure 2. Percent income respondents earned from property.

Survey respondents owned a mean property size of 2,444 acres (989 ha; standard deviation 3,371 acres [1364 ha]), median 620 acres (251 ha), range 1—12,000 acres (0.4—4,856 ha). The largest 3 properties were cooperatives (45,000; 56,000; and 120,000 acres, respectively) and so were excluded from the analysis. Inclusion of cooperatives skewed the property size mean that was meant to show individual ownership. Most respondents (72%) owned their properties for less than 20 years (Figure 3; mean 22 years, standard deviation 30, median 10).

Livestock grazing was the most frequently cited major use of the property, followed by management for game species (Figure 4). Most respondents (82.4%)

hunted on their property themselves or allowed others to hunt. Of those, 80% said they would continue to maintain wildlife habitat in the future. Only 19% of respondents belonged to a Wildlife Management Association (WMAs are cooperatives among rural property owners, with common goals for managing wildlife) at the time of their project.

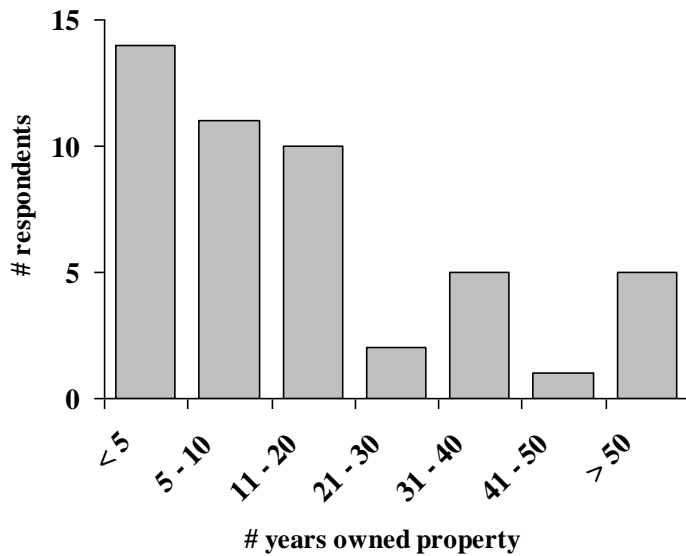


Figure 3. Number of years respondents owned their property.

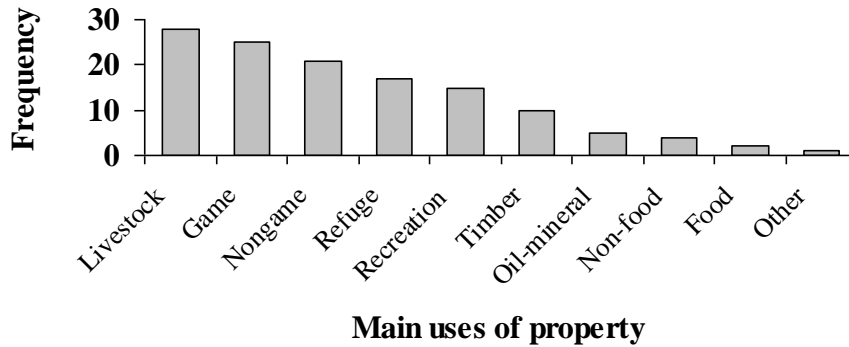


Figure 4. Major uses of respondents' properties.

When asked if they were involved in other conservation-oriented programs, 52% responded that they had been, and listed EQIP (54%), Safe Harbor (15%), Partners for Fish and Wildlife (4%), and CRP (Conservation Reserve Program; 4%), among others.

When asked whether LIP was a factor in increasing their land-based income, 66.7% of respondents were neutral or disagreed. From those that agreed with the statement, written reasons mostly were related to an increase in forage quality for livestock (“better grass management”, “increased carrying capacity for cattle”, “increased gross growth and grazing distribution”), or improved habitat for game animals (“better habitat more interest in leasing”, “our only income is derived from hunting”, “habitat improvement for game species”, “more cover on ground”). Other responses were timber-related (“lower establishment cost compared to normal loblolly

pine”, “promote timber growth”, “replanted in longleaf pine and more recreational value”).

When asked whether they would apply to LIP again, most respondents responded favorably but 10% were neutral or unsure and 4% in disagreement, giving the following written reasons: “I can dig my own ponds.”; “Poor communication with TPWD -- due to lack of TPWD personnel having time to devote to our project.”; “The type of project we undertook turned out to be much more costly than budgeted.”; and “Waste of taxpayer money, would never do it again.” Of the 86% that said they would apply for LIP again, almost all (93%) indicated that their goal had been achieved with their project(s).

Regarding individual species on which the LIP project focused, 72% of respondents said they had a target species for their LIP project. Others had a broader project goal of “native prairie restoration” or mentioned that their target species were “deer and quail”, for example. Some respondents listed “Ashe juniper” or brush as target species, and were eliminated from further analysis regarding target species. Of those listing rare species targets, 61% reported that the species was present on their property before the time of the project. For respondents reporting a specific target species (i.e., rare wildlife or plant species as the focus of their LIP project), 72% reported an increase in the target population since the project was completed. The other 28% reported no change or they did not know.

An important question for this evaluation was whether the landowner would have done their LIP-funded project without the program. Figures 5-7 illustrate the extent to which respondents agreed with the statement, the correlation between level of agreement

and income, and the correlation between level of agreement and percent income generated from the property, respectively. While not statistically significant ($p=0.074$; Figure 6), it appears that landowners in lower income categories relied on LIP funds to a greater extent than higher income earners. Figure 7, though also statistically insignificant ($p=0.179$), suggests that landowners who depended less on their property for income were more likely to have done their project anyway, or to be unsure.

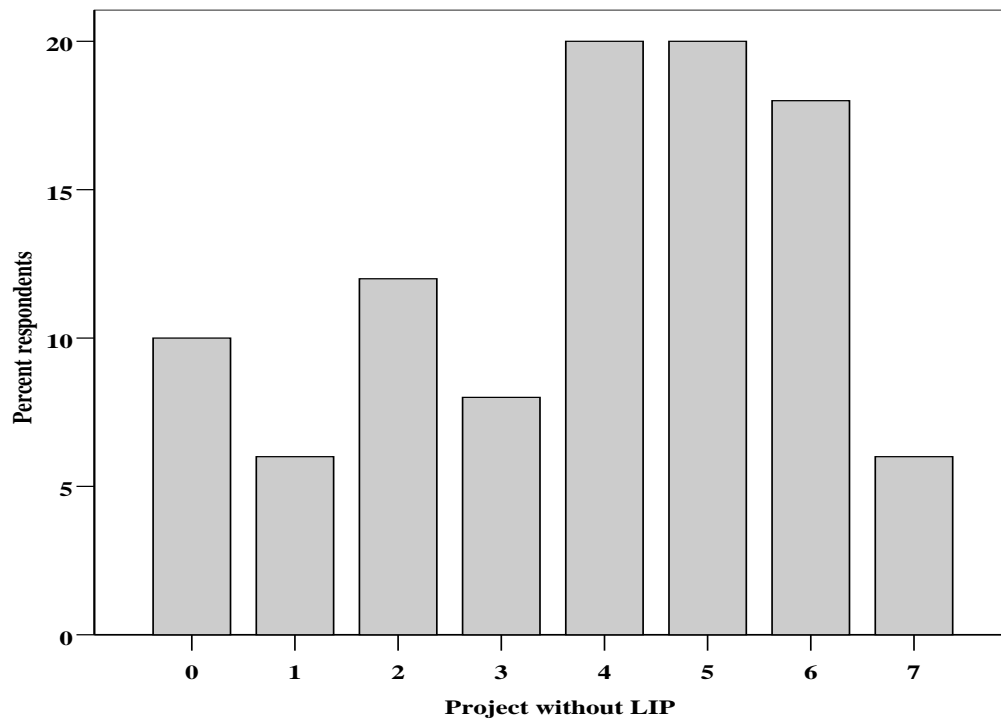


Figure 5. Percentages of respondents who would have done their project without LIP reimbursement (0=I don't know, 1=strongly disagree, 4=neutral, 7=strongly agree).

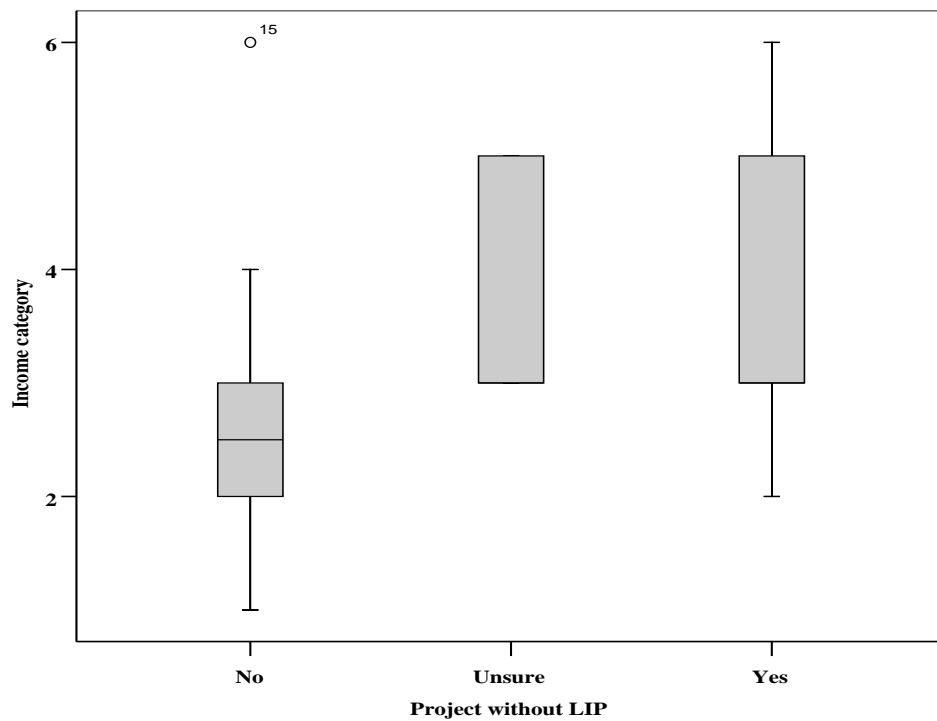


Figure 6. Income categories (see [Figure 1](#) for breakdown) for respondents who would or would not have done their LIP project without financial reimbursement. Respondents who were not sure or were neutral make up the remainder.

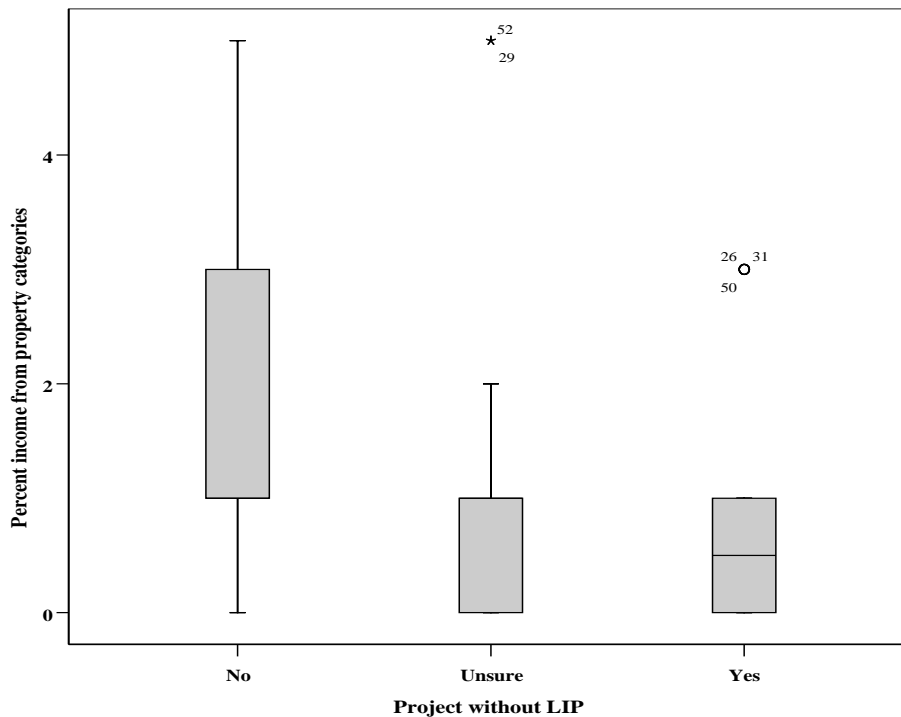


Figure 7. Categories of percent income generated from property (0=0%, 1=1-25%, 2=26-50%, 3=51-75%, 4=76-99%, 5=100%) for respondents who would or would not have done their LIP project without financial reimbursement. Respondents who were not sure or were neutral make up the remainder.

Because of the importance of privacy and confidentiality of landowner information, we wished to find out if the confidentiality inherent in the program was a factor in landowner willingness to participate. Sixty percent of respondents said confidentiality regarding natural resources on their property was important or very important to them (Figure 8). The percentage of respondents saying confidentiality was not important or neither important nor unimportant was 35%, leaving 5% for slightly important. For cultural resources, the percentage who said confidentiality was important or very important was 59%; 39% said not or neither, and 2% slightly important.

Regarding the method of hearing about the program, 51% of respondents said they heard of LIP from other agencies, 27% from TPWD biologists, 9% read about LIP in the media, 7% via word of mouth, and 6% other.

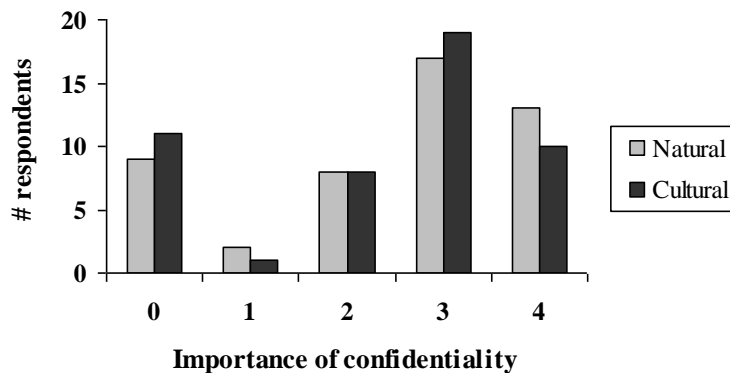


Figure 8. Respondents assigning importance level of confidentiality for natural and cultural resources on their properties (0=Not important, 1=Slightly important, 2=Neither important nor unimportant, 3=Important, 4=Very important).

A series of attitudinal and belief statements, along with the mean level of agreement are presented in Table 4. The statements with the greatest levels of agreement (where a score of 7 equals strongly agree) were “wildlife conservation is very important to me” (mean score 6.6), and “my overall experience with LIP personnel was satisfactory” (mean score 6.6), and “I will continue to maintain wildlife habitat on my property” (mean score 6.5). The statements with the least agreement were, “LIP resulted in an increase in land-based income” (mean score 3.4), “I would have chosen to do my

project without LIP funds” (mean score 3.8), and “LIP funding was sufficient to help cover the costs of my project” (mean score 4.8). Responses to this latter group of statements also had a much higher variation than those with stronger agreement (standard deviations near 2 rather than 1 for the statements above).

There was some disagreement with various conservation attitude and programmatic questions, but in general landowners agreed with the statements (mean >4). The largest variation in agreement was with statements regarding project-specific questions (Table 4).

Table 4. Mean responses to attitudinal and beliefs questions based on 7-point scale (0=I don't know, 1=strongly disagree, 4=neutral, 7=strongly agree).

	Mean response (standard deviation)
Conservation attitudes	
Wildlife conservation is very important to me.	6.6 (1.1)
All wildlife should be protected as a general rule.	5.2 (2.0)
I am interested in the management of game species.	5.8 (1.8)
I am interested in the management of non-game species.	5.4 (2.0)
I am interested in wildlife for aesthetic reasons.	5.8 (1.7)
I will continue to maintain wildlife habitat on my property.	6.5 (1.1)
Project-specific	
I believe the LIP project successfully contributed to wildlife habitat on my property.	6.0 (1.7)
I believe the goal for my LIP project was achieved.	5.9 (2.0)
I would have chosen to do my project without LIP funds.	3.8 (2.0)
LIP funding was sufficient to help cover the costs of my project.	4.8 (2.2)
LIP resulted in an increase in land based income.	3.4 (2.0)
I would apply for LIP funding again.	5.8 (2.0)
Programmatic	
The technical guidance I received from my LIP contacts was as important as the financial assistance.	5.6 (1.4)
My experience with LIP personnel was overall satisfactory.	6.6 (0.9)
My LIP contacts were usually available to provide assistance.	6.3 (0.9)
Based on my experience, I believe LIP has contributed toward effective rare species management in Texas.	5.5 (2.1)

No personal landowner characteristics, uses or sizes of property, nor answers to other questions were significantly ($p < 0.5$) correlated with success of individual LIP projects, except for two (Table 5). Income category and landowner age had negative relationships with project success ($F = 4.272, 6.049$; $p = 0.046, 0.018$; $df = 39, 48$, respectively). I defined success as an average score of “I will continue to maintain habitat”, “I believe the LIP project successfully contributed to wildlife habitat on my property”, “I believe the goal for my LIP project was achieved”, and “I would apply to LIP again in the future”. These statements together cover the landowner experience, ecological success, and programmatic achievement of the program.

Table 5. Correlations between project “Success” (defined in text) and various landowner characteristics (*=significant).

Characteristic	Pearson’s correlation coefficient	p-value	N
Landowner age	-0.338*	0.018	49
Years owned property	-0.016	0.915	47
Property size	-0.061	0.690	45
Income category	-0.318*	0.046	40
Percent income from property	0.092	0.530	49
Hunt on property	0.066	0.651	50
Belong to WMA	0.194	0.196	46
Enrolled in other programs	0.128	0.377	50
Native to Texas	0.126	0.388	49
Main use: livestock	0.027	0.853	48
Main use: food crop	-0.116	0.427	49
Main use: non-food crop	0.171	0.240	49
Main use: recreation	-0.066	0.653	49
Main use: refuge	-0.181	0.219	48
Main use: game management	0.072	0.625	49
Main use: non-game management	-0.014	0.925	50
Main use: timber	0.105	0.467	50
Main use: oil & minerals	0.110	0.465	46
Main use: other	0.113	0.441	49

Discussion

Based on the general agreement and positive responses, it seems most landowners considered LIP to be a good program that helped them achieve management goals. Respondents generally had positive experiences with LIP biologists and staff and appreciated the confidentiality of the process.

An interesting difference, however, was the variation and generally low agreement with the statement about undertaking projects without LIP funds. The fact that 42% of respondents would have done their project without LIP funds illustrates an important point. The LIP management project may have been one that fit with the landowner's management plan for their property, which Sorice and Conner (2010) suggested was an important factor influencing landowner willingness to participate in incentive programs. Either LIP funded a project that was going to be done anyway or was in the landowner's plan for the future and achieved the project sooner. Many of the 25% of respondents who would not have done their project without funding possibly needed the reimbursement to accomplish the management activity. Sorice (2008, p. 12) noted in his study of incentive participation, "landowners who depend on their land for income require a higher economic incentive than landowners who operate their land either for recreational or mixed objectives." Only 25% of respondents to my survey relied on their property for more than 50% of their income, and only 10% derived 75% or more of their income from the land.

My results suggested that landowners in lower income categories and those who depended more on their land for income would not have done their project without LIP reimbursement. This may seem an obvious point, but it is important to know whether public funds are being used for activities specifically meant to benefit rare wildlife, or to accomplish tasks on landowner's existing to-do lists. It is very handy when the two are working toward the same goal; however, the ultimate conservation lesson may be lost in such cases, with less educational impact for future activities on the land.

One of the goals of LIP is to encourage landowners to continue conservation of habitat on their properties after their project is complete. The relatively high agreement to the statement regarding continuation of habitat maintenance is a positive sign, though the wording of the question does not specify rare species. The 80% of those in agreement with the statement who hunt on the property have a personal interest to maintain habitat of some kind, not necessarily for rare species. This phenomenon calls into question whether the ease with which a LIP project is undertaken by a landowner depends upon the target species and what is required for its habitat. Often times, the management for black-capped vireo (*Vireo atricapilla*) habitat is simultaneously also beneficial for deer and quail habitat (D. Wolfe, Environmental Defense Fund, personal communication). Therefore, selling a vireo project would not be as difficult as selling pond creation for the Houston toad (*Bufo houstonensis*), for example. The fact that several respondents listed their target species as quail and deer suggests that landowners may perceive the focus of their project as something other than rare species. The 72% of

respondents who reported an increase in their target species may or may not have had scientific evidence to back their statements.

Raymond and Olive (2008, p. 495) put forth the hypothesis that landowners would be “more willing to cooperate with government authorities in places that were not yet subject to heated political conflict”. That could be true in the case of LIP cooperators, although the controversy in the Hill Country over golden-cheeked warbler habitat occurred just prior to the initiation of the program. On the other hand, changing demographics of land owners in Texas (Wilkins et al. 2000), with an increasing number of urban owners buying property for recreational purposes and who might not be aware of, or care about, the controversies. Just over half (51%) of the survey respondents had owned their properties 10 years or less, so the possibility exists that more of the newer landowners are interested in the program. Without the benefit of the non-respondents’ answers, it is difficult to say definitively whether this is the case.

Regardless of the mechanism influencing cooperation and enrollment in LIP and other incentive programs, the overriding benefit is the increased communication that stems from these programs, and the participation of the private landowner in rare species management. Collaboration is best achieved by parties that communicate and respect one another (Peterson and Horton 1995).

Limitations and further research.—Answers to this questionnaire came from participants who were willing to respond, whether because they had a memorable experience or because they simply had the time to complete it. A majority (77%) of non-respondents

were enrolled in LIP prior to 2003 (compared to 68% of respondents), so it is possible many of them had moved away or had forgotten about the program and chose not to respond, though it would be very interesting to determine the characteristics of non-respondents. In addition, some of the respondents appeared to confuse LIP with other programs in which they were enrolled, possibly negating the usefulness of their LIP-specific answers. A solution to this issue would be to have participants evaluate the program immediately upon completion and final reimbursement of their project.

It would be an interesting future study to determine characteristics of landowners who have not enrolled or applied to LIP and to find out why. Is it a matter of not knowing the program exists, or some other reasons for not applying? The relatively small number of landowners who heard of the program through popular media suggests that there needs to be more outreach and education, especially to newer landowners who might not yet have a working relationship with TPWD.

Every landowner is different, and landowners cannot be generalized for the most part, even as a group who has chosen to participate in a conservation program. Jackson-Smith et al. (2005) found in a survey of 1000 rangeland owners in Utah and Texas a wide variety of perspectives regarding property rights orientation, personal stewardship ethic, and obligation to society based on demographic characteristics, ties to the land, and area of residence. In that way, results of this study should be received as a general sampling of previous LIP participants, and future studies would do well to capture the inherent variability of humans using more qualitative methods.

CHAPTER IV
BLACK-CAPPED VIREO CASE STUDIES

Habitat loss is one of the main causes of decline for many wildlife species (Wilcove et al. 1998). Land use changes such as human development, agricultural conversion, and fire suppression over the last 200 years have modified the landscape to the extent that several species are on the verge of extinction (e.g. Attwater's prairie-chicken [*Tympanuchus cupido attwateri*]). Public lands receiving proper management are important refuges for declining species but they may be insufficient to maintain populations, particularly in states such as Texas where land is over 95% privately-owned. Management and restoration of habitat for rare species of wildlife on private lands presents challenges, however, when management activities conflict with landowner economics. Government incentive programs can help to defray costs of habitat maintenance and restoration, and can encourage conservation efforts on a voluntary basis.

One such program is the Landowner Incentive Program (LIP), which was established by the Texas Parks and Wildlife Department in 1997 as a cost share and technical assistance initiative for private landowners who were willing to enhance or create habitat for rare species on their properties. Initially a state-administered program, LIP was funded with section 6(d) funds under the Endangered Species Act (ESA; 16 U.S.C. 1531 *et seq.* 1973), and thus, naturally focused on conservation of threatened and

endangered (T&E) species and their habitats in Texas. Recovery plans for T&E species often call for restoration of habitat, and LIP has helped to fund many such projects.

Administrators of LIP wished to evaluate the first decade of the program for effectiveness and efficiency. As part of the comprehensive evaluation of the program, I conducted an in-depth case study of LIP projects focused on a single endangered songbird. By focusing on a single species, I could compare and contrast individual projects with a common denominator. I chose to study the black-capped vireo (*Vireo atricapilla*) projects because they encompassed the largest spending category over the study period.

The black-capped vireo (BCVI), listed as endangered in 1987, is an insectivorous neotropical migrant whose breeding range includes parts of Mexico, Texas and Oklahoma. In winter, the BCVI inhabits the Pacific slope of Mexico (USFWS 1991). Breeding habitat has been characterized as dense deciduous shrubs, growing close to the ground (up to 2 m; Grzybowski et al. 1994). Open spaces surrounding thick clumps of vegetation seem to be important for the BCVI. Much of the literature for this species focuses on its habitat requirements and selection (Graber 1961, USFWS 1991, Grzybowski et al. 1994, Bailey and Thompson 2007, Noa et al. 2007). Limiting factors thought to suppress BCVI populations have been identified as habitat losses due to residential development, overgrazing, and fire suppression (USFWS 1991); and brood parasitism by brown-headed cowbirds (*Molothrus ater*; Graber 1957, Wilkins et al. 2006).

Black-capped vireo habitat in many parts of the bird's breeding range, especially in the north and eastern portions, requires active management. Management activities for BCVI recovery include maintenance of an early- to mid-successional vegetation stage via prescribed burning or mechanical means, deferring livestock grazing for shrub regrowth, as well as trapping and euthanizing brown-headed cowbirds (TPWD 2003). The black-capped vireo was the focus of several LIP projects between 1998 and 2006, projects that each encompassed one or more of the activities listed above.

Researchers have learned a great deal about the BCVI since the recovery plan was written in 1991 (Wilkins et al. 2006). More still has been learned since Wilkins et al. (2006) prepared their population status and threat analysis for the BCVI, in part because of state-wide efforts to improve population estimates (Texas A&M Institute for Renewable Natural Resources, unpublished data). Researchers continue to discover more individual vireos on private lands, and have learned more about its behavior and habitat needs. These investigations are contributing to the ability to recover and down-list BCVI as an endangered species in the near future. Programs such as LIP that encourage private participation in habitat management can be critical for the recovery process, especially in a private lands state such as Texas.

The objectives of this investigation are to compare and contrast various methods of restoring BCVI habitat using LIP financial and technical assistance and to determine which factors contribute to success or failures of these projects. I then make specific recommendations for future incentive-based recovery efforts for the BCVI.

Study Area

My study area was LIP private lands within BCVI breeding habitat in the central Texas Hill Country and Edwards Plateau regions (Figure 9). This species breeds in mid-successional Texas red oak (*Quercus buckleyi*), shin oak (*Quercus sinuata*), and juniper (*Juniperus ashei*) vegetation communities (Graber 1961, Bailey and Thompson 2007). I conducted case studies in Edwards, Kerr, Bandera, Williamson, Mason, McCullough, Brown, Somervell, and Palo Pinto counties (Figure 9) based on landowner willingness to cooperate with my evaluation activities.

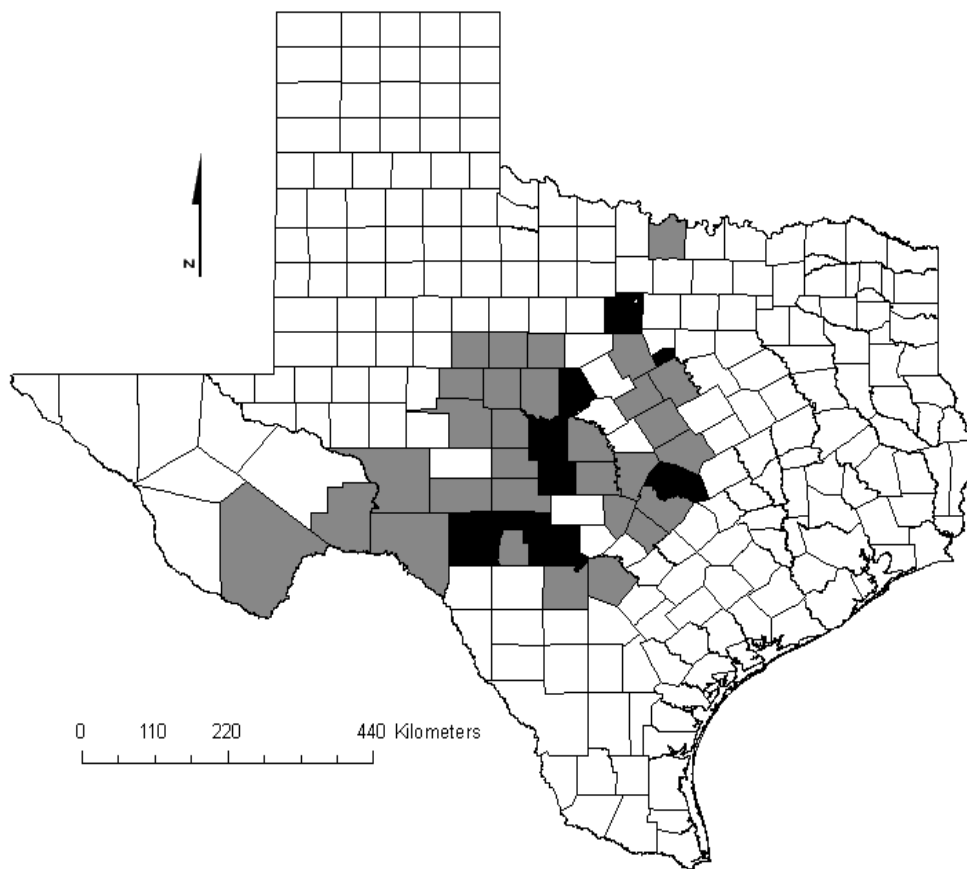


Figure 9. Counties (in gray) with known black-capped vireo (*Vireo atricapilla*) populations in Texas as of 2006 (Wilkins et al. 2006) with my case study counties shown in black.

Methods

I used a case study approach to the ecological evaluations of BCVI-focused LIP projects. Case studies are useful in situations where the researcher will conduct a number of different analyses and comparisons (Yin 1994); in this case using field data, interviews, and project documents to evaluate LIP's contribution to BCVI recovery. I selected the

BCVI projects to study because of their regional conservation concern. BCVI also were the focus of a relatively substantial number of LIP projects during the 10-year study period in Texas. These BCVI projects were second in number only to those focused on the lesser prairie-chicken (*Tympanuchus pallidicinctus*). More than \$580,000 was spent on BCVI habitat improvement (including cowbird trapping; Figure 10) over the study period, compared with about \$370,000 for lesser prairie-chicken projects, making it the top investment category for LIP projects during the study period. Other species identified in individual LIP projects were the golden-cheeked warbler (*Dendroica chrysoparia*), red-cockaded woodpecker (*Picoides borealis*), Attwater's prairie-chicken, ocelot (*Leopardus pardalis*), Pecos pupfish (*Cyprinodon pecosensis*), and Houston toad (*Bufo houstonensis*). Only a few LIP projects were conducted for these species, precluding their inclusion in the case studies. All other LIP projects were either focused on multiple species or did not identify target species.

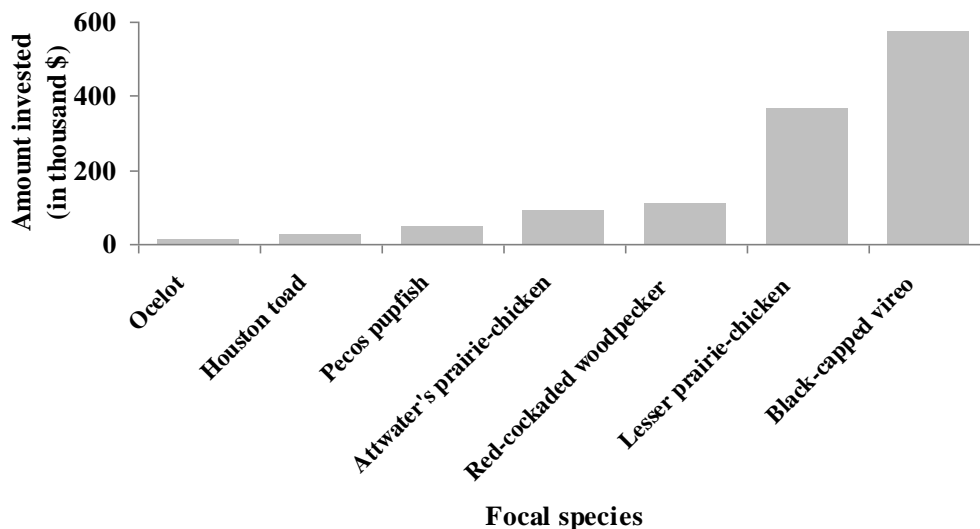


Figure 10. Relative investment of species-specific LIP projects conducted in Texas during 1997-2007 (data from a 2007 unpublished TPWD document).

I contacted 11 landowners whose LIP projects focused at least in part on the BCVI. Because I include cowbird trapping in the BCVI category, I cannot estimate how many landowners benefitted from LIP, as there were traps sent to individuals in over 30 counties. Of the habitat-enhancement projects, however, there were 12 landowners who focused on BCVI. Ten granted interviews and 9 allowed access to their properties for bird and habitat surveys. I conducted a four-part study on those 9 properties: landowner interviews, bird surveys, habitat surveys, and a spatial analysis. I also interviewed the contact person for a 33-county cowbird trapping project utilizing LIP funds.

Landowner interviews. — I interviewed participating LIP landowners who conducted BCVI-related projects to determine what management activities were undertaken on their properties, the history of local land management, their goal for their property, and

in what ways LIP helped them to achieve their management goals. I analyzed interviews using a qualitative, thematic analysis in which I separated interview transcripts into units (i.e., sentences or phrases) and placed units into themes in order to identify salient topics (Boyatzis 1998). The LIP funded several different management activities on these properties (e.g., prescribed fire, brush management, livestock management, and/or cowbird trapping), so I observed management activity affects used to produced suitable habitat, as described in the BCVI recovery plan (USFWS 1991).

Black-capped vireo surveys. — In an effort to determine presence or absence of BCVIs, I visited 8 LIP properties between 31 March and 9 July in 2008 and 2009. I did not survey the 9th property because a fellow student had done so and provided her data. Based on an unpublished report of BCVI detection probabilities in the vicinity (MacKenzie 2007), I visited each location 6 times to confidently determine presence or absence of vireos. I surveyed the LIP project areas on walking transects of sufficient length and pattern to cover the project areas (2- 200 ha). I proceeded at about 1 km/hr, and recorded BCVIs seen within 50 m of the transect (Bibby 2000). If BCVIs were detected, information was recorded for each sighting included sex (BCVI are sexually dimorphic), behavior, time seen, and a GPS location. Because I did not color band birds, and so could not differentiate individual birds in the field, I estimated the maximum number of male birds from the number of detections per visit. I recorded other bird species along transects that are potential nest parasites or predators, such as brown-headed cowbirds and members of the Corvidae family.

There were very little, if any, data regarding pre-project populations of BCVI, so I report only the number of vireos detected in my surveys. Several of the LIP properties have been monitored post-LIP by Environmental Defense Fund (EDF; David Wolfe, personal communication), and I report those numbers as an illustration of trends. Individual LIP projects were consistently conducted on a subset of the larger properties, so I performed my surveys only in those areas. The EDF surveyed entire properties rather than only the LIP areas, so their numbers often differ from my own.

Habitat surveys. — BCVI presence on a LIP property where it had not previously been was an obvious measure of success of the project, but absence of BCVI would not necessarily preclude success. I therefore characterized habitat in project areas for comparison with suitable habitat conditions. The BCVI recovery plan (USFWS 1991, p. 20) described suitable breeding habitat for the species as “shrubby growth of irregular height and distribution, with spaces between the small thickets and clumps, and with vegetation cover extending to ground level”. To determine habitat suitability of each LIP project area, I used point-centered plot vegetation surveys (James and Shugart 1970). For those properties with BCVI presence, I used a singing male location as the center of the plot. I used random points within the LIP project area for those properties without vireos present. Total area of plots was equivalent to roughly 10% of the project area (each plot covered 0.2 ha).

I placed two 50-m tapes perpendicular to one another, bisected at the survey point. One tape ran North-South, the other East-West. I collected continuous cover

information for each vegetation character (trees and shrubs were identified to species, grass and forbs were not). I noted the start distance of a particular vegetation characteristic, the finish distance, and estimated its average height and maximum height. The BCVI recovery plan described within-territory heterogeneity as an important habitat feature: “the primary component of this heterogeneity was the number of changes between woody vegetation and openings or separations between bushes, as well as within territory variance in other deciduous variables” (USFWS 1991, p. 20). Thus, I created a heterogeneity score based on the number of times the vegetation profile changed from grass to shrub and reported standard deviations of both heterogeneity and vegetation height (Table 6).

Because vegetation density at heights < 2 m is thought to be important for BCVI, I also determined substrate density along these transects up to 2 m. At each 10-m point (0, 10, 20, 30, 40, 50, 60) along the transects, I used a profile board to estimate percent concealment. The board was 2 m high with 20 0.1-m squares. I recorded the percent concealment of each square from a distance of 7 m along the transect, viewed from the starting direction. Results of the vegetation measurements are presented using graphical measures or descriptive statistics on a per site basis.

Spatial analysis. — Finally, I wished to illustrate whether the location of LIP projects mesh with other restoration projects or add to current suitable habitat using a spatial analysis. I used a Geographic Information System (GIS) to identify distances to other important BCVI areas on a landscape scale. I gathered known breeding location

information for BCVI from TPWD biologists or from Wilkins et al. (2006). I projected outlines of the LIP site boundaries into GIS (ArcGIS 9.0, ESRI 2006) using color infrared digital ortho-photo quarter-quadrangles (DOQQs), and used the measurement tool to estimate distances between vireo breeding areas.

Results

Each landowner signed a confidentiality agreement before being interviewed. Therefore, I report my results below using pseudonyms for each landowner.

Jefferson—Mr. Jefferson bought his ranch in 1992 after retiring from the medical profession. He is a strong believer in working with the property, tending to it in a responsible way, and encouraging the greatest diversity possible. He utilizes several endeavors to finance the property, including what he terms “corporate entertainment”, or quail hunts. He also has a bed and breakfast, a small grazing lease operation, and has expressed interest in a nature tourism operation.

Jefferson’s 2 LIP projects (total funding \$68,744) focused on the mechanical removal of hundreds of acres of juniper (*Juniperus asheii*), in preparation for a prescribed burn program (much of which he now does by himself). He also planted shin oak (*Quercus sinuata*) in treated areas. Vegetation was responding well in the treated areas and fit the description of suitable habitat (Grzybowski et al. 1994; Table 6). The main woody vegetation of this property were shin oak (*Q. sinuata*), live oak (*Q. fusiformis*), and Ashe juniper (*Juniperus asheii*).

In 2001, at the time of the first LIP project, Mr. Jefferson had several breeding pairs of BCVI on a naturally heterogeneous ridgetop (Bailey and Maresh 2002).

Through his LIP projects and prescribed burning, he increased the area of vireo habitat from 23 to 148 ha. EDF (David Wolfe, personal communication) has monitored BCVIs on Jefferson's property for over a decade, and reported the following number of pairs on the property (i.e. a larger area than the LIP project area):

Year	2001	2002	2003	2008	2009
BCVI Detections	17	16	17	10	5

During my 6 surveys in the LIP area in 2008, I detected a maximum of 6 male vireos. In the 8 surveys in 2009, I detected a maximum of 5 male vireos. In my search efforts in 2009, I found only 2 nests. One was parasitized and subsequently abandoned, and the other was abandoned with small holes in one of the eggs. I was unable to determine the demographic makeup of the residents or whether birds returning here year after year were the same birds. The landowner was interested to find out what the makeup of this population was, what kind of reproductive success they were having, and what birds were returning.

I detected a median of 8.5 (range of 0 to 35) cowbirds during my site visits—by far the most cowbirds of any property I surveyed. After a brief period of cowbird shooting at the beginning of the project, Mr. Jefferson decided he was happy to provide habitat for vireos but said he was not going “to go against nature” to trap cowbirds, despite cowbird trapping recommendations from TPWD and EDF. There was a power line running through the ridgetop habitat area where the cowbirds could perch, having

good visibility of vireo activity. In addition, Mr. Jefferson had livestock on the property (though not in the vireo areas during breeding season) and there was a large livestock operation adjacent to his property boundary.

Table 6. Vegetative characteristics measured for each of 8 LIP properties in Texas in 2008 and 2009. The BCVI recovery plan (USFWS 1991) states that 35-55% heterogeneous cover is recommended.

Property	Woody cover: mean %	Deciduous: mean %	Woody height (m): mean (SD)	Concealment @ 0-2m: mean, median	Heterogeneity:# gaps in canopy (SD)	BCVI breeding ?
Kennedy	71	71	2.3 (1.2)	71.5, 100	5.5 (1.3)	No
Washington	65	77	3.2 (1.9)	70.0, 95	4.5 (2.1)	No
Jefferson	51	65	1.7 (0.7)	61.0, 95	4.0 (1.8)	Yes
Jackson	46	100	1.9 (1.2)	40.0, 20	3.0 (1.8)	No
Eisenhower	41	40	2.2 (1.4)	47.0, 45	5.0 (3.1)	Yes
Roosevelt	26	86	4.7 (2.8)	12.0, 0	2.3 (1.4)	No
Adams	22	98	1.4 (0.8)	21.4, 0	4.5 (2.2)	No
Cleveland	6	100	1.0 (0.3)	10.8, 0	1.8 (1.3)	No

Coolidge—I was unable to interview Mr. Coolidge or gain access to his 587 ha property, which was 675 m from Mr. Jefferson’s property at the nearest points and likely contained similar vegetation. Between 2000 and 2005, \$15,440 of LIP funds were invested on the property for habitat enhancement for BCVI, including prescribed burns and mechanical brush management on an undisclosed portion of his property. The EDF surveyed the property for 5 years and reported the following data:

Year	2005	2006	2007	2008	2009
BCVI Detections	5	6	7	4	2

In 2008, a pair of BCVIs were first documented in the LIP project area (David Wolf, personal communication). To further enhance the area, EDF recommended cool season burns, more brush management, and a reduction of the deer population.

Eisenhower—Mr. Eisenhower purchased a 2,023 ha property in 1996. His goal for the land was primarily aimed towards ecological restoration and protection. The previous owner had a large sheep and goat ranching operation. Of the original 6,880 ha ranch, the owner sold all but Eisenhower’s portion to developers. Other ranches in the area conducted regular prescribed burning and most of Eisenhower’s neighbors were accepting of his frequent prescribed burns to improve BCVI habitat.

In 2000-2001, \$10,800 in LIP funds were invested for labor and equipment to accomplish a brush management project, clearing juniper and manipulating shin oak. Vegetation in the project area had the right components for suitable habitat (Table 6), considering that in this part of the range of BCVI there is a higher proportion of juniper. Floral components of this property were dominated by Ashe juniper, but also included live oak, Vasey oak (*Q. vaseyana*), and Texas persimmon (*Diospyros texana*).

Environmental Defense Fund had been conducting BCVI censuses since 1999, and reported the following numbers of BCVI for the entire 2,023 ha property:

Year	1999	2001/2002	2005	2007	2009
BCVI Detections	57	60	63	111	82

In 2008, among 6 surveys, I detected a maximum of 12 male vireos in the LIP project area and 0 cowbirds. In 2009, among 6 surveys, I detected a maximum of 8 male

vireos in the same area, and a median of 0 cowbirds (range of 0 to 3) (excluding a sighting of 9 cowbirds in a trap). The Eisenhowers trapped cowbirds on the property since 1997 or 1998, and the property was adjacent to a publicly-owned property that also trapped cowbirds. To improve habitat further, EDF recommended more burns (warm and cool season), more cowbird trapping, and a reduction of browsing pressure from exotic ungulates.

Lincoln—The Lincoln's property had been in the family since 1905 and the current owner took over management in 1965. The main use of the property was commercial cattle ranching and deer hunting leases. The landowner hoped to encourage photo-tourism in the future. The LIP area never received heavy grazing as observed on other ranches with LIP projects. Since 1982, the landowner had been running a time-controlled, intensive grazing program, rotating the entire cattle herd among a series of pastures with periods of rest between grazing periods.

In 2002, \$7,600 in LIP funds were invested for brush manipulation using hand tools (chainsaws and loppers) on a 16 ha parcel. The Lincolns did not conduct prescribed fires at the time of the interview because of burn bans in the county. Mr. Lincoln believed the lack of burning was bad for the cattle, as well as for deer antler development. He was concerned he would be challenged on future burning, however, because of housing developments in the area (the property east of the ranch had recently sold and was subdivided). Floral components of this area were Ashe juniper, live oak,

honey mesquite (*Prosopis glandulosa*), agarita (*Berberis trifoliata*), and Texas persimmon.

Though prior to manipulation this site was not considered to be suitable BCVI habitat, Environmental Defense Fund detected vireos on the project area in 2003, 2005, and 2006. The landowner believed there were 4 vireo pairs there in 2009. Based on my surveys, there was a maximum of 5 pairs.

There was a manager living on the property who ran 2 cowbird traps, and the LIP project area was adjacent to a Wildlife Management Area that also traps cowbirds. The EDF recommended reducing the deer population to allow the vegetation to increase in density.

Carter—In 1989, Ms. Carter began acquiring land from her father, who had grazed sheep and goats since 1978. She began removing them because “the deer were starving”. At the time of our interview, she had control of the entire ranch and had a minimal amount of cattle, which she rotationally grazed. The primary use of the property was for hunting leases.

In 2002, LIP funded \$18,900 for juniper removal via skid-loader with tree shears on 445 ha. The Carters had been doing large amounts of prescribed burning since the early 1990s, and had their own burn crew. The landowner admitted the LIP project was not specifically targeting BCVI habitat, but rather “ecosystem restoration” in general. The post-project vegetation had not yet grown up to the proper height and density for the vireos.

I did not have access to Carter's property for bird or habitat surveys. There were breeding vireos present elsewhere on the large ranch, however, < 1 km from the project area.

Roosevelt –Mr. Roosevelt purchased his property in 1997. When Roosevelt took over he removed all livestock from the property in order to qualify for the wildlife exemption. (The “wildlife exemption” is actually an agricultural valuation for a property resulting from certain wildlife management activities taken thereon (Texas Tax Code § 23.51 1995).) Wildlife habitat was the goal of the property, especially habitat for deer, quail, and turkey. The landowner released quail the year before but they had mostly disappeared except for a few on the top of a hill. In 2001, a total of \$27,000 in LIP funds were invested for 81 ha of juniper removal and fence construction to exclude browsers.

The vegetation was still recovering from treatment in 2008. There were quite a few tall trees left on the property, but very little suitable BCVI habitat, except a small amount on the hillsides. Woody vegetation species on this grass-dominated property included live oak, *Baccharis*, and Ashe juniper.

During 2008, among 6 surveys, I detected 1 male vireo on 9 May, but no indication of nesting. The landowner believed there were BCVIs in the next canyon over from his, < 2 km away. Wilkins et al. (2006) mentioned vireos were present in a state natural area 14 km away in 2003.

Mr. Roosevelt lived on the property and trapped cowbirds with the following capture rates: 175 in 2006, 135 in 2007, and 0 in 2008. He mentioned that a ringtail (*Bassariscus astutus*) ate his bait birds (cowbirds placed in the trap to lure others) in the final year. I did not detect any cowbirds on his property, even though there was an open pasture < 2 km from his property boundary.

Kennedy—Mr. Kennedy bought his property in the 1960s and placed it in a family trust. The family used the area primarily for recreational hunting, and they provided some supplemental feed for the deer. In 2001, \$5,000 in LIP funds were invested in native prairie restoration, which included brush management on a 12 ha area. The vegetation at the time of my surveys was very thick and very tall, with few openings (Table 6), and a percent cover that was higher than recommended for BCVI habitat. There was a large amount of *Baccharis* mixed with live oak, shin oak, and juniper.

Although I detected BCVI 5 times in my surveys, including a pair on 24 June, I did not see any evidence of nesting. The EDF saw 1 male BCVI in 2008 and heard another in 2010. There were breeding BCVIs at an adjacent publicly-owned property, <1 km away.

I observed a median of 0 (range 0 to 2) cowbirds during my site visits. The Kennedys trapped cowbirds, though no one lived on the property. Mr. Kennedy said that they “trapped them down pretty heavily” at first, but had not trapped in a few years. The publicly-owned property adjacent to Kennedy’s property conducted cowbird trapping as part of its normal management activities for BCVI.

There were pastures on 3 sides of the property, and Mr. Kennedy stated, “if we ever see any cows or goats [on our land] we just shoot them”. The EDF recommended maintaining lower deer numbers to prevent over-browsing, conducting a prescribed fire to set back succession of BCVI habitat, and trapping more cowbirds.

Adams— The Adams’ were “implementing an ecosystem-level management program to increase diversity of floral and faunal communities”. The goal for the ranch was to improve habitat for wildlife; the owners wanted to have a bird-banding station and a wildlife haven. They owned the ranch since 1994 at which time it was a mature juniper woodland. A similar condition prevailed on surrounding properties during my surveys. The land was previously overgrazed by goats, sheep, and cows, but all grazing was terminated in 2001 when the owners transferred to the wildlife management tax valuation. The LIP funds were invested to hand cutting juniper on the southern half of the 486 ha ranch (\$48,000), with plans for implementing prescribed burning thereafter.

The vegetation was still recovering from the prescribed burns (Table 6). However, the landowner confidently stated, “with the management the way we’re doing it and how brushy it will be, they will be nesting there, they just will.” Floral components of this grass-dominated landscape included live oak, catclaw (*Acacia greggii*), agarita, sotol (*Dasyllirion sp.*), Texas mountain laurel (*Sophora secundiflora*), and Texas persimmon.

No vireos were present prior to the LIP project, as Mr. Adams found while performing his own annual bird surveys. I did not detect BCVIs in my surveys either,

but in the years since I surveyed, the landowner reported to me that they caught 4 BCVI on the property as they were operating their bird banding station (a hatch year bird on 10 September, an after second year female on 22 April, a second year male on 26 April, and a second year male on 5 May). They reported that there was no indication of breeding yet. Wilkins et al. (2006) reported the nearest known vireos were located at 2 WMAs—one 25 km away, and the other 40 km away from the Adams' property.

I detected a median of 4.5 cowbirds (range 0 to 11) during my site visits. Trapping cowbirds was a future goal for the Adams', but at the time of the interview there was no one at the ranch frequently enough for the constant monitoring that is necessary when operating traps. As bird enthusiasts, the Adams wished to be very careful to prevent accidentally trapping non-target species, which is a common concern during trapping of cowbirds.

Cleveland—This property had been in the Cleveland family since 1898. In 2006, LIP funds (\$61,824) were invested for fencing large pastures and establishing water sources in each for livestock rotational grazing. The recommendation for the project came from the Natural Resources Conservation Service (NRCS), “to facilitate a more intensive short-duration grazing program”, and “to facilitate an aggressive prescribed burning program” (quotes from Mr. Cleveland's LIP application). Mr. Cleveland stated, “[My TPWD biologist] is into habitat management and all that stuff, I'm into growing grass and raising cattle and deer, and they work together hand-in-hand. He probably wouldn't want to hear me say that. I'm for what you're doing, with the habitat with the vireos, but

I'm more into raising deer.” The property had been grazed by goats until 1997, and the population of deer was very dense until an intensive management program reduced browsing pressure in 2000.

Mr. Cleveland's TPWD biologist had told him he did not have potential vireo habitat. He was later surprised to see that potential habitat did exist after the changes Mr. Cleveland had made. At the time of my surveys, most of the LIP area vegetation was not even marginal habitat yet and needed a significant amount of growth before it would be suitable for the vireo (Table 6). There were areas outside the LIP project area with better vegetative structure and species composition. Woody species dominant on the property were live oak, mesquite, and Ashe juniper. However, species present in the LIP area included agarita, Texas persimmon, *Ceanothus sp.*, kidneywood (*Eysenhardtia texana*), and *Yucca sp.*

In my 6 surveys, I did not detect any BCVIs. The only nearby record of BCVI was an unconfirmed male seen in 2001 in Mr. Cleveland's county (Wilkins et al. 2006), location unknown. However, a public wildlife management area was 25 km from the LIP location. I detected a median of 4 cowbirds (range 0 to 5) during my site visits. The vicinity of Mr. Cleveland's property was dominated by open pasture with a large livestock presence.

Jackson—This property was in the current ownership since 1956. The main use for most of the intervening years was livestock grazing, mostly with goats. At the time of my interview, the property was managed for cattle grazing and deer hunting, with leases

for both. After goats were removed from the property, the “brush really came up”. The Jacksons did not live on the property and there was no land manager.

In 2005, LIP funds (\$4016) were invested for cross fencing to enhance rotational grazing and reduce pressure on the vegetation. The Jacksons worked with NRCS on an EQIP project several years before. They also performed a prescribed burn in 2004 to open the shrubland area, separate from the LIP project. Mr. and Mrs. Jackson did not agree whether fire was good for the animals. They once had quail, but said they had not seen any in a few years. The vegetation looked very good for vireos (Table 6), and included live oak, agarita, skunk bush (*Rhus aromatica*), and cedar elm (*Ulmus crassifolia*).

I did not detect any vireos in my 6 visits. The nearest known vireos were at a publicly-owned property 7 km away. The Jacksons did not trap cowbirds because no one lived on the property to manage the traps. I detected a median of 1 cowbird (range 0 to 2) during my site visits. There were large pastures within 1 km on 3 sides of the vireo area, though the habitat did look suitable in the direction of the nearest known population for about 2 km.

Washington—The Washington’s property had been in the family since 1929. Mr. Washington’s goals were to break even to sustain his ownership of the large ranch. He wanted to improve the natural habitats for the animals, using a “long term, integrated landscape management plan” (quote from the Washington LIP application). The ranch was historically overgrazed but when he took it over from his father he managed it more

intensively to reduce grazing pressure. Mr. Washington did not live on the property but had an on-site manager who looked after the livestock.

In 2004, \$34,490 of LIP funds were invested for the construction of cross fencing for livestock rotation. Mr. Washington planned for future prescribed burning of an area in which he hand sheared juniper and topped shin oaks for BCVI (42 ha of potential habitat). County burn bans had prevented him from burning his vireo area at the time of my survey. Although the LIP money did not specifically fund the BCVI work, the cross fencing had the potential to contribute to a grazing regime that would allow for the vegetation to grow denser. The shin oak area looked very good (Table 6) but was still small (< 8 ha) and isolated (i.e., unknown distance from nearest known population). One male vireo was observed at an unknown location in the county in 2002 (Wilkins et al. 2006). Other woody species on site were Ashe juniper and cedar elm.

Mr. Washington hoped to encourage BCVI habitat as well as golden-cheeked warbler habitat for potential habitat banking opportunities in the future. I did not detect any BCVI in my 6 surveys. I detected a median of 4 (range 2-5) cowbirds during my site visits, including a sighting of a golden-cheeked warbler male feeding a cowbird fledgling. Mr. Washington trapped and shot cowbirds, and said they were not much of a problem on the property. He also did not allow cattle in the pastures near the BCVI habitat. However, there was a substantial open pasture on both sides of the vireo habitat, each < 1 km distant.

Cowbird trapping—In 2000-2001, \$226,865 in LIP funds were invested in building material and labor for construction of about 400 cowbird traps. Traps were disbursed among 33 Texas counties surrounding Fort Hood in partnership with the Texas Cattleman’s Association, the Texas Farm Bureau, USFWS, and ED. Trap building was part of a larger project which delivered traps and also provided training sessions for landowners. TPWD tracked the numbers of cowbirds removed per county (Table 7), though not all of the traps used to capture these birds are from the LIP-funded project.

Table 7. Number of cowbirds reported removed by landowners and agencies in the years following the LIP trapping projects (TPWD unpublished data: http://www.tpwd.state.tx.us/huntwild/wild/nuisance/cowbirds/trapping_program/index.html).

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Cowbirds removed	9,241	25,640	36,586	54,983	48,715	30,532	24,293	14,663	22,252	16,193

Discussion

There was mixed project success on the various case study LIP properties. I found the most tangible success where the landowner already had BCVI on the property prior to performing the LIP-funded activity. In those cases (Jefferson and Eisenhower), the landowner was already familiar with the habitat needs of the vireo and was working with other agencies (e.g. EDF) to enhance it and to monitor the results. Both of these properties also used prescribed burning to restore habitat, after mechanical manipulations, which is believed to be attractive to vireos. I define success for these projects as BCVI colonization of the project areas

Of those LIP properties without breeding vireos, there was a variety of possible explanations for their absence. Adams and Cleveland each had a large amount of project area, and both were using prescribed burning post-project to enhance habitat. However, the benefits to BCVI habitat might only be observed several years in the future when the vegetation has had time to grow more dense. Each of these properties is an island surrounded by very differently-managed properties, so it could take even more time for vireos to colonize these areas. Adams has reported on-site presence of the vireo in recent years—possibly migrating or foraging birds—so perhaps breeding pairs may occupy this area in the foreseeable future.

Washington and Jackson each have suitable habitat, but they are both a good distance from known populations of breeding BCVI. There is not enough known about BCVI colonization to be able to predict when or if the birds will find these areas of suitable habitat.

Mr. Kennedy's project area, while it is very near existing populations of BCVI and has had prescribed burns, has grown beyond the recommended canopy cover. What the site needs most is an additional burn to set back succession, but it does not appear to be a priority for the landowner.

Finally, Roosevelt's project area was not yet grown to the recommended canopy coverage for BCVI, but there is no reason to believe that it would not become suitable in the future with proper management. There were vireos known to be nearby, there were no cows or goats on the property, and the landowner managed deer and cowbird populations.

Current understanding of BCVI suggests that restoration of habitat includes active management for an early- to mid-successional stage of suitable vegetation. There are 4 major management recommendations commonly given for maintenance of BCVI habitat. I describe them here as they relate to the results of LIP projects.

1. Prescribed burning.— BCVI appear to be attracted to burned areas (Graber 1957, Grzybowski et al. 1994). In many areas of the breeding range, fire can favor the deciduous species that resprout after fire and maintain the dense lower shrubbery important for BCVI habitat. Wilkins et al. (2006, p. 40) state: “the unequivocal and substantial effect of fire on BCVI breeding habitat cannot be ignored. The social, legal, and political constraints to using prescribed burning as a management tool are, in fact, a concern for the species”. Indeed, many of the LIP landowners, and all of those with BCVI on-site, used fire as a management tool—with or without LIP funds. Of those who had not yet used fire for habitat maintenance, burn bans and concern about containment kept them from doing so.

Fire has been suppressed throughout the hill country for many years, creating a large expanse of mature juniper forests across many parts of the landscape. Fuhlendorf et al. (1996) estimated that a dense canopy woodland of juniper is created on the Edwards Plateau in Texas after 75 years of fire suppression, and that a fire return interval of less than 25 years is necessary to maintain grass-dominated landscapes. Once a woodland establishes itself, only a catastrophic wildfire can return it to an open

structure. However, large, hot fires are not typically preferred on private lands (Kreuter et al. 2008), so mechanical means are often necessary to reduce woodland cover.

2. Selective brush management.— Selective cutting is an alternative to prescribed burning for initially reducing woody coverage in BCVI habitat improvement. In developing and fragmented areas, this technique would likely be favored. Landowners and managers conservatively use mechanical means of vegetation management when the vegetation has grown very dense and senescent, as on Adams' and Jefferson's properties. When existing vegetation is in this condition, prescribed burning is considered too risky for many landowners. As an initial course of action, mechanical clearing has improved many properties, especially when in preparation for a routine prescribed burning program. Mr. Jefferson, for example, is able to do most of his own burning at a relatively low cost because of the initial mechanical work using LIP funds. In situations where a landowner does not feel comfortable using fire, or is in a location where it is not perceived as feasible, mechanical brush treatments must be repeated periodically to maintain the open canopy (35-55%) structure for BCVI habitat. Mechanical treatments do not have the same effects as prescribed fires, however. They reduce the physical structure of the treated area, but they do not return nutrients to the soil in the same way as fire. Another benefit of fire, besides favoring resprouting deciduous plants, could be that it helps stimulate new growth and an increased insect abundance, thus creating an increased food source for vireos (Swengel 2001).

3. Grazing and browsing management.— Ms. Carter’s removal of goats from her property allowed shin oak to come back in many areas, without additional management. Goats can overbrowse at the lower levels of shrubs where the BCVI places its nests. (Graber (1961) estimated average nest heights in Texas were 112 cm, while Bailey and Thompson (2007) found an average nest height of 89 cm.) Ms. Carter mentioned that her father (and presumably this was a practice among other landowners) would keep his goat herd in one pasture for long periods in hopes of killing the shinnery all together. In fact, a TPWD (2010) pamphlet for managing white-tailed deer states, “the most common biological control used in the Hill Country is the practice of overgrazing with goats to control shin oak”. Many landowners believe that shin oak, one of the preferred nesting substrates for the BCVI (Grzybowski et al. 1994), competes with the grass as it spreads, and therefore reduces food for livestock (as Mr. Lincoln stated in our interview).

Graber (1961) believed goats reduced BCVI habitat but the browsing of deer did not bother the bird. However, at high densities, deer and exotic ungulates will overbrowse the lower growth of shrubs as goats do. All of the LIP landowners I interviewed had a deer management program as part of their Wildlife Management Plan (WMP), which included annual censuses. WMPs are requisite both for receiving LIP funds and for qualifying for the wildlife tax valuation, and responsible deer and exotic ungulate management can benefit BCVI habitat. EDF also recommends ungulate management based on their evaluation of BCVI habitat on individual properties.

Livestock grazing is by far the most common land use in Texas (Wilkins et al. 2003), and conversion of shrubland and native grasslands to improved pastures has

reduced much of the habitat for BCVI. Only 3 of the landowners I interviewed had removed all livestock from their properties, and each of them did so to qualify for the wildlife tax valuation. Some cattle grazing can be good for maintaining habitat (Vavra 2005), especially in the absence of fire, so a well-timed grazing regime, coupled with proper stocking rate, is important on grazed properties.

One of the more common uses of incentive money for livestock management is the erection of pasture fences. The LIP funded roughly \$100,000 for Jackson, Washington, and Cleveland's fencing projects, so that they could follow a rotational grazing practice. A common recommendation from NRCS is to follow a short-duration, high-intensity grazing period followed by an extended rest period (Toombs and Roberts 2009). However, this method is one that decreases the heterogeneity of the vegetation by applying similar grazing pressure across the landscape (Toombs and Roberts 2009). Fuhlendorf and Engle (2001) maintain that historic grazing pressures, combined with fire, created "shifting mosaics" of different successional stages. The herbaceous heterogeneity resulting from differential pressures increased the diversity of a wide variety of wildlife species.

The fact that BCVI inhabit a middle range of succession indicates that a heterogeneous landscape could be an important landscape quality of its habitat, in that there will always be some suitable habitat available at any one time. While livestock rotation can be a good method of avoiding overgrazing, Fuhlendorf and Engle (2001) recommended patch burning followed by grazing for maximum heterogeneity of vegetation without the need for excess fencing. Three LIP landowners used their

financial assistance for fence building, but further study is necessary to determine whether the BCVI habitat will respond favorably to cattle rotation alone, or whether more direct methods of habitat enhancement are necessary.

An important consideration when attempting to restore habitat is the size of the treatment area. Graber (1961) estimated 4 to 5 ha would be necessary for the bird to be established in any one place, however she based that on the fact that the vireo, “is not a solitary species” and that enough area must be in place for several pairs to settle near each other. Conspecific attraction has garnered an increasing amount of attention for songbirds (Ward and Schlossberg 2004, Campomizzi et al. 2008, Ahlering et al. 2010). Songs of other males possibly act as signals that the habitat is suitable, especially for second-year males who are finding breeding areas for the first time (Ahlering and Faaborg 2006). Other potential explanations for this phenomenon are an increase in mating success by settling in areas with established populations, protection from predators, or a defense against intruders (Stamps 1988). Regardless of the mechanism, Ward and Schlossberg (2004) reported a higher proportion of younger males settling in uncolonized areas where they experimentally broadcast BCVI calls during the settling period. Older males show strong site fidelity and will often return to areas in which they were previously successful in breeding (Graber 1961).

Cimprich et al. (2009) reported 3 banded vireos 75.2, 78.1, and 49.6 km from their natal sites. However, the location where they were resighted was an established vireo breeding area, not a newly colonized property. Based on Ward and Scholssberg’s (2004) experiments, it is possible dispersing vireos could be attracted to colonize

previously unused areas, such as Jackson's property, through the use of vocal broadcasting. This method has not been tested thoroughly for BCVI, however, and should only be used with caution in areas that have minimal cowbird presence. Attracting vireos to sites with moderate to high parasitism rates potentially creates ecological sinks (Ward and Schlossberg 2004, Ahlering and Faaborg 2006).

4. Reducing impacts from cowbirds.— The brown-headed cowbird is a nest parasite, laying its eggs in the nests of other bird species. They are native to the United States, but have experienced great increases in range as a result of an increase in their habitat. Cowbirds feed in open areas, often alongside cattle or other livestock, and breed in nearby forested areas, typically near edges (Hosoi and Rothstein 2000). The BCVI probably lived with cowbird parasitism for millennia. However, it was not until their habitat was so greatly reduced by human development and agricultural conversion, simultaneous to an increase in the cowbird habitat and widespread presence of livestock, that parasitism became a problem for the vireo's existence.

Trapping and shooting of cowbirds is a controversial practice (Ehrenfeld 2001), even though it is espoused by conservation agencies as beneficial to BCVI and other rare host species. On Fort Hood military installation, a decade-long trapping and shooting campaign resulted in parasitism rates on BCVI nests decreasing from 90.9% to 8.6% (Eckrich et al. 1999). Rothstein and Peer (2005) point out that while cowbird control increases host productivity, an increase in habitat can be more important to long-term population increases.

Some LIP landowners do not wish to trap cowbirds, either because they do not live on the properties and cannot manage the traps, or because they do not believe in it.

As Mr. Jefferson said,

I have a philosophy on that. We go to great effort to put everything back as normal as we can in nature but if a species cannot survive without constant input, then you have to decide what, longterm, its viability is. And [TPWD] agreed and we were more interested in what would happen if we gave them everything we could give them to survive on their own, what would happen survivability-wise. I don't have the manpower to handle the traps.

In fact, only 4 of the case study landowners (Washington, Eisenhower, Roosevelt, and Lincoln) are trapping and/or shooting cowbirds on their land.

In an attempt to increase nest success of rare songbirds in LIP invested funds to construct cowbird traps used in 33 counties. Removal of 283,098 cowbirds in the decade following can be partly attributable to the use of LIP-constructed traps. Steve Manning, president of the Texas Cattleman's Association, says that with the "traps we're running, we're making an impact". Without doubt there were fewer cowbird eggs laid in those years, but there was little research into the resulting parasitism rates and nest success of BCVIs. Rothstein and Peer (2005) criticized the Texas cowbird-trapping programs as providing too little training to operators and as defusing efforts to address grazing issues.

Goguen and Mathews (2001) found that cowbirds fed almost exclusively at the feet of cattle, catching insects that cow hooves flushed from the grass. The authors experimentally removed cows from pastures and found the cowbirds did not return to the pasture, even though they were breeding in neighboring forests. They concluded that

cowbirds will breed (and parasitize nests) in the nearest suitable habitat to the feeding areas, but will travel long distances between if necessary to forage alongside the cows. Theoretically, if a female cowbird is flying 9 km between feeding and breeding areas, she will have less energy available and thus lay fewer eggs (Curson and Mathews 2003). Kostecke et al. (2003) also researched the reduction of cattle stocking rates on Fort Hood as an alternative to cowbird trapping. However, they reported plentiful cowbird feeding sites in close proximity to their study area, and the experiment showed different results than Goguen and Mathews, who were working in very remote areas with fewer cattle. Curson et al. (2000) observed female cowbirds traveling in excess of 18 km between feeding and breeding sites. Thus, removal of cattle from pastures near BCVI habitat would likely prove more successful in areas where the nearest pasture was a significant distance (> 20 km) away.

Several LIP landowners mentioned that they did not allow their cattle to graze in BCVI areas during the breeding season, mostly as a means to reduce the disturbance to nests from individual cattle. We can see from the previously mentioned studies, however, that moving livestock to a nearby pasture is not very effective in reducing cowbird pressure. Mr. Jefferson, for example, kept his cows on a distant pasture from the vireo areas, but there were open pastures with plenty of cattle on neighboring properties. There were consistently multiple cowbirds present on his property, which could be an indication of high parasitism rates (Farrell et al. 2010). Both nests I found had been parasitized, but further research is necessary to determine the overall parasitism rates on Jefferson's property.

Black-capped vireos have evolved with cowbird parasitism. Cowbirds were not a major contributor to the endangerment of BCVI, but the loss of their habitat was (Ehrenfeld 2001, Wilkins et al. 2006). Loss of habitat and fragmentation result in reduced and isolated populations, and these can be more susceptible to parasitism and predation. Camera studies have shown that the majority of predators at vireo nests are snakes and ants (Stake and Cimprich 2003, Conkling et al. in review). Wilkins et al. (2006), however, theorize that predation on BCVI by snakes and fire ants could be compensatory with cowbird parasitism rates, thus resulting in no net gain even with trapping programs. Further research is necessary to determine the extent of that phenomenon.

With the remaining BCVI habitat, and with what can be restored, it might be necessary to continue the trapping and removal of cowbirds until we have better ways to benefit BCVI populations. We cannot know the impact we are making with cowbird removal without monitoring host populations. The BCVI recovery plan calls for downlisting the vireo from endangered to threatened by the year 2020. Recovery plans are in themselves experiments in management (Boersma et al. 2001), and every effort should be made to manage adaptively to habitat and population changes, as well as new technologies and techniques.

Recommendations

Incentive-based programs come with the cost of accountability. Conservation agencies must target limited funds to those projects with the highest chances of success for the

target species. Based on my results, I propose the following suggestions for BCVI-related projects, though the recommendations could hold for other species as well.

1. Targeted projects. Those LIP projects that were conducted on properties with BCVI either on-site or on bordering properties had colonization of treated areas. Expanding the habitat that is already producing young vireos can increase the population, thus the potential for source populations.

2. Size of property under single ownership or bordering larger conservation area.

Whether a bordering site is in private holdings or public, a larger area in which to have consistent habitat management can produce a higher potential for success. Areas where a landowner belongs to a management association with his neighbors holds a higher likelihood for responsible fire management, an important attractant for the vireo.

3. Avoid ecological traps. Sites without vireos present might be lacking them for good reasons that landowners and biologists are unaware of (e.g., high parasitism, high predation). Isolated, uninhabited properties might not be the best sites to encourage vireos to colonize, without first investigating these phenomena. Ecological traps are possibly created in situations where vireos are attracted to a location where they are unable to maintain local population levels. Similarly, sites with vireos present but with declining populations might be acting as sink populations and should be investigated further before expanding habitat thereon.

4. Cowbird trapping. Until we know more about management activities that are not lethal to cowbirds, trapping programs should continue. Drawing cowbirds away from BCVI habitat seems to be more important than maximum numbers of birds killed.

5. Property management. A property that has either an on-site landowner or manager, or someone who visits the site frequently, has higher potential for vigilant cowbird trapping, as well as better control of livestock and deer populations and their effects on BCVI habitat.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The Landowner Incentive Program was developed to help bridge the gap between private landowners and government entities, and to encourage conservation of rare species habitat. There were many successful projects, many satisfied landowners, and more than likely many more conservationists on private lands than before as a result of the program. As pioneers of LIP administration, TPWD naturally encountered difficulties as they were learning the best way to administer the program, attract more landowners, adapt to different funding sources, and accomplish conservation of habitat efficiently and effectively. The tide of program participation changed during the decade 1997-2007, and the selection process went from working with any willing landowners to waiting lists and competition among landowners for resources provided by LIP.

The finding of a majority of participants who had a positive experience with LIP reflects well on the advisory board and selection process. However, lessons for improvement were learned as a result of problems and conflicts. TPWD made many adjustments to the program in response to such issues, and I add to those positive changes below with suggestions for improvement. I end the chapter with a more theoretical discussion regarding incentive program effectiveness as a means to a conservation end, and how different kinds of landowners require different approaches for successful outcomes.

Benefits of the Program

1. Voluntary conservation. None of the LIP participants were forced to undertake their projects. They participated because it was “the right thing to do”, because it fit with their management goals, or in some cases purely because they were reimbursed 75% of the project costs. For those landowners who wished to enact conservation projects on their property anyway, the funds and the technical assistance accelerated the implementation of the project.

2. Increased communication and reciprocal education. There is no doubt that some LIP participants enrolled in the program because of the confidentiality involved. The promise of a program that confidentially helps landowners with funding *and* guidance facilitated a greater avenue of communication. Environmental conflicts cannot be handled if the parties are not exchanging ideas and feelings (Horton and Peterson 1995). Once effective communication has occurred, education is made easier, and both sides can understand one another better. Education of the landowner is what will encourage him or her to continue with conservation after the project has been completed. It is this continued commitment that makes the use of public funds justifiable. In the process, the contact person (biologist), and the administrators of the program, learn about the needs of the landowner and to recognize the importance of personal contact.

3. Increased access. Participants might previously have been reticent to allow government officials access to their property, whether for fear of ESA regulation or

otherwise. However, as part of the LIP application process, they must agree to allow access by LIP representatives for initial surveys, demonstrations, or follow-up monitoring. In some cases the confidentiality incorporated in LIP enhanced willingness of landowners to allow this access, while in others it was the promise of the financial and technical assistance. The building of relationships can create open doors for access in the future. Wildlife agencies cannot monitor wildlife populations if they do not have access to the habitat, so this aspect is very important.

4. Putting conservation on the list of management goals for a property. The bottom line for most landowners is that conservation must be profitable or at least be a break-even endeavor. Owning property can be expensive, and anything that can be done to help a landowner avoid the subdivision option is in the best, long-term interest of the public. Piecing together funds from a variety of sources from the conservation toolbox, in cooperation with multiple agencies, is an effective method of affecting positive conservation change.

5. Improvement of habitat for declining species. We have come to the realization as stewards of the land that we cannot wait for species to become endangered before we can protect them. We cannot afford to wait until species are listed under the regulatory process of the ESA, and then watch as T&E species continue to decline because there are not enough resources to monitor or enforce the act. LIP can be a proactive tool for preventing future listing.

Recommendations for Improvement

Administrative

Outreach. The more landowners who are aware of the program and its benefits, the more potential that high quality applications will be submitted for consideration. Websites are increasingly used by landowners. For example, Amos Eno established the Private Landowner Network (<http://www.privatelandownernetwork.org>) with links, blogs, and success stories that currently lists a LIP advertisement. Hunting, extension, agricultural, and agency websites could also be receptive. Word of mouth has been shown to be effective, so requesting participants to encourage their neighbors and associates to apply would be helpful as well. Especially where there are collections of landowners with similar management goals, as in prescribed burn associations or WMAs, participants should be encouraged to share their success stories. They can be given newsletters or business cards to distribute to others.

Interagency cooperation and training. The LIP advisory committee already consists of representatives from a mix of agencies and landowners. However, the biologists and landowner agents (e.g., consulting firms) that complete applications could benefit from regular interaction with other agencies and extension groups working with landowners. Information and technology transfer, sharing success and failure stories, best management practices for a

variety of species, and a fuller understanding of the activities taking place in an area can come of this interaction.

Dedicated staff. During the course of my evaluation I heard many stories of biologists who did not have the time to do outreach campaigns, monitor completed projects, or anything outside their standard duties. A LIP-dedicated staff member, or members, who would report to the LIP coordinator could be extremely useful in these steps to aid in the success of projects and the monitoring necessary to maintain a quality program.

State funding. It makes sense for Texas to have its own LIP because of the size of the state and the great diversity of species and ecosystems, some of which are endemic, that it incorporates. In addition, TPWD is the main steward of wildlife, and therefore the state should fund programs that provide ecosystem services to all of its citizens. With state funding, Texas would determine its own priorities rather than following those of the out-of-state funding sources.

Revisit ranking criteria. Criteria for project selection are modified periodically based on input from the committee and other stakeholders. Because the ultimate goal is more and better quality conservation of habitat, those criteria that focus on higher potential ecological success should receive a higher weight.

Implementation

Streamline application process. Satisfaction with the program often comes with ease of use. Create a computerized form with drop-down menus, or have an application expert with the time to assist (i.e. the dedicated staff member).

Monitoring. Funding a conservation project is not enough. The only way to know if public funds are being used effectively is to monitor the outcomes of the projects. Monitoring also enables conservation agencies the ability to detect negative changes in rare species populations and be able to react quickly, which can be vital in times of climate change and other uncertainties.

Have clear goals for individual projects with tangible outcomes of success. Each LIP project will have a different set of goals, depending on target habitat, and will need a specific outcome to measure during monitoring. Vague or all-encompassing goal statements (e.g. “improve habitat”) make determination of success quite difficult for evaluators. Encourage those who submit applications to mention only those species that will directly benefit from the project and what measurable goal they expect in a specific time period. Monitoring will reveal whether the goal was achieved, and if not, what factors contributed to the failure.

Targeted projects. If we wish to increase the likelihood of success, we must target specific geographical areas with clear potential for connective or usable

habitat. The size of property under single ownership or cooperative management, or properties bordering larger conservation areas can be important factors in this regard.

Avoid ecological traps. Analyze project sites thoroughly for any potential hazards for target wildlife. For example, funding a project to enhance black-capped vireo habitat in an area with high brood parasitism might be doomed to failure unless cowbird population control measures are implemented simultaneously.

Education. Landowners generally have a desire to be good stewards of their property. The increased awareness of the diversity of species within their fences and what to do to help maintain their habitat furthers conservation tremendously, especially for the newer landowners who lack the experience with the land.

Emphasize the need for information transfer to the participants, from diversity biologists or anyone else who might be working directly with a landowner on any project. Landowners can in turn pass the information on to neighbors, associates, and friends. Take the time for thorough technical guidance on as many potential conservation-oriented activities as possible.

Future evaluation

Immediate evaluation. Request participant perspectives of their project and LIP itself while the activities are fresh on their minds. They will remember not only who they were working with, but also what the purpose of their project was, and any thoughts about improvement. Having an anonymous forum for suggestions could also provide a platform for quality input. Feedback and follow-through can make the difference between a landowner who carries the torch of conservation, and one who tells his or her colleague not to enroll in the program.

Qualitative methods. Finally, a note about methodology. Surveys can be useful in studies of a large number of sampling units (potential respondents), but where there are relatively few individuals, or where there is an ongoing process to evaluate, personal interviews can be advantageous. Each landowner is an individual, therefore great insight can be gained from open-ended discussions with them. The democratic process relies on the voices of all the people, not only the majority (Mouffe 2000). So often the minority opinion or unique situation is lost and forgotten in a quantitative analysis, especially when the sample population is small. To gain the perspectives of stakeholders, we must listen to each one of them, even the ones who have criticism.

Post-evaluation update

Since 2007, LIP administrators have made great changes, some of which mirror my recommendations for improvement. My evaluation was bounded by the years of the first decade of the program, however, so my recommendations reflect that time period.

Improvements they have made include the following:

1. A continuous administrator from 2006.
2. Increased marketing (an LIP Bulletin, landowner presentations, a flyer, etc.).
3. An invoicing process with a standardized invoice.
4. A clearance process adhering to the programmatic agreements between USFWS, TPWD, and THC (Texas Historical Commission) which has streamlined cultural resource and section 7 (ESA 1973) clearance significantly.
5. To further improve the cultural resource clearance situation the program began a series of field staff workshops, training biologists from TPWD as well as other agencies on the basics of cultural resource law, identification, and how to build a LIP project that adheres to the programmatic agreement thereby not requiring consultation with the THC and ultimately getting a contract in place more rapidly.

Limitations of Study

My case studies (and landowner interviews included in the stakeholder perspective chapter) were focused on a single species among many in the LIP database. The opinions and statements provided by those landowners within the range of the vireo

cannot be generalized to all LIP landowners. The study was meant as a detailed investigation that logistically could not have occurred for all projects across the state in my given timeline. Had I the time and support, it would have been interesting to compare pairs of similar properties, one with LIP support and the other without. How did the presence of LIP financial and technical support contribute to the outcome in comparison? An even more powerful study would be one that Ferraro and Pattanayak (2006) recommend for program evaluations: the study of the “counterfactual”. This type of study requires great planning prior to the conservation action to observe outcomes of similar areas, with and without the program.

My mail survey had a 52% response rate. This is quite good in comparison to other human dimensions surveys. However, the perspectives of the other half of participants, as well as the perspectives of non-participants, would have been very advantageous to my evaluation. I realize many people, and maybe especially landowners, are quite occupied with the business of living.

Incentives are not one size fits all

In a study of rural Texas landowners, Sanders (2005) found that the individuals she interviewed could be categorized into 3 groups: (1) “Born to the Land” landowners identified strongly with the agricultural lifestyle and the preservation and continuation of that heritage; (2) “Re-Born to the Land” owners were often living out a dream of land stewardship and had a romantic view of the agricultural lifestyle, feeling that they were saving rural ways; and (3) “Ag. Business” landowners identified strongly as ranchers

and felt they brought good business sense to an otherwise break-even endeavor. Obviously, each of these categories of landowners would respond differently to potential conservation initiatives like LIP. Sanders suggests that Born to the Land individuals would be more likely to respond to programs that promote stewardship on the landowner's terms; ones that preserve the heritage of agriculture. Re-Born to the land owners would favor programs that provided a good deal of technical assistance, but also provided some financial assistance to help them achieve the stewardship they desire to enact. Ag. Business landowners would be most likely to enroll in programs "that tout short-term economic gains and that validate their production focus" (Sanders 2005, p. 78).

An argument could be made that LIP appealed to each of these categories of landowners, depending on who was "selling" the program. Biologists often have the personal knowledge of the landowners they work with, and know best how to approach them about LIP. Ag. Business owners responded well when LIP was introduced by agencies they had worked with, like NRCS, and couched in terms of improving their business. LIP was attractive to the Re-Born to the Land category of landowners, who desired the technical and, secondarily important, the financial assistance.

The fact that different aspects of the program are attractive to different kinds of landowners helps to explain a lack of consensus about the relative importance of certain program characteristics in the quantitative mail survey. Landowner backgrounds contribute to a different experience with the program. However, each landowner was also unique regarding enrollment in other incentive or assurance programs (such as Safe

Harbor). The important point to take from this is that conservation-cooperative landowners cannot be generalized, and attempts to put together a package of publicly-supported conservation measures must be tailored to the owner's needs.

LIP as a tool among other conservation initiatives

Conservation of rare wildlife species on private lands is not going to happen with programs like LIP alone. LIP has acted as a supplement to other programs, as a means to increase the size of a project, and as an incentive to do a management action that a landowner otherwise might not have done. The funding for the program has been small relative to other federal programs, however it remains one of the few Texas programs focused on rare species. If the money for LIP was not spent on the program as it is, there would have to be a similar focus for the funds, or conversely, money would have to come from elsewhere to fund rare species management on private lands. A cost-sharing program such as LIP might be more effective when combined with assurance programs like Safe Harbor (Langpap 2006). Certainly, the partnerships that some landowners experienced among different agencies seemed to contribute to the effect size of conservation actions, and perhaps the maintenance of the habitat as well. Kammin et al. (2007) found a similar situation in their study of private lands programs in Illinois. Their main findings were that cooperating landowners needed continuing interaction with biologists in order to keep the conservation actions going, and that partnership among agencies contributed greatly to successful habitat management on private lands.

Though it is difficult to determine the exact effect incentive programs are having on the enhancement and maintenance of wildlife habitat, there seems to be a tremendous improvement in the relationships of stakeholders—both between and among administrators, biologists, and landowners—as a result of them. The enhancement and maintenance of cooperating stakeholder relationships can be what makes the difference between conservation and no conservation of rare species habitat.

LITERATURE CITED

- Ahlering, M. A., D. Arlt, M. G. Betts, R. J. Fletcher, Jr., J. J. Nocera, and M. P. Ward. 2010. Research needs and recommendations for the use of conspecific-attraction methods in the conservation of migratory songbirds. *The Condor* 112:252–264.
- Ahlering, M. A., and J. Faaborg. 2006. Avian habitat management meets conspecific attraction: if you build it, will they come? *The Auk* 123:301–312.
- Bailey, J. W., and J. P. Maresh. 2002. Census and monitoring of the black-capped vireo at Quail Ridge Ranch, Somervell county, Texas. Report to Texas Parks and Wildlife Department. 22 pp.
- Bailey, J. W., and F. R. Thompson, III. 2007. Multiscale nest-site selection by black-capped vireos. *Journal of Wildlife Management* 71:828–836.
- Bean, M. J., and D. S. Wilcove. 1997. The private-lands problem. *Conservation Biology* 11(1):1–2.
- Bibby, C. J., N. D. Burgess, D. A. Hill, and S. H. Mustoe. 2000. Bird census techniques, 2nd edition. Academic Press, London. 302 pp.
- Boersma, P. D., P. Kareiva, W. F. Fagan, J. A. Clark, and J. M. Hoekstra. 2001. How good are endangered species recovery plans? *BioScience* 51:643–649.
- Boyatzis, R. E. 1998. Transforming qualitative information: thematic analysis and code development. Sage Publications, Inc. Thousand Oaks, CA. 179 pp.

- Brook, A., M. Zint, and R. De Young. 2003. Landowners' responses to an Endangered Species Act listing and implications for encouraging conservation. *Conservation Biology* 17:1638–1649.
- Brown, K. L., and G. L. Graham. 2001. The Landowner Incentive Program: lessons learned and preliminary results. pp. 525–537 *in* Transactions of the 66th North American Wildlife and Natural Resources Conference. Wildlife Management Institute, Washington, DC.
- Campomizzi, A. J., J. A. Butcher, S. L. Farrell, A. G. Snelgrove, B. A. Collier, K. J. Gutzwiller, M. L. Morrison, and R. N. Wilkins. 2008. Conspecific attraction is a missing component in wildlife habitat modeling. *Journal of Wildlife Management* 72:331–336.
- Cimprich, D. A., C. W. Sexton, P. K. McDowell, G. Lasley, and W. S. Simper. 2009. Long-distance dispersal records for the black-capped vireo. *Bulletin of the Texas Ornithological Society* 42:44–47.
- Clayton, M. 2007. Warblers, vireos, and tanks: Army tries new approach. *The Christian Science Monitor*: August 6, 2007. <http://www.csmonitor.com/2007/0806/p01s10-usmi.html>>. Accessed 12/25/2010.
- Conkling, T., T. Pope, K. Smith, H. Mathewson, M. Morrison, R. Wilkins, and J. Cain. Forthcoming. Black-capped vireo nest predator assemblage and predictors for nest success. *Journal of Wildlife Management*: *in review*.
- Cook, R. D., and S. Weisberg. 1982. Criticism and influence analysis in regression. *Sociological Methodology* 13:313–361.

- Curson, D. R., C. B. Goguen, and N. E. Mathews. 2000. Long-distance commuting by brown-headed cowbirds in New Mexico. *The Auk* 117:795–799.
- Curson, D. R., and N. E. Mathews. 2003. Reproductive costs of commuting flights in brown-headed cowbirds. *Journal of Wildlife Management* 67:520–529.
- DeLuca, T. H., G. H. Aplet, B. Wilmer, and J. Burchfield. 2010. The unknown trajectory of forest restoration: a call for ecosystem monitoring. *Journal of Forestry* 108:288–295.
- Dillman, D. A. 2000. *Mail and internet surveys: the tailored design method*, Second Edition. John Wiley and Sons, Inc., New York, USA. 464 pp.
- Eckrich, G. H., T. E. Koloszar, and M. D. Goering. 1999. Effective landscape management of brown-headed cowbirds at Fort Hood, Texas. *Studies in Avian Biology* 18:267–274.
- Ehrenfeld, D. 2001. Extinction and blame. *Orion* 20:12–14.
- Farrell, S. L., M. L. Morrison, R. N. Wilkins, R. D. Slack, and A. J. Campomizzi. 2010. Brown-headed cowbird parasitism on endangered species: relationships with neighboring avian species. *Western North American Naturalist* 70:474–482.
- Fernandez-Gimenez, M. E., H. L. Ballard, and V. E. Sturtevant. 2008. Adaptive management and social learning in collaborative and community-based monitoring: a study of five community-based forestry organizations in the western USA. *Ecology and Society* 13:4.
- Ferraro, P. and S. K. Pattanayak. 2006. Money for Nothing? A Call for Empirical Evaluation of Biodiversity Conservation Investments. *PLoS Biology* 4(4):482–

488. Fuhlendorf, S. D., and D. M. Engle. 2001. Restoring heterogeneity on rangelands: ecosystem management based on evolutionary grazing patterns. *BioScience* 51:625–632.
- Fuhlendorf, S. D., F. E. Smeins, and W. E. Grant. 1996. Simulation of a fire-sensitive ecological threshold: a case study of Ashe juniper on the Edwards Plateau of Texas, USA. *Ecological Modeling* 90:245–255.
- Goguen, C. B., and N. E. Mathews. 2001. Brown-headed cowbird behavior and movements in relation to livestock grazing. *Ecological Applications* 11:1533–1544.
- Graber, J. W. 1957. A bioecological study of the black-capped vireo (*Vireo atricapilla*). Ph.D. Dissertation, University of Oklahoma, Norman. 203 pp.
- Graber, J. W., 1961. Distribution, habitat requirements, and life history of the black-capped vireo (*Vireo atricapilla*). *Ecological Monographs* 31: 313–336.
- Grzybowski, J. A., D. J. Tazik, and G. D. Schnell. 1994. Regional analysis of black-capped vireo breeding habitats. *The Condor* 96:512–544.
- Hosoi, A., and S. I. Rothstein. 2000. Nest desertion and cowbird parasitism: Evidence for evolved responses and evolutionary lag. *Animal Behaviour* 59:823–840.
- Jackson-Smith, D., U. Kreuter, and R. S. Krannich. 2005. Understanding the multidimensionality of property rights orientations: evidence from Utah and Texas ranchers. *Society and Natural Resources* 18:587–610.
- James, F. C., and H. H. Shugart, Jr. 1970. A quantitative method of habitat description. *Audubon Field Notes* 24: 727–736.

- Kammin, L. A., P. D. Huvert, R. E. Warner, and P. C. Mankin. 2007. Private lands programs and lessons learned in Illinois. *Journal of Wildlife Management* 73(6):973–979.
- Kleiman, D. G., R. P. Reading, B. J. Miller, T. W. Clark, J. M. Scott, J. Robinson, R. L. Wallace, R. J. Cabin, and F. Felleman. 2000. Improving the evaluation of conservation programs. *Conservation Biology* 14(2):356–365.
- Kostecke, R. M., J. A. Koloszar, and D. C. Dearborn. 2003. Effect of a reduction in cattle stocking rate on brown-headed cowbird activity. *Wildlife Society Bulletin* 31:1083–1091.
- Kreuter, U. P., J. B. Woodard, C. A. Taylor, and W. R. Teague. 2008. Perceptions of Texas landowners regarding fire and its use. *Rangeland Ecology and Management* 61:456–464.
- Langpap, C. 2006. Conservation of endangered species: can incentives work for private landowners? *Ecological Economics* 57:558–572.
- Lewis, D. J., A. J. Plattinga, and J. Wu. 2009. Targeting incentives to reduce habitat fragmentation. *American Journal of Agricultural Economics* 91(4):1080–1096.
- Lewis, N. 2008. The Landowner Incentive Program: engaging the private landowner in cooperative conservation. The University of Michigan, School of Natural Resources and Environment. 38 pp.
- Lincoln, Y. S., and E. G. Guba. 1985. *Naturalistic Inquiry*. Sage Publications, Inc. Newbury Park, CA, USA. 416 pp.

- MacKenzie, D.I. 2007. Analysis of 2003–2006 occupancy data for black-capped vireo and golden-cheeked warbler. Unpublished report for Texas A&M University.
- McCann, S. 1999. Keeping the estate tax. *Rangelands* 21:3–4.
- Mouffe, C. 2000. *The democratic paradox*. Verso. London, UK. 143 pp.
- Natural Resources Conservation Service [NRCS]. 2010. Environmental Quality Incentives Program, FY 2009 EQIP Data - Contracts and Funding. <<http://www.nrcs.usda.gov/programs/eqip/2009data/fundingdata.html>>. Accessed 12/12/10.
- Nichols, R. K., J. Steiner, L. G. Woolaver, E. Williams, A. A. Chabot, and K. Tuininga. 2010. Conservation initiatives for an endangered migratory passerine: field propagation and release. *Oryx* 44:171–177.
- Noa, L. A., D. H. Hirth, T. M. Donovan, and D. Cimprich. 2007. Demographic differences of black-capped vireos in 2 habitat types in central Texas. *Journal of Wildlife Management* 71: 1042–1049.
- Peterson, T. R., and C. C. Horton. 1995. Rooted in the soil: how understanding the perspectives of landowners can enhance the management of environmental disputes. *The Quarterly Journal of Speech* 81:139–166.
- Raymond, L., and A. Olive. 2008. Landowner beliefs regarding biodiversity protection on private property: and Indiana case study. *Society and Natural Resources* 21:483–497.

- Rothstein, S. I., and B. D. Peer. 2005. Conservation solutions for threatened and endangered cowbird (*Molothrus* spp.) hosts: separating fact from fiction. *Ornithological Monographs* 57:98–114.
- Salant, P., and D. A. Dillman. 1994. *How to conduct your own survey*. John Wiley and Sons, Inc., New York, NY. 232 pp.
- Sanders, J. C. 2005. Relationships among landowner and land ownership characteristics and participation in conservation programs in central Texas. Texas A&M University M.S. Thesis. 89 pp.
- Scott, J. M., F. W. Davis, R. G. McGhie, R. G. Wright, C. Groves, and J. Estes. 2001. Nature reserves: do they capture the full range of America's biological diversity? *Ecological Applications* 11:999–1007.
- Sorice, M. G. 2008. Understanding participation in wildlife conservation programs on private lands. Texas A&M University doctoral dissertation. 126 pages.
- Sorice, M. G., and J. R. Conner. 2010. Predicting private landowner intentions to enroll in an incentive program to protect endangered species. *Human Dimensions of Wildlife* 15:77–89.
- SPSS, Inc. 2005. Version 14.0. SPSS, Inc., Chicago, Illinois, USA.
- Stake, M. M., and D. A. Cimprich. 2003. Using video to monitor predation at black-capped vireo nests. *The Condor* 105:348–357.
- Stamps, J. A. 1988. Conspecific attraction and aggregation in territorial species. *The American Naturalist* 131:329–347.

- Stem, C., R. Margoluis, N. Salafsky, and M. Brown. 2005. Monitoring and evaluation in conservation: a review of trends and approaches. *Conservation Biology* 19(2):295–309.
- Stone, R. 1995. Incentives offer hope for habitat. *Science* 269:1212–1213.
- Swengel, A. B. 2001. A literature review of insect responses to fire, compared to other conservation managements of open habitat. *Biodiversity and Conservation* 10:1141–1169.
- Texas Parks and Wildlife Department [TPWD]. 2005. Comprehensive wildlife conservation strategy: 2005–2010. TPWD Publication, Austin, TX. 1151 pp.
- Texas Parks and Wildlife Department [TPWD]. 2003. Management guidelines for black-capped vireo. *In* Campbell, L. Endangered and threatened animals of Texas: their life history and management. Texas Parks and Wildlife Department, Austin, TX, USA.
- Toombs, T. P., and M. G. Roberts. 2009. Are Natural Resources Conservation Service range management investments working at cross-purposes with wildlife habitat goals on western United States rangelands? *Rangeland Ecology and Management* 62:351–355.
- United States Census Bureau. 2011. 2010 Census data. <<http://2010.census.gov/2010census/data/>>, Accessed 5/20/2011.
- United States Fish and Wildlife Service. 1991. Black-capped vireo (*Vireo atricapilla*) recovery plan. Austin, Texas. pp. vi + 74 pp.

- United States Fish and Wildlife Service [USFWS]. 2007. Fiscal Year 2008 Budget Justifications.
http://www.doi.gov/budget/2008/data/greenbook/FY2008_FWS_Greenbook.pdf.
Accessed 11/15/10.
- United States Fish and Wildlife Service [USFWS]. 2010. Endangered Species Program: critical habitat. <http://www.fws.gov/endangered/what-we-do/critical-habitats.html>. Accessed 1/26/11.
- United States Government Accountability Office [GAO]. 1994. Endangered Species Act: information on species protection on nonfederal lands. GAO/RCED-95-16. Washington, D. C.
- Vavra, M. 2005. Livestock grazing and wildlife: developing compatibilities. *Rangeland Ecology and Management* 58:128-134.
- Ward, M. P., and S. Schlossberg. 2004. Conspecific attraction and the conservation of territorial songbirds. *Conservation Biology* 18:519-525.
- Weiss, C. H. 1998. Evaluation: methods for studying programs and policies, second edition. Prentice-Hall, Upper Saddle River, NJ. 372 pp.
- Wilcove, D S., M. J. Bean, R. Bonnie, and M. McMillan. 1996. Rebuilding the ark: toward a more effective Endangered Species Act for private land. Environmental Defense Fund, Washington, D.C.
- Wilcove, D. S., and J. Lee. 2004. Using economic and regulatory incentives to restore endangered species: Lessons learned from three new programs. *Conservation Biology* 18:639-645.

- Wilcove, D. S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying threats to imperiled species in the United States. *BioScience* 48:607–615.
- Wilkins, R. N. 2009. The power of incentives: can we get better ESA performance from private lands? American Enterprise Institute for Public Policy Research.
- Wilkins, R. N., R. D. Brown, R. J. Conner, J. Engle, C. Gilliland, A. Hays, R. D. Slack, and D. W. Steinbach. 2000. Fragmented lands: changing land ownership in Texas. The Agricultural Program, Texas A&M University, College Station. 12 pp.
- Wilkins, R. N., A. Hays, D. Kubenka, D. Steinbach, W. Grant, E. Gonzales, M. Kjelland, and J. Shackleford. 2003. Texas rural lands: trends and conservation implications for the 21st century. Texas Cooperative Extension, Texas A&M University, College Station. 28 pp.
- Wilkins, R. N., R. A. Powell, A. A. T. Conkey, and A.G. Snelgrove. 2006. Population status and threat analysis for the black-capped vireo. Prepared for USFWS, Region 2.
- Wolf, C. M., B. Griffith, C. Reed, and S. A. Temple. 1996. Avian and mammalian translocations: update and reanalysis of 1987 survey data. *Conservation Biology* 10:1142–1154.
- Yin, R. K. 1994. Discovering the future of the case study method in evaluation research. *American Journal of Evaluation* 15:283–290.

APPENDIX A

Sample biologist interview protocol

1. Tell me about your experience with the Landowner Incentive Program.
2. How many years did you work with landowners on LIP projects?
3. What percentage of your time was spent working on this program?
4. What would you say were the most successful aspects of the program?
5. What were some of the least successful aspects of the program?
6. What changes would you make to the program?
7. How successful overall would you say the Landowner Incentive Program was between 1997 and 2007?
8. How did you get the word out to landowners that LIP existed?
9. Do you think the projects undertaken with LIP funds were mostly successful in achieving the management goal? Why or why not?

APPENDIX B

Landowner questionnaire

**The Landowner Incentive Program:
a participant's perspective**



Texas A&M University

Texas Parks and Wildlife Department

July, 2009

General instructions:

Thank you for taking the time to assist in the evaluation of the Landowner Incentive Program (LIP). The person most knowledgeable about the management of the property where the LIP project took place should fill out this questionnaire. Please fill out each section to the best of your knowledge and return the survey in the enclosed envelope. There is space at the back of this booklet for general comments or additional information.

Many thanks for your assistance and have a great day.

Anna Knipps
Graduate Research Assistant
Texas A&M University
Department of Wildlife and Fisheries Sciences
210 Nagle Hall
2258 TAMU
College Station, TX 77845
aknipps@neo.tamu.edu



Your project:

1. What was your motivation for enrolling in the Landowner Incentive Program?

2. Please indicate which aspects of the program process were most user-friendly and which in your opinion were the least-user friendly (for example: the application process, the reporting process, the invoicing process, the technical guidance, etc.):

3. Please indicate what level of importance you would assign to privacy and confidentiality regarding natural and cultural resources on your LIP project:

Natural Resources

- Very Important*, confidentiality was my main reason for utilizing this particular incentive program
- Important*, it's important to me but I would have utilized the program regardless
- Neither Important or Unimportant*
- Slightly Unimportant*
- Not important at all*. I am proud to share information regarding the natural resources on my property.

Cultural Resources

- Very Important*, confidentiality was my main reason for utilizing this particular incentive program
- Important*, it's important to me but I would have utilized the program regardless
- Neither Important or Unimportant*
- Slightly Unimportant*
- Not important at all*. I am proud to share information regarding the cultural resources on my property.

4. How many years had you known your area biologist (TPWD biologist or other agent informing you about the program) before enrolling in LIP? _____ years

5. Was your Landowner Incentive Program project completed?

- YES If **YES**, what year? _____ Please continue on to Question 6 below.
- NO If **NO**, please explain why not and then skip ahead to Question 13 on page 6.
-

6. How many years did you receive LIP funding? _____ years.

7. Did you have a particular target species as the focus of your LIP project?

- Yes
- No

If yes, what was (were) your target species?

8. Did you see or know of the target species on your property prior to the start of the LIP project?

- Yes
- No

9. If applicable, have you seen an increase, decrease, or no change of target species on your property since completion of the project?

- Increase
- Decrease
- No change
- I don't know

10. Please indicate with an X how much you agree with each statement below.

	Strongly disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree	Unsure
a. Wildlife conservation is very important to me.	1	2	3	4	5	6	7	8
b. All wildlife should be protected as a general rule.	1	2	3	4	5	6	7	8
c. I am interested in the management of game species.	1	2	3	4	5	6	7	8
d. I am interested in the management of non-game species.	1	2	3	4	5	6	7	8
e. I am interested in wildlife for aesthetic reasons.	1	2	3	4	5	6	7	8
f. My experience with LIP personnel was overall satisfactory.	1	2	3	4	5	6	7	8
g. My LIP contacts were usually available to provide assistance.	1	2	3	4	5	6	7	8
h. Based on my experience, I believe LIP has contributed toward effective rare species management in Texas.	1	2	3	4	5	6	7	8
i. The technical guidance I received from my LIP contacts was as important as the financial assistance.	1	2	3	4	5	6	7	8
j. I would have chosen to do my project without LIP funds	1	2	3	4	5	6	7	8
k. LIP funding was sufficient to help cover the costs of my project.	1	2	3	4	5	6	7	8
l. LIP resulted in an increase in land based income.	1	2	3	4	5	6	7	8
m. I believe the LIP project successfully contributed to wildlife habitat on my property.	1	2	3	4	5	6	7	8
n. I believe the goal for my LIP project was achieved.	1	2	3	4	5	6	7	8
o. I will continue to maintain wildlife habitat on my property.	1	2	3	4	5	6	7	8
p. I would apply for LIP funding again.	1	2	3	4	5	6	7	8

11. If you indicated in Question 10.1. (above) that you agreed your LIP resulted in an increase in land base income, please explain why.

12. If you indicated in question 10.p. (above) that you would not apply for LIP funds in the future, please state why not.

Background:

13. Are you currently enrolled in other incentive programs (e.g., EQIP) or assurance programs (e.g., Safe Harbor)?

Yes

No

If yes, in what programs are you enrolled?

14. Why did you choose LIP?

15. How did you hear about LIP?

16. What would you consider to be the main purpose, or use, of your land (*select as many as apply*)?

- Food crop production
- Other crop production
- Timber production
- Livestock production
- Wildlife management for hunting
- Wildlife management for non-hunted species
- Wildlife refuge
- Recreation
- Mineral or oil extraction
- Other (*please specify*) _____

17. Did you belong to a Wildlife Management Association at the time of your project?

- Yes
- No

If yes, which one? _____

18. Do you or does anyone else hunt on your property?

- Yes
- No

19. What was your property size at the time of your project? _____ acres.

20. How many years had you owned your property at the time the LIP project was performed? _____ years.

21. Are you originally from Texas?

- Yes
- No

If no, how many years have you physically resided in Texas? _____years.

22. How many generations of your family has lived in Texas? _____generations.

23. In what year were you born?_____

24. What is your ethnicity?

- White/Caucasian
- Hispanic
- Black/African-American
- American Indian
- Asian-American

25. What percentage of your income is generated from your property?

- None
- 1 – 25 %
- 26 – 50 %
- 51 – 75 %
- 75 – 99 %
- All of it

26. Into which annual income category did you belong at the time of your LIP project?:

- Less than \$ 25,000
- 25,001 – 50,000
- 50,001 – 100,000
- 151,000 – 200,000
- 100,001 – 200,000
- 200,001 – 500,000
- Greater than \$ 500,000

27. May we contact you for further information if necessary?

- Telephone
- Email
- No thank you.

If yes, what number and time or email address would be best to contact you? _____

Please feel free to add any LIP-related information not previously covered in this questionnaire.

Many thanks for your assistance!

Questions to add for the immediate evaluation:

1. What is your level of education?
2. Do you live on your property where the LIP project took place?
3. Do you have a manager living on the property?
4. How likely would you be to recommend LIP to a neighbor, family member, or friend?

APPENDIX C

LIST OF PROJECTS BY COUNTY

Project objective	County
Cowbird ¹ project	30 counties
Restore longleaf pine ² ecosystem	Angelina
Restore/enhance native short-grass prairie and protect 292 ac of playa lake wetlands	Armstrong
Attwater prairie-chicken ³ habitat enhancement	Austin Colorado
Habitat restoration	Bandera
Houston toad pond	Bastrop
Houston toad pond construction	Bastrop
Houston toad	Bastrop
Houston toad	Bastrop
Cowbird trapping	Bell Coryell Hamilton
Cave restoration	Bexar
Buffer ⁴	Brewster
Plant succession in riparian zones	Briscoe
Texas Horned Lizard ⁵ /BCVI habitat	Brown
Prairie restoration	Brown
Increase wetland floral and faunal species	Burnet
Coastal prairie enhancement	Calhoun
Native grassland enhancement	Calhoun
Habitat enhancement for waterfowl	Cameron
Ocelot ⁶ habitat	Cameron
Shortleaf pine ⁷ savannah	Camp
Longleaf pine	Cherokee
Rotational grazing	Cochran
LPC ⁸ nesting habitat	Cochran
Buffer	Coke
Buffer	Coke

¹ *Molothrus ater*

² *Pinus palustris*

³ *Tympanuchus cupido atwateri*

⁴ Buffer projects were riparian fence construction

⁵ *Phrynosoma cornutum*

⁶ *Leopardus pardalis*

⁷ *Pinus echinata*

⁸ Lesser prairie-chicken (*Tympanuchus pallidicinctus*)

Buffer	Coke
Created waterfowl and bird habitat	Dimmit
Wetland restoration	Dimmit Maverick
Short grass prairie enhancement for LPC	Donley
Prairie restoration, LPC benefit	Donley
BCVI habitat enhancement	Edwards
Restore old field pasture	Ellis
Buffer	Frio
Coastal prairie enhancement	Goliad
Enhance coastal prairie and riparian woodlands	Goliad
Restore native grasslands	Goliad
Coastal prairie habitat restoration	Goliad
Coastal prairie enhancement via grazing, burn, brush removal	Goliad
Enhance 3870 acres of native grasslands	Goliad/Refugio
Habitat enhancement - prairie - LPC	Hemphill
Increase extent of short/mid grass prairie to improve habitat for LPC	Hemphill
Re-forest and re-establish native plants	Hidalgo
Fenced natural lagunas from cattle, rotational grazing and cowbird trapping	Hidalgo
Restoration of native brush	Hidalgo
Guinea grass ⁹	Hidalgo
LPC	Hockley
LPC habitat restoration	Hockley Cochran Yoakum
LPC habitat restoration	Hockley/Terry
Longleaf pine	Houston
Longleaf pine	Houston
Longleaf pine	Houston
Native grassland enhancement	Karnes
Riparian enhancement	Kerr
BCVI habitat enhancement	Kerr
Habitat restoration; clearing, rotational grazing and future burn	Kerr
Rotational late season prescribed burn to benefit BCVI	Kimble
LPC habitat enhancement	Lamb
Improve habitat for LPC	Lamb Hockley
Riparian enhancement	Lee
Native prairie restoration	Lee
Prairie-chicken enhancement	Lipscomb
Buffer	Mason
Habitat/ species diversity enhancement	Mason

⁹ *Panicum maximum*

BCV, bobwhite quail ¹⁰ , Texas horned lizard enhancement	McCulloch
Rotational grazing to improve habitat	Menard McCulloch
Buffer	Medina
Buffer	Medina
Buffer	Medina
Buffer	Menard
Buffer	Menard
Red-cockaded woodpecker ¹¹ restoration	Montgomery
Longleaf pine	Nacogdoches
Longleaf pine	Nacogdoches
Restore native prairie via rotational grazing and burn	Navarro
Prairie restoration	Navarro
Riparian enhancement, planting	Navarro
Regional habitat restoration	Newton
Habitat enhancement to improve status of LPC	Ochiltree Roberts
BCVI & GCWA	Palo Pinto
Buffer	Pecos
Pecos pupfish ¹² pond and restocking	Pecos
Habitat enhancement - rotational grazing, juniper removal	Real Uvalde
Snowbell restoration	Real Edwards Val Verde
	Kinney Uvalde
Restore bottomland hardwood	Sabine
Longleaf pine	Sabine
Restore longleaf pine ecosystem, replant hardwoods	Sabine
Longleaf pine	Sabine
Longleaf pine	Sabine
Longleaf pine	Sabine
Longleaf pine restoration	Sabine
Establish longleaf pine ecosystem	San Augustine
Longleaf pine	San Augustine
Longleaf pine	San Augustine
Longleaf pine restoration	San Augustine
Establish longleaf pine ecosystem	San Augustine
Longleaf pine	San Augustine
Longleaf pine restoration	San Augustine
Establish longleaf pine and 10 acres riparian baygall seep	Shelby
Longleaf pine	Shelby
Habitat enhancement, burns, brush management	Somervell

¹⁰ *Colinus virginianus*

¹¹ *Picoides borealis*

¹² *Cyprinodon pecosensis*

Texas Horned Lizard/BCVI	Somervell
BCVI, GCWA habitat enhancement via brush mgt, fire, watering	Somervell
Buffer	Taylor
Buffer	Taylor
Buffer	Taylor
Buffer	Taylor
Buffer	Taylor
Restoration/enhancement of native vegetation	Titus
Buffer	Tom Green
Buffer	Tom Green
Longleaf pine	Trinity
RCW habitat improvement	Tyler
Native grassland restoration - coastal prairie	Victoria
Restore coastal prairie	Victoria
Coastal prairie restoration	Victoria
Pecos pupfish	Ward
Riparian enhancement	Washington
Riparian enhancement	Washington
Re-establish native plant community	Washington
Native grassland/wetland	Wharton
Mesquite clearing	Willacy
Restoration of native prairie	Williamson Travis Burnet
Enhance springs and riparian area	Wise
Prairie restoration - LPC	Yoakum

VITA

ANNA CHRISTIEN STUART KNIPPS

Department of Wildlife and Fisheries Sciences, 2258 TAMU
College Station, TX 77843

aknipps@neo.tamu.edu

EDUCATION

Texas A&M University Graduation: Aug. 2008
College Station, TX M.W.S.: Wildlife and Fisheries Sciences
Research: Suitable habitat model for the Rafinesque's big-eared bat in east Texas

University of Arizona Attended: Jan. to Dec. 1999
Tucson, AZ M.S. student: Wildlife Ecology
Research: Effects of prescribed fire on the Mexican spotted owl in Saguaro National Park

Rutgers University Graduation: May 1996
Cook College, New Brunswick, NJ B.S.: Natural Resource Management
Option: Conservation and Applied Ecology

SELECTED EXPERIENCE

Tom Slick Senior Graduate Fellow Sep. 2010 to Aug. 2011
Texas A&M University, College Station, TX

Graduate Research Assistant May 2007 to Sep. 2010
Texas A&M University, Department of Wildlife and Fisheries Sciences, College Station, TX

Editorial Assistant Apr. 2006 to present
The Wildlife Society, Journal of Wildlife Management

Teaching Assistant –ornithology Aug. 2006 to May 2007
Texas A&M University, Department of Wildlife and Fisheries Sciences, College Station, TX

Term Biological Science Technician –swift fox Aug. 2004 to Mar. 2005
Badlands National Park, Interior, SD

Crew Leader –small mammals Jun. 2004 to Aug. 2004
Wildlife Conservation Society, Sequoia National Park, CA

Research Assistant –reptiles and amphibians Mar. 2002 to Jul. 2003
Archbold Biological Station, Venus, FL