Evaluation of the Effectiveness and Reach of the Educational Programs and Technical Assistance Activities of the U.S. Forest Service, Forest Stewardship Program

Technical Report

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Additional Information

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Executive Summary

The U.S. Forest Service, Forest Stewardship Program (FSP) provides technical and educational assistance to non-industrial private forest (NIPF) owners in order to promote good forest stewardship practices. To evaluate this program, a mixed-methods approach was taken, including summarization of existing performance metrics; cataloguing of state forest stewardship activities; National Woodland Owner Survey data analyses; analyses of FSP activities in relation to forest area trends; and focus groups.

Key Findings

1. **FSP reaches many NIPF owners, but these owners represent only a fraction of the NIPF owners.** On average, 14,700 new or revised FSP management plans, covering 1.9 million acres, were written per year across the U.S. between 2007 and 2011; the number of plans decreased by 5% and acres covered increased by 14% over this period. Landowner assists, averaging 146,000 per year, decreased by 19% between 2007 and 2011. Landowners educated, averaging 468,000 per year, decreased by 68% between 2007 and 2011. Disregarding double counting and other reporting issues, FSP management plans, landowner assists, and landowner education are annually reaching <1%, 3.3%, and 10.5% of the estimated number of eligible NIPF owners, respectively.

It was not possible to explicitly identify FSP participants in this evaluation; instead, assisted landowners (i.e., those who have a forest management plan, received advice, or received cost-share assistance) were compared with non-assisted landowners for the next three "Key Findings." These activities encompass more than just FSP-affiliated activities, but the comparisons are intended to be indicative of comparisons between FSP participants and other landowners.

2. **Some characteristics are *different* between assisted and non-assisted landowners.** Assisted landowners are more likely than non-assisted landowners to have commercially harvested timber; improved wildlife habitat; planted trees; reduced wildfire risk; higher annual incomes; and higher levels of education.

3. **Some characteristics are *similar* between assisted and non-assisted landowners.** These groups are similar with respect to future intentions to sell or subdivide land; age; primary residence location; ethnicity; gender; how the land was obtained; and farm ownership.

4. **There were few discernible differences on landowner behavior among the different types of assistance (i.e., plans, advice, or cost-share).** Landowners who received any single form of assistance acted nearly the same as those receiving any other single form of assistance. Owners receiving all three types do appear to be managing more intensively.
5. **For those landowners interested in active management, landowner assistance activities (i.e., management plans, advice, or cost share) appear to be helping them manage their forests better and more intensively, but they do not appear to be influencing landowners' land use decisions (e.g., selling or subdividing) or to be encouraging non-engaged owners to become engaged.**
6. **No discernible relationships between FSP activities and forest area trends were detected.** No relationships were found in state- or county-level analyses between FSP activities and changes to forest cover. This may have been due to data limitations or FSP not having a large enough impact.

Key Recommendations

1. **Maintain state-level flexibility.** This will allow states to meet their critical forest resource needs. However, continuing this approach underscores the importance of collecting consistently defined data necessary for conducting program monitoring and evaluation.
2. **Expand the diversification of FSP to emphasize and encourage innovation.** Continue to encourage states to diversify their portfolio of FSP activities beyond the more traditional activities (i.e., management plans and technical assistance) that currently receive the greatest percentage of FSP allocation. Investments in innovative initiatives should be core parts of programs.
3. **Shift focus from management plans to outreach and technical assistance.** The impact on behavior does not appear to differ much among these activities and the shift will allow for a greater percentage of NIPF owners to receive assistance. Approaches such as peer-to-peer learning (e.g., Master Forest Owner) and supporting professional conservation advice could be emphasized.
4. **Emphasize opportunities to utilize FSP as a means to keep forests as forests.** Assist NIPF owners to acquire services of estate planning professionals to conserve their land, and encourage states to incorporate conservation-based planning through adoption of models, such as Ties to the Land. In addition, stronger ties can be made between FSP and other programs, such as Forest Legacy.
5. **Continue to focus resources in the most critical areas.** The concept of Important Forest Resource Areas (IFRAs) should continue to evolve to ensure the most important landscapes are targeted. IFRAs of national importance should also be identified and prioritized.
6. **Improve data collection.** There are many limitations to monitoring and evaluating FSP that will be at least partially overcome by regularly performing quality control checks on the monitoring data being collected; establishing landowner case files or databases for those receiving education; and implementing more uniform IFRA definitions.
7. **Refine allocation metrics.** Consider a system that rewards professional advice and landowner contacts in addition to plans and acres, taking into account the relative efforts involved and effectiveness. Incentivize efforts that target IFRAs, especially those that target unengaged landowners and long-term stewardship.

Report Synopsis

RS.1 Introduction

The U.S. Forest Service, Forest Stewardship Program (FSP) is designed to provide educational and technical assistance to non-industrial private forest (NIPF[1]) owners, predominately family and individual forest owners, in order to promote good forest stewardship practices. The program is administered by the USDA Forest Service through individual state forestry agency private forest owner assistance programs. FSP is the most comprehensive and prominent assistance program for NIPF owners in the country. Due to the significant presence of NIPF owners across our landscapes (they own 49% of the nation's forest land (Butler 2008)) and the public benefits they provide, FSP is an important tool for assisting these owners in practicing good forestry. FSP has an extensive, existing infrastructure through the state forestry agencies that implement the program (e.g., people, relationships, funding) and with some changes, it could significantly increase its impact.

The national FSP administrator, on behalf of all FSP administrators, tasked a team of researchers from the Family Forest Research Center—a joint venture between the U.S. Forest Service, the University of Massachusetts Amherst, and the University of Minnesota—with

1. cataloguing recent FSP activities;
2. comparing characteristics between assisted and non-assisted landowners;
3. assessing the influence of assistance on landowners' behaviors;
4. quantifying the impact of FSP on forest trends;
5. identifying effective FSP activities;
6. reviewing funding allocation metrics.

The focus of this assessment was on FSP activities that occurred between 2007 and 2011. The definition of activities considered to be part of FSP includes all technical assistance and educational activities undertaken by state forestry agencies that are aimed at aiding NIPF owners in maintaining and sustainably managing their forest lands.

Previous evaluative studies of FSP (both national and state-specific assessments), focused largely on surveys of FSP participants (Lorenzo, Beard et al. 1996; Esseks and Moulton 2000; Egan, Gibson et al. 2001; Baughman and Updegraff 2002; Esseks and Moorhouse 2005; Jennings and McGill 2005;

[1] The terms *non-industrial private forest (NIPF) owners* and *family forest owners* are used in this report. These terms are not synonymous. NIPF refers to corporate, non-governmental organization, unincorporated partnerships, tribal and family/individual landowners who do not own primary wood-processing facilities. Family forest owners refer to the last category of NIPF owners: family and individual landowners. Each particular analysis component contained in this evaluation refers to landowners with one of these terms, based on what was available from the most suitable data. Specifically, Chapters 3, 6 and 7 discuss family forest owners, while Chapters 5, 6 and 8 discuss NIPF owners. Chapter 8 also discusses privately-owned forests; NIPF forests are a subset of private forests which include industrially-owned forests.

Holzmueller, Martinek et al. 2012). This study focuses on evaluating the impact of FSP assistance activities through

- a summary of existing performance metrics (i.e., as reported in the FSP Performance Measurement Accountability System [PMAS] database);
- a cataloguing of state forest stewardship activities, as reported by state forest agencies;
- several analyses of National Woodland Owner Survey data;
- analyses of FSP activities in relation to forest area and other trends;
- focus groups with family forest owners.

Compared to previous approaches, this study expands the scope of the assessment to include NIPF owners who have not been recipients of assistance provided through FSP, thus enabling a broader overall evaluation of the program's impact. Previous studies focused solely on program participants and were limited to examining the need for the program and its process. This evaluation examines the program's impact and various administrative aspects.

The goal of this effort was to evaluate the impact FSP activities have on NIPF owners' decisions. Determining the effectiveness of FSP necessitates identifying those NIPF owners who have participated in the program. Assistance activities supported by FSP are broad and include the development of formal management plans, technical assistance, and NIPF owner educational programs. A nationwide database of FSP participants does not exist. At the state level, there is tremendous variability in the types of FSP-sponsored assistance provided (e.g., management plans, technical assistance contacts) and the form in which NIPF owner participation in these activities is recorded (e.g., paper, electronic, individual records, summary databases). This variability, in large part, reflects the flexibility given to state forestry agencies in developing and implementing state-tailored versions of FSP (see "Cataloguing" section below). Further, because FSP typically provides only a portion of the funding for a state forestry agency's NIPF owner assistance work, it becomes even more difficult to isolate those landowners who have been beneficiaries of FSP.

With such amorphous boundaries on the definition of an FSP landowner, as well as the lack of obtainable, reliable nationwide records of FSP participation, analysis of FSP participation was conducted using the most suitable data available for each particular component of this evaluation. For some chapters, this approach included defining landowners based on the types of landowner assistance they received (e.g., having a management plan, receiving advice, or receiving technical assistance), and using analyses of these various assisted-landowner groupings as *suggestive* of results with data on actual FSP participants. Importantly, this method results in several different definitions of an assisted landowner. A description of how assisted landowners are defined is included in the relevant chapters. These definitional differences do result in some variation between the findings of each analysis and do not allow exact comparisons between them. However, the methods do allow us to conduct a more holistic evaluation of the impact of FSP using a broad, inclusive definition of an assisted landowner.

This executive summary provides the most salient findings of the assessment. The approaches are summarized by chapter, followed by a synthesis of key findings and recommendations based on these results.

RS.2 Chapter Summaries

Literature Review (Chapter 2)

Previous federal- and state-level evaluations are limited to focusing on FSP participants (Lorenzo, Beard et al. 1996; Esseks and Moulton 2000; Egan, Gibson et al. 2001; Baughman and Updegraff 2002; Esseks and Moorhouse 2005; Jennings and McGill 2005; Holzmueller, Martinek et al. 2012). They describe such things as management plan implementation rates, participant opinions of the program, and participant characteristics, but do not provide an examination of those who FSP is not reaching. A variety of literature exists that summarizes accepted ways to comprehensively evaluate any program. Rossi et al. (2004) discuss five areas of evaluation that should be considered: need for the program (justification); program design, given the need (appropriateness of design); operation and delivery of services (process); outcomes and impacts (effectiveness); and efficiency (cost-benefit analysis). Most past evaluations of FSP and other incentive programs address only one or two of these areas. This assessment expands on previous analyses to include addressing FSP's appropriateness of design, a more in-depth look at FSP's process, and an attempt to evaluate FSP's effectiveness.

Examination of Socio-Demographic Characteristics of Landowners Who Receive Forestry Practice Assistance (Chapter 3)

To provide an understanding of the population targeted by FSP, this chapter identifies socio-demographic characteristics of family forest owners who have received types of landowner assistance similar to that provided by FSP and compares them to the same characteristics of those who have not received those types of landowner assistance. The data used to develop these characterizations came from the USDA Forest Service, National Woodland Owner Survey (NWOS; Butler 2008). Due to limitations in the NWOS dataset, this analysis focuses on family forest owners, not NIPF owners. The chapter identifies potential differences and similarities between assisted and non-assisted family forest owners using socio-demographic data derived from the 2006 NWOS data.

Although the NWOS data do not explicitly identify FSP participants, the data are used to identify family forest owners who received landowner assistance that is indicative of the assistance provided by FSP. For purposes of this chapter, these individuals are referred to as assisted landowners. The NWOS survey contains information that identifies family forest owners who have an active forest management plan, have received cost-share assistance, or have received any type of management advice. Family forest owners holding between 10 and 10,000 acres and receiving any of these three forms of assistance are considered assisted landowners; family forest owners who did not receive at least one of these types of assistance are considered non-assisted landowners. The assumption of this analysis is that socio-demographic characteristics of assisted landowners are suggestive of socio-demographic characteristics of FSP participants.

Performance Measurement Accountability System (PMAS) Data (Chapter 4)

FSP accomplishments related to NIPF owners were evaluated across multiple spatial scales using data collected in the FSP Performance Measurements Accountability System (PMAS) database. We focus on six PMAS metrics that were consistently collected from 2007 to 2011 (number of NIPF owners receiving assistance, number of NIPF owners receiving education, acres under new or revised plans, number of Important Forest Resource Area [IFRA] acres in new or revised plans, number of new or revised plans, and designated IFRA areas) and three metrics collected from 2008 to 2011 (acres in current plans, IFRA acres in current plans, and sustainably managed IFRA acres in current plans). Chapter 4 provides an in-depth discussion regarding the reliability and interpretability of the PMAS data.

Survey of State Administrators of the Forest Stewardship Program (Chapter 5)

The annual PMAS report collects information regarding state forestry agency activities in very specific categories. However, prior to this evaluation, there had been no attempt to capture more comprehensive information about the broad range of activities that state forestry agencies engage in through FSP and the ways in which FSP fits into the larger framework of state forestry agency budgets. A survey instrument looking at 5 years of NIPF owner assistance activity was developed and sent to FSP program coordinators in all 50 states and the 9 protectorates. FSP administrators from 43 states and three protectorates responded to the survey.

Examination of the Attitudes and Behaviors of Landowners Receiving Forestry Practice Assistance Using National Woodland Owner Survey Data (Chapter 6)

While the NWOS does not directly ask about FSP participation, it does provide data on landowner assistance that is similar to that provided by FSP. Using this landowner assistance data as a proxy for assistance provided by FSP, the 2006 NWOS data (Butler 2008) were examined using a variety of statistical techniques to identify important similarities and differences in attitudes and behaviors between assisted and non-assisted landowners. For the purposes of our analysis, assisted landowners were defined as family forest owners who had received assistance in one or more of the following ways: a forest management plan, cost-sharing of forestry practices, or advice on managing their forest land. Several definitions of an assisted landowner were developed according to the type(s) of assistance received and were subsequently used to compare the attitudes, past actions, and future intentions of assisted and non-assisted landowners. As in Chapter 3, the assumption of this analysis is that attitudinal and behavioral characteristics of assisted landowners are suggestive of attitudinal and behavioral characteristics of FSP participants.

Behavioral Impacts of the Forest Stewardship Program on Family Forest Owners: A Qualitative Assessment (Chapter 7)

To help determine what influences family forest owner behavior, how FSP influences this behavior, and FSP strengths and weaknesses, 12 focus groups were conducted with family forest owners in six states. A focus group approach is well suited to this task because it allows us to gain richer data than that provided by survey research.

FSP Activities in Relation to Forest Area and Other Trends (Chapter 8)

Another way to evaluate FSP is to determine if FSP activities have had a positive influence on the amount of forested acreage across the U.S. Because of data limitations, existing data (at a sub-national resolution) combined with various analytical approaches help to explore the relationships between FSP activities and various measures of forest acreage trends for the 2007–2011 time period. In particular, this effort includes county-level and state-level analyses. The county-level analysis compares private forest change data (derived from USGS MODIS/MLCT data) to FSP NIPF management plan acreage. The county-level data analysis focuses on two states (i.e., Michigan and New York) that describe total acreage associated with all active FSP plans (i.e., existing, new, or revised). The state-level analysis explores PMAS and state FSP administrator survey data to determine whether the data might describe a type of FSP implementation approach that is correlated with landscape forest measures.

RS.3 Key Findings by Research Objective

Below, grouped according to the research objectives, are the key findings of this report based on the work described above. The 6th project objective, reviewing funding allocation metrics, is addressed in the recommendations section.

1. Cataloguing recent FSP activities

- Use of FSP funds varies extensively from state to state.
    - States and protectorates shape FSP to meet the unique challenges and opportunities of their forest resources and administrative needs. This has resulted in 59 different varieties of FSP (50 states and 9 protectorates).
    - Typically, direct NIPF owner assistance (e.g., field visits, technical assistance, phone consultations) and management plans are the program areas receiving the most FSP allocation.
    - States are experimenting with unique FSP implementation strategies, such as educational programs aimed at emerging issues that are reported to be quite effective, but these types of strategies receive fewer state resources in comparison to the traditional types of assistance activities.
- Hundreds of thousands of NIPF owners have benefited from one or more FSP activities, including 730,000 NIPF owner-assists from 2007 to 2011, but even this large number represents only a fraction of the eligible NIPF owners.
    - The exact number of NIPF owners touched by FSP is difficult to discern because FSP has impacts across all landowner assistance programs, its activities cannot be separated from those funded by other sources, and data on FSP participation is limited or is not consistently collected for the activities supported by FSP.
- The number of acres covered by FSP forest management plans increased by 12% from 2008 to 2011.
    - NIPF owners who have FSP forest management plans increasingly own larger forest acreage. The average acreage per new or revised plan increased by 20% from 2008 to 2011.
- The number of NIPF owners touched by FSP is decreasing.

    - Landowner assistance decreased by 19% from 2007 to 2011.
    - Educational participation decreased by 68% from 2007 to 2011.
    - New or revised plans written decreased by 5% from 2007 to 2011, but the average acreage covered per plan increased and hence the increase in total acres covered reported above.
- The emphasis on IFRA is increasing.
    - IFRA acres in new or revised written management plans increased by 44%.
    - IFRA acres under current plans managed sustainably increased by 68%.

2. Comparing characteristics between assisted landowners and non-assisted landowners

- Socio-demographic comparisons show some differences and similarities between assisted landowners and non-assisted landowners:
    - Assisted landowners (i.e., family forest owners who had a forest management plan and received cost-share assistance or advice) are more likely to have higher annual incomes and have obtained higher levels of education.
    - However, there is no statistical difference between assisted landowners and non-assisted landowners in terms of age, race/ethnicity, gender, whether primary residence is located within one mile of forest land, how they obtained the forest land, single versus multiple parcel ownership, and whether they own a farm near their forest land.
- Behaviorally, regardless of how an assisted landowner is defined (i.e., receiving a forest management plan, cost-sharing, advice, or some combination), assisted landowners are significantly different from non-assisted landowners with respect to having implemented forest management practices (e.g., commercially harvest timber, improve wildlife habitat, plant trees, reduce wildfire risk).
- On the other hand, assisted landowners were no different from non-assisted landowners with respect to future intentions to sell or subdivide the land, regardless of how an assisted landowner is defined (i.e., receiving a forest management plan, cost-sharing, advice, or some combination).
- Under the assumption that assisted landowners are similar to FSP participants, the results presented above are suggestive of FSP participant characteristics and behaviors versus those of non-FSP participants.

3. Assessing the influence of FSP on landowners' behaviors

- FSP is having a limited impact on NIPF owner behavior; specifically, PMAS data show that on an annual basis, an average of 3.3% of NIPF landowners were assisted from 2007 to 2011 and 5.7% of NIPF acres were covered by FSP management plans from 2008 to 2011.
- FSP is most likely to impact the behavior of family forest owners who have already decided they want to manage their forest in some way. For example, it influences already-active family forest owners to intensify their management efforts or cover more acres because of cost-share funding.

- We found no evidence that traditional FSP activities are influencing inactive family forest owners to become active managers.

- FSP does not appear to influence decisions related to land use.
  - Family forest owners told us that traditional FSP activities are not having any impact on land-use decisions like selling or subdividing their forest land.

4. Quantifying the impact of FSP on trends in forest coverage

- Data limitations make it difficult to discern relationships between FSP and forest coverage trends at the county level.
  - Analysis of land cover change found an increasing amount of private forest cover in the U.S. from 2007 to 2011, although the accuracy of using these data at the county level is questionable.
  - Non-significant relationships were found between changes in private forest cover and limited measures of FSP activity; however these results describe only two states.
  - This analysis relies on an incomplete measure of FSP activity that does not describe forest owner behavior as completely as needed: it reflects only NIPF owner management plan activity.
- Some of these data limitations may be overcome with the data being collected through the new SMART reporting tool and the NLCD land cover data scheduled to be released in December of 2013.

5. Identifying effective FSP activities

While this study's analyses are able to provide an indication of the possible relationships between FSP activities and NIPF owner behavior, it is unable to directly assess which FSP activities are most effective. As noted in Objective 1 "Cataloguing recent FSP activities," FSP participants are not able to be exclusively identified. Existing datasets do not provide the information that would enable a causal analysis, but they do provide a means to assume linkages between landowners who receive forestry planning and practice assistance (e.g., having a management plan, receiving advice) and those who receive FSP assistance. At best, we are able to gain a better understanding of FSP activity effectiveness by taking an approach that is more specific than that conducted for Research Objective 2 "Comparing characteristics between assisted landowners and non-assisted landowners." Whereas the analysis conducted for Research Objective 2 compares landowners having received various types of assistance, this assistance is not exclusive (e.g., a landowner with a management plan may or may not have also received advice). Research Objective 2 analyses define a more generalized population of assisted landowners than the analyses conducted to examine effectiveness.

The analyses of this research objective focus on comparing assisted landowners for each different type of forestry practice assistance individually, as well as all three simultaneously. By doing this, we can examine not only whether forest management practices differ between assisted landowners and non-assisted landowners for each specific type of assistance (i.e., management plan, cost-share, advice, all three simultaneously), but we can compare this result

across landowner assistance types. For purposes of this analysis, forest management practices include improving wildlife habitat, planting trees, reducing fire hazard, and harvesting timber.

- Regardless of how defined (i.e., only has a management plan, only received cost share, only received advice, had all three simultaneously), assisted landowners were more likely to have conducted activities to improve wildlife habitat or activities to reduce fire hazard.
- Some differences were observed based on the form of assistance received. Compared to owners who received no assistance, those who only had a management plan show different correlations with past and future timber harvest and tree planning behaviors versus those who received only cost-share or only advice or had all three types of assistance simultaneously. This result implies something about the effectiveness of management plans.
    - Assisted landowners, defined as those with a forest management plan, were not different from non-assisted landowners with respect to commercially harvesting timber and planting trees, both past practices and future plans.
    - Yet assisted landowners, defined as those receiving cost-share, advice, or all three forms of assistance, were different from non-assisted landowners with respect to these same past and anticipated future practices.
- When family forest owners receive three different forms of assistance (forest management plan, cost-share assistance, and advice) the likelihood of conducting any of the forest management practices (past or future) is, on average, 1.8 times more likely to occur than with the individual types of landowner assistance.
- Thus, to summarize, one type of assistance does not seem to be more effective than another in terms of encouraging wildlife habitat improvement or fire hazard reduction. Assistance in the form of management plans may be less effective in terms of harvesting timber or planting trees. The most effective means to encourage all forms of forestry management practices considered appears to be providing all three types of landowner assistance.

RS.4 Recommendations

Based on the above findings, the following recommendations are offered.

1. Maintain state-level flexibility

- **Maintain state-level flexibility in tailoring FSP to meet the specific critical forest resource needs of each state.** FSP allows states to implement NIPF owner assistance programs that best suit the needs of the individual states. Each state faces a variety of challenges and opportunities with regards to its landscape and socioeconomic conditions. Keeping the flexibility in FSP allows each state to address its own unique needs. It is important to recognize, however, that allowing state-level flexibility comes with trade-offs, particularly increased difficulty in performing national assessments of program impact. Staying this course underscores the importance of developing consistent definitions and collecting data and reporting protocols necessary to conduct a national evaluation of the FSP.

2. Expand FSP's impact

- **Continue to refine the approach that provides emphasis on IFRA to ensure states are choosing important landscapes of an effective size and that important *national* IFRA priorities are not being overlooked at the expense of individual state priorities.** The recent emphasis on IFRA is a very good start to having a greater impact by concentrating resources in specific areas of high economic or ecological value; however, refining this approach may expand FSP's landscape impact.
- **Shift focus from management plans to outreach (e.g., advice, telephone consultations) and technical assistance to reach more NIPF owners.** Based on our analyses, FSP is reaching a small percentage of eligible NIPF owners and forest land. Management plans do not always meet NIPF owner needs or address important NIPF land challenges. Moreover, the focus groups revealed that FSP family forest owners were often already interested in implementing land management practices, suggesting FSP is not helping inactive landowners to become active forest managers. NIPF owners have diverse goals and reaching them will require varied approaches to resonate with those owner segments. It is likely FSP could reach and have a similar impact on more landowners when FSP assistance efforts involve promoting a broad range of tactics (e.g., education, advice). Landowners in our focus groups also noted that outreach and technical assistance are their preferred methods of assistance.

  Representative quotes from the focus groups (see Chapter 7) supportive of these findings and recommendations include:

  Focus Group Moderator: Okay, you knew you wanted to harvest and they just helped you do it. Georgia Resident: Yes.

  Yeah, I would have done the same thing, it just would have cost me twice as much. I mean, it was in my mind to do it anyway. – Washington Resident

  If I can get the one-on-one visit then it gets me started. – Iowa Resident

  …It would be good to have somebody walk with me and ask questions and tell me what's wrong. That would be ideal. – New York Resident

- **Utilize existing models of peer-to-peer learning (e.g., Master Forest Owner) as well as new peer-to-peer learning models.** Connecting with peers was identified by focus group participants as a preferred method by which family forest owners would like to receive advice. Service foresters can likely reach more landowners and more effectively inform decisions by helping to facilitate peer learning. Bringing these models into the FSP repertoire could be advantageous by promoting program goals and also by allowing FSP to be more strategic with investments of time and resources.

  Representative quotes from the focus groups (see Chapter 7) supportive of these findings and recommendations include:

Because the more I get out and do some of these field tours and workshops…the more I see what other people are doing, it excites me and motivates me and "why didn't I think of that," and "that's a good idea," and "I could do that better." – Iowa Resident

Well, [the class] let me know a whole lot that I didn't know. And it let me know where to look for more information. And another thing, too, is I met a lot of people that are gonna help me in the future. – Kentucky Resident

I think if people got together like this [referencing the focus group] in their own areas and it's like a workshop, I think that would be very helpful. – Colorado Resident

- **Promote use of consulting foresters and other professionals (e.g., land trusts, estate planners, real estate appraisers, surveyors, attorneys, wildlife biologists) to give advice and technical assistance.** There are numerous professionals who can provide advice and technical assistance. Sometimes state forestry agency personnel are the best ones to provide it, but other times it will be more efficient and more effective for other professionals to do so.

3. Expand the diversification of FSP to emphasize and encourage innovation

- **Continue to encourage states to diversify their portfolio of FSP activities beyond the more traditional activities (i.e., management plans, technical assistance) and to invest in creative initiatives.** Many of the unique and effective strategies that states reported were funded through competitive grants and involved activities that were often a departure from traditional landowner assistance. This approach likely better meets the specific needs of the state and also harnesses the creativity of each state to develop effective landowner assistance strategies that can be shared among other states. For example, the Kennebec Woodlands Partnership in Maine is made up of 13 organizations with diverse interests collaborating on forest conservation projects and is reaching NIPF owners who are not attracted to traditional programs. In addition, Illinois is buying conservation easements on woodlands associated with farm fields through the USDA Conservation Reserve Enhancement Program (CREP) as a strategy to maintain forest cover. While these efforts are important and appear to be effective, states are continuing to use most of their resources for traditional activities. See Chapter 5 for more examples of unique and innovative approaches. FSP funding may be the catalyst for innovation and can be further encouraged by allocating a greater percentage of FSP funding toward competitive funding and/or refining the allocation metrics (see Recommendation 6 below).

4. Emphasize opportunities to utilize FSP as a means to keep forests as forests

- **Assist NIPF owners who would like to acquire the services of an estate planning professional to conserve their land.** Land conversion is one of the top issues facing NIPF owners across the country. Our analysis suggests that landowners receiving FSP related assistance are not different from other landowners with respect to their intent to sell or

subdivide their forest land. If "Keeping Forests as Forests" is indeed an important goal of FSP, then the program needs to be more explicit about that expectation and encourage activities that will lead to perpetuating forest cover.

- **Encourage states to incorporate conservation-based estate planning into their activities using existing models of success from across the country (e.g., Ties to the Land) and new methods that are developed.**
- **Create a tighter connection between FSP and the Forest Legacy Program. For example, incentivize IFRAs that overlap Forest Legacy Areas.**

5. Improve data collection and reporting

- **Take advantage of the new FSP reporting tool, SMART, and perform initial data downloads and analyses with the data to ensure that what is being collected and recorded is sufficient for conducting nationwide evaluations in the future.** Understanding whether this new tool is collecting the right data accurately and consistently over time is crucial for evaluating program performance in the future. Such an effort might also identify program elements that are unique to states; fields could also be added to the database to help track these unique data.
- **Regularly perform quality assurance/quality control checks for the data entered into the SMART system.** Many of the PMAS metrics were problematic for issues of double-counting, lack of standardization in definition and large variability year to year.
- **Establish landowner case files or databases for those receiving education just like those receiving other forms of assistance (e.g., forest management plans).** Case files can help to reduce the double-counting issues associated with PMAS and provide better data for analyzing trends.
- **Provide a more uniform definition of what constitutes IFRAs.** FSP would benefit from standardizing or tightening the definitions of IFRA-designated acres and IFRA acres sustainably managed so there is greater consistency among states and over time.
- **Identify and collect program performance data that addresses FSP metrics of success and collect it consistently over time.** Being parsimonious will help to reduce FSP coordinator report fatigue.
- **Track the IFRA-based metrics into the future to see if states are able to engage landowners in IFRAs to undertake stewardship activities on their land.** Due to the recent focus on landowner assistance activities in IFRA, it is too soon to determine whether this program focus is having the impact or outcome intended.
- **Utilize the NWOS survey as a means for data collection on FSP participation to remove the onus from program administrators and provide a consistent basis across the country.** Such an effort could help program administrators know more about who FSP is serving (e.g., socio-demographically). If deemed useful, a more intensive survey of FSP participants can also be initiated, similar to Esseks et al. (2000).

6. Refine allocation metrics

- **Consider a system that rewards professional advice and landowner contacts in addition to FSP management plans and acres. Contacts could be weighted (e.g., mailing a postcard is different than a one-on-one visit) with greater priority given to activities within IFRA-designated areas.** States use the current plans and acres-allocation method to maximize their FSP funding allocation. Refining the allocation model would encourage an important shift in state activity that could lead to greater FSP impact both in terms of landowners assisted as well as on the landscape. A system of this nature may require the development of a database (or modification of SMART) that states can use to track contacts and establish landowner case numbers.
- **Reward efforts that specifically target unengaged landowners and encourage long-term stewardship.**
- **Incorporate elements related to effort (e.g., number of interactions) and effectiveness (e.g., plans and phone calls are not treated equally) or at least resources or time expended.**
- **Survey landowners in IFRAs to understand how land protection is changing within IFRAs.** The survey could track variables such as the landowner's ability to make informed land management and use decisions, land ownership turnover rates, and average parcel size, as well as tracking changes in these variables over time. A survey of this type could be done as a part of the NWOS, which would reduce the data collection and reporting burden imposed on states.

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1 Introduction

1.1 Forest Stewardship Program background

Of the 751 million acres of forested land in the U.S., 56%—423 million acres—is privately owned (Butler 2008). How this land is managed will have a substantial effect on the welfare of the American public. Some of the benefits of well-managed forests include sustained timber product supply, protection of water quality, fish and wildlife habitat, preservation of cultural and historic sites, carbon storage, and recreational opportunities(Stein, McRoberts et al. 2009). About 92% of all timber harvested in the U.S. in 2006 came from private forests. One quarter of this country's freshwater flows from private forests (Stein, McRoberts et al. 2009). Sixty percent of at-risk species lives on private forests (Robles, Flather et al. 2008). Housing density increases and subsequent forest fragmentation threaten the continued provision of these forest amenities and ecological services (Stein, McRoberts et al. 2009). There is a trend of parcellation of forests in the U.S. (Zhang, Liao et al. 2009) that underscores the importance of policies which promote effective multiple-objective forest management across many small forests (Belin, Kittredge et al. 2005).

Technical and financial assistance to promote forest management by private forest landowners dates back to the 1924 Clarke-McNary Act, which supported seedling nurseries and tree distribution to private landowners. The Clarke-McNary Act saw several amendments and expansions before the 1978 Cooperative Forestry Assistance (CFA) Act, which replaced all previous legislation. The law consolidated and delegated a broad suite of program authorities to state forestry agencies (USDA Forest Service 2011).

An amendment to the CFA Act within the 1990 Farm Bill (16 U.S.C. 2103a) authorized the Forest Stewardship Program (FSP), one of the nation's largest federal private forestry assistance programs. Legislation defines the FSP's purpose as "to encourage the long-term stewardship of nonindustrial private forest lands by assisting owners of such lands to more actively manage their forest and related resources by utilizing existing state, federal, and private sector resource management expertise and assistance programs" (Cooperative Forestry Assistance 1978, Sec. 2103a[2]). For purposes of this legislation, non-industrial private forest (NIPF[3]) lands are "rural, as determined by the Secretary, lands with existing tree cover, or suitable for growing trees, and owned by any private individual, group, association, corporation, Indian tribe, or other private legal entity." FSP's goal is to help landowners understand and evaluate a variety of management activities, including

[2] Cooperative Forestry Assistance 1978. United States Code, Title 16: Conservation, Sec. 2103a - Forest Stewardship Program. http://www.gpo.gov/fdsys/pkg/USCODE-2010-title16/html/USCODE-2010-title16-chap41-sec2103a.htm (Accessed 12.18.2012).

[3] More recently, the term *family forest owners* has largely supplanted the term *NIPF,* but there are some differences, for example NIPF can include any corporate that does not own a mill, such as timber investment management organization, and the family forest owner group clearly exclude this type of ownership. Federal forestry and conservation laws within USDA continue to be based on NIPF.

> "(1) managing and enhancing the productivity of timber, fish and wildlife habitat, water quality, wetlands, recreational resources, and the aesthetic value of forest lands;
>
> (2) investing in practices to protect, maintain, and enhance the resources identified in paragraph (1);
>
> (3) ensuring that afforestation, reforestation, improvement of poorly stocked stands, timber stand improvement, practices necessary to improve seedling growth and survival, and growth enhancement practices occur where needed to enhance and sustain the long-term productivity of timber and non-timber forest resources to help meet future public demand for all forest resources and provide the environmental benefits that result; and
>
> (4) protecting their forests from damage caused by fire, insects, disease, and damaging weather" (USDA Forest Service 2011).

In short, FSP is intended to offer NIPF landowners technical and planning assistance and educational opportunities with the goal of promoting active, multiple-use, and long-term management of private forests. Furthermore, landowners with FSP plans are better equipped to enroll in certification programs and emerging markets such as those for carbon credits (USDA 2011).

The U.S. Forest Service (USFS) published its National Standards and Guidelines (last updated in 2009) to more specifically direct states and territories toward FSP implementation. The guidelines reaffirm the longstanding requirement since the establishment of State Forest Stewardship Coordinating Committees in 1990, that they provide advice and recommendations to the state forester with respect to FSP implementation and provide assistance and recommendations with respect to the state-wide assessment and resource strategies authorized in 2008 (USDA Forest Service 2009).

The 2008 Farm Bill amended the CFA Act to direct states to complete an assessment of forest resources and to develop a forest resource strategy (Forest Action Plan). Assessments and strategies are to be based upon the following national themes and objectives: conserve working forest lands; protect forests from harm from fire, storms, floods, insects and diseases, and invasive species; and enhance public benefits from trees and forests, including air and water quality, soil conservation, biodiversity, carbon sequestration, products, jobs, renewable energy production, and wildlife habitat (USDA Forest Service 2009).

Neither legislation nor the USFS guidelines set minimum acreage eligibility requirements for participation in FSP. However, states have varying requirements. Esseks and Moorhouse (2005) inventoried 32 state FSP websites and found that, as of 2003, several did specify eligibility criteria. For example, Hawaii, Maryland, and Pennsylvania required a minimum of five acres, while Florida specified a 20-acre minimum. Other states specified minimum percentages of the land that had to be forested.

States differed in several other important ways, including who was allowed or supposed to write the FSP management plan (Esseks and Moorhouse 2005). Some states designated state foresters or other such government staff. Others were less specific, allowing for certified private foresters as well as state

employees to write plans. Still others used a coached planning approach, wherein landowners take related courses and then write their own plans. States differed in cost to the landowner for plan assistance and preparation. In some states, the assistance was free to most landowners while other states specified cost percentage ceilings, floors, and ranges. Finally, states differed in specifying objectives that management plans should include. Most states emphasized multiple-resource objectives. One (West Virginia) allowed for single-objective plans. A few states encouraged long-term (ten years or more) management plans.

Since the creation of FSP, there have been several notable innovations within the program. One was the Geographic Information System (GIS) based Spatial Analysis Project (SAP), through which all states had identified regions on which to more efficiently focus their efforts. That helped states to establish Forest Action Plans. FSP has also developed an interactive tool for tracking specific management plan accomplishments. As of 2008, states have implemented a nationally consistent, statistically valid monitoring system that allows for verifying that landowners are sustainably managing their lands (USDA 2011). Beginning in FY2013, a new data reporting system and accomplishment tracking tool called SMART (Stewardship Mapping and Reporting Tool) will be replacing the current system. SMART will be a spatial database system that will allow program managers enhanced mapping capability and the ability to exhibit the FSP footprint on the landscape.

By September of 1997, 130,000 FSP-assisted management plans covering 16.5 million acres had been written. By the same month in 2004, an additional 123,000 such plans associated with 11.6 million acres had been written (Esseks and Moorhouse 2005) . In 2010, acreage being managed sustainably under FSP plans was 19.6 million (USDA 2011). Of those acres, 9.2 million were in Important Forest Resource Areas, identified by the Spatial Analysis Program and/or State Forest Action Plans to be of high priority (USDA 2011).

1.2 Study objectives

The present study aims to evaluate the Forest Stewardship Program along appropriateness, process, effectiveness, and efficiency criteria. The objectives of this effort are to assess the educational and technical assistance activities of the USFS FSP between 2007 and 2011, and investigate metrics for assisting program allocation by considering

- state forestry agency activities conducted to increase forest stewardship by NIPF owners;
- the characteristics (size of holdings, attitudes, behaviors, demographics, etc.) of the owners who are being educated and/or assisted, and the characteristics of the owners who are not being assisted;
- to what extent FSP recipients are different from non-FSP recipients in terms of land conservation, management, and investment;
- how FSP program activities affect forest loss or gain;
- the most and least effective FSP activities.

1.3 Study components

To achieve these objectives, this study comprises the following seven elements:

- **Literature review (Chapter 2):** This chapter reviews and synthesizes relevant literature regarding FSP, as well as financial assistance program and program evaluation studies.
- **Examination of socio-demographic characteristics of landowners receiving forestry practice assistance (Chapter 3):** This chapter provides an understanding of the differences and similarities in socioeconomic and demographic characteristics between landowners receiving forestry practice assistance and landowners not receiving this assistance and presents these results as suggestive of the characteristics likely to be associated with FSP participants versus non-FSP participants.
- **Summary of existing performance metrics (Chapter 4):** This chapter summarizes FSP data collected by the federal government as part of the FSP Performance Measurement and Accountability System (PMAS) to allow for broad assessment of differences in program implementation across the country and over time.
- **Catalogue of state forest stewardship activities (Chapter 5):** This chapter provides the results of a state FSP program administrators' survey of forest stewardship activities conducted in their state between 2007 and 2011.
- **Examination of the attitudes and behaviors of landowners receiving forestry practice assistance using National Woodland Owner Survey (NWOS) data (Chapter 6):** This quantitative analysis of the NWOS segments data into subpopulations of assisted landowners and non-assisted landowners to compare and contrast attitudinal and behavioral characteristics of the two types of landowners. These results are suggestive of characteristics likely to be associated with FSP participants versus non-FSP participants.
- **Focus groups with family forest owners (Chapter 7):** This chapter provides the results of focus groups conducted with family forest owners designed to probe barriers to participating in FSP and identify needs of forest owners.
- **Analysis of FSP activities in relation to forest area and other trends (Chapter 8):** This chapter uses the best available data to quantify and correlate the relationships between FSP activities and various forest landscape trends.

The goal of this effort was to evaluate the impact FSP activities have on NIPF owner decisions. Determining the effectiveness of FSP necessitates identifying those NIPF owners who have expressly participated in the program. By comparing FSP landowners to non-FSP landowners and assisted landowners to non-assisted landowners, it is possible to determine if FSP interventions (e.g., management plans, education) result in decisions and actions that are significantly different from those of landowners who have not had FSP interventions, or interventions similar to that provided by FSP.

Assistance activities supported by FSP are broad and include the development of formal management plans, technical assistance, and NIPF owner educational programs. A nationwide database of FSP participants does not exist. At the state level, there is tremendous variability in the types of FSP-sponsored assistance provided (e.g., management plans, technical assistance contacts) and the form in

which NIPF owner participation in these activities is recorded (e.g., paper, electronic, individual records, summary databases). This variability, in large part, reflects the flexibility given to state forestry agencies in developing and implementing state-tailored versions of FSP (see "Cataloguing" section below). Further, because FSP typically provides only a portion of the funding for a state forestry agency's NIPF owner assistance work, it becomes even more difficult to isolate those landowners who have been beneficiaries of FSP.

With such amorphous boundaries on the definition of an FSP landowner, as well as the lack of obtainable, reliable nationwide records of FSP participation, analysis of FSP participation was conducted using the most suitable data available for each particular analysis component of this evaluation. For some chapters, this approach included defining landowners based on the types of landowner assistance they received (e.g., having a management plan, receiving advice, or receiving technical assistance), and using analyses of these various assisted-landowner groupings as *suggestive* of results with data on actual FSP participants. Importantly, this method results in several different definitions of an assisted landowner. A description of how assisted landowners are defined is included in the relevant chapters. These definitional differences do result in some variation between the findings of each analysis and do not allow exact comparisons between them. However, the methods do allow us to make suggestive judgments on the impact of FSP using a broad, inclusive definition of an assisted landowner.

This study relies on numerous abbreviations throughout, provided in Table 1-1 below.

Table 1-1. Abbreviations used in this report.

Abbreviation	Term
CFA Act	Cooperative Forestry Assistance Act
CFM	Cooperative Forest Management
CRP	Conservation Reserve Program
CREP	Conservation Resource Enhancement Program
FIP	Forestry Incentives Program
FFP	Farm Forestry Program
FSP	Forest Stewardship Program
FY	Fiscal Year
GIS	Geographic Information System
IFRA	Important Forest Resource Areas
IGBP	the International Geosphere-Biosphere Programme
IITF	International Institute of Tropical Forestry
KWP	Kennebec Woodlands Partnership
MLCT	MODIS Land Cover Type
MODIS	Moderate Resolution Imaging Spectroradiometer
NIPF	Non-industrial Private Forest
NLCD	National Land Cover Database
NRCS	Natural Resources Conservation Service
NTFP	Non-timber Forest Products
NWOS	National Woodland Owner Survey
OMB	Office of Management and Budget
PAD	Protected Areas Database
PFAP	Private Forestry Assistance Program
PMAS	Performance Measurement and Accountability System
RFA	Rural Forestry Assistance
RNGR	Reforestation, Nurseries and Genetics Resources
SAP	Spatial Analysis Project
SFIA	Sustainable Forest Incentive Act
SIP	Stewardship Incentive Program
SMART	Stewardship Mapping and Reporting Tool
USDA	United States Department of Agriculture
USFS	United States Forest Service

2 Literature Review

Following is a review of the program evaluation literature, in five parts. First is a summary of relevant program evaluation approaches and techniques. Next is a review of federal, regional, and state evaluations of the Forest Stewardship Program (FSP). Third is a review of evaluations of other forestry incentive programs. Fourth, we review literature that assesses differences between participants and non-participants of forestry incentive programs. Finally, we make mention of the program evaluation literature in other fields.

2.1 Program evaluation: Approaches and techniques

Rossi et al. (2004) published a comprehensive guide to evaluating programs, defining program evaluation as "the use of social research methods to systematically investigate the effectiveness of social intervention programs." They listed five domains of evaluation. An evaluation may employ one or more of the following frames of assessment: *need* for the program (justification), program *design* (appropriateness), *operation and delivery of services* (process), *outcomes and impacts* (effectiveness), and *efficiency*.

Any useful program evaluation must "construct a valid description of program performance in a form that permits incisive comparison with the available criteria." This process starts with identifying and formulating questions that the evaluation study will seek to address. Understanding the social problems and *needs* underlying a program will help formulate questions, as will assessing the program's *design*. The authors noted that this high standard cannot always be met as all evaluation studies have constraints of time, money, and data availability. The importance and characteristics of useful performance information recording are described in detail in a report to Congress (U.S. Government Accountability Office June 2012).

Rossi et al. (2004) elaborated that assessing a program's *process* involves answering questions about who is receiving services, how many, and whether it is equitable; how smooth is the administration; is the program in compliance with applicable standards and rules; are participants satisfied with various elements of the program; and others.

Assessment of the program's *impacts* can be complicated; effects must be compared with what would have happened in the absence of the program, accounting for natural changes in the indicators. The authors of an evaluation of effectiveness of state wildlife grants list the following criteria for selecting effectiveness measures: linked (related to elements in a theory of how the program is *supposed* to affect outcomes); measurable; precise; consistent; sensitive (to changes on the ground); overarching (able to be measured throughout the life of the program); and achievable (not too tedious to collect necessary data) (Association of Fish and Wildlife Agencies April 2011). According to Rossi et al. (2004), randomized field experiments comprise the most reliable form of impact assessment but are often not possible.

Measuring *efficiency* is best accomplished through benefit-cost analysis. A complete benefit-cost analysis will include opportunity cost, secondary and distributional effects, and valuation of non-market

benefits; where these are difficult or impossible to measure, cost-effectiveness analysis may be preferable.

Mendes (2006) presented a rigorous framework for assessing the appropriateness of a program's *design* on the basis of implementation analysis. He applied it to Portugal's Forest Action Plan. The author focused on three types of "implementation constraints," which can, by design, render a program ineffective or inefficient. There are three types: feasibility, individual rationality, and incentive-compatible constraints. Where there are feasibility constraints, funds or labor may be insufficient. Individual rationality constraints will prevent individuals from wanting to join the program; there has to be a good reason for them to participate. The absence of incentive-compatible constraints means the program's incentive structure drives participants to act according to the program's goals. The author suggested that where there is information asymmetry and private, fragmented land, individual rationality and incentive-compatible constraints are more insidious.

A program that fulfills all three constraints is called "controllable." The author cited "Tinbergen's rule," which states that where there are specific quantitative targets for a program, there needs to be an equal or greater number of concrete, specific and controllable policy instruments to deal with them; otherwise there will be failures.

Mendes (2006) outlined several hypothetical features of controllable programs. Participation throughout the policy process by stakeholders improves knowledge of feasibility and individual rationality constraints. Inter-sectorial cooperation will help reduce constraints associated with redundancy. Adaptiveness throughout the policy process will allow for an evolving knowledge of constraints to be incorporated. Decentralization of the program may help to meet all three kinds of constraints; delegation may help with feasibility constraints but may hurt the other two.

The author also outlined four basic criteria commonly used for evaluating outcomes of forestry programs: efficiency, distributional equity, sustainability of forest management (international standards), and whether or not the program has the internationally standardized attributes of a good national forest program. Distributional equity measures test for micro- and macro-decoupling, wherein a few bear all the costs for the many or the many bear all the costs for a few. The last two criteria are defined standards.

It is within this framework of program evaluation presented by Rossi et al. (2004) and demonstrated by Mendes (2006) that past evaluations of FSP and other forestry incentive programs are reviewed here.

2.2 Previous evaluations of the Forest Stewardship Program

2.2.1 Evaluations at the federal level

There have been two national level evaluations of the Forest Stewardship Program. Esseks and Moorhouse (2005) conducted an evaluation very similar to that of Esseks and Moulton (2000). They both used phone and mail survey instruments as the central evaluative tool; most of the questions were identical, with the later study adding a few additional questions. Therefore, the two studies are discussed together here.

Esseks and Moorhouse (2005) conducted phone and mail surveys of 1,281 FSP participants with management plans written between 1997 and 2004. They sampled, according to the number of participants enrolled, from four regions: Pacific, Mountain/Plains, Southern, and Northern. They achieved respective cooperation rates of 72, 80, 52, and 67% for each region. Esseks and Moulton (2000) surveyed 1,238 participants from the same regions and achieved respective response rates percentages of 63, 71, 66, and 76%.

Esseks and Moorhouse (2005) addressed several "intermediate outcome" questions as measures of program effectiveness. Results from these questions follow. The authors found that 95% of respondents had stayed in the program (92% for the previous study). The regional dropout rates were similar.

An important outcome question was whether or not the landowners spent enough time on their land to manage progress toward their management plans' objectives. The authors found that 69% of respondents lived on the land at least one month per year, compared to 61% in the previous study. Another outcome question was whether or not the participating owners were the principal decision-makers for the land. Ninety-five percent of respondents were found to be either the principal or co-decision maker (with spouse). Esseks and Moulton (2000) found that number to be 94%. Finally, 73% of respondents had looked at their management plans at least once over the past year, compared to 69% in the previous study. This is an important outcome question because the degree to which landowners consult their plans must in part represent their commitment to following its recommendations.

Both studies included some basic implementation success measures to further investigate program effectiveness. Authors of the more recent study found that 87% of respondents had started implementing their management plans (84% for the previous study). They found that 74% of respondents were actively pursuing at least two management objectives; that number was 49% for at least three objectives (55 and 31% respectively for the previous study). Both studies reported that 69% of respondents had spent money on plan implementation that would not be reimbursed. Average expenditure increased from $756 in the first study to $996 in the later study.

The authors of the more recent study conducted a logistic analysis to test for relationships between landowner management behaviors (viewed as indications of FSP "success") and independent variables relating to the type of assistance and landowner characteristics. Four binary-dependent variables were used to measure landowner behaviors: the landowner has started to carry out the plan; applied recommended activities to at least two management objectives; done so for at least three objectives; and spent at least $1000 on plan implementation that would not be reimbursed. Independent variables included time elapsed since receipt of plan, duration of ownership, frequency of visitation, number of acres in plan, frequency of plan consultation, proportion of total owned acres enrolled in the plan, receipt of follow-up technical assistance/cost-share money, pre-FSP receipt of professionally written plan, whether the landowner previously had an FSP plan, occupation, age, gender, and formal education. Results indicated that receipt of technical assistance/cost share money was the only significant and positive factor for all four responses. Frequently visiting or living on the land, pre-FSP management plan, and higher formal education were also significant and positive for two or more dependent variables.

Analyses in both studies indicated that receipt of follow-up technical assistance made respondents more likely to engage in various desirable management practices. The same was true of cost-sharing, though the authors of the second study noted that cost-sharing funds declined considerably since the first study was conducted.

In a more basic analysis of landowner behavior, Esseks and Moulton (2000) found that receipt of cost-sharing assistance was associated with higher spending by the landowner and that technical assistance was not significant.

The authors of both studies examined possible changes in landowner management behavior that may have resulted from FSP. Both studies examined three kinds of behavioral changes: applying new (to the landowner) practices; using new management information sources; and being more likely to pursue certain management objectives than before their FSP interaction. Fifty-four percent of respondents to the 2005 survey reported applying at least one management activity that was new to them (55% for the 2000 study). Thirty-one percent of respondents (30% previously) were employing new activities that supported two or more management objectives. The later survey included a few questions not in the first. Twenty percent of respondents paid money for information on forest management only after getting involved with FSP, indicating another positive behavioral change. Respondents were asked to indicate how likely they were to continue seeking professional advice over the following two years; 64% said very or moderately likely while 36% were very or moderately likely to pay for such advice.

In a cursory consideration of the program's equity, both studies noted with concern that participants were nearly all white and were better educated than landowners in general. Both surveys included an analysis of respondents' attitudes toward certain elements of the program and overall, finding high levels of satisfaction.

2.2.2 Evaluations at regional and state levels

There are several other evaluations of FSP at state and regional levels. Lorenzo et al. (1996) evaluated FSP and the Stewardship Incentive Program (SIP) in Louisiana. The authors assessed the State Stewardship Committee's goal of enrolling 300 non-industrial private forest (NIPF) landowners within the first five years; 591 plans had been drawn up covering over 61,000 acres by 1995. The authors provided an overview of SIP in terms of number of cost-sharing applications, approvals, and actual money dispersed. Using input from forestry experts and data from a 1995 survey of all Louisiana FSP participants (39% response rate), the authors utilized a method apparently unique in the forestry program evaluation literature to identify and rank landowners' objectives and motivations. With lists of pairwise rankings from the survey, they combined the Delphi method and analytical hierarchy processes to weight and then rank management objectives. At the top of the priority list were wildlife habitat and income. The authors also established a series of significant correlations between objectives and probability of using SIP cost-sharing.

Egan et al. (2001) evaluated the West Virginia Forest Stewardship Program. They conducted a mail survey of 1,759 landowners (total contacted) enrolled in the program. With a response rate of 64%, the authors tested for associations between landowner characteristics (income, acres owned, number of

years owned and was activity recommended in plan) and implementation of four different types of management activities: timber harvest, stand improvement, grapevine removal, and wildlife habitat. For all four response variables, the only significant factor was whether or not the activity was recommended —which was positively correlated.

The authors found implementation rates of all four types of management to be much lower than the national average. The implementation rate was 60% for grapevine removal, 48% for wildlife habitat, and 45% for both timber harvesting and stand improvement. The majority of respondents indicated high levels of satisfaction with plans, with the associated foresters, with FSP generally, and with the implementation of plans. Based on responses of those not satisfied with the program, the authors suggested that more funding for visits by a forester and for assistance with non-timber management practices was needed to improve the program.

Jennings and McGill (2005) evaluated the same program five years later in a similar fashion. This study examined 1,672 FSP participants with a response rate of 63%. Respondents ranked management objectives, revealing the top three to be improvement of timber production, wildlife habitat, and soil erosion prevention.

Estimating a logistic regression similar to that of Egan et al. (2001), the authors expanded response variables representing implementation of different types of management practices from four to ten. They augmented the list of independent variables to include levels of satisfaction with elements of the program, participation in similar programs, motivation for enrollment in FSP, and more demographic variables. Results showed that, as in the previous study, activity recommended in plan was significant and positive for eight of the ten response variables. The year plan the was written was negative for seven response variables; certainty of recommendation positive for six; and enrolled in other programs positive for five. A few other factors were significant for one or two response variables.

The authors found that since the earlier study of West Virginia's FSP, implementation rates of management practices had increased substantially. The ten different practices had rates between 78 and 47%, with the implementation for wildlife habitat (78%) very close to the national average of 81% (Esseks and Moorhouse 2005). Though the gap lessened, all implementation rates still lagged behind national averages. The authors suggested that to improve the program, efforts should be made to raise awareness about FSP and similar programs, since there appeared to be a multiplier effect associated with involvement in related programs. They also implicate insubstantial cost-sharing funds.

Baughman and Updegraff (2002) evaluated FSP for the North Central region (minus Missouri)[4]. Specifically they determined the impacts FSP plans had on actual forest management, elicited levels of landowner satisfaction and identified areas for improvement. They sent out 2,900 mail surveys to randomly selected FSP participants, recovering 1,782 useful responses.

[4] Illinois, Indiana, Iowa, Michigan, Minnesota, and Wisconsin.

The authors determined that, on average, landowners accomplished much more after receiving FSP plans than before: 181% more acres of timber stand improvement; 125% more acres of timber harvested; 172% more acres of wildlife habitat planted; 197% more acres of wildlife habitat improved; 171% more acres of endangered species habitat improved; 197% more wetland and pond improvement projects; 120% more acres of wind breaks planted; 116% more acres of herbaceous ground cover in fields planted; 176% more acres of riparian vegetation; and 137% more yards of roads and trails built. On the other hand, planting trees for timber, fencing off woodlands from livestock, and fencing off riparian areas decreased.

In ascertaining landowner satisfaction with the program, the authors found that 53% of respondents recommended FSP to a neighbor or friend. An additional 18% had not thought neighbors and friends would benefit. A majority thought the plans incorporated their objectives well and were clearly written.

Landowners were asked to rank particular types of incentives. In descending order of preference, incentives were ranked as follows: property tax reductions, income tax deductions, free management assistance and educational materials. Least preferred incentive types included cost-sharing, higher product prices, conservation easements, annual rental payments, and loans.

The survey also elicited ratings of particular sources of technical assistance. In descending order, landowners preferred field tours, publications/books/newsletters, videos, conferences/seminars/workshops, newspaper/magazine articles, television outreach, correspondence courses, Internet, CDs, and radio outreach. All preferences differed significantly by ownership size and owner motivation. Larger landowners preferred tax deductions and cost-sharing over information and technical assistance. This group was also more likely to own land for financial reasons, whereas smaller landowners tended to have recreational and aesthetic reasons. Finally, the authors uncovered interactions between motivation and size in terms of type of management activities undertaken.

The authors identified areas where the program could be improved. Based on preferences revealed in the survey, they determined that organization and format of management plans should be improved; so should management options and maps. More cost-sharing, professional technical assistance, and education would improve the program's appeal.

Most recently, Holzmueller et al. (2012) examined the Spatial Analysis Program (SAP) within Illinois' FSP. Forest policy in that state dictates that the primary objective for FSP plans in Illinois should be timber production. The authors spatially analyzed seven counties in southern Illinois to determine whether or not the SAP method of identifying high-priority areas effectively captures land with highest timber productivity potential. They found evidence that SAP prioritization does not correspond to level of timber productivity, and subsequently suggested an improved method.

The few FSP evaluations at the federal, regional, and state levels have revealed high levels of satisfaction and rates of plan implementation among responding participants[5]. Some have demonstrated a need for more cost-sharing funds, professional technical assistance, and landowner visits from foresters. The federal evaluations in particular indicated low drop-out rates, majorities pursuing multiple management objectives, and majorities applying management activities that were new to them. They also revealed a bias with respect to participant demographics toward white and better-educated individuals.

In short, these evaluations generally suggested positive results but were not comprehensive in their evaluative approaches. They have tended to focus solely on FSP participants, assessing management plan implementation rates and landowner opinions of the program as effectiveness measures. Some logistic regressions were estimated to investigate factors associated with plan implementation. There was no comparison to non-participants, discussion of design appropriateness, efficiency measures, or broader evaluation of program performance in a national context.

2.3 Evaluations of other forestry management programs

While FSP-specific evaluations have been quite limited in their approaches, the broader forestry program evaluation literature is more expansive in terms of evaluative measures used. Following is a summary of such studies, organized by type of evaluation.

2.3.1 A landmark evaluation

The evaluation conducted by Race and Curtis (1996) of Australia's Farm Forestry Program (FFP) appears to be the most thorough study of its kind. Therefore a detailed summary of the study's approach and findings follows. The FFP was designed to improve Australia's domestic wood products market, raise the skills base of landowners, and stimulate economic development regionally through promotion of commercial wood production on otherwise non-forested agricultural land. The program was supposed to assist in the development of regional demonstrations of farm forestry, execute extension and training activities, and create and improve linkages between farming communities and the wood products industry.

Evaluative instruments included consideration of the appropriateness of FFP design in light of alternatives; assessment of the program's achievements to measure effectiveness; and cost-benefit analysis to measure efficiency. The evaluation was segmented into three phases: a "desk-top review" of the 26 separate research and community development projects; a review of selected regional projects; and interviews with 85 program participants including farmers, industry, and related government staff.

The authors found that the program's design was appropriate given the objectives and assumptions underlying the FFP. Unfortunately, they did not report findings from the cost-benefit analysis in the available journal article. Each project was analyzed separately along the following effectiveness criteria: impacts on management practices of landholders and on industry and government stakeholders; breadth of project's findings; contribution to raising awareness; contribution to knowledge and training

[5] The possibility that responding participants would be more satisfied with the program than non-responding participants was not addressed in these evaluations.

of landowners; contribution to enhancing linkages between stakeholders; overall performance compared to objectives; and administrative performance. A summary number indicating overall quality between one and five (worst and best) was assigned to each project. The authors reported percentages of projects given a three or higher rating within each criterion.

Results of the effectiveness measures were mixed. All 26 projects did establish links between farm forestry stakeholders and the particular project. While no specific goals in terms of numbers were set by the original FFP, the low amount of hectares (500) of tree plantings was far below where it needed to be for a viable timber market. The authors determined that more than half the projects focused on raising awareness without a systematic approach to training. The authors found inadequate monitoring, evaluation, and dissemination of findings in many of the projects.

The authors noted an important finding in the interviews: the major barriers to the project's goals were simply economic. These barriers included such problems as the irregularity of income from farm forestry. The authors suggested that to overcome these and previously mentioned obstacles, funding needed to be better coordinated, with linkages among the various federal agencies involved in similar programs.

2.3.2 Assessments of effectiveness

The majority of evaluative studies have limited their approach to measuring effectiveness. Ellefson and Risbrudt (1987) evaluated the Forestry Incentive Program in the simplest possible terms. They asked a sample of landowners (representing 9% of total acres affected by the program) whether or not their land was still under treatment seven years after initial participation; responses indicated that 96.5% of acres were.

Shockley and Martin (2000) evaluated and compared three different forestry incentive programs in eight Wisconsin counties using data from the state's Department of Natural Resources and input from foresters familiar with the individual cases. Programs were rated according to the percentage of enrollees who had finished or started implementing their management plans. The program with the highest percentage was tax based.

Brockett et al. (2003) evaluated the effectiveness of a tax-based forestry incentive program in one county in Tennessee. The authors estimated physical impacts of the program under different assumptions about preferred land selling prices among landowners. They posited that land conversion (what the program attempted to avoid) occurs when the value of conversion use exceeds the value of present use, plus a "reservation premium" representing any non-monetary benefits the landowner enjoys from having the land, plus any back-tax penalties associated with the conversion. The effectiveness measure, then, was the hypothetical difference with and without the program between estimated rates of land conversion given a reservation premium. Analyzing three different premiums, the authors found that the program most likely saved very little land from conversion because conversion rates would have been roughly the same without it.

Surprisingly, the authors found almost no significant differences between participants and non-participants. Intent to change land use in the next ten years was actually higher for participants. The authors concluded that the program simply gave tax breaks to a group that did not behave differently.

Jacobson et al. (2009) relied on input from forestry professionals to evaluate the effectiveness of a comprehensive list of state and federal programs (including FSP) for each of the 20 Northern states[6]. Officials were asked to assess forest owners' awareness of each program, its appeal among landowners, how effectively it encouraged sustainable forestry and enabled owners to meet management objectives, and percentage of program practices that remained in place and kept forest acres enrolled over time. FSP was one of the higher-ranking programs by all considerations. The officials surveyed believed that, in light of low levels of enrollment in any program, all programs needed higher visibility and availability. Further, they indicated that programs needed to establish and increase long-term consistency in funding and to implement simpler application and approval processes.

2.3.3 Assessments of efficiency

Several forestry program evaluations included benefit-cost analysis as a measure of efficiency. While Skok and Gregersen (1975) warned early on that rigorous evaluation of forestry programs' efficiency was needed, relatively few such analyses have employed corresponding measures. That may be because of the difficulty and expense associated with valuation of program benefits (Henly, Ellefson et al. 1988). In a review of forestry and conservation program evaluations, Gaddis (1996) pointed out the problematic lack of non-market and secondary benefit valuation. Cubbage et al. (1996) reviewed evaluation studies of state forestry technical assistance programs. He noted prophetically that, in future evaluations of FSP, benefit valuation would be much more difficult than for other programs because of FSP's broad scope of management objectives. Indeed, valuation of non-market benefits was beyond the scope of every evaluation study reviewed here.

As noted by Bisang and Zimmermann (2006), any benefit-cost analysis must begin by assessing the program's effectiveness; physical effects must be measured. Therefore all of the following efficiency-based evaluations include some type of estimation of program effectiveness. Some authors used survey data to that end, trusting a correspondence between what landowners say and do. Yet readers must be cautioned that at least one study (Egan and Jones 1993) has demonstrated that such trust is not always warranted at the individual level. Other authors used data collected by governments or conducted "cruises" of sampled plots to measure physical effects themselves.

Risbrudt et al. (1983) estimated net benefits of the Forestry Incentive Program, authorized by Congress in 1973 as a cost-sharing incentive designed to stimulate timber production. The authors simply compared estimated timber revenue increases resulting from the program to the private and federal expenditures, finding that returns should exceed federal expenditures 2.5 times over. In evaluating Minnesota's Private Forest Management Program, Henly et al. (1990) estimated landowner, state, federal, and public net benefits. They considered only a very small matched sample of recipients and

[6] Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin

non-recipients of aspen timber sale assistance. Based on taxes, expenditures, and returns to landowners in the form of higher stumpage prices, the authors found positive net benefits to the program at the federal level and to the landowner. Net benefits to the state and to society as a whole were negative.

MacFarlane and Zundel (1995) conducted the most thorough analysis of this type in their evaluation of several New Brunswick "private woodland silviculture" cost-sharing programs. The authors estimated direct, indirect, and induced economic impacts of the programs. These impacts include employment in the logging industry (direct), supplies bought from other sectors by the logging industry (indirect), and employee wages going into the local economy (induced). The impacts thusly analyzed resulted specifically from the dollars spent by program participants. All participants with the exception of government employees, including landowners and members of the logging industry, were considered.

The authors used detailed data from the Management Information System and a survey of participants to classify expenditures by type of participant. Their sample accounted for 60% of total estimated relevant expenditures. The New Brunswick Statistics Agency provided an input/output simulation model based on commodity vectors for each type of participant. The authors found that all three types of impacts were likely net positive ("likely" because considerations like opportunity cost of labor and capital could not be taken into account).

2.3.4 Assessments of equity

In a review of forestry incentive program evaluations, Gaddis (1996) discussed several studies that included equity analyses. The author observed that taxpayers of course bear the cost of these programs. Distributional equity of a program's benefits and costs can be analyzed in regional or income terms. A few studies have looked at dispersion of program benefits in terms of acres involved by region. Others have considered participation disparities by income.

In addition to a tax-incentive program's effectiveness, Brockett et al. (2003) evaluated the equity of it in one county in Tennessee. They analyzed the concentration of land and tax benefits among participants and taxpayers. They found a minority of those enrolled to be enjoying the majority of tax benefits. Many of these beneficiaries were absentee owners. The county was subsidizing them without gaining much in return, since only a small percentage of the county's land was enrolled in the program.

2.4 Modeling probability of participation

Something often not discussed in the evaluation literature is that modeling landowners' likelihood to enroll in a forestry incentive program can illuminate its strengths and weaknesses. Understanding what types of landowners are more likely to enroll in certain types of programs and why is a critical prerequisite to successful program design. Presented below are a handful of studies that emphasize the need for any forestry program to incorporate potential participants' heterogeneous motivations. Following that is a summary of studies that have sampled both participants and non-participants to test for differences between the groups and/or model the likelihood of participating in a program.

2.4.1 Landowner motivations are important

Worrell and Irland (1975) articulated various obstacles to the expansion of forestry incentive programs, which up to that point had focused on timber harvesting. They observed that many landowners were

not interested in timber harvesting and/or saw it as incompatible with their other non-income management objectives. Indeed, many studies have since demonstrated this through survey analysis and suggested that forestry incentive programs should focus on non-timber management objectives and/or emphasize the compatibility of timber harvesting with many alternative objectives (Young, Reichenbach et al. 1985; Greene and Blatner 1986; Mills, Hoover et al. 1996; Baughman 2002; Erickson, Ryan et al. 2002; Bovee and Holley 2003; Belin, Kittredge et al. 2005; Greene, Daniels et al. 2005).

Other studies show that motivations for owning land can vary regionally. For example, related survey analyses suggest that Southern landowners are more likely to have income-based objectives (Melfi, Straka et al. 1997; Rasamoelina, Johnson et al. 2010; Rossi, Carter et al. 2010). Greene et al. (2005) discovered through focus groups and interviews with foresters that financial return on the land was not a priority among landowners except for in the South. Additionally, Williams et al. (1996) presented evidence from focus groups that interest in harvesting timber varied regionally within the state of Arkansas.

In a survey of Utah landowners, Salmon et al. (2006) used cluster analysis to divide respondents into three "audience-segmented" groups by management objectives. They offered distinct outreach strategies for each, based on modeling the likelihood that members of each group had certain characteristics. They suggested that any forestry incentive program should incorporate such flexibility and targeted outreach.

2.4.2 Participants versus non-participants

A rich body of literature, including both forestry program evaluations and non-evaluative analyses of landowner participation, displays a limited consensus on how landowner characteristics and program attributes are associated with participation in forestry incentive programs. These results are generally obtained through logistic regression of survey data, though some studies stop at a bivariate analysis. Results are discussed here in terms of factors associated with participation in a generic forestry assistance program (cost-sharing, technical assistance, or tax-based) unless otherwise specified for ease of presentation.

Bell et al. (1994) found that landowners with more than $50,000 in income, unmanaged land, and experience with other forestry programs were more likely to indicate in a survey that they would participate in Tennessee's FSP. The income effect was substantiated by Mills et al. (1996), Bovee and Holley (2003), Rasamoelina et al. (2010), and Fortney et al. (2011). Rossi et al. (2010) found it to be insignificant. Other studies have found a positive association between membership in forest ownership or conservation groups and participation, similar to the finding of Bell et al. (1994) regarding experience with other forestry programs (Mills, Hoover et al. 1996; Rossi, Carter et al. 2010).

Mills et al. (1996) found additionally that commercial reasons for ownership and having government sources of information were significant and positive predictors of participation. In comparing participants to non-participants, they discovered a positive and significant correlation between size of parcel and participation. Similar evidence was found for the effect of government sources of information by Kaetzel et al. (2009) and Rasamoelina et al. (2010). Rasamoelina et al. (2010) found an association

between participation and financial motivations for owning land. The size effect was supported by Mayfield et al. (2006), Kilgore et al. (2008), Kaetzel et al. (2009), and Rossi et al. (2010).

Within an innovation adoption theoretical framework, Graesser and Force (1996) revealed a positive association between participation in Idaho's FSP and shorter ownership tenure. They also found that participants tended to spend less time on their land. Bovee and Holley (2003), in a comparison of those with and without written management plans, found evidence that land tenure had the opposite effect. Further, they found that the distance landowners live from the land was positive and significant. Similarly, Fortney et al. (2011) found a positive association between absentee ownership and participation.

Bovee and Holley (2003) demonstrated that those with written management plans were better educated and lived further from the land than those without. The education effect was corroborated by Mills et al. (1996) and Belin et al. (2005), but found to be insignificant by Rossi et al. (2010). It should be noted that Belin et al. (2005) were modeling positive attitudes toward ecosystem-based management and not participation in a program. These authors' results indicated that living in lower population density areas and being enrolled in a current-use tax program are associated with a more positive attitude.

Beach, et al. (2005) conducted a meta-analysis of studies that investigated NIPF landowner participation in timber harvesting, reforestation, and silvicultural treatment. To the extent that factors driving participation in these activities also drive participation in related forestry programs, the results are relevant to the current study. In general, types of variables that were significant (and corresponding frequencies of significance) included policy variables (87%), plot/resource conditions (79%), landowner characteristics (77%), and market conditions (73%). The authors found that cost-sharing, technical assistance, and tax incentives were frequently significant and positive policy factors of landowner participation. The same was true for the landowners' plot size, income, and education. Age did not have a consistent sign. Market factors were significant relatively infrequently.

The results summarized above should be viewed with caution regarding their applicability to the current study. Only the analyses of Bell et al. (1994) and Graesser and Force (1996) were FSP-specific. As observed by Mills et al. (1996) and Rasamoelina et al. (2010), effects of landowner characteristics and other variables can differ according to the type of forestry assistance program. The literature discussed here simply offers an idea of how likelihood to participate in FSP might vary by landowner characteristics.

2.5 Evaluations in other fields

A brief review of public program evaluations in the fields of education, medicine, and agriculture yielded no particularly useful findings. One common theme, as in the forestry program evaluation literature, is the use of surveys to gather opinions and attitudes of participants. Generally, though, the specific evaluative instruments are tailored to the type of program and not applicable to forestry programs.

2.6 Summary

In summary, there are a few evaluations of FSP at the national, regional, and state levels. These have tended to focus on measures of effectiveness and participant opinions. There are many more evaluations of forestry incentive programs in general. This literature includes a variety of appropriateness, process, effectiveness, and efficiency considerations. A number of studies have simply compared participants to non-participants and/or modeled the probability of participation in forestry programs. The evaluation literature in other fields appears to have limited applicability.

3 Examination of Socio-Demographic Characteristics of Landowners Who Receive Forestry Practice Assistance

To provide an understanding of the population targeted by FSP, this chapter identifies socio-demographic characteristics of family forest owners who have received types of landowner assistance similar to that provided by FSP and compares them to the same characteristics of those who have not received those types of landowner assistance. The data used to develop these characterizations came from the USDA Forest Service, National Woodland Owner Survey (NWOS; Butler 2008). Due to limitations in the NWOS dataset, this analysis focuses on family forest owners, not NIPF owners. In particular, this chapter identifies potential differences and similarities between assisted and non-assisted family forest owners using socio-demographic data derived from the 2006 NWOS data.

While the purpose of NWOS is to better understand the attitudes and behaviors of the nation's private forest landowners to better inform private forest land policies and programs, the survey also collects landowner demographic and socioeconomic information (USDA Forest Service 2008). In particular, the survey collects information on landowner age, primary residence, income, ethnicity, gender, education; how the land was obtained (e.g., purchased, inherited, gifted); whether ownership is single or multiple parcels; and whether the landowner owns a farm near their woodland. An examination of the potential differences and similarities between assisted landowner attitudes and behaviors using NWOS data is the subject of Chapter 6.

Although the NWOS data do not explicitly identify FSP participants, we can identify landowners who engage in management behaviors similar to those promoted by FSP. For purposes of this chapter, we refer to these individuals as assisted landowners. The NWOS survey contains information that identifies family forest owners who have an active forest management plan, have received cost-share assistance or have received any type of management advice. Family forest owners holding between 10 and 10,000 acres of forest land and receiving any of these three forms of assistance are taken to be assisted landowners; family forest owners with 10 to 10,000 acres of forest land who did not receive at least one of these types of assistance are taken to be non-assisted landowners. The assumption of this analysis is that socio-demographic characteristics of assisted landowners are suggestive of socio-demographic characteristics of FSP participants.

Statistical tests of differences in demographic and socioeconomic characteristics between proportions of assisted landowners and non-assisted landowners show statistically significant differences for two of the socio-demographic variables (see Table 3-1).[7] Specifically:

[7] We calculate the proportion of family forest owners that satisfy assisted landowners criteria defined above as a ratio of the estimated number of assisted landowners to the estimated number of family forest owners. Specifically, we use the Hansen-Hurwitz estimator of total to obtain unbiased estimates of total owners with given characteristics, along with the associated variances for all owners holding between 10 and 10,000 acres. To estimate the variance of this ratio estimate, we employ Taylor series

- Income: Twenty-four percent of assisted landowners have an annual household income of $100k or more. This is significantly different from the 17% of non-assisted landowners who have an annual income of $100k or more.
- Education: Seventy-five percent of assisted landowners have a college education (i.e., associate degree or higher). This is significantly different from the 58% of non-assisted landowners who have a college education.

Many other demographic and socioeconomic characteristics show no statistical differences between proportions of assisted landowners and non-assisted landowners (Table 3-1): age, whether primary residence is located within one mile of forest land, ethnicity, gender, how they obtained the forest land, single versus multiple parcel ownership, and whether they own a farm near forest land.

Table 3-1. Hypothesis tests of differences between proportions of assisted landowners and non-assisted landowners for selected attributes when assisted landowners are defined as having a management plan, receiving cost-share assistance or advice or any combination thereof.

Characteristic	Assisted Landowner[a]	Non-assisted Landowner[a]
Age (65 years or older)	0.347	0.404
Primary residence (lives within 1 mile of forest land)	0.627	0.670
Income (annual household income $100k or more)	0.236***	0.166***
Ethnicity (white = 1, non-white = 0)	0.994	0.964
Gender (male = 1, female =0)	0.832	0.828
College education (associate degree or higher)	0.751***	0.582***
Purchased land (versus inherited, gifted, or other)	0.784	0.798
Single parcel ownership	0.467	0.549
Owns a farm near woodland	0.378	0.362

[a] Significance is indicated by the following: *= $p \leq 0.10$, ** =$p \leq 0.05$, ***= $p \leq 0.01$

These findings suggest that forestry practice assistance is not preferentially serving any demographic other than higher income, educated households. If these results are suggestive of the reach of FSP assistance and if FSP is trying to target a certain socio-demographic (e.g., minority, female), these data suggest that either FSP may not be succeeding in reaching this target or the sample size of the data reflecting these populations of landowners is too small to make a determination with statistical significance.

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linearization. Using these data, we conduct hypothesis tests of the differences between the proportions of assisted landowners and non-assisted landowners for each socio-demographic characteristic. Specifically, we test the hypothesis that this difference is zero (the proportions are not different) using the Taylor series linearization to estimate the variance of that difference and a Z-test to estimate the probability of a Type I error.

4 Performance Measurement Accountability System (PMAS) Database

4.1 Introduction

This chapter summarizes changes in Forest Stewardship Program (FSP) implementation and accomplishments over time and across different spatial scales using data collected in the FSP Performance Measurements Accountability System (PMAS) database. For the past 15 years, FSP accomplishments have been reported in this database. The amount of information collected has varied over this time period, with a trend toward a smaller reporting burden, i.e., fewer data elements collected for states. States submit tabular data for uploading into PMAS within 30 days of the end of each fiscal year. A subset of the PMAS reporting elements are then used to determine FSP funding allocations for the following fiscal year.

We focus on those PMAS measures that have been consistently collected over the past 5 years (2007–2011) since the goal of this evaluation was to assess recent FSP performance. Over this time frame, the following six variables were consistently collected:

4.1.1 Number of landowners receiving assistance

A landowner known by program staff to have benefited in some significant and lasting way from FSP or Rural Forestry Assistance is defined as one having received assistance. This includes

- landowners who receive individualized and repeated technical assistance and for whom a case file is established and maintained; and
- landowners who have received assistance in the way of practice plans and management plans other than FSP plans.

The following activities are not, however, considered to count toward landowner assistance:

- landowners who only attended a technical or training session without any follow-up
- landowners who were spoken to only once—such as over the phone, with no follow-up contact or later assistance

4.1.2 Number of landowners receiving education

Landowners who have participated in an FSP or a Rural Forestry Assistance-sponsored educational workshop, course, or program designed to further enable them to sustainably manage their forest properties are considered to have received education. Examples of such programs include landowner field days, timber tax seminars, estate planning workshops, silviculture courses, wildlife management seminars, and management plan writing workshops. However, landowners who have attended only program marketing or orientation seminars that provide programmatic and application information are not counted. Videos, newsletters, brochures, publications, or public educational broadcasts or media are also included in this reporting element.

4.1.3 Number of acres under new or revised FSP plans

This metric captures the number of acres covered by new or revised FSP plans that were approved by the state forester or a representative in a given year. A plan revision requires a material change or update in all or part of the plan and field time with the landowner.

4.1.4 Number of acres under new or revised FSP plans in Important Forest Resource Areas (IFRA)

IFRA are the areas that are considered to be of high program potential or priority as identified by the state's Spatial Analysis Project (SAP) assessment or a Statewide Assessment of Forest Resources as required by the 2008 Farm Bill. These areas can be defined as SAP-generated high priority pixels on the landscape, by aggregating high priority pixels and summarizing to create landscape-scale delineation such as a watershed, or delineated using criteria and methodology established in a Statewide Assessment or Resource Strategy. Acres reported as IFRA are to include only those acres that are eligible to receive FSP Assistance or those defined through SAP as Stewardship Capable Lands. States are not to include areas ineligible for FSP assistance such as public land, developed urban centers, and open water. FSP encourages states to target IFRA areas through strategic marketing and education.

4.1.5 Number of new or revised plans

This metric is a tally of new or revised FSP plans that were approved by the state forester or a representative in a given year.

4.1.6 Designated Important Forest Resource Areas acres

This metric is a summation of the total number of identified IFRA acres in a state in a given year.

The following three variables that were collected between 2008 and 2011 were also included in our analysis since they offered valuable insights into acreage under *current* plans as opposed to new and revised plans.

4.1.7 Acres covered in current FSP plans

An FSP plan is considered to be current if it is within the effective period stated within the plan. If no effective period is stated or known, an FSP plan is considered to be current if it has been written, revised, or updated in the past 10 years. An FSP plan that explicitly covers a period of more than 10 years as required by a state-administered program is considered current as long as there is sufficient documentation and monitoring to indicate that it meets all state and federal program requirements during the entire plan period. To provide consistency in national reporting and related funding methodology, states are encouraged to use ten years as a standard effective period for FSP plans. Exceptions based on specific needs and conditions are to be stated within the plan.

4.1.8 Acres in Important Forest Resource Areas covered by current FSP plans

This metric is a tally of the total number of identified IFRA acres in a state that are under current FSP plans in a given year. This metric gives an indication of (1) how well states are doing at placing their IFRA designated acres under plans and (2) in relation to total acres under plans, how well states are doing at targeting IFRA acres and owners.

4.1.9 Total number of acres in Important Forest Resource Areas managed sustainably

This measure has a monitoring component that requires a random sample of plans to be verified for implementation. States conduct site visits to ensure a plan is being implemented. The number of plans that must be checked is determined by a formula, either one that a region calculates or the one provided by FSP program managers. A sample of properties under FSP plans are visited and assessed by state, USFS, or other qualified resource management professionals to verify that current forest conditions are consistent with landowner stewardship objectives and the result of sustainable management, as defined in the landowner's FSP plan. A visit to a property may indicate that some stands or compartments are being managed sustainably as defined by the FSP plan and that others are not. Visits to selected properties will yield a percentage of total acres visited that are being managed sustainably as defined by approved FSP plans. This percentage will be used as an indication of overall accomplishment in terms of acres managed. All plans over 1,000 acres need to be visited at least once each 5-year cycle.

FSP monitoring is a requirement that all states adopted in FY2008. This information is being used to better describe the impact of FSP to Congress and Office of Management and Budget (OMB). In addition, the results factor into a revised FSP allocation strategy that went into effect in FY2011. This metric is a means of assessing how well or to what degree plans are being put into action. Thus, it is trying to get at a measure of FSP outcome and get beyond just counting the number of plans.

4.2 Role of PMAS metrics in state-level FSP allocations

A relationship exists between these PMAS performance metrics and a state's FSP funding level. A state's annual FSP allocation is determined, in part, by a weighted equation that takes into account FSP performance from the previous year as measured by total acres covered by current FSP plans, the number of priority or IFRA acres covered by current FSP plans, and the number of priority or IFRA acres under current FSP plans which that have been determined to be managed sustainably, as well as a measure of the state's program potential as measured by the potential total number of non-industrial private forest (NIPF) owners and acres (greater than 10 acres). Thus, while all of the nine metrics outlined above are important indicators of FSP accomplishments, not all are tied to future funding streams.

4.3 Summary of PMAS performance metrics (2007–2011)

The remainder of this chapter describes the analysis of each of the nine PMAS metrics described above. The tables referenced throughout Sections 4.3.1 and 4.3.9 are all located on the CD that is included with this report. The following list summarizes the tables that are provided on the companion CD.

PMAS analysis tables on the CD included with this report

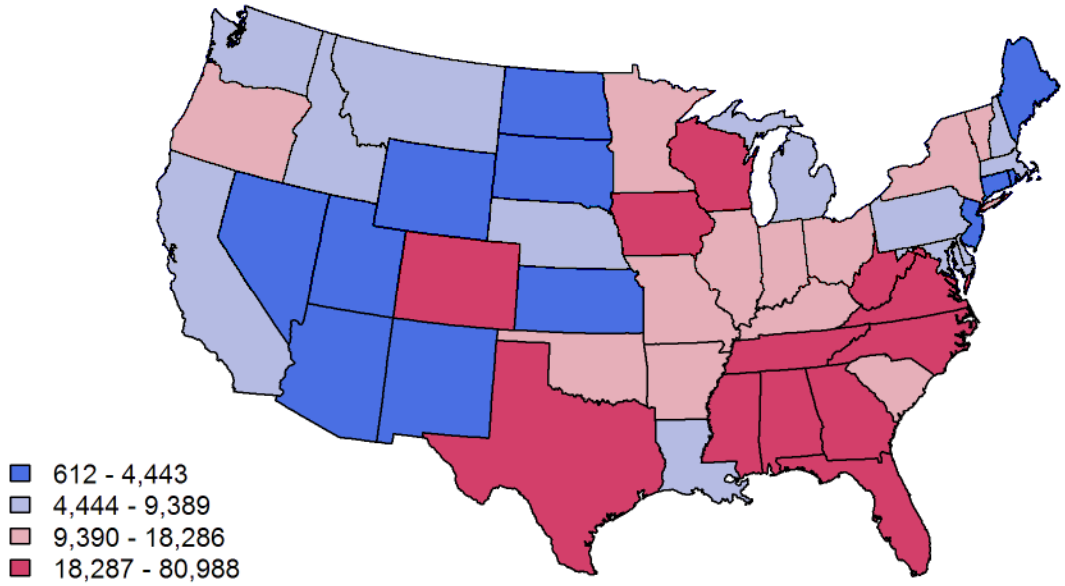
- **Table 4-1 Number of landowners assisted**
- **Table 4-2 Number of landowners educated**
- **Table 4-3 Number of acres in new or revised plans**
- **Table 4-4 Number of Important Forest Resource Area acres in new or revised plans**
- **Table 4-5 Number of new or revised plans (2007–2011)**
- **Table 4-6 Total designated Important Forest Resource Area acres**
- **Table 4-7 Acres in current plans (2008 –2011)**
- **Table 4-8 Important Forest Resource Area acres under current plans (2008–2011)**
- **Table 4-9 Important Forest Resource Area acres under current plans that are managed sustainably**

4.3.1 Number of landowners assisted

Over the evaluation period (2007–2011), 729,734 landowners received assistance through the FSP program. The majority of the landowner assists occurred in the Southern region (57%) and the Eastern region (31%), with comparatively fewer assists occurring in the Western sections of the country (Table 4-1 and Map 4-1).[8] The average number of landowners assisted nationally per year during this period was 145,947, with a range of 61 landowners in the Alaska region to 45,736 in the Eastern region.

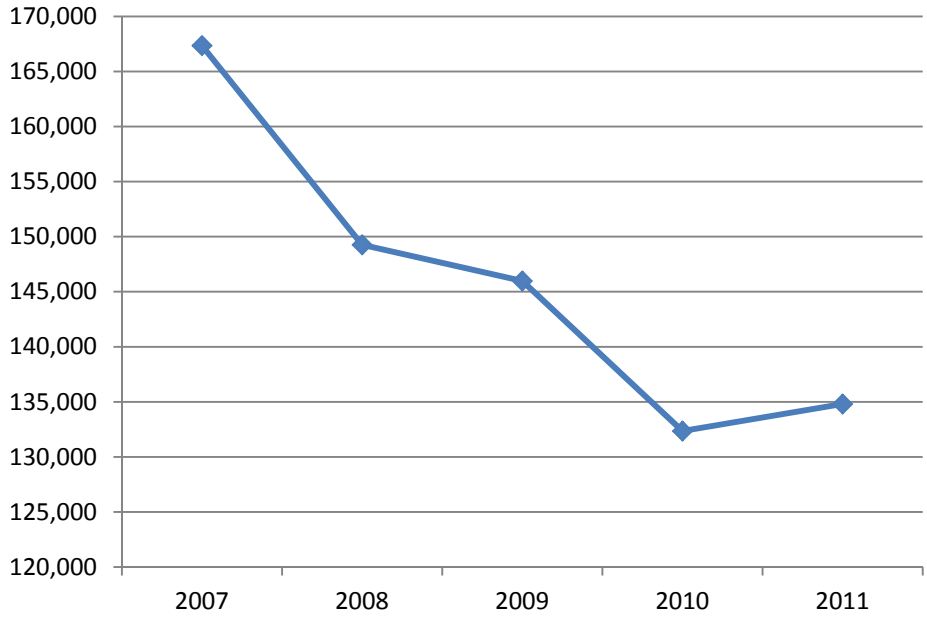
[8] Throughout this chapter, we discuss PMAS statistics in the various Forest Service regions: Alaska, International Institute of Tropical Forestry (IITF) consisting of the U.S. Virgin Islands and Puerto Rico, Intermountain, Eastern, Northern, Pacific Northwest, Pacific Southwest, Rocky Mountain, Southern, and Southwestern regions. Detail on the states in these regions is found in Table 4-1, located on the CD that is included with this project report.

Map 4-1. Total number of landowners assisted between 2007 and 2011.

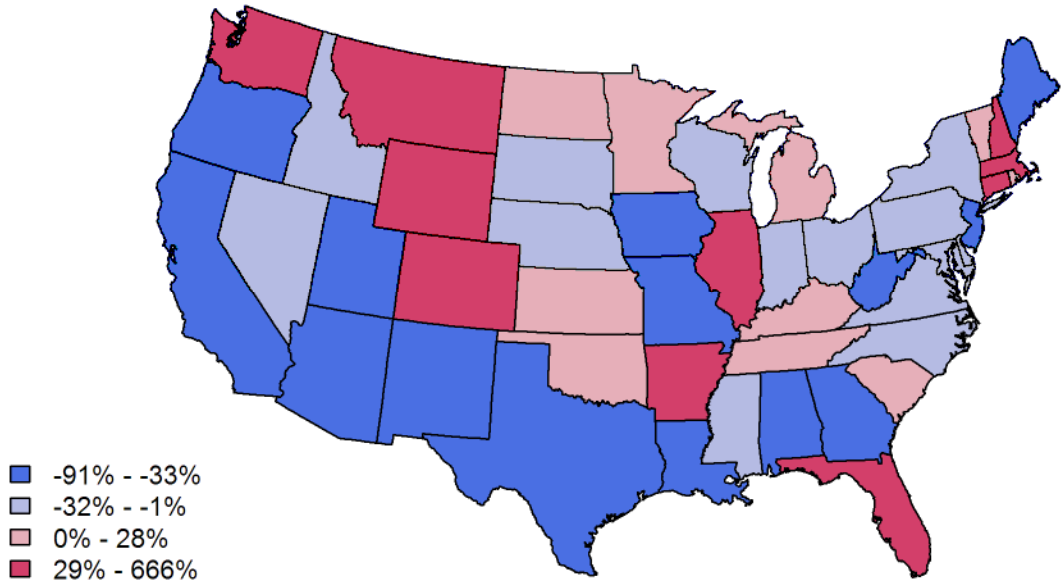


Nationally, 19.5% fewer landowner assists occurred in 2011 as compared to 2007 (Figure 4-1 and Table 4-1). As Table 4-1 illustrates, six of the regions reported a decline in the number of landowner assists during this time frame (Southwest, Southern, Pacific Southwest, Pacific Northwest, Eastern, and Intermountain regions), with the Southwest region experiencing the largest percentage decline (71%). Four regions reported increases in assists during this time frame: Rocky Mountain, Northern, IITF, and Alaska regions, with IITF reporting the greatest percentage increase at 26%. At the state-level, 33 states reported a decline in assists, 25 with an increase in assists, and one state remained at the same level. Thus, although the national statistics indicate a decline in assists over the five years, high variability was observed year-to-year, region-to-region, and state-to-state over the evaluation period.

Figure 4-1. Total number of landowners receiving FSP assistance (2007–2011).



Map 4-2. Percent change in the number of landowners assisted in 2011 versus 2007.



In an effort to provide more direct comparability among states and regions, a normalization of the number of landowners assisted was computed by dividing the number of landowners assisted in a state (or region) by the total number of NIPF landowners in that state (or region) owning at least 10 forested acres (Butler 2008). We utilized the 10-acre threshold because the FSP program has a minimum acreage requirement of 10 acres in many states. With this normalization, the national average percentage of

NIPF landowners assisted between 2007 and 2011 was 3.26%, with a range of 7.12% in the Northern region to 0.67% in the IITF region (Table 4-1, Map 4-3). On a state-level basis, the average percent of NIPF landowners receiving assistance ranged from a high of 21% in Idaho to a low of 0.79% in Maine. The national percentage of NIPF landowners assisted slightly declined over the 5-year period (–0.73%) in the percentage of landowners assisted in 2011 (3.01%) versus 2007 (3.74%) (Figure 4-2). Thus, as a percentage of the total NIPF landowners in the country, the number of landowners receiving FSP assistance over the past 5 years has remained fairly steady but quite small.

Map 4-3. Average percent of total NIPF landowners assisted between 2007 and 2011.

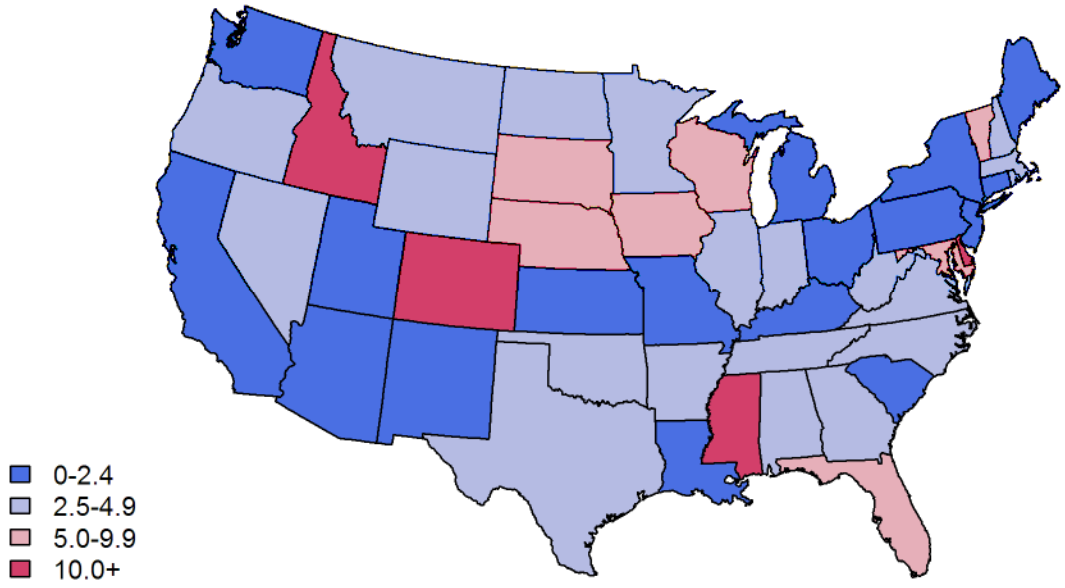
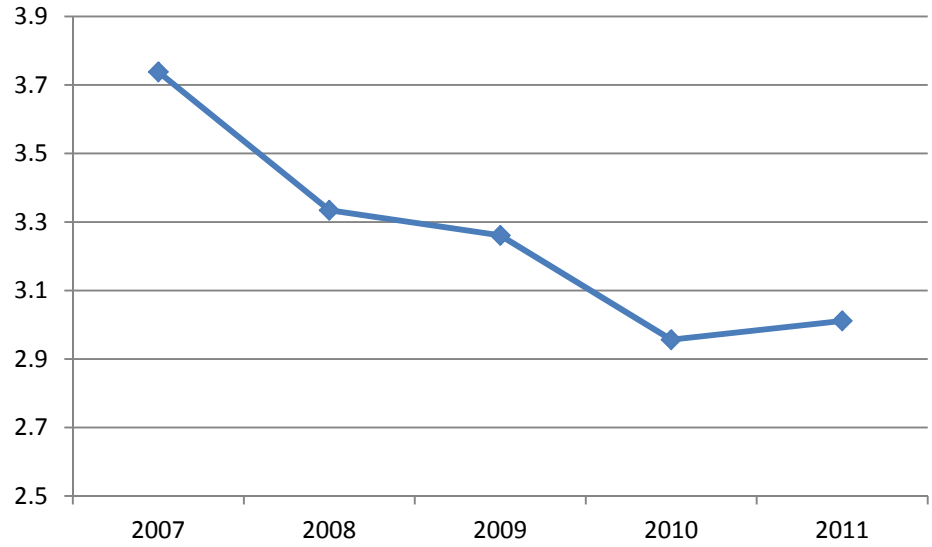


Figure 4-2. Percent of NIPF landowners receiving FSP assistance (2007–2011).

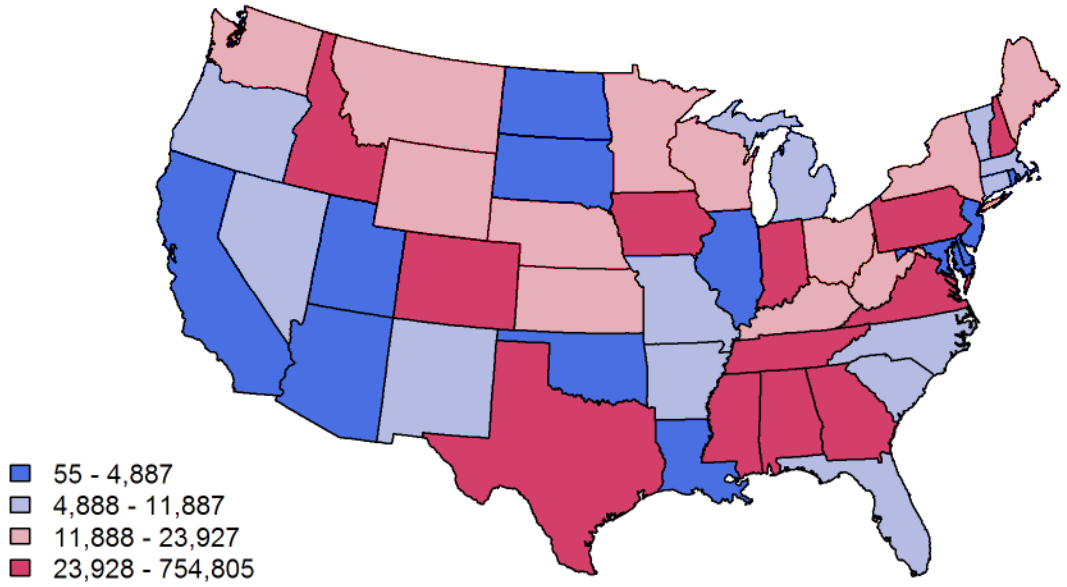


It is important to point out, however, that these normalizations are not exact because in addition to NIPF landowners, some agricultural landowners are also eligible for FSP assistance. Specifically, 10% of agricultural land with a soil erodibility index of 10 or higher in a state is also FSP-eligible. However, we did not have reliable information on these agricultural land ownerships to estimate the total number of FSP-eligible owners in a state in a given year. Thus, our estimate of the total percentage of NIPF owners in a state receiving FSP assistance is an overestimation of both the percentage of the NIPF owners receiving assistance and the percentage of FSP-eligible landowners receiving assistance. A second source of error with this normalization is due to the fact that we used NWOS data from a single point in time to represent the total number of NIPF landowners in each period over our 5-year time frame rather than an annually updated value, but results from the 2011 NWOS are not yet available. Finally, there is some possibility of double-counting with this variable, but it is likely minimal as states are directed to open case files on landowners who have received assistance.

4.3.2 Number of landowners educated

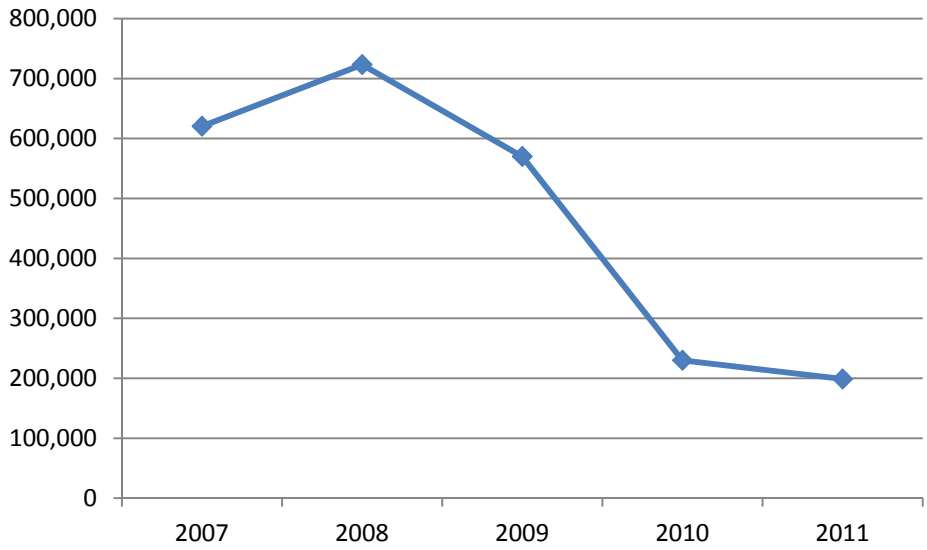
Over the evaluation period (2007–2011), 2,342,480 landowners participated in FSP-sponsored educational programs. Thus, approximately three times as many landowners were the recipients of FSP-related education as opposed to assistance during this time period. As with landowner assists, the Southern region had the greatest number of landowner educational contacts. Approximately half of the landowners receiving education were located in the Southern region (49%), followed by the Rocky Mountain (35%) and Eastern regions (13%) (Table 4-2 and Map 4-4). The average number of landowners receiving FSP-related education nationally between 2007 and 2011 was 468,496.

Map 4-4. Total number of landowners in education programs between 2007 and 2011.

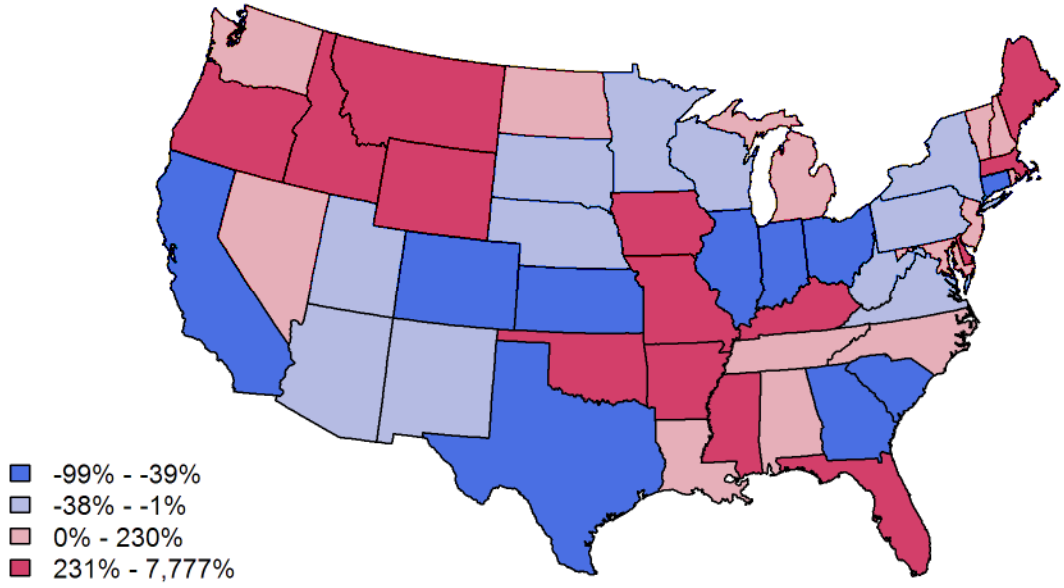


Nationally, there was a 68% decline in the number of landowners who participated in FSP-related education programs in 2011 as compared to 2007 (Figure 4-3). On a regional basis, however, this downward trend was not universally observed (Table 4-2). Six of the 10 regions reported increases in the number of landowners receiving FSP-related education in 2011 as compared to 2007 (IITF, Intermountain, Northeastern Area, Northern, Pacific Northwest, and the Pacific Southwest regions). Moreover, some of the regions reported very large increases in landowners educated in 2011 versus 2007: e.g., an 842% increase in the Northern region, 244% increase in the Pacific Southwest, and 111% increase in the Pacific Northwest. Declines were reported for the Rocky Mountain region (–97%), Southern (–64%) and the Southwestern regions (–21%). On a state-level basis, the percentage change in number of landowners educated varied widely, from an increase of 7,777% in Oregon to a decrease of 99% in Colorado (Table 4-2 and Map 4-5). Twenty-three states reported a decrease in the number of people educated in 2011 versus 2007, while 34 reported an increase. Year-to-year, region-to-region and state-to-state, there was extremely high variability in the number of landowners participating in FSP-related education activities.

Figure 4-3. Total number of landowners receiving FSP education (2007–2011).



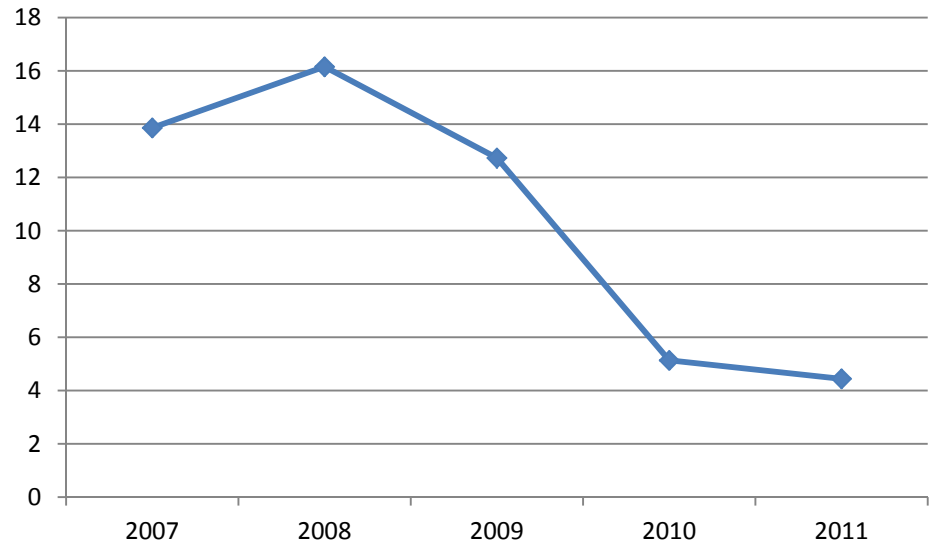
Map 4-5. Percent change in the number of landowners educated in 2011 versus 2007.



In an effort to provide some level of comparability among states and regions, a normalization of the number of landowners educated was computed by dividing the number of landowners assisted in a state (or region) by the total number of NIPF landowners in that state (or region) owning at least 10 forested acres. With this calculation, the national average percentage of NIPF landowners educated during the period (2007–2011) was 10.5%. The national average percentage of NIPF landowners

receiving FSP-related education declined 9.4% over the study period from 13.9% in 2007 to 4.4% in 2011 (Figure 4-4).

Figure 4-4. Percent of NIPF landowners receiving FSP education (2007 – 2011).



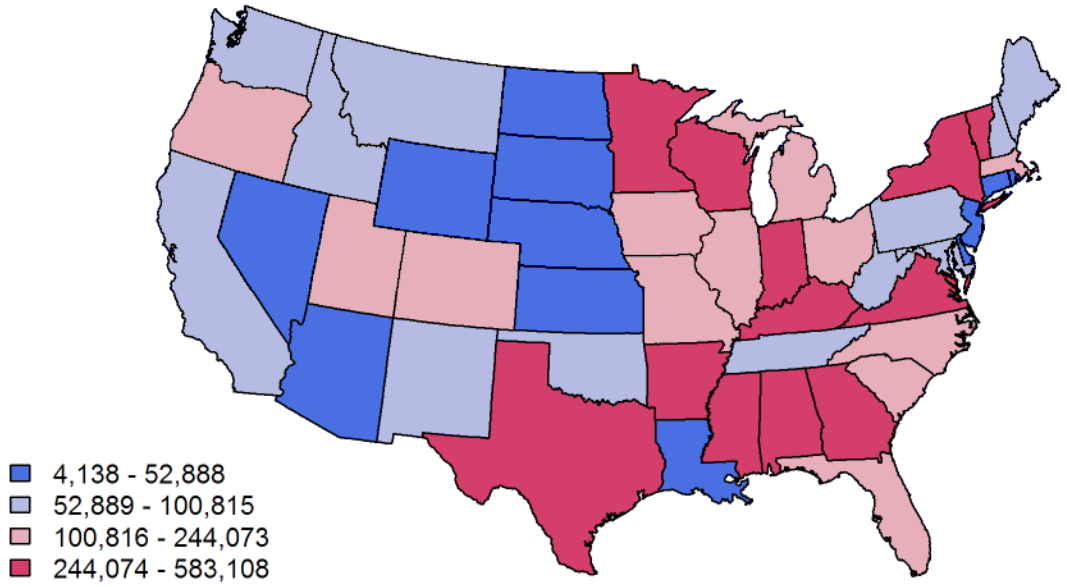
A strong word of caution is necessary in interpreting the results from this table because there is significant possibility for double-counting with the education metrics as a landowner could attend multiple educational programs in a year, each of which could be counted separately in the numbers reported to PMAS. In PMAS, there are instances where states or regions report a higher number of NIPF landowners receiving education in a year than actually reside in that state or region according to the NWOS estimate of NIPF landowners. For example, Colorado reported that in 2007 250,000 landowners received education, while the NWOS estimates that only 45,749 NIPF owners reside in the state. This equates to 547% of NIPF landowners in Colorado receiving education that year. As another example, the Rocky Mountain region reported that the average percentage of landowners receiving education across the region over the 5-year period was 145%. These discrepancies are likely due to the possibility of double (or higher) counting for this variable; e.g., a landowner could have received multiple forms of education in a given year and thus could be counted multiple times within PMAS reporting. Given this, the percentages of NIPF owners receiving education we calculated are likely to be inflated in many instances and would serve as an upper bound on the true percentage of landowners who are being educated by FSP. Another source of error with these calculations arises from the fact that some agricultural landowners are also eligible for FSP education. Here again we are normalizing by only NIPF owners. Thus, our estimate of the percentage of NIPF owners in a state receiving FSP education is an overestimation of both the number of NIPF owners receiving education and the number of FSP-eligible landowners receiving education.

4.3.3 Number of acres in new or revised plans

Over the evaluation period (2007–2011), 9,689,702 acres were placed under new or revised FSP plans. Three-quarters of these acres were in the Eastern region (40%) and the Southern region (37%)

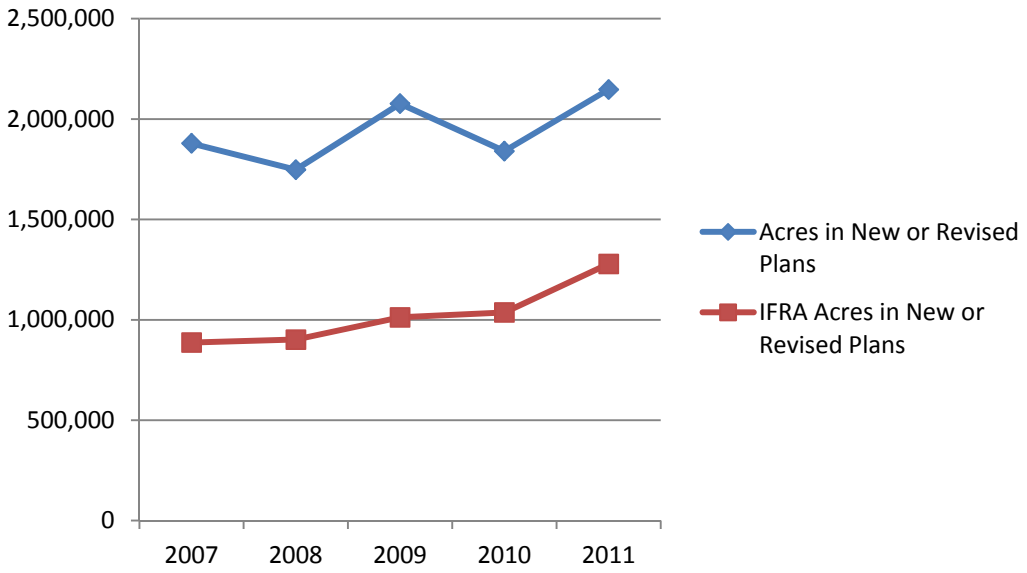
combined, followed by an additional 11% in the Alaska region. As a general trend, the states that added higher amounts of acreage under new or revised plans tended to fall east of the Mississippi River (Table 4-3 and Map 4-6).

Map 4-6. Total number of acres in new or revised plans between 2007 and 2011.

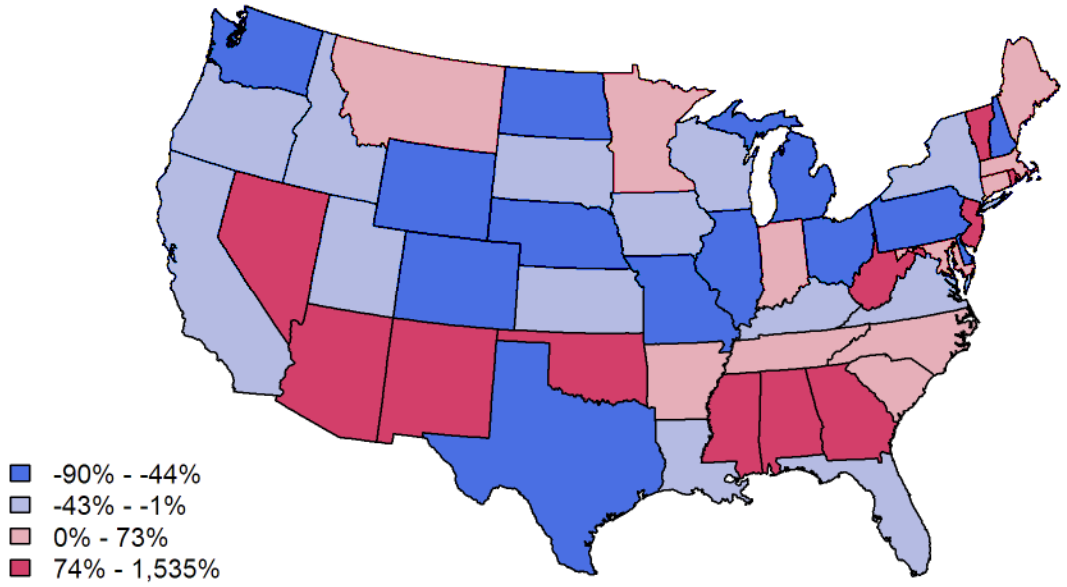


The number of acres in new or revised plans increased nationally by 14% from 1,878,654 acres in 2007 to 2,146,703 acres 2011 (Figure 4-5 and Table 4-3). However, high variability was observed among regions and states over the evaluation period. On a regional basis, six of the regions reported an increase in acres under new or revised plans during this time frame (Alaska, IITF, Intermountain, Eastern, Southern, and Southwest regions), with the Southwest region experiencing the largest percentage increase (320%). Four regions reported declines in acreage under new or revised plans during this time frame: Northern, Pacific Northwest, Pacific Southwest, and Rocky Mountain regions, with the Rocky Mountain region reporting the greatest percentage decrease at 77%. At the state-level, 29 states reported a decline in acreage under new or revised plans, while 26 reported an increase. States differed greatly in their percentage change of acres under new or revised plans between 2011 and 2007. For example, Nevada reported a 1,535% increase in acreage added under new or revised plans in 2011 versus 2007. In contrast, North Dakota reported a 90% decrease (Map 4-7).

Figure 4-5. Total acres and IFRA acres in new or revised plans.



Map 4-7. Percent change in the number of acres in new or revised plans in 2011 versus 2007.

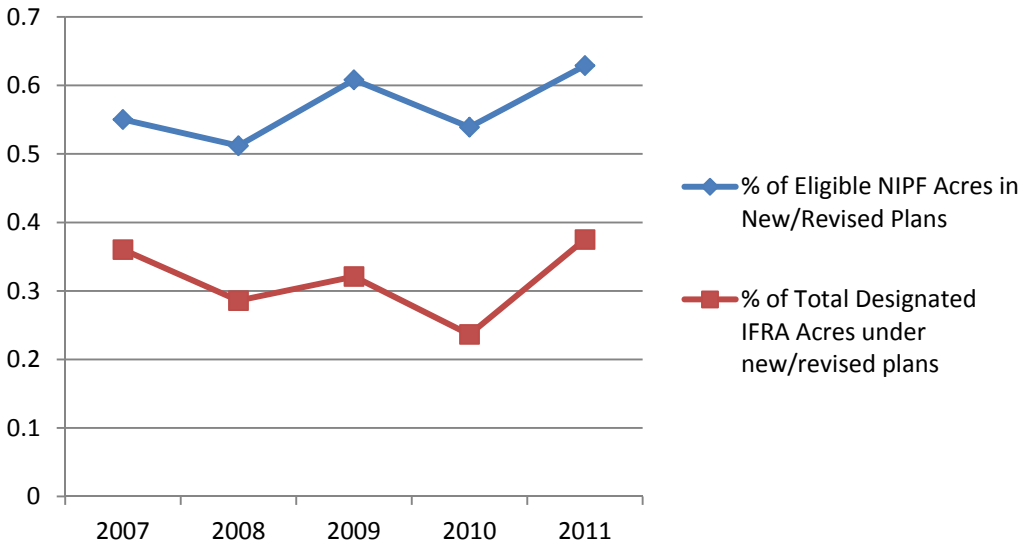


The average number of acres annually added in new or revised plans nationally between 2007 and 2011 was 1,937,940. The regions with the highest average acreage under new or revised plans during the study period were the Northeastern region (782,533) and the Southern region (716,081).

As with earlier discussed PMAS metrics, a normalization of the number of acres under new or revised plans was computed by dividing by the total number of NIPF acres in a state (or region) of holdings

greater than 10 acres (Butler 2008). The national annual average percentage of NIPF acres in new or revised plans during the period (2007–2011) was 0.57%, with a range of 1.04% in the Intermountain region to 0.11% in the IITF region (Table 4-3). The percentage of NIPF acres in new or revised plans changed little over the evaluation period, with a 0.08% increase from 0.55% in 2007 to 0.63% in 2011 (Figure 4-6). As with the previous two tables, these normalizations are not exact because in addition to NIPF acreage, some agricultural land is also eligible for FSP funds. Thus, our estimate of the percentage of NIPF acres in a state or region under new or revised plans is an overestimation of both the number of NIPF acres under new or revised plans and the number of FSP-eligible acres under new or revised plans and should serve as an upper bound.

Figure 4-6. Percent of eligible NIPF and IFRA acres in new or revised plans.



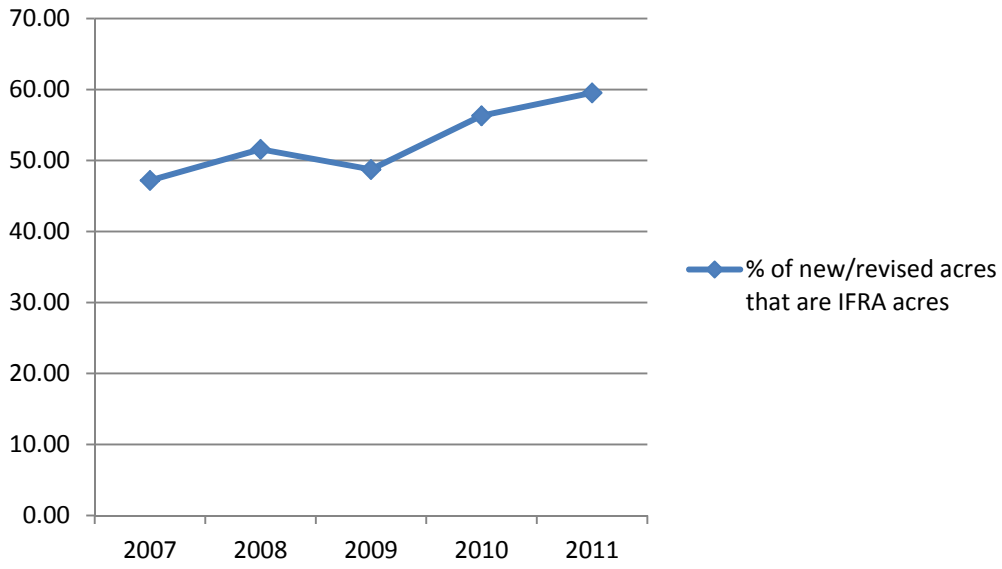
4.3.4 Number of Important Forest Resource Area acres in new or revised plans

Over the evaluation period (2007–2011), a total of 5,114,620 acres of new or revised plans were added in Important Forest Resource Areas (IFRA) nationally. Two-thirds of these IFRA acres were in the Southern (37%) and Eastern Regions (31%) combined, followed by an additional 17% in Alaska (Table 4-4). These three regions also placed the most total acreage under new or revised plans during this time period.

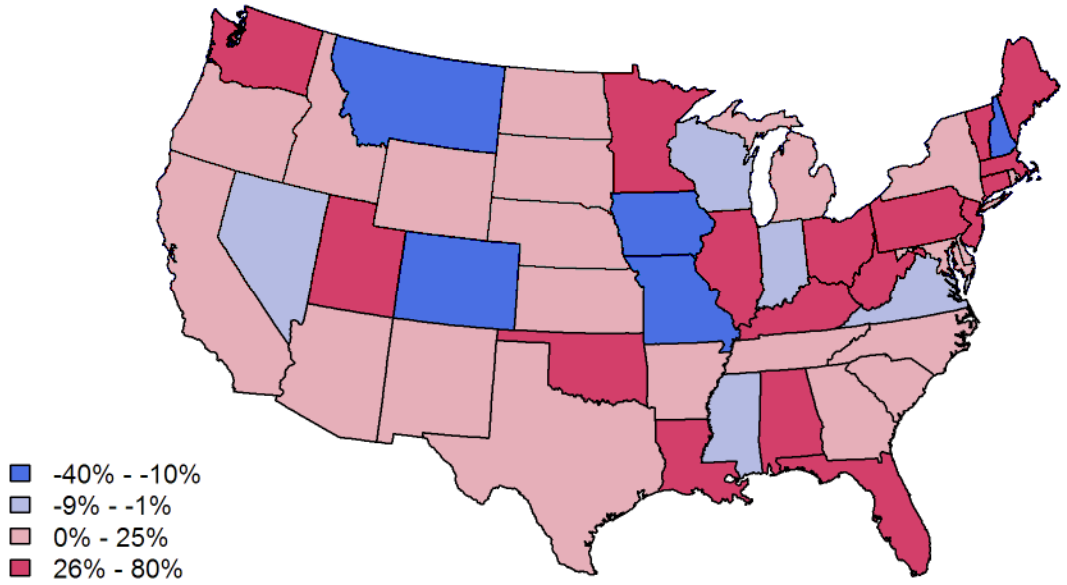
The number of IFRA acres added annually in new or revised plans increased nationally by 44% from 886,674 acres in 2007 to 1,278,106 acres in 2011 (Figure 4-5 and Table 4-4). Seven regions reported an increase in IFRA acres under new or revised plans in 2011 as compared to 2007 (Alaska, IITF, Intermountain, Eastern, Pacific Northwest, Southern, and Southwest regions), with the Pacific Southwest region experiencing the largest percentage increase (800%). However, the Northern, Pacific Southwest, and Rocky Mountain regions reported declines, with the Rocky Mountain region reporting the greatest percentage decrease at 79%. At the state-level, 26 states reported a decline in IFRA acreage under new or revised plans, while 29 reported an increase.

The percentage of new or revised plan acres that were also IFRA acres was computed in an effort to see to what degree IFRA acres were being emphasized in new or revised plans over non-IFRA areas. These percentages were calculated by dividing the number of IFRA acres in new or revised plans in a given year by the total number of acres in new or revised plans in that year, and then multiplying by 100. On average over the evaluation period, 53% of acres added under new or revised plans were in IFRA-designated acres (Table 4-4). This national percentage increased 13% between 2007 and 2011 from 47% to 60% (Figure 4-7). This increasing trend was generally seen throughout the country (Map 4-8). In 2007, 11 states reported 0 IFRA acres in new or revised plans. Since that year, all states have reported some percentage of their new or revised plans cover IFRA acres. By 2011, 11 states were reporting that 100% of their acres in new or revised plans were IFRA-designated acreage. In 2011, seven regions reported that at least 66% of their total new or revised plan acres were also IFRA acres: Pacific Southwest (97%), Rocky Mountain (90%), IITF (92%), Southwest (79%), Alaska (77%), Northern (68%), and Intermountain (67%). The remaining regions percentages ranged from 22% (Pacific Northwest) to 52% (Southern).

Figure 4-7. Percent of new or revised acres that are IFRA acres.



Map 4-8. Change in percent of acres under new or revised plans that are IFRA acres in 2011 versus 2007.



The percentage of IFRA acres under new or revised plans as compared to the total number of designated IFRA acres was computed to gauge how well states and regions are doing at putting priority areas under plans. Nationally, the average percent of IFRA-designated acres under new or revised plans during the 5-year evaluation period was quite low at 0.32%. The percentage was essentially static over the evaluation period, increasing from 0.36% in 2007 to 0.38% in 2011 (Figure 4-6). Thus, while states and regions are increasingly emphasizing IFRA acres when developing new or revised plans as evidenced by the previous paragraph, the amount of total designated IFRA acres under new or revised plans remains quite small.

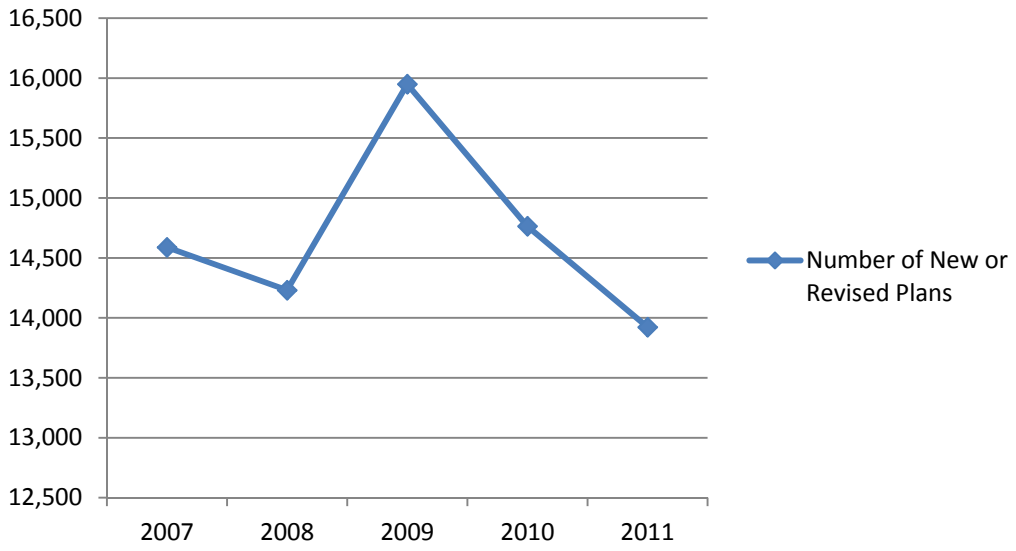
Caution needs to be raised regarding these IFRA acre statistics. States self-define their IFRA acres, and as such, there is no standard definition states use when designating an acre as an IFRA acre. Thus, comparisons between states and regions should be made with caution for this variable. Also, the total amount of IFRA-designated acreage has exhibited significant swings over the past 5 years (see Table 4-6). This makes the comparison of year-to-year trends in the percentage of IFRA acres under plans in relation to the total designated IFRA acres difficult since IFRA-designated acreage has not been stable.

4.3.5 Number of new or revised plans (2007–2011)

Over the evaluation period (2007–2011), 73,456 new or revised FSP plans were written nationally. Two-thirds of these plans were written in the Northeastern region (65%), with an additional 29% in the Southern region. The average number of plans written annually over this time frame nationally was 14,691. As with the number of acres in new or revised plans (Map 4-6), the states that added the greatest number of new or revised plans over the evaluation period tended to fall east of the Mississippi River (Table 4-5).

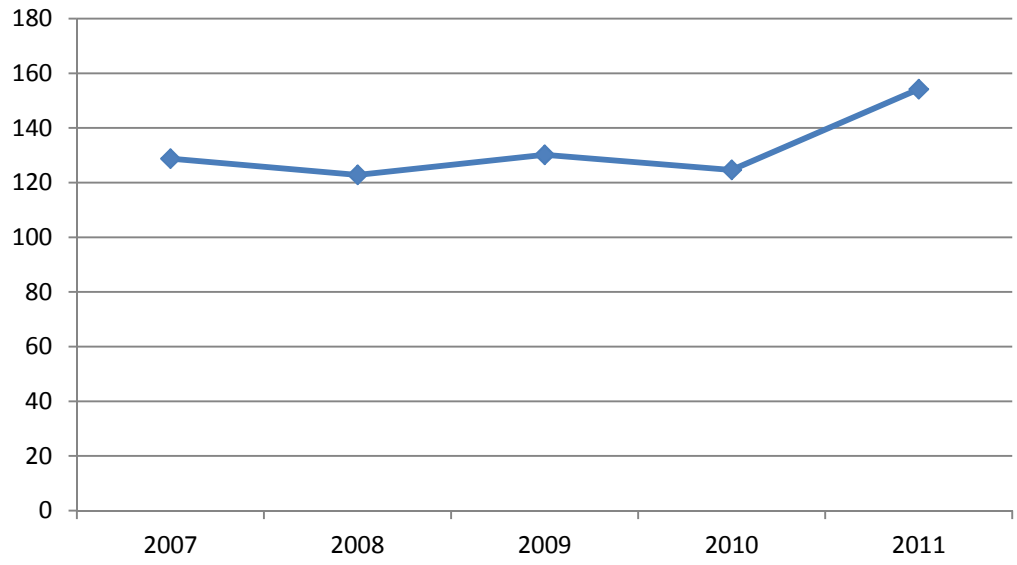
Nationally, the number of new or revised plans written decreased 4.6% between 2007 and 2011 (Figure 4-8), although there was a large increase in plans written in 2009. This 2009 spike was driven by increases in the number of new or revised plans written in a portion of the states in the Southern, Northern, and Eastern regions. Eight regions reported a decrease in the number of new or revised plans written in 2011 as compared to 2007 (Alaska, IITF, Intermountain, Northern, Pacific Northwest, Pacific Southwest, Rocky Mountain, and Southern regions), with the greatest decrease in the IITF region (96%). Two regions reported increases in the number of new or revised plans written (Northeast and Southwest), with the largest increase in the Southwestern region (72%). At the state-level, 37 states reported a decline in the number of new or revised plans, 16 reported an increase, and one reported a constant level. States that reported larger increases in the number of new or revised plans over the time period included Montana, Indiana, Vermont, and Georgia.

Figure 4-8. Number of new or revised plans.



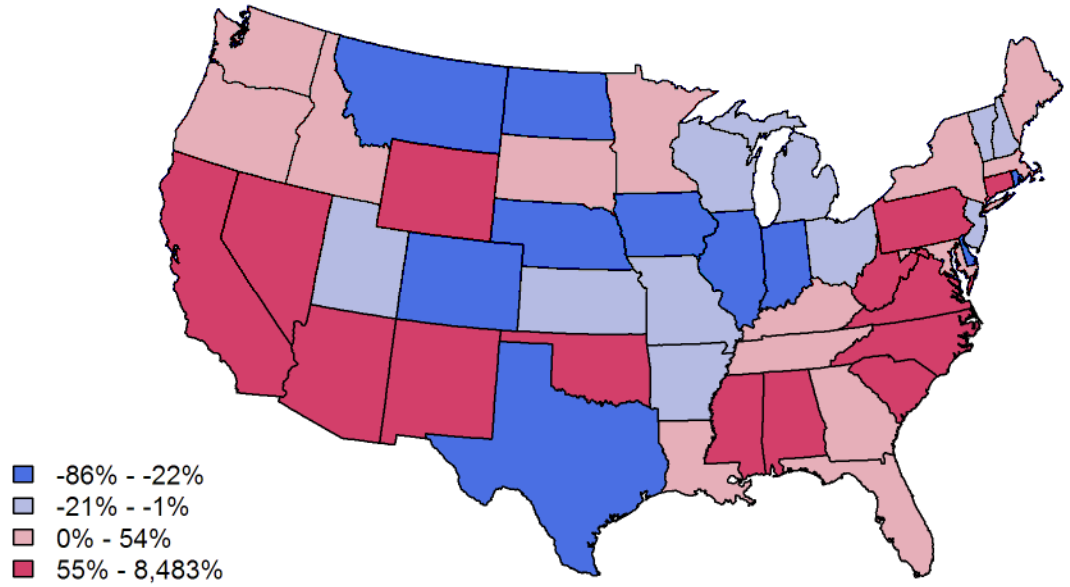
In order to assess trends in the size of plans over time and across regions, the average plan size (in new or revised plans) was computed. The national average over the 5-year evaluation period was 132 acres/plan, which represented a 19.7% increase from 2007 (129 acres) to 2011 (154 acres) (Figure 4-9). The average plan size varied widely at the state level, which would be expected given differences across the country in average size of NIPF landholding. Alaska's average plan size over the 5-year time period was 16,253 acres whereas the Virgin Islands average plan size was 24 acres.

Figure 4-9. Average acres/new or revised plan



At the regional level, seven regions reported increases in the average plan size in 2011 versus 2007, while the Northeastern Area, Rocky Mountain, and Pacific Southwest regions reported declines. Decreases in average plan size were less than 3% for both the Northeastern Area and Rocky Mountain regions, however (Map 4-9). Thus, increasing average plan size was the norm among many states, particularly those in the East, Southeast, West Coast, and Southwest. Thus, while fewer new or revised plans were being written on average, average plan size was generally increasing.

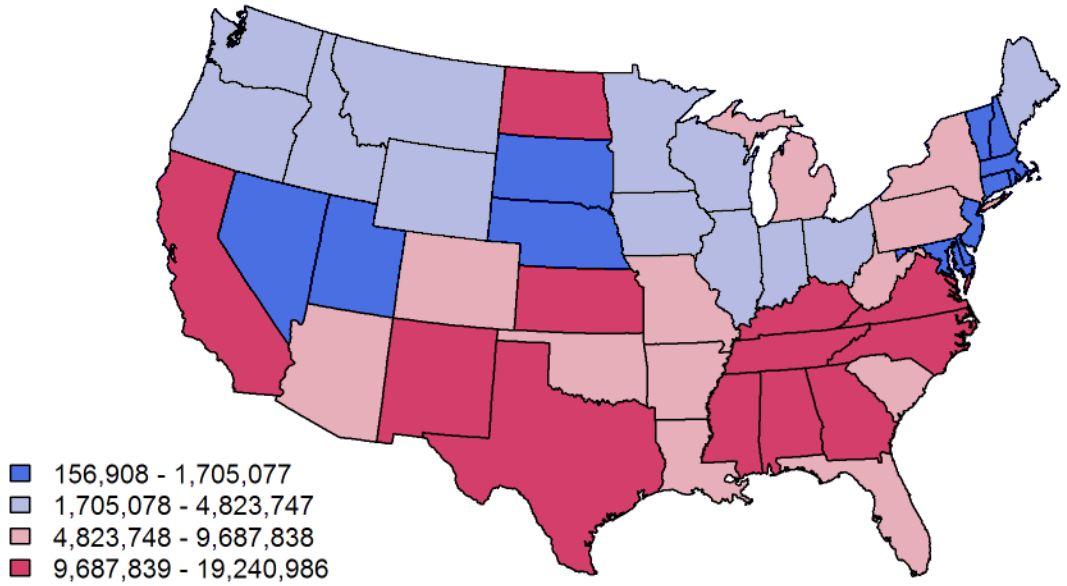
Map 4-9. Percent change in average acres per new or revised plan in 2011 versus 2007.



4.3.6 Total designated Important Forest Resource Area acres

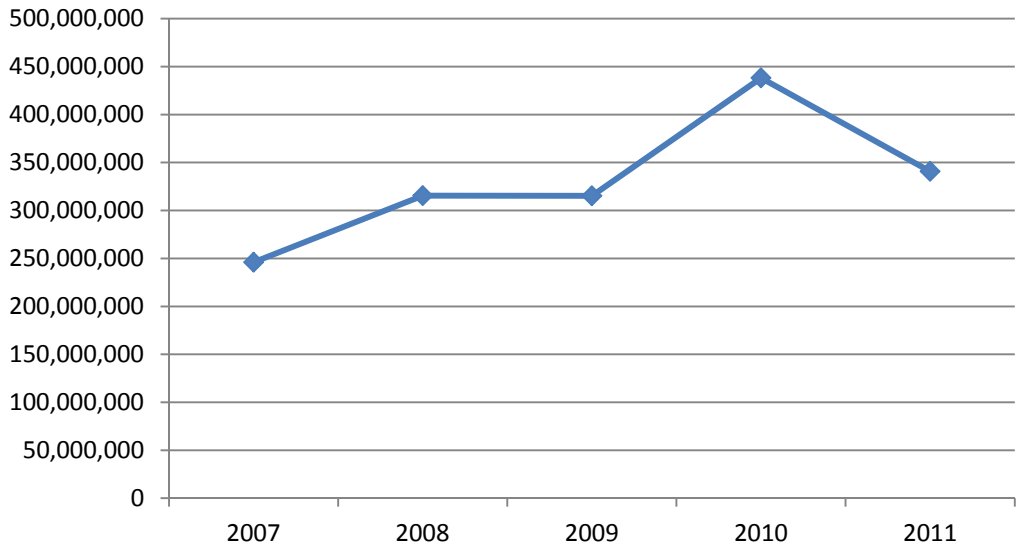
States are directed to identify their priority or IFRA acres for FSP activities each year. Once identified, these are areas that states are encouraged to target for FSP activities. In general, states with greater amounts of designed IFRA acres appear to be those in the southern half of the country, which is a reflection in some measure of state size (Table 4-6 and Map 4-10). The average number of annually designated IFRA acres over this time period was 331,106,320.

Map 4-10. Average number of designated IFRA acres between 2007 and 2011



Nationally, the number of IFRA-designated acres increased 39% between 2007 and 2011 from 246,016,023 to 340,723,540 acres (Figure 4-10 and Table 4-6). A large increase in 2010 was observed, followed by a decline in 2011 back to levels more commensurate with previous years. This spike in 2010 was largely driven by a 100-million-acre increase in IFRA designated areas in Alaska. From a regional perspective, all but two regions (Southwest and Pacific Southwest) increased their IFRA acreage over this time period, with increases ranging from 4,657% in the Intermountain region to 16% in the Northeastern region. Thirty-two states reported increased IFRA acreage in 2011 as opposed to 2007. Nine states reported no change in IFRA acreage across all 5 years, and 14 states reported declines between 2007 and 2011 (Map 4-10) California, Tennessee, Michigan, and Nebraska were among the states reporting the greatest decreases in IFRA designated acres over the evaluation period.

Figure 4-10. Total IFRA-designated acres.



The average annual percent of total NIPF acres in a state that were also identified as IFRA-designated areas was computed to gain a sense of the magnitude of need or potential that states are identifying. This calculation reveals some problems and requires a word of caution, however. When comparing total (or average) IFRA-designated acreage in a state to total NIPF acres (> 10-acre holdings), IFRA acreage is sometimes greater (see the last column of Table 4-6). For example, Alaska estimates that 130% of its NIPF holdings greater than 10 acres are IFRA-designated acres. North Dakota estimates that 3,458% of its total NIFP holdings greater than 10 acres are IFRA-designated acres. Numbers like these occur, in part, because some agricultural lands are available for FSP funds. Thus, normalizing by total NIPF acres underestimates the true potential FSP-eligible acres. However, in cases where the difference between IFRA acres and total NIPF acres is orders of magnitude higher, we suggest there may have been methodological or definitional errors in calculating IFRA-eligible areas. Because of this, comparisons of IFRA-designated acres as a percentage of total NIPF acres should be interpreted with caution.

Table 4-6 also illustrates that for some states or regions, the IFRA-designated acreage varied quite widely year to year, sometimes orders of magnitude in difference. As one example, Nevada identified 63,000 IFRA acres in 2007, 768,000 acres in 2008, and 3.95 million acres in 2011. The large swings in IFRA-acres may be attributed in part to a lack of consistency in the ways in which states identify IFRA acres over time, the inclusion of shrub-scrub areas as eligible IFRA acres, large wildfires, as well as land development and conversion in a state or region. However, such large variability in these numbers calls for greater scrutiny of the data.

4.3.7 Acres in current plans (2008–2011)

Table 4-7, Table 4-8, and Table 4-9 are drawn from data collected between 2008 and 2011 rather than the 5-year period used for the previous tables because 2008 was the first year in which these data were collected. Table 4-7 reports the total number of acres under *current* FSP plans during a given year. Average acreage in current plans over the four-year period is displayed in Map 4-11, which illustrates a

general trend for states with larger numbers of acres under current plans to be in the eastern half of the country. Nationally over this four-year period, acreage in current plans increased 12% from 18,823,374 acres in 2008 to 21,124,245 acres in 2011 (Figure 4-11 and Table 4-7). The average annual acreage under current plans over the past four years nationally was 19,574,181. All but three regions (Northeastern Area, Northern, and Pacific Southwest) reported increased acreage under plans in 2011 versus 2008. Of those regions that reported declines, all were less than 6%.

Map 4-11. Average number of acres in current plans between 2008 and 2011.

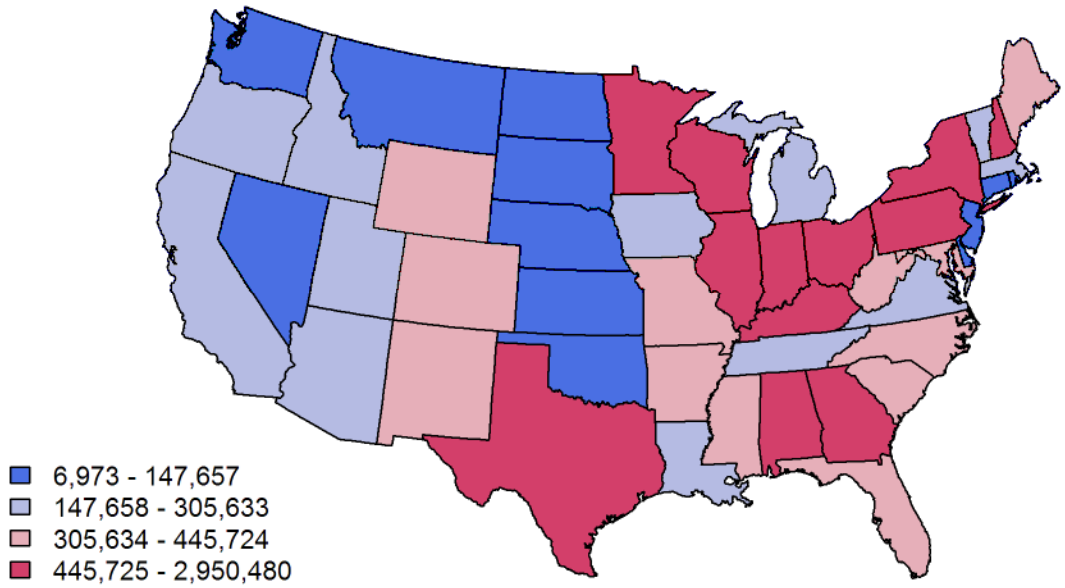
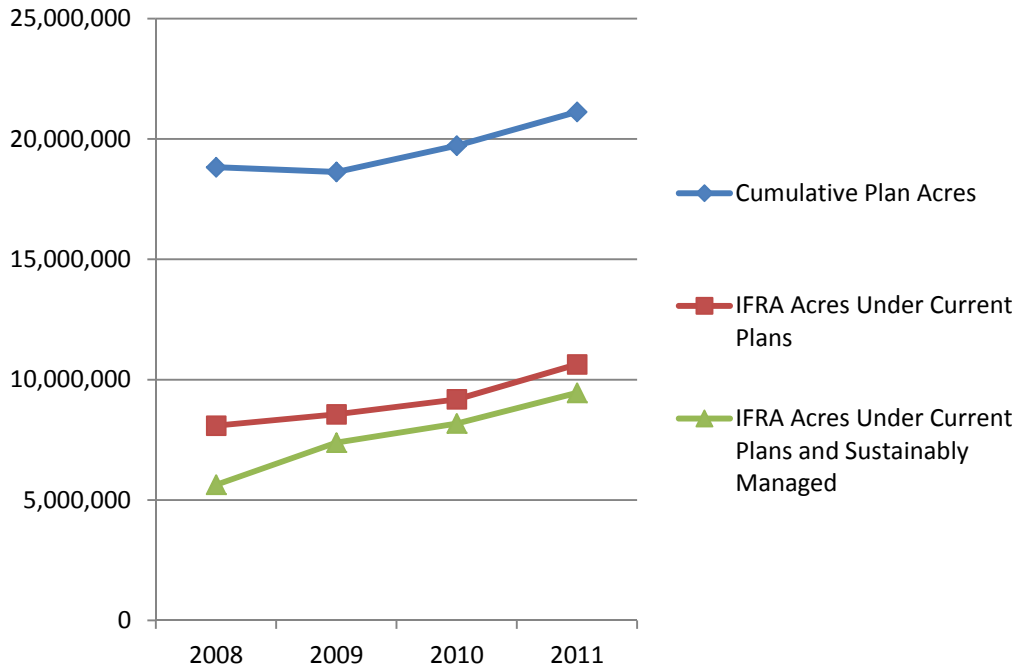


Figure 4-11. Trends in acres under current plans (total, IFRA, and sustainably managed)

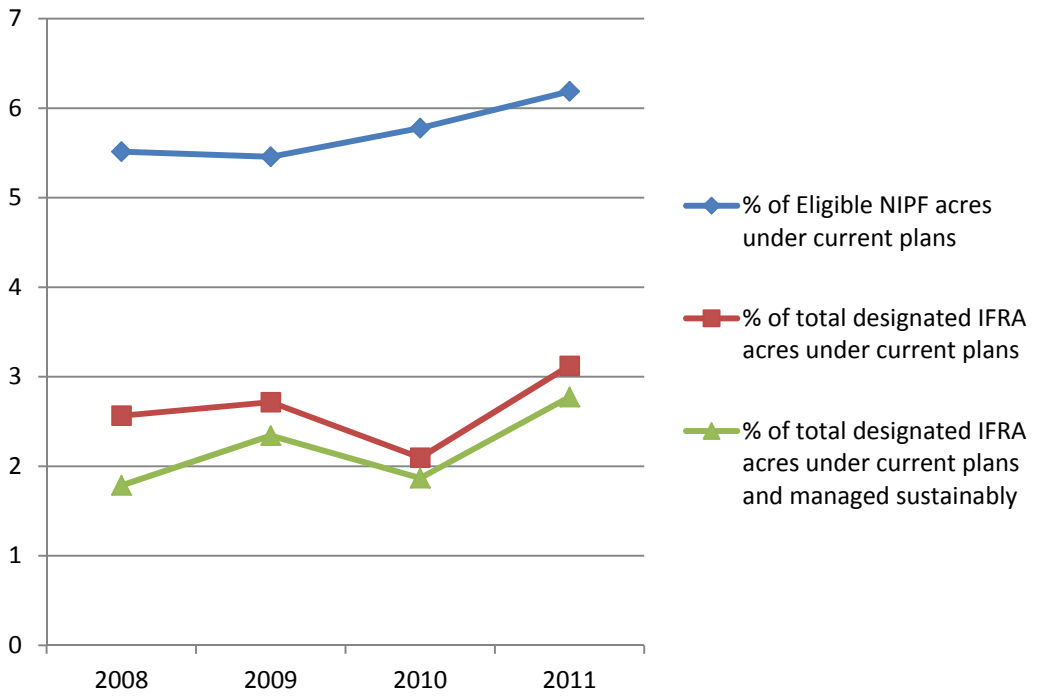


In an effort to provide some level of comparability among states and regions, a normalization of the number of acres under current plans was computed by dividing the number of acres in a state (or region) in current plans by the total number of NIPF acres (> 10 acre holdings) in that state (Butler 2008). The annual average percentage of total NIPF acres in current plans during the period 2008 to 2011 was 5.73%, with a range of 9.1% in the Rocky Mountain region to 0.63% in the IITF region. The average annual percentage remained fairly stable over the four-year evaluation period, increasing by only 0.67% from 5.5% in 2008 to 6.2% in 2011 (Figure 4-12). Thus, while acreage under current plans has remained steady over the past four years, it represents only a small fraction of eligible NIPF acres.

The percentage of acres under plans in a given year that were under new or revised plans specifically was computed to gain a sense of the breakdown between newly added acres versus existing plan acres. The national annual average for this time period was 9.98%. Thus, the bulk of acreage under plans in any given year is from existing plans, as would be expected. The percentage of acres under plans that were new or revised remained fairly constant over the past four years, increasing by less than 1% nationally between 2008 (9.29%) and 2011 (10.2%).

As with some of the other variables, these normalizations are not exact because in addition to NIPF acreage, some agricultural land is also eligible for FSP funds. Thus, our estimate of the percentage of NIPF acres in a state under current plans is an overestimation of both the number of NIPF acres under plans and the number of FSP-eligible acres under plans.

Figure 4-12. Trends in acres under current plans by percentages.



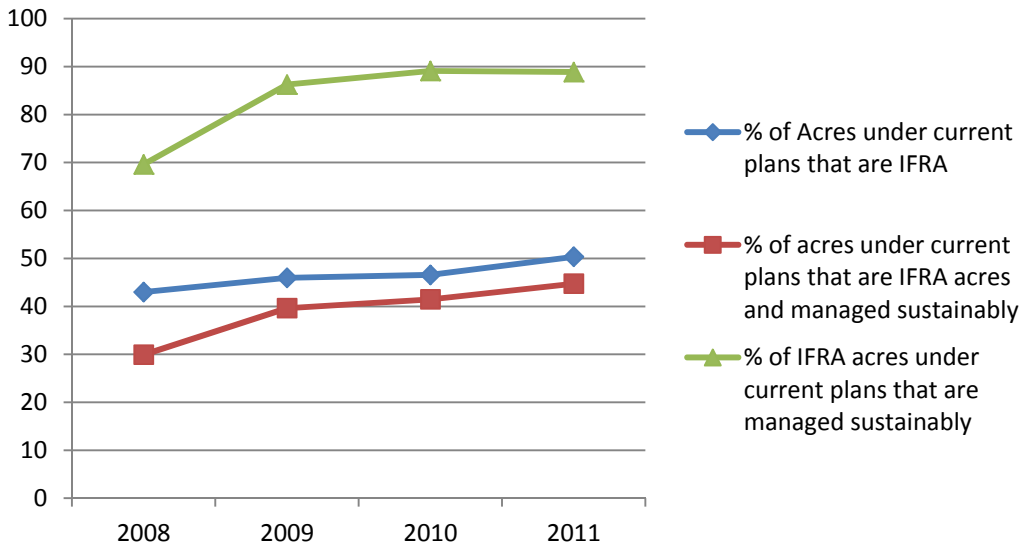
4.3.8 IFRA acres under current plans (2008–2011)

Nationally over this four-year period, IFRA acreage in current plans increased 31% from 8,088,291 acres in 2008 to 10,634,126 acres in 2011 (Table 4-8 and Figure 4-11). The average national IFRA acreage under plans over the four-year period was 9,115,556 acres. Nine of the 10 regions reported an increase in the number of IFRA acres under plans in 2011 versus 2008. This increasing trend in IFRA acres under plans is likely influenced by the fact that IFRA plan acres factor into the FSP allocation equation.

From the number of IFRA acres under current plans, two figures were calculated: the percent of total acres under current plans that were also IFRA acres and the percent of total *designated* IFRA acres that were under current plans. These numbers provide an indication of the extent to which IFRA acres are being emphasized in plans over non-IFRA acres, and the extent to which these designated priority acres are being placed under plans.

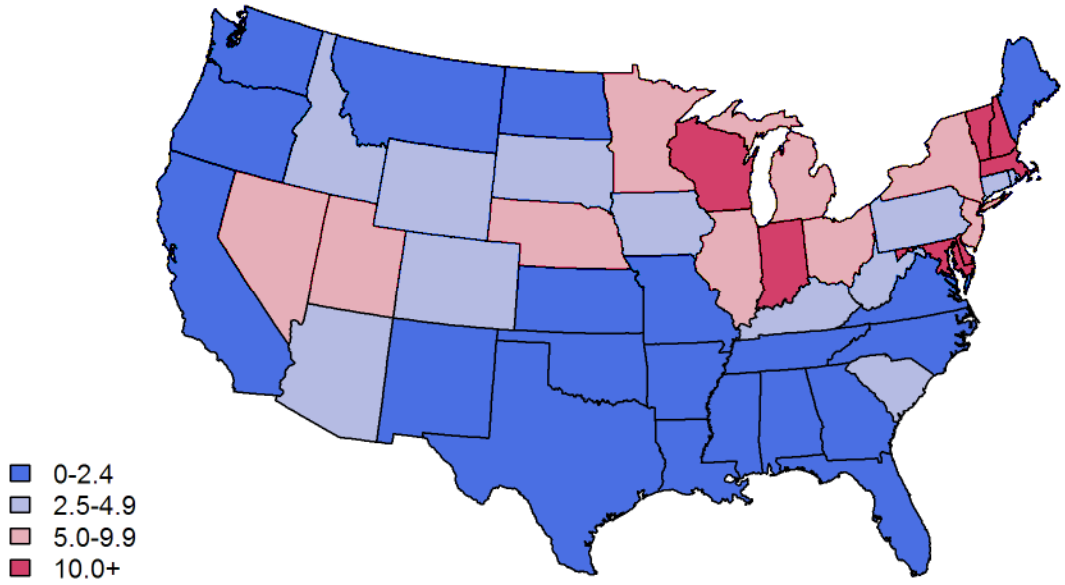
Nationally, the average annual percent of current plan acres that were also IFRA acres was 46% over the four-year period. Five of the 10 regions reported the percentage of current plan acres that were also IFRA acres to be over 75%; four were between 50% and 75%, and the remaining two (Northeastern Area and Pacific Northwest regions) were between 27 and 50%. The average annual national percent of current plan acres that were also IFRA acres increased 7% from 43% in 1998 to 50% in 2011 (Figure 4-13). Seven regions reported an increase in the average percentage of current plan acres that were also IFRA acres ranging (2.7% to 20.3%). Three regions reported decreases ranging from 1% to 11% (IITF, Intermountain, and Pacific Southwest). Thus, on average nationally, there is a trend toward increasing IFRA acreage versus non-IFRA acreage in current plans. As noted above, this trend is likely influenced by the emphasis that IFRA acres under plans received in the allocation equation.

Figure 4-13. IFRA plan acre trends (2008 – 2011).



The percentage of total-*designated* IFRA acres under current plans in a given year was also computed to evaluate the progress FSP is making in placing *IFRA-designated* areas under plans. The four-year national average was 2.6%. The average annual percentage over the evaluation period increased slightly from 2.6% to 3.1% (Figure 4-12). The average percentage declined in 2010 due to a large spike in the number of designated IFRA acres in 2010. At the regional level, three regions (Alaska, Intermountain, and Northeastern Area) reported the percentage of total-designated IFRA acres under current plans to be approximately 6%, although the majority of regions reported between 1% and 2%. Thus, in spite of increasing emphasis on IFRA acres, the proportion of total IFRA-designated acres under plans has remained static and low over the past four years. The states reporting the highest percentages of total-IFRA designated acreage under current plans tended to fall in the northern part of the country (Map 4-12).

Map 4-12. Average percent of total designated IFRA acres under current plans between 2008 and 2011.

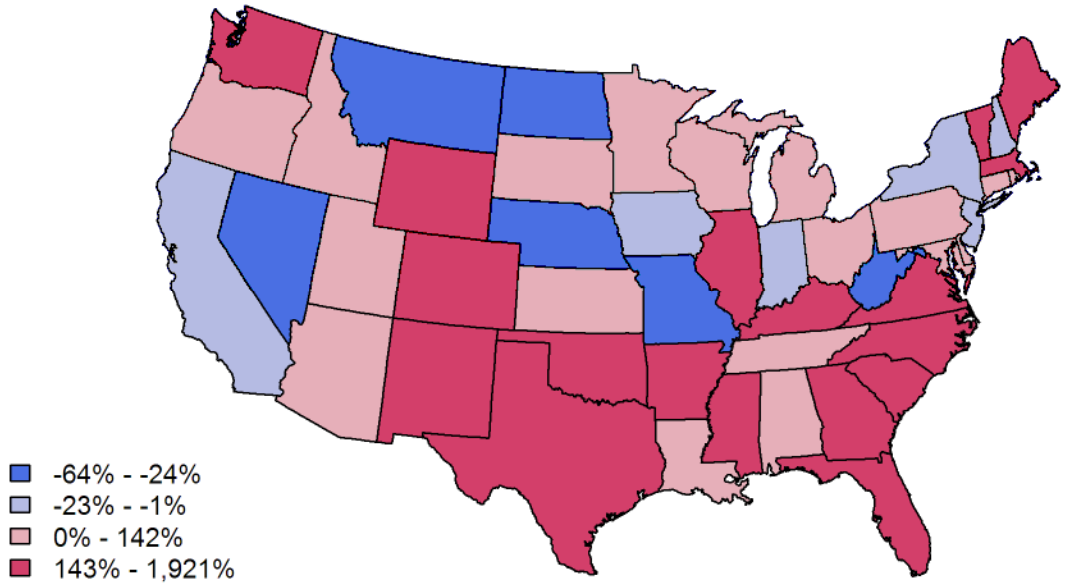


As with the other IFRA-based metrics, these numbers need to be interpreted with caution when comparing among states and regions due to the lack of a standard definition and the large variance experienced in some states year to year in the amount of IFRA-designated acreage.

4.3.9 IFRA acres under current plans that are managed sustainably

Table 4-9, Figure 4-11, Figure 4-12, and Figure 4-13 contain information about IFRA acres under current plans that were determined to be managed sustainably. The number of IFRA acres under current plans managed sustainably rose 68% nationally between 2008 (5.6 million acres) and 2011 (9.5 million acres) (Figure 4-11). The national annual average over the four-year period was 7.7 million acres. All but two regions (IITF and Pacific Southwest) reported increases in the number of sustainably managed IFRA plan acres in 2011 versus 2008. Of those regions reporting increases, three reported increases more than 100% in 2011 versus 2008: Pacific Northwest (131%), Rocky Mountain (188%) and Southern (353%). Many states reported double- and triple-digit percentage increases over this time frame (Map 4-13). Overall, states and regions are placing increasing emphasis on documenting or ensuring that IFRA acres under current plans are being managed sustainably. This is not a surprising finding given that this metric factors into the funding allocation equation.

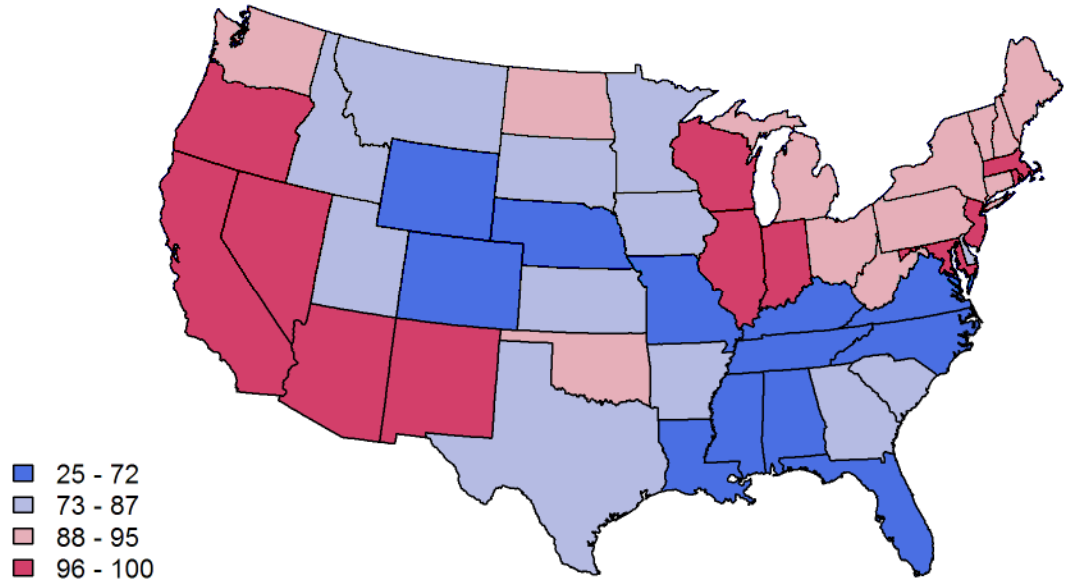
Map 4-13. Percent change in the number of sustainably managed IFRA acres under current plans in 2011 versus 2008.



The percentage of total acres under plans in a given year that were sustainably managed IFRA acres was also computed. This percentage rose 15% nationally from 2008 to 2011 (30% to 45%) (Figure 4-13). This is reflective of increases in both the number of IFRA acres under plans and the number of IFRA plan acres deemed to be managed sustainably. Seven regions reported increases in this metric over the four years, ranging from a 31% increase in the Southern region to a 5% increase in the Alaska region. The IITF reported the largest decrease at 23%. Overall, the national trend is toward an increasing proportion of total plan acres being sustainably managed IFRA acres.

The percentage of IFRA acres under current plans that were deemed to be sustainably managed was computed (Figure 4-13). Nationally, this percentage increased 19% from 70% in 2008 to 89% in 2011, although the numbers plateaued in 2010. The average annual percentage over the four-year time period was 84%. Eight regions reported an increase in the percentage of IFRA acres under plans that were managed sustainably, and two regions had a decrease. Some states reported very high percentages for this variable, with seven states reporting 100% of their IFRA acres under plans were sustainably managed in each of the four years in the study time frame (Map 4-14). Thus, it appears that states and regions are placing increasing effort on documenting or ensuring that IFRA plan acres are being managed sustainably. Again, this is not surprising given that states are rewarded for the amount of sustainably managed IFRA acres.

Map 4-14. Average percent of IFRA acres under current plans that are sustainably managed between 2008 and 2011.



Finally, the percent of total *designated* IFRA acres that were under current plans and managed sustainably was computed (Figure 4-12). Nationally, this percentage is quite low, with an annual average over the four years of 2%. This percentage grew by 1% from 1.8% in 2008 to 2.8% in 2011. Thus, even though states and regions are making strides at ensuring that increasing proportions of IFRA plan acres are being identified, placed under plans and managed sustainably, only a very small portion of the total designated IFRA acreage are under plans and being managed sustainably.

4.3.10 National summary of Average Annual PMAS statistics

Below is a quick summary of the average annual FSP-related activities reported in PMAS, over the evaluation period(s). The remainder of this section describes these results in more detail; and Table 4-10 provides a national summary of the variables reported in Table 4-1 through Table 4-9.

- 145,947 NIPF landowners receiving direct landowner assistance
- 468,496 NIPF landowners participating in educational activities
- 14,691 new or revised written management plans
- 1,937,940 acres of land covered by new or revised written management plans
- 19,574,181 acres covered by current (new, revised, or existing) management plans
- 47% of total acres under current plans were IFRA acres
- 83.45% of IFRA acres under current plans were managed sustainably
- 3.26% of total NIPF landowners assisted
- 5.73% of total NIPF acres under current plans
- 2.62% of total designated IFRA acres were under current plans
- 2.19% of total designated IFRA acres were under current plans and managed sustainably

Annual trends over this time period showed:

- Landowner assistance decreasing by 19%
- Educational participation decreasing by 68%
- New or revised plans written decreasing by 5%, but total acreage in current plans increasing 12%
- Average acreage per new or revised plan increasing by 20%
- IFRA acres in new or revised written management plans increasing by 44%

Over the past five years, both the number of landowners assisted and educated declined significantly: 20% for assists and 68% for educational contacts. This decline may be a function of declining budgets, higher costs of doing business, fewer personnel, and/or a focus on plan writing at the expense of landowner assistance and education. Since landowner assists and education do not factor into the FSP funding allocation equation, it is not surprising that states would be directing their efforts and resources to other FSP activities. An additional factor that may be leading to these declines is that since 2008, states are required to conduct monitoring to determine to what extent acres under plans are being managed sustainably. Additional funds were not made available to support this activity, thus, this monitoring requirement has drawn funds away from other aspects of the FSP program.

Over the past five years, 9.7 million acres were added under new or revised FSP plans. This represents a 14% increase in acreage under new or revised plans between 2007 and 2011. The number of new or revised plans written nationally declined by 4.6 over the evaluation period, while average plan size for new/revised plans increased by 20% (from 128 acres/plan to 154 acres/plan). These trends could be due to the targeting of larger landowners and/or states with larger average landholdings writing more plans.

Despite the efforts of the FSP program, it appears that it is only reaching a fraction of potential NIPF owners and acres. Of the total NIPF-eligible acres in the country only about one-half of 1% was put into new or revised plans on average annually over the five-year analysis period, with approximately 6% of total NIPF acres under current plans. One-third of a percent of total designated IFRA acres in the country on average annually were put under new or revised plans during the evaluation period with approximately 3% of total designated IFRA acres on average annually under current plans. These percentages were largely static over the evaluation period. Approximately 3% of NIPF landowners (with holdings larger than 10 acres) were assisted on average over the evaluation period, and 10% received educational contacts. Thus, the imprint of FSP as a function of total NIPF owners and acres in the country is small.

One trend that becomes apparent when evaluating these data is that states are placing increasing emphasis on IFRA acres. Emphasis on IFRA acres is to be expected, because state-funding allocation is based, in part, on its success in putting IFRA acres under plans. Nationally over the past five years, total designated IFRA acres increased 39%, and the number of IFRA acres put into new or revised plans increased 44%. These increases are due to states self-identifying more IFRA acres of concern as well as an increasing share of acres put under new or current plans being IFRA acres**.** Despite this trend of increasing emphasis on IFRA acres, almost half (47%) of new plans acres on average over the past five years have been in non-IFRA acres. This trend is likely a function of the first-come, first-served aspect of many public programs. Starting in 2008, states were asked to report on the number of IFRA plan acres

that were being managed sustainably. As with the other IFRA metrics, it appears that states are placing increasing emphasis on ensuring that IFRA acres under plans are being sustainably managed. Over the past four years, the average national percent of IFRA acres under current plans that are managed sustainably was 83%, which represents a 19% increase. So, of those IFRA acres that states are able to place under plans, they are really making an effort to document or ensure that a high percentage is being managed sustainably.

In spite of increasing emphasis on IFRA priority acres, the average annual percent of total designated IFRA acres nationally that were under current plans between 2008 and 2011 was only 2.6%, and the average annual percent of total IFRA-designated acres under current plans and managed sustainably was 2.2%. In comparison, the average annual percent of total NIPF acres under current plans was 5.7%. Thus, while it appears that states are focusing on increasing IFRA acres that are under plans and managed sustainably, the percentage of the total eligible IFRA acres as well as total NIPF acres under FSP plans remains quite small.

A note on the annual FSP budget is also needed. A key consideration in the performance of FSP is what the resource levels have been over time. Is the program doing more with more, more with less, or holding its own at stable funding levels? The annual budget for FSP has varied year to year with no consistent annual increasing or decreasing trend since 1991. Between 1991 and 2010, the budget increased $3.8 million or 15% from $25,567,000 to $29,369,000, current dollars. However, in intervening years the budget ranged between a low of $23,280,000 to a high of $52,320,000. The long-term average over this time period was $30,881,000. The average budget between 2007 and 2010 was $31,962,000. Figure 4-14 shows the annual budget from 1991 to 2010 in both current and constant (1991) dollars. Thus, while the program budget has not had a clear trajectory over time, it is probably safe to assume that costs of implementing FSP have increased, in part due to the addition of IFRA sustainability monitoring. Without more detailed information on the costs to implement and administer FSP, however, it is difficult to discern anything about the efficiency of the program's operations over time and/or by region.

Figure 4-14. Annual appropriations for the Forest Stewardship Program, 1991–2010.

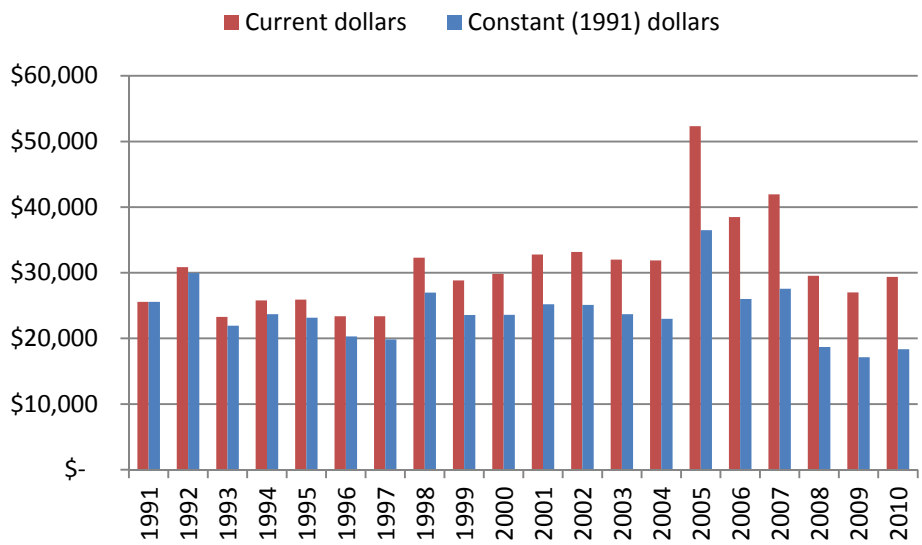


Table 4-10. Summary of national PMAS statistics (when holdings less than 10 acres are removed) (2007–2011)

PMAS Statistic Category	Total	Average	Percentage Change
Number of Landowners Assisted (2007–2011)	729,734.00	145,947.00	–19.45
Average Percent of Total NIPF Landowners Assisted (2007–2011)		3.26	–0.73
Number of Landowners Educated (2007–2011)	2,342,480.00	468,496.00	–67.95
Average Percent of Total NIPF Landowners Educated (2007–2011)		10.47	–9.42
Number of Acres in New or Revised Plans (2007–2011)	9,689,702.00	1,937,940.40	14.27
Average Percent of Total NIPF Acreage in New or Revised Plans (2007–2011)		0.57	0.08
Total Number of IFRA Acres in New or Revised Plans (2007–2011)	5,114,620.00	1,022,924.00	44.15
Average Percent of New or Revised Acres that Are IFRA Acres (2007–2011)		52.67	12.34
Average Percent of Total IFRA-Designated Acres Under New or Revised Plans (2007–2011)		0.32	0.01
Number of New or Revised Plans (2007–2011)	73,456.00	14,691.20	–4.57
Average Acres per New or Revised Plan (2007–2011)		132.12	19.73
Total Designated IFRA Acres (2007–2011)		331,106,320.40	38.50
Average Number of NIPF Acres in Current Plans (2008–2011)		19,574,180.50	12.22
Average Percent of Total NIPF Acres Under Current Plans (2008–2011)		5.73	0.67
Average Percent of Plan Acres that Are under New or Revised Plans (2008–2011)		9.98	0.88
Average Number of IFRA Acres Under Current Plans (2008–2011)		9,115,556.25	31.48
Average Percent of Total Acres Under Current Plans that Are IFRA Acres (2008–2011)		46.45	7.37
Average Percent of Total Designated IFRA Acres under Current Plans (2008–2011)		2.62	0.56
Average Number of IFRA Acres Under Current Plans Managed Sustainably (2008–2011)		7,659,850.50	67.83
Average Percent of Total Acres Under Current Plans that Are IFRA Acres and Managed Sustainably (2008–2011)		38.93	14.82
Average Percent of IFRA Acres Under Current Plans that Are Managed Sustainably (2008–2011)		83.45	19.25
Average Percent of Total Designated IFRA Acres Under Current Plans that Are Managed Sustainably (2008–2011)		2.19	0.99

4.4 PMAS data issues

In analyzing these data, some issues regarding reliability or interpretability of the PMAS data were uncovered. First, for some metrics, state- and regional-level comparisons of performance are problematic due to normalization issues. Specifically, since the FSP program can apply to some agricultural lands, in addition to private forest lands, it is difficult to determine the total number of FSP eligible acres or owners in any state or region. In this analysis, we normalized by NIPF acres and owners, but these are proxies for true number of FSP-eligible acres and owners that in general result in overestimations for most of the calculations. State-level comparisons are further hampered by the fact that states receive differing amounts of money that not only vary state to state, but also year to year. A final point about comparability among states is that states are encouraged to leverage a variety of resources, both federal and non-federal, to successfully implement their Forest Stewardship and Rural Forestry Assistance programs. States are directed to report all program accomplishments delivered consistent with the Forest Stewardship Program (SEC. 3) and Rural Forestry Assistance (SEC. 5) authorities of the Cooperative Forestry Assistance Act, regardless of funding source, in PMAS. Thus, PMAS numbers reflect a mix of funding streams and are not a direct reflection of state-level FSP annual allocations. Two other issues confound interpretation of PMAS data. First, some of the PMAS metrics such as IFRA acres and Sustainably Managed acres lack standard or consistent definitions. This introduces reliability and comparability issues. Second, at least two of the PMAS metrics, number of landowners educated and number of landowners assisted, suffer from the possibility of double-counting. Because of these issues, it is difficult to have much confidence in some of the PMAS reporting, and in conducting regional or state-level comparisons.

Beginning in FY2013, a new data reporting system and accomplishment tracking tool called SMART (Stewardship Mapping and Reporting Tool) will be replacing PMAS. One advantage that SMART will offer is that it will be a spatial database system that will allow program managers enhanced mapping capability and the ability to exhibit the FSP footprint on the landscape and with respect to IFRA areas. States will be required to report their program accomplishments in SMART for the first time by October 31, 2013. Since the adoption of new performance measures for the Forest Stewardship Program in 2008 that focused on IFRA areas and plans implemented in IFRA areas, states have been required to maintain a geospatial record of current FSP plans. SMART will provide a nationally consistent way to meet the spatial reporting requirement of the Forest Stewardship Program that PMAS, as a tabular reporting system, could not do. However, it does not appear that changes are planned to any of the metrics currently reported in PMAS. Thus, the issues, limitations, and problems that we have identified with some of the PMAS reporting metrics will remain in the new SMART database.

4.5 PMAS analysis summary points

- Analysis of the PMAS data underscores the reality that there is significant variability in how FSP is implemented across the country. States vary in how they use FSP funds and in the activities they prioritize in implementing the program. This complicates the ability to effectively and clearly analyze the performance of the FSP program.
- The imprint of FSP is small relative to the total number of NIPF acres and owners in the country. What is not known, however, is whether this is a reflection of FSP funds being small relative to

the task at hand, whether there is a lack of interest or participation of FSP-eligible owners, or whether there are inefficiencies in how FSP is being implemented.

- Significant variability, both spatially and temporally, were found in reported PMAS numbers.
- Data integrity, definition, and standardization issues exist within PMAS.
- Many of the PMAS metrics are problematic for issues of double-counting and lack of standardization in definition. Because of that, it makes use and comparative analysis of them difficult. Of the PMAS metrics evaluated in this study, only three seem to be free of these data issues: Number of acres in new or revised plans, number of new or revised plans, and number of acres in current plans.
- FSP assists and educational contacts are on the decline.
- As a percentage of the total NIPF landowners in the country, the number of landowners receiving FSP assistance over the past five years has remained quite small, but steady.
- As a percentage of total NIPF acres in the country, the number of acres under new/revised FSP plans over the past five years has remained steady but very small.
- Fewer plans were being written, but average plan size was increasing over the past five years. This trend is likely due to the fact that FSP funding allocation rewards states for the number of acres under plans, but does not account for the number of plans written. Thus, states may be focusing efforts on getting landowners with bigger landholdings under new or revised plans.
- The number of IFRA acres in new or revised plans increased nationally by 44% from 2007 to 2011. This is reflective of the increasing emphasis on IFRA acres in the FSP funding allocation equation.
- The proportion of IFRA to non-IFRA acres under new/revised plans is growing.
- While states and regions are increasingly emphasizing IFRA acres when developing new or revised plans, the amount of total *designated* IFRA acres under new or revised plans remains quite small.
- Total IFRA-designated acreage varied substantially year to year in some states; sometimes by orders of magnitude.
- Total acreage in *current* plans increased 12% nationally from 2008 to 2011.
- In spite of targeting in IFRA areas, approximately half of acres under current plans are in non-IFRA areas.
- In spite of increasing emphasis on IFRA acres, the percentage of total IFRA-designated acres under plans has remained static and low over the past four years.
- The number of IFRA acres under current plans managed sustainably rose 68% nationally between 2008 and 2011.
- States are reporting that the majority of IFRA acres under current plans are being managed sustainably.
- Even though states and regions have identified priority areas of focus through the IFRA acreage, the percentage that is actually under plans and managed sustainably is a very small portion of the total designated IFRA acreage.

4.6 Recommendations

- It does not appear that there is great use or examination of PMAS data beyond what goes into the annual funding allocation. An annual review PMAS metrics at the state, regional, and national levels would be useful for tracking trends over time as well as helping to ensure that the data being reported are reasonable and consistent.
- Some of the PMAS metrics have exhibited large annual variability. We suggest that a quality assurance/quality control check be put into place that requires states to provide an explanation when the percent change year to year is above a specified threshold. We also suggest these current data be evaluated by FSP managers further to gain insight into the reasons for the large differences that were observed. Greater standardization in definition and reporting of some of the PMAS metrics (i.e., IFRA acres and Sustainably Managed IFRA acres) as well as periodic auditing may be useful in helping to address this.
- Review methods for determination of Sustainably Managed IFRA acres. Make sure these methods are standardized and defensible.
- Collecting information on the number of landowners receiving assistance or education is one means of assessing FSP effort. Ultimately, however, it would be more useful to assess how these efforts relate to actions on the ground on whether landowners obtain and/or implement a plan. Ideas: assess whether certain types of educational efforts lead to plans more often, or number of assists before a plan is obtained or action undertaken, or percent of management activities influenced by FSP professional advice, or percent of professionally assisted management activities.
- If FSP wants a metric associated with FSP educational efforts, we suggest that states establish landowner case files or databases for those receiving education just like those receiving assistance. As it is currently defined, this metric is not useful or reliable due to the distinct possibility of double-counting of efforts.
- Because there is increasing emphasis on IFRA areas, states might consider reporting the number of educational programs or number of landowners educated or assisted within IFRA-designated areas. Are states targeting marketing and educational efforts in these areas?
- If FSP wants states to place more emphasis on activities like education or assistance, then these metrics have to factor into the allocation calculation. It appears that states are deprioritizing landowner education/assistance in order to put effort into creating plans and covering more acres, despite education being an early step on the road to forest stewardship. It is not surprising that landowners educated and landowners assisted have both declined in recent years given the allocation equation.
- FSP would benefit from standardized or tighter definitions of IFRA-designated acres and IFRA acres Sustainably Managed so there is greater consistency among states and over time. Some of the estimates of IFRA acres sustainably managed that have been reported in PMAS in recent years seem unrealistic, as do the large swings in IFRA-designated acreage year-to-year. These issues make the use of IFRA estimates within the allocation equation a little problematic, as well as comparisons among states and regions unreliable. It is obvious that states are emphasizing what they are currently rewarded for; getting IFRA acres under plans and managed sustainably.

Because of this, FSP needs to ensure they have confidence in how these acres are being defined and how sustainable management is being determined. Moreover, FSP needs to ensure that states are not inflating the number of IFRA-designated areas in order to improve their accomplishment reporting and chances of funding.

- A key question is whether this increasing emphasis on IFRA acres is resulting in meaningful improvements to the program and on the ground. Given the recent nature of the IFRA focus, we suggest more time is needed to determine whether the IFRA focus is making a difference. It will be important for FSP to track the IFRA-based metrics into the future to see if states are able to make measurable improvements in getting these acres under plans. Currently, these numbers still appear small due in part because the IFRA metrics are based upon acres in current plans rather than new plans. Because of this there is the legacy and time lag associated with plans that were developed prior to the IFRA emphasis.
- From the PMAS statistics, 5.7% of total NIPF acres are under current plans and 2.6% of total designated IFRA acres are under current plans. Thus, in both categories, FSP is just scratching the surface in terms of eligible forest area and owners. Because of this, it may be difficult to capture quantitative measures of impact or outcome on the ground at landscape scales. FSP may need to focus on individual behavior or changes to behavior as a measure of program impact rather than searching for landscape-level impacts such as change in forest cover.
- If it is useful to develop estimates of the percent of FSP-eligible landowners who are participating in or being impacted by FSP in a given year, then states need to provide a more accurate estimate of the number and acreage of agricultural landowners who are eligible. In our analysis, we estimated this by dividing by the number of NIPF landowners who own more than 10 acres. However, our analysis points to cases where this results in overestimations of program impact because we did not have an accurate estimate of total FSP-eligible acres and owners.
- Would an FSP efficiency measure be useful as a barometer of FSP performance over time (e.g., cost/plan acre or cost/plan written)? To compute this, states would need to provide estimates of the total funds put toward various FSP activities in a year. Efficiency metrics could track trends in the cost to put new plans in effect and acres under plans and would serve as another dimension of FSP performance.

5 Survey of State Administrators of the Forest Stewardship Program

5.1 Introduction

A confounding factor in trying to determine the effectiveness of the Forest Stewardship Program (FSP) is that implementation is largely dictated by each state forestry agency and hence, there are 59 (50 states plus 9 protectorates) different approaches. This is both a strength of the program and, at least in terms of evaluation, a weakness. Some limited information on each state program is provided through the Performance Measurement Accountability System (PMAS; see Chapter 3), but detailed activity information is not available through this reporting system. Hence, this study undertook a survey of the state FSP administrators to document the activities undertaken to increase stewardship among private forest owners. The results of this survey are reported in this chapter.

This survey focused on agencies' landowner assistance activities over the past five years. The nature of and funding for activities change over time; consequently, the administrators were asked to respond for a "typical" year. The survey asked about some specific FSP activities, but many of the questions were about all of an agency's landowner assistance efforts. This approach was taken because FSP is considered a "foundational" program; it can have impacts across all landowner assistance programs, and therefore, it cannot be separated from activities funded by other sources. In addition to these types of questions, a simple question was asked to a subset of state foresters and their staff members (n=17): "What is the Forest Stewardship Program?" Although the sample was small and not random, responses to this question should provide some insights into how, in their own words, these key individuals define FSP.

5.2 Methods

The survey sent to all FSP state administrators was designed with the intent to quantify

- the funding sources for forest landowner assistance programs;
- allocation of FSP funding to general program areas and specific activities;
- types of publicly funded management plans;
- frequency of direct landowner assistance activities (e.g., one-on-one visits);
- frequency/existence of landowner outreach and education programs/activities – both traditional (e.g., pamphlets) and more modern (e.g., Facebook); and
- the relative effectiveness of the assistance activities as ranked by the administrators.

The survey collected qualitative information on the content of the management plans, direct landowner assistance activities, and landowner outreach/education programs. In addition, the administrators were asked to describe specific strategies they considered to be unique and/or effective. A copy of the survey is located on the CD that is included with this report. A list of FSP administrators for all U.S. states and protectorates was obtained from the USFS regional FSP coordinators. An initial contact was made to the state foresters and the administrators from the director of the USFS Cooperative Forestry program to alert them of this study, to the fact that the survey was coming, and provide background information. The study team first contacted the state administrators in May 2012 with follow-up contacts made by

the research team and the regional FSP coordinators. The survey used an electronic survey instrument that could be downloaded, saved by the respondent, and, when returned, automatically compiled with other responses by the software Adobe Acrobat©. Detailed results for each respondent are located on the CD that is included with this report.

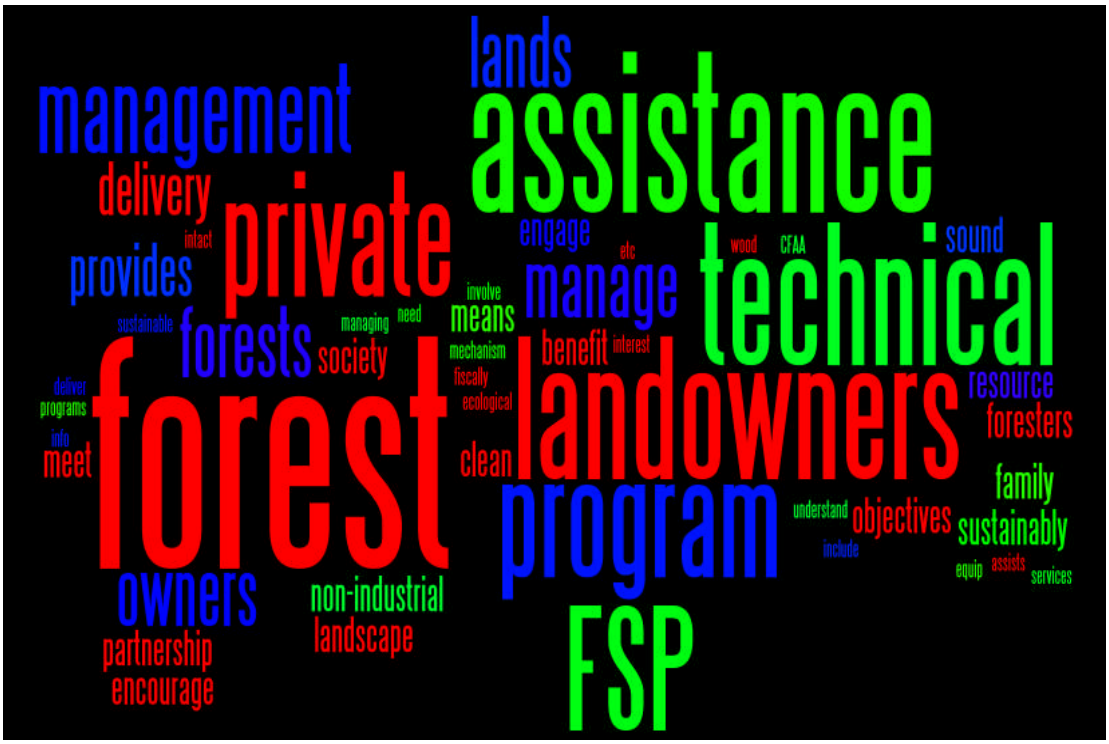
The study team assembled data responses and cleaned the data as appropriate. We normalized the frequency of the direct landowner assistance activities by the number of NIPF owners, with 1+ acres, in the state (taken from Butler (2008)) and provided results in terms of percentage of respondents. In addition to the summaries below, some of the survey responses were used in the grouping of state programs presented in Chapter 7. We analyzed the responses to the open-ended questions by identifying themes and calculating the frequencies of these themes. Illustrative excerpts of the survey results are included below.

The responses from the protectorates proved unique enough to warrant a separate analysis, presented below. Detailed responses by the responses from protectorates are also included in a file on the CD.

5.3 Results

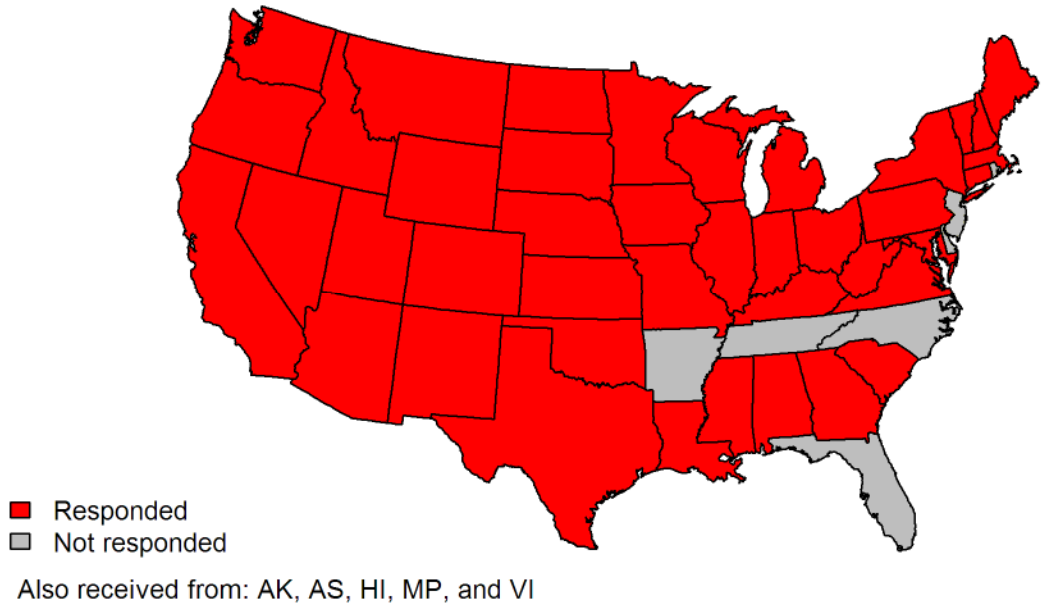
When state foresters and their staff members described the FSP, the words most commonly used, besides those in the program title, were *private, landowners, management, technical,* and *assistance.* We report these responses with a "word cloud"—a graphical display with the size of words proportional to their frequency in the responses (Figure 5-1). The first two words refer to whom the program applies, and the other terms refer to how they perceive the program operating—providing technical assistance to enhance forest management.

Figure 5-1. Word cloud of terms used by a group of state foresters and their staff to describe FSP.



FSP administrators from 43 states and three protectorates responded to the survey (Figure 5-2). The response rate among the states was 86 percent; four of the non-response states are in the south and three of the non-response states are in the north. The response rate among the protectorates was 33 percent. Due to numerous geographical, social, economic, and political differences between the states and the protectorates, the results are reported separately. The small number of protectorates that responded dictated those responses be qualitatively analyzed.

Figure 5-2. States that responded to the survey of activities related to FSP.



5.4 Funding

Funding for forest landowner assistance programs run by state forestry agencies comes from a variety of sources (Figure 5-3) and varies significantly by state (Figure 5-4). On average, a little more than half (56 percent) of states' funding for landowner assistance programs comes from the state government, but this ranges from 0 to 98 percent. FSP contributes, on average, 28% of the funds used for landowner assistance. The remaining funding comes from other federal agencies, other state agencies, and competitive grants.

Figure 5-3. Sources and percentages of funding state agencies receive for landowner assistance, education, outreach, and related activities.

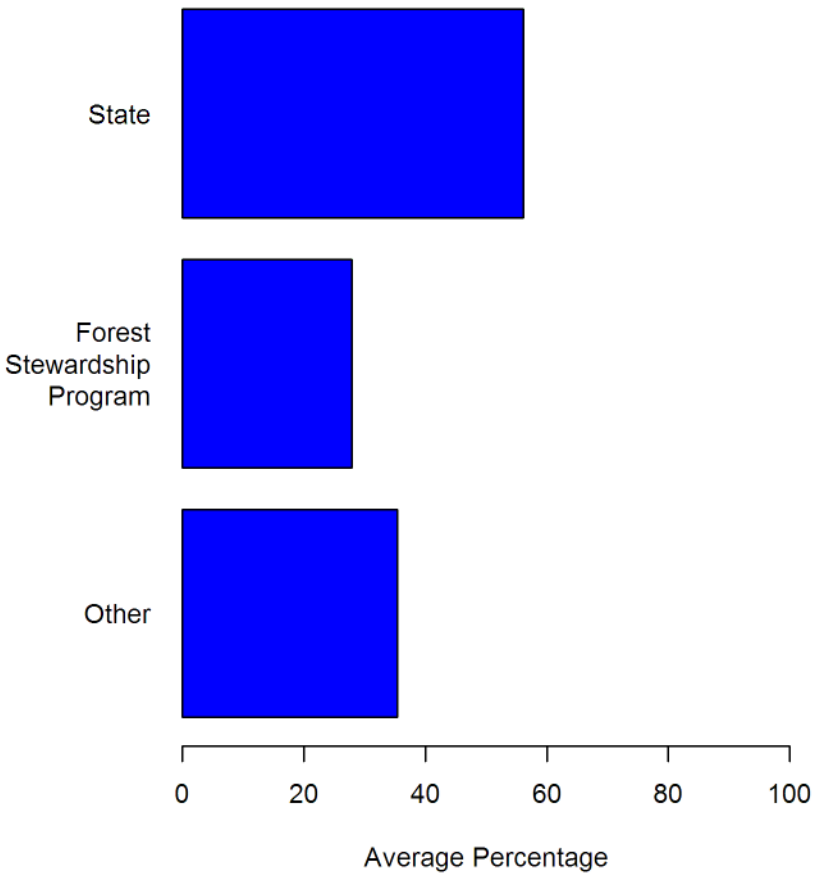
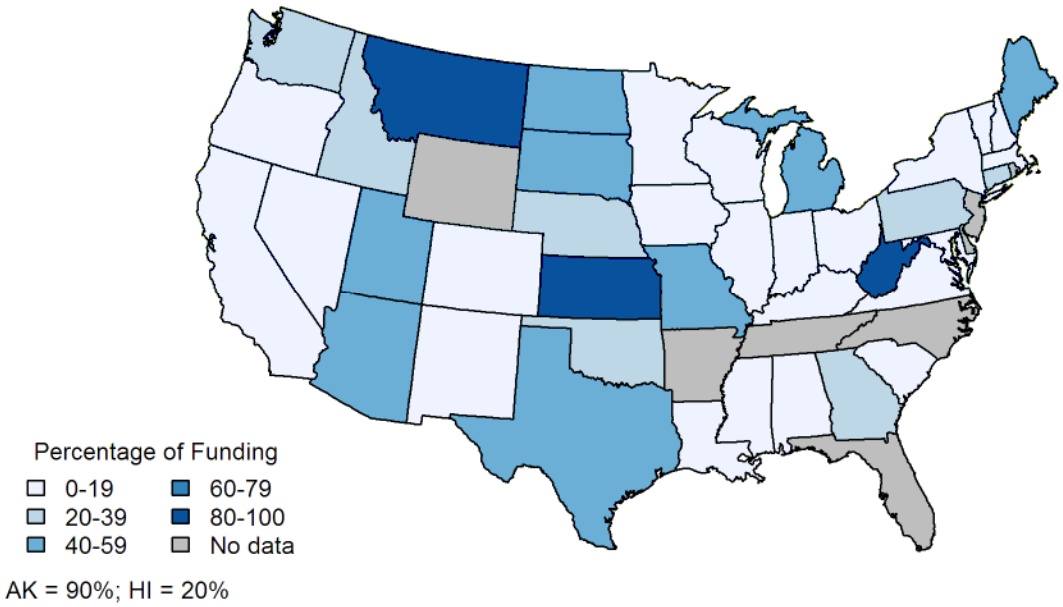


Figure 5-4. Percent of total state agency funding received from FSP for landowner assistance, education, outreach, and related activities.



AK = 90%; HI = 20%

On average, 40% of FSP funding that state forestry agencies receive is allocated toward direct landowner assistance, a similar amount is allocated toward management plans, 19% toward education and outreach, and the remaining going toward other efforts, such as Reforestation, Nurseries and Genetics Resources (RNGR) and extension (Figure 5-5). The allocations vary significantly by state (Figure 5-6) with some putting almost all their FSP funding toward management plans and others putting almost all of it toward direct landowner assistance.

Figure 5-5. Percentages of state FSP funding allocations by program area.

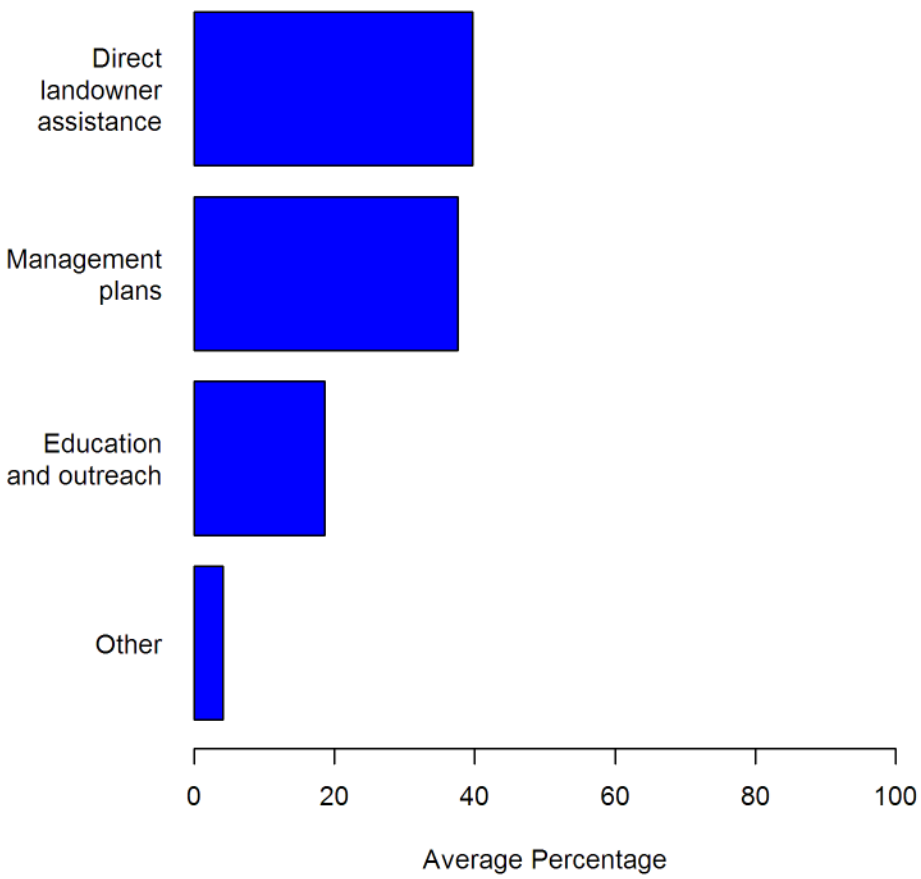
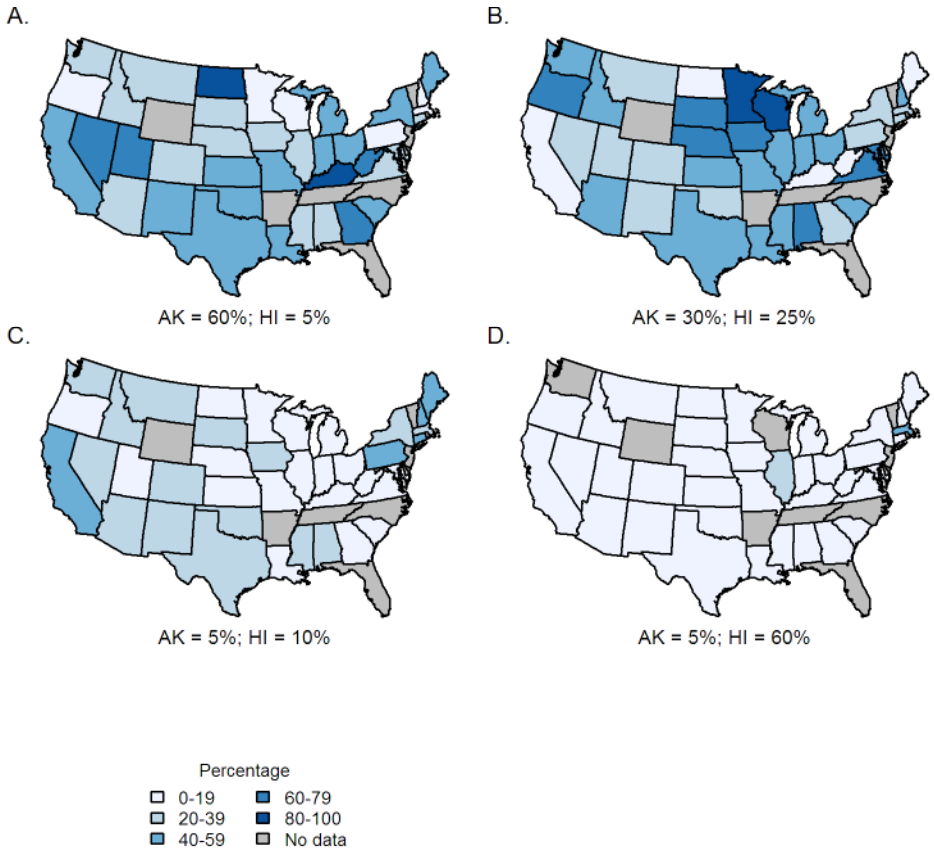


Figure 5-6. Percentage of FSP funding allocations going toward (A) management plans, (B) direct landowner assistance, (C) education and outreach, and (D) other program areas, by state.



Within the direct landowner assistance and education/outreach program areas, FSP funding is allocated to different activities. Field visits account for, on average, 47% of FSP funding used for direct landowner assistance with technical assistance and phone consultations accounting for another 21 and 12%, respectively (Figure 5-7). FSP funding used for education and outreach were spread across a number of activities with workshops and field tours receiving, on average, the greatest percentages, 34 and 24%, respectively (Figure 5-8).

Figure 5-7. FSP funding allocation among direct landowner assistance activities.

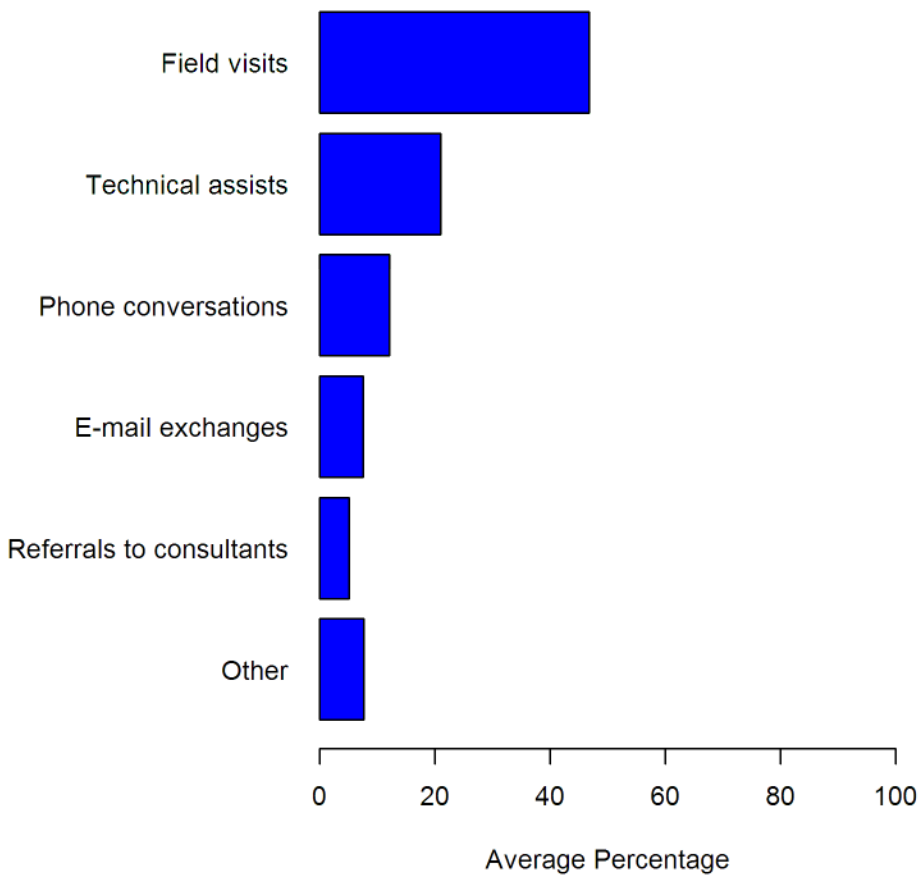
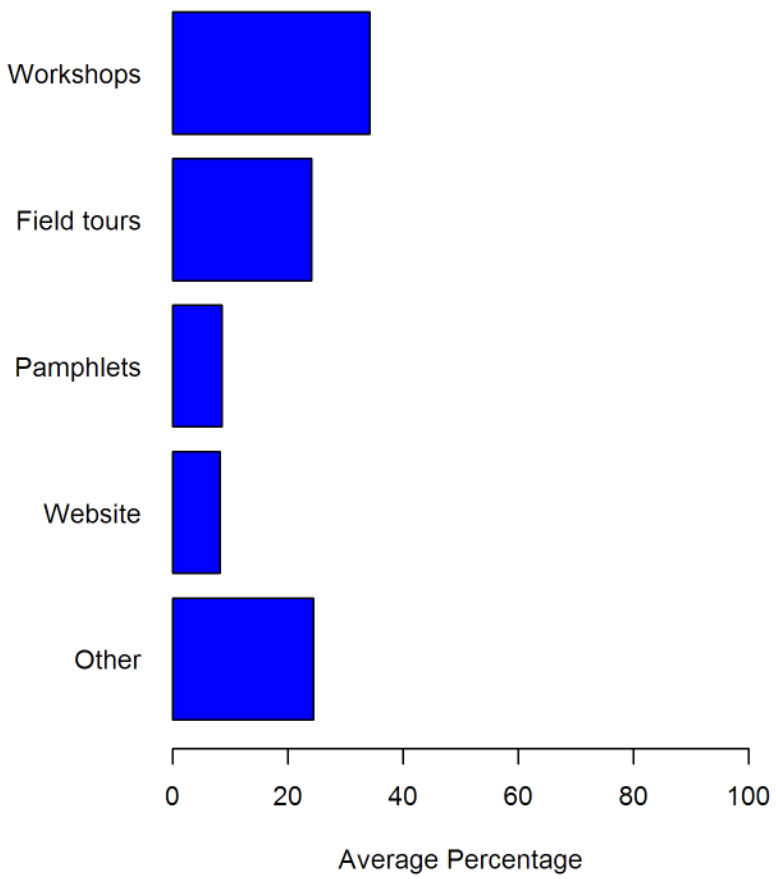


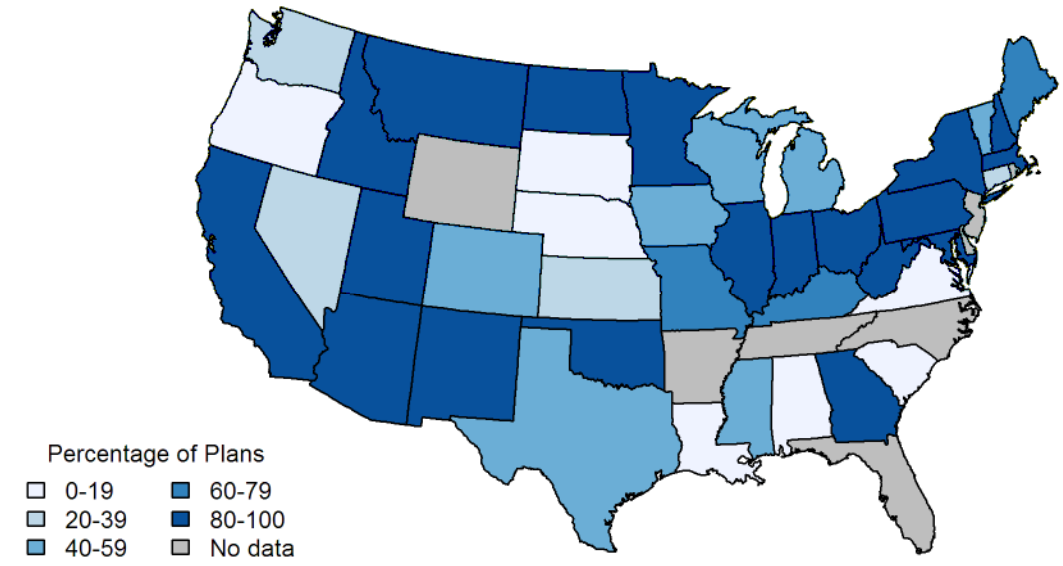
Figure 5-8. FSP funding allocation among education and outreach activities.



5.5 Management plans

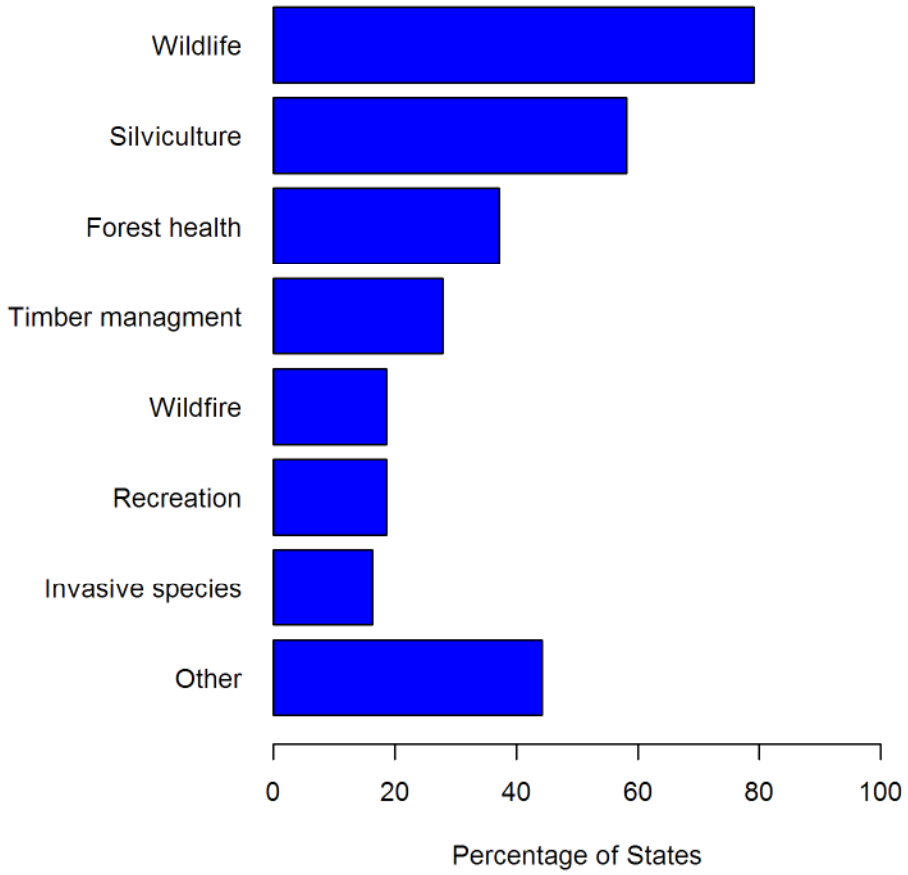
On average, FSP plans reflect the majority of publicly funded plans developed over the past five years (59 percent). Percentages range from 4% in Oregon to 100% in California and West Virginia (Figure 5-9). A majority of the other types of plans consists of practice plans, tax programs, project work plans, and plans part of other cost-share programs, such as the Conservation Reserve Program (CRP) and the Conservation Resource Enhancement Program (CREP). The topics most commonly addressed in the plans were related to wildlife, silviculture, and forest health (Figure 5-10). Some other topics had more regional importance, such as wildfires in the West.

Figure 5-9. Percentage of states' publicly funded forest management plans that are FSP plans.



AK = 30%; HI = 38%

Figure 5-10. Most common topics addressed by publicly funded forest management plans.



5.6 Direct landowner assistance

Direct landowner assistance involves one-on-one interactions with landowners; the interactions may be through field visits, phone conversations, or other means. The most common of these activities are e-mail exchanges and phone conversations that occur, on average, 50 and 39 times per 1,000 NIPF ownerships per year, respectively (Figure 5-11). More time and resource intensive activities occur at lower rates. For example, there are an estimated 13 field visits per 1,000 NIPF ownerships per year. Similar to management plans, direct landowner assistance activities most commonly address issues related to wildlife, silviculture, and forest health (Figure 5-12).

Figure 5-11. Average frequency of direct landowner assistance activities.

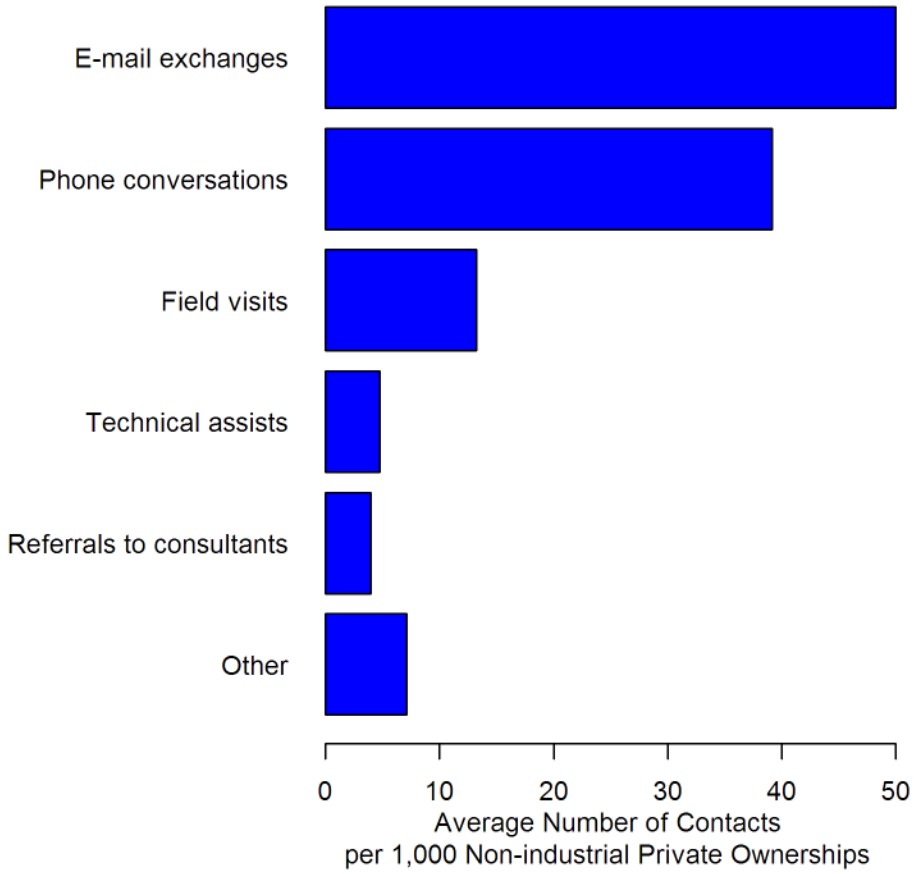
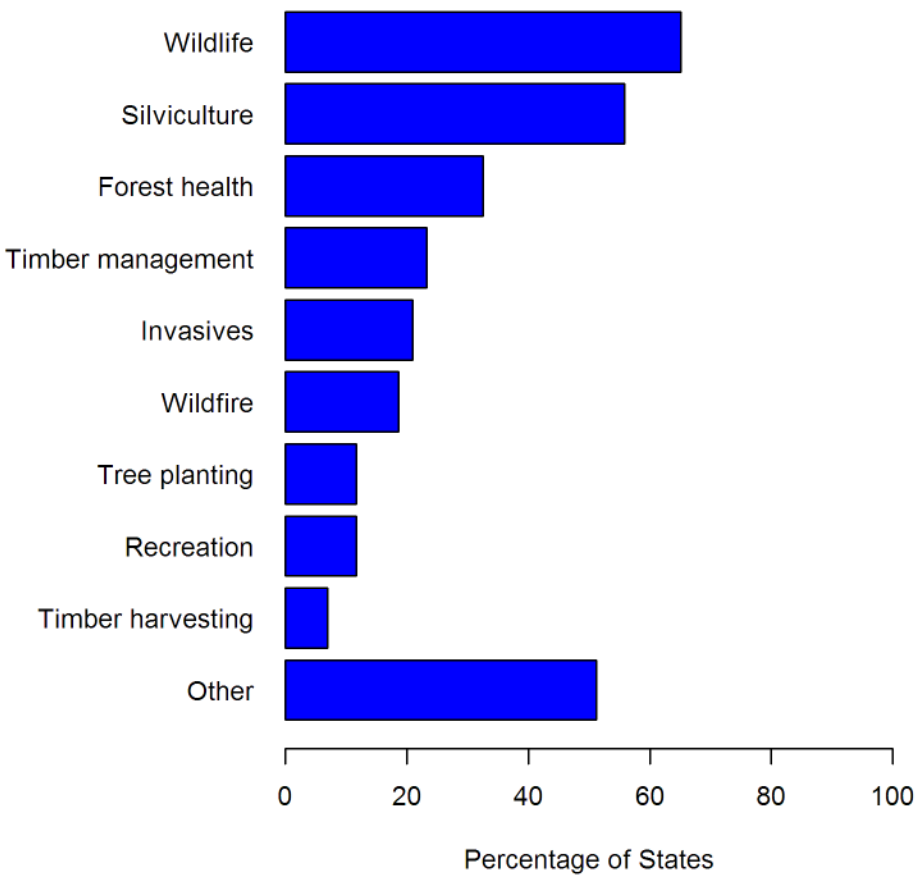


Figure 5-12. Most common topics addressed by direct landowner assistance activities.



5.7 Landowner education and outreach

Most states use a combination of traditional and electronic methods for interacting with private forest owners. On average, states host 61 workshops, write 48 articles, conduct 41 field tours, and prepare 7 pamphlets per year (Figure 5-13). In addition, all of the states use websites to communicate with NIPF owners, and over half of the responding states use radio, TV, and/or Facebook (Figure 5-14); 63% of states use four or more of these methods. The topics covered by education and outreach efforts are more varied (Figure 5-15) than those for management plans (Figure 5-10) or direct landowner assistance (Figure 5-12). Although wildlife, silviculture, and forest health are still the most common topics, the percentages are much lower than those for the other program areas and the percentage of "other" topics is significantly higher. The other topics range from tax programs to estate planning to carbon credits.

Figure 5-13. Average numbers of workshops and field tours conducted and articles and pamphlets written per state per year.

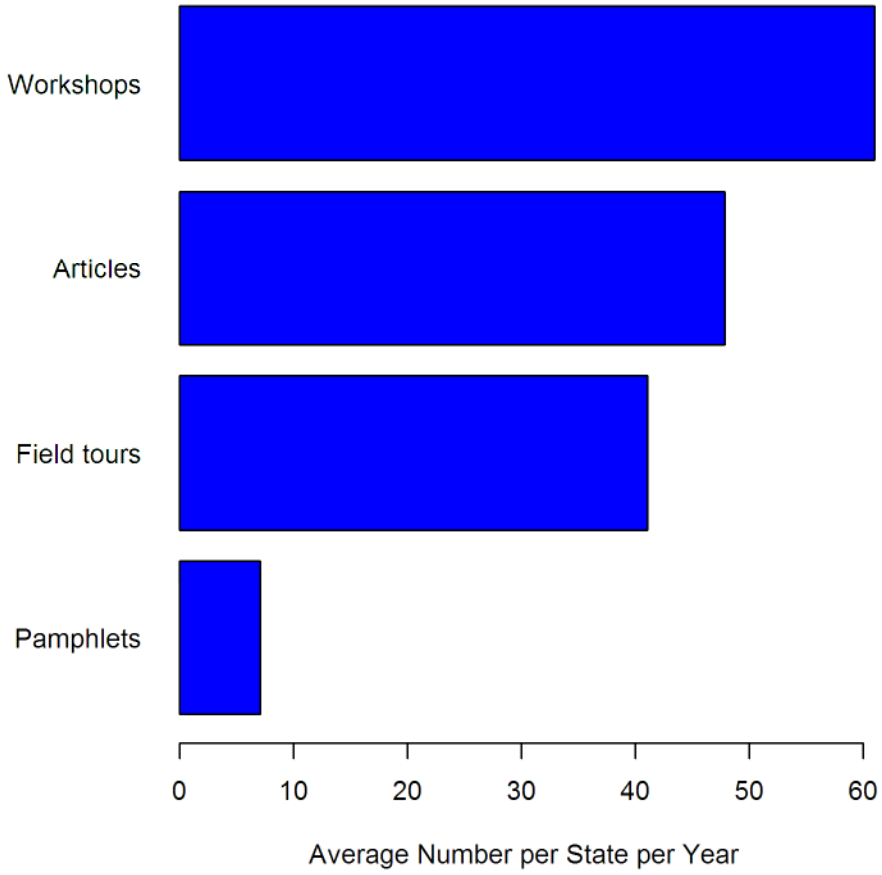


Figure 5-14. Percentage of state forestry agencies that utilize various electronic means for communicating with private landowners.

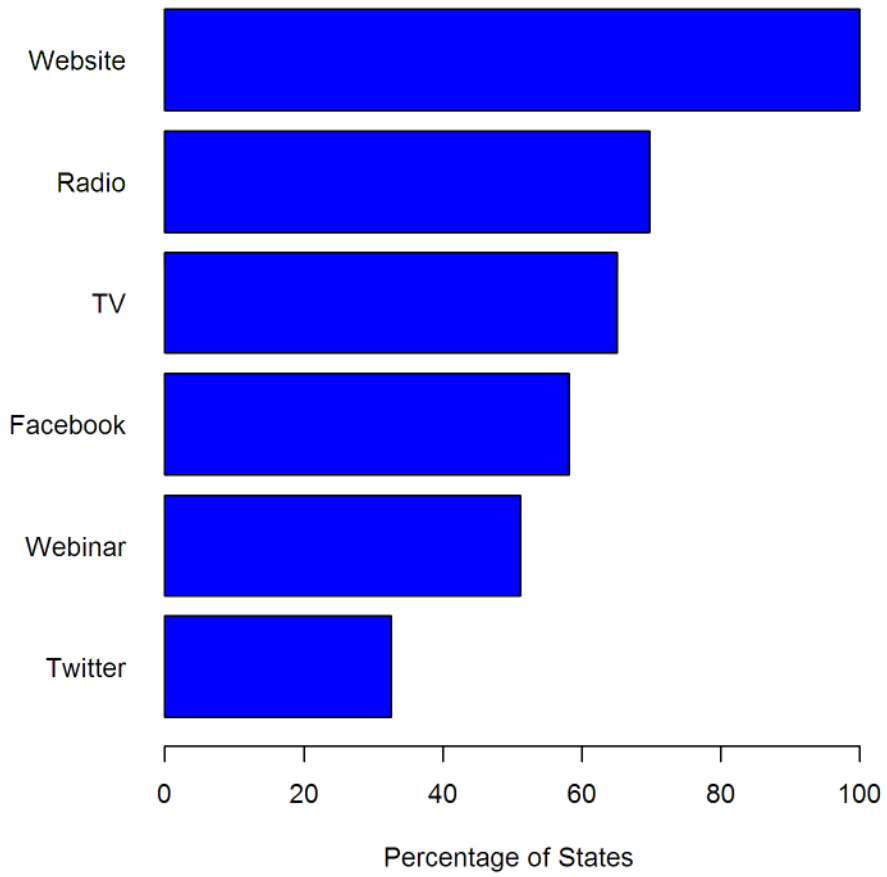
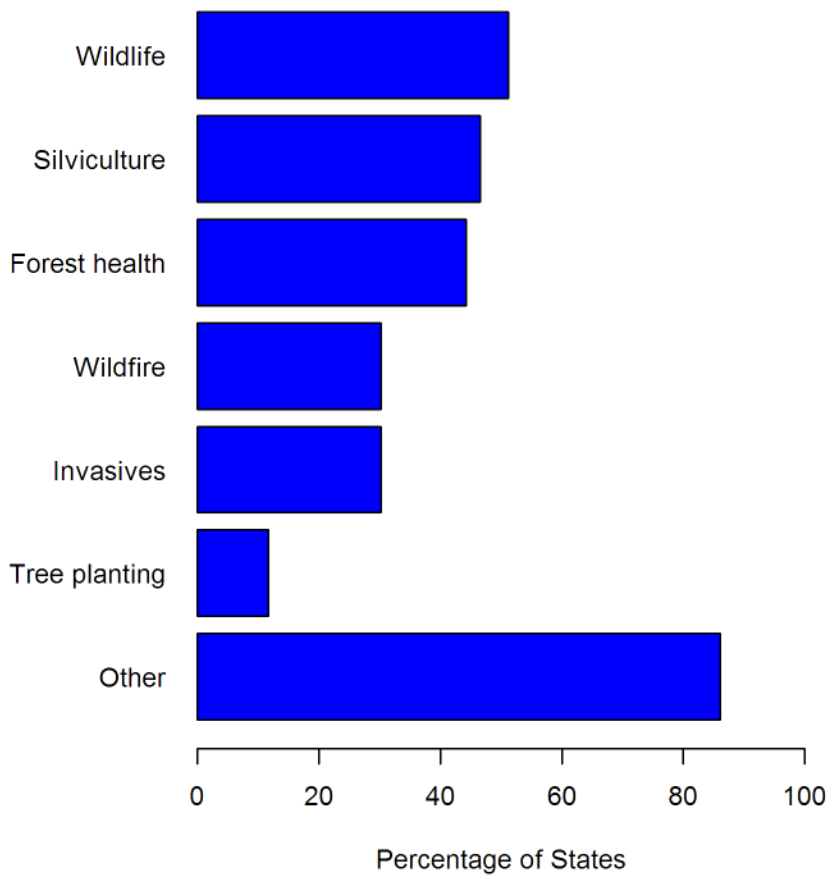


Figure 5-15. Most common topics covered by traditional and/or electronic educational and outreach efforts.



Master forest owners programs are peer-to-peer programs that encourage and empower landowners to reach out to fellow landowners; this program is akin to master gardener programs. About one-third (37 percent) of states have a master forest owners program with the largest concentrations in the Northeast, Upper Midwest, and the Northwest (Figure 5-16). The role of state forestry agencies in these programs varies considerably, with the most common activities being presentations and providing written materials (Figure 5-17).

Figure 5-16. States with a master forest owners programs.

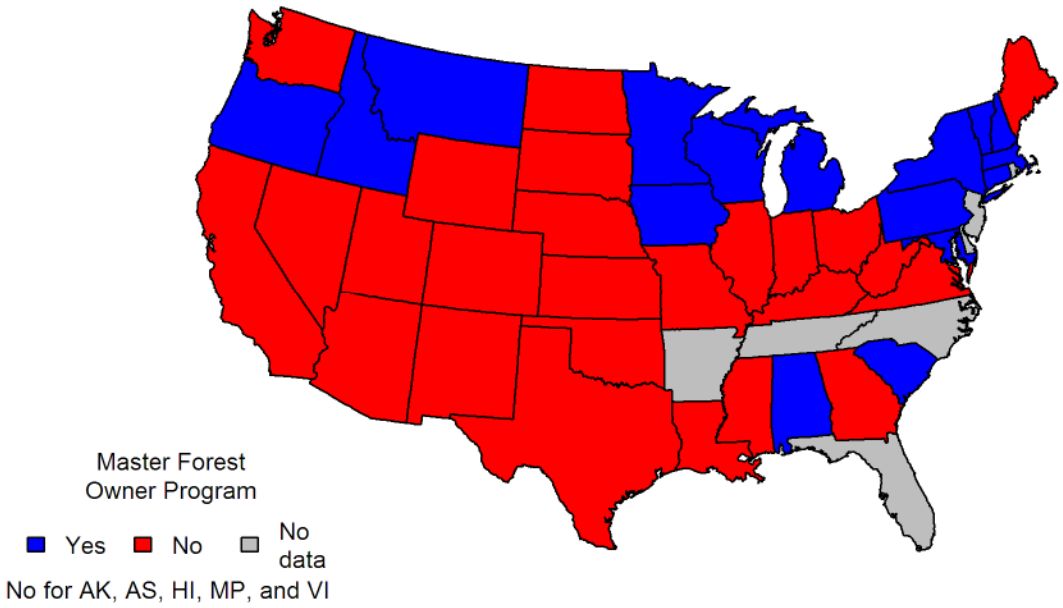
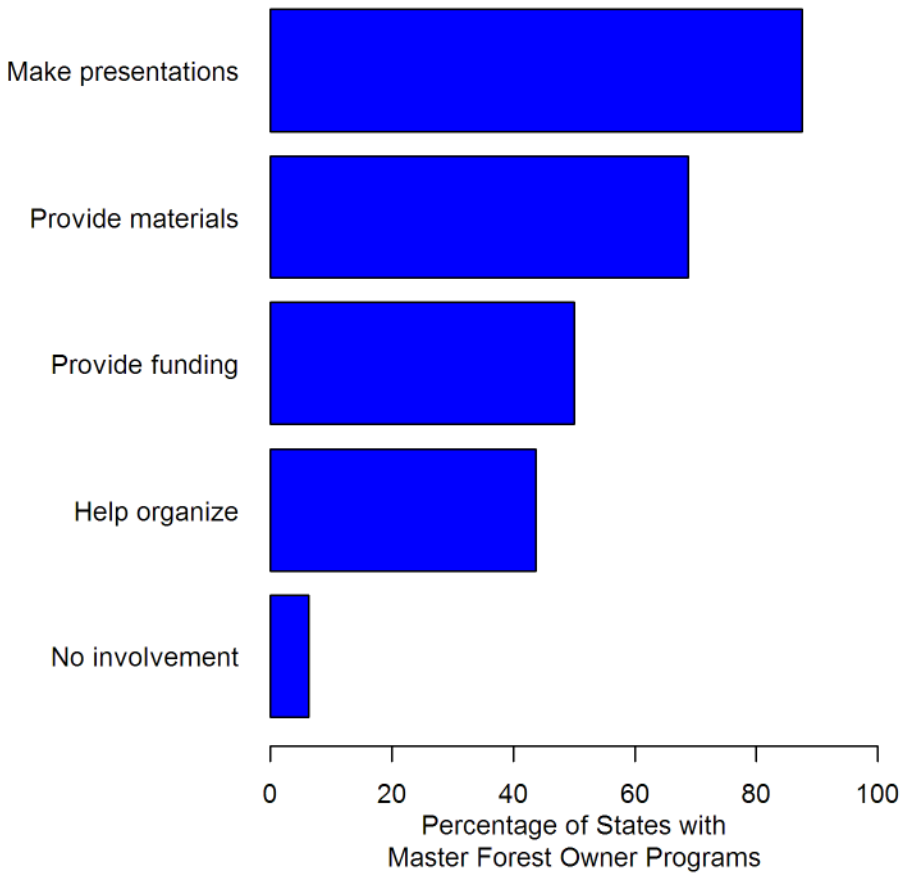


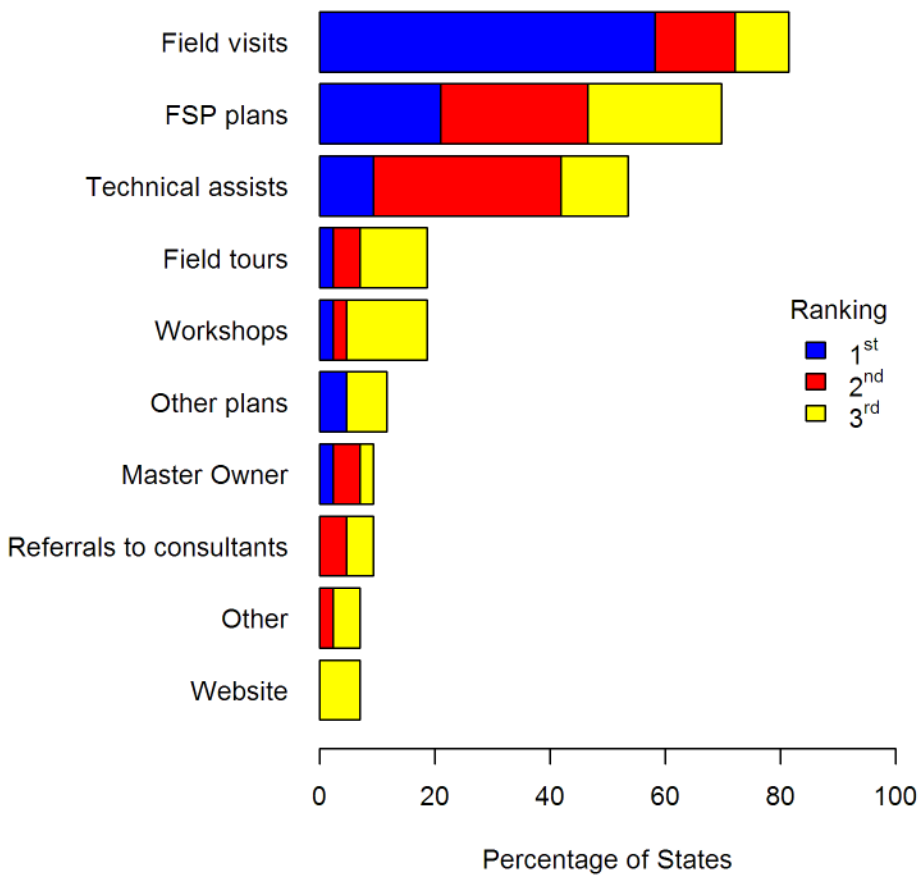
Figure 5-17. The role of state forestry agencies in master forest owners programs in states that have such programs (see Figure 5-16).



5.8 Perceived effectiveness

State FSP administrators were asked to rank landowner assistance activities according to what they consider to be the most effective activities to "help landowners to sustainably manage their forest properties." Fifty-eight percent of the administrators stated that one-on-one landowner visits is the most effective activity, and an additional 14 and 9% of the administrators rated it as the second or third most effective activity, respectively (Figure 5-18). Other activities that were rated highly were FSP management plans and technical assistance. Of the 16 states that have a master forest owners program, Pennsylvania considers it the most effective activity and three others (Connecticut, Massachusetts, and Vermont) consider it to be among the top three most effective activities in their state.

Figure 5-18. Relative effectiveness of landowner assistance activities as reported by state FSP administrators.



5.9 Descriptions of most unique and effective programs

The responses to the open-ended questions that the administrators felt were "unique or have been particularly effective" yielded an array of activities. A complete list of responses can be found on the CD that is included with this report. Below are some select responses of innovative efforts that offer valuable examples for other states.

Many states are using partnerships to achieve goals by leveraging resources. Many of these partnerships are between traditional partners, such as the USDA Natural Resources Conservation Service (NRCS). However, some of these partnerships are seeking to reach landowners who are not attracted to traditional programs by developing relationships with new partner organizations. An excellent example of this type of partnership is the Kennebec Woodlands Partnership (KWP) in Maine.

> Thirteen organizations with diverse interests currently collaborate on forest land conservation projects that support the region's woods products, tourism, and recreational economies and protect water quality, wildlife habitat, scenic resources, and quality of life. KWP activities include introductory woodland owner workshops; an inaugural conference focused on the economic and ecological value of Kennebec forests; development of a 'Stewardship Storyline'—

> a series of steps on a woodland owner's path towards forest conservation; publication of Your Woodland: A Resource Guide for Kennebec County Landowners.

Several states have undertaken specific efforts to "keep forests as forests":

> Ties to the Land Project: This is an ongoing multi-state (CA, ID, OR, and WA) competitive grant project that is intended to help protect family forest lands from fragmentation and conversion which may occur when property passes from one generation to the next.

> Michigan "applied for a grant to provide outreach and education to landowners regarding transferring the land to the next generation of owners. These two-part workshops have been offered all over the state and delve into the necessary although sometimes uncomfortable discussions on estate planning in a supportive atmosphere."

In addition to education, Illinois is buying conservation easements on woodlands associated with farm fields through the USDA CREP as a strategy to maintain forest cover:

> Partner within Illinois DNR Forestry, Wildlife, Realty and Farm Programs Divisions and dozens of Soil & Water Conservation Districts to deliver Illinois CREP permanent easements. Private landowners sell DNR a permanent conservation easement of their federal CREP field plus additional surrounding forest acres within floodplain as negotiated (ranking, grading, approval of each by technical committee). CEs require timber may only be harvested with a DNR Forester's approval of a timber management plan.

While funding is always a challenge for states, Maryland offers a very innovative revenue source:

> A very small portion of sales tax associated with transfer of wooded properties is directed to our Woodland Incentive Fund, which in turn is used to support forester salaries and cost-share activities.

A common problem facing forestry is reaching beyond those landowners who are currently engaged. Because landowners have diverse goals, reaching landowners will need approaches that resonate with these different landowner segments. The state of Missouri offers a range of programs: from traditional forest owners (American Tree Farm System) at one end of the spectrum, to the Heritage Woods Program for landowners who are interested in some active work on their land, but not the full commitment of Tree Farm, and to the Forestkeepers Network for landowners and citizens interested in education and monitoring at the other end of the spectrum:

> Missouri Forestkeepers Network is 2500 members who receive a quarterly newsletter and information on tasks to engage them in forest health and monitoring issues. A component of this is the Heritage Woods Program that recognizes landowner[s] doing good management but do not fit the American Tree Farm System model of certification.

The development of a network uses a "light" touch (i.e., not investing resources into the development of a management plan) and allows Missouri to not only reach diverse landowners and other interested

citizens, but also allows them to be in contact with a larger number of people. Missouri also complements these efforts with robust internet resources.

Landowners consistently rank peers as an important source of information. Vermont uses peer education to help connect new landowners to information about their land:

> Using real estate transaction information, contacts by peers were made to new forest landowners. They were given a sap bucket with advice and tools for getting started with forest management activities on their land.

Many states are focusing work in priority landscapes. In Idaho, the focus is on education and technical assistance on an aquifer:

> Spokane Valley-Rathdrum Prairie Aquifer Improvement Project: This is an ongoing multi-state (ID and WA) competitive grant project to protect and enhance a critical aquifer (Spokane Valley-Rathdrum Prairie aquifer), a sole source aquifer for more than a half million people in two states.

In addition to focusing on ecologically important landscapes, South Carolina's concentration is on important decision makers to derive the greatest impact for the limited amount of people they are able to reach:

> Forest Resource Institute—City and county planners, landscape architects, and others attended the 2012 Forest Resource Institute held at Springmaid Beach Resort in Myrtle Beach. Attendees were taught to understand Firewise principles, learn about forestry in South Carolina, the value of forestry to our state, the benefits of trees, and how to plan for trees in your city/community.

Like all tools, the internet is most effective when used appropriately. Texas is using the internet in conjunction with a partnership effort that target priority landscapes:

> …region-wide partners were established to direct and lead the [outreach] effort, and a website (www.texasconservation.org) was developed in 2010 as a place for landowner information and posting of future events.

The internet offers other types of opportunities to meet the needs of landowners and foresters, as well as collect valuable data on impacts. Indiana is a good example:

> In 2009 Indiana received a grant to update our Classified Forest and Wildland Owners database. This database is now an online application that will allow landowners and consultant foresters access to their records and allow real time updating of Stewardship Plans, Practice Plans, and accomplishment reporting.

Of course, measuring impact is critical to showing the impact of efforts and has long been a challenge for forestry agencies. While the number of management plans and acres covered under plans is a

straightforward metric, there is growing agreement that it is not the best metric to capture impact. Georgia is working on an effort to demonstrate impact in a different way.

> In Georgia we are developing a way to measure the delivery of the stewardship program that goes beyond acres and numbers of plans. We are attempting to measure actual accomplishment on the ground in the form of acres of trees planted, acres prescribed burned, numbers of water quality control structures installed, acres of wildlife habitat created, etc.

As the above examples demonstrate, the implementation of FSP is highly tailored to the state's individual circumstances. While this diversity makes it difficult to make generalizations about the program, one benefit is the ability for states to innovate and meet their own needs. Importantly, many of these innovative examples are the result of competitive funding.

5.10 U.S. protectorates

FSP is the exclusive funding source for forest landowner assistance for the protectorates who responded to the survey. Two of the three protectorates (Commonwealth of the Northern Mariana Islands (CNMI) and American Samoa) use approximately half of this funding for a combination of management plans, technical assistance, and education with the other half of the funding going toward activities they categorized as "other." The Virgin Islands use most of their allocation to fund management plans. The type of management plans developed in these protectorates varied. None of the plans in American Samoa were FSP, 50% of the plans in the CNMI were FSP, and 100% in the Virgin Islands were FSP. The content of these plans addressed subjects largely focusing on invasive exotic plants, reforestation using native trees, soil conservation, and watershed health.

When engaging in direct landowner assistance, American Samoa put all of their efforts toward one-on-one visits. The Virgin Islands and CNMI divided their efforts evenly across the other methods. Outreach activities in all three reporting protectorates were evenly divided among workshops, field tours, and pamphlets/fact sheets. The content of these outreach methods focused on subjects such as tree care/pruning, climate change, agroforestry, silviculture, and wildlife. The program administrators consistently ranked one-on-one technical assistance as the most effective method of landowner assistance activities. Other highly ranked activities included referral to a consultant, pamphlets/fact sheets, phone calls/e-mails, and field walks.

5.11 Discussion

Although FSP is not the dominant funding source for landowner assistance programs in most states (Figure 5-3), it does provide a substantial amount of funding and likely has an influence beyond this funding—for example, influence on overall landowner assistance activities. Direct landowner assistance and management plans are the dominant categories of activities on which FSP funds are being expended (Figure 5-5).

Overall, management plans and field visits are the activities that receive the greatest percentage of FSP funding (Figure 5-5 and Figure 5-7). These were also the activities rated by the program administrators to be the most effective (Figure 5-18). The funding distribution is due in part to the funding allocation

algorithm that rewards more acres under stewardship plans and in part is due to the traditional belief among many in the forestry profession that plans are the key to sustainable forest management. The true effectiveness, versus the perceived effectiveness, on forest owners' behaviors has not been established and is discussed further in Chapter 7 of this report.

The information collected by this survey indicated how many activities are performed each year, but not how many landowners are impacted or how. The number of ownerships touched by the landowner assistance activities is addressed in Chapter 3 of this report. The influence, or at least correlation, of these activities on landowners' behaviors is addressed in this chapter and in Chapters 6 and 7. As would be expected, there are a greater number of "light" touches (e.g., e-mail exchanges and phone conversations) than "heavy" touches (e.g., field visits). This is due, at least in part, to the fact that the financial and resource costs are substantially higher for the heavier touches.

There are many efforts that are attempting to use non-traditional methods for influencing private forest owners. The voracity and efficacy of these efforts cannot be quantified from this survey, but it is obvious that they are receiving attention in at least some of the states. For example, master forest owners programs are established in some parts of the country, but not others (Figure 5-16). These programs are commonly run by university extension staff, and the roles of the state forestry agencies with these programs vary substantially.

The topics addressed by the direct landowner assistance and management plans (Figure 5-10 and Figure 5-12) are strongly focused on wildlife, silviculture, and forest health. A number of other topics, such as timber management or forest management, are closely akin to silviculture. By contrast, the topics covered by the education and outreach activities appear to be more varied (Figure 5-15). There is still a concentration on wildlife, silviculture, and forest health, but additional topics, such as estate planning, receive more emphasis.

Low response rates, 33 percent, from the protectorates and territories may be indicative of a number of issues. For one, the survey may not have been well-aligned with their circumstances. The protectorates also tend to have very small forestry staffing levels and this too may have contributed to the low response rates. The surveys show some significant differences to FSP programs in the states, but, interestingly, some close similarities. Perhaps the biggest difference between the protectorates and the states is the fact that FSP is the sole source of funding for landowner assistance programs in the protectorates while FSP is typically one part of multiple funding sources in the states. Not surprisingly, the content provided to landowners in the protectorates is largely different than in the states. Protectorates seem to be more focused on the role of invasive/exotic plants and restoring native trees and also focus on water and soil health more than the states. Despite these differences, there were some striking similarities. Foremost among these similarities is that, like the states, the protectorates also ranked one-on-one visits as the most effective method of landowner assistance. In addition, the distribution of protectorate focus across management plans, technical assistance, and education showed a similar range as did the states.

5.12 Conclusions

States are investing in a range of activities, but the emphasis is on the traditional management plans and one-on-one visits. Although these activities likely provide benefit to the individuals being impacted, they have failed to reach a large segment of the target population. FSP has been in place since the 1990s, and currently only 4% of the family forest owners, who own 17% of the family forest acres, have a written management plan (FSP or otherwise (Butler 2008)). Can these activities be considered effective if they are reaching such a small percentage of the target population?

This survey provides information on funding allocation and frequency of activities, but more can be done to measure the full costs and full benefits of the individual activities. This is especially applicable for the more dispersed and harder-to-measure education and outreach activities. As one respondent stated:

> The problem of decreasing funds for service forestry (e.g., the Forest Stewardship Program) stems from (1) the larger economic and political climate and (2) the failure to create compelling messages about the accomplishments of the Forest Stewardship Program. We can't control the first reason for lower funding, but we can do a better job with regards to the second reason for lower funding. Hopefully, this evaluation of the Forest Stewardship Program will be used to develop effective messages about the accomplishments of the program (assuming they are documented) rather than used to nibble around the edges with suggested or required program changes/improvements.

6 Examination of the Attitudes and Behaviors of Landowners Receiving Forestry Practice Assistance Using National Woodland Owner Survey Data

6.1 Introduction

The goal of this chapter is to conduct quantitative analyses with existing data on NIPF owners to help understand similarities and differences in attitudes and behaviors between FSP and non-FSP landowners, with the intention of providing FSP administrators with information on how to define and reach current non-participants. Such analyses will contribute to making a more complete picture of the impact of FSP.

In particular, this chapter evaluates how assisted landowners differ from non-assisted landowners with respect to past forest and land management practices and related investments made in their forest land, as well as future management, use, and ownership intentions. It does so by utilizing data from the 2006 National Woodland Owner Survey (NWOS), a national survey that quantifies family forest owner demographics, attitudes, ownership purposes, and current and future land management objectives (Butler 2008). As discussed in Chapter 3, the NWOS does not directly ask about FSP participation, but it does provide data on landowner assistance that is similar to that provided by FSP. By defining assisted landowners according to various attributes ascertained on this survey that are commonly associated with FSP (e.g., landowners who have a forest management plan), this analysis provides an assessment of factors correlated with landowners receiving forestry practice assistance and an indication of characteristics of landowners who receive such assistance. As in Chapter 3, the assumption of this analysis is that attitudinal and behavioral characteristics of assisted landowners are suggestive of attitudinal and behavioral characteristics of FSP participants.

To our knowledge, the analysis in this chapter is the first to conduct a national evaluation of FSP using several ways of defining assisted landowners. By developing several definitions of an assisted landowner, the analysis identifies important similarities and differences between assisted and non-assisted landowners, as defined by a range of landowner assistance metrics commonly associated with FSP. We are not aware of any FSP studies that have incorporated such a large and diverse set of factors that determine forest land management behavior, including landowner characteristics, land characteristics, past activities, concerns, and future landowner plans for their land. In addition, this analysis is also unique in that it is the first to use the NWOS data to evaluate a national forestry assistance program.

6.2 Data and methods

6.2.1 National Woodland Owner Survey (NWOS) data – 2006 cycle

The primary data set for the analysis derives from the 2006 NWOS (Butler, 2008). The purpose of the NWOS is to provide information on the nation's private forest landowners that can be used to better understand their attitudes and behaviors that, in turn, can be used to design more effective private

forest land policies and programs. Landowners who participate in the survey receive a questionnaire that requests the following information (USDA Forest Service 2008):

- a description of the forest land they own
- reasons for forest landownership
- how the forest land is used
- if and how the forest land is managed
- sources of information consulted in managing their forest land
- forest landownership and management concerns and issues
- intentions for future plans for their forest land
- landowner demographic and socioeconomic information

USFS conducted the "2006" NWOS between 2002 and 2006 by randomly sampling approximately 6,000 private forest owners across the country each year using an area-based sampling method. Private forest owners from all states received NWOS surveys during this survey cycle except owners in interior Alaska, Hawaii, Nevada, western Oklahoma, and western Texas. The survey was administered by following standard mail-survey protocols (i.e., sending pre-notice postcards, surveys, follow-up mailings, and telephone interviews) (USDA Forest Service 2008). By the end of 2006 cycle, 15,440 family forest owners had participated in the NWOS, representing a 51% overall cooperation rate (Butler 2008).

The following criteria were used to screen the NWOS data:

- **Eliminate the outliers in the dataset:** A few respondents have extremely large parcels (e.g., 1,532,000 acres) of forest land, and many respondents own extremely small parcels (i.e., 1 acre or less). Including these records would have distorted our characterizations of the typical assisted landowner, so we dropped owners who owned less than 10 or more than 10,000 acres of forest land.
- **Capture the landowners who are eligible for FSP:** Most states set minimum tract size requirements (e.g., 5, 10, 25 acres) to be eligible to participate in FSP. Although the minimum size varies from state to state, we excluded owners with less than 10 acres, the most common acreage minimum.
- **Eliminate multiple parcel owners:** Landowners in the NWOS dataset indicate the number of parcels they own in a state, and a considerable number own multiple parcels. The NWOS questions, however, are not parcel-specific. Respondents answer each NWOS question only once for their entire forest landownership portfolio. This single answer can be problematic if a respondent owns multiple parcels and manages them differently. For example, a landowner with multiple parcels may harvest timber in one parcel, yet invest in wildlife habitat projects on the remaining parcels. For this reason, and to reduce potential bias or data consistencies, we eliminated multi-parcel owners from this analysis.

Specifically, we removed approximately 1,482 records representing ownerships other than family forest landowners from the 2006 NWOS dataset. Additionally, we checked each record to assess whether any of the variables needed for the analysis were missing due to item-nonresponse. We removed records

containing missing values resulting from item nonresponse. After removing item nonresponses and re-coding the sub-questions, 12,785 landowner records from the 2006 NWOS data resulted as useable for this analysis. Following this, we further restricted the NWOS records to include only those representing landowners owning one parcel between 10 and 10,000 acres. The screening criteria resulted in a dataset reflecting 3,676 records from the 2006 NWOS survey.

To understand how representative the restricted analysis sample is compared to the larger NWOS data, we compared the 3,676 records to the full NWOS dataset containing 12,785 records using descriptive statistics. Tukey and Scheffe tests were performed to see whether significant differences exist between the data groups and to ensure that the reduced sample is representative of family forest landowners in the U.S. The results of this test indicated the restricted dataset is representative of the 2006 NWOS data.

6.2.2 Conceptual framework for defining an assisted landowners

FSP provides financial and technical assistance to help and encourage private forest landowners to undertake forest stewardship activities. Assistance tools offered by FSP include a variety of direct and indirect technical assistance activities, landowner advice, and preparation of a forest management plan. For example, landowners can receive technical assistance through land management practices such as tree planting and timber stand improvement. Landowners can also receive advice from a professional forester or a consultant on a variety of issues related to forest land management. Such advice can take many forms, the most common being one-on-one consultations, workshops, and field training sessions. Finally, a traditional form of assistance that has been provided to forest landowners is help in preparing a written management plan, which a public service or consulting forester generally provides.

Because FSP implementation priorities vary from state to state, there is no universal definition of an FSP participant. In addition, the NWOS dataset did not allow us to identify landowners who had participated specifically in FSP. Consequently, we developed several different definitions of landowners based on the types of landowner assistance they received. These definitions capture a range of the most common types of assistance activities that support stewardship of forest land. The definitions of assisted landowners included:

1. assisted landowners who have a forest management plan (coded as M);
2. assisted landowners who received advice (coded as A);
3. assisted landowners who received cost-share assistance (coded as CS); and
4. assisted landowners who have a forest management plan or received advice or cost-share assistance (coded as MCA).

The definitions above are not mutually exclusive; one respondent could be reflected in some or all of the definitions above. For example, a landowner with a forest management plan and advice would show up in the MCA, M, and A subsets. Similarly, a landowner who received cost-share assistance and advice would show up in the MCA, A, and CS subsets.

Note the non-assisted landowners associated with each of the above definitions are defined as landowners in the NWOS database who do not exhibit the characteristic in question. For example, when an assisted landowner is defined as MCA, a non-assisted landowner is a forest landowner who has

received no assistance (cost-share, advice, a forest management plan). Similarly, when an assisted landowner is defined as M, a non-assisted landowner is one who does not have a forest management plan.

We take the results of the comparison between assisted landowners and non-assisted landowners to be suggestive of the results of a comparison between FSP participants and non-participating landowners. We acknowledge that these results are only suggestive (and not definitive) because we are unable to identify FSP participants in the NWOS dataset.

The number of assisted and non-assisted landowners in the 2006 NWOS dataset for each of four definitions is listed in Table 6-1. For each assisted landowner definition, there are fewer assisted landowners than non-assisted landowners. The number of assisted landowners in the dataset varies from 40% (MCA: landowners who have a forest management plan or have received either cost-share or advice) to 14% (CS: landowners who have received cost-share funding).

Table 6-1. Number of assisted landowners vs. non-assisted landowners, by assisted landowner definition.

Definition	Assisted Landowners	Non-assisted Landowners
Management plan or Cost-share or Advice (MCA)	1,455 (40%)	2,221 (60%)
Management plan (M)	597 (16%)	3,079 (84%)
Advice (A)	1,239 (34%)	2,437 (66%)
Cost-share (CS)	518 (14%)	3,158 (86%)
Source: National Woodland Owner Survey 2006. Only contains landowners owning one parcel and parcel size is between 10 and 10,000 acres. n = 3,676		

6.2.3 Methods

We conduct several analyses to explore the relationship between respondents defined as assisted landowners and those defined as non-assisted landowners. We first explore whether there are differences between assisted and non-assisted landowners by considering whether the two groups of respondents have different probabilities of undertaking an activity (e.g., harvesting timber) using relative probabilities. We then use a logistic regression model to explore whether the likelihood of assisted landowners conducting a certain activity differs significantly from the likelihood of non-assisted landowners conducting that same activity, while controlling for other variables.

Both the relative probability and logistic regression analyses rely on seven categories of landowner and land variables from the 2006 NWOS data: landowner characteristics, land characteristics, past activities, ownership purpose, concerns, financial activity, and future plans. Table 6-2 provides the definitions for the variables under each of these categories.

Table 6-2. Description of variables from the NWOS dataset used in the landowner assistance analyses.

Category/ Variable	Description
Landowner characteristic	
Landowner age	Landowner is greater than 60 years old (0 = No/1 = Yes)
Land characteristic	
Parcel size	Size of the forest land parcel is greater than 72 acres (0/1) (72 acres is the median size of forest landholding in our sample)
Activity in past five years	
Improved wildlife habitat	Conducted wildlife habitat improvements projects in past 5 years (0/1)
Planted trees	Planted trees in past 5 years (0/1)
Reduced fire hazard	Implemented fire hazard reduction projects in past 5 years (0/1)
Posted against trespass	Posted the land to restrict public access in past 5 years (0/1)
Harvested timber	Harvested trees in past 5 years (0/1)
Collected NTFP	Collected non-timber forest products in past 5 years (0/1)
Ownership objective	
Objective: aesthetics [a]	Enjoying aesthetic beauty and scenery is an important reason for owning the forest land (0/1)
Objective: timber [a]	Production of timber and other timber products is an important reason for owning the forest land (0/1)
Objective: recreate [a]	Recreation (other than hunting) is an important reason for owning the forest land (0/1)
Landowner concerns	
Development concerns [a]	Development of nearby land is a concern for the landowner (0/1)
Keep land intact for heirs concern [a]	Keeping the land intact for their children or other heirs is a concern for the landowner (0/1)
Financial activity	
Ever leased	Landowner has leased the forest land (0/1)
Has easement	Landowner has a conservation easement on the forest land (0/1)
Future plans	
Sell plans	Landowner plans to sell all or some of the forest land (0/1)
Harvest plans	Landowner plans to harvest timber on the forest lands (0/1)
Subdivide plans	Landowner plans to subdivide parts or all of the forest land (0/1).
Afforestation plans	Landowner plans to plant trees (0/1).
Conversion plans	Landowner plans to convert the forest land to another land use (0/1).
Collect NTFP plans	Landowner plans to collect non-timber forest products (0/1).
No plans	Landowner has no plans for the forest land (0/1)

[a] The 2006 NWOS survey respondents are asked to rank their response to these questions on a scale of one to seven: 1 = very important/great concern and 7 = not important/no concern. We converted this scale to a binary variable the same way for both the "importance" questions and "concern" questions. That is, we assigned the variable a value of 1 if the respondent answered 1 or 2 to the importance/concern question and 0 if the respondent answered 3, 4, 5, 6, or 7 to the question.

6.2.3.1 Relative probabilities

Relative probabilities are useful for explaining the magnitude of the relationship between two groups (e.g., assisted versus non-assisted landowners) with respect to a specific characteristic or event. A relative probability estimate is the ratio of the estimated probability of an event (e.g., parcel size greater than 72 acres) occurring in a target group (i.e., assisted landowners) divided by the estimated probability of the event occurring in a control group (i.e., non-assisted landowners) (Zhang and Kai 1998). Statistically, a relative probability is defined as:

$$Relative\ Probability \rightarrow \frac{\rho}{q} = \frac{\frac{frequency\ of\ event\ in\ target\ group}{\sum frequency(event)}}{\frac{frequency\ of\ event\ in\ control\ group}{\sum frequencys(event)}}$$

ρ: Probability of an event occurring in a target group
q: Probability of an event occurring in a control group

Data from the 2006 NWOS dataset illustrate the calculation of relative probability of assisted landowners versus non-assisted landowners having forest land holdings greater than 72 acres. Using the above equation, we calculate:

- the probability of assisted landowners with forested land > 72 acres (ρ): 455/620 = 0.73
- the probability of non-assisted landowners with forest land > 72 acres (q): 1,395/3,545 = 0.39
- the relative probability of assisted landowners versus non-assisted landowners owning forest land > 72 acres (ρ/q): (0.73/0.39) = 1.87 (that is, assisted landowners are 1.87 times as likely to own a forest parcel greater than 72 acres as compared to non-assisted landowners)

For purposes of this analysis, we use the above equation to estimate the relative probabilities between the assisted landowners group and the non-assisted landowners group with respect to the 22 variables listed in Table 6-2. Further, we estimate these relative probabilities four times—once for each of the four definitions of "assisted landowner" (see Table 6-1).

For this model and all models discussed in following sections (Section 6.2.3.2), we minimize multicollinearity effects by selecting independent variables that satisfy criteria based on the Pearson correlation test. The Pearson correlation test is based on the null hypothesis that there is no correlation among explanatory variables (i.e., H_0: ρ=0 where ρ is the correlation coefficient). The cut-off value we use for determining unacceptably high correlation among independent variables is 25 percent, based on the previous empirical studies. We apply this 25% cut-off for selecting independent variables for all models.

6.2.3.2 Logistic regression models: Characteristics of assisted and non-assisted landowners

Logistic regression models (i.e., logit models) are probability-based models that test for statistically significant differences between groups (e.g., assisted versus non-assisted landowners) while controlling for variables representing group characteristics (e.g., landowner characteristics, land characteristics, indicators of the landowners' actions, attitudes and behaviors). Logistic regression models provide the information necessary to compute the influence that a single, independent variable has on the probability of a respondent being in a group (e.g., assisted landowners). To calculate these marginal effects, the analyst uses mean sample values and the regression model results.

The logistic function $L_i(Y)$ is defined as the natural logarithm of the odds of an event (p) occurring (i.e., having received assistance), given individual characteristics. Following Peng et al. (2002), we use the logit model below to estimate the forestry practice assistance-based probabilities.

$$L_i(Y) = \log \frac{p_i}{1 - p_i} = \beta_o + \beta x_i$$

$$Prob(Y = 1) = \Pr\{y = 1 | x_i\}$$

$$= \frac{\exp(\beta_o + \sum \beta x_i)}{1 + \exp(\beta_o + \sum \beta x_i)}$$

i: Individual respondent

Y: Event participation, 1 = "yes", 0 = "no"

p_i: Conditional probability of respondent participating in the event Y

x_i: Vector of characteristics of the individual respondent

β: Vector of parameter estimates

We use the above model to ask two different questions regarding receiving forestry practice assistance:

1. What factors, if any, significantly influence landowners' decisions to receive landowner assistance?
2. To what extent does landowner assistance influence landowners' decisions to harvest timber, undertake wildlife habitat improvement projects, or make future plans for their forest (e.g., harvest timber, sell or subdivide the land)?

For each of these questions, we conduct an analysis for each of the four definitions of assisted landowners (see Table 6-1).

6.2.3.2.1 Factors influencing receipt of landowner assistance

To explore whether any factors significantly influence landowners' decision to receive forestry practice assistance, we develop the following based on the logistic model above:

Receiving forestry practice assistance = fn(landowner characteristics, parcel size, past activities, landowner concerns, financial activities, future plans)

We hypothesize that receiving forestry practice assistance is influenced by landowner characteristics (age, residency status), parcel size, past activities conducted on the land (wildlife habitat improvement projects, timber harvesting, posting against trespass), landowner concerns about development, financial activities (leasing the land, having an easement on the land), and future plans (afforestation, no plans, selling the land) for the land. These variables are based on a review of the literature and the objectives of this research. Table 6-3 and the following paragraphs describe the independent variables used in these logistic regression models.

Forest owner demographics have been found to influence participation in forest management programs. Age, for example, has been found to be a useful indicator that explains landowner management decisions (USDA Forest Service 1983; Joshi and Arano 2009). However, study findings with respect to age vary based on the research questions of interest in this study. Joshi and Arano (2009) found that older landowners are less likely to engage in silvicultural activities and conduct wildlife habitat improvement and recreational activities on their forest land. USDA (1983) found that older landowners are more likely to harvest timber. For this study, we hypothesize that landowners older than 60 years are more likely to receive forestry practice assistance.

Forest owners whose primary residence is located on their forest land have different preferences and attitudes toward participation in forestry assistance programs, compared to landowners who are not residing on their forest land. Ma et al. (2012) found that landowners who reside on their land are more likely to participate in cost-share programs but less likely to have obtained forest certification or a conservation easement than absentee owners. In this study, we hypothesize that landowners residing on their land are more likely to receive forestry practice assistance.

The literature indicates that parcel size is an important predictor for participating in FSP and other forestry assistance programs. The literature shows that landowners with larger parcels are more likely to participate in FSP and other forestry assistance programs (Pan, Zhang et al. 2007). Therefore, we expect parcel size to have a positive impact on receiving forestry practice assistance.

There is a body of literature that investigates factors associated with a forest owner's decision to participate in forest management programs such as certification, cost-share, and conservation easements. The most common activities include harvesting timber, conducting wildlife habitat improvement projects, and restricting public access (Egan, Gibson et al. 2001; Joshi and Arano 2009; Ma, Butler et al. 2012). Therefore, we expect that the forest owners who harvested timber, conduct wildlife habitat improvement projects, and restrict public access into their lands are more likely to be assisted landowners.

Previous national and state-level assessments of FSP focused on the relationship between a landowner's forest land ownership objectives and participating in FSP (Esseks and Moorhouse 2005; Joshi and Arano 2009; Ma, Butler et al. 2012). Timber and non-timber objectives were found to be major influences on the landowner's decision to participate in forest management programs (Esseks and Moulton 2000;

Esseks and Moorhouse 2005). Landowners who value recreation and timber management as an objective for ownership have been found to be more likely to participate in FSP or to obtain management plans that are funded by FSP (Esseks and Moorhouse 2005). Thus, we expect primary ownership objectives of timber harvesting and recreation to have a positive influence receiving forestry practice assistance.

The literature describes the general concerns forest landowners have with respect to their ability to use and manage the land (Ma, Butler et al. 2012). As such, we hypothesize that if landowners have concerns about development near their land, then they could be more likely to be assisted landowners.

Conveying an easement and leasing land are two proxies for non-timber–related financial benefits from owning forest land. Ma et al. (2012) found that landowners who lease their land are less likely to participate in cost-share assistance programs but more likely to participate in forest certification and conservation easement programs. We hypothesize that landowners who have a conservation easement on their forest land are more likely to receive assistance compared with those who do not have a conservation easement, but landowners who lease their land are less likely to receive assistance compared with those who do not lease their land.

The relationship between forest landowner future land intentions and participation in forestry assistance programs has not been explored in the literature. However, future land intentions may influence landowners' participation in forestry practice assistance programs. We hypothesize that landowners who plan to sell their forest land are less likely to receive assistance. Conversely, we hypothesize that landowners who have future intentions for creating forest cover on their land not currently occupied by trees (i.e., afforestation) are expected to be associated with forestry practice assistance. Finally, we hypothesize that landowners who have no plans for their land in the next five years would be less likely to receive assistance as they are likely unengaged owners.

Table 6-3. Definition of logistic regression independent variables for assisted versus non-assisted landowner models.

Variables	Definition	Expected Impact
Age	1 if age of the landowner is greater than 60, 0 otherwise	-
Resident	1 if the respondent lives on their forest land, 0 otherwise	+
Parcel size	1 if landholding is greater than 72 acres, 0 otherwise	+
Improved wildlife habitat	1 if the landowner has conducted any wildlife habitat improvement projects on their forest, 0 otherwise	+
Harvested trees	1 if landowner has harvested trees on their forest, 0 otherwise	+
Posted against trespass	1 if the landowner posted land to restrict public access into their forest, 0 otherwise	+
Objective: recreate	1 if recreation (other than hunting/fishing) is an important reason for owning the forest, 0 otherwise	+
Objective: timber	1 if production of timber and other timber products is an important reason for owning the forest, 0 otherwise	+
Development concerns	1 if development of nearby land is a concern of the landowner, 0 otherwise	+
Has easement	1 if the landowner has a conservation easement on their forest, 0 otherwise	+
Ever leased	1 if the landowner has ever leased their forest, 0 otherwise	+
Sell plans	1 if the landowner plans to sell all or some of their forest, 0 otherwise	-
Afforestation plans	1 if the landowner plans to convert their non-forested land into forest, 0 otherwise	+
No plans	1 if the landowner has no plans for their forest lands in the future, 0 otherwise	-

For each of the four definitions of assisted landowner, we estimate a logistic regression model describing landowner assistance:

1. Assisted landowners who have a forest management plan or received cost-share assistance or advice (coded as MCA):

$$\textit{MCA} = \beta_0 + \beta_1 \text{ age} + \beta_2 \text{ parcel size} + \beta_3 \text{ resident} + \beta_4 \text{ improved wildlife habitat} + \beta_5 \text{ harvested timber} + \beta_6 \text{ posted against trespass} + \beta_7 \text{ objective: recreate} + \beta_8 \text{ objective: timber} + \beta_9 \text{ development concerns} + \beta_{10} \text{ has easement} + \beta_{11} \text{ ever leased} + \beta_{12} \text{ sell plans} + \beta_{13} \text{ afforestation plans} + \beta_{14} \text{ no plans} + \varepsilon$$

2. Assisted landowners who have a forest management plan (coded as M):

   $\boldsymbol{M} = \beta_0 + \beta_1$ age $+ \beta_2$ parcel size $+ \beta_3$ resident $+ \beta_4$ improved wildlife habitat
   $+ \beta_5$ harvested timber $+ \beta_6$ posted against trespass $+ \beta_7$ objective: recreate
   $+ \beta_8$ objective timber $+ \beta_9$ development concerns $+ \beta_{10}$ has easement $+ \beta_{11}$ ever leased
   $+ \beta_{12}$ sell plans $+ \beta_{13}$ afforestation plans $+ \beta_{14}$ no plans $+ \mathcal{E}$

3. Assisted landowners who received advice (coded as A).

   $\boldsymbol{A} = \beta_0 + \beta_1$ age $+ \beta_2$ parcel size $+ \beta_3$ resident $+ \beta_4$ improved wildlife habitat
   $+ \beta_5$ harvested timber $+ \beta_6$ posted against trespass $+ \beta_7$ objective: recreate
   $+ \beta_8$ objective: timber $+ \beta_9$ development concerns $+ \beta_{10}$ has easement $+ \beta_{11}$ ever leased
   $+ \beta_{12}$ sell plans $+ \beta_{13}$ afforestation plans $+ \beta_{14}$ no plans $+ \mathcal{E}$

4. Assisted landowners who received cost-share assistance (coded as CS).

   $\boldsymbol{CS} = \beta_0 + \beta_1$ age $+ \beta_2$ parcel size $+ \beta_3$ resident $+ \beta_4$ improved wildlife habitat
   $+ \beta_5$ harvested timber $+ \beta_6$ posted against trespass $+ \beta_7$ objective: recreate
   $+ \beta_8$ objective: timber $+ \beta_9$ development concerns $+ \beta_{10}$ has easement $+ \beta_{11}$ ever leased
   $+ \beta_{12}$ sell plans $+ \beta_{13}$ afforestation plans $+ \beta_{14}$ no plans $+ \mathcal{E}$

6.2.3.2.2 Landowner assistance effect on past activities and future intentions

In addition to using logistic regression to examine factors influencing the receipt of landowner assistance, we also developed logistic regression to assess whether receiving landowner assistance is a significant factor in describing forest land activity that occurred in the past five years (i.e., timber harvesting and wildlife habitat improvement projects) and landowner intentions to undertake certain activities in the next five years (i.e., harvest timber, subdivide, or sell their land). As these models consider the effect of landowner assistance on these decisions, it also controls for other variables thought to influence these decisions. In particular, the other variables that are included in these models are the same as those used to explore the factors influencing the decision to receive landowner assistance (see Section 6.2.3.2.1 and Table 6-3).

For each of the following four models explaining past behavior/future intentions, we estimate four logistic regression models—one for each definition of assisted landowners (i.e., MCA, M, A, CS). That is, we estimate a total of 16 logistic regression models.

1. Probability of having conducted a timber harvest in the past five years ("Harvested timber" from Table 6-2):

Conducted a timber harvest

$= \beta_0 + \beta_1$ assisted landowner $+ \beta_2$ age $+ \beta_3$ parcel size $+ \beta_4$ resident
$+ \beta_5$ improved wildlife habitat $+ \beta_6$ posted against trespass $+ \beta_7$ objective recreate
$+ \beta_8$ objective timber $+ \beta_9$ development concerns $+ \beta_{10}$ has easement $+ \beta_{11}$ ever leased
$+ \beta_{12}$ sell plans $+ \beta_{13}$ afforestation plans $+ \beta_{14}$ no plans $+ \mathcal{E}$

2. Probability of having conducted wildlife habitat improvement projects in the past five years ("Improved wildlife habitat" from Table 6-2):

Conducted wildlife habitat improvement projects

$= \beta_0 + \beta_1$ assisted landowner $+ \beta_2$ age $+ \beta_3$ parcel size $+ \beta_4$ resident
$+ \beta_5$ harvested timber $+ \beta_6$ posted against trespass $+ \beta_7$ objective recreate
$+ \beta_8$ objective timber $+ \beta_9$ development concerns $+ \beta_{10}$ has easement $+ \beta_{11}$ ever leased
$+ \beta_{12}$ sell plans $+ \beta_{13}$ afforestation plans $+ \beta_{14}$ no plans $+ \mathcal{E}$

3. Probability of having a timber harvest in the future ("Harvest plans" from Table 6-2):

Future timber harvest plans

$= \beta_0 + \beta_1$ assisted landowner $+ \beta_2$ age $+ \beta_3$ parcel size $+ \beta_4$ resident
$+ \beta_5$ improved wildlife habitat $+ \beta_6$ posted against trespass $+ \beta_7$ objective recreate
$+ \beta_8$ objective timber $+ \beta_9$ development concerns $+ \beta_{10}$ has easement $+ \beta_{11}$ ever leased
$+ \mathcal{E}$

4. Probability of subdividing or selling forest land in the future ("Sell plans" or "Subdivide plans" from Table 6-2):

Future subdivide or sell plans

$= \beta_0 + \beta_1$ assisted landowner $+ \beta_2$ age $+ \beta_3$ parcel size $+ \beta_4$ resident
$+ \beta_5$ harvested timber $+ \beta_6$ harvested timber $+ \beta_7$ posted against trespass
$+ \beta_8$ objective recreate $+ \beta_9$ objective timber $+ \beta_{10}$ development concerns
$+ \beta_{11}$ has easement $+ \beta_{12}$ ever leased $+ \mathcal{E}$

6.3 Results

6.3.1 Descriptive statistics

Forty percent of the sample landowners had some experience with landowner assistance-related activities (i.e., they participated in a management plan, received advice, and/or participated in a cost-share program). Taking these landowner assistance-related activities separately, approximately 16% of the sample landowners had a management plan for their land, 34% had received advice from various sources, and 14% had participated in a cost-share program (Table 6-1).

Nearly 75% of all the landowners in the sample were less than 60 years old. The median size of the forest land ownership in our sample was 72 acres. The majority of landowners have harvested trees in the past five years (63%), whereas 21% conducted wildlife improvement projects in the past five years. The majority (74%) of respondents in the sample own their land primarily for its aesthetic value, whereas 46% have recreation as a primary ownership objective. Even though nearly two-thirds have harvested timber, only 23% indicate timber management is the primary ownership objective. Approximately 37% of the landowners are concerned about development near their land, and only 7% of the landowners have a conservation easement on their property. Approximately 14% of the landowners have leased their forest land. Just over one in five owners plan to harvest timber in the future, while nearly 30% do not have any plans for forest or land management activities in the near future. Table 6-4 summarizes these descriptive statistics.

Table 6-4. Descriptive statistics for the respondents in the sample.

Category/ Variable	Percent of Respondents	
	Yes	No
Age (older than 60 years)	27%	73%
Parcel size (> 72 acres)	50%	50%
Improved wildlife habitat	21%	79%
Planted trees	27%	73%
Reduced fire hazard	17%	83%
Posted against trespass	45%	55%
Harvested timber	63%	37%
Collected NTFP	24%	76%
Objective: aesthetics	74%	26%
Objective: timber	23%	77%
Objective: recreate	46%	54%
Development concerns	37%	63%
Keep land intact for heirs concern	53%	47%
Ever leased	14%	86%
Has easement	7%	93%
Sell plans	6%	94%
Harvest plans	22%	78%
Subdivide plans	1%	99%
Afforestation plans	2%	98%
Conversion plans	3%	97%
Collect NTFP plans	11%	89%
No plans	28%	72%
Source: National Woodland Owner Survey 2006. Sample reflects landowners owning one parcel, where parcel size is between 10 and 10,000 acres. n = 3,676		

6.3.2 Relative probabilities

The relative probability analysis shows many significant differences between respondents defined as assisted landowners and those defined as non-assisted landowners, for each method of defining landowner assistance (i.e., MCA, M, A, CS; see Table 6-1). In addition, the range of relative probability results is similar across assisted landowner definitions. Table 6-5 reports on all of the relative probability results; unless otherwise indicated with NS (i.e., not significant), the relative probabilities are significant at the ten-percent level. The remainder of this section describes the results using landowner assistance defined as the landowner who has a forest management plan (M) as the benchmark for contrasting with relative probabilities of the other three definitions (MCA, A, CS).

Landowner characteristic

Age: Assisted landowners are 0.80 (NS–0.82) times as likely to be older than 60 years compared to non-assisted landowners. [9]

Land characteristic

Parcel size: Assisted landowners are 1.65 (1.60–1.65) times as likely to own a forest parcel greater than 72 acres compared to non-assisted landowners.

Activity in the past five years

Improved wildlife habitat: Assisted landowners are 2.43 (2.32–2.86) times as likely to have conducted wildlife habitat improvement projects on their forest land *in the past five years* compared to non-assisted landowners.

Planted trees: Assisted landowners are 1.91 (1.91–2.21) times as likely to have planted trees on their forest land *in the past five years* compared to non-assisted landowners.

Reduced fire hazard: Assisted landowners are 1.94 (1.85–2.20) times as likely to have implemented practices that reduced fire hazard on their forest land *in the past five years* compared to non-assisted landowners.

Posted against trespass: Assisted landowners are 1.23 (1.21–1.23) times as likely to have posted their forest land to restrict public access *in the past five years* compared to non-assisted landowners.

Harvested timber: Assisted landowners are 1.35 (1.33–1.40) times as likely to have harvested timber on their forest land *in the past five years* compared to non-assisted landowners.

[9] For this and all other results in this section of this format, the first result (e.g., 0.8 in this case) reflects the result with the assisted landowner sample defined as "M", and the range provided parenthetically (e.g., NS–0.82 in this case) reflects the range of results provided with the remaining three samples defined as "A", "CS," and "MCA."

Collected NTFP: Assisted landowners are 1.25 (1.25–1.53) times as likely to have harvested non-timber forest products *in the past five years* compared to non-assisted landowners.

Ownership objective

Objective: aesthetics: Assisted landowners are 1.07 (no significant differences between assisted and non-assisted landowners for all other definitions) times as likely to have aesthetics as an ownership objective as compared to non-assisted landowners.

Objective: timber: Assisted landowners are 2.00 (2.00–2.40) times as likely to have harvesting timber as an ownership objective as compared to non-assisted landowners.

Objective: recreate: Assisted landowners are 1.18 (NS–1.18) times as likely to have recreation as an ownership objective as compared to non-assisted landowners.

Landowner concerns

Development: Assisted landowners are not significantly different from non-assisted landowners with respect to concerns over nearby land development.

Keep land intact: Assisted landowners are not significantly different (NS–1.08) from non-assisted landowners with respect to keeping their land intact for children or other heirs.

Financial activity

Lease: Assisted landowners are 1.86 (1.86–2.14) times as likely to have leased their land as compared to non-assisted landowners.

Easement: Assisted landowners are 2.21 (1.98–2.23) times as likely to have conveyed a conservation easement on their forest land as compared to non-assisted landowners.

Future plans

Sell plans: Assisted landowners are not significantly different from non-assisted landowners with respect to plans to sell their land *in the next five years*.

Harvest plans: Assisted landowners are 2.71 (2.71–3.08) times as likely to plan to harvest timber on their land *in the next five years* as compared to non-assisted landowners.

Subdivide plans: Assisted landowners are not significantly different from non-assisted landowners with respect to plans to subdivide their land *in the next five years*.

Afforestation plans: Assisted landowners are 2.39 (2.39–3.46) times as likely to have plans to plant trees on currently nonforested land *in the next five years* as compared to non-assisted landowners.

Conversion plans: Assisted landowners are not significantly different from non-assisted landowners with respect to planning to convert their land to a non-forested use *in the next five years*.

Collect NTFP plans: Assisted landowners are 1.73 (1.39–1.89) times as likely to plan to harvest non-timber forest products on their land *in the next five years* as compared to non-assisted landowners.

No plans: Assisted landowners are 0.40 (0.40–0.52) times as likely to have no plans for their forest land *in the next five years* as compared to non-assisted landowners.

Table 6-5. Relative probabilities of assisted versus non-assisted landowners (four definitions) with respect to landowner and land characteristics

Variable	Landowner assistance = management plan (M)	Landowner assistance = management plan, cost-share, or advice (MCA)	Landowner assistance = received advice (A)	Landowner assistance = cost-share (CS)
Age (older than 60 years)	0.80	0.82	0.80	NS
Parcel size (> 72 acres)	1.65	1.64	1.60	1.60
Improved wildlife habitat	2.43	2.86	2.77	2.32
Planted trees	1.91	2.17	2.21	2.19
Reduced fire hazard	1.94	2.20	2.18	1.85
Posted against trespass	1.23	1.21	1.21	1.21
Harvested timber	1.35	1.33	1.33	1.40
Collected NTFP	1.25	1.53	1.45	1.32
Objective: aesthetics	1.07	NS	NS	NS
Objective: timber	2.00	2.35	2.24	2.40
Objective: recreate	1.18	1.18	1.17	NS
Development concerns	NS	NS	NS	NS
Keep land intact concerns	NS	NS	NS	1.08
Ever leased	1.86	2.11	2.10	2.14
Has easement	2.21	2.07	1.98	2.23
Sell plans	NS	NS	NS	NS
Harvest plans	2.71	3.04	3.08	2.39
Subdivide plans	NS	NS	NS	NS
Afforestation plans	2.39	3.46	3.42	2.41
Conversion plans	NS	NS	NS	NS
Collect NTFP	1.73	1.89	1.84	1.39
No plans	0.40	0.52	0.50	0.51
NS = not statistically significant at the 10-percent level				

6.3.2.1 Evaluating how different forms of assistance impacts landowner behavior

An important aspect of evaluating programs like FSP that support many different forest landowner assistance efforts is understanding the effectiveness that each form of assistance, by itself, has on influencing landowner behavior. In this section, we evaluate three major ways in which landowner assistance influences a landowner: assisting the landowner in acquiring a forest management plan, providing cost-share assistance that helps defray the cost of carrying out certain forest and land management practices, and providing advice that increases landowner knowledge regarding forest and land management practices. This analysis differs from the previous one because we partitioned the NWOS sample into landowners who had received only one of these three assistance efforts and

contrasted them with landowners who had not received any of these three efforts. Specifically, we conducted relative probability analyses for the following:

Only management plan landowners (OM): Landowners with only a forest management plan versus landowners who had received none of these three assistance efforts.

Only advice landowners (OA): Landowners who had received only advice versus landowners who had received none of these three assistance efforts.

Only cost-share landowners (OC): Landowners who had received only cost-share assistance versus landowners who had received none of these three assistance efforts.

All assistance effort landowners (MCAall): Landowners who had received cost-share assistance *and* advice *and* have a forest management plan versus landowners who had received none of these three assistance efforts.

Creating these cohorts of forest landowners enabled us to evaluate the relative impact each form of assistance has on landowner behavior, specifically how landowners with different types of assistance are similar to or different from landowners who have received no assistance. Table 6-6 contains the relative probability estimates for these four landowner cohorts that are statistically significant at the ten-percent level. Each comparison is to landowners who have received no assistance. Major findings from these analyses are described below.

- Forest landowners who simultaneously received cost-share assistance and advice and a management plan (i.e., heavily assisted) are much more likely to do things commonly associated with good stewardship (e.g., improve habitat, plant trees, reduce fire hazard, harvest timber) as compared to landowners who have only done just one of the three (received cost-share, has a plan, received advice). In other words, it takes three different assistance "touches" (having a forest management plan, receiving cost-share assistance, and receiving advice) to see big differences between assisted and non-assisted landowners, compared to assisted and non-assisted differences when landowner assistance is defined by exposure to only one of the three assistance efforts.
- While the number of landowners indicating an intention to sell or subdivide their forest land is small in our sample, our analysis found that regardless of the level of assistance received, assisted landowners are generally no less likely to sell or subdivide their land than non-assisted landowners. In fact, for the OM and OC participants, they are almost twice as likely to sell their forest land as non-assisted landowners.
- When comparing the three different levels of single assistance contact (OA, OM, OC), there does not appear to be a significant difference in behavior between FSP and non-FSP participants when considering past activities related to providing wildlife habitat and reducing fire hazard.

Table 6-6. Relative probabilities of an assisted landowner (defined four ways) to non-assisted landowner (defined as landowners who have received no assistance [no management plan, no cost-share, and no advice]).

Variable	Has received only advice (OA)	Has only a forest management plan (OM)	Has only received cost-share assistance (OC)	Has a management plan, received advice & cost-share assistance (MCAall)
Age (older than 60 years)	0.76	NS	NS	NS
Parcel size (> 72 acres)	1.39	1.47	1.45	2.01
Improved wildlife habitat	2.42	2.10	1.97	4.39
Planted trees	1.98	NS	1.42	3.19
Reduced fire hazard	1.14	1.65	1.48	2.89
Posted against trespass	1.22	NS	NS	1.30
Harvested timber	1.22	NS	1.31	1.60
Collected NTFP	1.08	NS	NS	NS
Objective: aesthetics	NS	NS	NS	NS
Objective: timber	1.81	NS	2.09	3.27
Objective: recreate	1.18	NS	NS	1.20
Development concerns	NS	NS	0.68	NS
Keep land intact concerns	NS	NS	NS	1.14
Ever leased	1.77	1.65	NS	3.00
Has easement	1.40	2.46	NS	3.15
Sell plans	NS	1.97	1.83	NS
Harvest plans	2.44	NS	2.33	4.69
Subdivide plans	NS	NS	NS	NS
Afforestation plans	2.72	NS	3.18	3.74
Conversion plans	1.53	NS	NS	NS
Collect NTFP plans	1.57	NS	1.59	1.38
No plans	0.61	NS	NS	0.22
n	2,848	2,291	2,329	2,470

Source: National Woodland Owner Survey 2006. Sample reflects only landowners owning one parcel, where parcel size is between 10 and 10,000 acres. NS = No significant differences between FSP and non-FSP participants

6.3.3 Factors influencing receipt of landowner assistance

The results of the logistic regression models that estimate the probability of having received landowner assistance indicate relative consistency with respect to differences between assisted and non-assisted landowners, regardless of how assistance is defined (i.e., MCA, M, A, CS; see Table 6-1 for definitions). The variables *Parcel size, Improved wildlife habitat, Harvested timber, Objective: timber,* and *No plans* are significant for all regression models, each one using a different definition of landowner assistance. Except for the predicted relationship between assisted landowners and landowners who reside on their forest land, the direction of the relationships between the dependent variables and the explanatory variables is also consistent with the expected impacts as described in Table 6-3. Additionally, the impact

of each predictor on the different dependent variables (i.e., marginal effects) is similar. Table 6-7 presents the results of these four logistic regression models.

We conducted an F-test to compare and verify whether these models are statistically different from each other based on their dependent variables. The F-test estimates show no statistically significant differences across the different models. We tested the goodness-of-fit of each model using the Hosmer-Lemeshow chi-square test (Kennedy 1998) and pseudo R-squared test, and found no evidence of lack of fit in any of the four logistic regression models.

The magnitude of the impact of the explanatory variables on landowner assistance varies slightly across the models. The marginal results indicate the percentage likelihood of being an assisted landowner (as defined). For example, using the MCA definition of assisted landowner, landowners with forest land greater than 72 acres are 15% more likely to be an assisted landowner than owners with fewer than 72 acres. For those independent variables with significant differences between assisted and non-assisted landowners, we describe the range of marginal effects across the four assisted landowner definitions below and in Table 6-7.

- **Parcel size**: No matter how an assisted landowner is defined, landowners with parcels greater than 72 acres are 5 to 15% more likely to receive forestry practice assistance compared to landowners with parcels smaller than 72 acres.
- **Improve wildlife habitat**: No matter how assistance is defined, landowners who have conducted wildlife habitat improvement projects in the past five years are 8 to 22% more likely to receive forestry practice assistance compared to the landowners who have not conducted wildlife habitat improvement projects in the past five years.
- **Harvest timber**: No matter how assistance is defined, landowners who have harvested timber on their land in the past five years are 5 to 15% more likely to receive forestry practice assistance compared to the landowners who have not harvested timber in the past five years.
- **Objective: timber:** No matter how assistance is defined, landowners who have timber management as a primary ownership objective are 6 to 17% more likely to receive forestry practice assistance compared to the landowners who do not have timber management as primary ownership objective.
- **No plans**: No matter how assistance is defined, landowners who have no future plans for their forest lands in the next five years are 8 to 21% less likely to receive forestry practice assistance compared to the landowners who have future plans for their land.

Table 6-7. Comparison of different logistic regression models using different definitions of an assisted landowner. Dependent variable: Assisted landowner (MCA, M, CS, A).

Variable	Management plan, cost-share, or advice (MCA)		Management plan (M)		Cost-share (CS)		Advice (A)	
	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect
Age	-0.222 *	-0.052	-0.024	-0.003	0.149	0.013	-0.172	-0.039
Parcel size	0.617 ***	0.146	0.694 ***	0.080	0.618 ***	0.052	0.558 ***	0.126
Resident	-0.225 ***	-0.053	-0.566 ***	-0.065	-0.168	-0.014	-0.244 **	-0.055
Improved wildlife habitat	0.945 ***	0.223	0.696 ***	0.080	0.922 ***	0.078	0.887 ***	0.200
Harvested timber	0.627 ***	0.148	0.704 ***	0.081	0.641 ***	0.054	0.646 ***	0.146
Posted against trespass	-0.013	-0.003	-0.129	-0.015	0.099	0.008	0.001	0.000
Objective: recreate	0.219 *	0.052	0.434 ***	0.050	0.055	0.005	0.176	0.040
Objective: timber	0.712 ***	0.168	0.534 ***	0.062	0.973 ***	0.082	0.751 ***	0.169
Development concerns	-0.075	-0.018	-0.034	-0.004	-0.290 *	-0.025	-0.097	-0.022
Has easement	0.964 ***	0.227	1.193 ***	0.137	0.487	0.041	0.941 ***	0.212
Ever leased	0.587 ***	0.138	0.137	0.016	0.487 **	0.041	0.423 *	0.095
Sell plans	0.259	0.061	0.137	0.016	0.316	0.027	-0.016	-0.004
Afforestation plans	0.982 ***	0.232	0.352	0.041	0.618	0.052	1.023 ***	0.230
No plans	-0.875 ***	-0.206	-1.195 ***	-0.138	-0.983 ***	-0.083	-0.782 ***	-0.176
Intercept	-1.454 ***	-0.343	-2.656 ***	-0.306	-3.266 ***	-0.277	-1.556 ***	-0.350
Hosmer-Lemeshow goodness of fit: chi-square test shows no lack of goodness-of-fit for any of the four models Number of observations: 1,566 for each of the four models [a] Significance is indicated by the following: * = p ≤ 0.10 , ** = p ≤ 0.05, *** = p ≤ 0.01								

6.3.4 Receipt of landowner assistance effect on past activities and future intentions

The logistic regression models were used to determine whether landowner assistance was a significant explanatory factor in landowner decisions to have harvested timber in the past five years, undertake wildlife habitat improvement projects in the past five years, have future plans for harvesting timber, or have future plans for selling or subdividing the land. The results show some consistency across models, but also some differences. The sections below indicate that models of past activity are more consistent than models of future intentions. Explanatory variables that show up in the majority of the models

include receipt of landowner assistance, parcel size, and residency status. For the models where receipt of landowner assistance provided a consistent result across assisted landowner definition (harvested timber, conducted wildlife habitat projects, has future plans for timber harvest), an assisted landowner is 13 to 17% more likely to have conducted or have plans to conduct the activity. Sections 6.3.4.1 to 6.3.4.4 describe these results in detail.

6.3.4.1 Probability of having conducted a timber harvest

The results of the logistic regression models of factors that influence, or are correlated with, a landowner's decision to harvest timber in the past five years indicate a great deal of consistency regardless of how *assisted landowner* is defined (i.e., MCA, M, A, CS; see Table 6-1 for definitions). The variables *Assisted landowner, Age, Parcel size, Resident, Improved wildlife habitat, Objective: timber, Sell plans,* and *No plans* are significant for all regression models.

The marginal results of this model are interpreted as in the model describing the factors influencing receipt of landowner assistance (see Section 6.3.3) and show a narrow range of marginal effects across the four models. Importantly, the results suggest some relationship between participating in landowner assistance (i.e., MCA, M, A, CS) and the landowner having a history of harvesting timber. For those independent variables showing a significant impact on having harvested timber in the past five years, we describe the range of marginal effects across the four assisted landowner definitions below and in Table 6-8.

- **Assisted landowner**: No matter how an assisted landowner is defined, landowners who received assistance are 14 to 16% more likely to have harvested timber on their land than non-assisted landowners.
- **Age:** Landowners who are older than 60 years are 11 to 12% more likely to have harvested timber on their land compared to landowners who are younger than 60 years old.
- **Parcel size:** Landowners who own forested parcels larger than 72 acres are 9 to 10% more likely to have harvested timber on their land compared to landowners with smaller parcels.
- **Resident**: Landowners who reside on their forest land are 15 to 16% more likely to have harvested timber on their land compared to absentee owners.
- **Improved wildlife habitat**: Landowners who conducted wildlife habitat improvement projects on their land are 6 to 7% more likely to have harvested timber on their land compared to landowners who have not implemented these projects.
- **Objective: timber:** Landowners who have timber management as a primary ownership objective are 26 to 27% more likely to have harvested timber on their land compared to landowners who do not have timber management as a primary ownership objective.
- **Sell plans:** Landowners who plan to sell their forest land are 10 to 11% less likely to have harvested timber on their land compared to landowners who do not plan to sell their land.
- **No plans:** Landowners who have no plans for their forest land in the next five years are 9 to 10% less likely to have harvested timber on their land compared to landowners who have a plan for their forest land in the next five years.

Table 6-8. Comparison of logistic regression models using different definitions of an assisted landowner using landowners who have *harvested timber* as the dependent variable.

Variable	Management plan, cost-share, or advice (MCA)		Management plan (M)		Cost-share (CS)		Advice (A)	
	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect
Assisted landowner	0.618 ***	0.144	0.694 ***	0.162	0.660 ***	0.154	0.643 ***	0.150
Age	0.526 ***	0.122	0.494 ***	0.115	0.483 ***	0.113	0.525 ***	0.122
Parcel size	0.366 ***	0.085	0.388 ***	0.090	0.415 ***	0.097	0.375 ***	0.087
Resident	0.641 ***	0.149	0.663 ***	0.155	0.628 ***	0.146	0.646 ***	0.151
Improved wildlife habitat	0.246 *	0.057	0.309 **	0.072	0.306 **	0.071	0.251 *	0.058
Posted against trespass	0.049	0.011	0.056	0.013	0.039	0.009	0.049	0.011
Objective: recreate	0.024	0.006	0.016	0.004	0.046	0.011	0.032	0.007
Objective: timber	1.129 ***	0.263	1.170 ***	0.273	1.158 ***	0.270	1.123 ***	0.262
Development concerns	–0.156	–0.036	–0.164	–0.038	–0.152	–0.036	–0.155	–0.036
Has easement	–0.062	–0.015	–0.094	–0.022	0.027	0.006	–0.069	–0.016
Ever leased	0.100	0.023	0.162	0.038	0.139	0.032	0.120	0.028
Sell plans	–0.457 *	–0.106	–0.437 *	–0.102	–0.453 *	–0.106	–0.418 *	–0.097
Afforestation plans	–0.064	–0.015	–0.003	–0.001	–0.022	–0.005	–0.079	–0.018
No plans	–0.368 **	–0.086	–0.396 ***	–0.092	–0.416 ***	–0.097	–0.379 **	–0.088
Intercept	–0.585 ***	–0.136	–0.496 ***	–0.116	–0.460 ***	–0.107	–0.583 ***	–0.136
Hosmer-Lemeshow goodness of fit: chi-square test shows no lack of goodness-of-fit for any of the four models Number of observations: 1,566 for each of the four models [a] Significance is indicated by the following: * = p ≤ 0.10 , ** = p ≤ 0.05, *** = p ≤ 0.01								

6.3.4.2 Probability of having invested in wildlife habitat improvement

The results of the logistic regression models of factors that influence, or are correlated with, a landowner's decision to have invested in wildlife habitat improvement projects in the past five years indicate a great deal of consistency regardless of how assisted landowner is defined (i.e., MCA, M, A, CS; see Table 6-1 for definitions). The variables *Assisted landowner, Age, Parcel size, Harvested timber, Posted against trespass, Objective recreate, Development concerns, Sell plans,* and *Afforestation plans* are significant for all regression models.

The marginal results of this model are interpreted as in the model describing the factors influencing receipt of landowner assistance (see Section 6.3.3) and show a narrow range of marginal effects across

the four models. Importantly, the results suggest some relationship between receipt of landowner assistance (i.e., MCA, M, A, CS) and the landowner having a history of conducting wildlife habitat improvement projects; however, the marginal results show a lower probability than the past timber harvest model. For those independent variables showing a significant impact on having conducted wildlife habitat improvement projects in the past five years, we describe the range of marginal effects across the four FSP participant definitions below and in Table 6-9.

- **Assisted landowner**: No matter how an assisted landowner is defined, landowners who received landowner assistance are 10 to 14% more likely to have improved wildlife habitat on their land than those who did not receive assistance.
- **Age:** Landowners who are older than 60 years are 6 to 7% less likely to have improved wildlife habitat on their land compared to landowners who are younger than 60.
- **Parcel size:** Landowners who own forest parcels larger than 72 acres are 6 to 7% more likely to have improved wildlife habitat on their land compared to landowners with parcels smaller than 72 acres.
- **Harvested timber**: Landowners who harvested timber are 4 to 5% more likely to have improved wildlife habitat on their land compared to landowners who have not harvested timber.
- **Posted against trespass:** Landowners who post their forest land are 10 to 11% more likely to have improved wildlife habitat on their land compared to landowners who do not post their land against trespass.
- **Objective: recreate:** Landowners who have recreation as a primary ownership objective are 7 to 8% more likely to have improved wildlife habitat on their land compared to landowners who do not have recreation ownership objective.
- **Development concerns:** Landowners who have concerns about development near their forest land are 5 to 6% more likely to have improved wildlife habitat on their land compared to landowners who are not concerned about development.
- **Sell plans:** Landowners who plan to sell their forest land are 9 to 11% less likely to have improved wildlife habitat on their land compared to landowners who do not plan to sell their land.
- **Afforestation plans:** Landowners who plan to plant trees on their forest land are 11 to 14% more likely to have improved wildlife habitat on their land compared to landowners who do not plan to plant trees.

Table 6-9. Comparison of logistic regression models using different definitions of an assisted landowner using landowners who have *improved wildlife habitat* as the dependent variable.

Variable	Management plan, cost-share, or advice (MCA)		Management plan (M)		Cost-share (CS)		Advice (A)	
	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect
Assisted landowner	0.946 ***	0.142	0.684 ***	0.104	0.916 ***	0.139	0.889 ***	0.133
Age	–0.414	–0.062	–0.452 ***	–0.069	–0.466 ***	–0.071	–0.431 ***	–0.064
Parcel size	0.402 ***	0.060	0.470 ***	0.071	0.476 ***	0.072	0.427 ***	0.064
Resident	0.001	0.000	0.027	0.004	–0.012	–0.002	0.002	0.000
Harvested timber	0.251 *	0.038	0.306 **	0.047	0.305 **	0.046	0.255 ***	0.038
Posted against trespass	0.701 ***	0.105	0.703 ***	0.107	0.685 ***	0.104	0.695 ***	0.104
Objective: recreate	0.485 ***	0.073	0.492 ***	0.075	0.531 ***	0.080	0.498 ***	0.074
Objective: timber	–0.088	–0.013	–0.010	–0.002	–0.091	–0.014	–0.092	–0.014
Development concerns	0.368 ***	0.055	0.355 ***	0.054	0.383 ***	0.058	0.373 ***	0.056
Has easement	–0.004	–0.001	–0.010	–0.002	0.086	0.013	0.000	0.000
Ever leased	0.120	0.018	0.215	0.033	0.151	0.023	0.159	0.024
Sell plans	–0.693 **	–0.104	–0.645 *	–0.098	–0.725 **	–0.110	–0.632 *	–0.094
Afforestation plans	0.747 **	0.112	0.890 **	0.135	0.840 **	0.127	0.744 **	0.111
No plans	–0.226	–0.034	–0.313	–0.048	–0.323	–0.049	–0.260	–0.039
Intercept	–2.747 ***	–0.412	–2.540 ***	–0.386	–2.519 ***	–0.381	–2.704 ***	-–0.403
Hosmer-Lemeshow goodness of fit: chi-square test shows no lack of goodness-of-fit for any of the four models Number of observations: 1,566 for each of the four models [a] Significance is indicated by the following: * = p ≤ 0.10 , ** = p ≤ 0.05, *** = p ≤ 0.01								

6.3.4.3 Probability of a future timber harvest

The results of the logistic regression models of factors that influence a landowner's future plans to harvest timber indicate reasonable consistency regardless of how *assisted landowner* is defined (i.e., MCA, M, A, CS; see Table 6-1 for definitions). The variables *Assisted landowner, Parcel size, Objective: timber,* and *Ever leased* are significant for all regression models. The variable *Resident* is significant for all but the model that defines assisted landowner as one who has received cost-share funding (CS). Landowners who own large parcels, reside on their land, and have timber as an ownership objective are more likely to have intentions to commercially harvest timber in the future. Landowners who have leased their forest land are less likely to harvest timber in the future.

The marginal results of this model are interpreted as in the model describing the factors influencing receipt of landowner assistance (see Section 6.3.3) and show a narrow range of marginal effects across the four models. As in the models of past behavior, these results suggest some relationship between receipt of landowner assistance (i.e., MCA, M, A, CS) and the landowner having plans to conduct a future timber harvest. The marginal results for this variable show a higher probability of future plans for a timber harvest for assisted landowners than for models of past activity. For those independent variables showing a significant impact on having plans to conduct timber harvest in the future, we describe the range of marginal effects across the four assisted landowner definitions below and in Table 6-10.

- **Assisted landowner:** Regardless of how an assisted landowner is defined, landowners who received landowner assistance are 13 to 17% more likely to have intentions to harvest timber in the next five years than landowners who did not receive assistance.
- **Parcel size**: Landowners who own large parcels (>72 acres) are 12 to 14% more likely to have intentions to harvest timber in the next five years than small acreage owners.
- **Resident**: Landowners who reside on their forest land are 4 to 5% more likely to have intentions to harvest timber in the next five years than absentee owners.
- **Objective timber**: Landowners who have timber as a primary ownership are 24 to 26% more likely to have intentions to harvest timber in the next five years, compared to landowners who do not have timber as an ownership objective.
- **Ever leased:** Landowners who have leased their forest land are 7 to 9% less likely to have intentions to harvest timber in the next five years compared to landowners who have not leased their forest land.

Table 6-10. Comparison of logistic regression models using different definitions of an assisted landowner using landowners who *plan to harvest timber* as the dependent variable.

Variable	Management plan, cost-share, or advice (MCA)		Management plan (M)		Cost-share (CS)		Advice (A)	
	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect
Assisted landowner	1.069 ***	0.174	1.032 ***	0.169	0.750 ***	0.125	1.051 ***	0.170
Age	0.067	0.011	0.024	0.004	–0.002	0.000	0.045	0.007
Parcel size	0.754 ***	0.123	0.795 ***	0.131	0.836 ***	0.139	0.768 ***	0.124
Resident	0.233 *	0.038	0.274 *	0.045	0.198	0.033	0.225 *	0.036
Improved wildlife habitat	–0.103	–0.017	0.004	0.001	0.024	0.004	–0.095	–0.015
Posted against trespass	0.089	0.014	0.109	0.018	0.082	0.014	0.082	0.013
Objective: recreate	0.017	0.003	–0.012	–0.002	0.046	0.008	0.022	0.004
Objective: timber	1.491 ***	0.242	1.567 ***	0.257	1.538 ***	0.255	1.485 ***	0.240
Development concerns	0.055	0.009	0.052	0.008	0.072	0.012	0.062	0.010
Has easement	–0.302	–0.049	–0.320	–0.052	–0.150	–0.025	–0.301	–0.049
Ever leased	–0.527 ***	–0.086	–0.412 **	–0.068	–0.462 **	–0.077	–0.493 **	–0.080
Intercept	–2.613 ***	–0.425	–2.411 ***	–0.396	–2.306 ***	–0.383	–2.569 ***	–0.415

Hosmer-Lemeshow goodness of fit: chi-square test shows no lack of goodness-of-fit for any of the four models
Number of observations: 1,566 for each of the four models
[a] Significance is indicated by the following: * = p ≤ 0.10 , ** = p ≤ 0.05, *** = p ≤ 0.01

6.3.4.4 Probability of subdividing or selling forest land

The results of the logistic regression models of factors that influence a landowner's future plans to sell or subdivide their forest land indicate the least amount of consistency of all the logistic regression models in terms of how *assisted landowner* is defined (i.e., MCA, M, A, CS; see Table 6-1 for definitions). Of the variables, *Resident, Improved wildlife habitat,* and *Objective: timber* are significant in all four models; *Assisted landowner* and *Harvested timber* are significant only in the MCA model; and *Objective recreate* is significant only in the MCA and M models. Landowners who have timber as a primary ownership objective are more likely to have plans to subdivide or sell their forest land. Landowners who reside on their forest land and have improved wildlife habitat are less likely to have intentions to subdivide or sell their forest land, regardless of how *assisted landowner* is defined.

The marginal results of this model are interpreted as in the model describing the factors influencing receipt of landowner assistance (see Section 6.3.3) and show a narrow range of marginal effects when

the significance is consistent across the four models. Only for the model where assisted landowner is defined as having either a management plan, receiving advice, or receiving cost-share funding is assisted landowner significant.

For those independent variables showing a significant impact on having plans to sell or subdivide their land in the future, we describe the range of marginal effects for the various assisted landowner definitions below and in Table 6-11.

- **Assisted landowner:** Only when an assisted landowner is defined as having received a forest management plan, cost-share assistance, or advice (MCA) is the landowner more likely to have intentions to subdivide or sell their forest land, and this likelihood is only 2% more likely than those who have not received assistance.
- **Resident:** Landowners who reside on their forest land are 4% less likely to have intentions to subdivide or sell their land in the next five years compared to landowners who do not reside on their land (for all four models).
- **Improved wildlife habitat:** Landowners who conducted wildlife habitat improvement projects on their lands in the past five years are 3% less likely to have plans to subdivide or sell their land in the next five years compared to landowners who have not conducted wildlife habitat improvement projects on their land (for all four models).
- **Harvested timber:** When an assisted landowner is defined as having a forest management plan (M), landowners who have harvested timber are 2% less likely to have intentions to subdivide or sell their forest land compared to landowners who have not harvested timber.
- **Objective: recreate:** When an assisted landowner is defined as having received a forest management plan, cost-share assistance, or advice (MCA) or as having a forest management plan (M), landowners with recreation as a primary ownership objective are 2% less likely to have intentions to subdivide or sell their land in the next five years compared to landowners who do not have recreation as a primary ownership objective.
- **Objective: timber.** Landowners who have timber management as a primary ownership objective are 2 to 3% more likely to have intentions to subdivide or sell their forest land compared to landowners who do not have timber management as a primary ownership objective.

Table 6-11. Comparison of logistic regression models using different definitions of an assisted landowner using landowners who *plan to subdivide or sell their forest land* as the dependent variable.

Variable	Management plan, cost-share, or advice (MCA)		Management plan (M)		Cost-share (CS)		Advice (A)	
	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect	Coeff.[a]	Marginal Effect
Assisted landowner	0.406 *	0.020	0.124	0.006	0.272	0.013	0.012	0.001
Age	0.131	0.006	0.107	0.005	0.101	0.005	0.103	0.005
Parcel size	–0.046	–0.002	0.002	0.000	–0.006	0.000	0.012	0.001
Resident	–0.790 ***	–0.039	–0.789 ***	–0.039	–0.794 ***	–0.039	–0.797 ***	–0.039
Improved wildlife habitat	–0.622 *	–0.030	–0.541 *	–0.027	–0.569 *	–0.028	–0.529 *	–0.026
Harvested timber	–0.414 *	–0.020	–0.368	–0.018	–0.374	–0.018	–0.356	–0.018
Posted against trespass	0.111	0.005	0.107	0.005	0.101	0.005	0.104	0.005
Objective: recreate	–0.383 *	–0.019	–0.377 *	–0.019	–0.370	–0.018	–0.371	–0.018
Objective: timber	0.482 *	0.024	0.556 **	0.028	0.527 **	0.026	0.566 **	0.028
Development concerns	–0.162	–0.008	–0.171	–0.008	–0.160	–0.008	–0.170	–0.008
Has easement	–0.743	–0.036	–0.690	–0.034	–0.684	–0.034	–0.661	–0.033
Ever leased	0.193	0.009	0.222	0.011	0.202	0.010	0.221	0.011
Intercept	–2.211 ***	–0.108	–2.133 ***	–0.106	–2.128 ***	–0.105	–2.130 ***	–0.106
Hosmer-Lemeshow goodness of fit: chi-square test shows no lack of goodness-of-fit for any of the four models Number of observations: 1,566 for each of the four models [a] Significance is indicated by the following: * = p ≤ 0.10 , ** = p ≤ 0.05, *** = p ≤ 0.01								

6.4 Discussion

Relative probability and logistic regression analysis of a subsample of respondents from the 2006 NWOS survey provides important insights into the similarities and differences between landowners who have received forestry practice assistance and those who have not, using a range of assisted landowner definitions. The sections below summarize our findings.

6.4.1 Relative probabilities: assessing differences between assisted and non-assisted landowners

We categorized assisted landowners based on four definitions (i.e., landowners who have a management plan or received advice or received cost-share assistance [MCA], those with a forest management plan [M], those who received advice [A], and those who received cost-share assistance [CS]) and examined differences between assisted and non-assisted landowners with respect to a variety of landowner characteristics and behaviors. One of the major findings is that regardless of how an assisted landowner is defined, the results show evidence that assisted landowners are significantly

different from non-assisted landowners in several important respects. These differences can be seen in their actions and attitudes regarding uses and management of their forest land.

The analysis illustrates six important distinctions between assisted and non-assisted landowners. First, there are important differences between assisted and non-assisted landowners with respect to their attitudes and actions. For example:

- Assisted landowners are significantly different from non-assisted landowners with respect to having conducted and planning to conduct activities on their land that are considered examples of good stewardship. Assisted landowners are more likely to have conducted several types of forest management activities than non-assisted landowners, including improving wildlife habitat, planting trees, reducing wildfire risk, harvesting timber, and permanently protecting their land from development through a conservation easement. Assisted landowners are more likely to have intentions to harvest timber and plant trees in the future than non-assisted landowners.
- It appears that assisted and non-assisted landowners are not different with respect to concerns about development pressure and being able to pass their forest land on as a legacy to their heirs. Our analysis found no significant differences between these two groups in terms of these concerns. One interpretation of this finding is that landowner assistance activities, commonly associated with FSP, are not directly addressing landowners' concerns about being able to keep their forest land intact.
- Assisted and non-assisted landowners are not different with respect to their intention of selling or subdividing their forest land. The intent of FSP is to enhance forest land management, health, and productivity; it is not explicitly intended to be a tool to protect forest land from development. Nonetheless, given the pressure to develop forest land and its associated impact on forest fragmentation and parcellation, this suggests that the various types of landowner assistance commonly associated with FSP may not be relevant to landowners seeking to keep land in a forested condition.
- With few exceptions, the analysis suggests that regardless of assisted landowner definition, the distinction between assisted and non-assisted landowners is minor. For example, assisted landowners (regardless of how defined) are between two and three times as likely to have conducted wildlife habitat improvement projects on their forest land when compared to non-assisted landowners. Similarly, assisted landowners are approximately twice as likely to have planted trees, reduced fire hazard as their non-assisted counterparts. This consistency also applies to landowner actions many might consider undesirable—plans to sell or subdivide their forest land. Landowners who have future plans to sell or subdivide their land are not more or less likely to have received forestry practice assistance.
- Our analysis indicates that when a landowner receives only one form of assistance, the type of assistance received does not appear to influence landowner behavior as much (or at all) compared with landowners who receive all three forms of assistance. For example, landowners who have received one form of assistance (OA, OM, OC; see Table 6-6) are about twice as likely to have conducted wildlife habitat improvement projects, regardless of what form that

assistance was; whereas landowners who received all three forms of assistance (MCAall) are more than four times as likely to have conducted wildlife habitat improvement projects. It is only when landowners have a forest management plan, have received cost-share assistance, and have received advice (i.e., a heavily assisted landowner) are they much more likely to do things commonly associated with good stewardship (e.g., have conducted wildlife improvement projects, planted trees, reduced fire hazard, harvested timber) as compared to landowners who have only received one form of assistance (received cost-share, have a plan, received advice). In other words, it takes three different assistance "touches" (having a forest management plan, receiving cost-share assistance, *and* receiving advice) to see big differences between assisted and non-assisted landowners, compared to assisted and non-assisted differences when landowner assistance is defined by exposure to only one of the three assistance efforts.

- Finally, when comparing landowners who only have a forest management plan (but who have not received cost-share assistance or advice, i.e., "OM") to those who have received no assistance, many of the distinctions between these two cohorts do not exist. For example, landowners who have received only cost-share assistance or only advice are more likely to harvest timber and plant trees (both past and planned future activities) than landowners who have received no assistance. Yet landowners who only have a forest management plan are no different than landowners who have received no assistance with respect to these same two activities. These findings suggest that if landowners receive only one form of assistance, professional advice and cost-share funds may be more effective than a forest management plan.

In reviewing these findings, it is important to keep in mind that while correlation between landowner assistance and landowner actions was established, causality was not. The data do not allow us to determine whether having received landowner assistance influenced landowner action (i.e., the decision to harvest timber) or whether the two are simply correlated activities.

6.4.2 Factors influencing landowner assistance

The results from the logistic regression models that explore the factors influencing having received landowner assistance support the conclusions derived from the relative probability analyses. Irrespective of how an assisted landowner is defined, landowners who received assistance have different land management behaviors and activities compared to landowners who did not receive assistance. Specifically, as was found with the relative probability analyses, the regression analyses found that assisted landowners differ from non-assisted landowners in several other important ways such as their primary reason for owning the land and past land management activities such as timber harvesting and managing wildlife habitat. Parcel size is also an important factor. Assisted landowners, on average, own more forest land compared to non-assisted landowners. Larger parcel size increases the probability of the landowner participating in some type of assistance program. Landowners who live further than one mile from their forest land are also more likely to have received assistance. Landowner future land use goals and intentions are not consistently important factors in explaining whether a landowner received assistance. Having plans to sell land in the future is not a significant determinant for any of the four landowner assistance definitions. Landowners who have afforestation plans are more likely to have received assistance defined as having a management plan, receiving cost-share or advice

(MCA) or defined as advice (A). However, consistently, landowners who have no future plans for their land are less likely to have received landowner assistance.

6.4.3 Landowner assistance effect on past activities and future intentions

The results of the logistic regression models to estimate the likelihood of specific past (timber harvest, wildlife habitat) and planned future (timber harvest, subdivide or sell their forest land) landowner actions show some insight as to how assisted landowners differ from non-assisted landowners. Assisted landowners are more likely to have harvested timber and implemented wildlife habitat improvement projects than non-assisted landowners, regardless of how an assisted landowner is defined. Also, assisted landowners are more likely to intend to conduct a timber harvest on their land in the next five years than their non-assisted counterparts across the four assisted landowner definitions used. Yet being in receipt of landowner assistance is generally not associated with a landowner being more or less likely to subdivide or sell their forest land within the next five years. These results support the relative probability and assisted landowner factor models that show that assisted landowners are more actively managing their lands (particularly with respect to timber and wildlife habitat improvement) than non-assisted landowners. Yet, assisted landowners do not appear to have different plans than non-assisted owners with respect to future plans to subdivide or sell their forest land.

6.5 Conclusions

This analysis is the first to use data from the NWOS survey to assess how various forms of assistance commonly associated with FSP are associated with landowner attitudes and actions. The results of this analysis identified important differences between assisted and non-assisted landowners, and these differences are largely invariant of the type of assistance landowners received (i.e., how an assisted landowner was defined). The differences between assisted and non-assisted landowners include characteristics of the owners and the forest land they own, past land management practices, and reasons for forest ownership. However, the analysis did not find consistent distinctions between the assisted and non-assisted groups with respect to their plans to subdivide or sell their land. Such findings should be instructive to administrators of FSP and similar private forest land assistance programs.

Although the 2006 NWOS data we used for this analysis are the most comprehensive profile of family forest landowner attitudes and behaviors in the U.S., it does not identify FSP participants, per se. The data provide variables that serve as surrogates for FSP participation (i.e., having a forest management plan, participating in cost-share assistance programs, receiving professional advice). Consequently, while our analyses identified relationships between assisted and non-assisted landowner as proxies for FSP participation, we were not able to identify explicitly landowners who have actually participated in FSP. Moreover, we were unable to identify the causal factors that distinguish the attitudes and behaviors of these two landowner cohorts. Including questions in future NWOS surveys that request information about activities specifically funded by FSP would allow landowners who have explicitly participated in FSP to be identified and to be directly contrasted with non-FSP participants. Such information would enable a more direct and complete analysis of FSP program effectiveness in the future.

7 Behavioral Impacts of FSP on Family Forest Owners: A Qualitative Assessment

7.1 Introduction

This chapter reports the results of a qualitative analysis of data from focus group interviews with a subset of non-industrial private forest (NIPF) owners: family forest owners. Specifically, this chapter addresses:

- what influences family forest owners' behavior regarding their forest land;
- whether the components of FSP (e.g., management plans, technical assistance, education) influence that behavior; and
- what the strengths and weaknesses of FSP are as perceived by FSP's target population: family forest owners.

The results of this study—combined with the other components of the larger evaluation project—will allow administrators, policy-makers, and foresters to triangulate the effectiveness of FSP and identify areas for improvement.

7.2 Background

While Chapter 2 reviews and synthesizes relevant literature regarding FSP, as well as financial assistance program and program evaluation studies of past FSP evaluations, this section provides a brief review of qualitative studies of family forest owners to put the current qualitative analysis of FSP influence into perspective with the literature.

Qualitative methods provide a unique approach for exploring the question of whether FSP influences family forest owner behavior in that they allow researchers to directly address the "why" or causal questions regarding individuals' behavior. Bliss and Martin (1989) note that the quantitative survey approach—though not without its strengths—has significant limitations, including:

- This type of approach requires researchers to decide beforehand what questions they must ask and what responses should be available for closed-ended questions. However, "appropriate categories are seldom known *a priori* for less tangible variables such as attitudes, beliefs, motivations, or objectives" (Bliss and Martin 1989, p. 602).
- The unit of analysis for the survey method is the trait of inquiry and not the person as a whole. If the goal of a research effort is a comprehensive understanding of individual behavior and motivation, it is essential to study the individual "intact" (Bliss and Martin 1989, p 603).
- The researcher must maintain survey protocol throughout the study, not modify the survey instrument to adjust to changing circumstances, and limit a desire/need to probe more deeply into questions.

Qualitative methods, Bliss and Martin (1989) argue, address these limitations in several ways. For one, qualitative research is inductive and not deductive, meaning that researchers can approach data collection with fewer preconceived notions and be open to themes and ideas as they present themselves. Second, the primary unit of analysis is the "case," i.e., the individual is studied intact so that

their comments can be studied in the context of their circumstances. Third, qualitative approaches allow researchers to develop a rapport with their informants that affords the researcher the opportunity to assess data quality and probe more deeply into statements of interest. Whereas surveys quantify population parameters, "qualitative methods are more effective for discovering the relationships between beliefs, attitudes, and behavior, and for identifying parameters of importance. The methods complement, rather than conflict with each other" (Bliss and Martin 1989, p 605). Recent research also highlights the need to employ a more diverse method—quantitative and qualitative—to understand the complex contexts in which owners make decisions and form meanings about forests and forestry (Fischer, Bliss et al. 2010).

Much of the qualitative NIPF literature relies upon one-on-one interviews as the primary method of data collection (Bliss and Martin 1989; Tikkanen, Isokääntä et al. 2006; Hujala and Tikkanen 2008; Rickenbach 2009) and typically examines the less-than-tangible attitudes, perception, values, and decision-making processes of NIPF owners. The present study, however, employs a method that is more novel in the NIPF literature: focus group interviews. The focus group method holds appeal because it encourages free-flowing conversation and idea generation (Eliason, Blinn et al. 2003) that is difficult to achieve through other methods. Focus group interviewing also boasts a degree of utility: it allows researchers to collect data from many informants at once, while one-on-one interviews are more costly in terms of time and resources.

Kingsley et al. (1988) performed one of the earliest focus group based studies of NIPF owners' interests and motivations. The authors established the effectiveness of the focus group method for gaining a deeper understanding of the NIPF owner population and their values. Additionally, the authors noted that the results of their study brought new depth and meaning to earlier statistics generated by Birch and Kingsley (1978).

While there are no qualitative studies that directly assess the impact of FSP on NIPF owner behavior, Kilgore et al. (2007) evaluated the contribution of forestry incentive programs (FIPs)—including FSP—to promoting sustainable forestry practices on NIPF lands. The authors employed a multi-method approach that included both surveys of forestry program administrators and focus groups of NIPF owners nationwide. Using the data from Kilgore et al. (2007), Daniels et al. (2010) conducted a qualitative analysis that examined the situation from the perspective of the potential clients of FIPs: the NIPF landowners themselves. The authors of both studies demonstrated that substantial differences existed between the perspectives of FIP administrators and the needs of NIPF owners themselves, despite the fact that there is no structural disconnect between the goals of FIPs and the goals of the NIPF owners themselves. Such findings would not have been possible without a qualitative analysis component; findings that provide administrators with information that could be used to improve program implementation and adoption.

In an examination of forest certification programs in Minnesota, Ednie and Leahy (2007) asked "why"- and "how"-type questions of NIPF owners. Qualitative inquiry through focus group interviews was well suited for that task. The study explored NIPF owner preferences for educational outreach formats that would encourage inquiry and participation in forest certification programs. In a later study of forest

certification programs, Leahy et al. (2008) used focus group interviewing to determine NIPF owner perceptions of and interest in such programs. The authors note that focus groups can provide foresters, policy-makers, and program administrators with detailed, specific information from family forest landowners that can later be used to inform program design and implementation. Both studies provided insight on how administrators can tailor programs to their target population.

Several other studies have also demonstrated the usefulness of focus group for understanding attitudes, values, and behaviors. By conducting focus group interviews with New York state residents, Barnhill and Smardon (2012) discovered implementation barriers for green infrastructure projects and suggested means of addressing them. Follo (2011) used a mixed-methods approach to illustrate how the government of Norway might facilitate NIPF owners in achieving federal forestry policy goals. Guffey et al. (2009) conducted focus groups with African-American NIPF owners in Arkansas to explore their attitudes toward and perceptions of forestry. The results enabled the authors to identify avenues by which the USFS might engage the population to promote forest management.

7.3 Methods

7.3.1 Data collection

For this study, we designed focus groups with family forest owners using methods described by Krueger and Casey (2009). We conducted twelve focus groups in six locations (i.e., two focus groups per location): Boulder, Colorado; Statesboro, Georgia; Decorah, Iowa; Somerset, Kentucky; Oneonta, New York; and Spokane, Washington. Each focus group lasted two hours, and they were held in September and August 2012. The specific locations were chosen based on a cluster analysis that was performed as part of another component of the FSP evaluation project. Three clusters emerged from the analysis, and we chose two states from each cluster. Our criteria for state selection included whether identifiable FSP participant information was available in a GIS format. For those states, we chose cities within a 30- to 45-minute driving radius of areas with FSP activity.

We generated lists of potential study participants from available FSP GIS and for non-FSP participants from property tax records coupled with remote sensings of land cover data to distinguish woodland owners. The candidates were contacted by telephone. A screener questionnaire was used for the phone calls in order to recruit ideal participants; this screener questionnaire is included on the companion CD to this project report. The screener sought family forest owners who were at least 18 years of age and owned at least 10 acres of forest land. The participants also had to be one of the principal decision-makers regarding the management of their forest. The recruiters attempted to recruit family forest owners from a range of age and gender-based demographics, acreage sizes, and ownership types (joint, single, and family). Potential study participants were also screened on the intensity of their land management activities. Family forest owners with professional forestry experience were disqualified from participation in the study. An average of 8 participants, ranging from 5 to 13, were at each session, and they were awarded $75 for their attendance. The study was performed in accordance with the Institutional Review Board of the University of Massachusetts.

Because part of the focus group method is to control for participant characteristics and create a safe social environment for interaction and disclosure (Daniels, Kilgore et al. 2010), the goal was to have separate focus groups for FSP and non-FSP participants. Having separate groups would prevent less active family forest owners from being intimidated or "drowned-out" by more active owners. In addition, separate groups would provide the ability to determine what differences, if any, existed between the two groups.

Despite the fact that consistency and replication is one of the major disadvantages of qualitative research (Bliss and Martin 1989), our goal was to conduct the focus groups with as much consistency as possible. The same two individuals conducted each of the twelve focus group sessions; one person moderated and the other handled logistics and note-taking, with the tasks always conducted by the same individuals. Prior to each session, participants filled out a survey asking what land management and land use activities they had recently performed or intended to perform. A "topic guide" was created by the researchers to help guide the discussions, but due to the open-ended nature of the discussions and the ability of the moderator and the participants to probe topics of interest, not all the same subjects were covered in each session. As such, some variability exists among each of the twelve discussions. At the end of each session, participants were also asked to fill out surveys indicating what topics they were interested in learning more about and their preferred education method.

All focus groups were audio recorded. The recordings were then transcribed, resulting in more than 700 pages of text. That text became the principal data source for this analysis.

7.3.2 Data analysis

Although this study had very particular research goals, we refrained from forming hypotheses *a priori*. In order to fully explore the research questions, we remained open to all possible theoretical directions indicated by readings of the data (Charmaz 2006). Even though the participants were asked to what degree the components of FSP influenced their management behavior, they were also asked to explain any and all factors that influence their behavior. Given the exploratory nature of this research, this research endeavor adopted a grounded theory approach (Strauss and Corbin 1998; Charmaz 2006) for the data analysis given the exploratory nature of the research.

Given the semi-structured nature of the focus groups, wherein participants spontaneously leap to different topics, structural coding was employed to analyze the text according to the research questions used to frame the discussions (Guest and MacQueen 2008). This process disassembled the text into many discrete parts, enabling the researchers to compare and contrast the data. This process resulted in an exhaustive list of recurrent themes and salient ideas relating to the research questions of what influences family forest owner behavior, and what are the strengths and weaknesses of FSP as perceived by family forest owners.

After the initial coding process was completed, the data were "strategically reassembled" using a modified axial coding approach (Saldaña 2009). We developed several draft coding schemes over a lengthy and iterative analytic process. This portion of the analysis sought to refine the code to point

where the conceptual categories were in line with the research questions and all the data could be adequately covered by coding scheme.

7.4 Results

The analysis yielded four major categories describing the data:

- **Motivators:** factors that influence the participants' behavior to varying degrees and can be conceptualized as "external" to the family forest owner (examples include finances or natural disasters)
- **Stewardship ethic:** "internal" values and beliefs the participants have toward their woodlands
- **Knowledge sources:** who or what is informing and influencing the participants' decision-making process
- **Program perceptions:** what the participants believe to be the relative strengths and weaknesses of FSP

The analysis produced far more results than what are reviewed here. What follows is a presentation of the themes and ideas most salient to the research objectives.

7.4.1 Motivators

7.4.1.1 Management plans

Most of the family forest owners who participated in the focus groups indicated that written management plans had a moderate to minimal impact on their behavior:

> *Moderator:* Did you do that because of the plan or were these things you were going to do anyway?
>
> *Colorado Resident:* It's what I was going to do anyway.

Exchanges like these were commonplace throughout the discussions. The participants who had management plans often developed them incidentally through the pursuit of their pre-existing management objectives. Typically, the plans were recommended by a forester the owner had contacted for advice regarding their pre-existing objectives. Many participants also stated they acquired a plan in order to be eligible for tax-abatement or cost-sharing programs. In either case, the participants indicated that their management plans generally did not influence them to engage in behavior on which they were not already planning.

However, even though the plan did not influence *what* the participants wanted to do, it did affect *how* they were doing it.

> We probably wouldn't have had the forestry plan and we probably would have just gone by the seat of our pants and hired somebody and got taken because we didn't know anything. And yeah, it would've happened but probably not in a good way. —*Washington Resident*

> It made me realize that some of the trees that I wanted to plant in certain areas was [sic] not the best match for the area. —*Kentucky Resident*

For many of the participants, management plans seemed to act as a type of quality assurance plan, in that the plans helped them accomplish their objectives in a sound manner.

> It [the plan] gives you kinda [an idea] where you're going, where you came from. And it gives you a path and you know what worked and what didn't work. —*Washington Resident*

7.4.1.2 Technical assistance and advice

It was difficult to discern from the analysis, however, if management plans were responsible for this sense of "quality assurance" or if it was coming from the foresters who wrote the plans. The confusion stems from the fact that, much like with the management plans, participants generally had some sort of objective in mind that prompted them to contact a forester who helped them accomplish their objectives the "right" way:

> *Moderator:* Has the information the forester's given you been useful?
>
> *Washington Resident:* Oh man, yeah. Very useful.
>
> *Moderator:* Would you have done things differently without them?
>
> *Washington Resident:* Yeah I wouldn't have got it right, that's for sure.

It is also possible that technical assistance provides an opportunity for landowners to be exposed to ideas and strategies that are in line with their pre-existing values and objectives. Ideas that may prompt them to pursue further management activities:

> But the Department of Natural Resources has been fortunate to go the next step. Say "well, yeah, you marked it now but what about the future?" And they've been good at giving us ideas and programs and all that. Some kind of guideline. —*Iowa Resident*

Discussions with the participants also suggested that site visits from foresters might have the added effect of positively reinforcing the owner's objectives or intensifying their effort in accomplishing those objectives:

> If I can get the one-on-one visit then it gets me started. —*Iowa Resident*
>
> I talked to the local experts and sort of set the stage as to what I was preparing to do and they seemed to encourage it. So I went ahead and set that in motion. —*Kentucky Resident*

7.4.1.3 Finances

Other studies have shown that financial return is not a primary motivating factor for family forest owners (Kenniston 1962; Binkley 1981; Kingsley, Brock et al. 1988; Lönnstedt 1997; Kittredge 2005;

Butler 2008). The results of the present study concur. Participants who did engage in financial transactions like commercial timber harvests typically did so to defray other expenditures, and not as a means of income:

> Well the first time I harvested some trees was right after I bought it like you guys [referring to other participants]. Used a little bit of the money to help offset the cost of getting in there and getting situated in the homestead. —*Georgia Resident*

> The fact that I had just purchased the house and I had laid out a lotta money for the home and property. And I figured I could gain some of my money back and that's why I did it. —*New York Resident*

> There were a lot of harvestable trees. And we owed a lot of money. —*Iowa Resident*

Many participants also indicated that commercial harvests were simply incidental in accomplishing more stewardship-based objectives.

> *Moderator:* So do you think you would have done that stuff if you did not get the money?
>
> *Washington Resident:* Oh, absolutely. Because it needed to be brought up to its very prime. And that's where it is now.

Even funds offered through cost-sharing programs were not a major behavioral influence for most of the participants. Much like with management plans, cost-share funding was the incidental result of pursuing pre-existing management goals, and they only learned of the funding after talking to a forester or peer:

> Oh yeah, I was gonna do it before I got the money. So yeah, I was real happy. He said, "I think this will qualify for the program." And I went, "The program?" He said, "Yeah, we'll pay part of this." And I went, "Lemme get this straight…" —*Kentucky Resident*

While cost-sharing did not initially inspire the participants' behavior, receipt of the funds did cause many to go beyond their objectives or intensify their management efforts:

> *Moderator:* Okay. So in the absence of this cost-sharing would you have done the same things?
>
> *Colorado Resident:* No. Not in those years.
>
> *Moderator:* So you would have done nothing in those years?
>
> *Colorado Resident:* Oh, I would have done my plan, but I wouldn't have gone beyond my plan like I did.
>
> *Moderator:* So you'd have done something, just not as much of it. Gotcha.

Colorado Resident: …I'm going to be doing a lot more than I would have done on my own.

Moderator: So you've done some stuff but…you're doing more because of this it sounds like?

Colorado Resident: Oh yeah.

None of the participants explicitly stated that cost-share funds or financial profits were motivating factors in the decision-making process regarding their forest land. However, economic incentives and cost-benefit considerations did appear to play a role in both land management and land use decisions:

> Gosh, it'd be wonderful if I could manage at a reasonable cost to improve the quality of the forest, wooded area. I don't know how to do that at a reasonable cost. —*Iowa Resident*

> And what could I turn around and sell it for? I think less. So why would I make that kind of economic decision? So at this point I'm just kind of on hold. —*Washington Resident*

For some of the participants though, financial considerations were not a factor:

> Oh, I don't know—I guess I just don't want to make a profit off my sacred space. —*Iowa Resident*

7.4.2 Stewardship ethic

The notion of the forest as a "sacred space" is a quintessential example of the stewardship theme that developed during the analysis. Stewardship can be an ambiguous term, but in this context it is conceptualized as the desire to care for the forest to maintain or enhance its intrinsic value:

> You know, we're all kind of caretakers of this land. We don't really own it.

This statement from an Iowa resident represents the sentiments of a large majority of the participants. This stewardship ethic appears to form the basis of many of the participants' values and beliefs regarding their forest. And for many of the participants, this ethic has a direct influence on their management behavior.

> I get a lot of satisfaction knowing that what I'm doing's helping the forest. —*Kentucky Resident*

> And some things I want to save, they say "why?" I told them I want it to stay in the wild. —*Georgia Resident*

> *Moderator*: So if there's nothing worthy of harvesting you're not gonna do it, are you? But if you did would you be willing to do it?
>
> *Kentucky Resident*: For the health of the forest, absolutely.

In some instances, these beliefs manifested themselves temporally as a need to preserve the forest for future generations:

> Well, to me it [conservation] means good stewardship of the land and that I'm taking care of it properly and making sure that it's gonna be there for the generations beyond mine. —*Iowa Resident*

And as a testament to the strength of these beliefs, one participant even stressed the need to think beyond the usual familial ties:

> Even if something happens that it goes out of our family, basically what I'm looking at is stewardship long-term. You know, I don't know who'll wind up with it but I'm gonna leave it in good shape for them. They can do whatever they want to do with it but hopefully they'll make the right choice. —*Kentucky Resident*

After all, as one Iowa resident mused:

> Somebody else had to do it ahead of me or I couldn't see it, right?

Some of the more insightful participants stretched the stewardship notion spatially, citing that land management must be performed at the landscape or regional level to be effective. Simply working within one's own property line was not effective:

> …it's comprehensive management. There are no known boundaries within the forest. So if my 80-acre parcel sits in a community of other 80-acre parcels we're huge. And that whole forest has common problems, common assets. And that's where I would like to see the greatest amount of help and participation in, you know, a community. — *Washington Resident*

> One of the big issues we have here, a problem that I see prevalent is that we are isolated owners and we have no control over what goes on somewhere else. [State natural resource officials] can come on our property, they can thin trees, they can take care of fire reduction. I've got a 40-acre patch here and another 20-acre patch somewhere else and it's in the middle of a forest. I do what I can, you know, but we don't control the neighbors…one person can't take on the whole forest. —*Washington Resident.*

A few participants expressed hesitation about landscape-level management, assuming it would involve a loss of autonomy or handing over control to a bureaucracy. However, others believed this loss of control might not necessarily be bad provided the right conditions are met:

> I think there are some places you'd probably want to give up some autonomy or control. If for instance you had someone say "okay we can eliminate this invasive species if we can…"—we've all agreed, or at least 99% of us agree is bad thing—"but we're gonna

have to do it across this whole section." I would be willing to go along with that. —*Iowa Resident*

What that actually meant for me was some kind of consensus-building outreach that we're all in this together and we've got to take some—pay some attention to our comprehensive management. —*Washington Resident*

7.4.3 Knowledge sources

7.4.3.1 Natural resource professionals

For the study participants who are actively managing their land, foresters are an important factor in their decision-making processes. Many of the participants cited experiences with state service foresters, but private foresters were held in equally high regard. In several discussions, the participants all consulted with the same area forester, illustrating the influence one forester can have on forest management:

And they're really good. I mean, I was shocked. And they love it. They take you through every inch of your trees and they point out different species and look for goodies. It was amazing to spend the day with him. I mean he was just fantastic. —*Kentucky Resident*

I don't do anything without the advice of a forester. —*Washington Resident*

I have a forester who I have faith in. —*New York Resident*

Extension agents and land grant universities were also cited as useful and influential sources of information for land management.

Well, of course about anything that's [from] …the extension agent, you know, they're good. —*Kentucky Resident*

Colorado State University is huge into the forestry. And I can get all the help I want. —*Colorado Resident*

7.4.3.2 Public agencies

Despite the trust placed in state foresters and extension agents, participants expressed a range of opinions on public agencies:

But then I got some tree-hugging airhead that come in and tells me "the wilderness is better roadless." You know, I think there are just too many people getting involved here that don't know what they're doing. Government bureaucrats. —*Colorado Resident*

Oh I'd start with the DNR because I haven't kept up with some of the groups that you have and it sounds like I should. But that's where I've gone is the DNR. —*Iowa Resident*

The degree to which participants trusted or distrusted public agencies seemed to stem from past experiences. In general though, participants said they were more likely to seek help from local or state agencies than from federal ones for reasons of access (real or perceived):

> I'd call the local. I know them. I don't know the USDA guy. —*Kentucky Resident*

7.4.3.3 Personal relations

Aside from natural resource professionals, the participants' family, friends, and neighbors also play important roles in their decision-making process:

> I've got sons that would love to inherit the property or take it over and it's my way of keeping the land so that I'm giving them something for their future. Something for them to look forward to. So I involve them in many of the decisions. —*Iowa Resident*

> One of my neighbors said, "Hey man, you gotta get in this program." —*Colorado Resident*

> *Moderator:* How'd you know to go to the DNR?

> *Iowa Resident:* Oh, neighbors.

7.4.3.4 Private agencies

Unlike their public counterparts who received mixed-reviews, private or third-party groups were generally held in high esteem, though cited far less often as useful sources of information. Groups like the Arbor Day Foundation, the Nature Conservancy, or the American Tree Farm System were believed to be reputable sources of information. Participants who cited such groups appreciated the newsletters and magazines they published; though it is very unclear to what extent they influenced their behaviors.

7.4.4 Program perceptions

During each of the sessions, participants were given a sheet of paper that included a generic description of FSP and its basic components: management plans, technical assistance, and educational opportunities regarding forest management. Interestingly, almost none of the study participants had heard of FSP prior to the study. Some stated they had heard of it, but had no knowledge of the details. A few participants even thought they had been enrolled in the program at a time before it even existed. These observations suggest that FSP may suffer from a lack of "name recognition" and confusion over the program's purpose.

After reviewing a description of FSP, the focus group participants were asked what questions they might have about the program or what information they might need to decide whether or not to enroll. Participants were also asked to describe what might be a "deal-breaker" for them, i.e., what would make them not want to enroll. Similarly, they were also asked to describe any "deal-makers," i.e., features that would draw them to the program. Another interesting observation is that management plans were not mentioned by any of the participants as being a deal-maker or deal-breaker.

7.4.4.1 Deal-breakers

7.4.4.1.1 Control

One concern expressed by many participants revolved around the issue of lost control and autonomy. Participants expressed the fear that enrolling in the program might prevent them from interacting with their woodland in the way they are accustomed due to onerous restrictions. These fears, whether real or perceived, manifested themselves as being forced to open the land for public use, prohibitions of certain activities, or being forced to undertake undesirable management activities:

> Like if you go into the program you can't go on your land. That'd be a deal-breaker for me. Enter the program, you can't drive your 4-wheeler on the land. Deal-breaker for me. Enter the program, can't hunt your land—deal-breaker for me. —*Iowa Resident*

> That's the biggest thing. I mean, that would be the question, you know, is what kind of restrictions I have to get into this program. I mean, I don't mind taking advice and doing things, but there is a limit. —*Georgia Resident*

7.4.4.1.2 Cost-share funding

Participants often associated these fears with cost-share funding, believing that accepting such funds might result in a situation where they are obligated to manage their land in an undesirable way:

> I mean, I would not want somebody coming in and tell me what I could and could not do, you know, just because they helped me financially or something. —*Georgia Resident*

> I wouldn't mind getting a plan but I'm not interested in cost-sharing. I'm not interested in somebody paying for it. I would like to take a look at what plans are available or what things are available and then I'd like to control it and not take money for it. 'Cause money means somebody wants control, too. And I'm not willing to give that up on my own land. —*Washington Resident*

7.4.4.1.3 Contracts

The participants also connected concerns over control to the program's duration and unrealistic contractual obligations:

> The down side with any plan is that it needs to be liquid enough to change as things change. That's the hard thing about having something that's set in stone 15 years out. By the time you get to year 10, you had to change already. —*Iowa Resident*

> Because it ties—what you're doing is you're saying in perpetuity you're tying up that portion of your land. It doesn't make any difference what the situation becomes or anything else. —*Washington Resident*

7.4.4.1.4 Minimum acreage requirements

Some participants who were genuinely excited about the program and expressed interest in enrolling believed they would not qualify due to the size of their acreage. Nowhere in the description of FSP was mention made of minimum acreage requirement.

> Yeah, they were not interested in smaller—and see, we're near [town in Georgia] so we're not talking about…you know, they're talking about thousands of acres. So they're not interested in lil' ol' me. —*Georgia Resident*

Participants who expressed this concern seemed to be basing it off experience with other FIPs or state tax-exemption programs, while others just seemed to assume they owned too few acres to be considered.

7.4.4.1.5 Value

Several participants voiced their concerns in the form of a question, i.e., "Why is the government doing this?"

> I guess I'd want to know what's the objective? I mean, what's the expectation? I mean, are we—am I managing my land to build, you know, big trees to be logged? Am I growing it to help the wildlife come in? Am I growing it so that someone can feel good about the fact that "oh look, here's an area that's a designated wooded area." You know, what's in it for them? —*Washington Resident*

Whenever this concern was raised, other participants usually speculated on the program's value. Some hypotheses were pessimistic and some were optimistic:

> It's always follow the dollar signs. If somebody wants some money for some program they have to justify—if somebody wants a job paid for by the federal government they gotta justify a program to make it function…Anyways I guess that's what I wonder…do they really have a greater vision and need my help in this vision? Or do they just [say]—there's a department that has to justify its existence, therefore it comes up with a program to justify its existence. —*Washington Resident*

> So that's why I want to hang onto my land and make sure that it stays in wooded and farm and not a…store-house place for somebody. I don't want to build, I don't want my brother to come in there to build no 200 storage units in [town in Georgia], I don't want my neighbor to build it next door to me. I want it to stay woods down there and pretty, you know. And I want there to be a space where people can go through and it will stay that way. Now if the government was to say, you know, "I'm going to help you do that," I would say thank you very much, you know, because I think that kids today need to have woods tomorrow. And that's where I stand on it. —*Georgia Resident*

> It's a national heritage, even if it's owned privately. —*Washington Resident*

7.4.4.2 Deal-makers

7.4.4.2.1 Education

> I just think the three choices would be education, education, and education. It's the only way we learn. —*Iowa Resident*

Of the four FSP components described to the participants, education elicited the most vocal, positive response. In fact, receiving education and advice was so important to the participants that many were willing to forgo other parts of the program, including financial assistance:

> *Moderator:* So if the money's a pittance what's the exciting part? Or what's good about the program?
>
> *Washington Resident:* Educational.
>
> My hook is the education. Bottom line. I don't give a rat's tooth about the rest of the stuff. —*Iowa Resident*
>
> Can you participate without the financial assistance thing? In other words, can you go through education…without making a commitment of "okay, this land has to be handled in this way." No money involved and yet they want to take control. I don't want to do that. Because you know, I want to be free to work my land and work on it. But assistance for the plan where it's just, hey, ideas, thoughts, information, whatever you want to call it—I'm open to that. —*Washington Resident*

7.4.4.2.2 Networking

Access to peer networks and peer networking opportunities were strongly implied by the participants to be a strength of a program like FSP. In fact, several participants suggested that learning from and interacting with peers might motivate them to engage in more intensive land management behavior.

> Because the more I get out and do some of these field tours and workshops…the more I see what other people are doing, it excites me and motivates me and "why didn't I think of that," and "that's a good idea," and I could do that better. —*Iowa Resident*
>
> Well, [the class] let me know a whole lot that I didn't know. And it let me know where to look for more information. And another thing, too, is I met a lot of people that are gonna help me in the future. —*Kentucky Resident*
>
> I think if people got together like this [referencing the focus group] in their own areas and it's like a workshop, I think that would be very helpful. —*Colorado Resident*

7.4.4.2.3 Cost-share funding

The data do not suggest that the participants unanimously disliked cost-share funding. Those who had fears of losing autonomy simply attached those suspicions to cost-sharing, believing such funds come with "strings attached." There were many participants who welcomed the idea of cost-sharing as a

means to accomplish their management objectives. The only drawback to cost-share funding, several felt, is that there is not enough of it:

> And when they first started they paid you so much an acre to be in the plan. All of a sudden that went away. Now you didn't get paid at all. Then pretty soon you gotta hire somebody to do it. And the thinning, they used to pay you by the acres to thin it. This was all paid for by the state. Now it's kinda flipped over the other way. Now we pay for everything that gets done. —*New York Resident*

> I learn something every year. But still I think I know what needs to be done and, you know, I'm energy-limited. And funding-limited. So if there was more bucks I could do more. —*Colorado Resident*

7.4.5 In-group survey results

Prior to the start of each discussion, participants completed a brief survey that asked what land management and land use activities they have performed in the past five years, and what activities they are likely to perform in the next five years. The results corroborate what was heard in the discussions: participants were generally more interested in caring for, or improving the intrinsic value of, their land and less interested in financially motivated activities. Very few of the participants had engaged in land use activities like sales or subdivisions (See Figures 7-1 and 7-2).

Figure 7-1. In-group survey of land management and land use activities performed in past five years.

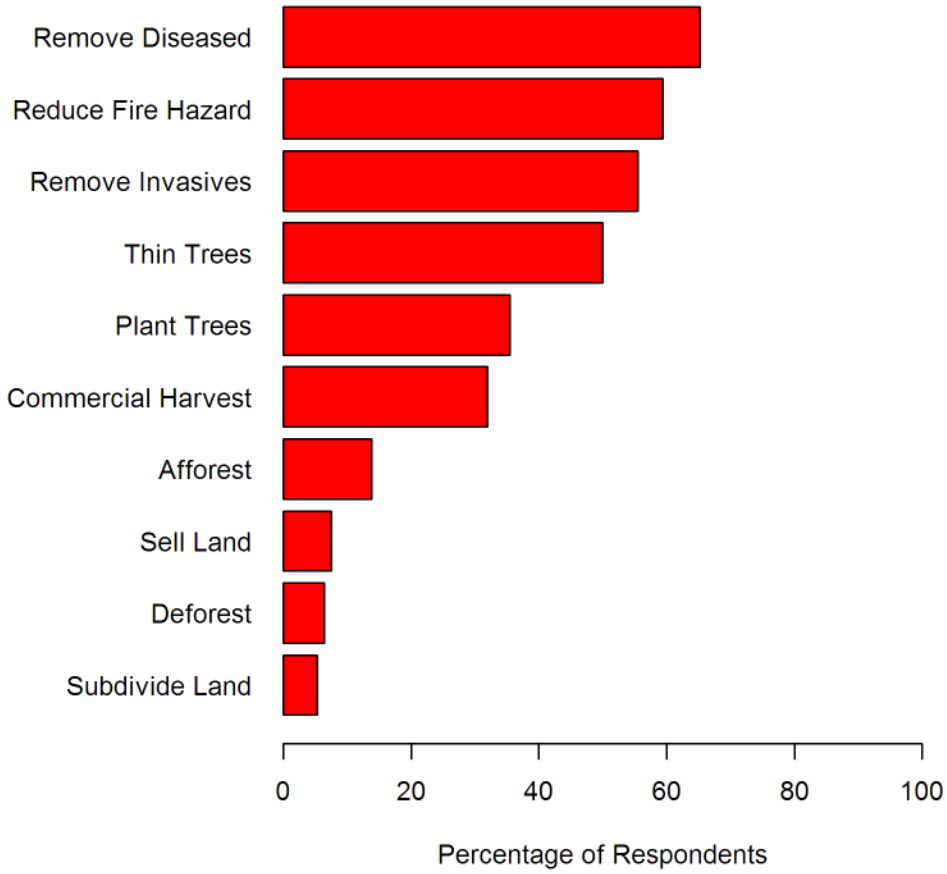
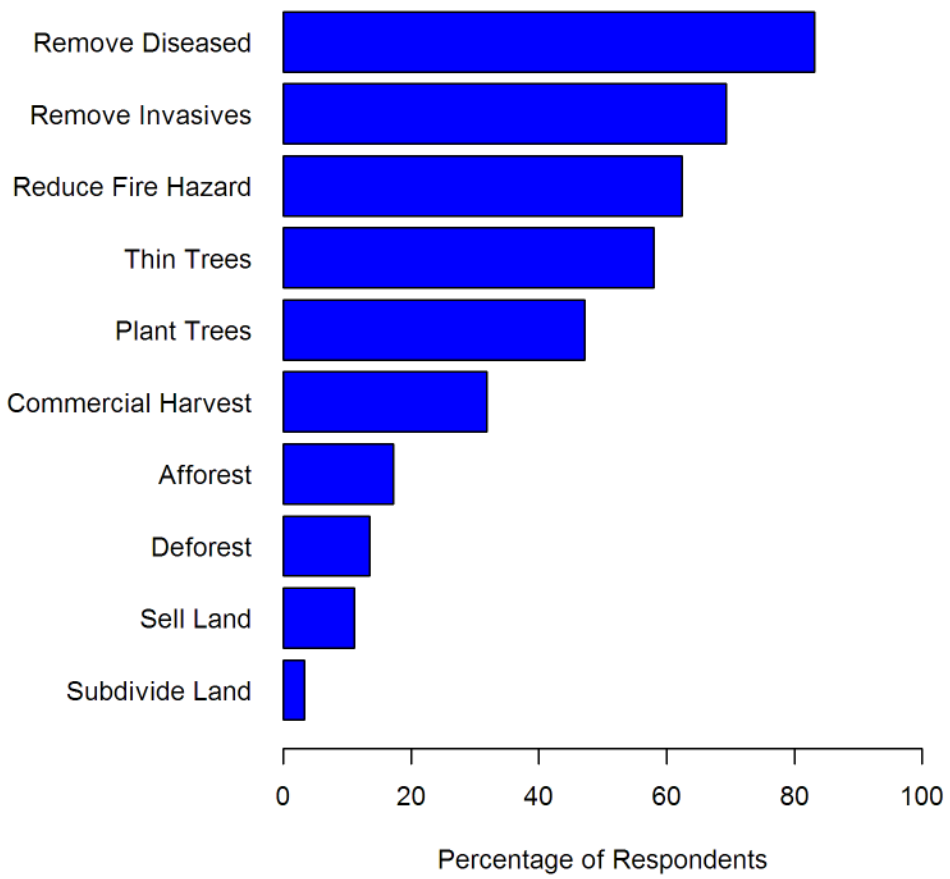


Figure 7-2. In-group survey of land management and land use activities planned to be performed in next five years.



And the end of each discussion, the participants received two sheets. One sheet contained a list of topics relating to woodland management, and the other sheet contained a list of educational methods. The exceptions were the participants in the first focus groups, in New York, who only received the educational methods sheet. Participants ranked their top three topics of interest, and their top three preferred educational methods for learning about those topics. Participants were also asked to explain their choices.

The results of the topics sheet are illustrative of the "Stewardship ethic" category that resulted from the data analysis, in that they demonstrate the participants' preference for managing the land for its intrinsic value. Although "Income" was ranked second on the list, most participants expressed this simply as an extension of defraying the costs associated with owning their woodland, and not as a means of making a profit (See Figure 7-3).

The results of the educational methods sheet demonstrate the participants' preference for personal contact, either through site visits with a natural resource professional or by networking with fellow landowners through workshops or field tours (See Figure 7-4).

It is important to note that the in-group survey results are not representative of family forest owners nationwide. They are simply illustrative of the findings of this study.

Figure 7-3. In-group survey ranking of top three woodland management topics.

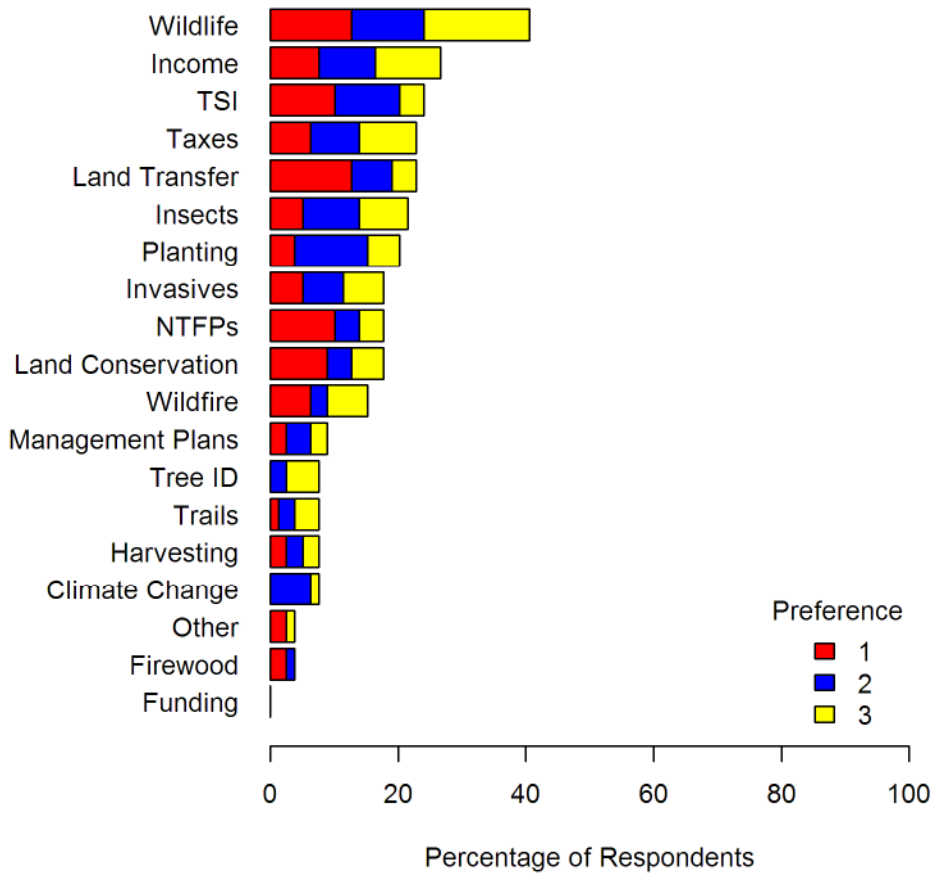
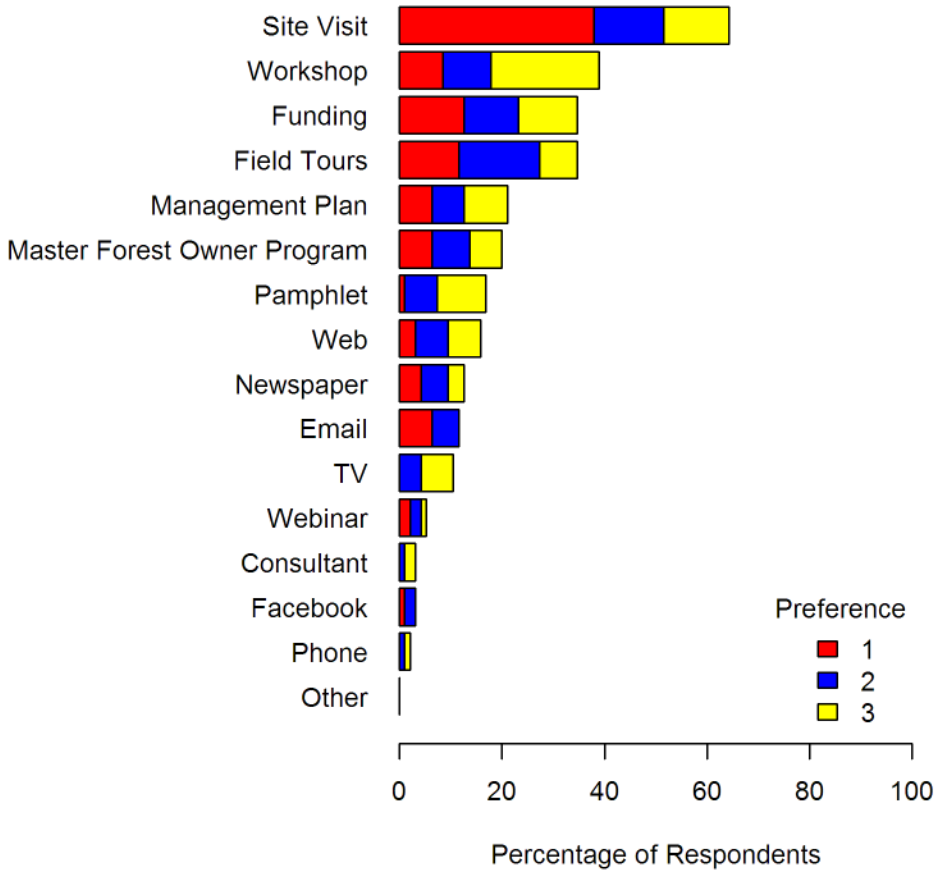


Figure 7-4. In-group survey ranking of top three preferred educational methods.



7.5 Discussion

7.5.1 Behavioral impacts of technical assistance, management plans, and cost-sharing

A major finding of the focus groups is that FSP might not be influencing family forest owner behavior in the way that other studies have suggested. Based on the focus groups, it appears that the owners who have taken advantage of programs like FSP had pre-existing management objectives in mind before pursuing technical assistance, management plans, or education. A frequent remark heard in the discussions was "[I had] in mind to do it anyway." "It" might have been a vague objective like wanting to "clean up" or "help" the forest, but after consulting with a professional or developing a management plan, landowners might have been exposed to "new" strategies to accomplish those goals, e.g., timber stand improvements. This supports and further enhances the findings of Esseks and Moorhouse (2005).

For family forest owners with more specific objectives like reforestation, FSP appears to help them accomplish objectives in the "right" way, presumably a scientifically or economically sound way. For instance, consulting with a forester helped one study participant to determine the proper tree species to plant in a low-lying area of his property. The participant believed that without technical assistance, the pursuit of his reforestation objective might have failed. Additionally, for those study participants who

had explicit objectives, technical assistance and cost-share funding helped them to "do more" by enabling them to intensify their management efforts.

From the analysis, FSP can be surmised to have the following effects on family forest owner management behavior.

1. FSP exposes them to "new to them" management activities; however, there is no evidence to suggest that the program influences family forest owner values. The data do not suggest that FSP is causing disengaged or inactive family forest owners to adopt and pursue a stewardship ethic.
2. FSP, through mechanism like technical assistance and management plans, can influence family forest owners to pursue their management objectives in what they believe to be a sound manner, i.e., the "quality assurance" aspect of the program.

In addition, cost-share funding appears to influence already-active family forest owners to intensify their management efforts or cover more acres.

7.5.2 Education and peer-to-peer networking

Education is considered separately from the other components of FSP due to the ambiguous manner in which it was described by the participants. While there was a strong desire for "boots on the ground," i.e., technical assistance or professional advice, participants also expressed a strong affinity for educational methods that can occur independent of the FSP, e.g., networking with fellow family forest owners. Peer-to-peer learning and communication was regularly described by the participants as a desirable way to learn about new management strategies. This finding is consistent with other studies that show landowners tend to trust their peers equally or more than professional experts (Kittredge 2004; Hujala, Tikkanen et al. 2009; Gootee, Blatner et al. 2010; Knoot and Rickenbach 2011). Additionally, the efficacy of peer-to-peer learning is supported by the social learning theory, the theory of reasoned action, and the diffusion of innovation theory (Ma, Kittredge et al. 2012).

Kittredge (2004) notes that local peer opinion leaders are effective because they are not perceived to be promoting an agency or industry position. Therefore, programs that train local opinion leaders to instruct their peers, like the Master Woodland Owners, might be an effective means for foresters and program administrators to reach family forest owners.

7.5.3 Perceptions vs. reality

Participants expressed fears that FSP enrollment may result in the loss of autonomy and control over their land; for example: opening up the land for public access, restrictions on activities that the owner enjoys, being forced to perform unwanted management activities, or being locked into a management plan that lacks fluidity. Participants also expressed concerns over minimum acreage requirements, even though the FSP description they were given did not mention acreage requirements. Some states do impose requirements for various incentive or tax-abatement programs, and it is possible that some participants based their concerns on that fact. However, many participants simply *assumed* their acreage was "too small" for FSP without knowing what the actual requirements were, or if there even were any.

Regardless of the legitimacy of these concerns, they merit attention because some family forest owners may perceive them to be real and may therefore be discouraged from exploring the program foresters and program administrators should keep these concerns in mind. The data also suggest that an explanation of the program's purpose and value might help to alleviate some of these concerns.

7.5.4 Caveats and considerations

This study, like most other qualitative studies, is limited by the fact that standardization is nearly impossible to achieve due to the semi-structured, open-ended nature of the approach. Therefore, the results are difficult to replicate. Furthermore, there is no assurance that the participants or the data collected from them are statistically representative of family forest owners nationwide. Indeed, the findings presented here are illustrative and should be used in conjunction with other data sources to gain a deeper understanding of the subject at hand.

It should also be noted the goal to have separate groups of "FSP" and "non-FSP" participants was not accomplished. This was most likely due to a failure of the recruitment screening questions to properly identify and distinguish the desired participants. Therefore, it is entirely possible that the voices of the more active land managers are overrepresented in the results. The study may have been unable to assess the values and behavioral influences of less active or disengaged landowners. Furthermore, the data analysis did not distinguish differences between regions or between demographics like age and gender. Conceptually, data from the discussions were analyzed as one large group. However, there appeared to be more similarities than differences between the regional and demographic groups.

The study was not able to assess what influences family forest owners to make land use decisions like selling and subdividing. The lack of this assessment might be due to the discussion guide, which covered more land management than land use topic, but also, importantly, most of the participants had not sold or subdivided their land (nor were they planning to in the future). The topic was simply not relevant for most, and therefore very few participants had any thoughts to contribute on the topic. Financial hardship or poor health conditions were indicated as important factors in hypothetical future sales.

7.6 Conclusions

The present study demonstrates the usefulness of the focus group method for assessing and exploring the factors that influence family forest owner management behavior. We placed emphasis on the main components of FSP (technical assistance, management plans, and education). Although FSP does not appear to inspire a stewardship ethic in family forest owners, it does appear to facilitate landowners with pre-existing management objectives and reinforce existing values. The focus group findings, combined with the other components of this evaluation report, provide foresters, program administrators, and policy-makers with information that can inform the future direction of FSP. To further promote the stewardship of family forest lands, future research might explore how family forest owners form a stewardship ethic. Specifically, it would be useful to explore how family forest owners might be encouraged to develop such values. Peer-to-peer networking may provide a suitable context for this endeavor. The theory of planned behavior (Ajzen 1991) may also provide considerable insight.

8 FSP Activities in Relation to Forest Area and Other Trends

8.1 Introduction

Another way to evaluate the Forest Stewardship Program (FSP) is to consider how the program activities are associated with forest loss or gain. We look for evidence to determine if FSP activities have a positive influence on the amount of forested acreage across the U.S. The perfect data do not exist to answer that question directly, we therefore rely on several data sources and take a multiple analysis approach to understand the relationships between FSP activities and various measures of forest acreage trends. The limited availability of data suggests that the best course of action is to conduct complementary analyses to paint a picture of FSP activities in relation to forest area trends.

The two major approaches of this section rely on existing data to consider changes in forest area at a sub-national resolution and explore links between FSP-impacted lands and forest trends:

1. County level analysis showing the relationship between areas where the U.S. appears to be gaining (losing) forest and areas where FSP management plan acreage appears to be high (low).
2. State level analysis of existing FSP-activity data exploring whether the data describe a type of FSP implementation approach that might be correlated with measures of forest area.

8.2 County analysis

In this analysis, we use geographic information systems (GIS) data to describe forest change (i.e., forest losses, forest gains) and areas with FSP management plans by county. We compare and analyze the relationship between these measures. In particular, we compare these measures for privately owned lands for the 2007–2011 time period.

8.2.1 Data

8.2.1.1 Areas of forest change

The U.S. Department of the Interior, U.S. Geological Survey's Moderate Resolution Imaging Spectroradiometer (MODIS) land cover type (MCD12Q1) data (hereafter referred to as MLCT), and the Protected Areas Database of the United States (PAD) provide the underlying data to estimate privately owned forest change over time (MLCT: https://lpdaac.usgs.gov/get_data, PAD: http://www.protectedlands.net/).

We use the MLCT data to calculate forested acres by county for all ownerships for both 2007 and 2011. The MLCT data provides five different land cover classifications (Friedl, Sulla-Menashe et al. 2010); this analysis focuses on Type 1 land cover classification: the International Geosphere-Biosphere Programme (IGBP) global vegetation classification scheme (Loveland and Belward 1997; Loveland, Reed et al. 2000). In particular, we define forested acres as those that IGBP categorizes in the following ways (Hansen, Defries et al. 2000):

- Evergreen needleleaf forests: lands dominated by trees with a percent canopy cover >60% and height exceeding 2m. Almost all trees remain green all year. Canopy is never without green foliage.
- Evergreen broadleaf forests: lands dominated by trees with a percent canopy cover >60% and height exceeding 5m. Almost all trees remain green all year. Canopy is never without green foliage.
- Deciduous needleleaf forests: lands dominated by trees with a percent canopy cover >60% and height exceeding 5m. Trees shed their leaves simultaneously in response to cold seasons.
- Deciduous broadleaf forests: lands dominated by trees with a percent canopy cover >60% and height exceeding 5m. Trees shed their leaves simultaneously in response to dry or cold seasons.
- Mixed forests: lands dominated by trees with a percent canopy cover >60% and height exceeding 5m. Consists of tree communities with interspersed mixtures or mosaics of needleleaf and broadleaf forest types. Neither type has <25% or >75% landscape coverage.
- Woody savannas: lands with herbaceous and other understory systems, and with forest canopy between 30 and 60%. The forest cover height exceeds 2m.

Friedl et al. (2010) discuss the classification accuracy of the IGBP classes and report overall accuracy across all classes to be 74.8%. Using the same underlying data and approach, we calculate that the accuracy across the six IGBP classes we use to define forest is approximately 82%.

The PAD data provide boundaries of federal and state lands in a GIS format. We use these data to remove federal and state lands from the MLCT data. The result is an estimate of the acres of privately owned forests by county for 2007 and 2011.

8.2.1.2 All active FSP management plan acres, 2007–2011

Many states are now collecting spatial data describing lands with existing, new, or revised FSP management plans. These data describe, geographically, where FSP plans are in a state. Of the 18 states that provided data, only Michigan and New York provide all active (i.e., existing, new, or revised) FSP management plan information for all relevant counties during the 2007–2011 time period. Our analysis uses these two states' county-level, total acreage associated with all active FSP plans during the 2007–2011 time period as a measure of FSP activity.

8.2.1.3 New or revised FSP management plan acres, 2007–2011

While not all data included active FSP management plan acreage for 2007–2011, eight states provided data describing just new or revised FSP management plans for this time period: Colorado, Iowa, Kansas, Michigan, Minnesota, North Dakota, Nevada, and New York. These data are not exactly what is needed to define FSP activity. Nonetheless, in the absence of better data for these states, we conduct an additional analysis of these new or revised FSP plan acres during the 2007–2011 time period.

8.2.2 Methods

This section describes how we use the data described above to conduct county-level analyses exploring the relationship between forest area change in the U.S. and FSP management plan acreage. To do this, we use the MLCT/PAD forest change data to develop our sample and to develop forest change

categories: high loss, low loss, stable, low gain, high gain. We describe this methodology first, and then we describe the methodology we use to consider the relationship between forest change and FSP management plan acreage.

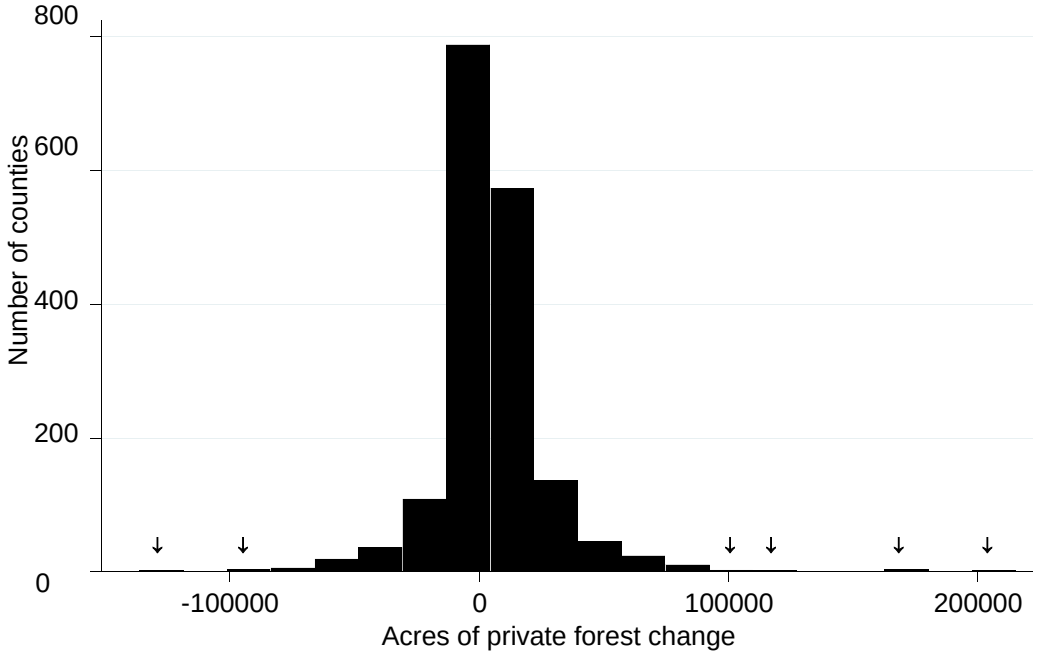
8.2.2.1 Sample selection criteria

To conduct our analysis, we developed sampling selection criteria to exclude counties with small forest acreages. As noted above, the MLCT data have some inaccuracies when classifying forest land. In addition, we would expect that smaller tracts of forest land that may be found in more developed areas would be more likely to be classified in error, as opposed to larger tracts of forest land that are easily distinguished from other land cover types. As a result, the sample selection criteria we develop exclude counties having less than 10% of total county area in forest (i.e., this includes private, federal, and state forests). This approach is similar to that applied by Stein et al. (2005) in their analysis to understand the effects of housing development on private forests. Stein et al. used sampling criteria that select those counties that had 10% or more forest and, simultaneously, 50% or more of those forest acres in private ownership. Because the PAD data remove all non-private lands from our sample, we do not need the second component of the Stein et al. criteria. Applying our sampling criteria to the 2007 MLCT land use data, the number of observations (i.e., number of counties) is reduced from 2,840 counties to 1,754 counties.

8.2.2.2 Forest change, 2007–2011

For each of these 1,754 counties, we calculate the change in forest acres by county by subtracting the 2011 acres from the 2007 acres. In some cases, this result is a loss, in others a gain. Figure 8-1 shows that the acres of forest change are distributed relatively normal by county, with some outliers.

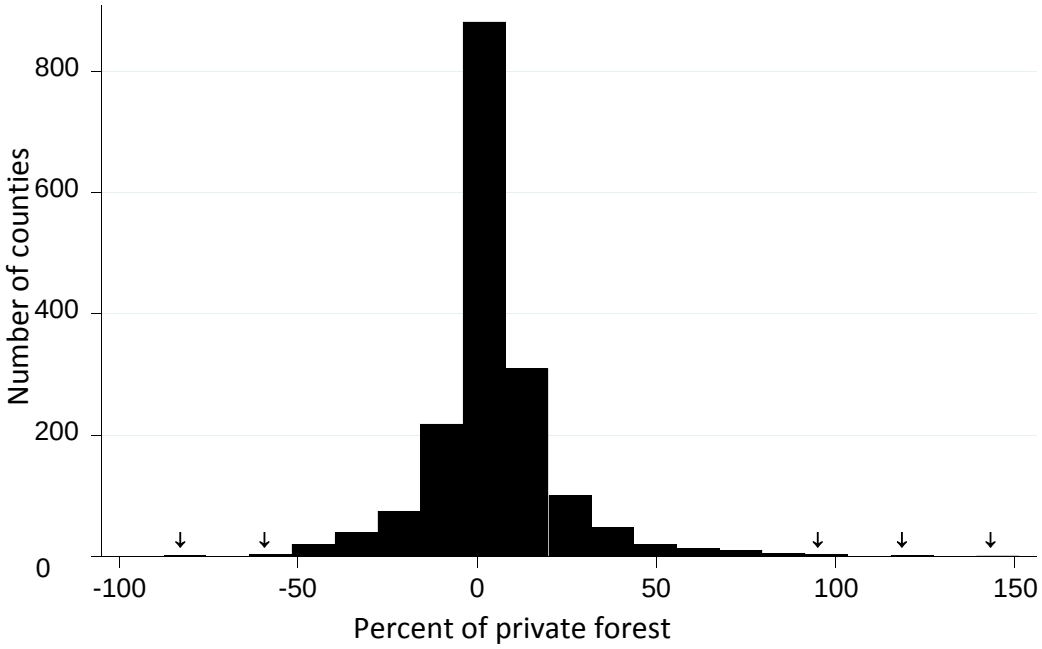
Figure 8-1. Acres of private forest change by county for U.S. counties with at least 10% of county acreage in forest (n = 1,754[a]).



[a] Arrows identify categories having a small number of counties.

We normalize these acres by the amount of total private forested land in 2007 in the county (using the MLCT and PAD data), thereby estimating the percent of total private forested land in the county that has been lost or gained. The average percent forest change for 2007–2011 was 4.4% (standard deviation 18.7), with a maximum loss of 87.5% and a maximum gain of 151.3%. The private forest change data show a relatively normal frequency distribution of these percentages by county, but one not without outliers (see Figure 8-2).

Figure 8-2. Percent of private forest change by county for U.S. counties with at least 10% of county acreage in forest (n=1,754[b]).



[b]Arrows identify observations having a small number of counties.

Using these data, we rely on ranges, as opposed to point estimates, to develop five categories of forest change (stable, low forest loss,low forest gain, high forest loss, and high forest gain). We establish these ranges to acknowledge that there is measurement error in the land cover data (see Section 8.2.1.1). While the forest change data may show that a county has lost some small percent of forest, the loss may, in fact, be not statistically different from zero. We designate a county to be *stable* if the county has gained or lost less than 1% of forest; *low forest loss/low forest gain* if the county has lost/gained at or between 1% and 10% of forest; and *high forest loss/high forest gain* if the county has lost/gained more than 10% of forest.

We find that of all five categories, the majority of counties fall into either the low or high forest gain categories. Approximately 33.9% of the counties fall into the low forest gain category (averaging a 4.5% gain), 24.4% into the high forest gain category (averaging a 26.4% gain), 17.5% into the low forest loss category (averaging a 4.4% loss), 12.1% into the stable category (averaging a 0.1% loss), and 11.9% into the high forest loss category (averaging 24.0% loss). Table 8-1 presents these results.

Table 8-1. Forest change categories based on privately owned forest change percentages (n = 1,754).

Forest change category	Number of counties	Mean percent change	Standard deviation	Minimum change	Maximum change
High forest loss (< −10%)	209	−23.97	12.79	−10. 02	−87.50
Low forest loss (−1% to −10%, inclusive)	308	−4.37	2.57	−1.03	−10.00
Stable (between −1% and 1%)	212	0.08	0.52	−0.98	0.98
Low forest gain (1% to 10%, inclusive)	596	4.50	2.62	1.00	9.98
High forest gain (> 10%)	429	26.37	19.96	10.01	151.27

8.2.2.3 Relationship between FSP management plan acres and forest change, 2007–2011

The state-supplied FSP plan acreage data provide a means to report the nature of land with FSP management plans and changes in forest acres between 2007 and 2011. As described earlier, using the forest change data we focus on counties that satisfy our sample selection criteria of at least 10% forest acreage in the county.

This analysis considers how FSP activity relates to forest change for the 2007–2011 time period using the following procedure:

- Calculate the percent of private forest land having an FSP management plan, by county.
- Calculate the correlation between percent of FSP plan acreage and percent forest change.
- Develop three categories of FSP activity based on the percent of private forest acres in a county having FSP plans: low percent of FSP activity, medium percent FSP activity, and high percent FSP activity. Use percentiles to construct these categories. Specifically, the low FSP activity category reflects FSP percentages that fall at or below the 33rd percentile; the medium category reflects percentages that fall above the 33rd percentile and at or below the 67th percentile; the high category reflects percentages that fall above the 67th percentile.
- Explore the relationship between the three categories of FSP activity and the five categories of forest change.

While we would like to do these analyses for all states that supplied FSP plan acreage data, this analysis is limited to considering two subsets of these FSP plan acreage data: All active FSP plan activity (new, revised, existing) and new or revised FSP plan activity for the 2007–2011 time period. These two subsets provided groupings of data that were both spatially and temporally consistent with the forest change data. The next section discusses the results for each of these subsets in turn.

8.2.3 County analysis results

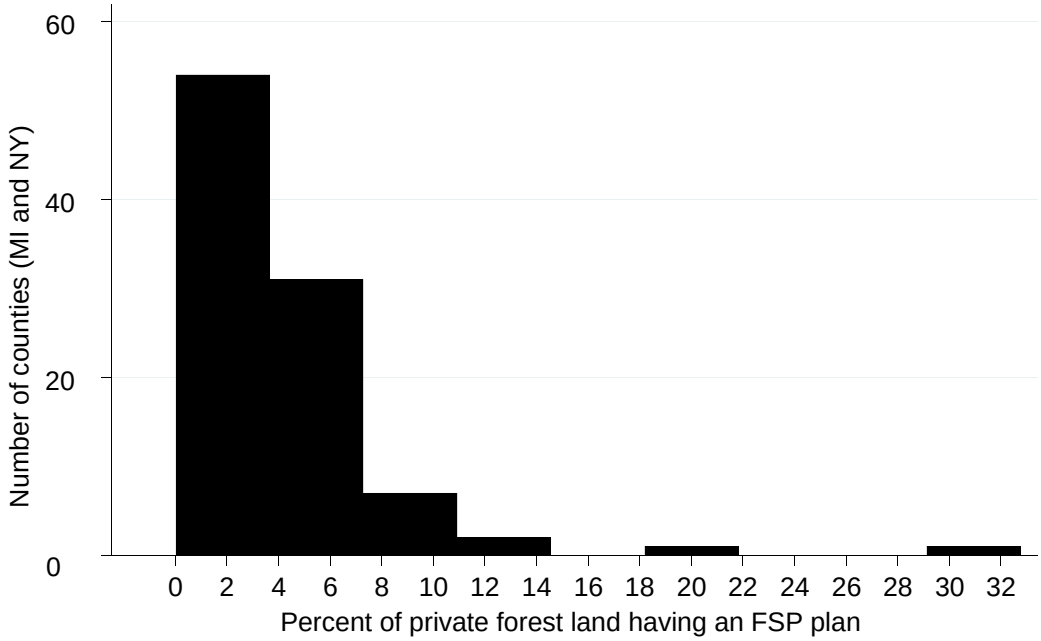
8.2.3.1 All active FSP-managed land, 2007–2011

8.2.3.1.1 Percent of private forest land

To calculate the percent of private forest land having an active FSP management plan, we first apply the sampling criteria to the Michigan and New York data. Data were provided for 135 counties from these two states (81 Michigan counties and 54 New York counties). When counties having less than 10% of forest coverage were removed, the resulting sample is 96 counties (49 Michigan counties and 47 New York counties).

In the majority of these counties (57 counties), less than 4% of private forest land has an active FSP plan (see Figure 8-3). The 49 Michigan counties average an FSP percentage of 4.22%, a minimum percent of 0.87 and a maximum of 21.47%. The 47 New York counties average an FSP percentage of 4.23%, a minimum percent of 0.21 and a maximum of 32.75% (see Table 8-2). The 21.47% maximum in Michigan reflects one observation, Roscommon County. The 32.75% maximum in New York reflects one observation, Livingston County.[10]

Figure 8-3. Percent of private forest reflected by active FSP plan acreage in Michigan and New York (2007–2011); counties with at least 10% forest (n = 96).



[10] Roscommon County is between Midland and Traverse City, Michigan. Livingston County is directly south of Monroe County, which encompasses Rochester, New York.

Table 8-2. Percent of private forest having an active FSP plan for 2007–2011 (Michigan and New York counties with at least 10% forest).

State	Number of Counties	Mean FSP percentage	Standard Deviation	Minimum/Maximum
Michigan	49	4.22	3.50	0.87/21.47
New York	47	4.23	5.22	0.21/32.75

8.2.3.1.2 FSP/forest change correlation

The results of the correlation between the percent of private forest having an active FSP plan and the percent forest change, by state, do not show significant correlations for either state (Table 8-3).

Table 8-3. Correlation between percent of private forest having an active FSP plan and percent forest change (2007–2011).

State	Correlation	Significance (p-value)
Michigan	0.0668	0.6481
New York	0.0770	0.6068

This analysis also considers the correlation between the percent of private forest having an FSP plan and the percent forest change for counties having stable, low loss, or high loss. The MLCT data unexpectedly show many counties with forest gain; we remove these from the correlation analysis. Ultimately we are interested in knowing whether FSP is successful at keeping forest as forest in areas subject to forest loss. In lieu of being able to directly answer this question, we approach it by testing the correlation between the percent of FSP plan acreage acres and percent forest change just with stable/forest loss areas. Similar to the above analysis, we find statistically insignificant correlation (–0.4063, p-value = 0.1683) between the two.

8.2.3.1.3 FSP activity categories

For these 96 counties, the three categories describing the percent of private forest having an active FSP plan are based on the 33rd and 67th percentiles. Counties with a high percent of FSP plan acres (high FSP*)* have percentages greater than 4.60%; counties with a medium percent of FSP plan acres (medium FSP) have percentages that are less than or equal to 4.60% and greater than 2.03%, and those with a low percent of FSP plan acres (low FSP) are at or below 2.03%.

The majority of the Michigan counties are found in the Upper Peninsula and mainly the upper half of Michigan state (see Figure 8-4). The New York counties are distributed throughout the state with the exception of seven southern Lake Ontario counties, and several counties roughly described as being in the Long Island and New York metropolitan area (see Figure 8-5).

Figure 8-4. FSP activity categories by county for Michigan. Low FSP: at or below 2.03%; Medium FSP: above 2.03% and less than or equal to 4.60%; High FSP: above 4.60% (n = 49).

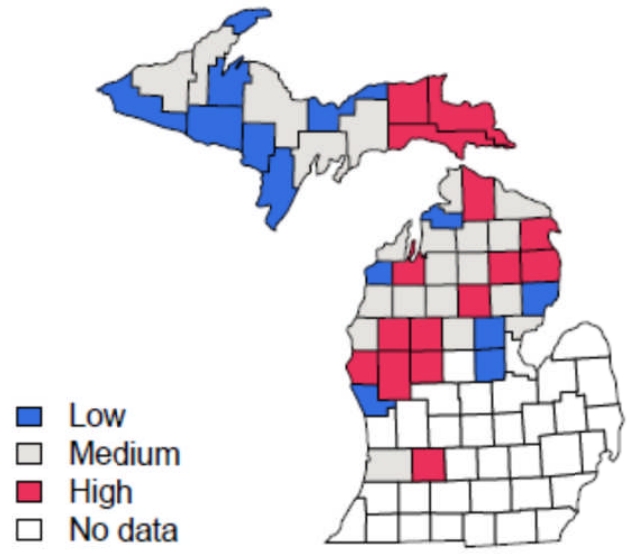
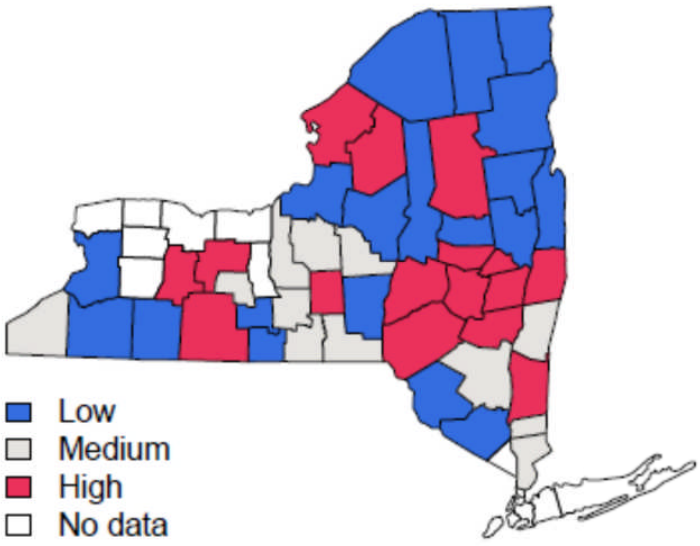


Figure 8-5. FSP activity categories by county for New York. Low FSP: at or below 2.03%; Medium FSP: above 2.03% and less than or equal to 4.60%; High FSP: above 4.60% (n = 47).



8.2.3.1.4 FSP activity categories vs. forest change categories

In this section, we compare FSP activity categories (viewed in Figure 8-4 and Figure 8-5) and forest change categories. The majority of forest change categories for these two states are low forest gain and high forest gain counties (see Figure 8-6 and Figure 8-7). The results of the comparison between FSP activity categories and forest change categories show that forest gains (low or high) occur at each FSP activity category for a similar number of counties; that is, 25 counties show a gain in the low FSP activity category, 30 counties show a gain in the medium FSP activity category, and 28 counties show a gain in the high FSP activity category (see Table 8-4). However, when considering the low gain versus high gain categories, the high FSP activity category is associated with high forest gain (20 counties) more than low forest gain (8 counties). For the medium FSP activity category, counties are roughly evenly split between low and high forest gain. For the low FSP activity category, more counties are in the low forest gain category. That is, 21% of the counties (n = 20) are high forest gain and high FSP, while 17% of the counties (n = 16) are high forest gain/medium FSP and 11% (n = 11) are high forest gain/low FSP categories. Whereas, approximately 8% of the counties (n = 8) are low forest gain/high FSP, 15% (n = 14) are low forest gain/medium FSP, and 15% (n = 14) low forest gain/low FSP (see Table 8-4 and Figure 8-8).

Figure 8-6. Forest change categories by county for Michigan (2007–2011); Stable: between –1% and 1% forest change; Low: loss/gain at or between 1% and 10% forest change; High: loss/gain more than 10% forest change (n = 49).

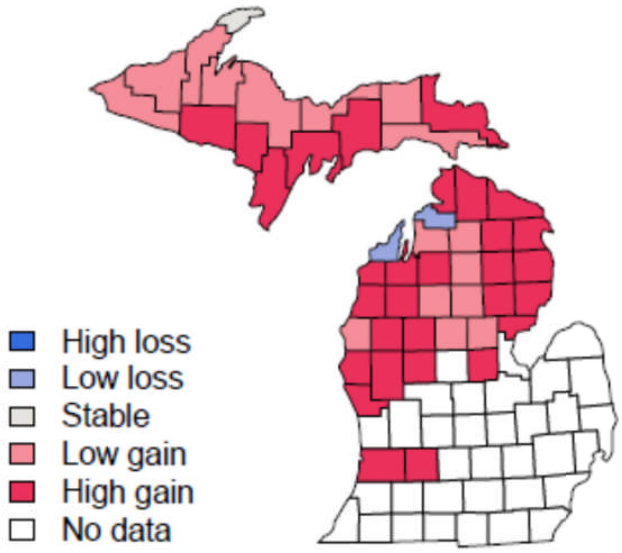


Figure 8-7. Forest change categories by county for New York, (2007–2011); Stable: between –1% and 1% forest change; Low: loss/gain at or between 1% and 10% forest change; High: loss/gain more than 10% forest change (n = 47).

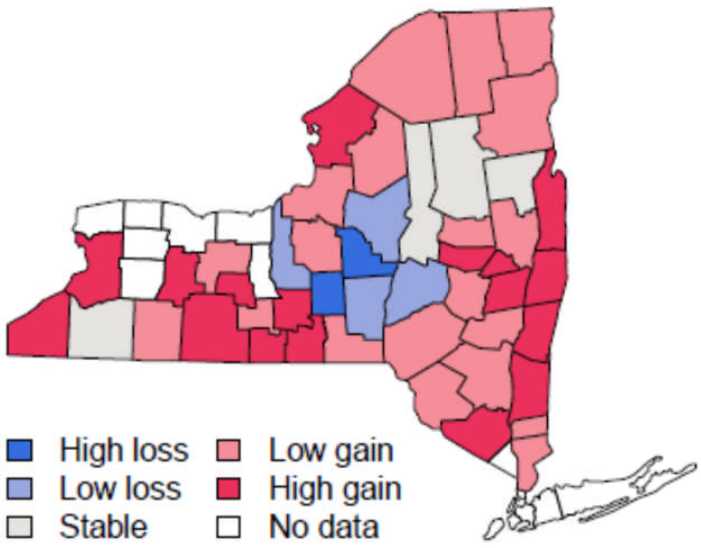
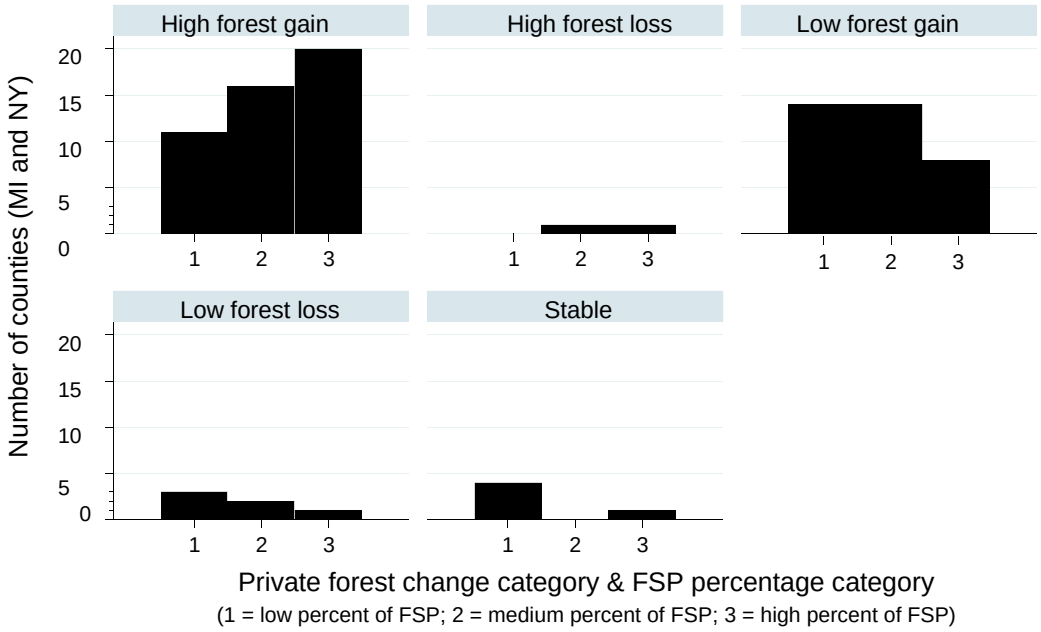


Table 8-4. FSP activity versus forest change categories for counties with active FSP plans and at least 10% forest (2007–2011).

	Low FSP activity (FSP percent <=2.03)	Medium FSP activity (2.03< FSP percent <=4.60)	High FSP activity (FSP percent >4.60)	Total
High Forest Loss (>–10%)	0 counties	1 county	1 county	2 counties
Low Forest Loss (–1% to –10%)	3 counties	2 counties	1 county	6 counties
Stable (–1% to 1%)	4 counties	0 counties	1 county	5 counties
Low Forest Gain (1% to 10%)	14 counties	14 counties	8 counties	36 counties
High Forest Gain (>10%)	11 counties	16 counties	20 counties	47 counties
Total	32 counties	33 counties	31 counties	96 counties

Figure 8-8. FSP activity category by forest change category (2007–2011) Michigan and New York, 96 counties.



To determine the significance of the association between FSP activity and forest change category, the data are used to calculate Pearson's chi-squared test. This tests the hypothesis that the two categories are independent of one another. The results of this test show insignificance at the standard 10 and 5% levels (p = 0.16). That is, we are not able to conclude that there is an association between the two categories for these two states, unless you consider the 16% significance level.

8.2.3.2 New or revised FSP management plan acres (2007–2011)

8.2.3.2.1 Percent of private forest land

To calculate the percent of private forest land that has new or revised FSP plans between 2007 and 2011, we first apply the sampling criteria to the eight states providing data. FSP coordinators provided 414 counties worth of data for eight states (Colorado, Iowa, Kansas, Michigan, Minnesota, North Dakota, Nevada, and New York). After counties having less than 10% of forest coverage were removed, the data reflect 151 counties representing five states for the time period 2007–2011 (33 Colorado counties, 49 Michigan counties, 20 Minnesota counties, 2 Nevada counties, 47 New York counties).

In the majority of these counties, less than 3% of private forest land also has an active FSP plan (see Figure 8-9). The 33 Colorado counties average an FSP percentage of 23.9%, a minimum percent of 1.7% and maximum of 147.6%. The 49 Michigan counties average and FSP percentage of 2.3%, a minimum percent of 0.02 and a maximum of 19.8%.[11] The 20 Minnesota counties average an FSP percentage 12.5%, a minimum percent of 0.3 and a maximum of 69.9%. The two Nevada counties average an FSP

[11] For Michigan and New York, currently active FSP acres are removed to be consistent with data from the other states in this analysis. That is, these data reflect only new or revised plan acres in the state.

percentage of 0.2%, a minimum percent of 0.1 and a maximum of 0.2%. The 47 New York counties average an FSP percentage of 3.2%, a minimum percent of 0.02 and a maximum of 32.59% (see Table 8-5). Of the 17 counties that have FSP percentages greater than 20%, 13 of them are in Colorado, 3 in Minnesota, and 1 in New York. The top five outliers (i.e., counties with greater than 50% new/revised FSP management plan acres) include Jackson County, Colorado (147.6%), Grand County, Colorado (116.6%), Roseau County, Minnesota (69.9%), Gunnison County, Colorado (52.8%), and Archuleta County, Colorado (51.5%).

Figure 8-9. Percent of private forest reflected by new/revised FSP plan acreage in Colorado, Michigan, Minnesota, Nevada, and New York (2007–2011); counties with at least 10% forest (n = 151).

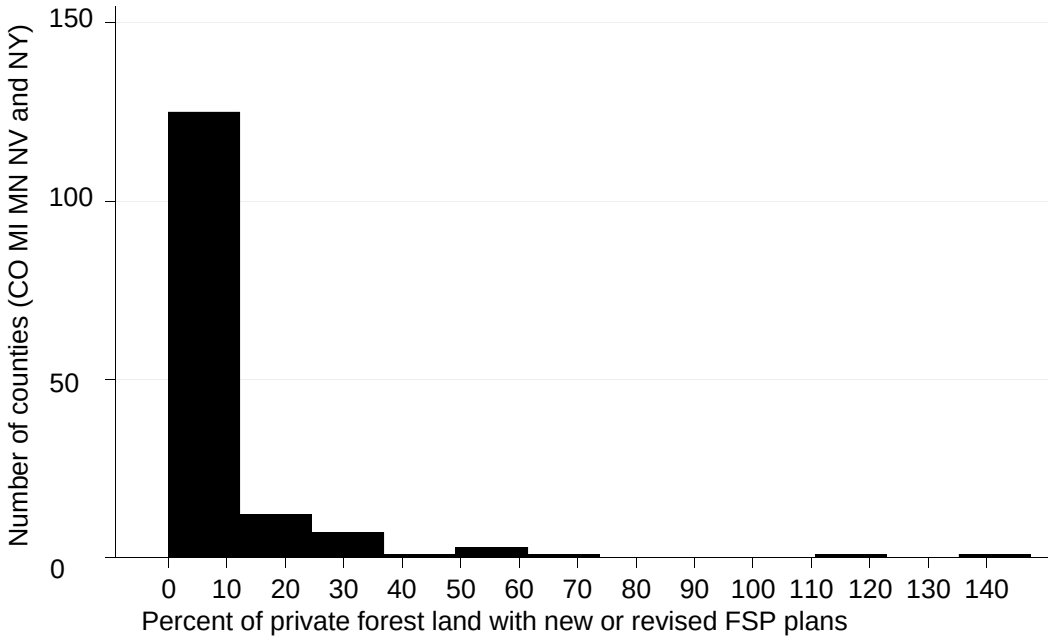


Table 8-5. Percent of private forest having a new or revised FSP plan for 2007–2011; counties selected have at least 10% forest coverage.

State	Number of Counties	Mean FSP percentage	Standard Deviation	Minimum/Maximum
Colorado	33	23.90	31.08	1.66/147.59
Michigan	49	2.32	2.97	0.02/19.76
Minnesota	20	12.52	18.65	0.34/69.94
Nevada	2	0.16	0.10	0.09/0.23
New York	47	3.22	5.17	0.02/32.59

8.2.3.2.2 FSP/forest change correlation

The results of the correlation between the percent FSP plan acres and the percent forest change, by state, shows significant, negative correlation for the state of Colorado; however, it appears that this state has many large, perhaps outlying, observations (see Table 8-6). The two Colorado outliers (i.e., Jackson County, Colorado, FSP percent = 147.6%; Grand County, Colorado, FSP percent = 116%) are

associated with high forest loss percentages (–42% and –32%, respectively). It is unclear whether these lands have been converted to agricultural use or development. When these two counties are removed from the data, the Colorado correlation coefficient (–0.18) becomes insignificant (i.e., p = 0.34). The correlations for all other states do not show significance.

Table 8-6. County data correlations by state: Percent new or revised FSP-managed acres and percent forest change (2007–2011).

State	Correlation	Significance (p-value)
Colorado (n = 33)	–0.56	0.00
Michigan (n = 49)	0.03	0.84
Minnesota (n = 20)	0.25	0.29
Nevada (n = 2)	–1.00	1.00
New York (n = 47)	0.00	0.99

8.2.3.2.3 FSP activity categories

For these 151 counties, the three categories describing the percent of private forest having an active FSP plan are based on the 33rd and 67th percentiles. Counties with a high percent of FSP plan acres (high FSP*)* have percentages greater than 4.77%; counties with a medium percent of FSP plan acres (medium FSP) have percentages that are less than or equal to 4.77% and greater than 1.62%, and those with a low percent of FSP plan acres (low FSP) are at or below 1.62%.

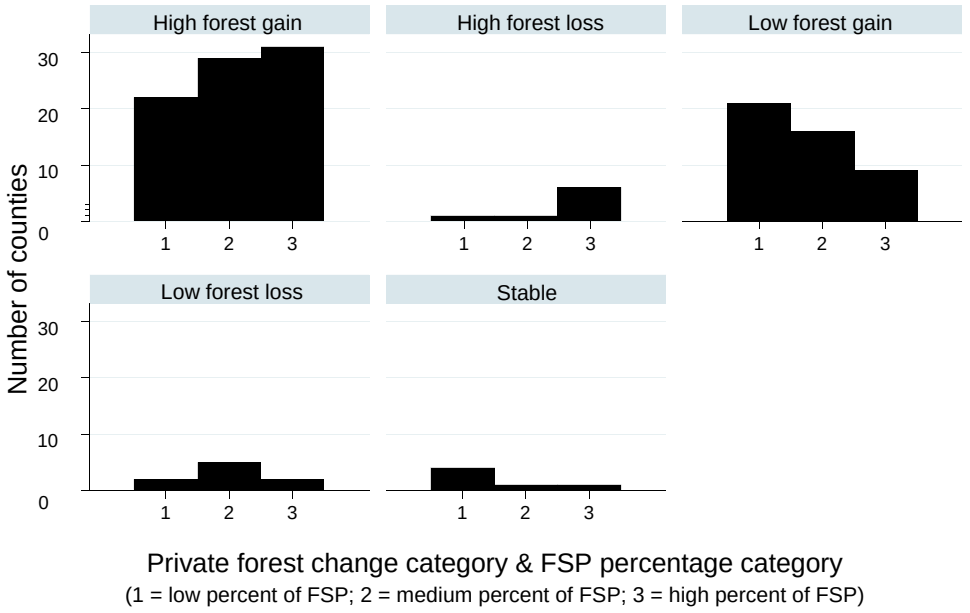
8.2.3.2.4 FSP activity categories vs. forest change categories

Similar to the results of the all active FSP plans, the results of the comparison between FSP activity categories of new/revised plans and forest change categories show that forest gains (low or high) occur at each FSP activity category for roughly similar number of counties; that is, 43 counties show a gain in the low FSP activity category, 45 counties show a gain in the medium FSP activity category, and 40 counties show a gain in the high FSP activity category (see Table 8-7). When considering the low gain versus high gain categories, the high and medium FSP activity categories are associated with high forest gain more than low forest gain. That is, for the high FSP category, 21% of the counties (n = 31) are high forest gain while 6% are low forest gain. For the medium FSP category, 19% of the counties (n = 29) are high forest gain while 11% of the counties (n = 16) are low forest gain. For the low FSP category, the counties are split relatively evenly between low and high forest gain: 15% of counties (n =22) are High forest gain and 14% (n = 21) are low forest gain (see Table 8-7 and Figure 8-10).

Table 8-7. FSP activity versus forest change categories for counties with new or revised FSP plans and at least 10% forest (2007–2011).

	Low FSP activity (FSP percent <=1.62)	Medium FSP activity (1.62< FSP percent <=4.77)	High FSP activity (FSP percent >4.77)	Total
High Forest Loss (>–10%)	1 county	1 county	6 counties	8 counties
Low Forest Loss (–1% to –10%)	2 counties	5 counties	2 counties	9 counties
Stable (–1% to 1%)	4 counties	1 county	1 county	6 counties
Low Forest Gain (1% to 10%)	21 counties	16 counties	9 counties	46 counties
High Forest Gain (>10%)	22 counties	29 counties	31 counties	82 counties
Total	50 counties	52 counties	49 counties	151 counties

Figure 8-10. New/revised FSP activity category by private forest change (2007–2011); Colorado, Michigan, Minnesota, Nevada, and New York, 151 counties.



To determine the significance of the association between FSP activity and forest change category, the data are used to calculate Pearson's chi-squared test. This tests the hypothesis that the two categories are independent of one another. The results of this test show significance at the five percent level ($p = 0.024$). That is, there is some non-random association between these two categories for this five-state data sample. When the two outlying Colorado counties (i.e., Jackson and Grand Counties) are removed from the data, the significance of the Pearson's chi-squared test drops to $p = 0.07$.

8.2.4 County analysis conclusions

Overall, it appears that during this time period—a time period when the FSP program is in full swing—the nation is seeing an increase in private forest land cover by approximately 4%, in counties where more than 10% of the county contains forest. Analysis of the MLCT data at the county level shows that this forest growth is distributed across many counties in the U.S. Nearly 34% of counties in our sample show private forest growth in the range of 1 to 10%, and nearly 24% of counties show private forest growth above 10%.

We understand that there is measurement error associated with this overall forest cover trend (measurement error in the underlying MLCT data at one point in time, at the county-level resolution, and in comparing across time periods) and attempted to address this by seeking out other sources of land use data. Our search of existing land use/land cover data included internet searches; conversations with individuals at a variety of federal, state, local, and non-profit organizations; and GIS listservs. Besides MLCT, suggestions for U.S.-wide coverage includes the U.S. Department of the Interior, U.S. Geological Survey's National Land Cover Database (NLCD) (Homer, Dewitz et al. 2007; Fry, Xian et al. 2011). In addition, for New York and Michigan (the focus of our all active FSP management plan analysis), no other better statewide or county data exist than what we found with MLCT or NLCD. As such, we consider the NLCD data that provide land cover change data from 2001–2006 on a county-wide basis.

8.2.4.1 NLCD Forest Trend

Employing the same methodology with the NLCD data as the MLCT data, Appendix A shows an average percent forest change between 2001 and 2006 in the U.S. for counties with at least 10% of county acreage in forest to be –0.12% (standard deviation 1.4), with a maximum loss of 15.2% and a maximum gain of 4.4%. These data show a relatively normal frequency distribution of these percentages by county, with similarly low but smaller mean estimates and fewer outliers than the MLCT data (see Table 8-8 and Appendix A for more detail). These differences are not unusual, given the different measurement approaches, the temporal differences, and spatial resolutions (NLCD 30 m resolution vs. MLCT 500m resolution).

Table 8-8. Comparison of U.S. forest change statistics MLCT (2007–2011) vs. NLCD (2001–2006); counties with at least 10% of total county acreage in forest.

	Mean forest change percentage	Maximum forest loss percentage	Maximum forest gain percentage
MLCT	4.4%	–87.5%	151.3%
NLCD	–0.12%	–15.2%	4.4%

8.2.4.2 Forest trend data and FSP management plan activity

Noting the temporal difference between the NLCD data and the FSP management plan acreage data, we conduct the same analyses of all active FSP-managed land with the NLCD forest trend data that we did with the MLCT forest trend data (Section 8.2.3.1). The analysis results between NLCD forest trend data and FSP management plan activity do not show a strong statistical significance between the two

measures (see Appendix A for the detailed analysis). Correlations between the percent of private forest having an active FSP plan and the percent forest change, by state, do not show significant correlations for either New York or Michigan. The comparison of FSP activity categories and NLCD forest change categories shows similarly insignificant relationships; all New York and Michigan counties included in this analysis are categorized as "stable" forest change.

We find it difficult to find forest trend results for numerous reasons related to data availability. Consistent U.S. land coverage data enabling analysis at the county level over time does not exist for the 2007 to 2011 time period of the analysis. The MLCT data provides that time frame, but at a 500m resolution. Although we have done it here, Friedl, et al. (2010) warn against differencing MLCT data across years to measure change. The NLCD data provide a better resolution, but not for the relevant time frame of the analysis.

In addition, this analysis relies on an incomplete measure of FSP activity that does not describe forest owner behavior as accurately as we would like for a number of reasons.

- First, the data describing active FSP management plans for the 2007 to 2011 time period are limited to two states out of 50. With such a small sample, it is difficult to draw broad conclusions for the national program.
- Second, while we have more statewide data on new or revised FSP management plans for this time period, this measure of FSP activity does not include currently active plans.
- Third, the data describing FSP management plan acres itself may be under- or over-estimates. The state-provided spatial FSP data may include agricultural lands that are FSP-eligible, thus including more land than just forested acres and overestimating FSP acres. Moreover, these data do not account for lands that may have dropped out of the FSP program during the time period of the analysis. Both of these factors confound the data by introducing noise.
- Fourth, tax programs requirements affect forest change and may be linked to FSP activity, making it difficult to disentangle results. Both Michigan and New York require an approved forest management plan, not necessarily an FSP management plan. It is possible that many Michigan or New York forest acres are preserved or incurring growth under this program, but because the management plan is not mandated to be an FSP plan, it is not part of our analysis. Both Colorado and Minnesota require an FSP management plan as part of the tax program application process; it is unclear whether the incentive to get a FSP management plan is due to the desire to receive tax relief.
- Association between forest change and FSP activity is not geographically specific. Forest change might be happening, but the current data do not allow us to determine if that change happens on FSP lands or not.
- Finally, FSP is far reaching in the private landowner community; while acres under FSP management plans is one measure, FSP educates and informs landowners in a variety of ways. These measures are not included in the measure of FSP plan acres.

8.3 Types of FSP approaches and forest change measures

While the state-level cataloguing and PMAS data have been discussed in detail in previous chapters to this report (Chapters 3 and 5), this analysis explores whether these 2007–2011 data might describe a "type" of FSP approach that could be correlated in some way to landscape forest measures. In particular, in this analysis, we use cluster analysis to make this exploration, and then box plot and ANOVA analyses to see whether these different types of FSP approaches are related to various measures of forest change.

8.3.1 Data

Both the State FSP Administrator survey and PMAS survey provide data that could describe types of state-wide FSP activity. In particular:

State FSP Administrator survey data

- Question 13: The percentage of FSP funding that state agencies spend on landowner management plans.
- Question 14: The percentage of state forestry agency funding that comes from the Forest Stewardship Program (FSP).

PMAS data

- The total number of acres covered by new or revised FSP plans approved by the state forester or representative.

We chose these variables for our analysis based on their reliability and their ability to measure differences in FSP approaches across states. We believe the above-described data could help describe FSP approaches based on existing state behaviors. The state FSP administrator survey data questions 13 and 14 help present a description of general FSP activity in a state. We would expect that states having high percentages of their funding coming from FSP to also spend high percentages of their funding on FSP management plans. Management plans are designed to conserve forest in the long run, a crucial element to FSP. However, states having lower percentages of their funding coming from FSP may or may not spend higher percentages of their FSP funding on FSP management plans. Whether or not states fund management plans with their FSP dollars will depend on such things as the sources of other funding in the state or the overall level of state funding. In addition, the PMAS data also adds its own element to describing FSP activity. States spending high levels of FSP funding on landowner management plans are likely to have high acreages covered by new or revised FSP plans. However, some state tax programs have FSP enrollment as a requirement; these states might have low levels of FSP funding spent on landowner management plans correlated with high acreages covered by new or revised FSP plans.

For the state FSP administrator survey data, blanks were replaced with zeros; territories and protectorates were dropped; and the resulting data set reflects the 42 states that provided complete responses. For the PMAS survey data, "Not applicable" responses (NAs) were replaced with zeros; all variables were log transformed to correct for normality; only 50 states were included (i.e., territories and protectorates were dropped); and means were taken across the five years of data (i.e., 2007–2011).

8.3.2 Methods and results

One means to develop a "type" of FSP approach is cluster analysis. Cluster analysis explores groupings in data by organizing data into discrete groups, maximizing within-group similarity, and minimizing among-group similarity (Hair, Anderson et al. 1998). Partition cluster-analysis methods divide data into distinct, non-overlapping groups. We use the k-means partition cluster method to assign states into groups based on the state FSP administrator survey and PMAS FSP variables, described above. Our cluster analyses explored two, three, and four groups, and we selected the three-group cluster analysis based on consistency within and across clusters.

The three-group cluster analysis shows reasonably distinct groups. Cluster 1 reflects states having lower percentages of their funding coming from FSP, not spending high percentages of their funding on FSP management plans. Cluster 2 reflects states having lower percentages of their funding coming from FSP, spending higher percentages of their funding on FSP management plans. Cluster 3 reflects states having high percentages of their funding coming from FSP, also spending high percentages of their funding on FSP management plans. Table 8-9 shows the mean, minimum, and maximum statistics for each of these groups, and Figure 8-11 shows these clusters.

The cluster analysis results show some consistency with regards to state tax programs that have management plan enrollment requirements. The results show low levels of FSP funding spent on landowner management plans yet higher acreages covered by new or revised FSP plans for states that we would expect given tax program requirements (e.g., Hawaii, Illinois, Indiana, Iowa, Maryland, Massachusetts, Minnesota, New Hampshire, Wisconsin all require management plans as part of the tax program). In fact, Minnesota is one of the states with the lowest percent of state FSP funding spent on management plans *and* highest acres of new or revised FSP plans. This state's tax exemption program (i.e., 2c managed forest land) requires an FSP management plan to participate. Several of the states having the highest percent state FSP funding spent on management plans either do not have a tax program (e.g., Kentucky, Alaska) or do not require a management plan for the tax program (e.g., North Dakota, Utah, Nevada, Georgia). Figure 8-12 shows these results.

Table 8-9. Summary of FSP approach attributes by group: Mean [Minimum, Maximum]

Group	FSP funding spent on management plans (Q13)	Percent of forestry funding from FSP (Q14)	New/revised FSP plan acres (PMAS)[a]
1	11.92 [0, 25]	15.77 [2, 45]	–4.89 [–6.49, –3.97]
2	45.44 [30, 95]	14.37 [2, 35]	–5.27 [–6.86, –3.49]
3	51.82 [30, 80]	64.27 [40, 100]	–5.95 [–8.94, –4.47]

[a]Log transformed

Figure 8-11. Percentage of FSP funding spent on plans vs. Percentage of state funding obtained from FSP.

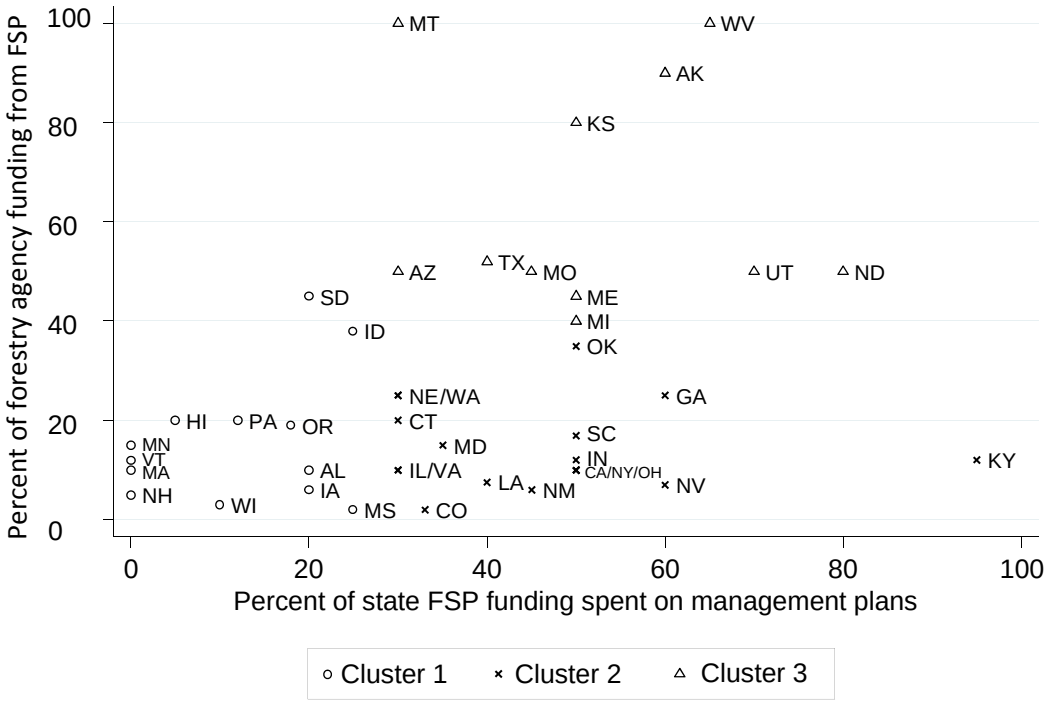
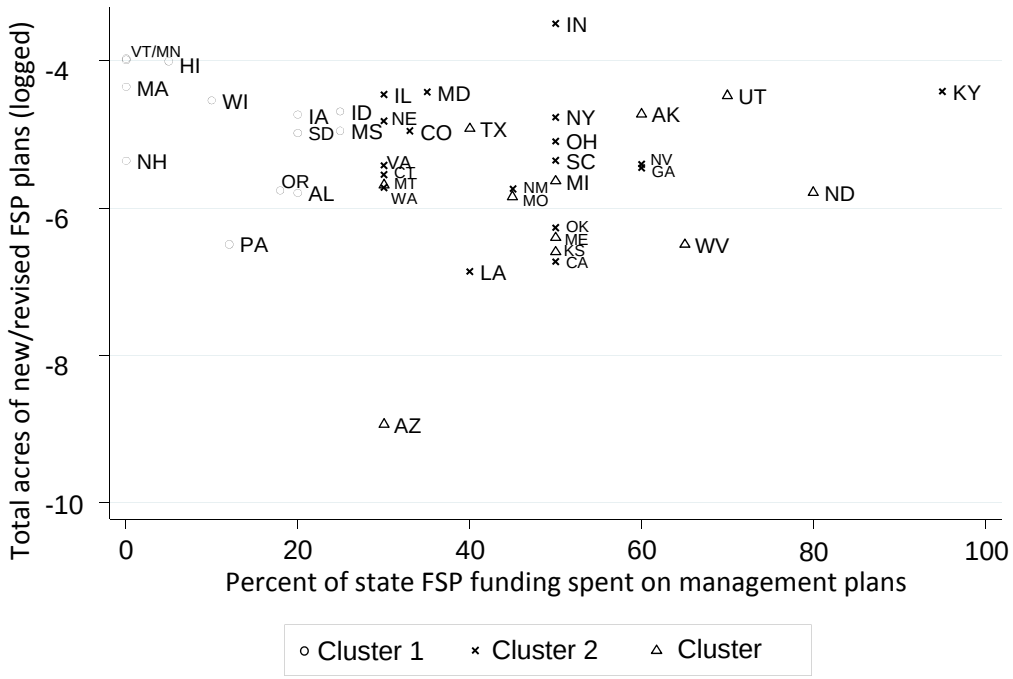


Figure 8-12. Percentage of FSP funding spent on plans vs. New/revised plan acres (log transformed, normalized).



We examined the relationships between the three types of FSP approaches derived from the cluster analysis and three measures of forest conservation at the state level with box plots and ANOVA. We relied on three variables to reflect forest conservation:

- Acreage changes of private forested land between 1997 and 2007 (Smith, Miles et al. 2009);
- Size changes of private forested land holdings between 1993 and 2006 (Birch 1996; Butler 2008); and
- Percentages of family forest acres owned by people having written forest management plans in 2006 (Butler 2008).
- Differences among clusters were not significant for any of the three forest conservation measures at the 10% significance level (see Figure 8-13, Figure 8-14, and Figure 8-15).

Figure 8-13. Change in private state-level forest land area between 1997 and 2007 (Smith, Miles et al. 2009) by FSP approach cluster.

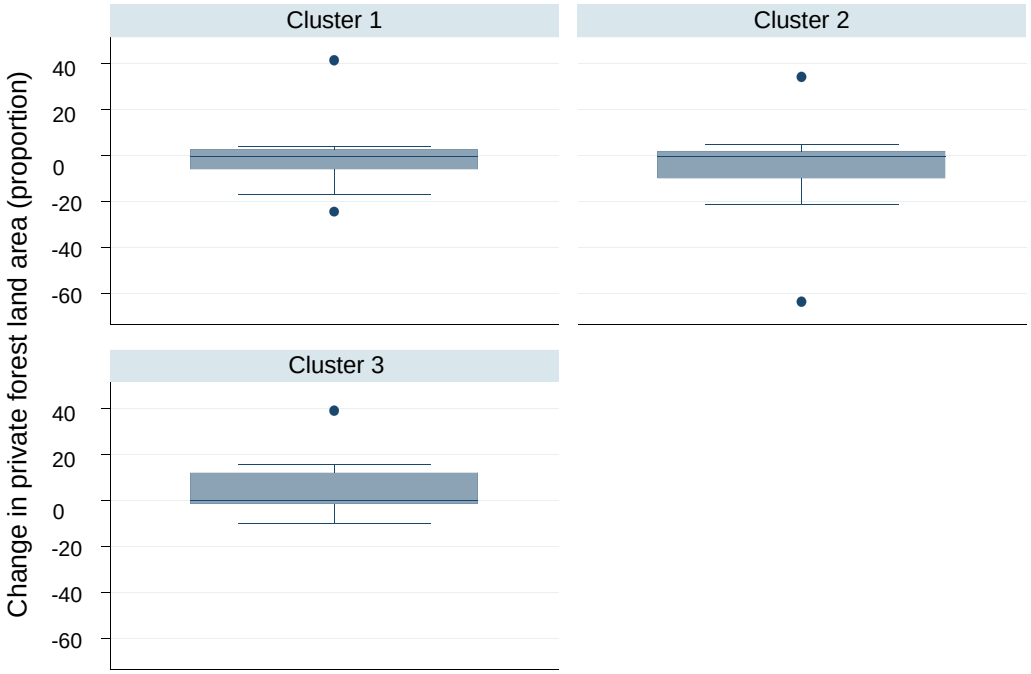


Figure 8-14. Change in mean, state-level size of private forest holdings between 1993 and 2006 (Birch 1996; Butler 2008) by FSP approach cluster.

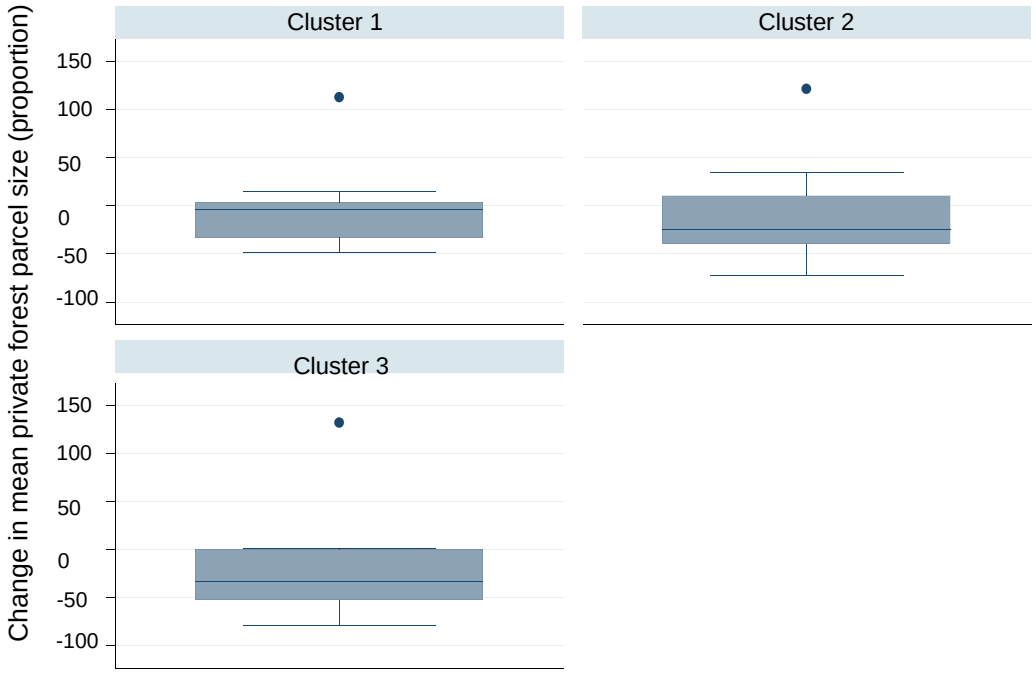
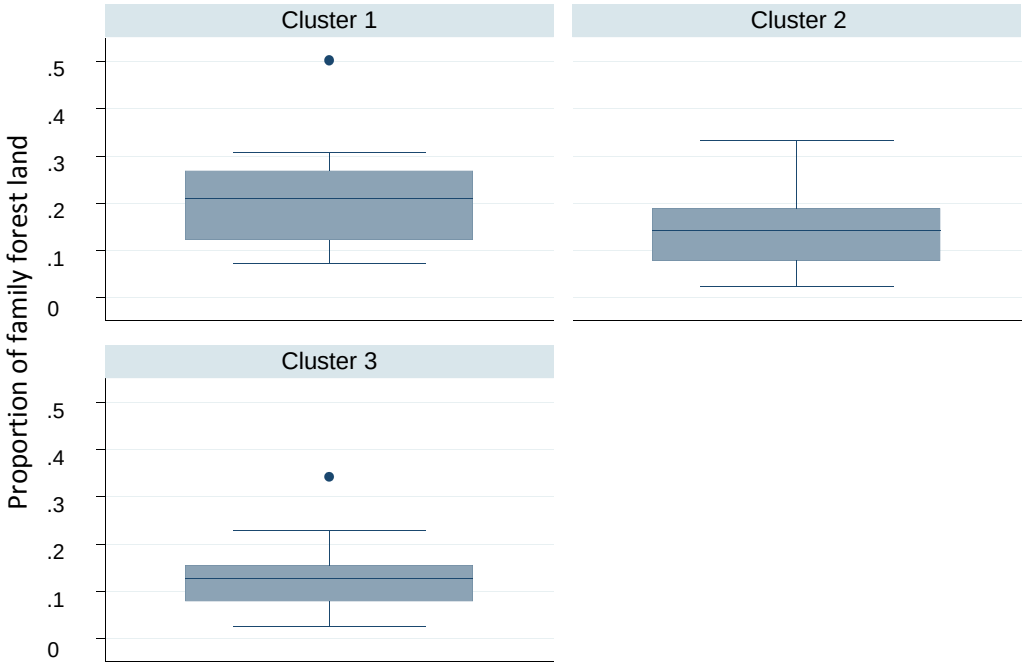


Figure 8-15. Difference in state-level percentage of family forest acres owned by people having a written forest management plans in 2006 (Butler 2008) by FSP approach cluster.



8.3.3 State analysis conclusions

This analysis is based on the underlying assumption that FSP activity could vary in some methodical way with respect to owner, market, and landscape characteristics. States are given the ability to administer the FSP program as they see fit to further their conservation goals in light of the forestry-based markets that exist in their region. Different states receive different funding amounts from FSP and from alternative federal agencies. Each state may tailor their FSP program administration to address differing private landowner preferences in their region. Butler (2008) discusses how forest management activities vary across the country, some focused on harvesting and others on amenity based benefits (e.g., aesthetics, recreation, nature, and privacy). However, we know that the state FSP administrator survey and PMAS survey data are incomplete means to measure such groupings, as seen by this analysis. While we believe these groupings are likely to exist, the data we have available to us do not allow us to define those groupings with statistical significance.

8.4 Recommendations

Answering the question of how FSP activity is linked to forest trends is complex and requires consistently collected information about regional characteristics, landowner preferences, forestry markets, and FSP implementation factors for the majority of (if not all) states. We see positive landscape trends for private forestry in the time period we analyze, although we call in to question the accuracy of using these data at the county level. For the most part, we see positive, but insignificant relationships between these private forestry landscape trends and our current, limited measures of FSP activity; however, these results describe a minority of states.

While obtaining new data to describe all aspects of the FSP program would be ideal for conducting a better trend analysis, we understand the limitations of such an effort (see Chapters 3 and 5). This ideal measure of FSP activity would be weighed against regional socioeconomic factors (e.g., income, education, age) and development trends; regional forestry markets (e.g., common harvesting practices); private forest owner preferences (e.g., for harvesting, aesthetics, recreation, privacy). Of all the requirements for such an analysis, admittedly the FSP activity measures are the most difficult to obtain. Disentangling FSP activity from other programs (i.e., tax exemption programs) would also need to be carefully considered.

Despite these data limitations, we believe that an improved trend analysis is possible by gathering more and better quality data. This is the focus of our recommendations for the trend analysis.

While the FSP plan acreage data by state that we used was useful for the analysis, the number of states providing relevant, consistent information was very limited. There were a number of issues rendering some of the state data not useful. In particular, some states

- provided only new or revised FSP plan acreage during the requested time period;
- did not provide enough date information to determine whether or how they fit into the analysis time period;
- recorded plan dates that had either typographical errors or inconsistencies among various date fields (e.g., plan begin and plan end were the same);
- reported FSP plan acreages not reflecting the entire analysis time period; and
- provided data in a format inconsistent with other states and that hid necessary detail.

Focusing on the 48 contiguous U.S. states, 18 provided any data at all.[12] Of these, eight states provided new/revised useable data fitting the time period of this analysis and only two provided data describing all active FSP plans for the time period of the analysis. This data collection effort shows the difficulty in obtaining high quality, consistent data when provided by disparate entities in a self-defined format.

[12] This analysis focuses on the 48 contiguous U.S. states for purposes of analytical consistency. Spatial data allowing the analysis to focus only on private lands (i.e., PAD data) are not available for all U.S. protectorates (i.e., it is only available for the U.S. Virgin Islands—a protectorate for which spatial data was unavailable). In addition, it was important to be able to compare these results with a similar analysis using the NLCD data; NLCD spatial data is only available for the 48 contiguous U.S. states.

Certainly, with a revised effort, these data could be improved. We recommend conducting this revised effort, especially in light of being able to cross check results with those soon-to-be-available data from the SMART (Stewardship Mapping and Reporting Tool), discussed below.

As described in Chapter 3, collection of FSP plan information under the SMART data system has begun, and this tool could aid in conducting trend analysis in the future. This spatial database system will transcend the problem of having states self-define the format that they provide FSP plan information in that it provides a nationally consistent way to report active plan data. Each state enters information individually for active FSP, landscape, and non-stewardship forestry projects, including plan type (new or revised), plan start date, plan period, funding source, percent in priority lands, forested acres, tax abatement program status, and conservation easement restriction status, among others. Although the data collected are the same as with PMAS, the nature of the database format may allow users to gather management plan data in a way different from the current PMAS system. Searches can be conducted by plans using a variety of parameters, including priority areas, active/inactive, date, or funding source, to name a few. While a complete inventory of active plans is not currently available, all active plans must be in SMART by September 30, 2013. We recommend gathering data from this tool once available and expand the analysis to include IFRA lands.

The limitations of the land coverage data have been described in detail previously, and we understand that absent state efforts to digitize their land cover at a resolution allowing county-level analysis, we must rely on the existing consistent nationwide data sources: MLCT or NLCD. Specifically, we recommend re-visiting the NLCD land cover data that are scheduled to be released in December of 2013. These data would enable analysis of land cover changes in the 2007–2011 time period at 30m resolution.

8.5 Appendix A

The U.S. Department of the Interior, U.S. Geological Survey's National Land Cover Database (NLCD) (Homer, Dewitz et al. 2007; Fry, Xian et al. 2011) provides data on land cover change from 2001–2006 on a county-wide basis at a 30m resolution. While there is a temporal difference between the NLCD data and the FSP management plan acreage data, we explore the relationship between forest trends during this time period (2001 to 2006) and the FSP management plan acreage data between 2007 and 2011. We utilize the same methodology on the NLCD data as that used to estimate forest change percentages with the MLCT data. We also apply the exact same FSP management plan acreage data to consider the relationship between NLCD forest trends (2001–2006) and FSP management plan acreage. In particular, for purposes of this appendix, we only consider the relationship between NLCD forest trends and "all active FSP management plan acres"; that is, we focus on New York and Michigan.

8.5.1 NLCD areas of forest change

The NLCD data differ from the MLCT data in that they provide data on acreages that have changed from or to a multitude of land coverages over the six-year time period. We define forest gains and losses using NLCD data that estimate forest change in the following ways:

Gains:

- Developed, open space to deciduous forest, evergreen forest, mixed forest, shrub/scrub, or woody wetlands
- Developed, low intensity to deciduous forest, evergreen forest, mixed forest, shrub/scrub, or woody wetlands
- Developed, medium intensity to deciduous forest, evergreen forest, mixed forest, shrub/scrub, or woody wetlands
- Developed, high intensity to deciduous forest, evergreen forest, mixed forest, shrub/scrub, or woody wetlands
- Pasture/hay to deciduous forest, evergreen forest, mixed forest, shrub/scrub, or woody wetlands
- Cultivated crops to deciduous forest, evergreen forest, mixed forest, shrub/scrub, or woody wetlands

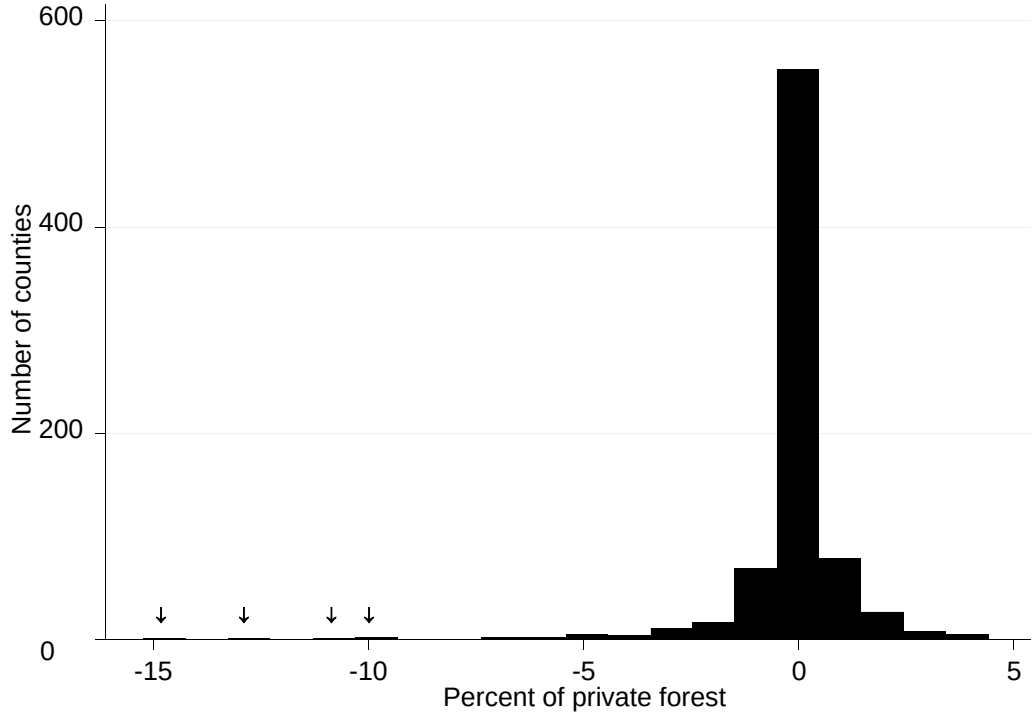
Losses:

- Deciduous forest to developed, open space; developed, low intensity; developed, medium intensity; developed, high intensity; pasture/hay; or cultivated crops
- Evergreen forest to developed, open space; developed, low intensity; developed, medium intensity; developed, high intensity; pasture/hay; or cultivated crops
- Mixed forest to developed, open space; developed, low intensity; developed, medium intensity; developed, high intensity; pasture/hay; or cultivated crops
- Shrub/scrub to developed, open space; developed, low intensity; developed, medium intensity; developed, high intensity; pasture/hay; or cultivated crops
- Woody wetlands to developed, open space; developed, low intensity; developed, medium intensity; developed, high intensity; pasture/hay; or cultivated crops

To define the rest of the sample, we employ the same methodology as that applied to the MLCT forest change data (see Section 8.2.2). The PAD data provide boundaries of federal and state lands in a GIS format. We use these data to remove federal and state lands from the NLCD data. We exclude counties with small forest acreages; in particular, we exclude counties having less than 10% of total county acreage in forest. The result is privately owned forest acreage changes by county for 2001 to 2006.

We normalize these acres by the amount of total forested land in 2001 in the county (also NLCD data), essentially estimating the percent of total forested land in the county that has been lost, gained, or remained stable. The average percent forest change was –0.12% (standard deviation 1.41), with a maximum loss of 15.2% and a maximum gain of 4.4%. The NLCD data show a relatively normal frequency distribution of these percentages by county, but one not without outliers (see Figure 8-16).

Figure 8-16. Percent of private forest change by county for U.S. using NLCD data (2001–2006); counties with at least 10% of county acreage in forest (n = 787[a])



[a]Arrows identify observations having a small number of counties.

As described in Section 8.2.2.2, we establish five categories of forest change: stable, low forest loss, low forest gain, high forest loss, and high forest gain. In this case, the measurement error driving the creation of these categories is similar to that of the MLCT data: the NLCD 2001 data has an Anderson Level I class accuracy of 85.3% (Wickham, Stehman et al. 2010). We find that 82.7% of the counties fall into the stable category, 8.3% of the counties fall into the low forest loss category, 8.5% into the low forest gain category, 0.4% into the high forest loss category, and 0% into the high forest gain category. Counties categorized as *stable* averaged a 0.01% loss, *low forest loss* counties averaged a 2.7% loss, *low*

forest gain counties average a 1.9% gain, and *high forest loss* counties averaged a 12.9% loss (see Table 8-10). The fact that the majority of the counties were categorized as *stable* is consistent with the overall NLCD 2001–2006 land cover change results: only approximately 1.68% of the total land area in the U.S. changed land cover (Fry, Xian et al. 2011).

Table 8-10. Forest change categories based on percent forest change using NLCD data (2001–2006).

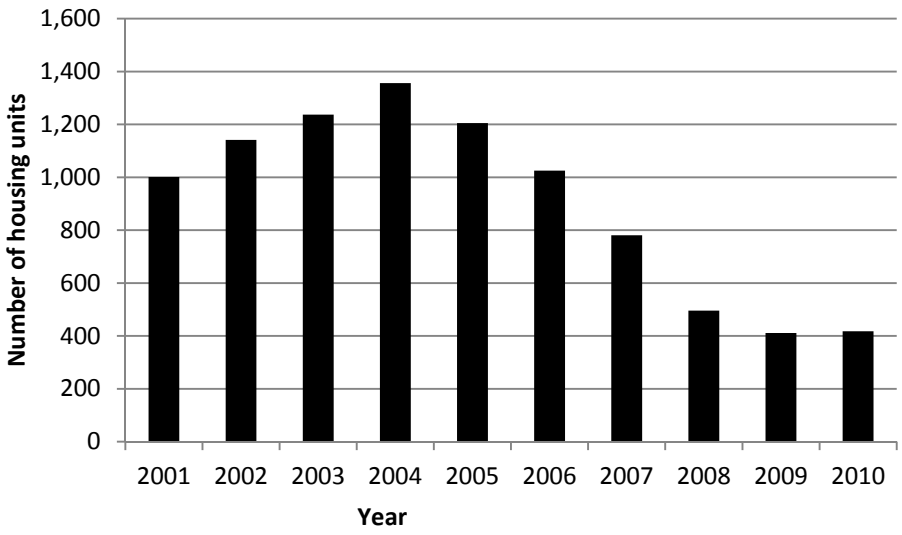
Forest change category	Number of counties	Mean percent change	Standard deviation	Minimum change	Maximum change
Stable (–1% to 1%)	651	–0.01	0.3	–1.0	1.0
Low Forest Loss (–1% to –10%)	66	–2.7	1.9	–1.0	–9.7
Low Forest Gain (1% to 10%)	67	1.9	0.8	1.0	4.1
High Forest Loss (>–10%)	3	–12.9	2.2	–10.9	–15.2
High Forest Gain (>10%)	0	--	--	--	--

8.5.2 NLCD forest change compared with all active FSP-managed land

We compare these NLCD forest change percentages with the percent of private forest land having an active FSP management plan described in Section 8.2.3.1. Specifically, New York and Michigan FSP plan percentages and activity categories discussed here are identical to those described in Section 8.2.3.1.1 and Section 8.2.3.1.3.

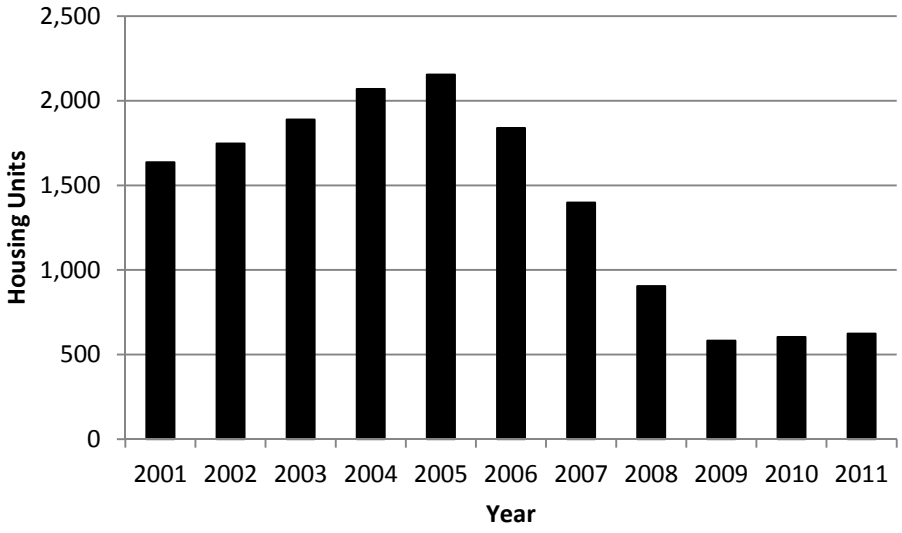
We acknowledge the inconsistency in the timing of the data collection and the strict definition of FSP lands. We do not expect forest change percentages to remain the same in the 2007–2011 time period as the 2001–2006 time period. U.S. Census Bureau statistics on new privately owned housing units under construction and units authorized by building permits show sharp decreases from the 2001–2006 to 2007–2011 time periods (see Figure 8-17 and Figure 8-18). This downturn was felt in each region of the U.S., showing a 50 to 60% decrease in new privately owned housing units authorized by building permits for the Northeast, Midwest, South, and West (see Table 8-11). Despite likely differences in the absolute levels of forest change associated with the economic downturn, we may expect, however, that the relative level of activity among counties and regions of the country to remain stable. That is, it is possible that the relative forest change categories (stable, low forest loss/gain, and high forest loss/gain) could be consistent from 2001–2006 to 2007–2011. Given the limitations of these data, we consider the relation between total active FSP acreages (2007–2011) and forest change for 2001–2006. These data also enable us to explore total FSP acreages in the years following high development.

Figure 8-17. New privately owned housing units under construction[a.]



[a]Source: U.S. Department of Commerce, United States Census Bureau, http://www.census.gov/construction/nrc/historical_data/

Figure 8-18. New privately owned housing units authorized by building permits[b].



[b]Source: U.S. Department of Commerce, United States Census Bureau, http://www.census.gov/construction/nrc/historical_data/

Table 8-11. Change in average annual privately owned housing units authorized by building permits between 2001–2006 and 2007–2011[c].

	Northeast	Midwest	South	West
2001–2006	181.9	343.5	883.3	481.0
2007–2011	96.1	131.2	412.2	183.5
Percent decline	–47%	–62%	–53%	–62%

[c]These data reflect 1-unit structures. Source: U.S. Department of Commerce, United States Census Bureau, http://www.census.gov/construction/nrc/historical_data/

8.5.2.1 FSP/forest change correlation

The results of the correlation between the percent of private forest having an active FSP plan and the percent forest change, by state, do not show significant correlations for either state (Table 8-12).

Table 8-12. Change in average annual privately owned housing units authorized by building permits between 2001–2006 and 2007–2011[c].

State	Correlation	Significance (p-value)
Michigan	0.0287	0.8448
New York	0.0378	0.8007

8.5.2.2 FSP activity categories vs. forest change categories

In this section, we compare FSP activity categories (viewed in Figure 8-4 and Figure 8-5 of Section 8.2) and NLCD forest change categories. All of the forest change categories for these two states are stable counties. The results of the comparison between FSP activity categories and forest change categories show that forest gains (low or high) occur at each FSP activity category for similar number of counties; that is, 32 counties show a gain in the low FSP activity category, 33 counties show a gain in the medium FSP activity category, and 31 counties show a gain in the high FSP activity category (see Table 8-13).

Table 8-13. FSP activity (2007–2011) versus NLCD forest change categories for counties with active FSP plans and at least 10% forest (2001–2006).

	Low FSP activity (FSP percent <=2.03)	Medium FSP activity (2.03< FSP percent <=4.60)	High FSP activity (FSP percent >4.60)	Total
High Forest Loss (>–10%)	0 counties	0 counties	0 counties	0 counties
Low Forest Loss (–1% to –10%)	0 counties	0 counties	0 counties	0 counties
Stable (–1% to 1%)	32 counties	33 counties	31 counties	96 counties
Low Forest Gain (1% to 10%)	0 counties	0 counties	0 counties	0 counties
High Forest Gain (>10%)	0 counties	0 counties	0 counties	0 counties
Total	32 counties	33 counties	31 counties	96 counties

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The included CD contains the following materials:

- Detailed summaries of the Performance Measurements Accountability System (PMAS) database metrics (Tables 4-1 through 4-10)
- Cataloguing survey
- Detailed results from the cataloguing survey
- Focus group screener—the questionnaire used for recruiting participants
- Focus group topic guide