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ECONOMIC CONTRIBUTIONS OF CONSERVED FORESTLANDS: THE ROLE OF THE USDA FOREST SERVICE'S FOREST LEGACY AND FOREST STEWARDSHIP PROGRAMS

Jacqueline Dias
Brett J. Butler*
Henry Eichman

Family Forest Research Center
University of Massachusetts Amherst

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Cover photo: The Paul C. Jones Working Forest located in Leverett and Shutesbury, MA permanently protected via funds from Forest Legacy Program. The land serves as a source of sustainable forestry, wildlife habitat, and recreation for the public. Photo credit: Jacqueline Dias

*Corresponding author
Brett J. Butler brett.butler2@usda.gov

Family Forest Research Center
https://www.familyforestresearchcenter.org/

EXECUTIVE SUMMARY:

- This project sought to quantify the economic contributions coming from forests participating in the USDA Forest Service's Forest Legacy Program (FLP) and Forest Stewardship Program (FSP) across the conterminous United States.
    - FLP permanently protects working forestland from conversion to non-forest uses through conservation easements or fee-simple land purchases. There are 2.7 million acres across the conterminous US that have been conserved by FLP as of 2020.
    - FSP provides funding to State forestry agencies and other organizations to increase the long-term stewardship of nonindustrial private forestland through active management. The focus of this assessment is on Forest Stewardship Plans associated with FSP funding. Across the conterminous US, there are 16.6 million acres with FSP Forest Stewardship Plans as of 2020.
- The forest-related activities included in this analysis are timber harvesting and recreation expenditures associated with FLP and FSP lands.
- IMPLAN, an input-output economic modeling system, was used to estimate how economic activities contributed to local and State economies.
- FLP lands across the conterminous US contribute an estimated 4,560 jobs and $306.8 million per year in value-added from timber harvesting and recreation, or about $112/acre.
- FSP lands contribute an estimated 27,600 jobs and $1.9 billion in value-added from timber harvesting and recreation activities across the conterminous US, or $113/acre.
- The results of this study reinforce that forests participating in FLP and FSP positively contribute to the community where they're located, in terms of economic and ecosystem services – the full effects, of which, were not measured in this assessment.
- Additional research is needed to fully understand the complete benefits associated with the lands participating in FLP and FSP. This could include more detailed, parcel-level information, counterfactual analyses that assess the additive benefits the programs have beyond the status quo, or estimate the total economic value of the participating forests.
- As an example of a complementary analysis, a pilot study was conducted to estimate the value of carbon sequestration on FLP and FSP lands in New England. The 1.14 million acres of FLP lands in New England sequester an average of 147,000 metric tons of CO_2 per year which has a monetary value of $7.5 million or $6.82/acre. The 1.02 million acres of FSP lands in New England sequester an average of 82,000 metric tons of CO_2 per year which as a monetary value of $4.1 million in CO_2 or $4.01/acre.

INTRODUCTION

The majority of America's forests are privately owned (Butler et al. 2021). Specifically, 420 million acres throughout the United States are privately owned, or 60% of US forests excluding interior Alaska (Butler et al. 2021). Forested lands provide many benefits, including timber harvesting and recreation, as well as non-use or non-extractive benefits like carbon sequestration, air purification, habitat, water filtration, and mental health improvement (MEA 2005). Forests are particularly beneficial for rural communities whose economy often relies on forest-related activities like timber and recreation. However, some private forest owners describe facing pressures related to owning parcels of forestland including financial restrictions (e.g., high taxes), fragmentation, development pressures, and legacy planning (Sanborn-Stone and Tyrrell 2012; Butler et al. 2016; Markowski-Lindsay et al. 2017a; Markowski-Lindsay et al. 2017b). Often times, it may be easier to sell land, or subdivide it, when faced with development pressures or other impacts like invasive insects or wildfire. These deleterious impacts can reduce the contributions forests make to rural communities and the landowner. The United States Department of Agriculture (USDA) Forest Service, State and Private Forest Deputy Area administers a variety of landowner assistance programs for landowners who wish to keep their forests intact and improve the stewardship of their land (USDA Forest Service, 2011). The two landowner assistance programs assessed in this study are the Forest Legacy Program (FLP) and the Forest Stewardship Program (FSP) (Table 1).

Table 1. Descriptions of the USDA Forest Service, Forest Legacy Program (FLP) and Forest Stewardship Program (FSP), by purposes and attributes (USDA Forest Service 2011; A. Bhuta, personal communication, October 2021).

Program	Purpose	Attributes
FLP	The purpose of FLP is to protect "environmentally important forest areas that are threatened by conversion to nonforest uses and, through the use of conservation easements and other mechanisms, for promoting forest land protection and other conservation opportunities" (USDA Forest Service 2011)	• FLP was established in 1990 through an amendment to the Cooperative Forestry Assistance Act • FLP funds up to 75% of the cost of projects, and the remainder must come from non-federal sources. • As of 2021, FLP provided $895 million to conserve 991 tracts across the US and islands total 2.8 million acres.
FSP	The purpose of FSP is "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	• The total number of accomplishments for all aspects of FSP (i.e., stewardship plans, other plans, projects, and landscape plans) is 147,288 accomplishments as of 2021.

	existing State, Federal, and private sector resource management expertise and assistance programs" (USDA Forest Service 2011)	• FSP has 16.6 million acres participating in the forest stewardship plan aspect of the program, as of 2021. • There are 425 million acres considered priority lands through FSP, 4.5% of which, have been impacted by the program.

Input-output models are commonly used to evaluate economic contributions in the natural resources field and analyze interindustry dependencies within an economy (Miller and Blair 2009). This study uses the definition of economic contribution as defined by Watson et al. (2007): "the gross change in economic activity associated with an industry, event, or policy in an existing regional economy." This is not to be confused with an economic impact analysis which estimates the net change in economic activity when introducing a new industry or activity (Watson et al. 2007). The economic activities assessed in this study are not newly introduced, therefore "contribution" is most appropriate. Input-output economic models use economic activities (e.g., timber harvesting, recreation, new businesses or industries, etc.) to estimate how effects resonate in other parts of the economy (e.g., housing, job creation, wages, gross regional product) (Hughes 2003). IMPLAN (Impact analysis for PLANning; IMPLAN Group, LLC 2021) is an input-output economic modeling system that uses multipliers to estimate how money flows through the economy in a region (Figure 1). Multipliers account for the total effect of economic activity within a given geographic area (van Leeuwen et al. 2005; Hughes 2003). IMPLAN was created by the USDA Forest Service in the 1970s to estimate how the timber harvest and other resource outputs on Forest Service lands contributed to local economies. Today, IMPLAN is used to estimate jobs supported by the recreation industry (e.g., Hjerpe, 2018; Kebede et al. 2008; Poudel et al. 2017; Guo et al, 2017), economic contributions of the timber industry (e.g., Jolley et al. 2020; Henderson et al. 2017; Brandeis and Hodges 2015), and return on investment for Federal programs (e.g., the US Fish and Wildlife Services' Partners for Fish and Wildlife Program and Coastal Program; Laughland et al. 2013), among other uses.

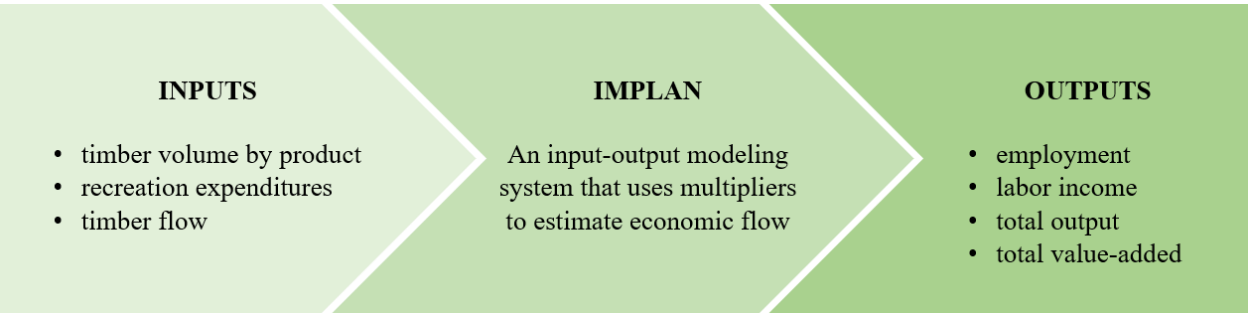

Figure 1. IMPLAN (IMpact analysis for PLANning; IMPLAN Group, LLC 2021) flow of inputs to outputs used to measure economic contributions in a given area. Definitions are available in Table 3.

To the authors' knowledge, IMPLAN has only been used once in relation to USDA Forest Service, State and Private Forestry landowner assistance programs. In four case study areas (Northern Forest region of New York, Vermont, New Hampshire, Maine; Northern Wisconsin and Michigan Upper Peninsula; Georgia and South Carolina; Northern Idaho and Western Montana), lands conserved through FLP produced an estimated $140 per acre from timber harvesting, tree planting, maple syrup, and recreation activities (Murray et al. 2018). Across the study areas, just over 2 million acres produced a combined total of 4,000 jobs and over $279 million in annual value-added to the regional economies (Murray et al. 2018). The impact of FLP beyond these case study areas has not been calculated.

METHODS

Study Area

This analysis focused on all FLP and FSP lands in the conterminous US as of 2021. Due to input data limitations, Alaska and Hawaii were excluded (e.g., Sass et al. 2020; Pickard et al. 2015). As shown in Table 2, FLP has 2.7 million acres of forestland in the conterminous US across 1,480 projects, and FSP has 16.6 million acres across 136,473 stewardship plans (USDA Forest Service, 2020a; USDA Forest Service, 2020b). Results below are presented per state, as well as for the conterminous US.

Table 2. Total acres in Forest Legacy Program (FLP) and Forest Stewardship Program (FSP) as of 2019 (USDA Forest Service, 2020a; USDA Forest Service, 2020b).

Program	Acres	Number of Projects
FLP	2,746,980	1,480
FSP	16,619,869	136,473

IMPLAN

Input-output models, like IMPLAN, use multipliers that are estimated from economic output. For example, employment, in actual jobs, is estimated per $1 million of production (IMPLAN Group LLC 2021). Given the inputs (i.e., timber volume by product, timber utilization, and recreation expenditures; Figure 1), IMPLAN uses multipliers to estimate the total economic effects in an area, or the direct, indirect, and induced effects (for definitions see Table 3). The timber harvesting and processing multipliers are a combination of volume-based direct response coefficients from the timber industry (Sorenson et al. 2016). They are used to estimate employment and labor income associated with timber harvesting and processing, and are calculated by the Bureau of Business and Economic Research at the University of Montana based on timber product output and federal employment data (Sorenson et al. 2016;). To estimate the indirect and induced effects, the IMPLAN model uses the direct effect from the volume-based response coefficient, as suggested by Sorenson et al. (2016).

Table 3. Definitions and examples of frequently used terms in input-output model economic contribution analyses (IMPLAN Group LLC 2021; Clouse 2020; adapted from Murray et al. 2018 and Jolley et al. 2020).

Term	Definition	Example
Direct effects	The impacts the inputs, or changes in spending or production, have on sectors	A contractor buys lumber from a home improvement store and an employee gets paid
Indirect effects	Contributions from inter-industry (or business to business) purchases	The home improvement store buys more lumber from a supplier
Induced effects	Changes in spending from individuals resulting from income variability	The home improvement store employee uses their paycheck to buy groceries
Employment	Average number of full-time equivalent jobs in an industry	Number of loggers hired to harvest timber
Labor income	Total monetary value of all forms of employment income, including wages and salaries, benefits, payroll taxes, and capital consumption allowance	Money made by the loggers' wages and benefits plus any self-employed income
Value-added	A measure of contribution to GDP made by individual producers, industries, or sectors. Equal to gross output minus intermediate inputs (consumption of goods and services purchased from other industries or imported).	Aggregated labor income plus taxes paid on products, plus profits
Output	The value of production by an industry in a calendar year (Output = Employee Compensation + Proprietor Income + Intermediate Inputs + Tax on Production and Imports + Other Property Income)	Total value of all lumber sales from sawmill processing above

Using the direct, indirect, and induced effects, IMPLAN provides estimates of employment, labor income, value-added, and output, for a given region (Brandeis and Guo 2016). Using the timber products industry as an example, an increase in production of wood products leads to an increase in wages or hiring more labor (direct effect). In order to meet the demand, some industries might purchase production materials from other industries (indirect effect). By hiring more labor, this may lead to increased area population, higher employment rates and increased income to spend in the area (induced effect) (USDA Forest Service 2018).

Data Synthesis

To capture the estimated economic contributions, two separate sets of models were created: timber harvesting and recreation. To model the economic contributions resulting from timber harvesting on FLP and FSP lands, the inputs were timber harvest volume by product (Table 4), percent harvested by loggers, and timber utilization rates in the region. For the recreation model, the inputs are expenditures per activity in US Dollars (USD) for each applicable economic sector (i.e., food, public and private transportation, lodging, guide fees, public and private land use, equipment fees, bait, ice, and heating and cooking fuel) in each region (Table 5).

Timber harvesting

State-level annual timber harvest volumes for FLP and FSP lands were estimated using data from the USDA Forest Service Forest Inventory and Analysis (FIA) (Evalidator; annual harvest removals volume of timberland in cubic feet; area change of timberland; USDA Forest Service, FIA Program 2020) and USFS Timber Product Output Survey data for each state (J. Bentley, personal communication, June 2020; R. Piva, personal communication, June 2020; USDA Forest Service, 2020c; see Table 11 for a list of citations of Northern Research Station TPO Reports). We assumed harvests on FLP and FSP lands were the same as harvests on similarly owned land (i.e., public versus private ownership) within the same state. Using this assumption, we multiplied the percent of timber product volume (i.e., softwood sawtimber; hardwood sawtimber; softwood pulp; hardwood pulp; posts, poles, pilings; fuelwood; and other products) by the estimated volume of annual removals per acre in a state by the acres in public (FLP- fee simple) or private (FSP, FLP – conservation easement). Timber flow and utilization rates in each state were taken from the USDA Forest Service National Forest System Timber Flow database (H. Eichman, personal communication, February 2021) established for use with the IMPLAN model. Using consistent data across all states allows for comparative estimates. Lastly, we assumed a 100% removal of timber in each state was removed by local loggers, not household removals, due to local household removals being assumed to be negligible.

Recreation

In order to estimate the expenditures from recreation on FLP and FSP lands, we used data from the EPA's EnviroAtlas Database (Pickard et al. 2015), US Department of the Interior Fish and Wildlife Service National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

(FHWAR; US Department of the Interior 2016), forest ownership distribution of the conterminous US (Sass et al. 2020), and US Geological Survey's Watershed Boundary Dataset (USDA Natural Resources Conservation Service 2020). The EPA's EnviroAtlas Database provides estimated annual days of recreation by HUC12 watershed (Pickard et al. 2015). We created a proportion to estimate annual days of recreation using a percent of forest under private, public, and family forest ownership in a HUC8 (extrapolated from HUC12 level data) watershed and recreation visitor data from EnviroAtlas. This estimate was then multiplied by a proportion of acres in the program by forestland acres in a respective ownership (i.e., FLP private by private acres; FLP public by public acres; and FSP acres by family forest owner acres). Lastly, we multiplied visitor spending data available in the FHWAR by the estimated annual days of recreation on FLP and FSP lands for each recreation activity and each recreation sector (food, fees, travel, etc.).

Project-specific information is not gathered regarding access to FSP and FLP, therefore all acres participating in the programs are assumed to be open for recreation. Of course, not all lands or landowners are the same in regards to land access, but without detailed parcel-specific information, assuming all are open to recreation is the most inclusive assessment available. We estimated visitor expenditures related to FLP and FSP on a subset of activities (i.e., big game hunting, migratory bird hunting, freshwater fishing, and wildlife watching) based on the data available at the time of the assessment (Pickard et al. 2015; US Department of the Interior 2016). These do not include other recreation activities, such as hiking, biking, boating, backpacking, snowmobiling, or camping. Therefore, our analysis underestimates total recreation expenditures.

Analysis

Using IMPLAN data from 2018 with the inputs summarized above, the economic contributions were estimated for timber harvesting and recreation. The IMPLAN analysis was run at the state-level for each program, for a total of 96 models. The state level results were then adjusted to 2021 dollars and also aggregated across states to calculate total economic contributions for the conterminous US[1]. All results represent estimated total effects, which include both direct and secondary estimates (indirect and induced).

RESULTS

Summary of Inputs

The following are aggregated estimates of timber harvesting volume (Table 4) and recreation expenditures (Table 5) for FLP and FSP lands in the conterminous US. The models were run at the state-level and are presented here as aggregates. State-level values can be found in the Supplemental Materials (Table 7 and Table 8).

[1] Adding effects across states ignores interstate trade and thus does not comprise an analysis of national effects, however provides an approximation useful for discussion.

Table 4. Summary of timber harvesting volume by product for Forest Legacy Program (FLP) and Forest Stewardship Program (FSP) forestland for the conterminous US, 2021.

Program	Softwood Sawtimber	Hardwood Sawtimber	Softwood Pulp	Hardwood Pulp	Posts, Poles, Pilings	Fuelwood	Other Products
	Thousand Cubic Feet						
FLP	21,966	7,979	9,718	16,544	376	9,672	2,174
FSP	109,115	104,143	86,621	85,120	4,540	30,473	29,103

Table 5. Aggregated recreational expenditures for Forest Legacy Program (FLP) and Forest Stewardship Program (FSP) per expenditure sector, in 2016 USD, for the conterminous US (FHWAR; US Department of the Interior, 2016).

Expenditure Sector	FLP	FSP
Food	$18,424,000	$127,969,000
Public Transportation	$1,722,000	$11,505,000
Private Transportation	$21,513,000	$149,144,000
Lodging	$6,899,000	$49,695,000
Guide Fees	$3,779,000	$25,737,000
Public Land Use Fees	$687,000	-
Private Land Use Fees	$7,945,000	$53,197,000
Equipment Fees	$1,711,000	$11,660,000
Bait	$2,666,000	$20,250,000
Ice	$975,000	$7,409,000
Heating and Cooking Fuel	$998,000	$6,784,000

Economic Contributions

The aggregated national results from the IMPLAN models are shown in Table 6. The following maps (Figure 2A, 2B, 3A, and 3B) show the results of estimated economic contribution activities on FLP and FSP lands in the conterminous US from both timber harvesting and recreation as activities. All results are the total effects estimated via IMPLAN (i.e., the aggregated direct and secondary estimates). State-level results of the total economic contributions (i.e., employment, labor income, total output, and value-added) for recreation, timber harvesting, and the sum of both activities, can be found in the Supplemental Materials (Table 9 and Table 10).

Table 6. The aggregated results of economic contributions resulting from timber harvesting and recreation on Forest Legacy Program (FLP) and Forest Stewardship Program (FSP) lands in terms of employment, labor income, total output and value-added for the conterminous US, 2021.

Program	Employment	Labor Income	Total Output	Value-added
FLP	4,560	$216,401,200 ($79/acre)	$2,255,734,500 ($821/acre)	$306,883,600 ($112/acre)
FSP	27,600	$1,255,026,000 ($76/acre)	$9,349,315,000 ($563/acre)	$1,882,793,000 ($113/acre)

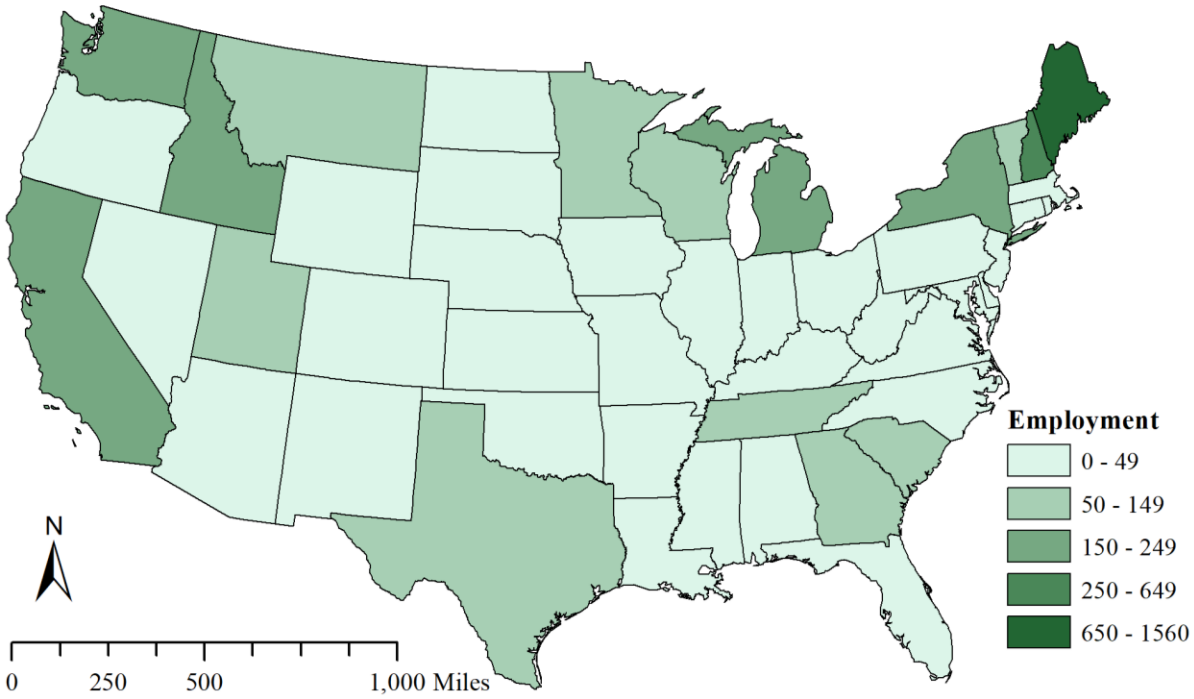

Figure 2A. Timber and recreation employment from Forest Legacy Program (FLP) lands by state for the conterminous US, 2021.

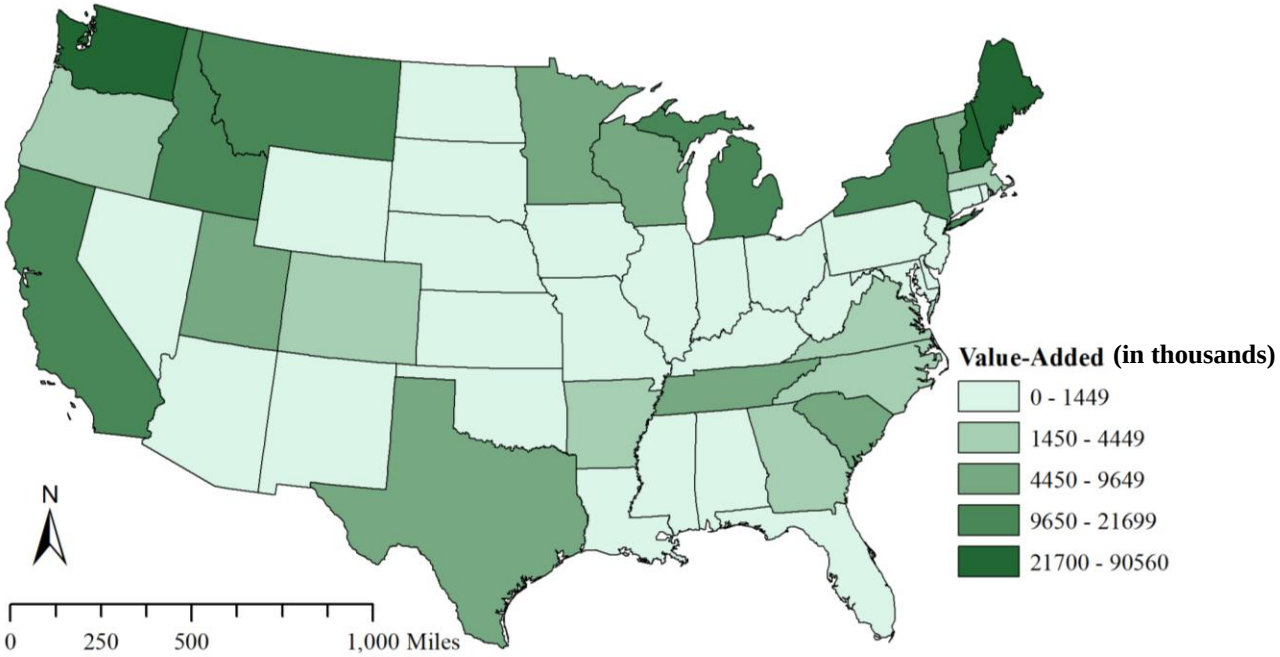

Figure 2B. Timber and recreation value-added from Forest Legacy Program (FLP) lands by state for the conterminous US, in 2021 USD. Values in legend are presented in thousands.

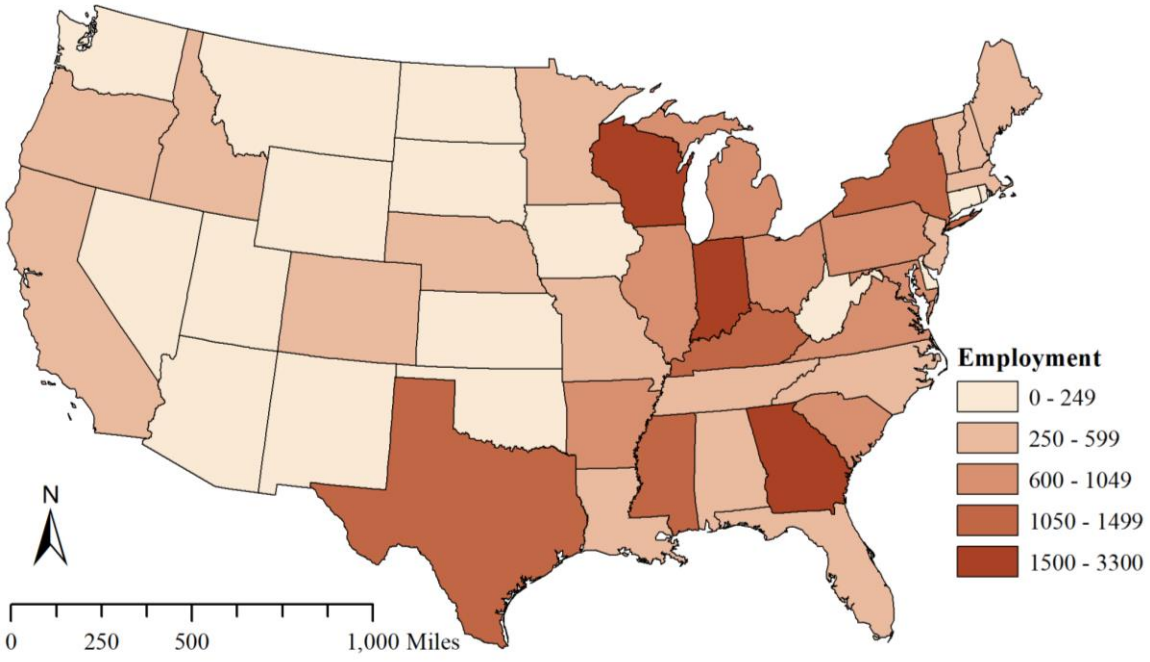

Figure 3A. Timber and recreation employment from Forest Stewardship Program (FSP) lands by state for the conterminous US, 2021.

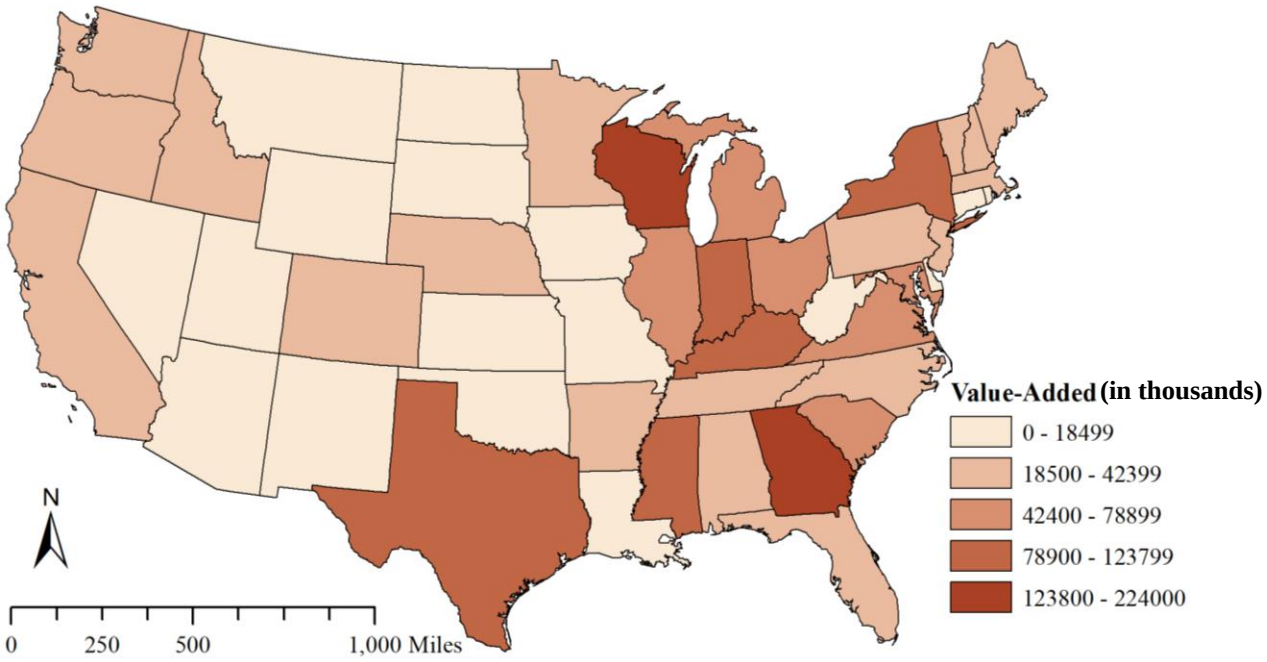

Figure 3B. Timber and recreation value-added from Forest Stewardship Program (FSP) lands by state for the conterminous US, in 2021 USD. Values in legend are presented in thousands.

DISCUSSION

The results show that working forests are economically important to the rural communities where they are located. The information presented can be used to inform policy regarding working forests and wildlife-associated recreation. It is unknown, however, the extent to which FLP and FSP are mutually exclusive or overlap in some capacity (i.e., a landowner participates in both programs). Overall, FSP has greater contributions than FLP partially due to the number of acres, 16.6 million, associated with the program. FLP, however, protects forests in perpetuity, therefore the long-term effects associated with the program are greater than those temporarily managed via FSP. Future research may further explore these differences.

In a similar study, Jolley et al. (2020) found that Maine and Wisconsin's forest products industries had the largest share of state value-added for commercial logging and pulp & paper mills, which mirrors the results of this study. Wisconsin stands out among the results of this study for FSP as the single greatest contributor, primarily due to the Wisconsin Managed Forest Law, which is associated with FSP (Wisconsin Department of Natural Resources 2021). The private landowners, as a part of the Wisconsin Managed Forest Law, have to follow guidelines including having a Forest Stewardship Plan, at least 20 acres of forestland, and at least 80% of the land covered by forest (Wisconsin Department of Natural Resources 2017) and are all included as FSP participants.

There are some attribution issues in this assessment relating to points in Butler et al. (2014) and Andrejczyk et al. (2016). For instance, landowners described management plans from

FSP participation as something "they would have done anyways" (Andrejczyk et al. 2016). It is unknown if the economic contributions estimated in this study would have been there if the specific program lands were not associated with either program. Similarly, it is uncertain whether a local resident would rather recreate, and therefore spend their money, on local program land or to travel or use non-program land. The user may wish to use the land for recreation, regardless of its program status. However, without the parcel-specific data, it is not possible to estimate these differences.

Simplifying assumptions were made throughout the study due to a lack of program-specific or state-level data. For example, in an attempt to use the most recent data related to our analysis, we used the 2016 iteration of the FHWAR which was only available at the national level. Therefore, we used state-level proportions and program acreages to estimate state-level expenditures. We also assumed all states within a Forest Service region were the same in regards to timber utilization processing rates. In other cases, when recent state-level data was not available for the Timber Products Output survey, the most recent reports were used, some dating back to the 1970s (see supplementary materials Table 11 for list of report citations). Standardizing data collection for timber harvesting and recreation visits will make assessments, such as this one, easier and more accurate.

IMPLAN estimates are measures of a transfer of economic activity in a given area (IMPLAN Group, LLC 2021; White 2017) and do not reflect the benefits of FLP or FSP as Federal programs, such as a cost-benefit analysis would estimate. The contribution analysis conducted as a part of this study did not account for the allocations of federal dollars to fund the program, so the results are also not reflective of a return on investment. This study only looked at economic activities on estimated FLP and FSP lands in the conterminous US by users of the forestland.

IMPLAN is a static model where change over time is not accounted for. This is important to acknowledge when estimating economic contributions made from FLP lands, as they are protected in perpetuity. The methods of calculating this are beyond the scope of this report, but could be done via a model of the total contributions of a forest over time using an appropriate discount rate. IMPLAN also focuses solely on the economic contributions based on traditional economic activities (i.e., timber harvesting, recreational spending) and does not account for other ecological benefits often associated with forests (e.g., water filtration, carbon sequestration and storage, cultural or spiritual relevance, air purification). Lastly, IMPLAN's estimation does not include standard errors similar to some other modeling systems. Estimating and quantifying the full economic effects of all benefits associated with FLP or FSP lands would provide a clearer understanding of the benefits landowner assistance programs have on society.

In previous research, Murray et al. (2018) used a similar methodology and found that FLP lands in four regions of the US produced a combined total of 4,000 jobs and over $279 million in value-added to the regional economies. Because they focused their study on major contributor regions (i.e., the Northern Forest of Maine, New Hampshire, Vermont and New York, among others), it is understandable that their results are less than those presented in this

study, yet not substantially so. This could be due to the large concentration of acres in the North and Midwest, which account for a great portion of the results of this study.

Future analysis could focus on the total economic value of the forests enrolled in FLP and FSP. The total economic value of a forest is the aggregated total of both the use (direct and indirect) and non-use benefits (option value, bequest value, and existence value) (Pascual et al. 2010). Expanding to indirect or non-use benefits (e.g., carbon, water quality, pollution mitigation, soil health) would provide a more comprehensive assessment of the value of the programs. See the call out box below for a pilot study on the estimation and valuation of carbon sequestration on FLP and FSP lands in New England. Valuation and monetization of all ecosystem services is difficult, but could provide supplemental information to economic contribution analyses such as this one. Lastly, qualitative data from case studies, similar to those presented in Murray et al. (2018), could be used to complement the results of the quantitative studies.

Alternative programs were not compared to FLP and FSP, but evaluation of the economic contributions of varying types of policies, or inclusion of the other landowner assistance programs not assessed in this study (e.g., Community Forestry Program and Landscape Scale Restoration), could be useful. Similarly, as factors relating to consumer choice were not analyzed, it could be instructive to complete a cost benefit or counterfactual analysis comparing those lands within and outside of the program. While valuation of programs' economic and ecosystem service contributions provides context for political or governmental decisions, it is still a relatively controversial methodology.

Assessment and Valuation of Carbon Sequestration on Landowner Assistance Program Lands in New England

A pilot study estimated the amount and value of carbon sequestration on FLP and FSP lands in New England, using data from the USDA Forest Service Forest Inventory and Analysis program (Domke et al. 2021) and the Interagency Working Group on the Social Cost of Carbon (US Gov 2021). New England is one of the densest forest areas in the US, accounting for over 32 million acres of forest area, 26 million of which is privately owned (Oswalt et al. 2019; Butler et al. 2021). Of those 26 million acres, FLP accounts for 1.1 million and FSP accounts for just over 1 million acres (USDA Forest Service, 2020a; USDA Forest Service, 2020b). Forestland area in New England is decreasing (Thompson et al. 2017) and with it the ability to sequester and store carbon. Climate change is expected to exacerbate forest loss, not only in New England but also globally. Forestry incentive programs, like FLP and FSP, are not the only solution to remediate forest loss, but they can provide education and technical and financial assistance to landowners. Quantifying and estimating the value of carbon sequestered on FLP and FSP land is integral to understanding how federal landowner assistance programs can impact climate change mitigation and provide continued support to the landowner, their communities, and the global carbon network. The results of the study show that FLP lands in New England sequester an estimated 147,000 metric tons of aboveground CO_2, or $7.5 million, on average per year ($6.82/acre). FSP lands in New England sequester 82,000 metric tons of aboveground CO_2, or $4.1 million in CO_2, on average per year ($4.01/acre). The results are based on estimates of aboveground biomass in New England which is

described as “all living biomass above the soil including stem, stump, branches, bark, seeds, and foliage,” including the live understory (Domke et al. 2021). Considering climate change mitigation in prioritizing lands for landowner assistance programs will only increase the potential for ecosystem service benefits. FLP and FSP are not examples of tax or carbon payment policies, however, carbon sequestration is another benefit of conservation and properly managed forestland. The results of this study could be supplemental in arguing for stronger climate mitigation (i.e., carbon storage) management practices on FLP and FSP lands. Continued funding of landowner assistance programs is imperative, as non-market benefits (i.e., carbon, water and air purification, aesthetic value) are useful to society.

POLICY IMPLICATIONS

Landowner assistance programs, as administered by the USDA Forest Service, have the capacity to provide great value to rural communities across the US. The results of this study suggest that forests participating in FLP and FSP positively contribute to the communities where they are located, in terms of economic contributions and ecosystem services – the full effects of which were not measured in this assessment. This analysis, however, would have been more straightforward if there had been more specific program data available at the state-level. Similarly, in order to have a clearer understanding of the total contributions of the programs, it would have been useful if there were parcel-specific data related to the activities happening on the property (e.g., types of recreation, levels of harvest by species type, recreation expenditures, etc.).

State Forest Stewardship Coordinating Committees (as outlined in Section 19 of the Cooperative Forestry Act of 1978) are instrumental in incorporating an integrated approach to FLP and FSP. As a part of these committees, landowners play a role in the implementation of the landowner assistance programs. Continued federal funding will allow outreach to private landowners, both engaged and unengaged, to ensure they have a complete understanding of the options associated with owning, managing, and potentially conserving their land.

In accordance with the National State and Private Forestry Priorities (i.e., “conserve and manage working forest landscapes;” “protect forests from threats;” and “enhance public benefits from trees and forests;” USDA Forest Service 2015) and the results of this study, funding can serve to encourage sustainable forest management practices for climate resiliency in priority areas. Likewise, in order to “enhance public benefits from trees and forests” (USDA Forest Service 2015), there could be greater emphasis on management for recreation potential on FLP and FSP lands. Recreation management, standards, and practices could be outlined in management plans for landowners, managers, and non-profits to follow and abide by. As the results of this study demonstrate, timber harvesting is not the sole opportunity for economic contributions, but recreation is an economic opportunity, not only for the landowner but the community as well. The coordinated use of multiple Landowner Assistance programs can maximize the ability for the programs to act on multiple National State and Private Forestry Priorities and expand the potential economic contributions inherent to individual programs.

CONCLUSIONS

Overall, both FLP and FSP provide substantial economic contributions to their local and regional communities. For FLP, these benefits are available to the community in perpetuity due to the permanent protection mandated by the program. FSP is a more short-term (compared to FLP) assistance program that relies heavily on state agencies and foresters to administer technical assistance to forest landowners. The potential for long-term contributions from FLP far outweigh those of FSP, but those contributions come at a much higher per acre cost and is not appropriate for all lands or landowners. Without parcel-specific data, it is difficult to comprehend the benefits associated with individual lands based on location specific criteria (e.g., acreage, tree age, tree species). It is important to indicate the benefit variation in contributions across states and that federal mandates, or a one-size-fits-all approach, may not best meet the needs of the participants of these programs. Lastly, when reviewing the results, it is imperative to not equate dollar contributions from economic activity with value of a program.

This study is the first to attempt to estimate the economic contributions from US Forest Service State and Private Forestry landowner assistance programs for the conterminous US. It will hopefully be valuable to government agencies in administering these programs and lead to more informed decisions.

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SUPPLEMENTAL MATERIALS

Table 7. Annual harvest volumes on Forest Legacy Program (FLP) lands by product type (softwood and hardwood sawtimber, softwood and hardwood pulp, posts, poles and pilings, fuelwood, and other products) and state for the conterminous US, in thousand cubic feet, 2021.

State	Softwood Sawtimber	Hardwood Sawtimber	Softwood Pulp	Hardwood Pulp	Posts, Poles, Pilings	Fuelwood	Other Products
	Thousand Cubic Feet						
AL	68.0	17.8	98.5	44.8	2.9	16.5	11.9
AR	310.6	70.8	214.3	107.4	1.5	23.7	24.8
AZ	10.2	0.0	-	-	1.8	4.2	1.1
CA	2,399.3	0.0	-	-	13.6	526.7	30.0
CO	103.6	1.4	-	-	35.6	59.2	8.6
CT	3.8	54.8	3.5	9.3	-	0.4	0.9
DE	2.3	36.4	4.5	1.4	3.1	-	0.1
FL	40.8	0.2	67.4	4.2	1.1	17.9	14.4
GA	519.6	120.9	617.9	160.9	41.2	131.6	131.0
IA	-	22.7	-	-	-	-	-
ID	1,422.7	-	170.9	-	-	-	-
IL	0.0	7.0	0.0	0.6	-	-	0.5
IN	1.9	149.6	0.1	5.9	-	-	6.5
KS	0.6	1.6	-	-	-	-	-
KY	1.5	57.3	-	-	0.5	0.7	0.2
LA	0.9	0.1	1.2	0.6	0.0	0.1	0.2
MA	60.8	98.4	8.4	14.1	0.0	2.3	3.8
MD	2.6	19.0	3.4	13.7	-	-	1.6
ME	5,386.9	2,919.1	3,657.1	8,059.0	15.1	5,297.1	28.4
MI	400.3	809.7	300.9	1,692.1	64.5	330.8	23.7

MN	117.9	176.0	178.1	1,047.4	2.4	54.4	391.2
MO	0.2	2.6	0.0	0.1	0.0	0.0	0.2
MS	48.8	16.8	54.6	29.8	2.1	8.0	4.3
MT	1,849.6	19.5	302.2	-	64.5	90.4	9.8
NC	148.4	93.4	156.3	37.5	-	45.2	23.7
ND	-	-	-	-	-	-	-
NE	1.4	-	-	-	0.0	-	0.0
NH	2,412.3	621.1	814.6	2,911.6	5.7	740.8	663.9
NJ	0.4	5.6	3.3	1.9	0.7	-	1.9
NM	31.6	0.0	-	-	3.0	65.6	8.2
NV	0.0	-	-	-	-	-	-
NY	186.9	753.2	261.2	351.0	3.6	932.4	2.4
OH	1.0	100.6	6.5	50.3	-	-	2.4
OK	-	-	-	-	-	-	-
OR	343.0	6.8	53.3	7.9	3.5	6.9	0.2
PA	3.3	67.1	1.8	22.7	-	-	2.2
RI	4.9	28.4	-	0.3	-	-	-
SC	807.6	89.0	873.6	239.1	34.3	194.9	193.0
SD	4.5	-	-	-	-	-	-
TN	23.2	376.4	46.6	112.6	-	69.8	3.2
TX	570.5	97.4	340.7	297.6	7.1	14.1	225.9
UT	367.0	0.4	-	-	10.4	109.1	142.9
VA	68.2	89.8	115.1	79.9	0.9	49.1	44.1
VT	409.0	189.4	171.0	167.9	1.6	804.6	16.0
WA	3,690.4	203.2	852.7	40.8	53.2	75.1	0.0
WI	130.1	589.7	337.2	1,006.0	-	-	151.0
WV	0.2	66.2	1.7	25.6	1.7	-	0.2
WY	9.3	0.1	-	-	0.7	1.1	0.2

Table 8. Summary of annual harvest volumes on Forest Stewardship Program (FSP) lands by product type (softwood and hardwood sawtimber, softwood and hardwood pulp, posts, poles and pilings, fuelwood, and other products) and state for the conterminous US, in thousand cubic feet, 2021.

State	Softwood Sawtimber	Hardwood Sawtimber	Softwood Pulp	Hardwood Pulp	Posts, Poles, Pilings	Fuelwood	Other Products
	Thousand Cubic Feet						
AL	3,547.4	809.2	5,139.1	2,037.2	150.3	809.5	611.9
AR	6,939.5	1,540.9	4,788.3	2,337.6	33.1	526.2	554.0
AZ	238.1	0.3	-	-	42.8	98.4	26.7
CA	5,169.2	0.0	-	-	29.3	1,134.7	64.7
CO	2,371.9	32.4	-	-	815.0	1,356.2	196.3
CT	22.2	253.5	20.5	42.9	-	1.8	4.6
DE	3.4	551.5	6.7	21.5	40.0	-	0.2

FL	3,032.9	19.8	5,003.5	343.1	85.2	1,397.2	1,076.5
GA	13,504.1	3,195.6	16,059.5	4,251.7	1,070.0	3,430.3	3,405.2
IA	-	2,437.9	-	-	-	-	63.0
ID	4,688.7	-	563.1	-	102.1	108.8	193.2
IL	5.9	6,750.3	32.1	545.4	-	-	496.9
IN	61.5	15,284.6	3.9	600.8	-	-	608.1
KS	82.9	1,136.4	-	-	-	-	-
KY	731.1	10,847.9	-	-	219.7	164.7	76.7
LA	1,159.7	167.7	1,478.8	703.6	9.9	130.9	246.3
MA	590.5	928.3	81.5	133.4	0.1	22.0	35.8
MD	402.1	2,894.3	517.8	2,081.8	-	-	240.9
ME	1,815.3	1,009.6	1,232.4	2,787.3	5.1	1,812.1	9.7
MI	1,842.5	3,772.9	1,384.8	7,884.9	297.0	1,538.4	110.0
MN	710.0	1,083.2	1,072.8	6,445.6	14.4	333.5	2,404.9
MO	166.9	2,671.9	9.3	82.2	21.6	6.1	161.8
MS	10,345.3	3,423.4	11,574.9	6,098.7	443.2	1,694.5	914.7
MT	490.6	5.2	80.2	-	17.1	24.0	2.6
NC	3,076.9	2,057.5	3,240.1	826.8	-	986.6	496.9
ND	-	710.6	-	-	-	-	-
NE	1,469.9	1,116.4	-	-	28.4	-	24.5
NH	2,273.2	585.0	767.6	2,742.7	5.4	697.9	625.4
NJ	55.0	351.8	496.7	116.6	47.3	-	169.1
NM	193.7	0.3	-	-	18.6	401.8	50.1
NV	2.7	-	-	-	-	44.1	-
NY	959.7	4,114.1	1,341.2	1,917.4	18.5	5,092.6	12.2
OH	55.0	5,243.5	342.0	2,620.7	-	-	127.3
OK	1,400.6	207.3	-	-	199.2	-	3,116.0
OR	7,348.3	212.7	1,141.4	248.2	75.7	148.1	3.8
PA	200.7	3,623.7	109.1	1,225.0	-	-	120.6
RI	71.6	419.7	-	5.0	-	-	-
SC	6,959.5	1,193.8	7,528.7	3,207.9	295.6	1,998.6	1,673.1
SD	135.8	-	-	-	4.9	-	1.6
TN	295.4	2,859.2	593.4	855.6	-	544.1	27.6
TX	12,997.6	2,219.5	7,762.5	6,780.3	161.6	320.4	5,146.7
UT	1,302.9	1.5	-	-	37.0	387.3	507.3
VA	2,942.9	3,953.2	4,962.5	3,514.4	37.3	2,149.9	1,905.8
VT	1,560.7	667.8	652.4	592.1	6.2	2,872.5	56.9
WA	3,449.1	192.0	796.9	38.6	49.8	70.2	0.0
WI	3,003.9	13,647.4	7,788.6	23,283.6	-	-	3,494.2
WV	5.6	1,933.7	48.8	747.7	50.2	-	5.1
WY	1,433.4	16.4	-	-	108.9	170.4	34.5

Table 9. Summary of economic contributions from timber, recreation, and combined activities, on Forest Legacy Program (FLP) properties in terms of employment, labor income, total output, and total value-added, by state for the conterminous US in 2021 USD, 2021.

State	Timber Jobs	Recreation Jobs	All Jobs	Timber Labor Income	Recreation Labor Income	All Labor Income	Timber Total Output	Recreation Total Output	All Total Output	Timber Value-added	Recreation Value-added	All Value-added
AL	0	6	6	$0	$219,000	$219,000	$0	$587,000	$587,000	$0	$331,000	$331,000
AR	29	6	35	$1,546,000	$158,000	$1,704,000	$11,107,000	$403,000	$11,510,000	$2,087,000	$240,000	$2,327,000
AZ	2	0	2	$79,000	$8,000	$87,000	$507,000	$18,000	$525,000	$114,000	$12,000	$126,000
CA	204	30	234	$10,498,000	$1,155,000	$11,653,000	$71,848,000	$2,919,000	$74,767,000	$14,238,000	$1,802,000	$16,040,000
CO	19	7	26	$801,000	$228,000	$1,029,000	$2,553,000	$550,000	$3,103,000	$1,141,000	$343,000	$1,484,000
CT	7	17	24	$274,000	$612,000	$886,000	$997,000	$1,151,000	$2,148,000	$436,000	$832,000	$1,268,000
DE	5	4	9	$202,000	$116,000	$318,000	$779,000	$270,000	$1,049,000	$325,000	$162,000	$487,000
FL	5	12	17	$310,000	$341,000	$651,000	$1,574,000	$761,000	$2,335,000	$450,000	$496,000	$946,000
GA	35	41	76	$1,732,000	$1,162,000	$2,894,000	$9,181,000	$2,593,000	$11,774,000	$2,019,000	$1,702,000	$3,721,000
IA	3	0	3	$107,000	$12,000	$119,000	$3,675,000	$28,000	$3,703,000	$179,000	$17,000	$196,000
ID	171	4	175	$8,386,000	$118,000	$8,504,000	$969,131,000	$267,000	$969,398,000	$14,832,000	$167,000	$14,999,000
IL	1	0	1	$26,000	$7,000	$33,000	$116,000	$17,000	$133,000	$39,000	$11,000	$50,000
IN	14	5	19	$628,000	$155,000	$783,000	$5,155,000	$372,000	$5,527,000	$930,000	$228,000	$1,158,000
KS	0	0	0	$10,000	$1,000	$11,000	$1,268,000	$4,000	$1,272,000	$16,000	$2,000	$18,000
KY	7	5	12	$289,000	$135,000	$424,000	$10,036,000	$319,000	$10,355,000	$495,000	$194,000	$689,000
LA	0	0	0	$5,000	$3,000	$8,000	$26,000	$7,000	$33,000	$7,000	$4,000	$11,000
MA	21	24	45	$863,000	$892,000	$1,755,000	$33,283,000	$1,621,000	$34,904,000	$1,485,000	$1,164,000	$2,649,000
MD	4	2	6	$171,000	$61,000	$232,000	$16,305,000	$122,000	$16,427,000	$268,000	$85,000	$353,000
ME	1463	90	1553	$61,802,000	$2,692,000	$64,494,000	$221,359,000	$6,308,000	$227,667,000	$86,649,000	$3,904,000	$90,553,000
MI	153	70	223	$7,363,000	$2,013,000	$9,376,000	$108,812,000	$4,717,000	$113,529,000	$9,892,000	$2,987,000	$12,879,000
MN	73	25	98	$3,561,000	$767,000	$4,328,000	$28,757,000	$2,003,000	$30,760,000	$5,069,000	$1,176,000	$6,245,000
MO	0	0	0	$18,000	$4,000	$22,000	$1,118,000	$10,000	$1,128,000	$29,000	$6,000	$35,000
MS	4	3	7	$306,000	$71,000	$377,000	$2,030,000	$193,000	$2,223,000	$415,000	$109,000	$524,000
MT	126	7	133	$6,796,000	$190,000	$6,986,000	$50,844,000	$505,000	$51,349,000	$9,397,000	$265,000	$9,662,000
NC	19	7	26	$1,217,000	$201,000	$1,418,000	$68,909,000	$433,000	$69,342,000	$1,885,000	$283,000	$2,168,000
NE	0	0	0	$7,000	$900	$7,900	$71,000	$1,900	$72,900	$9,000	$1,200	$10,200
NH	449	182	631	$33,042,000	$6,252,000	$39,294,000	$260,679,000	$11,904,000	$272,583,000	$44,814,000	$8,428,000	$53,242,000
NJ	1	21	22	$45,000	$766,000	$811,000	$1,340,000	$1,601,000	$2,941,000	$68,000	$1,071,000	$1,139,000
NM	8	3	11	$336,000	$68,000	$404,000	$2,691,000	$185,000	$2,876,000	$490,000	$108,000	$598,000
NV	0	0	0	$0	$3,000	$3,000	$0	$7,000	$7,000	$0	$5,000	$5,000

NY	150	64	214	$7,682,000	$2,435,000	$10,117,000	$36,722,000	$4,496,000	$41,218,000	$10,831,000	$3,343,000	$14,174,000
OH	10	9	19	$503,000	$273,000	$776,000	$4,722,000	$685,000	$5,407,000	$801,000	$430,000	$1,231,000
OR	23	2	25	$1,712,000	$67,000	$1,779,000	$9,878,000	$144,000	$10,022,000	$2,431,000	$95,000	$2,526,000
PA	6	4	10	$272,000	$136,000	$408,000	$1,900,000	$311,000	$2,211,000	$375,000	$197,000	$572,000
RI	2	6	8	$108,000	$194,000	$302,000	$805,000	$387,000	$1,192,000	$159,000	$272,000	$431,000
SC	78	40	118	$4,090,000	$1,089,000	$5,179,000	$21,099,000	$2,406,000	$23,505,000	$5,623,000	$1,556,000	$7,179,000
SD	0	0	0	$31,000	$300	$31,300	$1,499,000	$600	$1,499,600	$44,000	$400	$44,400
TN	42	31	73	$2,098,000	$995,000	$3,093,000	$12,643,000	$2,182,000	$14,825,000	$3,062,000	$1,425,000	$4,487,000
TX	47	22	69	$2,955,000	$746,000	$3,701,000	$34,540,000	$1,998,000	$36,538,000	$5,207,000	$1,171,000	$6,378,000
UT	55	53	108	$2,561,000	$1,522,000	$4,083,000	$10,404,000	$4,320,000	$14,724,000	$3,623,000	$2,359,000	$5,982,000
VA	15	10	25	$1,035,000	$293,000	$1,328,000	$9,360,000	$632,000	$9,992,000	$1,502,000	$421,000	$1,923,000
VT	109	19	128	$4,098,000	$565,000	$4,663,000	$13,302,000	$1,218,000	$14,520,000	$5,398,000	$823,000	$6,221,000
WA	231	11	242	$15,244,000	$386,000	$15,630,000	$121,016,000	$1,023,000	$122,039,000	$21,076,000	$630,000	$21,706,000
WI	76	42	118	$4,899,000	$1,189,000	$6,088,000	$28,659,000	$2,731,000	$31,390,000	$7,823,000	$1,757,000	$9,580,000
WV	6	2	8	$313,000	$41,000	$354,000	$2,251,000	$94,000	$2,345,000	$416,000	$58,000	$474,000
WY	1	0	1	$37,000	$4,000	$41,000	$268,000	$11,000	$279,000	$53,000	$6,000	$59,000
US	3674	886	4560	$188,055,000	$28,346,200	$216,401,200	$2,193,219,000	$62,515,500	$2,255,734,500	$266,205,000	$40,678,600	$306,883,600

Table 10. Summary of economic contributions from timber, recreation, and combined activities, on Forest Stewardship Program (FSP) properties in terms of employment, labor income, total output, and total value-added, by state for the conterminous US in 2021 USD, 2021.

State	Timber Jobs	Recreation Jobs	All Jobs	Timber Labor Income	Recreation Labor Income	All Labor Income	Timber Total Output	Recreation Total Output	All Total Output	Timber Value-Added	Recreation Value-Added	All Value-Added
AL	395	70	465	$19,730,000	$2,465,000	$22,195,000	$56,232,000	$6,628,000	$62,860,000	$27,806,000	$3,731,000	$31,537,000
AR	580	103	683	$23,264,000	$3,452,000	$26,716,000	$114,811,000	$9,473,000	$124,284,000	$31,850,000	$5,377,000	$37,227,000
AZ	50	2	52	$1,340,000	$95,000	$1,435,000	$12,375,000	$233,000	$12,608,000	$1,709,000	$144,000	$1,853,000
CA	380	27	407	$19,190,000	$1,381,000	$20,571,000	$124,708,000	$3,612,000	$128,320,000	$26,233,000	$2,197,000	$28,430,000
CO	390	46	436	$14,601,000	$2,046,000	$16,647,000	$43,263,000	$5,268,000	$48,531,000	$20,130,000	$3,166,000	$23,296,000
CT	31	79	110	$1,578,000	$3,897,000	$5,475,000	$12,352,000	$8,256,000	$20,608,000	$2,478,000	$5,587,000	$8,065,000
DE	54	14	68	$2,609,000	$560,000	$3,169,000	$15,504,000	$1,390,000	$16,894,000	$4,041,000	$809,000	$4,850,000
FL	309	129	438	$23,229,000	$5,094,000	$28,323,000	$155,627,000	$12,600,000	$168,227,000	$34,664,000	$7,717,000	$42,381,000
GA	1366	269	1635	$75,589,000	$10,197,000	$85,786,000	$465,571,000	$25,332,000	$490,903,000	$108,342,000	$15,483,000	$123,825,000
IA	177	34	211	$7,274,000	$1,150,000	$8,424,000	$33,114,000	$2,909,000	$36,023,000	$9,394,000	$1,713,000	$11,107,000
ID	550	8	558	$23,791,000	$299,000	$24,090,000	$1,514,744,000	$753,000	$1,515,497,000	$41,214,000	$439,000	$41,653,000
IL	673	168	841	$27,395,000	$7,736,000	$35,131,000	$203,693,000	$19,911,000	$223,604,000	$41,933,000	$12,183,000	$54,116,000
IN	1212	469	1681	$56,463,000	$17,809,000	$74,272,000	$261,479,000	$45,876,000	$307,355,000	$79,816,000	$26,763,000	$106,579,000

KS	48	29	77	$2,172,000	$1,086,000	$3,258,000	$7,404,000	$3,167,000	$10,571,000	$2,867,000	$1,711,000	$4,578,000
KY	1201	246	1447	$49,421,000	$8,822,000	$58,243,000	$779,355,000	$22,583,000	$801,938,000	$78,501,000	$13,043,000	$91,544,000
LA	303	23	326	$9,638,000	$832,000	$10,470,000	$1,174,632,000	$2,402,000	$1,177,034,000	$17,082,000	$1,349,000	$18,431,000
MA	131	213	344	$5,889,000	$10,439,000	$16,328,000	$23,153,000	$21,465,000	$44,618,000	$8,834,000	$14,435,000	$23,269,000
MD	411	273	684	$21,055,000	$12,417,000	$33,472,000	$154,734,000	$27,576,000	$182,310,000	$29,639,000	$18,144,000	$47,783,000
ME	431	52	483	$22,151,000	$2,005,000	$24,156,000	$86,886,000	$5,088,000	$91,974,000	$30,891,000	$3,028,000	$33,919,000
MI	698	346	1044	$32,896,000	$13,428,000	$46,324,000	$375,390,000	$33,976,000	$409,366,000	$47,725,000	$20,193,000	$67,918,000
MN	393	162	555	$20,158,000	$6,755,000	$26,913,000	$113,140,000	$18,301,000	$131,441,000	$27,322,000	$10,438,000	$37,760,000
MO	250	72	322	$10,002,000	$2,712,000	$12,714,000	$42,466,000	$6,668,000	$49,134,000	$14,093,000	$3,958,000	$18,051,000
MS	1050	226	1276	$59,305,000	$7,299,000	$66,604,000	$377,412,000	$21,168,000	$398,580,000	$85,130,000	$11,477,000	$96,607,000
MT	32	1	33	$1,649,000	$36,000	$1,685,000	$7,944,000	$97,000	$8,041,000	$2,491,000	$49,000	$2,540,000
NC	371	102	473	$17,924,000	$3,901,000	$21,825,000	$97,598,000	$9,396,000	$106,994,000	$29,009,000	$5,698,000	$34,707,000
ND	41	0	41	$2,193,000	$0	$2,193,000	$94,010,000	$0	$94,010,000	$4,001,000	$0	$4,001,000
NE	412	24	436	$18,367,000	$879,000	$19,246,000	$77,168,000	$2,165,000	$79,333,000	$35,769,000	$1,301,000	$37,070,000
NH	408	180	588	$18,732,000	$8,132,000	$26,864,000	$132,964,000	$17,390,000	$150,354,000	$27,010,000	$11,425,000	$38,435,000
NJ	76	353	429	$3,173,000	$17,373,000	$20,546,000	$10,136,000	$39,544,000	$49,680,000	$4,929,000	$25,227,000	$30,156,000
NM	60	2	62	$2,169,000	$67,000	$2,236,000	$5,869,000	$191,000	$6,060,000	$2,961,000	$108,000	$3,069,000
NV	2	1	3	$97,000	$53,000	$150,000	$303,000	$125,000	$428,000	$128,000	$81,000	$209,000
NY	874	303	1177	$36,552,000	$15,186,000	$51,738,000	$119,442,000	$31,683,000	$151,125,000	$56,765,000	$22,135,000	$78,900,000
OH	755	190	945	$27,842,000	$7,762,000	$35,604,000	$582,881,000	$20,719,000	$603,600,000	$44,194,000	$12,384,000	$56,578,000
OK	135	37	172	$6,386,000	$1,333,000	$7,719,000	$19,774,000	$3,871,000	$23,645,000	$9,277,000	$2,088,000	$11,365,000
OR	444	5	449	$27,767,000	$196,000	$27,963,000	$104,871,000	$459,000	$105,330,000	$39,178,000	$285,000	$39,463,000
PA	479	169	648	$17,270,000	$7,322,000	$24,592,000	$188,362,000	$17,949,000	$206,311,000	$25,426,000	$10,885,000	$36,311,000
RI	43	83	126	$1,673,000	$3,512,000	$5,185,000	$9,993,000	$7,901,000	$17,894,000	$2,601,000	$5,197,000	$7,798,000
SC	733	125	858	$40,151,000	$4,447,000	$44,598,000	$159,782,000	$10,958,000	$170,740,000	$62,511,000	$6,565,000	$69,076,000
SD	10	1	11	$415,000	$44,000	$459,000	$1,613,000	$107,000	$1,720,000	$593,000	$63,000	$656,000
TN	371	69	440	$13,284,000	$2,908,000	$16,192,000	$50,836,000	$6,930,000	$57,766,000	$19,232,000	$4,281,000	$23,513,000
TX	1267	93	1360	$58,008,000	$4,047,000	$62,055,000	$216,828,000	$11,238,000	$228,066,000	$87,406,000	$6,433,000	$93,839,000
UT	183	27	210	$7,287,000	$1,002,000	$8,289,000	$21,860,000	$2,968,000	$24,828,000	$10,514,000	$1,585,000	$12,099,000
VA	583	239	822	$29,483,000	$9,401,000	$38,884,000	$150,559,000	$22,549,000	$173,108,000	$42,840,000	$14,092,000	$56,932,000
VT	360	49	409	$16,677,000	$1,893,000	$18,570,000	$58,448,000	$4,511,000	$62,959,000	$23,992,000	$2,852,000	$26,844,000
WA	213	4	217	$14,455,000	$176,000	$14,631,000	$62,299,000	$485,000	$62,784,000	$20,265,000	$295,000	$20,560,000
WI	2229	1004	3233	$101,587,000	$37,655,000	$139,242,000	$362,216,000	$94,838,000	$457,054,000	$166,632,000	$56,759,000	$223,391,000
WV	194	46	240	$7,594,000	$1,570,000	$9,164,000	$31,601,000	$3,976,000	$35,577,000	$11,093,000	$2,330,000	$13,423,000

WY	108	5	113	$4,511,000	$169,000	$4,680,000	$18,744,000	$488,000	$19,232,000	$6,813,000	$264,000	$7,077,000
US	21466	6170	27636	$1,003,987,000	$251,039,000	$1,255,026,000	$8,734,145,000	$615,170,000	$9,349,315,000	$1,507,324,000	$375,469,000	$1,882,793,000

Table 11. Citations of Timber Product Output reports used in methodology.

Citation	Year	State
Bones, J. 1973. The timber industries of New Jersey and Delaware (No. NE-28). Northeastern Forest Experiment Station.	1973	New Jersey
Hackett, R.L., Sester, J.A. 1998. Illinois timber industry – An assessment of timber product output and use, 1996. North Central Research Station 73.	1998	Illinois
Haugen, D.E. 2014. Kansas timber industry – an assessment of timber product output and use, 2009. Northern Research Station 62.	2014	Kansas
Haugen, D.E. 2013. Wisconsin timber industry – an assessment of timber product output and use, 2008. Northern Research Station 116.	2013	Wisconsin
Haugen, D.E., Harsel, R. 2013. North Dakota timber industry – an assessment of timber product output and use, 2009. Northern Research Station 40.	2013	North Dakota
Haugen, D.E., Michel, D.D. 2009. Iowa timber industry – an assessment of timber product output and use 66.	2009	Iowa
Haugen, D.E., Walters, B., Piva, R.J., Neumann, D. 2014. Michigan timber industry – an assessment of timber product output and use, 2008. Northern Research Station 74.	2014	Michigan
Nevel, R., Wharton, E. 1991. The timber industries of Delaware, 1985. Northeastern Forest Experiment Station.	1991	Delaware
Piva, R.J., Cook, G.W. 2011. West Virginia timber industry – an assessment of timber product output and use, 2007 (No. NRS-RB-46). U.S. Department of Agriculture, Forest Service, Northern Research Station, Newtown Square, PA. https://doi.org/10.2737/NRS-RB-46	2011	West Virginia
Piva, R.J., Josten, G. 2013. South Dakota timber industry – an assessment of timber product output and use, 2009. Northern Research Station 40.	2013	South Dakota
Piva, R.J., Treiman, T. 2013. Missouri timber industry – an assessment of timber product output and use, 2009. Northern Research Station 94.	2013	Missouri
Walters, Brian F, Adams, D., Piva, R. 2012. Nebraska timber industry – an assessment of timber product output anduse 2009. Northern Research Station 60.	2012	Nebraska
Walters, Brian F., Rider, D.R., Piva, R.J. 2012. Maryland timber industry – an assessment of timber product output and use, 2008 (No. NRS-RB-64). U.S. Department of Agriculture, Forest Service, Northern Research Station, Newtown Square, PA. https://doi.org/10.2737/NRS-RB-64	2012	Maryland
Walters, Brian F, Settle, J., Piva, R. 2012. Indiana timber industry – an assessment of timber product output and use, 2008. Northern Research Station 78.	2012	Indiana

Walters, B.F., Vongroven, S., Piva, R.J. 2016. Minnesota timber industry – an assessment of timber product output and use, 2010. Northern Research Station 80.	2016	Minnesota
Wharton, E., Bearer, J. 1994. The timber industries of Pennsylvania, 1988 (No. NE-130). Northeastern Forest Experiment Station.	1994	Pennsylvania
Wharton, E.H., Martin, T.D., Widmann, R.H. 1998. Wood removals and timber use in New York, 1993 (No. NE-RB-141). U.S. Department of Agriculture, Forest Service, North Central Research Station, St. Paul, MN. https://doi.org/10.2737/NE-RB-141	1998	New York
Widmann, R., Long, M. 1992. Ohio timber products output - 1989 (No. NE-121). Northeastern Forest Experiment Station.	1992	Ohio