USDA-Forest Service RESEARCH WORK UNIT DESCRIPTION Ref: FSM 4070	1. Number FS-SRS-4804	2. Station Southern Research Station
	3. Unit Location: Research Triangle Park, NC	

4. Research Work Unit Title: SRS-4804 **Forest Economics and Policy** (Research Triangle Park, NC)		

5. Project Leader:
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6. Area of Research Applicability: Regional, National, Global	7. Estimated Duration: 5 years

8. Mission:
   To advance understanding of the relationship between natural and human-caused disturbances and economic values, how those disturbances can be managed to reduce undesired impacts on society and ecosystems, and how disturbances and their management affect different parts of the economy; to examine how public and private forestland management is affected by government policies and private sector institutions, including taxes, subsidies, certification, and forest governance, and quantify how these policies and institutions affect the provision of ecosystem goods and services; and to characterize domestic and international supply and demand for forest products in the United States and globally, including how domestic and international policies, climate, and technology affect these markets, and to develop, deploy, and test new models of land use that are more accurate and operationally useful for evaluating the effects of land market, biophysical, and policy factors affecting land use choices.

9. Justification and Problem Selection Summary:
   The values people obtain from public and private forests are affected by natural processes, forest management, and society and the broader economy. Values of the goods and services that forests provide are altered by climate change, wildfire, and other natural disturbances, and yet climate and disturbance processes are constantly changing in frequency, severity, and impacts, so research is needed on how government and the private sector can effectively respond to reduce negative consequences. Outputs from forests vary jointly with government policies and with management, yet governments seek to design and implement policies, laws, programs, and taxes that have forestry and economic consequences that are not completely understood, particularly regarding landowner decision making and distributional impacts. Research is needed that can better quantify the observed historical and potential future impacts of existing and proposed policy and management changes so that landowners and society achieve greater overall benefits from forests. Timber and non-timber values, which affect forest and land use decision making, are directly impacted by forest product markets. The values of alternative land uses, determined through other markets and biophysical and policy variables, interact with forest product markets to identify land use allocations. Because such markets are influenced by trade and related policies, research is needed that can better identify how global forest sector developments and trade measures affect the production and trade of timber, wood, and paper products. Included among the factors affecting forest product markets are technology change, investments in timber productivity, shifts in consumer preferences, public policies, and changes in biophysical conditions. Research that accurately quantifies how all such factor changes affect markets can lead to more effective and equitable policies and more efficient investment decisions. Finally, sound science, credible forest sector assessments, and accurate agency reporting on national and globally consequential forest sector variables requires that the unit generate data products that are publicly accessible and meet standards of quality assurance and control.

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9. JUSTIFICATION AND PROBLEM SELECTION

The Forest Economics and Policy Research Work Unit has historically addressed research questions related to the economics of natural disturbances, taxes, programs, and policies, forest product markets and trade, and the economics of ecosystem services. As personnel and hence the research capacity of the unit has evolved in the past several years, the unit has cemented its capacity to address economic and policy issues at regional, national, and international scales. Disturbance economics research has gravitated towards quantifying the impacts of disturbances, how society and climate affect disturbances, and how management interventions can be undertaken to reduce overall costs and losses from wildfires and hurricanes. Interest in the effects and efficacies of disturbance interventions continues to grow, particularly in how to address difficult wildfire management and timber salvage following many kinds of disturbances, grappling with the difficult choices we make in the face of a changing climate and society.

The number of RGEG researchers engaged in policy, program, and tax research has decreased over the last two decades. Some research capacity has been maintained by engaging external partners. During this time, the importance of this research, particularly for understanding private land management and impacts on private landowners, has risen as the U.S. South's forest sector has grown in relative importance domestically. Because the South produces most timber and ecosystem services from private lands, public policies directed at private forest landowners have the potential to greatly affect what southern forests provide. Projections emerging from the Resources Planning Act Assessment indicate that the region is likely to continue its national dominance of domestic markets, highlighting the importance of advancing our understanding of the effects and efficacies of policies. Private forest dominance in the South notwithstanding, policies impacting the management of the agency's national forests and other public forests also have an outsize impact on many communities nationwide. At the same time, interest in addressing sustainability related policies and programs has grown as the salience of such policies has risen nationally and globally. The unit therefore can contribute to advances in understanding the effects and effectiveness of efforts to certify forests, stem the flow of illegal wood in global markets, improve forest governance in countries currently experiencing unsustainable and illicit harvests, and address growing questions regarding the values of forests and wood for mitigating carbon emissions.

Markets are affected by a wide variety of variables that are under constant change and that subject the sector to biophysical and economic shocks. Rising overseas investment in tree growing and forest product manufacturing and demand alter the market environment for U.S. timber and forest product producers. Similar dynamics additionally affect returns to alternative land uses, leading to land use change that affects forests and the overall forest sector. Trade policy changes interrupt those forest product and land markets in ways that affect producers and consumers in the U.S. and abroad, with consequences in terms of income and employment in the forest products sector. Climate change is projected to alter forest growing conditions and timber growth rates, leading to shifts in the comparative advantage of the United States in global

markets generally. Although the unit's overall capacity in markets and trade research has contracted markedly in the last decade, it is recognized as taking the leading role in regional, national, and international market assessments and data reporting. As such assessment roles continue, we anticipate the need to further advance market assessment tools in ways that can provide answers to current and unanticipated future questions about how sector development, policies, technology, and climate changes will impact producers, consumers, and the forests upon which markets are based.

Mission: To advance understanding of the relationship between natural and human-caused disturbances and economic values, how those disturbances can be managed to reduce undesired impacts on society and ecosystems, and how disturbances and their management affect different parts of the economy; to examine how public and private forestland management is affected by government policies and private sector institutions, including taxes, subsidies, certification, and forest governance, and quantify how these policies and institutions affect the provision of ecosystem goods and services; and to characterize domestic and international supply and demand for forest products in the United States and globally, including how domestic and international policies, climate, and technology affect these markets, and to develop, deploy, and test new models of land use that are more accurate and operationally useful for evaluating the effects of land market, biophysical, and policy factors affecting land use choices.

Problem Area 1. Human and Natural Disturbances

- Analyze the effects of human and natural disturbances, including wildfire, on public and private forestland on humans and society, identify the forces that drive such disturbances, and thereby inform potential policy and management strategies designed to achieve desired societal and environmental outcomes.

Wildfires, tropical cyclones, insect and disease outbreaks, and invasive exotic species are disruptive agents that rearrange ecosystem resources and economic wealth and affect the well-being of landowners, consumers of forest-based goods and services, and the wider society. Existing research suggests that climate change can alter the frequency and severity of many of these kinds of natural disturbances. Some research has quantified the historical impacts of these disturbances on forests and society, but new research is needed to assess how changes in climate and society may lead to shifts in those impacts.

Although many of these disturbances are generated by natural biological and physical drivers, humans can affect their frequencies and severities, including through human-caused wildfire ignitions, introductions of exotic species, and land use changes. Disturbance management activities have been shown in limited research to be effective. For example, some research has shown that wildfire prevention programs and law enforcement efforts focused on human-caused wildfires—which, given their location and timing, tend to be more damaging than natural fires to humans and property—are effective at reducing their occurrence.

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Forest management directed specifically at disturbances (interventions) includes prevention, pre-disturbance treatments, detection, suppression, and mitigation. How the various kinds of interventions can be combined in ways that generate the largest net benefits, however, is not completely understood. Additionally, there is need for new research on intervention effects and efficacies, the underlying drivers of their costs, and how changing biophysical, economic, and ecological factors may influence effects and costs. Such research could improve the usefulness and accuracy of assessments and tools to understand the long-run impacts and consequences of changes in underlying drivers and of the effects of alternative interventions. A prerequisite for identifying the most effective kinds of interventions is new research on how each contributes to disturbance generation processes, which can be studied through new statistical analyses that combine historical information about observed disturbances, interventions, and climate and society drivers. Policy and management benefits of that research include refinements in our understanding of how a changing climate and society could affect the frequency and severities of future disturbance events, informing assessments on their possible future socioeconomic impacts and decisions on how to intervene to reduce their expected long-run costs, losses, and economic distributional consequences.

Given the unit's limited research capacity, our research entails collaborations internally in the Forest Service and externally with scientists and forest managers in governmental and non-governmental organizations. Such collaborations involve joint, cross-disciplinary efforts that add disciplinary diversity to modeling and policy analysis efforts, including in ecology, wildfire science, entomology, pathology, atmospheric science, and the social sciences. Because the quality of such research can benefit by building models and testing theories in a diversity of ecological, economic, and policy environments, our research is extended through international collaborations. The collaborative, cross-disciplinary, and international research approach advances the agency's goal of delivering our science globally and exceling as a high-performing agency.

Problem Area 2. Forest Management and Society

- Study how public and private forestland management is affected by government policies and private sector institutions, including taxes, incentive programs, payments for ecosystem services, subsidies, certification, and forest governance; and quantify how these policies and institutions affect the provision of ecosystem goods and services.

Forests provide a variety of tangible and intangible goods and services, including timber and non-timber forest products, as well as other ecosystem services, such as water quality improvement, wilderness, and carbon sequestration. Forests can be managed to sustain and enhance these forest outputs; however, management often involves trade-offs between various potential benefits. Economics research is needed that can quantify those benefit trade-offs and reveal the equity consequences for forest landowners of alternative taxes, policies, programs, and management practices. Such research is also needed to better understand not just the effects of those interventions but also their effectiveness at achieving desired outcomes. Furthermore, forests provide numerous non-market ecosystem services for which property rights are not well-defined; lacking policy stimulus or incentives, private production of these externalities will fall at a socially sub-optimal level. Governments therefore employ a variety of interventions intended

to assist national forests, private forest landowners, tribes, and communities in managing their forests in a way that generates supply of ecosystem services that meets society's demand. These interventions are designed to influence the choices made when managing forests, with both intended and unintended outcomes in terms of income, economic equity, and desired forest conditions.

Because society and the natural environment are undergoing constant flux due to economic and population growth and climate change, science is needed that measures how those changes affect the ways that interventions influence outcomes. Among policies of specific concern for decision makers are voluntary and mandatory sustainability benchmarks (e.g., certification, forest loss minimums), trade measures designed to stem the flow of illegal wood fiber in world markets, forest sector governance development assistance, and international agreements to limit the trade in threatened and endangered species. Because such sustainability focused policies and actions are constantly evolving with the global economy, research is needed to evaluate their effects and effectiveness so that policy makers can more closely achieve desired objectives.

The studies in this problem area will evaluate management decisions; governance approaches; and laws, policies, taxes, programs, and cultural practices that influence both national forests, other public forests and private forestland management. Such research will therefore advance the agency's mission to deliver benefits of forests to the public and its strategic goal of sustaining our nation's forests and grasslands.

Problem Area 3. Markets and Trade

- Address questions regarding domestic and international supply of and demand for forest products that derive from public and private forests in the United States, including how policies, climate, technology, and societal change affect these markets, and advance models of land use change to more accurately assess the effects of biophysical, economic, and policy variables.

Domestic and global socioeconomic and policy variables affect the prices, production, consumption and trade of timber and non-timber forest products. Investments in new technologies and new products, including energy products, further alter the market and trade landscape. Because of a changing climate and shifting domestic and overseas investments in tree growing, forest inventories, which are the basis for comparative advantage, are also evolving over time. Changes in timber inventory, timber product outputs, trade, and the consumption of wood products have additional consequences for national and global efforts to mitigate global carbon emissions. Because such socioeconomic and forest conditions are steadily evolving, research is needed to accurately predict how new policy and management interventions lead to changes in market variables—prices, production, consumption, trade, income, and employment—and domestic and global carbon. Changes in forest product markets also lead to changes in forest land management and investments in forests, which affect timber inventory and growth rates. Such market changes in the forest sector are paralleled by similar changes in the benefits to urban and agricultural uses which also respond to climate, policy, technology, and the broader economy. It is the balance among those competing land markets that determines

forestland in much of the United States and globally. Changes in that balance thereby lead to the overall long-run potential of forests to provide products, ecosystem services, and employment.

The effects of all influences on markets (changes in socioeconomic variables, technology, climate, policies) can be parameterized in market models, including in regional and national partial equilibrium and global forest sector models. Regional and national modeling can provide the parameters needed for global models, which are used to assess the sector-level consequences of climate, technology, societal, and policy changes. Because global models are a specific focus of research in this unit, research is needed that advances the structure and performance of such models in ways that more accurately assesses changes in socioeconomic, climate, technology, and policy phenomena. Advances may include faster model solution speeds, finer spatial representation of market regions within countries (e.g., in the United States), mechanisms for optimally aggregating collections of global producing regions, more accurate projections of climate change-induced productivity changes, an improved ability to project global planted forest investments, the capacity to model wood energy, and an ability to track forest and harvested wood products carbon. These advances would allow for more accurate domestic and global forest sector assessments and answer critical questions about how policy interventions (including trade measures, incentives to sequester carbon in forests and harvested wood products, and programs to advance new products) and natural and economic shocks lead to changing outcomes in domestic regional, national, and global markets. In the development and improvement of market models, advancement in systems of data assembly is essential to providing the raw inputs of statistical analyses, mandatory forest sustainability reporting, short- and long-run market forecasts needed by the agency and our global partners.

Given that the research described in this problem area is both national and global in scope, the unit advances the agency's strategic goal to apply knowledge globally. Given the focus of carrying out model development and data monitoring and reporting, this area of study helps to deliver benefits to the public.

10. APPROACH TO PROBLEM SOLUTION

Problem Area 1. Human and Natural Disturbances

Research and accomplishments planned by emphasis area:

a. **Advance understanding of the underlying drivers and trends of wildfire occurrences**
   i. *Improve accuracy and precision of wildfire suppression expenditure forecasting models for federal lands*. New econometric models, specified at varying spatial and temporal and ownership scales will be developed, tested, and implemented to meet the needs of Fire and Aviation Management and the Department of the Interior.
   ii. *Develop tools for wildland managers that can aid in planning for upcoming wildfire seasons.* Results of econometric studies of wildfire production, including the effects of intervention methods, will be converted to technology transfer products.
   iii. *Conduct novel studies on the production of human-ignited wildfires.* Specific studies will more accurately describe the intentional (arson) and accidentally ignited wildfire ignition and wildfire damage processes on lands of any ownership or jurisdiction.
b. **Improve understanding of the human impacts of forest-based disturbances of all types**
   i. *Assess how climate, society, and policies interact with natural disturbances.* Evaluate how land management and policy interventions affect the frequency and severity of disturbances and identify the effects of alternative disturbance intervention methods, focusing on post-disturbance impact assessment and quantification of forest product market impacts from salvage and inventory losses.
   ii. *Quantify the socioeconomic impacts of forest-based disturbances.* Examine how forest-based disturbances affect human health, amenities, and other societal variables, including on income and equity.

At this time, we have the resources to complete parts of each of the two sub-problems, with 1.1 total scientist-years devoted to this problem area.

Anticipated outcomes in Problem Area 1:

- Improved wildfire suppression forecasts for the USDA Forest Service and other agencies.
- Better wildfire prevention strategies designed to reduce intentional and unintentional human wildfire ignitions, leading to lower overall costs and losses from wildfires.
- Advanced understanding of how humans and managers can reduce the overall costs and losses derived from forest-based disturbances, including those emanating from land use change, leading to gains for taxpayers and better post-disturbance outcomes for landowners and society.
- A better understanding of the many impacts of forest-based disturbances on the economy, humans, and society, which will provide information to policy makers about the overall possible impacts from the implementation of new policies and forest management approaches.
- Better predictions of post-disturbance impacts of mitigation efforts, including on prices of timber, so that affected and unaffected landowners can more optimally plan salvage decisions.

Problem Area 2. Forest Management and Society

Research and accomplishments planned by emphasis area:

a. **Improve understanding of the effectiveness, efficiency, and equity of domestic taxes, policies, programs, and practices directed at forest management and forest landowners.**

i. *Federal, state and local taxes.* Federal, state and local tax regulations have the potential to influence all types of land ownership, but due to the intermittent nature of returns to timber management and largely financially uncompensated nature of ecosystem service provision, forestland is particularly affected by current and potential tax laws. We will continue to build on the previous research regarding the effect of federal tax policies on forests, forest management and forest landowners.

ii. *Policies and incentives directed at domestic private forest landowners.* Developing a more thorough understanding of the impacts of federal and other government policies that seek to alter forest management or improve forest landowner well-being is crucial to the provision of sustainable forests and ecosystem services from forests. We will evaluate the effectiveness, efficiency, and equity of proposed and existing subsidy, incentive or regulation policies to achieve their stated goals.

iii. *Policies impacting management of public forests.* Understand and describe how laws, directives, budgets, agency culture, collaborative decision-making, and other factors impact how public forest managers attempt to achieve agency objectives. Quantify the impacts on forest resources and communities in and around public forests.

iv. *Governance, management, and benefits received from community-based forest management.* Identify, inventory, and document key community forest characteristics. Classify community forests in the U.S. based on these key characteristics. Identify direct and indirect economic benefits and costs. Understand community forest governance, management, and use approaches that have had successes and failures in advancing rural opportunities and prosperity. Explore the relationships between key characteristics and rural prosperity.

b. **Develop knowledge of the effect of taxes, policies and programs which do not target forests specifically, on forests, forest management, and forest landowners.**
   i. *Federal policies that encourage/discourage development including tax provisions and transportation subsidies.* Policies enacted for completely independent purposes, such as improving interstate trade and transport, or encouraging single family home ownership, have the potential to alter the future landscape of forested areas in the US south and other regions. We will examine the impacts of these policies using econometric techniques and both public and private data sources to begin to quantify the effects of these non-forest-directed policies on sustainable forest management.

   ii. *Effects of policies and changes in policies that are primarily aimed at other natural resources, production, or pollution, including the Endangered Species Act, the Clean Water Act, the Clean Air Act, renewable energy policies, farm programs and incentives, and policies directed at climate change mitigation.* While these policies were not initially directed at forests and forest management, their impacts on forests can be important. We will build on existing research and continue to use the latest econometric and simulation techniques to determine both the intended and unintended consequences of these policies and programs.

c. **Improve understanding of the impact of international trade standards, policies and programs on the forest products sector and forest sustainability**
   i. *Forest certification and standards.* Numerous organizations and governments have developed standards with the intent to communicate to consumers that wood products are sourced from sustainably managed forests. Differences among standards makes compliance with international sustainability requirements difficult; additional analysis is needed to determine the impacts of these rules on U.S. and international forests and forest owners.

   ii. *Payments for ecosystem services.* Voluntary and compliance markets have emerged,

which pay some forest landowners for producing ecosystem services credits. These have had historically low demand, but grown in recent years. At the same time there have been significant barriers to entry in the market for suppliers, but recent programs attempting to scale up. We will attempt to identify, quantify, and understand the impacts of these markets.

iii. *Effect of other countries' renewable energy and climate policies.* Current energy and climate mitigation policies in other parts of the world may affect timber markets, timberland area, and sustainable forest management in the US South and nationally. An established supply chain, inexpensive wood supply, and subsidies for renewable energy will converge to change wood markets and forests as policies require countries to reduce their greenhouse gas emissions. We will work with both domestic and international partners to address these policy impacts using simulation analyses.

iv. *Illegal fiber sourcing.* Concern over trade in illegally logged wood products has led to revisions to US policies, and this concern will likely continue to affect international trade policies of the US and other countries. We will evaluate the effects of these policies on world trade and on forests of the countries in question, as policies change or as enforcement of these policies changes.

At this time, we have the resources to complete parts of each of the three sub-problems, with 1.4 total scientist-years devoted to this problem area.

Anticipated outcomes in Problem Area 2:

- Increased understanding of how forest certification and related forest management standards affect measures of forest sustainability and the effects of various domestic, bilateral, and multilateral efforts to address forest sustainability, leading to the design of policies and programs that more closely achieve desired sustainability outcomes.
- A better understanding of the effects of taxes, private forests incentive programs, and regulatory programs, which can potentially lead to increased landowner income and programs that achieve desired objectives.
- Better appreciation of the effects of the wood energy sector on forests of the United States and the markets for traditional timber and forest products globally; such enhanced understanding can lead to agreed international approaches to meeting global carbon emissions goals.
- Advanced understanding of how trade measures directed at illegal fiber sourcing can affect global markets and forest conditions, leading to policies that more capably lower overall illegal wood fiber flows internationally, higher domestic U.S. timber and wood prices that accrue to landowners and industry, and enhanced forest governance in countries with unsustainable and illicit actors in their forest sectors.

Problem Area 3. Markets and Trade

Research and accomplishments planned by emphasis area:

a. **Evaluate how changing technologies and the forest land base affect both domestic and international timber product supply and demand**.
   i. *Technology in the forest products sector.* By examining recent changes in silvicultural techniques and wood products production technologies, we will use econometric methods to quantify how such changes result in shifts in timber product supply and demand, and the implications of those shifts.

ii. *Changes in forest productivity domestically and globally.* Using data from global climate-vegetation models and information on forest investment, use domestic and global forest sector models to evaluate prospective futures of domestic and global forests and the forest product sector.

iii. *Effects of changes in forests on the forest sector.* Combining models and results of land use change models, forest conditions models, and global forest sector models, quantify how changes in driving variables (economic growth, population change, the agricultural sector, climate, public policies, etc.) can lead to changes in forest conditions and forest area and associated timber and forest product markets domestically and globally.

b. **Evaluate land use change in the United States under alternative modeling structures**

i. *Design new land use change models from Forest Inventory and Analysis plots.* Combine FIA data and hypothesized variables affecting land use to estimate new models that can be used in forest dynamics and forest product market models.

ii. *Estimate and evaluate alternative land use models that better quantify the economic value of non-forest land.* Update information on the returns to the subcomponents of agricultural and developed land uses to more accurately predict forestland change in response to market, climate, and policy variables.

iii. *Develop new data products for empirical analysis of forest land change.* Advance the use of fine-scale resolution data from remotely sensed observations to drive economic models.

c. **Develop greater understanding of the structure, size, value and impact of emerging, specialized, or informal markets, including non-timber forest products.**

i. *Describe market chains and market structure for lesser-known forest products.* Numerous non-timber forest products operate on the edge of the formal economy and are relatively undocumented. However, these economies can have a marked impact on communities and forest ecosystems. We will work to create a better understanding of the functioning of these economies.

ii. *Develop tools for assessing market size and economic values.* Given the informal nature of many NTFP markets, as well as emerging markets for new timber products, relatively little is known about their size and value.

d. **Develop understanding of how new products, such as those focused on wood for energy production, and their production technologies affect markets for traditional forest products, domestically and internationally.**

i. *Quantify how wood pellet markets for energy interact with traditional forest product markets.* With current data on prices and quantities of traditional timber products as well as wood pellets, we will evaluate how demand for both products affects the harvesting decisions of forest landowners. We will also compile information on policies that affect wood for energy production to characterize how these policy factors affect production for both domestic and international markets.

ii. *Evaluate the various available and potential technologies for wood-for-energy timber product outputs.* With information on technologies for wood pellet production, we will evaluate how wood pellet markets may more effectively compete with traditional timber product markets, and the market consequences of that competition.

e. **Advance the accuracy, solution speed, and scope of domestic and global forest sector models**

i. *Test how climate-driven changes in forest productivity affect future domestic U.S. and global market outcomes.* More accurate models include greater ability to model at finer spatial scales and therein facilitate spatial downscaling of market projection variables.

     ii. *Translate the language of domestic and global market models to computer code that is open access, so that the market models developed can be more readily used by external customers. Use these alternative models in policy analyses.* Greater openness can advance research productivity in the forest sector modeling community, to the benefit of the Forest Service in its many forest sector assessment efforts.

f. Evaluate how domestic and international trade policies affect U.S. imports, exports, and overall global trade
     i. *Quantify the effects of trade measures designed to discourage production, consumption, and trade in illegal wood and endangered forest species.* Apply a variety of statistical methods that can account for the effects of various countries' trade measures to evaluate how global flows, prices, consumption, and production of forest products are affected by these policies.
     ii. *Quantify the effects of trade frictions and trade agreements on domestic and global forest products trade.* Current and possible continued future trade frictions are likely to affect prices and consumption and production of forest products domestically, and such frictions are common globally. Statistical analyses can reveal the economic welfare, price, production, and consumption effects of these policies and describe the effects of proposed changes to such frictions.
     iii. *Contribute to forest assessments, such as the Resources Planning Act Assessment and regional forest assessments.* Accurate data gathering and reporting are needed to improve the accuracy and transparency of periodic assessments and market intelligence products. Advances in forest sector models depend on continuous improvements in modeling methods and data inputs.

At this time, we have the resources to complete parts of each of the four sub-problems, with 1.5 total scientist-years devoted to this problem area. However, completing the work proposed in this problem area on dataset improvements supporting reporting to international bodies and for use in forest sector modeling could require the creation of a new position within the current SRS-4804 Organizational Chart or could be filled within one of two currently vacant Research Economist positions in the current Organizational Chart.

Anticipated outcomes in Problem Area 3:

- Improved domestic and global forest sector models, which can more accurately replicate historical patterns and changes in production, consumption, and trade of timber products, allowing for better policy analyses and Resources Planning Act-mandated projections
- More accurate, higher resolution, and inter-model compatible land use models that can better support regional and national assessments, evaluate existing and proposed policies, and quantify the ecosystem service consequences of land use change
- Increased understanding of the wood-based bioenergy sector's role in the nation's forest sector, allowing for improved assessments of the evolution of the forest sector, more accurate quantification of the role that these products play in mitigation carbon emissions, and better analyses of the overall effects on markets and forests of proposed and existing policies and programs
- A better understanding of the role of illegal fiber sourcing, including illegal logging, and other unsustainable forest practices on the domestic U.S. and global forest sectors, which can aid in the assessment of the effects of existing and quantification of the effects of proposed future

policies and programs that target illegal fiber sourcing and damaging harvesting and utilization practices
- Enhanced appreciation and more accurate estimates of what might be expected, including effects on the domestic U.S. forest sector in the United States, of trade policies, including tariffs, quotas, and other non-tariff barriers
- More accurate and transparent data sets, improved forest sector data reporting to national and international bodies, and forest sector models that can more credibly project futures

11. ENVIRONMENTAL CONSIDERATIONS

The SRS-4804 program of research includes activities that are not expected to have a significant adverse effect on the quality of the human environment. The environmental effects of specific actions will be considered during the development of study plans, at which time the existence of extraordinary circumstances related to the proposed action and any categorical exclusions will be documented as a part of the study plan as described in FSH 1909.15, Chapter 30. For research involving the use of toxicants, environmental considerations will be further evaluated through Environmental Assessments or Environmental Impact Statements prepared with, and reviewed by, the cooperating District or Forest staffs. For research having the potential to affect a plant or animal species that is federally listed as endangered or threatened or proposed for such listing, RWU-4804 will consult with District or Forest biologists and the U.S. Fish and Wildlife Service as per Section 7 of the Endangered Species Act of 1973, as amended.

Key Cooperators: Research described in this document involves collaborations with individuals at universities in the US South and nationwide, private organizations, state and federal governments, analysts in international organizations, and scientists worldwide. Within the US Forest Service, this research involves collaboration with other Research Work Units at the Southern Research Station and other Stations, the RPA Assessment Team, State and Private Forestry, National Forests.

Southern Research Station:
>SRS-4353—Center for Forest Watershed Research
>SRS-4854—Eastern Forest Environmental Threat Assessment Center
>SRS-4855—Center for Integrated Forest Science
>SRS-4952—Integrating Human and Natural Systems
>SRS-4156—Center for Forest Disturbance Science
>SRS-4801—Forest Inventory and Analysis
>SRS-4703—Forest Operations
>SRS-4704—Utilization of Southern Forest Resources

Federal Agencies:
>USDA Forest Service, National Forest System
>USDA Forest Service, Research and Development, Washington Office, Inventory, Monitoring, and Assessment Research
>USDA Forest Service, Region 8, Regional Office, USDA Forest Service
>USDA Forest Service, Region 8, State and Private Forestry, Forest Health Protection
>USDA Forest Service, State and Private Forestry, Fire and Aviation Management
>USDA Forest Service, State and Private Forestry, Cooperative Forestry
>Department of the Interior

Department of State
USDA Forest Service, International Programs

Universities:
Land Grant and minority-serving institutions of higher learning, nationwide

State Agencies:
Southern Group of State Foresters
National Association of State Foresters
State natural resource and forestry agencies, nationwide

Private organizations:
AF&PA
The Nature Conservancy
Environmental Defense
NCASI

International organizations:
Food and Agricultural Organization of the United Nations
Economic Commission for Europe of the United Nations
World Bank

12/13. STAFF AND COSTS

The RWUD describes an ambitious five-year plan of work. Based on a proposed current staffing level of 4 scientists and 2 support personnel and the possible addition of one Scientist in the coming two fiscal years, we have enough research capacity to carry out research in all problem areas. Aside from one anticipated new Scientist, dataset improvement work that supports reporting to international bodies and for use in forest sector modeling could require the creation of a new position within the current SRS-4804 Organizational Chart or could be filled within one of two currently vacant Research Economist positions in the current Organizational Chart. Given that funding for the salaries and expenses (FRSE) for all current unit employees is assured, additional funding, both internal (FRRE) and external, competitively acquired, would extend our research impacts and further advance science through extramural research agreements. The unit has historically been successful in acquiring internal (FRRE) and external funds, directing them primarily to our research partners primarily at universities, but a risk facing the unit is that support of partnerships and research advances associated with them will not emerge.

Staffing Plan

There are currently four Scientists in the Unit, with two additional support staff. We anticipate the addition of one Scientist in this RWUD cycle (assumed here to be in FY 2023).

Problem Area	Scientist-years per year of the RWUD, by Fiscal Year				
	2022	2023	2024	2025	2026
1	1.10	1.40	1.40	1.40	1.40

2	1.40	1.50	1.50	1.50	1.50
3	1.50	2.10	2.10	2.10	2.10

Funding:

Research costs are divided into salary and expenses (FRSE), FS research (FRRE), and external, the latter two categories uncertain and competitively acquired.

	Funding ($ Million) by Fiscal Year				
	2022	2023	2024	2025	2026
FRSE	0.85	0.98	1.02	1.06	1.09
FRRE	0.20	0.20	0.20	0.20	0.20
External	0.10	0.10	0.10	0.11	0.11
Total	1.15	1.29	1.32	1.36	1.40