

Resource Availability and Coordination for Prescribed Fire Use across Significant Geographic Areas of Longleaf Pine

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Abstract. The need for prescribed fire use is becoming increasingly evident and recognized throughout the southeastern United States. Due to the tight fiscal environment and increased costs of fire suppression, more emphasis is being placed on the efficiency and effectiveness of prescribed fire efforts. Researchers have focused on identifying impediments to prescribed fire implementation in multiple geographic regions and have cited the potential for collaboration to ensure successful implementation. To gain insight into opportunities for collaboration, we conducted a broad multi-state investigation into the inventory of prescribed fire resources and coordination between state and federal governmental agencies as well as non-governmental organizations in the Southeast longleaf pine region. We surveyed key stakeholders across nine states to determine opportunities for large-scale resource sharing and increased coordination to address air quality concerns. We map current prescribed fire large-scale equipment and air quality concerns, identify prescribed fire resource needs, and offer opportunities for future prescribed fire collaborations.

Keywords: prescribed fire, smoke management, partnerships, resource needs

Introduction

Longleaf pine was once prevalent across the landscape of the southeastern United States. Frequent burning of the landscape maintained and enhanced the longleaf pine ecosystem (Glitzenstein *et al.* 1995). Once covering 90 million acres, the longleaf pine ecosystem had declined to approximately 3 million acres by the late 1990's due to a variety of factors (Longleaf Partnership Council 2014). However, due in part to the efforts of a range-wide partnership, longleaf pine has begun to increase in acreage over the last decade (Longleaf Partnership Council 2014). This partnership effort, which includes numerous state and federal agencies and non-governmental organizations (NGOs) throughout the Southeast, seeks to increase longleaf pine to 8 million acres by 2025 (Regional Working Group for America's Longleaf 2009). Since the longleaf pine ecosystem is fire dependent, increased prescribed fire resources and coordination will be necessary to maintain and to enhance the projected increase in acreage. The Southeastern Regional Partnership for Planning and Sustainability's (SERPPAS) Prescribed Fire Work Group was formed to help implement the region-wide application of prescribed fire at the scale and frequency needed to establish and to maintain the additional acreage of longleaf pine called for in the Range-Wide Conservation Plan (Regional Working Group for America's Longleaf 2009).

The SERPPAS Prescribed Fire Work Group includes representatives from state and federal forestry, wildlife, and environmental agencies, academic institutions, and NGOs who work closely with prescribed fire and/or longleaf pine. The Work Group identified eight goals as benchmarks to achieve 8 million acres of longleaf pine by 2025. Goals include ensuring sufficient resources; implementing effective private landowner communication and education campaigns to increase awareness of prescribed fire and willingness to burn; increasing the number of qualified burners; minimizing liability; providing support for prescribed fire programs on public lands; minimizing smoke impacts on air quality by maximizing coordination between air and fire communities; implementing a consistent fire activity and emissions tracking system; and ensuring coordination and collaboration at the regional, state, and local levels (Burke *et al.* 2012a). The Work Group's goals dovetail with the main impediments to implementing prescribed fire in the Southeast, which include limited capacity (i.e., personnel, training, private contractors, partnerships, and equipment), liability concerns, and air quality/smoke management challenges (Melvin 2012).

Currently, the capacity to burn rests with local, state, and federal natural resource agencies, NGOs (such as The Nature Conservancy and The Longleaf Alliance), and private consultants and landowners. In the nine states located within the longleaf pine range, state forestry agencies, not air quality agencies, issue the permits for the states that require burn permits. Ideally, forestry agencies work closely with air quality agencies to manage the timing and quantity of emissions to be released. However, given the different missions of land management agencies and air quality agencies (i.e., ecosystem health vs. air quality and public health), forest management policies can conflict with air quality objectives. For example, multiple burn permits may be given in one location that may impact air quality in another location. Prescribed burning causes air quality concerns for two main reasons: public health and safety. Smoke from prescribed fires contains both fine particulate matter (PM_{2.5}) and ozone precursors, which can negatively affect human health and reduce visibility (Burke *et al.* 2012b).

In 2013, prescribed burns were conducted on an estimated 135,000 acres of privately owned longleaf pine (Longleaf Partnership Council 2014). America's Longleaf Restoration Initiative's Partnership Council's goal is to increase prescribed burning in longleaf ecosystems on private lands by between 280,000 to 360,000 acres annually by 2015 (Strategic Priorities and

Actions 2013). Given the barriers to implementing prescribed fire and the call for increased prescribed burning within the southeast, relevant stakeholders must work together to implement a strategy at the magnitude and frequency needed to maintain and to expand longleaf pine ecosystems. Uncoordinated efforts can lead to inefficient use of resources, inability of natural resource agencies to meet their common goals, and decreased air quality.

Many studies have reviewed what makes initiatives succeed. Agreeing on common rules and practices, coordinating usage, engaging in conflict resolution, negotiating various tradeoffs, sharing information, and building common knowledge provide for better management of resources (Folke *et al.* 2005). Collaboration can range from information sharing, coordinating services, and sharing of services and resources to joint planning and action (Bryson *et al.* 2006; Langman and McLaughlin 1993; Orr 1999; Wondolleck and Yaffee 2000). Although collaborative efforts have often been cited as helping initiatives to succeed (Gruber 2010; Moore 2011), little to no research has been conducted specific to prescribed fire collaboration. While research efforts have considered impediments to implementing prescribed fire (Melvin 2012; North *et al.* 2012; Quinn-Davidson and Varner 2012; Penman *et al.* 2011), a need exists for a broad multi-state investigation into the inventory of prescribed fire resources and actual coordination among state, federal agencies, and NGOs in the longleaf pine region. This study examines current prescribed fire resources and collaboration across the Southeastern United States. The following goals were established for this study:

- To determine opportunities for large-scale resource sharing in the longleaf pine region,
- To examine the degree to which agencies and organizations are coordinating to address prescribed fire-related air quality concerns, and
- To identify opportunities for collaboration between agencies and organizations not currently engaged in collaborative management.

With adequate knowledge of prescribed fire resources and collaboration, land managers will have a better opportunity to apply prescribed fire to efficiently meet their land management objectives without negatively impacting air quality.

Methodology

In January-February 2014, online surveys were distributed to key air quality and prescribed fire stakeholders in each of the nine states containing longleaf pine, including Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas. The air quality survey was designed to gain information about existing collaborative efforts among agencies to address air quality concerns in relation to prescribed fire, while the prescribed fire survey focused primarily on large scale equipment used for prescribed burning and which could potentially be used for prescribed fire resource sharing in the future.

The original list of key stakeholders for survey distribution was populated using agency and organization websites, prescribed fire council websites for each state, and suggestions made by the SERPPAS Prescribed Fire Work Group. Initial contact was made with study participants via email or telephone to introduce the purpose of the study and to solicit participation. The survey was administered using Qualtrics, a web-based tool for building surveys. Similar to research from Nulty (2008), an increased response rate was sought by reminding participants about the survey,

making the survey easy to access through a URL sent directly to them, and informing participants that their responses were useful. After the original report was published in March 2014, more participants came forth with additional data, which were subsequently included in this revised August 2014 report.

Air Quality

The air quality survey was sent to representatives from each of the state air quality agencies within the nine longleaf pine states. One representative from each state air quality agency was surveyed. The state air quality agencies included Alabama Department of Environmental Management, Air Division; Florida Department of Environmental Protection, Division of Air Resource Management; Georgia Department of Natural Resources, Environmental Protection Division; Louisiana Department of Environmental Quality, Air Permits Division; Mississippi Department of Environmental Quality; North Carolina Division of Air Quality; South Carolina Department of Health and Environmental Control, Bureau of Air Quality; Texas Commission on Environmental Quality; and Virginia Department of Environmental Quality. Questions within the air quality survey focused primarily on the following areas:

- Agencies currently working together to address air quality concerns during prescribed fire operations,
- Locations of concern for particulate matter and ozone near large forested parcels, and
- Limitations for addressing prescribed fire air quality concerns (i.e., personnel, equipment, communication between agencies, coordination between agencies, technology, etc.).

The survey contained text boxes and “other” categories to provide respondents with a better opportunity to respond more completely to the survey.

Air quality survey responses were mapped using ArcGIS 10.1 (ESRI 2012). The air quality cooperation layer was created utilizing results from this study. A base map was obtained from ESRI (2012). Additional data layers were added to the GIS maps to include state boundaries (US Census Bureau: <http://www.census.gov/geo/maps-data/data/tiger-line.html>), longleaf pine range (USGS: <http://esp.cr.usgs.gov/data/little/>), US FWS lands (US FWS Simplified Boundaries: <http://www.fws.gov/GIS/data/cadastralDB/index.htm>), Significant Geographic Areas (SGAs) for longleaf pine (Regional Working Group for America’s Longleaf 2009), prescribed fire activity (Melvin 2012), ozone non-attainment areas within the Southeast (EPA: http://www.epa.gov/oaqps001/greenbk/gis_download.html) and PM2.5 non-attainment areas within the Southeast (EPA: http://www.epa.gov/oaqps001/greenbk/gis_download.html).

Prescribed Fire

The prescribed fire survey was sent to representatives from state and federal agencies and NGOs that utilize prescribed fire within each of the nine longleaf pine states. The surveyed entities included the U.S. Forest Service, U.S. Fish and Wildlife Service, National Park Service, state forestry and wildlife agencies, The Nature Conservancy, and The Longleaf Alliance. In some instances more than one representative provided responses from each agency since the surveys were designed to gather information from each state and/or management area. The survey focused primarily on large scale equipment that could be used for conducting prescribed fires and

prescribed fire resource sharing. Surveys requested information such as type and amount of large-scale prescribed fire equipment, types of equipment needed for prescribed fire operations, and prescribed fire resource sharing agreements. The survey contained text boxes and “other” categories to provide respondents with a better opportunity to respond more completely to the survey. Once all responses were received, data were aggregated by state.

Prescribed fire survey responses were mapped using ArcGIS 10.1 (ESRI 2012). The equipment layer was created utilizing results from this study. Results were summarized by state without differentiating between agencies. Points were placed based on the locations that each agency provided in their survey responses. Any response listed as “statewide” resulted in a point placed in the state capital, although that is likely not the location where the equipment is actually housed. Four points from the National Park Service were not included on the map, as specific locations were not provided. A base map was obtained from ESRI (2011). Additional data layers were added to the GIS maps, including state boundaries (US Census Bureau: <http://www.census.gov/geo/maps-data/data/tiger-line.html>), USFWS lands (USFWS Simplified Boundaries: <http://www.fws.gov/GIS/data/cadastralDB/index.htm>), and SGAs for longleaf pine (Regional Working Group for America’s Longleaf 2009).

In addition to the prescribed fire survey, a list of memorandums of understanding (MOU) which incorporate some aspect of prescribed fire throughout the longleaf pine range was developed by searching the Internet in concert with the knowledge and expertise of members of the SERPPAS Prescribed Fire Work Group.

Results

Air Quality

All nine state air quality agencies participated in this survey. Existing collaboration between state air quality agencies and other agencies and organizations can be seen in Table 1. In all states, survey responses depict active collaboration between state air quality agencies and their respective state forestry agencies. Some states also have collaboration between their respective state wildlife agencies as well as other federal agencies, industries, NGOs, and in two instances the general public.

State	State Forestry	Federal Forestry	State Wildlife	Federal Wildlife	Industry	NGO	Public
Alabama	x						
Florida	x						
Georgia	x	x	x	x			
Louisiana	x	x	x	x	x	x	
Mississippi	x						
North Carolina	x	x				x	x
South Carolina	x	x			x	x	x
Texas	x		x			x	
Virginia	x						

Table 1. Existing collaboration between state air quality agencies and other agencies, organizations, and the public within the nine longleaf pine states

Survey responses depict active collaboration between state air quality agencies and other entities. Areas of concern and limitations for addressing prescribed fire related air quality concerns were noted. Specific areas of concern were identified by Florida, Georgia, South Carolina, and Virginia for particulate matter and ozone near large forested areas in the survey responses. A total of eight states have either ozone or PM2.5 non-attainment areas either inside the state or touching the state. Figure 1 depicts a map containing the SGA's, non-attainment areas of both PM2.5 and ozone, prescribed fire activity (Melvin 2012), and existing collaboration between state air quality agencies and others. The only state that does not have ozone or PM2.5 non-attainment areas is Florida. Louisiana, Alabama, and Georgia have non-attainment areas for ozone or PM2.5 either in the longleaf pine range or touching the longleaf pine range. In addition to the information provided on the map, survey responses indicate that limitations for state air quality agencies related to air quality concerns include personnel, equipment, technology, and coordination.

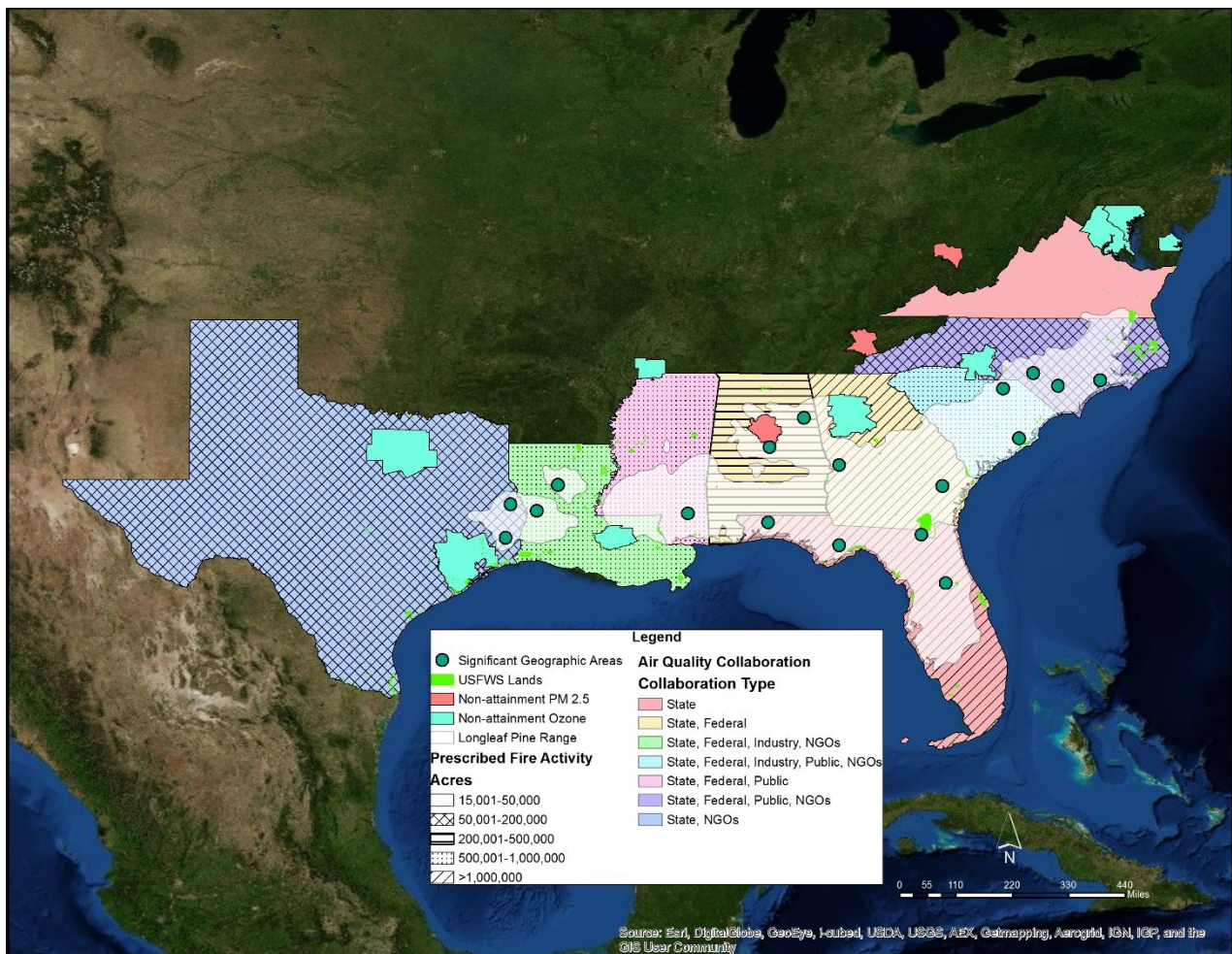


Figure 1. Existing air quality collaborations, SGAs for longleaf pine, USFWS lands, ozone and PM2.5 non-attainment areas, and acres of prescribed fire activity within the nine states historically containing longleaf pine

Prescribed Fire

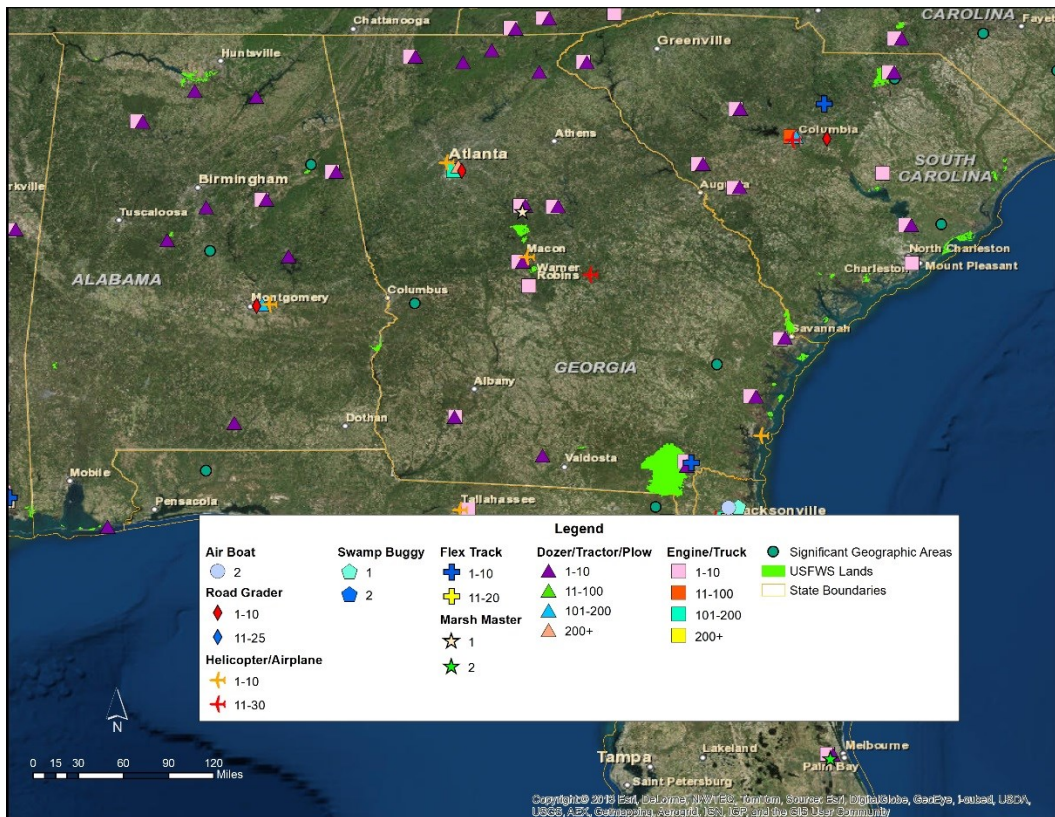
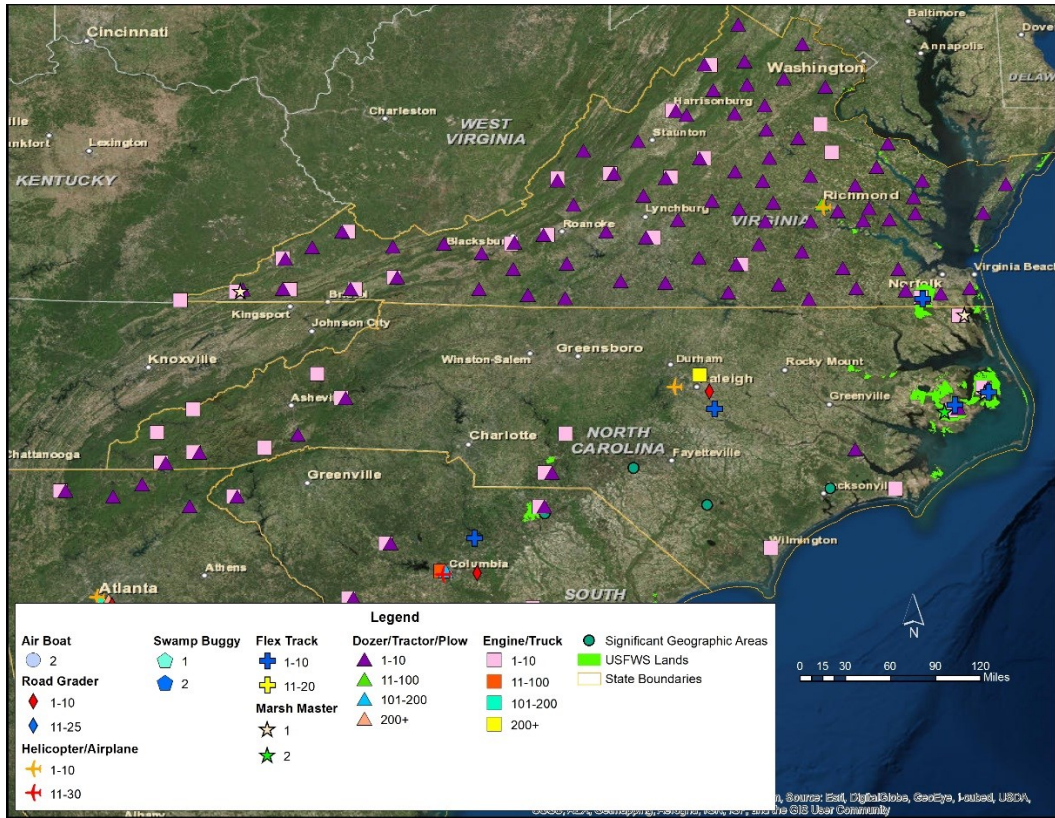
We did not receive responses back from all agencies; thus results are not comprehensive. However, input was received by at least one agency and/or organization for each of the nine longleaf pine states. Data were aggregated for each entity by state, producing the following categories:

- Type and number of large scale prescribed fire equipment owned,
- Equipment needs for prescribed fire operations, and
- Prescribed fire resource sharing.

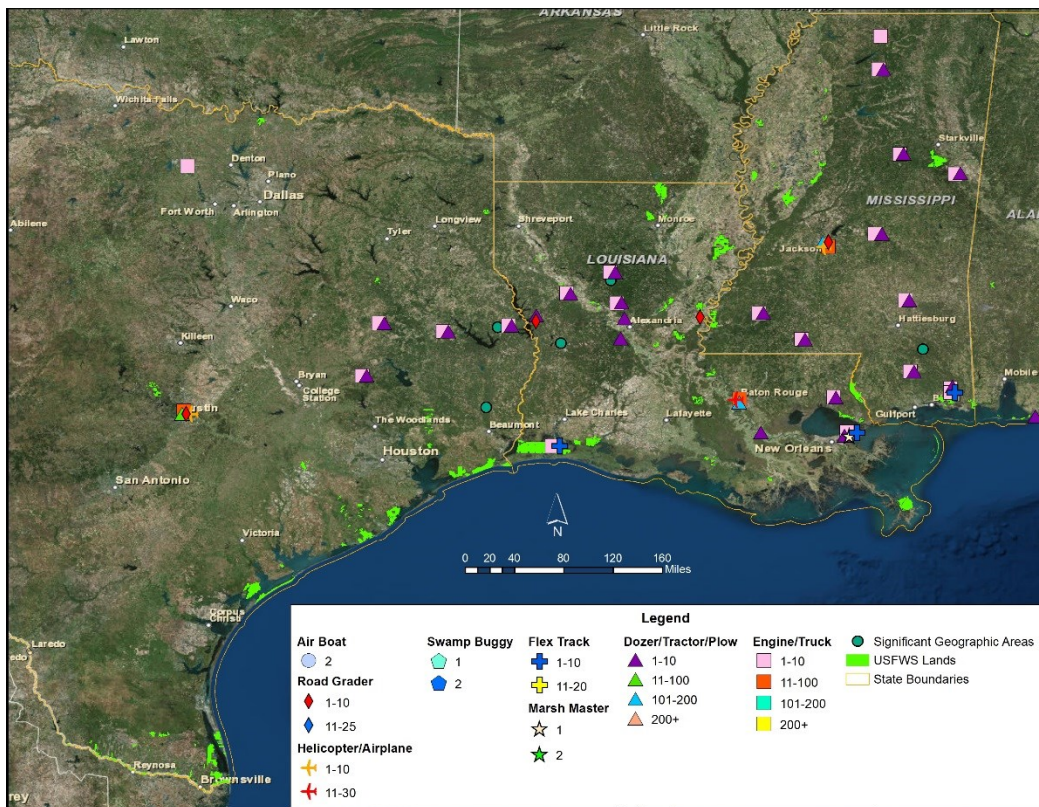
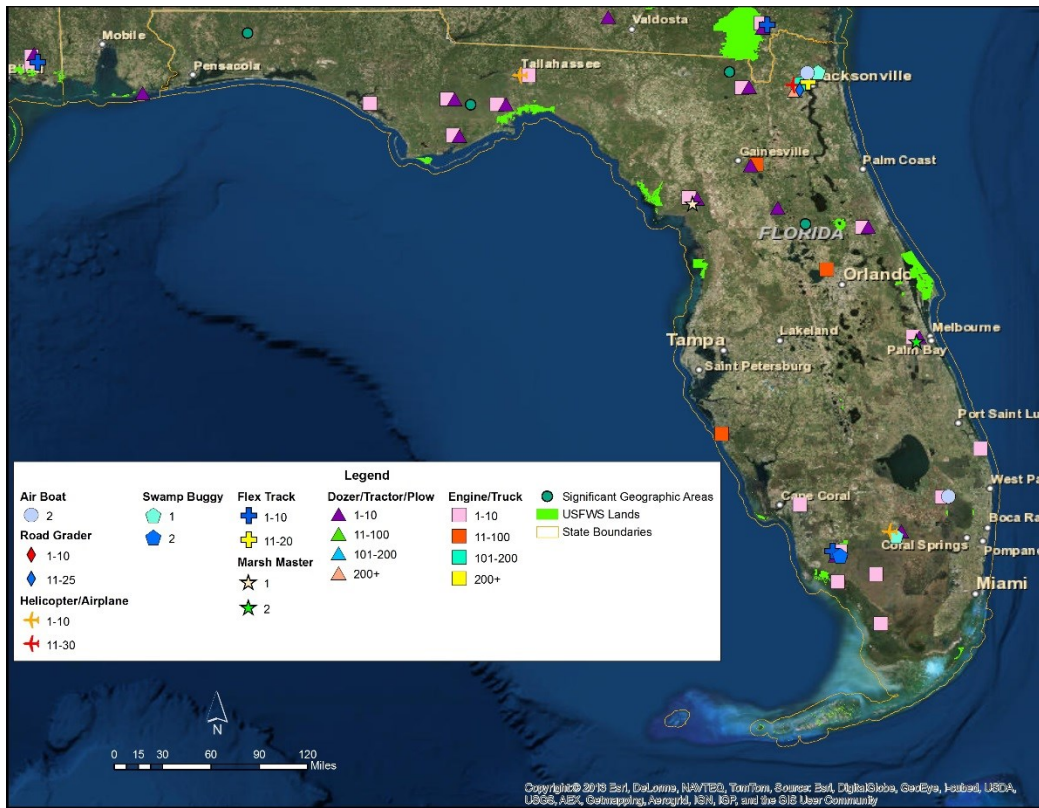
The table provided in Appendix A contains the existing large scale prescribed fire equipment owned by agencies and organizations, and is shown by state. Large scale equipment is only listed in the table if the agency/organization noted the location of the equipment by state, district, or county. Although not included in the table, The National Park Service reported to have 16 Type 6 engines, two Type 3 engines, two tracked masticators, and six fire suppression swamp buggies across the Southeast. The two most noted prescribed fire resources by participants in this survey were dozers/tractors/plows and engines/trucks. Figures 2 through 5 display the large scale prescribed fire equipment by state for agencies and organizations who participated in the survey. A point was placed in the capital for responses in which equipment was denoted as “statewide.” The maps only depict information obtained from survey participants, and are not considered to be comprehensive.

Prescribed fire resource needs were also identified in the survey. Resource needs consisted of personnel and various types of equipment. Appendix B displays the resource needs identified by agency and organization. Needs were only included in the table for agencies and organizations that specified a need by state, district, or county (as opposed to regional needs). The two most common needs identified were personnel and engines/trucks.

Survey responses indicate that prescribed fire collaboration exists among agencies and organizations (Appendix C). All nine longleaf pine states currently have some type of collaboration for prescribed fire. The major collaborators based on survey responses are state and federal agencies, and NGOs. Appendix D identifies the specific collaborators based on existing Prescribed Fire Memorandums of Understanding (MOUs).



Figures 2 (top) and 3 (bottom). Prescribed Fire Equipment Resources by State for VA, NC, SC, GA, and AL



Figures 4 (top) and 5 (bottom). Prescribed Fire Equipment Resources by State for FL, MS, LA, and TX

Discussion

Air Quality

Collaboration between the air and fire communities currently exists within all nine longleaf pine states. However, there is potential for greater collaboration within each of the states. One important opportunity for collaboration is with the public. With the need for prescribed fire growing due to increased longleaf pine and prevention of catastrophic wildfires, the public must be included. Between-state collaboration will also be very important. Smoke from prescribed fires does not stay within agency, organizational, or political boundaries. Adjacent states containing non-attainment areas may be able to collaborate with neighboring states to ensure that smoke from one state does not affect the non-attainment areas of another.

Prescribed Fire

As can be seen from Appendix C, many of the agencies and organizations responding to the survey have prescribed fire resource needs. Resource needs are listed in Appendix B. However, caution must be taken when considering whether the resource needs may be fulfilled simply by collaborating. Collaboration among agencies and organizations is already occurring in all of the states at some level. Furthermore, resources are often needed in states at the same time and are used for fighting wildfires in addition to conducting prescribed burns. Based on the responses, there is still an identifiable need for additional resources in the form of personnel, trucks/engines, and dozers/plows. The need for more personnel might provide an opportunity for more agencies and organizations to partner with nearby universities where wildlife and forestry students are interested in learning effective land management techniques, or with neighboring agencies who are already conducting prescribed burns.

MOUs may take months or years to complete due to the multiple agencies involved, especially with the liability of prescribed fires. However, with the number of MOU's already in place (Appendix D) agencies and organizations only need to look to their prescribed fire counterparts for help. Developing a template for MOU's to address prescribed fire concerns could help speed up the process for effective collaboration. A potential template for a prescribed fire MOU can be seen in Appendix E. The potential template MOU was taken from the MOU among USFWS (GA Ecological Services), USFWS (Piedmont National Wildlife Refuge), GA Forestry Commission, GA Department of Natural Resources, TNC (GA Chapter), Project Orianne, LTD., and USFS (Chattahoochee/Oconee National Forests). This MOU was chosen as a possible template since it includes state, federal, and NGO cooperators and provides specific, yet brief, guidelines for cooperators to include liability.

Conclusion

With the given obstacles to implementing prescribed fire, there is a clear need for effective and efficient use of resources. Results from this survey show that although many collaborative efforts are currently in place for prescribed fire in the longleaf pine range, more resources are needed. Although collaboration with new partners has the potential to help some prescribed fire challenges such as lack of personnel, more resources will likely be needed. Much of the prescribed

fire equipment in the Southeast is used during the same time period (prescribed fire season). Furthermore, large-scale equipment can be expensive to move. As longleaf pine restoration efforts and catastrophic wildfire prevention efforts are scaled up, more resources will be needed in the longleaf pine range. Future research could include determining how collaboration can be more efficiently developed and whether existing collaborative efforts can be made more effective.

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References

- Burke, C., Steelman, T., Gharis, L. (2012a). Comprehensive strategy for prescribed fire to restore longleaf pine in the Southeast United States: A Vision for 2025. Regional Readiness Cooperative. August. 35 pp.
- Burke, C., Steelman, T., Serenari, C. (2012b). Synthesis Report: Current Work on Prescribed Fire Related to Longleaf Pine Restoration. Regional Readiness Cooperative. April. 27 pp.
- Bryson, J., Crosby, B., Stone, M. (2006). The design and implementation of cross-sector collaborations: Propositions from the literature. *Public Administration Review*, (Special Issue), 44-55.
- ESRI 2012. ArcGIS Desktop: Release 10.1. Redlands, CA: Environmental Systems Research Institute.
- Folke, C., Hahn, T., Olsson, P., Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources*, 30:441-473.
- Glitzenstein, J., Platt, W., Streng, D. (1995). Effects of fire regime and habitat on tree dynamics in North Florida longleaf pine savannas. *Ecological Monographs* 65:441-476.
- Gruber, J. (2010). Key principles of community-based natural resource management: A synthesis and interpretation of identified effective approaches for managing the commons. *Environmental Management*, 45:52-66.
- Langman, J., McLaughlin, M. (1993). Collaborate or Go It Alone? Tough Decisions for Youth Policy. In S. B. Heath and M. W. McLaughlin (eds.), *Identity and Inner-City Youth*. New York: Teachers College Press.
- Longleaf Partnership Council. (2014). 2013 Range-wide accomplishment report. America's Longleaf Restoration Initiative.
- Melvin, M. (2012). National prescribed fire use survey report. Coalition of Prescribed Fire Councils. Technical Report 01-12.
- Moore, T., Lonsdorf, E., Knutson, M., Laskowski, H., Lor, S. (2011). Adaptive management in the U.S. National Wildlife refuge system: Science management partnerships for conservation delivery. *Journal of Environmental Management*, 92:1395-1402.

- North, M., Collins, B., Stephens, S. (2012). Using fire to increase the scale, benefits, and future maintenance of fuels treatments. *Journal of Forestry*, 110:392-401.
- Nulty, D. (2008). The adequacy of response rates to online and paper surveys: what can be done? 33:301-314.
- Orr, M. (2001). Community colleges and their communities: Collaboration for Workforce development. *New Directions for Community Colleges*, 115:39-49.
- Penman, T., Christie, F., Andersen, A., Bradstock, R., Cary, G., Hendersen, M., Price, O., Tran, C., Wardle, G., Williams, R., York, A. (2011). Prescribed burning: How can it work to conserve the things we value? *International Journal of Wildland Fire*, 20:721-733.
- Quinn-Davidson L., Varner, J. (2012). Impediments to prescribed fire across agency, landscape and manager: an example from northern California. *International Journal of Wildland Fire*, 21:210-218.
- Regional Working Group for America's Longleaf. (2009). Range-Wide Conservation Plan for Longleaf Pine. America's Longleaf Restoration Initiative.
- Strategic Priorities and Actions 2013-2015. (2013). America's Longleaf Restoration Initiative.
- Wondolleck, J., Yaffee, S. (2000). *Making collaboration work: Lessons from innovation in natural resource management*. Washington DC: Island Press.

Appendix A. Large Scale Prescribed Fire Equipment by State

State	Agency	Helicopters/ Airplanes	Dozers/ Plows/ Tractors	Road Graders	Engines/ Trucks	Air Boat	Swamp Buggy	Flex Track	Marsh Master
Alabama	Forestry Commission	0	120	0	0	0	0	0	0
Alabama	Parks Division	0	4	0	0	0	0	0	0
Alabama	US Fish & Wildlife Service	0	1	0	0	0	0	0	0
Alabama	US Forest Service	1	10	0	3	0	0	0	0
Alabama	Wildlife and Freshwater Fisheries	0	7	7	0	0	0	0	0
Florida	Forest Service	27	281	25	101	2	1	19	0
Florida	National Park Service	2	0	0	4	0	0	0	0
Florida	Park Service	0	4	0	71	0	0	0	0
Florida	Seminole Tribe	1	4	0	0	0	1	0	0
Florida	US Fish & Wildlife Service	0	9	0	15	2	2	1	3
Florida	US Forest Service	1	10	0	6	0	0	0	0
Georgia	Forestry Commission	14	350	0	100	0	0	0	0
Georgia	Jones Ecological Research Center	0	1	0	1	0	0	0	0
Georgia	Natural Resources	2	0	0	2	0	0	0	0
Georgia	Natural Resources, Forest Management	2	7	5	0	0	0	0	0
Georgia	State Parks	0	2	0	0	0	0	0	0
Georgia	The Nature Conservancy	0	0	0	1	0	0	0	0
Georgia	US Fish & Wildlife Service	0	10	0	8	0	0	1	1
Georgia	US Forest Service	1	4	0	2	0	0	0	0
Louisiana	Agriculture and Forestry	12	104	0	20	0	0	0	0
Louisiana	The Nature Conservancy	0	1	0	1	0	0	0	0
Louisiana	US Fish & Wildlife Service	0	1	0	4	0	0	3	1
Louisiana	US Forest Service	2	9	0	4	0	0	0	0
Louisiana	Wildlife and Fisheries	0	13	2	0	0	0	0	0
Mississippi	Forestry Commission	0	120	0	35	0	0	0	0
Mississippi	National Park Service	0	0	0	1	0	0	0	0
Mississippi	The Nature Conservancy	0	0	0	1	0	0	0	0
Mississippi	US Fish & Wildlife Service	0	4	0	8	0	0	2	0
Mississippi	US Forest Service	3	10	0	11	0	0	0	0
Mississippi	Wildlife, Fisheries, & Parks	0	7	5	0	0	0	0	0
North Carolina	Forest Service	5	100	0	250	0	0	2	0

Appendix A. Large Scale Prescribed Fire Equipment by State (Continued...)

State	Agency	Helicopters/ Airplanes	Dozers/ Plows/ Tractors	Road Graders	Engines/ Trucks	Air Boat	Swamp Buggy	Flex Track	Marsh Master
North Carolina	National Park Service	1	0	0	0	0	0	0	0
North Carolina	The Nature Conservancy	0	0	0	5	0	0	0	0
North Carolina	US Fish & Wildlife Service	0	5	0	8	0	0	4	5
North Carolina	US Forest Service	1	6	0	10	0	0	0	0
North Carolina	Wildlife Resources Commission	0	12	6	20	0	0	0	0
South Carolina	Forestry Commission	11	150	2	26	0	0	3	0
South Carolina	US Fish & Wildlife Service	0	3	0	5	0	0	0	0
South Carolina	US Forest Service	2	8	0	9	0	0	0	0
Texas	TX A&M Forest Service	0	96	2	11	0	0	0	0
Texas	TX Parks & Wildlife	0	0	0	6	0	0	0	0
Texas	US Forest Service	2	8	0	5	0	0	0	0
Virginia	Department of Forestry	4	91	0	10	0	0	0	0
Virginia	Game and Inland Fisheries	0	20	0	0	0	0	0	0
Virginia	National Park Service	0	0	0	1	0	0	0	0
Virginia	US Fish & Wildlife Service	0	1	0	2	0	0	1	1
Virginia	US Forest Service	1	5	0	7	0	0	0	0

*If no number was provided by the agency/organization completing the survey, then a zero was entered into the table. Information was only included for those agencies and organizations which responded to the survey.

Appendix B. Resource Needs by Agency

State	Agency	Helicopters/ Airplanes	Dozers/Plows	Engines/Trucks	Personnel
Alabama	State Parks	x		x	x
Alabama	Wildlife & Freshwater Fisheries		x		
Florida	Forest Service		x	x	x
Florida	Park Service	x	x	x	x
Florida	Seminole Tribe				x
Florida	The Longleaf Alliance			x	x
Georgia	Forestry Commission				
Georgia	Jones Ecological Research Center		x	x	x
Georgia	Natural Resources			x	x
Georgia	Natural Resources, Forest Management	x	x	x	x
Georgia	State Parks			x	x
Georgia	The Nature Conservancy			x	x
Louisiana	The Nature Conservancy		x	x	x
Louisiana	Wildlife and Fisheries				x
Mississippi	Fisheries and Parks		x		x
Mississippi	Forestry Commission		x	x	x
Mississippi	The Nature Conservancy		x	x	x
North Carolina	Forest Service				x
North Carolina	The Nature Conservancy	x	x	x	x
North Carolina	Wildlife Resources Commission	x	x	x	x
South Carolina	Forestry Commission		x	x	x
Texas	TX A&M Forest Service			x	x
Texas	TX Parks and Wildlife		x	x	x
Texas	The Nature Conservancy			x	x
Virginia	Department of Forestry		x	x	x
Virginia	Game and Inland Fisheries				x

* Information was only included for those agencies and organizations which responded to the survey.

Appendix C. Existing Collaboration for Prescribed Fire

State	State Agencies	Federal Agencies	Academic Institutions	NGOs	Other
Alabama	x		x	x	
Florida	x	x		x	x
Georgia	x	x		x	x
Louisiana	x	x			
Mississippi		x		x	
North Carolina	x	x		x	
South Carolina		x			
Texas	x	x	x	x	x
Virginia	x	x		x	

* Information was only included for those agencies and organizations which responded to the survey.

Appendix D. Existing Prescribed Fire Memorandums of Understanding

Parties	Date	Prescribed Fire Description	Area
AL Forestry Commission, The Nature Conservancy (TNC) of Alabama, Auburn University, University of North Alabama	Current	Share prescribed fire resources	Alabama
Florida Park Service/Florida Dept of Environmental Protection, Forest Service, TNC, USFWS, and others	Current	Share prescribed fire resources	Florida
USFWS and USDA NRCS	Current	Provides guidance and outlines procedures the parties agree to follow with respect to planning and implementing prescribed burning for wetland habitat restoration purposes	Florida
Department of Defense, Florida Dept. of Environmental Protection, Florida Forest Service, Florida Fish and Wildlife Conservation Commission, The Longleaf Alliance, National Park Service, NW Florida Water Management District, National Forests in Alabama, TNC, Nokuse Plantation, and Westervelt Ecological Services	Current	Share prescribed fire resources	Florida & Alabama
TNC, USDA, Longleaf Alliance, Georgia Dept. of Natural Resources, Forest Management Unit	Current	Share prescribed fire resources	Georgia
USFWS (Georgia Ecological Services and Piedmont National Wildlife Refuge), Georgia Forestry Commission, Georgia Department of Natural Resources, TNC, Project Orianna LTD., USDA USFS	Current	Provide personnel and equipment for: technical assistance of burn plans, pre-burn preparations, burn implementation, post-burn monitoring and evaluation	Georgia
Kisatchie National Forest and Louisiana Department of Agriculture and Forestry	Current	Share resources for crucial ecosystem restoration and hazardous fuel reduction through the use of prescribed fire	Louisiana
TNC and USFWS	Current	Share crews, equipment, technical assistance for prescribed fire planning, fire effects monitoring and prescribed fire to expand capabilities to restore or maintain ecosystems through multiple projects on or around National Wildlife Refuge System lands, TNC Preserves, and other common priority areas across the country	National
US DOI, BLM, USFWS, NPS, USDA FS	Current	Enhance stewardship of federal lands and resources; agency may share resources, including equipment and facilities	National
The Nature Conservancy, NC Department of Environment and Natural Resources (DENR)/Division of Parks and Recreation, NC Wildlife Resources Commission (WRC)	Current	Personnel, equipment, and other resources may be provided by parties to assist in conducting prescribed fire and exotic species management	North Carolina
US DOI NPS Blue Ridge Parkway, NC WRC, NC DENR/Division of Parks and Recreation, TNC	Current	Allow adjoining land management agencies to conduct prescribed fires on property owned and managed by the Blue Ridge Parkway and to share resources concerning prescribed burning and ecosystem restoration techniques where permitted	North Carolina
DOI	Through 9/30/2012	To conduct a prescribed burn to achieve restoring, protecting, or enhancing resources within a watershed	South Carolina
TNC, DOI, Texas A&M Forest Service, Texas Parks & Wildlife	Current	Share prescribed fire resources	Texas
Virginia Dept of Game and Inland Fisheries, TNC, Dept of Conservation and Recreation, USFWS, USFS	In-Progress	Shared prescribed fire resources	Virginia

Appendix E. Sample Memorandum of Understanding (Duplicate of MOU among USFWS (GA Ecological Services), USFWS (Piedmont National Wildlife Refuge), GA Forestry Commission, GA Department of Natural Resources, TNC (GA Chapter), Project Orianna, LTD. and USFS (Chattahoochee/Oconee National Forests))

MEMORANDUM OF UNDERSTANDING

Among

THIS MEMORANDUM OF UNDERSTANDING (hereinafter referred to as "Understanding") is made and entered into on the ___ day _____, 20___, among _____ and _____, _____, and _____ (here after referred to as "Cooperator(s)").

The purpose of this Understanding is to provide the Cooperators an opportunity to share equipment and personnel to achieve each Cooperators' burn objectives. The goal of this Understanding is to ensure that fire is effectively applied to fire dependent habitats and to facilitate the Cooperators' use of prescribed fire to maintain or restore wildlife habitats and fire dependent ecosystems and habitats beneficial to endangered or threatened species. Through this Understanding, prescribed fire will be an effective management tool that can be applied to the landscape using the highest safety standard in the industry, National Wildfire Coordinating Group (NWCG). This Understanding will facilitate training of the NWCG standards.

The Understanding would not commit the Cooperators to any actions but it would facilitate the sharing of resources when facilitation would be helpful to achieve management goals. Sharing resources will reduce the cost of all Cooperators by reducing the amount of staff that must be trained and the amount of equipment that must be maintained to conduct the management goals of all Cooperators. Utilizing the personnel and equipment of Cooperators will reduce mobilization cost when managing resources across the state. Cooperators shall develop and implement a voluntary and cooperative stewardship strategy to sustain the long-term viability of native plants and animals, the integrity of ecosystems, the production of commodities and ecosystem services, and the human communities that depend upon all of them.

The Cooperators enter into this Understanding under the authority of the Fish and Wildlife Coordination Act of 1934 (16 US 761), which permits the Service to act on non-Service lands to benefit wildlife and habitat. Further authorization is provided by Chapter VIII of the 1982 Supplemental Appropriation Act (P.L. 97-257), which allows the Secretary of the Interior to enter into contracts with local, nonprofit organizations. The Understanding provides for the limited interchange of personnel, equipment, and information to obtain this goal.

This Understanding recognizes that the individual Cooperators have legitimate and varied management goals, including but not limited to producing forest commodities, providing recreational opportunities, protecting water quality, enhancing rare species habitat, and conserving native species and ecosystem integrity. This Understanding is in no way intended to limit or constrain the Cooperators' individual goals.

This Understanding is entered into pursuant and subject to all applicable Federal, State, and local laws. This Understanding is not entered into the interest of obtaining advice or recommendations for any office or agency of the Federal government and nothing herein shall be

construed, nor is intended to state or imply, that this Understanding establishes a Federal advisory committee or that the Federal Advisory Committee Act (5 U.S.C. Appendix 2) shall apply.

The Cooperators agree:

The Cooperators hereby agree to share expertise, personnel, and equipment for the purpose of accomplishing the purpose of this agreement on the terms and conditions contained herein. In addition to this Understanding, specific agreements among all or some of the Cooperators and/or third parties, including but not limited to working plans for individual projects, agreements with regard to allocations of responsibilities and liabilities, including limitation of expenditures under this Understanding will be developed whenever deemed appropriate by the relevant Cooperators. Such agreements shall provide for the use of specialized equipment and personnel to meet management goals agreed upon by all or some of the Cooperators. In the absence of any specific agreement, provision of personnel and equipment for any particular project shall be at the discretion of the affected Cooperators depending on station workloads, priorities, and fire danger. Each Cooperator may provide personnel and equipment pursuant to the Understanding for the following purposes.

- a. Technical assistance including preparation or review of fire management plans and prescribed burn plans
- b. Pre-burn preparations including vegetation and fuel load sampling, control line construction and maintenance, environmental monitoring, and fuels manipulation
- c. Burn implementation including project supervision, ignition, holding, fire behavior and weather monitoring, and mop-up
- d. Post-burn monitoring and evaluation

A Cooperator requesting assistance to burn either on the Cooperator's land or land owned by a third party shall become the administering Cooperator. Land that a prescribed burn shall be applied to shall have a burn boss assigned and a burn plan completed by the administering Cooperator. The assisting Cooperators will be given an opportunity to assist in the development of individual prescribed burn plans or review and provide comments to the administering Cooperator. The Cooperators shall mutually agree to the burn plan. The burn plan will clearly state the roles to be filled for the burn, such as prescribed fire burn boss, firing boss, holding specialist, fire effects monitor, and prescribed fire crew member. Contingency planning in the event of an escaped fire will be an essential element of each plan. Each Cooperator shall designate a chief-of-party for each burn.

Cooperator participates in pursuant to this Understanding. A chief-of-party will be designated when Cooperators participate on a prescribed fire. The chief-of-party shall be responsible for mobilizing and accounting for that Cooperator's personnel and equipment. The chief-of-party will work closely the burn boss. If the chief-of-party determines that the proposed burn is unsafe or has serious concerns about the advisability of burning and is unable to reach a satisfactory agreement with the burn boss to rectify the situation, he or she retains the option of withdrawing the assisting Cooperator's resources.

Fire crew members assigned responsibilities of prescribed fire burn boss, firing boss, holding specialist, fire effects monitor, and prescribed fire crewmember shall meet the NWCG standards for prescribed burn qualifications. The chief-of-party shall be responsible for ensuring that all personnel from their organization have the appropriate qualifications.

All prescribed burning completed under this agreement will be conducted in accordance with state policy and procedure, including a Prescribed Burning Agreement signed by the landowner, a written prescribed burn plan, a burn permit, and a state certified prescribed burn manager on site during the burn.

Each Cooperator waives all claims against the other Cooperators for compensation for any loss, damage, personal injury or death occurring in the consequence of the performance of this Understanding.

It is understood that for the purpose of _____ worker's compensation coverage, employees of the _____ assisting in prescribed burns on Federal, State or private lands are to be considered employees of _____.

Nothing in this MOU shall require the Cooperators to obligate or transfer any funds. Specific work projects or activities that involve the transfer of funds, services, or property among the various Cooperators will require execution of separate agreements and be contingent upon the availability of appropriated funds. Such activities must be independently authorized by appropriate statutory authority. This MOU does not provide such authority. Negotiation, execution, and administration of each such agreement must comply with all applicable statutes and regulations.

Each Cooperator to this agreement shall appoint a Project Officer responsible for implementation of this agreement.

Project Officers and Contact Information

REQUIRED CLAUSES:

1. All activities pursuant to the Agreement shall be in compliance with the requirement of Executive Order 11246, as amended: Title VI of the Civil Rights Act of 1964 (78 Stat. 252:42 US 200d); and with all other federal laws and regulations prohibiting discrimination on grounds of race, color, national origin, handicap, religion, or sex in employment and in providing facilities and services to the public.
2. No member or delegate to Congress, or resident Commissioner shall be admitted to any share or part of this Agreement, or to any benefit that may arise there from, but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.
3. Any information furnished to the Forest Service under this instrument is subject to the Freedom of Information Act (5 U.S.C. 552).
4. This instrument in no way restricts the Cooperators from participating in similar activities with other public or private agencies, organizations, and individuals.
5. Each Cooperator will handle their own activities and utilize their own resources, including the expenditure of their own funds, in pursuing these objectives. Each party will carry out its separate activities in a coordinated and mutually beneficial manner.
6. This MOU is not intended to, and does not create, any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity, by a party against the United States, its agencies, its officers, or any person.

7. By signature below, the Cooperators certify that the individuals listed in this document as representatives of the Cooperator are authorized to act in their respective areas for matters related to this agreement.

ENACTMENT AND DURATION:

The Service is prohibited by law, from obligations that exceed available funds and therefore, the Service can do only that work which is funded. In the event funds are not available to do the wildlife development work within the period of time or in the manner prescribed under the Project Plan, the Service will advise the Cooperators accordingly.

This Understanding will be effective from signature date by all Cooperators and shall be valid through _____. This Understanding may be modified at any time by mutual written consent of the Cooperators. This Understanding may be terminated by any Cooperator upon 30 days advance written notice to the other Cooperators.

IN WITNESS WHERE OF the Cooperators hereto have executed this Memorandum of Understanding as of the first date above written.

Signatures
