

TITLE: Locate, Map, and Establish Long-Term Monitoring of Exotic-Invasive Plant Species in Forests of the Southern Appalachian Mountains—Year 2 (FY06).

APPLICANT: Equinox Environmental Consultation and Design, Inc.

LOCATION: Appalachian District, Pisgah National Forest in/around Hot Springs, NC; Nolichucky-Unaka District, Cherokee National Forest near Hartford, TN; Mount Rogers National Recreation Area, Jefferson National Forest in/around Konnarock/Whitetop, VA

DURATION: Year 2 of 3-year project **FUNDING SOURCE:** Fire Plan

PROJECT LEADER:

Andy Brown, Equinox Environmental Consultation and Design, Inc.; coordinator of SAMAB Volunteer Environmental Monitoring Program—Level 1 Surveys of Exotic Plants

Jack Ranney, University of Tennessee; lead investigator on SAMAB—SAVEM Program

Gary Kaufmann, National Forest Systems, Southern Region

COOPERATORS:

Ken Stolte, USDA Forest Service, Southern Research Station RWU-4803

John Peine, US Geological Survey

PROJECT OBJECTIVES:

The Southern Appalachian Man and the Biosphere (SAMAB) Foundation, in cooperation with the USDA Forest Service and with funding from the National Forest Foundation, initiated in 2002 a simple, presence/absence study based on invasive-exotic plant surveys (Level I Surveys), utilizing *Citizen Scientists* to inventory and monitor exotic species along trails, roads, and other rights-of-way in National Forests of the southern Appalachians (<http://samab.org/Focus/Monitor/Invasives/invasives.html>). In 2005 the FHM-EM program (Fire-EM) funded the development of a Level 2 Survey (L2S) that explored the expansion of 22 exotic invasive plant species, common in the Level 1 Surveys, into forest interiors and new habitats in burned areas.

- Year 1 (FY05): Define Level 2 Survey types and locate and map exotic-invasive plant species *intrusions into interior forests and spread in recently burned areas*, starting at Level I Surveys (L1S) locations where exotic invasive species were located and documented by SAMAB's SAVEM program.

This proposal submitted to the FHM program for FY06 would extend that collaboration to accomplish the following objectives:

- Year 2 (FY06): establish long-term FHM plots (Phase 4 type) in survey areas where exotic-invasive species are common or pernicious. A stratified-random design will be used to select clusters of exotic invasive species (unbiased selection) for establishment of P4 plots.

Each year we will particularly target 22 of the 33 plant species identified as Nonnative Invasive Plants of Southern Forests (Miller, FS-SRS General Technical Report SRS-62, 2003), and a few other invasive exotic plant species as suggested by US Forest Service botanists and land managers. Our FHM surveys and plots will continue to include coverage of recent wildfire and proposed prescribed burn areas. In FY07 we will:

- Year 3 (FY07): establish stratified-random based FHM P4 plot system in similar forest areas adjacent to locations of Year 2 FHM P4 plots containing numerous exotic, invasive species. Compare status and development of forest plant communities (plant species and abundance, soils, etc.) containing exotic invasive species with similar forest plant communities containing no exotic invasive species.

This proposal submitted to the FHM program for 2005-2006 (FY06) would extend the Level 2 Survey results from 2005 to a *Step 1* of a Level 3 Survey (L3S) that focuses on the establishment of FHM Phase 4 plots (enhanced FIA Phase 3 plots) in areas with high concentrations of exotic invasive plant species. The fixed-area FHM P4 plots will detect changes in native forest plant communities due to the invasion and spread of exotic plant species.

JUSTIFICATION:

Exotic-invasive plant species have been identified in the National Fire Plan and by the Chief of the USDA Forest Service as one of the biggest threats to forest health and sustainability. Dr. James Miller (Forest Service-Southern Research Station) has identified, described, and proposed treatments for 33 exotic-invasive plant species of particular concern to southern forest ecosystems. What is not well known is the geographic extent of these exotic-invasive plant species within forest interiors, colonization strategies and preferences in burn areas, and the ecological ramifications of the establishment and spread of these species on native plant communities in the Southern Appalachian forests. This information is needed to evaluate invasive exotic plant control efforts conducted by the NFS Districts and others in these project areas, understand the role of fire and fire management in invasive plant colonization and spread; and the influence of the urban/forest interface in exotic plant introductions and distribution. This research has particular on-the-ground relevance in the Appalachian District of the Pisgah National Forest where SAMAB is currently working in tandem with a number of partners to control exotic invasive plant outbreaks within significant natural heritage areas in sites that have recently burned and at the urban/forest fringe in the town of Hot Springs, NC. Partners involved in this project and for which this research will be directly meaningful include: the Appalachian Ranger District of the Pisgah National Forest, National Forests in North Carolina, Appalachian Trail Conservancy, Western North Carolina Alliance, North Carolina Natural Heritage Program, National Park Service Southeast Exotic Plant Management Team, North Carolina Exotic Pest Plant Council, and University of Tennessee.

DESCRIPTION:

a. Background: The SAMAB SAVEM program utilizes volunteer recruits from nearby communities (e.g., Citizen Scientists) and trains them on Level I Survey protocols involving: a) identification techniques for these species; b) data entry indicating species presence/absence, relative abundance, and area infected; and c) GPS mapping of these plants. As suggested by NFS personnel, many of these surveys were conducted through or adjacent to recent burned areas. SAMAB has been sharing the data from this program with district rangers and their staffs. While these limited “right of way” based data sets are proving useful information for environmental assessments and larger invasive species control plans at the local and district level (personal communications, 2004; L Randolph [Pisgah NF] and C. Thomas [MRNRA]), the national forests still have an important need to definitively identify exotic plant species that are encroaching into forest interiors, and to measure the impact of these plants on forest health and sustainability.

In Year 1 (FY05) the Level 2 Survey identified 22 exotic invasive plant species (3 trees; 7 shrubs; 5 vines; and 7 herbs) that were frequently encountered, abundant, or of high ecological risk in Level 1 Surveys (subset of the 33 plant species identified as Nonnative Invasive Plants of Southern Forests (Miller, FS-SRS General Technical Report SRS-62, 2003). We compiled a list of key ecological characteristics of each species (e.g., physical habitat requirements, soil requirements, reproductive

strategies, etc.), grouped species by similar characteristics when possible, and designed stratified Level 2 Surveys (based on ecological characteristics) into forest interiors, along streams, within burn areas, etc. Because of contractual problems leading to late reception of funds (September 2005), Level 2 Surveys will be conducted with significant assistance from Citizen Scientists (trained and field-audited) in the Fall 2005. Many of these species can be identified and enumerated even when dead or in a dormant state (i.e., *Bernie's*).

b. Methods: In Year 2 we will establish FHM Phase 4 (P4) plots in areas identified in L1S and L2S based as having significant concentrations of 1 or more of the 22 target species from L1S and L2S. P4 plots are composed of most of FIA's P3 suite of indicators with addition of canopy density, digital photography, and salamander/reptile monitoring (the latter at a subset of mesic plots). Initially L1S/L2S sites will be identified as potential LS3 sites by type and number of exotic species, abundance, and biological and physical site characteristics. In forest areas the initial level of native and exotic species establishment will be compared to observe how each exotic species replaces native species over time—what native species are first and last to be displaced, what is the process in each displacement, and what physical and other biological factors are relevant in the process. In FY06 our emphasis will be on defining the biological and environmental factors that predominate in process of exotic replacement of native species, identifying the P3 FHM/FIA indicators that are most informative when establishing P4 plots in these areas, and how new or developmental Phase 4 indicators (P3 plus canopy density, digital photography, salamanders/reptile, etc.) can improve the determination of the effects of exotic species on native plant communities. Digital photography will provide a visual record of the exotic/native interactions and will be linked to quantitative data from P4 indicators. Consequently our emphasis in FY06 will be pairs of P4 plots in a variety of burned and unburned habitats. The results of FY06 evaluations will allow establishment of additional P4 plots in FY07 to begin to understand the effects of exotic species on native communities at local spatial scales—FY07 will be a more population-based evaluation of exotic plant effects. The P4 plots will provide an excellent source of information on the effectiveness of herbicide and other eradication procedures that will be administered by NFS units in some of these areas. Citizen monitors from nearby communities will continue to assist in data collection and their work will be subject to rigorous QA/QC checks. The NPS Southern Appalachian Information Network's (SAIN) National Biological Information Infrastructure (NBII) will be used for data storage, communication among exotic species teams, and dissemination of information to land managers, policy makers, academia, and the public.

c. Products: The Level II Surveys and P4 plot establishment (FY06 and FY07) will generate a web-based database on exotic species found in NFS and NPS units in the Southern Appalachians, reports on interactions of exotic and native plant species, posters for each FHM annual Workgroup meetings, journal articles, and interpretive materials that can be used by National Forest Systems and National Park Service units. A framework will be developed for FS-NFS, NPS, and others to evaluate the effectiveness of exotic-invasive plant treatment methods, prescribed and natural fire effects on establishment and spread of exotic-invasive species, and movement of these species into forest interior areas.

d. Schedule of Activities: Fall 2005. Conduct Level 2 Surveys (based on similar ecological characteristics of exotic species) in areas where exotic invasive species were found in Level I surveys (2002-2004). Winter 2005-2006. Analyze data from Level 2 Surveys, interpret, and identify areas where establishment of FHM Phase 4 plots will create a baseline of current conditions to determine the effects of exotic plants on native plant species. Write L2S report and prepare poster for FHM Annual Meeting (January 2006). Spring 2006. Train new and returning CEMs in exotic species identification and establishment of FHM P4 plots. Summer 2006. Continue establishment of P4 plots in areas with high concentrations of exotic, invasive species. Fall 2006. Analyze data, write Level 3 Survey reports, and

develop posters. Submit portions to journals. Provide relevant data to NFS and NPS for interpretive and education purposes.

e. Progress/Accomplishments: Winter 2004—Fall 2005: Developed target list of 22 exotic plant species; reviewed literature and developed exotic species and ecological characteristics table; designed Level 2 Survey methods (contiguous w/o stratification; contiguous with stratification of habitat-types; and random or sporadic surveys of specific habitat types (gaps in forests, rocky outcrops, etc.). Plan, train, and execute Level II surveys based on ecological characteristics of exotic species. Winter 2005—Fall 2006: Analyze data and produce information products (reports, posters, journal articles, etc.). Design Level 3-local population estimates plot system using a stratified-random selection of plot locations. Train citizen-scientists in FHM and FIA plot establishment and indicators. Winter 2006—Fall 2007: Design probabilistic sample of forest areas where exotic invasive plants are becoming established and spreading, and reference areas with little or no exotic plant species. Train citizen-scientists in FHM and FIA plot methods and indicators. Establish Level III plot system to determine invasion, spread, and ecological effects of exotic-invasive plant species at forest population level (areas with and without exotic invasive species).

COSTS:

	Item	Requested FHM EM Funding	Other-Source Funding	Source
YEAR 2 (FY06)				
Administration	Salary	\$11,000	\$1,500	SAMAB/JIEE
	Overhead			
	Travel	\$300		
Procurements	Contracting	\$24,000	\$20,000	USGS-NBII
	Equipment	\$1,200		
	Supplies	\$300		
Year 2-TOTAL		\$36,800		
YEAR 3 (FY07)				
Administration	Salary	\$11,000	\$1,500	SAMAB/JIEE
	Overhead	0		
	Travel	\$300	\$20,000	USGS-NBII
Procurements	Contracting	\$28,000		
	Equipment	\$500		
	Supplies	\$500		
Year 3-TOTAL		\$40,300		
TOTAL 3YR COSTS		\$117,900	\$64,500	

- FHM Funding for YR 2 Administration Salary = \$7,000 to FS Southern Research Station RWU 4803; \$4,000 to Principal Investigator J Ranney
- FHM Funding for YR 2 Contracting = \$20,000 to Equinox Environmental field work and citizen monitor supervision; \$4,000 to PI J. Ranney
- FHM Funding for YR 3 Administration Salary = \$7,000 to FS Southern Research Station RWU-4803; \$4,000 to Principal Investigator J. Ranney
- FHM Funding for YR 3 Contracting = \$24,000 to Equinox Environmental fieldwork and citizen monitor supervision; \$4,000 to PI J Ranney
- Other Source Funding for YR 1-3 Administration Salary = \$1,500 from SAMAB/JIEE as in-kind contribution
- Other Source Funding for YR 1-3 Contracting = \$10,000 NBII Data Management Systems; \$10,000 USGS J. Peine, student intern, communication Portal; All other-source funding is contributed in-kind

LITERATURE CITED

Gateway to Federal and State invasive species activities and programs. <http://www.invasivespeciesinfo.gov/>

Miller, J.H. 2003. Non-native invasive plants of Southern forests. A field guide for identification and control. United States Department of Agriculture, Forest Service, Southern Research Station, General Technical Report SRS-62.

Swearingen, J., K. Reshetiloff, B. Slattery, and S. Zwicker. 2002. Plant Invaders of Mid-Atlantic Natural Areas. National Park Service and U.S. Fish & Wildlife Service, Washington, D.C. 82 pp.

Westbrooks, R. 1998. Invasive plants, changing the landscape of America: Fact book. Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), Washington, D.C. 109 pp.