

**NEW FINDINGS OF THE FORESTLAND SURVEY OF NONNATIVE PLANT INVASIONS IN THE SOUTH.** Victor A. Rudis, USDA Forest Service, Southern Research Station, 4700 Old Kingston Pike, Knoxville, TN 37919 ([vrudis@fs.fed.us](mailto:vrudis@fs.fed.us))

#### ABSTRACT

Before arming oneself to defend and win control over any nonnative plant invasion, one needs to think strategically about what would be most effective in the long term. That means knowing the size of the job, i.e., the location, extent, and severity of infestations. Monitoring helps to gauge the size of the problem and effectiveness of control, but such endeavors often are localized. Regional monitoring has been attempted for only a few high-profile nonnative plant species, with still fewer efforts in less accessible areas.

One effort to address this information gap is the regional nonnative plant species inventory and monitoring sponsored by the U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis Program (FIA) and its State forestry department cooperators. The survey's strength is that frequency and cover class observations are made systematically at remeasured 5-km grid intervals on forestland which facilitates statistical estimation of regional infestation frequency and severity. Examples provided from earlier, more limited FIA surveys show that periodic remeasurement and predictive modeling with associated remote sensing and on-the-ground measurements have the capability to provide more detailed spatial and temporal assessments. The limitations are that the FIA survey records species observations only on forestland and monitors only from a selected list of easily recognized nonnative invasive species (1). The primary goal of the 5-km grid survey is directed toward forest resource assessments, but FIA also conducts a growing-season, all-vascular plant survey with trained botanists on a 22-km grid for forest health assessments. However, the all-vascular plant portion of the survey has been implemented at present for one year in South Carolina, and only in a few other areas of the South due to funding limitations.

From partially-completed panels of the 5-km grid, estimates provided are based on sample observations from a broad cross-section of southern U.S. forestland—from east Texas to Virginia. For all ecological provinces except the Everglades, Japanese honeysuckle (*Lonicera japonica*) outranks the other 30 monitored taxa in the extent of infestations (Table 1). Ranked second is Chinese tallowtree (*Triadica sebifera*), which predominates primarily in the extreme southwestern Gulf Coast, Privet (*Ligustrum* spp.) in scattered areas throughout the central portion of the region, and tall fescue (*Lolium arundinaceum*) and nonnative roses (*Rosa* spp.) in the northern provinces. Studies associating other attributes suggest that many nonnative invasive species are highly correlated with forestland samples at the forest/nonforest edge and in nonforest neighborhoods (forested regions fragmented by urban and agriculture-dominated land cover), than associated with samples in the forest interior, in forest-dominated neighborhoods, or associated with fire disturbances.

There are degrees of infestation, and the occurrence of nonnative taxa on forestland only illustrates the potential for impacting forestland. Estimates of severity refer to current areal impacts in occupied areas. The FIA survey approximates this severity by recording infestations by cover category, i.e., <1, 1 to 10, 11 to 50, and >50 percent. Kudzu (*Pueraria montana*), for example, has very few infestations across the region's forestland. In a forest stand, much of kudzu's distribution occurs at the forest edge rather than the forest interior. However, FIA forestland surveys note that where kudzu is found, infestation severity outranks most other taxa, with 31 percent of kudzu-infested samples having greater than 50 percent coverage.

By State, information on the frequency of selected taxa is reproduced in Tables 2 and 3 from an in-press report with additional details for selected states (2). In addition, a Web site with distribution information by county is under development (3).

#### LITERATURE CITED

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Table 1. Percent frequency of 0.017-ha (0.04-ac) forestland samples containing one or more selected taxa<sup>a</sup> by ecological province and the five most common taxa, FIA surveys 2001-2004<sup>b</sup>

Ecological province <sup>c</sup>	One or more selected taxa <sup>a</sup>	Japanese honeysuckle	Privet	Chinese tallowtree	Tall fescue	Non-native roses
Eastern Broadleaf Forest (Continental)	52	36	5	0	12	10
Southeastern Mixed Forest	38	30	10	3	1	1
Prairie Parkland (Subtropical)	29	15	7	10	0	0
Eastern Broadleaf Forest (Oceanic)	28	17	4	0	5	7
Central Appalachian Broadleaf Forest-Coniferous Forest-Meadow	21	12	4	0	3	0
Outer Coastal Plain Mixed Forest	19	9	5	4	<1	<1
Lower Mississippi Riverine Forest	17	8	5	3	<1	<1
Ouachita Mixed Forest	12	10	3	0	0	0
Ozark Broadleaf Forest-Meadow	8	6	2	0	0	0
All regions	31	21	7	3	2	2

<sup>a</sup>Taxa include the following trees: *Ailanthus altissima*, *Albizia julibrissin*, *Paulownia tomentosa*, *Melia azedarach*, *Triadica sebifera*, *Eleagnus angustifolia*; shrubs: *E. pungens*, *E. umbellata*, *Ligustrum sinense*, *L. vulgare*, *L. japonicum*, *L. lucidum*, *Lonicera* spp. shrubs, *Nandina domestica*, *Rosa* spp., vines: *Celastrus orbiculatus*, *Dioscorea bulbifera*, *D. oppositifolia*, *Euonymus fortunei*, *Lonicera japonica*, *Pueraria montana*, *Vincaspp.*, Nonnative *Wisteria* spp.; grasses: *Arundo donax*, *Lolium arundinaceum*, *Imperata cylindrica*, *Microstegium viminium*, *Miscanthus sinensis*, Nonnative bamboo; ferns: *Lygodium japonicum*; and forbs: *Alliaria petiolata*, *Lespedeza bicolor*, *L. cuneata*, *Solanum viarum*.

<sup>b</sup> Preliminary data from completed survey panels as of 2004 and representing a systematically distributed proportion of the final 5-km sample grid intensity. States and approximate proportions are: Alabama, 0.40; Arkansas, 0.20; Florida 0.40; Georgia, 0.14; Kentucky, 0.33; Louisiana, 0.40; East Texas, 1.00; North Carolina, 0.20; South Carolina, 0.20; Tennessee, 0.60; and Virginia, 0.20. To date, the Everglades province contains limited forestland samples; early returns suggest Brazilian pepper (*Schinus terebinthifolius*) and Melaleuca (*Melaleuca quinquenervia*) outrank Florida's list of selected taxa, which includes 20 additional species.

<sup>c</sup>Ecological provinces are defined by the National Hierarchical Framework of Ecological Units and county boundaries (4).

Table 2.—Sampled locations on forestland containing one or more of selected taxa<sup>a</sup> and percent frequency by State, 2001-2004<sup>b</sup>.

Attribute	All States	Arkansas	East Texas	South Carolina	Louisiana	North Carolina	Georgia	Virginia	Tennessee	Alabama	Kentucky
Number of forestland plots	10,368	639	2,202	484	955	711	597	638	1,552	1,681	909
Percent infested with one or more of selected taxa <sup>a</sup>	49	23	40	41	42	47	50	51	53	63	72

For footnote a, see Table 1.

<sup>b</sup>Preliminary data from completed survey panels as of 2004 and representing a systematically distributed proportion of the final 5-km sample grid intensity. States and approximate proportions are: Alabama, 0.40; Arkansas, 0.20; Georgia, 0.14; Kentucky, 0.33; Louisiana, 0.40; East Texas, 1.00; North Carolina, 0.20; South Carolina, 0.20; Tennessee, 0.60; and Virginia, 0.20.

Table 3.—Relative frequency of infested forestland subplots by selected taxa<sup>a</sup> and State, 2001-2004.<sup>b</sup>

Taxa	All States	Arkansas	East Texas	South Carolina	Louisiana	North Carolina	Georgia	Virginia	Tennessee	Alabama	Kentucky
	<i>Relative frequency</i>										
Japanese honeysuckle	50	77	41	62	25	58	62	50	54	66	31
Chinese and European privet	11	1	11	10	13	14	25	6	5	19	0
Chinese tallow	7	0	31	2	26	0	1	0	0	1	0
Tall fescue	6	0	0	3	0	0	0	15	5	0	25
Non-native roses	6	2	1	0	0	9	0	8	7	0	20
Japanese and glossy privet	5	14	5	8	8	6	2	3	8	6	0
Japanese climbing fern	3	0	5	0	23	0	1	0	0	2	0
Bush honeysuckles	3	0	0	0	0	2	0	3	2	0	11
Tree-of-heaven	2	0	0	1	0	1	0	7	4	0	3
Chinese lespedeza	2	3	0	5	0	3	6	2	2	0	2
Nepalese browntop	1	0	0	0	0	1	0	0	6	0	1
Mimosa	1	2	2	0	1	1	1	0	1	2	0
Chinaberry	1	0	2	1	1	0	2	0	0	1	0
Kudzu	1	1	0	1	0	0	1	0	0	2	0
15 other taxa	4	0	1	6	2	6	1	5	6	2	6
All taxa <sup>b</sup>	100	100	100	100	100	100	100	100	100	100	100
Number of infested subplots											
Sum(#subplots) <sub>TAXA</sub>	17,362	343	2,473	598	1,329	1,049	1,014	1,195	2,909	3,726	2,726

For footnote a, see Table 1. For footnote b, see Table 2.