

Direct Costs Associated with Invasive Non-Native Plants in Tennessee

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Introduction

Plant invasions pose a serious problem to resource managers, horticulturalists, and policy makers in Tennessee. While many introduced non-native plants are highly viable commodities in the nursery and horticulture industry (i.e., periwinkle cultivars *Vinca major* and *Vinca minor*); privet species (i.e., *Ligustrum vulgare* and *Ligustrum sinense*); and English ivy (*Hedera helix*), they are just a few prominent examples of the 135 non-native plant species listed as invasive or potentially invasive by the Tennessee Exotic

Pest Plant Council (TNEPPC). Many of the TNEPPC listed species pose a serious threat to natural areas in the state now or in the future (TNEPPC 2009). While exotic plant species can be attractive, low-maintenance additions to cultivated landscapes, about 1% of all introduced species will escape from lawns and gardens to

become invasive in our state's fields and forests, decreasing native plant diversity and turning an aesthetic landscape into a management nightmare (Williamson 1993).

While the ecological impacts of invasive plants have been relatively well addressed (i.e., Pejchar & Mooney 2009, Pyšek *et al.* 2012, Vilá *et al.* 2011), estimating the economic impact of invasive plants can be extremely complex; hence, dollar estimates vary greatly depending on methods used. In fact, the U.S. General Accounting Office (GAO) wrote that economic analyses of invasive plants are "hampered by a lack of data...and a lack of economists assigned to assessing their economic impacts on commercial activities and natural ecosystems" (2002).

Since the time of the GAO report, researchers have estimated economic costs of invasive plant species on a national basis (Colautti *et al.* 2006, Olson 2006, Pimentel *et al.* 2005). Most notably, Pimentel, Zuniga and Morrison of Cornell University estimated that invasive plant species

cause \$25 billion in damages to the United States (2005). However, this study has been criticized due to its methods, and shows the difficulty in collecting and extrapolating data to understand economic costs.

While such large figures serve to demonstrate the vast scale of impact, refining estimates regionally and statewide can be useful when addressing local- and state-based policy and management. The California Invasive Plant Council (CAL-IPC) conducted a study of the direct costs of invasive plants (costs including direct control, mapping and outreach) and found that invasive plants cost California at least \$82 million annually (Brusati 2009). The findings of this CAL-IPC study, as well as the ongoing dichotomy between horticulture's introduction of non-native plants and management's removal and control of non-native invasive plants, served as an impetus for TNEPPC's cost assessment of invasive plants in Tennessee.

Methods: Expenditures Survey

With support from a Southeast Exotic Pest Plant Council research grant, we conducted a study to quantify direct expenditures in the state of Tennessee on invasive plant management. We emailed a survey to federal agencies (i.e., National Park Service, US Fish and Wildlife Service), state agencies (i.e., TN Wildlife Resources Agencies, TN Department of Environment and Conservation), non-profits (i.e., nature centers and advocacy groups), and private commercial landowners to query how much they spent annually between 2009-2011 on invasive plant management. We asked respondents to consider "management" any activity comprised of direct control measures (biological, chemical and mechanical methods), mapping and monitoring, and outreach and education programs. Respondents could choose any combination of categories. We also asked respondents to include any in-kind contributions (i.e., volunteer hours) put towards invasive plant work, and multiplied this hour count by the Independent Sector's estimated value of volunteer time (Independent Sector 2012).

In addition to budget figures, we asked survey respondents to list the three most problematic plant species in the area they manage, the acreage of land infested by and/or managed for invasive plant species, the percentage of their total budget dedicated to invasive plant management, and the sources of their funding (general budget, private or government grant, visitor/member fees or other source).

"We found federal agencies, state agencies, municipal parks and governments, non-profit organizations, and private land managers spend on average \$2.6 million annually on invasive plant management in Tennessee."

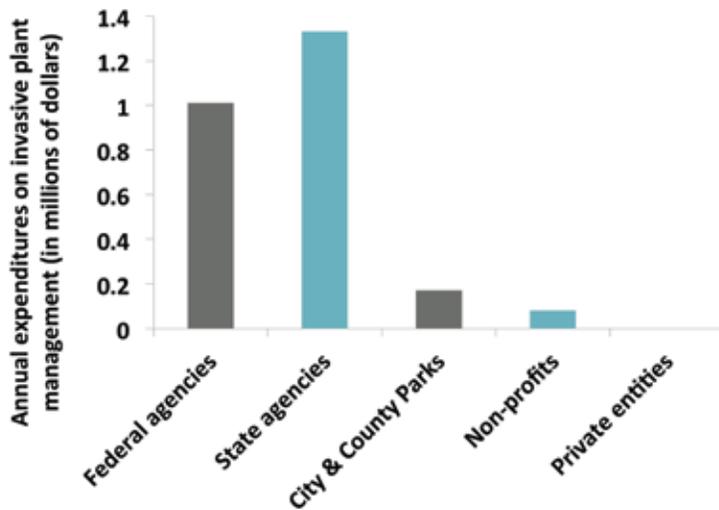


Fig. 1

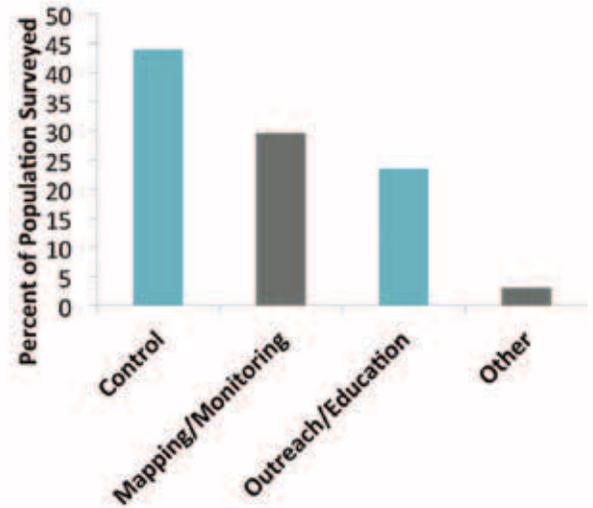


Fig. 2

Results and Discussion

We sent our survey to approximately 188 agencies and organizations working in Tennessee, and received roughly a 56% final response rate. While federal agencies, state agencies, non-profits, and private property managers were well represented (50-75% response rate), municipal and county park systems responded only 5% of the time. Counting the total expenditure on invasive plants of a given agency is often not as easy as reading a budget line; in fact, most agencies are not required to explicitly track spending on invasive plant management. Because of this, land managers often provided us with their *best estimate* of costs and expenditures (see Figure 1).

Types of Management

Respondents utilized all types of management activities, including direct control (44%), mapping and monitoring of invasive plant species (30%), education and outreach programs (23%), and “other” management such as consultation services (3%; see Figure 2). Though the bulk of management activities were focused directly on controlling existing infestations, 53% were focused on mapping and education on plant invasion, which indicates that agencies are not only managing existing problems, but also working to prevent and raise awareness of possible future invasions.

Most Problematic Species

Respondents reported a total of 29 non-native species. The three most commonly reported species, in order of decreasing frequency, were privet species (*Ligustrum vulgare* and *L. sinense*), kudzu (*Pueraria...*

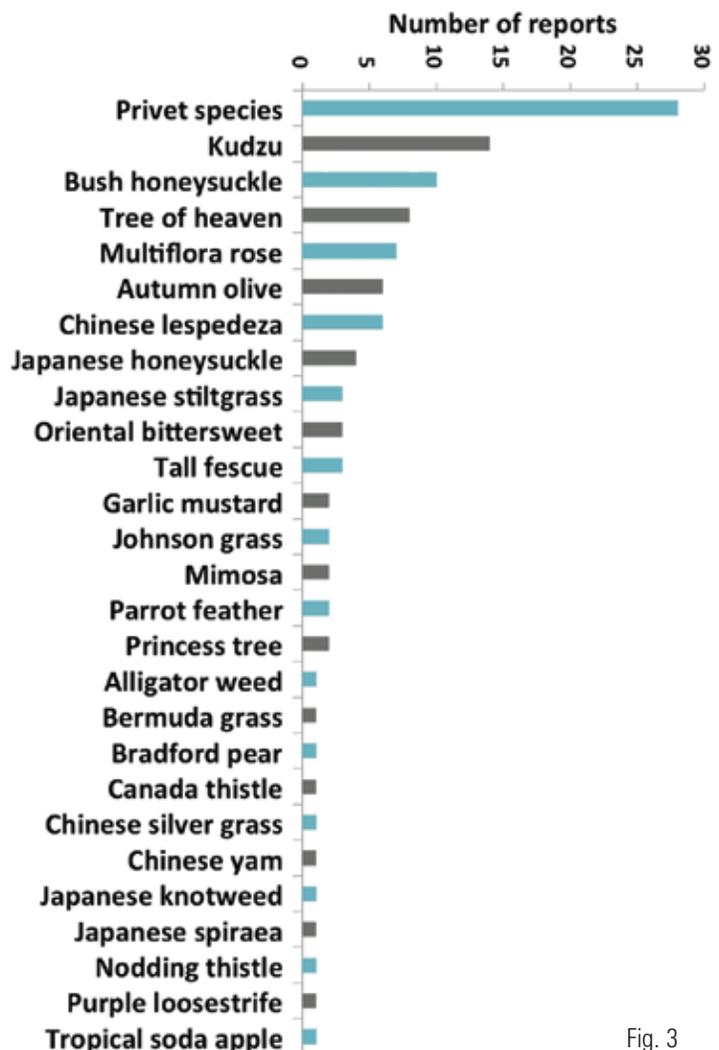


Fig. 3



Amur bush honeysuckle
(*Lonicera maackii*)

montana var. *lobata*), and Amur bush honeysuckle (*Lonicera maackii*). See Figure 3 for frequencies of all species reported.

Interestingly, 16 of the reported species (55%) are currently listed by TNEPPC as “Severe Threats,” which are invasive species of highest concern that spread easily into native plant communities and displace native vegetation. Eight of the reported species (25%) are listed as “Significant Threats,” which are species that possess invasive characteristics but are not considered to displace native vegetation as easily

as Severe Threat species. Two species reported, burning bush (*Euonymus alatus*) and English ivy (*Hedera helix*) are listed by TNEPPC as “Lesser Threats” which are species that spread into disturbed areas but are not considered a threat to native plant communities. Two other species reported, Bradford pear (*Pyrus calleryana*) and Canada thistle (*Cirsium arvense*), are listed as “Alert” which indicates species known to be invasive in similar habitats *outside* of Tennessee (TNEPPC 2009). One reported species, Bermuda grass (*Cynodon dactylon*), is not currently listed by TNEPPC as invasive. While the Severe and Significant Threat species would be expected to be highly problematic, the latter three groups reported—Lesser Threat, Alert, and Not Listed—may merit special monitoring in the future to ensure they do not become more highly invasive.

Expenditures on Invasive Plant Management

We found federal agencies, state agencies, municipal parks and governments, non-profit organizations, and private land managers spend on average \$2.6 million annually on invasive plant management. State agencies spent the most on invasive plant management: roughly \$1.33 million per year. Federal agencies spend about \$1.01 million per year (this figure would likely be higher if such key respondents as the Tennessee Valley Authority were to respond to the survey); municipal parks and governments spend approximately \$170,000 per year; non-profits about \$80,000 per year; and private land managers, less than \$10,000 per year. It is important to stress once again the conservative nature of this figure: not all of the population responded to this survey, and many of those

who did commented on the lack or complete absence of funding for invasive plant management projects in the past three to five years. This indicates that the true, comprehensive cost of invasive plants to the state of Tennessee is likely much higher than the estimated \$2.6 million. We encourage other EPPC chapters to conduct a similar cost assessment for their state. Contact the corresponding author or visit www.tneppc.org/ to learn more.

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