
Additional Notes on Invasiveness of *Paulownia tomentosa* in Natural Areas

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In the "Steward's Circle" section of the July 1993 issue of this journal (*NAJ* 13:221-222), Charles E. Williams provided an excellent synopsis of the life history of the exotic *Paulownia tomentosa* (Thunb.) Steud., the princess or empress tree. The information provided will assist land managers dealing with infestations of this tree species. We are concerned, however, about his suggestion that this species "is unlikely to aggressively invade natural areas" in the East or become "a recurring management problem in many natural areas." We would like to provide some additional per-

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spectives based on observations in the southern Appalachians, especially at Great Smoky Mountains National Park in Tennessee and North Carolina. Work here confirms Williams's view that *P. tomentosa* will only be a temporary problem in mesic forests. Large natural areas, however, are usually patchworks of different natural communities, each with different species responding to often dissimilar disturbance/regeneration regimes. Our observations show *P. tomentosa* to be a problem in the following two communities in Great Smoky Mountains National Park.

Forests requiring frequent fire

The Smokies have endured 60 years of fire suppression. Like many stewards of natural lands, National Park Service staff plan to restore this natural process by carefully reintroducing fire in several xeric communities. Williams's description of prerequisites for *P. tomentosa* germination appears accurate — that is, exposed mineral soil with high light levels and little or no leaf litter. We know of several wildfires that have resulted in significant reproduction of this exotic, even though the closest parent trees were a few kilometers away. The xeric forests of the park are more than 490 km² in extent (MacKenzie 1991) and may have experienced fire at a frequency of approximately once every 12 years (Harmon 1981). The park's future fire program may repetitively create favorable seedbed conditions in these areas. The prodigious growth, seed production, and dispersal potential of this tree, therefore, heightens our concern.

Cliffs and other specialized habitats

Many of the park's 100+ rare vascular plants tolerate or require disturbance in some form for long-term survival. Within the park, cliffs and outcrops, sometimes associated with river gorges, are the primary communities that support these rare plants. These sites, along with some transportation and utility corridors and similar sunny sites, are virtually the only habitats left in the park for shade-intolerant rare plants. It is precisely these open, sunny habitats that *P. tomentosa* invades — and quite rapidly. One cliff system that supports several species of rare shade-intolerant plants was rapidly invaded by *P. tomentosa*, to the point that regular control action was initiated in the 1980s. *P. tomentosa* is likely to invade similar specialized habitats elsewhere in the park and the eastern United States. Areas of particular concern are those associated with anthropogenic activity, particularly road and utility corridors.

Roadway cut-and-fill slopes, underground utilities, reservoir shores, and sunny trail sections all seem to be vulnerable to invasion. We believe that colonization within these habitats provides both radii and corridors for invasion of other susceptible communities.

In 1975 three botanists carefully surveyed 430 km of roadway and trail on the Tennessee side of the park for exotic plant species and found exactly eight princess trees (Baron et al. 1975). They concluded that princess tree invasion would not become a problem. Despite control actions in the intervening years, these trees are now nu-

merous, with possibly several thousand in this same district. We have found that seedlings of *P. tomentosa* frequently establish in the park 3–4 km from parent trees.

By the mid-1980s the National Park Service began to map *P. tomentosa* distribution, initiate monitoring efforts, and fund research on control techniques (Woods and Ashburn 1989). Suppression efforts in the park include eradication of all accessible trees, especially those in rare plant habitat, and surveys of burned or otherwise disturbed areas for detection. New construction contracts for projects in infested areas often contain clauses for the postconstruction removal of *Paulownia*, as well as several other invasive exotic plant species.

In summary, *P. tomentosa* is not the most threatening exotic plant pest in this national park, but we believe it does pose current and future threats to some natural communities. Despite current control efforts, the species is expected to expand aggressively its range and numbers here, and certainly qualifies as a recurring management problem.

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