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Chinese Tallow (*Triadica sebifera* (L.) Small) Population Expansion in Louisiana, East Texas, and Mississippi

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Abstract

Chinese tallow (*Triadica sebifera*) is a nonnative invasive species with high fecundity rates that has naturalized from the coastal prairies of east Texas along the Gulf and Atlantic coasts as far north as North Carolina. Population differences were computed for two forest inventory periods (mid-1990s and late 2000s) in Louisiana, east Texas, and Mississippi using data collected by the U.S. Department of Agriculture Forest Service, Southern Research Station, Forest Inventory and Analysis Program. Substantial population expansions of Chinese tallow were noted in all three States.

Keywords: Chinese tallow, FIA, invasive species, tallowtree, *Triadica sebifera*.

Introduction

Chinese tallow (*Triadica sebifera* (L.) Small) is a nonnative invasive species with high fecundity rates that has naturalized from the coastal prairies of east Texas along the Gulf and Atlantic coasts as far north as North Carolina (Bruce and others 1995, Renne and others 2002, McCormick 2005). The species is known to change soil chemical properties and alter the composition and structure of native plant communities (Bruce and others 1995, Cameron and Spencer 1989). Additionally, Chinese tallow litter is suspected to alter the amphibian habitat in invaded wetland communities, potentially impacting populations of some frog species (Leonard 2005). Despite the potential negative impacts, Chinese tallow provides a limited array of wildlife and commercial benefits. The flowers have been cited as a possible food source for honeybee populations in the Southeast (Deplane 1998), the fruits have been suggested as a potentially important winter food source for yellow-rumped warblers (Baldwin and others 2008, Conway and others 2002), and the tree has been suggested as a potential source for short-rotation commercial woody biomass (Scheld and Cowles 1981, Shupe and others 2006) in addition to limited use as a horticultural specimen (Jubinsky and others 1996).

This note reports findings drawn from two inventory periods in three Southern States known to contain large populations of Chinese tallow: east Texas, Louisiana, and Mississippi. The inventory was conducted by the U.S. Department of Agriculture Forest Service, Southern Research Station, Forest Inventory and Analysis (FIA) Program, in conjunction with forestry agencies in each State.

The FIA Program collects detailed data only on plots that fall on "accessible forest land" (land at least 1.0 acre, at least 120 feet wide, at least 10 percent stocked by trees of any size, and safe to visit). Historically, some data were only collected and summarized on timberland (land available for wood production and management). Therefore, this research note uses summarized data on timberland from two points in time for each of three States to note the expansion of Chinese tallow in number and volume of live trees on timberland. The resulting dataset included 2,413 timberland plots from Louisiana in 1991 and 2,250 in 2005; 2,056 timberland plots in east Texas in 1992 and 1,983 in 2007; and 3,185 timberland plots in Mississippi in 1994 and 3,231 in 2006. Data were obtained from the FIA database on September 9, 2009.

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Population

Chinese tallow was the fifth most numerous individual species after loblolly pine (*Pinus taeda*), sweetgum (*Liquidambar styriciflua*), red maple (*Acer rubrum*), and water oak (*Quercus nigra*) in the entire State of Louisiana in 2005. It was the fourth most common species recorded in the Southeast unit of Louisiana (only superseded by loblolly pine, water oak, and sweetgum, in that order). Similarly, the species was the fifth most common species recorded in east Texas in 2007, after loblolly pine, sweetgum, water oak, and winged elm (*Ulmus rubra*), and the fourth most common species in the Southeast unit of east Texas after loblolly pine, sweetgum, and water oak. In Mississippi in 2006, Chinese tallow was the 19th most common in the South unit, but was not within the top 20 most common species, statewide.

Chinese tallow populations increased from an estimated 46 ± 20 million trees > 1.0 inch diameter at breast height (d.b.h.) (estimate ± 95 percent confidence interval; Bechtold and Patterson 2005) in the 1991 Louisiana survey to an estimated 280 ± 63 million live trees in the 2005 survey (an increase of > 500 percent). In Mississippi, populations increased 445 percent from about 9 ± 11 million trees > 1.0 inch d.b.h. in 1994 to 49 ± 24 million trees in 2006. Chinese tallow populations in east Texas increased by 174 percent from 102 ± 42 million trees > 1.0 inch d.b.h. to 279 ± 68 million trees.

The number of Chinese tallow trees > 1.0 inch in Louisiana increased in all diameter classes except the largest (17.0 to 18.9 in d.b.h.; fig. 1). There were six and one-half times as many saplings in the 1.0–2.9 inch diameter class in 2005 as were estimated in 1991. Similarly, the number of Chinese tallow trees > 1.0 inch in Mississippi increased in all diameter classes from 1994 to 2006, and included six times as many trees in the smallest diameter class (fig. 2). The estimated population of Chinese tallow > 1.0 inch in east Texas also increased in each diameter class, nearly tripling in the smallest diameter class (fig. 3).

The increase in the number of live trees estimated was accompanied by a spatial expansion of the area occupied by the species, as shown on map comparing plots containing Chinese tallow in the 1990s with plots containing Chinese tallow in the mid-to-late 2000s (fig. 4, plot locations are approximate).

Chinese tallow seedlings were estimated at 689 ± 159 million in Louisiana in 2005, with the majority concentrated in the Southwest, South Delta, and Southeast survey units, respectively. The latest (2006) survey in Mississippi showed an estimated 104 ± 50 million Chinese tallow seedlings, concentrated primarily in the South and Southwest survey units, respectively. In the east Texas 2007 survey, there were an estimated 931 ± 295 million seedlings, with the overwhelming majority concentrated in the Southeast survey unit.

Tree Volume

Chinese tallow volume in Louisiana increased 395 percent from 22 ± 9 million cubic feet to 110 ± 30 million cubic feet. That equates to about 5 ± 1 million short tons of oven-dry biomass contributed by Chinese tallow statewide in 2005.

The volume of Chinese tallow in Mississippi rose 23 million cubic feet from 2 ± 2 million cubic feet in 1994 to 25 ± 18 million cubic feet in 2006. That equates to an estimated 968,000 ± 607,000 short tons of oven-dry biomass in 2006 across the State.

East Texas gained 66 million cubic feet of Chinese tallow volume between 1992 and 2007, from 21 ± 12 million cubic feet to 87 ± 27 million cubic feet. The oven-dry biomass equivalent is an estimated 4 ± 1 million short tons in the eastern portion of the State.

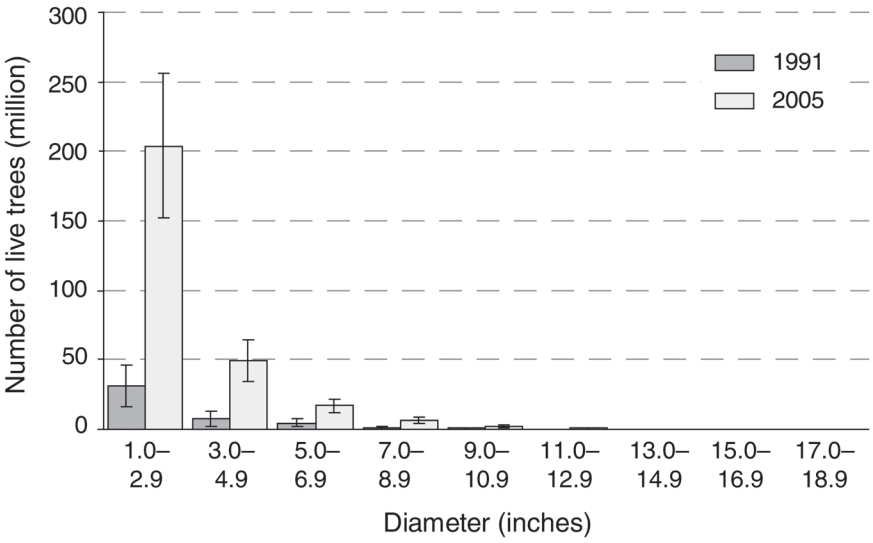

Figure 1—Number of Chinese tallow in Louisiana by diameter class and year.

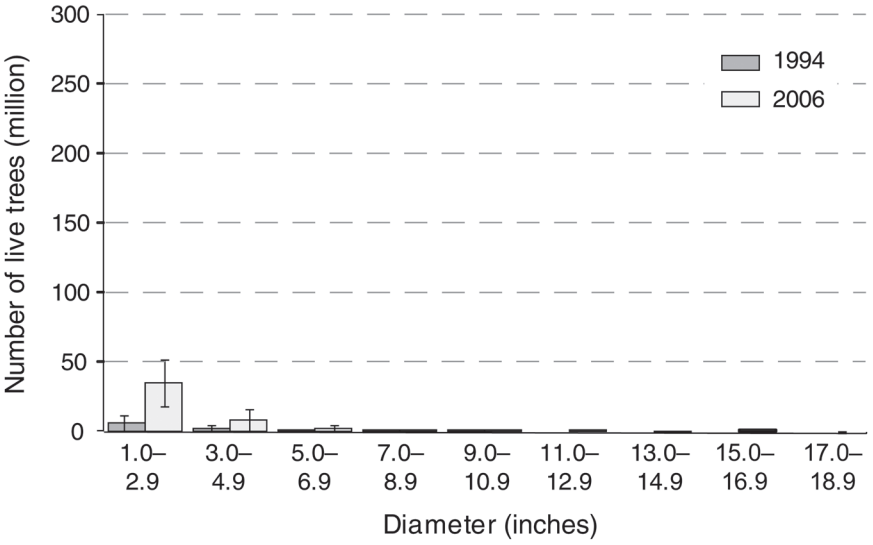

Figure 2—Number of Chinese tallow in Mississippi by diameter class and year.

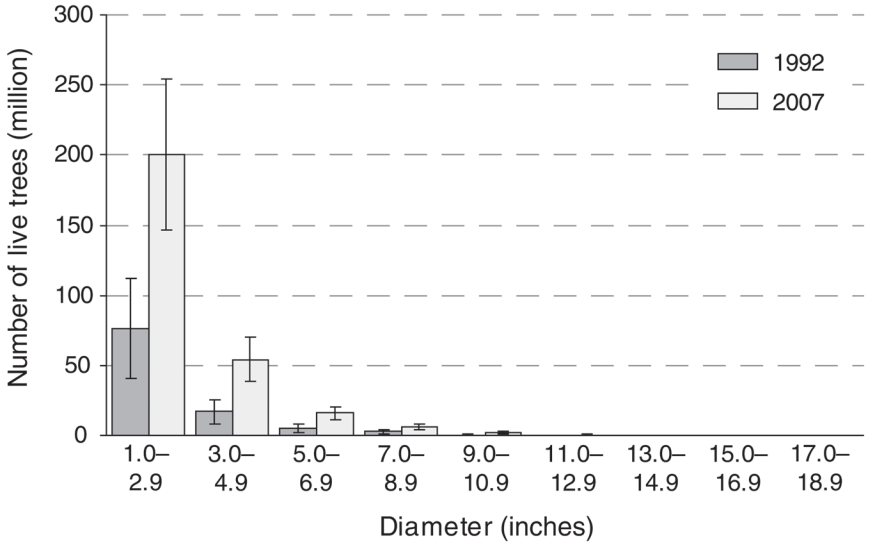

Figure 3—Number of Chinese tallow in east Texas by diameter class and year.

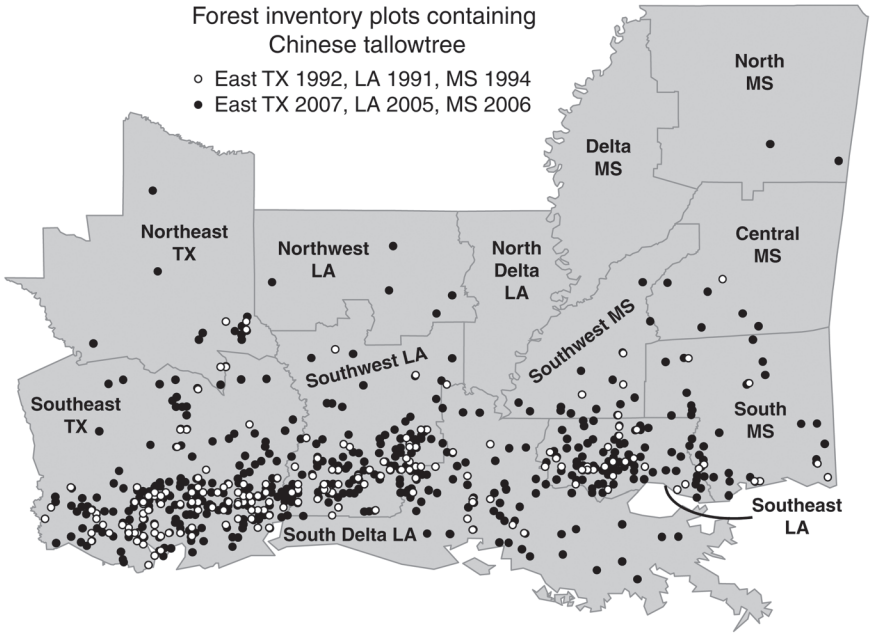

Figure 4—Plots containing Chinese tallow at two points in time across three Southern States. White circles represent plots containing tallow in east Texas 1992, Louisiana 1991, and Mississippi 1994. Black circles represent plots containing tallow in east Texas 2007, Louisiana 2005, and Mississippi 2006. States are divided by FIA survey unit. Plot locations are approximate, as required by federal law.

Conclusions

Chinese tallow tree has experienced considerable expansion in all three States discussed in this research note. Additionally, Gan and others (2009) predict further dramatic expansion in their models based on FIA data, particularly in light of regional warming. Those authors provide a discussion of measures for mitigating the further spread of the species. Further Chinese tallow expansion has the potential to severely impact both forest and nonforest ecosystems throughout the Gulf Coast.

The rate of expansion of Chinese tallow in three States over the course of a single decade illuminates the need for additional studies regarding the potential impacts of the species on the ecosystems it inhabits, and the need for discussions regarding management of the species long-term in the near and distant future.

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