

## Management information on *Triadica sebifera*

Bogler (2000) states that, "As with all prolific invaders, the key to successful control is to prevent new infestations or to control them as soon as possible. *T. sebifera* has a high degree of reproductive vigor, a wide range of adaptability, and few pests and predators. It produces a large number of viable seeds that are readily dispersed by birds and by water, and which germinate at high rates in a wide range of conditions. If controlled during the early stages of invasion, the potential for successful management is high. The potential for large-scale restoration of wildlands where *T. sebifera* has become established, is probably low."

Bogler (2000) states that, "Flooding is not effective in controlling *T. sebifera*, as it is adapted to flooding in fresh, brackish, and saltwater."

Physical: Hand removal of trees is usually limited to trees less than three feet tall or to small infestations. Sawing down large trees will help to remove seed sources. Fruit should be removed from fallen trees in order to reduce the number of seeds present. In order to prevent resprouting, however, cut-stumps will require a herbicide application. Heavy equipment can be effectively used to control tallow trees on canal banks and in areas where soil disturbance and selective species removal are not important considerations. Stumps remaining following such treatment will require herbicide application to prevent regrowth from cut surfaces (Bogler, 2000). In some agricultural areas, bulldozing and disking have been effective in the control of *T. sebifera* (Bruce *et al.* 1997). Trees standing in water may be successfully killed by cutting them below the water line.

Bogler (2000) states that, "The use of prescribed fire can be used to control *T. sebifera*. Fire has various effects on *T. sebifera*: (1) complete kill (preliminary data suggest that this is unlikely); (2) top-kill where the aerial portions of the trees are killed but resprouting occurs from the base, and (3) incomplete top-kill where the crown can resprout after fire. In areas with sufficient fuel, such as in prairies with good grass cover, summer burns killed or top-killed trees as tall as three meters. The control of trees growing in wet sites where fuels were poor, however, is less effective. Burning during the dormant season (December), followed by burning or mowing during the growing season (July-August) seems to be the most effective. Additional experimental work is being done on the effect of fire on tallow trees (J.B. Grace, personal communication, Federal Wetlands Laboratory, USGS, Lafayette, LA)."

Chemical: Bogler (2000) states that, "The most effective method for the control of *T. sebifera* is the basal bark application of herbicide. Several organizations, including the Florida Department of Environmental Protection, the Florida Exotic Pest Plant Council, Florida Native Plant Society, the Florida Nature Conservancy, the Louisiana Nature Conservancy, and the Texas Nature Conservancy, have adopted this method of treatment (Jubinsky and Anderson, 1996; Randall and Rice, unpublished). Effective treatment consists of spraying a band at least 15 cm wide around the lowest 30-60 cm of the trunks with triclopyr (brand names Garlon 3A, Garlon4, Pathfinder II and others) at a concentration of approximately 15%. Concentrations up to 20% might be required for larger trees. Vegetable oil and other similar products are effective surfactants. Basal bark applications may be ineffective on large trees with thick bark; for such trees a cut-stump method may be necessary. For a cut-stump treatment, excellent results are reported with a 50% solution of the triclopyr formulation Garlon 3A or with a 10% solution of the herbicide imazapyr (brand names Arsenal, Chopper and others). Imazapyr is a soil-active herbicide that requires careful use when applied near desirable plants or trees to prevent it from killing them. Other herbicides that have successfully controlled *T. sebifera* include the combined 2,4-D and picloram formulations (Grazon P+D and Grazon) applied to foliage, or hexazinone (Velpar L) applied to soil near plants (Bruce *et al.* 1997; Jubinsky and Anderson, 1996). Frilling using glyphosate (Rodeo) is also an effective control method. Bergen (1998, pers. comm.) reports from Texas that the most effective time to apply herbicide to minimize seed spread is in late summer to early fall."

Biological: Bogler (2000) states that, "There are currently no biocontrol agents identified for control of *T. sebifera*. They are generally free of insect pests and serious pathogenic organisms. A few organisms known to associate with *T. sebifera* (potential agents) include a bagworm, *Eumeta* spp., which feeds on the leaves, and the root-knot nematode *Meloidogyne javanica*. Fungi known to attack this tree include *Cercospora stilingiae*, *Clitocybe tabescens*, *Dendrophthoe falcata*, *Phyllactina corylea*, *Phyllosticta stilingiae*, and *Phymatotrichum omnivorum* (Duke 1983). Adult and juvenile leaf-footed bugs (*Lepotglossus zonatus*) have been observed feeding on fruits of *T. sebifera* at Brazoria National Wildlife Refuge in Texas (Johnson and Allain, 1998)."

Rogers and Siemann (2004) state that, "Land managers view *T. sebifera* as an excellent candidate for biological control because it is taxonomically isolated in the south-eastern USA (McFayden, 1998; Pemberton, 2000). There are certain advantages to using introduced root herbivores alone or in conjunction with folivores as biological control agents for other invasive plants in North America (Müller-Schärer, 1991; Prins, Nell & Klinkhamer, 1992; Blossey, 1993; McEvoy & Coombs, 1993; Blossey & Hunt-Joshi, 2003), but similar efforts for *T. sebifera* should proceed with the knowledge that genetic differences in herbivore tolerance of native and invasive *T. sebifera* ecotypes may significantly modify the effectiveness of its native pests. Evolutionary change is increasingly being recognized as an important factor contributing to the success of exotic invaders. Understanding that the compensatory capacity for herbivore damage may differ between native and introduced plant ecotypes will be essential for implementing effective biological control strategies for problematic invasive species."

Bogler (2000) states that, "Sheep and goats will eat the leaves of *T. sebifera*, but toxicity to cattle limits their effectiveness as a control agent. Cattle will eat seedlings less than 6 cm tall (Bruce et al.1997)."