

Shorter Contributions

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FIRST RECORD OF THE EXOTIC INVASIVE *VITEX ROTUNDIFOLIA* (VERBENACEAE) IN VIRGINIA. – *Vitex rotundifolia* L.f., commonly referred to as beach vitex or roundleaf chastetree, is a low-growing, crawling, invasive shrub that was discovered growing wild on the backslope, crest, and foredune of Willoughby Spit in Norfolk, Virginia by L. Rosenberg in September 2008 (Fig. 1). This is the first documented record of *V. rotundifolia* in the Commonwealth of Virginia. Specimens were collected and verified on 10 October 2008 by the authors, and have been deposited in the herbarium, College of William and Mary, Williamsburg, Virginia.

Vitex rotundifolia is a perennial, deciduous, woody shrub indigenous to coastal sand dunes of eastern and southern Asia, Australia, and the Pacific Islands. It is a highly salt- and drought-tolerant species that is adapted to full-sun and grows well in dune and other sandy environments, well-drained soils, or disturbed sites (Socha & Roecher, 2004; Madsen et al., 2005). *Vitex rotundifolia* grows 0.5-1.0 m in height; however growth is primarily concentrated in a dense mat horizontally, with spreading branches up to 20 m long and approximately 5 m in width (Kim, 2004; Madsen et al., 2005; Fig. 1). Nodal rooting of the branches contributes to this mat-like growth (Socha & Roecher, 2004).

Negative effects of *V. rotundifolia* on the local environment include the exclusion of native plants from beaches, increased rates of dune erosion, and lower rates of successful reproduction in sea turtles (Swearingen et al., 2002). It is also known to crowd out the federally threatened plant, seabeach amaranth (*Amaranth pumilus* Raf.) (Invasive Plant Atlas of the MidSouth). Native plants are excluded locally due to shading by the *V. rotundifolia* growth mat and the plant's release of allelopathic compounds that make the soil hydrophobic (Ono et al., 2002). These changes cause both light and drought stress in less tolerant native species and result in vast dune monocultures of *V. rotundifolia* (Gresham & Neal, 2004). Ensuing monocultures trigger increased rates of dune erosion (Sea Grant North Carolina, 2006). Unlike the fibrous root structures of native dune grasses, *V. rotundifolia* features a deep tap root (Fig. 2) with minimal branches that provides little structure to the soil matrix (GISDB, 2007). Furthermore, the low growth of *V. rotundifolia* makes it a poor catchment species for blown sand, thereby increasing wind erosion of dunes (ZhiQuan et al., 1996). Monocultures of *V. rotundifolia* also lead to

increased mortality rates in young sea turtles. The dense growth of this invasive species decreases quality nesting areas for adults and entraps newly hatched turtles migrating to the water in its long, branching runners (Gresham & Neal, 2004).

The plant was originally introduced to the United States by North Carolina State University Arboretum for the purpose of dune stabilization and ornamental use in the mid-1980s (Socha & Roecher, 2004). Today, *V. rotundifolia* is categorized as an exotic, invasive species typically found in the coastal Carolinas and is described as a quarantine significant pest with medium-high risk potential (National Research Council, 2002; GISDB, 2007). Because of the plant's ability to: 1) survive in five U.S. hardiness zones, 2) create a large seed bank, and 3) reproduce at leaf nodes, spreading of *V. rotundifolia* from the Carolinas to other southeastern



Fig. 1. The main colony of *Vitex rotundifolia* found growing on the backslope, crest, and foredune of Willoughby Spit, Norfolk, Virginia, September 2008 (photo by L. Rosenberg).



Fig. 2. The deep tap root of *Vitex rotundifolia* provides little structure to the soil matrix and increases dune erosion (photo by L. Rosenberg).

coastal states has long been expected (Madsen et al., 2005). Transportation to new areas is accomplished via consumption and excretion of seeds by fauna, floating of vegetation in water currents and the subsequent deposition and rooting of vegetative fragments on beaches, and the continued sale and use of *V. rotundifolia* as a woody ornamental (Socha & Roecher 2004; GISDB, 2007).

In Norfolk, it is suspected that the main *Vitex* colony originated from plantings by local property owners, but this has not been substantiated. One possible source was suggested following a radio show on the issue, when L. Rosenberg received a call from a concerned homeowner stating that she had inadvertently planted *V. rotundifolia* in her yard as an ornamental. The caller's property is located approximately four miles (6.4 km) from Willoughby Spit in the Lafayette River watershed in Norfolk; however, the site is not on any body of water. It was reported by the property owner that the *V. rotundifolia* specimens had been purchased from a nursery on the Eastern Shore of Virginia two years prior. Although seeds could have been moved from these specimens to the infested dune via ingestion and excretion by birds, this would appear to be highly unlikely because the specimens planted as ornamentals were highly stressed due to shading and, according to the homeowner, had not flowered or produced seeds during the past growing season (pers. comm. to Rosenberg). A more likely explanation for the invasive colony is that individuals were introduced via direct planting of the shrub in the dunes by other local property owners. *Vitex rotundifolia* is currently in the process of being registered as a Federal Noxious Weed (National Research Council, 2002; GISDB, 2007). If listed, its sale and transport within the United States would be strictly regulated. In the Carolinas, community involvement efforts have already been put in place to minimize the impact and spread of this species. Programs include promoting identification of new *V. rotundifolia* communities, and monitoring and eradicating existing communities (Sea Grant North Carolina, 2006).

Accepted practices for eradication include physical and chemical removal (Britton et al., 2002; GISDB, 2007). Physical removal may include hand-pulling and digging. Mechanical digging, however, is often discouraged due to the fragile nature of dunes and the risk of erosion caused by this method (Britton et al., 2002). During physical removal caution must also be taken to extract the entire root structure, as well as any remaining stem fragments, to minimize reestablishment (National Research Council, 2002; GISDB, 2007). Other physical methods include clipping flowering/fruiting stems and seaward runners to reduce species

migration. All plant material should be disposed of in landfills in sealed plastic bags rather than mulched or composted to further decrease the risk of introduction (GISDB, 2007). Chemical treatment of *V. rotundifolia* can be accomplished in one of three ways: 1) cut the aboveground vegetation back to a stump and then apply a glyphosate paint to the exposed cut, 2) wound the stem and then apply a herbicide to the wound, or 3) apply an oil-based herbicide mixture to the stem in a 30-45 cm length band at the base of the stem (Gresham & Neal, 2004; Sea Grant North Carolina, 2006; GISDB, 2007). It is important to note that revegetation with native grass and dune species should be incorporated into any control program to prevent erosion and recolonization (ZhiQuan et al., 1996).

In Norfolk, the main colony of *V. rotundifolia*, as well as 20 additional plants found nearby, was treated with the herbicide Habitat on 10 October 2008. Individuals were cut at the base and then sprayed with the herbicide directly on the open wound per the recommendations of Hal Drotor of Clemson University. Initial treatments will be followed with a second herbicide treatment of Garlon in the spring on plants that exhibit new growth. Physical removal of dead plants will then occur following the spring treatment of Garlon. The City of Norfolk Environmental Services Division will also continue monitoring for new outbreaks of the plant and has notified adjacent localities and state agencies of the potential for further invasion into Virginia's dune areas.

While it is likely *V. rotundifolia* will continue to migrate north by water currents, the planting of nursery stock by local residents remains the most likely source of introduction. In fact, while it has been confirmed that many local nurseries in the Hampton Roads area are aware of the invasive nature of *V. rotundifolia*, and do not sell the plant, at least one nursery located near the barrier islands of Virginia provided the plant for public sale as recently as 2008 (phone survey by L. Rosenberg). If the sale of this plant continues, and it reaches the beachhead of the undeveloped barrier islands, it will pose serious threats to this unique Virginia ecosystem.

Note added in proof: A temporary quarantine prohibiting the movement of *Vitex rotundifolia* was issued by the Virginia Department of Agriculture and Consumer Services in late October 2009. This quarantine has been made permanent, effective on 3 December 2009, and specifically restricts transport of the plant, or any of its parts, within or from Virginia Beach, Norfolk, Accomack County, and Northampton County, Virginia. Property owners are also being advised to contact their local cooperative agricultural

extension offices in the event that any new *V. rotundifolia* colonies are discovered.

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