Torreya taxifolia Arn. Florida Torreya

Taxaceae Yew family

Richard Stalter

Florida torreya ***(Torreya taxifolia)*** is an endangered species. This small rare tree is nearly extinct in the wild, threatened by a fungal disease of the stem. Known locally as stinking-cedar because of the pungent odor given off when the leaves are crushed, it was first discovered in 1833 by H. B. Croom near the Aspalaga Crossing on the Apalachicola River. Its rarity limited its use except locally for fenceposts and Christmas trees. The largest living specimen is in North Carolina and measures about 89 cm (35 in) in d.b.h., 14 m (45 ft) in height, with a crown spread of 12 m (40 ft).

Habitat

Native Range

Florida torreya (fig. 1) grows naturally in three counties in Florida, Gadsden, Liberty, and Jackson. It is also found in southern Decatur County, GA, just north of Chattahoochee, FL. The natural range of this species extends along the limestone bluffs for a 64-km (40-mi) stretch on the eastern bank of the Apalachicola River and its tributaries from Chattahoochee south to Torreya State Park in northern Liberty County, FL. One population exists approximately 11 km (7 mi) west of the Apalachicola River in the vicinity of Ocheessee Pond in Jackson County, FL.

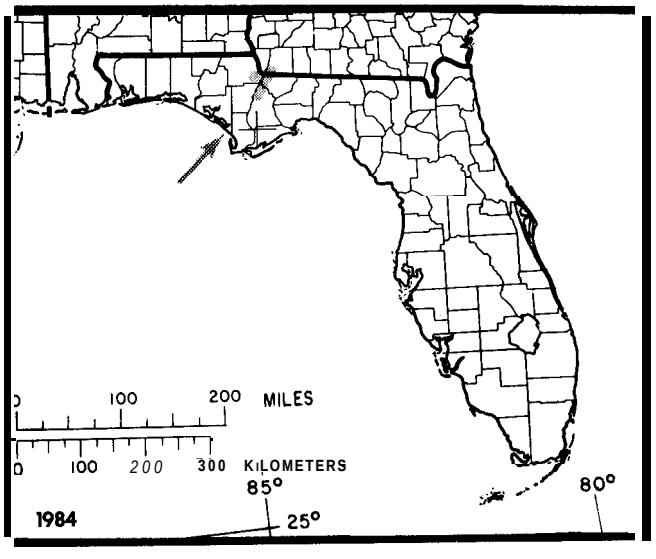

Figure *1-The native range of Florida torreya.*

Climate

The climate of the region in the Florida Panhandle where ***Torreya taxifolia*** grows is warm and humid, with a wet summer and dry fall and winter. Average rainfall is 810 to 860 mm (32 to 34 in) during the growing season from April 1 to September 30, while the average yearly rainfall totals 1420 mm (56 in). The growing season averages 270 days. Killing frosts usually occur between November 25 and February 28. The average January temperature is 12" C (54" F), while the average July temperature is 27" C (81° F). Occasional cold waves in the winter bring a minimum temperature of -9" to -7" C (15" to 20" F). A low of -19" C (-2" F) has been recorded in Tallahassee, 64 km (40 mi) east of the Apalachicola River (10).

Soils and Topography

Florida torreya is restricted to steep, deeply shaded limestone slopes and wooded ravines. Soils in these areas most likely fall within the orders Alfisols and Mollisols.

Associated Forest Cover

Florida torreya (fig. 2) is not included among the forest cover types established by the Society of American Foresters but is commonly known to be among the oak-gum-cypress or oak-pine types. In 1919, it made up about 4 percent of the forest along the Apalachicola River. The most commonly associated species are beech *(Fagus **grandifolia),*** yellow-poplar ***(Liriodendron tulipifera),*** American holly *(**Ilex opaca),*** Florida maple *(**Acer barbatum),*** loblolly pine *(**Pinus taeda),*** spruce pine ***(I? glabra),*** white oak ***(Quercus** alba)*, eastern hophornbeam ***(Ostrya virginiana),*** and sweetgum ***(Liquidambar** styraciflua)*. Shrubs and lianas associated with Florida torreya are poison-ivy ***(Toxicodendron** radicans)*, greenbriar ***(Smilax*** spp.), crossvine ***(Bignonia capreolata),*** yaupon *(**Ilex vomitoria),*** Florida ***yew** (Taxus floridana)*, blackberry and dewberry *(**Rubus*** spp.). Forbs, grasses, and sedges include sedges ***(Carex***

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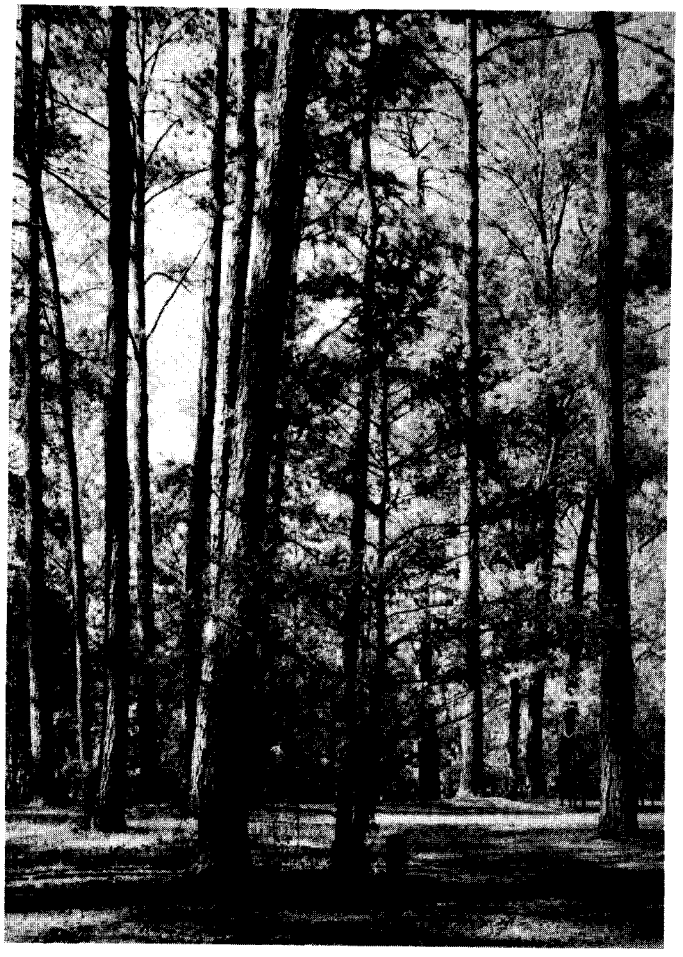

Figure *Z-Florida torreya about 6 m (20 ft) tall and 9 cm (3.5 in) in d.b.h.*

spp.), panic grass ***(Panicum*** spp.), partridgeberry ***(Mitchella repens)***, little sweet Betsy *(Trillium cuneatum)*, giant cane ***(Arundinaria gigantea),*** and American climbing fern *(Lygodium* ***palmatum)*** *(4,5,6)*.

Life History

Reproduction and Early Growth

Flowering and Fruiting-Florida torreya is dioecious. Female flowers are produced in March and April and the ovule develops in a sessile, arillate structure. At the end of the second season, the fertilized ovule forms a single, nearly globose gray-blue fruit 2.5 to 4.1 cm (1.0 to 1.6 in) long, 1.9 to 3.6 cm (0.75 to 1.4 in) wide, which matures as early as August or as late as early November. Staminate cones are also initiated in March and April. These are small, globular-ovate, and bear four pollen sacs on each scale. ***Torreya taxifolia*** first produces male and female cones at age 20 *(2,8,9)*.

Seed Production and Dissemination-Little is known about germination of ***Torreya taxifolia*** seeds; they may germinate without stratification. According to R. Bowden at the Maclay State Gardens in Tallahassee, FL, some seeds germinated when placed in rich, damp topsoil. At Maclay, Bowden is currently investigating the physiological requirements for ***Torreya taxifolia*** germination. He has obtained 80 percent germination of 35 seeds by placing them in wet sphagnum moss *(2)*. Germination is hypogeal. ***Torreya taxifolia*** requires an after-ripening period before germination as does its closest American relative, *T. californica (8,9)*.

Seedling Development-Little is known about seedling development because few seedlings have been produced in the wild since the species was infected by a blight in the late 1950's. Perhaps mycorrhizae are beneficial to seedling establishment and growth. Seedlings in their natural habitat have developed in the deep shade of hardwoods and pines.

Vegetative Reproduction-Florida torreya can perpetuate itself vegetatively by producing sprouts at the base of the parent tree, although, in almost every instance, only one sprout survives after several years. Probably every existing Florida torreya in its present native habitat is a product of vegetative reproduction.

Sapling and Pole Stages to Maturity

Growth and Yield-The bark on mature trees is about 1.3 cm (0.5 in) thick and irregularly divided by shallow fissures. The dark-brown outer bark often is tinged with orange while the inner bark is yellow. The twigs are green and stiff. The leaves are green, lustrous, stiff, and pungent. The common name, stinking-cedar, is derived from the disagreeable odor given off when any part of the tree is bruised.

Florida torreya is a small tree with whorled branches, reaching 12 m (40 ft) in height and 30 to 50 cm (12 to 20 in) in d.b.h. Its habitat on steep bluffs and its small stature and low population have made its exploitation impractical, and the species has never been commercially important *(3,8)*.

Rooting Habit-Florida torreya seedlings have a well-branched taproot. A 5-cm (2-in) seedling produces a taproot 5 cm (2 in) long. No information

is available on root growth and the development of mature trees.

Reaction to Competition-Florida torreya appears to grow better in full sunlight at the Maclay State Gardens than in the dense shade of its natural habitat. It may most accurately be classed as tolerant of shade in its native habitat. No information on competition is available, however.

Damaging Agents-Godfrey and Kurz examined populations of ***Torreya taxifolia*** in 1962 and observed that many trees were infected by fungi that cause a stem and needle blight. They reported that many areas where the species previously thrived contained only a few skeletal trunks, some with abortive sprouts at their bases. The fungi responsible for the blight appear to be ***Physalospora*** spp. and *Macrophoma* spp., but investigators have not determined precisely how the fungal agents act to cause the blight. There is speculation that a sexual stage of the causal agent may be necessary to establish the infection and that the condition or age of the tree may be the important factor. Researchers found that the commercial fungicide Maneb at a concentration of 671 g per 378 liters (1.5 lb per 100 gal) applied at weekly intervals resulted in good control over 9 weeks of treatment, and that treated trees recovered markedly and produced new growth with little or no infection *(1,5)*.

Special Uses

Florida torreya has finely grained wood that is light, hard, strong, and durable. Its specific gravity is 0.5145. Because of its durability, it was formerly used for fence posts. Florida torreya have been cut for Christmas trees, but in 1980 and 1981 there were only a few Florida torreya tall enough to be used for this purpose *(7)*. Observation indicates that animals frequently eat torreya seeds *(8,9)*.

Genetics

No population differences have been observed in this species. No natural hybrids occur because this species is separated from its nearest North American relative, *T. californica*, by more than 2090 km (1,300 mi).

If Florida torreya is to be preserved, it will be necessary to isolate and propagate blight-resistant trees. Such genetic material may be propagated from ***Torreya taxifolia*** cuttings because they root readily. Once the seedlings are well established, they may be outplanted in suitable habitats along the Apalachicola River.

A number of diseased Florida torreya up to 9 m (30 ft) in height are growing in the Maclay State Gardens, FL. There are 14 disease-free specimens on the Biltmore Estate, Asheville, NC, that are more than 40 years old and up to 12 m (40 ft) tall but it is unlikely that they are blight resistant. Seeds and cuttings from the Biltmore Estate should be used to perpetuate disease-free trees inside and outside the species' natural range. All of the species at the Maclay Gardens as well as any accessible trees in their natural habitat should be treated for fungal infection if ***Torreya taxifolia*** is not to become extinct.

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