

A CENSUS OF ATLANTIC WHITE-CEDAR, *CHAMAECYPARIS THYOIDES* (L.) B.S.P., ON THE WESTERN SHORE OF MARYLAND

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"Don't stove the boats needlessly, ye harpooners; good white cedar plank is raised full three per cent within the year."

Herman Melville, *Moby Dick*

Abstract—Nine stations are reported for Atlantic white-cedar (*Chamaecyparis thyoides* (L.) B.S.P.) on the western shore of Maryland. Three sites occur on the Magothy River at Cockey and Cypress Creek, while the other six stands are found at Arlington Echo, Carrollton Manor, Evergreen Road (Cypress Creek), East Branch of Forked Creek, Lakeland, and Sullivan Cove on the Severn River. The western-shore Atlantic white-cedar populations consist of 1214 trees over 1.2 m tall, 1895 seedlings and saplings less than 1.2 m, and 827 dead trees. Mean tree diameter ranged from 5.52 cm at Sullivan Cove to 22.46 cm at Arlington Echo. Seedling recruitment was highest at Sullivan Cove with 1475 seedlings. The nine Atlantic white-cedar populations are found on the western shore of Maryland growing in spring freshes along intertidal zones, pond margins, and sandy or mucky creeks. Propagated western-shore Atlantic white-cedar should be used as part of reforestation programs on the Severn and Magothy Rivers due to the attractive and commercial value of the tree, as mitigation for lost historic sites, and to safeguard against population loss at the few remaining sites.

INTRODUCTION

Atlantic white-cedar (*Chamaecyparis thyoides* (L.) B.S.P.) is a rare to uncommon plant in Maryland and has been placed on the state watch list (Maryland Natural Heritage Program, 1994). Steiber (1967, 1971) reported Atlantic white-cedar for a few locations on the western shore of Maryland in Anne Arundel County, while Sipple and Klockner (1984) classified Atlantic white-cedar habitat as uncommon for this region.

The nearest Atlantic white-cedar stands to the western shore Maryland populations are found 80 km to the east on the Delmarva Peninsula where a total of 58 extant and historic sites are known (Laderman 1989). The closest Virginia populations occur 274 km to the south in the Dismal Swamp and in pine barrens along the Blackwater River (Fernald 1939, 1940, 1947).

We became interested in the exact status of Atlantic white cedar populations on the western shore of Maryland because of their isolation, local nature, and associated rare plant species. This project was undertaken to provide data for Atlantic white-cedar recovery and restoration on the western shore of Maryland.

MATERIALS AND METHODS

Atlantic white-cedar sites on the western shore of Maryland were determined by consulting Severn River Association (1990), Sipple (1977), Sipple and Klockner (1980, 1984), and field reports (Milt McCarthy, personal communication to DNR, Sipple, field notes 15 August, 1978). Sites were visited in July 1997 to determine the number of living and dead trees as well as seedlings. Additional site visits were

made in December 1997 and January and February 1998 to verify some population counts and to inventory new sites. Individuals measuring 1.2 m and over in height were scored as trees while specimens under 1.2 m were recorded as seedlings. Dead individuals were also recorded as part of the census as a separate category. Circumference of all specimens was measured in inches at breast height with a tape measure and then converted to metric diameter. Physical characteristics and plant associates were recorded for each site. Herbarium specimens of Atlantic white-cedar populations were deposited at Towson State University herbarium (herbarium code: BALT).

RESULTS

Three sites for Atlantic white-cedar occur on the Magothy River, while six are found on the Severn River (Fig. 1). Two new Severn River Atlantic white-cedar populations were found, one on the east branch of Forked Creek and the other on the south shore near Sunrise Beach off Evergreen Road at a tributary listed as Cypress Creek (Davison and Rucker, 1988).

Tree populations ranged from as few as 9 at one location to as many as 383 individuals at another, with a total of 1214 Atlantic white-cedar trees for the western shore of Maryland (sum of all sites listed in Table 1). The largest number of seedlings (1475) was found at Sullivan Cove. Mean living tree diameter was smallest at Sullivan Cove (5.52 cm) and greatest at Cypress Creek Swamp (22.46 cm). No dead trees were found at two sites, while the largest mean dead tree diameter was recorded at Lakeland (48.17 cm). Cypress Creek Savanna had 77 percent of the population in

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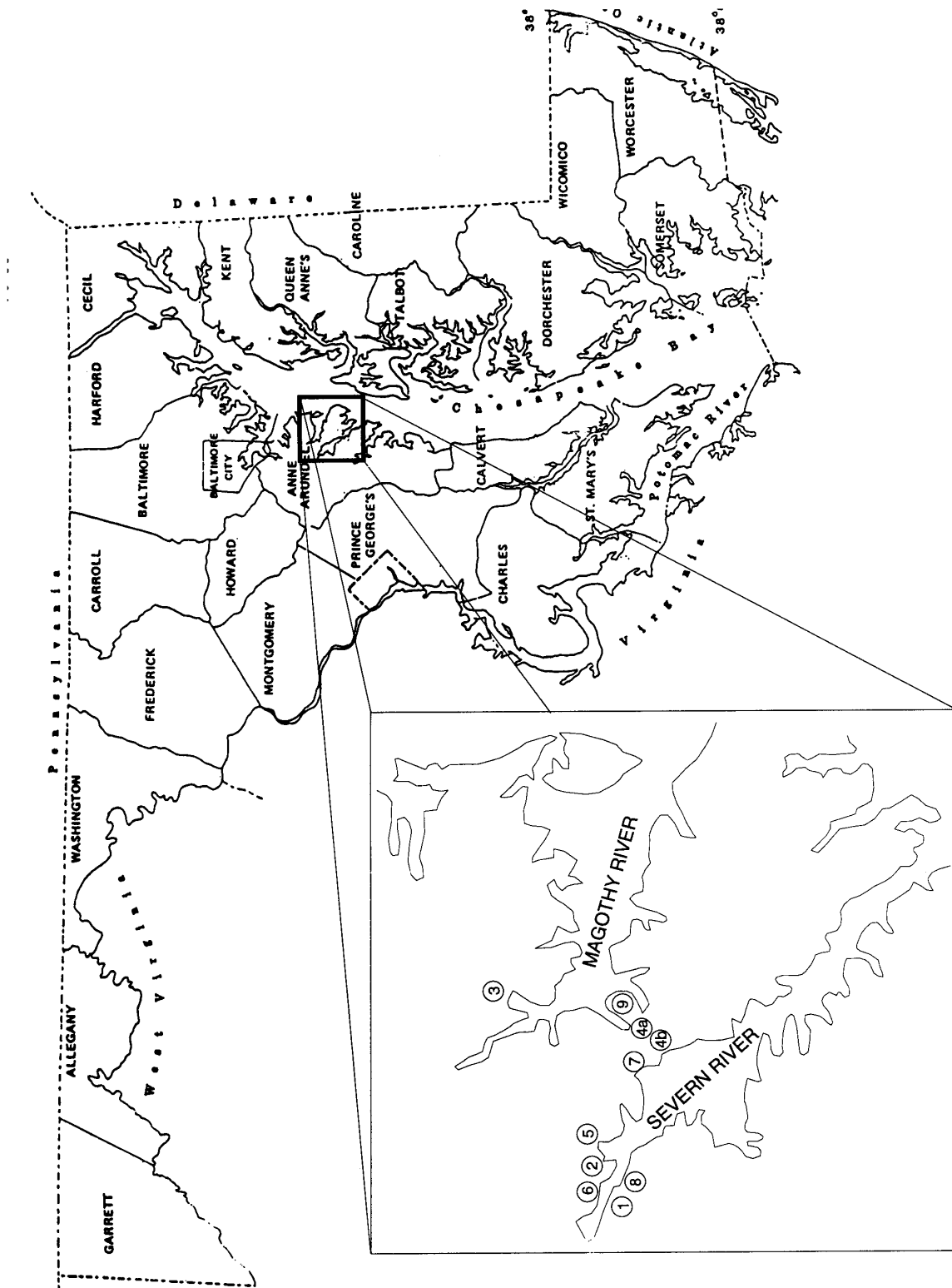


Figure 1—Distribution of Atlantic white-cedar on the western shore of Maryland. Sites are: 1 Arlington Echo; 2 Carrollton Manor; 3 Cockeys Creek; 4a Cypress Creek; 4b Cypress Creek Swamp; 5 Forked Creek; 6 Lakeland; 7 Sullivan Cove; 8 Cypress Creek; 9 Dill Road.

Table 1 - Population data for Atlantic white-cedar sites on the Western Shore of Maryland

Parameter	Sites ^a										Total
	1	2	3	4a	4b	5	6	7	8	9	
# Seedlings	40	300	11	24	10	7	9	1,475	—	19	1,895
# Living Trees	88	70	49	125	234	9	86	383	11	159	1,214
# Dead Trees	25	20	—	501	73	—	11	92	15	90	827
Total	153	390	60	650	317	16	106	1950	26	268	3,936
Mean dia. living (cm) (S.D.)	19.45 (17.73)	7.95 (8.69)	14.47 (11.40)	11.76 (8.34)	22.46 (11.24)	15.64 (14.27)	16.18 (15.84)	5.52 (7.16)	7.36 (2.76)	10.78 (7.87)	
Mean dia. dead (cm) (S.D.)	17.36 (9.82)	12.54 (10.41)	—	1.50 (0.80)	14.18 (9.02)	—	48.17 (17.42)	8.29 (6.31)	23.33 (13.53)	13.92 (11.78)	

^a 1 = Arlington Echo; 2 = Carrollton Manor; 3 = Cockney Creek; 4a = Cypress Creek Savanna; 4b = Cypress Creek Swamp; 5 = Forked Creek; 6 = Lakeland; 7 = Sullivan Cove; 8 = Cypress reek; 9 = Dill Road

dead trees, while Cypress Creek (Severn River) had a mortality of 58 percent. The champion living Atlantic white-cedar tree on the western shore occurs at Arlington Echo and has a diameter of 69 cm. The largest diameter Atlantic white-cedar found during the census, which had been hit and apparently killed by lightning, is at lakeland and is 86 cm in diameter.

Interestingly, the Lakeland population seemed to be particularly susceptible to lightning strikes. Lightning scars were found on 50 percent of dead trees and lightning was clearly the cause of death in one tree in 1997. Clewell and Ward (1987, 1989) found that lightning was the cause of mortality for mature Atlantic white-cedar and attributed this to the trees protruding above the canopy and incurring an increased chance of lightning strikes. This seems like a reasonable hypothesis but Clewell and Ward (1987, 1989) did not demonstrate that lightning-struck trees were indeed taller than surrounding trees. Atlantic white-cedar is not the tallest tree at Lakeland and hardwoods intermixed with this tree have not been struck by lightning at anywhere near this rate. The other Atlantic white-cedar populations on the western shore did not have lightning strikes of this magnitude and it is not clear what factor(s) are responsible for this effect. One possible explanation is that some Atlantic white-cedar bogs contain bog iron and are preferentially attracting lightning. Trees in this situation face an increased risk of mortality due to lightning strikes. Lightning mortality on Atlantic white-cedar may be worth investigating in a future study.

Soils on uplands of Atlantic white-cedar habitats on the western shore were either on Collington, Evesboro, Galesboro, or Sassafras fine to loamy sand on slopes ranging from 2 to 40 percent (Kirby and Matthews 1973). Wetlands are composed of mixed alluvial or Bibb silt loam grading to tidal marsh at the outflow from Atlantic white-cedar habitat.

Herbarium vouchers were obtained from all sites and are recorded for Anne Arundel County, Maryland as follows: 16 December 1995, sandy and mucky areas on Cockey Creek feeding Magothy River, Phil Sheridan, Bill Scholl, Keith Underwood, Judy Broersma-Cole, Robert Cole, Robert Muller, *Sheridan 1865*; 17 December 1995, pond margins and intertidal freshes feeding Severn River at Lakeland, Phil Sheridan and Keith Underwood, *Sheridan 1866*; 29 July 1997, pond edges and river banks at Carrollton Manor on the Severn River, Phil Sheridan and Robert Muller, *Sheridan 1987*; 29 July 1997, spring freshes at juncture of deciduous sandy uplands and intertidal marsh as well as sphagnous hummocks at Sullivan Cove on the Severn River, Phil Sheridan and Robert Muller, *Sheridan 1989*; 29 July 1997, seepage bank at head of eastern branch of Forked Creek on Severn River, Phil Sheridan, Robert Muller, and Keith Underwood, *Sheridan 1990*; 13 August 1997, edge of Cladium marsh at head of Cypress Creek on east side of MD Route 2, 3/4 mile west of Severna Park, Sheridan 1991; 13 August 1997, peaty edge of creek at Arlington Echo Education Center off Indian Landing Road, located at head of Severn River southwest of Lakeland and 1 mile west of Sunrise Beach, *Sheridan 1992*; 30 January 1998, Atlantic white-cedar bog on branch feeding Cypress Creek at Dill Road, Phil Sheridan, William Sipple, and Keith Underwood, *Sheridan 2004*; 19 April 1998, sphagnous peat bog at mouth of Cypress Creek on the Severn River east of Evergreen Road and north of Sunrise Beach, Keith Underwood, *Sheridan 2007*.

DISCUSSION

Carrollton Manor and Sullivan Cove contain more than 94 percent of the Atlantic white-cedar seedlings on the western shore of Maryland. Cypress Creek Swamp and Sullivan Cove contain 51 percent of the mature trees. The skewed nature of the population data on these Atlantic white-cedar populations may reflect both their site history and natural quality.

Sullivan Cove has a large number of both seedlings and mature trees. The number of seedlings and trees at Sullivan Cove may reflect the high natural quality and relatively undisturbed nature of the site. Sullivan Cove is an excellent example of an intact intertidal fresh and sphagnum-bog Atlantic white-cedar habitat (Fig. 2) and is only disturbed by a small gravel road bisecting the site. Several state rare plant species such as *Cladium mariscoides* (Muhl.) Torrey and *Platanthera ciliaris* (L.) Lindl. were also found at this site during the census.

The number and mean diameter (22.46 cm) of trees at Cypress Creek Swamp indicate a mature Atlantic white-cedar forest, compared to the early successional state of Sullivan Cove where there are many seedlings but tree diameter averages only 5.52 cm. Cypress Creek Savanna and Sullivan Cove share many floristic and hydrologic affinities. Both sites exhibit a continuum from tidal marsh to open sphagnum hummocks (savanna) to Atlantic white-cedar swamp. Cypress Creek Savanna has an unusually high rate of dead wood (77 percent) with a small mean diameter as well as very few living seedlings, which contrasts with the report of many vigorous Atlantic white-cedar seedlings at this site (Sipple and Klockner 1984). Sipple (personal communication, 1998) reports that much of this mortality occurred around 1988 along with a change in the floristic composition of the site. The most likely explanation for the mortality at Cypress Creek Savanna is some kind of hydrologic disturbance. We found no evidence of pathogens being responsible for this mortality, since dead trees were restricted within a zone, and adjacent trees in Cypress Creek Swamp were unaffected. Atlantic white-cedar is known to be killed by high tidal salinities (Fleming 1978), and tidal levels are known to be increasing along the eastern seaboard. Lowering of ground water levels through

surface wells, interdiction of seepage from Cypress Creek Swamp through improvements along an adjacent road, general rise in tidal river levels, and subsequent salt intrusion into Cypress Creek Savanna appear to be the most likely cause of tree mortality.

Sullivan Cove has probably escaped the fate of Cypress Creek Savanna because of its somewhat higher topographic position. We have noted some mortality as well at Arlington Echo where trees formerly grew further out the cove where higher salinities might be expected. An understanding of effects of development on seepage waters, projected rises in tidal levels, and salt intrusion of coastal freshwater wetlands will be an important component of Atlantic white-cedar restoration on the western shore of Maryland.

The Dill Road site on Cypress Creek, also known as Bonnie's Bog, formerly contained *Sarracenia purpurea* L. (Sipple, personal communication, 1998), and a few *Chamaedaphne calyculata* (L.) Moench are still extant. Sedimentation and pollution from an adjacent road has resulted in the destruction of the upper reaches of the bog, and there are many large-diameter Atlantic white-cedar snags of 70-100 years in age. Restoration of the Dill Road site is warranted given the significant elements formerly or currently present at this site.

Carrollton Manor and Lakeland both contain tidal freshes and ponds with Atlantic white-cedar borders. Carrollton Manor has a large number of seedlings in comparison to Lakeland, a difference which we attribute to the effect of beavers browsing woody vegetation and lightly disturbing soils on the pond borders. Removal of plant competition by beavers may provide increased light for germination, or there may be an ancillary beneficial effect from soil



Figure 2 - View of Sullivan Cove from Severn River beach at intertidal marsh. Note Atlantic white-cedar at intertidal fresh fracture at base of hillside slope and Dramatic change to tidal marsh.

disturbance. Atlantic white-cedar pond habitats, such as Lakeland, which lack beaver disturbance, have a much lower number of seedlings.

Arlington Echo, Cockey Creek, and the Severn River Cypress Creek contain relatively few trees or seedlings despite apparently suitable soils and hydrology. They differ from the other sites in that they are positioned on or at the outflow of meandering creek systems over 2 km in length. The low numbers of Atlantic white-cedar in these three sites may be caused by competition with hardwood species preventing seedling establishment, disease, repeated logging, sterility, or other factors. Part of the population at Cypress Creek (Severn River) was destroyed by slumping of a hillside at a stormwater discharge point and subsequent inundation of the bog. Former abundant populations of Atlantic white-cedar on the Eastern Shore have been reduced to scattered individuals or loose aggregations (Sipple and Klockner, 1984). Similarly these three sites may represent fragments of former larger populations, and present conditions may eventually result in their loss. This would represent a significant reduction in current Atlantic white-cedar stands on the western shore of Maryland.

The Forked Creek population of Atlantic white-cedar is locally restricted by wetland habitat. The site is characterized by peaty soils on a springy hillside along a 20-meter bank of the Severn River. Surrounding banks are dry and limit this population to one cove.

Documentation of the former extent of the western shore populations of Atlantic white-cedar through examination of logging and naval records and peat analysis may help guide recovery efforts on the Severn and Magothy Rivers. The few individuals, low recruitment, and ample habitat or recovery potential at many of these sites warrant a restoration program to prevent the loss of these important populations on the western shore of Maryland.

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