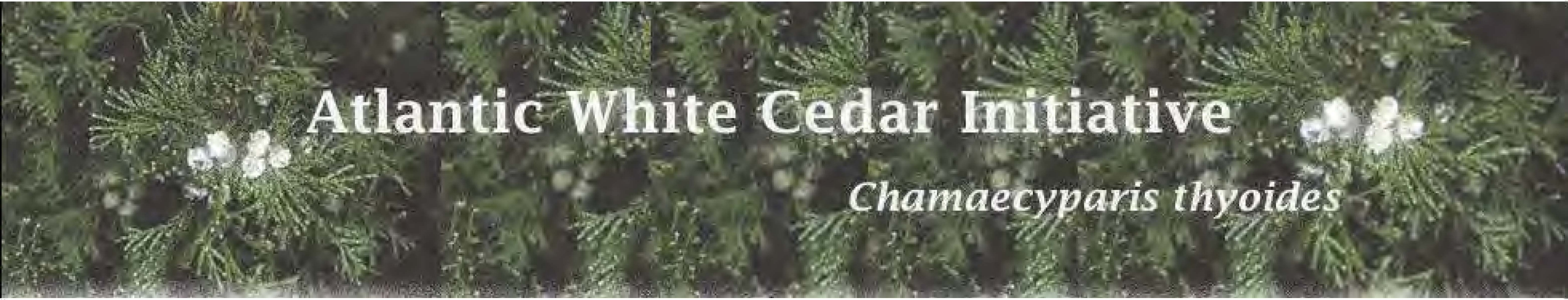
Atlantic White Cedar Initiative
Chamaecyparis thyoides

This is the Atlantic white cedar (AWC) website devoted to *Chamaecyparis thyoides,* a coniferous, evergreen tree native to the Atlantic coast of North America from Maine to Georgia with a separate population on the Gulf of Mexico coast from Florida to Mississippi. You may also know this tree by one of its other common names such as southern white-cedar, white-cedar, and swamp-cedar.

The purpose of this website is to collect science-based information on the ecology, management, utilization, and restoration of Atlantic white cedar. Please use the ***Navigation*** links on the left side of this page to explore information about this very unique tree species and the free resources available on this website.

Materials linked and displayed on these pages are provided through a grant by the US Fish and Wildlife Services along with support by many volunteers and organizations devoted to restoring and sustaining Atlantic white cedar in the United States. An advisory board made up of researchers, commercial organizations, and natural resources government agencies, meets quarterly to review content and determine website updates.

To learn more about the Atlantic White Cedar Initiative, please visit the Contact & Support page. We encourage your feedback, corrections, and suggested items for inclusion in this website.

### AWC Quick Links

- USDA Natural Resources Conservation Service, Plant Fact Sheet on Atlantic white cedar, Chamaecyparis thyoides
- USDA Natural Resources Conservation Service, Plants Profile Chamaecyparis thyoides
- USDA Forest Service, Index of Species Information on Chamaecyparis thyoides
- USDA Forest Service, Center for Wood Anatomy Research, Technology Transfer Fact Sheet
- NC State University, Department of Horticulture, Consumer Fact Sheet on Atlantic white cedar

**All about Atlantic white cedar**

Atlantic White Cedar, [*Chamaecyparis thyoides* (AWC)] is native to the Atlantic coast of North America from Maine to Georgia with a separate population on the Gulf of Mexico coast from Florida to Mississippi (Laderman 1989). It is a coniferous, evergreen tree species that exists in pure stands as a consequence of major disturbance, such as fire or weather-related blow-down.

Atlantic white cedar is an obligate wetland species (Natural Resources Conservation Center 2012) that grows best when the water table is within 4 to 8 inches of the soil surface during the growing season (Little 1950). It can tolerate short-term flooding during the growing season (Golet and Lowry 1967), but unlike baldcypress, is intolerant of long-term, deep water flooding. Drainage of wetlands in the 19th and 20th centuries played an important role in the decline of Atlantic white cedar and cypress (Frost 1987; Krinbill 1956). Even today, excessive drainage appears to be the likely cause of high Atlantic white cedar mortality in some stands (Laderman 2012); in other situations, impeded water movement, most often by road beds, can also have negative effects. Drainage of swamps for agriculture greatly contributed to the demise of Atlantic white cedar and cypress by permanently altering the hydrology of large areas, and by changing the frequency and severity of wildfires (Frost 1987; Lilly 1981).

Pure AWC stands owe much of their existence to fire, but fire at too frequent intervals will destroy them (Frost 1987). In Atlantic white cedar stands, good forest management practices, combined with appropriate management of soil water table levels, alter the frequency and severity of fires to achieve desired objectives while minimizing the risk of catastrophic loss. A high water table, however, does not guarantee immunity from fire; head-fires can travel through tree crowns, resulting in complete destruction (Little 1946). If water tables can be maintained near or just above the soil surface, fires that do occur likely will burn small blocks of trees, depending on the micro-topography, resulting in a patchwork mosaic of stands in the landscape. These groups, in turn, can subsequently provide seed to regenerate adjacent areas. Alternatively, when the peat is dry to considerable depth, fires tend to wipe out the forest over large areas, leaving no seed source for regeneration.

When settlers arrived along the eastern coast, there was an estimated 0.5 million acres of the AWC type (Kuser and Zimmermann 1995). The greatest concentrations of AWC were in The Great Dismal Swamp (NC/VA), eastern North Carolina, and southern New Jersey. In the late 1990s, the acreage of pure AWC (more than 50% of the stems = AWC) was estimated to be less than 50,000 (Sheffield et al. 1998). Since 2003, hurricanes (Isabelle and Sandie) struck eastern North Carolina and southern New Jersey, resulted in major losses in the acreage of AWC stands (Lowie et al. 2009). Extensive losses following Hurricane Isabelle have occurred in southern New Jersey as a result of what is believed to be salt injury. Compounding these losses were two large fires in the Great Dismal Swamp during efforts to salvage AWC damaged or destroyed by Hurricane Isabelle (Lowie et al. 2009). No recent inventory is available, but the current acreage of the AWC type is believed to be well below estimates for the late 1990s.

*Revised 28 October 2013*
*Eric Hinesley*

For more information about this species, its habitat, range, natural history and wood qualities, please visit the For Researchers section of this website.

Atlantic White Cedar Initiative
Campus Box 8008, Raleigh, NC 27695-8008
919-515-9563, 919-515-7793
info@atlantic-white-cedar.org

## Management of Atlantic White Cedar

The management of a forest depends on the objectives of ownership. If the primary objective is timber production, the treatment of stands will seek to optimize that objective, with other objectives taking less precedence. As stated earlier, the position of this website is that the best hope for conserving and/or expanding the AWC resource is to pursue a course of active forest management which has a sound ecological argument as well as profit potential for owners and stakeholders, private or public. With this approach, part of the revenue generated by the forest could be used to perpetuate the forest.

The website also seeks to emphasize that active forest management and conservation of the AWC resource are compatible objectives. In the future, preservation or passive management simply will not be sufficient to conserve and expand the AWC resource; a more active approach is needed, based on good science, sound economics, and rational public policy.

Obviously, without a forest, there is nothing to manage, so there is value in simply establishing more AWC in the landscape, wherever and whenever possible. That said, however, the establishment of any forest stand is influenced by management objectives, so there should be specific objectives in mind prior to planting.

Forest management deals with a number of major issues, including 1) species selection and site selection, 2) regeneration of stands, including site preparation; 3) release of crop trees from competing vegetation early in the life of the stand (examples: cleanings, herbicide treatments), 4) manipulation of stand density (initial spacing, cleanings, thinning), 5) protection from damaging agents (insects, predators, disease, fire), 6) improving value (example: stem pruning, thinning), 6) creation of habitat for endangered or threatened species (example: red-cockaded woodpecker in longleaf pine), 7) improvement of water quality (examples: riparian zones, created wetlands, buffer zones), 8) and stabilization and/or reclamation of degraded landscapes (examples: planting loblolly pine to stabilize eroding farmland, site conversion back to AWC [term for Underwood projects?], and 9) forest inventory (example: cruising for timber volume, assessment of animal or plant populations).

Management practices must recognize ecological and silvicultural characteristics of AWC. Fortunately, there is already an extensive body of knowledge (examples: archived publications). Familiarity with this literature is important, but it is not the purpose here to review it in detail; instead, the goal is to use this knowledge to develop better management practices for AWC. Understanding the nature and requirements of the species as well as knowing the history of its management can help identify where gaps exist in the knowledge, and what needs to be done to close the gaps. It is not enough, however, to simply know the best management practices for AWC. There must be more effective efforts to draw attention to AWC, to convey the message about its good attributes, to expand its market footprint, and to effectively apply good management and conservation practices in real-world situations.

This section loosely addresses three topics: 1) basic information based on experience and early literature, 2) progress since 1990 (See archived conference proceedings), and 3) areas where additional knowledge is needed, with an eye toward increasing the importance and economic value of the AWC resource. The site will focus on what is known about management of AWC, and determine steps that are needed to ensure the future of a healthy AWC resource. The cornerstone of this effort will be the publication, *Atlantic White-cedar: Ecology and Best Management Practices Manual* (Mylercraine and Zimmermann, 2000).

*Revised May 28, 2013*
*Eric Hinesley, Susan Moore, and Kelley McCarter*

**For more information**

- USDA Natural Resources Conservation Service, Plant Fact Sheet on Atlantic white cedar, Chamaecyparis thyoides
- USDA Natural Resources Conservation Service, Plants Profile Chamaecyparis thyoides

- USDA Forest Service, Index of Species Information on Chamaecyparis thyoides
- USDA Forest Service, Center for Wood Anatomy Research, Technology Transfer Fact Sheet
- USDA Forest Service, Fact Sheet 225, Atlantic White-Cedar, An American Wood (1985)
- NC State University, Department of Horticulture, Consumer Fact Sheet on Atlantic white cedar

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919-515-9563, 919-515-7793
info@atlantic-white-cedar.org

# Fun Facts at Atlantic White Cedar Trees

Where's the nearest Atlantic white cedar to me?

*Chameacyparis thyoides*, What does it Mean?

## Atlantic White Cedar Products

Prized for its beauty, versatitlity and resliency, the wood of Atlantic white cedar (AWC) is highly sought after in the modern forest products landscape. Limited supply of the tree keeps availabilities and pricing at a premium. The current marketplace for wood products leans toward fast-growing and abundantly available southern pine and eastern hardwood species, including many from outside the United States. US landowners often feel pressure to participate in these generic products that are often seen on the racks of "big box" retail stores. AWC is not one of these generic products. The wood is light-weight, resistant to decay, straight-grained, Present day uses include flooring, siding, boat railing, telephone poles, piling, ties, and ice cream tubs (USDA Forest Service).

## Detailed Utilization History

Prior to man-made wood preservatives, e.g., creosote and pentachlorophenol, people relied upon the natural decay resistance of certain tree species to provide building materials that could withstand biological agents that could quickly destroy ordinary wood. In the eastern United States, the species of greatest importance were American chestnut (*Castanea dentata*), longleaf pine (*Pinus palustris* ), baldcypress (*Taxodium distichum* ), Atlantic white cedar (*Chamaecyparis thyoides*), and eastern red cedar (*Juniperus virginiana)* . American chestnut -- widely distributed throughout the Appalachian Mountains, and arguably the most important timber tree in the eastern United States at the time – was destroyed by the chestnut blight (*Cryphonectria parasitica*) between 1900 and 1950. Longleaf pine (*Pinus palustris)*covered about 92 million acres in the Southeast when the Europeans arrived (Early 2004); today, about 3 million acres still remain (Finch et al. 2012). In 1901, there was an estimated 40 billion board feet of cypress in the Southeast, compared to about 6 billion board feet in 1956 (Krinbill 1956b). The cypress volume in 2010, based on FIA data, was 7.7 billion cubic feet (Greis et al. 2012).

When European settlers arrived, Atlantic white cedar (AWC) occupied about 500,000 acres (Kuser and Zimmermann 1995), including 115,000 acres in New Jersey (New Jersey Forest Service 1997). The exact composition of the total acreage was presumably stands dominated by AWC. The largest concentration of AWC was in peat swamps of eastern NC and Virginia, particularly the Great Dismal Swamp. Possibly half the AWC in eastern NC was cut between 1880 and 1900 (Frost 1987), mostly by John L. Roper Lumber Co. (Anonymous 1907) and Richmond Cedar Works. In the 1890s, AWC occurred on about 200,000 acres in eastern NC (Pinchot and Ashe 1897); another 100,000 acres was in Virginia (Akerman 1923).

By the late 1980s, the acreage of AWC had decreased by at least 90% in the Carolina's (Frost 1987). In 1990, the combined volume of AWC sawtimber ( $^{3}$10 inches in diameter) in the northern and southern Coastal Plain of North Carolina was ~210 million board feet (Johnson 1990; Thompson 1990). Davis et al. (1997) stated that less than 10,000 acres of AWC (= 5 inches in diameter) still remained in NC, with more than half in Dare Co. Only 5700 acres had stands in which AWC comprised 50% or more of the basal area. In 1999, AWC occupied an estimated 32,000 acres in New Jersey with a merchantable volume (trees = 5 inches dbh) of 120 million cubic feet (3.5 million cubic meters) (Widmann 2005).

Range-wide, AWC was present on about 530,000 acres in 1990, but it was dominant (=50% of the trees) only on 108,000 acres – about 20% of the total (Sheffield et al. 1998); stands where AWC composed 75% to 100% of the stems occupied only 50,000 acres. The range-wide estimate of merchantable volume was 850 million board feet (9.8 million cubic meters) (Sheffield et al. 1998). Estimates of annual cut are variable, ranging from 10 to 19 million board feet per year in the 1990s (Sheffield et al. 1998; Ward 1989). Currently, the annual harvest of AWC is about 0.2 to 0.5 million board feet in NC. Perhaps 0.2 million board feet of AWC have been cut annually in NJ during the last 20 years (Bob Williams, personal communication). The resource, if properly managed, could easily sustain a greater cut each year, but public policy currently makes little provision for active management (personal communication: Bob Williams).

Across its range, AWC is not in danger of depletion, but that generalization might not apply in every locale (Sheffield et al. 1998). Based on FIA plots, the region-wide merchantable volume of AWC increased a little in the 1990s (Sheffield et al. 1998). However, the distribution of AWC has become so patchy that FIA plots probably do not have enough resolution to estimate the current acreage with reasonable accuracy.

Historically, AWC was prized for siding, shingles, shakes, decking, cooperage, decoys, buckets, tankage, fencing, shutters, posts, and poles. Owing to its light weight, straight grain, ease of machining, ease of finishing and painting, low shrinkage, and extreme resistance to decay, it was also the wood of choice for small, shall-draft boats. Howard Krinbill, a graduate of Biltmore School of Forestry, was hired by John L. Roper Lumber Company (Washington County, NC) in 1911 to cruise their forest holdings in eastern NC. Late in his life, Mr. Krinbill reminisced that AWC was 2 to 5 times more valuable than other species, so loggers made a special effort to reach it wherever it could be found (Krinbill 1956a).

In addition to its high value as standing timber, logs from ancient AWC forests – embedded in the peat and muck of swamp soils -- were commercially important. Loggers often excavated buried logs (Defebaugh 1907), especially after severe fires which consumed the peat matrix, thus exposing the logs (Hall and Maxwell 1911; Ruffin 1861). The acid, anaerobic peat combined with extreme decay resistance of AWC created conditions where logs were essentially pickled within the peat matrix.

Optimum management practices can increase utilization and value. Clear AWC lumber or lumber with tight knots commands high prices, whereas wood with loose knots has much less value. When grown at moderate spacing, AWC retains dead branches for decades, resulting in wood with loose knots. Natural stands with high stem density self-prune at an early age, yielding clear wood thereafter. Therefore, future regeneration and silvicultural practices must be tailored to produce wood that is clear or has tight knots if restoration of AWC is to be commercially feasible.

In recent years, AWC occurred on about 500,000 acres across its range, but, "as stands dominated by AWC have been cut, the resource tends to exist more and more in mixed stands, thus discouraging the utilization of the species for timber products (Sheffield et al. 1998)." Regeneration and silvicultural practices must be determined which yield pure stands or stands with a high AWC component. Owing to their high value, such stands will be more attractive to loggers, which should increase utilization if suitable markets exist.

The mechanical and structural properties of AWC are similar to those of western redcedar (*Thuja plicata* ) (WRC). Both are light weight (22 pounds per cubic foot at 12% moisture content) (Glass and Zelinka 2010) and similar in strength and hardness (Kretschmann 2010). Shrinkage of WRC is equal to or slightly less than AWC (Glass and Zelinka 2010). In other respects, however, the two species are strikingly different. Old-growth WRC could live to extreme age, and sometimes reached truly herculean size. Darius Kinsey documented logging in the Pacific Northwest between 1900 and 1945. One of his pictures shows a monstrous WRC -- the biggest tree in the state of Washington -- that was 100 feet in circumference at the base (Bohn and Petschek 1978).

AWC is a pioneer species with typical longevity of 200 to 300 years (Ward and Clewell 1989), but ring counts from buried logs indicate a maximum potential age of 1000 years (Defebaugh 1907). The longevity of AWC is limited by its susceptibility to windthrow, fire, and lightning. Literature from the 19th century suggests a maximum size of 100 to 120 feet in height and 4 to 5 feet in diameter (Krinbill 1956; Korstian and Brush 1931), but older accounts document even larger trees. In 1812, a huge cache of buried AWC logs was discovered in a swamp near Dennisville, NJ, with some logs up to 6 feet or more in diameter (Defebaugh 1907). In 1792 (verify?), Johann Schoepf , a German naturalist) observed AWC iin eastern NC 12 to 15 feet in circumference at the base (Morrison 1911). The North Carolina Forestry Historical Society (Durham, NC) has a picture of an AWC -- likely taken in the 1890s (See archived pictures) – that was close to 6 feet in diameter (at 1.3 m) (Baines 1989; North Carolina Forestry Historical Society). [Note: that same picture was incorrectly identified by Pinchot and Ashe(1897, page 121, plate XIII) as eastern redcedar]. Current logging operations in eastern North Carolina and New Jersey harvest AWC trees averaging 12 to 14 inches in diameter, with occasional trees of 20 to 24 inches (Brian Martin, personal communication).

The existing reserve of WRC dwarfs that of AWC. In 2004, British Columbia had an estimated 750 million cubic meters of WRC (Gonzalez 2004). By comparison, the estimated merchantable volume of AWC (trees = 5 inches) in 1998 was 9.8 million cubic meters (Sheffield et al. 1998) – less than 2% of WRC. WRC is widely used for a variety of products, is recognized and accepted by consumers, is backed by two strong marketing organizations (http://www.wrcea.org/ ; http://www.wrcla.org/ ) and is exported to numerous foreign countries. Although AWC wood is suitable for the same products, comparing the commercial footprint of AWC to that of WRC is like comparing a Piper Cub to a B-52 bomber.
Increasing the acreage and utilization of AWC likely will require positive economic incentive(s) for landowners and other stakeholders. The Longleaf Alliance (http://www.longleafalliance.org/) has been successful, in part, because it provided "a reasonable economic argument to complement the strong ecological argument (Johnson 2012)." The need to link a profit motive with conservation is clear in the following quote (Phillips et al. 1998):

> "In 1989, Duke University and Weyerhaeuser Corporation conducted a diverse regional survey was conducted to determine attitudes and motives for those individuals and organizations participating in the comeback of AWC. Included were federal agencies, universities, private consulting groups, state agencies, corporations, and a wildlife magazine editor. The survey revealed diverse motives, but profit or economic benefit was the main reason for interest in white cedar recovery. AWC plantations were seen as an opportunity to generate income in coastal NC counties unlikely to attract much commercial interest otherwise. Based on this survey, conservation of the remnant stands of AWC appears to be strongly motivated by profit or the "value-added" opportunity. Conservation could bring jobs and a stronger tax base into coastal areas with a preponderance of wetlands or marginal agricultural lands. Indirectly, the profit motive could save an endangered species."

Planting AWC simply with the objective of restoring it is a good rallying point, but it can only go so far when trying to persuade land owners to tie up their land for decades – sometimes beyond the life of the owner. Unlike public agencies, landowners have to consider things like internal rate of return and return on investment. Thus, a landowner is more likely to buy into the idea of growing AWC if there is some profit motive or economic benefit to him or his heirs. Unless the economics of growing and harvesting AWC can be changed, the percentage of AWC on public lands likely will increase in the future (Ward 1989).

It is reasonable to assume that if more AWC is planted or regenerated, the supply will increase, and utilization will increase. However, increasing its utilization also will require more aggressive promotion and marketing. It is not enough to be good biologists or good foresters, or to simply put more trees in the landscape; people working in the realm of AWC must become better salesmen, too. Many products previously made from AWC have been replaced with man-made products – often cheaper and better -- so increasing the future use of AWC will require romanticizing the unique properties of AWC wood (Ward 1989).

Methods must be developed to ensure a more reliable annual stream of raw material to support manufacturers. Better logging practices are needed to minimize site damage, facilitate regeneration, and reduce costs. New products and uses must be identified. If local markets for AWC can be developed close to home, there might be a competitive advantage resulting from lower shipping costs. Utilization of AWC will increase only if AWC provides new and unique products, or has qualitative and/or economic advantage(s) over its primary competitor, WRC.

Natural disasters also affect the supply of AWC in the market. In 2003, Hurricane Isabelle struck northeastern NC, and destroyed or severely damaged 85% of the mature AWC stands in the Great Dismal Swamp (Belcher and Poovey 2009). Salvage operations in 2005 and 2006 yielded 3 million board feet of timber as well as 22 to 25 million pounds of fuel material consisting of splintered logs and logs with heart rot (Belcher and Poovey 2009). More recently, Hurricane Sandy struck New Jersey in October 2012, resulting in severe damage or destruction to hundreds of acres of AWC (Colimore 2013). Very little is being done to salvage the downed timber, which not only represents a big economic loss, but also creates a tremendous fire hazard (Bob Williams, 2013, personal communication). Clearly, fires and hurricanes in recent years have significantly impacted the acreage of pure AWC to the extent that the current acreage is unknown.

Although hurricanes regularly strike coastal ecosystems in the Southeast (Conner 1998), the impact of a single storm now can be far more significant that the total reserve of AWC is so low. Similarly, a single devastating wildfire, can significantly impact the total acreage of AWC, as in The Great Dismal Swamp in 2008 (Lowie et al. 2009). When these catastrophic events occur, contingency plans already need to be in place to expeditiously salvage the timber. In addition, precautions must be taken by loggers and land managers to minimize the risk of fires, especially during hot weather.

Currently, there is not a reliable supply of AWC logs for mills – a situation somewhat akin to poor cash flow. A more reliable supply likely would increase utilization of AWC. About one-fourth of the AWC acreage is controlled by public agencies (Sheffield et al. 1998) where management objectives are more complex, management plans tend to be multiple-use, timber production might be of secondary importance, and the regulatory environment is more difficult, compared to the private sector. In 1997, about 77% of the AWC stands in North Carolina were publicly owned (Davis et al.1997). In some places, regulations are very restrictive towards active forest management, e.g., bedding, burning, herbicides; so any improvement likely would increase the availability and utilization of AWC, and improve the situation for forest management in general. Sustaining the AWC resource and increasing its utilization will depend not only upon planting and regenerating more acreage, but also will require management models that effectively combine empirical wisdom and science with social/economic/political factors that operate in any particular location (Williams 2012).

*Revised 21 May 2013*
*Eric Hinesley and Kelley McCarter*

References

### Workshops and Conferences

In the late 1980s, Weyerhaeuser Corporation sought to stimulate interest in restoring AWC to former sites in eastern North Carolina. Along with this effort, workshops were initiated where people could share information concerning the ecology, restoration, and management of AWC. These meetings grew in attendance, and were called symposia beginning in 1997. Since that time, meetings have been held at 2- and 3-year intervals to present results of studies related to all aspects of AWC ecology, management, restoration, growth and yield, and nursery production. Workshops and symposia also included field trips. Until now, Proceedings of these workshops and meetings have not been available in a single place. To facilitate access to the historical record, workshops and symposia are listed below, including links to handouts or Proceedings. The next conference is tentatively scheduled for 2015 in Massachusetts.

- 1992 Atlantic White-Cedar Meeting, March 5th, 1992, Tidewater Experiment Station, Plymouth, NC
  - Meeting Agenda
- 1995 Workshop : Current Developments with Atlantic White-Cedar Management, August 1-3, 1995, Washington, NC
  - Workshop Brochure; Workshop Agenda and Abstracts; Workshop Speakers and Attendees
  - DEHNR Followup
- 1997 Symposium : Atlantic White-Cedar: Ecology and Management Symposium - August 6-7, 1997, Newport News, VA
  - Proceedings
- 2000 Symposium : Atlantic White Cedar Restoration Ecology and Management - May 31-June 2, 2000, Newport News, VA
  - Proceedings
- 2003 Symposium : Atlantic White Cedar: Ecology, Restoration, and Management - June 2-4, 2003, Millersville, MD
  - Proceedings
- 2006 Symposium : The Ecology and Management of Atlantic White-Cedar (*Chamaecyparis thyoides*) Ecosystems - June 6-8, 2006 Atlantic City, NJ
  - Proceedings
- 2009 Symposium : The Ecology and Management of Atlantic White-Cedar (*Chamaecyparis thyoides*) Ecosystems - June 9-11, 2009, Greenville, NC
  - Presentations
- 2012 Symposium: The Ecology and Management of Atlantic White Cedar (*Chamaecyparis thyoides*) - June 12-14, 2012, Suffolk, VA
  - Presentations
- 2016 Symposium: Emperiled Ecosystems in a Changing Climater - May 24-26, 2016 in Plymouth, Massachusetts
  - Presentations (coming soon)

### US FWS Site

- US FWS Site

Atlantic White Cedar Initiative
Campus Box 8008, Raleigh, NC 27695-8008
919-515-9563, 919-515-7793
info@atlantic-white-cedar.org

**Our Cause, the Atlantic White Cedar Initiative**

The late 1800s and early 1900s saw tremendous exploitation of forest resources in the southeastern United States and other regions. Forests were regarded as inexhaustible; wasting timber was a virtue, not a crime; and the concept of sustained yield had never been considered (U. S. Forest Service 2004). Two forest types that fell in the path of that philosophy were longleaf pine (*Pinus palustris*) (Early 2004) and baldcypress (*Taxodium distichum*) (Krinbill1956). AWC was far less ubiquitous than either of those species, but it was important to the local culture and economy where it occurred. Because Atlantic white cedar was so valuable, it was reduced in North Carolina to less than 10% of the original acreage by the 1980s (Frost 1989), possibly 5% by the late 1990s (Davis et al. 1997).

Since the late 1980s, there has been strong interest in the ecology and restoration of AWC. Today, there is a large body of scientific knowledge related to the ecology of Atlantice white cedar (AWC) and the ecosystems in which it is found (See the Archived Proceedings on this website). Work in the area of forest management goes back to the 1920s; but more is needed. It is no longer enough simply to plant more trees, to talk about the great attributes of AWC, or to continue describing AWC ecosystems in more detail. It is important to look at the big picture, and figure out how to move the resource forward in the future.

As with forests in general, sustainable forest management likely is the best hope for conserving and restoring the AWC resource and its associated values (Pinchot Institute for Conservation 2012). This does not preclude, however, preserving designated AWC stands to reach their maximum potential size and age, without being harvested. In addition, recent experience with hurricanes and fires in eastern North Carolina and Virginia indicate that “active management is essential for achieving sufficient seedling densities and survival for regenerating a mature cedar stand” (Laing et al. 2011).

The long decline in longleaf pine acreage recently ended largely as a result of efforts by the Longleaf Alliance . The success of the Longleaf Alliance has come, in part, because, “it provided a reasonable economic argument to complement the strong ecological argument” (Johnson 2012) for restoring the species. Similarly, to secure the future of the AWC resource, more people have to recognize that loggers and landowners must be able to make a profit that allows for reinvestment into the forest for restoration and future timber supplies (Williams 2008). Where those conditions exist, restoration can be paid for many times over by the forest itself rather than at taxpayer expense through cost share programs.

Although there is a small but steady flow of good scientific information concerning AWC (see Proceedings archived in this website), it might be beneficial to do some refocusing. Efforts should be made to increase the utilization of AWC, especially given the widespread use of its formidable competitor, western redcedar (Thuja plicata) (WRC). New products and uses for AWC should be sought. New and more reliable markets must be established; otherwise, there is too much uncertainty for people and businesses in the supply chain (Williams 2008).

Education is needed to show how restoration, conservation, and forest management can be mutually compatible. People must understand that increasing utilization and forest management cannot be separated if the goal is to support industry in a sustainable manner while at the same time preserving long-term quality and productivity of the ecosystem. Public agencies and the public at large must see that forest management, including logging, can be carried out responsibly without permanently degrading the ecosystem. Logging practices are available that minimize the negative impact of harvesting (Williams 2008).

Other technology is available to release AWC regeneration from competition by other species. Advocates of AWC must get better at conveying the available technology and message to people and agencies making policy decisions affecting the resource. Restoration of AWC can be enhanced by a policy of wise use, similar to the philosophy of Gifford Pinchot (U.S. Forest Service 2004). Where appropriate, it can also involve an element of preservation. In addition, public perception and policy should be undergirded by science as well as empirical experience in the field.

Based on its ecology, management policies that exclude disturbance are likely to eventually lead to a decline in the importance of AWC (Motzkin et al. 1992). Thus, "…an understanding of processes that influence community composition and structure over long periods of time may indicate conservation objectives and management guidelines different from those directed at the preservation of communities that, at a given point in time, appear to be unique on the landscape (Motzkin et al. 1992)."

The word "restoration" can have numerous meanings, representing anything from merely putting AWC back on the land, without site preparation, perhaps with 200 to 300 trees per acre (low intensity), to heavy site preparation and machine planting of 1250 trees per acre (high intensity). The measure(s) of success for restoration depends on the objectives of ownership. For example, public agencies tend to have either multiple-use missions, or in some cases, a "preservationist" mindset. On the other hand, landowners, businesses, and potential investors might be specifically interested in timber production or some other product that can produce revenue.

Regardless of scale, if the goal is to restore and maintain Atlantic white cedar in the landscape, effort should be made to restore and control hydrology as part of the overall management plan (Lowie and Ward 2012). Pocosin Lakes National Wildlife Refuge is a good example of hydrologic restoration on landscape scale (Ward 2010). In addition to greatly minimizing the risk of catastrophic wildfires, maintaining a higher water table is also is important in the control of hardwood vegetation, especially red maple (*Acer rubrum*), which tends to take over AWC sites when the soil becomes drier (references).

Everyone can agree that AWC is a beautiful and valuable tree with a rich history. If the objective is to restore AWC and expand its footprint as well as its utilization, advocates of the species need to bring all resources to bear on that objective. Knowledge is just one part. These resources involve a combination of science-based knowledge, sound economics, forest management, cultivation of potential partners, and education. Science, technology, and empirical wisdom must be integrated with an awareness of social, political, cultural, and economic factors to effectively achieve all management objectives for the long-term benefit of the resource and people who use it (Williams 2012).

For years, there has been talk of forming an Atlantic White Cedar Alliance, but critical mass (people and financial backing) to support it is lacking at this time. Nevertheless, plans are moving ahead to use this website (http://atlanticwhitecedar.org/) to focus on initiatives that would be addressed by an Alliance:

1. To serve as a hub for dissemination of information and for educational outreach,

2. To promote the commercial utilization of AWC, identify new products and markets, and identify opportunities where forest management and silviculture can solve environmental problems while also generating a profit.

3. To encourage research related to basic ecology of AWC.

4. To educate the public about the unique characteristics of AWC ecosystems, including threatened or endangered species.

5. To research and promote better forest management practices (BMPs) for AWC.

6. To encourage restoration of AWC to its historic range.

7. To archive significant publications related to AWC.

8. To archive images and video related to AWC and the initiatives listed above.

*Revised 28 October 2013*
*Eric Hinesley*

Atlantic White Cedar Initiative
Campus Box 8008, Raleigh, NC 27695-8008
919-515-9563, 919-515-7793
info@atlantic-white-cedar.org