
ATLANTIC WHITE CEDAR RESTORATION IN SOUTH CAROLINA: EFFECT OF FALL PLANTING DATE ON GROWTH AFTER 2 YEARS IN THE FIELD

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Abstract—Six thousand Atlantic white cedar (AWC) transplants were established in October 2002 in a recently-drained 4-ha man-made impoundment in Aiken County, South Carolina. Survival was close to 100%. In a small replicated experiment (120 trees), growth the following year was significantly better for transplants established in September and October compared to November and December. This advantage was attributed to a shorter time of root confinement in containers during the fall. After 2 years in the field, transplants were about 1.3 m tall, and those planted in September were significantly taller than those planted in October or later. Planting throughout the fall appears feasible if soil moisture is adequate.

Key Words: Atlantic white cedar, *Chamaecyparis thyoides*, transplants, survival, seedlings, restoration, Sandhills

INTRODUCTION

In the Southeast, Atlantic white cedar (AWC: *Chamaecyparis thyoides*) often grows within the once extensive longleaf pine ecosystems that dominated the Coastal Plain from Virginia to Texas. Bill Boyer (USFS, retired; personal communication) has asserted that longleaf enthusiasts should pay closer attention to unique ecosystems embedded within longleaf pine forests. He mentioned cane (*Arundinaria* spp.) specifically, but his point is also germane to AWC swamps in much of the Southeast. Atlantic white-cedar occupies only a small fraction of its former extent, mostly because of overharvesting, lack of regeneration, drainage and filling of wetlands, and alterations in fire regimes (Davis et al. 1997, Frost 1987). Juniper communities are classified by the United States Fish and Wildlife Service (USFWS) as critically endangered (Noss et al. 1995), and by The Nature Conservancy as globally threatened (G2). Juniper tends to occur in blackwater swamps, most often along streams, but also in isolated swamps such as Carolina Bays. In the Carolinas, it typically grows in frequently saturated peat soils atop sand, or in wet sandy soils near streamheads. Factors such as soil and other seedbed requirements, hydrologic dynamics, competing vegetation and past fire history of the site all play critical roles in regeneration of AWC. Pure AWC stands can maintain up to twice as many healthy trees per acre as other forest tree species. Juniper wood has always commanded a premium price relative to pine and many other species. Our objective was to evaluate various planting dates (September to December) to facilitate restoration efforts with AWC in ecosystems where it grew in earlier times.

METHODS

On 28-30 October 2002, about 6,000 AWC seedling transplants ([figure 1](#)) were hand-planted in a recently drained, 4-ha man-made impoundment along Spring Branch, a first-order blackwater stream on Aiken Gopher Tortoise Heritage Preserve and Wildlife Management Area in Aiken County, SC. Seedlings had been raised for 1 year in

Ropak Multi-Pots (39-cm³ cell), and a second year in Anderson deep tree bands (7.5 x 7.5 x 23.5 cm)(Anderson Die & Manufacturing Co., Portland, Oregon). Planting conditions ranged from firm sand to muck almost 1.3 m deep. To determine if temporal variation in planting date affected seedling survival and growth, we also conducted a small replicated experiment by planting AWC transplants in mid-September, -October, -November, and -December. Thirty transplants were planted on each date. The experimental design was a randomized complete block with 30 blocks, four treatments (planting dates), and single-tree plots. Plants were placed in two adjacent rows, with 15 blocks in each row. The two rows ran along a set contour. Spacing was 2.4 m in rows and between rows. During the fall, plants that were still in containers were watered as needed. Total height of the experimental plants was measured at the end of the first (Fall 2003) and second (Fall 2004) years in the field. Data were subjected to analysis of variance, and 1-df contrasts were used to compare planting dates.

RESULTS

After one year in the field, survival was 100 percent for the 120 experimental seedlings, and seedlings planted in September and October were significantly taller than those planted later. All planting dates yielded good results ([table 1](#)), possibly because the site was constantly wet and rainfall was abundant. Differences in height were judged to result from a longer period of root confinement in containers during the fall of 2002 for seedlings outplanted in November and December. Survival after 2 years in the field was virtually 100 percent, with almost all trees healthy and some trees 1.5 to 1.8 m tall. After 2 years in the field, total height was significantly greater for the September planting date (131 cm) compared to an average of 119 to 124 cm for the other planting dates. A similar study with Fraser fir seedlings (*Abies fraseri*) showed that planting in irrigated transplant beds early in the fall yielded more growth the following year compared to later planting dates (Hinesley 1986). [Figures 2](#) and [3](#) show aspects of the restoration.

CONCLUSIONS

AWC transplants can be established successfully throughout the fall if soil moisture is adequate and competition not limiting. Based on total tree height, there was a small advantage to earlier planting (September) that was still evident after 2 years in the field.

ACKNOWLEDGEMENTS

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Table 1--Growth of Atlantic white-cedar planted on various dates in the fall of 2002, Aiken Gopher Tortoise Heritage Preserve, South Carolina. Measured in 2003 and 2004

Planting date - 2002	Number	Initial height (cm)	Total height growth (cm) Dec 2003	Total height growth (cm) July 2004	Total height (cm) Dec 2003	Total height (cm) July 2004
September	30	47.4	44.8	92.1	84.0	131.4
October	30	53.0	35.6	89.2	65.0	118.6
November	30	56.5	29.3	85.7	67.4	123.9
December	30	57.3	31.3	85.4	68.3	122.5
Sept vs. Oct		**	**	NS	**	**
Oct vs. Nov		*	NS	NS	NS	NS
Nov vs. Dec		NS	NS	NS	NS	NS
NS, *, ** Non-significant or significant at $P \leq 0.05$ or 0.01, respectively						

Figure 1— AWC transplants grown in Anderson deep tree bands (7.5 x 7.5 x 23.5 cm). Containers were removed to show the root systems.



Figure 2 – Two-yr-old AWC transplant typical of those planted on Aiken Gopher Tortoise Heritage Preserve and Wildlife Management Area (Aiken County, SC). Seedlings had been grown 1 year in Ropak Multi-Pots (39-cm³ cell), and a second year in Anderson deep tree bands (7.5 x 7.5 x 23.5 cm)(Anderson Die & Manufacturing Co., Portland, Oregon). Shown in picture is Johnny Stowe.



Figure 3 – Drained impoundment on Aiken Gopher Tortoise Heritage Preserve and Wildlife Management Area (Aiken County, SC) that was planted with 2-yr-old AWC transplants in October 2002. The two flagged rows were used to plant AWC on different dates in the fall (mid- September to mid-December). Shown in picture is Johnny Stowe.

