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BIOL 535 Wetlands Ecology Laboratory Report

AGE DISTRIBUTION OF BALDCYPRESS (*TAXODIUM DISTICHUM*) AT THE INGER AND WALTER RICE CENTER FOR ENVIRONMENTAL LIFE SCIENCES, CHARLES CITY COUNTY, VIRGINIA

Abstract: Regeneration of baldcypress (*Taxodium distichum*) on the grounds of Virginia Commonwealth University's Inger and Walter Rice Center for Environmental Life Studies was studied. Locations of individual baldcypress were located using global positioning systems (GPS). Diameter at breast height (DBH) of saplings and adult trees was measured. Stem height of saplings was either measured or estimated. Estimated age distribution data suggest a growing baldcypress population because of a preponderance of young trees. Most of the regeneration is occurring in low-lying areas recently drained by the breaching of a dam across Kimages Creek that restored the creek's natural flow to the James River. While the area appears suitable for natural and artificial regeneration of baldcypress, rising sea levels and potential increased salinity of tidal waters may undermine such a project's success.

The baldcypress, *Taxodium distichum* (L.) Rich., is an iconic resident of deepwater swamps in the southeastern United States, ranging throughout the Gulf and southern Atlantic coastal plains and the Mississippi River Valley (Braun, 1950). Baldcypress swamps reach their northern extent in southern Indiana (Cain 1935) and Delaware (Shreve 1910). The volume of baldcypress has declined significantly from an estimate of 40 billion board-feet in 1909 (Kennedy 1972), largely through intensive harvesting of the timber and conversion or modification of its wetland habitat (Conner and Toliver 1990, Wilen and Frayer 1990).

The wetlands of VCU's Inger and Walter Rice Center for Environmental Life Sciences were likewise affected by the many land-use changes that have occurred in Virginia since the English settlement of Jamestown in 1607. Much of the site, once part of Berkeley Hundred and long owned by the Harrison and Tyler families, has been at times cleared or at least selectively logged, but much of the wetland area – particularly in the Kimages Creek bottom – remained forested until the Civil War, when portions of the site was occupied by Union forces (Egghart

2009). That disturbance was short-lived, however. Much of the bottomland in the Kimages Creek area had reverted to forest by the dawn of the 20th century (Egghart 2009).

In the 1920s, the land was transformed into the Berkeley Hunt Club. Kimages Creek was dammed to form Lake Charles. Much of the timber in the creek bottom was harvested and used to build a hunting lodge on site. While the hunt club failed during the Great Depression, the site was eventually transformed into a YMCA summer camp. Ambassador Walter Rice bought the land from the YMCA in the 1970s. Inger Rice, donated the parcel to Virginia Commonwealth University in 2000 (Egghart 2009). VCU officials began considering ways to restore the natural flow of Kimages Creek to the James River in 2006. Several large storms in 2007 began the project by partially breaching the dam. The project officially began in December 2010 with the removal of the portion of the dam across the Kimages Creek channel. With the dam breached, VCU and The Nature Conservancy experts plan to try to re-establish baldcypress into previously inundated portions of the Kimages Creek floodplain (Blankenship 2011, Springston 2011).

Before artificial replanting of baldcypress takes place, it is best to understand the local conditions under which natural regeneration is possible and identify sites suitable for the establishment and survival of baldcypress seedlings and saplings. That is the goal of the current project.

MATERIALS AND METHODS

Data for this project were collected during several visits to the site by members of VCU's Fall 2001 BIOL 535 (Wetlands Ecology) class. On each visit, members of the class were divided into two teams, each assigned to search a specific path through wetland areas on the Rice Center grounds. When an adult or juvenile baldcypress was located, team members armed with global positioning system (GPS) receivers recorded the location of the baldcypress individual. Where

seedlings were tightly clustered together, one GPS datapoint was recorded for the cluster. Other team members armed with either calipers or taped measured the diameter at breast height (DBH) of the individuals. Age of individuals was likewise estimated based on an assumed growth rate of 1 cm diameter every four years. When multiple DBH measurements were obtained, the average of the measurements was used to estimate the age. Where trees were branched at or below breast height, the DBH for the largest branch at breast height was used to estimate age. The height of saplings was measured or estimated. In the case of seedlings and saplings where only height was recorded, the minimum age was assumed to be 4 years or less.

RESULTS

An image map of the Rice Center, with locations of baldcypresses denoted by orange circles, is given in Figure 1. Most of the baldcypress are concentrated along the eastern edge of Kimages Creek and a tributary creek that feeds into it from the east. Another concentration is on portion of the western edge of the creek near the former dam. Smaller pockets occur at the mouth of the creek alongside the former dam as well as along Harris Creek in the western portion of the grounds.

As can be seen in Figure 2, the vast majority of baldcypress are less than 4 years old. The median age of baldcypress at the Rice Center is 31 years old, but that figure is skewed upward by the presence of a handful of extremely large – and presumably old – individuals. The median and modal age is 4 years or less.

The mean height of Rice Center baldcypress is 27 meters, with a median of 1.2 meters and a mode of 1 meter or less.

DISCUSSION

The age estimates, given that they are based on diameter alone, are fraught with error. The only accurate method to determine the age of a tree is via dendrochronology (Fritts 1976), and even then, given that increment cores are generally taken at breast height and that they often miss the pith (anatomical center) of the bole, are at best an underestimate of the actual age. (The only way to get an absolutely accurate age would be to core the tree so as to intersect the pith at the junction of the roots and shoots – a task all-but-impossible in trees with buttressed roots such as baldcypress – and properly crossdate the core against those obtained in a similar fashion from other trees.)

Nevertheless, the data suggest that the vast majority of Rice Center baldcypress are quite young, with regeneration occurring in areas exposed by the draining of Lake Charles following the 2007 storms. The preponderance of young trees suggests a growing population.

Although baldcypress seeds are dispersed by water, they will not germinate under water – though they may remain viable for more than two years while submerged. On the other hand, they will not generate on well drained soils. Saturated, but not inundated soils are required (Demaree 1932, Burns and Honkala 1990). After germination, the seedling must grow fast enough to keep it head literally above water during the ensuing growing seasons (Burns and Honkala 1990). While somewhat shade-tolerant, young baldcypress grow better with plenty of light (Demaree 1932, Burns and Honkala 1990).

These regeneration patterns appear to be borne out in the Rice Center data, as most of the seedlings and saplings are located in low areas drained in the last few years by the breaching of Lake Charles dam. These areas would be classified as sites with potential for natural regeneration – RCC-I in the system proposed by Chambers et al. (2005), as implemented by Faulkner et al. (2009). Nevertheless, the changing hydrology may affect the future establishment

of seedlings and saplings on those very same areas if the soils dry out. There appears to be relatively little baldcypress regeneration under the closed canopy of the Harris Creek area or along Kimages Creek where a relatively mature forest still reaches the water's edge. These areas would fall into sites with potential for artificial regeneration only (RCC-II) or sites with no potential for natural or artificial regeneration (RCC-III), whereas the upland portions of the Rice Center would squarely fall in RCC-III.

Efforts to restore the original character of the Kimages Creek area could fail in the long run as a consequence of sea-level rise triggered by anthropogenic climate change. Rising sea levels could, in turn, raise the water levels in the lower portion of the Kimages Creek drainage and re-flood the land exposed by the breaching of the dam. Several studies have mentioned the risks posed to coastal and tidal forested wetlands by the dual hazards of sea-level rise and increased salinity of tidal waters (Allen et al., 1996, Conner 1994, Faulkner et al., 2009).

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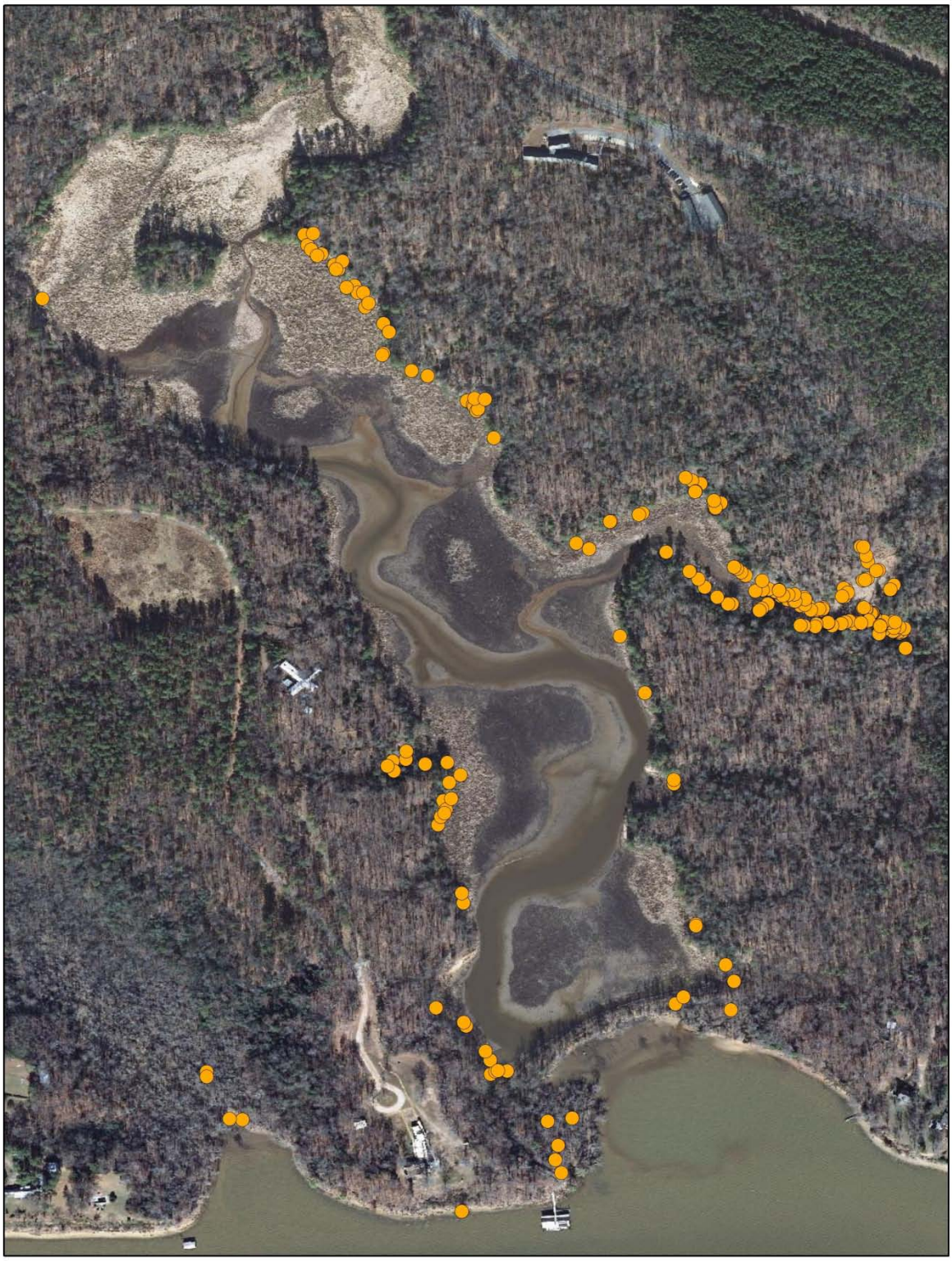

Figure 1. Satellite image of the Inger and Walter Rice Center for Environmental Life Studies, with locations of baldcypress (*Taxodium distichum*) marked by orange circles.

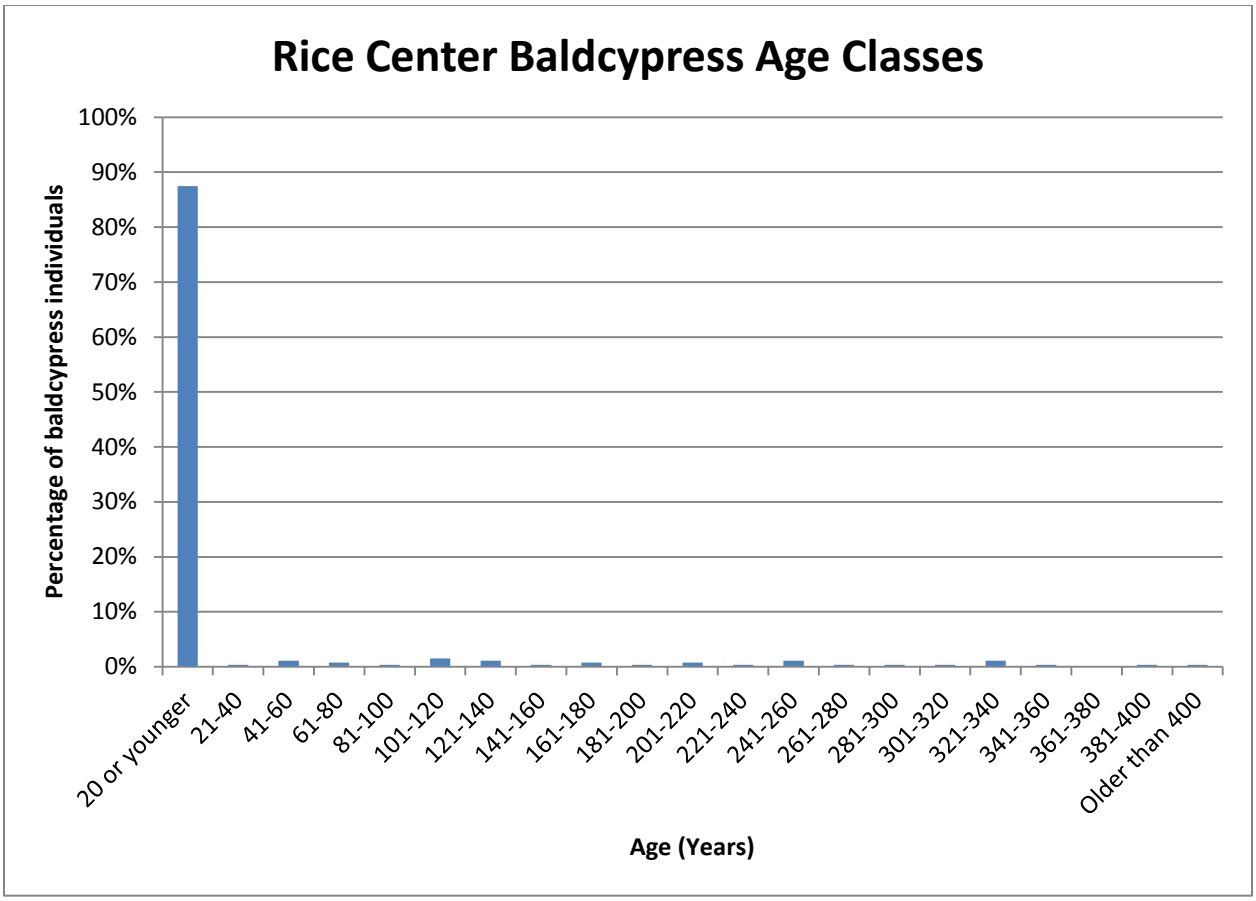

Figure 2. Age distribution of baldcypress (*Taxodium distichum*) at the Inger and Walter Rice Center for Environmental Life Studies in 20-year increments. The vast majority of baldcypress are estimated to be less than 20 years old.