North Carolina Forest Service

FORESTRY Leaflets

Focus Series on Bottomland Swamp Forests

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Natural Reforestation in Cypress-Tupelo Swamps

Many factors affect natural reforestation in swamps that contain primarily cypress and/or tupelo species: hydrology of the site, the depth of flooding and the soil substrate. In this leaflet, the term 'deep swamp' is used to describe these large complexes of mixed cypress and tupelo forests. Often, these deep swamp forests are part of a Red River/Water or Black River/Water bottomland system. However, they can also occur in Carolina Bays and other non-riverine, low-gradient, depressional wetlands.

Differences in Swamp Types and Species

Although at first glance many swamps look alike, there are subtle differences that can affect the process by which reforestation naturally occurs, either from seed or by sprouts. These differences include:

- Average seasonal high-water level.
- Frequency of flooding or inundation.
- Depth of flooding or inundation.

In river bottoms, these differences are often driven by the distance from the river or main stream channel. In non-riverine, depressional swamps, these differences are likely the result of the depth of the depression.

The reason why different species of cypress and tupelo are often found in different types of swamps is most likely because of the variety of ways their seed is naturally distributed, and perhaps due to specific biological adaptations each species has for surviving saturated or inundated conditions. It is important to keep in mind that while we often see swamps dominated by one or two species, it is not uncommon to find mixtures of all the cypress and tupelo species in the same swamp forest complex.

Hummocks are naturally-occurring, small mounds, with examples circled in this photo. Hummocks seem to play an important role in catching tree seed, thus allowing new forest regeneration to gain a foothold in a swamp.

Red River/Water Bottoms

Water tupelo (*Nyssa aquatica*) and bald cypress (*Taxodium distichum*) tend to dominate deep swamps that are associated with Red River Bottomland systems and are usually situated within the back-water swamp areas, either at the edge of the first river terrace, or in sloughs winding through the major bottomlands.

Key Reforestation Points:

- ✓ The seed of both species will float for extended periods and can be transported by stream flow and flood waters.
- ✓ Seed will catch against material in the swamp such as stumps, logs and hummocks (mounds).

Black River/Water Bottoms

Swamp tupelo (*Nyssa biflora*) and pond cypress (*Taxodium ascendens*) are most often associated with Black River Bottomland systems, which often have muck soils, infrequently flood and may not have flowing water when they do flood. These swamps may be somewhat shallow when compared to Red River Bottoms.

Often, these species will also occupy depressional wetlands that are largely fed by groundwater, such as Carolina Bays and similar areas in the coastal plain of North Carolina.

Key Reforestation Points:

- ✓ Because of the differences in hydrology, seed is not able to float into these sites by flowing water and therefore must be distributed by other means.
- ✓ Distribution must occur by seedfall from residual trees or adjacent forests, and from scattering by wildlife and birds.

Role of Wildlife in Seed Dispersal

In addition to being dispersed by gravity, wind and floating, seed distribution by bird and wildlife may play an important role in reforestation of bottomland swamps. For example, seed of both tupelo species and its associated understory trees (Red Bay and Sweetbay magnolia) are almost certainly distributed by wildlife, based on observations from field work.

The seed of the tupelo species is contained inside of a fleshy fruit and can pass through the digestive process of animals. Once deposited by the animal after digestion, the seed remains viable and can germinate. While it is unclear on the importance that animals have in seed dispersal, it can be presumed that there is some beneficial effect in the natural reforestation process.

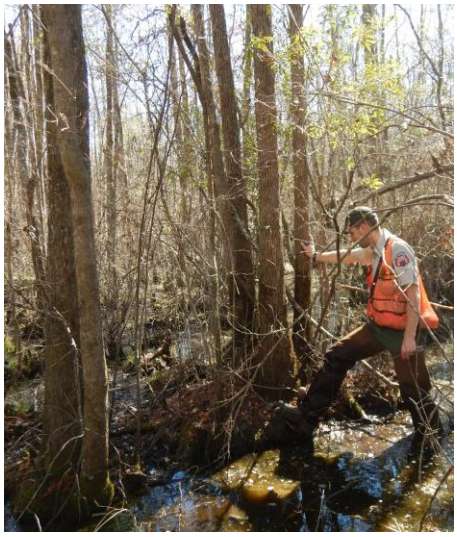
Coppice / Stump Sprouting

Both species of cypress and tupelo can regenerate by stump sprouts, known as 'coppice'. While there remains some debate about how important or reliable coppice is for natural reforestation of swamps, it is clear that these stump sprouts play a role.

The reliability and success of coppice appears to be very site-specific. Today, there are some good examples of swamp forests where coppice growth dominates or contributes to the overall forest structure. However, because these swamps were harvested nearly 100 years ago, it is impractical to know the exact conditions or methods that were used to successfully regenerate these well-established, coppice-regenerated forests.

Factors believed to drive the success of coppice are:

- **Tree Age** --- Younger aged trees tend to coppice more readily.
- **Tree Diameter** --- Smaller sized trees tend to coppice more readily, and may also callus over quicker than large stumps, which could contain leftover rot and result in coppice failure in the future.
- **Species** --- The wood of tupelo species is softer, lighter and more prone to decay. It is not uncommon to see a cutover tupelo swamp with very few stumps observed due to quick decomposition. The wood of cypress is somewhat more resistant to rot; its stumps may have a longer window of time to coppice.
- **Stump Height** --- Stumps should be left at, or just above, the average high-water mark. This mark is often seen as a permanent water stain or moss-line around the base of the trunk.
- **Average Water Depth** --- If the stump is submerged, coppice sprouting may not be as successful. Fluctuating water depths seem to foster more successful regeneration than does stagnant water level.



Photos show good coppice growth in two different swamps.

Hydrology

The information in this Leaflet thus far assumes that the hydrology of the swamp is unaltered. Drainage or impoundment drastically limits the ability of either tree species (cypress or tupelo) to regenerate or compete with other tree species. For example:

If the site is dried out from drainage, then other fast-growing species such as sweetgum, maple, sycamore, ash and others will out-compete cypress or tupelo. A drier site may also allow invasive plants to colonize the site more readily.

If the site retains too much water due to impoundment, then trees cannot regenerate by seed and coppice may not be as vigorous.

Key Reforestation Points:

- ✓ For seed to successfully germinate, it requires moist soil conditions and sunlight. Seed will not germinate in standing water.
- ✓ Once cypress or tupelo seedlings are established (usually at least waist-high), they can tolerate some inundation, if the trees are not totally submerged.

In a healthy bottomland swamp forest system, the natural rise and fall of water levels occurs on a cyclical or seasonal pattern, thereby allowing natural reforestation to develop over a period of multiple years when the conditions are optimal.

Landscape Assessment

When assessing the potential for natural regeneration it is important to look not only on the site, but also at the site's overall landscape position, both upstream and downstream. This assessment should occur before a timber harvest so that the harvesting methods align with the needs to promote natural reforestation afterwards. Even after a harvest, this assessment can help determine the likelihood of successful regeneration. Some key questions to assess are listed below:

Are there upstream impoundments (dams) that alter the flow or seasonal timing of flooding, or inhibit upstream sources of floating seed?

Recurring flooding during the growing season can hinder the growth of seedlings. Strong flooding soon after seed-fall can wash away the seed crop.

Are there downstream impoundments that back-up water and prevent proper seed germination, or drown young seedlings?

Beaver dams have proven to be especially troublesome in many bottomland swamps. They create stagnant conditions of abnormally high-water levels and usually require repeated work to breach the dam(s) or control beaver populations.

Has ditching or draining occurred, causing the site to be drier than normal, or rapidly release water?

Seed requires moist soil conditions to germinate. Bottomland swamp forests should not be ditched or drained.

In depressional wetlands, has the subsurface water table been drawn down, causing the wetland area to be drier than normal?

Many of these depressions are fed by groundwater, springs, and/or rainwater. Drier soil can allow undesirable vegetation to colonize.

Is there a source of seed on-site, or nearby, that can be dispersed across the harvest area over a period of multiple years?

Consider retaining suitable, permanent seed-source trees in the harvest area, and within any Streamside Management Zone. Seed dispersal can occur by gravity, wind, water or wildlife. Also see Forestry Leaflet #BF-4 for reforestation recommendations when planning a harvest.

Summary

Natural regeneration of deep swamp sites is subject to many factors, any of which may alter the next generation forest. It is not uncommon for reforestation in swamps to occur over a period of several years. For the first several years after a harvest, species such as willow may colonize the site. However, based on site surveys conducted by the N.C. Forest Service and others, the willow usually dies out after 10 to 20 years, allowing the smaller tree seedlings underneath to take over. You cannot accurately assess the status of reforestation in a swamp unless you walk out into it; observing from the surrounding high ground usually will not provide a complete perspective. Monitor the water levels in the swamp, with the goal of attaining natural flow and inundation patterns without altering the hydrology or site conditions.