



Little Big Econ State Forest (Seminole County)

Photo by Kimberly Gullede

## **Baygall**

**Description:** Baygall is an evergreen forested wetland of bay species situated at the base of a slope or in a depression. Loblolly bay (*Gordonia lasianthus*), sweetbay (*Magnolia virginiana*), and/or swamp bay (*Persea palustris*) form an open to dense tree canopy and are also dominant in the understory along with fetterbush (*Lyonia lucida*), large gallberry (*Ilex coriacea*), dahoon (*I. cassine*), myrtle dahoon (*I. cassine* var. *myrtifolia*), titi (*Cyrilla racemiflora*), black titi (*Cliftonia monophylla*), wax myrtle (*Myrica cerifera*), coastal doghobble (*Leucothoe axillaris*), swamp doghobble (*L. racemosa*), red maple (*Acer rubrum*), Florida anisetree (*Illicium floridanum*), coco plum (*Chrysobalanus icaco*), and/or Virginia willow (*Itea virginica*). Composition of the understory varies regionally; coco plum is restricted to South Florida, Florida anisetree to the central and western Panhandle. Black titi is a dominant component of baygall in the Florida Panhandle, but uncommon in other areas. Loblolly pine (*Pinus taeda*), slash pine (*P. elliottii*), and/or pond pine (*P. serotina*) are occasionally found in the canopy, as well as sweetgum (*Liquidambar styraciflua*), and in the Panhandle, Atlantic white cedar (*Chamaecyparis thyoides*). Wetter baygalls may also contain swamp tupelo (*Nyssa sylvatica* var. *biflora*) and/or pond cypress (*Taxodium ascendens*). The canopy and understory do not generally form distinct strata but may appear as a dense, tall thicket (Clewell 1986). Vines, especially laurel greenbrier (*Smilax laurifolia*), coral greenbrier (*S. walteri*), and muscadine (*Vitis rotundifolia*), may be abundant and contribute to the often impenetrable nature of the understory. Herbs are absent or few, and typically

consist of ferns such as cinnamon fern (*Osmunda cinnamomea*), netted chain fern (*Woodwardia areolata*), and Virginia chain fern (*W. virginica*). Sphagnum mosses (*Sphagnum* spp.) are common.

Baygall typically develops on wet soils at the bases of slopes, edges of floodplains, in depressions, and in stagnant drainages. The soils are generally composed of peat with an acidic pH (3.5 - 4.5). Seepage from uplands, rainfall, and/or capillary action from adjacent wetlands maintains a saturated peat substrate (Duever et al. 1982). While baygalls are not generally influenced by flowing water, they are often drained by small blackwater streams. Within the slough and glades marsh communities of the Everglades in South Florida, baygall may develop on elevated islands of peat (often called “bayheads”). Although most baygalls are small in acres, some form large, mature forests, often called “bay swamps.”

**Characteristic Set of Species:** loblolly bay, sweetbay, swamp bay

**Rare Species:** Baygall forests are important habitat for Florida black bear (*Ursus americanus floridanus*) and provide cover for their dens. South Florida bayheads are critical for supporting wading bird rookeries.

**Range:** Baygall occurs throughout mainland Florida and much of the southeastern coastal plain. The largest examples occur near the Georgia border in the Pinhook Swamp area south of Okefenokee Swamp.

**Natural Processes:** Deep peat soils and seepage from uplands or adjacent wetlands work to maintain a constantly saturated but rarely flooded environment. Constant damp conditions limit decomposition of organic material, which in turn keeps available nutrient levels low (Larson 1995). In deep swamps dominated by cypress and swamp tupelo, baygall can eventually develop. Leaf litter accumulation raises the soil level and creates a shallower depression, allowing bay species that require a shorter hydroperiod to become established. As the broad-leaved species proliferate, the shade-intolerant cypress and swamp tupelo seedlings are inhibited, shifting vegetation and soil conditions to favor broadleaf species that can germinate and grow in low light (Loftin 1998).

The dominant baygall species are fire-intolerant, and a mature canopy indicates the lack of destructive fire for many years (Clewell 1986). Although the saturated soils and humid conditions within baygalls typically inhibit fire, droughts may create conditions that allow them to burn catastrophically. These fires not only destroy the canopy, but also may ignite the deep peat layers that can smolder for weeks, or even months. This occurs perhaps only a few times each century in the deepest baygalls.

Where the peat layer is destroyed, the lower soil level may collect open water that can be re-colonized by marsh or cypress/tupelo swamp vegetation. If the root systems are not killed, bay species will readily re-sprout and form a shrub thicket (Clewell 1986). Peat areas with more frequent fires develop shrub bog vegetation rather than baygall (Lynch and Baker 1988). Thus, certain vegetation types (baygall, basin swamp, shrub bog, and open water) in the Okefenokee Swamp have been described as a “moving mosaic” of vegetation determined by fire history and hydrology (Loftin 1998). In South Florida

bayheads, severe fires that consume the peat can convert a bay-dominated forest to a lower thicket of coastalplain willow (*Salix caroliniana*; Wade et al. 1980).

**Community Variations:** Several pine species can withstand hydric soil conditions (loblolly pine, pond pine, slash pine), and the occurrence of these pines in baygall is apparently part of the natural variation. Many baygall species common in the northern peninsula and Panhandle reach their southern limits in the central peninsula (titi, black titi, coastal doghobble, and swamp doghobble). In the western Panhandle, Atlantic white cedar may be found in baygall which grades into bottomland forest along blackwater streams in the region.

The following variants are defined for two common situations.

- Variants:
- BAY SWAMP – A large basin with deep peat soils and a well-developed baygall forest such as those found in Pinhook Swamp.
  - SOUTH FLORIDA BAYHEAD – Occurs on tree islands in the Everglades. These are on small elevated sites of Gandy peat, a woody peat that is more resistant to decay under aerobic conditions (Lodge 2005). These communities may or may not be underlain by a limestone bedrock high. The open or closed canopy and shrub layers are dominated by swamp bay, sweetbay, dahoon, coastalplain willow, and/or coco plum, and the understory consists of ferns (on higher sites) or marsh species (Olmsted and Loope 1984; Lodge 2005). Portions of more elevated, drier sites may support hammock vegetation.

**Associated Communities:** The dominance of evergreen bay trees rather than a mixture of deciduous and other evergreen species can be used to distinguish baygall from other forested wetlands. Baygall may be quite similar to bottomland forest, sometimes forming a transition between the floodplain where the bottomland forest occurs and the adjacent uplands. Cypress/tupelo swamps are similar to baygalls (bay swamp variant), and there are many instances of intermediate stages between these communities caused primarily by fire and/or logging history. Many swamps may have a baygall understory, but retain a cypress or tupelo canopy. In general, cypress/tupelo swamps experience greater water fluctuation and maximum water depth than do baygalls (Monk 1966; Wharton 1978). Hydric hammocks are dominated by evergreen oaks and cabbage palms rather than bays.

Shrub bogs lack a closed canopy of bay trees. Baygall that has burned recently may be shrubby, but will have a large component of re-sprouting bay trees and burned tree stumps. Overgrown wet or mesic flatwoods may contain a sizable amount of evergreen bay species, particularly along ecotones between swamps and uplands. In addition, many baygalls can have a significant number of canopy pines, making these communities difficult to distinguish. The dominance of flatwoods species in the understory, such as saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), coastalplain staggerbush (*Lyonia fruticosa*), and shiny blueberry (*Vaccinium myrsinites*), as well as a nearly continuous pine overstory, can indicate a recent development of baygall vegetation in historic flatwoods communities.

**Management Considerations:** As with other wetlands, baygall communities are best managed with a landscape level focus on maintaining high quality adjacent natural uplands and upland-wetland ecotones. When possible, fires from adjacent communities should be allowed to extinguish naturally at the edges of the baygall to prevent encroachment of bay species into other communities and to maintain open, grassy wetland/upland ecotones. The maintenance or restoration of natural hydrology is critical to wetland communities. Artificial drainage of baygalls creates an opportunity for catastrophic peat fires.

Invasive exotic plants are a concern in all natural communities of Florida. Old world climbing fern (*Lygodium microphyllum*) has been documented in baygall communities, and poses a current threat to tree islands in Loxahatchee Slough in the northern Everglades (Lockhart, pers. comm. 2008).

Historically, many areas that were a mosaic of flatwoods, wet prairies, bay swamps, and shrub bogs were converted to pine plantation, and these communities may be difficult to distinguish after such disturbance. Baygalls have been cleared in order to grow horticultural plants in the mucky soil, and many areas, including bayheads in the Everglades have also been altered by drainage manipulation (USFWS 1999). These activities may expose the normally saturated peat soils to air, speeding decomposition. Baygalls have also been damaged or eliminated by peat mining.

Timber harvest and fire exclusion can encourage the replacement of other natural community types by baygall. For example, existing baygalls may have once been cypress-dominated swamps. Examination of historic aerial photography suggests that logging of these swamps led to a shift in vegetation to baygall (Loftin 1998). Baygall may also be generated by the removal of pine trees in wet flatwoods; shading from the remaining shrub layer may inhibit pine regeneration but does not limit bay species growth. This process is further promoted by fire exclusion (Loftin 1998).

Swamp bay, a major component of baygall, is susceptible to Laurel Wilt Disease, which is caused by a fungus spread by an exotic wood-boring ambrosia beetle (*Xyleborus glabratus*). As of 2009, the infestation had spread to 20 counties in north Florida (USFS 2009). There is no known means of treating diseased trees or controlling the spread of the disease, although root-flare injections of propiconazole has recently shown promise to provide temporary protection of individual trees (Mayfield, III et al. 2008). Wood or mulch from areas with infected trees should not be transported to avoid creating new centers of infection.

**Reference Sites:** Blackwater River State Forest (Santa Rosa and Okaloosa Counties), Lake Talquin State Forest (Gadsden and Leon Counties), Osceola National Forest (Columbia and Baker Counties), Avon Park Air Force Range (Highlands and Polk Counties), and Everglades National Park (Dade and Monroe Counties)

**Global and State Rank:** G4/S4

**Crosswalk and Synonyms:**

Kuchler	112/Southern Mixed Forest
Davis	2/Pine Flatwoods

	8/Swamp Forests, mostly of Hardwoods
SCS	12/Wetland Hardwood Hammocks
Myers and Ewel	Freshwater Swamp Forests - titi swamps, bayheads
SAF	85/Slash Pine - Hardwood
	104/Sweetbay-Swamp Tupelo-Redbay
FLUCCS	611/Bay Swamps

Other synonyms: seepage swamp, sandhill bog

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