Corkscrew Swamp Sanctuary (Collier County) Photo by Gary Knight

Strand Swamp

Description: Strand swamp is a shallow, forested, usually elongated depression or channel situated in a trough within a flat limestone plain, and dominated primarily by bald cypress (*Taxodium distichum*). Smaller strand swamps and shallow edges may instead contain pond cypress (*T. ascendens*). Small, young cypress trees at the outer edge of strand swamps grade into large old ones in the deeper interior, giving a strand a distinctly rounded cross-sectional profile (Duever et al. 1986). The variable woody understory contains a mixture of temperate and tropical elements, mainly red maple (*Acer rubrum*), pond apple (*Annona glabra*), swamp laurel oak (*Quercus laurifolia*), cabbage palm (*Sabal palmetto*), strangler fig (*Ficus aurea*), swamp bay (*Persea palustris*), sweetbay (*Magnolia virginiana*), coastalplain willow (*Salix caroliniana*), wax myrtle (*Myrica cerifera*), myrsine (*Rapanea punctata*), and common buttonbush (*Cephalanthus occidentalis*). In the Fakahatchee Strand, Florida royal palm (*Roystonea regia*) may also be present in the subcanopy. Herbs include string lily (*Crinum americanum*), giant leather fern (*Acrostichum danaeifolium*), toothed midsorus fern (*Blechnum serrulatum*), royal fern (*Osmunda regalis* var. *spectabilis*), sawgrass (*Cladium jamaicense*), and waterhyssops (*Bacopa* spp). Vines such as eastern poison ivy (*Toxicodendron radicans*) and white twinevine (*Sarcostemma clausum*) may be common. The warm, humid climate in strand swamp make it ideal habitat for epiphytic orchids and bromeliads. While the greatest diversity of these epiphytes may be found along the deeper sloughs, several are common throughout the swamp. These include a variety of air-plants (*Tillandsia* spp.), particularly common wild-pine (*Tillandsia fasciculata*), which is often abundant.

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Strand swamp soils are peat and sand over limestone. Swamps with larger cypress and a more diverse understory are on deep peat that acts as a wick to draw moisture from groundwater up into the root zone during droughts (Duever et al. 1986). Swamp edges, however, often have little organic matter over deep sand. The normal hydroperiod ranges from 100-300 days (Duever 1984). Water levels rise with increasing rainfall around June and then decrease to their lowest levels during winter and early spring (Duever et al. 1986). Water is deepest and remains longest near the center.

Characteristic Set of Species: cypress, pond apple, strangler fig

Rare Species: Rare plants in strand swamps include many epiphytic species restricted in Florida to the southern peninsula. These include American bird's nest fern (*Asplenium serratum*), narrow-leaved strap fern (*Campyloneurum angustifolium*), tailed strap fern (*C. costatum*), many-flowered catopsis (*Catopsis floribunda*), cowhorn orchid (*Cyrtopodium punctatum*), Fakahatchee guzmania (*Guzmania monostachia*), hand fern (*Ophioglossum palmatum*), fuzzy-wuzzy air-plant (*Tillandsia pruinosa*), entire-winged bristle fern (*Trichomanes holopterum*), and leafy vanilla (*Vanilla phaeantha*).

Strand swamp provides important foraging and nesting habitat for several rare animals including American alligator (*Alligator mississippiensis*), short-tailed hawk (*Buteo brachyurus*), swallow-tailed kite (*Elanoides forficatus*), mangrove fox squirrel (*Sciurus niger avicennia*), American alligator (*Alligator mississippiensis*), Florida panther (*Puma concolor coryi*), Florida black bear (*Ursus americanus floridanus*), southern mink (*Neovison vison*, southern Florida population). Many wading birds depend on the mosaic of habitats found in strands for feeding and nesting, especially wood storks (*Mycteria americana*).

Range: Strand swamps are restricted to South Florida, and probably do not occur north of Lake Okeechobee. They are mainly in Collier County where the Fakahatchee Strand and Corkscrew Swamp are perhaps the finest examples.

Natural Processes: Fire occurs rarely in strand swamps, with the largest trees on the deepest peat towards the center of the strand burning least frequently. However, fires from surrounding pine-dominated communities can frequently burn into the outer edges of strand swamps. Duever et al. (1986) report that cypress trees along these edges are typically both smaller and younger than those toward the interior, resulting from greater fire frequency along the edge that often kills adult cypress already stunted by poor sandy soils. In addition to having a shorter stature, strand edges are often a monospecific stand of cypress, owing to the vulnerability of the typical understory components to fire (Wade et al. 1980; Duever 1984). In this way, occasional fire contributes to the maintenance of a cypress dominated community; without fire, hardwood invasion and peat accumulation create a mixed hardwood and cypress swamp, and under certain conditions the strand may convert to hydric hammock (Penfound 1952). Cypress is very tolerant of light surface fires, but muck fires burning into the peat can kill the trees and lower the ground surface, transforming a strand swamp into a slough. Where severe fires have killed cypress, coastalplain willow commonly establishes as a thicket.

Community Variations: In undisturbed strand swamps, higher plant diversity is partly attributable to topographical variations, such as depressions caused by peat fires, high

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spots on old stumps, and irregularities caused by unequal solution of the underlying limestone, that allow species of varying flood tolerance to become established (Duever 1984; Larson 1995).

Associated Communities: Strand swamps are similar to other swamps in Florida that have a primarily cypress dominated canopy. Both basin and dome swamps, however, occur in relatively closed depressions with little water flow except during heavy rainfall. While many basin swamps north of Lake Okeechobee are roughly linear in outline, these usually occupy basins of former lagoons parallel to the coast that formed during times of high sea level, rather than troughs aligned with bedrock lows in a very gently sloping limestone plain. Floodplain swamp is a similar community that also has flowing water. However, the flat landscape of South Florida, with its very slight elevation gradient, prevents the typical downcutting of flowing streams found elsewhere in the state. Thus floodplain swamps occur along streams and rivers, as opposed to strand swamps, which have an irregular network of lower sloughs. Due to climate differences, strand swamps have a more tropical understory than most floodplain swamps, which tend to be found further north. Dome swamps occur within the same range as strand swamps where solution sinkholes fill with peat. With additional subsidence in the limestone substrate, these domes can grow together, forming an irregular strand (Duever et al. 1986). Hydric hammocks often occur on slightly higher ground in strand swamps. These areas have drier soils and are oak dominated rather than cypress dominated.

Management Considerations: Cypress wood is important to the forest products industry in Florida. Its natural resistance to rot makes it useful for many outdoor applications, including siding, outdoor furniture, fence posts, and garden mulch. Most strands were heavily disturbed by cypress logging in the early 20th century but many have recovered well, and there are a few small stands that are thought to be virgin, including within the Corkscrew Swamp Sanctuary. However, clearcutting of cypress for mulch is still practiced (USFWS 1999). Although stands generally regenerate from resprouting stumps and fast growing seedlings, logging of cypress may lead to a shift in canopy dominance, with hardwoods normally restricted to the subcanopy replacing the cypress that was removed (Duever et al. 1986). Logged swamps may be more vulnerable to destructive fires and the subsequent establishment of coastalplain willow thickets (Alexander and Crook 1973). Soil compaction from machinery used for logging can also inhibit cypress regeneration (Brandt and Ewel 1989).

Conversion of surrounding lands to pasture, citrus groves, and developments that interfere with the natural fire and hydrological regimes can be highly detrimental to strand swamps. Roads and old logging trams running perpendicular to water flow can impede water, causing unnatural ponding on the upstream side and droughty conditions on the downstream side (Duever et al. 1986; USFWS 1999). These effects are usually localized and may be partially ameliorated by bridge construction that distributes flow more evenly.

Restoration efforts in strand swamp should focus on landscape level management that re-establishes natural hydrology and maintains high quality surrounding uplands. Any clearcutting operation should leave a cypress seed source adjacent to the cleared area for regeneration to occur. Cypress seedlings require light and cannot withstand either severe

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flooding or fire (Loftin 1998; USFWS 1999). In order to maintain a natural ecotone between strand swamp and surrounding communities, fires should be allowed to extinguish naturally in the edge of the swamp when possible.

Exotic pest plants that show the greatest potential for disrupting strand swamp communities include old world climbing fern (*Lygodium microphyllum*), Java plum (*Syzygium cumini*), and Peruvian primrosewillow (*Ludwigia peruviana*). Brazilian pepper (*Schinus terebinthifolius*) and melaleuca (*Melaleuca quinquenervia*) can also invade artificially drained sites and drier edges. These species have the potential to crowd out native plants and form large monocultures. Old world climbing fern can cover trees and create a ladder for fires to burn into the canopy (FLEPPC 2007).

Reference Sites: Fakahatchee Strand Preserve State Park (Collier County), Corkscrew Swamp Sanctuary (Collier and Lee Counties)

Global and State Rank: G3/S3

Crosswalk and Synonyms:

Kuchler	113/Southern Floodplain Forest
Davis	7/Cypress Swamp Forests
SCS	17/Cypress Swamp
Myers and Ewel	Freshwater Swamp forests - sloughs and strands
SAF	101/Baldcypress
FLUCCS	621/Cypress

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