

# Information Sheet on Ramsar Wetlands (RIS)

— 2009-2012 version

Available for download from [http://www.ramsar.org/ris/key\\_ris\\_index.htm](http://www.ramsar.org/ris/key_ris_index.htm).

*Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8<sup>th</sup> Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX.22 of the 9<sup>th</sup> Conference of the Contracting Parties (2005).*

## Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2<sup>nd</sup> edition, as amended by COP9 Resolution IX.1 Annex B). A 3<sup>rd</sup> edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.
3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

---

### 1. Name and address of the compiler of this form:

C. Michael Knight  
Corkscrew Swamp Sanctuary  
375 Sanctuary Road  
Naples, Florida 34120  
Phone: 239-348-9143  
Email: [mknight@audubon.org](mailto:mknight@audubon.org)

FOR OFFICE USE ONLY.

DD MM YY

--	--	--

Designation date

--	--	--	--	--	--

Site Reference Number

---

### 2. Date this sheet was completed/updated:

7 July 2008

---

### 3. Country:

United States of America

---

### 4. Name of the Ramsar site: Corkscrew Swamp Sanctuary

---

### 5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):

- a) Designation of a new Ramsar site ; or  
b) Updated information on an existing Ramsar site

---

### 6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area

The Ramsar site boundary and site area are unchanged:

or

**If the site boundary has changed:**

- i) the boundary has been delineated more accurately ; or
- ii) the boundary has been extended ; or
- iii) the boundary has been restricted\*\*

and/or

**If the site area has changed:**

- i) the area has been measured more accurately ; or
- ii) the area has been extended ; or
- iii) the area has been reduced\*\*

\*\* **Important note:** If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

**b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:**

---

**7. Map of site:**

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

**a) A map of the site, with clearly delineated boundaries, is included as:**

- i) a hard copy (required for inclusion of site in the Ramsar List): ;
- ii) an electronic format (e.g. a JPEG or ArcView image) ;
- iii) a GIS file providing geo-referenced site boundary vectors and attribute tables .

**b) Describe briefly the type of boundary delineation applied:**

e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The boundary is the legal property boundary of Corkscrew Swamp Sanctuary (CSS), owned in fee simple by National Audubon Society (Audubon of Florida).

---

**8. Geographical coordinates** (latitude/longitude, in degrees and minutes):

Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

26°24'N; 81°31'W

---

**9. General location:**

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

Corkscrew Swamp Sanctuary is a 13,000 acre (ca. 5,261 ha) wildlife sanctuary in northern Collier County, Florida that lies north of Naples, Florida approximately 15 miles (ca. 24 km) east of Interstate 75. CSS is bound on the northeast, northwest, south, and portions of the west by state-owned conservation land. The Sanctuary includes land acquired from the Panther Island Mitigation Bank (PIMB), a 2,778 acre (ca. 1,124 ha)

site in Collier County, bordering Lee County that lies roughly seven miles (ca. 11 km) east of Interstate 75. Additional land from PIMB totalling 1124 ha is planned for transfer to CSS in phases over the next few years.

\* PIMB property is not part of the Ramsar site until legal transfer to Audubon/CSS.

**10. Elevation:** (in metres: average and/or maximum & minimum)

Average elevation is approximately 5.4 m above sea level

**11. Area:** (in hectares)

CSS is approximately 5261 ha.

**12. General overview of the site:**

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

Corkscrew Swamp Sanctuary was created in 1954 in order to protect the area from the booming logging industry. Most of the wild swamps—and much of the wildlife characteristic of this area less than a generation ago—have sadly disappeared. Corkscrew Swamp Sanctuary contains the largest remaining stand of virgin bald cypress trees in the world. Corkscrew has earned an international reputation because nearly 200 species of birds live on the preserve. The most notable of those species is the endangered wood stork, which nests high in the 500-year-old cypresses from December through May. (Sullivan-Hartung 2001). Land from the former PIMB is located within two separate subcoreregions, the south-western Florida Flatwoods and the Big Cypress, and is a vital link between several different watersheds including the Estero Bay and Big Cypress watersheds.

**13. Ramsar Criteria:**

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9

**14. Justification for the application of each Criterion listed in 13 above:**

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

**Criterion 2.** Corkscrew Swamp Sanctuary provides protection to representatives of south Florida’s major upland and freshwater wetland ecosystems. The ecosystems within the sanctuary are relatively stable and have evolved in response to natural regimes of fire, water, soil, and climate. Additionally, these ecosystems have not been noticeably affected by pronounced human disturbance. The upland and wetland ecosystems within Corkscrew Swamp Sanctuary support numerous species of plants and animals, including many listed as threatened or endangered.

Species	IUCN Status	U.S. Status	Florida Status
Wood Stork ( <i>Mycteria americana</i> )	Least Concern ver 3.1	Endangered	Endangered
American Alligator ( <i>Alligator mississippiensis</i> )	Lower Risk ver 2.3	NA	Special Concern
Eastern Indigo Snake ( <i>Drymarchon corais couperi</i> )	Least Concern ver 3.1	Threatened	Threatened
Gopher Tortoise ( <i>Gopherus polyphemus</i> )	Vulnerable ver 2.3	Threatened	Threatened

Bald Eagle ( <i>Haliaeetus leucocephalus</i> )	Least Concern ver 3.1	Threatened	Threatened
Florida Panther ( <i>Felis concolor coryi</i> )	NA	Endangered	Endangered
Black Bear ( <i>Ursus americanus</i> )	Least Concern ver 3.1	Threatened	Threatened
Audubon's Crested Caracara ( <i>Polyborus plancus audubonii</i> )	Least Concern ver 3.1	Threatened	Threatened
Florida Bonneted Bat ( <i>Eumops floridanus</i> )	Critically Endangered ver 3.1	NA	Endangered
Southeastern American Kestrel ( <i>Falco sparverius paulus</i> )	Least Concern ver 3.1	NA	Threatened
Red-cockaded Woodpecker ( <i>Picoides borealis</i> )	Vulnerable ver 3.1	Endangered	Special Concern
Big Cypress Fox Squirrel ( <i>Sciurus niger avicennia</i> )	Least Concern ver 3.1	NA	Threatened

Species	IUCN Status	U.S. Status	Florida Status
Florida Royal Palm ( <i>Roystonea elata</i> )	NA	NA	Endangered
Cowhorn Orchid ( <i>Cyrtopodium punctatum</i> )	NA	NA	Endangered
Umbrella Star Orchid ( <i>Epidendrum floridense</i> )	NA	NA	Endangered
Ghost Orchid ( <i>Polyradicion lindenii</i> )	NA	NA	Endangered
Satinleaf ( <i>Chrysophyllum oliviforme</i> )	NA	NA	Threatened

The natural ecosystems and wildlife within the sanctuary are protected from a variety of threats, including human population growth in Florida.

**Criterion 4.** Corkscrew Swamp Sanctuary has been used for nesting by the federally endangered wood stork since the 1950s. Corkscrew Swamp often contains the nation's largest wood stork rookery. In 2006, 600 nests were recorded with 1,428 young fledged (CSS unpublished data). Other nesting species utilizing CSS include the snail kite (*Rostrhamus sociabilis*), roseate spoonbill (*Ajaia ajaja*), limpkin (*Aramus guarana*), little blue heron (*Florida coerulea*), snowy egret (*Leucophoyx thula*), tri-colored heron (*Hydranassa tricolor*), white ibis (*Gaura alba*), Florida sandhill crane (*Grus canadensis*), bald eagles, osprey (*Pandion halioetus*), red-cockaded woodpeckers (*Melanerpes erythrocephalus*), and swallow-tailed kites (*Elanoides forficatus*).

**Criterion 6.** From 2001 through 2006, an average of 7,900 wood storks nested in the US (Wood Stork 5-year review, USFWS). Corkscrew's colony supported an average of 550 wood stork nests per year during that span. However, during the 2000 nesting season the Corkscrew had over 1700 nesting pairs, which is over 20% of the average nesting effort of the entire population from 2001-2006. (North Florida nesting is absent from the database in 2000, therefore the USFWS has no total nesting value for that year). The capacity of Southwest Florida to support a nesting colony at Corkscrew of that magnitude represents a significant contribution to the US wood stork nesting population. According to the "Waterbird Population Estimates, 4<sup>th</sup> edition" the 1% level is 280 for the North America wood stork population. The wood stork population at CSS (the Ramsar site) currently represents approximately 4.3% of the total North American population. Historically (CSS records to 1954), the wood stork population at CSS represented approximately 10.3% of the total North American population. The decrease from 10.3% to the current 4.3% is indicative, not of a shift in

bird use of the Ramsar site, but an overall decline in the wood stork population.

---

**15. Biogeography** (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

**a) biogeographic region:**

Nearctic/Neotropic, Florida peninsula ecoregion, temperate coniferous forest combined with subtropical mixed forest/savanna

**b) biogeographic regionalisation scheme**

World Wildlife Fund ecoregion classification (Olsen et al. 2001, Abell et al. 2008)

---

**16. Physical features of the site:**

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Corkscrew Swamp lies within the Estero Bay Watershed. The Corkscrew Swamp Basin is the largest secondary basin in the Estero Bay Watershed, making up nearly 92,000 acres and 31% of the 295,620 acre watershed. The Estero Bay Watershed occurs within the Florida Peninsula sedimentary province and is dominated by nonclastic sediments, which are primarily carbonates and anhydrites, chemically or biologically produced (Drew and Schomer, 1984). Surficial geology in the watershed is composed primarily of undifferentiated shell beds, while smaller areas of organic matter and clay associated with lagoonal deposits occur along the coast and limestone and marls occur along the western edges of the watershed. The land within the watershed is a mixture of uplands and wetlands which display very little topographic relief. The basin lies within the Southwestern Slope region of the Southwestern Flatwoods physiographic province. The slope most likely originated as a marine terrace during periods of higher sea level and varies in elevation from a high of 25 feet to sea level. The surface consists of shells, marls, and organic material underlain by limestone. The soil types in the watershed include limestone rock, calcareous muds (marls), sands (marine terraces), organic materials (peats and muck), and mixed solids (Duever et al., 1979; SFWMD, 1980). Compared with peats of the Everglades, swamp peats of the Corkscrew Swamp are more degraded and mucky, with less conspicuous plant issues. The condition may suggest a shorter hydroperiod, or deeper aeration zone (Stone and Gleason, 1976). Southwest Florida has two seasons: a dry season in the winter months and a rainy season in the summer months. Typical temperatures in the winter/dry season are highs in the 70's and lows in the 50's, and in the summer/rainy season, highs are in the 90's and lows in the 70's. A typical summer day begins with sunshine; then, clouds and humidity build in the early afternoon leading to a late afternoon thunderstorm and clearing skies in the evening. Corkscrew Swamp Sanctuary is a hydrologically intact and pristine ecosystem, containing North America's largest and last stand of old-growth bald cypress forest. Land use has not changed significantly since initial acquisition of sanctuary property in 1954; there has been little human impact. Much of the acquired PIMB land is restored or created wetlands, formerly agricultural land.

---

**17. Physical features of the catchment area:**

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

Same as site features (#16 above).

---

**18. Hydrological values:**

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

The sanctuary provides a crucial hydrological link between inland freshwater wetlands and the Gulf of Mexico, essentially tying the Corkscrew Regional Ecosystem Watershed (CREW) lands and the Estero Bay Estuary. The sanctuary preserves short-hydroperiod wetlands that are critical foraging areas for wading birds and other wildlife, as well as long-hydroperiod wetlands that serve as source areas for numerous vertebrate and invertebrate aquatic organisms. The wetlands preserved by CSS serve a valuable role in flood control and groundwater recharge.

## 19. Wetland Types

### a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar “Classification System for Wetland Type” present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

**Marine/coastal:** A • B • C • D • E • F • G • H • I • J • K • Zk(a)

**Inland:** L • M • N • O • P • Q • R • Sp • Ss • Tp • Ts • U • Va •  
Vt • W • Xf • Xp • Y • Zg • Zk(b)

**Human-made:** 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

### b) dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

Code	Name	% Area
Tp	Marsh, Flag Pond/Emergent, Pond/Low Pool	60
Xf	Pine Flatwoods, Pine/Oak/Cabbage Palm, Cypress	40

## 20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

At CSS, there are approximately 13,000 acres (ca. 5261 ha) of pine flatwoods, wet prairie, cypress swamp, and marsh ecosystems. Land acquired from PIMB includes approximately 94 acres (ca. 38 ha) of hydric pine flatwoods and roughly 460 acres (ca. 186 ha) of created/restored marsh wetlands. Relatively stable communities have evolved at CSS in response to natural regimes of fire, water, soil, and climate. Benefits of CSS wetlands include ground water recharge, filtration, flood control, increased flora/fauna biodiversity, and recreation/education.

## 21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

CSS has recorded 546 plant species in 118 plant families. This includes a number of rare, threatened, or endangered species, including 22 different species of threatened or endangered orchids.

For a full list of plant species and their status, see: <http://www.corkscrew.audubon.org>

---

## 22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

The endangered Wood stork: In 2006, it was reported that there were 600 wood stork nests—producing 1,428 chicks—on the Corkscrew Swamp Sanctuary and PIMB lands. Wood stork nesting data can be accessed at [http://www.audubon.org/local/sanctuary/corkscrew/Wildlife/Birds/Nesting\\_Data.html](http://www.audubon.org/local/sanctuary/corkscrew/Wildlife/Birds/Nesting_Data.html)

The U.S. wood stork population has declined sharply from 20,000 nesting pairs in the 1930s to 5,000 pairs in the late 1970's. At its peak prior to the 1970's, South Florida had supported approximately 70% of the US nesting effort. On two occasions the colony at Corkscrew supported 6000 nesting pairs. Corkscrew's wood stork colony has supported an average of 600 nesting pairs per year since 2000, which is roughly 9% of the nesting effort of the entire population over that span. Despite the widespread habitat loss in Southwest Florida, Corkscrew has been the most productive colony in every decade. Wood storks are especially sensitive to environmental conditions at feeding sites. Annual nesting effort and productivity varies greatly across the breeding range. Nesting success and size of regional populations are closely regulated by year-to-year differences in quality and quantity of suitable habitat. Corkscrew Swamp Sanctuary provides assurance of quality habitat needed by nesting wood storks.

CSS is critical to the wood stork because of the critical water requirements for the wood stork to eat and breed. Water must be deep enough to provide an adequate food supply throughout the nesting season for the adults and eventual chicks. But at the same time, the water must be shallow enough (15-18") for the adults to hunt and the levels must be slowly receding to create isolated ponds and puddles with highly concentrated fish populations so the adults can easily catch enough food; each chick requires about 440 pounds of fish from hatch to independence. The water and food levels must be adequate from the time the adults begin to arrive in late December and January through the end of the nesting season in late May and early June. If it is not, the adults will either not nest or will abandon the nests. Additionally, there must be water, preferably with alligators present, around the bases of the colony's nesting trees to prevent predators such as raccoons from climbing the trees and eating the eggs and just-hatched chicks. The chicks must also fledge before the rainy season begins in earnest in late spring and early summer. Once the rains begin, water levels rise and the food supply disperses. Without that concentrated food supply to feed the nestlings, the adults will abandon the nests.

The endangered red-cockaded woodpecker (*Picoides borealis*): The red-cockaded woodpecker plays a vital role in the intricate web of life of the southern pine forests. A number of other birds and small mammals use the cavities excavated by red-cockaded woodpeckers, such as chickadees, bluebirds, titmice, and several other woodpecker species. Larger woodpeckers may take over a red-cockaded woodpecker cavity, sometimes enlarging the hole enough to allow screech owls, wood ducks, and even raccoons to later move in. Flying squirrels, several species of reptiles and amphibians, and insects, primarily bees and wasps, also will use red-cockaded woodpecker cavities. (U.S. Fish & Wildlife Service).

The threatened eastern indigo snake (*Drymarchon corais couperi*): The eastern indigo snake is the largest snake in North America. It occurs throughout Florida and southeast Georgia. Indigos are widespread throughout Florida, but nowhere are they abundant. They occur in hardwood forests, moist hammocks, pine flatwoods, prairies, and around cypress ponds. It inhabits a region that is experiencing rapid development resulting in considerable loss of available habitat. Because it seeks refuge in gopher tortoise burrows, along with diamondback rattlesnakes and many other organisms, in some parts of Florida the indigo is called the 'gopher snake'. Many indigo snakes are killed by rattlesnake hunters when they pour gasoline into tortoise burrows to

flush out eastern diamondback rattlesnakes. The eastern indigo snake was in great demand in the pet trade with prime specimens selling for as much as \$200-\$250. The extremely docile nature of the snake and its large size make it highly desirable as a pet and, therefore, avidly sought by dealers.

For a full list of animal species and their status, see: <http://www.corkscrew.audubon.org>

---

**23. Social and cultural values:**

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

Tourism/Outdoor Recreation/Education: A 2.25-mile (ca. 3.6 km) raised boardwalk takes visitors through four distinct environments: a pine upland, a wet prairie, a cypress forest, and a marsh. Interpretive signs along the boardwalk and a field guide and Children's Activity Book available at the admissions desk in the Blair Center allow each visitor to take the self-guided tour. Benches and rain shelters are along the trail. For those who do not wish to walk the full 2.25 miles, an optional trail shortens the walk to one mile. Volunteer naturalists are usually on the boardwalk to answer questions.

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box  and describe this importance under one or more of the following categories:

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:
- ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
- iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
- iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

---

**24. Land tenure/ownership:**

a) within the Ramsar site:

Audubon of Florida owns Corkscrew Swamp Sanctuary. The Sanctuary includes 2,778 acres (ca. 1,124 ha) of land previously owned by Southwest Florida Joint Venture (a joint venture between Collier Mitigation Joint Venture and BC Wetlands) that was acquired in November 2005 from the Panther Island Mitigation Bank (PIMB). This land is no longer used for mitigation purposes, but is managed for conservation. Additional land transfers from PIMB likewise will no longer function as mitigation land after ownership transfer to Audubon/CSS>

b) in the surrounding area:

Corkscrew Regional Ecosystem Watershed (CREW), managed by the South Florida Water Management District. Collier Enterprises owns some land east of CSS that is included in the broader Corkscrew watershed.

---

**25. Current land (including water) use:**

a) within the Ramsar site:

Primary land use of the Ramsar site (CSS) is conservation. Limited scientific research is also conducted on site. Tourism is an additional land use, but it is strictly limited to a 2.25 mile (3.662 km) boardwalk trail open to the public. Land formerly used as a mitigation bank, but currently part of the CSS Ramsar site, are no longer used for mitigation but are used for conservation and scientific research.

b) in the surroundings/catchment:

Human use of land surrounding the Ramsar site (CSS) includes conservation, residential/habitation, recreation, mining, and agriculture.

---

**26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:**

a) within the Ramsar site:

It is important that Corkscrew Swamp remain in its natural state, the way Florida looked for hundreds of years. Therefore, removal of nonindigenous plant and animal species is a constant concern. Special emphasis is placed on the eradication of invasive exotic species. Among plants, problem species include: Australian Melaleuca (*Melaleuca quinquenervia*), Old-World Climbing Fern (*Lygodium microphyllum*), Brazilian Pepper (*Schinus terebinthifolius*), and Water Hyacinth (*Eichhornia crassipes*). Also troublesome to a lesser degree are Primrose Willow (*Ludwigia peruviana*), Phragmites (*Phragmites australis*), Air Potato (*Dioscorea bulbifera*) and Java Plum (*Syzygium cumini*). While some of these species can be eradicated by mowing or pulling out of the ground, most cannot be killed without the use of herbicides. In fact, some species like Melaleuca will set seed or sprout new trees if burned, cut, or otherwise disturbed.

Some exotic animal species also pose a threat to native wildlife. Wild hogs (*Sus scrofa*) are an occasional problem at Corkscrew Swamp Sanctuary. Hogs' rooting behavior causes serious damage to the land and contributes to the establishment & spread of invasive plants. Problem animals are trapped and destroyed.

CSS land acquired from PIMB was historically altered and included a series of logging operations, hydrologic and vegetative alterations by agricultural activities, cattle grazing, invasion by exotic vegetation, water quality impacts, harmful/negative trespass, and ongoing hunting pressures. All these issues have been addressed during the site's restoration in the process to become a mitigation bank. After initial restoration of hydrologic and vegetative properties, PIMB land was (and continues to be) transferred to CSS for perpetual conservation management that includes maintaining low levels of invasive exotic vegetation. Cattle grazing, logging, and hunting are excluded. All PIMB land is fully mitigated and ceases to function for mitigation purposes upon transfer to Audubon/CSS.

b) in the surrounding area:

Human land use of areas surrounding CSS has historically included logging operations, agriculture, cattle grazing, mining, and residential housing. Today, mining and agriculture (primarily located north and east of CSS) present a continued threat to the ecological stability of the area, largely by altering natural hydrologic patterns and nutrient/pesticide loading in the greater wetland catchment. Human population growth throughout southwest Florida has resulted in significant urban sprawl. In addition to existing residential areas, at least three proposed urban developments located south and west of CSS currently threaten the hydrology, wildlife populations (esp. the federally protected Wood Stork, *Mycteria americana*) and ecological integrity of

the Ramsar site. The combined effect of these three proposed developments, based on U.S. Fish & Wildlife Service models, would be the loss of at least 1000 acres (405 ha) annually. The threatened Ramsar wetlands connect the water flowing from Corkscrew Regional Ecosystem Watershed into the Wiggins Pass/Cocohatchee River coastal estuary, and also serve to recharge aquifers utilized by the southwest Florida human population. In addition to the aforementioned threats of urban development, increased human presence in the Ramsar catchment area has, and continues to present, the risk of new nonindigenous species introductions to CSS.

---

**27. Conservation measures taken:**

**a)** List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

The National Audubon Society's Corkscrew Swamp Sanctuary meets the IUNC (1994) definition of a National Park (though not owned by the government) as a "Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible"

**b)** If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ; Ib ; II ; III ; IV ; V ; VI

**c)** Does an officially approved management plan exist; and is it being implemented?:

Yes. CSS management focuses on five principle components: hydrology, invasive species, fire, wildlife, and human access. Human access at CSS is limited to public education along the sanctuary's boardwalk trail and also limited scientific research. Water levels are monitored throughout Corkscrew Swamp Sanctuary using staff gauges and either analog or digital rainfall gauges. Special emphasis is placed on the eradication of invasive exotic species. Herbicide use is an acceptable and necessary means of invasive plant control. The most common herbicides in use at Corkscrew Swamp Sanctuary are Glyphosate (e.g. Round-Up, Aquaneat, etc.) and Triclopyr (e.g. Garlon). These herbicides are very safe when used in accordance with the manufacturer's safety guidelines. Application techniques employed at Corkscrew Swamp Sanctuary limit exposure as well as damage to non-target plants. An active prescribed burning program maintains historic wildland fire regimes. Staff and volunteers maintain an active database of daily wildlife sightings around the boardwalk, conduct monthly bird and yearly butterfly censuses, and are a part of the amphibian monitoring network. Wood Storks are a federally endangered species and Corkscrew Swamp typically serves as the largest nesting colony in south Florida. During the nesting season, stork colonies are censused from aircraft on a biweekly basis. More active research has been initiated and efforts are underway to track storks with satellite transmitters, learn more about foraging behavior, and identify critical wetland habitats that these birds depend on for survival.

**d)** Describe any other current management practices:

CSS is fenced and posted with "no trespassing/conservation area" signs; it is patrolled on a routine basis. Trespass law is strictly enforced and all offenders are prosecuted to the severest extent of the law.

Current PIMB property is bound to follow the PIMB Management Plan. It has been implemented and includes re-establishing historic water flows into severely stressed cypress sloughs on site, exotic species removal and maintenance, and the creation of a fire management program. Additionally, perpetual management has been funded by the creation of a Perpetual Management Trust Fund. Moneys from this fund are transferred to Audubon along with land transfers in order to manage the land for perpetuity.

---

**28. Conservation measures proposed but not yet implemented:**

e.g. management plan in preparation; official proposal as a legally protected area, etc.

Perpetual management of PIMB will be assumed by the National Audubon Society upon full success of the creation and restoration projects and on selling of the credits offered at the bank. PIMB land is not part of the Ramsar site until legally transferred to Audubon. Maintenance on former PIMB land (now part of Audubon/Ramsar site) is performed to prevent the accumulation of silt and sediments so as to provide for the smooth discharge of water into spreader slough and marsh systems. This maintenance is only expected to occur every five years as needed.

---

**29. Current scientific research and facilities:**

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Audubon of Florida supports an active on-site science research program. Additionally, CSS has a memorandum of understanding with nearby Florida Gulf Coast University to foster academic research. Corkscrew Swamp Sanctuary is an ideal location for research to be conducted because natural conditions are pristine and land use is not changing rapidly.

Staff and volunteers maintain an active database of daily wildlife sightings around the boardwalk, conduct monthly bird and yearly butterfly censuses, and are a part of the amphibian monitoring network. Additionally, the sanctuary has a keen interest in those species listed as threatened or endangered. Listed species that inhabit Corkscrew Swamp include the Florida Panther (*Felis concolor*), Black Bear (*Ursus americanus*), and Wood Stork (*Mycteria americana*). Wood Storks are a federally endangered species and Corkscrew Swamp typically serves as the largest nesting colony in south Florida. During the nesting season, stork colonies are censused from aircraft on a biweekly basis. More active research has been initiated and efforts are underway to track storks with satellite transmitters, learn more about foraging behavior, and identify critical wetland habitats that these birds depend on for survival. Proper land management and maintenance of hydrologic conditions will help ensure the preservation of these imperiled species.

---

**30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:**

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

Corkscrew Swamp Sanctuary operates a 2.25 mile boardwalk nature trail and a visitor center; annual tourist visitation is approximately 100,000. CSS presently offers educational programs for schools, grades kindergarten through college, and for adults interested in learning more about ecology. Occasional off-site education programs are conducted throughout the year. PIMB is private land currently closed to the public. However, it has been used in the past for university field trips and other educational uses with permission from the land owner. As land has/will be transferred to the National Audubon Society, land use will remain the same.

---

**31. Current recreation and tourism:**

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

CSS annually attracts over 100,000 visitors but most are restricted to the boardwalk trail; backcountry areas are off limits to the general public. Except for staff, the only persons allowed backcountry access are visiting scientists, special guests, Florida Wildlife Commission officers, and cooperating conservation agencies. The boardwalk begins and ends at the Blair Audubon Center, which since its opening has served as the model for other National Audubon Society Centers in the United States. In addition to serving as the entrance to the Sanctuary and the boardwalk, it houses the Swamp Senses Media Theater, a tearoom with food service counter, two fully equipped classrooms, a foyer featuring paintings, sculptures and photography by regional artists, and a retail nature store. The nature Store offers field guides, books, videos, signature clothing and accessories, optics, jewelry, cards, photographs, bird feeders and bird houses, gift items, and educational games and toys for children. During the late fall, winter, and early spring, bird feeders placed at the start of the boardwalk attract a variety of birds such as buntings, cardinals, woodpeckers, chipping sparrows, and towhees. Native plants in the adjoining butterfly garden and around the Living Machine draw hummingbirds and butterflies throughout the year. A back porch with benches and rocking chairs invites visitors to linger and to collect their impressions and memories after their stroll on the boardwalk.

PIMB is not currently used for recreation or tourism.

---

### 32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

CSS – National Audubon Society, Audubon of Florida, 444 Brickell Avenue, Suite 850, Miami, FL 33131

PIMB land not yet transferred to Audubon (i.e. not currently part of Ramsar site) is under jurisdiction of South Florida Water Management District (P.O. Box 24680, West Palm Beach, Florida 33416) and Florida Department of Environmental Protection (3900 Commonwealth Boulevard, Tallahassee, Florida 32399)

---

### 33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Ed Carlson, Executive Director  
Corkscrew Swamp Sanctuary  
375 Sanctuary Road West  
Naples, FL 34120  
Phone: 239-349-9143  
Email: [ecarlson@audubon.org](mailto:ecarlson@audubon.org)

---

### 34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

Abell, R., M. L. Thieme, C. Revenga, M. Bryer, M. Kottelat, N. Bogutskaya, B. Coad, N. Mandrak, S. Contreras Balderas, W. Bussing, M. L. J. Stiassny, P. Skelton, G. R. Allen, P. Unmack, A. Naseka, R. Ng, N. Sindorf, J. Robertson, E. Armijo, J. V. Higgins, T. J. Heibel, E. Wikramanayake, D. Olson, H. L. Lopez, R. E. Reis, J. G. Lundberg, M. H. Sabaj Perez, and P. Petry. 2008. Freshwater Ecoregions of the World: A New Map of Biogeographic Units for Freshwater Biodiversity Conservation. *BioScience* 58(5):403-414.

Audubon Society, Stop Invasives – Corkscrew Swamp, <http://www.audubon.org/campaign/invasives/corkscrew.shtm> (last accessed Oct. 8, 2006).

Charlotte County Florida, *Florida Eastern Indigo Snake* (*Drymarchon corais couperi*), <http://www.charlottecountyfl.com/EnvironmentalServices/NaturalResources/indigo.htm> (last accessed Oct. 10, 2006).

Corkscrew Swamp Sanctuary, *Natural Resources Management Plan*, [http://www.corkscrew.audubon.org/Information/Land\\_Manage.html](http://www.corkscrew.audubon.org/Information/Land_Manage.html) (last accessed Oct. 8, 2006).

Corkscrew Swamp Sanctuary, *Vascular Plant List*, <http://www.corkscrew.audubon.org/Wildlife/ListPlant.html> (last accessed Oct. 8, 2006).

Corkscrew Swamp Sanctuary, *Wood Stork Nesting Data*, [http://www.corkscrew.audubon.org/Wildlife/Birds/Nesting\\_Data.html](http://www.corkscrew.audubon.org/Wildlife/Birds/Nesting_Data.html) (last accessed Oct. 8, 2006).

Corkscrew Swamp Sanctuary, *Wildlife Checklist*, <http://www.corkscrew.audubon.org/Wildlife/WildlifeChecklist.pdf> (last accessed Oct. 8, 2006).

Drew, R.D. and N.S. Schomer, *An Ecological Characterization of the Caloosahatchee River/Big Cypress Watershed* (U.S. Department of the Interior, Minerals Management Service and Fish and Wildlife Service 1984).

*The Ghost Orchid—A Natural Wonder*, <http://www.uhaul.com/supergraphics/orchid/natural-wonder.html> (last accessed Oct. 10, 2006).

Klinkerberg, J. *Coming Back on Its Own Terms*, 36 NATIONAL WILDLIFE 52 (1998).

Olson, D. M., E. Dinerstein, E. D. Wikramanaya, N. D. Burgess, G. V. N. Powell, E. C. Underwood, J. A. D'Amico, I. Itoua, H. E. Strand, J. C. Morrison, C. J. Loucks, T. F. Allnutt, T. H. Ricketts, Y. Kura, J. F. Lamoreux, W. W. Wettengel, P. Hedao, and K. R. Kassem. 2001. Terrestrial Ecoregions of the World: A New Map of Life on Earth. *BioScience* 51(11):933-938.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT, ESTERO BAY WATERSHED ASSESSMENT (1999), available at <http://www.sfwmd.gov/org/exo/ftmyers/report-text/index.html>.

Sullivan-Hartung, M. *Nurtured Nature: Corkscrew Swamp Sanctuary*, ECOFLORIDA (Summer 2001), available at [http://www.ecofloridamag.com/archived/corkscrew\\_swamp.htm](http://www.ecofloridamag.com/archived/corkscrew_swamp.htm).

U.S. Fish & Wildlife Service, *Endangered Species Information*, <http://www.fws.gov/endangered/wildlife.html> (last accessed Oct. 8, 2006).

U.S. Fish & Wildlife Service, *Red-Cockaded Woodpecker*, <http://www.fws.gov/rcwrecovery/rcw.htm> (last accessed Oct. 9, 2006).

U.S. Fish & Wildlife Service, *Revised Recovery Plan for the U.S. Breeding Population of the Wood Stork* at iii (1996), available at [http://ecos.fws.gov/docs/recovery\\_plans/1997/970127.pdf](http://ecos.fws.gov/docs/recovery_plans/1997/970127.pdf).

U.S. Forest Service, *Chrysophyllum oliviforme*, <http://www.fs.fed.us/global/iitf/pdf/shrubs/Chrysophyllum%20oliviforme.pdf#search=%22Chrysophyllum%20oliviforme%22> (last accessed Oct. 9, 2006).

U.S. Forest Service, *Kuchler Type Management Considerations: Cypress Savanna*, [http://www.fs.fed.us/database/feis/kuchlers/k091/kuchler\\_type\\_management\\_considerations.html](http://www.fs.fed.us/database/feis/kuchlers/k091/kuchler_type_management_considerations.html) (last accessed Oct. 9, 2006).

Please return to: **Ramsar Convention Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**  
Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: [ramsar@ramsar.org](mailto:ramsar@ramsar.org)