



Photo: Ralph Arwood

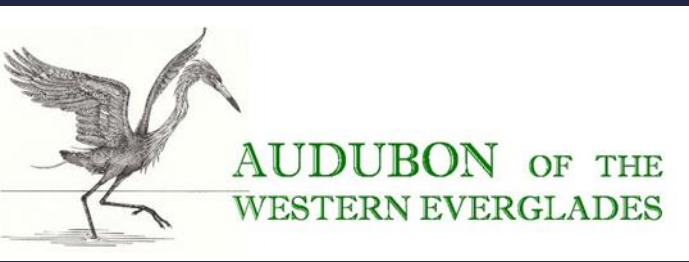
# ECOLOGICAL ILLS IN ESTERO BAY WATERSHED AND BEYOND: THE SOUTH LEE COUNTY WATERSHED RESTORATION INITIATIVE TO THE RESCUE



**Brad Cornell**

Audubon of the Western Everglades  
and Audubon Florida

Estero Bay Agency on Bay  
Management – Cella Tega 2020  
Saturday, January 25, 2020

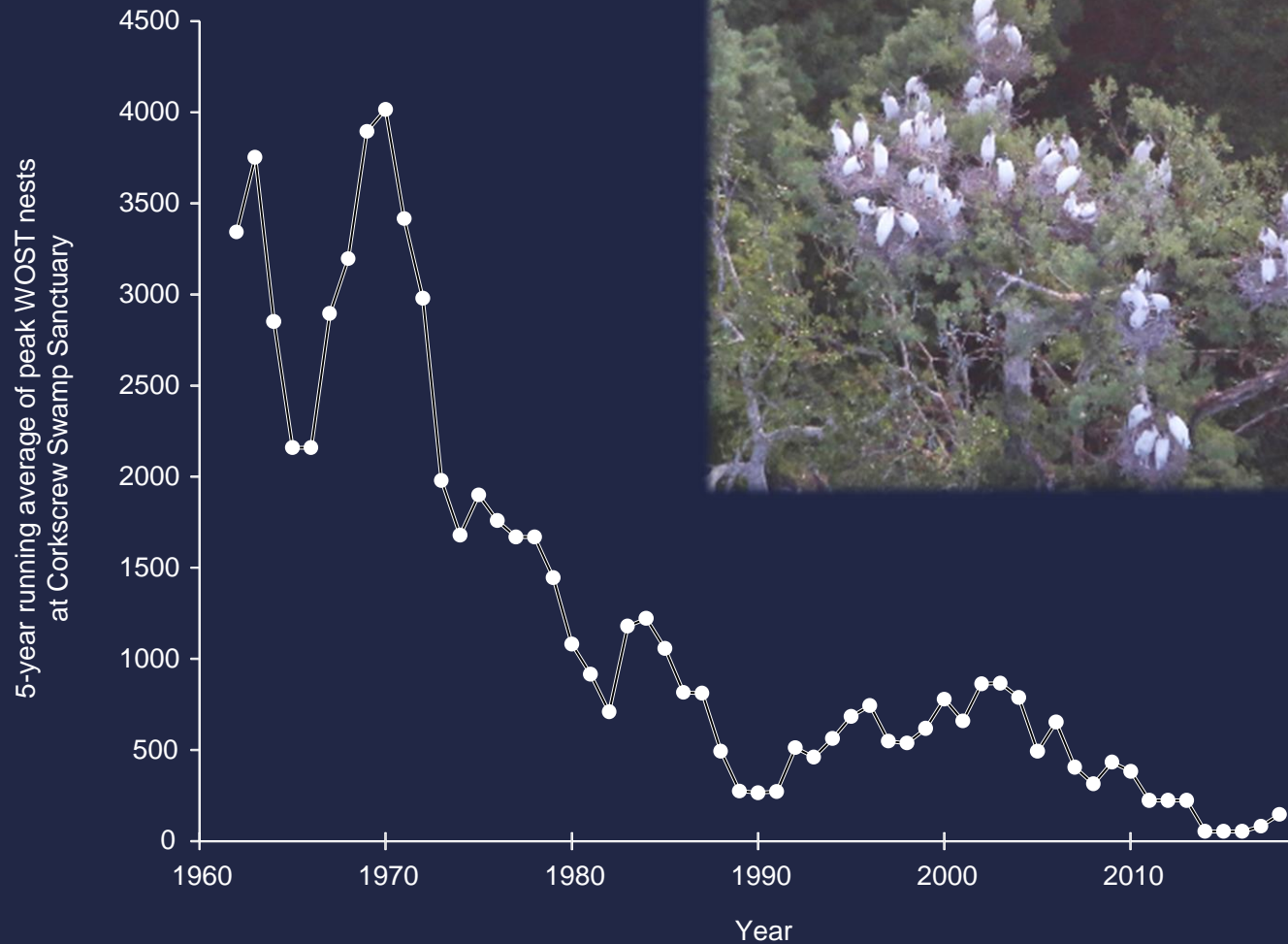


# Plagues Upon Us...

- Bonita flooding
- Corkscrew Swamp water level impacts
- Water quality decline and HAB's
- Lack of Fire and vulnerability to catastrophe
- Wading bird losses, esp. wood storks
- Loss of regional habitats/connections
- Exotics and invasives (habitat/hydrology)
- Climate destabilization: drought, coastal impacts, storms – all increasing

# Why?

- Overdrainage for flood protection
- Wetland destruction (& other habitats)
- Invasive, woody vegetation increase
- Development in floodplains
- Regional barriers to water/wildlife
- Inefficient land use
- Human overpopulation
- Poor mgmt. of nutrients (fertilizer, biosolids)
- Too many lakes and ponds



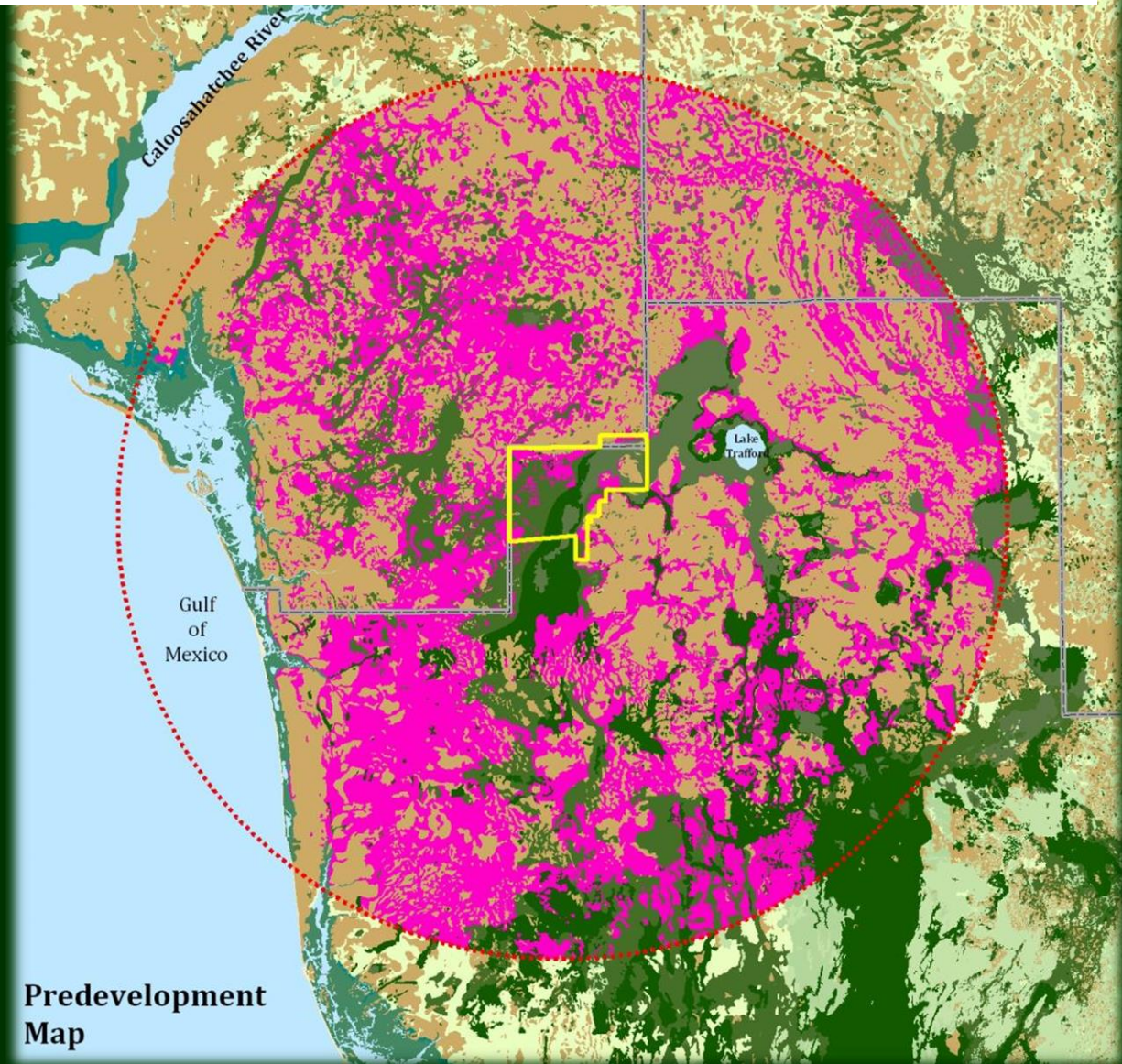
**Corkscrew's Wood Stork colony has declined severely—  
is further stressed by hydrologic changes**

# Wood storks are canary in the coal mine

Hydrologic change also has implications for

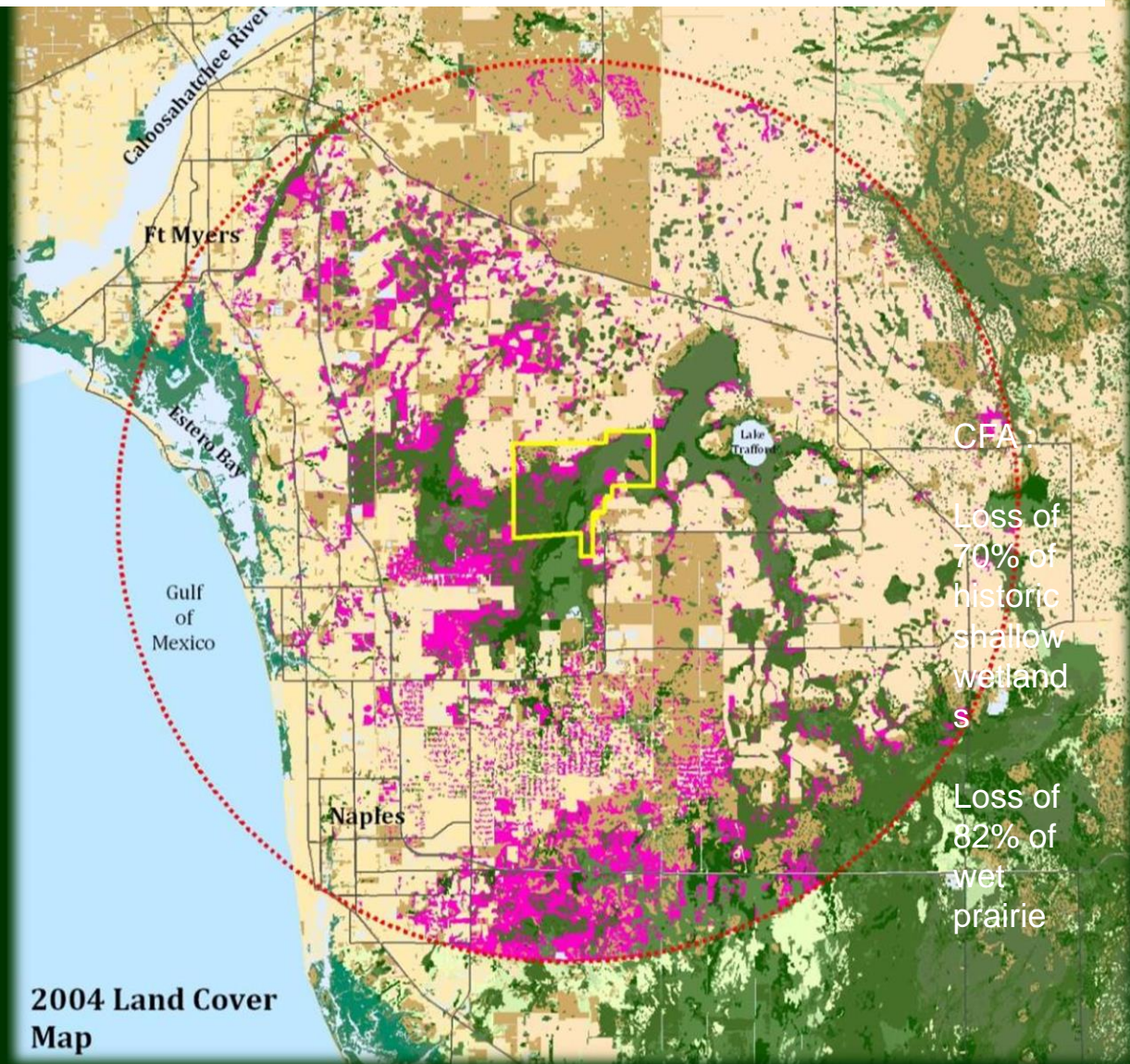
- Other aquatic-dependent wildlife
- Plant communities
- Dry season severe fire risk
- Winter temperature buffering & microclimate
- Downstream water quality and flooding
- Area economy – agriculture and tourism
- Possible human health issues



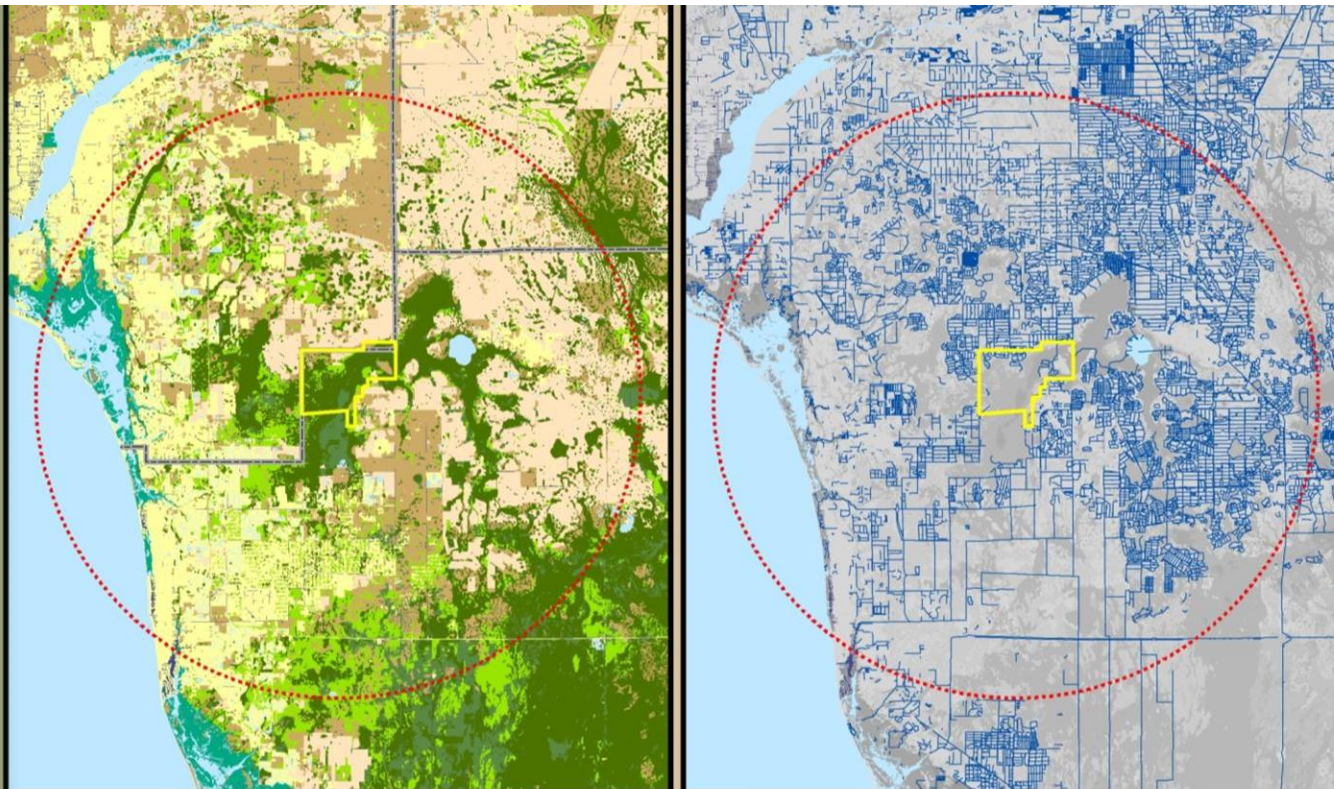


**Predevelopment  
Map**









## Land Cover & Canals in the Corkscrew Swamp Sanctuary Wood Stork Core Foraging Area

2004 Land Use Land Cover dataset SFWMD

- ⋯ Core Foraging Area
- Corkscrew Swamp
- Shallow wetlands
- Deep wetlands
- other wetlands
- Tidal wetlands
- Water
- Uplands
- Agriculture
- Urban/Built-up
- Canals
- Ditches & small canals



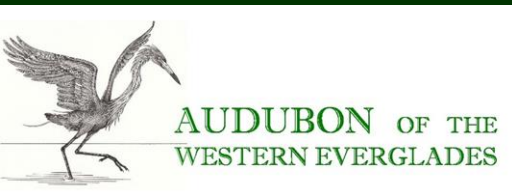
**Corkscrew  
Swamp  
Sanctuary**

0 1.53 6 9 12 Miles

Note: The South Florida Water Management District 2004 Land Use Land Cover map for 2004 was used to create this map. Land Cover categories are based on FLUCCS.



# Hydrologic impact causes: drainage and pumping for irrigation and water supply





# Intense Fire in Picayune Strand Last Year



# Flooding in floodplains (who would have thought?!)



Photo: NBC2



# Algae: Blue/Green and Red Tide



# Nutrient Pollution from Urban and Farms





# Downstream Consequences – all the way to the Beach!



© jean hall



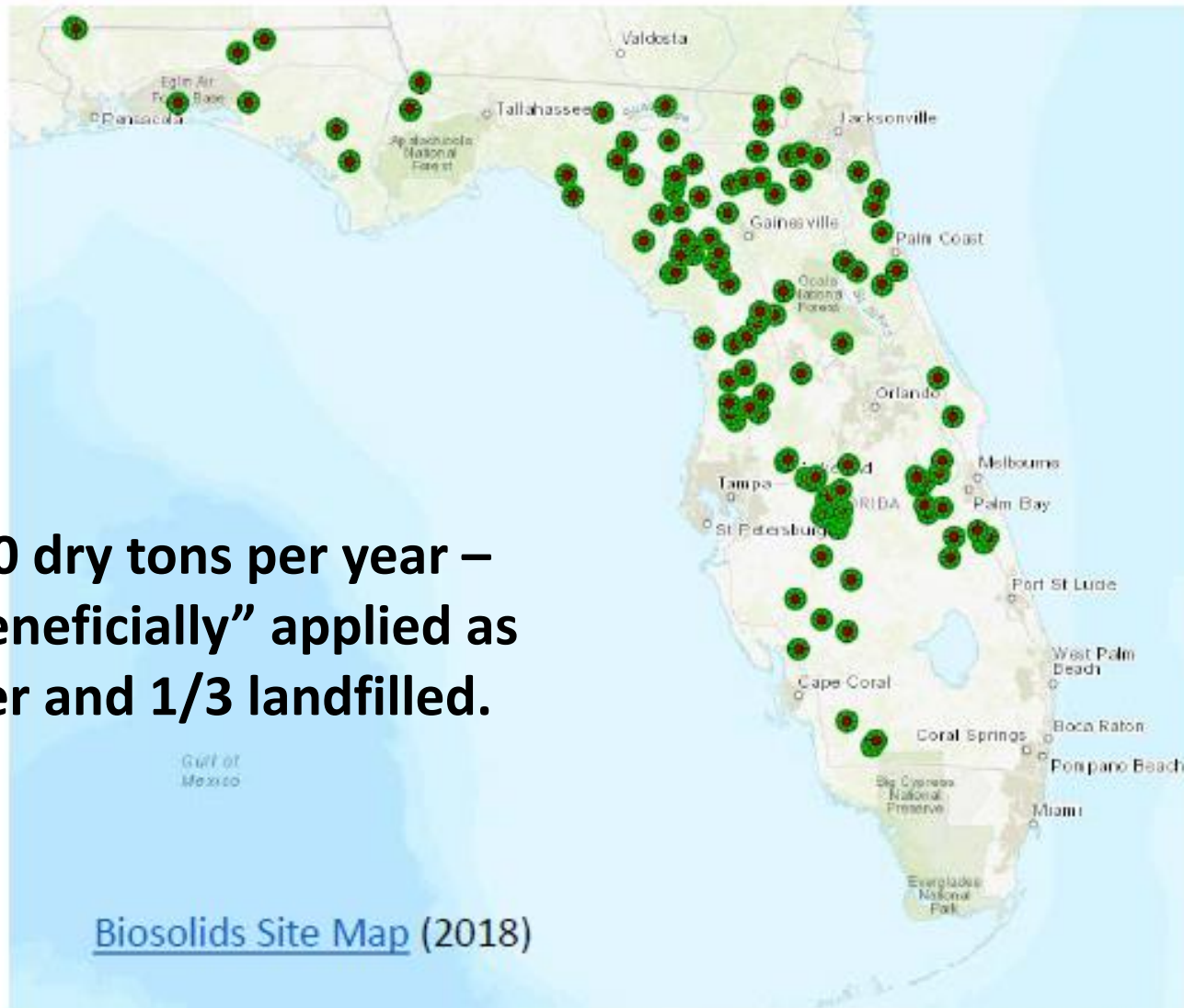
# Red Tide Impacts to Coastal Birds & Wildlife





# Map of Biosolids Land Application Sites

**340,000 dry tons per year –  
2/3 “beneficially” applied as  
fertilizer and 1/3 landfilled.**





# Fixes, perhaps?

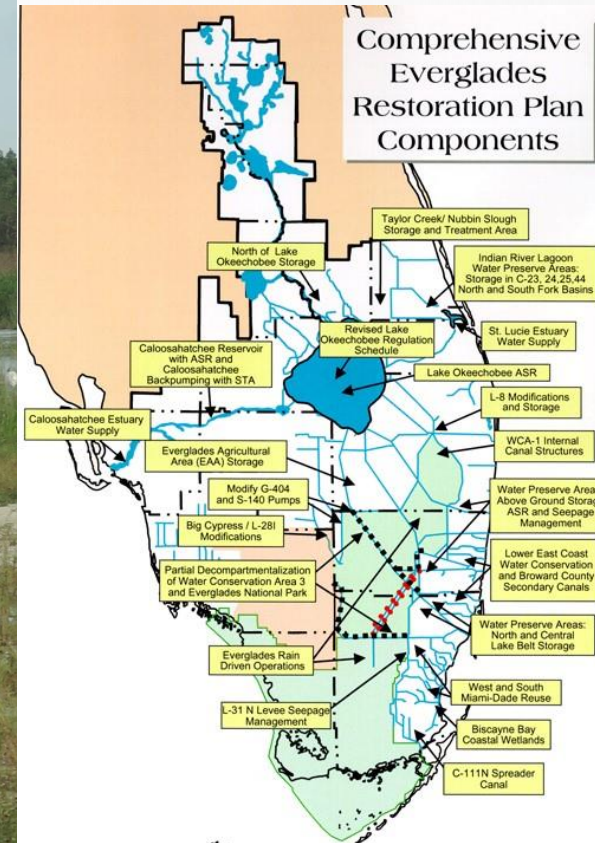
- Wetland rules fixed (WOTUS!, mitigation)
- Wise land use (no floodplain building)
- Hydrologic modeling (causes/fixes)
- Science: monitor, research
- Human wastes: septic, sewer, biosolids
- Land acquisition
- Water conservation (Ag and urban)
- Alternative water supply (get off surfacial)
- Nutrient pollution rules fixed and enforced



# More fixes...

- Rx fire; brush clearing; hold more water into dry season
- Lower the flood protection Level of Service
- Restore wetlands (regulatory, Everglades)
- SW Fla Comprehensive Watershed Restoration Plan (fka, SWFFS)
- S. Lee Watershed Restoration Initiative

# RESTORATION: EVERGLADES, HABITAT, WETLANDS



# RELEVANT RESTORATION EFFORTS

- SW FLORIDA FEASIBILITY STUDY, NOW THE SW FLORIDA COMPREHENSIVE WATERSHED MANAGEMENT PLAN
- SOUTH LEE COUNTY WATERSHED PLAN UPDATE 2009
- BONITA SPRINGS FLOOD REDUCTION PLAN
- LEE COUNTY FLOOD MITIGATION PLAN (DUE 2020)
- CORKSCREW REGIONAL HYDROLOGIC MODEL (DUE 2020)
- LEE CONSERVATION 2020 MANAGEMENT, ESPECIALLY KIKER PRESERVE
- VILLAGE OF ESTERO STORMWATER PLAN
- SOUTH LEE WATERSHED RESTORATION INITIATIVE
- LOWER WEST COAST WATER SUPPLY PLAN



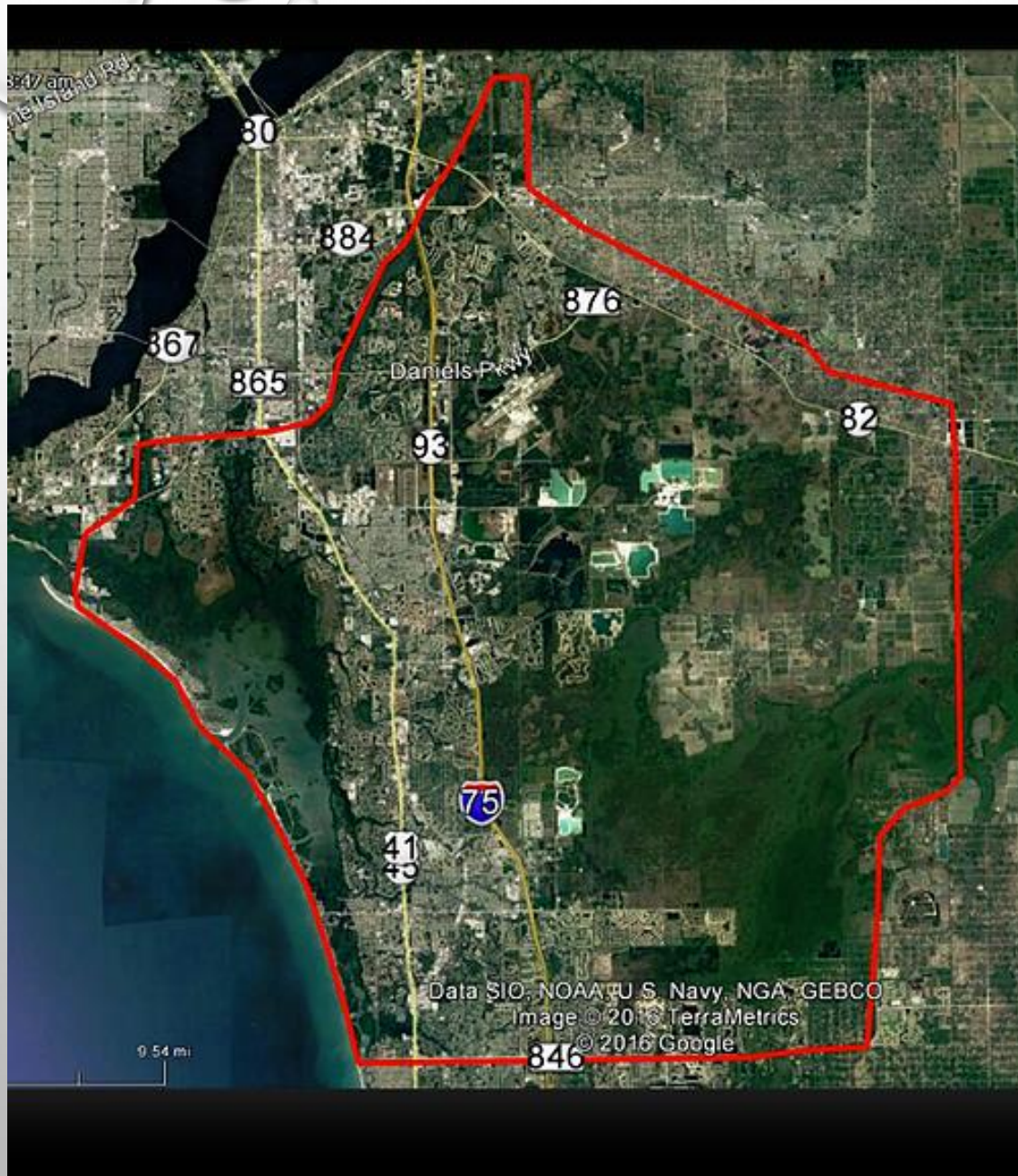
# ONE PERSON'S RESTORATION IS ANOTHER'S IMPACT, OR MIXED BAG

- SW FLORIDA FEASIBILITY STUDY, NOW THE SW FLORIDA COMPREHENSIVE WATERSHED MANAGEMENT PLAN
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- **BONITA SPRINGS FLOOD REDUCTION PLAN**
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# RESTORATION EFFORTS FOCUS

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## S. LEE WATERSHED RESTORATION INITIATIVE: REGIONAL WATER RESOURCE MODELING AND PLANNING FOR SOUTH LEE COUNTY



THE OBJECTIVE IS TO “GET THE WATER RIGHT” – IDENTIFYING WHAT NEEDS TO HAPPEN TO RESTORE AND MAINTAIN OUR WATER SUPPLY, FLOOD PROTECTION, WATER QUALITY AND WATER-DEPENDENT RESOURCES IN THE FACE OF EXISTING DEGRADATION AND DEPLETION, SEA LEVEL RISE AND CONTINUED REGIONAL GROWTH.



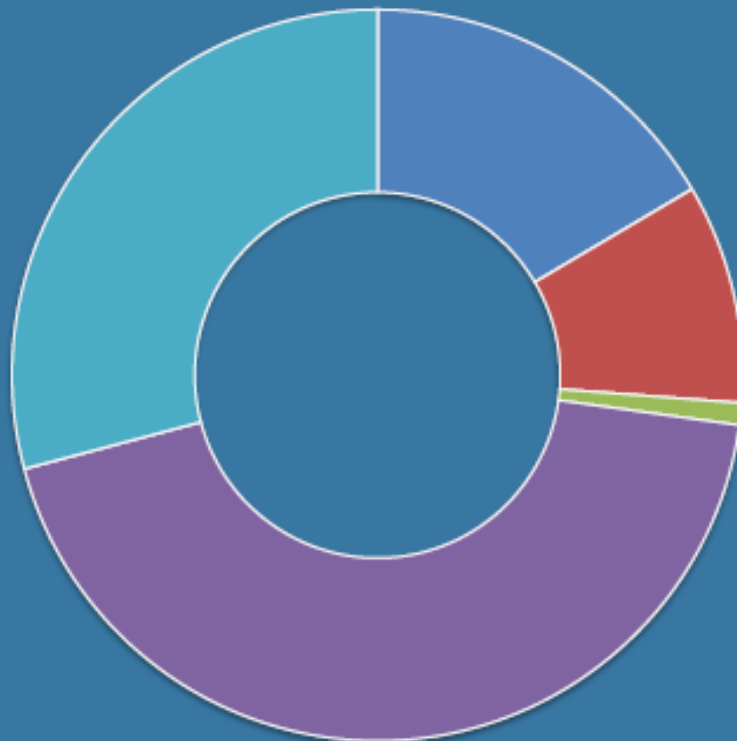
So. CREW Restoration





# Southwest Florida Comprehensive Watershed Master Plan

## Breakdown by Types of Projects



Water Quality (17)

Water Storage (10)

Flood Control (1)

Hydrological Restoration (45)

Habitat Restoration (30)

Total: 103 Projects

*Protecting and restoring water resources from Venice to Bonita Springs to Winter Haven*



# SWFCWMP List View by Type

## Water Quality (17)

Cocohatchee Slough

Corkscrew Swamp Sanctuary MAPS

Southwest Unacquired Yucca Pens

Manuals Branch Shoreline

Otter Creek Corridor

Harnes Marsh Expansion

Orange River Canal/Weir Improvements

Cape Coral Spreader

Cape Coral Canal

East Branch Daughtreys Creek MAPS

North Fort Myers Centralized

Lehigh Acres Country Club

Lehigh Centralized Wastewater

Alico Road MAPS

Ten Mile Canal MAPS

W19San Carlos Estates Centralized

San Carlos Park Centralized Wastewater



# SWFCWMP List View by Type (cont.)

## Water Storage (10)

Corkscrew Watershed Ag Water Containment Area

Kehl Canal Storage Reservoir

Gator Slough Storage Seepage Barrier along Gator Slough

Orange River Storage Reservoir

Bell West Storage Reservoir

Six-mile Cypress Upper Storage Reservoir

Six-mile Cypress Lower Storage Reservoir

Freeman Storage Reservoir

Alico Road Storage Reservoir

Alico Flow-ways West Storage Reservoir

## Flood Control (1)

Lehigh Stormwater

## SWFCWMP List View by Type (cont.)

### Hydrologic Restoration (45)

Corkscrew Regional Ecosystem Watershed Acquisition & Management

Corkscrew Swamp Sanctuary Hydrologic Restoration

Bird Rookery Swamp Hydrologic Improvement

Northern Golden Gate Estates Unit 53 Restoration & Acquisition

Yucca Pens Buffer

Hog Branch Headwaters

Yucca Pen Inholdings

Yucca Pen Inholding East

Hancock Creek Riverine Corridor

Old Bridge Point

Lower Powell Creek Marshes

Royal Palm Estates

Reinke Property

Alliance of Casa La Linda

West Branch Daughtreys Creek

East Branch Daughtreys Creek

Stroud Creek

Northwest Thompson Cutoff

J. Naumann Property

Thompson Cutoff Northeast

Palm Creek

Bayshore Conservation Easement

Owl Creek

Telegraph Creek Corridor

Able Canal

## SWFCWMP List View – Hydrologic Restoration List Cont.

**Yellow Fever Creek Headwaters**

**North Palm Creek Headwaters**

**Powell Creek Restoration**

**Spring Creek Hydrologic Improvement**

**Bonita Springs Utilities**

**Benson Property**

**Leitner Creek Connector**

**Imperial River Corridor Flow-way**

**Lakes Park/Hendry Creek**

**Island Park Road/Hendry Creek Filter Marsh**

**Bluejack Oak Parcel**

**Freeman**

**Alico Flow-ways West**

**Alico Flow-ways East on Ginn Proposal**

**Airport Expansion Flow-way**

**Airport Mitigation Connector**

**Stairstep Connection**

**Estero River North**

**Six-Mile Cypress Headwaters West**

**Addition to Six-Mile Cypress**



## SWFCWMP List View by Type (cont.)

### Habitat Restoration (30)

Corkscrew Woodstork Flow-ways
East Bird Rookery Swamp Upland Habitat Restoration
Palm Tree Farm Restoration
CREW Center Restoration
Yucca Pens (Charlotte Harbor Flatwoods)
Yucca Pen Mines
Yucca Pen Creek West
Zemel Grade/Powell Creek
Gatorland Vistas (Addition to Prairie Pine
Stolle Property
Caloosahatchee Creeks
Popash Creek Corridor
Popash Creek Headwaters/ Lee
FPL North Transmission Line Filter
Mouth of Orange River
Trout Creek/Strickler Gulley Corridor
Riverine
Daughtrey Branch Headwaters
Tidal Caloosahatchee Oxbow #1
Agripartners Properties
Halfway Creek Flow-ways
North side of Section 25 in 4725
Flow-way north of Alico Road (Alico Mine Flow-way) (Tam-Alico)
Florida Rock Industries Flow-way Buffers
Six-mile Cypress Connection under SR 82
East Estero Bay Buffer
Mullock Creek Preserve
North Estero Bay Buffer
Imperial River Preserve
Green Meadows

TABLE D-9: FUNCTIONAL GROUP 34 - ESTERO CREEKS AND HEADWATERS FLOW-WAYS DETAILED COMPONENT DESCRIPTIONS

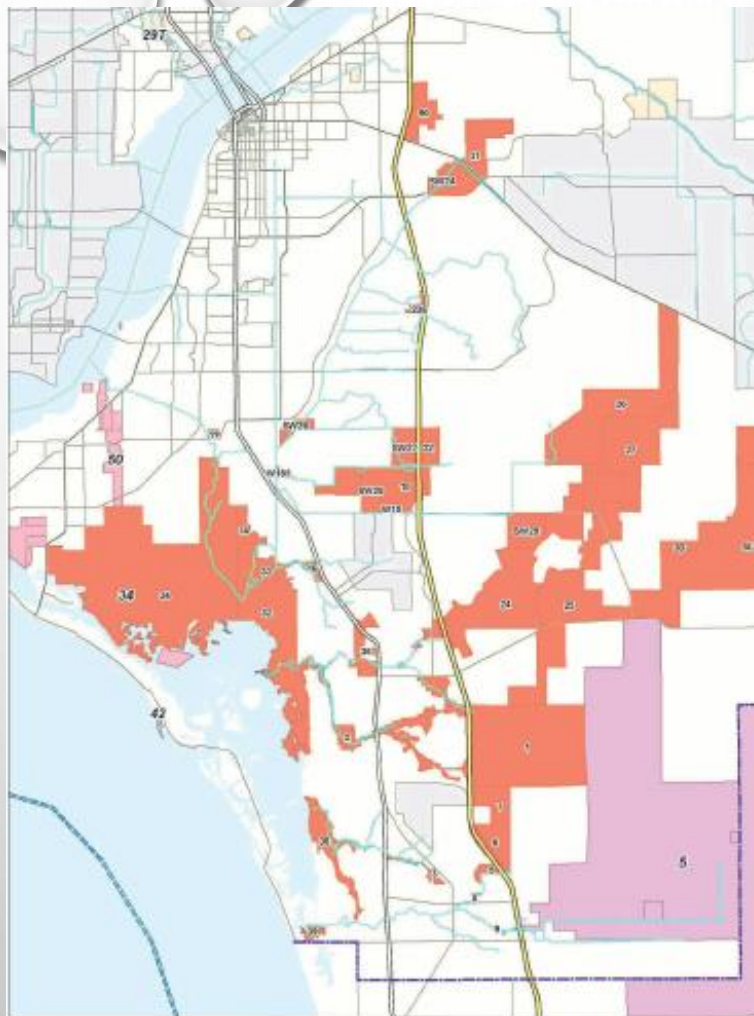
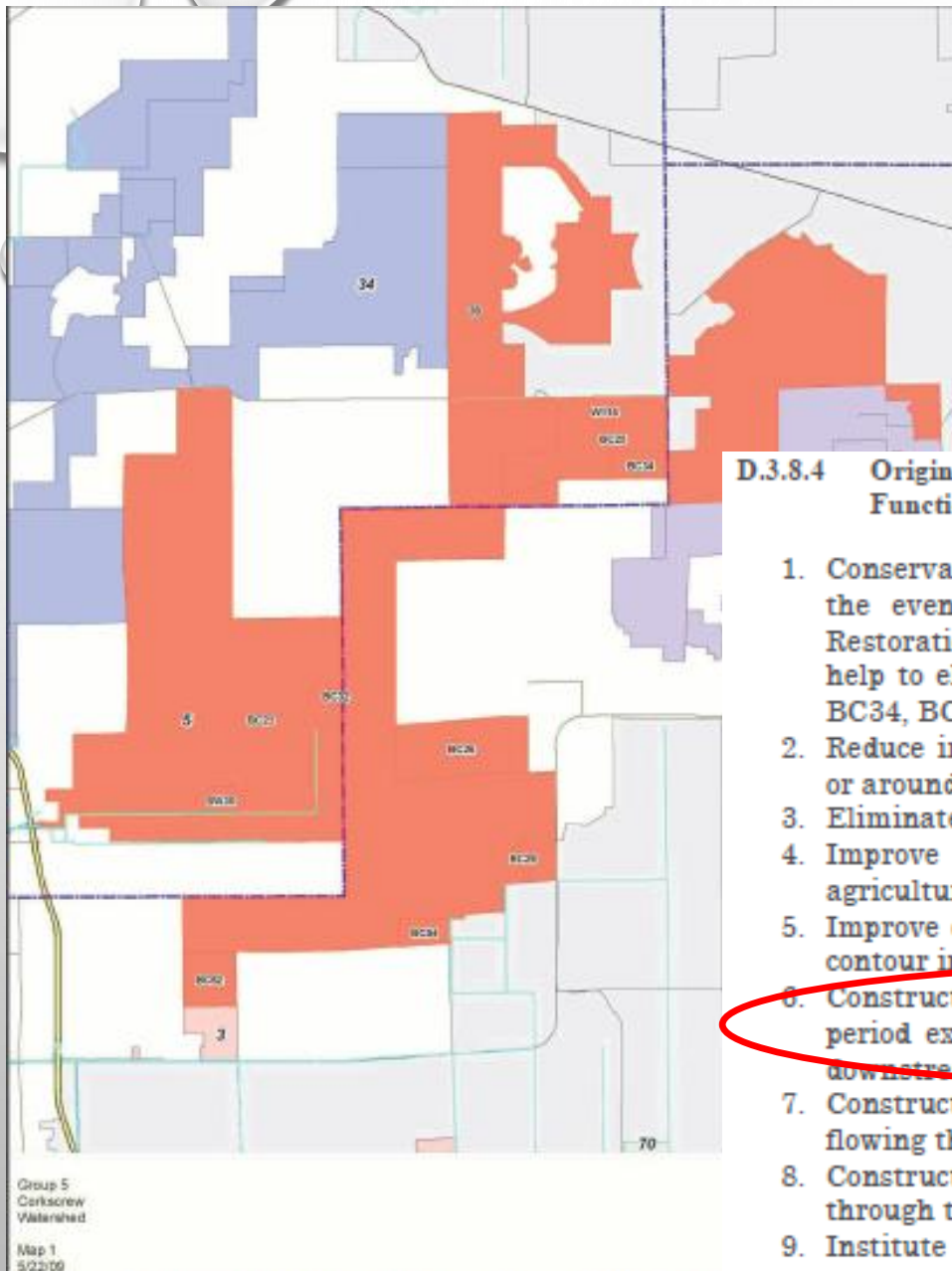


FIGURE D-12: FUNCTIONAL GROUP 34 ESTERO CREEKS AND HEADWATERS FLOW-WAYS COMPONENT BOUNDARIES

Functional Group 34-Estero Creeks and Headwaters Flow-ways			
BAT ID Number	Component Title	Component Justification	Component Description
1	Agripartners Properties	Dan Arnoff is the current owner. The agripartners property alternative name is Arnoff. This property is headwaters for halfway Creek, habitat for Florida panther, woodstork, Eastern indigo snake	This is a 6-square mile property, east of I-75, opposite the Brooks. This includes Section 5, 6, 7, 8 of T47 R26 and Sections 1 and 12 of T47 R25. The purpose of this component is to preserve through acquisition and restore the site through
<b>D.3.6.4 Original Components and Associated Management Measures in Functional Group 34 (Table D-9)</b>			
<ol style="list-style-type: none"> <li>1. Conservation easements or acquisition would avoid the possibility of the eventual loss of lands in FG 34 to residential development. Restoration of developed lands to their pre-development habitats could help to eliminate nutrients problems. (1, 2, 3, 6, 7, 10, 11, 16, 22, 24, 25, 26, 27, 29, 30, 31, 36, 90, SLL02)</li> <li>2. Reduce impediments to sheetflow through conveyance structures (1, 2, 11, 90, 236, SLL02)</li> <li>3. Provide improved habitat through the creation of littoral zones in borrow pits (1, 7)</li> <li>4. Backfill canals to restore sheetflow (7)</li> <li>5. Reduce impediments to sheetflow by eliminating mosquito ditches (32, 33, 34, 39)</li> <li>6. Eliminate exotic vegetation (1, 7, 9, 10, 11, 14, 16, 22, 24, 25, 30, 31, 32, 33, 34, 38, 39, 90)</li> <li>7. Improve downstream hydrologic regimes by constructing weirs at 1 ft contour intervals in canals (8, 10, 11, 22, 38)</li> <li>8. Remove portions or all of spoil berms in wetlands next to dredged channels (11, 34)</li> <li>9. Improve the quality of water in inland canals and flow-ways through the construction of filter marshes (5, 8, 10/W1, 14/W21, 36)</li> <li>10. Reduce impediments to sheetflow by regrading vehicle trails (34)</li> <li>11. Construct Managed Aquatic Plant Systems to improve quality of water flowing through canals and coastal lagoon tributaries (W156/16, W15/38, W185)</li> <li>12. Improve groundwater and surface water quality through conversion of septic to central sewer systems and construction of a storm water retrofit (9, W13, W23)</li> <li>13. Construct above-ground reservoirs to reduce point discharges to coastal waters (SW24, SW26, SW27, SW28, SW29)</li> </ol>			

# CORKSCREW PROJECTS



## D.3.8.4 Original Components and Associated Management Measures in Functional Group 5 (see Table D-11)

1. Conservation easements or acquisition would avoid the possibility of the eventual loss of lands in FG 5 to residential development. Restoration of developed lands to their pre-development habitats could help to eliminate nutrients problems. (28, BC23, BC25, BC28, BC32, BC34, BC54, BC62)
2. Reduce impediments to sheetflow with improved conveyance through or around structures (BC23, BC25, BC26)
3. Eliminate exotic vegetation (28, BC23, BC25, BC28, BC62)
4. Improve downstream hydrologic regimes by increasing storage on agricultural lands and associated detention ponds (SW07)
5. Improve downstream hydrologic regimes by constructing weirs at 1 ft contour intervals in canals and ditches (28, BC23, BC25, BC54)
6. Construct an above-ground reservoir along a major canal to store wet period excess flows and to provide supplemental dry period flows to downstream flowways (SW30)
7. Construct a Water Quality Treatment Area to improve quality of water flowing through the Corkscrew Watershed (W113)
8. Construct an Algal Turf Scrubber to improve quality of water flowing through the Corkscrew Watershed (W114)
9. Institute urban BMPs in watershed (W110)

FIGURE D-14: FUNCTIONAL GROUP 5 CORKSCREW WATERSHED COMPONENT BOUNDARIES





## BEFORE MOST OF THESE PROJECTS MOVE FORWARD, A REGIONAL HYDROLOGIC MODEL IS NEEDED

- CORKSCREW SWAMP SANCTUARY/AUDUBON FLORIDA IS PARTNERING WITH SFWMD/BIG CYPRESS BASIN TO REFINE A REGIONAL HYDROLOGIC MODEL FOR CORKSCREW WATERSHED TO FIND CAUSES AND SOLUTIONS TO WATER LEVEL IMPACTS
  - A LARGER SOUTH LEE REGIONAL HYDROLOGIC MODEL IS ALSO NEEDED TO IDENTIFY FEASIBLE RESTORATION PROJECTS AND LOOK AT CLIMATE DESTABILIZATION AND SEA LEVEL RISE.
- 