

Florida Department of Agriculture & Consumer Services Division of Aquaculture Monitoring Programs



**Prepared by: Chris Brooks, Karen Metcalf, Paul
Zajicek, and Kal Knickerbocker**

Presented by: Chris Brooks

**Florida Department of Agriculture and
Consumer Services**

Division of Aquaculture Monitoring Programs

- Routine statewide monitoring for Shellfish Harvesting Areas
- Site specific monitoring to determine potential impacts of clam culture activities
- Site specific monitoring to evaluate new marine biotoxin monitoring technology
- Site specific monitoring to evaluate new nutrient and flow monitoring technology
- Clam Lease Assessment Management and Modeling Using Remote Sensing
- Testing and Evaluation of in situ Nutrient Analysis

Monitoring For Shellfish Harvesting Areas

- Fixed stations are monitored throughout the Shellfish Harvesting Areas (oysters, clams, mussels, whole scallops)
- Water samples are collected just below the surface
- Water samples are analyzed for fecal coliform bacteria (Group of indicator bacteria found in the feces of warm blooded animals) and marine biotoxins
- All coastal states monitor and classify shellfish harvesting waters using the uniform methods of the National Shellfish Sanitation Program (**NSSP**)

Indicator Monitoring

Where

Sampling Station Locations

1. Pollution sources
2. Fresh water sources
3. Classification boundaries
4. Shellfish resources
5. Grid

What

What is Measured?

Fecal coliform

Collection time

Surface and bottom salinity

Surface and bottom temperature

Surface and bottom DO

Surface pH

Surface turbidity

Wind direction and velocity

Tide stage is calculated

Rainfall (and River) level(s)

Marine Biotoxin Monitoring

- *Karenia brevis* (**Brevetoxin**):
 - Is a toxic dinoflagellate associated with Florida saltwater discoloration, fish kills, **neurotoxic shellfish poisoning**, and an airborne respiratory irritant in sea spray
 - Respiratory irritation can occur when concentrations increase above normal background levels of 1,000 cells per liter
 - **Concentrations of 5,000 cells per liter in waters or brevetoxin concentrations >20 mouse units in shellfish tissue are considered too high for human consumption**
 - Concentrations at 250,000 cells per liter can cause fish kills
 - Concentrations >1,000,000 cells per liter can cause seawater discoloration

- NSP Marine Biotoxin Monitoring

- Initiated when fish-kills, discolored waters, and/or respiratory irritation are present and/or reported in or near a Shellfish Harvesting Area (early warning)
- Initiated when NASA satellite imagery from NOAA suggests potential bloom in or near a Shellfish Harvesting Area (early warning)

- NSP Monitoring: Where, When, and How:

- Samples shall be collected from fixed stations at intervals determined by the Department
- Water samples are collected at the fixed stations (off-shore and near shore) to determine if concentrations are above 5,000 cells per liter
- Shellfish tissue samples are collected in areas where marine biotoxins are likely to occur in shellfish
- FWC, FWRI conducts all of the tissue laboratory analysis and the majority of the cell counts from the samples collected

Marine Biotoxin Monitoring

- *Pyrodinium bahamense* (Saxitoxin):
 - Is a toxic dinoflagellate associated with Florida saltwater discoloration and **paralytic shellfish poisoning**.
 - **Saxitoxin concentrations >80 micrograms in shellfish tissue are considered too high for human consumption**
 - Cell concentrations >1,000,000 cells per liter can cause seawater discoloration

- PSP Monitoring: Where, When, and How:

- Routine tissue sampling for toxin concentration is required
- Samples shall be collected from fixed stations at intervals determined by the Department
- Tissue samples are collected in areas where marine biotoxins are likely to occur in shellfish
- FWC, FWRI conducts all of the tissue laboratory analysis and cell counts from the samples collected

Shellfish Harvesting Area Monitoring

Who

- 11 Environmental Specialist II's: 35% of each position is for monitoring related activities (sample equipment preparation, travel time, sampling, sample packaging /shipping, equipment maintenance)
- 1 Environmental Health Aide: 50% of the position is for monitoring related activities

When

Strive for monthly when open and 5 times per year under adverse pollution conditions

- Adverse pollution condition sampling is a requirement of the **NSSP**
- Sampling is conducted timely after an area is closed in order to reopen the area
- Intensive annual evaluations are conducted by the **US Food and Drug Administration**

*During 2005, staff conducted 694 sampling excursions & collected 14,572 samples for Department laboratory analysis for **fecal coliform** bacteria alone.

Managing Shellfish Harvesting Areas: Closure and Reopening

Criteria for Closure

1. SHA exceeds the established management plan predicting high fecal coliform indicator bacteria -
Based on rainfall, river stage, season, or a combination of these
2. Emergency fecal coliform indicator conditions:
discharge of improperly treated sewage, hurricanes, and tropical storms

Criteria for Closure (Continued)

3. For NSP: *Karenia brevis* cell count exceeds 5,000 per liter or during early warning conditions of respiratory distress, burning eyes, fish kills, or discolored water
4. For PSP: >80 micrograms saxitoxin in shellfish tissues
5. For Reported Illness Outbreaks: SHA's are closed when shellfish illness outbreaks are reported (2 or more illnesses from the same time and location)

Criteria for Reopening

1. Good fecal coliform sample results in waters (*and shellfish meat samples following sewage spills or emergency conditions*) and improving environmental conditions

or

2. Emergency conditions not realized (hurricane shifted course, no surge, no failure of sewage collection systems, red tide did not come inshore

or

3. For NSP <5,000 cells/L of *Karenia* in water samples
plus shellfish tissue samples testing <20 mouse units

or

4. For PSP <80 micrograms saxitoxin in shellfish tissues.

or

5. Cause of illness outbreak corrected or mitigated.



Pensacola Bay System #02

LEGEND

ESCAMBIA BAY



CONDITIONALLY APPROVED
(0222)



CONDITIONALLY RESTRICTED
(0216)



PROHIBITED

EAST BAY



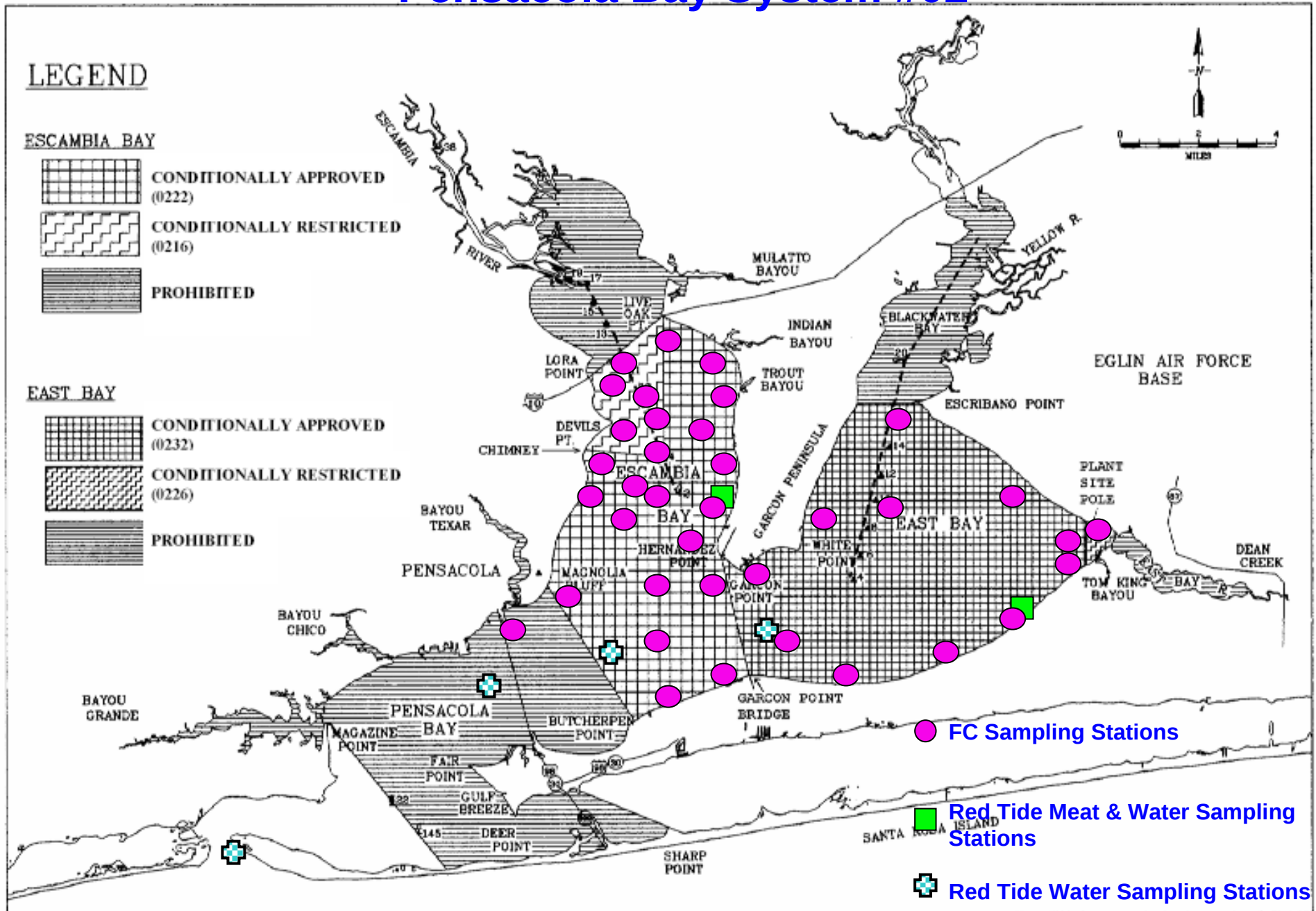
CONDITIONALLY APPROVED
(0232)



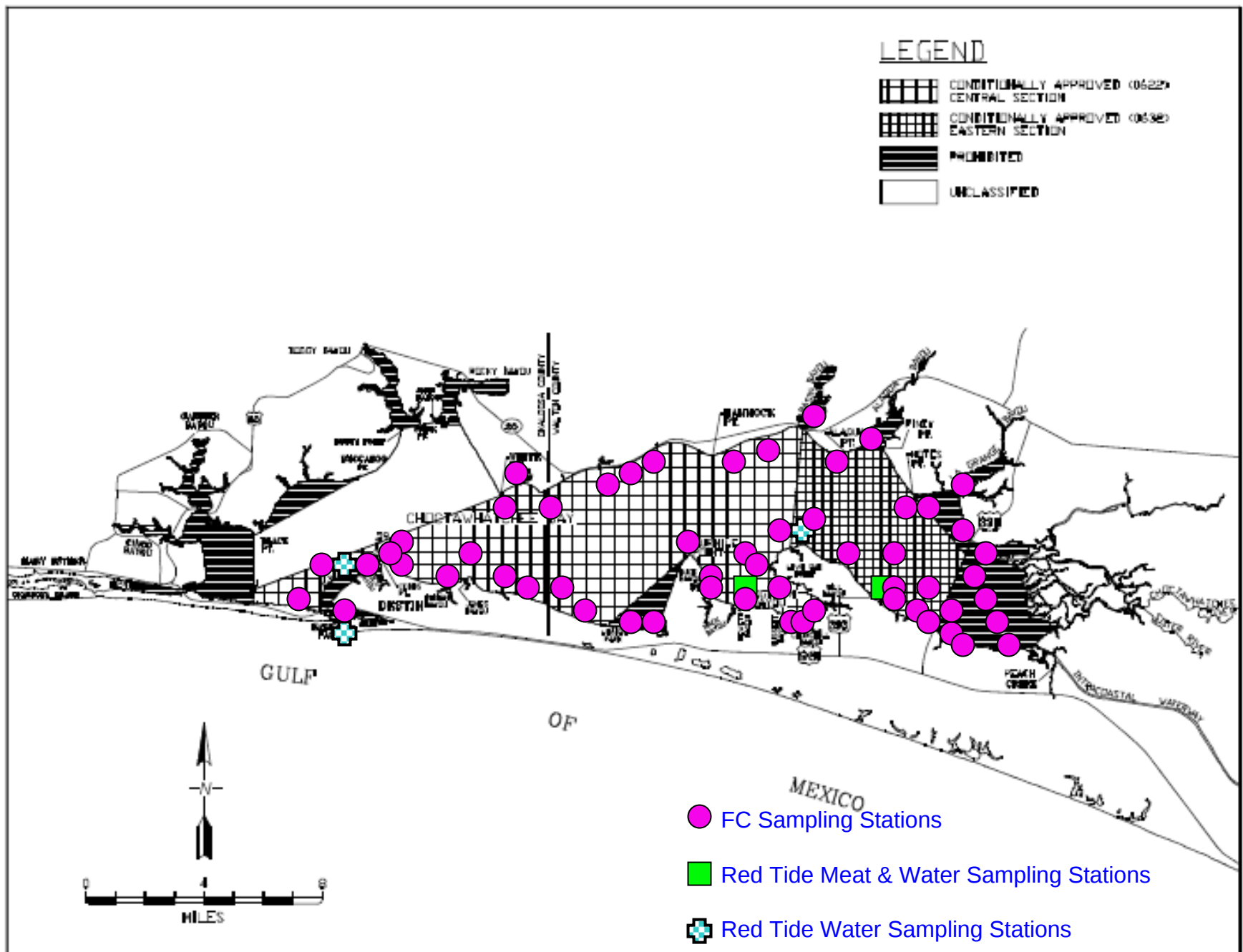
CONDITIONALLY RESTRICTED
(0226)



PROHIBITED

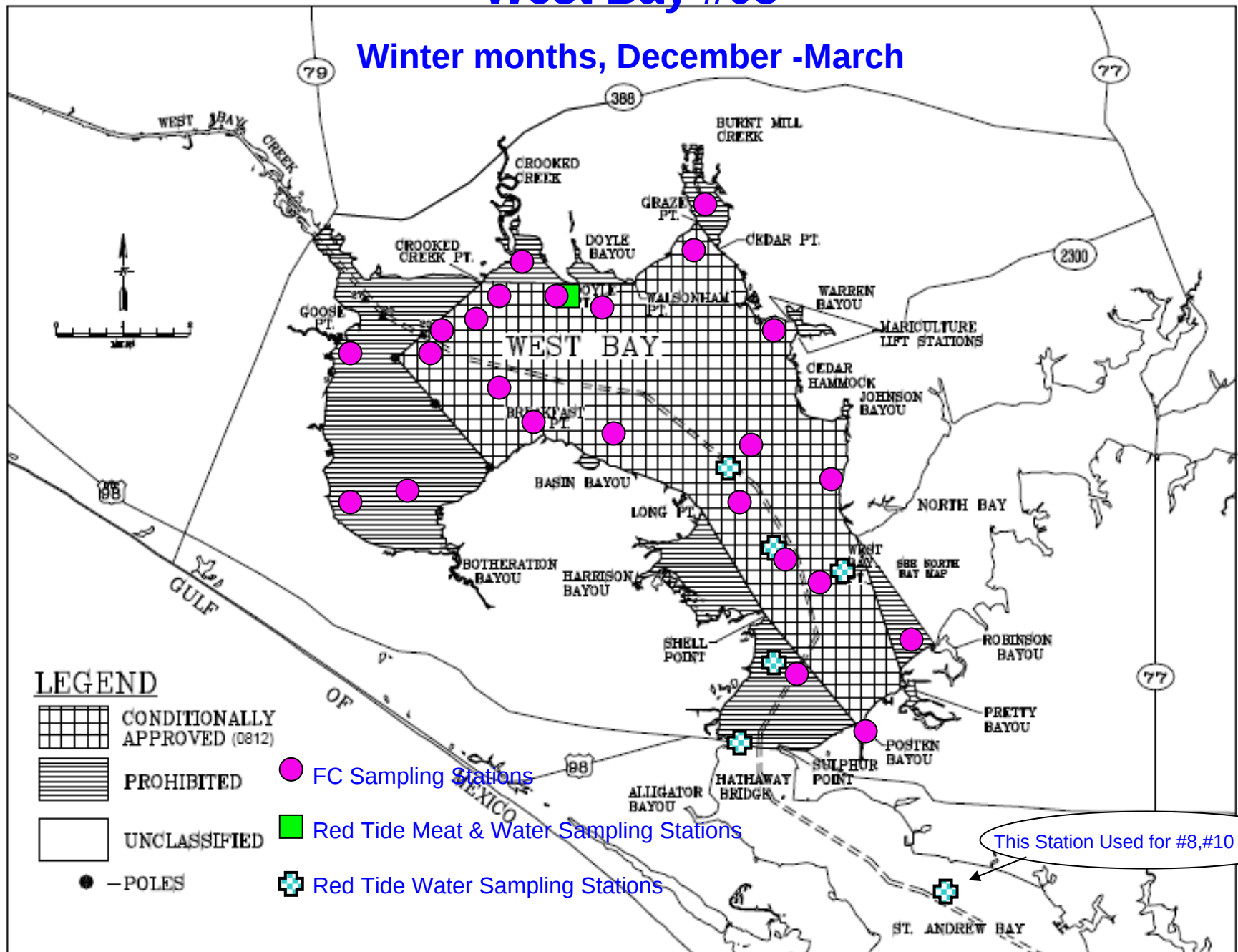


Choctawhatchee Bay #06

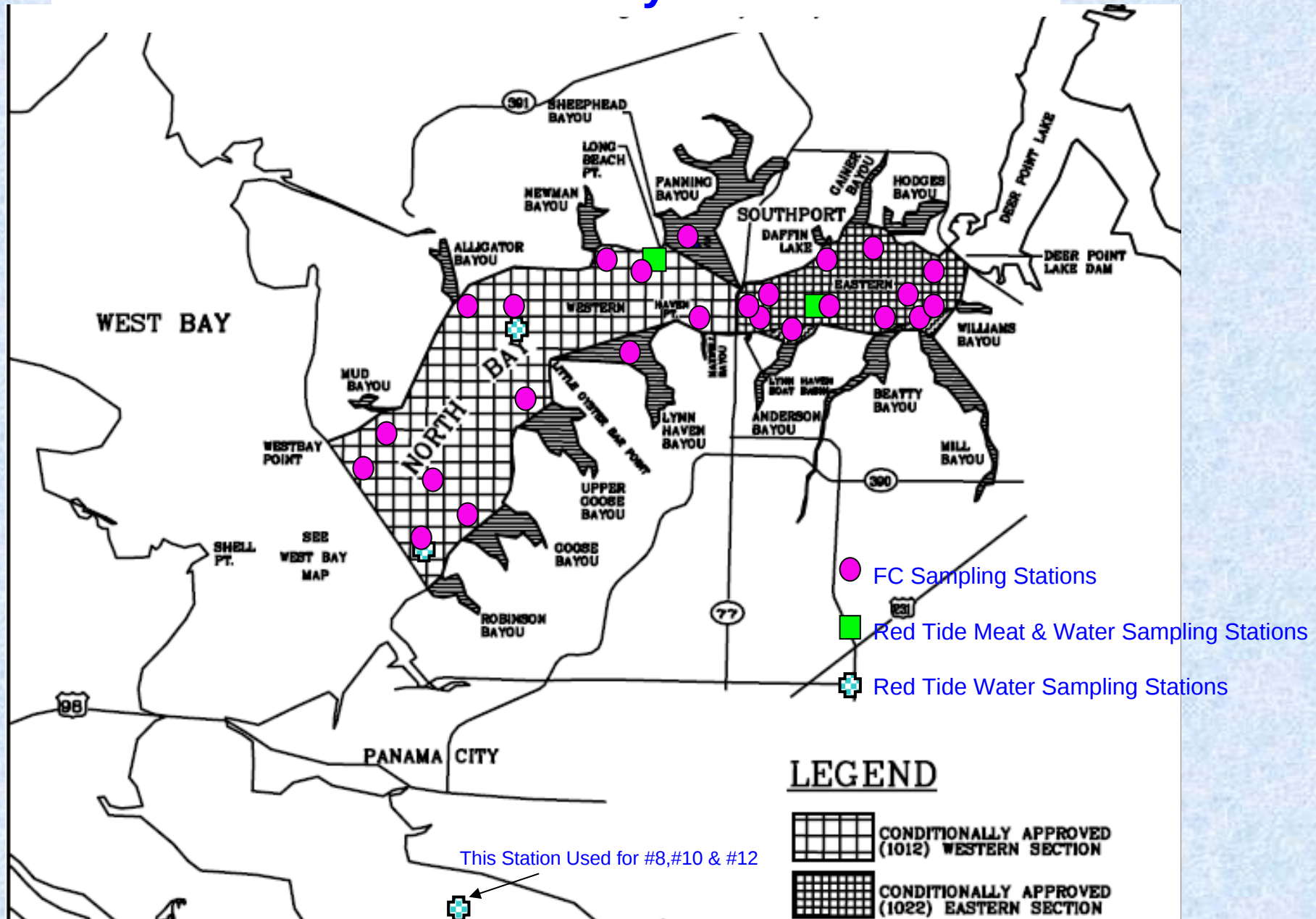


West Bay #08

Winter months, December -March



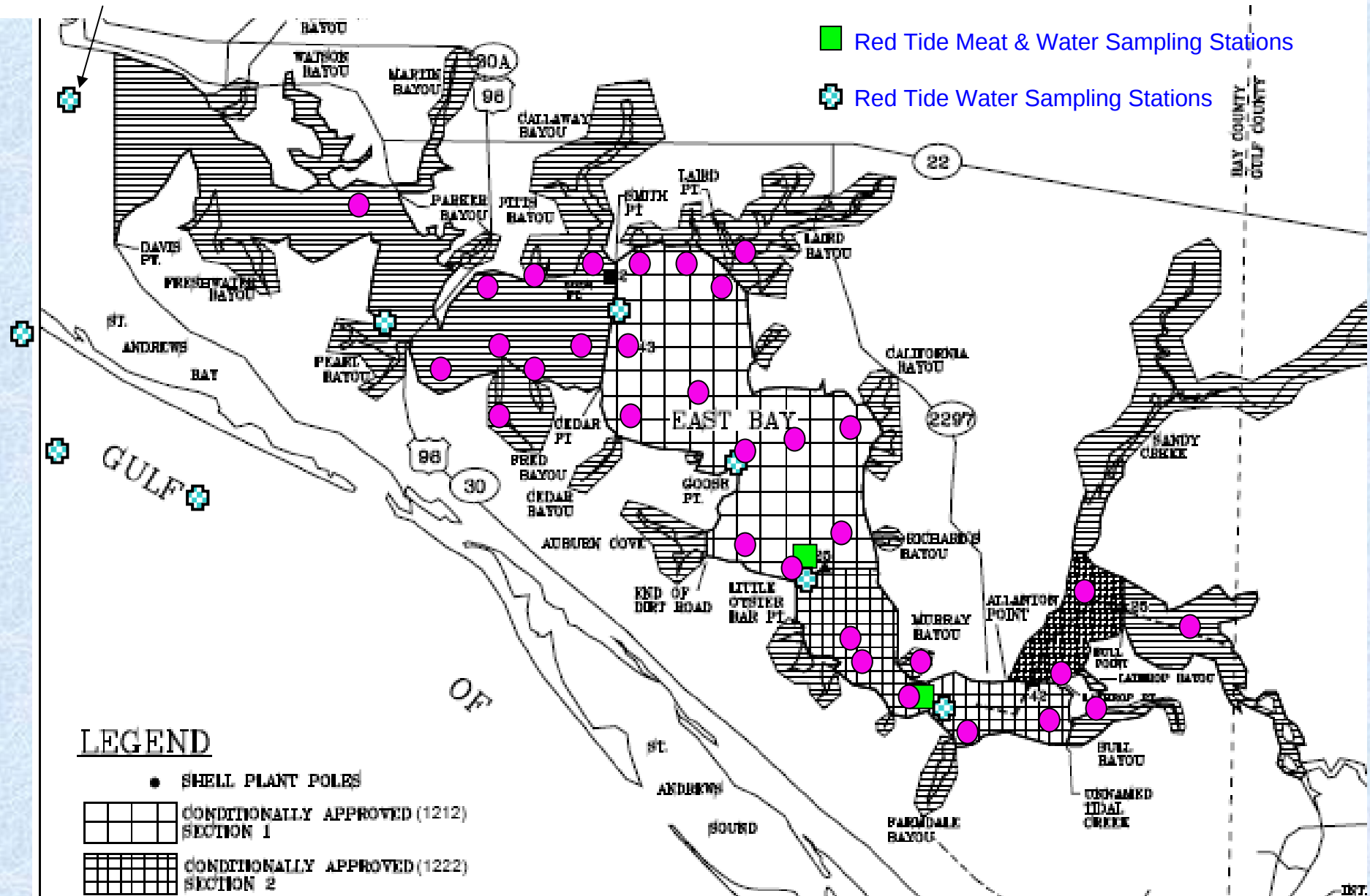
North Bay #10



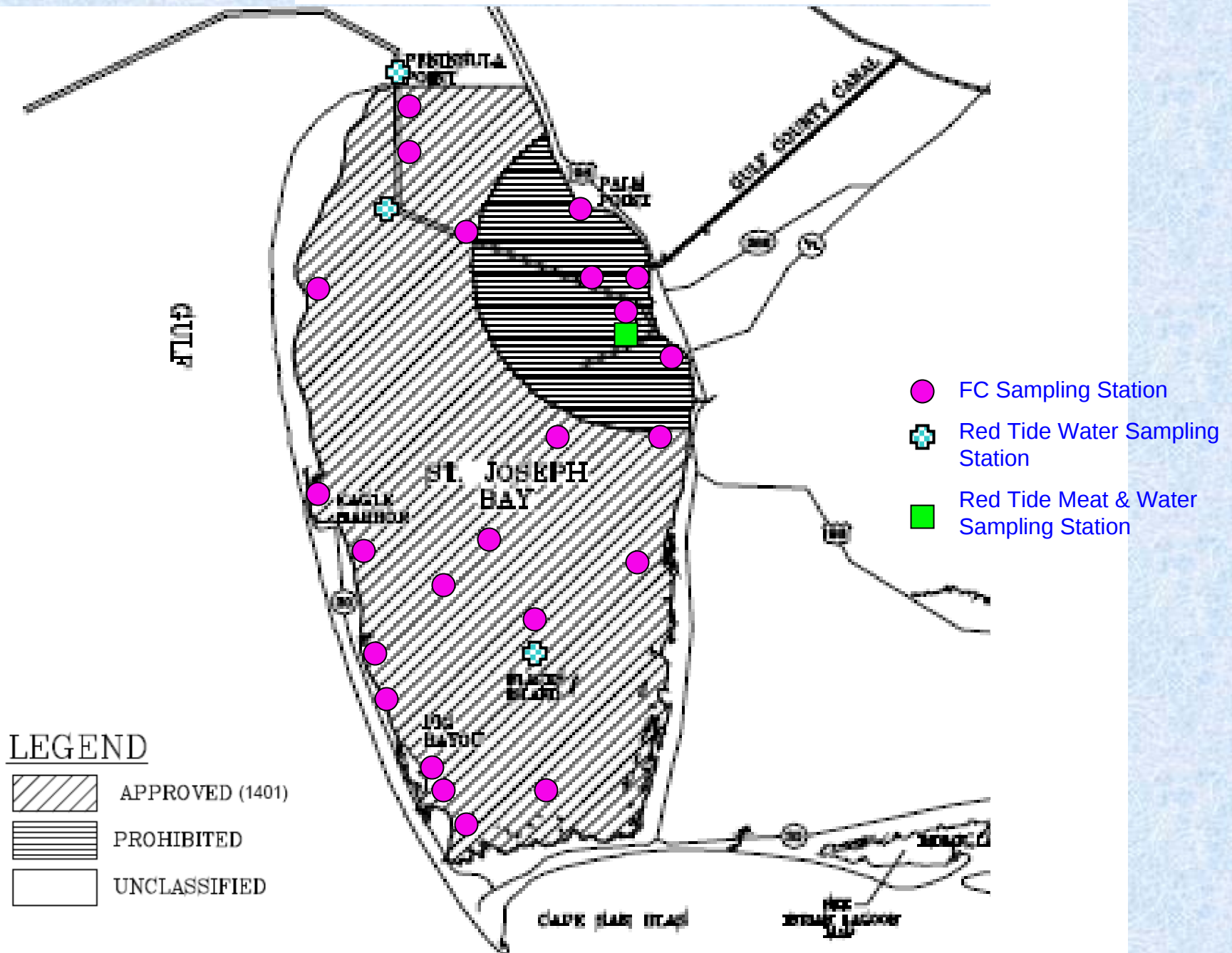
East Bay #12

This Station Used for #8,#10 & #12

- FC Sampling Stations
- Red Tide Meat & Water Sampling Stations
- ✱ Red Tide Water Sampling Stations



St. Joseph Bay #14

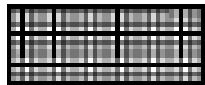


Winter months, November-February

LEGEND



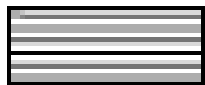
CONDITIONALLY APPROVED Zone A
(342)



CONDITIONALLY APPROVED Zone II
(1351)



CONDITIONALLY RESTRICTED
(1506)

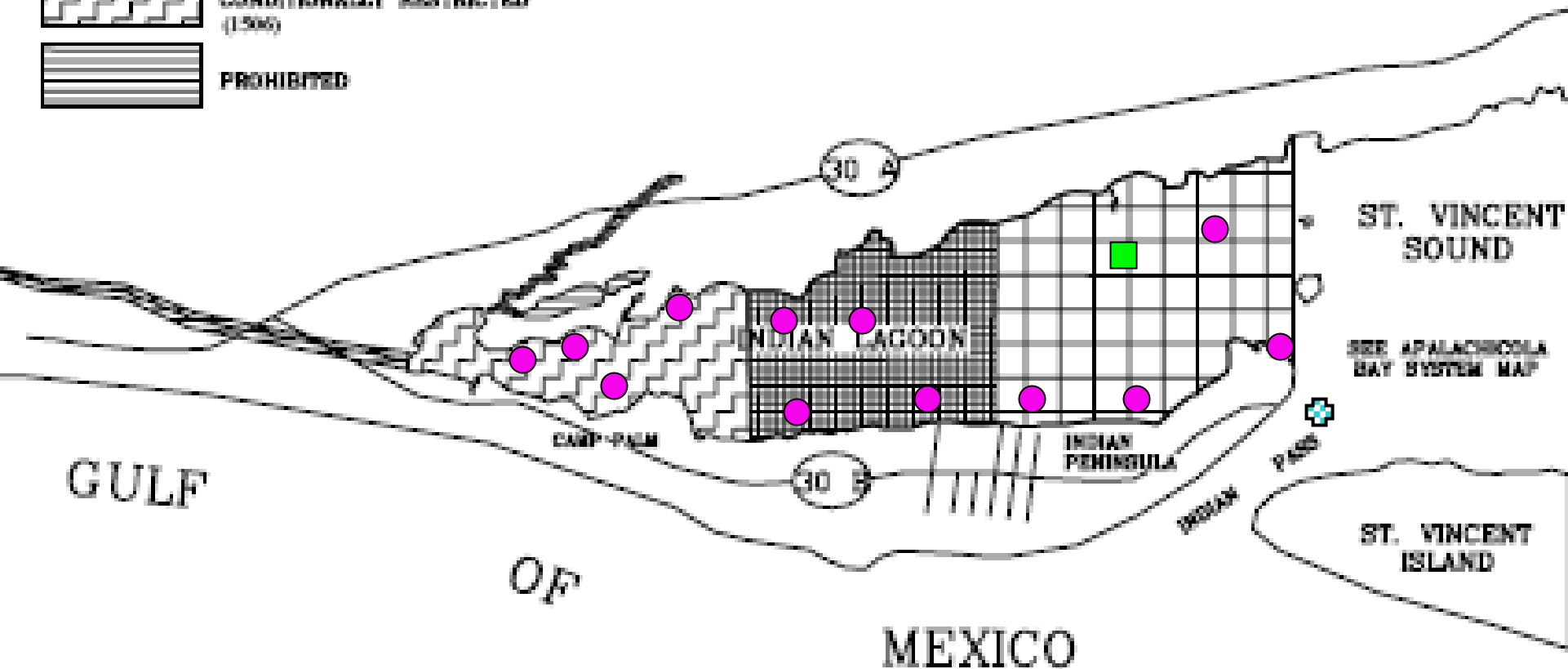


PROHIBITED

● FC Sampling Station

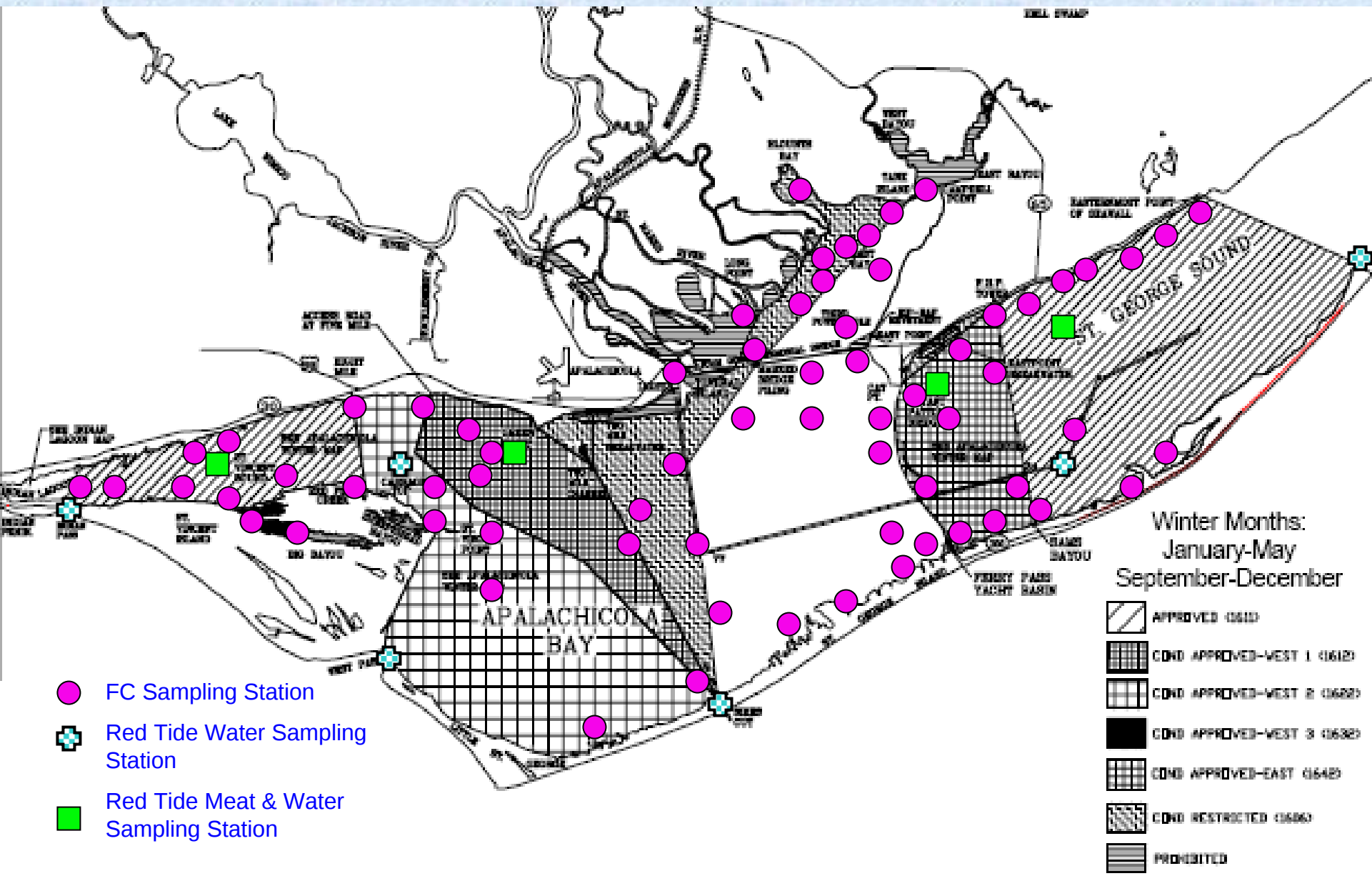
 Red Tide Water Sampling Station

 Red Tide Meat & Water Sampling Station

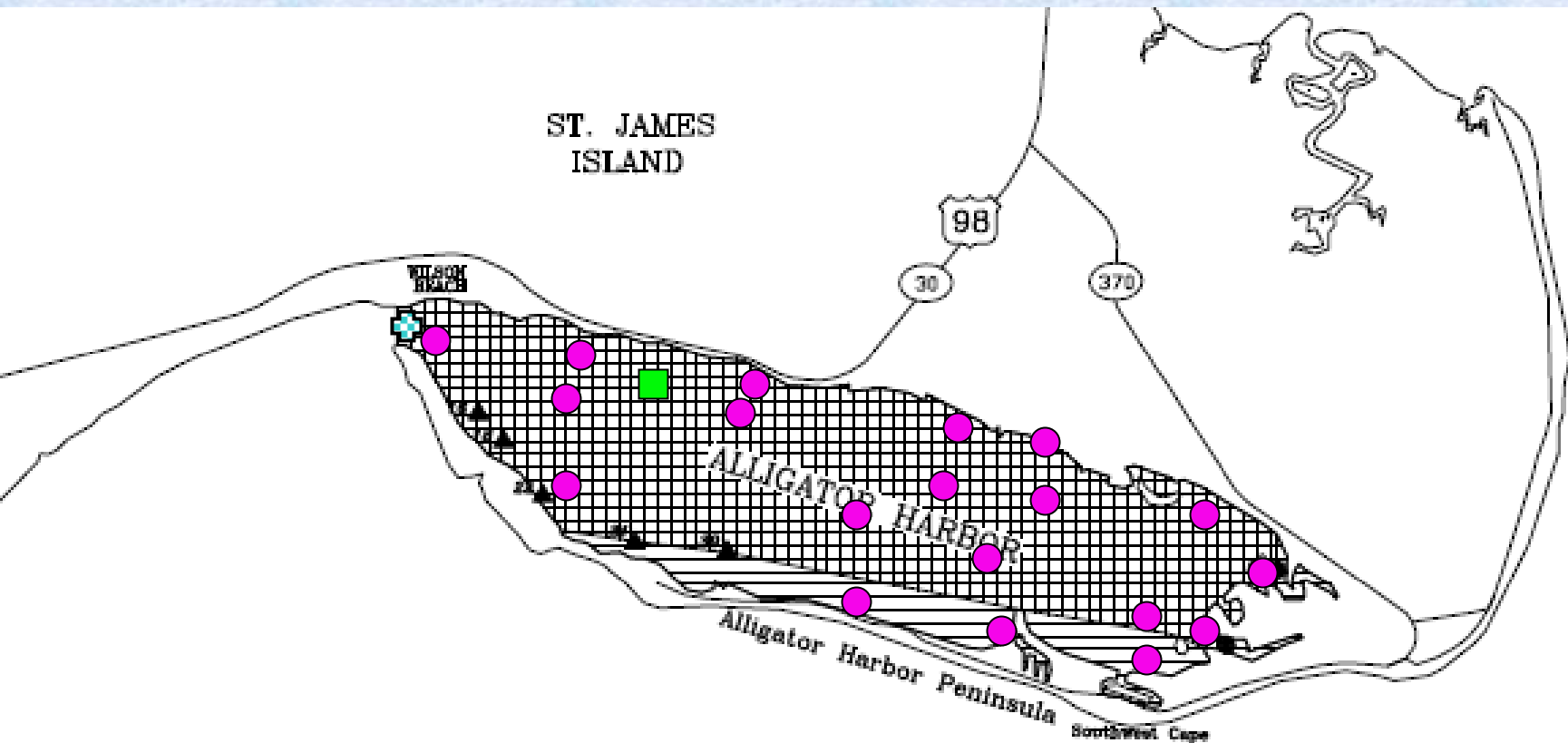


Apalachicola Bay #16

Winter months, January-June, October-December



Alligator Harbor #18



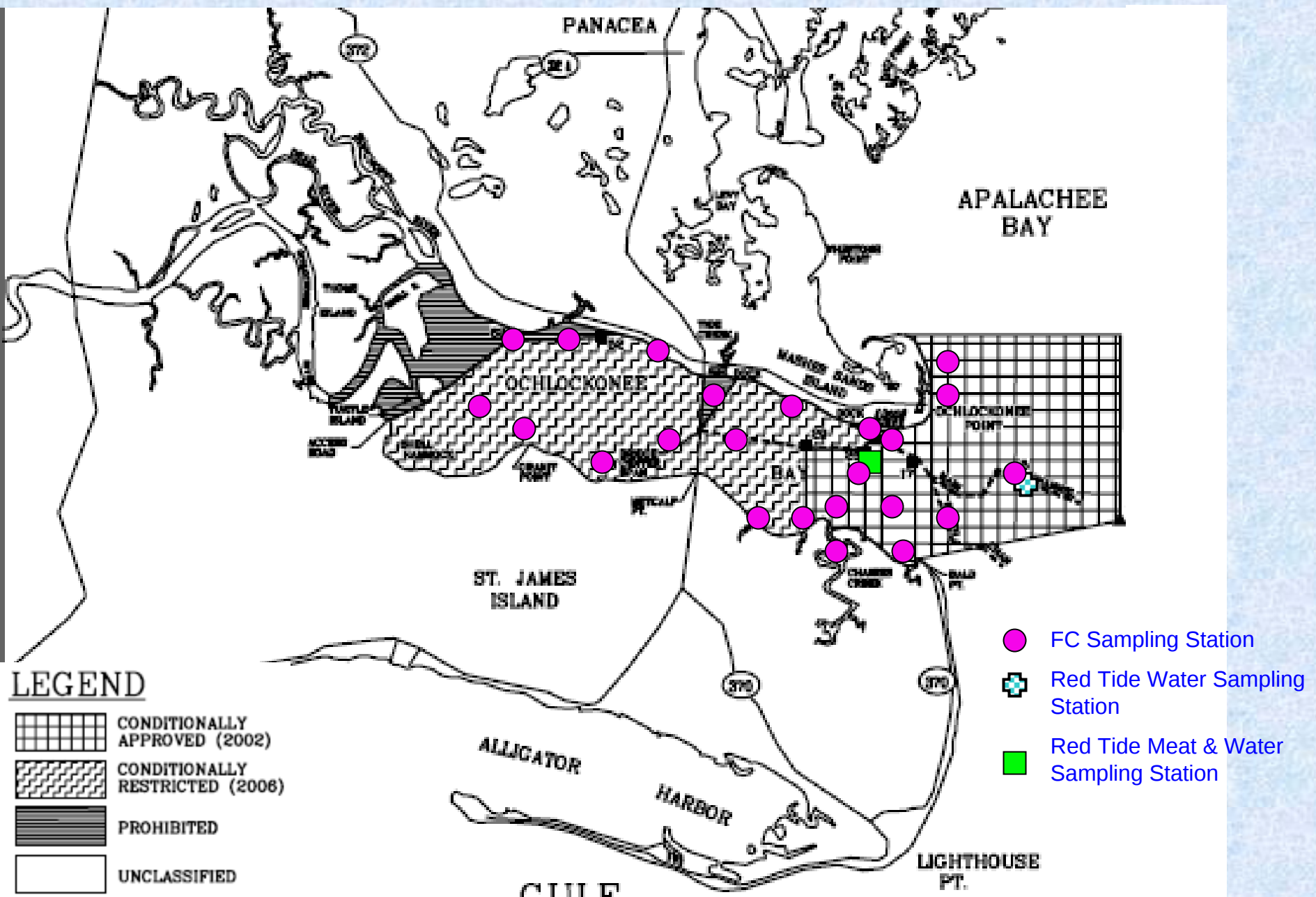
- FC Sampling Station
- ⊕ Red Tide Water Sampling Station
- Red Tide Meat & Water Sampling Station

Gulf of Mexico

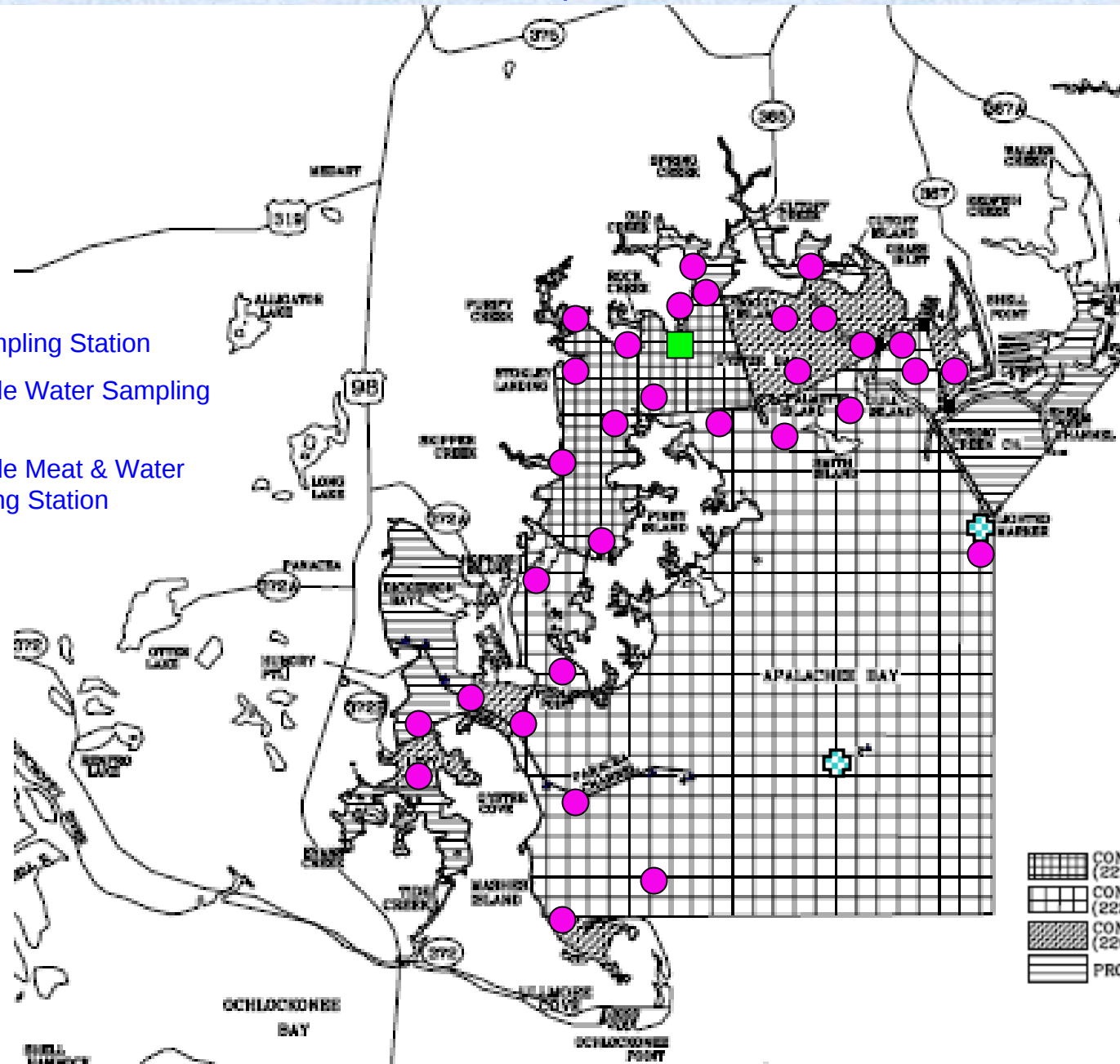
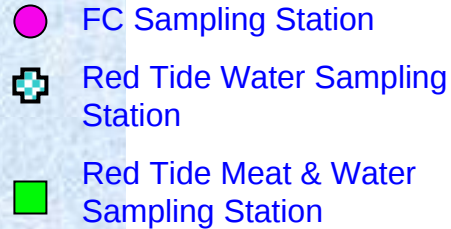
Legend

- ⊞ CONDITIONALLY APPROVED (1802)
- ▬ PROHIBITED

Ochlockonee Bay #20



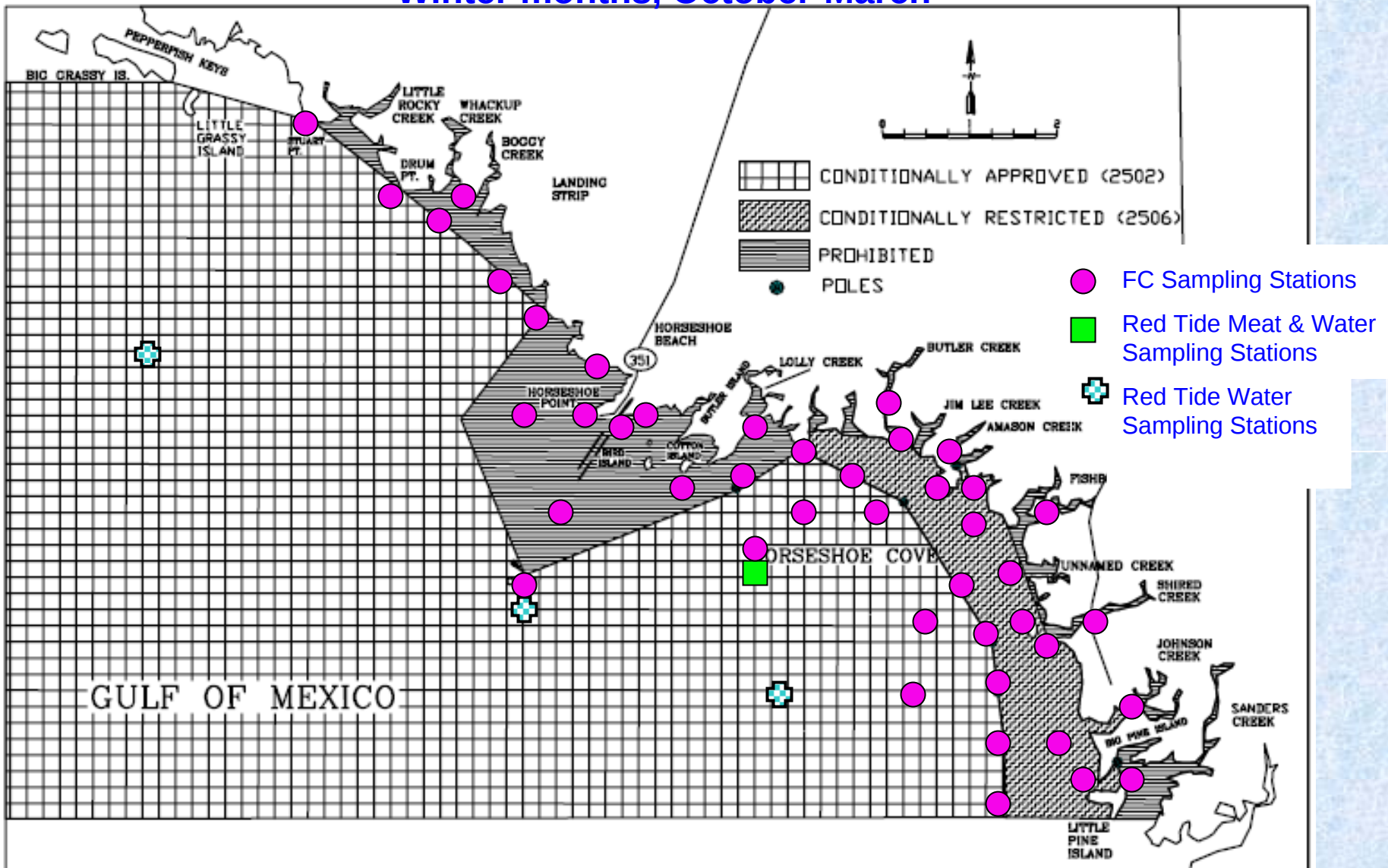
Winter months, October-March



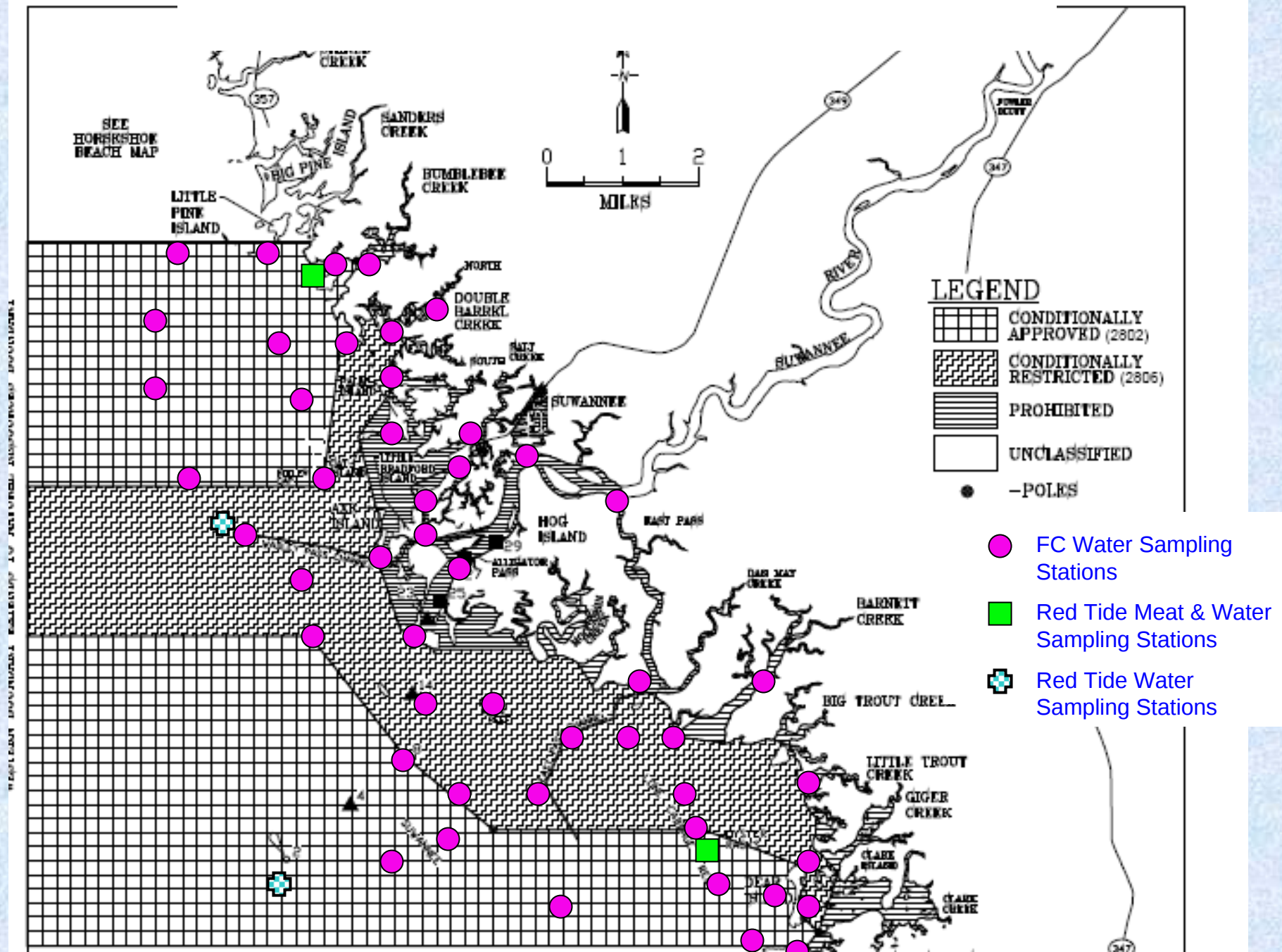
- | | |
|---|---|
|  | CONDITIONALLY APPROVED ZONE 1
(2212) |
|  | CONDITIONALLY APPROVED ZONE 2
(2222) |
|  | CONDITIONALLY RESTRICTED
(2206) |
|  | PROHIBITED |

Horseshoe Beach #25

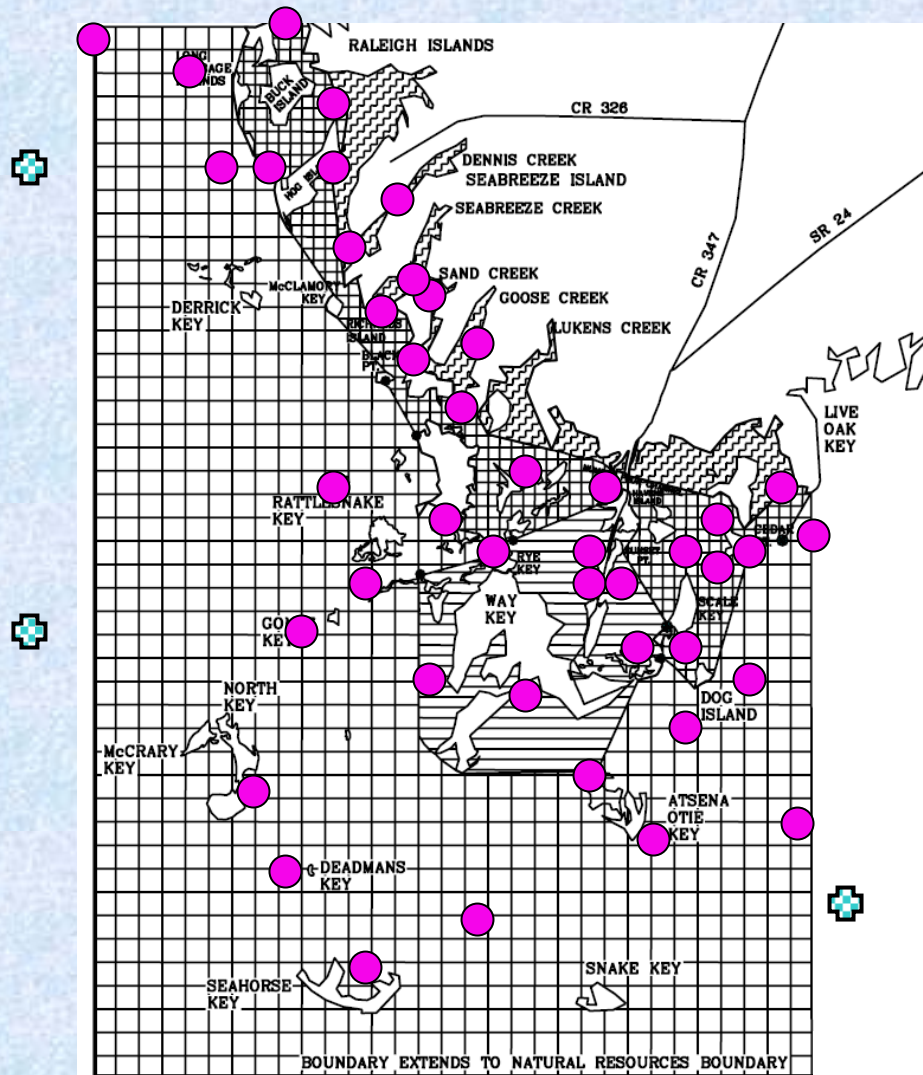
Winter months, October-March



Suwannee Sound #28



Cedar Key #30



● FC Sampling Stations

✚ Red Tide Water Sampling Stations

LEGEND

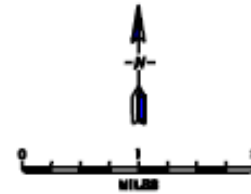
	CONDITIONALLY APPROVED ZONE A (3012)
	CONDITIONALLY APPROVED ZONE B (3022)
	CONDITIONALLY RESTRICTED (3006)
	PROHIBITED

Waccasassa Bay #32

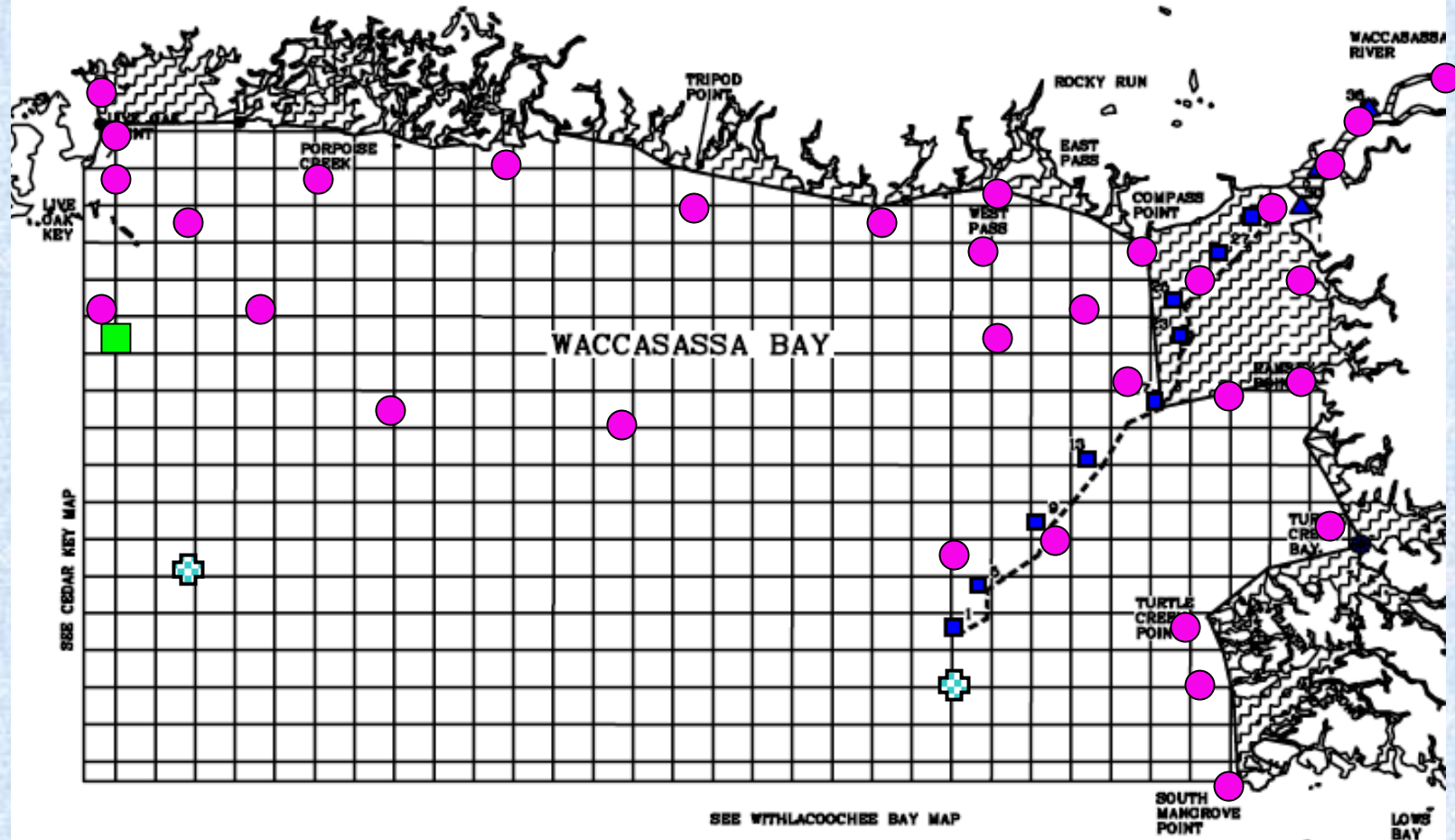
LEGEND



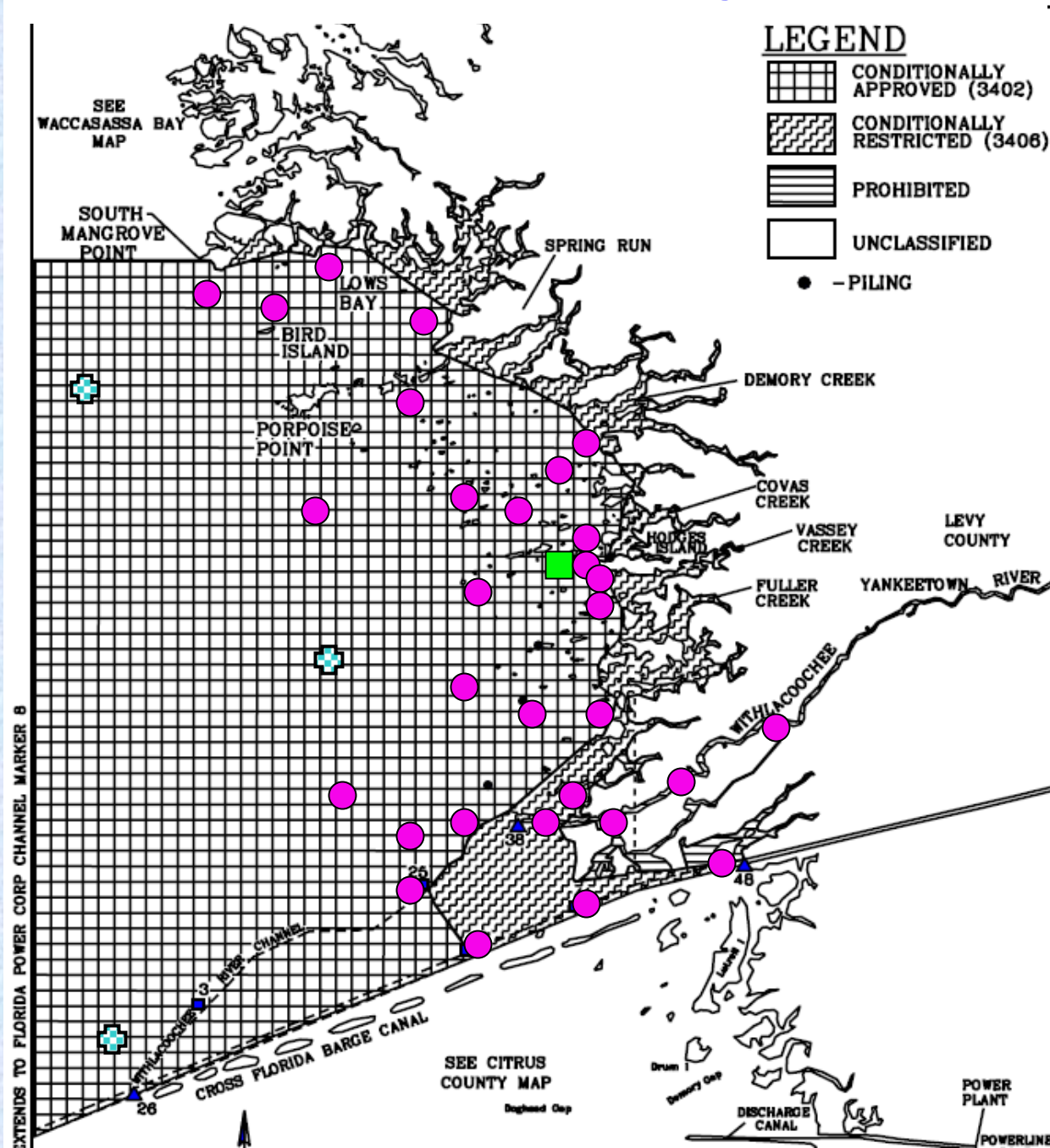
● - PILING



- FC Water Sampling Stations
- Red Tide Meat & Water Sampling Stations
- Red Tide Water Sampling Stations



Withlacoochee Bay #34



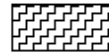
- Water Sampling Stations
- Red Tide Meat & Water Sampling Stations
- Red Tide Water Sampling Stations

Citrus County #37

LEGEND



CONDITIONALLY (3702)
APPROVED



CONDITIONALLY (3706)
RESTRICTED

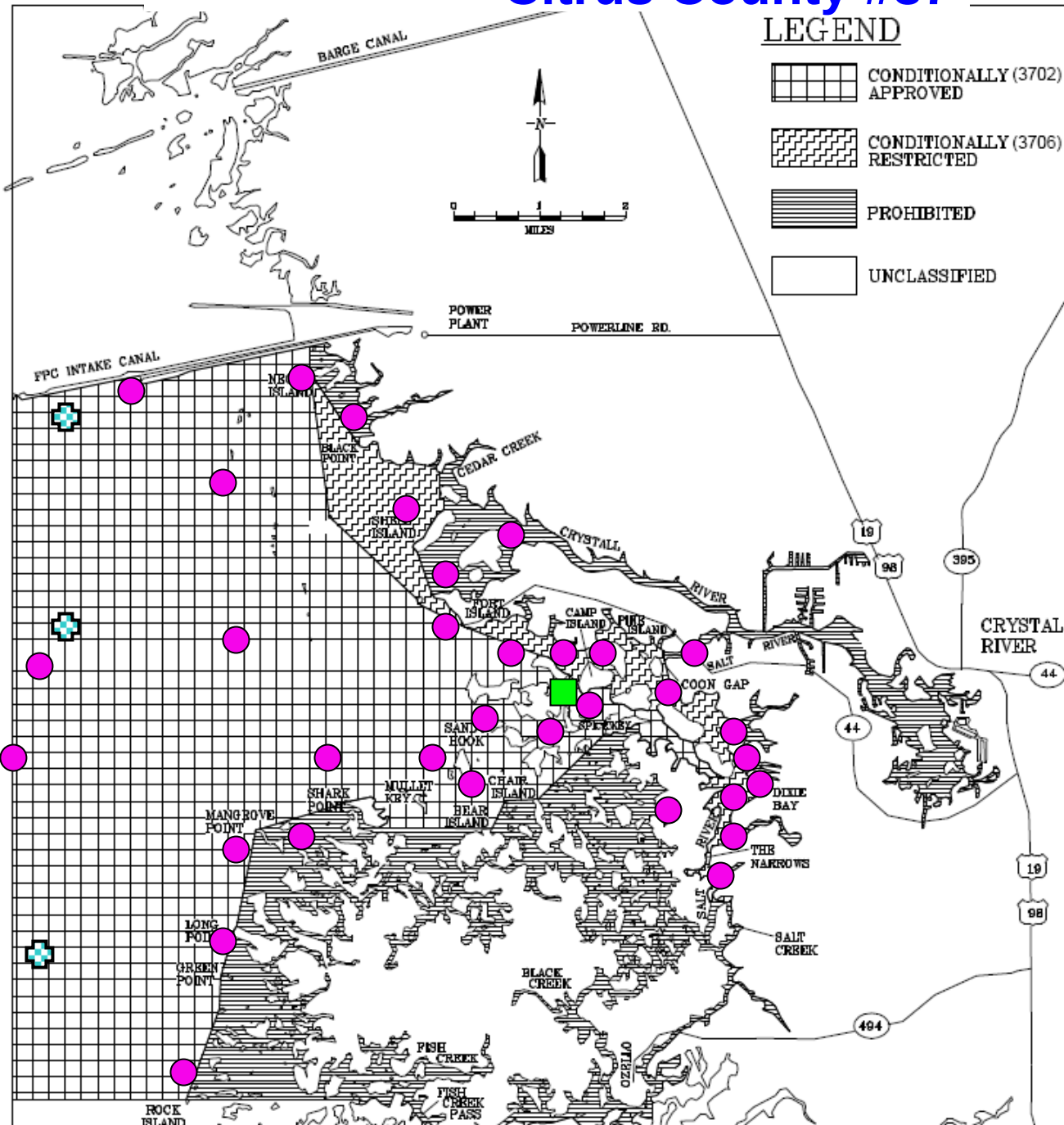


PROHIBITED

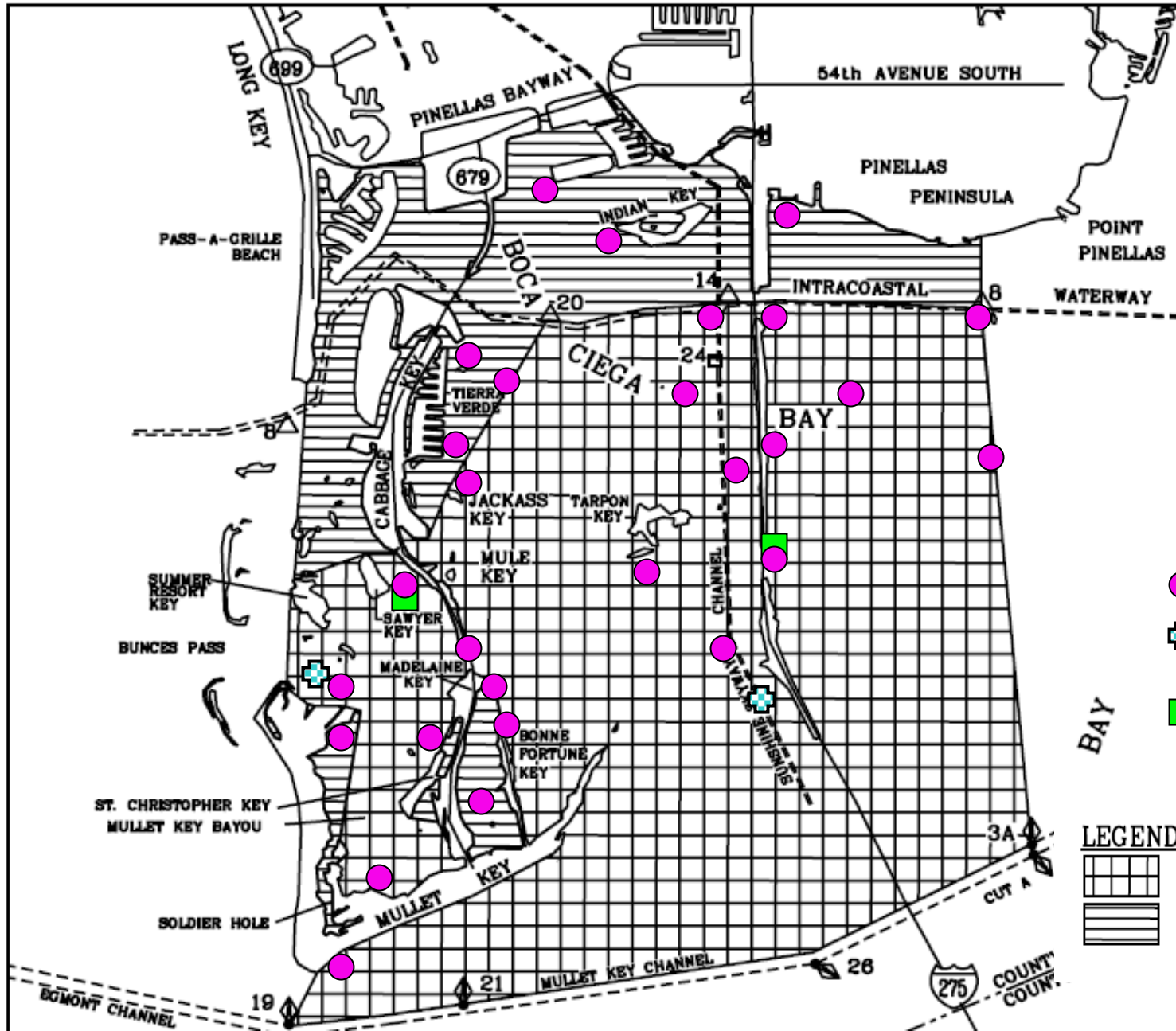


UNCLASSIFIED

- Water Sampling Stations
- Red Tide Meat & Water Sampling Stations
- Red Tide Water Sampling Stations



Boca Ciega Bay #42

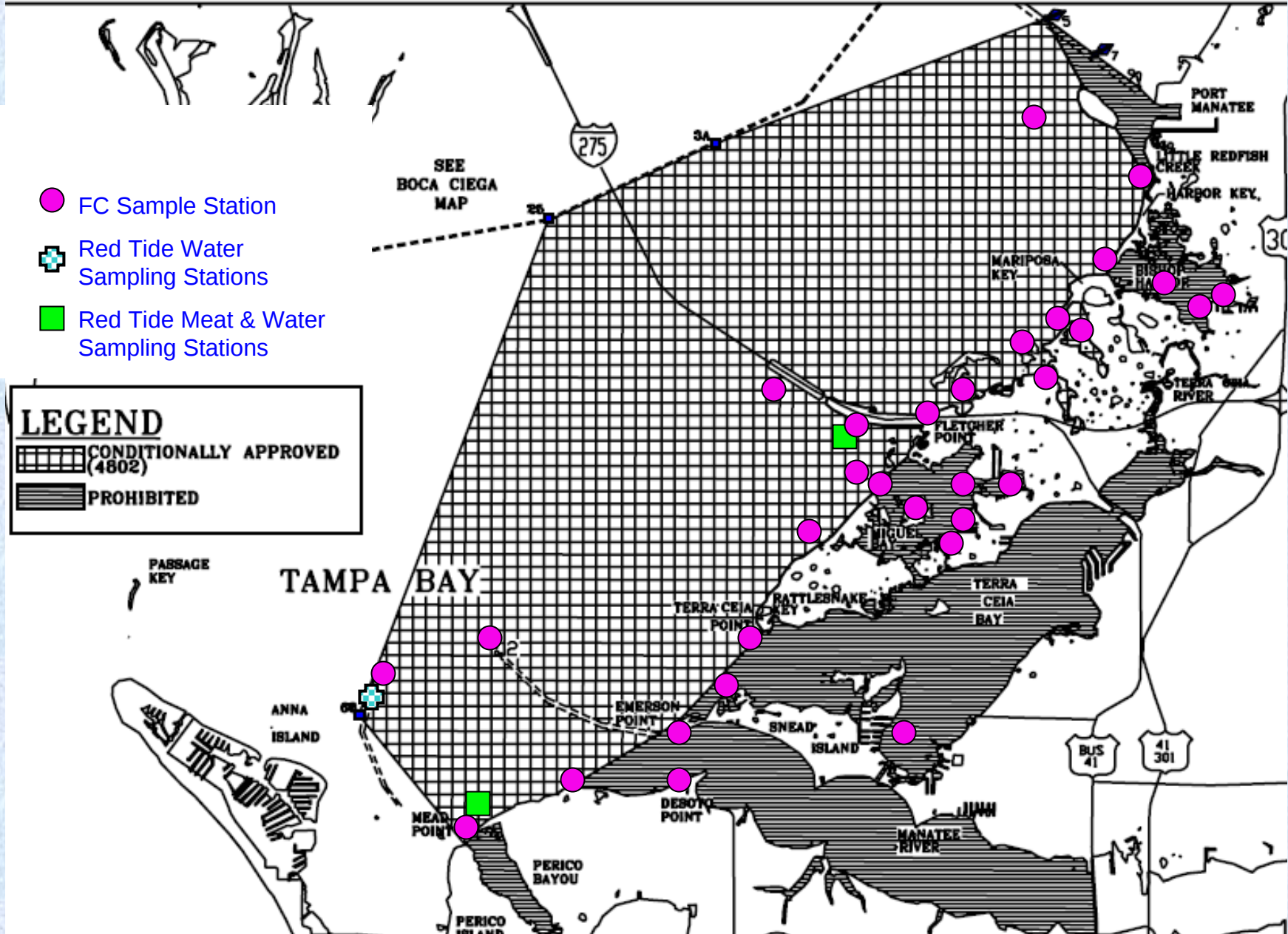


- FC Sample Station
- ⊕ Red Tide Water Sampling Stations
- Red Tide Meat & Water Sampling Stations

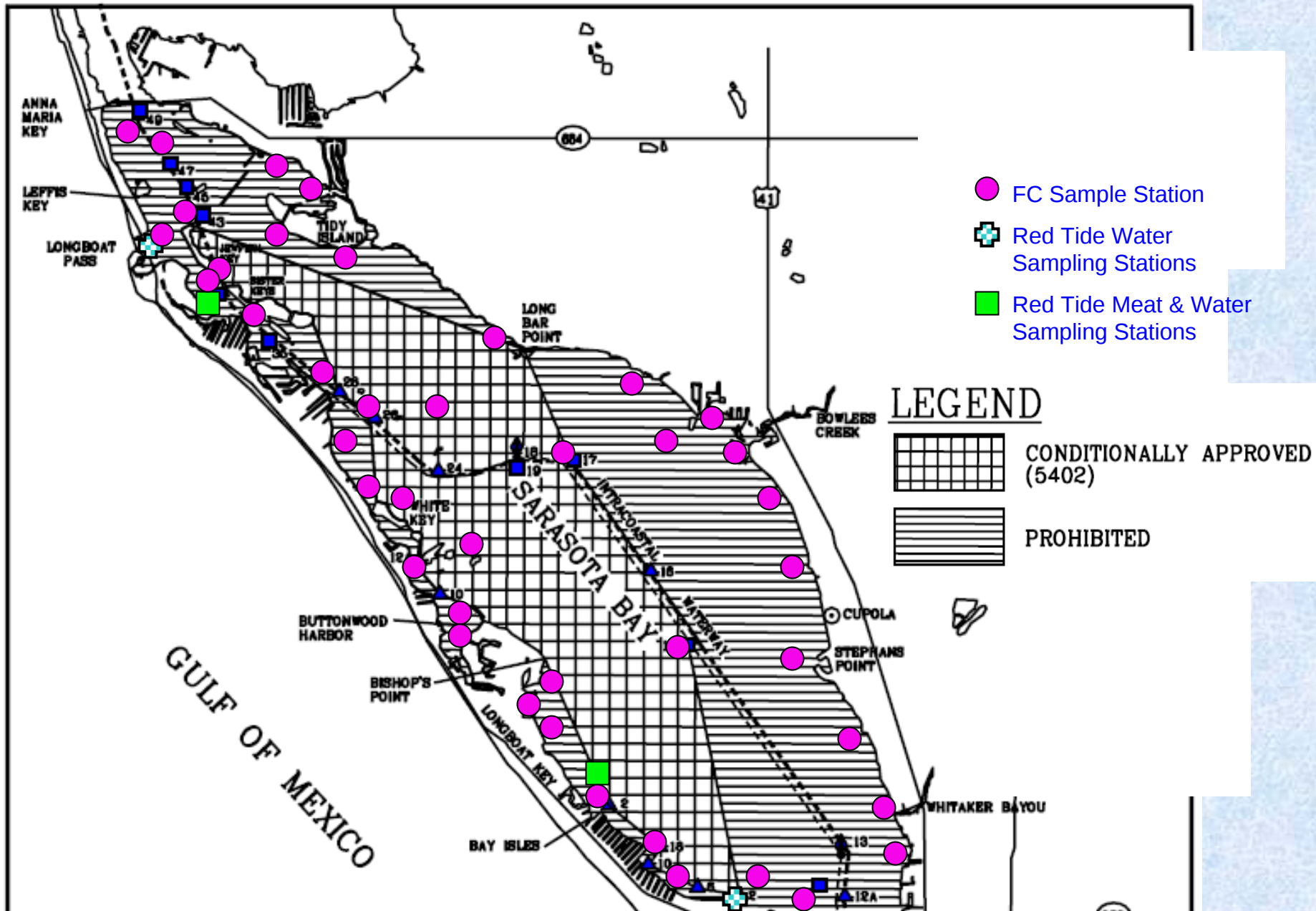
LEGEND

- CONDITIONALLY APPROVED (4202)
- PROHIBITED

Lower Tampa Bay #48

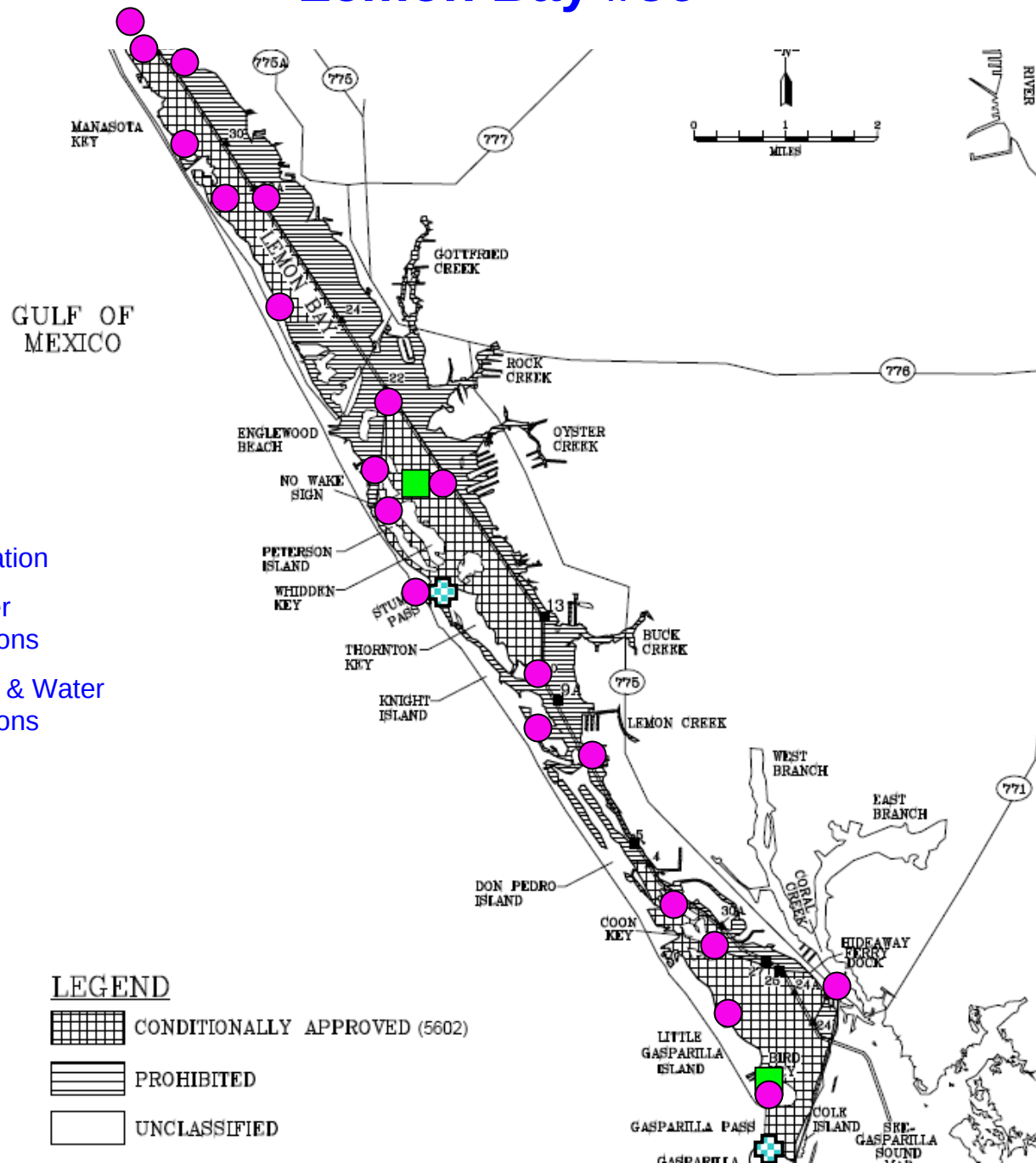


Sarasota Bay #54



Lemon Bay #56

- FC Sample Station
- ⊕ Red Tide Water Sampling Stations
- Red Tide Meat & Water Sampling Stations



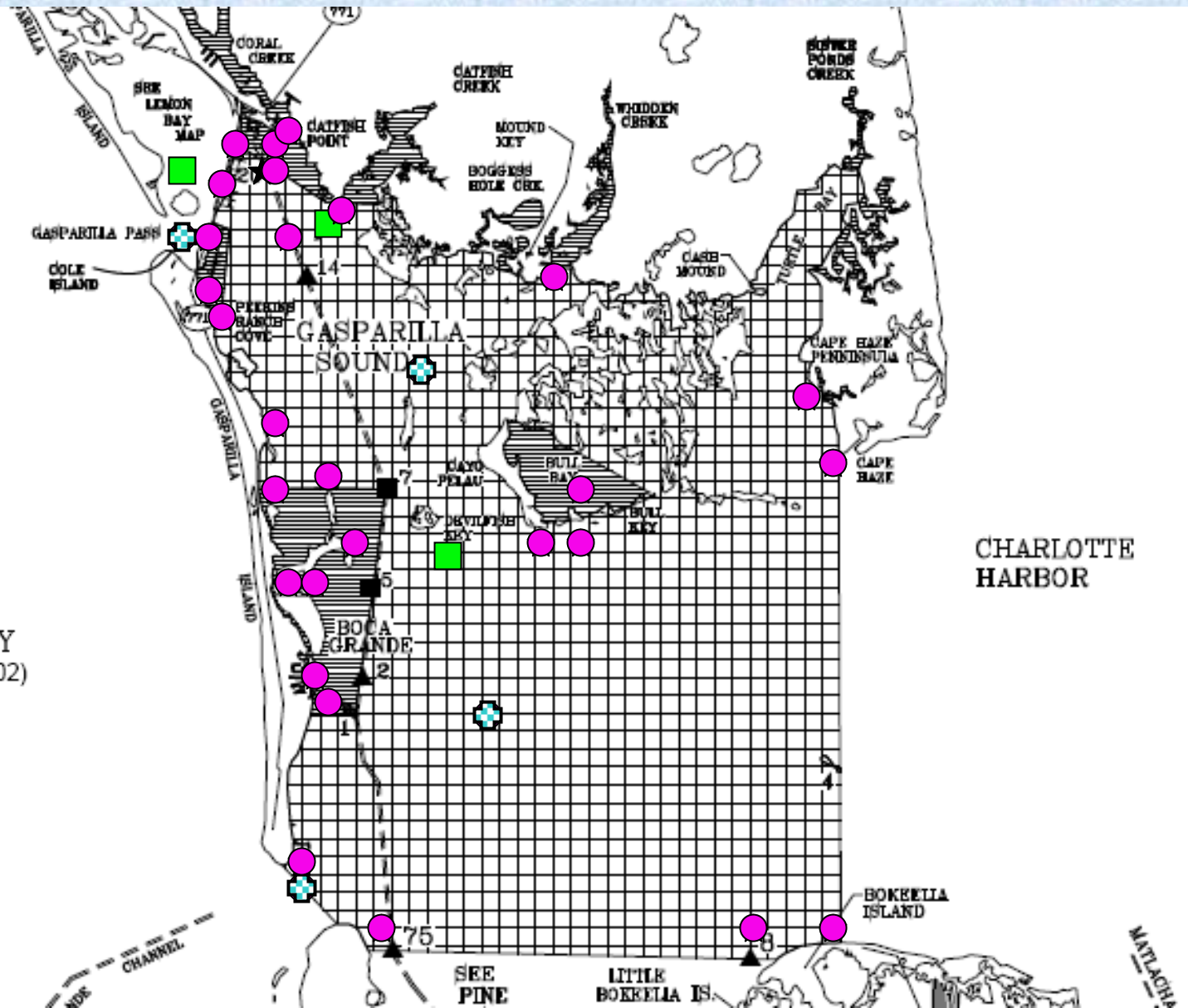
Gasparilla Sound #58

GULF

- FC Sample Station
- ⊕ Red Tide Water Sampling Stations
- Red Tide Meat & Water Sampling Stations

LEGEND

- | | |
|--|-------------------------------|
|  | CONDITIONALLY APPROVED (5802) |
|  | PROHIBITED |
|  | UNCLASSIFIED |



Myakka River #60



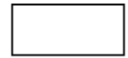
CONDITIONALLY APPROVED (6002)



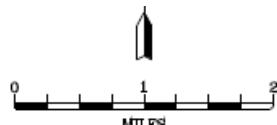
CONDITIONALLY RESTRICTED (6006)



PROHIBITED



UNCLASSIFIED



NW Corner of Southern
RR Fishing Pier

FREZZEL
CANAL

CATTLE
DOCK
POINT

TROUT
CREEK

BLIND
CREEK

BIG
MUDDY
CREEK

WLOPPOCK
CREEK

TIPPECANOE
BAY

MUDDY
COVE

DEERFLY
BAY

MYAKKA
CUTOFF

HOG
ISLAND

SHOAL
POINT

LOCUST
POINT

MANGROVE
POINT

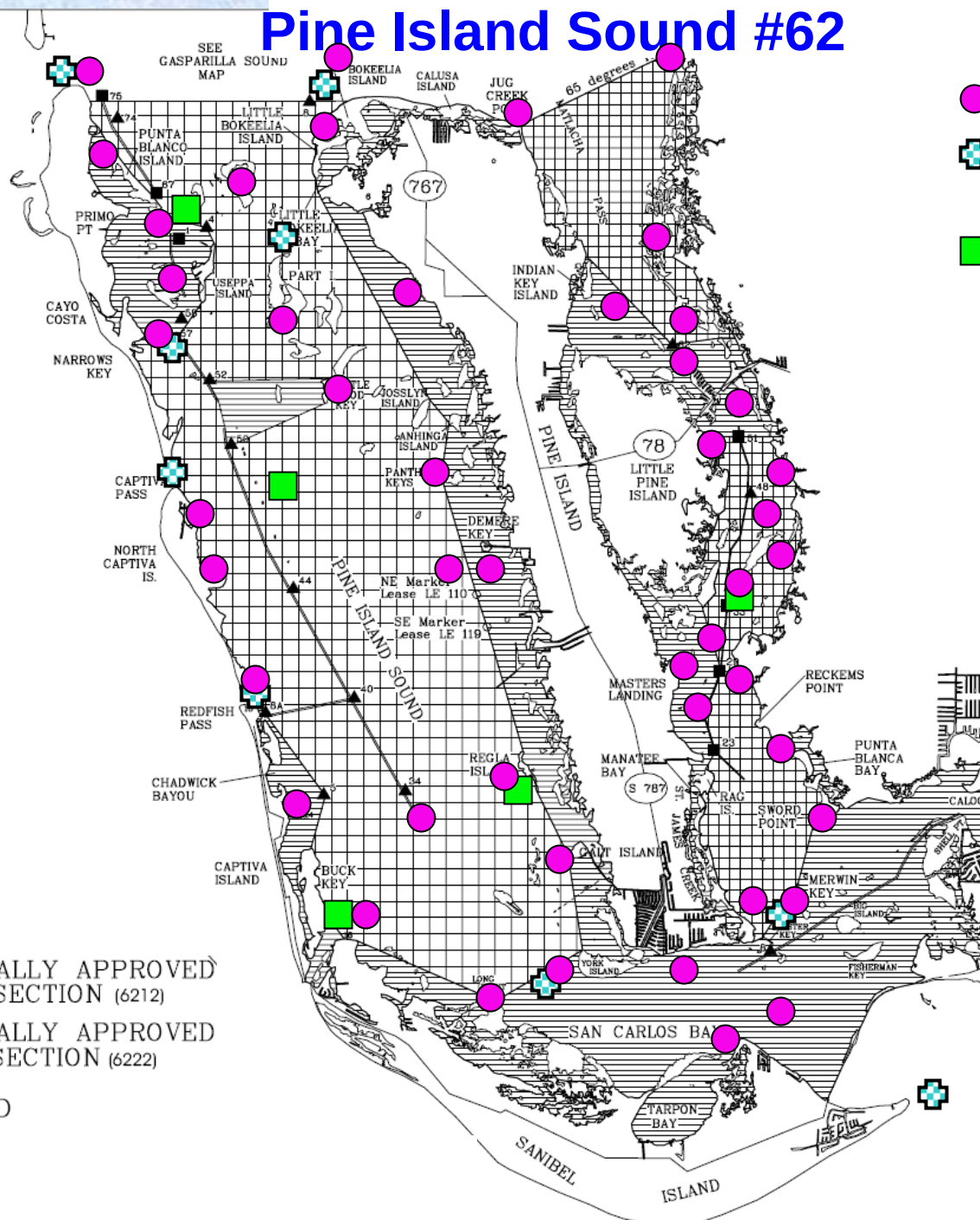
CHARLOTTE
HARBOR

FC Sample Station

Red Tide Water
Sampling Stations

Red Tide Meat & Water
Sampling Stations

Pine Island Sound #62



- FC Sample Station
- Red Tide Water Sampling Stations
- Red Tide Meat & Water Sampling Stations

- CONDITIONALLY APPROVED WESTERN SECTION (6212)
- CONDITIONALLY APPROVED EASTERN SECTION (6222)
- PROHIBITED

The map displays the Ten Thousand Islands region, including Gulliver Bay, Gulliver Key, and various rivers like the Blackwater, Whitney, and Pumpkin. Sampling stations are marked with pink circles (FC), blue crosses (Red Tide Water), and a green square (Red Tide Meat & Water). Land status is indicated by a grid pattern for 'CONDITIONALLY APPROVED (6602)' and a solid black pattern for 'PROHIBITED'. Major roads 92 and 41 are shown. The map is titled 'TEN THOUSAND ISLANDS' and includes a scale bar for 1K.

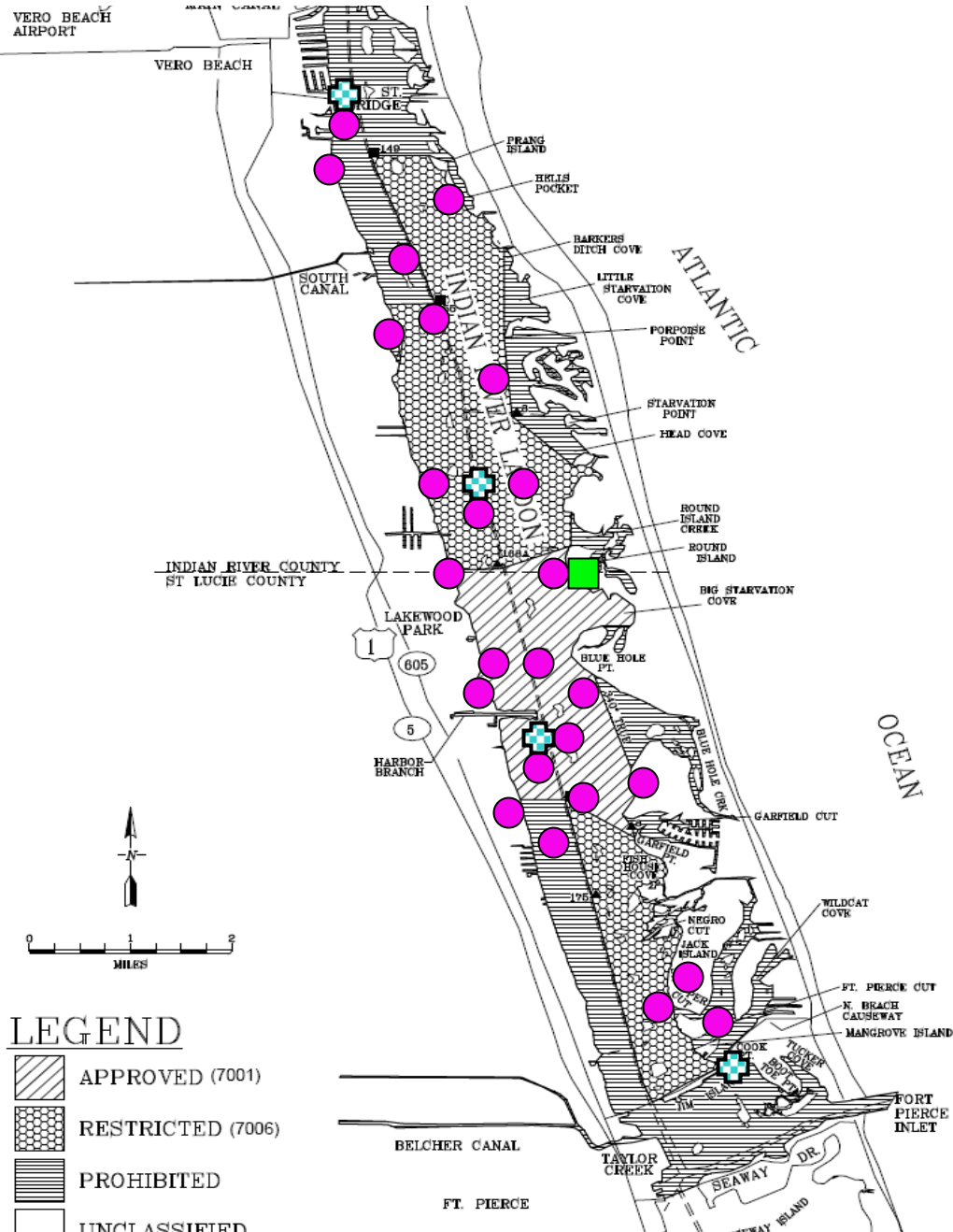
LEGEND

- CONDITIONALLY APPROVED (6602)
- PROHIBITED
- FC Sample Station
- Red Tide Water Sampling Stations
- Red Tide Meat & Water Sampling Stations

 CONDITIONALLY APPROVED (6602)
 PROHIBITED

INDIAN RIVER/ST. LUCIE #70

-  FC Sample Station
-  Red Tide Water Sampling Stations
-  Red Tide Meat & Water Sampling Stations

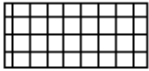


LEGEND

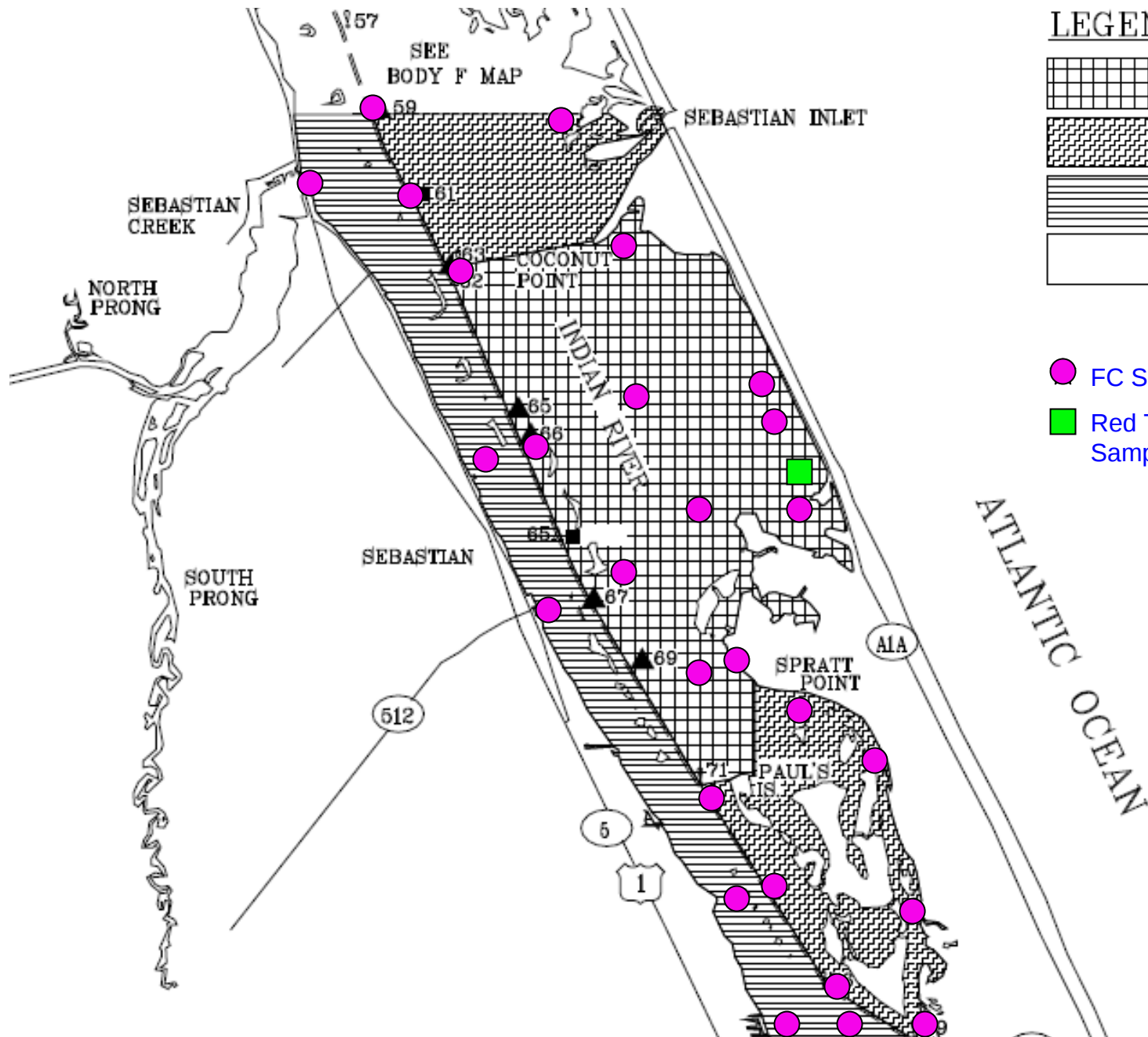
-  APPROVED (7001)
-  RESTRICTED (7006)
-  PROHIBITED
-  UNCLASSIFIED

North Indian River #72

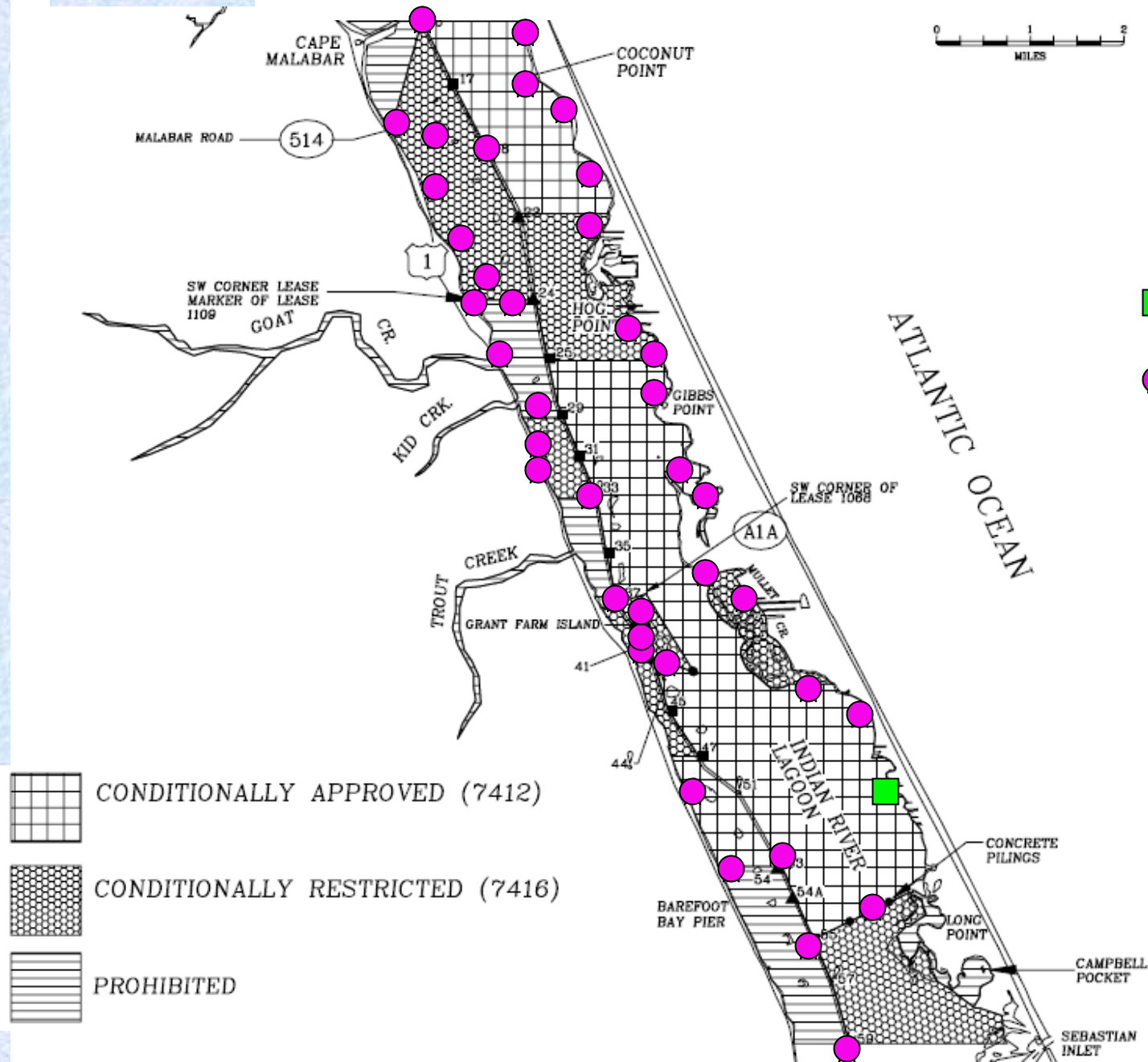
LEGEND

	CONDITIONALLY APPROVED (7202)
	CONDITIONALLY RESTRICTED (7206)
	PROHIBITED
	UNCLASSIFIED

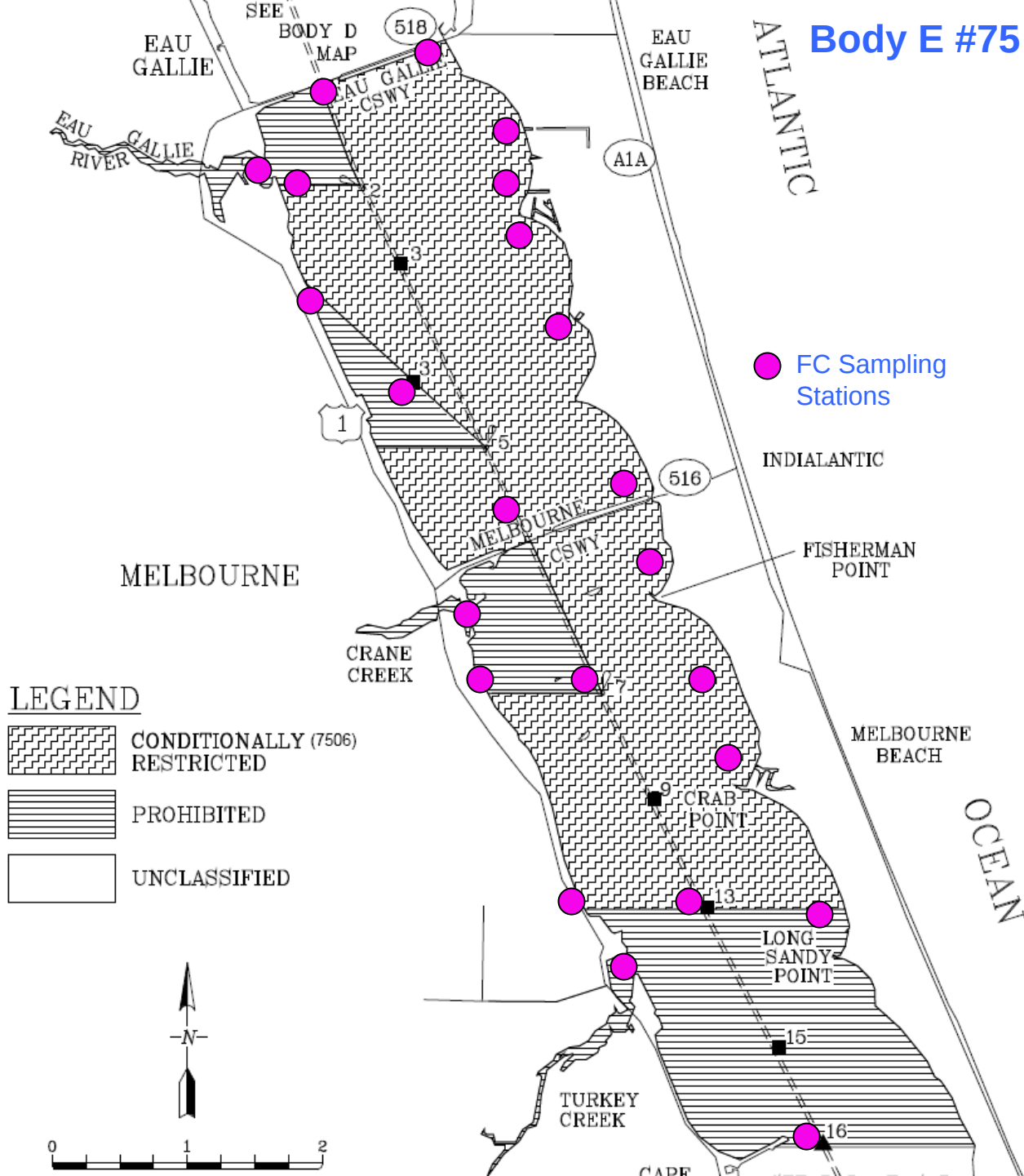
-  FC Sampling Station
-  Red Tide Meat & Water Sampling Station



Body F #74



Body E #75



Body D #76

FC Sample Stations

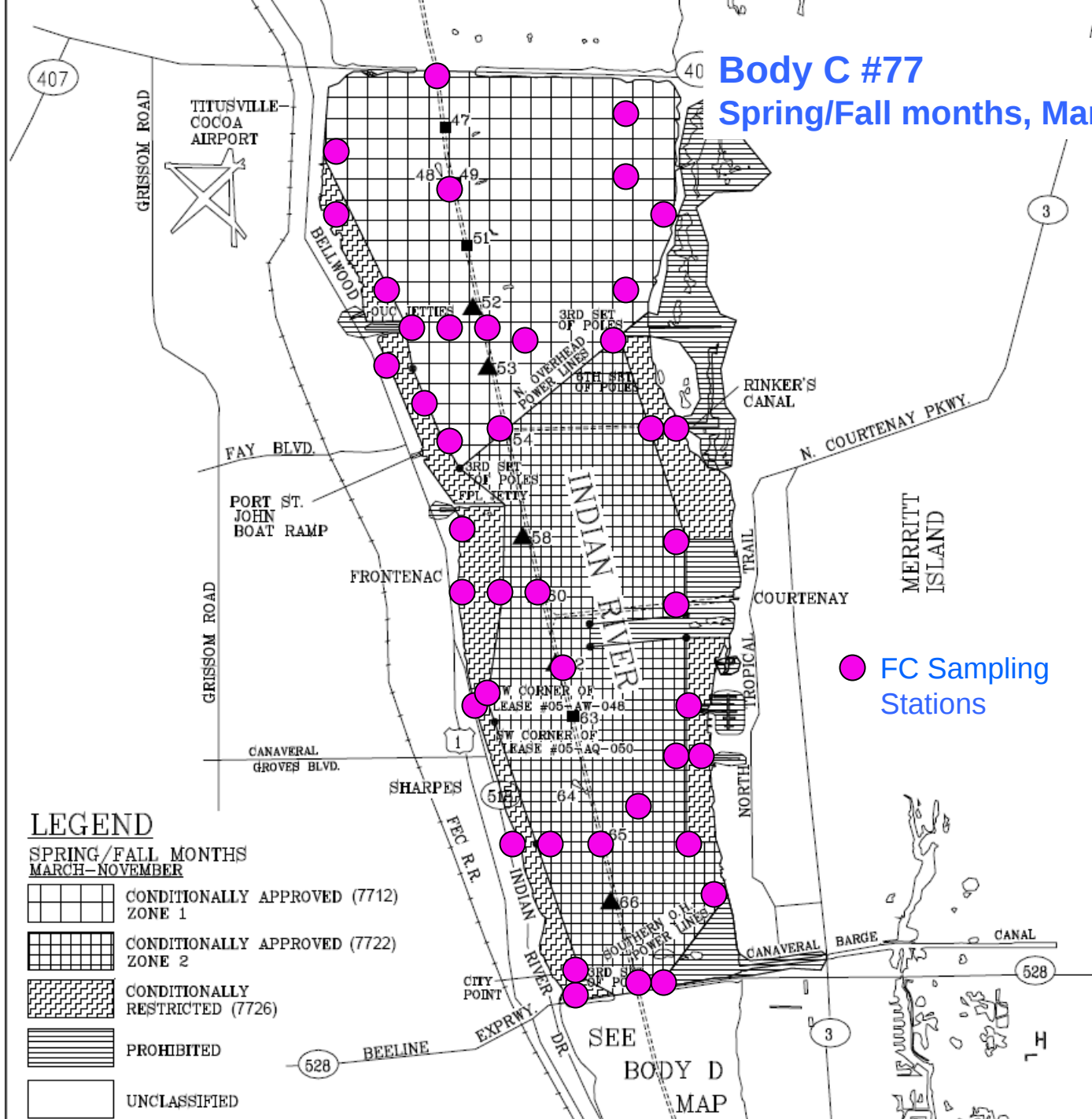
LEGEND

- CONDITIONALLY APPROVED (7602)
- CONDITIONALLY RESTRICTED (7606)
- PROHIBITED
- UNCLASSIFIED

FC Sample Stations

Body C #77

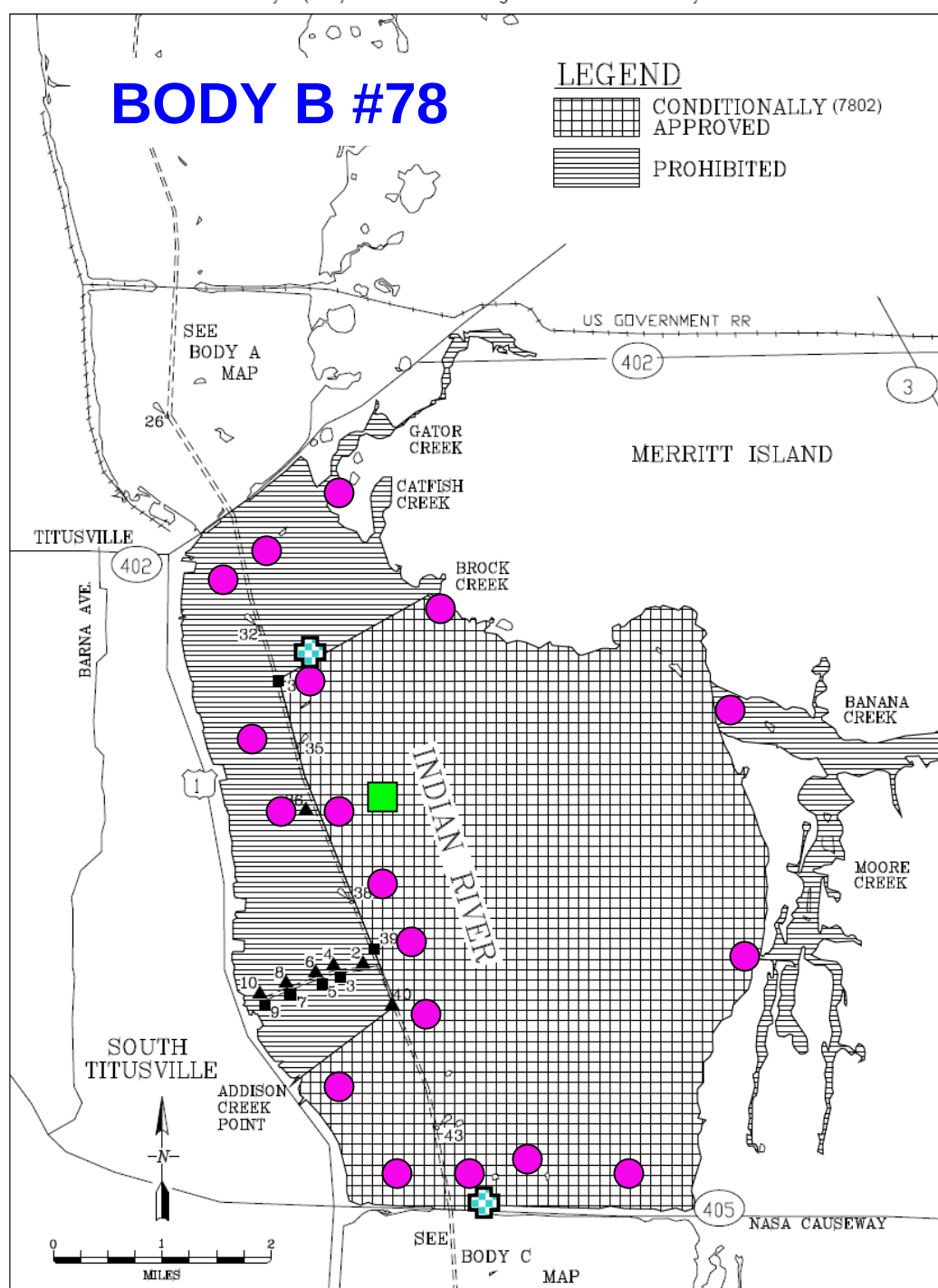
Spring/Fall months, March-November



BODY B #78

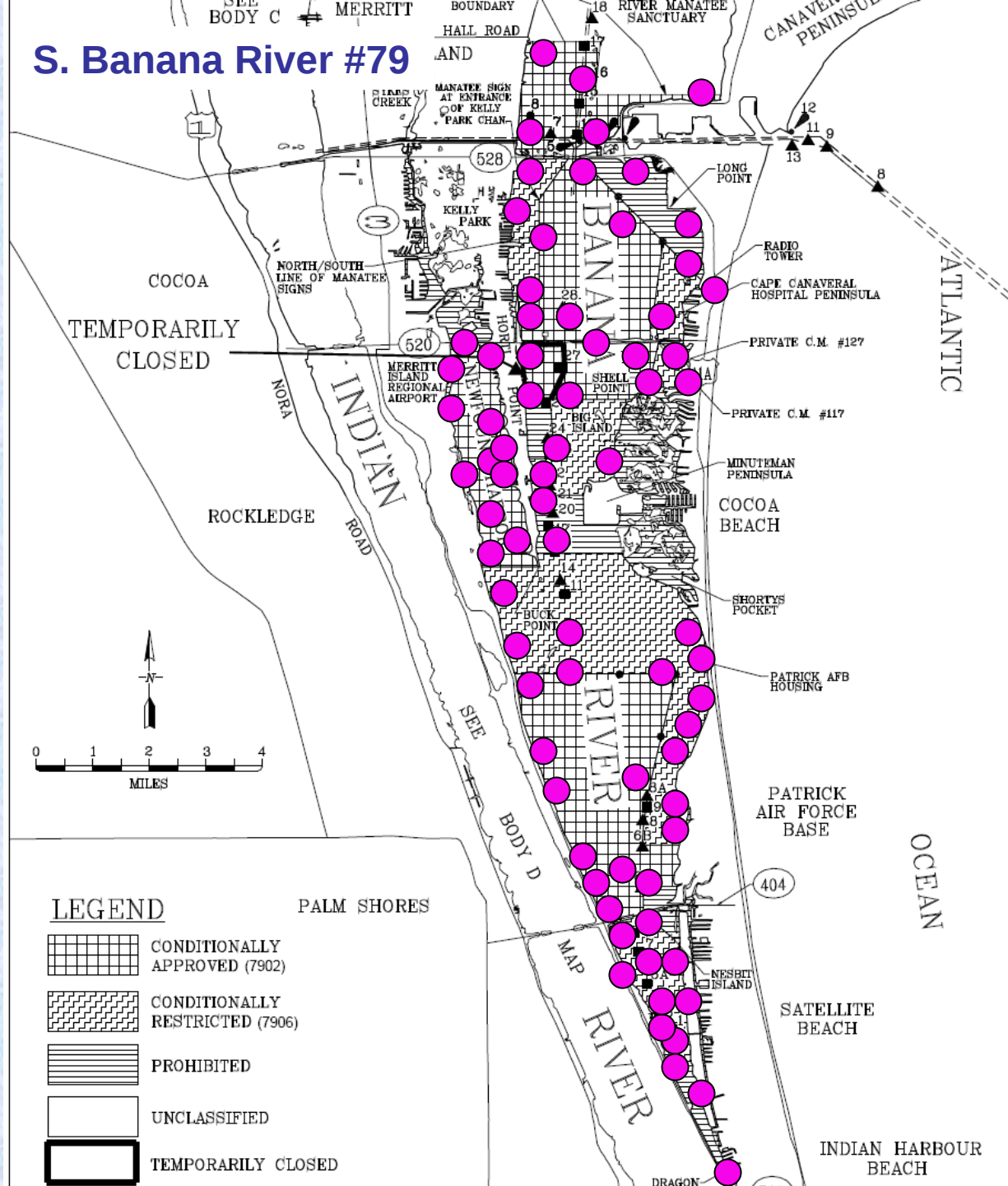
LEGEND

-  CONDITIONALLY (7802) APPROVED
-  PROHIBITED



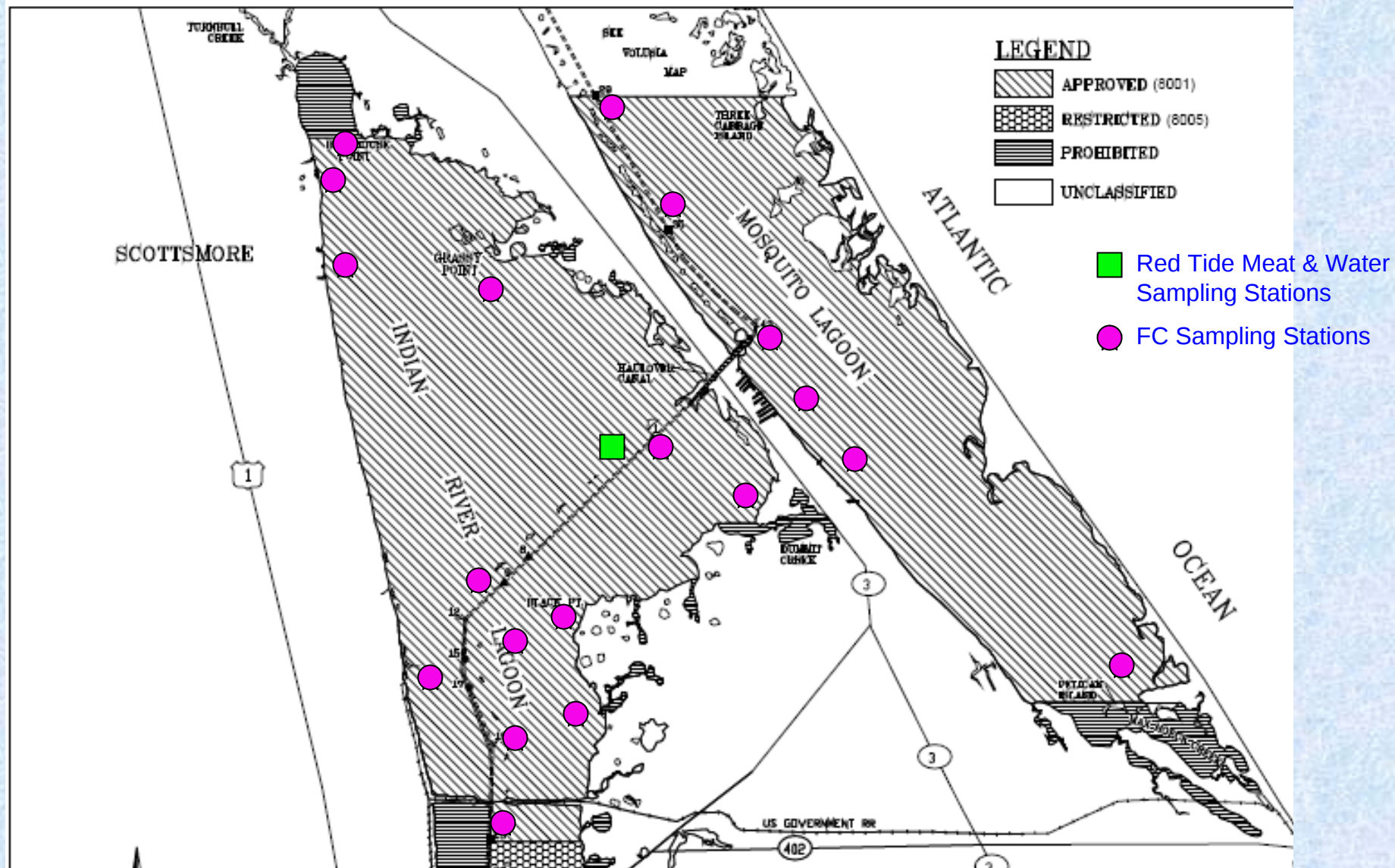
-  FC Sample Station
-  Red Tide Water Sampling Stations
-  Red Tide Meat & Water Sampling Stations

S. Banana River #79



● FC Sampling Stations

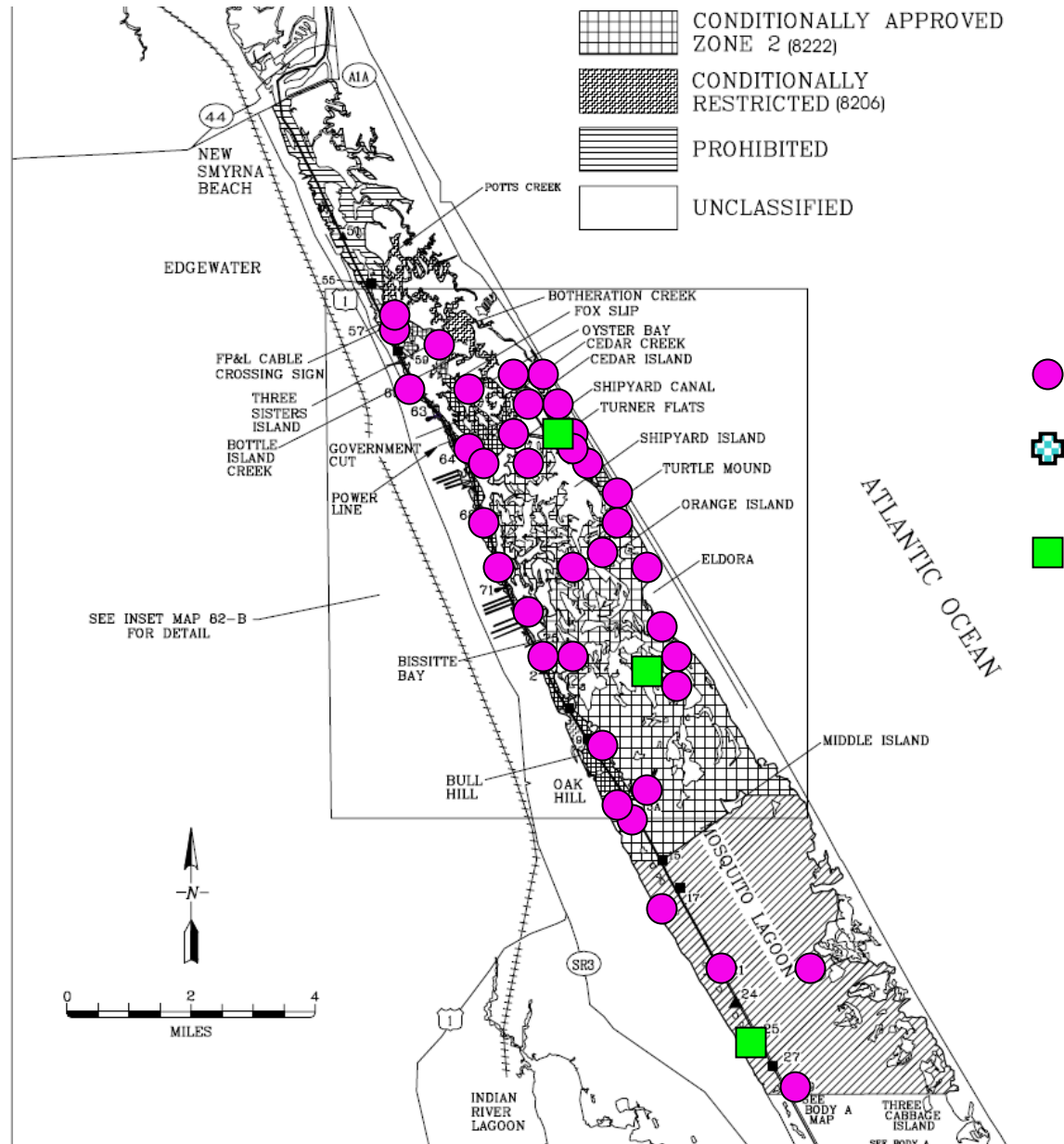
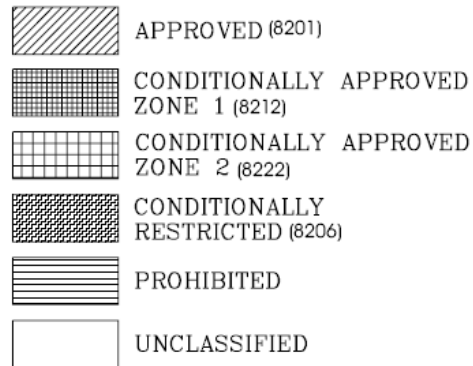
Body A #80



SOUTH VOLUSIA

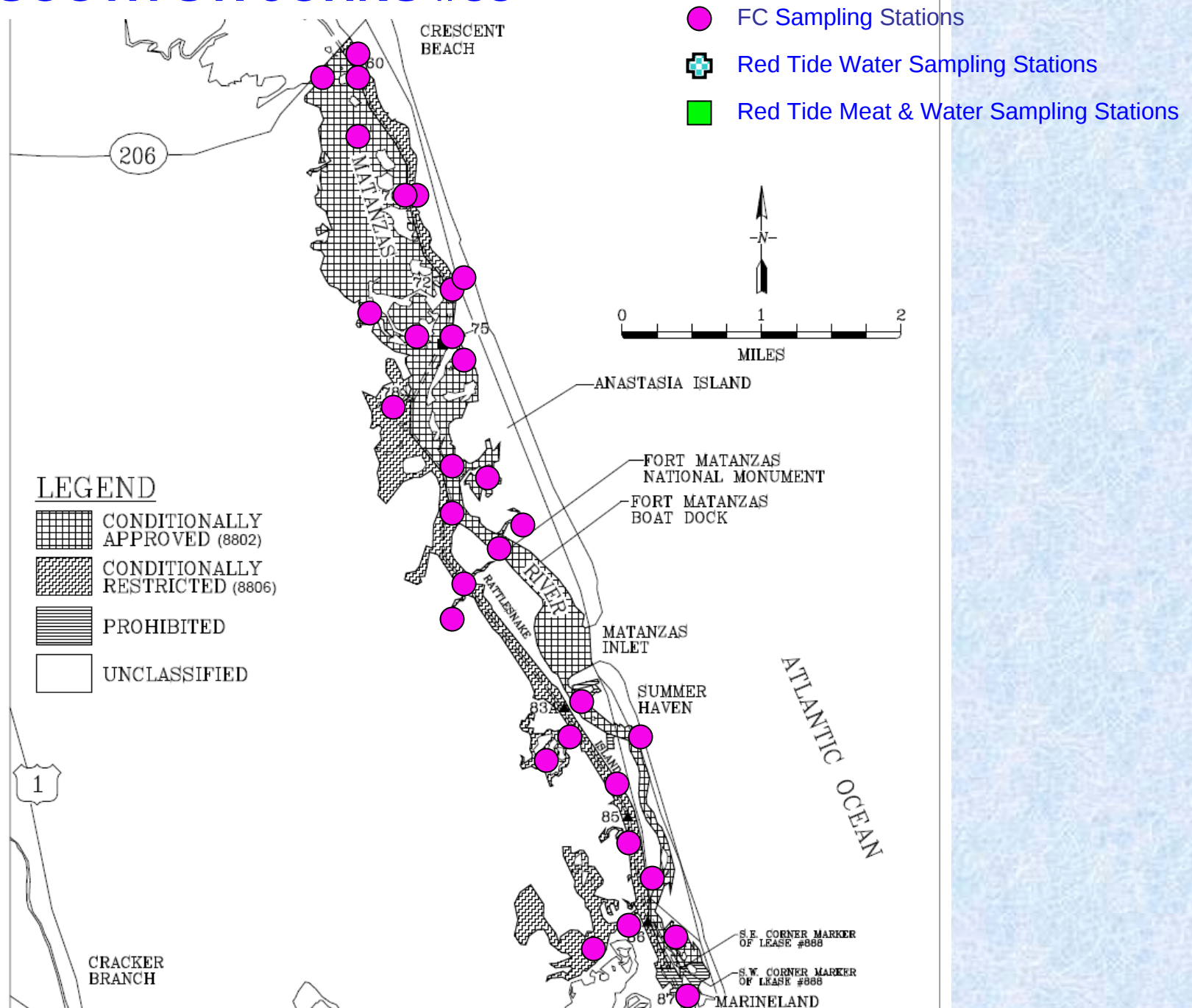
#82

LEGEND

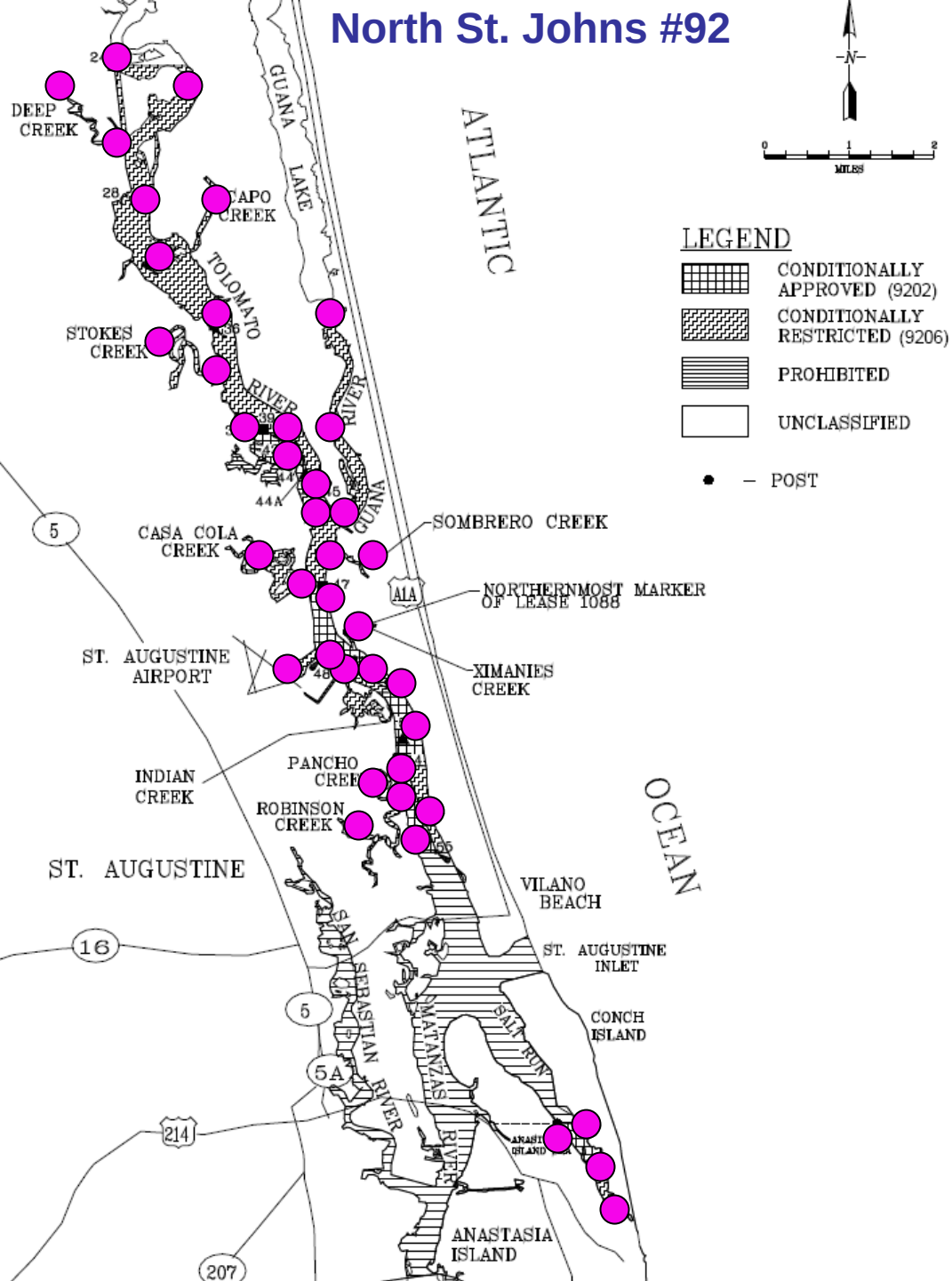


-  FC Sample Station
-  Red Tide Water Sampling Stations
-  Red Tide Meat & Water Sampling Stations

SOUTH ST. JOHNS #88



North St. Johns #92



● FC Sampling Stations

CLAMMRS

Clam Lease Assessment Management and Modeling Using Remote Sensing

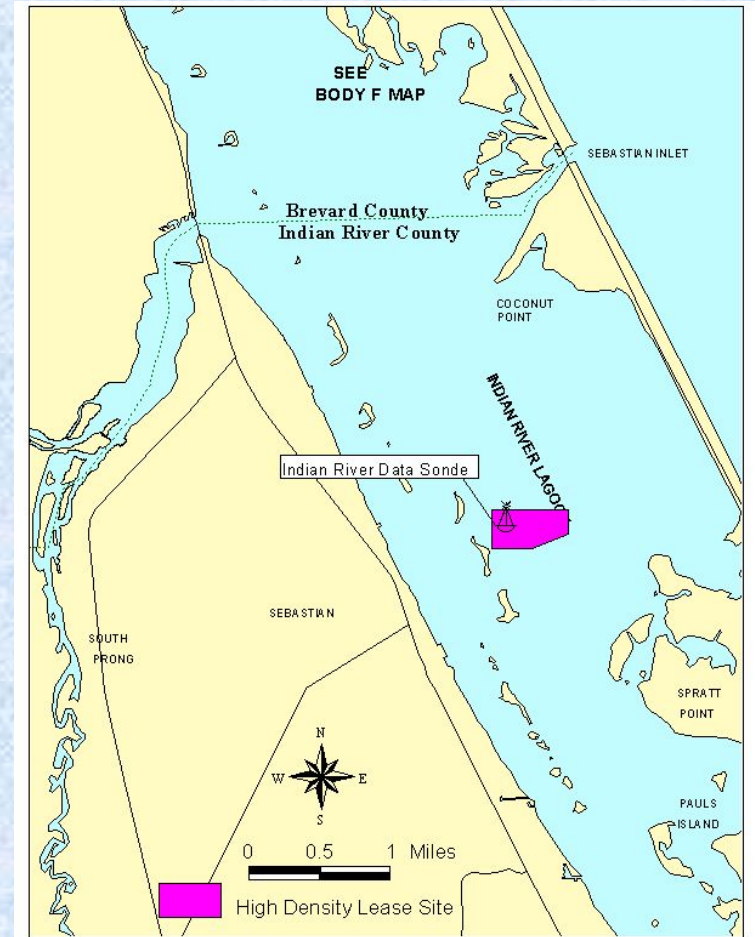
- **DACS/IFAS cooperative project**
- **A four year USDA funded grant to monitor water and weather conditions at high density aquaculture lease areas and aquaculture use zones.**
- **Water conditions: temperature, salinity, dissolved oxygen, turbidity, and chlorophyll**
- **Weather conditions: temperature, wind speed, wind direction.**



Ten different remote data collection stations

- Brevard County
Body F Data Sonde
**Body A Data Sonde
- Charlotte County
** Charlotte Harbor Data Sonde
- Dixie County
** Horseshoe Data Sonde
Pine Island Data Sonde
- Franklin County
**Alligator Harbor Data Sonde
- Indian River
**Indian River Data Sonde
- Lee County
Pine Island Sound Sonde
- Levy County
**Gulf Jackson Data Sonde
Dog Island Data Sond

** Denotes Real-Time Live Data Sondes



Florida Department of Agriculture and Consumer Services

DIVISION OF AQUACULTURE

www.FloridaAquaculture.com

CHARLES BRONSON, COMMISSIONER

