

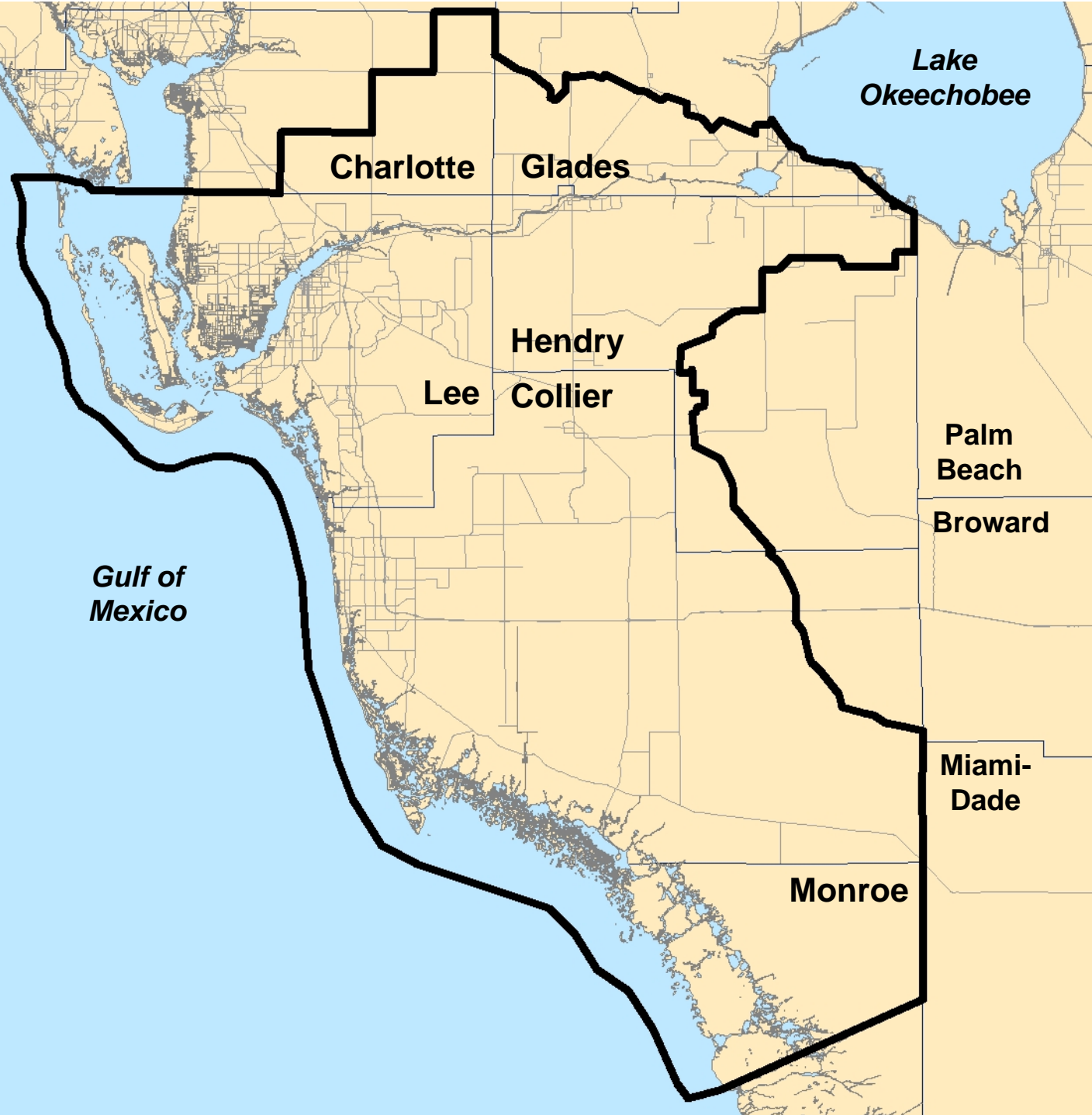
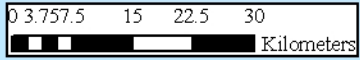
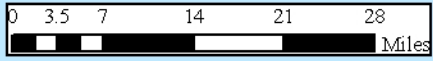


The Southwest Florida Feasibility Study and Climate Change

Lisa B. Beever, Charlotte Harbor National Estuary Program
Dan Trescott, Southwest Florida Regional Planning Council
James W. Beever III, SW Florida Regional Planning Council
Tim Walker, Southwest Florida Regional Planning Council
Tim Liebermann, South Florida Water Management District

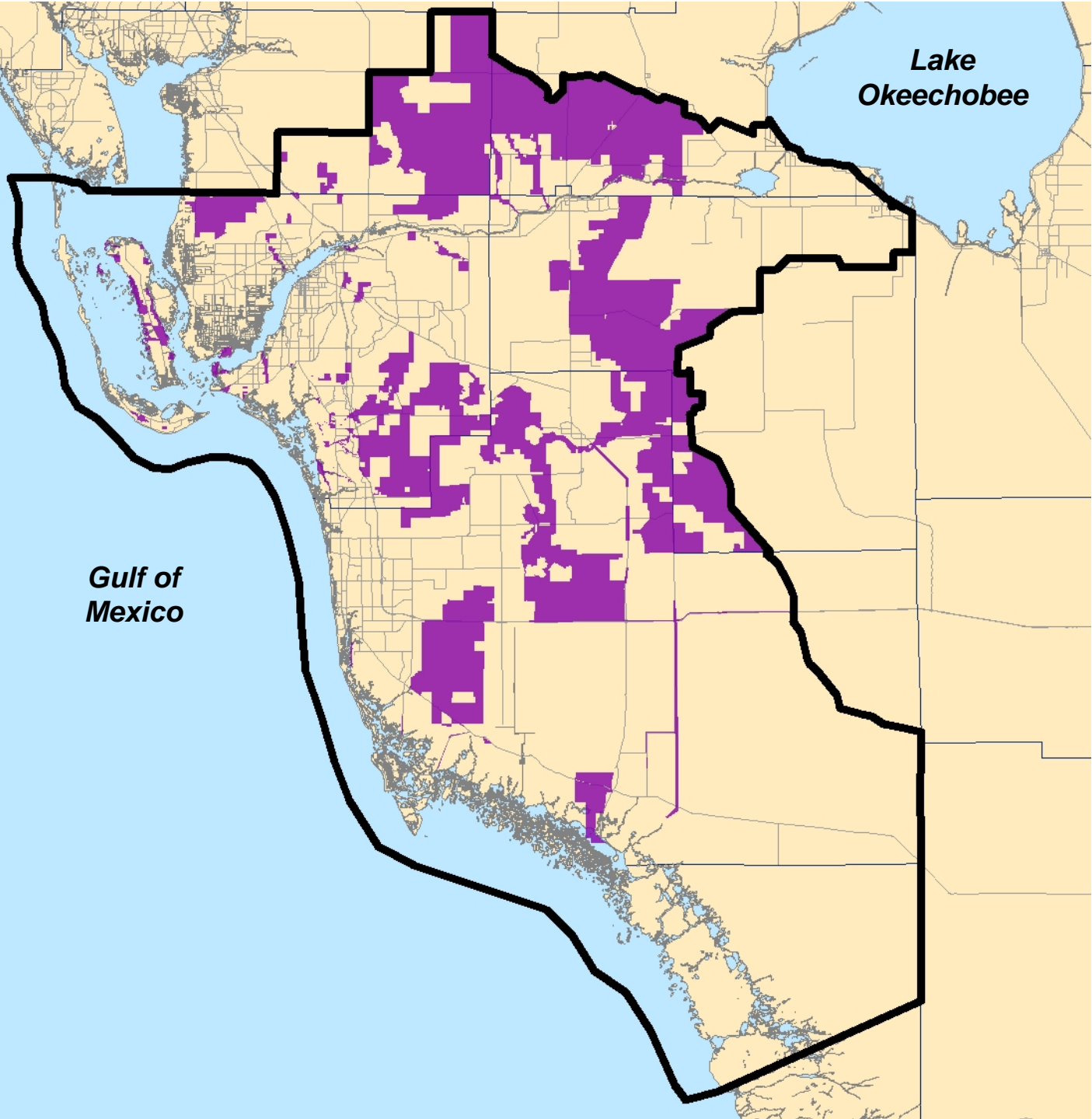
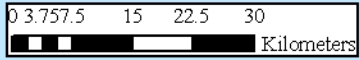
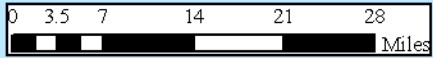
July 30, 2008

Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
South Florida Water Management District
Florida Natural Areas Inventory
Date: June 18, 2008







Legend
SWFFS Boundary
County Boundaries
Roads

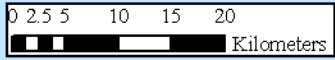
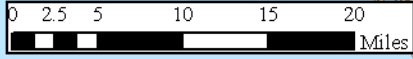
Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
South Florida Water Management District
Florida Natural Areas Inventory
Date: June 18, 2008



Legend

-  SWFFS Alternatives
-  SWFFS Boundary
-  County Boundaries
-  Roads

Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
South Florida Water Management District
Florida Natural Areas Inventory
Date: June 18, 2008

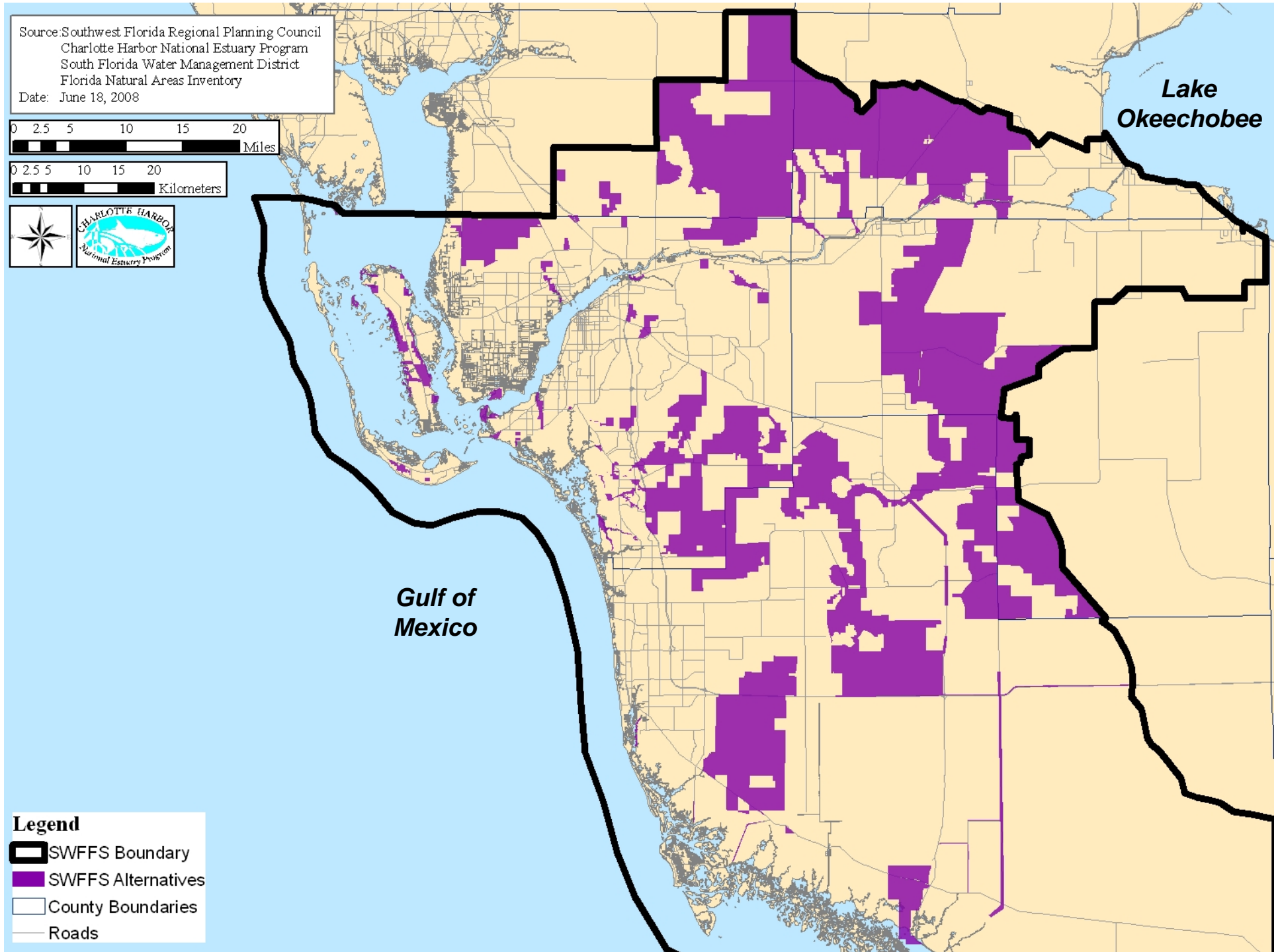


Lake
Okeechobee

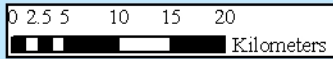
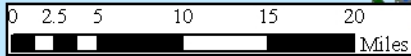
Gulf of
Mexico

Legend

- SWFFS Boundary
- SWFFS Alternatives
- County Boundaries
- Roads



Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
South Florida Water Management District
Florida Natural Areas Inventory
Date: June 18, 2008



Lake Okeechobee

Gulf of Mexico

- Land Use Decisions
- Infrastructure Investments
- Conservation Planning

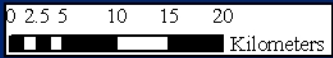
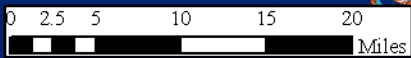
Legend

Storm Surge

- Tropical Storm
- Category 1
- Category 2
- Category 3
- Category 4/5

- SWFFS Boundary
- County Boundaries
- Roads

Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
South Florida Water Management District
Florida Natural Areas Inventory
Date: June 18, 2008



Legend

Potential Sea Level Rise

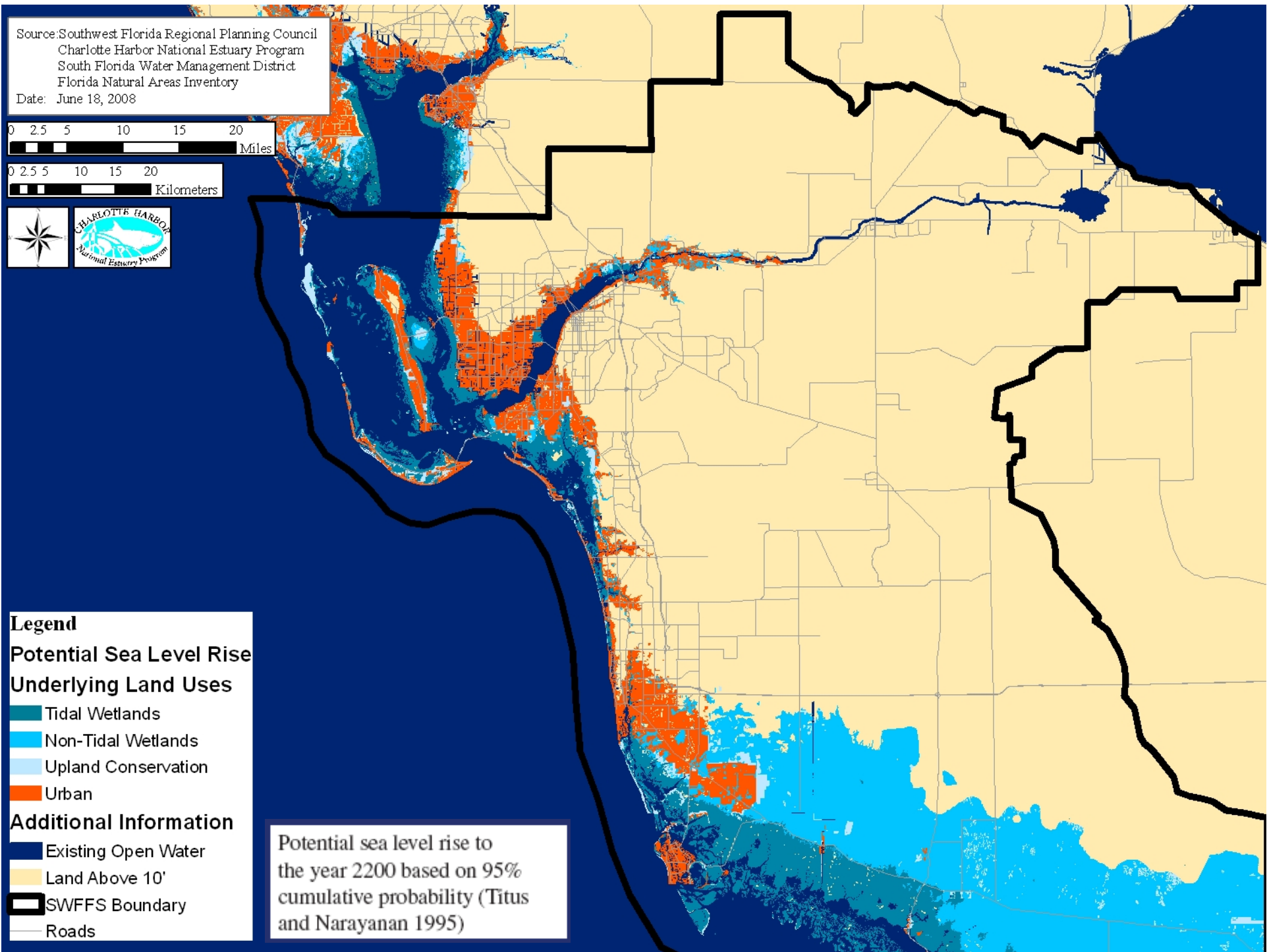
Underlying Land Uses

- Tidal Wetlands
- Non-Tidal Wetlands
- Upland Conservation
- Urban

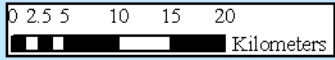
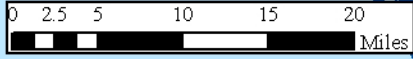
Additional Information

- Existing Open Water
- Land Above 10'
- SWFFS Boundary
- Roads

Potential sea level rise to the year 2200 based on 95% cumulative probability (Titus and Narayanan 1995)



Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
South Florida Water Management District
Florida Natural Areas Inventory
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Lake
Okeechobee

Charlotte Glades

Hendry

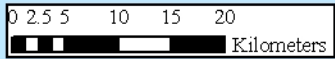
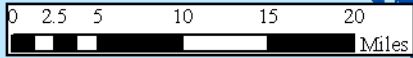
Lee Collier

Gulf of
Mexico

Legend

- 2200 Sea Level Risk
- County Boundaries
- Open Water
- SWFFS Boundary
- Roads

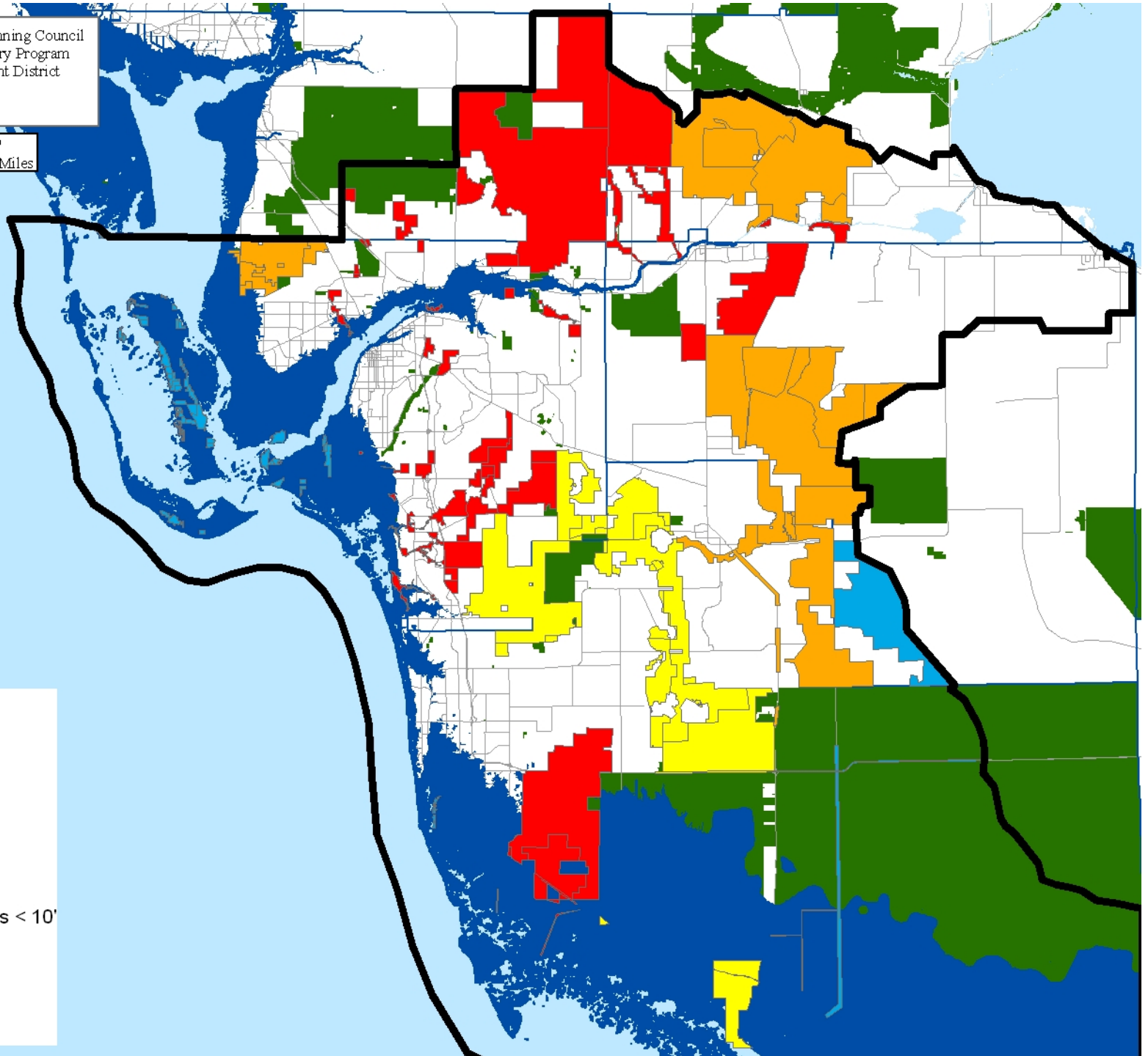
Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
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Legend

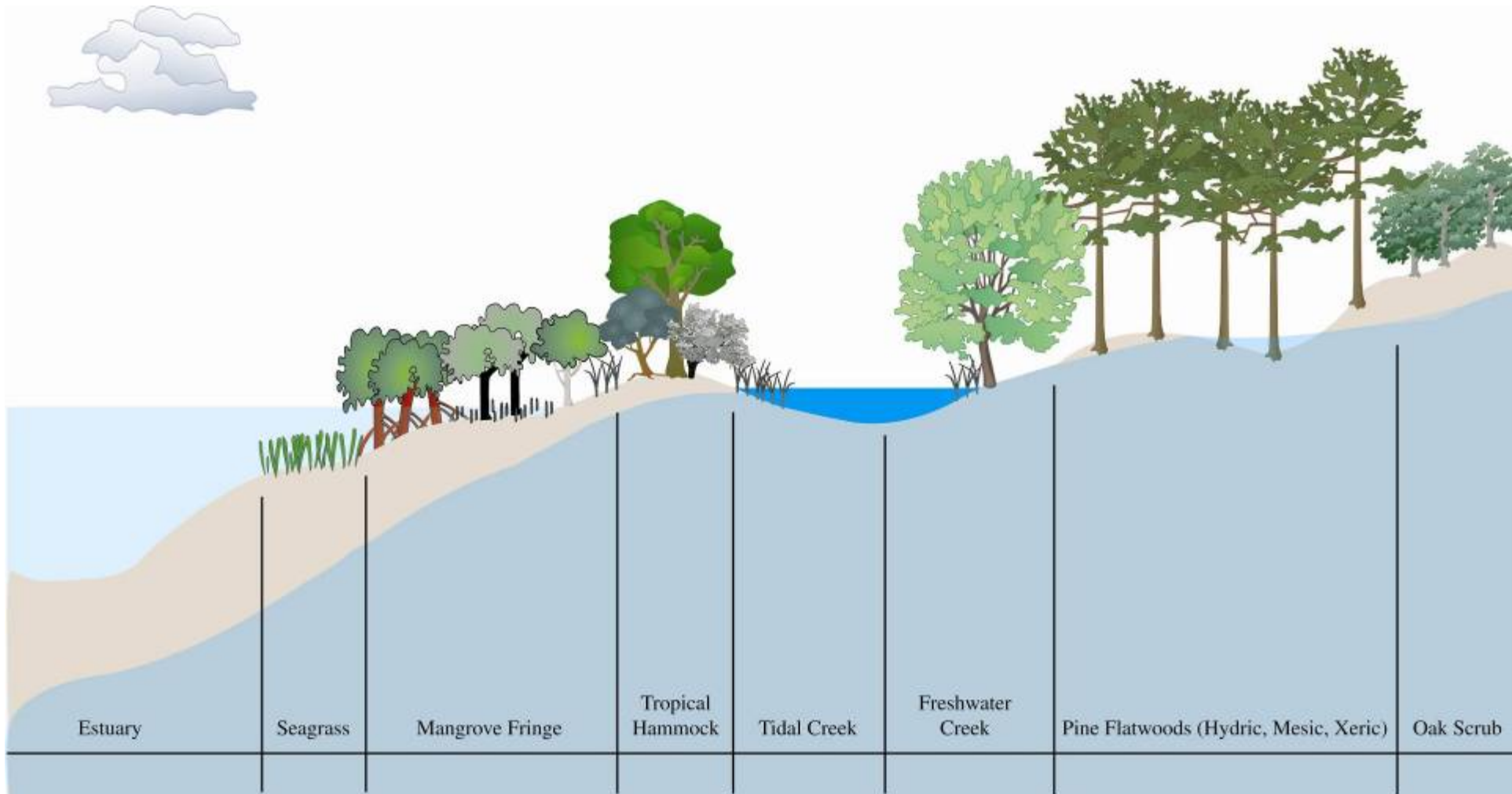
SWFFS Alternatives

- 1
- 2, adds to 1
- 3, adds to 1 and 2
- 0
- 2200 Sea Level Risk
- Additional Managed Areas < 10'
- SWFFS Boundary
- County Boundaries
- Open Water
- Roads



Anticipated SWF Climate Changes

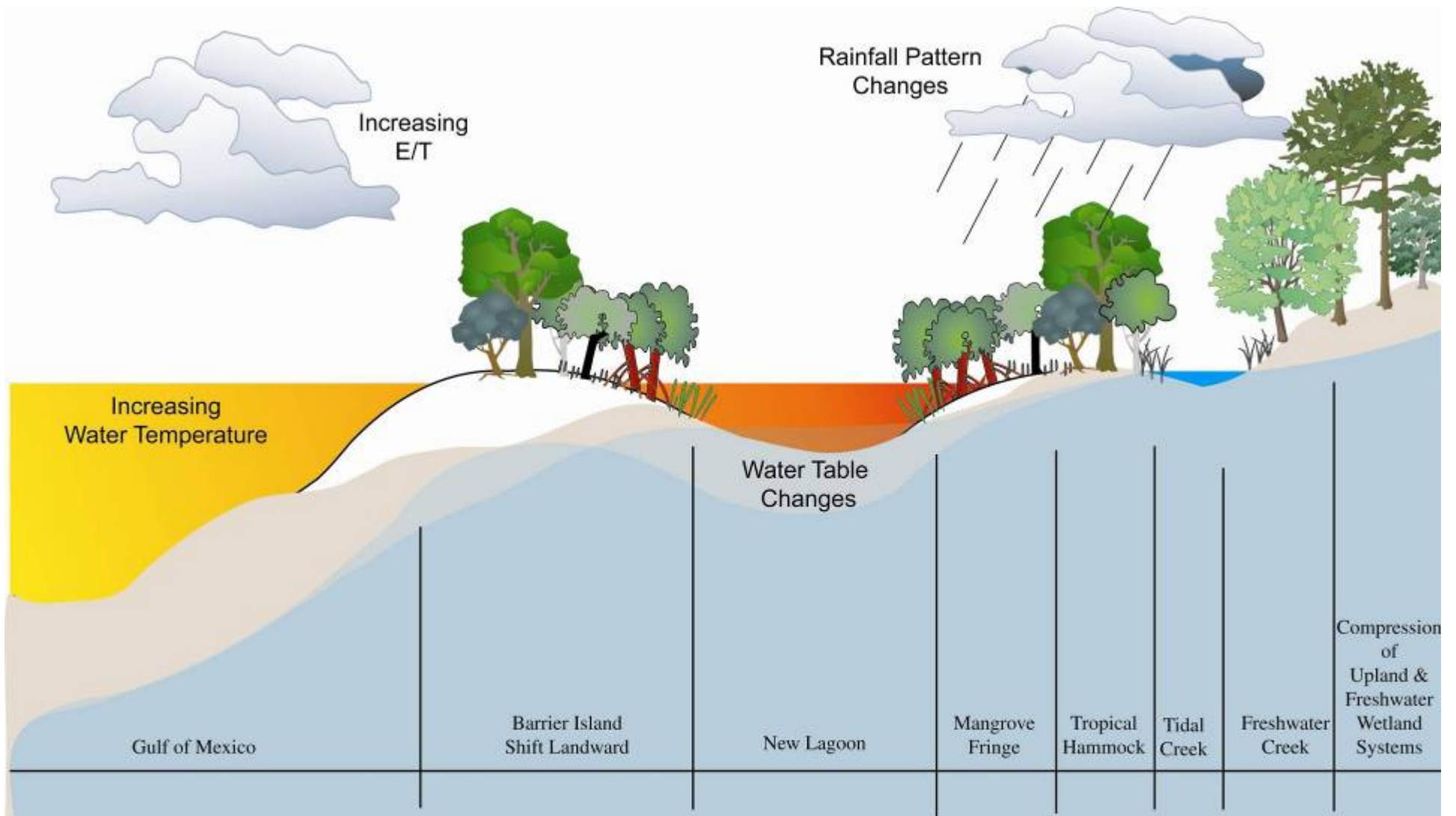
- Sea Level Rise
- Increased Severe Storms
- Increased Rainfall and Average Temperature
- Water Chemistry Changes (pH, DO, etc.)
- Landforms migration to maintain relative position within the coastal energy gradient (Pethick 2001)
- Migration of Barrier Islands if not hardened
- Mangrove ability to accrete sediment (Singh 2003)
- Habitat migration with landform changes
- Expansion of invasive species ranges
- Water Table Changes



By: Lisa B. Beever, PhD, AICP
 Date: 4/16/08
 Charlotte Harbor National Estuary Program

Habitat Structure-2000
 Southwest Florida

Symbols courtesy of the Integration and Application Network (ian.umces.edu/symbols/),
 University of Maryland Center for Environmental Science.



By: Lisa B. Beever, PhD, AICP
 Date: 4/16/08
 Charlotte Harbor National Estuary Program

Habitat Migration-2200
 Southwest Florida

Symbols courtesy of the Integration and Application Network (ian.umces.edu/symbols/),
 University of Maryland Center for Environmental Science.

Principals from Capitol Hill Oceans Week

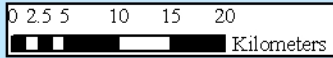
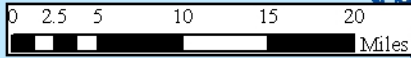
(National Marine Sanctuary Foundation, June 3-5, 2008)

- Maintain heterogeneous geophysical processes and gradients
- Maximize connectivity among these (Braun TNC)
- Enable natural world to change (Shumway TNC)
- Hydrologic restoration, migratory corridors, oyster reefs
- Protect refugia, gradients (latitudinal/elevational), heterogeneity, gene flow/connectivity (Larsen Ecodapt)
- Reduce non-climate stresses (invasive species, pollution, etc)
- Protect freshwater sources

Protect:

- Latitudinal and Elevational Gradients
- Heterogeneity and Refugia
- Gene Flow / Connectivity

Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
South Florida Water Management District
Florida Natural Areas Inventory
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Lake
Okeechobee

Gulf of
Mexico

Legend

Topography

Value

High : 98

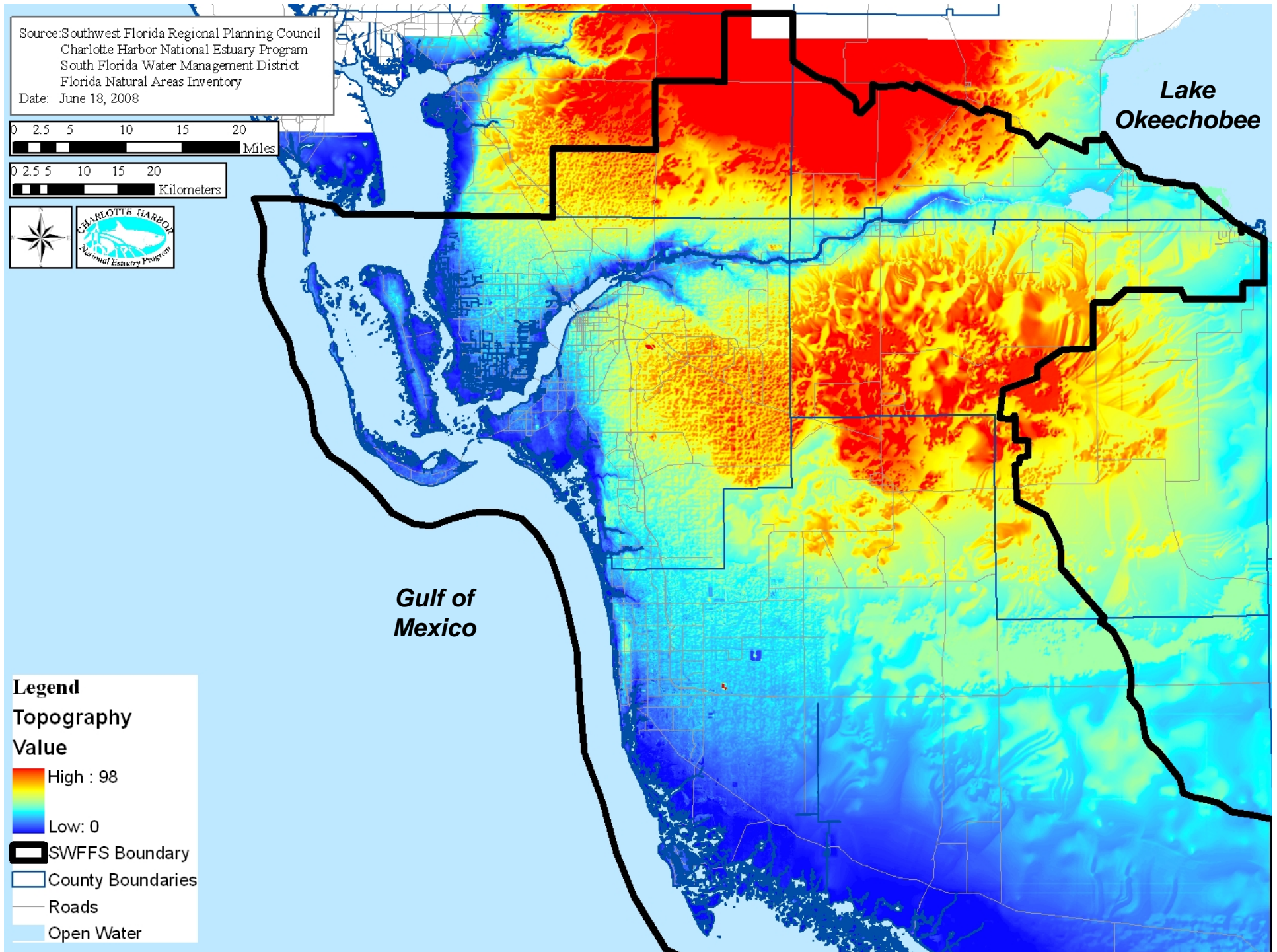
Low: 0

SWFFS Boundary

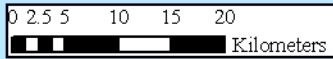
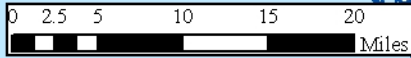
County Boundaries

Roads

Open Water



Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
South Florida Water Management District
Florida Natural Areas Inventory
Date: June 18, 2008



Legend

Topography

Value

High : 98

Low: 0

SWFFS Boundary

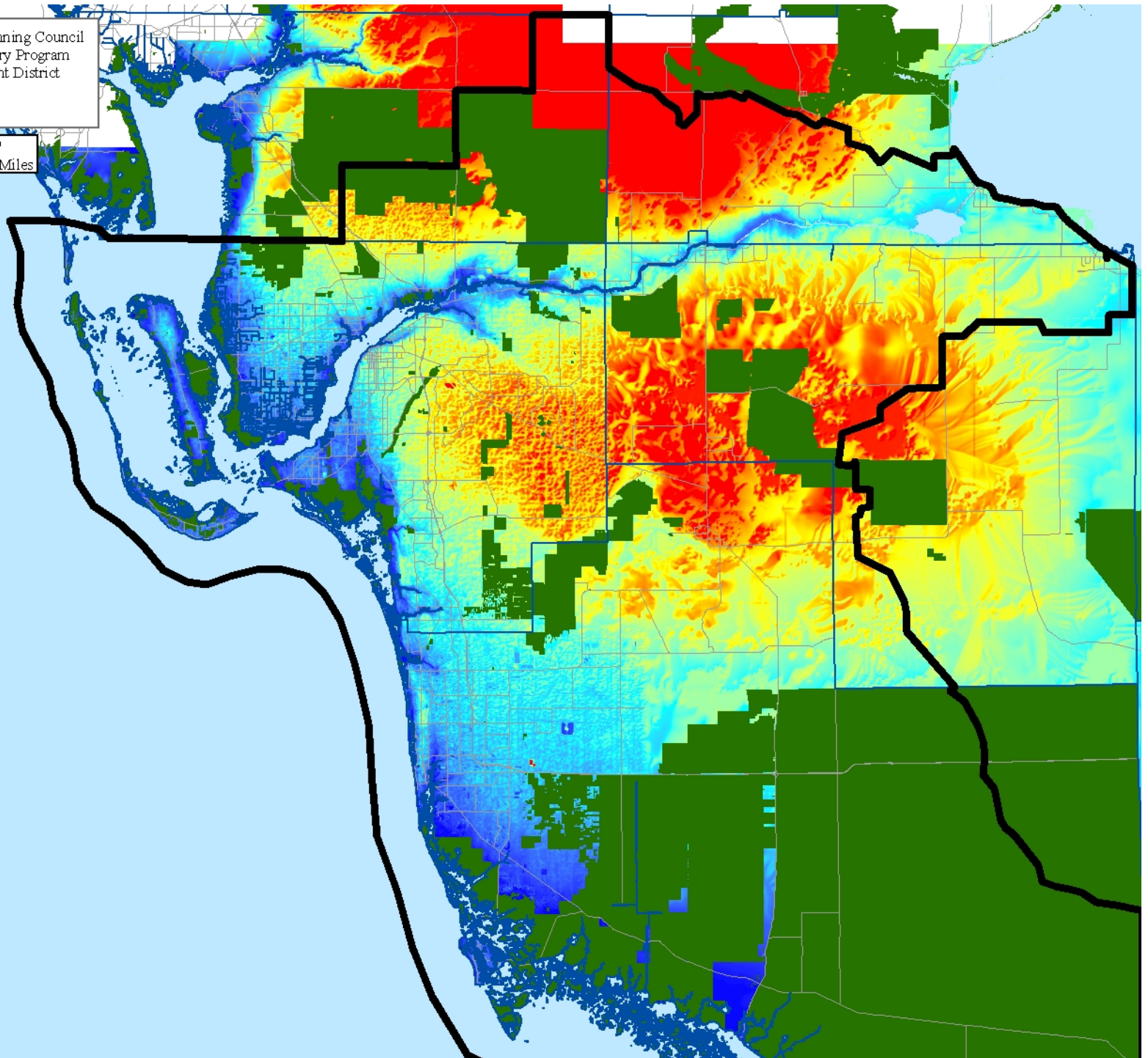
County Boundaries

Open Water

Roads

Managed Areas

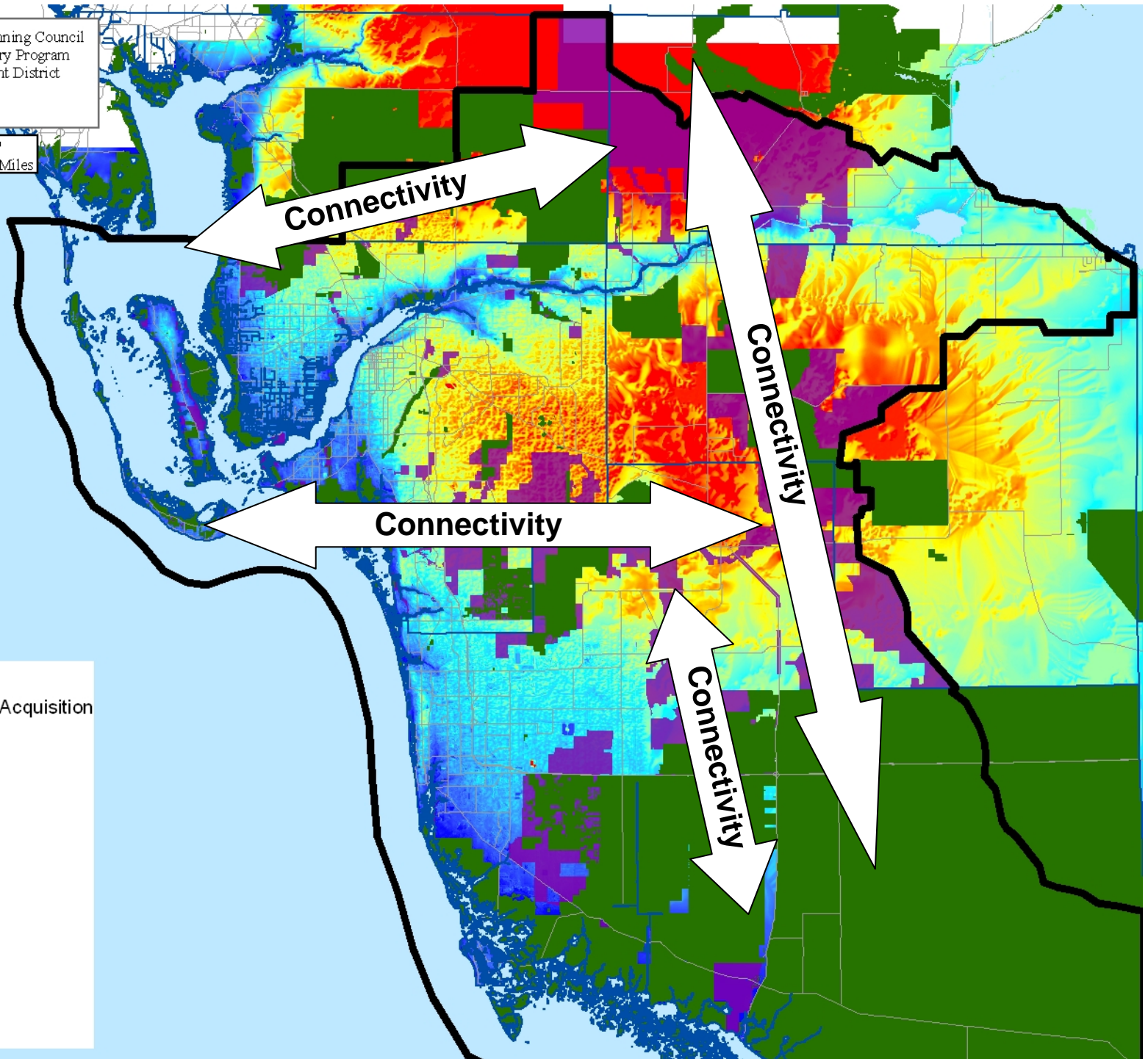
Open Water



Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
South Florida Water Management District
Florida Natural Areas Inventory
Date: June 18, 2008

0 2.5 5 10 15 20
Miles

0 2.5 5 10 15 20
Kilometers



Legend

SWFFS Alternative Land Acquisition

Managed Areas

Topography

Value

High : 98

Low: 0

SWFFS Boundary

County Boundaries

Open Water

Roads

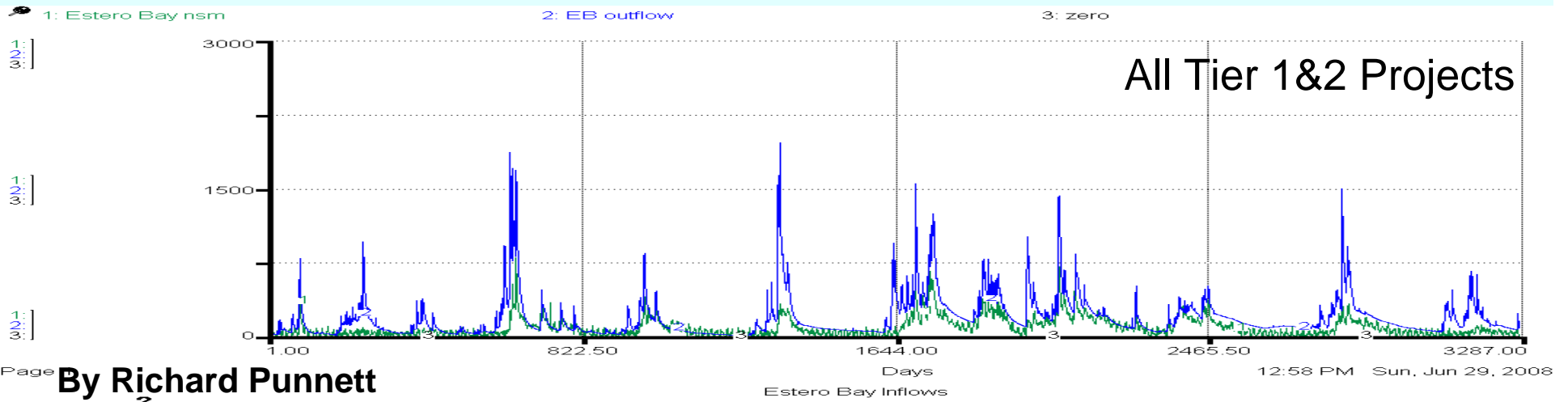
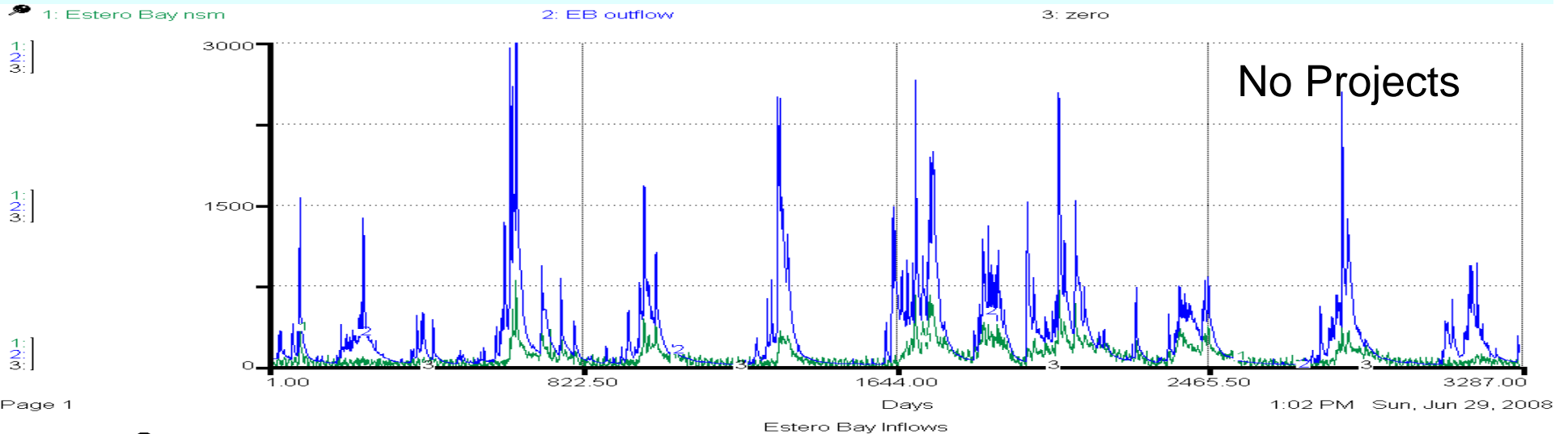
Open Water

Hydrologic Restoration Protect Freshwater Sources

Estero Bay STELLA Runs

Green: Natural System Model Flows

Blue: Resulting Flows



Reduce Non-Climate Stresses

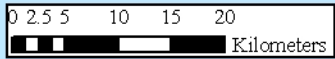
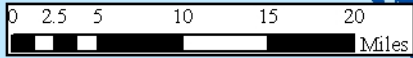
- Protective Water Quality Targets
 - Estero Bay TN of 0.5 mg/l greater than TMDL
 - Caloosahatchee load reduction of 1.2 m lb/yr
- Invasive Species Removal
 - Reduce Exotic Species Cover
 - Remove spoil and fill ditches
- Restored freshwater flow regimes

Protect Restoration Investments in the Context of Sea Level Rise

Most investment above sea level rise predictions

	Tier 1	Tier 2	Tier 3
Above 10'	85%	90%	91%
Lands in Conservation	1%	1%	1%
Wetlands	5%	4%	4%
Water	1%	1%	1%
Shore Protection Almost Certain	7%	5%	4%

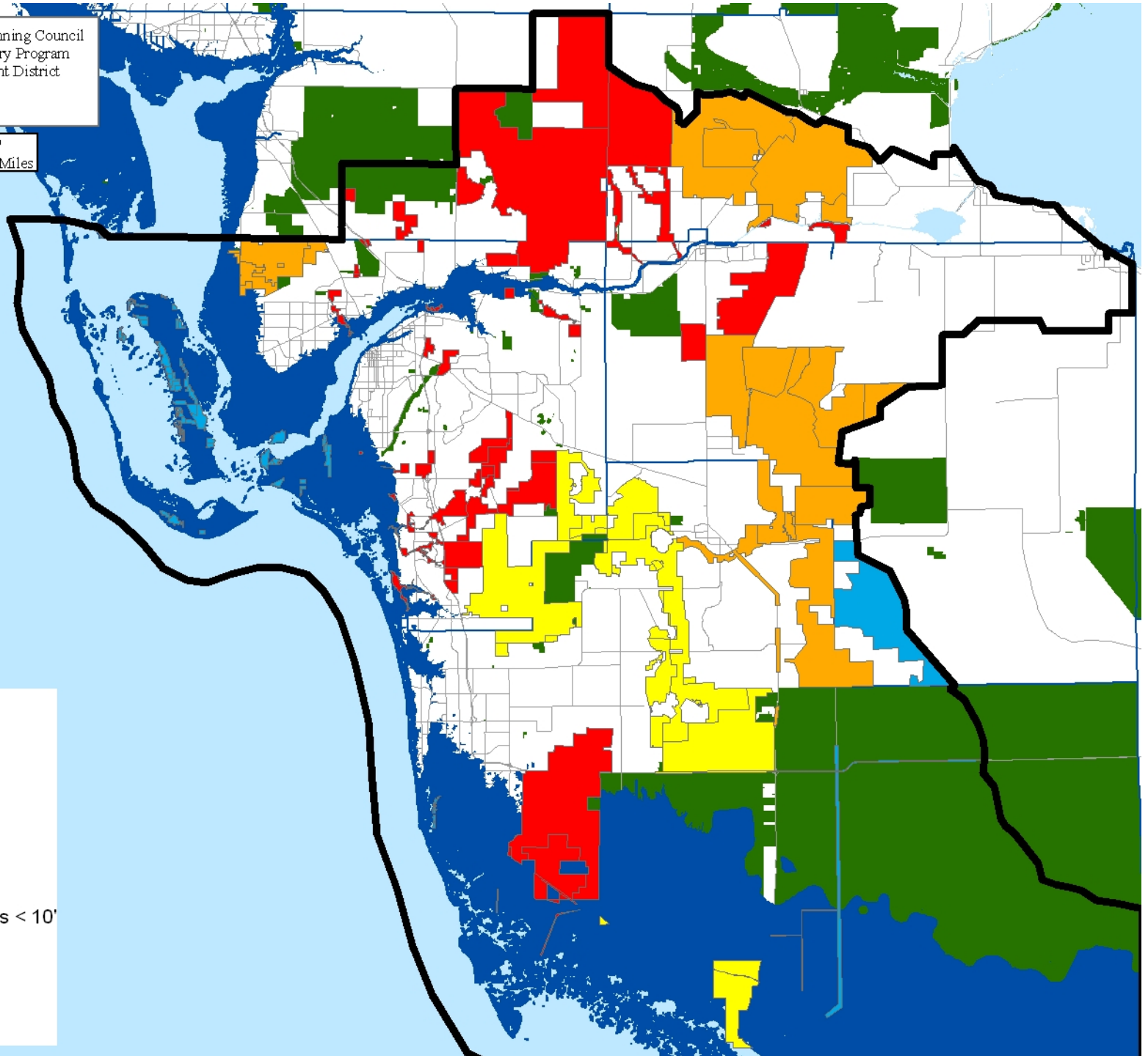
Source: Southwest Florida Regional Planning Council
Charlotte Harbor National Estuary Program
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Legend

SWFFS Alternatives

-  1
-  2, adds to 1
-  3, adds to 1 and 2
-  0
-  2200 Sea Level Risk
-  Additional Managed Areas < 10'
-  SWFFS Boundary
-  County Boundaries
-  Open Water
-  Roads



Source: Southwest Florida Regional Planning Council
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South Florida Water Management District
Florida Natural Areas Inventory
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0 2.5 5 10 15 20
Miles

0 2.5 5 10 15 20
Kilometers

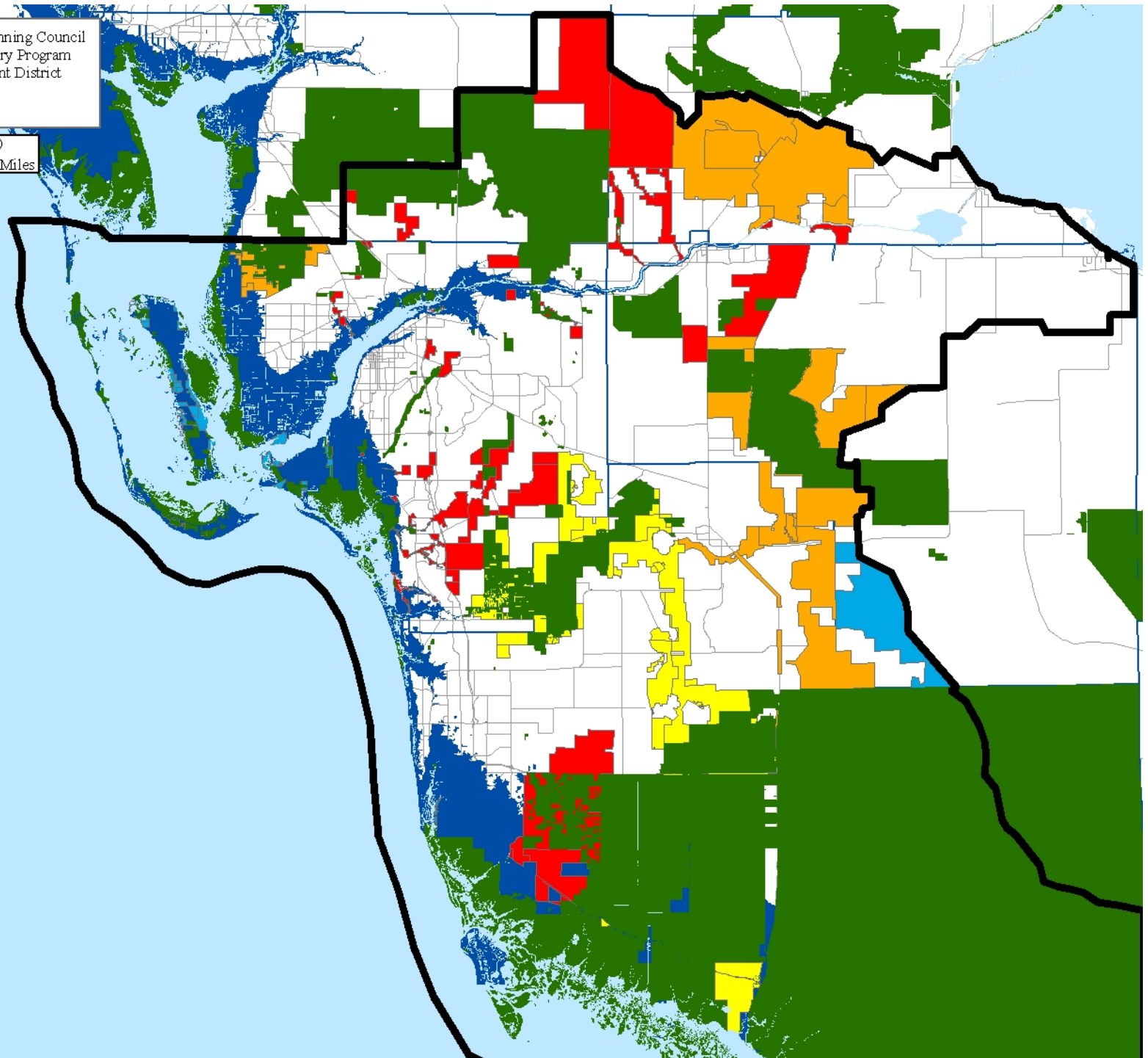


Legend

Existing Managed Lands

SWFFS Alternatives

- 1
- 2, adds to 1
- 3, adds to 1 and 2
- Not Selected
- 2200 Sea Level Risk
- SWFFS Boundary
- Open Water
- County Boundaries
- Roads



Shore Protection Almost Certain	Acres	Tier
Belle Meade Stormwater Master Plan/Central Flow-way Restoration	5,031	1
Belle Meade Flow-way south of Tamiami Trail	967	1
South Belle Meade Flow-way	349	1
Hancock Creek Riverine Corridor	179	1
Hickey Creek Swamp	158	1
41 Culvert Emplacement west of Tamiami Trail Culverts Project	131	1
Spring Creek Flow-way	99	1
Yucca Pen Mines	95	2
Southwest Unacquired Yucca Pens	91	2
Bluejack Oak Parcel	76	1
Yucca Pen Creek West	67	2
Estero River North	63	1
Mouth of Orange River	40	1
Bone Fish Springs Acquisition	39	1
Lakes Park/Hendry Creek Connector	29	1
Flow-way north of Alico Road (Alico Mine Flow-way) (Tam-Alico)	25	1
Halfway Creek Flow-ways	24	1
Alico Flow-ways West	9	1

Relevant Findings

- Consideration of predicted sea level rise can be used to reduce risk and assess benefits of restoration investments.
- The SWFFS includes alternatives which are predominately above long-term (200 year) sea level rise predictions.
- Issues of climate change mitigation and adaptation are best addressed thru interagency partnerships that CERP, CHNEP, and SWFRPC promote.
- SWFFS implementation protects latitudinal and elevational gradients, heterogeneity, connectivity, refugia.
- SWFFS implementation protects freshwater resources for ecosystem health and human use.
- SWFFS implementation reduces non-climate stresses.



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