Tilapia Risk Analysis

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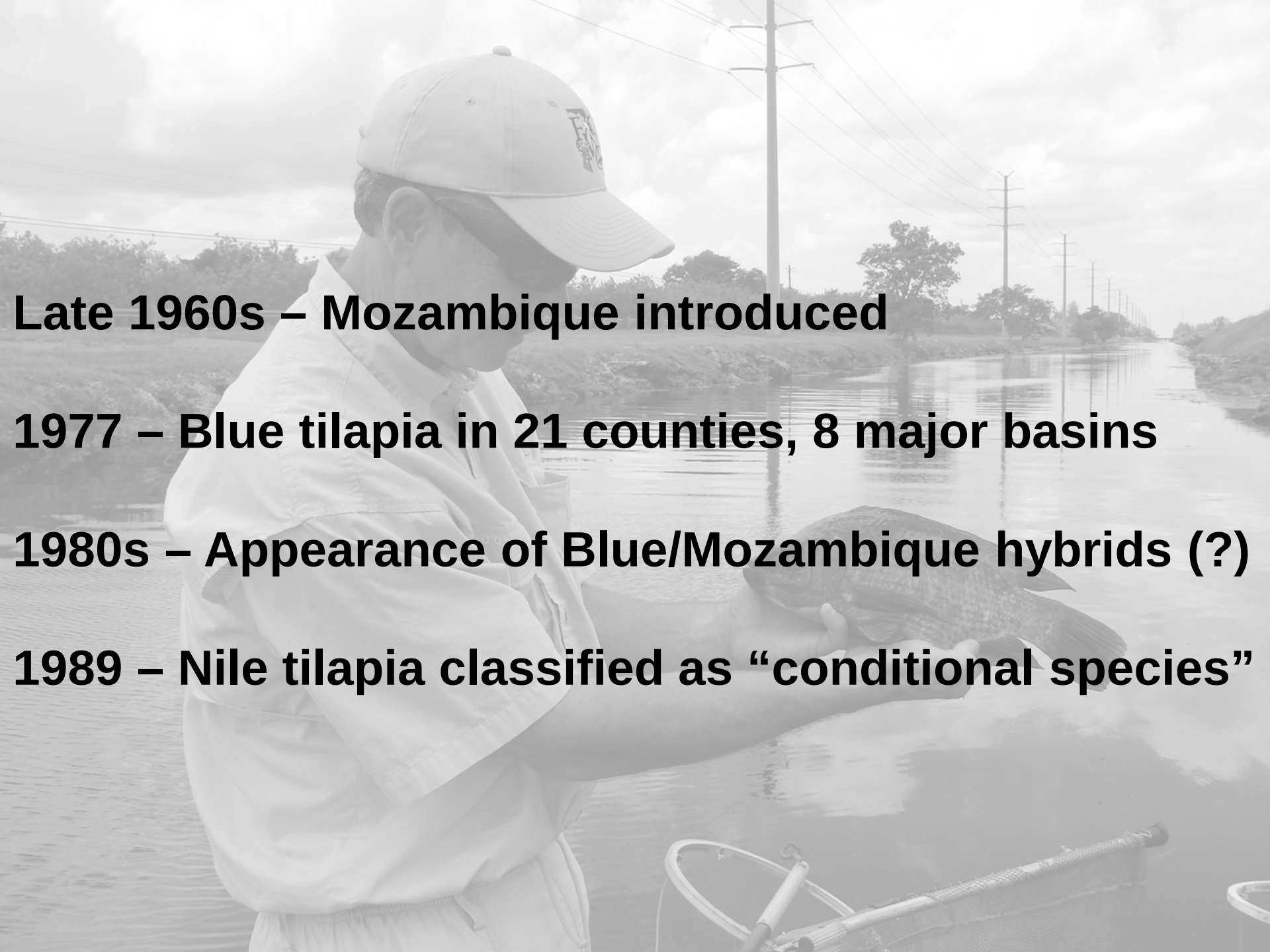
1961 – Blue tilapia brought to Florida
1961-62 – growth, sportfish attributes study
1964 – Recommend no stocking
1968 – illegal stocking in public waters



Late 1960s – Mozambique introduced

1977 – Blue tilapia in 21 counties, 8 major basins

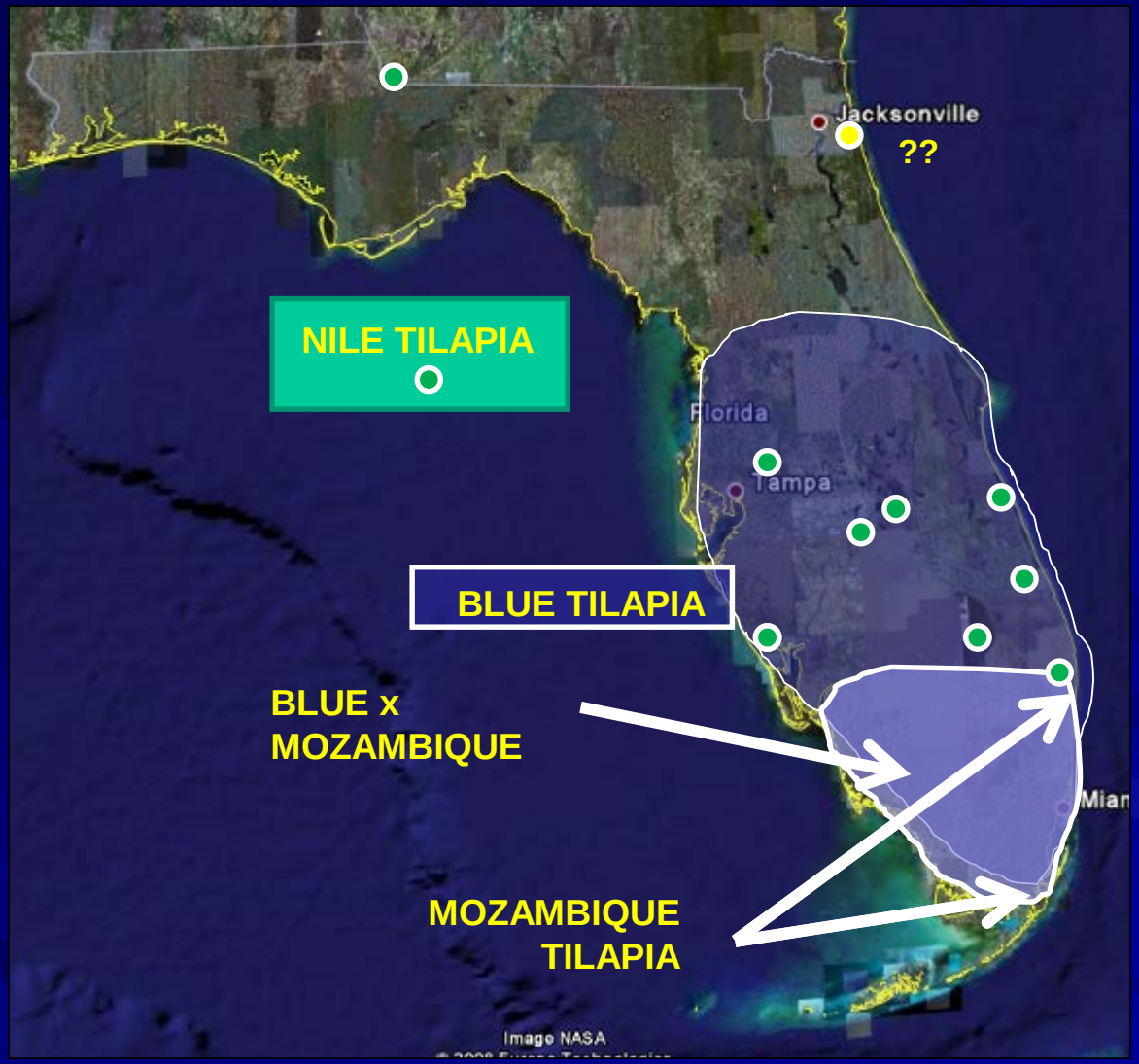
1980s – Appearance of Blue/Mozambique hybrids (?)

1989 – Nile tilapia classified as “conditional species”

2006 – Nile tilapia found in 3 counties

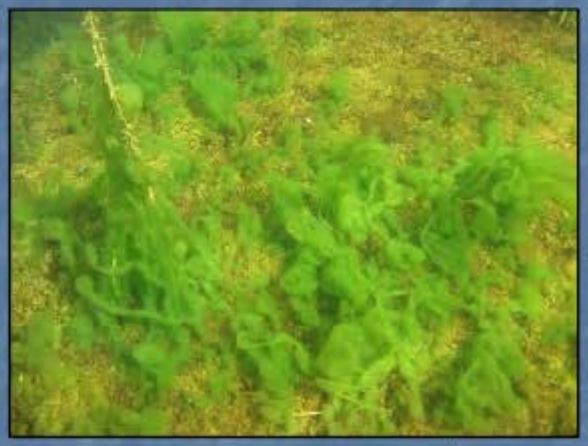
2007-09 – Nile tilapia in Okeechobee,Peace River Sarasota, Hendry, Alachua, Palm Beach counties

2011 – Niles in additional locations


Jacksonville
??
NILE TILAPIA
Florida
Tampa
BLUE TILAPIA
BLUE x
MOZAMBIQUE
MOZAMBIQUE
TILAPIA
Image NASA

Blue Tilapia Diet

- Primarily algae and detritus
- Flexible feeding
  - Water column, substrates, and sediments
- Juveniles eat more invertebrates
- Macrophytes little used
- Filamentous algae control?



pondboss.com

aquaplant.tamu.edu

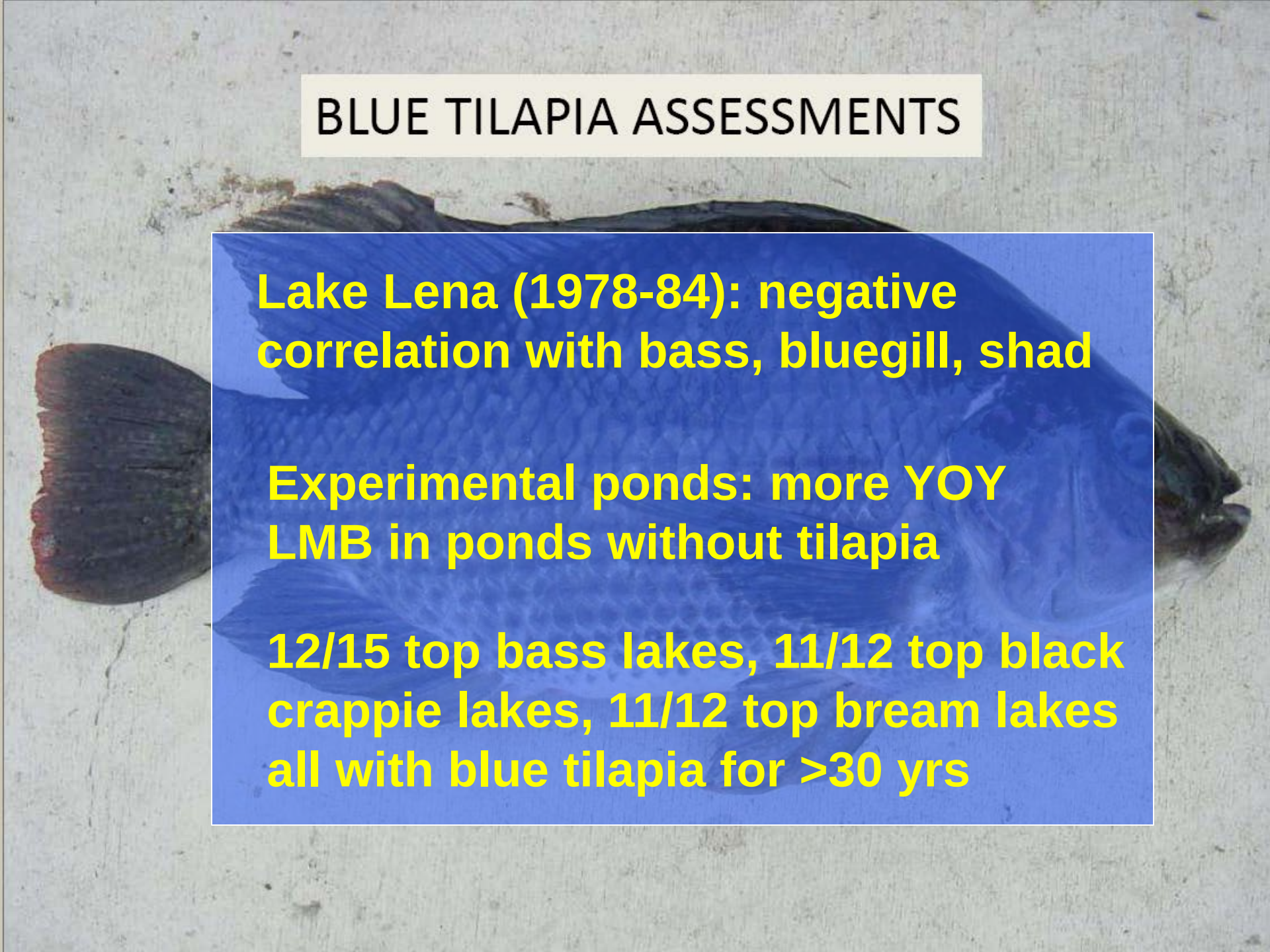
Potential Impacts

- Spawning site competition
- Disruption of spawning activities (high density)
- Food competition
  - Gizzard shad
  - Largemouth bass and sunfish

acesag.auburn.edu

The Native Fish Conservancy

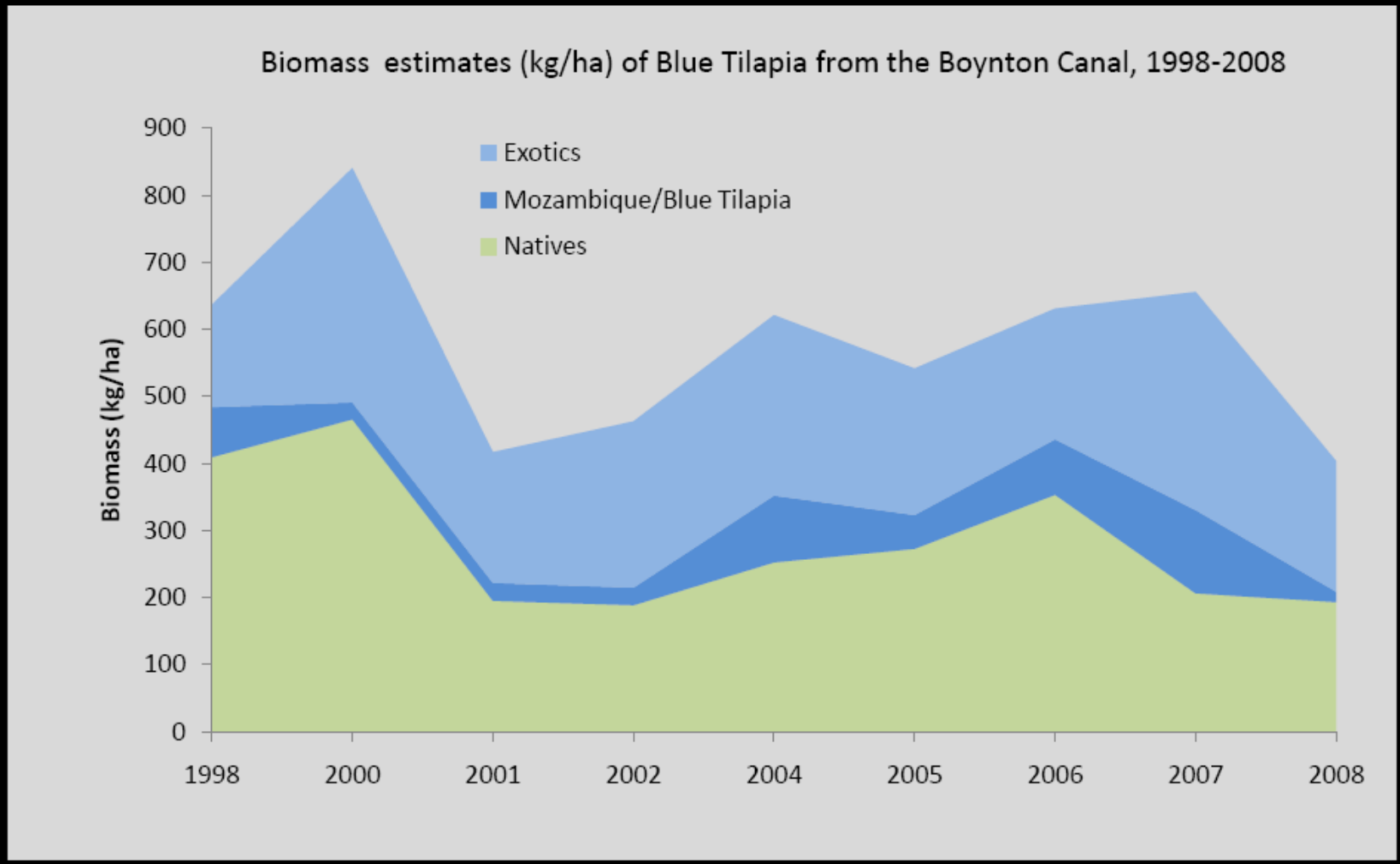
BLUE TILAPIA ASSESSMENTS



Lake Lena (1978-84): negative correlation with bass, bluegill, shad

Experimental ponds: more YOY LMB in ponds without tilapia

12/15 top bass lakes, 11/12 top black crappie lakes, 11/12 top bream lakes all with blue tilapia for >30 yrs



No significant negative correlations between Blue Tilapia and any individual or group of native fish species.

FWC Rule

CONDITIONAL TILAPIA

- ***Oreochromis aureus*** **(blue tilapia)**
- ***Oreochromis niloticus*** **(Nile tilapia)**
- ***O. mossambicus*** **(Mozambique tilapia)**
- ***O. urolepis hornorum*** **(Wami/Rufigi tilapia)**

ALL OTHER OREOCHROMIS, SAROTHERODON, TILAPIA ARE PROHIBITED

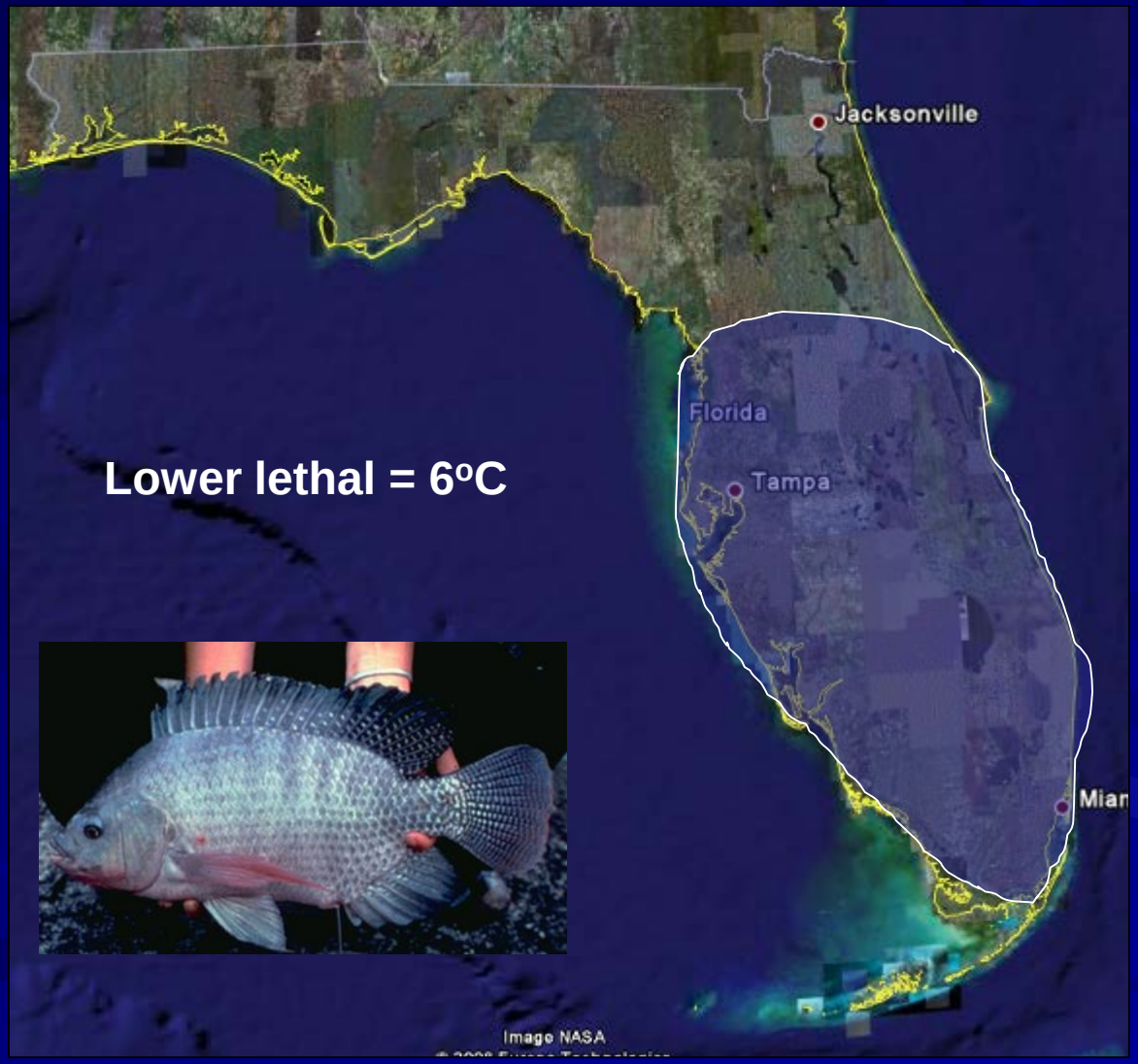
Introduction of ALL non-native species to Florida waters is prohibited.

FWC Rule

CONDITIONAL TILAPIA

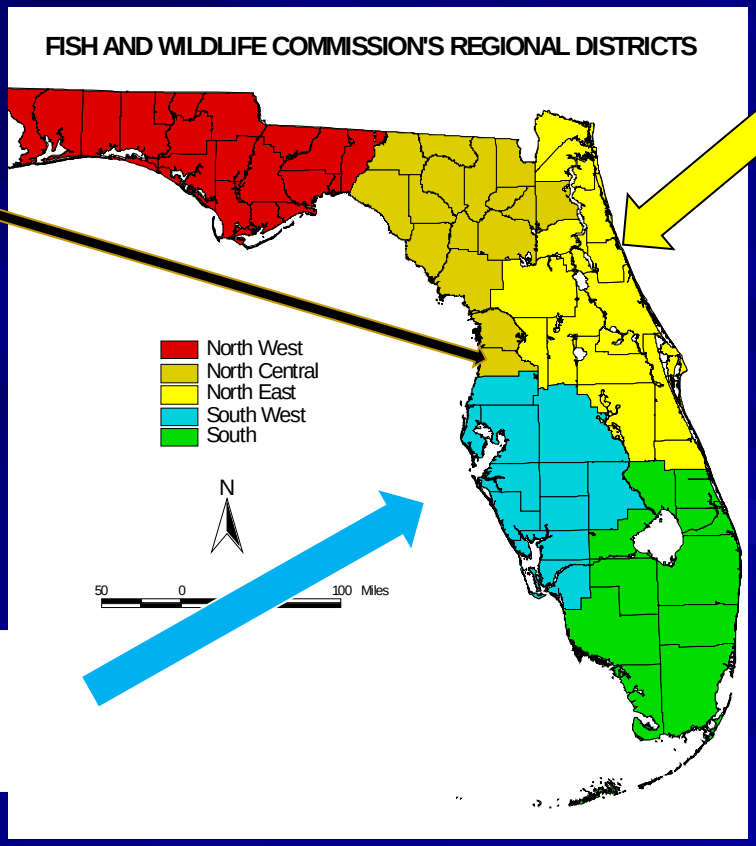
Permits for certified aquaculture, exhibition and research.

Bio-security, e.g., pond levees 1’ above 100-yr flood plain; no discharge into public waters


Jacksonville
Florida
Tampa
Lower lethal = 6ºC
Image NASA

EXCEPTION: *Oreochromis aureus* does not require a permit to possess, culture, and transport in areas where it is established

Citrus



NORTHEAST REGION

SOUTHWEST REGION

SOUTH REGION

Public Interest

- Residents want to stock blue tilapia to control filamentous algae in homeowners association ponds
  - Typically these ponds are connected to state waters via overflow structures, making stocking illegal
- Florida fish farmers want to culture wild-caught tilapia without a permit
  - Due to hybrids, DACS requires proof of species

Tilapia Risk Analysis

funded by U.S. Fish and Wildlife Service

To determine:

1) Statewide and regional ecological, economic, or human health risks

2) Risk prevention or mitigation options.

(above existing risks if proposed uses are allowed)

Generic Nonindigenous Aquatic Organisms Risk Analysis Review Process

Published by the Aquatic Nuisance Species Task Force in 1996

"…a standardized process for evaluating the risk of introducing nonindigenous organisms into a new environment and, if needed, determining the correct risk management steps need to mitigate risk."

Element (Risk/Consequence) Ratings

Low

acceptable risk – little concern - does not justify mitigation

Medium

unacceptable risk – moderate concern – mitigation justified

High

unacceptable risk – major concern – mitigation justified

Determining Organism Risk Potential

PROBABILITY OF ESTABLISHMENT

CONSEQUENCES OF ESTABLISHMENT

OVERALL RISK POTENTIAL

Using Generic Analysis matrix

Generic Analysis

Risk assessment

1) stakeholders
2) Information
3) qualify or quantify risk
4) Uncertainties
5) recommendations

Generic Analysis

Risk management

- Policies
- Regulations
- Operational measures

Blue tilapia

PROBABILITY OF ESTABLISHMENT

CONSEQUENCES OF ESTABLISHMENT

ADDITIONAL CONSEQUENCES OF AQUACULTURE/ WEED CONTROL

Expert Panel

- Allan Brown (USFWS)
- Charles Cichra (UF-Fisheries)
- Lt. Steve Delacure (FWC Law Enforcement)
- Kelly Gestring (FWC Non-native Fish)
- Freddy Langford (fisheries consultant)
- Leo Nico (USGS)
- Bill Pouder (FWC Fish mgmt)
- Jon Robinson (Myakka State Park)
- James Tiisler (aquaculturist)

WILD TILAPIA CULTURE SCENARIOS

Collect Nile or Mozambique tilapia, escape/release could increase Florida range of these conditional species

Collect blue tilapia AND Nile/Mozambique/B-M hybrids from the wild →create "new" hybrid with different cold/salinity tolerance

Could mix/match wild tilapia with existing stock of uncertain genetic parentage → escape/release

Could collect wild fish with parasites and pathogens and transfer with shipments of live fish

BLUE TILAPIA FOR WEED CONTROL SCENARIOS

Difficult to identify tilapia → stocking of Nile tilapia or hybrids of unknown parentage

Introduction of parasites and pathogens from fish of unknown origin

Introduction of other species of tilapia by unknowing or unscrupulous contractors

“OTHER” SCENARIOS

Increase use of tilapia as bait

Citizen fishery management (i.e., stocking novel waters)

Citizen or farm interest in the other conditional or prohibited tilapia species in Florida (*T. buttikoferi, T. mariae, T. sparrmani, T. zillii*).

ENVIRONMENTAL CONSEQUENCES

Impact on native fish, e.g.

- **Spawning site competition**
- **Behavioral spawning impacts**
- **Parasite/pathogen spread**

Impact on trophic structure (e.g., selective grazing)

- **Community structure changes**
- **Fish population size/age structure**
- **Predator/prey relationship**

Impact on aquatic habitat, water quality, e.g., through increased benthic sifting, filter feeding

ECONOMIC CONSEQUENCES

Loss of sportfishing

Increased commercial fishing

Bait production/distribution

SOCIAL/POLITICAL CONSEQUENCES

Adverse reaction to establishment of new exotic

Adverse reaction to relaxing rules for non-native species

Positive reaction to additional algae control options (alternative to chemicals)

Positive reaction to increased AQ opportunities

Tilapia Aquaculture			
Environmental Consequences			
Potential Impacts	**Risk Ranking**	**Uncertainty Code**	**Reference Code**
Native fish: Spawning site competition	L/M	RU - RC	PL, PO
Spawning behavior	L/M	RU - RC	PL, PO
New parasites/pathogens	L	RC	PL, PO
Trophic structure: Fish community structural change	L/M	RU - RC	PL, PO
Fish population size/age structure	L/M	RU - RC	PL, PO
Predator/prey relationships	L/M	RU - RC	PL, PO
Aquatic habitat: Increased benthic and filter feeding	L	RC	PL
Water quality: Increased benthic and filter feeding	L	RC	PL

Key: L = low, M = medium, RU = Relatively Uncertain, RC = Relatively Certain, PL = Published Literature, = Personal Observation

Tilapia Aquaculture			
Economic Consequences			
Potential Impacts	**Risk Ranking**	**Uncertainty Code**	**Reference Code**
Loss of sport fishing	L	RC - MC	PO
Increased commercial fishing	L	RC - MC	PO
Bait production/distribution	L	RC	PO

Key: L = low, M = medium, RC = Relatively Certain, MC = Moderately Certain, = Personal Observation

Tilapia Aquaculture			
Social/Political Consequences			
Potential Impacts	**Risk Ranking**	**Uncertainty Code**	**Reference Code**
Adverse reaction of establishment of a new exotic	H	VC	PO
Adverse reaction to relaxing non-native species rules	H/M	VU - RC	PO
Positive reaction to increased aquaculture opportunities	M	MC	PO

Key: M = medium, H = High, VU = Very uncertain, RC = Relatively Certain, MC = Moderately Certain, VC = Very Certain, = Personal Observation

Filamentous Algae Control			
Environmental Consequences			
Potential Impacts	**Risk Ranking**	**Uncertainty Code**	**Reference Code**
Native fish/trophic structure: Central Florida and lower St. Johns South Florida	 M L	 RC MC	 PL, PO
Aquatic Habitat	L	RC	PL
Water Quality	L	RC	PL

Key: L = Low, M = medium, RC = Relatively Certain, MC = Moderately Certain, PL – Published Literature, = Personal Observation

Filamentous Algae Control			
Social/Political Consequences			
Potential Impacts	**Risk Ranking**	**Uncertainty Code**	**Reference Code**
Adverse reaction of establishment of a new exotic	H	MC	PO
Adverse reaction to relaxing exotic species rules	H	MC	PO
Positive reaction to additional algae control option	M	VC	PO

Key: M = Medium, H = High, MC = Moderately Certain, VC = Very Certain, = Personal Observation

RISK MANAGEMENT - QUESTIONS

Hybrid tilapia environmental tolerance (temperature, salinity)

Status of hybrid tilapia on farms, Florida waters

Better define Nile tilapia distribution

RISK MANAGEMENT - QUESTIONS

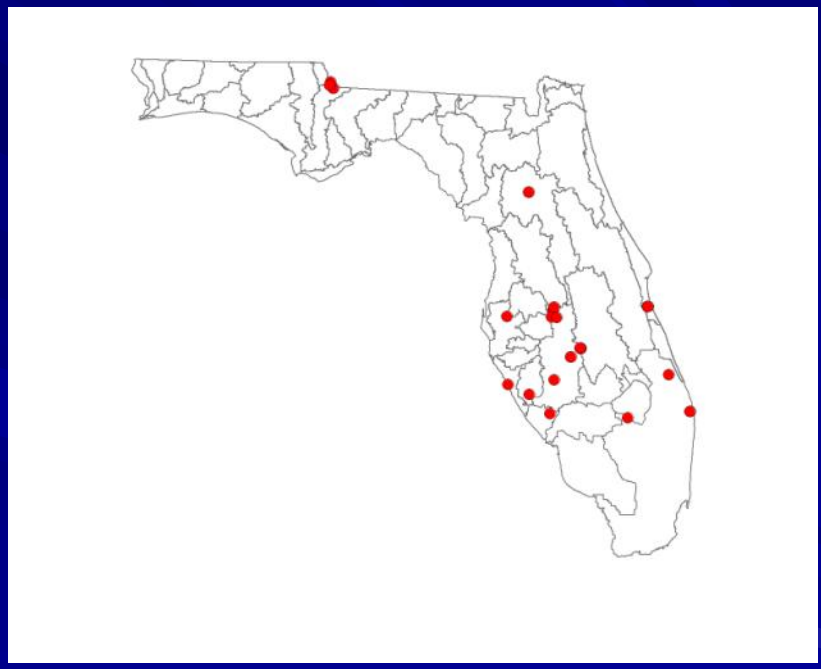
Hybrid tilapia environmental tolerance (temperature, salinity)

Lower lethal temperature for Nile tilapia
January 2012

Hybrid testing pending genetics

RISK MANAGEMENT - QUESTIONS

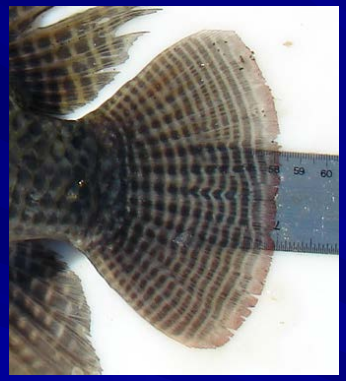
Nile tilapia distribution



Collect during fall fish monitoring

PANEL RECOMMENDATIONS

Public information fact sheet
regulations
photo id



Information to fish farmers
where to collect blue tilapia

Do tilapia really control filamentous algae?

Panel recommended study of

- consumption rates
- algae species preferences
- optimal size of fish

Aquarium studies at Non-native fish lab – late 2011, 2012

QUESTIONS?