



US Army Corps
of Engineers
Fort Worth District

Sam Rayburn Reservoir B. A. Steinhagen Lake



**Invasive Aquatic
Vegetation**

April 2012

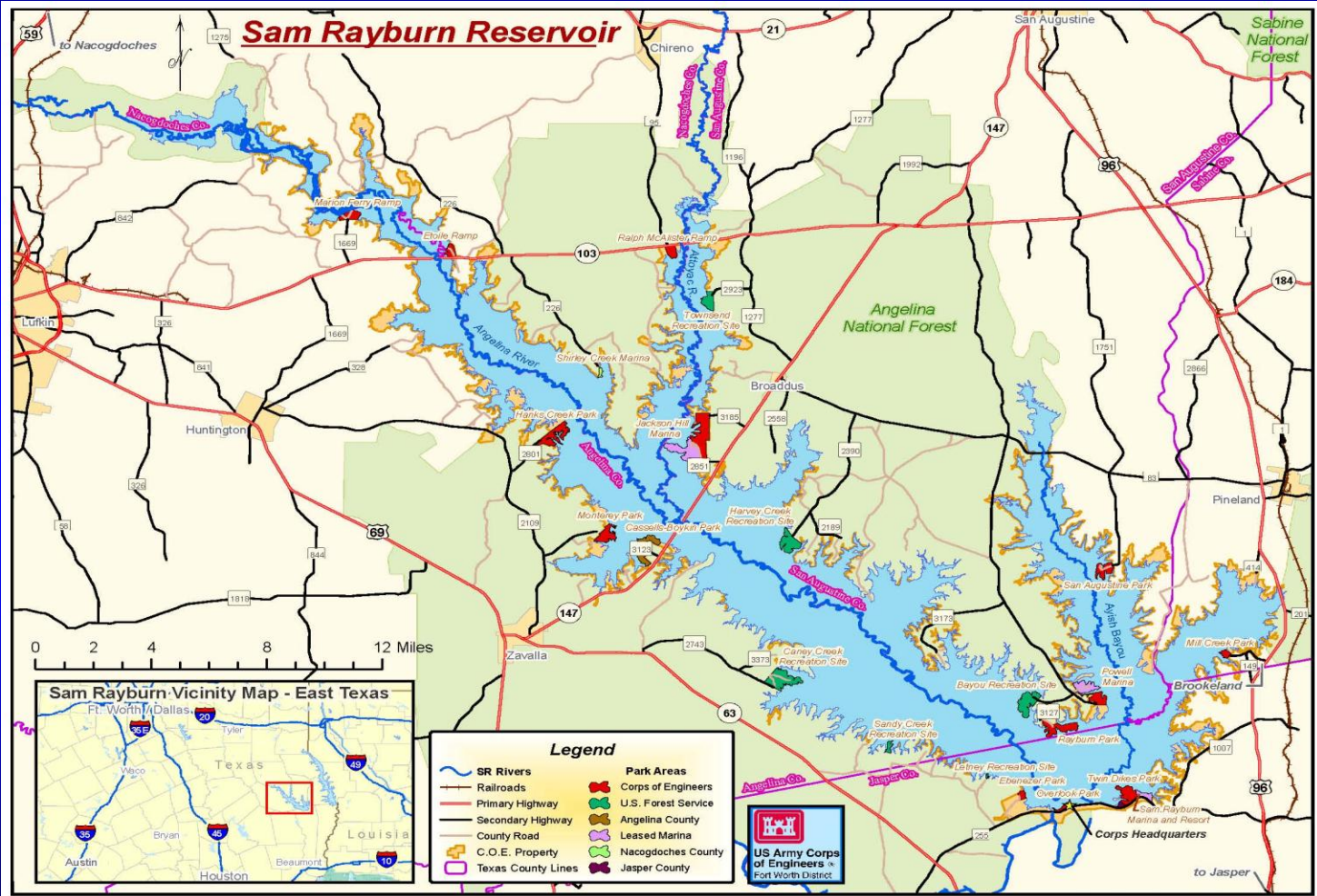
04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Sam Rayburn Reservoir



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

What's In A Name?

Sam Rayburn Dam and Reservoir

MaGee Bend Reservoir

Sam Rayburn Powerhouse

Town Bluff Project

Dam B

B. A. Steinhagen Lake

R. D. Willis Powerhouse



US Army Corps
of Engineers
Fort Worth District

Sam Rayburn Reservoir

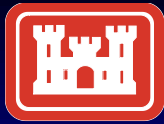
- Gates closed in 1965
- Largest reservoir totally in Texas – 114,000 surface acres
- Only significant lake on the Angelina River
- Normal elevation 164.4', TOD 190.0', spillway elevation 176.0'
- Twin generators with floodgates



US Army Corps
of Engineers
Fort Worth District

TOWN BLUFF PROJECT

- Closed gates in 1951.
- Southernmost project in group of 4 authorized in 1946 for Neches River Dam A, Dam B, Rockland, MaGee Bend— only other project completed was Sam Rayburn in 1965.
- Hydropower added in 1989.
- Average depth is 5 – 7 feet.



US Army Corps
of Engineers
Fort Worth District

TOWN BLUFF PROJECT

- Top of gates and uncontrolled spillway – 85 feet NGVD.
- Normal operation range – 81-83 NGVD.
- Elevation required for operation of powerhouse – 76 NGVD.
- Covers approximately 11,500 acres at 83 NGVD.
- Contains over 94,000 acre-feet at capacity.



US Army Corps
of Engineers
Fort Worth District

Town Bluff Project



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Town Bluff Project



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Town Bluff Project



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Town Bluff Project



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Town Bluff Project



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Town Bluff Project



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Town Bluff Project



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Town Bluff Project



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Giant Salvinia



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Town Bluff Project



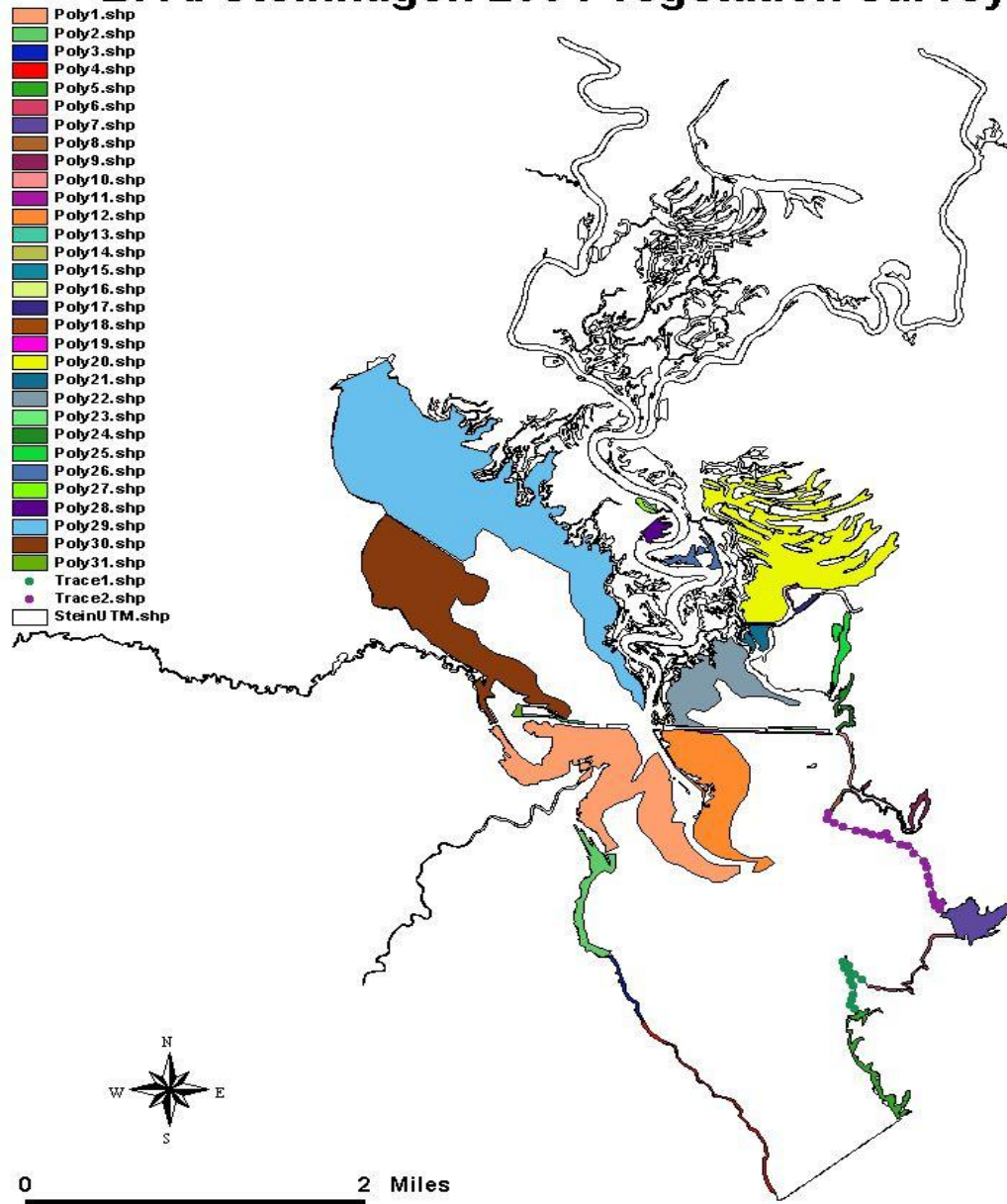
04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

B. A. Steinhagen 2004 vegetation survey



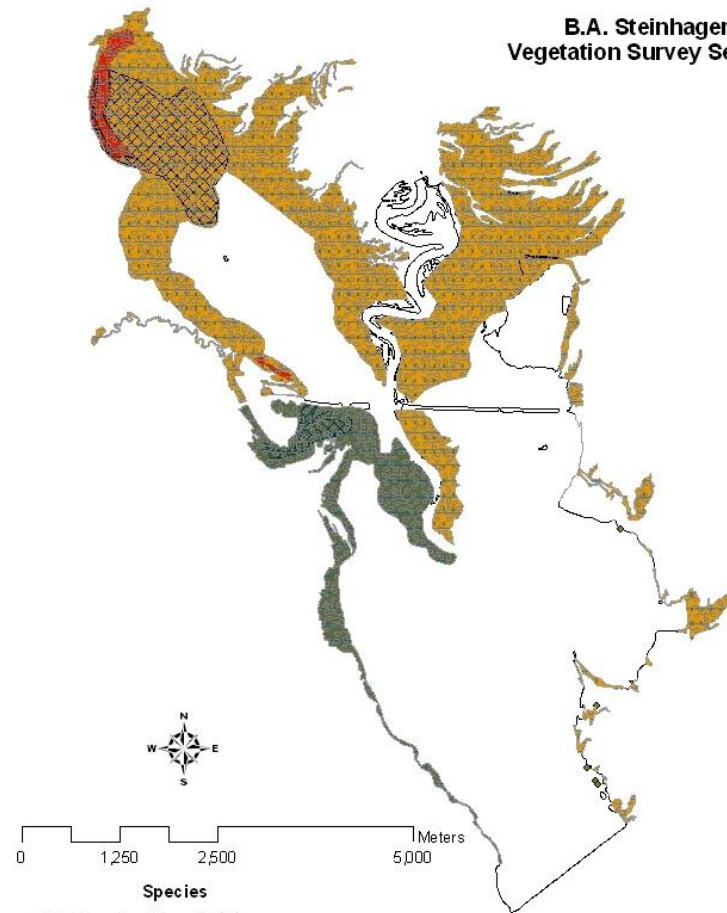
04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

**B.A. Steinhagen (Dam B)
Vegetation Survey September, 2009**



- Species**
- American lotus ~ 2800 acres
 - waterhyacinth >50% ~ 281 acres
 - waterhyacinth >20% ~ 318 acres
 - Torpedo grass ~ 0.83 acres
 - Hydrilla verticillata ~ 500 acres
 - Common salvinia ~ 2249 acres
 - Giant salvinia ~ 96 acres
 - Alligatorweed ~ 937 acres
 - Primrose ~ 937 acres

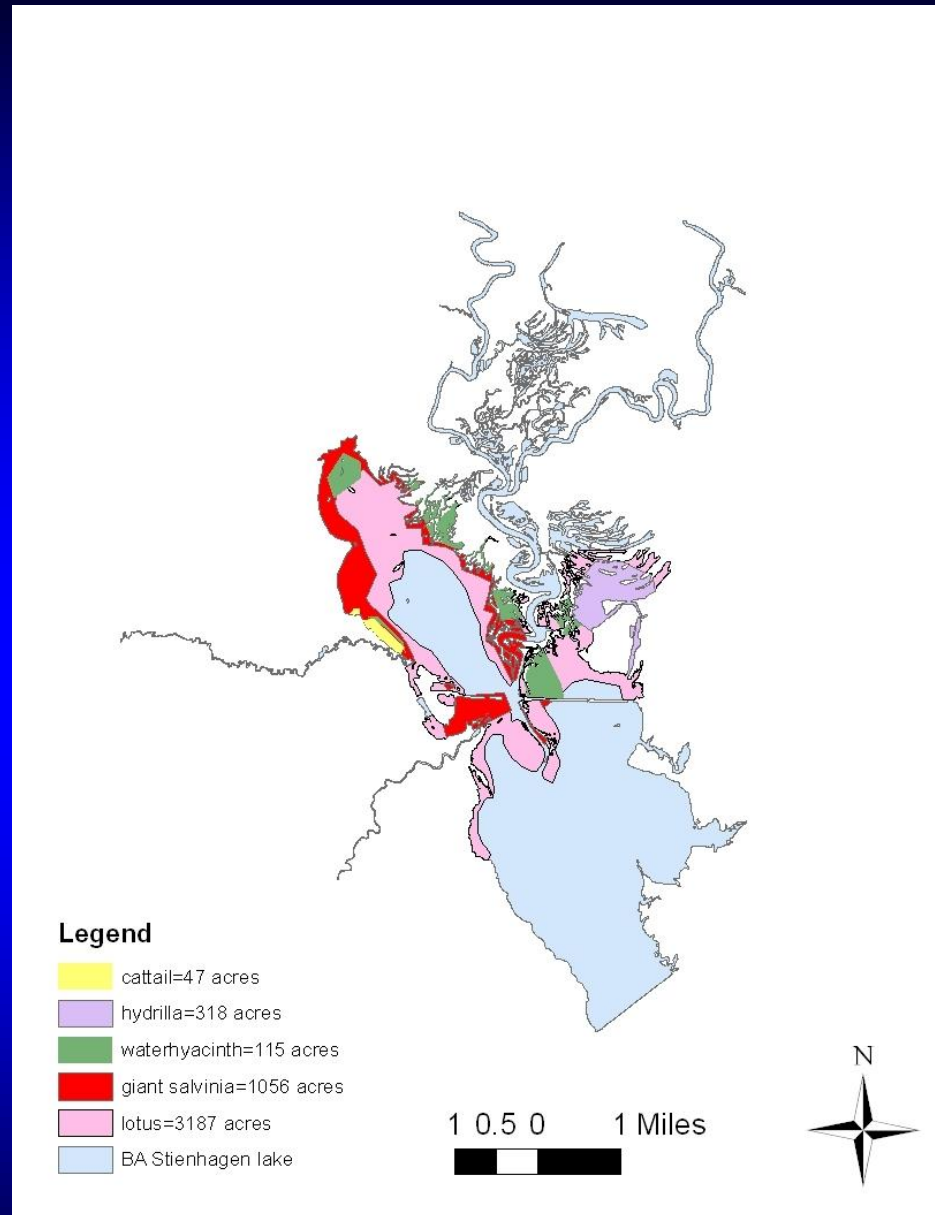
**Inland Fisheries Division
Texas Parks and Wildlife Department**

Prepared by: Dan Bennett
Projection: NAD 83 UTM Zone 15N

This map is for reference only.
The user must make their own site visit and
is liable for any responsibility for the appropriate
use of the information. No special liability errors,
digital map scale, collection methodology, currency
update, and other conditions specific to individual.



US Army Corps
of Engineers
Fort Worth District



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Why This Project Has Problems

- **High nutrient inflow**
- **Shallow water**
- **Hot summers and mild winters**
- **Lack of wave action due to high presence of emergent woody vegetation (cypress, willow, buttonbush)**
- **Numerous sloughs and oxbows that act as banks and nurseries for vegetation**
- **Relatively stable lake level.**



US Army Corps
of Engineers
Fort Worth District

CONTROL METHODS

- Mechanical – logistically difficult and very expensive. Hard to stay ahead of growth rate during summer. Not practical.
- Biological – Water Hyacinth beetle, Alligatorweed Flea Beetle, Salvinia Weevil, Hydrilla Fly. Not cold-hardy.
- Chemical – expensive and not effective alone.



US Army Corps
of Engineers
Fort Worth District

CONTROL METHODS

- **Winter drawdown – has been tried over last decade with limited success. Effect usually gone by late summer. Lake only dropped to elev. 76 to allow for generation.**
- **Summer drawdown – was used often before addition of powerhouse with good success. It is the method proposed by both TPWD and COE. Target elevation would be around 60 and duration would be June – September. Major drawback is no generation possible.**



US Army Corps
of Engineers
Fort Worth District

2005-6 Plan of Attack

- Corps of Engineers
- Lower Neches Valley Authority
- Texas Parks and Wildlife
- Southwestern Power Administration
- Lewisville Aquatic Environmental Research Facility
- SFASU



US Army Corps
of Engineers
Fort Worth District

2006 Plan of Attack

- Draw down lake to elevation 76' from June 15 – July 31.
- Fully drain lake from August 1 – September 15.
- Use aerial herbicide applications during drawdown to eliminate pockets of vegetation.
- TPWD survey after lake reaches full pool.
- Press Release



US Army Corp
of Engineers
Fort Worth District

Control Measure - Drawdown



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

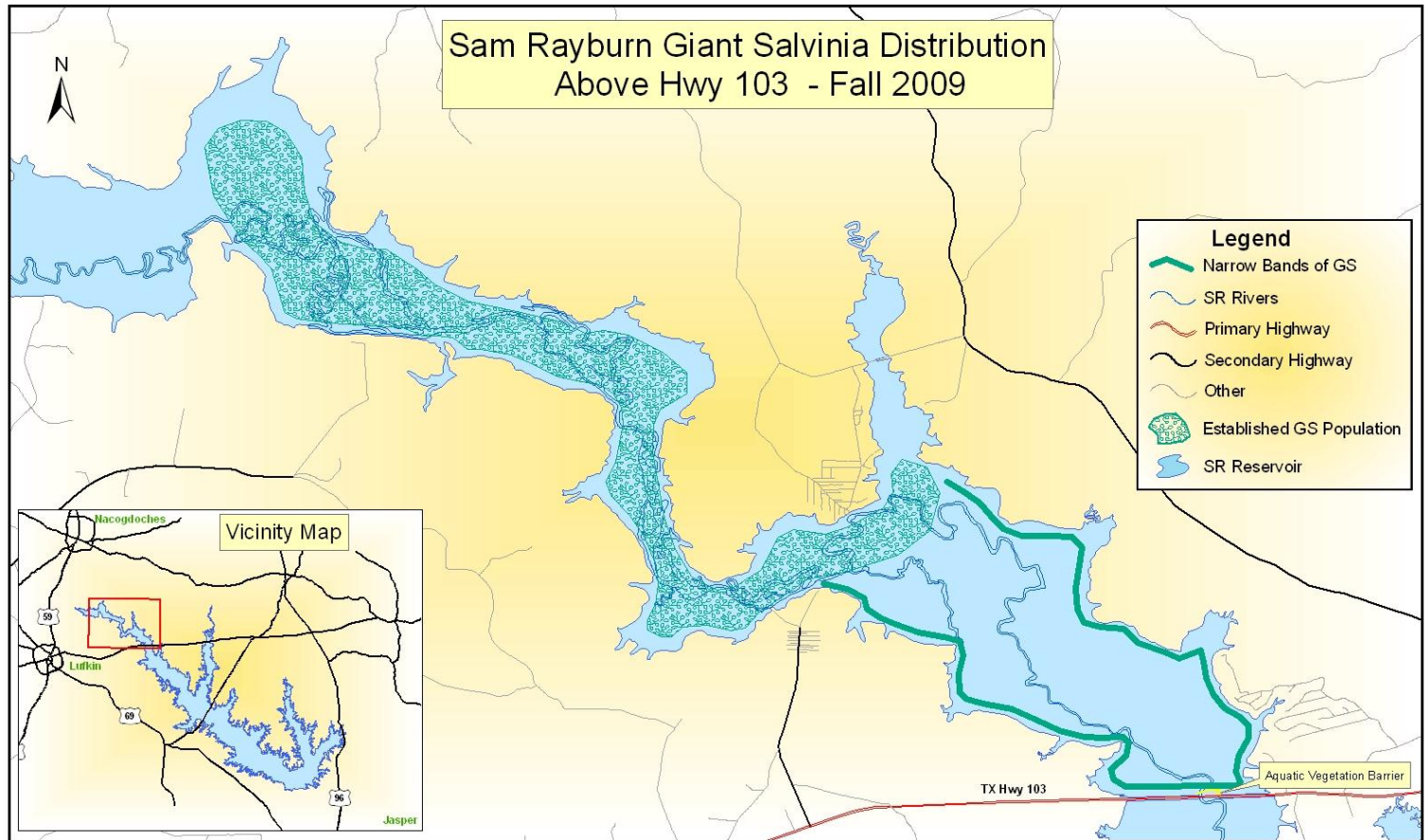
2007-8 Plan of Attack

- MOU – TPWD, LNVA, COE (2007)
- Nuisance Aquatic Vegetation Management Plan, B. A. Steinhagen Reservoir, 2008-09
- Aquatic Vegetation Treatment Proposals
- Educational/Warning Signs
- Vegetation Barriers
- Dedicated airboat spraying crew (LNVA)
- Yearly survey, revisions (TPWD)



US Army Corps
of Engineers
Fort Worth District

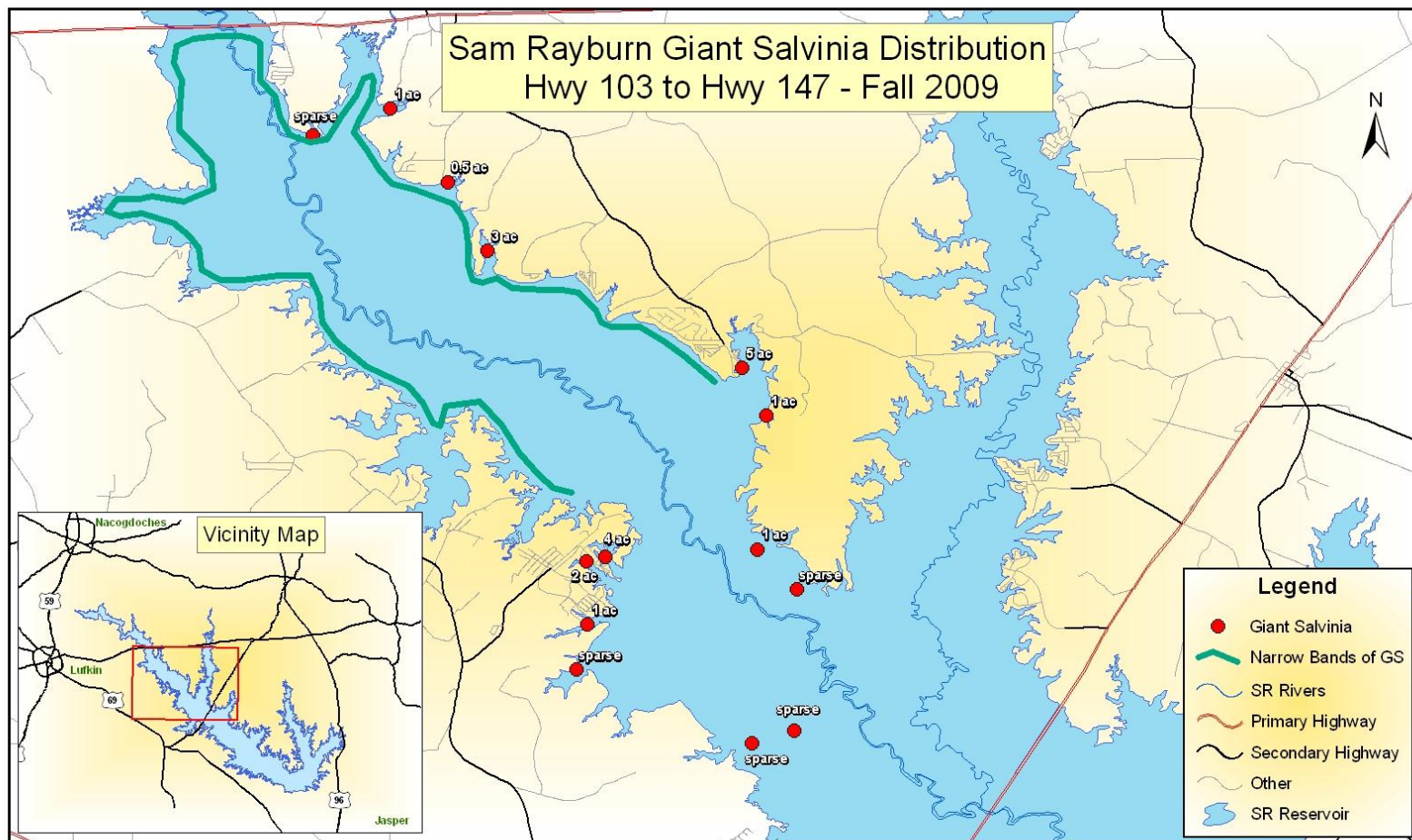
Sam Rayburn GS 2009





US Army Corps
of Engineers
Fort Worth District

Sam Rayburn GS 2009



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Control Measure – Education/Warning Sign

WARNING GIANT SALVINIA PRESENT IN RESERVOIR



US Army Corps
of Engineers ®
Fort Worth District

STATUS: Giant salvinia is a floating aquatic plant prohibited in the United States by Federal Law. Giant salvinia grows rapidly and forms thick mats which crowd out other vegetation, degrade water quality, and impede recreational access. Giant salvinia poses a serious threat to all water bodies in East Texas.

IT IS ILLEGAL TO POSSESS OR TRANSPORT GIANT SALVINIA

PREVENTION: Giant salvinia is easily transported to other water bodies by boats, propellers, and trailers. Even small plant fragments can create new infestations.

INSPECT AND CLEAN BOATS AND TRAILERS BEFORE LEAVING LAUNCH AREAS

For more information please call 409-384-9965

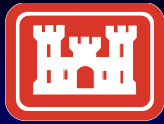


US Army Corps
of Engineers
Fort Worth District



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Control Measure - Vegetation Barrier



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

SH 103 Vegetation Barrier



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Control Measure - Airboat Rake



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Airboat Rake



04/27/2012

SR/TB Invasive Aquatic Vegetation



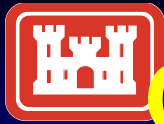
US Army Corps
of Engineers
Fort Worth Distr

Manual Spraying



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Control Measure - Aerial Spraying Dam B



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Control Measure - Airboat Spraying



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

Control Measure - Biological

Salvinia Weevils

Hyacinth Beetles

**Alligatorweed Flea
Beetles**

Hydrilla Flies

Grass Carp





US Army Corps
of Engineers
Fort Worth District

Wait and See



04/27/2012

SR/TB Invasive Aquatic Vegetation



US Army Corps
of Engineers
Fort Worth District

As the Grass Grows



04/27/2012

SR/TB Invasive Aquatic Vegetation