

Measuring Reservoir Drawdown Effects in Texas as Part of the 2012 National Lakes Assessment: A Pilot Study to Enhance National Methods

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Outcomes of 2007 National Lakes Survey

- Showed that the biggest problem for the nation's lakes is poor lakeshore habitat condition
- Linked poor shoreline condition with significant stresses on biological communities
- Stressed the importance of accurately measuring this attribute

Concerns for 2007 Shoreline Habitat Measurements

- Shoreline conditions in many parts of the country were affected by either flooding or drawdown
- While near shore conditions were accurately represented with the 2007 methods, they did not adequately describe the causes of habitat alterations in areas where drawdown or flooding occurred
- Did not adequately distinguish between riparian vegetation removal and lake drawdown or flooding
- Became apparent that methods needed to be modified to quantify drawdown or flooding effects

Development of 2011 lake Drawdown Pilot Survey

- Pilot survey was developed by National Lakes Assessment - Physical Habitat Sub-committee, led by Phil Kaufman (EPA-ORD, Corvallis) for trial around the country
- Texas served on the sub-committee to represent reservoir states and was a key voice in these effects being captured
 - 2007: Texas reservoirs experienced significant flooding
 - 2011: Texas reservoirs experienced significant drought

Lake Drawdown Pilot Objectives/Design

- Describe habitat effects of drawdown on near-shore terrestrial and littoral habitat structure.
- Determine how well 2007 metrics can be calculated from separate measurements in riparian and drawdown zone proposed for 2012.
- Current (2007) and proposed (2012) protocols applied on range of lake types and drawdown conditions.
 - Drawdown ranging from negative (flooding) to >100m horizontal distance
 - Included distance and height measurements of "drawdown zone", if any
 - Terrestrial vegetation, aquatic macrophyte, and fish habitat areal cover and complexity determined separately in littoral, drawdown, and riparian zones
 - Drawdown could be due to natural or anthropogenic causes

Lake Drawdown Pilot

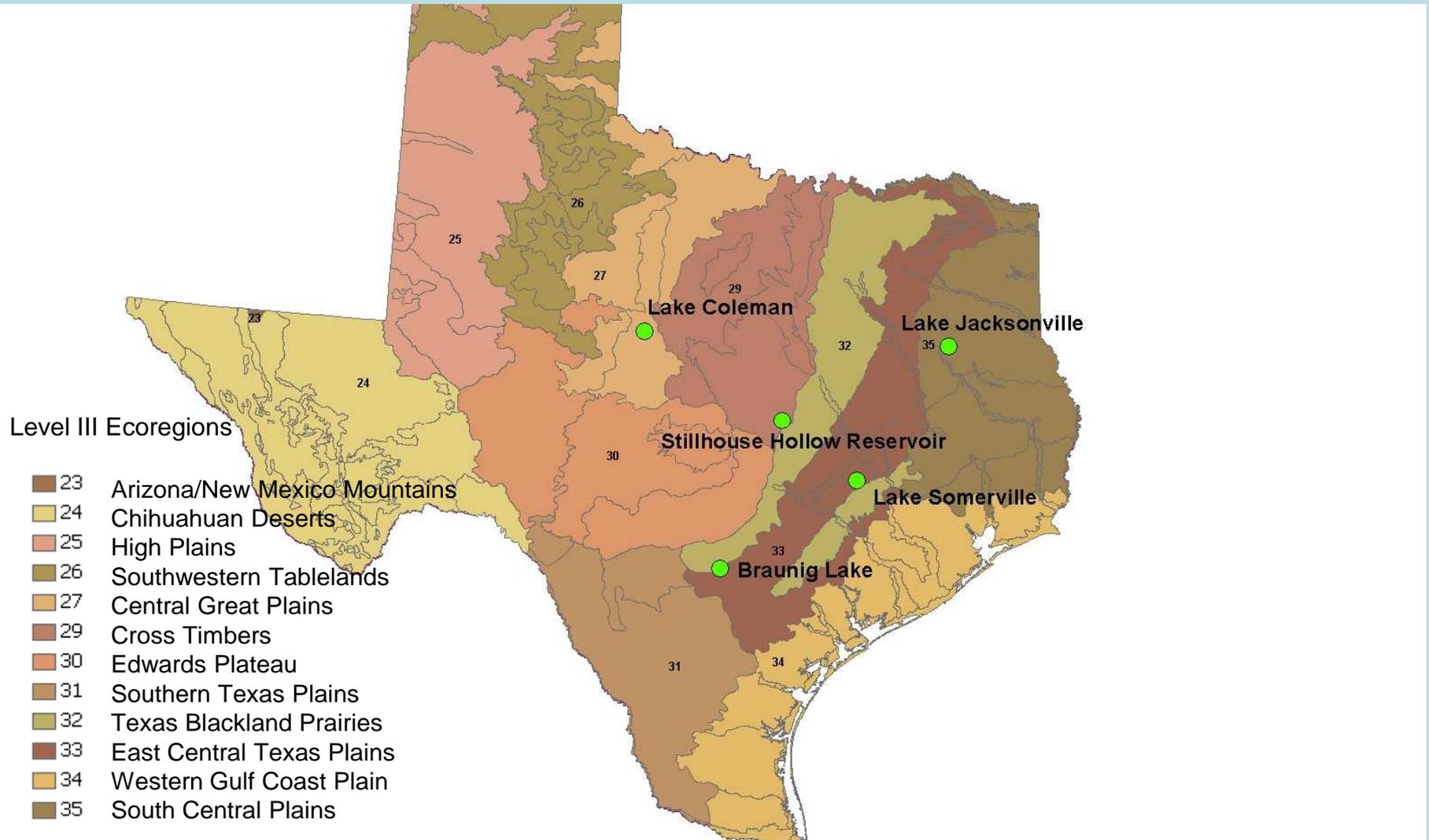
A Big Volunteer Effort:
21 lakes (210 stations) sampled
with both current and proposed protocols

Texas CEQ -----	5
Wisconsin DNR -----	1
Region 10/WA -----	4
Oregon DEQ -----	5
Reg 8 (WY, ND, CO) -----	6

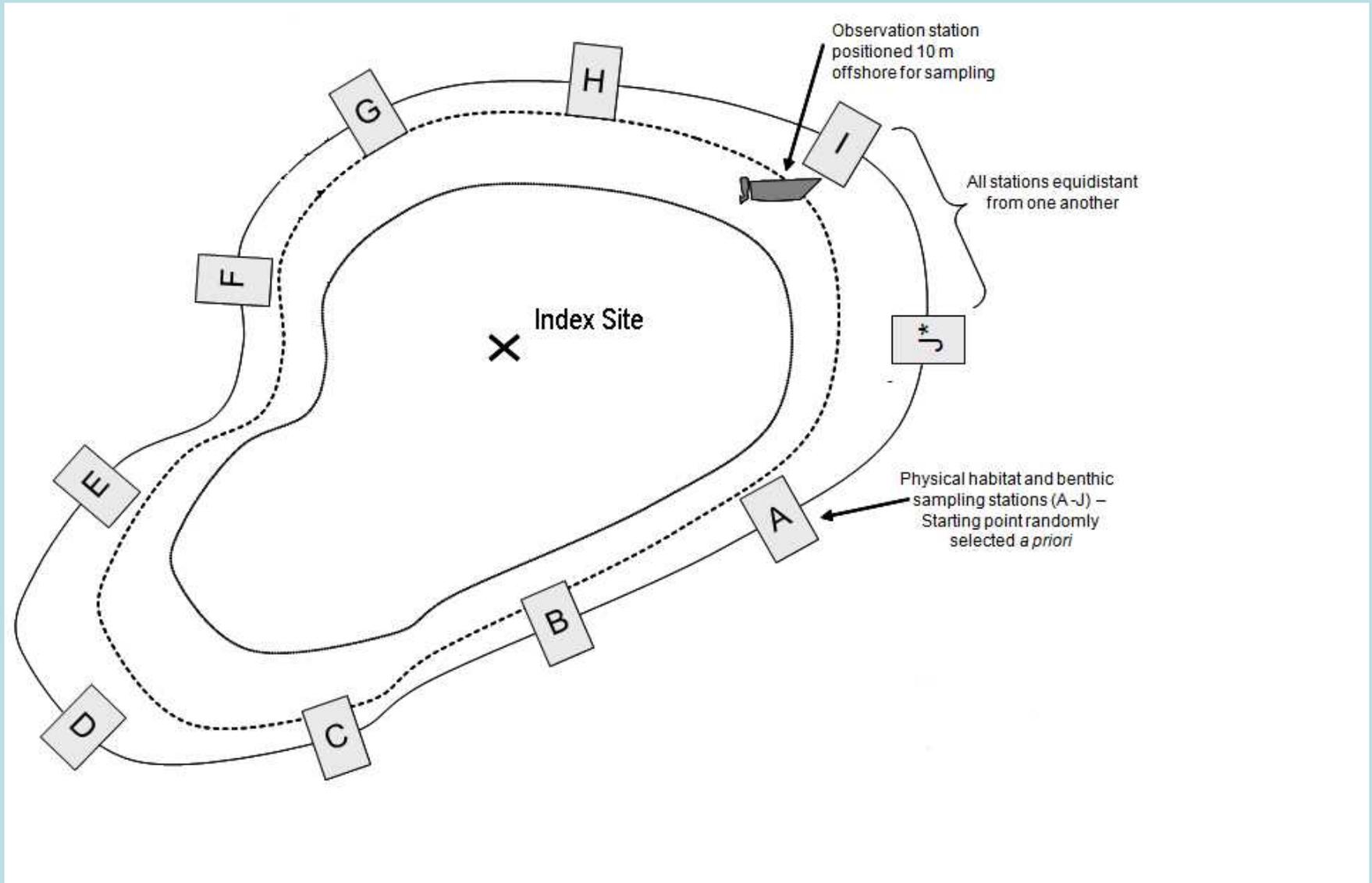
Selected Drawdown Lakes for Texas

Reservoir Name	Ecoregion	Percent Capacity	Date Sampled
Lake Somerville	33b	58	7/29/11
Stillhouse Hollow Reservoir	29e	68	8/19/11
Lake Jacksonville	35a	81	9/2/11
Braunig Lake	32a	99	9/15/11
Lake Coleman	27j	40	9/28/11

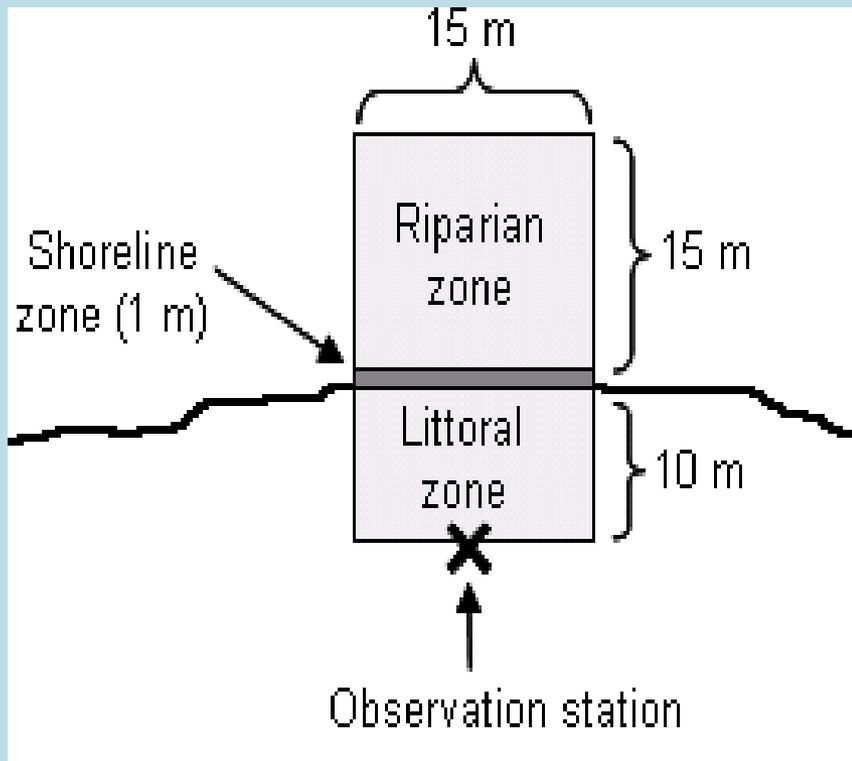
Location of Drawdown Pilot Lakes in Texas



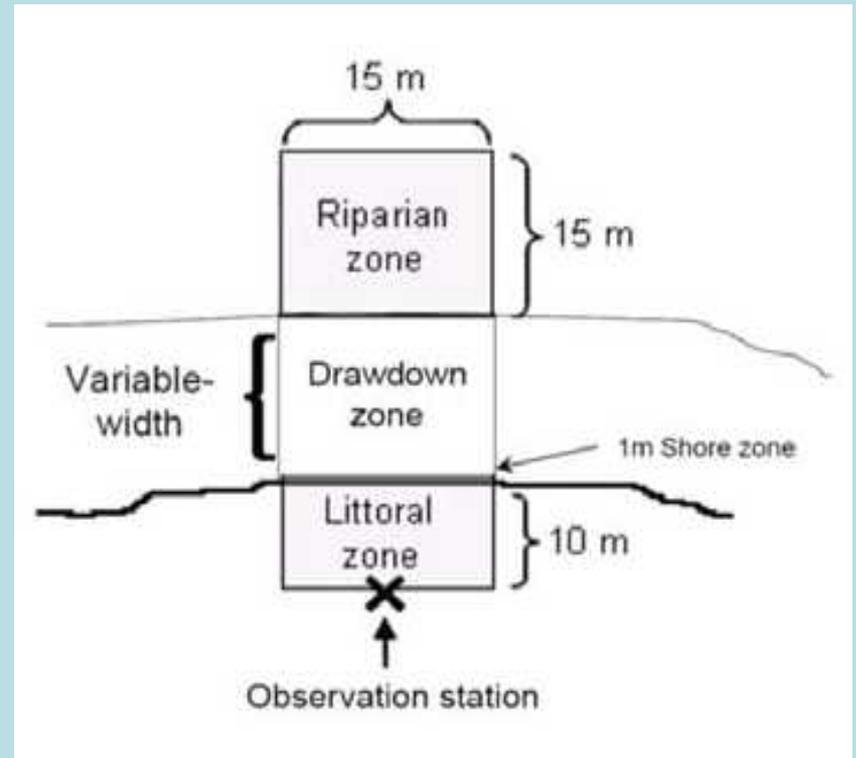
Sampling Locations

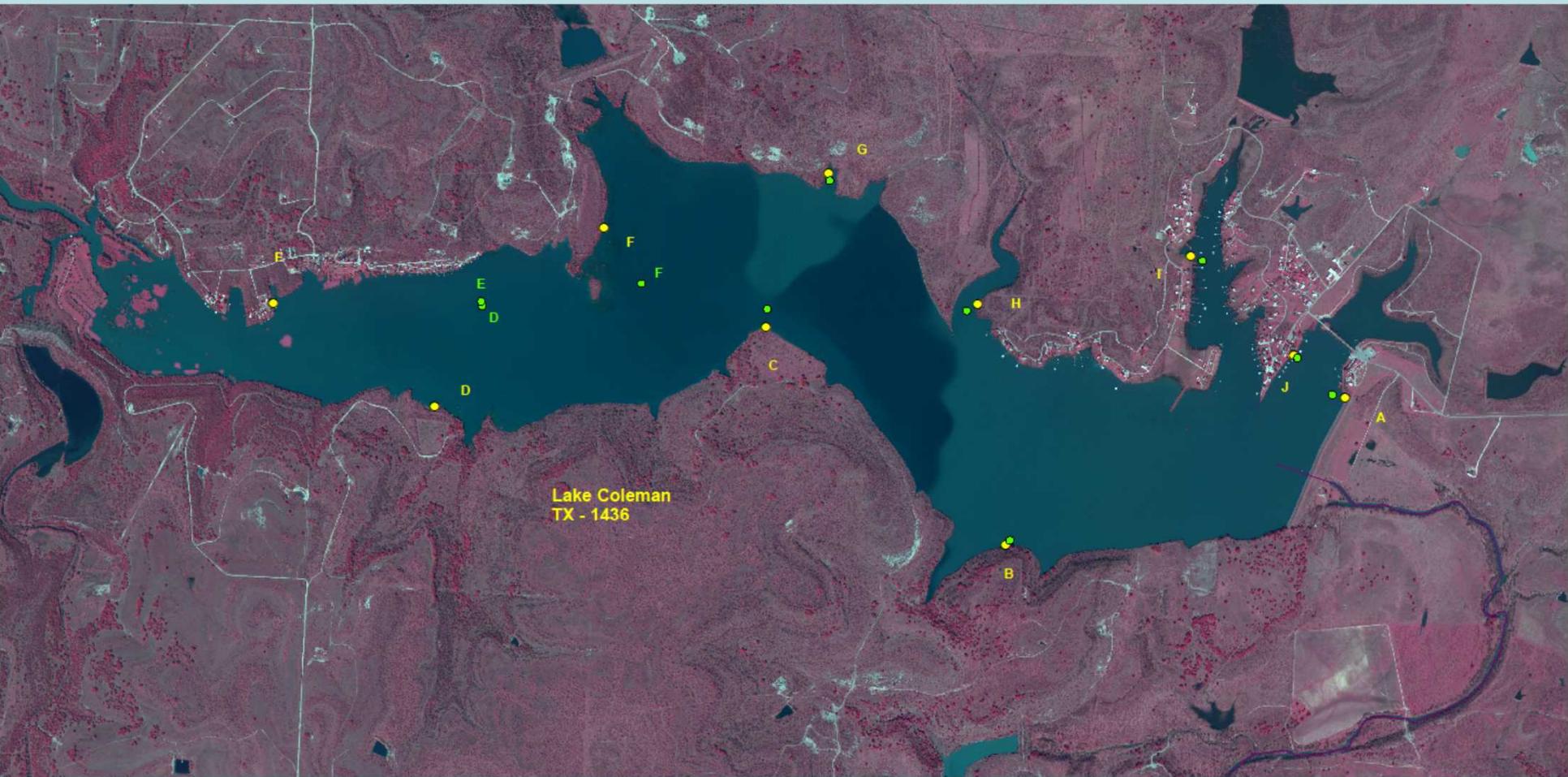


2007 NLA Survey



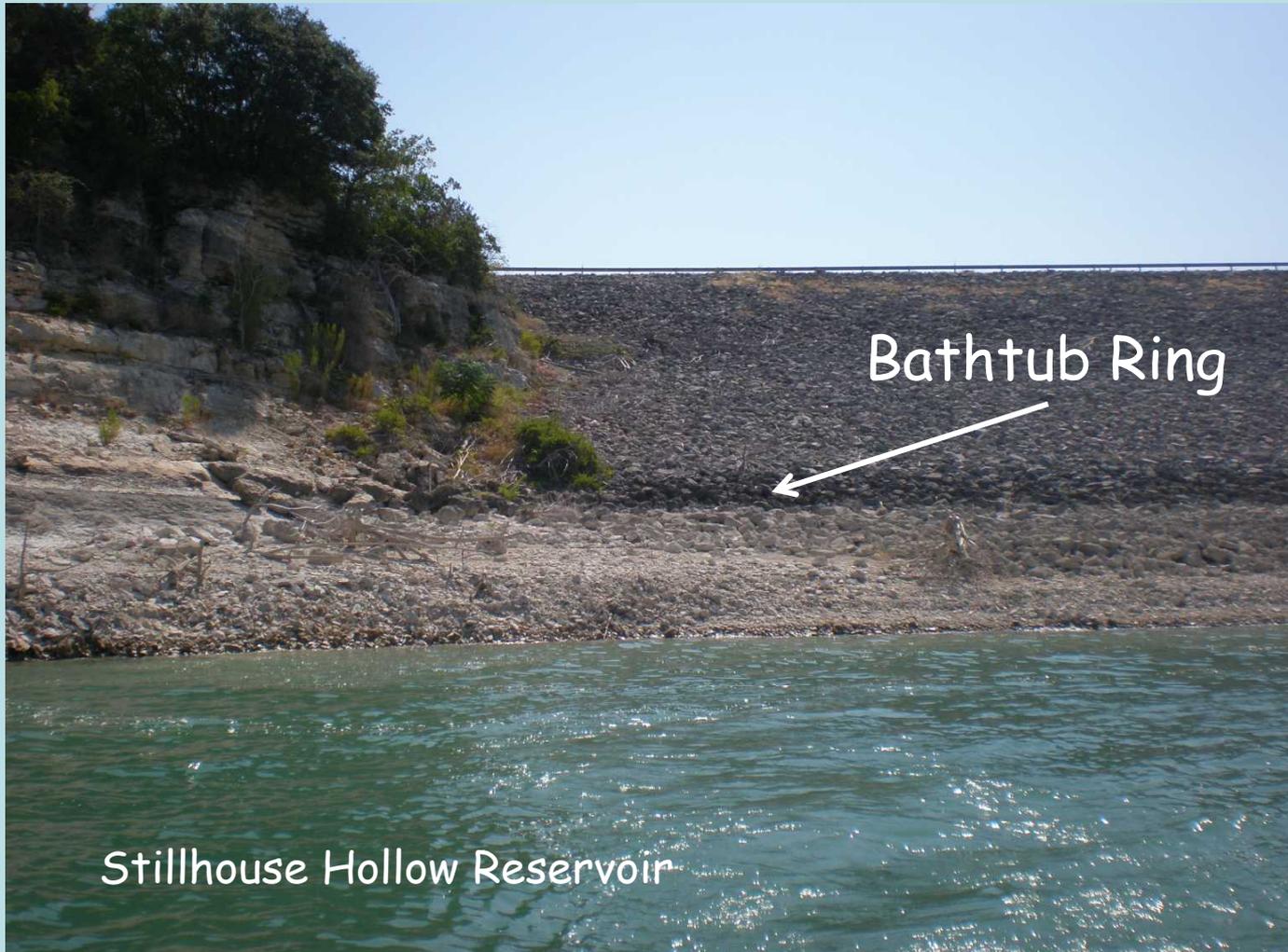
2012 NLA Survey





Map of Lake Coleman, Texas comparing selected sites from GIS (yellow) to location of sites that were accessible in the field (green)

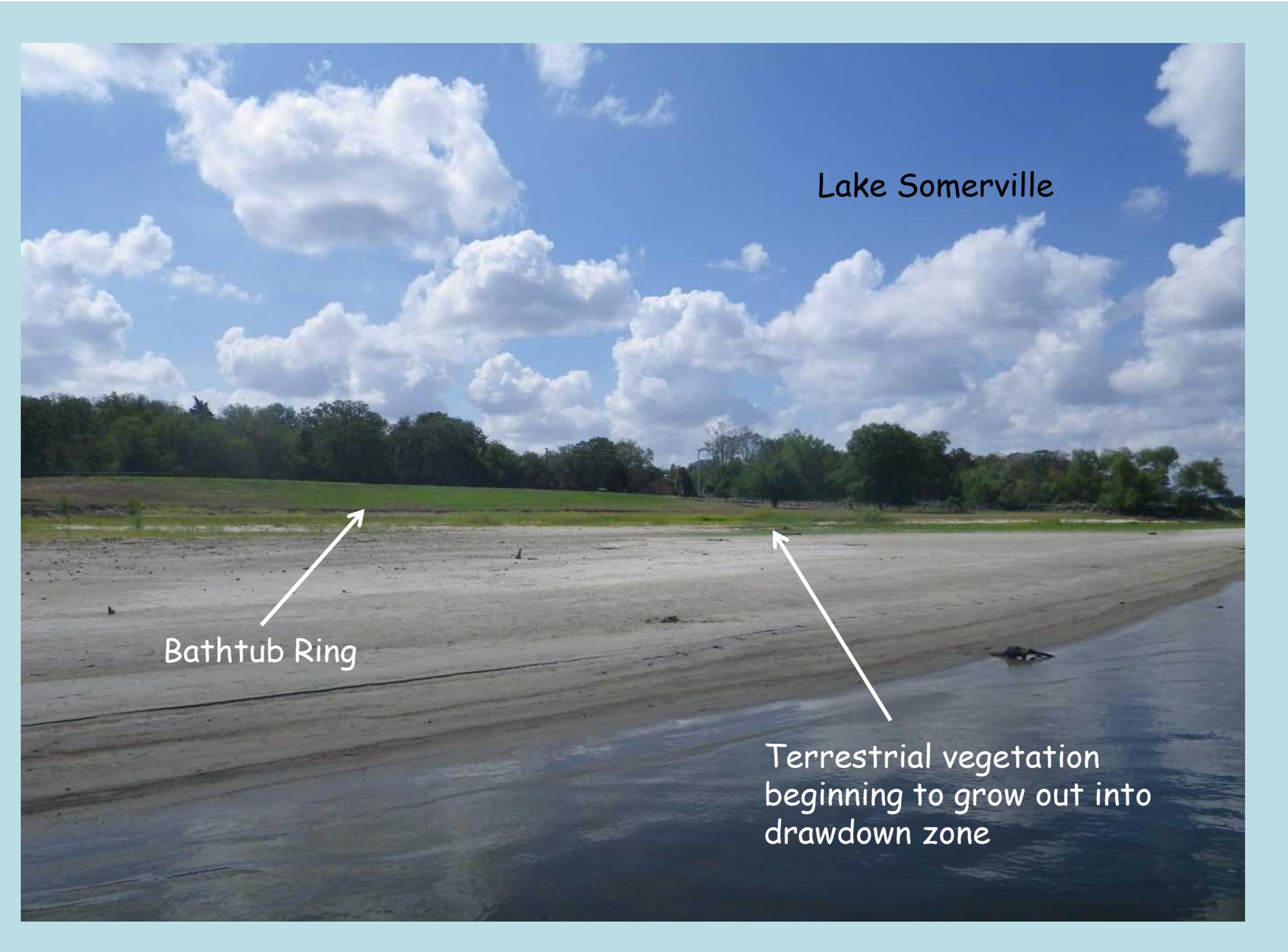
First evidence of drawdown or flooding is presence or absence of a "bathtub ring"



Bathtub Ring



Stillhouse Hollow Reservoir

A photograph of a lake shoreline under a blue sky with white clouds. The foreground shows a sandy beach with a dark, wet area near the water's edge. A line of green grass and low vegetation is visible in the middle ground, and a dense line of trees is in the background. Two white arrows point from text labels to specific features in the landscape.

Lake Somerville

Bathtub Ring

Terrestrial vegetation
beginning to grow out into
drawdown zone

Changes in Shoreline Condition Measurements Due to Drought

- Exposed elements such as aquatic macrophytes, pier pilings, boulders, and woody debris are no longer available in littoral zone for fish habitat
- True riparian zone now far from shoreline and may no longer provide adequate buffer from run-off
- Exposed substrate sediments in drawdown zone may be eroded by wind or rain causing future changes in shoreline vegetation composition

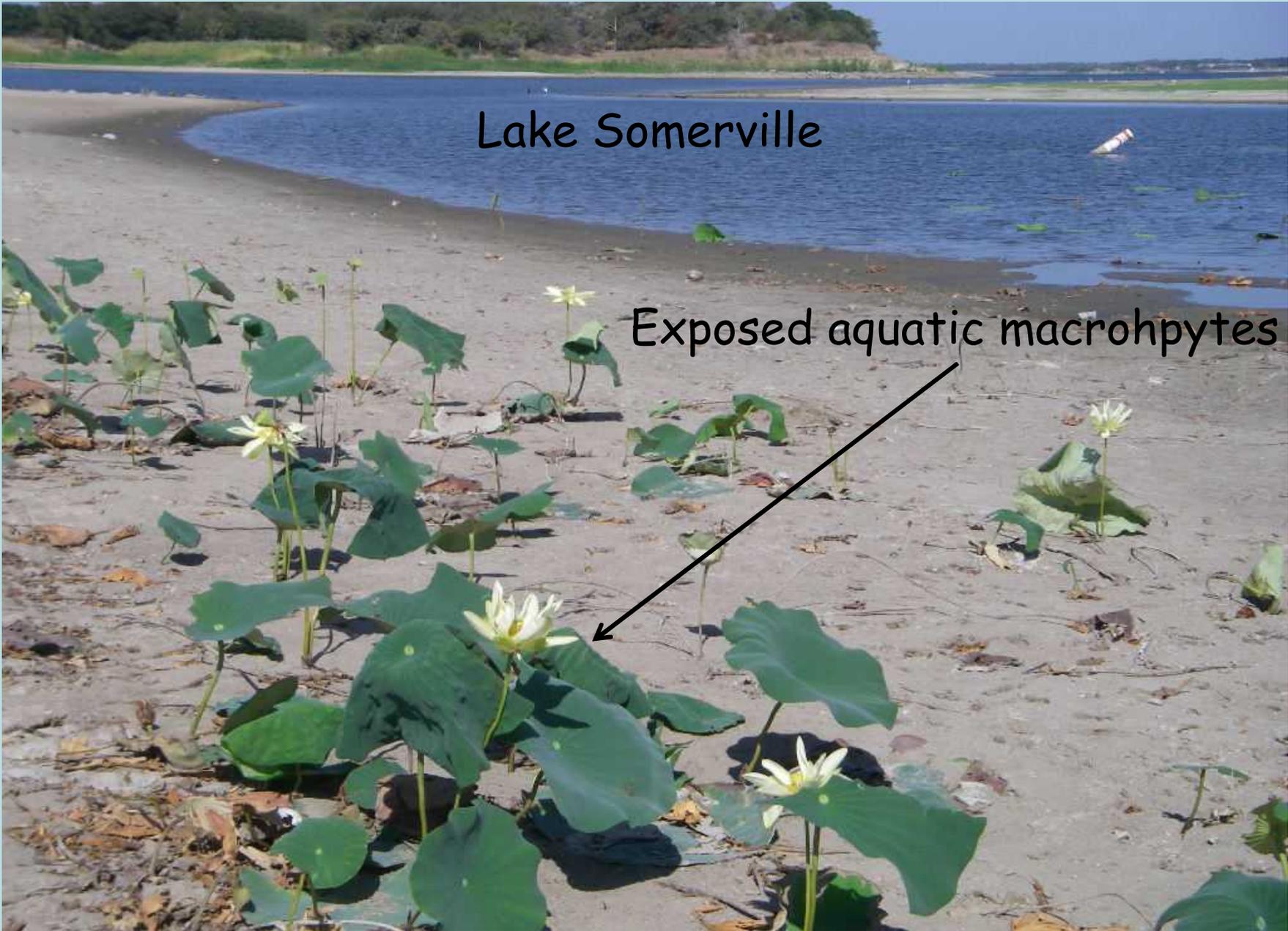
Stillhouse Hollow Reservoir

Instead of rocky shoreline, now shoreline is exposed aquatic macrophytes



Lake Somerville

Exposed aquatic macrophytes



Lake Somerville

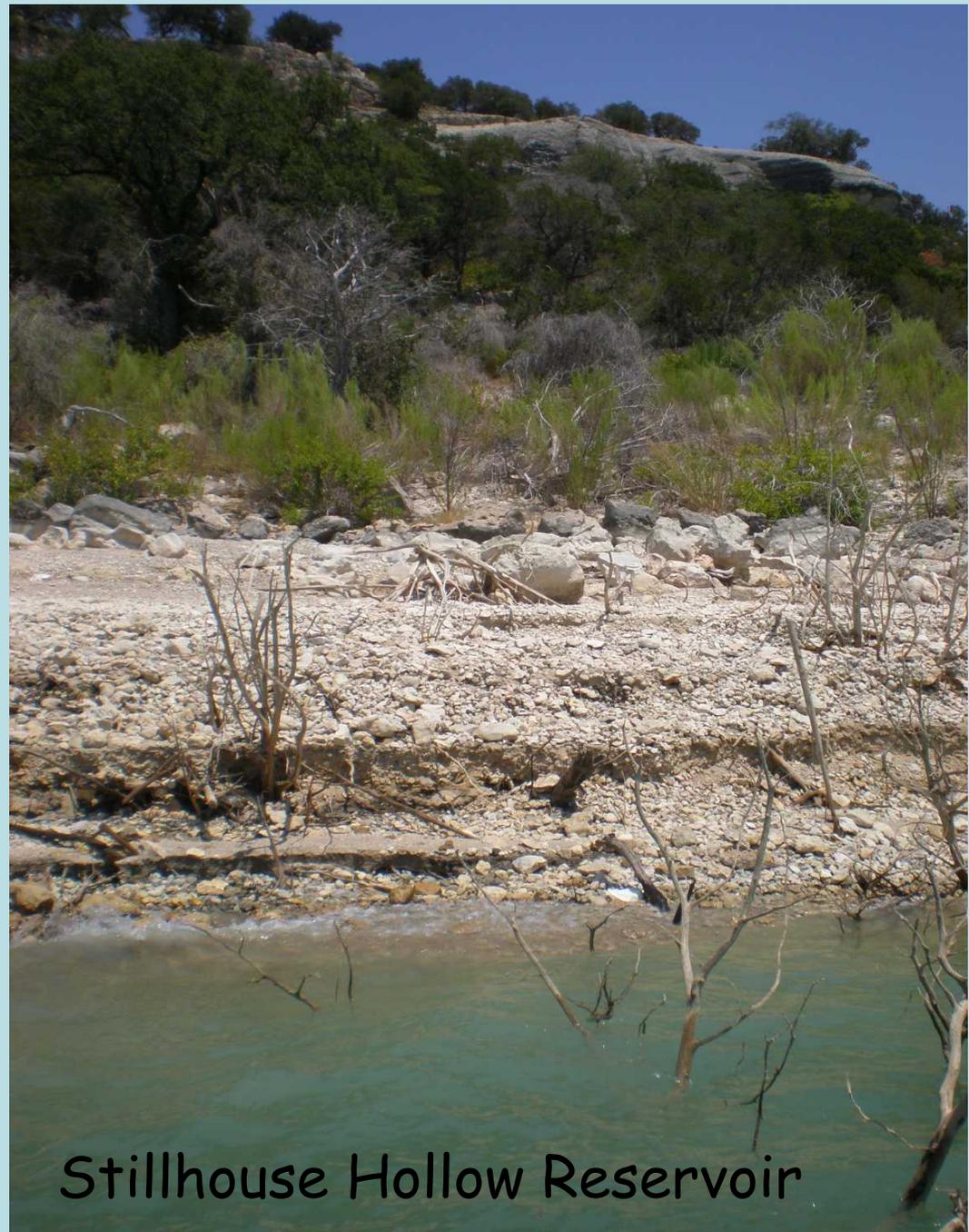
Exposed substrate sediments



Lake Somerville



When steep shorelines are exposed, scouring is much more likely during heavy rain events



Stillhouse Hollow Reservoir

Measuring drawdown distance and elevation





Flooded Crops

Miller Creek Reservoir in north Texas



Flooded Terrestrial Trees

Many lakes were flooded in 2007 due to summer rains across Texas



Example of Lake Somerville flooded in 2007

JUL 19 2007



Same picnic table

Example of same Lake Somerville site in drought in 2011



Braunig Lake - constant level reservoir
experiences no drawdown effects

A photograph of a dam structure made of large grey rocks, with a body of water (Braunig Lake) in the foreground. The sky is blue with scattered white clouds. In the background, there are several high-voltage power line towers and a few streetlights. The water is dark blue and reflects the sky. The dam extends from the left side of the frame towards the right, curving slightly. The water is calm with some ripples. The overall scene is a typical view of a dam and its reservoir.

Braunig Lake at the dam

Note absence of bathtub ring

Braunig Lake

Note woody debris contribution from terrestrial sources is constantly available for aquatic habitat



How will the NLA Benefit From the Pilot Survey?

- Will better quantify shoreline habitat condition
- Will allow for delineation of drought or flooding zones along shoreline
- Will result in a more accurate national report when explaining lake shoreline impacts across the country
- Will possibly save restoration resources in areas where shoreline degradation was identified, but has since been determined to be caused by flood or drought effects

Acknowledgements

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 - Bill Harrison, Art Crowe, Kirk Fleener, Christine Kolbe - TCEQ, SWQM Program
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 - Phil Kaufmann - EPA, ORD, Corvallis, OR
 - Members of the NLA 2012 Physical Habitat Subcommittee



Jenny Seeger on Lake Somerville

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