Landa Lake Invasive Species Removal Project

SWCA Environmental Consultants
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Introduction

- The Edwards Aquifer
  - Artesian aquifer system provides drinking water and recreational water sources to San Antonio, Austin, San Marcos, New Braunfels
  - Recharge and contributing zones are generally associated with the Texas Hill Country
  - Springs provide habitat for several endangered species


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Endangered Springs Species

Common Name	Binomen	Listing Status
Fountain darter	*Etheostoma fonticola*	Endangered
San Marcos gambusia	*Gambusia georgei*	Endangered
Texas blind salamander	*Typhlomolge rathbuni*	Endangered
Comal Springs riffle beetle	*Heterelmis comalensis*	Endangered
Comal Springs dryopid beetle	*Stygoparnus comalensis*	Endangered
Peck's Cave amphipod	*Stygobromus pecki*	Endangered
Texas wild rice	*Zizania texana*	Endangered
San	*urycea*	ned

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EAA HCP

- Edwards Aquifer Authority (EAA) Habitat Conservation Plan (HCP) February 2013
  - Supports Incidental Take Permit for activities associated with regulating and pumping of groundwater from the Edwards Aquifer
  - Developed through a stakeholder consensus process (utility, environmental, municipal, agricultural, industry)
  - Permit holders:
    - Edwards Aquifer Authority
    - San Antonio Water System
    - City of San Marcos
    - City of New Braunfels
    - Texas State University

Rehabilitation Activities

- City of New Braunfels
  - Old channel restoration
  - Flow split management
  - Aquatic vegetation restoration
  - **Non-native animal species control**
  - Decaying vegetation removal
  - Restoration of riparian zones and riffle beetle habitat improvement
  - Gill parasite control
  - Household hazardous waste program
  - Litter control and floating vegetation management
  - Golf course management plan

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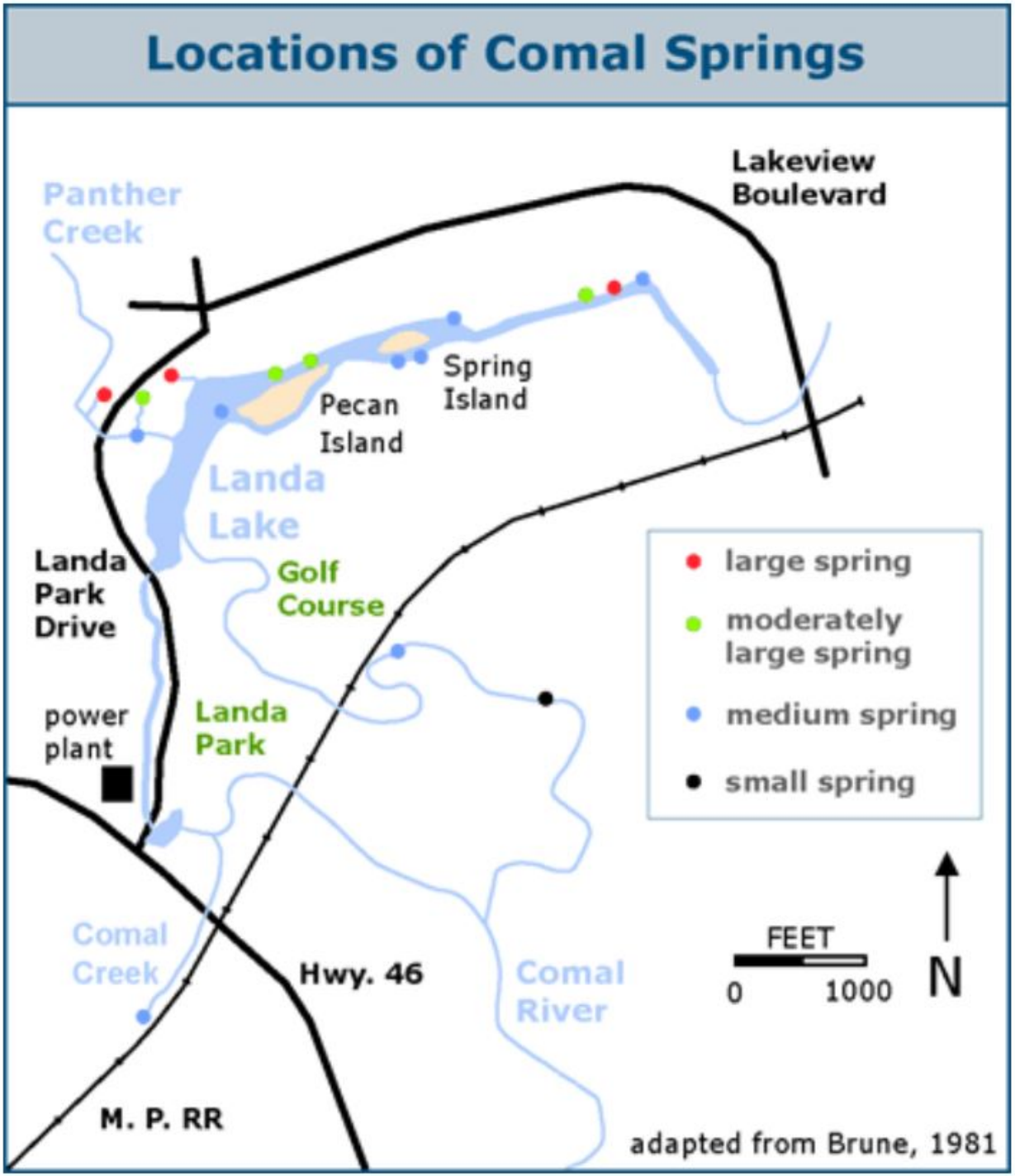
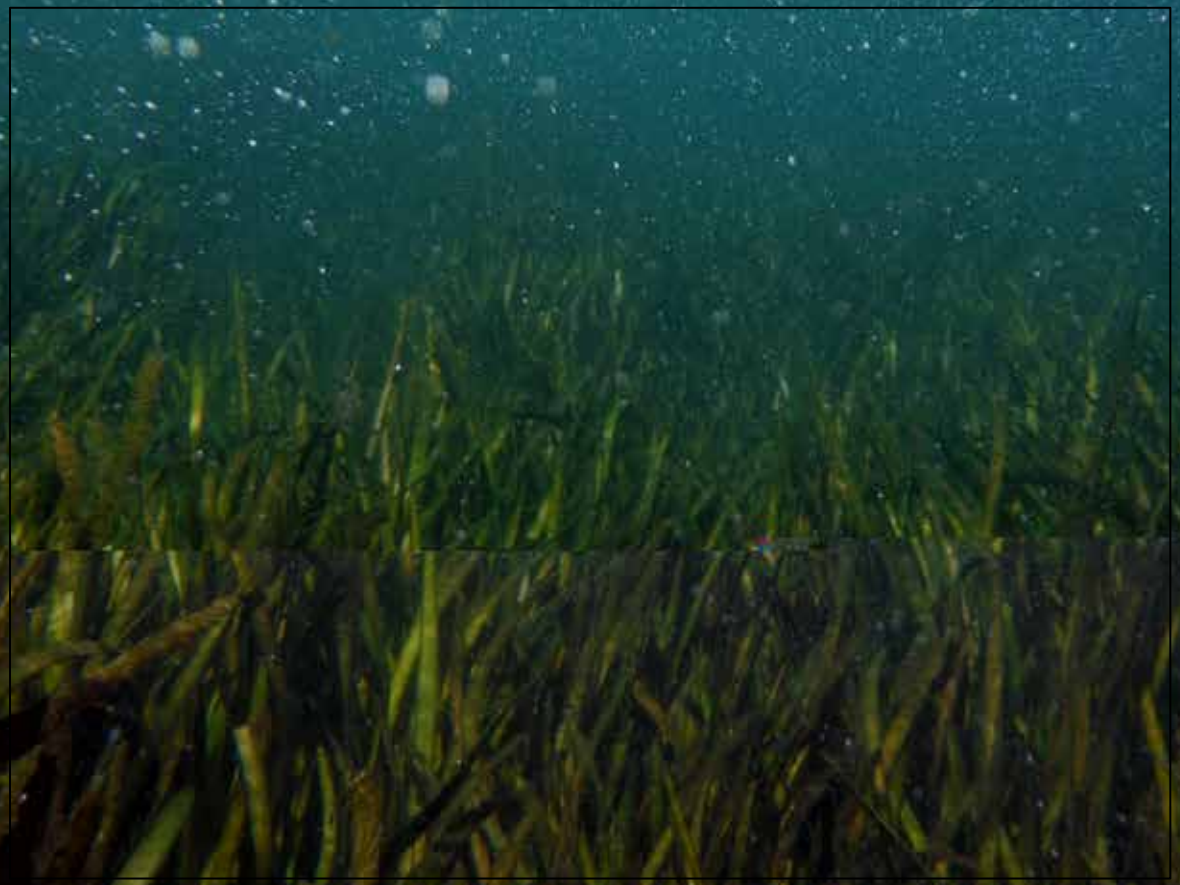
Locations of Comal Springs



Into the Water We Go!



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Invasive Species Removal

- Giant ramshorn snail (*Marisa cornuarietis*)
- Armored catfish (*Pterygoplichthys disjunctivus*)
- Tilapia (*Oreochromis aureus*)
- Nutria (*Myocastor coypus*)

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Primary Ecosystem Concerns

- Degradation of shoreline habitat – nutria
- Damage to native vegetation – all
- Displacement of native fishes – tilapia, armored catfish
- Consumption of endangered species – all
- Competition with endangered species – all

Removal Methods

- Nutria – live trapping and culling
- Armored catfish – spear fishing
- Tilapia – fyke nets and spear fishing
- Ramshorn snails – hand gathering

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Progress to Date

Species	Number Removed	Mass (kg)
Tilapia	2,250	2,112.0
Armored catfish	391	424.4
Nutria	40	220.34
Giant ramshorn snails	1,182	7.7
Total	**3,863**	**2,764.44**

- Reduced detection of exotics
- Removal of ≈3.0 tons of biomass
- Increased detection of natives fish species

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Thanks

- City of New Braunfels
- Edwards Aquifer Authority
- SWCA team members

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Questions are Welcome