Shoreline Stabilization

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Hydrology – makes life a little challenging....

Aquatic ecosystem restoration/habitat enhancement

Navigation
Flood Risk Management
Water Operations
What is it about hydrology that is so troublesome for water resource managers?

- Water - you either have it or you don’t
  - Regional variability (east coast to west coast)
  - Seasonality (spring, summer, fall, winter)
  - Flow regime
  - Water rights (surface water/ground water)

- When you do get it - not sure what you’re gonna get along with those H₂O molecules – i.e. excess nutrients, toxic contaminants, debris (not the good kind that helps to stabilize shorelines, but mostly trash)
For those of us working in lacustrine ecosystems... it means we encounter a lot of this.
I need a diet coke.

We’re totally screwed!
But what we really want is this... stable shorelines that provides ecosystem goods and services, i.e. habitat for wildlife; excellent water quality.
Switchgrass along the shoreline of Lake Aquilla, TX
What are common issues that cause shoreline erosion (an otherwise natural process) or more importantly, shoreline instability?

- Sediment transport (erosion vs. accretion)
  - Geology generally drives this – unconsolidated material (sand, gravel, clay, silt); consolidated material like bedrock
- Storms
  - Surface water runoff; long term inundation causing die-off of riparian/terrestrial vegetation; ice/wind; gully formation
- Wave energy
  - Splash, overwash, sediment drift; can be intensified with hard structures i.e. bulkheads.
Anthropogenic influences

- Development that increases impervious surfaces
- Control structures/bulkheads/revetments (↑ wave energy)
- Removal of riparian/aquatic vegetation along shoreline
  - Includes native or invasive vegetation
- Water operations
  - Navigation
  - Flood risk management (WATER LEVEL FLUCUATIONS)
  - Recreation (↑ wave activity)
What is a LIVING SHORELINE?

"A shoreline management practice that provides erosion control benefits; protects, restores, or enhances natural shoreline habitat; and maintains coastal processes through the strategic placement of plants, stone, sand fill, and other structural organic materials (e.g. biologs, oyster reefs, etc).” (NOAA)
Living shoreline
Navarro Mill Lake, Purdon, TX
What are some techniques to stabilize sediments to achieve a LIVING SHORELINE?

Other than minimizing disturbance and avoiding hard armoring…

- Soft armoring in low energy areas – degradable materials (coir), vegetation

- Mix of both hard infrastructure and vegetation in moderate to high energy areas - i.e. riprap planted with high stability rated vegetation; high density outplantings of suitable woody/emergent/submersed vegetation
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**SR - Stability Ratings (Draft) on a scale of 1 – 10.** Based on USFS GTR-47, by Al Winward. Bare ground has a SR of 1. Anchored rock or logs have a SR of 10. A SR of 7 (or 6) is considered the minimum for acceptable bank stability. Woody plants, when associated with stabilizing grasses and sedges provide a higher stability rating that shown.

Lady Bird Lake, Austin, TX - 2014

Outfall - 2012
Bioengineering Pilot Project with City of Austin and LAERF - 2009

Objective: Test living shoreline approach to stabilize shoreline and restore habitat function – biodegradable material (coir logs) and wetland vegetation (Clamann – COA)
Bioengineering Pilot Project with City of Austin and LAERF - 2009

Results of plantings in control and in coir bays:

Pickerelweed - none remaining after 4 years

American bulrush - none remaining after 4 years

American water-willow - in control = avg 50 stems/bay in coir bays = avg 247 stems/bay
Bioengineering Pilot Project with City of Austin and LAERF - 2009

After 5+yrs coir logs partially remain (even in a high wave-action zone)

Sep 2009  Oct 2014
Large Scale Implementation with City of Austin and LAERF - 2014

2014

2,100 feet of shoreline (600 logs)

2015

2009 coir bay in 2015
Experimental strategies for outplanting in reservoirs with fluctuating water levels...

Acropetal – growth or development upward from base or point of attachment – outward toward shoot and root apex...

Experimental strategies for outplanting in reservoirs with fluctuating water levels...

Chasing water levels with deeper containerized rhizomatic plants

522-ft
520-ft
518-ft

16-18" deep container

shoreline

saturated zone

lake bottom
Reservoir
Fish Habitat Management

a project of the

Chapter 16
Streambank and Shoreline Protection

Monitoring the Vegetation Resources in Riparian Areas

Alisa H. Winward

Suggested citation:
References/helpful links:


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