

PC C+O 5/18/10

Status Update: Staff Review of Shoreline Modification and Shoreline Access



**Andrew Clamann – Environmental Scientist, WPD, ERM
Environmental Board May 19, 2010**

Presentation Objective:

Staff development of code changes for trams and bulkheads – where are we now?

- **Background**
- **Proposed Code Changes**
- **Pilot Study**
- **Guidance for Bulkhead Alternatives**

Background - History

2



July 15, 2009 – Environmental Board resolution

Aug 25, 2009 – Parks Board resolution

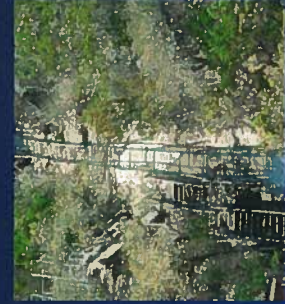
Oct 27, 2009 – Planning Commission initiates staff development for necessary changes in order to...

- clarify shoreline protection requirements
- prevent vertical bulkheads
- promote stable shorelines that provide native vegetation, environmental function and geomorphology
- to be processed in conjunction with code amendments relating to trams already under staff review

Apr 27, 2010 – Parks Board presentation for code changes

Background - Problems

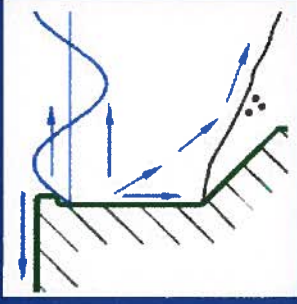
3



Trams

Development regulations not clear in code

- Potential impacts to CEFs, erosion, water quality



Bulkheads

Wave reflection

- redirects energy out and down (USACE 2002)
- increases lakebed erosion (Engle 1998, Herder 2007)



Reduces water quality

- increases turbidity (NOAA 2007)
- eliminates wetland plants (Engle 1998)



Degrades aquatic habitat

- removes shallow water habitat (Herder 2007)
- reduces productivity (Kahler, Grassley 2000)



Nonpoint Source

News-Notes

February 2010, #89

*The Condition of the Water-Related Environment
The Control of Nonpoint Sources of Water Pollution
The Ecological Management & Restoration of Watersheds*



Notes on the National Scene

First National Lakes Assessment Released

EPA (2010) - The first National Lakes Assessment supports this type of initiative

- “our lakes remain vulnerable to excess human disturbances, especially along the lake-shore”
- “local, state and national initiatives should center on protecting shoreline habitats, particularly maintaining vegetative cover and controlling development”
- “poor habitat condition along the lakeshore is the most significant stressor in lakes”
- “removing trees and shrubs and constructing docks, marinas, homes and other structures along shorelines all contribute to degraded lakeshore habitat”
- “poor biological health is three times more likely in lakes with poor lakeshore habitat than in lakes with good habitat”

Available at: <http://www.epa.gov/NewsNotes/pdf/89issue.pdf>

Background - Solutions

5



Trams

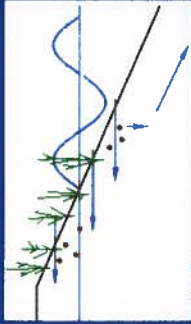
Require Site Plan and Building Permit

- Site plan review, zoning, code and criteria

Bulkheads

Non-vertical approach <45°

- Vegetation and slope absorb wave energy
(Gray and Sotir 1996, Gable et al. 2008)



Incorporate Vegetation

- Wetland plants consume nutrients (NRC 1995)
- Reduce turbidity (Kahl 1993, Vestergaard 2000)
- Microorganisms and plants sequester toxins (Hammer 1989)



Protect aquatic integrity

- Microorganisms and invertebrates (Dodds 2002, Baker 1986)
- Juvenile and adult fish (Wiley et al. 1984, Killgore et al. 1989)
- Shorebirds, amphibians, reptiles (Hammer 1989, Mitsch 1993)

Proposed Code Changes

6

Chapter 25-2, Subchapter C, Article 13 (Boat Docks)

- Change Article title to “Docks, Bulkheads and Shoreline Access”
- Name change: ~~Town Lake~~ → Lady Bird Lake
- Prohibit new boat ramps
- Prohibit storage of toxic or hazardous materials over water (fuel, oil, herbicides, insecticides, fertilizers)

Chapter 25-8-92 (Critical Water Quality Zones)

- Further clarify that inundated areas are part of the CWQZ

Proposed Code Changes for Trams

7

Chapter 25-2, Subchapter C, Article 13 (Boat Docks)

- Add applicability this article and Chapter 25
- Definition for shoreline access (trams)
- Require site plan and building permit for shoreline access
- Require a licensed third party inspection (meets State regs)
- Trams must minimize disturbance to vegetation, preserve canopy, replace herbaceous ground cover

Section 25-2-1066, (Screening Requirements)

- Trams must be screened from the view of property that is in an urban residence (SF-5) or more restrictive zoning district by providing vegetation and tree canopy as prescribed by rule.

Proposed Code Changes for Bulkheads

8

Chapter 25-2, Subchapter C, Article 13 (Boat Docks)

- Definition for bulkhead
- No vertical face >45° for any portion greater than 1ft
- Methods and materials in ECM
- Prohibit capturing or recapturing of land
(consistent with LCRA policy on the Highland Lakes)

Chapter 25-5-2 (Site Plan Exemptions)

Site plan not required for maintenance if....

- Structure was legally constructed
- No variance is required, no change to footprint
- Addition or replacement is <10% or ≤20 linear feet

not to exceed

Pilot Study

9

Coir (coconut husk) fiber rolls

- Low material cost (logs ~ 5 \$ per linear foot)
- Commonly used in Austin stream restoration
- Strong and biodegrade slowly
- Allow plant growth

Will coir logs work on Lake Austin?



Pilot Study

10

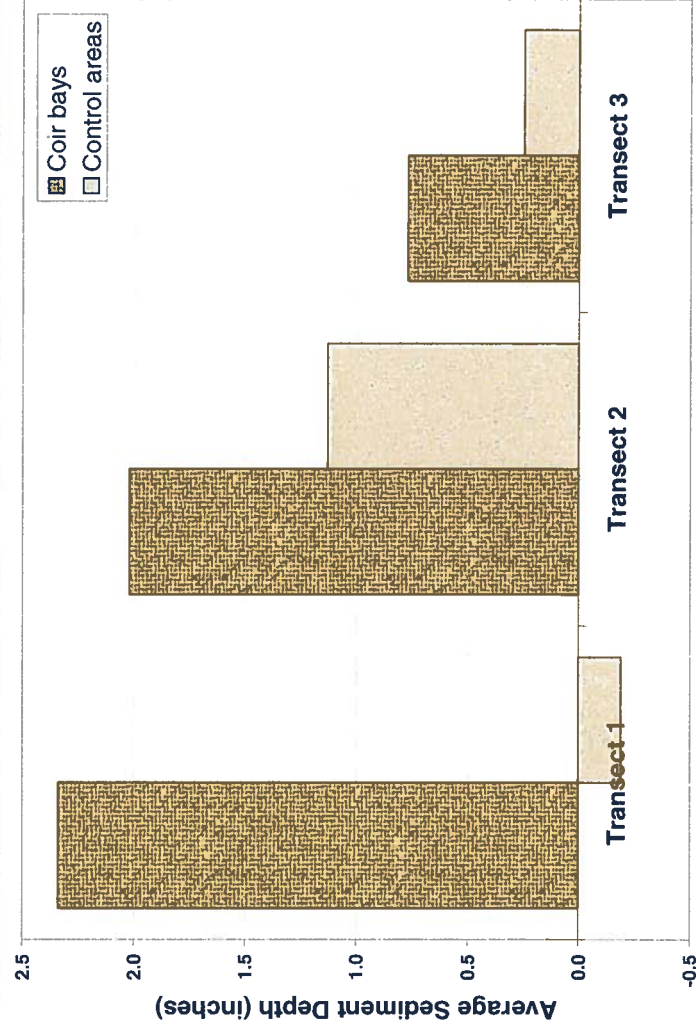


Justicia americana

- Six months of positive results!
- Monitoring 4 sites since September
 - Coir logs have maintained integrity
 - *Justicia* (plant) in Lake had 86% survival
 - Significant shoreline stabilization



>6" of deposition
behind coir log!

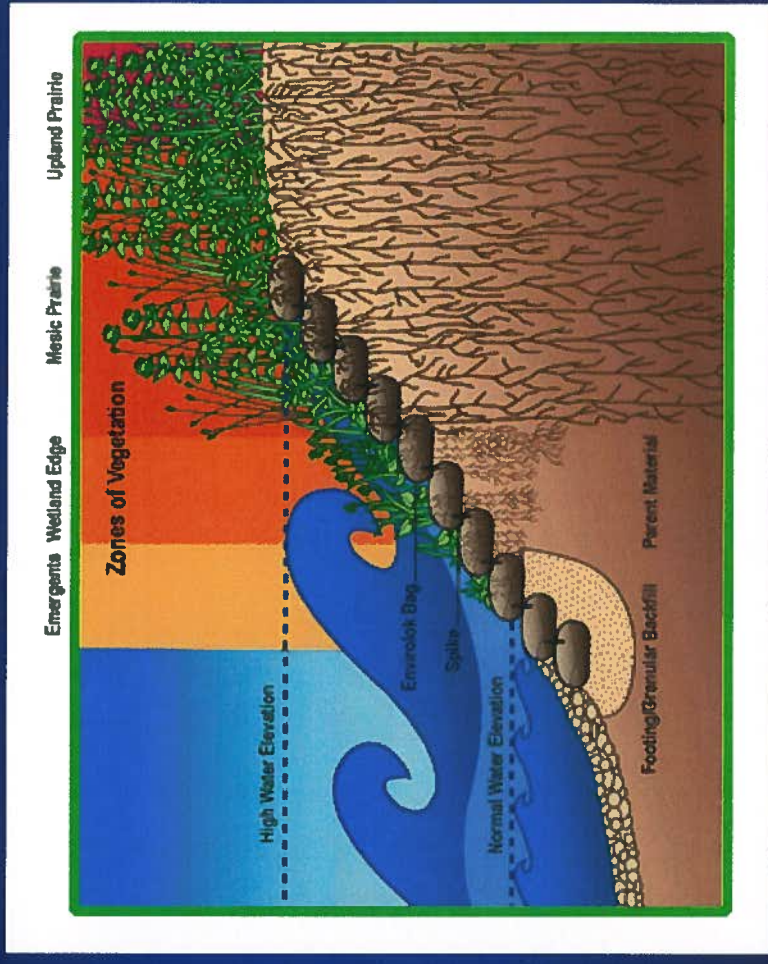


Alternatives

11

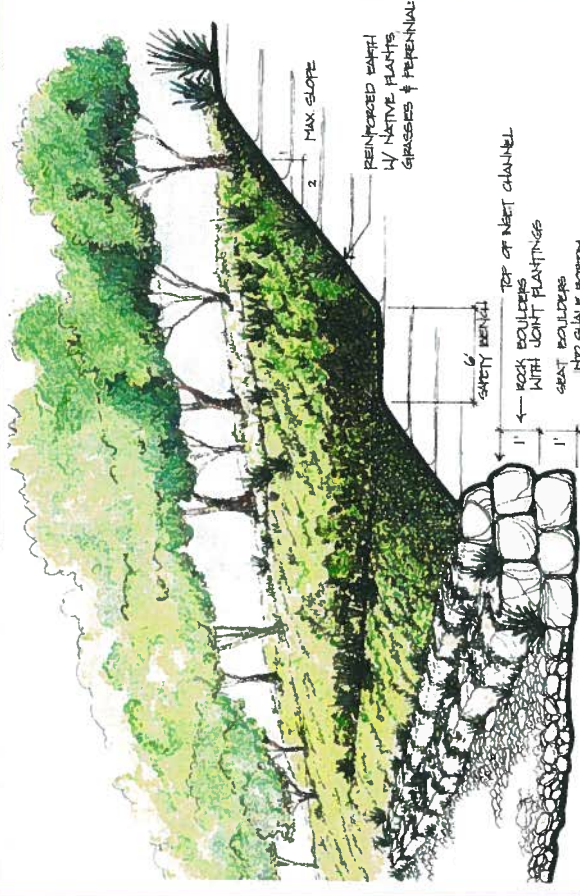
Several bioengineering methods in the literature and federal guidance*

- vegetated geogrids
- vegetated crib walls
- mechanically stabilized earth
- rip rap with joint plantings
- vegetated gabion baskets
- soil lifts
- turf reinforcement mats
- coir fiber rolls and mattresses



* (Gray and Sotir 1996, USACE 2002, USDA 1996)

Guidance is currently available from the federal government, regional authorities, professional organizations and in the private industry



Reinforced Earth Treatment

The Shoreline Stabilization Handbook



for Lake Champlain
and Other Inland Lakes



Project Name Lakes of Shorebrook
Location West Palm Beach, FL
Product Landlok TRM 1061B
Application Lake Shoreline Protection
Owner Lakes of Shorebrook
Date September 1999
Contractor Richard Simpson
Distributor AET Environmental



825 Lee Highway, Suite 204 • Chesapeake, VA 23041
(410) 598-0444 • (800) 794-2244
FAX (410) 598-1818 • www.s1geo.com
© 2002 S1 Corporation
Printed in USA
010-PS-261

Lake shoreline erosion problem solved with Landlok® TRM

The Lakes of Shorebrook homeowners association faced losing up to a foot a year in shoreline due to erosion caused by wind-induced wave action and rain erosion (clipping, or soil loss under the vegetative cover). Because local ordinance standards in the West Palm Beach, Florida neighborhood prohibited the placement of hard armor for protecting shorelines, a soft armor solution was needed.

Local contractor Richard Simpson, along with Synthetic Industries and area distributor AET Environmental, studied ways to permanently protect the leading edge of the shoreline. The result was the use of Landlok® TRM 1061B in a wrapped-face application. This unique turf reinforcement mat has a lightweight nonwoven geotextile stitched to the back to aid in the reduction of sediment loss due to piping.

The TRM was placed along the shoreline, filled with sand, wrapped with sand, wrapped and stapled to the bank and covered with soil. Once in place, Landlok TRM 1061B created a permanent reinforced backing for the soil durable enough that it withstood the forces of a hurricane that season.

This solution was ideal because the amount of installation damage was minimal and the cost was a fraction of typical hard armor alternatives like cribwall, sheet piling, rock riprap and concrete revetment.

with soil. Once in place, Landlok TRM 1061B created a permanent reinforced backing for the soil durable enough that it withstood the forces of a hurricane that season.

This solution was ideal because the amount of installation damage was minimal and the cost was a fraction of typical hard armor alternatives like cribwall, sheet piling, rock riprap and concrete revetment.

This solution was ideal because the amount of installation damage was minimal and the cost was a fraction of typical hard armor alternatives like cribwall, sheet piling, rock riprap and concrete revetment.

This solution was ideal because the amount of installation damage was minimal and the cost was a fraction of typical hard armor alternatives like cribwall, sheet piling, rock riprap and concrete revetment.

This solution was ideal because the amount of installation damage was minimal and the cost was a fraction of typical hard armor alternatives like cribwall, sheet piling, rock riprap and concrete revetment.

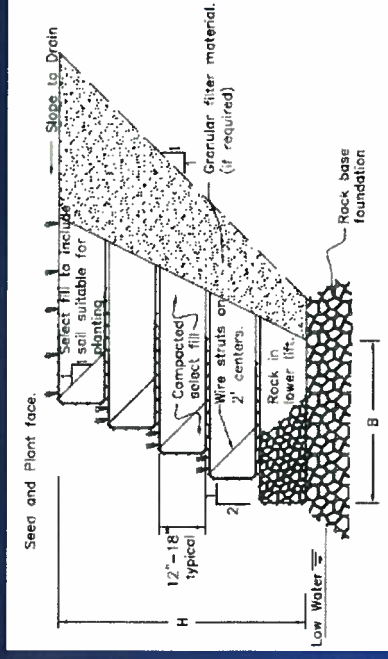
This solution was ideal because the amount of installation damage was minimal and the cost was a fraction of typical hard armor alternatives like cribwall, sheet piling, rock riprap and concrete revetment.



Landlok TRM 1061B was placed, filled with sand, wrapped as illustrated in the detail and staked. The result is a natural looking residential shoreline.

Guidance Example – USDA NRCS

13



Vegetated wire face MSE wall
with stone toe

Installation

Two years later



Guidance

14

Not only are several alternative methods available in technical guidance documents, but they are already on Lake Austin!



large boulders

small boulders

riparian vegetation



Vegetated, soil-filled gabions

graded rip rap

COA Guidance for Bulkhead Alternatives

15

Revise application packet

- assist development of docks/bulkheads/trams

New ECM section (currently in development)

- guidance for different materials and methods
- vetted through stakeholder process

Until then, guidance will be provided on a new City of Austin webpage:

- links to engineering manuals
- links to examples of alternatives
- links to literature and resources
- FAQ's
- and more!

Next Steps

16



LDC changes

- Interdepartmental Review for Code Changes (due May 19)
- Planning Commission (possibly June 22nd)
- City Council (possibly July 29th)

ECM new section

- Continue development of new section of the ECM
 - Additional study of wave action on Lake Austin
 - Additional study of near shore characteristics
 - Review alternatives
 - Provide guidance for choosing alternatives
- Presentations and Stakeholder Process for ECM Changes (Fall)

- Baker, J. H., and D. R. Orr. 1986. Distribution of epiphytic bacteria on freshwater plants. *Journal of Ecology*. 74: 155-165.
- Dodds, W. K. 2002. Freshwater ecology: concepts and environmental applications. Academic Press, San Diego, California.
- Engel, Sandy and Jerry L. Pederson Jr. 1998. The construction, aesthetics, and effects of lakeshore development: a literature review. Wisconsin Department of Natural Resources research report #177. Science Services Bureau Publications. WDNR PUBL-SS-577-99. Madison, Wisconsin. 46 pages
- Gabel, F., X.-F. Garcia, M. Brauns, A. Sukhodolov, M. Leszinski and M.T. Pusch. 2008. Resistance to ship-induced waves of benthic invertebrates in various littoral habitats. *Freshwater Biology*. (2008) 53: 1567-1578.
- Gray, D.H. & Sotir, R.B. 1996. *Biotechnical and soil bioengineering slope stabilization – A practical guide for erosion control*. John Wiley & Sons, Inc. New York, New York.
- Hammer, Donald A. 1989. *Constructed wetlands for wastewater treatment: Municipal, industrial, and agricultural*. Lewis Publishers. Chelsea, Michigan.
- Herder, Tom. 2007. "Living shorelines as alternatives to bulkheading/shoreline hardening." *Alabama Current Connection* 2(1). 1 page.
- Kahl, R. B. 1993. Aquatic macrophyte ecology in the upper Winnebago Pool lakes, Wisconsin. Wisconsin Department of Natural Resources, Technical Bulletin 182. Madison, Wisconsin.
- Kahler, Tom, Martin Grassley, and David Beauchamp. 2000. Final report on effects of shorezone development: A summary of the effects of bulkheads, piers, and other artificial structures and shorezone development on ESA-listed salmonids in lakes. Washington Cooperative Fish and Wildlife Research Unit, University of Washington School of Fisheries. Seattle Washington.
- Killgore, K. J., R. P. Morgan, and N.B. Rybicki. 1989. Distribution and abundance of fishes associated with submersed aquatic plants in the Potomac River. *North American Journal of Fisheries Management*. 9: 101-111.
- Mitsch, William J. and James G. Gosselink. 1993. *Wetlands*. Van Nostrand Reinhold. New York, New York.
- NOAA 2007. Shoreline protection alternatives. NOAA Sea Grant Mississippi-Alabama. Retrieved: October 05, 2009, from www.masgc.org/pdf/masgp/07-026.pdf.
- U S Army Corps of Engineers (USACE). 2002. U.S. Army Corps of Engineers Coastal Engineering Manual (CEM) EM 1110-2-1100 (Part V). Vicksburg, Mississippi.
- U S Department of Agriculture. 1996. Engineering Field Handbook. Chapter 16 Streambank and Shoreline Protection. National Resources Conservation Service. Retrieved: October 10, 2009, from <http://www.nrcs.usda.gov/technical/ENG/>
- Vestergaard, O., and K. Sand-Jensen. 2000. Aquatic macrophyte richness in Danish lakes in relation to alkalinity, transparency, and lake area. *Canadian Journal of Fisheries and Aquatic Sciences*. 57: 2022-2031.
- Wiley, M. J., R.W. Gorden, S.W. Waite, and T. Powless. 1984. The relationship between aquatic macrophytes and sport fish production in Illinois ponds: a simple model. *North American Journal of Fisheries Management*. 4: 111-119.