# WELCOME TO THE FEBRUARY EDITION OF THE 2019 M&R SEMINAR SERIES

#### **BEFORE WE BEGIN**

- SAFETY PRECAUTIONS
  - PLEASE FOLLOW EXIT SIGN IN CASE OF EMERGENCY
  - AUTOMATED EXTERNAL DEFIBRILLATOR (AED) LOCATED OUTSIDE
- PLEASE SILENCE CELL PHONES OR SMART PHONES
- QUESTION AND ANSWER SESSION WILL FOLLOW PRESENTATION
- PLEASE FILL OUT EVALUATION FORM
- SEMINAR SLIDES WILL BE POSTED ON MWRD WEBSITE (www. MWRD.org: Home Page ⇒ Reports ⇒ M&R Data and Reports ⇒ M&R Seminar Series ⇒ 2019 Seminar Series)
- STREAM VIDEO WILL BE AVAILABLE ON MWRD WEBSITE (www.MWRD.org: Home Page ⇒ MWRDGC RSS Feeds)

#### **ROBERT J. KIRSCHNER**

- Mr. Kirschner is *Director of Restoration Ecology* at Chicago Botanic Garden (CBG); Responsible for managing the CBG's Aquatics Program which includes water quality and aquatic habitat enhancement; shoreline restoration; creation of a preeminent collection of aquatic plants; and establishment of research, instruction and demonstration programs. Also responsible for oversight of environmental restoration and research in CBG's three other natural areas (oak woodland, prairie, and urban river corridor). *Principal Environmental Planner* with Northeastern Illinois Planning Commission.
- University of Illinois; Bachelors of Sciences Degree with Honors, Liberal Arts and Sciences/Aquatic Biology with advanced course work toward graduate degree.
- Numerous awards from USEPA and others: Professional Leadership Award (2002), Environmental Stewardship Award (2004), Conservation and Native Landscaping Award (2005), Outstanding Service Award (2007)
- Affiliated with many professional organizations: North American Lake Management Society; Illinois Lake Management Association; American Fisheries Society; Aquatic Plant Management Society

### Lessons Learned on Erosion Control in Shoreline Restoration







**Bob Kirschner** 

Curator of Aquatic Plant and Urban Lake Studies and Director of Restoration Ecology

#### **But What Will the Neighbors Think?**

Creating Lakeshore Landscapes That Are Easy on the Eye <u>and</u> Great for the Environment



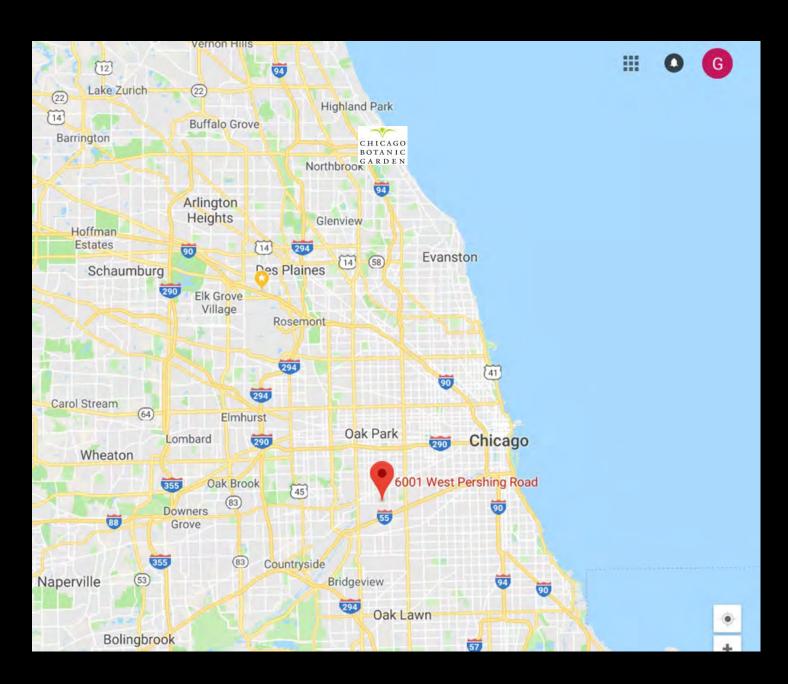


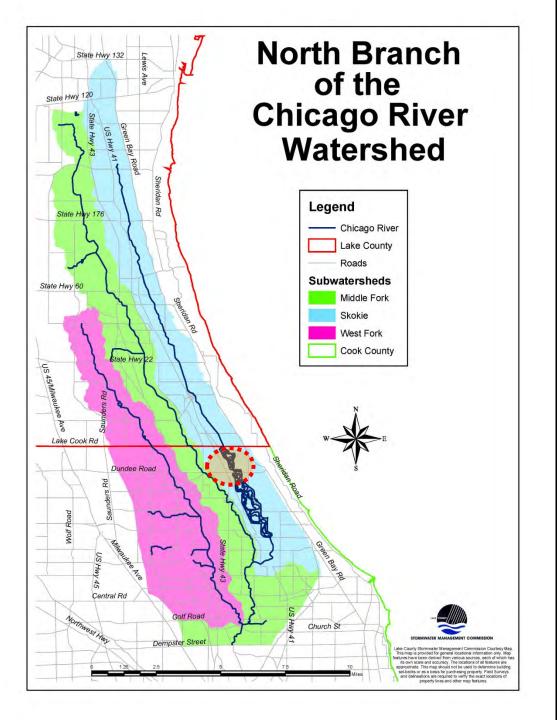
**Bob Kirschner** 

Curator of Aquatic Plant and Urban Lake Studies and Director of Restoration Ecology

#### Overview

- a closer look at the lakeshore edge
- a QUIZ?!
- bringing botany to your shoreline
- lessons learned at the Chicago Botanic Garden
- some great native plants for you to consider

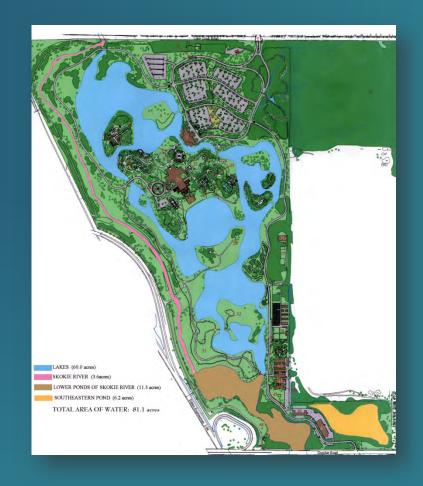






## Water is around every turn at the Chicago Botanic Garden . . .

- \* 81 acres of water (nearly 1/4 of our property)
- 60 acres of lakes
- 6 miles of lake shoreline
- Over 500,000 new shoreline plants



# The lake shoreline zone: rich in biodiversity



#### Some early troubles . . .

- Steep shorelines
- Unstable soils
- Fluctuating water levels
- Minimal biodiversity of shoreline plant communities
- Degraded water quality and aquatic habitat























## Conventional Approaches to Control Shoreline Erosion

Sheetpiling

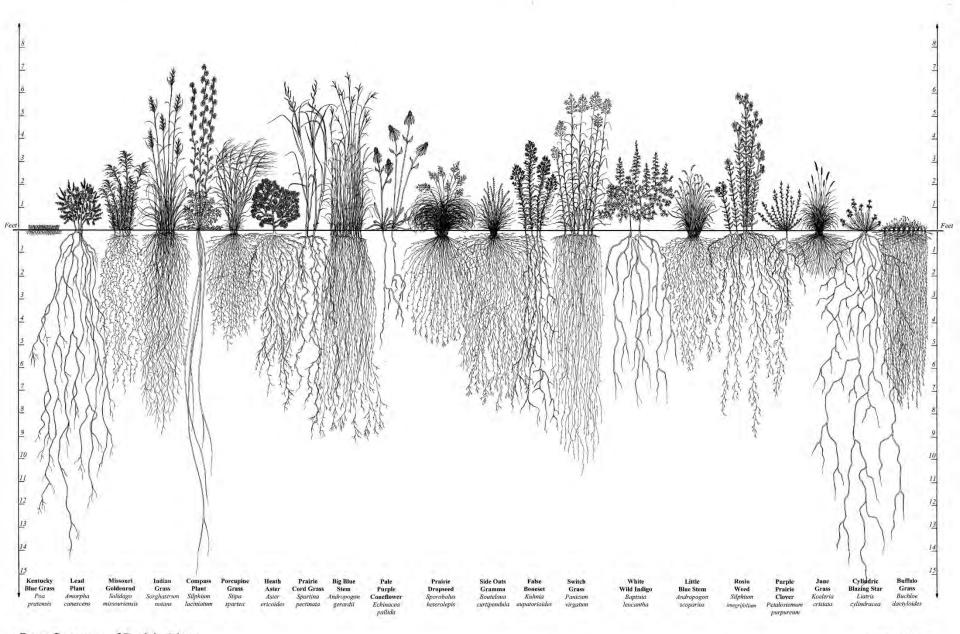
Stone riprap

Paving

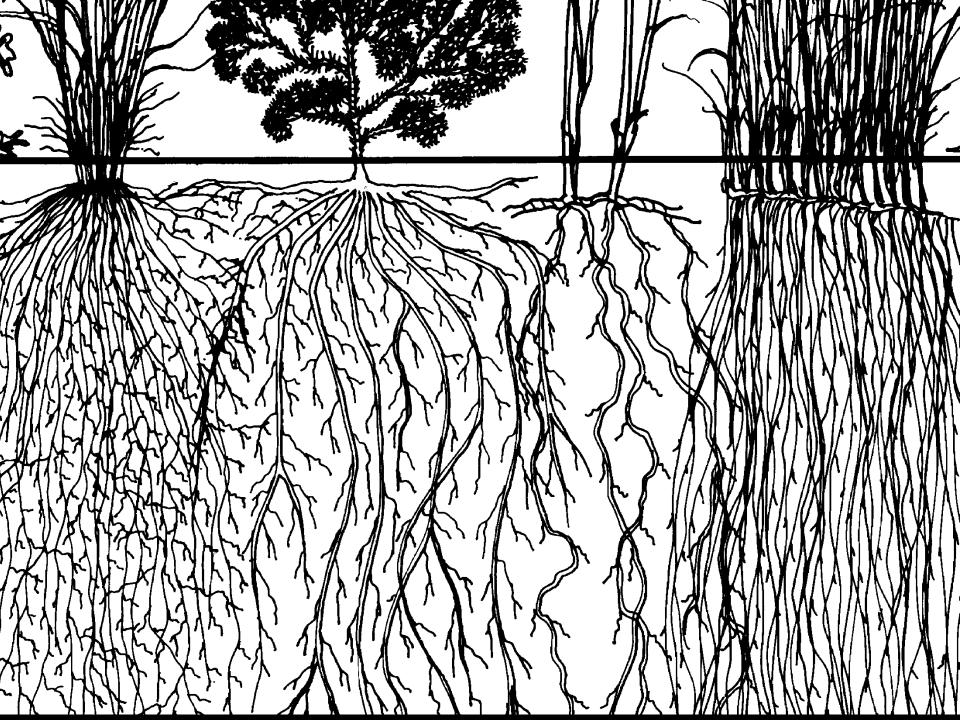


#### "Newer" approaches

- 1. Stabilize upslope erosion
- 2. Re-grade near-shore zones to flatter slopes
- 3. Aggressive shoreline planting
- 4. Protect new plantings
  - Biodegradable products (e.g., rolls of coconut husk) for short-term protection of new plantings
  - Non-degradable products (e.g., sheetpiling and riprap)
     for severe situations but in tandem with aquatic planting



Root Systems of Prairie Plants









Joan Iverson Nassauer, FASLA
Professor of Landscape Architecture
University of Michigan
Natural Resources and Environment

www-personal.umich.edu/~nassauer

#### Joan Iverson Nassauer, FASLA

Home

Lab Students

**Publications** 

Courses Taught

CV

Contact















Joan Iverson Nassauer
Phone: (734) 763-9893
nassauer@umich.edu

Students in the lab





Professor of Landscape Architecture

University of Michigan, School of Natural Resources and Environment

Co-Editor-in-Chief, Landscape and Urban Planning

Joan Iverson Nassauer works in in the field of ecological design. She develops design proposals to improve ecosystem services, and she uses social science methods to learn how human experience affects and is affected by landscapes. A Fellow of the American Society of Landscape Architects (1992) and a Fellow of the Council of Educators in Landscape Architecture (2007), she was named Distinguished Scholar by the International Association of Landscape Ecology (IALE) (2007) and Distinguished Practitioner of Landscape Ecology (1998) by US - IALE. The strategies she has developed for basing ecological design on strong science and interdisciplinary collaboration have been applied internationally.

This post on the London School of Economics American Politics and Policy blog describes some recent urban work.

An early discovery and continuing theme of her research is that evidence of human care in the landscape has a powerful normative effect on human perceptions and behavior to change landscapes. Her research has influenced green infrastructure design, ecological restoration, urban and rural watershed management, transportation planning, and the development of metropolitan neighborhoods and brownfields. The author of more than 80 refereed papers and books, she addressed ecological design in Placing Nature (Island Press 1997), and showed how to use scenario approaches to integrated assessment in From the Corn Belt to the Gulf (RFF Press 2007). Current research projects address ecological design for highly vacant urban neighborhoods, ecological implications of suburban landscape patterns, and agricultural landscape patterns to incorporate perennial biofuels.

Nassauer, J. I., Kosek, S. E., and Corry, R. C. 2001. Meeting public expectations with ecological innovation in riparian landscapes. Journal of the American Water Resources Association 37(6): pp 1-5.

Nassauer, J.I. 1998. Urban Ecological Retrofit. Landscape Journal. Special Issue. 15-17

Nassauer, J. I. 1997. Agricultural landscapes in harmony with nature, in Visions of American Agriculture, Wm. Lockeretz, ed., Iowa State University Press.

Nassauer, J. I., 1997. Cultural sustainability: Aligning aesthetics and ecology. In Placing Nature: Culture and Landscape Ecology. J. I. Nassauer, ed. Island Press. Washington, D. C.

Nassauer, J. I. 1995. Culture and changing landscape structure. Landscape Ecology. 10(4): pp. 229–237

Nassauer, J. I. 1995. Messy ecosystems, orderly frames. Landscape Journal. 14(2): pp. 161-170.

Nassauer, J. I. 1993. Ecological Function and the Perception of Suburban Residential Landscapes. In Gobster, P.H., ed., Managing Urban and High Use Recreation Settings, General Technical Report, USDA Forest Service North Central Forest Exp. Sta., St. Paul, MN.

Nassauer, J.I. 1992. The appearance of ecological systems as a matter of policy. Landscape Ecology. 6(4): pp 239-250

Nassauer, J.I. 1989. The Aesthetic Benefits of Agricultural Land. Renewable Resources Journal 7:4.

Nassauer, J.I. 1989. Agricultural policy and aesthetic objectives. Journal of Soil and Water Conservation. 44(5): pp.384-387.

Nassauer, J.I. 1988. Landscape care: Perceptions of local people in landscape ecology and sustainable development. Landscape and Land Use Planning, 8: pp. 27-41. American Society of Landscape Architects, Washington DC.

Nassauer, J.I. 1988. The aesthetics of horticulture: Neatness as a form of care. HortScience,



#### "Cues to Care"

#### "Cues to Care"

"The dominant culture in much of North America reads a neat, organized landscape as a sign of neighborliness, hard work, and pride."

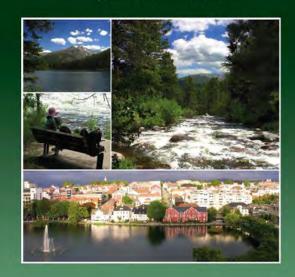
#### "Cues to Care"

"In settled landscapes, urban or countryside, people expect to see the look of human intention."

"To avoid looking neglected, ecologically innovative designs can incorporate cues to care that clearly connote an intentional landscape pattern that conveys the reassuring presence of caretakers."

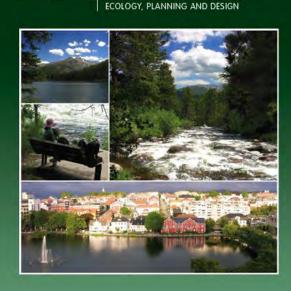


AN INTERNATIONAL JOURNAL OF LANDSCAPE ECOLOGY, PLANNING AND DESIGN



"Anecdotes abound of homeowners who have painstakingly developed native plant gardens only to have them replaced with conventional turf yards after the sale of their property."







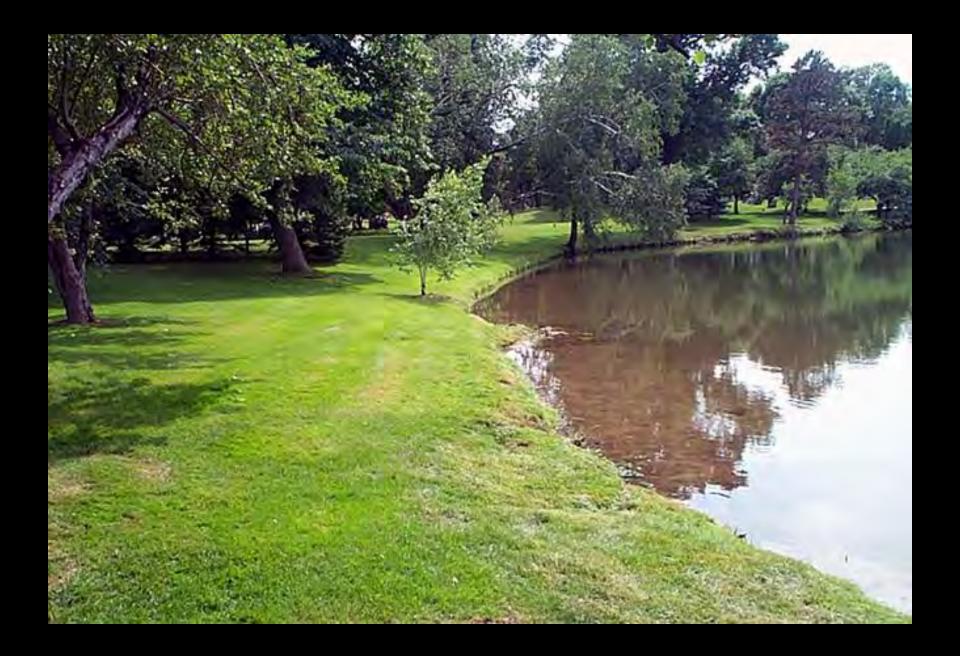




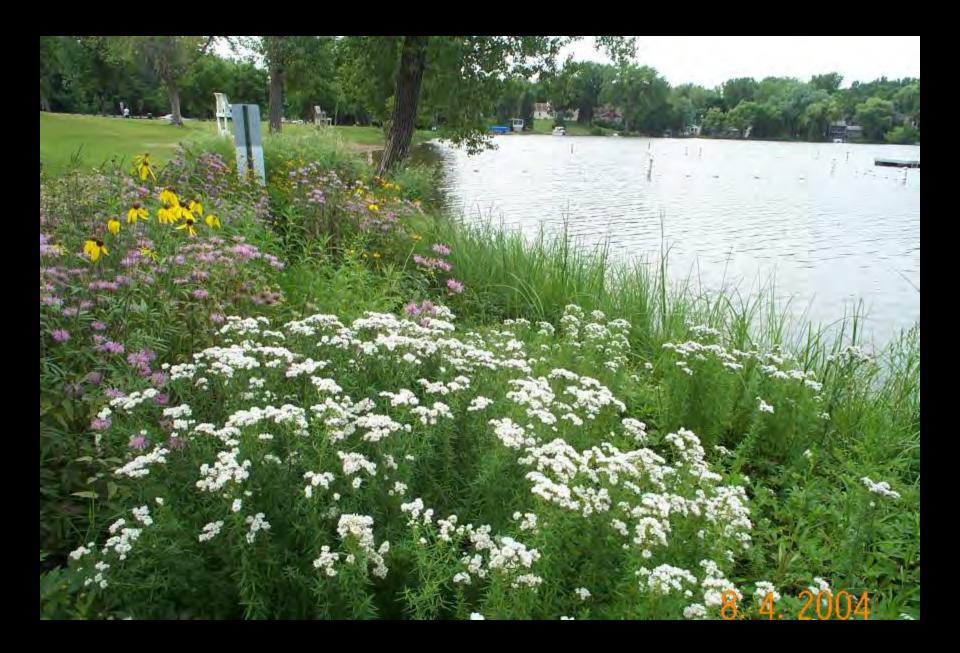






















# "Cues to Care"

- Mowing
- Flowering plants and shrubs
- Wildlife feeders and houses
- Trimmed shrubs
- Plants in rows
- Fences, architectural details, masonry work
- Lawn ornaments, fresh painting
- Sounds, smells



#### Research Scholarship Leadership

Overview

Landscape Performance Series

Case Study Briefs Explore by Map

Submit Your Case Study

Online Submission Form

Benefits Toolkit

Fast Fact Library

Scholarly Works

Case Study Investigation

Case Study Method for Landscape Architecture

Land and Community Design Case Study Books

LPS Videos: Leaders Discuss Landscape Performance

Support the Landscape Performance Series

Special thanks to:



Landscape Performance Series Founding Partner

Research | Landscape Performance Series | Case Study Briefs

# Chicago Botanic Garden Lake **Shoreline Enhancement Projects**



Search Case Study Briefs \*





#### Landscape Performance Benefits

- Increased species richness of the shoreline plant collections from 23 to 244 species, 100% of which are native perennials.
- Provides 6.05 acres of new and improved habitat for at least 217 observed species of waterfowl and shoreline birds, fish, turtles, mussels, frogs, and aquatic insects, 98% of which are native species
- Improved the garden's lake water quality as measured by in-lake nutrient concentrations. Monitoring data from 1997-98 (pre-restoration) and 2004-05 (post restoration) indicate total phosphorus reductions of 84%, dissolved phosphorus reductions of 98%, ammonia nitrogen reductions of 77%, and nitrate+nitrite nitrogen reductions of 23%.
- Educated nearly 10,000 children and adults in 2013 in garden-sponsored shoreline ecology/aquatics education programs held along the restored shoreline areas. These events are planned to continue annually and included family drop-in activities, school field trips, boy and girl scout visits, camp visits, World Environment Day visitors, and Northwestern University and IIT class visits.
- Demonstrates that ecologically-based shoreline restoration can be visually appealing. Visual preference surveys of garden visitors conducted in summer 2013 indicated a 63% profesence for a choraline rectoration approach that combines a modestly organized planting

#### Designer

Living Habitats

#### Land Use

Park/Open space

#### Project Type

Wetland creation/restoration Garden/Arboretum

#### Location

1000 Lake Cook Road Glencoe, Illinois 60022

Map it

#### Size

3 miles of reconstructed shoreline

#### Budget

\$17 million

Completion Date









## Of these four shoreline images, which shoreline do you find most attractive?









### Of these four shoreline images, which shoreline do you find most attractive?









## Which shoreline do you find LEAST attractive?









## Which shoreline do you find LEAST attractive?









## Which shoreline do you think functions best to enhance the lake's ecology?









## Which shoreline do you think functions best to enhance the lake's ecology?









### Which shoreline do you think does the poorest job to enhance the lake's ecology?



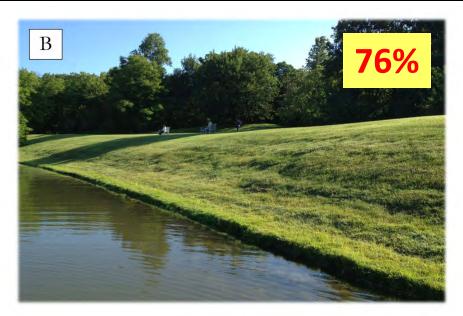






#### Which shoreline do you think does the poorest job to enhance the lake's ecology?









# If you owned property along a lake, which water-edge landscape(s) would you be willing to create along your own lakeshore? (multiple choices permitted)









# If you owned property along a lake, which water-edge landscape(s) would you be willing to create along your own lakeshore? (multiple choices permitted)









If there are publicly owned lakes in your community (for example, a park district pond), which shoreline landscape(s) would you like them to consider? (multiple choices permitted)









If there are publicly owned lakes in your community (for example, a park district pond), which shoreline landscape(s) would you like them to consider? (multiple choices permitted)









# Spider Island Shoreline



# The Water Gardens of the Great Basin



# U.S. and Illinois EPA Funded Shorelines



# Japanese Garden Shorelines





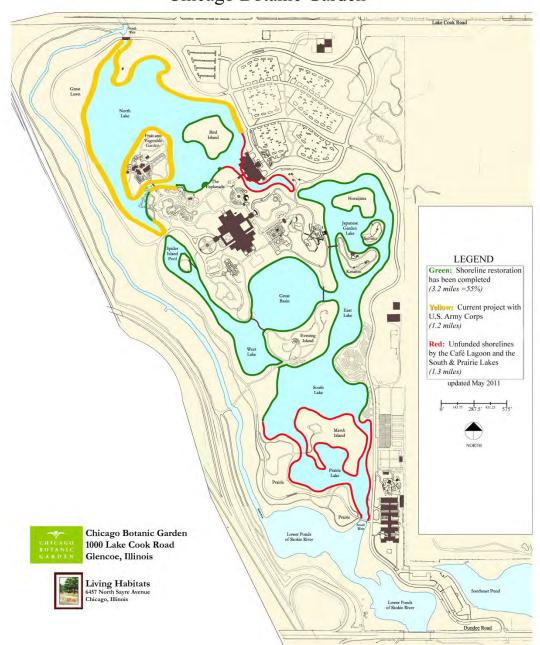
North Lake

Green: Shoreline restoration has been completed (3.2 miles)

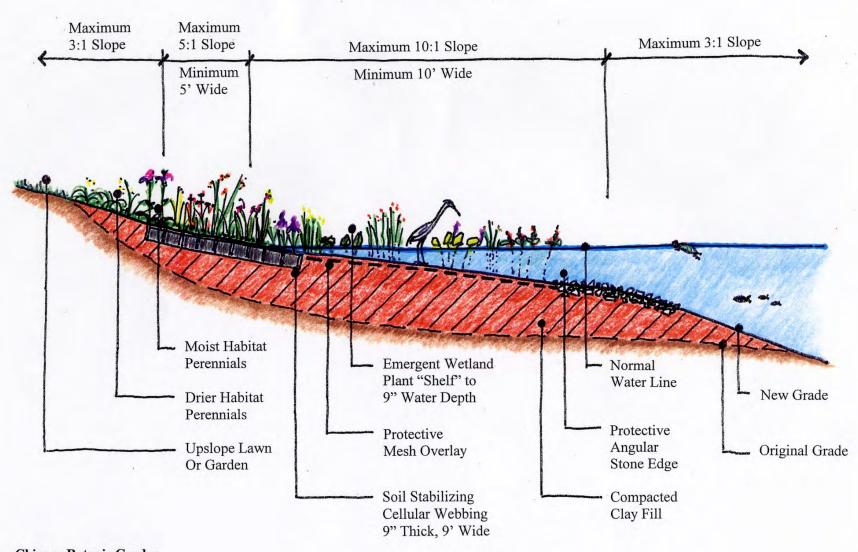
Yellow: Recently completed project with U.S. Army Corps of Engineers (1.3 miles)

Red: Unfunded shorelines by the Café Lagoon and the South & Prairie Lakes (1.2 miles)

# SHORELINE RESTORATION STATUS Chicago Botanic Garden



#### Chicago Botanic Garden Shoreline Habitat Enhancement



Chicago Botanic Garden 1000 Lake Cook Road Glencoe, Illinois 60022 847-835-5440

www.chicagobotanic.org

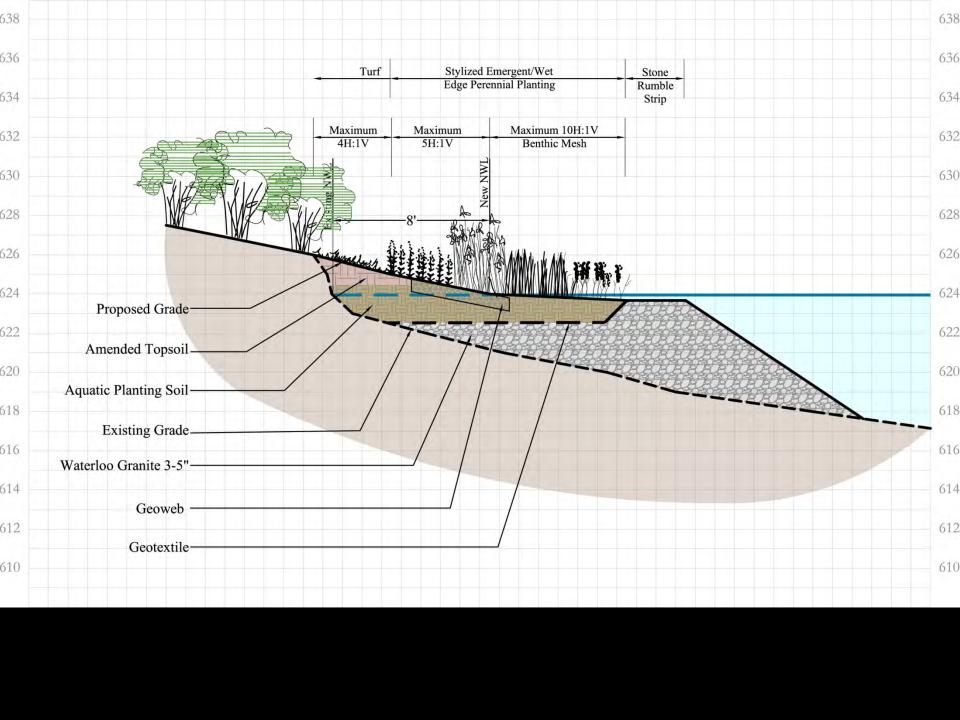
September 2002











## Geoweb shoreline

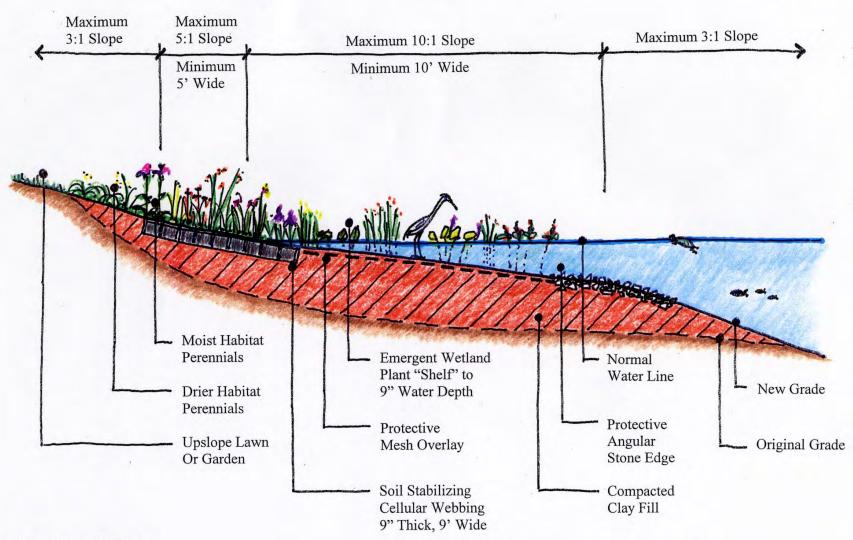








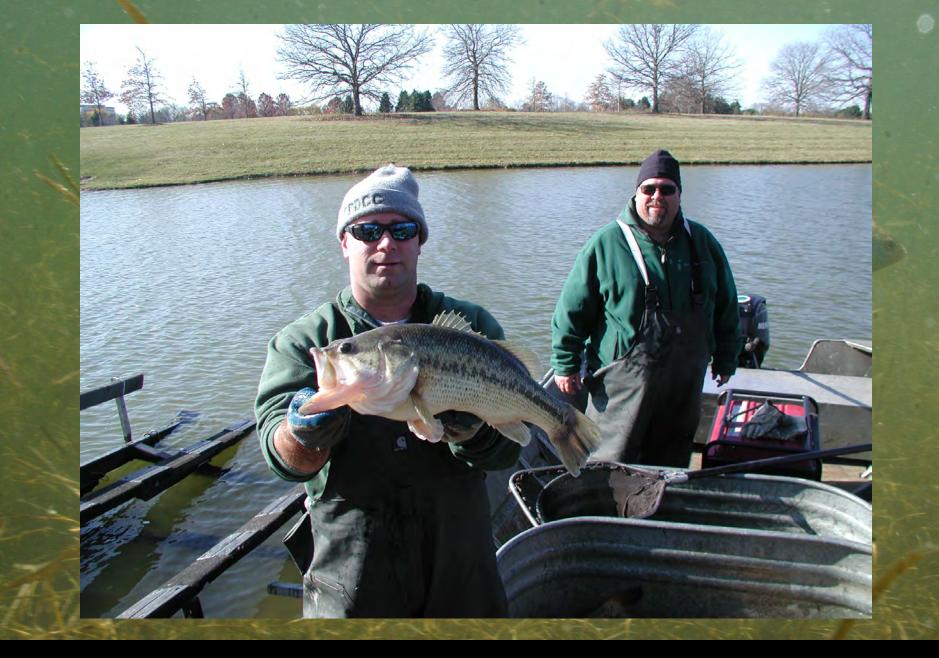
### Chicago Botanic Garden Shoreline Habitat Enhancement



#### Chicago Botanic Garden 1000 Lake Cook Road

1000 Lake Cook Road Glencoe, Illinois 60022 847-835-5440 www.chicagobotanic.org





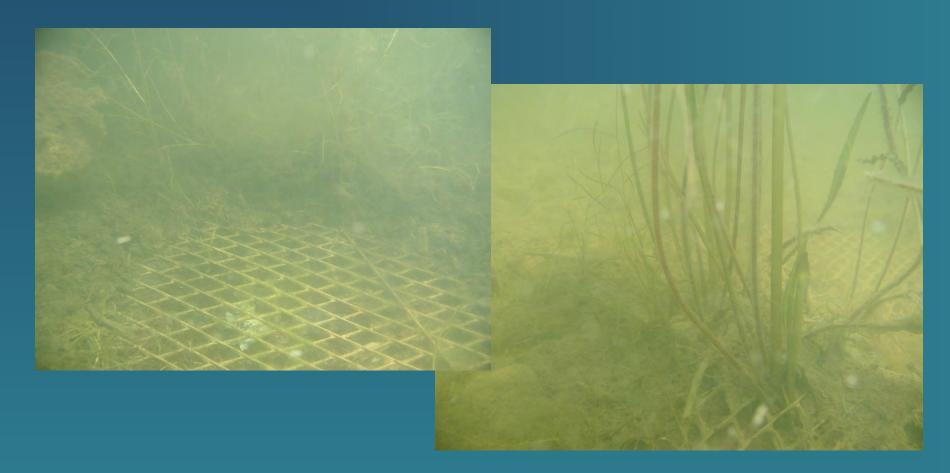




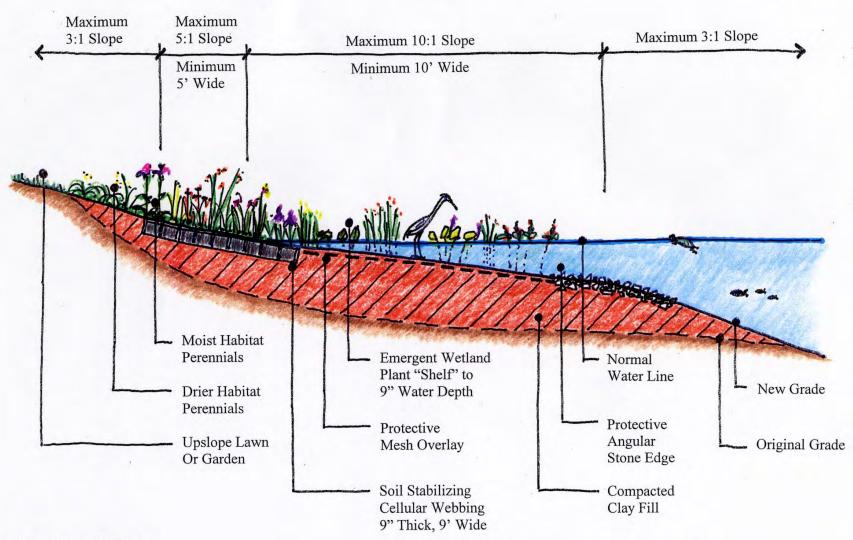




# Benthic mesh protects new aquatic plants



### Chicago Botanic Garden Shoreline Habitat Enhancement



#### Chicago Botanic Garden 1000 Lake Cook Road

1000 Lake Cook Road Glencoe, Illinois 60022 847-835-5440 www.chicagobotanic.org





# 3 sizes of stone:

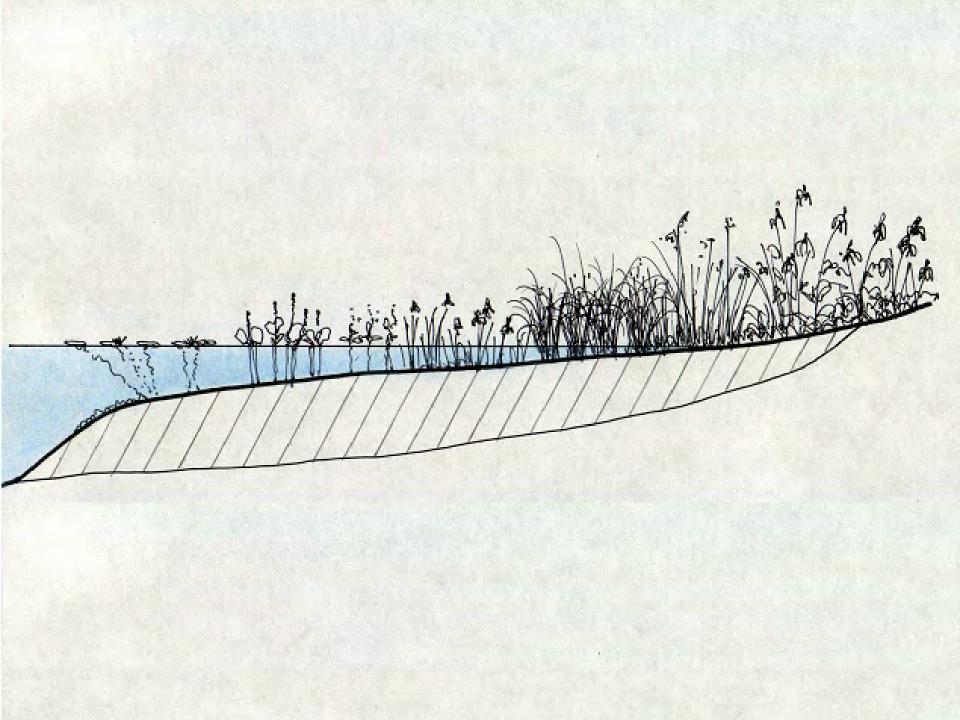
- 1/4" x 1/2"
- 3/8" x 3/4"
- 1-1/2" x 2-1/2"











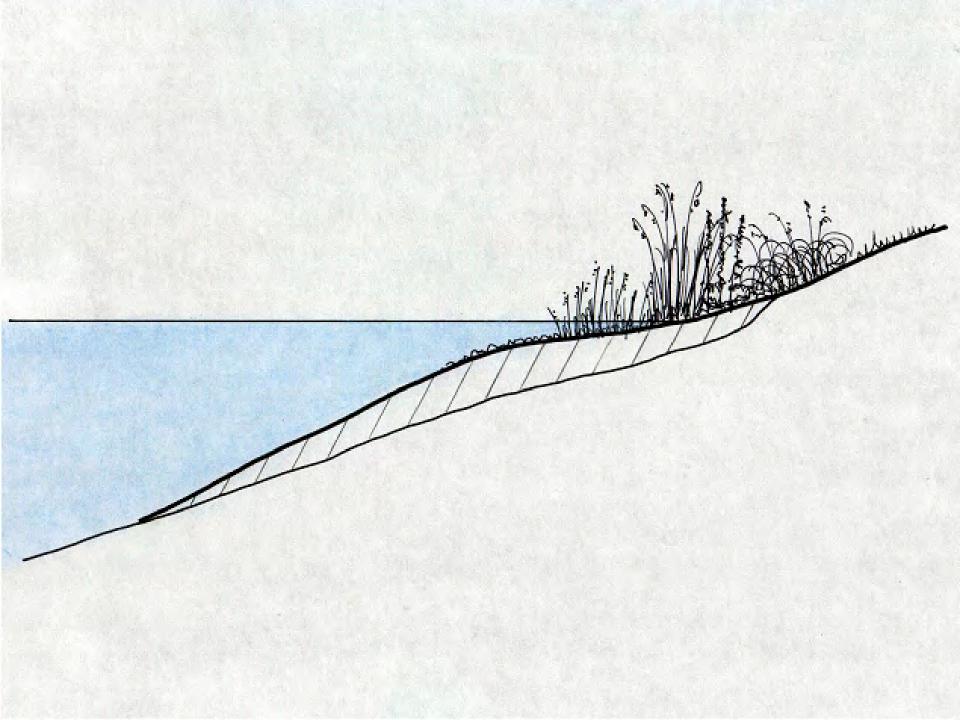
















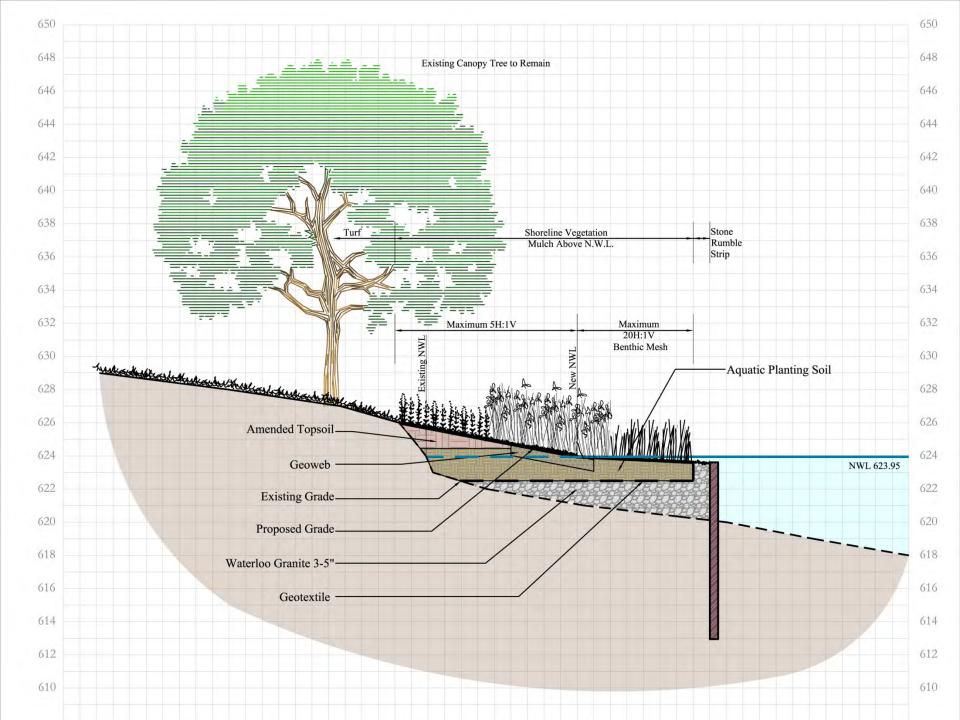




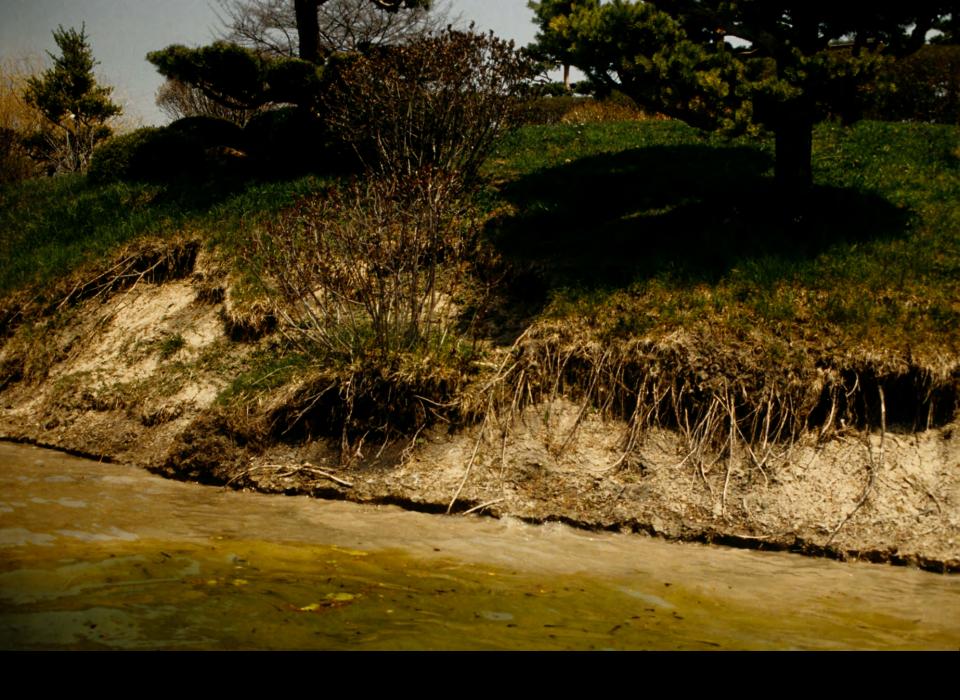










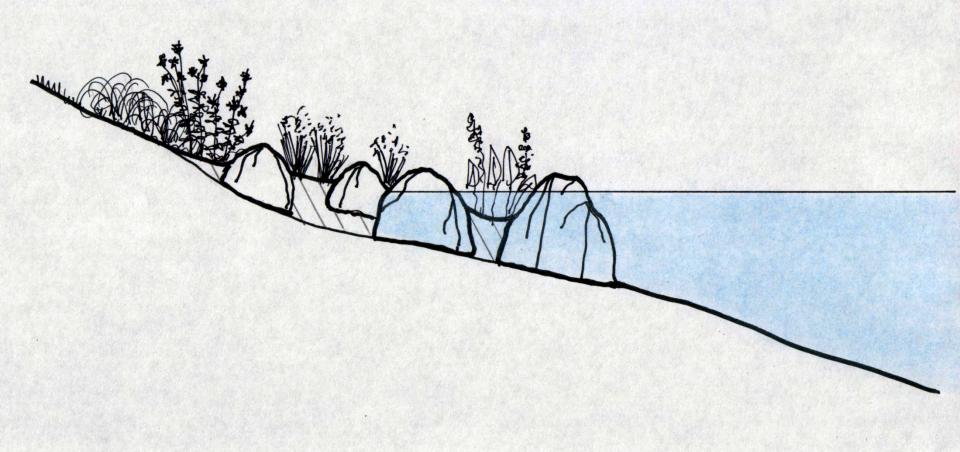












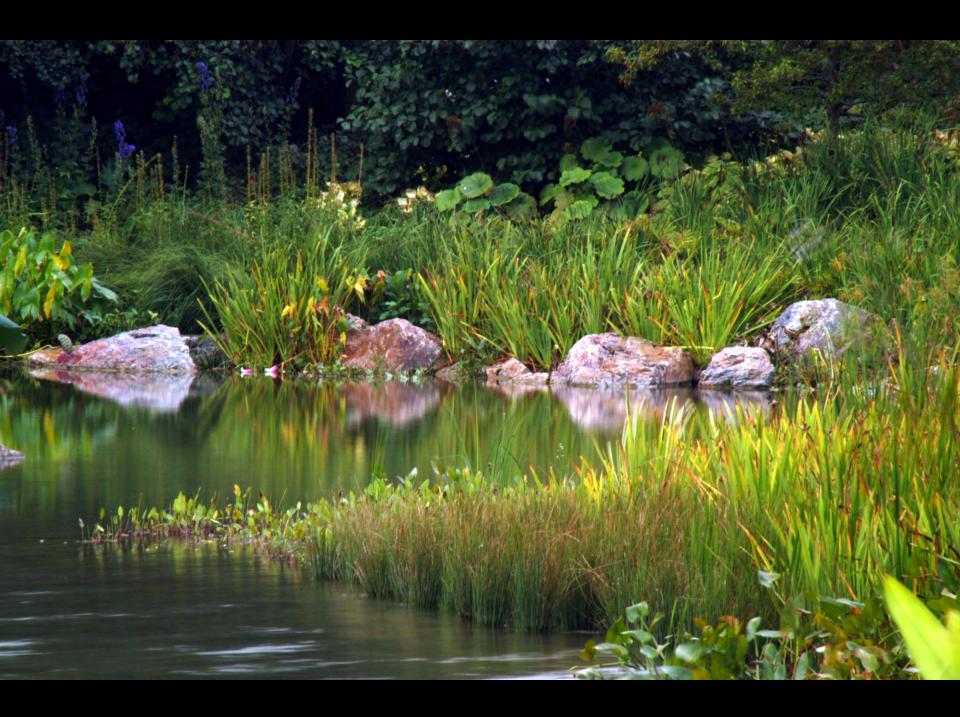




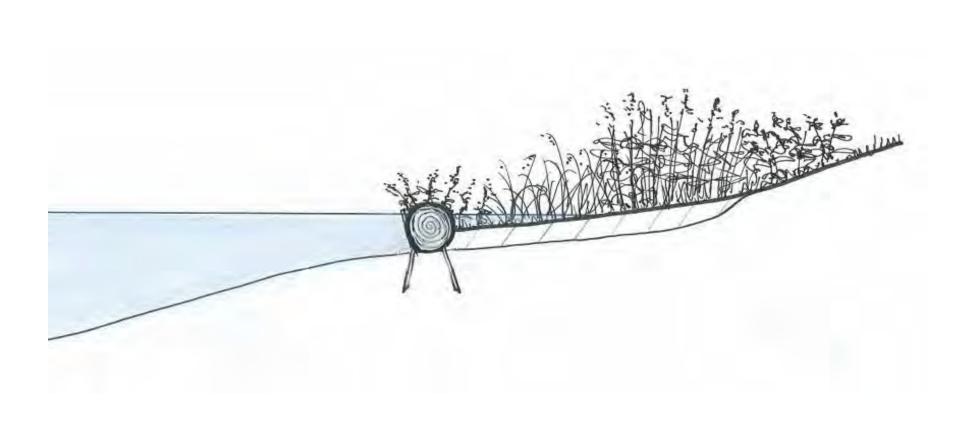






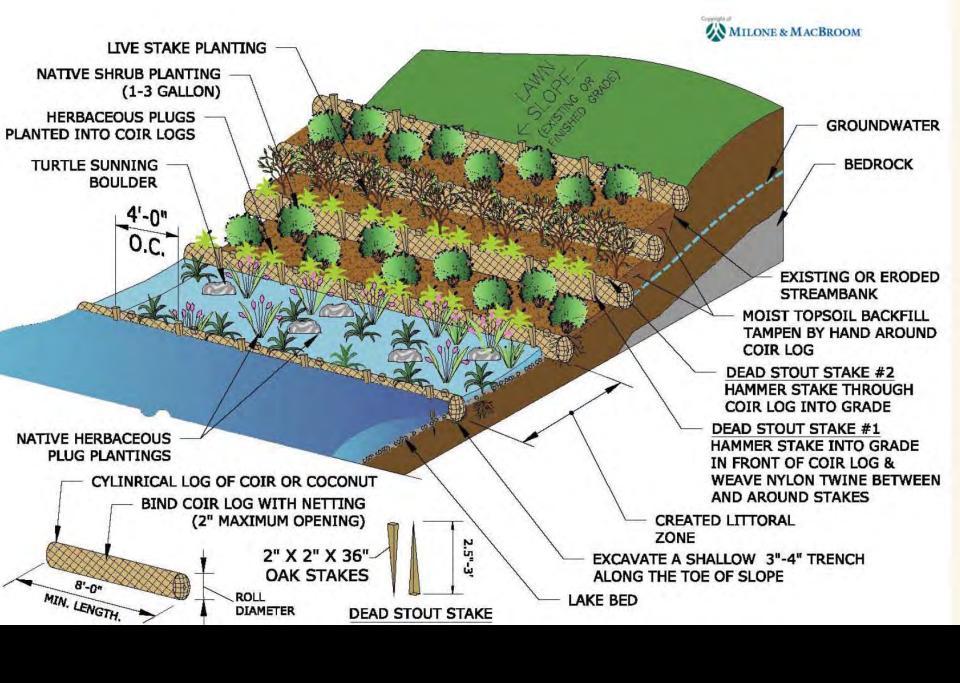








-















Site Preparation

#### Site Preparation

Remove unwanted vegetation
 THOROGHLY before planting

#### Site Preparation

- Remove unwanted vegetation THOROGHLY before planting
- Remove unwanted vegetation
   THOROGHLY before planting

#### Site Preparation

- Remove unwanted vegetation THOROGHLY before planting
- Remove unwanted vegetation THOROGHLY before planting
- Remove unwanted vegetation
   THOROGHLY before planting

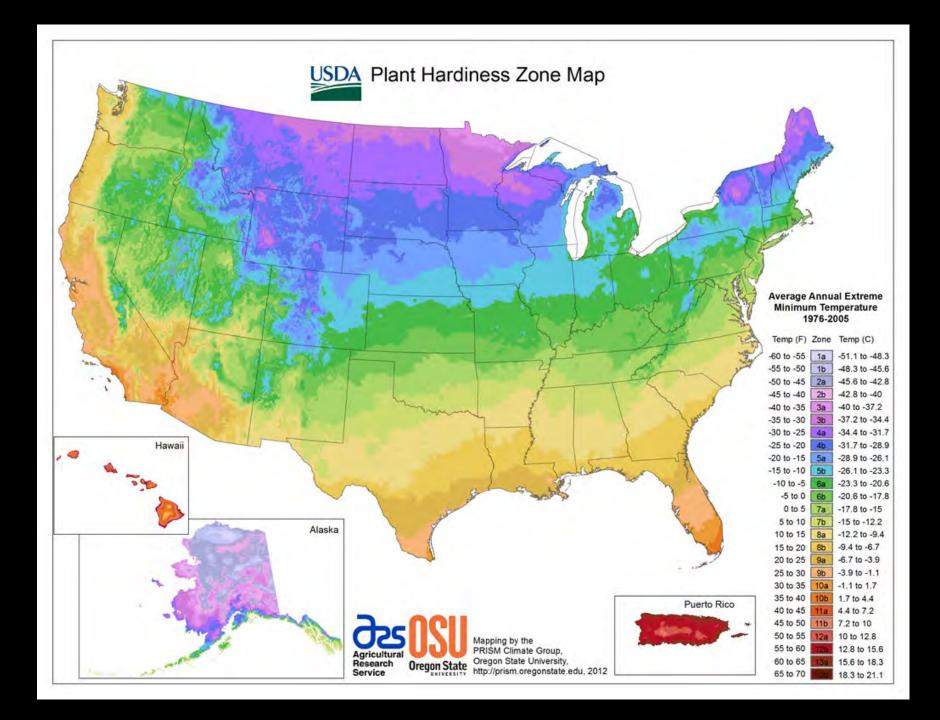
- Black plastic
- Soil tilling
- Herbicides





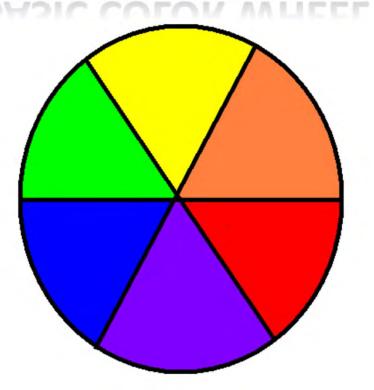


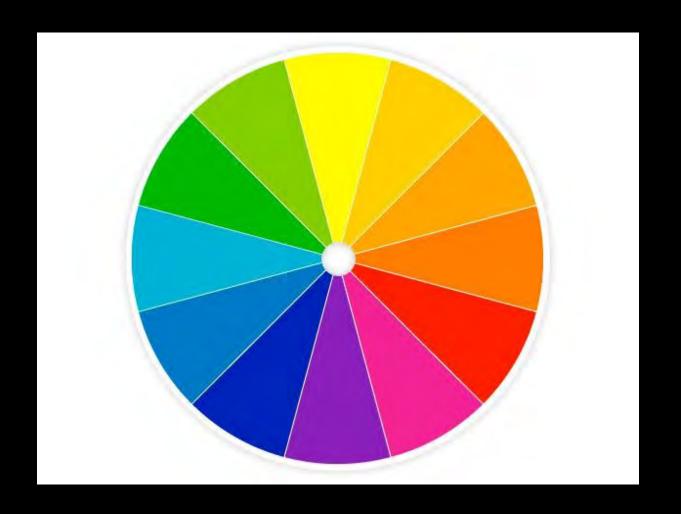
Plant Selection

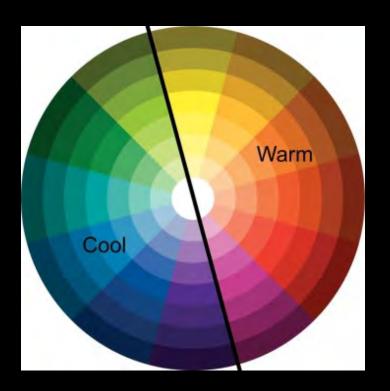




### BASIC COLOR WHEEL

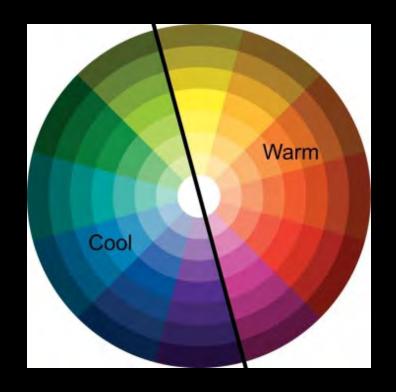








analagous colors: ADJACENT on wheel; "soothing/calming"



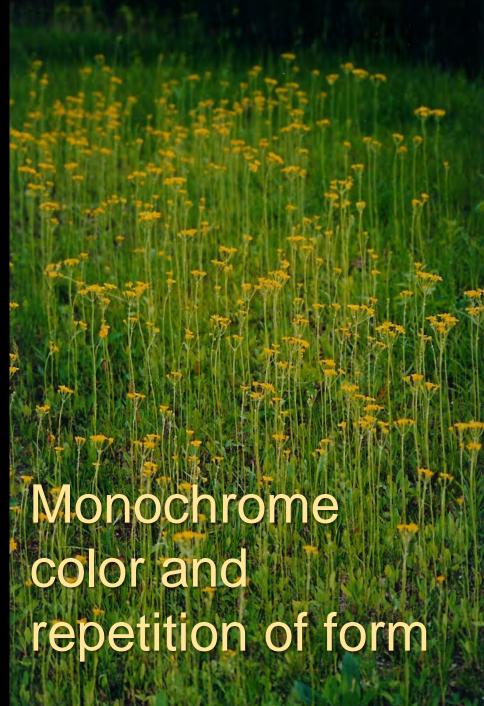
analagous colors: ADJACENT on wheel; "soothing/calming"

complementary colors: OPPOSITE on wheel; "dramatic/bold"

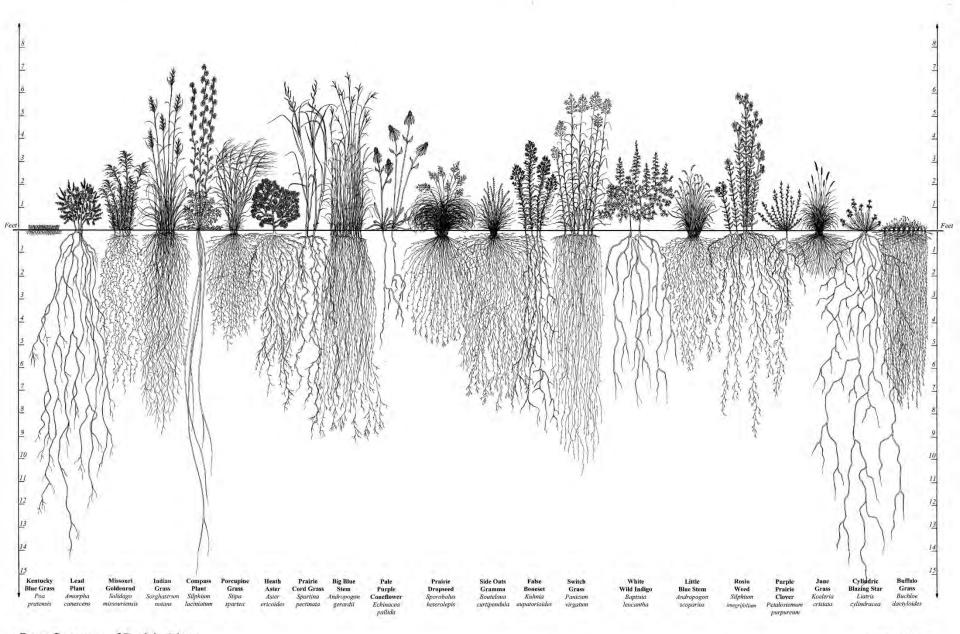












Root Systems of Prairie Plants

#### Plant Selection

Avoid planting too much candy







- Avoid planting too much candy
- Put the workhorse plants to work

#### Workhorse plants for the shoreline...

- rhizomatous/fibrous roots,
- "fill in" quickly,
- tolerant of wide range of inundation, soil moisture, soil nutrients, light, etc.,
- are not overly-favored by wildlife,
- are readily available from the nursery trade, and
- have a sturdy structure that plant easily and resist trampling.

- Avoid planting too much candy
- Put the workhorse plants to work
- Favor plants that offer 12 months of erosion protection







Juncus effusus (common rush)

# Carex stricta (tussock sedge)



- Avoid planting too much candy
- Put the workhorse plants to work
- Favor plants that offer 12 months of erosion protection
- Seek plant pots designed for natives



### GT-38 production pots





- Avoid planting too much candy
- Put the workhorse plants to work
- Favor plants that offer 12 months of erosion protection
- Seek form AND function in plant selection
- Seek plant pots designed for natives
- Carefully add shrubs chosen for wildlife





#### Plant Installation

Insist on quality plants

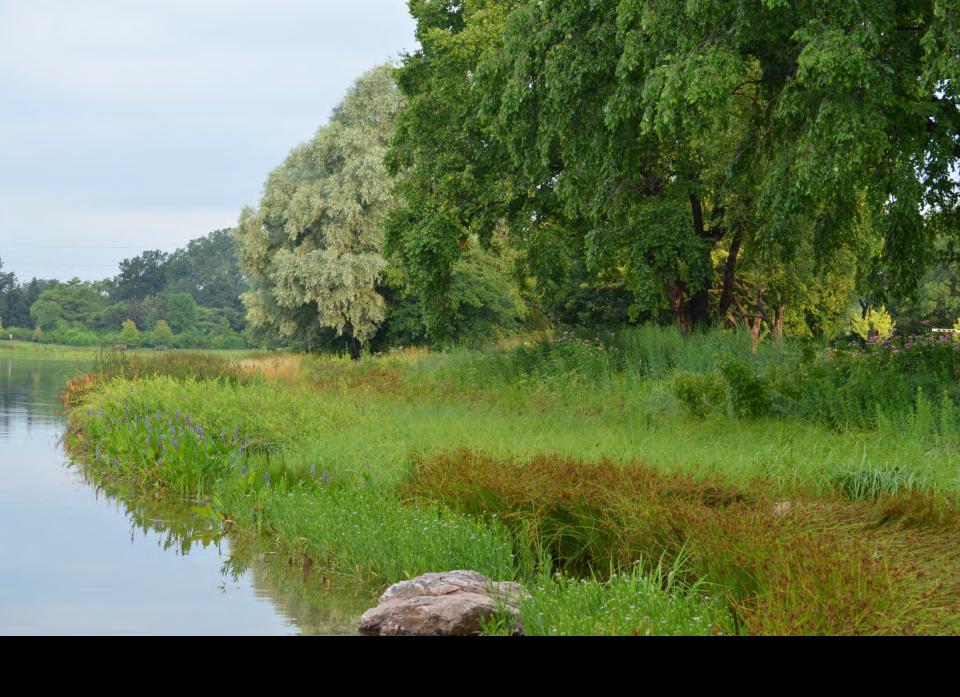












- Insist on quality plants
- Favor local genotype

- Insist on quality plants
- Favor local genotype
- If new soil's brought in, consider the source

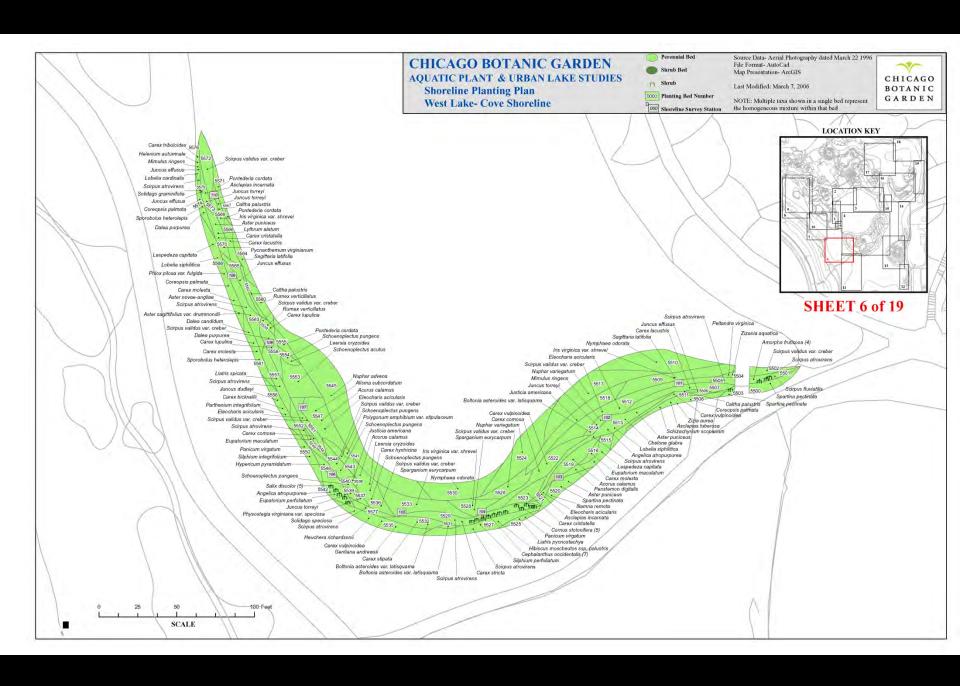
- Insist on quality plants
- Favor local genotype
- If new soil's brought in, consider the source
- When in doubt, stay shallow

- Insist on quality plants
- Favor local genotype
- If new soil's brought in, consider the source
- When in doubt, stay shallow
- Plant early enough to allow root establishment

- Insist on quality plants
- Favor local genotype
- If new soil's brought in, consider the source
- When in doubt, stay shallow
- Plant early enough to allow root establishment
- Ensure good root-to-soil contact; staple them down if below the water line

### Plant Installation

- Insist on quality plants
- Favor local genotype
- If new soil's brought in, consider the source
- When in doubt, stay shallow
- Plant early enough to allow root establishment
- Ensure good root-to-soil contact; staple them down if below the water line
- Plant as dense as you can afford!



### Plant Care and Maintenance

Pamper the new plantings – native does
 NOT mean maintenance-free

- Pamper the new plantings native does NOT mean maintenance-free
- Apply double-shredded hardwood mulch after planting



- Pamper the new plantings native does NOT mean maintenance-free
- Apply double-shredded hardwood mulch after planting
- WATER, WATER, WATER!





- Pamper the new plantings native does NOT mean maintenance-free
- Apply double-shredded hardwood mulch after planting
- WATER, WATER, WATER!
- WEED, WEED!



# **Aquatic Plant Harvester**









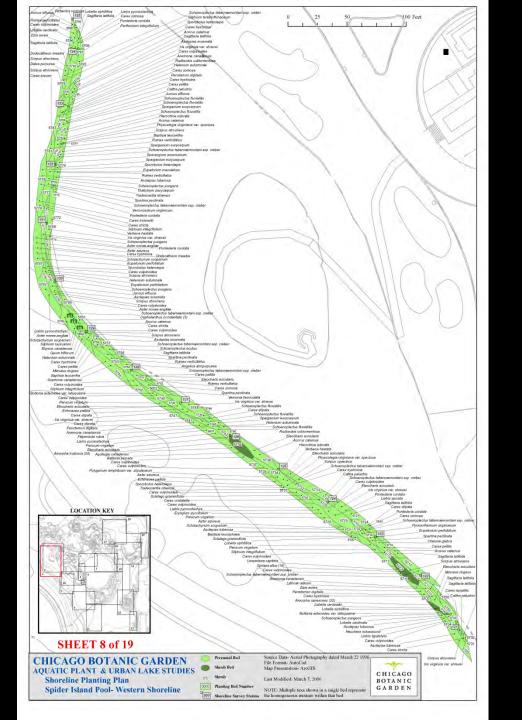
- Pamper the new plantings native does NOT mean maintenance-free
- Apply double-shredded hardwood mulch after planting
- WATER, WATER, WATER!
- WEED, WEED, WEED!
- Protect from wildlife

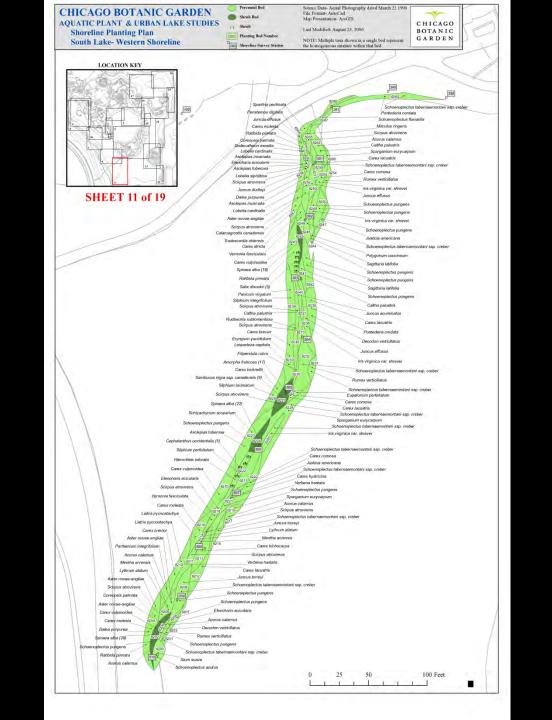




















# Videotape your shoreline, every year if you can!





Acorus americanus (Sweet Flag)



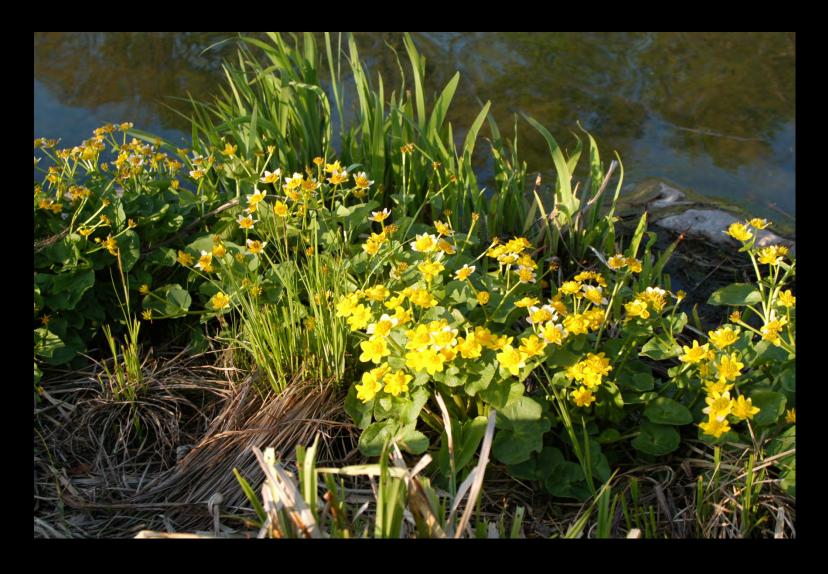


Alisma subcordatum (Common Water Plantain)





Asclepias incarnata (Swamp Milkweed)



Caltha palustris (Marsh Marigold)





Carex comosa (Bristly Sedge)



Carex lacustris (Common Lake Sedge)





Carex stricta (Tussock Sedge)









Echinacea pallida (Pale Purple Coneflower)





Eleocharis acicularis (Needle Spike Rush)



Filipendula rubra (Queen-of-the-Prairie)

Geum triflorum (Prairie Smoke)





Iris versicolor (Northern Blue Flag)



Juncus effusus (Common Rush)









Justicia americana (American Water Willow)

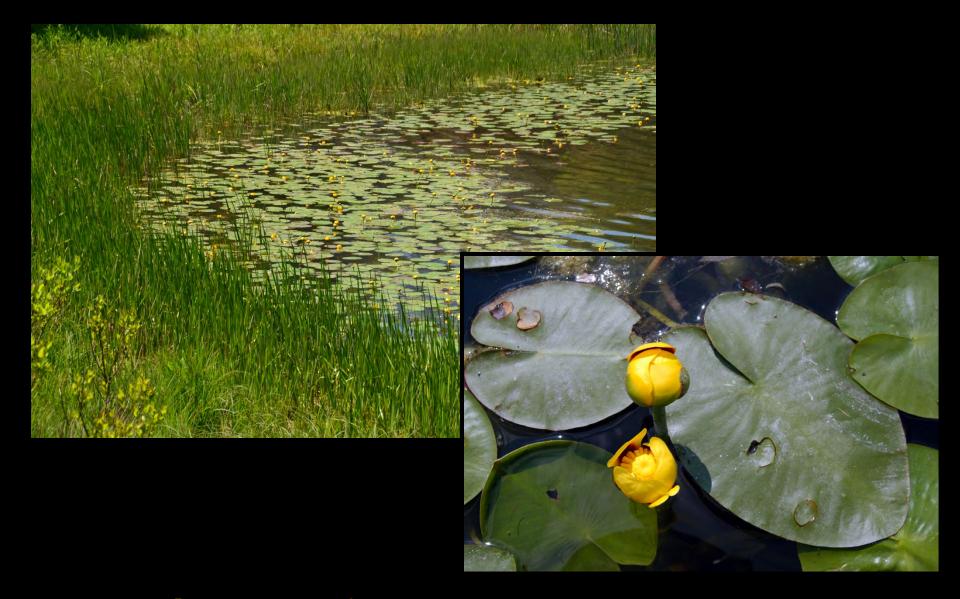


Leersia oryzoides (Rice Cutgrass)



Lobelia cardinalis (Cardinal Flower)





Nuphar variegatum (Yellow Pond Lily)



## Parthenium integrifolium (Wild Quinine)



(White Water Lily)



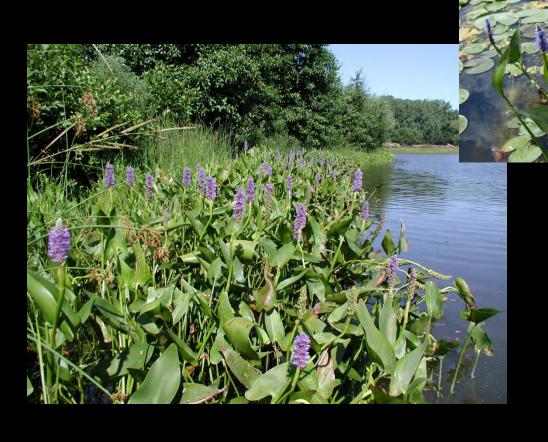
### Peltandra virginica

(Arrow Arum)



Penstemon digitalis (Foxglove Beardtongue)





Pontederia cordata (Pickerel Weed)



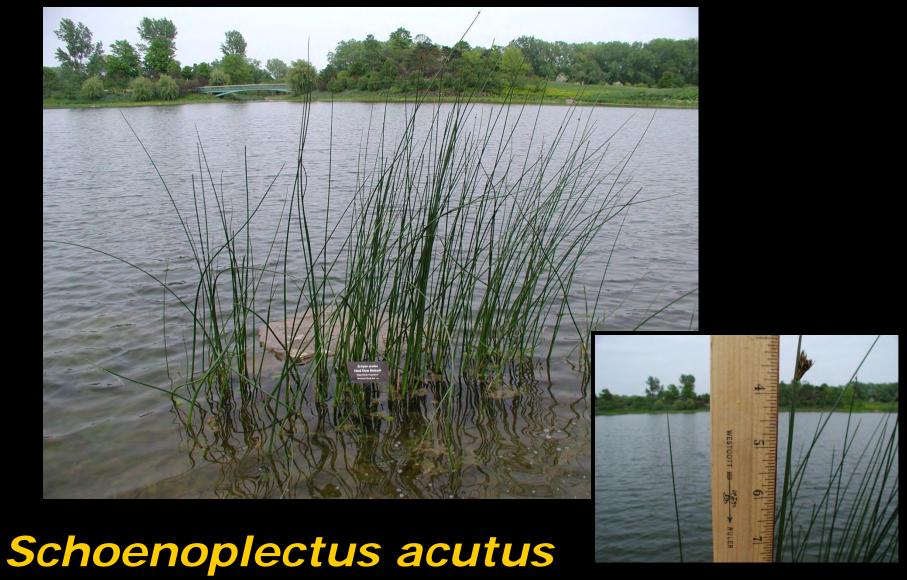




Salix discolor (Pussy Willow)



Schizachyrium scoparium (Little Blue Stem)



Schoenoplectus acutus (Scirpus acutus)

(Hard-stemmed Bulrush)

Scirpus pendulus (Red Bulrush)





Scheonoplectus pungens (Scirpus pungens) (Common Three Square Bulrush)





# Schoenoplectus tabernaemontani (Scirpus validus)

(Soft-stemmed Bulrush)



### Schizachyrium scoparium

(Little Bluestem)





### Sparganium eurycarpum

(Common Bur-Reed)



Spartina pectinata (Prairie Cordgrass)





Spiraea alba (Meadowsweet)









### Sporobolus heterolepis (Prairie Dropseed)



Zizia aurea (Golden Alexanders)

### Lake Water Quality Monitoring Preliminary Results

- Total Phosphorus: reduced ~50%
- Ortho Phosphorus: reduced ~75%
- ❖ Ammonia Nitrogen: reduced ~80+%
- Nitrate Nitrogen: reduced ~60%
- Suspended Solids: no change
- Transparency: increased ~38%





### Lake and Pond Shorelines: Controlling Erosion and Enhancing Habitat



Thursday, July 20, 2017 9 a.m. - 3 p.m.

www.chicagobotanic.org





## www.cbgshoreline.org



ENJOY YOUR VISIT AT THE GARDEN

YOUR GARDEN

EDUCATION

CONSERVATION

AND HABITAT

Shoreline Erosion

North Lake Restoration

#### Resources

Native Plants for Shorelines

Plant Science and Conservation

#### Lake Shoreline Erosion Control and Habitat Enhancement

The Chicago Botanic Garden and the U.S. Army Corps of Engineers' Ecosystem Restoration Program completed a ten-month Section 206 Ecosystem Restoration Project on 1 1/4 miles of shoreline around the Garden's North Lake. The entire perimeter of the Regenstein Fruit & Vegetable Garden, as well as areas along the North Lake's western and northern shoreline were restored. Read more about the project here.



#### EMBRACING NATIVE LANDSCAPING PRINCIPLES

In recent years, lake educators and managers have encouraged lakeshore residents to resist traditional societal pressures to have neatly groomed shorelines and instead to embrace native landscaping principles as a way to reduce shoreline erosion and enhance aquatic habitat. And while we've made some progress to revitalize the ecological health of our lakeshores, such environmental sensitivity is clearly the exception rather than the rule. This shoreline section of the Garden's website has been designed to explain environmentally sensitive approaches for restoring and protecting lakeshore ecosystems. Among other things, it explains

shoreline erosion and aquatic habitat enhancement techniques installed along the Chicago Botanic Garden's lakeshore through a partnership with the Illinois Environmental Protection Agency and the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act.

Of the Garden's 385 acres, nearly one-quarter (81 acres) is water. A 60-acre system of lakes winds throughout the gardens and research facilities. About 5.7 miles of shoreline encircles the Garden's lakes, so it is not surprising that the Garden is keenly interested in protecting its shoreline soils and enhancing aquatic habitat.

#### IDENTIFYING SHORELINE PROBLEMS

A 1998 study of shoreline conditions revealed that 80 percent of the Garden's lakeshores were experiencing moderate to severe erosion. In 1999, the Garden completed an Illinois Clean Lakes Program Diagnostic/Feasibility Study. This comprehensive study investigated existing lake





Main Shoreline Erosion Control

**Native Plants for Shorelines** 

Resources



#### CHICAGO BOTANIC GARDEN

### Welcome to Our Web site on Lake Shoreline Erosion Control and Habitat Enhancement!

The rich textures and colors of aquatic plants growing along the shores of Walden Pond surely helped inspire Henry David Thoreau's oft-quoted passage,

"A lake is the landscape's most beautiful and expressive feature. It is Earth's eye; looking into which the beholder measures the depth of his own nature."

-- Walden, 1854

In recent years, lake educators and managers have encouraged lakeshore residents to resist traditional societal pressures to have neatly groomed shorelines -- and instead to embrace native landscaping principles as a way to reduce shoreline erosion and enhance aquatic habitat. And while we've made some progress to revitalize the ecological health of our lakeshores, such environmental sensitivity is clearly the exception rather



than the rule. This Web site has been designed to help you better understand environmentally sensitive approaches for restoring and protecting lakeshore ecosystems. We'll examine shoreline erosion and aquatic habitat enhancement techniques recently installed along over one mile of the Chicago Botanic Garden's lakeshore through a partnership with the



Main Shoreline Erosion Control Native Plants for Shorelines Resources

#### **▶** Shoreline Erosion Control

- Traditional Approaches
- Bioengineered Solutions
  - Shoreline Techniques
     Implemented at the Garden
    - Treatment 1: Clay Soil Shelf
    - Treatment 2: Underwater
       Stone Berm
    - Treatment 3: Submerged Sheet Piling
    - Treatment 4: Exposed Sheet Piling
    - Treatment 5: Interplanted Boulders
    - Treatment 6: Coir Roll
  - · Technology Lends a Hand
  - Regulatory Programs
  - Project Design Assistance and Plant Nurseries
  - Cost Considerations
  - Installation Tips and Maintenance

#### **Shoreline Erosion Control**

How often have you seen lakeshores that resemble the photographs to the right: abrupt interfaces between the land and the water, exposed and denuded soil, and essentially nonexistent wildlife habitat? The shoreline zone is subjected to stress from myriad sources: wave energy generated by wind and recreational boats, burrowing by muskrats and other waterloving critters, erosion caused by runoff from upland areas, and downslope pressure from steep and heavy upslope soils.



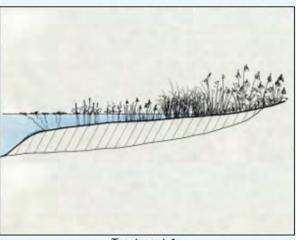
In relatively undisturbed natural settings, nearshore gradients along lake shorelines often are on the order of 10H:1V or shallower; in other words, the land rises no more than one vertical foot (V) for every 10 horizontal feet (H) back from the lakeshore). The figure below presents a greatly simplified version of the more than 40 different stabilization treatments that have been utilized by the Garden to help heal our eroding shorelines. Integral to nearly all our designs is the creation of shallow water planting "shelves" extending out from the water's edge, and a slope in nearshore land of never steeper than 5H:1V. As the shoreline areas are regraded, care is taken to thoroughly blend an interface layer of topsoil with the clay subsoils beneath, so as to avoid subsequent downslope sliding of the topsoil layer across the clay layer's slippery surface.

#### > Shoreline Erosion Control

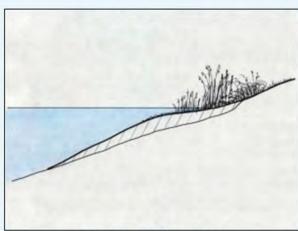
- Traditional Approaches
- Bioengineered Solutions
  - Shoreline Techniques
     Implemented at the Garden
    - Treatment 1: Clay Soil Shelf
    - Treatment 2: Underwater Stone Berm
    - Treatment 3: Submerged Sheet Piling
    - Treatment 4: Exposed Sheet Piling
    - Treatment 5: Interplanted Boulders
    - Treatment 6: Coir Roll
  - Technology Lends a Hand
  - Regulatory Programs
  - Project Design Assistance and Plant Nurseries
  - Cost Considerations
  - Installation Tips and Maintenance
  - Benefits of Project Implementation
  - Animation of Project Installation

#### Treatment 1: Clay Soil Shelf

Compacted clay was used to create shelves along the shoreline varying in width from 10 to 40 feet. The shelves were constructed with a gradual slope (10H to 20H:1V) until the outside edge and then a 3H:1V slope down to the bottom of the lake. Angular stone was placed at the outside edge to protect the shelf's soil from the energy of incoming waves.



Treatment 1: Cross-sectional view, with wide planting shelf including floating leaved plants



Treatment 1 Alternative: Cross-sectional view, with a narrower planting shelf

Main Shoreline Erosion Control Native Plants for Shorelines Resources

#### **▶** Species

Click here for a cross-reference alphabetical listing of the plants' common names.

- Acorus calamus
- Alisma subcordatum
- Amorpha canescens
- Amorpha fruticosa
- Anemone canadensis
- Angelica atropurpurea
- Aquilegia canadensis
- Asclepias incarnata
- Asclepias tuberosa
- Aster (Symphyotrichum) azureus
- Aster (Symphyotrichum) novaeangliae
- Baptisia leucantha
- Baptisia leucophaea
- Boltonia asteroides var. latisquama
- Bulboschoenus fluviatilis
- Calamagrostis canadensis
- Caltha palustris
- Carex aquatilis
- Carex bicknellii
- Carex comosa
- Carex cristatella
- Carex hystericina
- Carex lacustris
- Carex lupulina
- Carex molesta
- Carex pellita
- Carex stricta
- Carex tribuloides
- Carex trichocarpa

#### Native Plants for Shorelines

Native plantings along a restored lakeshore act like "glue" to keep the shoreline soils from washing away and they play a critical structural role in the battle against shoreline erosion. Almost without exception, plants native to your region will provide the best assurance of plant survival -- and the consequent success of the shoreline enhancement project. When choosing which plants to include, you will want to consider:

- Water depth preference (for plantings below the normal water line).
- Water inundation tolerance during floods or high water (for plantings at increasing elevations above the water line).
- · Relative resistance to overgrazing by waterfowl, muskrats, and other wildlife.
- · Soil structure and fertility preferences for the plants.

Some tips for improving the success of your shoreline planting project include:

- Choose quality plants from a reputable vendor that specializes in native plants; the root system should be vigorous and the plant should be free of visible diseases or pests.
- Avoid using root bound plants -- their growth rates may disappoint you. Consider
  plant plugs grown in square pots or circular "tubes" with ribs along the side that
  encourage roots to grow downward.



 Take meticulous care of your new plants; apply a handful of double-shredded hardwood mulch around the base of any plants installed above the waterline to help conserve moisture and reduce watering needs, carefully remove algae and other nuisance materials from plantings below the waterline to increase oxygen levels in the shallow waters and nearshore soils, and remove unwanted plants (especially invasive weeds) as soon as they appear. Many aquatic restoration projects fail over the medium and long terms because there was inadequate attention paid to removal of invasive plants during the first few years after installation.

#### **Species**

Click here for a cross-reference alphabetical listing of the plants' common names.

- Acorus calamus
- Alisma subcordatum
- Amorpha canescens
- Amorpha fruticosa
- Anemone canadensis
- Angelica atropurpurea
- Aquilegia canadensis
- Asclepias incarnata
- Asclepias tuberosa
- Aster (Symphyotrichum) azureus
- Aster (Symphyotrichum) novaeangliae
- Baptisia leucantha
- Baptisia leucophaea
- Boltonia asteroides var. latisquama
- Bulboschoenus fluviatilis
- Calamagrostis canadensis
- Caltha palustris
- Carex aquatilis
- Carex bicknellii
- Carex comosa
- Carex cristatella
- Carex hystericina
- Carex lacustris
- Carex lupulina
- Carex molesta
- Carex pellita
- Carex stricta
- Carex tribuloides
- Carex trichocarpa
- Carex vulpinoidea
- Cephalanthus occidentalis

#### Acorus calamus - Sweet Flag

Family: Acoraceae

Hydro Zone: -12" to +6"

C-value: 7

Hardiness Zones: 4 - 8

Bloom: 25 May - 30 June

Growth Form: Forb/Herb

NWC: OBL

Max Height: 3' to 6' Light: Sun - part shade

Collect Seed: Summer

Similar Species: Typha spp. (cattail), Sparganeum eurycarpum

**Distinguishing Characteristics:** Leaves of Acorus have one wavy margin and an off-center midrib (see photo). Also, all portions of the plant release a sweet, spicy scent when crushed.

**Early Growth** 







**Full Growth** 



Flower







expert picks | robert kirschner's favorites

Robert Kirschner, director at the Chicago Botanical Garden, says, "Here are four of my favorite shoreline plants—not necessarily the most showy, but from both form and function perspectives, they're winners in my book." See page 48 for more about Robert.



The common rush (Juncus effusus) grows to a height of about one and a half feet and blooms from June through August in yellowish green to pale brown. USDA Zones 4 to 9.



Commonly known as queen of the prair pendula rubra) it reaches a height of six to feet, blooming from June to August in pa Prefers full sun to part shade, Zones 3 to 8



Caltha palustris commonly called cowslip or yellow marsh manigold, is a mounded perennial that grows to two feet tall, blooms from April through June, and has heart-shaped leaves. Hardy to Zone 3.



Tussock sedge (Carex stricta) grows in three foot tall clumps that spread about t wide. They offer a safe haven for amphibit some waterfowl. Zones 5 to 8.



## An expanded view?

The Garden's original "vision" for shoreline restoration primarily was to stabilize lakeshore soils and prevent further erosion.





## A new paradigm

Our "shoreline restoration" efforts have evolved to become lakeshore habitat enhancement;



to create stunning aquatic plant displays from which to teach and to learn . . . that serve to delight our visitors—and the environment.







Continue with more "education" – or rather, acknowledge the public's <a href="VALUES">VALUES</a>

and work through those?



