

# But What Will the Neighbors Think?

*Creating Native Shoreline Landscapes That Are Easy on the Eye and Great for the Environment*

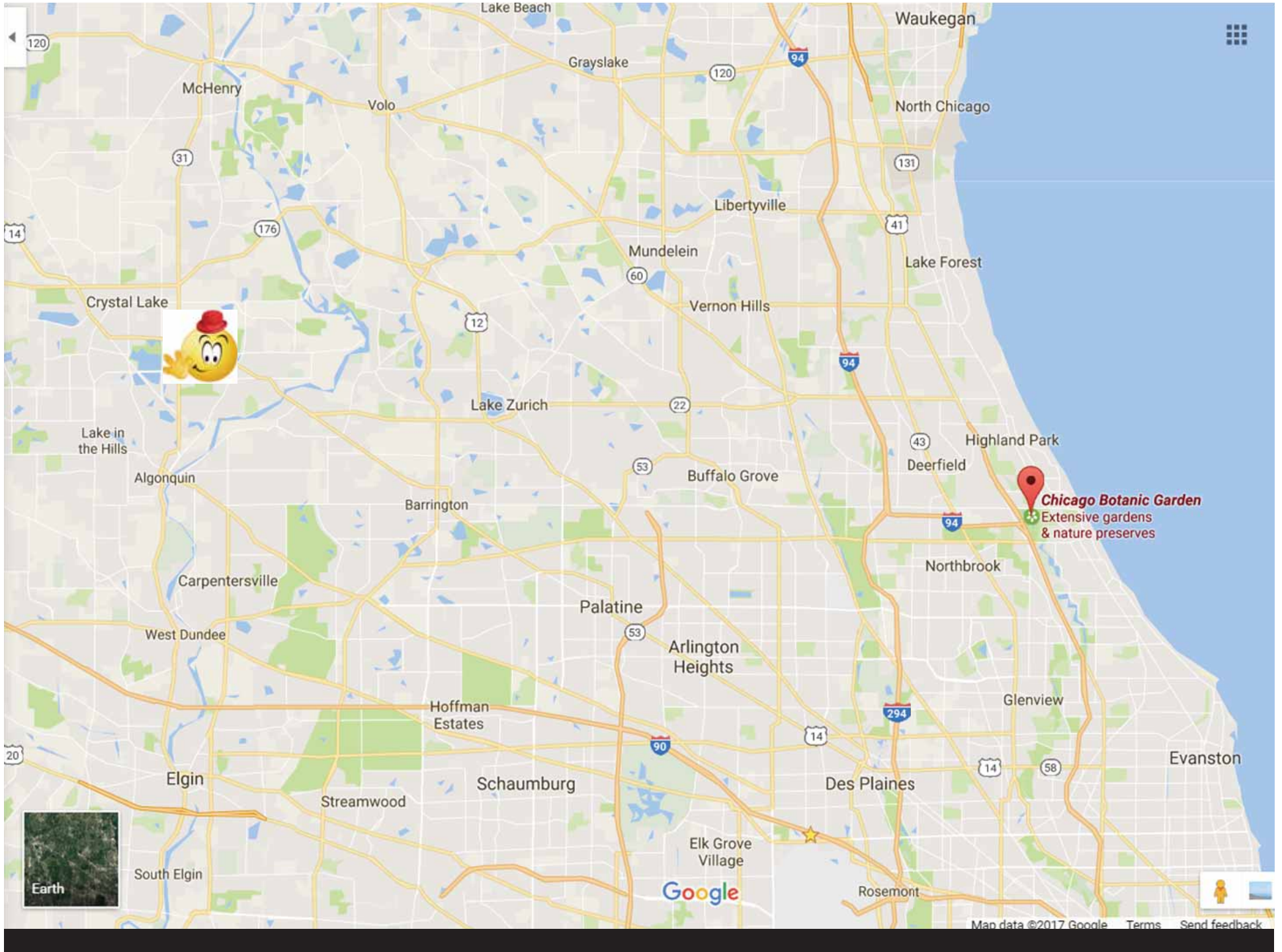


*Bob Kirschner*

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



**Chicago Botanic Garden**  
Extensive gardens  
& nature preserves



Google







# 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





















CHICAGO BOTANIC GARDEN



**“The Garden on the  
Water”**





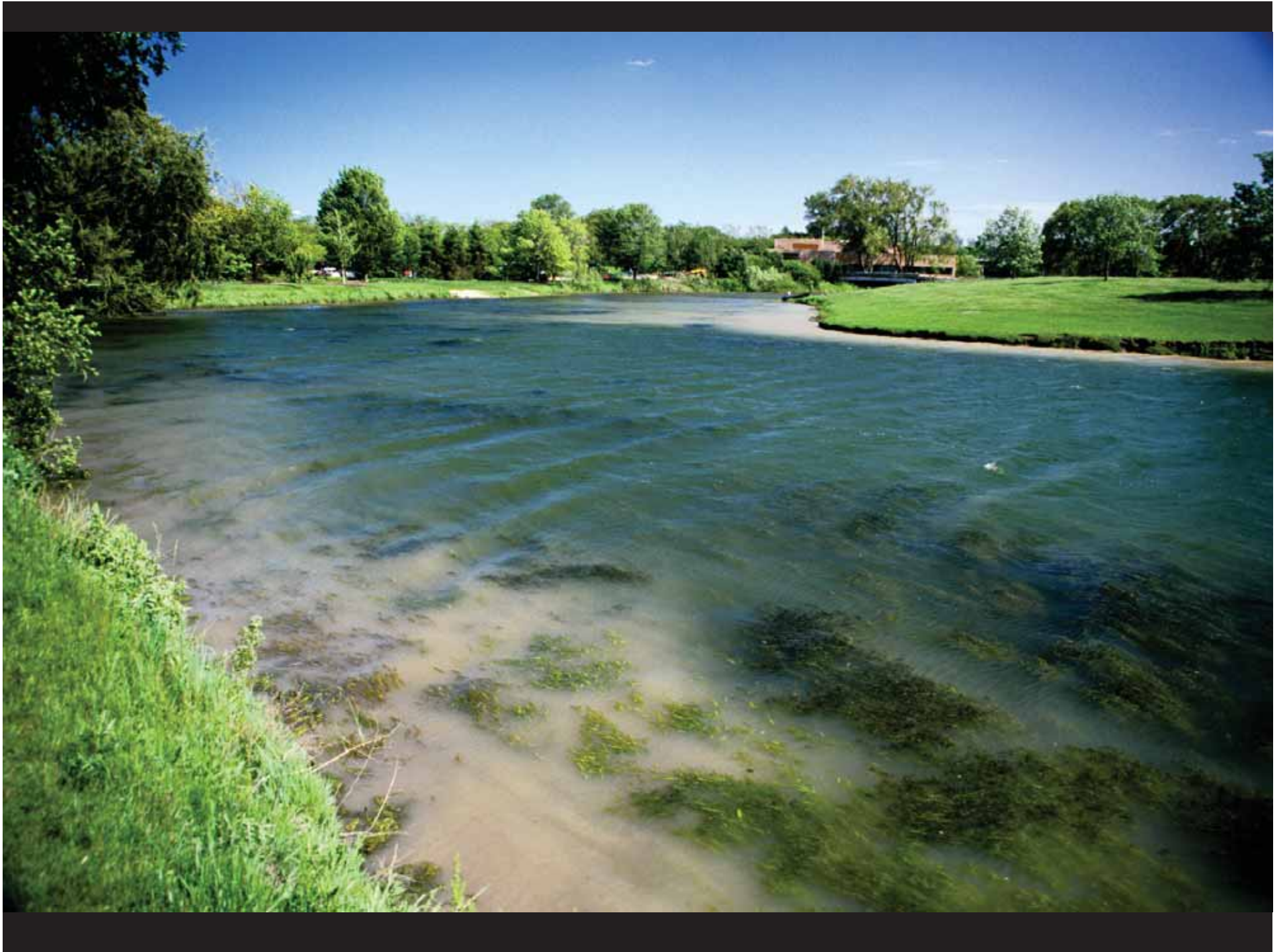
“The Garden **IN** the  
Water”













# Conventional Approaches to Control Shoreline Erosion

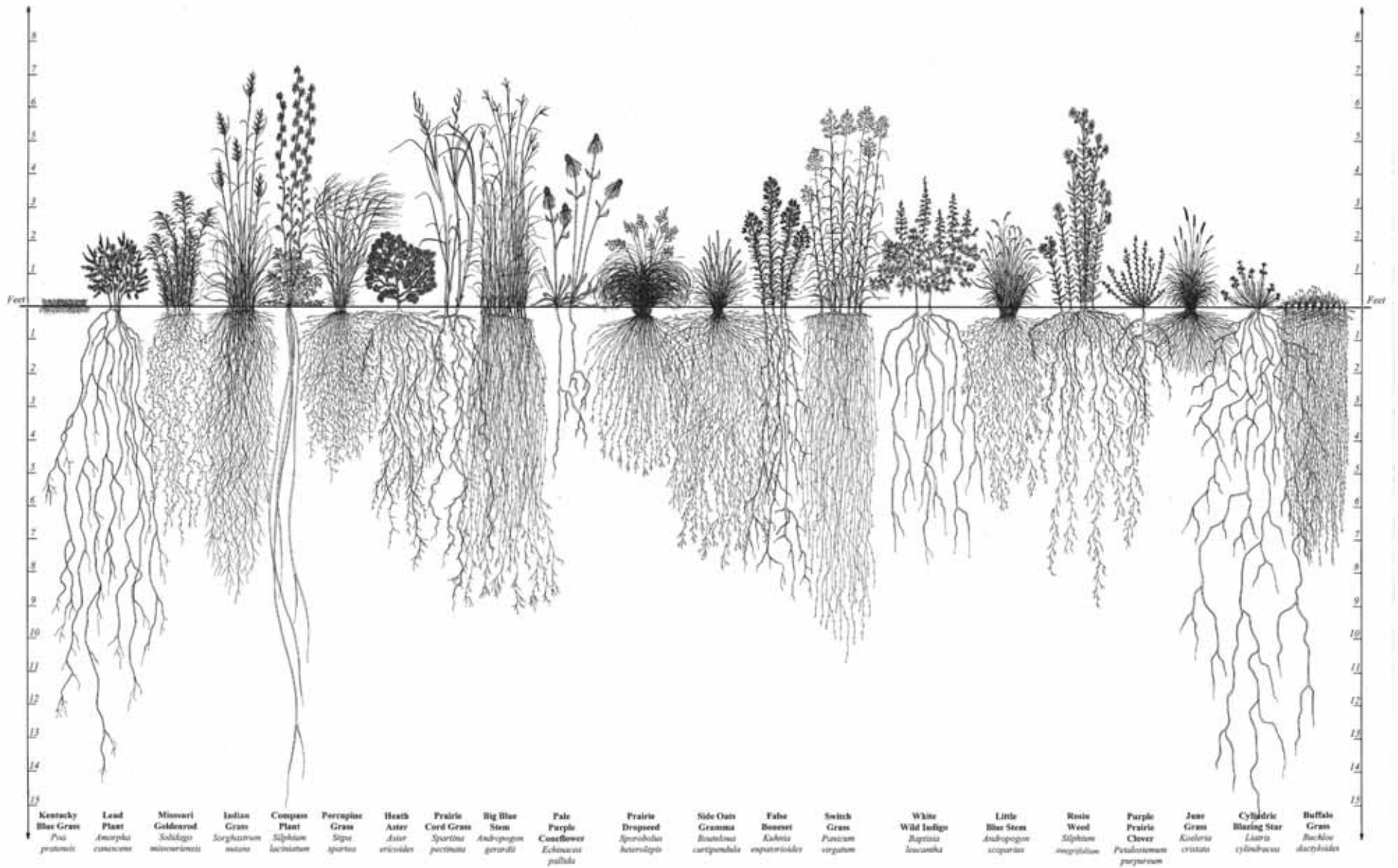
- ❖ Sheetpiling
- ❖ Stone riprap
- ❖ Paving



# “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











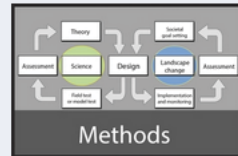
Joan Iverson Nassauer, FASLA  
Professor of Landscape Architecture  
University of Michigan  
Natural Resources and Environment

[www-personal.umich.edu/~nassauer](http://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 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.

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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*. 23(6): pp. 973-977.



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

# “Cues to Care”



# “Cues to Care”

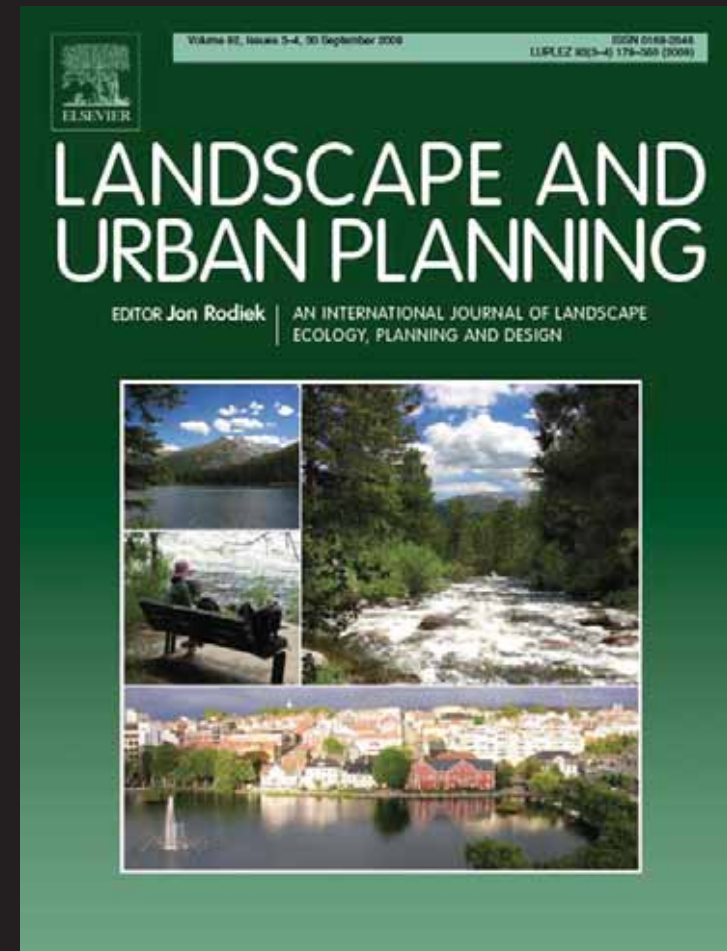
“The dominant culture in much of North America reads a neat, organized landscape as a sign of neighborliness, hard work, and pride.”

# “Cues to Care”

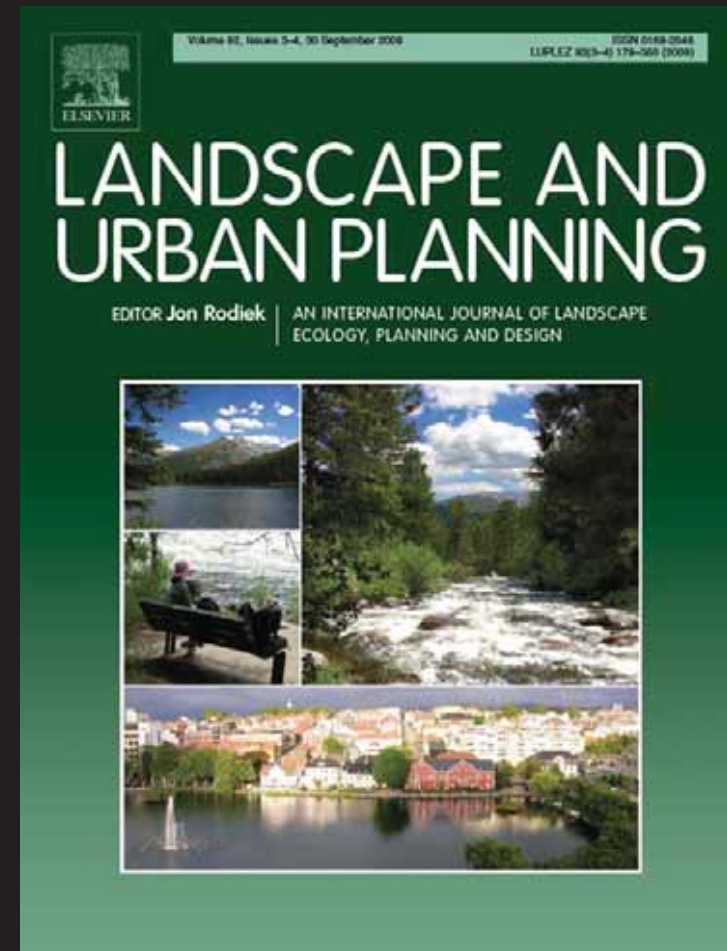
“In settled landscapes, urban or countryside, people expect to see the look of human intention.”



“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.”



**“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.”**







































8. 4. 2004























# “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

- Overview
- Landscape Performance Series
  - Case Study Briefs
  - Explore by Map
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# Chicago Botanic Garden Lake Shoreline Enhancement Projects

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## 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% preference for a shoreline restoration 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





**US Army Corps  
of Engineers®**  
Chicago District

# 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)*

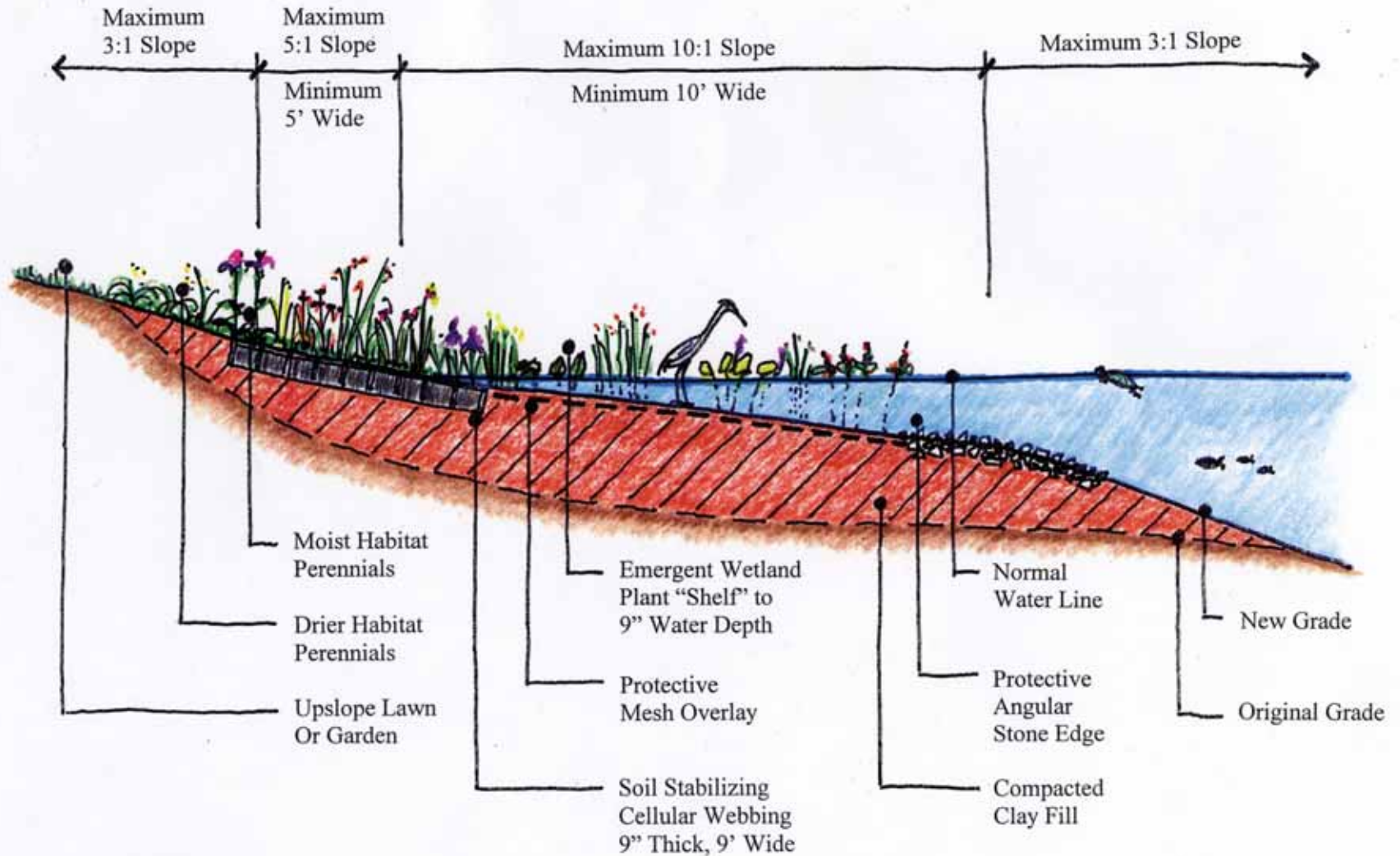
**Red:** Unfunded shorelines by the Café Lagoon and the South & Prairie Lakes

*(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](http://www.chicagobotanic.org)

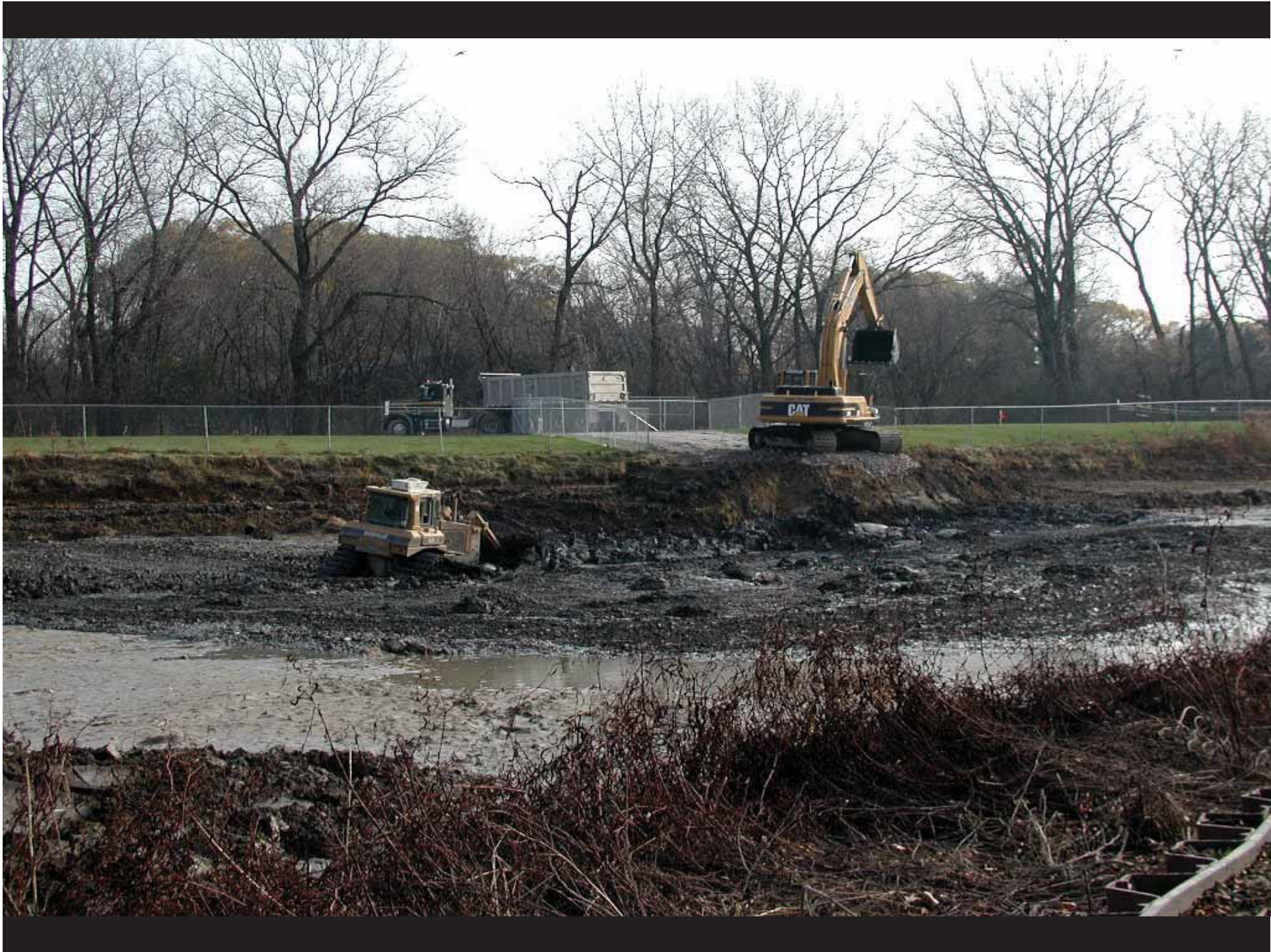
September 2002







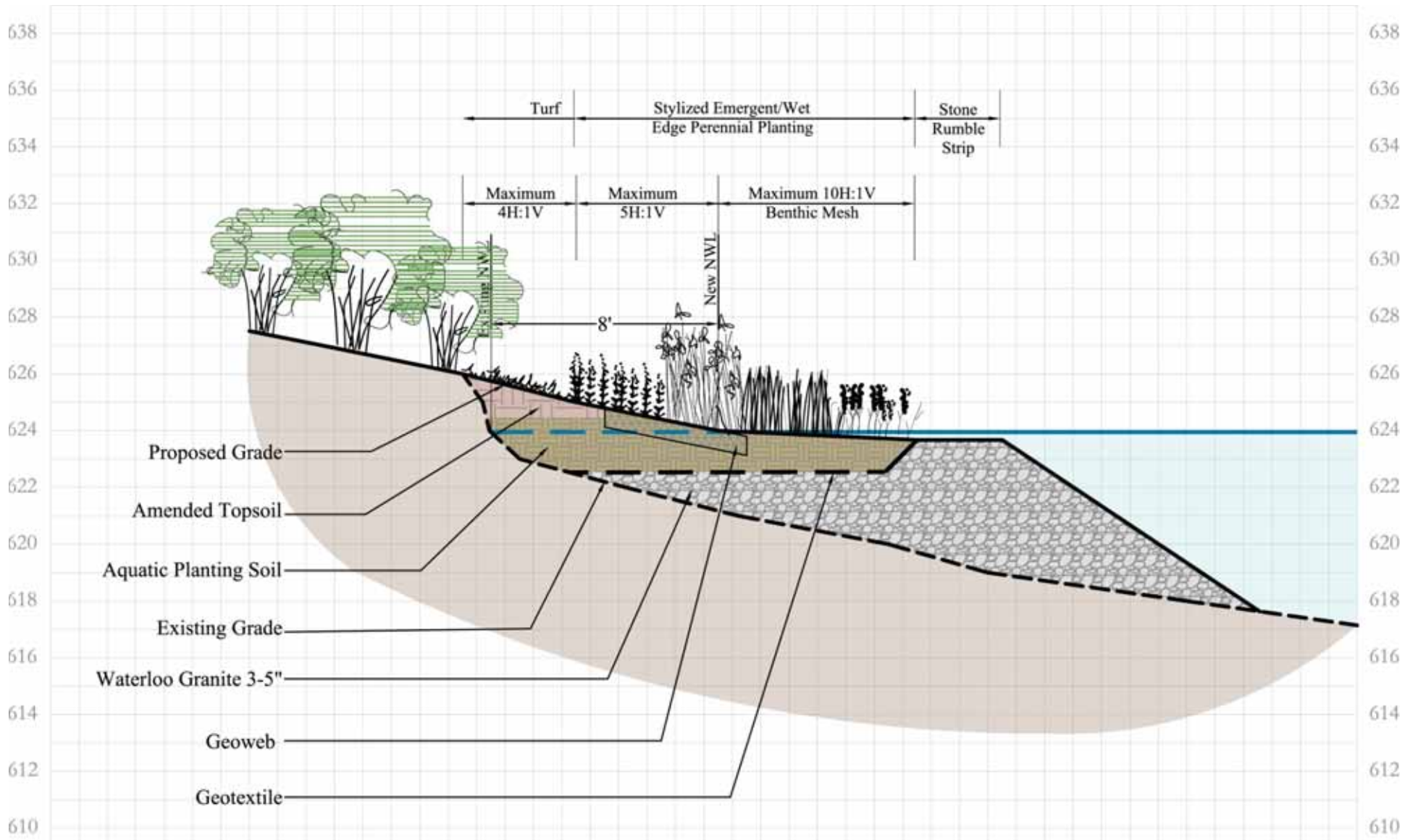












# Geoweb shoreline









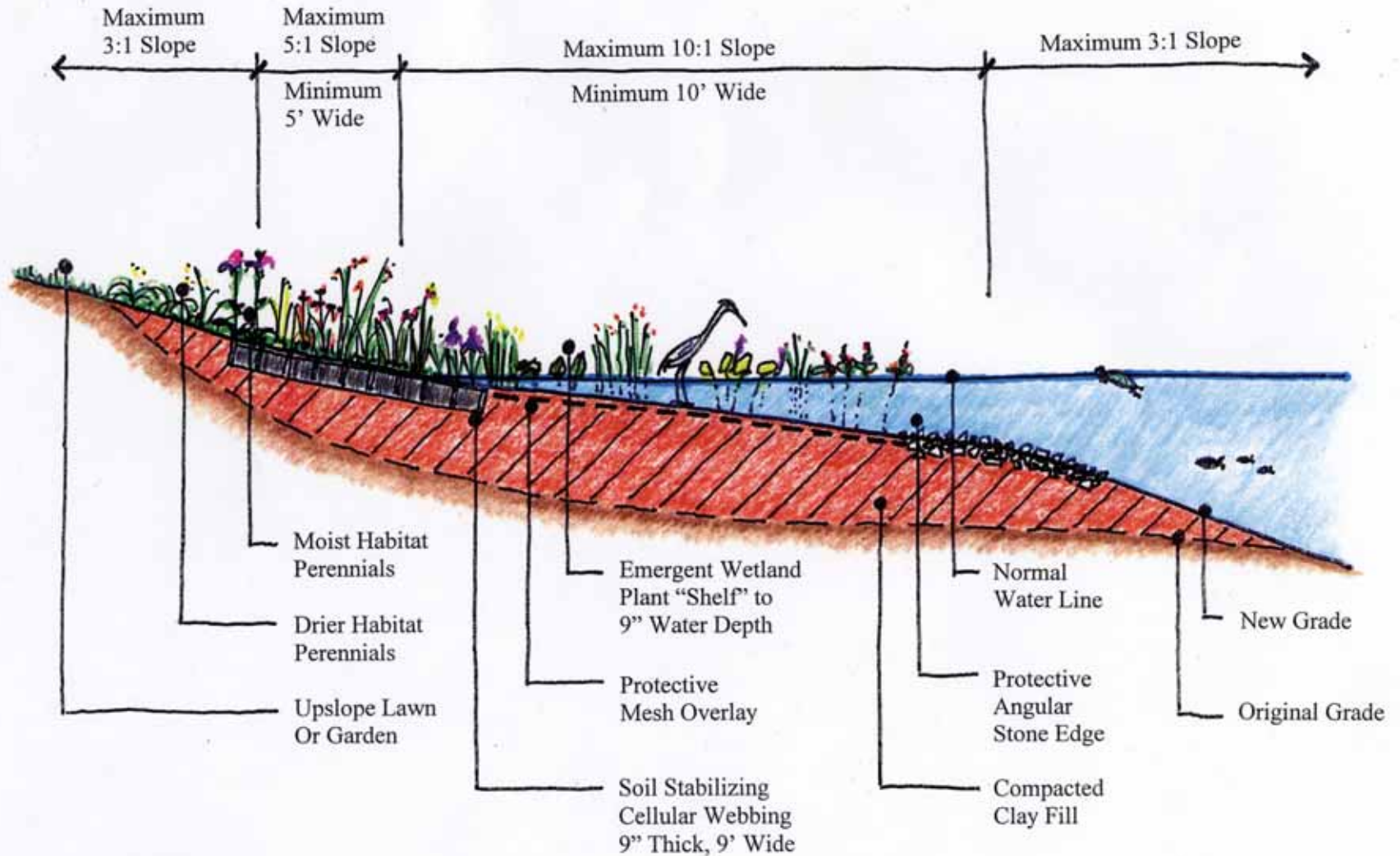








## Chicago Botanic Garden Shoreline Habitat Enhancement



Chicago Botanic Garden  
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847-835-5440  
[www.chicagobotanic.org](http://www.chicagobotanic.org)

September 2002





# Benthic Mesh













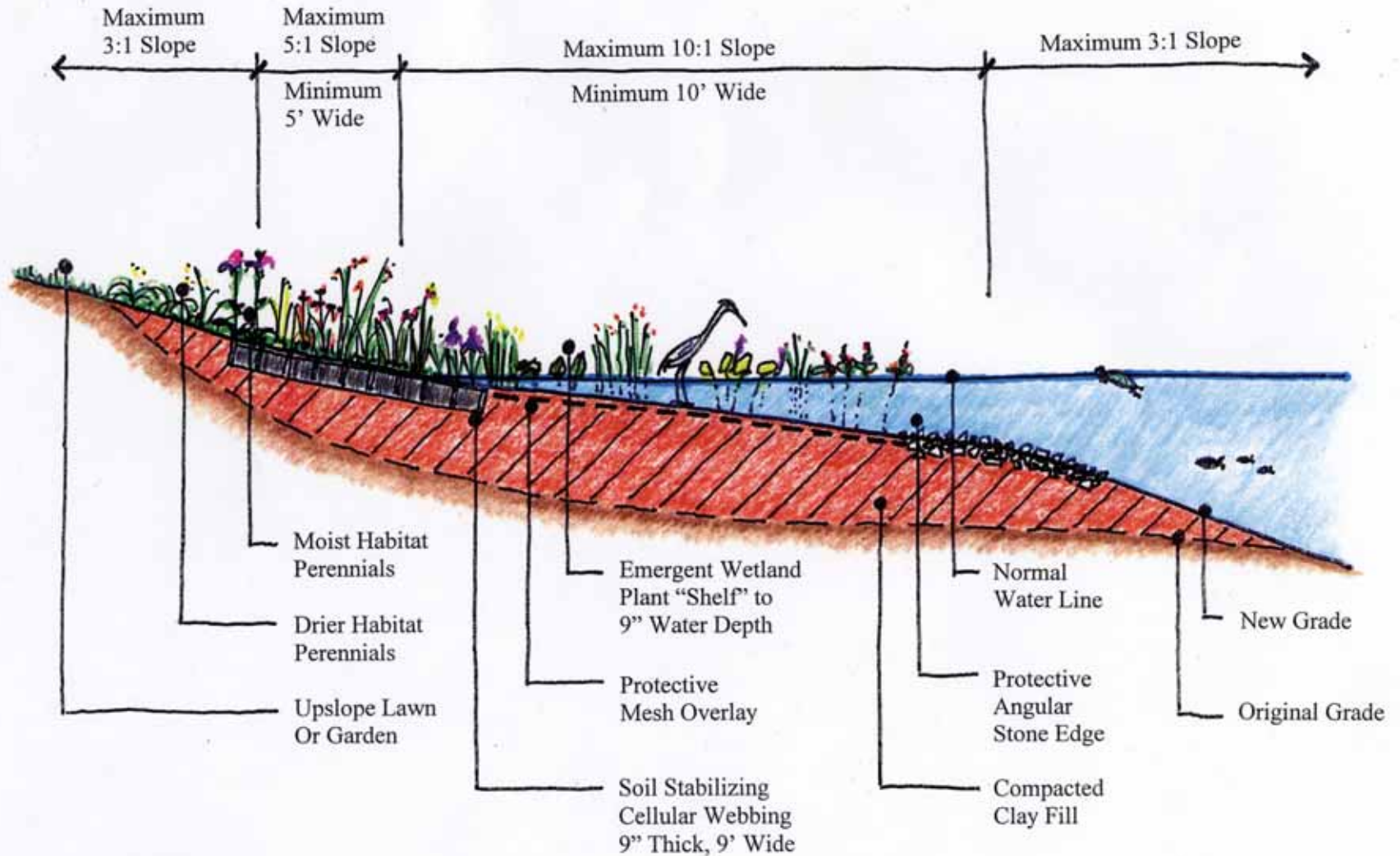


# Benthic mesh protects new aquatic plants





## Chicago Botanic Garden Shoreline Habitat Enhancement



Chicago Botanic Garden  
1000 Lake Cook Road  
Glencoe, Illinois 60022  
847-835-5440  
[www.chicagobotanic.org](http://www.chicagobotanic.org)

September 2002

# Planting beds and fish habitat







## 3 sizes of stone:

- ◆  $1/4'' \times 1/2''$
- ◆  $3/8'' \times 3/4''$
- ◆  $1-1/2'' \times 2-1/2''$







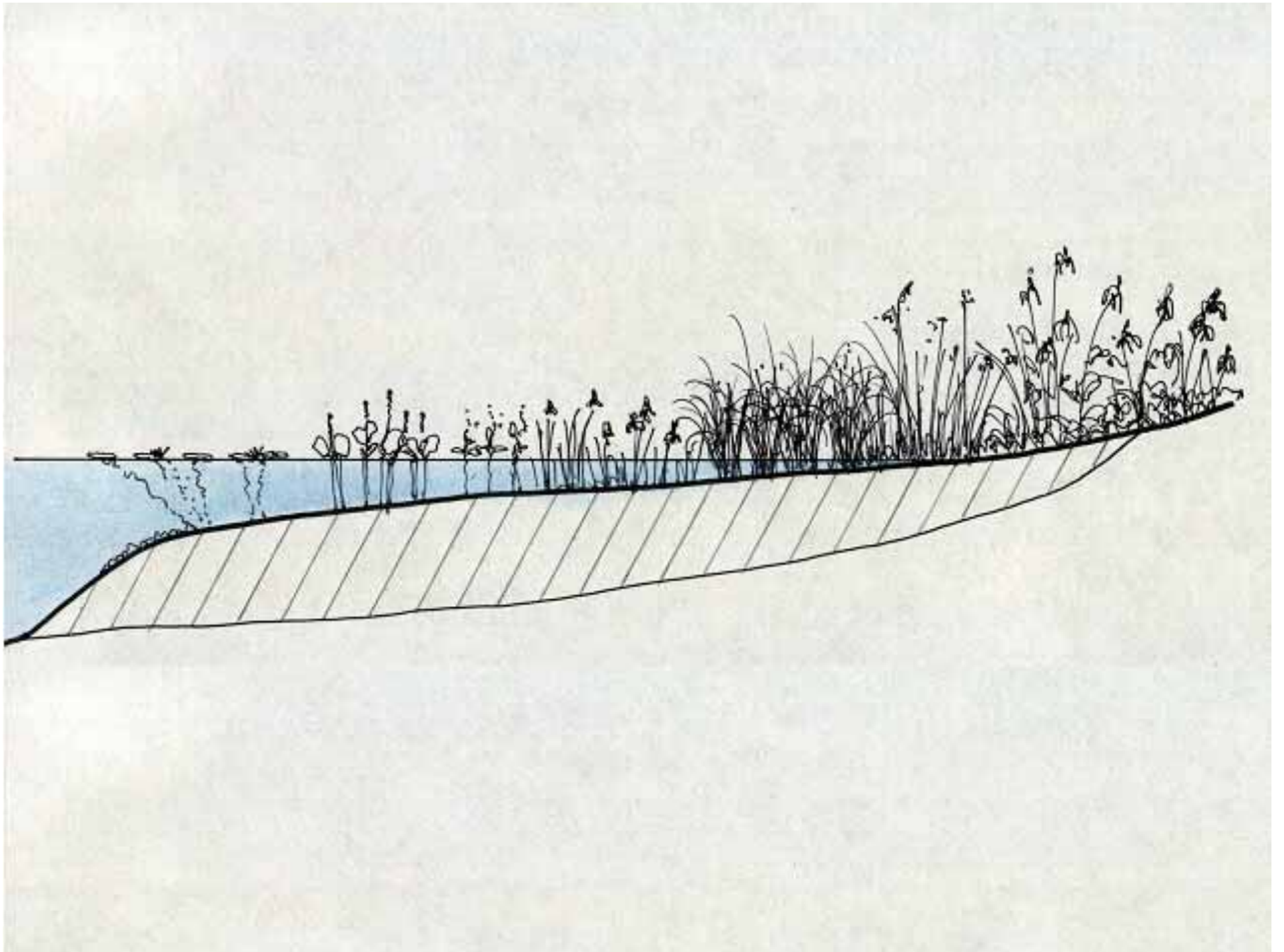






















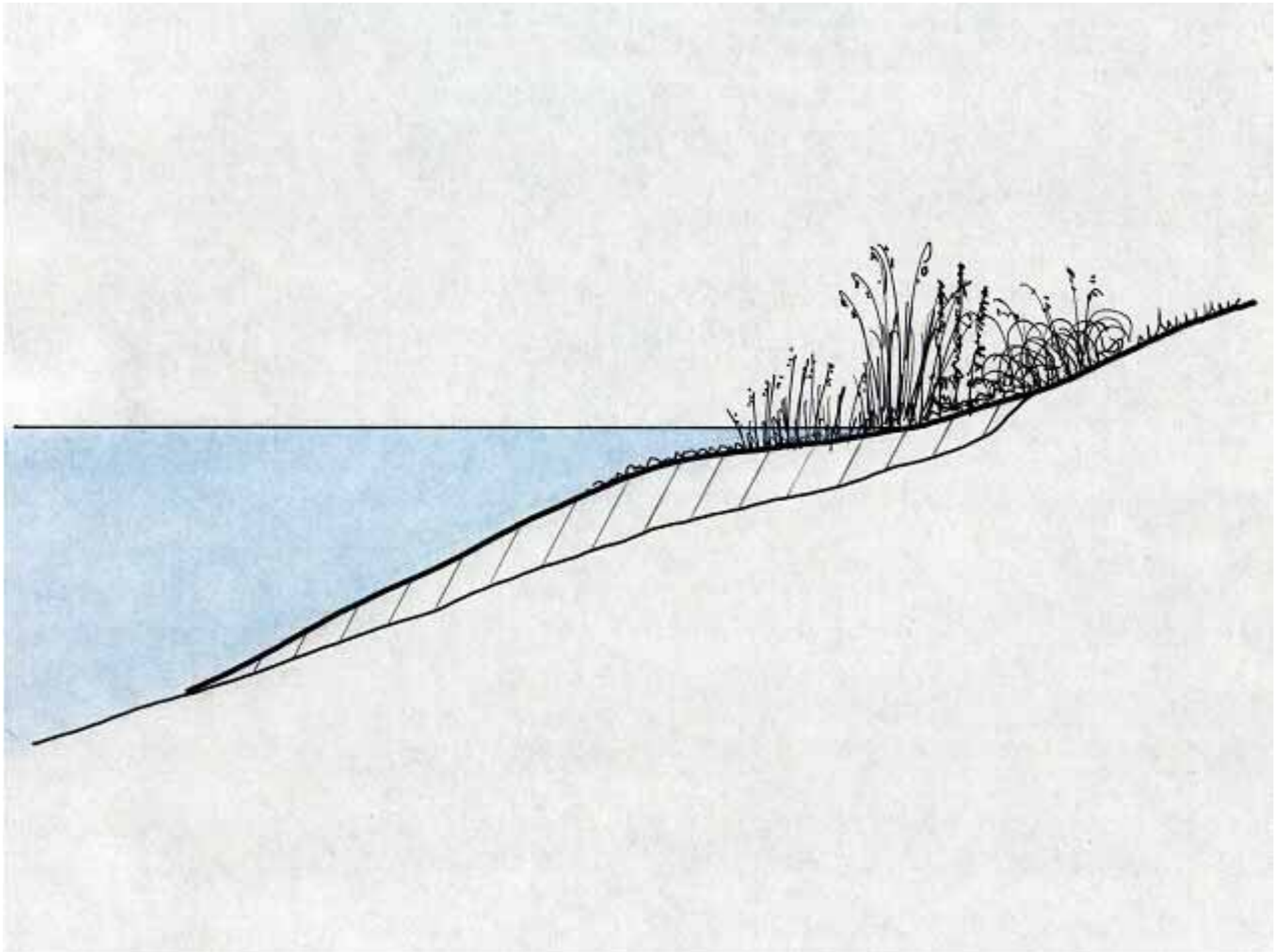






























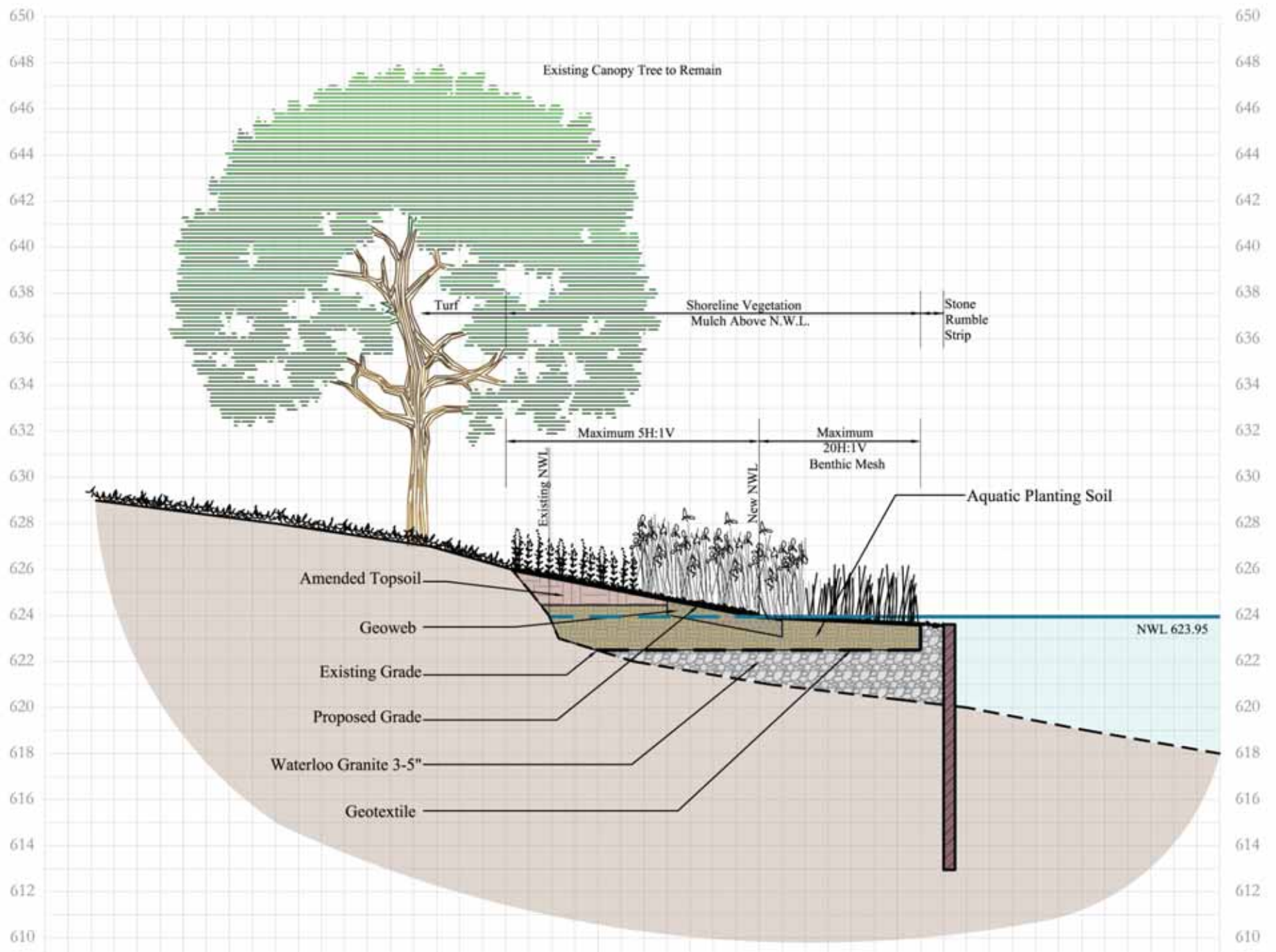






















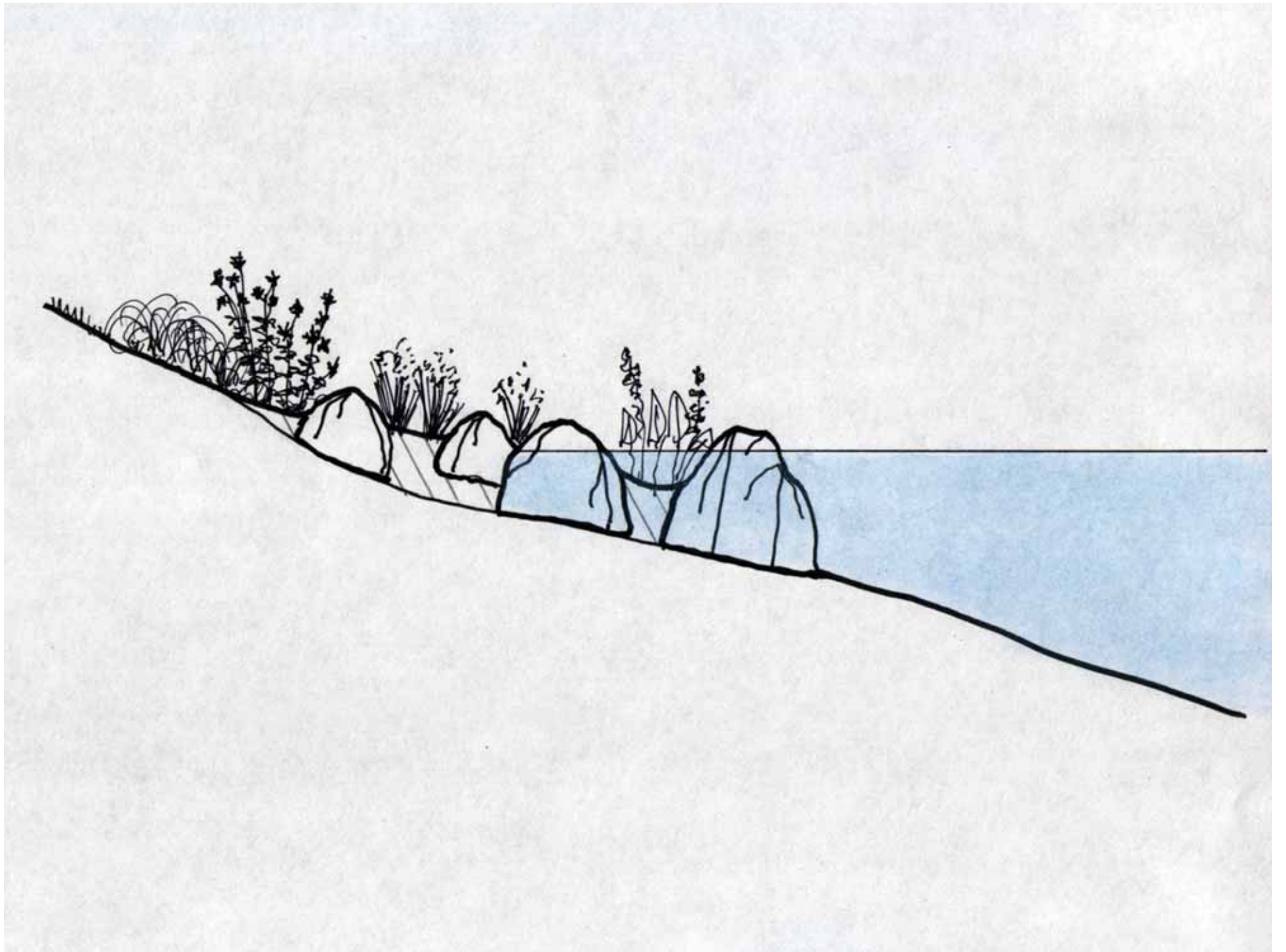
























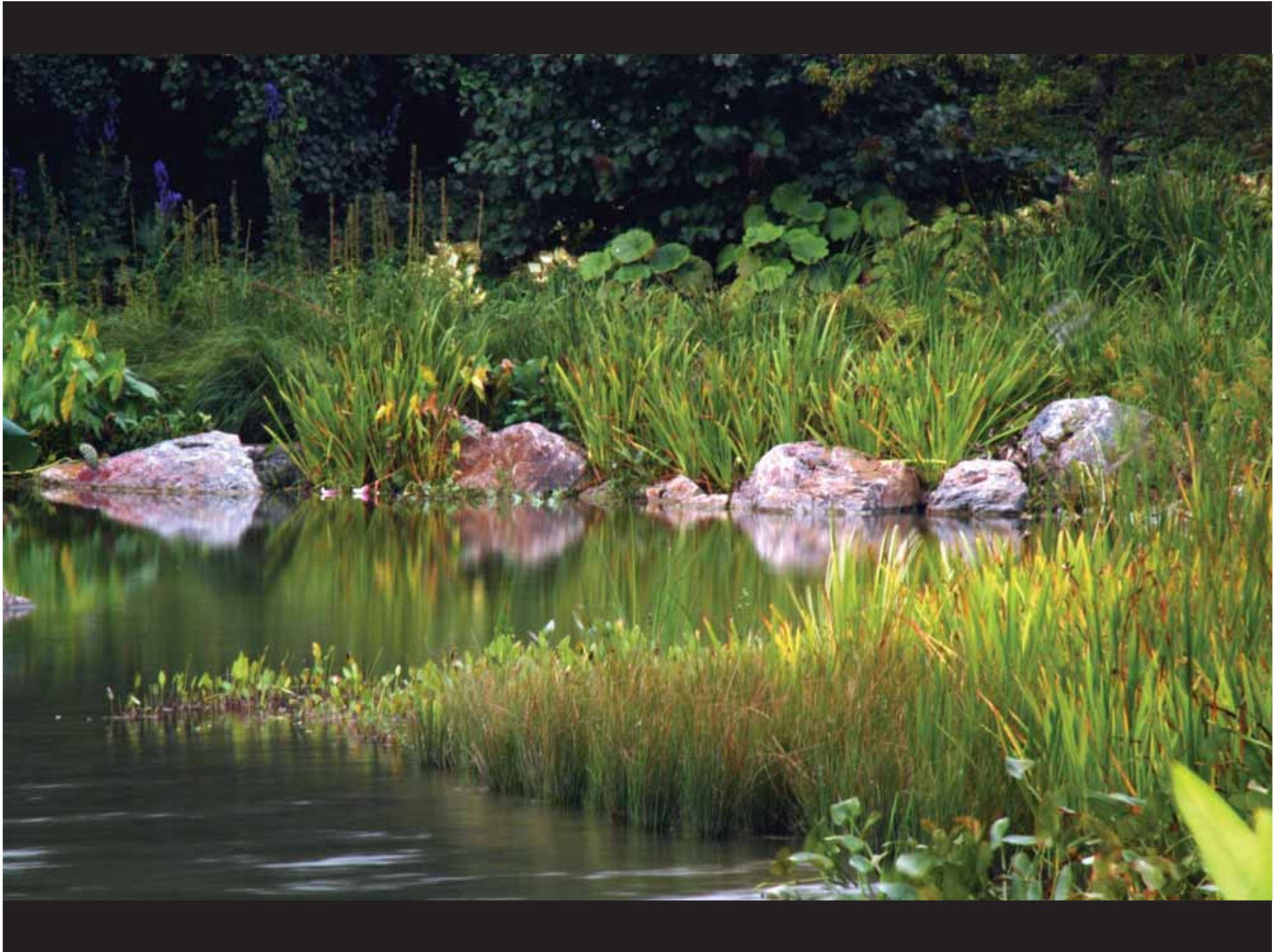






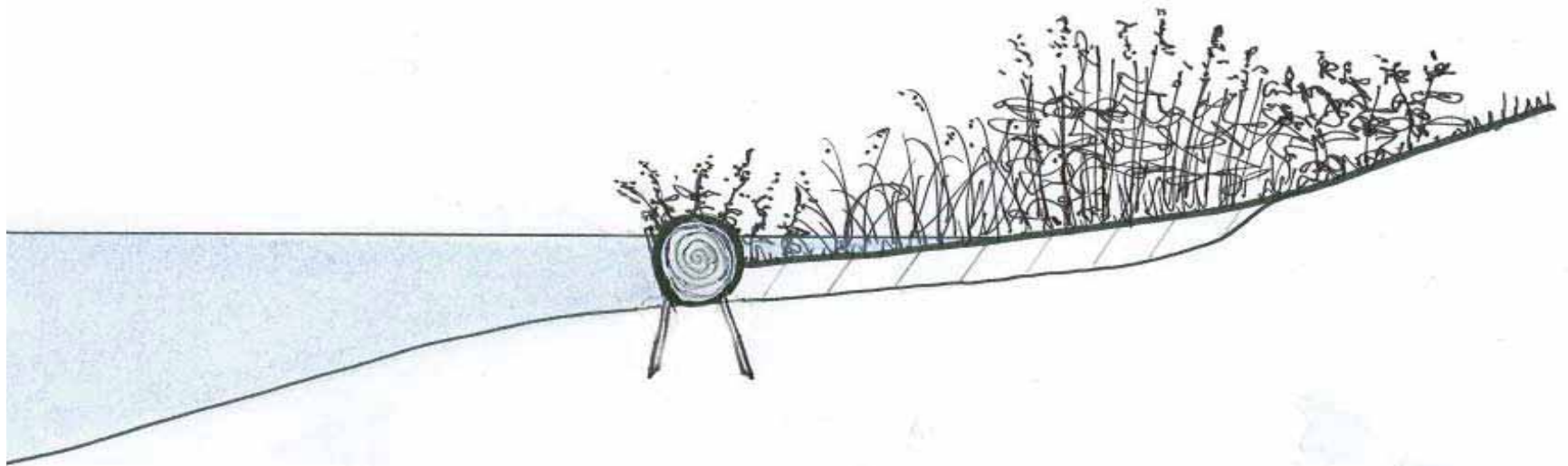
































2007.09.20

 **Envirolok**











# A few key lessons learned:

*Site Preparation*



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## *Site Preparation*

- **Remove unwanted vegetation THOROUGHLY before planting**



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# A few key lessons learned:

## *Site Preparation*

- Remove unwanted vegetation THOROUGHLY before planting
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- **Remove unwanted vegetation THOROUGHLY before planting**



- Black plastic
- Soil tilling
- Herbicides

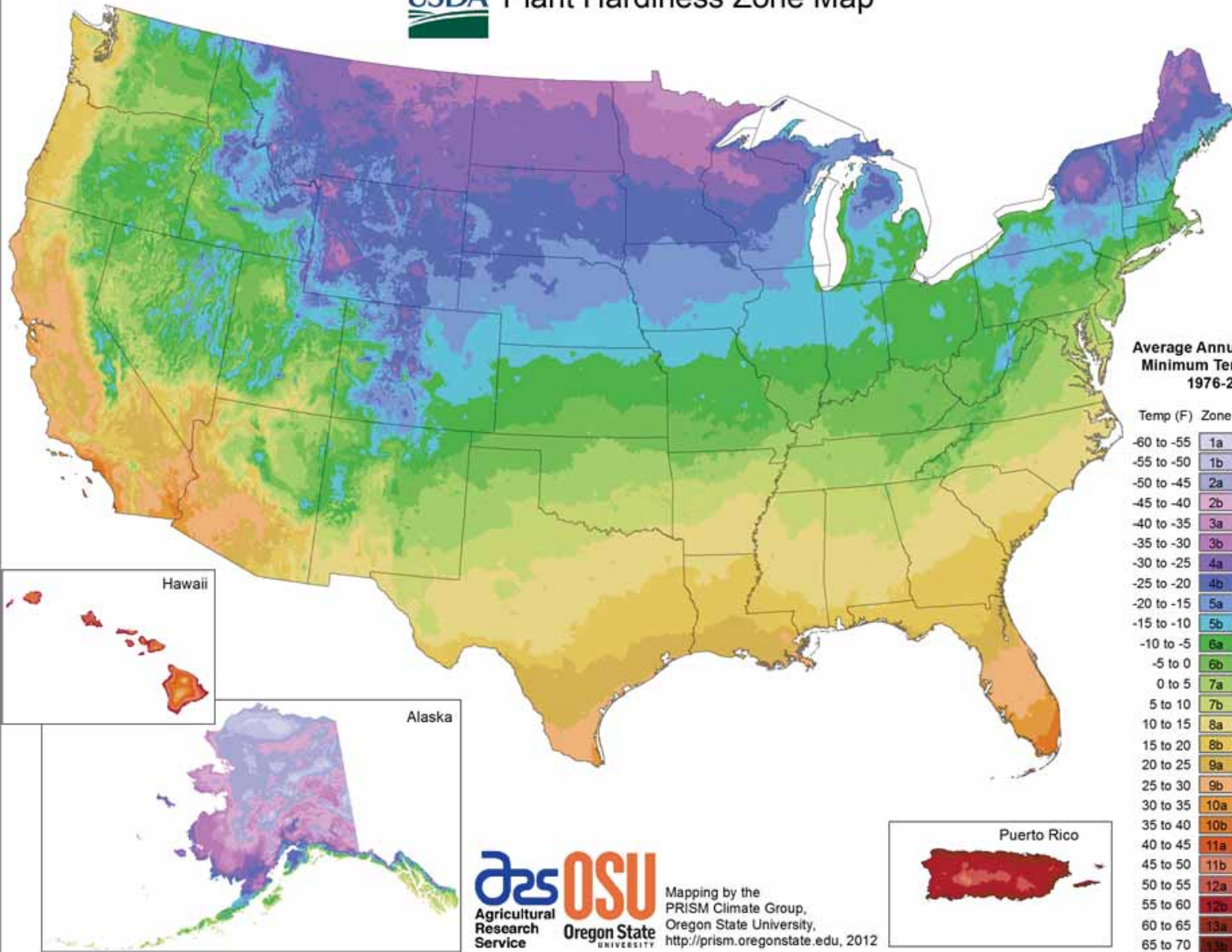


# A few key lessons learned:

*Plant Selection*



USDA Plant Hardiness Zone Map



Average Annual Extreme Minimum Temperature 1976-2005

Temp (F)	Zone	Temp (C)
-60 to -55	1a	-51.1 to -48.3
-55 to -50	1b	-48.3 to -45.6
-50 to -45	2a	-45.6 to -42.8
-45 to -40	2b	-42.8 to -40
-40 to -35	3a	-40 to -37.2
-35 to -30	3b	-37.2 to -34.4
-30 to -25	4a	-34.4 to -31.7
-25 to -20	4b	-31.7 to -28.9
-20 to -15	5a	-28.9 to -26.1
-15 to -10	5b	-26.1 to -23.3
-10 to -5	6a	-23.3 to -20.6
-5 to 0	6b	-20.6 to -17.8
0 to 5	7a	-17.8 to -15
5 to 10	7b	-15 to -12.2
10 to 15	8a	-12.2 to -9.4
15 to 20	8b	-9.4 to -6.7
20 to 25	9a	-6.7 to -3.9
25 to 30	9b	-3.9 to -1.1
30 to 35	10a	-1.1 to 1.7
35 to 40	10b	1.7 to 4.4
40 to 45	11a	4.4 to 7.2
45 to 50	11b	7.2 to 10
50 to 55	12a	10 to 12.8
55 to 60	12b	12.8 to 15.6
60 to 65	13a	15.6 to 18.3
65 to 70	13b	18.3 to 21.1

OSU  
Agricultural Research Service  
Oregon State University

Mapping by the PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>, 2012



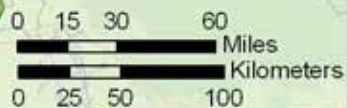
# Plant Hardiness Zone Map Illinois

## Average Annual Extreme Minimum Temperature 1976-2005

Temp (F)	Zone	Temp (C)
-20 to -15	5a	-28.9 to -26.1
-15 to -10	5b	-26.1 to -23.3
-10 to -5	6a	-23.3 to -20.6
-5 to 0	6b	-20.6 to -17.8
0 to 5	7a	-17.8 to -15

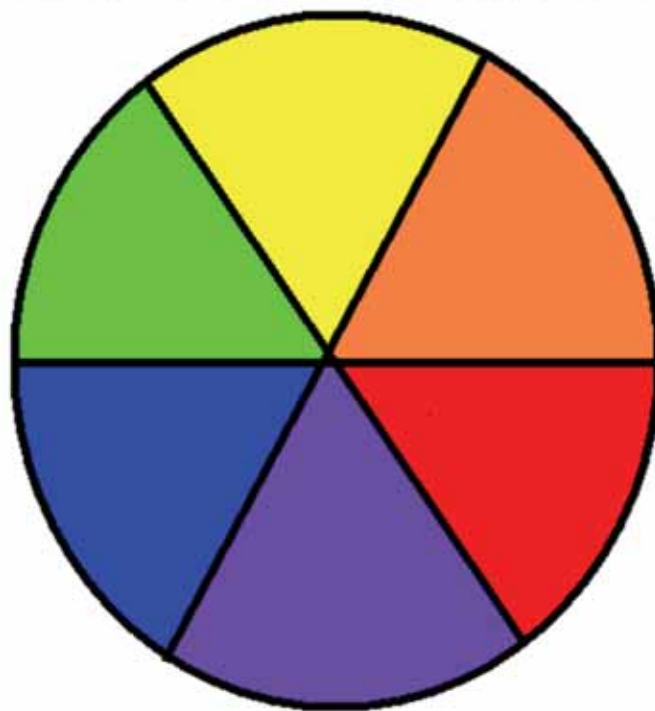


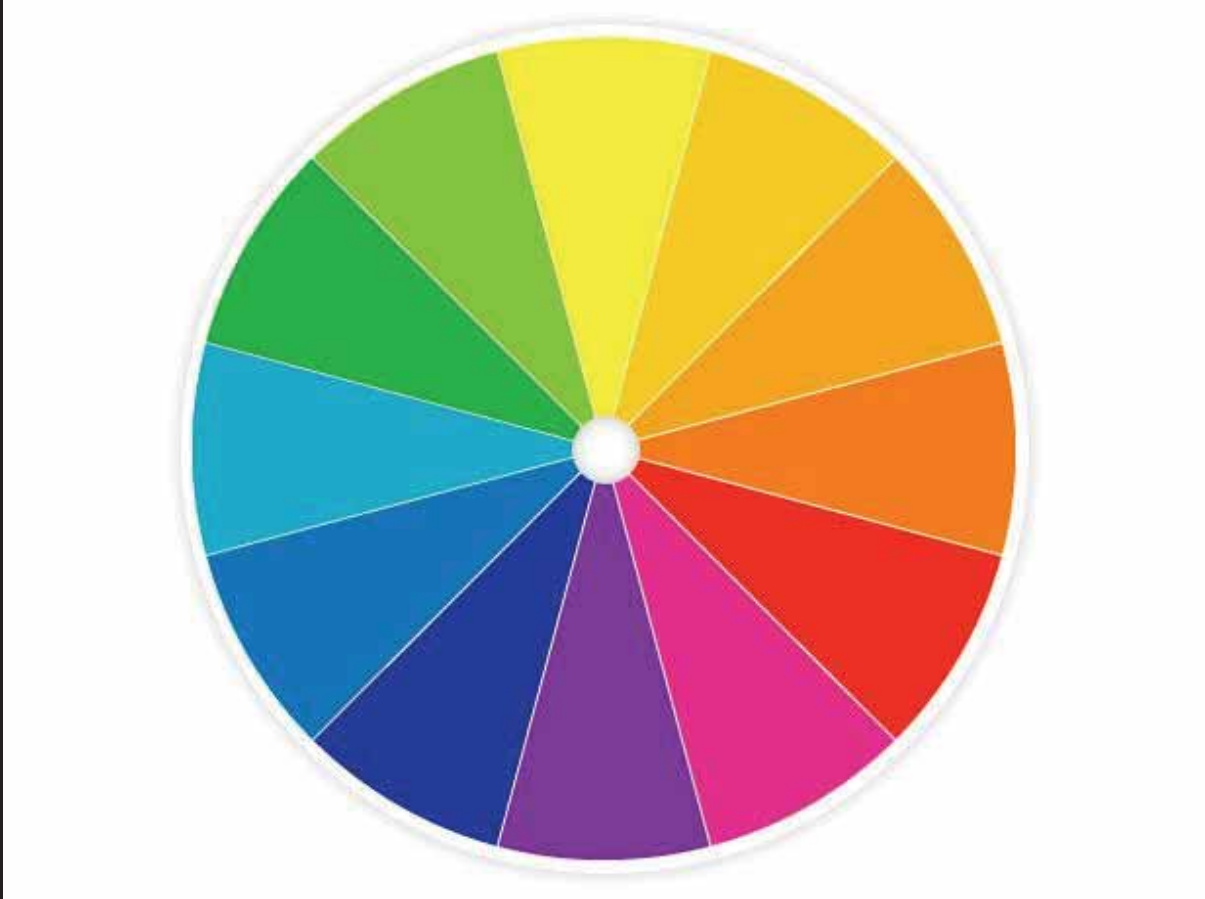
Mapping by the PRISM Climate Group  
Oregon State University



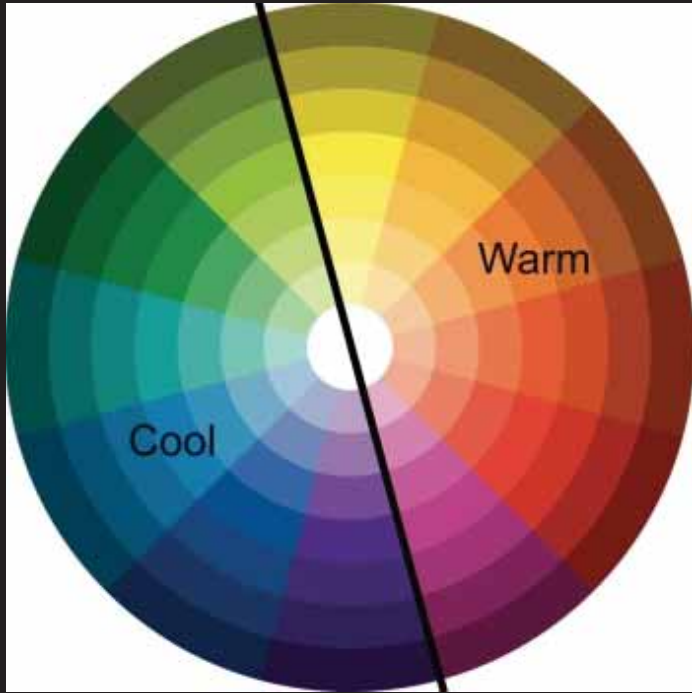


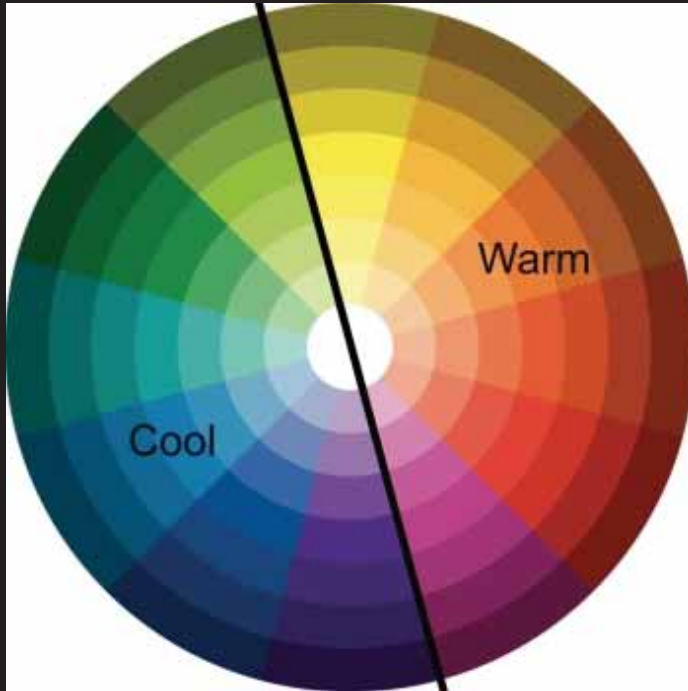
# BASIC COLOR WHEEL





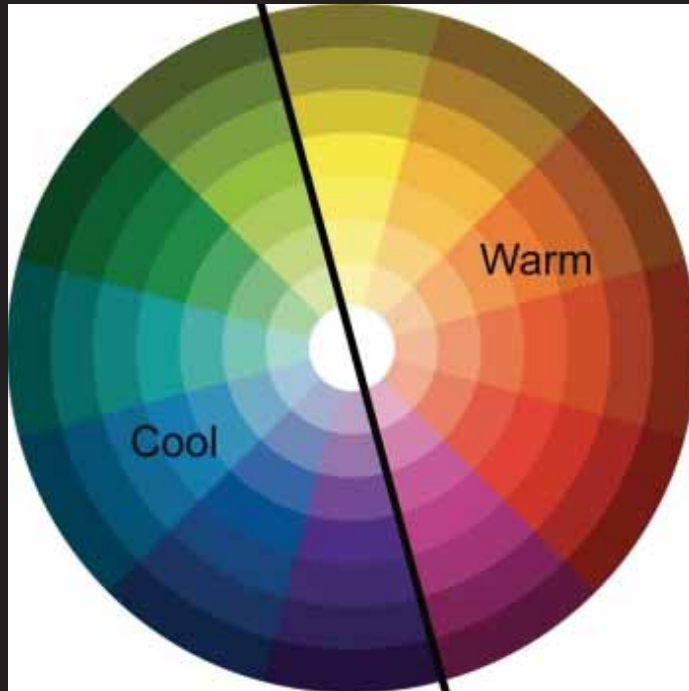






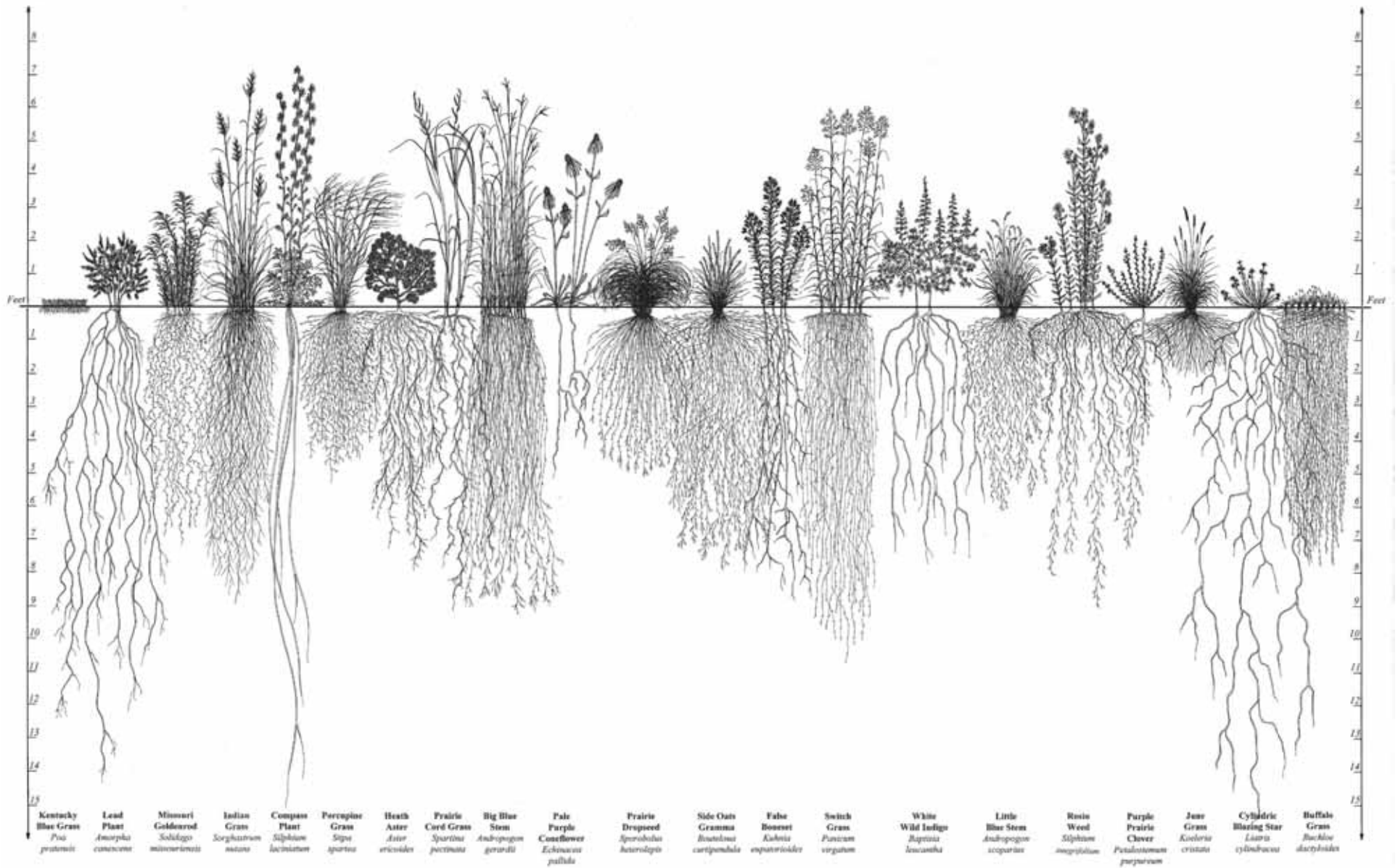
*analogous* colors: **ADJACENT** on wheel; “soothing/calming”





*analogous* colors: **ADJACENT** on wheel; “soothing/calming”

*complementary* colors: **OPPOSITE** on wheel; “dramatic/bold”



Root Systems of Prairie Plants



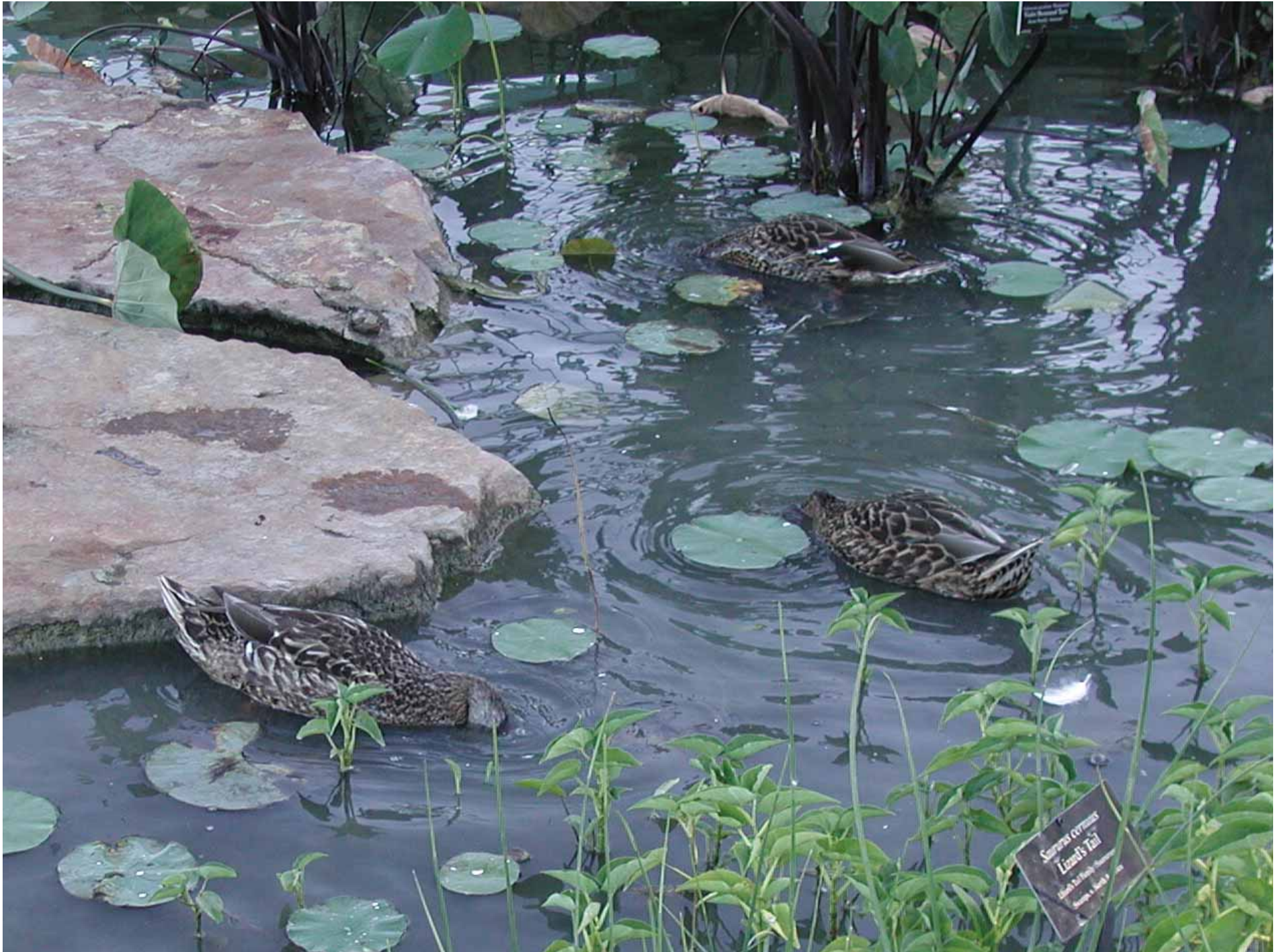
# A few key lessons learned:

## *Plant Selection*

- **Avoid planting too much candy**













# A few key lessons learned:

## *Plant Selection*

- 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.



# A few key lessons learned:

## *Plant Selection*

- 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)





# A few key lessons learned:

## *Plant Selection*

- 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









# A few key lessons learned:

## *Plant Selection*

- 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**







# A few key lessons learned:

## *Plant Installation*



# A few key lessons learned:

## *Plant Installation*

- **Insist on quality plants**

























# A few key lessons learned:

## *Plant Installation*

- Insist on quality plants
- **Favor local genotype**



# A few key lessons learned:

## *Plant Installation*

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

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## *Plant Installation*

- Insist on quality plants
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- If new soil's brought in, consider the source
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- **Plant early enough to allow root establishment**

# A few key lessons learned:

## *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**



# A few key lessons learned:

## *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!**





A few key lessons learned:

*Plant Care and Maintenance*

# A few key lessons learned:

## *Plant Care and Maintenance*

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



# A few key lessons learned:

## *Plant Care and Maintenance*

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





# A few key lessons learned:

## *Plant Care and Maintenance*

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









# A few key lessons learned:

## *Plant Care and Maintenance*

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



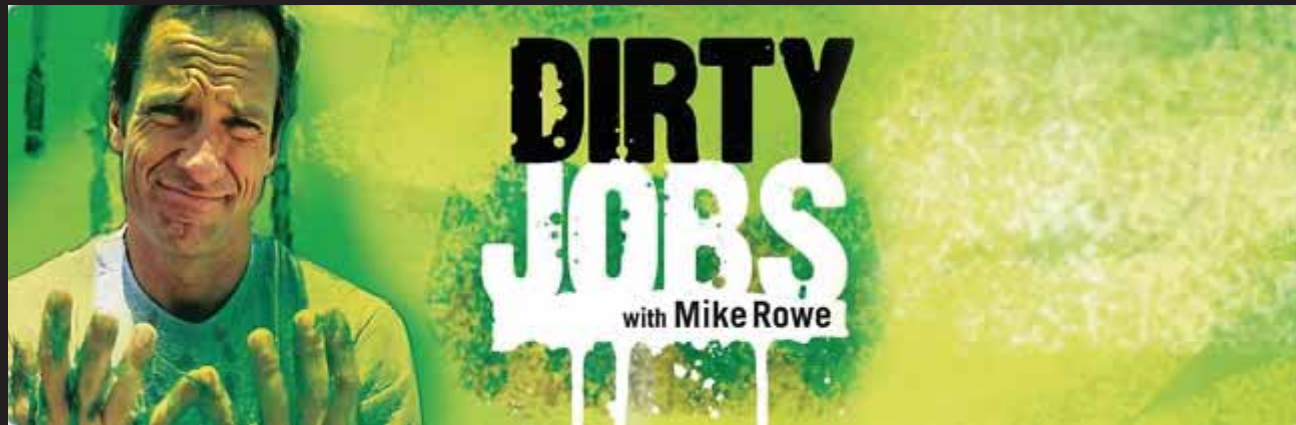




# Aquatic Plant Harvester















# A few key lessons learned:

## *Plant Care and Maintenance*

- 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**



The Wisconsin Lakes Partnership





**SHEET 8 of 19**

**CHICAGO BOTANIC GARDEN**  
**AQUATIC PLANT & URBAN LAKE STUDIES**  
 Shoreline Planting Plan  
 Spider Island Pool-Western Shoreline

● Present Bed  
■ North Bed  
■ Marsh  
■ Planting Bed  
■ Shoreline Survey Station

Project Date: Aquatic Photography dated March 22, 2016  
 File Format: ArcSDE  
 Map Projections: ArcSDE  
 Last Modified: March 7, 2016  
 NOTE: Multiple sites shown in a single bed represent the heterogeneous nature within the bed.



Project Number: 16-001  
 Date: 04/20/16



















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)**





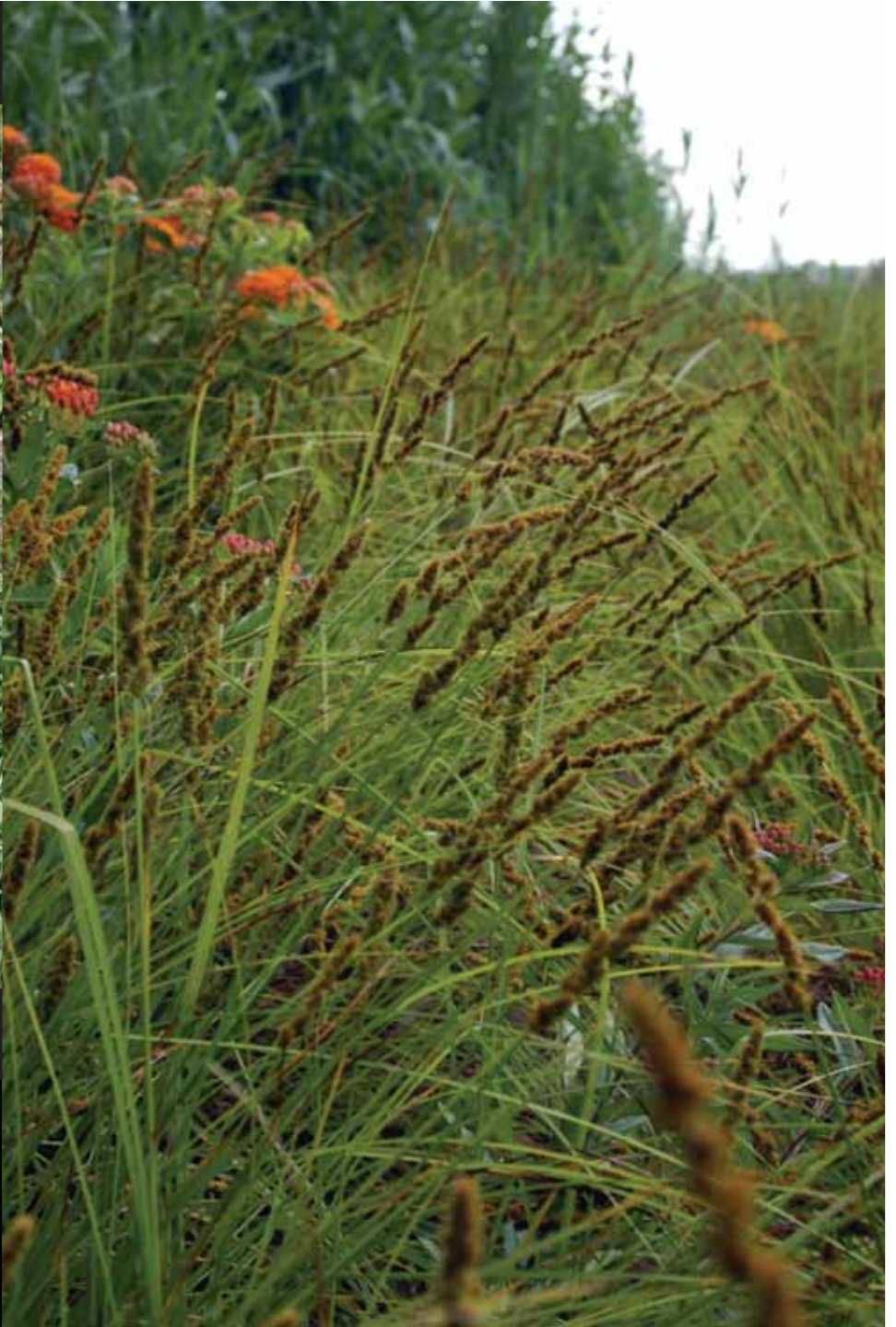
***Carex lacustris***  
**(Common Lake Sedge)**





*Carex stricta*  
(Tussock Sedge)





***Carex vulpinoidea***  
**(Fox Sedge)**





***Decodon verticillatus***  
***(Swamp Loosestrife)***





***Eleocharis acicularis***  
**(Needle Spike Rush)**



***Filipendula rubra***  
***(Queen-of-the-Prairie)***





***Iris versicolor***  
**(Northern Blue Flag)**



*Juncus effusus*  
(Common Rush)





***Justicia americana***  
***(American Water Willow)***





Foto: Torgny Roosvall

*Leersia oryzoides*  
(Rice Cutgrass)







***Lobelia cardinalis***  
***(Cardinal Flower)***





***Lobelia siphilitica***  
***(Great Blue Lobelia)***





***Nuphar variegatum***  
***(Yellow Pond Lily)***



***Nymphaea odorata***  
***(White Water Lily)***







*Peltandra virginica*

(Arrow Arum)



***Penstemon digitalis***  
***(Foxglove Beardtongue)***





***Pontederia cordata***  
***(Pickerel Weed)***





***Sagittaria latifolia***  
**(Common Arrowhead)**





***Salix discolor***  
***(Pussy Willow)***



***Schoenoplectus acutus***  
***(Scirpus acutus)***  
***(Hard-stemmed Bulrush)***



***Scirpus pendulus***  
***(Red Bulrush)***





***Scheuchzeria palustris***  
***(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 and Pond Shorelines: Controlling Erosion and Enhancing Habitat



CHICAGO BOTANIC GARDEN

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JOSEPH REGENSTEIN, JR. SCHOOL

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

**[www.chicagobotanic.org](http://www.chicagobotanic.org)**







# www.cbgshoreline.org

The screenshot shows the Chicago Botanic Garden website. At the top left is the logo with a stylized bird/plant icon and the text "CHICAGO BOTANIC GARDEN". To the right is a banner image of a lake with trees. Below the banner is a navigation menu with links: "ENJOY YOUR VISIT", "AT THE GARDEN", "YOUR GARDEN", "EDUCATION", "CONSERVATION", and "SUPPORT US". A search bar is located below the navigation menu. On the left side, there is a vertical green sidebar with the following text: "LAKE SHORELINE EROSION CONTROL AND HABITAT ENHANCEMENT", "Shoreline Erosion Control", "North Lake Restoration Resources", "Native Plants for Shorelines", and "Plant Science and Conservation". The main content area has a dark green header with the title "Lake Shoreline Erosion Control and Habitat Enhancement". Below the title is a paragraph: "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](#)." Below this is a photo of a lake with tall grasses and a purple flower in the foreground. To the right of the photo is the section "EMBRACING NATIVE LANDSCAPING PRINCIPLES" with text: "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." Below this is a map of the Garden's lakeshore. To the left of the map is text: "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 3.7 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." Below the map is the section "IDENTIFYING SHORELINE PROBLEMS" with text: "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 water problems and their causes, and identified





## Lake Shoreline Erosion Control and Habitat Enhancement

[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



Chicago Botanic Garden's lakeshore through a partnership with the



# Lake Shoreline Erosion Control and Habitat Enhancement

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 water-loving 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.

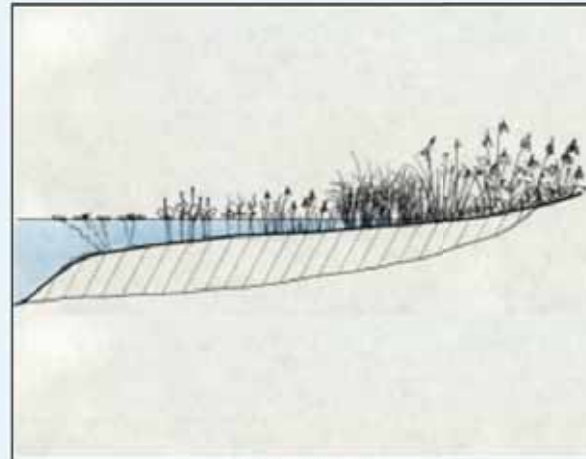


## ▶ Shoreline Erosion Control

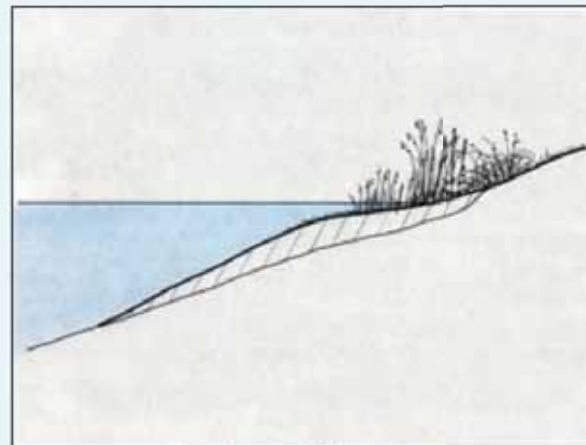
- Traditional Approaches
- Bioengineered Solutions
  - Shoreline Techniques Implemented at the Garden
    - Treatment 1: Clay Soil Shelf
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    - Treatment 6: Coir Roll
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  - Regulatory Programs
  - Project 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

### ► 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 \(Symphyotrichum\) novae-angliae](#)
- [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**

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- [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



Mid Growth



Full Growth



Flower







# Horticulture

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### expert picks | robert kirschner's favorites

Robert Kirschner, director at the Chicago Botanic 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.



**1** 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.

**2** Commonly known as queen of the reeds (perennial rush), it reaches a height of six feet, blooming from June to August in pale pinks full sun to part shade. Zones 3 to 9.



**3** *Caltha palustris*, commonly called zowzie or yellow marsh marigold, is a succulent perennial that grows to feet tall, blooms from April through June, and has heart-shaped leaves. Hardy to Zone 3.



**4** Tussock sedge (*Carex stricta*) grows in three-foot tall clumps that spread about a week. They offer a safe haven for amphibians and waterfowl. Zones 3 to 9.

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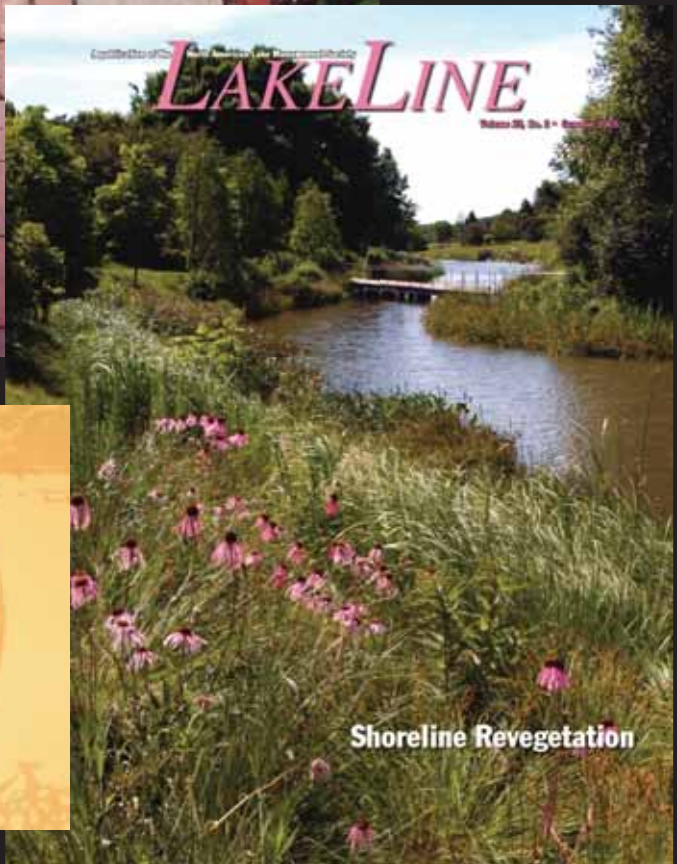
www.hortmag.com

# Public Garden



WATER MANAGEMENT

# LAKELINE



Shoreline Revegetation





# 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  
VALUES  
and work through those?























































Living Habitats

Heidi Natura  
Founder and Partner

