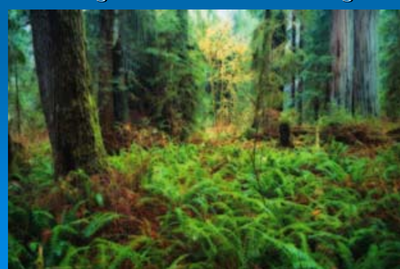
Ecological Revitalization Resources Seminar


Ellen Rubin, PhD, PE
US EPA

Ecological Revitalization Definition

- Ecological revitalization of a Superfund site is the process of returning a site to a functioning and sustainable use. Ecological revitalization re-established a site to a natural state, thus increasing or improving habitat for plants and animals without impairing the remediation activities that ensure the protection of human health and the environment. Although ecological revitalization can be used to create habitat as a specific goal, it also can be used to complement or enhance a traditional cleanup method; as a green remediation technology to remove and stabilize contaminants; or reduce erosion while providing valuable wildlife habitat. Ecological revitalization also can be used adjacent to areas redeveloped for commercial use, such as for riparian zones, and in conjunction with recreational features such as hiking and biking trails or bird-watching lookout stations.



A-2

Ecological Revitalization Resources

- Fact Sheets
  - Frequently Asked Questions (FAQs) about Ecological Revitalization of Superfund Sites (542-F-06-002)
  - Revegetating Landfills and Waste Containment Areas (542-F-06-001)
  - Ecological Revitalization and Attractive Nuisance Issues (542-F-06-003).

http://www.cluin.org/ecorevitalization

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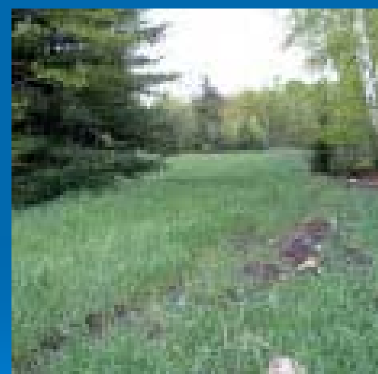
Frequently Asked Questions (FAQs) about Ecological Revitalization of Superfund Sites

- Sent out email asking for questions
- Received many responses and about 30 questions all across the board
- The goal of the first fact sheet is to answer basic questions
  - Definition of ER
  - Types of sites suitable for ER
- And refer folks to additional resources

A-4

Revegetating Landfills and Waste Containment Areas

- We kept hearing the same question – Can you revegetate a landfill?
- This fact sheet answers that question – yes you can!
- And tells you how
  - Types of vegetation
  - Establishing plants
  - Maintenance repair
  - Lessons learned
  - Additional Resources



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Ecological Revitalization and Attractive Nuisance Issues

- Defines Attractive Nuisance
- How to assess attractive nuisance issues at your site
- How to manage attractive nuisance issues at your site
- Illustrates problems and solutions through 5 case studies

A-6

Soil Amendments Working Meeting

- In August 2006, the U.S. EPA Technology Innovation and Field Services brought together approx. 20 federal and local government, academic, and private sector experts to answer questions about using soil amendments in remediating, revitalizing, and reusing contaminated lands.

- Two new tools to encourage and assist site cleanup managers to use soil amendments for remediation, revitalization, and reuse of their sites resulted from this collaboration.
  - *The Use of Soil Amendments for Remediation, Revitalization, and Reuse* is
  - *Soil Remediation, Revitalization, and Reuse: Technical Performance Measures*

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The Use of Soil Amendments for Site Remediation, Revitalization, and Reuse

- The white paper will address restoring disturbed soil, mainly metal contaminated lands, with amendments.
- Amendments consist of residuals such as municipal biosolids, manures, sugar beet lime, wood ash, log yard waste and a variety of composted agricultural by-products.

A-8

The Use of Soil Amendments for Site Remediation, Revitalization, and Reuse

- Reduce toxicity by immobilizing contaminants and restore the soil enabling revegetation and revitalization

- Ideal because you recycle waste products from industry while reclaiming previously unusable or devalued land.

A-9

The Use of Soil Amendments for Site Remediation, Revitalization, and Reuse

- Table 1 lists the types of bioavailability and phytoavailability problems (e.g., toxicity) and poor soil health and ecosystem function problems (e.g., high or low pH) and the potential solutions for each problem.

- Table 2 lists the types of sites where soil amendments can be used. This includes hard-rock and coal mining, smelting and refining, and construction and mixed waste sites, and the table provides information on potential solutions for each site type.

- Table 3 lists the types of soil amendments currently available, the advantages and disadvantaged of each, and the cost, public acceptance, and availability issues that can impact when and where each is used.

- Table 4 lists transportation, storage, and equipment needs that may impact decisions to use soil amendments.

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Soil Remediation, Revitalization, and Reuse: Technical Performance Measures

- Is an Internet-based tool that helps users determine whether soil amendments are functioning as designed to reduce risks to human health and the environment.
- Draw on the collective knowledge and experience of experts to identify and document a core set of commercially available, cost effective, and proven TPMs.
- Allows users to evaluate if sites where soil amendments have been used for remediation are ready for reuse.

http://www.cluin.org/products/TPM

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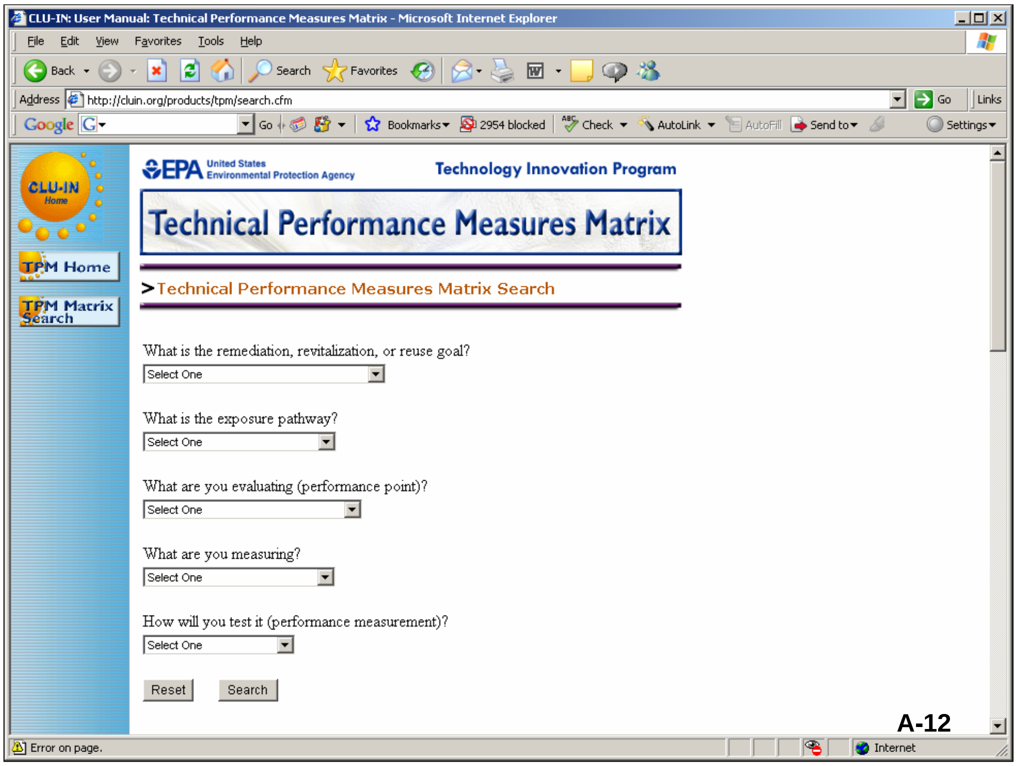
CLU-IN: User Manual: Technical Performance Measures Matrix - Microsoft Internet Explorer
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Address http://cluin.org/products/tpm/search.cfm
CLU-IN Home
TPM Home
TPM Matrix Search
EPA United States Environmental Protection Agency
Technology Innovation Program
Technical Performance Measures Matrix
>Technical Performance Measures Matrix Search
What is the remediation, revitalization, or reuse goal?
Select One
What is the exposure pathway?
Select One
What are you evaluating (performance point)?
Select One
What are you measuring?
Select One
How will you test it (performance measurement)?
Select One
Reset
Search
A-12
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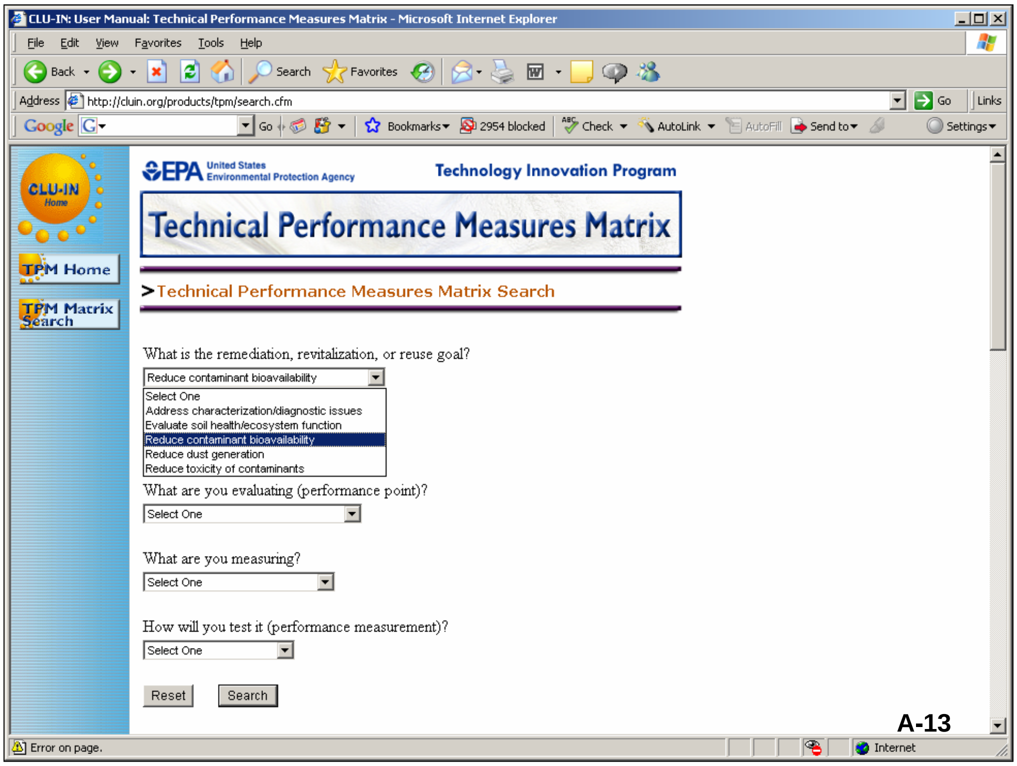
Internet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http://cluin.org/products/tpm/search.cfm
Technology Innovation Program
Technical Performance Measures Matrix
TPM Home
TPM Matrix Search
> Technical Performance Measures Matrix Search
What is the remediation, revitalization, or reuse goal?
Reduce contaminant bioavailability
Select One
Address characterization/diagnostic issues
Evaluate soil health/ecosystem function
Reduce contaminant bioavailability
Reduce dust generation
Reduce toxicity of contaminants
What are you evaluating (performance point)?
Select One
What are you measuring?
Select One
How will you test it (performance measurement)?
Select One
Reset
Search
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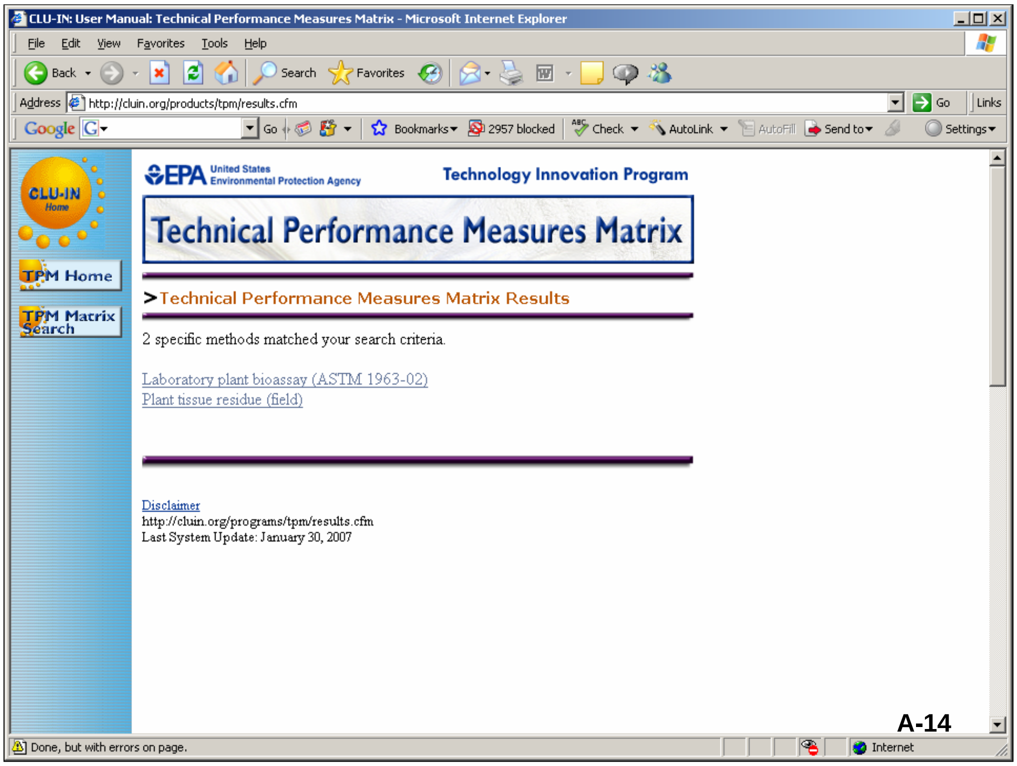
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http://cluin.org/products/tpm/results.cfm
United States Environmental Protection Agency
Technology Innovation Program
Technical Performance Measures Matrix
TPM Home
TPM Matrix Search
>Technical Performance Measures Matrix Results
2 specific methods matched your search criteria.
Laboratory plant bioassay (ASTM 1963-02)
Plant tissue residue (field)
Disclaimer
http://cluin.org/programs/tpm/results.cfm
Last System Update: January 30, 2007
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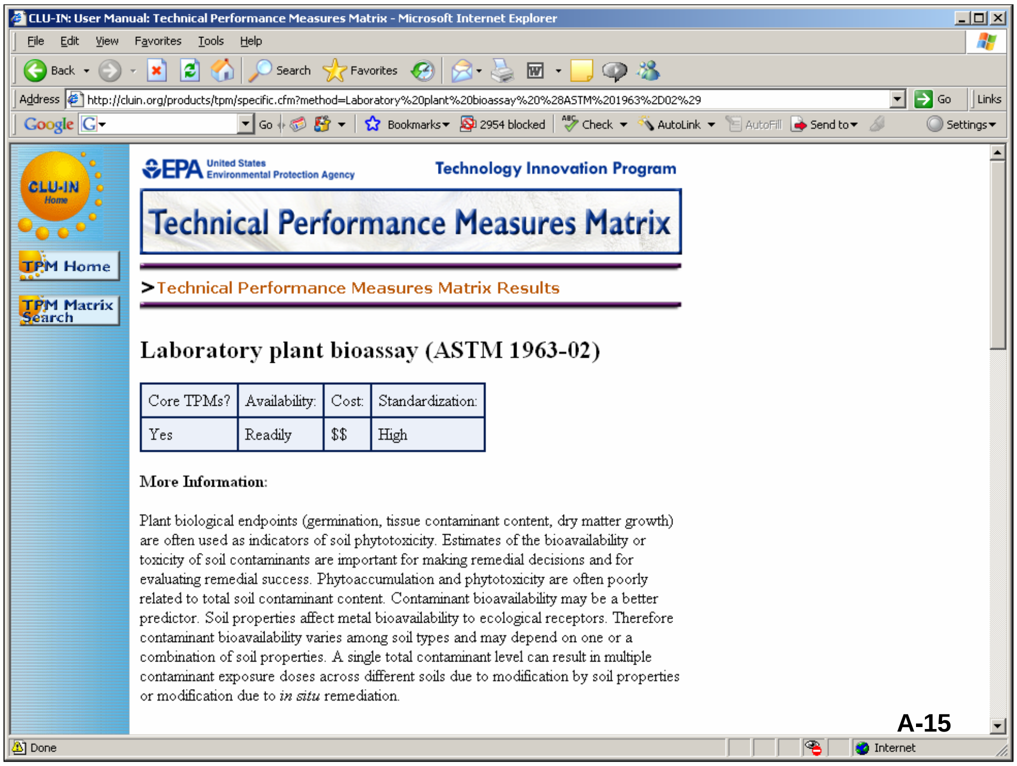
CLU-IN: User Manual: Technical Performance Measures Matrix - Microsoft Internet Explorer

Address http://cluin.org/products/tpm/specific.cfm?method=Laboratory%20plant%20bioassay%20%28ASTM%201963%2D02%29

EPA United States Environmental Protection Agency — Technology Innovation Program

Technical Performance Measures Matrix

> Technical Performance Measures Matrix Results

Laboratory plant bioassay (ASTM 1963-02)

Core TPMs?	Availability:	Cost:	Standardization:
Yes	Readily	$$	High

More Information:

Plant biological endpoints (germination, tissue contaminant content, dry matter growth) are often used as indicators of soil phytotoxicity. Estimates of the bioavailability or toxicity of soil contaminants are important for making remedial decisions and for evaluating remedial success. Phytoaccumulation and phytotoxicity are often poorly related to total soil contaminant content. Contaminant bioavailability may be a better predictor. Soil properties affect metal bioavailability to ecological receptors. Therefore contaminant bioavailability varies among soil types and may depend on one or a combination of soil properties. A single total contaminant level can result in multiple contaminant exposure doses across different soils due to modification by soil properties or modification due to *in situ* remediation.

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If you have a question on ecological restoration or a suggestion for fact sheets on ecological restoration we want to know.

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Ongoing Ecological Revitalization Efforts in EPA's Office of Superfund Remediation & Technology Innovation

Michele Mahoney
US EPA OSRTI
Mahoney.michele@epa.gov
703-603-9057

Sara Rasmussen, OSW RCRA Corrective Action

Ecological Restoration at hazardous waste sites, including RCRA sites, can provide many benefits to surrounding community. The speaker will cover some of the resources available on ecological restoration, including EPA's GreenScapes program. The speaker will also provide a few examples of ecological restoration at RCRA sites.

Bob Bastian, OW

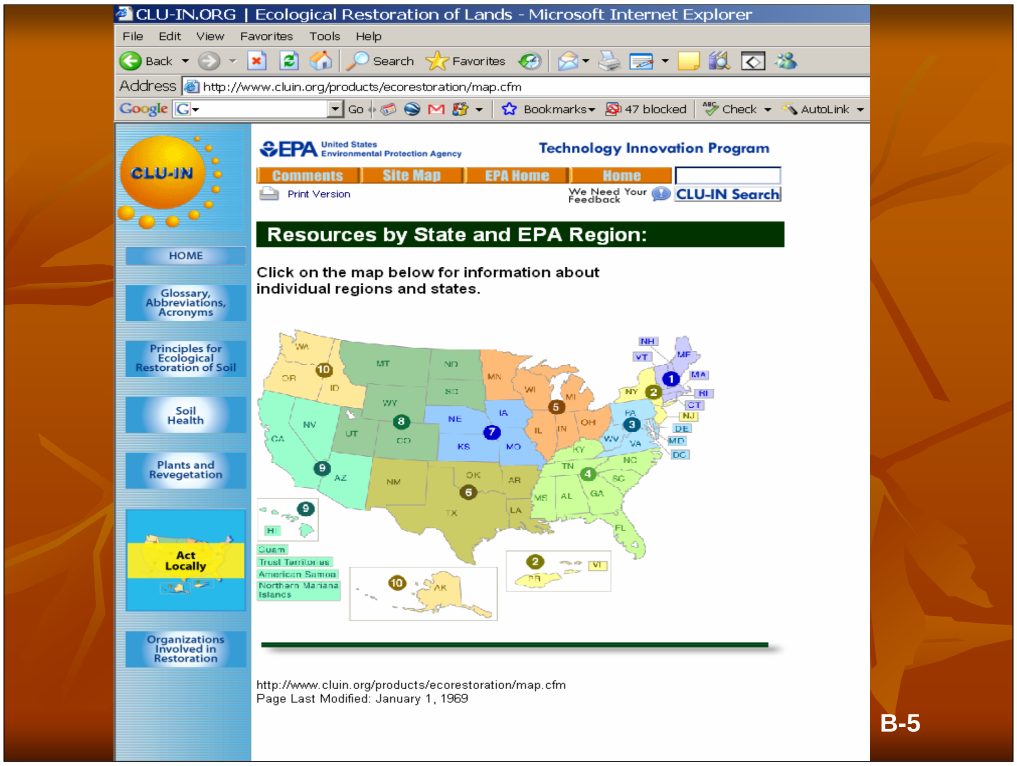
Use of Biosolids for Restoration of Contaminated Sites/Reclamation of Drastically Disturbed Lands ... Biosolids (treated sewage sludge) have been effectively used as a soil amendment and organic fertilizer for many years. Over half of the >7Million dry metric tons of biosolids produced by wastewater treatment plants in the U.S. are currently land applied in various forms (e.g., aerobically or anaerobically digested, alkaline treated, air or heat dried; liquid, dewatered cake, composted, pelletized), mostly to agricultural land, but also to forest land and reclamation sites, as well as in products used in urban areas. The organic matter and macro- and micro-nutrients in biosolids serve can help effectively remedy many of the problems associated with highly disturbed and/or contaminated sites and contribute to a soil's inability to support a vegetative cover. Efforts to use biosolids as a part of restoration efforts date back to at least the late 1960's when demonstration projects were established in the coal mining areas of Pennsylvania. Since then land reclamation projects involving biosolids to improve soil conditions and support revegetation of highly disturbed and in some cases contaminated sites (e.g., surface mines, mine waste piles, construction sites, barrow pits, sand dunes, areas devastated by forest fires) all across the country, with some projects demonstrating sustainable vegetation and continued soil improvement for more than 30 years. For more than ten years, there has been a growing interest and experience in the effective use of biosolids and other organic residuals and soil amendments to help with the revegetation and restoration of highly heavy metal-contaminated sites in the U.S. and overseas, including a number of Superfund and Brownfields sites.

Case Studies

- Database of Ecological Revitalization sites
- Identify at least three
  - Crozet township, VA
    - ERT video
    - TNT article
- Present as internet seminars

B-3

This web site is a resource for project managers and others seeking nformation and guidance on ecological restoration and revitalization. Includes a glossary of restoration terms and a set of principles for ecological restoration; as well as information and links to resources on soil health and amendmends, native and invasive plant species, and ecosystem-based restoration. Also features a comprehensive list of region-by-region and state-by-state federal and local resources for ecological restoration projects, including the Federal Highway Administration's publication, “Roadside Use of Native Plants.”.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EPA United States Environmental Protection Agency
Technology Innovation Program
Comments
Site Map
EPA Home
Home
Print Version
We Need Your Feedback
CLU-IN Search
CLU-IN
HOME
Glossary, Abbreviations, Acronyms
Principles for Ecological Restoration of Soil
Soil Health
Plants and Revegetation
Act Locally
Organizations Involved in Restoration
Resources by State and EPA Region:
Click on the map below for information about individual regions and states.
http://www.cluin.org/products/ecorestoration/map.cfm
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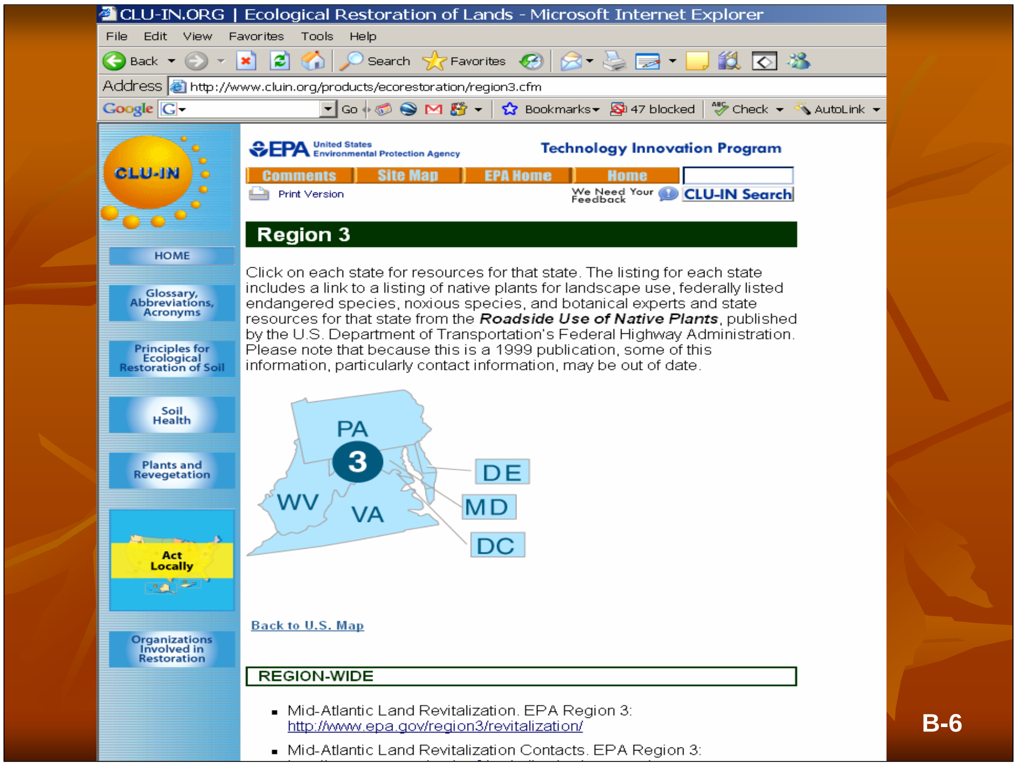
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EPA United States Environmental Protection Agency
Technology Innovation Program
Comments
Site Map
EPA Home
Home
Print Version
We Need Your Feedback
CLU-IN Search
Region 3
Click on each state for resources for that state. The listing for each state includes a link to a listing of native plants for landscape use, federally listed endangered species, noxious species, and botanical experts and state resources for that state from the Roadside Use of Native Plants, published by the U.S. Department of Transportation's Federal Highway Administration. Please note that because this is a 1999 publication, some of this information, particularly contact information, may be out of date.
PA
3
DE
WV
VA
MD
DC
Back to U.S. Map
REGION-WIDE
Mid-Atlantic Land Revitalization. EPA Region 3: http://www.epa.gov/region3/revitalization/
Mid-Atlantic Land Revitalization Contacts. EPA Region 3:
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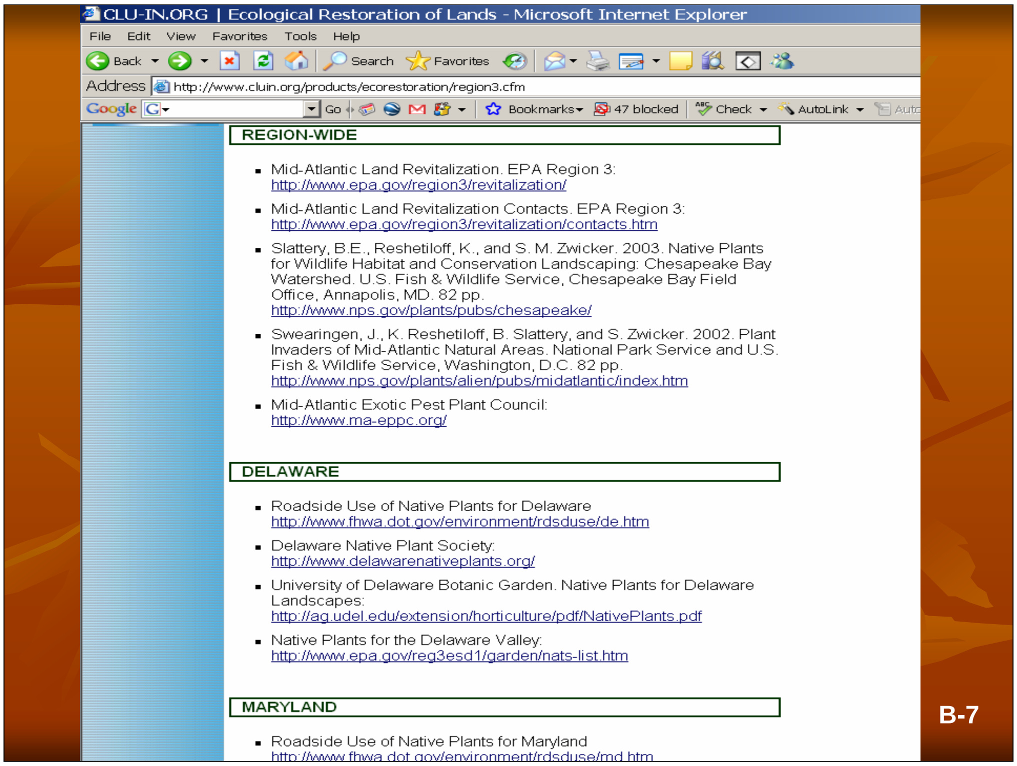

CLU-IN.ORG | Ecological Restoration of Lands - Microsoft Internet Explorer

Address http://www.cluin.org/products/ecorestoration/region3.cfm

REGION-WIDE

- Mid-Atlantic Land Revitalization. EPA Region 3: http://www.epa.gov/region3/revitalization/
- Mid-Atlantic Land Revitalization Contacts. EPA Region 3: http://www.epa.gov/region3/revitalization/contacts.htm
- Slattery, B.E., Reshetiloff, K., and S. M. Zwicker. 2003. Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed. U.S. Fish & Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD. 82 pp. http://www.nps.gov/plants/pubs/chesapeake/
- Swearingen, J., K. Reshetiloff, B. Slattery, and S. Zwicker. 2002. Plant Invaders of Mid-Atlantic Natural Areas. National Park Service and U.S. Fish & Wildlife Service, Washington, D.C. 82 pp. http://www.nps.gov/plants/alien/pubs/midatlantic/index.htm
- Mid-Atlantic Exotic Pest Plant Council: http://www.ma-eppc.org/

DELAWARE

- Roadside Use of Native Plants for Delaware http://www.fhwa.dot.gov/environment/rdsduse/de.htm
- Delaware Native Plant Society: http://www.delawarenativeplants.org/
- University of Delaware Botanic Garden. Native Plants for Delaware Landscapes: http://ag.udel.edu/extension/horticulture/pdf/NativePlants.pdf
- Native Plants for the Delaware Valley: http://www.epa.gov/reg3esd1/garden/nats-list.htm

MARYLAND

- Roadside Use of Native Plants for Maryland http://www.fhwa.dot.gov/environment/rdsduse/md.htm

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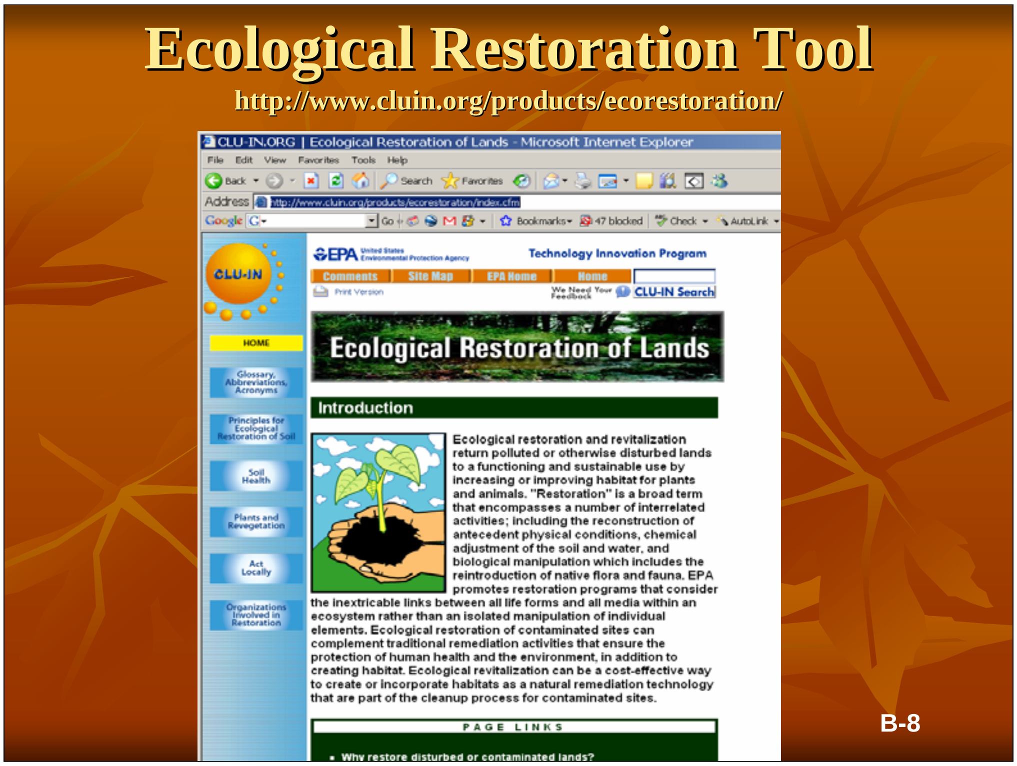

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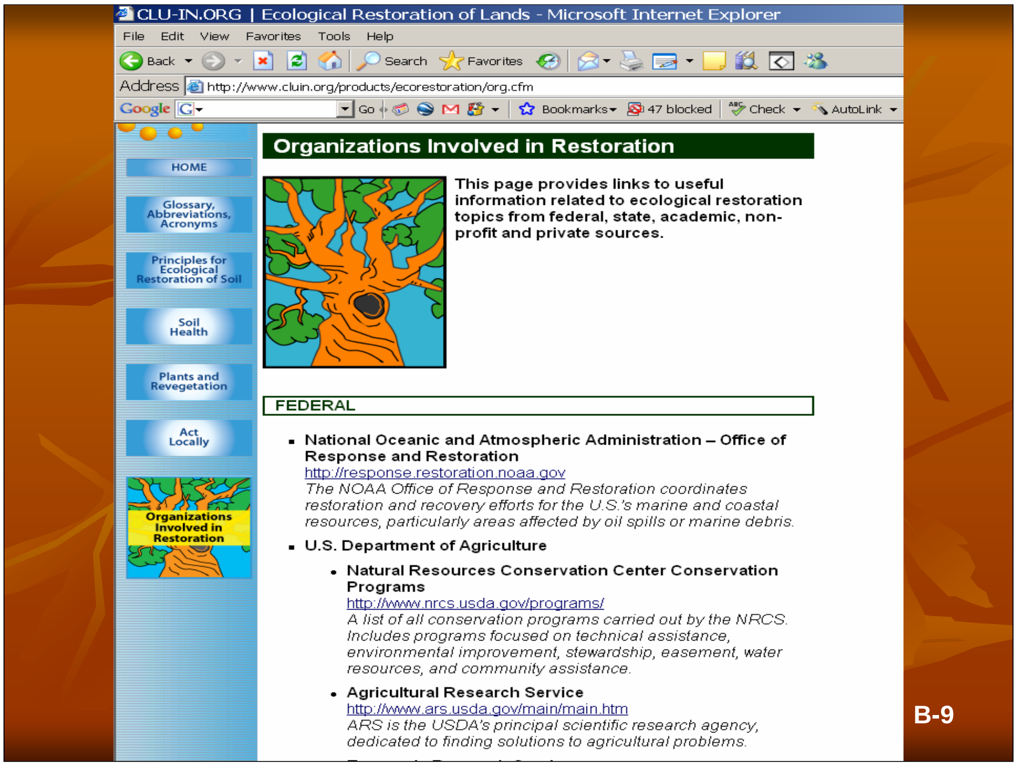
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HOME
Glossary, Abbreviations, Acronyms
Principles for Ecological Restoration of Soil
Soil Health
Plants and Revegetation
Act Locally
Organizations Involved in Restoration
Organizations Involved in Restoration
This page provides links to useful information related to ecological restoration topics from federal, state, academic, non-profit and private sources.
FEDERAL
National Oceanic and Atmospheric Administration – Office of Response and Restoration
http://response.restoration.noaa.gov
The NOAA Office of Response and Restoration coordinates restoration and recovery efforts for the U.S.'s marine and coastal resources, particularly areas affected by oil spills or marine debris.
U.S. Department of Agriculture
Natural Resources Conservation Center Conservation Programs
http://www.nrcs.usda.gov/programs/
A list of all conservation programs carried out by the NRCS. Includes programs focused on technical assistance, environmental improvement, stewardship, easement, water resources, and community assistance.
Agricultural Research Service
http://www.ars.usda.gov/main/main.htm
ARS is the USDA's principal scientific research agency, dedicated to finding solutions to agricultural problems.
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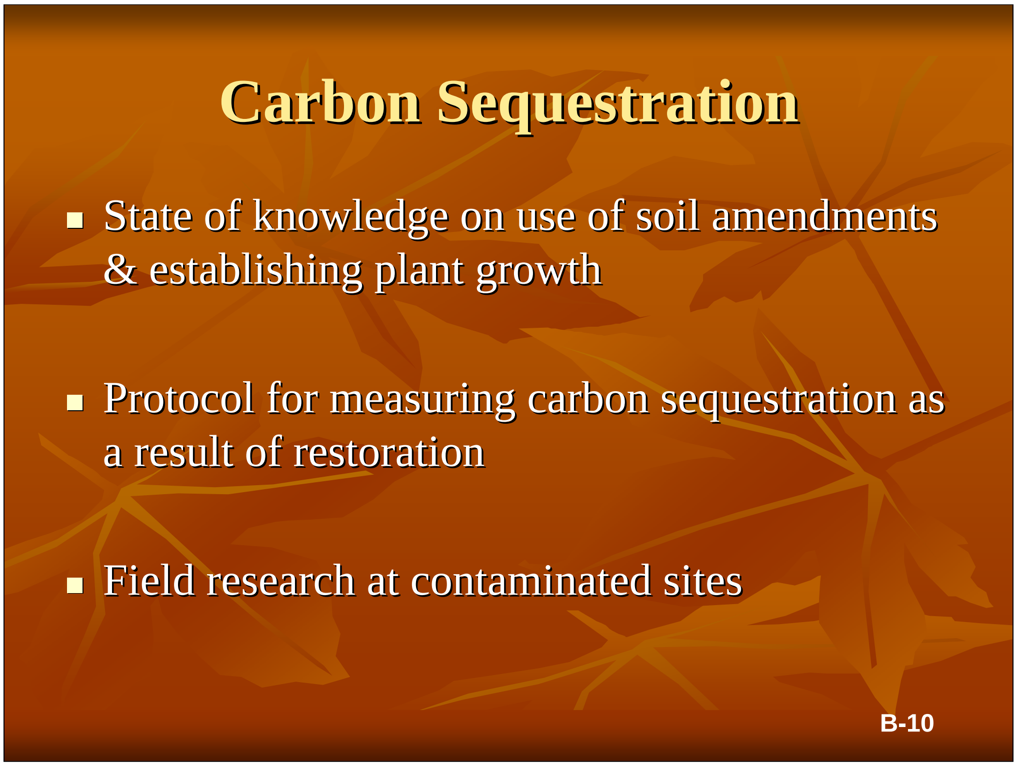

Contaminated Sites Workgroup - Carbon Sequestration on Contaminated Sites

Taskforce: Michele Mahoney (Co-Lead), Harry Compton (Co-Lead), Scott Fredericks, Marc Greenberg, Gary Newhart, Ellen Rubin, Marc Thomas, Catherine Allen, Joshua Stolaroff, Mark Sprenger

Coordination: Among EPA programs

Background:

Carbon dioxide (CO2) and methane (CH4) are two of the main greenhouse gases being emitted into the earth's atmosphere and contributing to global warming. Terrestrial carbon sequestration is long-term storage of carbon dioxide absorbed from the atmosphere by trees and plants by photosynthesis, and stored as carbon in soils and biomass (i.e. tree trunks, branches, foliage, and roots). Soils play an important role in maintaining a balanced global carbon cycle, primarily by storing carbon in the soil in the form of soil organic matter (SOM). Therefore, the addition of soil amendments that build soil organic matter, such as compost and biosolids, are important in increasing a soil's ability to sequester carbon. Such soil amendments are increasingly being used for soil remediation, land and ecological revitalization, and reuse of Superfund and other contaminated sites. In addition to the more obvious benefits associated with cleaning up contaminated sites (i.e. improved soil and water quality, restored ecological health, and protected human health), the application of soil amendments as part of the remedial strategy also provides the soil with the organic matter it needs to sequester carbon from the atmosphere. Further, soils rich in organic matter are more capable of growing plants that can absorb additional carbon from the atmosphere.

This workgroup was established to identify the current state of knowledge on carbon sequestration in soils, present a defensible protocol for measuring carbon sequestration and balance at contaminated sites, leverage resources, and strategize and implement a field research plan. This workgroup's goal is to study and quantify the added carbon sequestration from the addition of soil amendments and established plant growth in order to create additional incentives to cleaning up contaminated sites.Additionally, there is potential for the carbon sequestered to be traded as carbon credits in a carbon trading system such as the Chicago Climate Exchange. This work is part of the EPA Administrator's Clean Energy and Climate Priority, specifically within the Climate Change and Contaminated Lands Workgroup.

Workgroup Objectives: (1) Evaluate the current state of knowledge on carbon sequestration as a result of the use of soil amendments and establishing plant growth; (2) Identify soil amendment application techniques, types of plants, and locations that maximize carbon sequestration; (3) Develop a protocol for measuring carbon sequestration at contaminated site cleanup, leading to protocol for a defensible soil and plant carbon accounting system; and (4) Create a strategy and research plan to test the proposed protocols in a field setting.

Potential Benefits of Work: Evidence that remediation using soil amendments and plant growth for clean up also sequester carbon at contaminated sites. Create incentive for ecological revitalization of contaminated sites with since the resulting carbon sequestration is valuable for carbon trading.

Environmental Measures and Results: Soil and plant carbon accounting system is identified and promoted. Current tons of carbon sequestered determined for contaminated sites where soil amendments and plant growth were used for remediation.

Milestones:

<u>Conduct literature search</u>

Complete search of the literature for information on plant and soil carbon sequestration as a result of the addition of soil amendments. Compile relevant papers for review.

Timeframe: Literature search complete by mid-October 2007

<u>Review literature</u>

Summarize pertinent literature to this topic. Note data gaps.

Timeframe: Draft complete by late January 2008

<u>Identify experts</u>

Compile list of experts in the area of carbon sequestration in soils and plants. Also, compile list of conferences, meetings, and symposiums that discuss this topic. Build partnerships with these groups

Planning next steps

- Guide on converting disturbed sites to green space
- Fact sheet on sustainability
- Field demonstrations & long-term effectiveness of soil amendments at sites stewardship at sites
- GIS mapping of mine sites and location of amendments
- Engage Experts…Welcome your input
  - Contact: Michele Mahoney
    - Mahoney.michele@epa.gov
    - 703-603-9057

B-11

Remediation
to
Restoration

this presentation

- ecological restoration
- Great Lakes R to R case study
- landscaping

C-2

Remediation to Restoration

it's more than birds and bunnies....

C-3

The SER International Primer on Ecological Restoration

- **Section 2. Definition of Ecological Restoration**

  Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

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The SER International Primer on Ecological Restoration

The restored ecosystem:

- contains a characteristic assemblage of the species (native)
- integrated into a larger landscape,
- resilient to endure the normal periodic stress events in the local environment
- self-sustaining to the same degree as its reference ecosystem

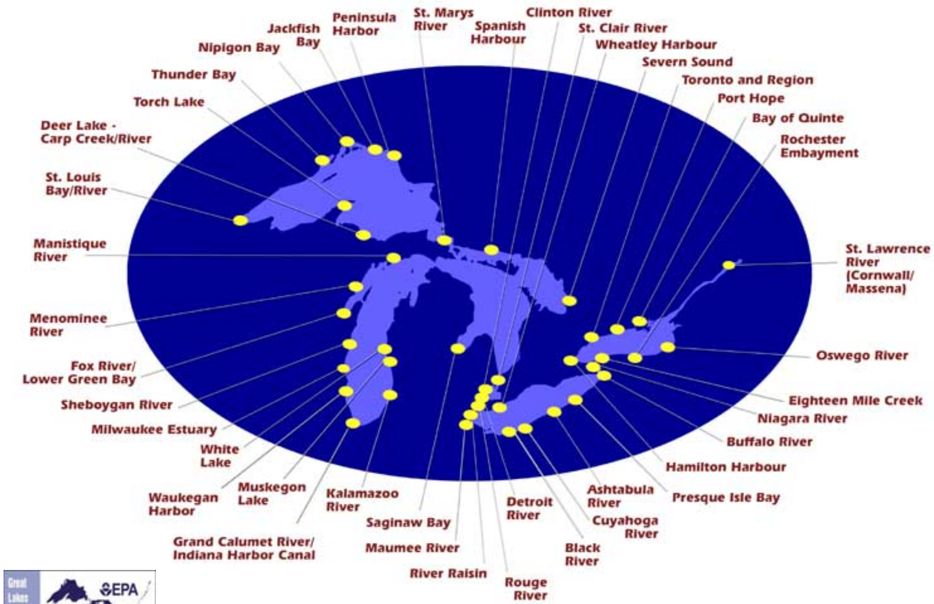
C-5

Engineers…………..

Great Lakes National Program Office EPA

C-6

Highly engineered solutions move water off of the land quickly. In essence this looks at water as a problem to be removed rather than as a resource.



Peninsula Harbor
Jackfish Bay
Nipigon Bay
Thunder Bay
Torch Lake
Deer Lake - Carp Creek/River
St. Louis Bay/River
Manistique River
Menominee River
Fox River/ Lower Green Bay
Sheboygan River
Milwaukee Estuary
White Lake
Waukegan Harbor
Muskegon Lake
Grand Calumet River/ Indiana Harbor Canal
Kalamazoo River
Saginaw Bay
Maumee River
River Raisin
Rouge River
Detroit River
Black River
Cuyahoga River
Ashtabula River
Presque Isle Bay
Hamilton Harbour
Buffalo River
Niagara River
Eighteen Mile Creek
Oswego River
St. Lawrence River (Cornwall/ Massena)
Rochester Embayment
Bay of Quinte
Port Hope
Toronto and Region
Severn Sound
Wheatley Harbour
St. Clair River
Clinton River
Spanish Harbour
St. Marys River

Habitat-related BUIs

- Beach closings
- Restrictions on fish and wildlife consumption
- Eutrophication or undesirable algae
- Restrictions on drinking water consumption or taste and odor
- Degradation of fish and wildlife populations
- Degradation of aesthetics
- Degradation of benthos
- Restriction on dredging activities
- Loss of fish and wildlife habitat

Great Lakes National Program Office EPA

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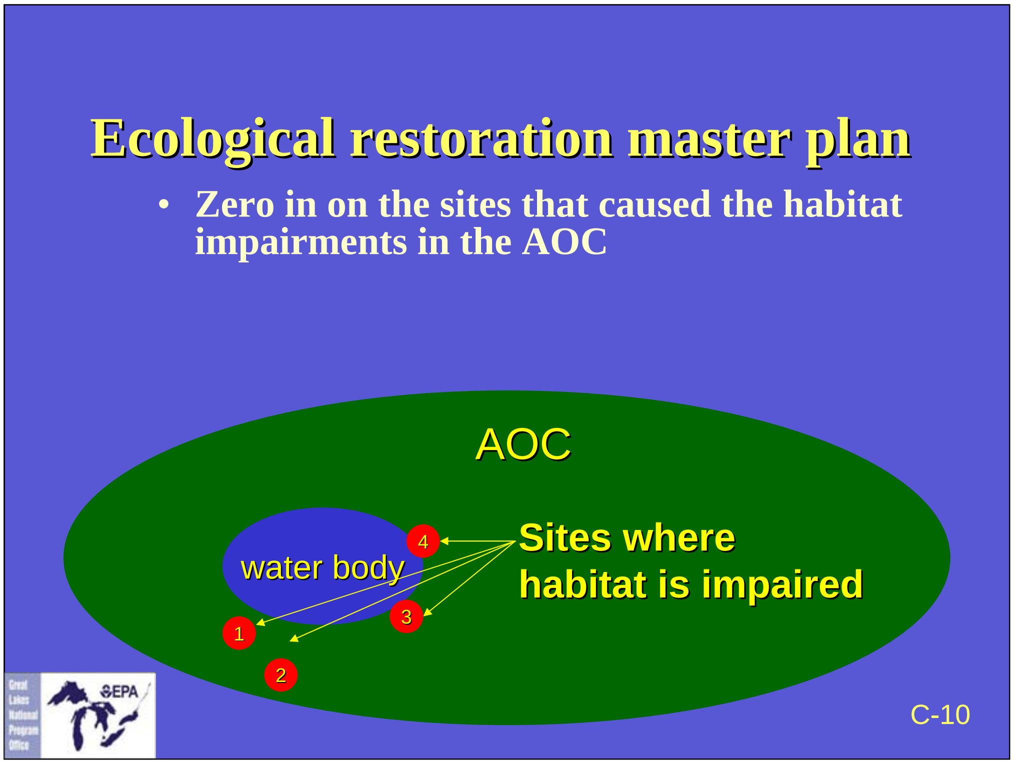
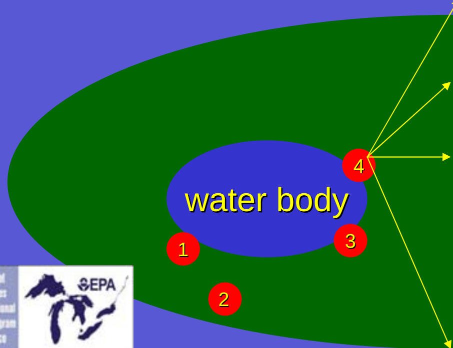


Define ecological restoration

Ecological restoration master plan

- For each site specify the following information:



Ecological and cultural description

Reference/target ecosystem

Schedules and costs for:

- site preparation
- implementation
- post implementation

Performance standards

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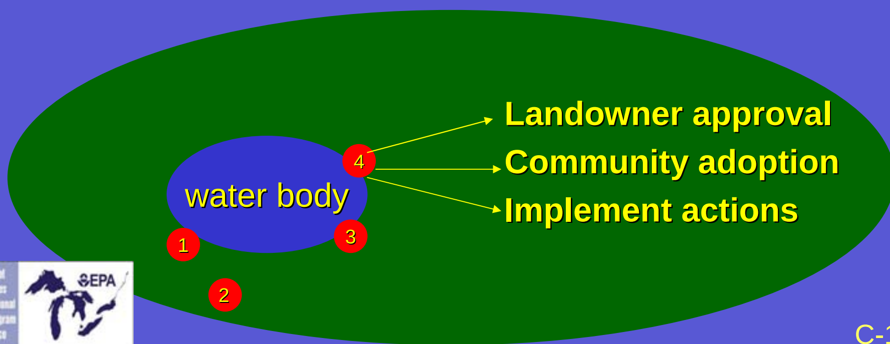
Ecological restoration master plan

- **Master plan review and adoption:**



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Case Study:
Hog Island and Newton Creek

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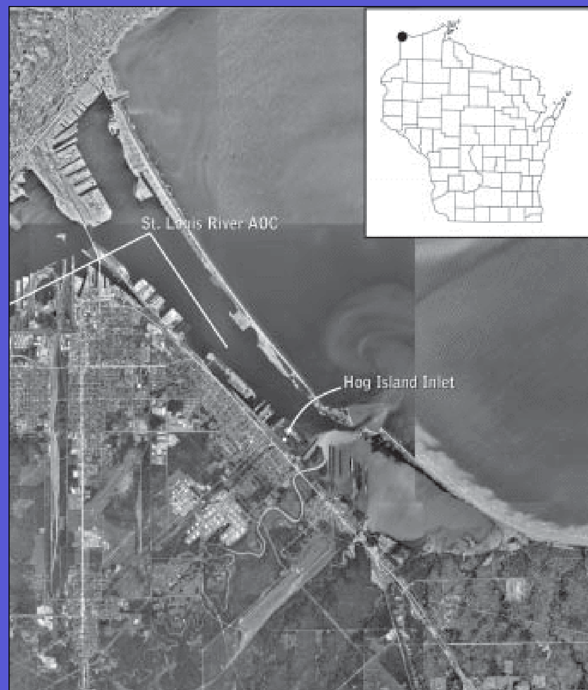

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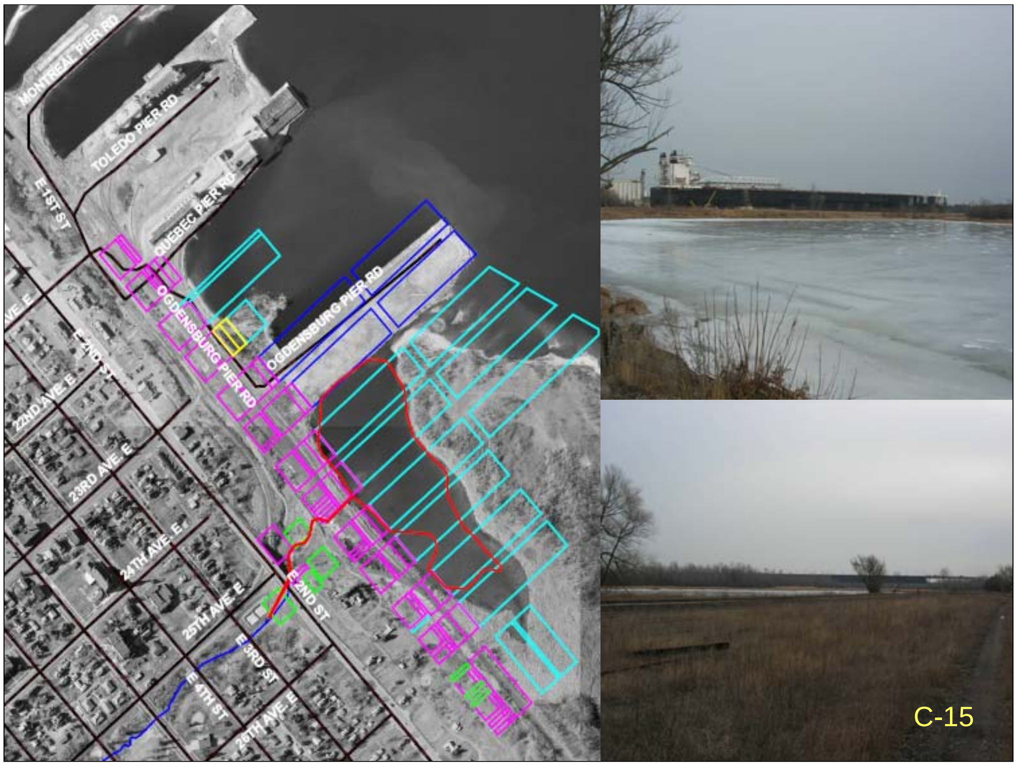
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TOLEDO PIER RD
QUEBEC PIER RD
E 1ST ST
OGDENSBURG PIER RD
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E 3RD ST
E 4TH ST
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Great Lakes Legacy Act Sediment Clean Up

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Hog Island and Newton Creek Ecological Restoration Master Plan

Kickoff Meeting
September 16, 2006

Public Workshops
January, May and July 2007

Final Restoration Plan
September 2007

C-19

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The process, partners

Great Lakes National Program Office

EPA

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Foreword

1.0 The Hog Island and Newton Creek Master Plan

2.0 The Master Planning and Plan Development Process

3.0 Existing Conditions

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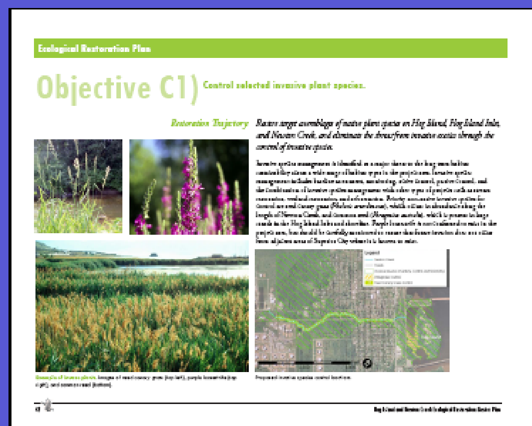
4.0 Ecological References

5.0 Ecological Restoration Plan

6.0 References

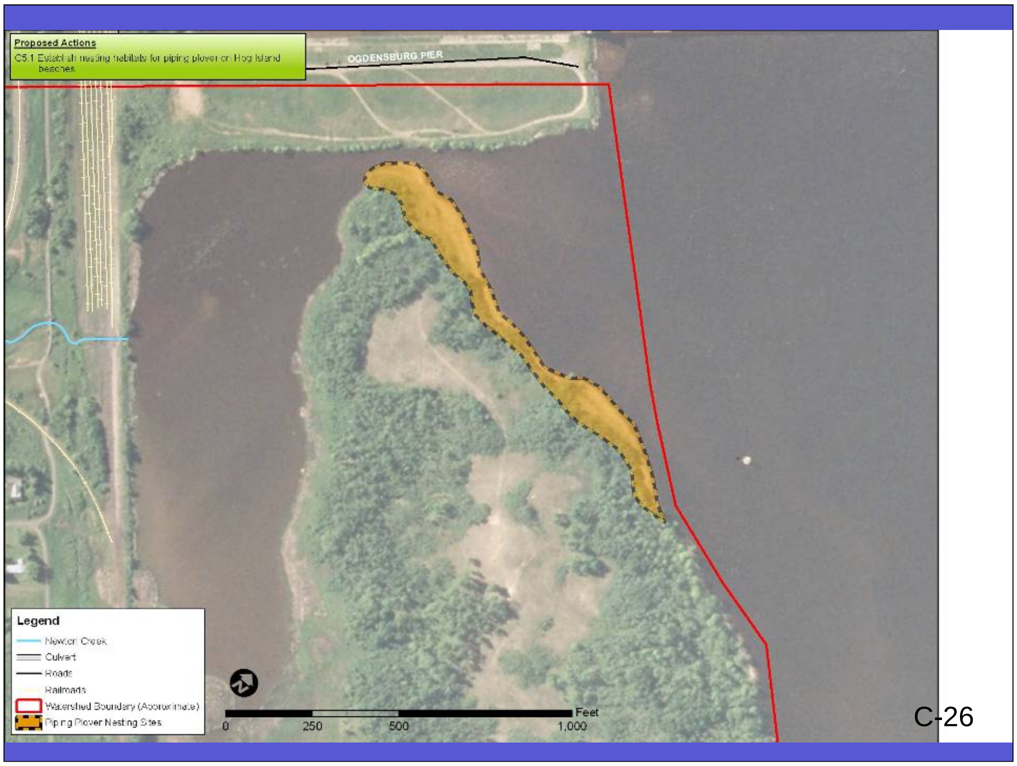
7.0 Appendices

C-24



C-25

Describe the actions, Douglas County taking ownership………



Proposed Actions
C5.1 Establish nesting habitats for piping plover on Hog Island beaches
OGDENSBURG PIER
Legend
Newton Creek
Culvert
Roads
Railroads
Watershed Boundary (Approximate)
Piping Plover Nesting Sites
N
Feet
0
250
500
1,000
C-26

Phasing of Restoration Actions

C-27

Phase 1

0 - 1 years from Master Plan adoption

- Initiate ecological flow regime determination and feasibility assessment (A1:1, A1:2);
- Initiate invasive species surveys and control efforts
- Initiate SAV restoration in Hog Island Inlet
- Develop monitoring plans protocols for ecosystem restoration efforts
- Initiate / continue public outreach, environmental stewardship and education programs

C-28

Phase 2

2 - 4 years from Master Plan adoption

- **Complete Phragmites control, continue reed canary grass control**
- **Establish riparian and shoreline buffers, begin culvert removal efforts**
- **Initiate wetland restoration**
- **Complete restoration of open water habitats in Inlet**
- **Improve wading shorebird habitats/begin monitoring**
- **Initiate post-project monitoring for completed projects**

C-29

Phase 3

5 - 10 years from Master Plan adoption

- Complete reed canary grass control efforts
- Continue and complete culvert removal efforts
- Complete wetland restoration and expansion efforts
- Continue monitoring of ecosystem restoration/invasives
- Continue public outreach, environmental stewardship and education programs

C-30

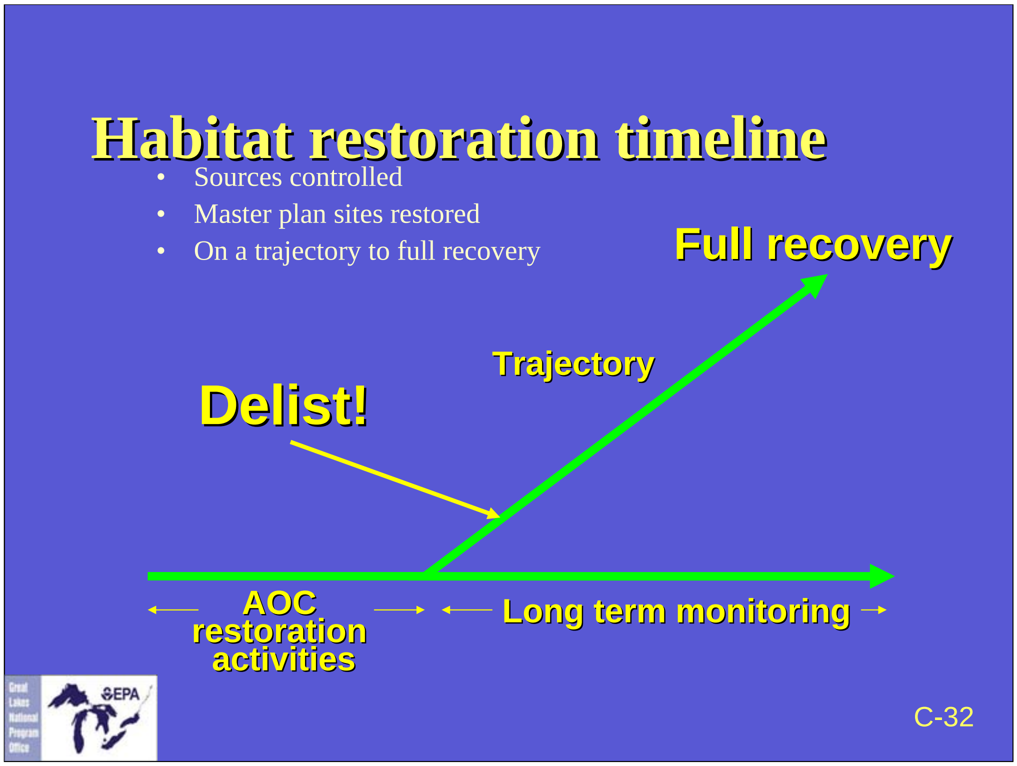
Phase 4

11 years to completion of ecosystem restoration efforts

- Continue monitoring (industrial operations, any additional remediation, completed ecosystem restoration efforts)

- Continue public outreach, environmental stewardship and education programs

C-31



Pathway to delisting…….

U.S. EPA/GLNPO Role

- remediation to restoration
- ecological restoration master plan development
- finding funding for actions

C-33

Recipe for Successful Ecological Restoration Master Plan

- eliminated/controlled sources of pollution
- ecological restoration expert/ facilitator
- agreement by State/Local agencies
- site accessibility
- inclusive process
- identified targets/known reference ecosystem
- institutional capacity

Great Lakes National Program Office

EPA

C-34

The process to identify a site as a candidate for a restoration blueprint incorporates agencies, appropriate public and private landholders and community stakeholders; the voice of the community is strong and active.

The Places

- Hog Island
- Muskegon
- White Lake
- Ashtabula
- Black River

C-35

Muskegon Lake

C-36

Tools

- Contract via GSA
- Grants to States
  w/out competition

Competitive w/in GL Watershed
Program

C-37

For more information:

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Karen Rodriguez:
rodriguez.karen@epa.gov; 312-353-2690

C-38

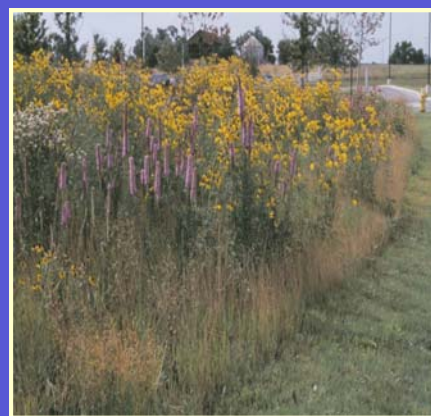
Environmental Implications

The Hidden Impacts of Landscaping

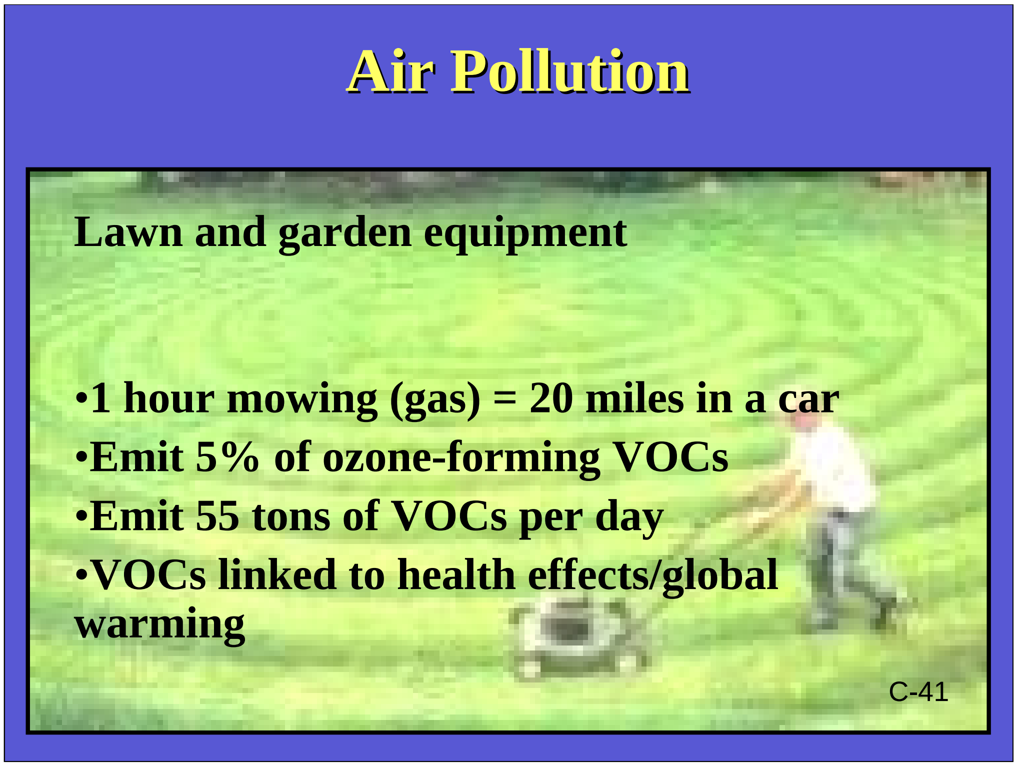
C-39

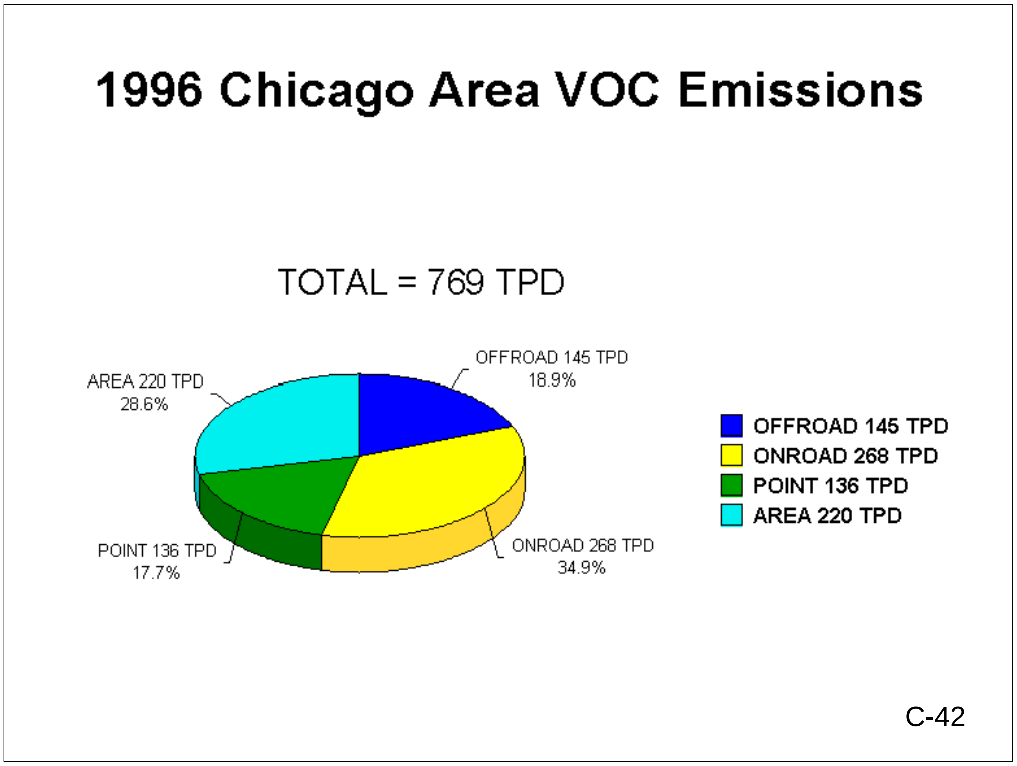
Sustainable Landscaping

- Reduce/ prevent pollution
- Conserve natural resources
- Maximize ecological function
- Look attractive



C-40


Air Pollution
Lawn and garden equipment
•1 hour mowing (gas) = 20 miles in a car
•Emit 5% of ozone-forming VOCs
•Emit 55 tons of VOCs per day
•VOCs linked to health effects/global warming
C-41



Off road – equipment not on a highway e.g. construction, fork lifts, trains, snow mobile

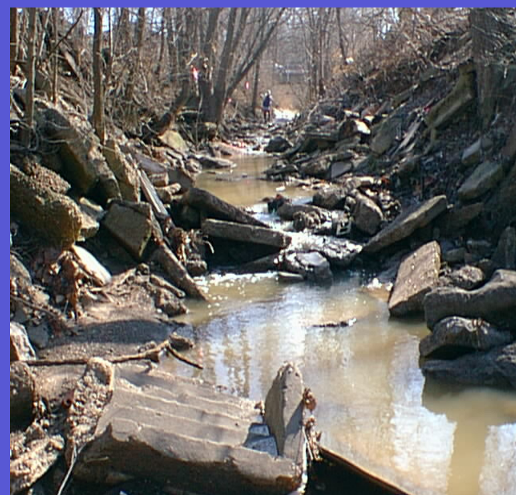
On road – cars, SUVs

Point – factories w/smoke stack, printing press – regulated

Area – lawn mowers hair spray cleaning products, fertilizers, pesticides, paints – house hold stuff unregulated in use (regs for manufacturing), snow blowers, leaf blowers

Water Pollution

- 25% Point Sources
- 25% Urban Runoff
- 50% Agricultural



C-43

Water Pollution
Pesticides

- Homeowners use 10X more per acre than farmers
- 67 million lbs applied on lawns each year
- 2/3 users dispose of excess in trash, remainder down drains
- Detectable limits found in 5-10% of wells

C-44

A lot of the chemicals that we apply to turf/plants run off and pollute our waterways

Americans over-use and mis-use pesticides and chemical fertilizers while maintaining their landscapes, resulting in runoff, leaching to surface (**streams, rivers)** and groundwater

Pesticides and fertilizers have been polluting surface and groundwater, endangering drinking water supplies and harming wildlife.

Water Pollution Fertilizers

40-60% of nitrogen surface and groundwater

Each Canada Goose
.4 lbs/yr phosphorus
1.3 lbs/yr nitrogen

Photo: Britt Slattery, USFWS

Photo: Chicago Park District

C-45

Canada Geese are big problem, Short manicured landscapes are the preferred habitat for the geese. Having taller natural landscapes will lessen the goose poop problem.


Garden Pollution
Affects Our Streams
Have you ever used garden fertilizers,
killed weeds with chemicals,
or sprayed for pesky bugs?
If you improve your
gardening practices,
you can help clean
polluted streams.
C-46

Flood Damage / Erosion

- Lawns only able to absorb 1/10 rainfall of a forest
- Turf has shallow root system; not able to stabilize streambanks
- Runoff results in erosion, flooding, aquatic habitat destruction

C-47

Our created landscapes cause a lot of runoff in moderate-heavy rains

The plants we choose impact the ability of the land to absorb and retain water.

Highly engineered solutions move water off of the land quickly. In essence this looks at water as a problem to be removed rather than as a resource.


C-49


C-50


C-51

Harm To Biodiversity
Pesticides

Photo: Britt Slattery, USFWS

- 60-70 million birds poisoned/year (US)
- >1% of the half-million plant and animal species considered pests (US)
- Beneficial species inadvertent targets of pesticides

C-52

Less than 1% of 500,000 species of plants and animals in U.S. considered pests

Our overuse/misuse of pesticides and fertilizers harms wildlife as does

Air pollution from power landscape equipment

Another harm to biodiversity is from **Habitat Loss**.

Consumption Of Natural Resources

Water

- **Lawns use 30% in East; 60% in West**
- **Droughts, water restrictions**

C-53

Our population is growing and our natural resources are limited; need to use them wisely.

We use a lot of water and consume a lot of energy (created from fossil fuels) to maintain our landscapes.

During droughts, water restrictions put traditional landscapes at risk.

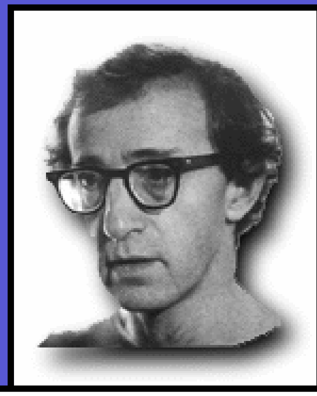
These typical landscapes could do more to contribute to the biodiversity of their local regions.

C-55

Implications of Traditional Landscaping

- Air, Noise, Water Pollution
- Flood Damage/Erosion
- Harm to Biodiversity
- Consumption of Natural Resources
- Impacts to Public Health and Safety
- Cost and Labor Intensive
- Monotonous Landscapes

C-56

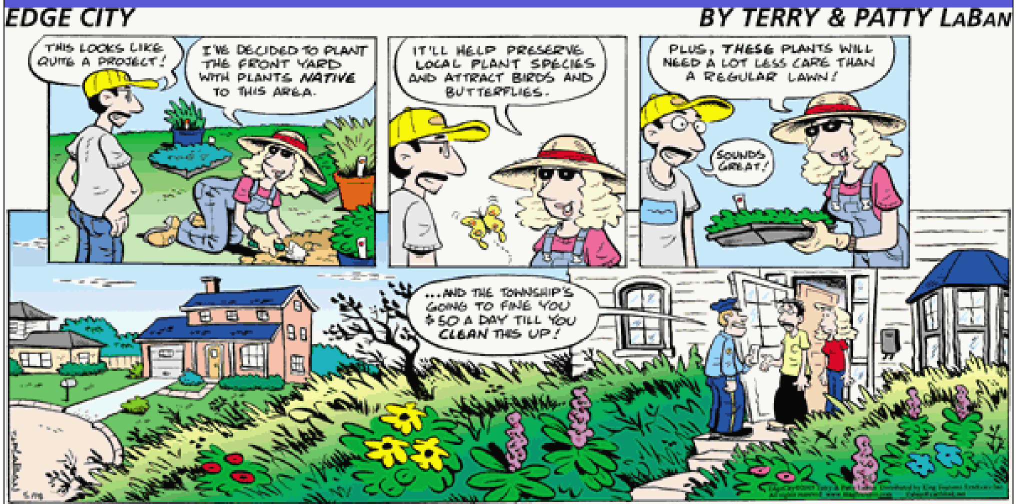


“Nature and I are two!”

Woody Allen

C-57

Slide Courtesy of Liam Heneghan



EDGE CITY
BY TERRY & PATTY LABAN
THIS LOOKS LIKE QUITE A PROJECT!
I'VE DECIDED TO PLANT THE FRONT YARD WITH PLANTS NATIVE TO THIS AREA.
IT'LL HELP PRESERVE LOCAL PLANT SPECIES AND ATTRACT BIRDS AND BUTTERFLIES.
PLUS, THESE PLANTS WILL NEED A LOT LESS CARE THAN A REGULAR LAWN!
SOUNDS GREAT!
...AND THE TOWNSHIP'S GOING TO FINE YOU $50 A DAY TILL YOU CLEAN THIS UP!

C-58

“Wherever I go in America, I like it when the land speaks its own language in its own regional accent.”

Mrs. Lyndon Johnson, *Wildflowers Across America*, 1993

C-59

Naturalistic Design

- **Requires less maintenance**
- **Reduces environmental harm**
- **Benefits wildlife**
- **Provides seasonal interest**

C-60

Natural landscaping offers more variety, more seasonal changing interest rather than a static landscape.

Native Plants

- Best adapted to local conditions / thrive with least care
- Great variety of species for all conditions
- Won't harm natural areas
- High habitat value
- Provide "sense of place"

C-61

Native plants can be used in both loose and formal garden designs.

Evolved over millennia, adapted to local climate, soils, etc

Once established, they require minimal maintenance (save time, money in long term maintenance).

Fire is a maintenance option for meadows, but mowing once a year will suffice.

Benefit to ecosystem by needing less chemical inputs, and providing food for bugs, butterflies and birds.

Migrating birds utilize even small backyard patches of native plants.

Planting natives replenishes part of the natural heritage in an area.

- **Assess site conditions**
- **Select plants that thrive in/under those conditions**
- **Select plants whose ultimate size, shape fits needs**
- **Compatible plants / plant communities**
- **Avoid invasives**

C-62

Selecting plants that will require least maintenance

(ideally a native plant; best suited for existing soil, sunlight, drainage conditions;

mature size won't be too large, require frequent pruning;

At the very least select a plant that is not invasive or problematic to natural areas.

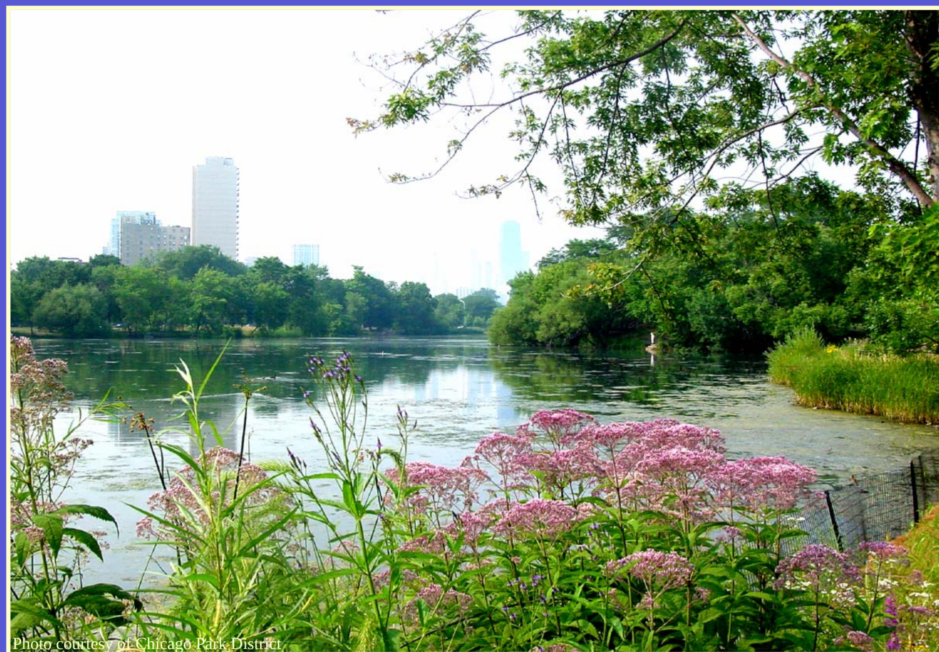
Butterfly weed (Asclepias tuberosa) for sunny spots

Foam flower (Tiarella cordifolia) for shady spots

Cardinal flower (Lobelia cardinalis) for wet spots.

Naturalistic Design

C-64

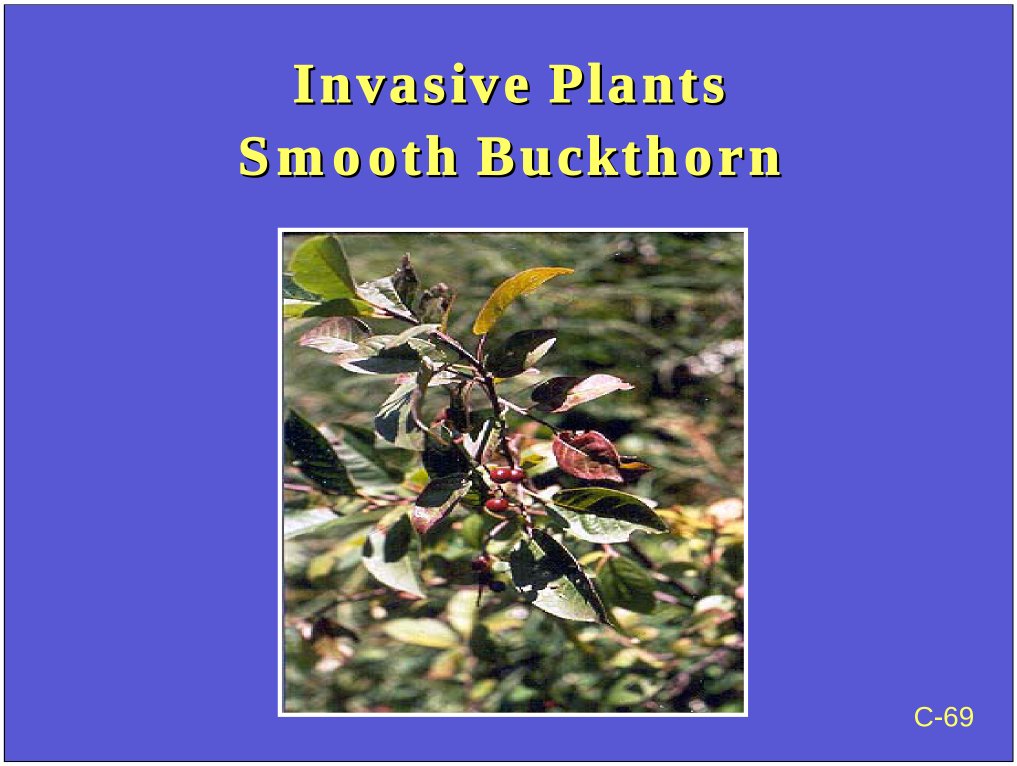


C-65

C-66

Examples of natural landscaping.

STOP. Natural landscaping is not an excuse to let weeds grow big and call it your natural look. Natural landscaping is a deliberate use of plants native to an area which both look beautiful and perform environmental services (e.g. storm water retention, habitat for songbirds and butterflies, etc.)

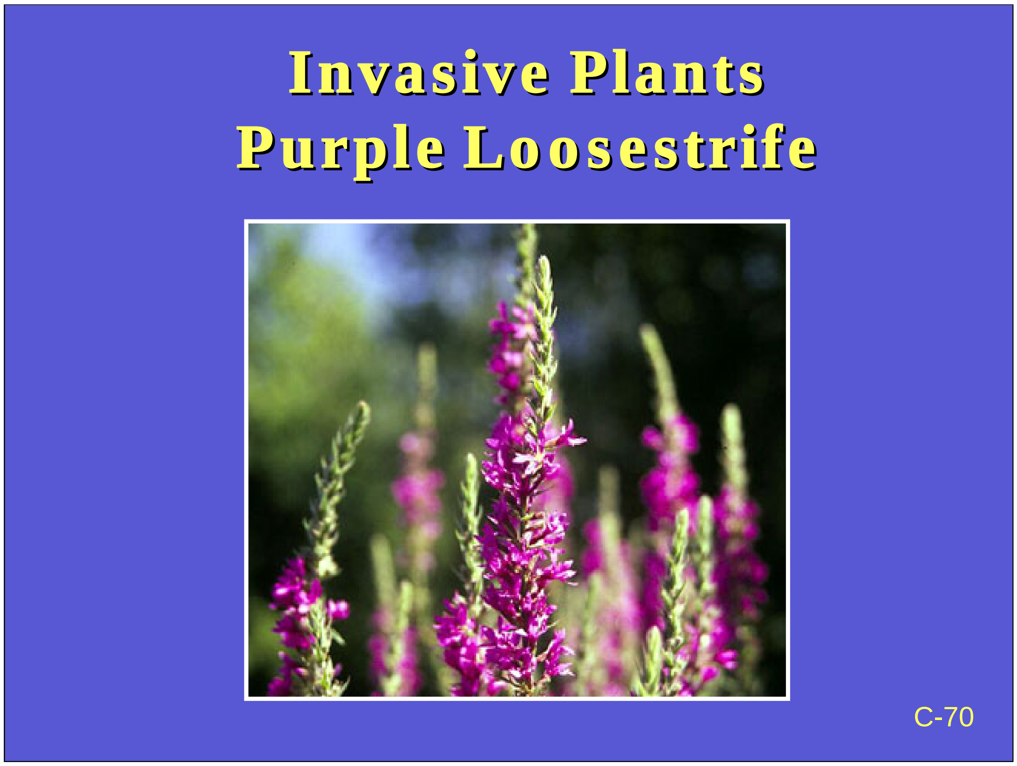


Smooth buckthorn is a shrub native to Eurasia.

It is recognized by its alternate, simple leaves, green flowers and red fruits, which turn black with age. The bark is smooth and covered with prominent lenticels, or pores, and the inner wood has a distinctive yellow color.

Since being planted as an ornamental, this shrub has invaded fens, bogs and other wetlands, especially in northeastern Illinois. It has a vigorous root system, and sprouts vigorously following fires or other injuries.

It produces fruit at a very early age, and mature plants produce thousands of seeds. Its control is very difficult because it is often mingled with desirable native vegetation.



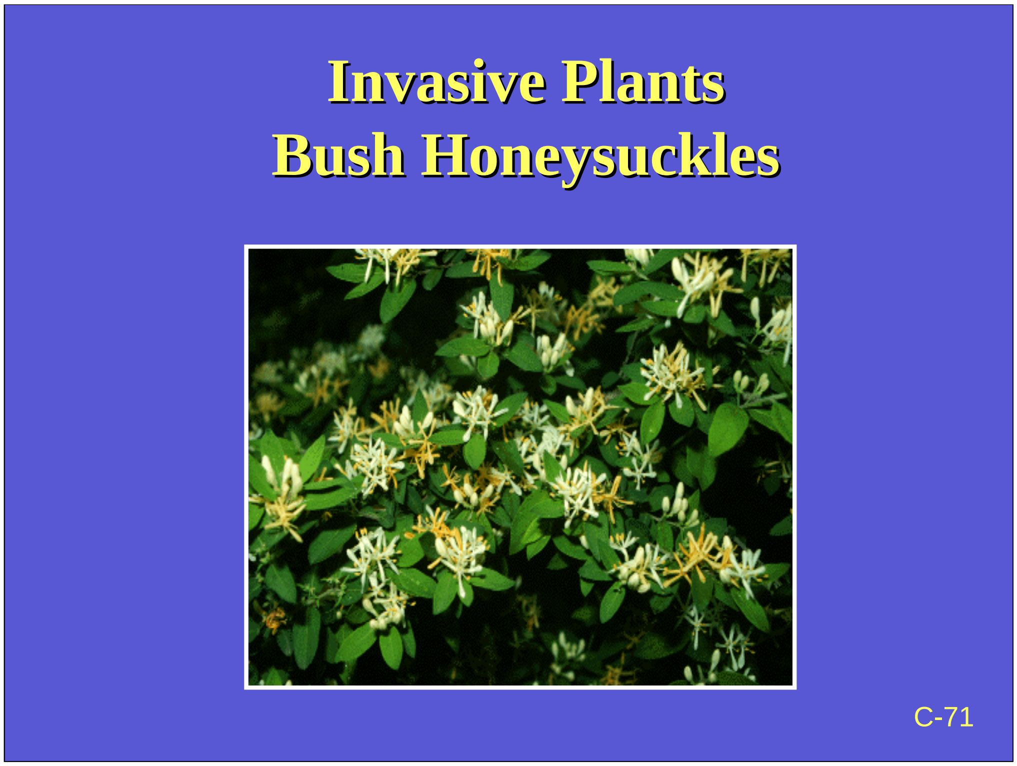
Purple loosestrife is an herbaceous perennial that may attain a height of two to seven feet. Its leaves are arranged opposite each other along the stem. Leaves are sessile. The small, purple flowers are borne at the tip of a stiff, four-sided stem. Flowers contain five or six petals.

Flowering in Illinois occurs from June through August. The fruit produced is a capsule.

Purple loosestrife is a native of Europe and Asia. It was introduced to the east coast of North America in the early 1800s by immigrants as an ornamental and herb, and accidentally through seeds in the ballast of ships and the wool of sheep. Transport of seeds from these plants has allowed purple loosestrife to escape into other areas.

It spread into the Midwest in the 1880s and reached Illinois in the 1940s or 1950s. Most Illinois populations are in Kane, Lake, McHenry, Cook, DuPage and Carroll counties, although it has been found in many other areas in Illinois.

Purple loosestrife invades moist areas and shallow water, making conditions unfavorable for the growth of native wetland plants. The dense clusters of purple loosestrife plants form areas which are unsuitable for cover, food or nest sites for a variety of wetland



Bush Honeysuckles: Tartarian, Morrow's, Belle, and Amur Honeysuckle (*Lonicera tatarica* L., *L. morrowii* Gray, *L. x bella* Zabel, and *L. maackii* (Rupr.) Maxim.)

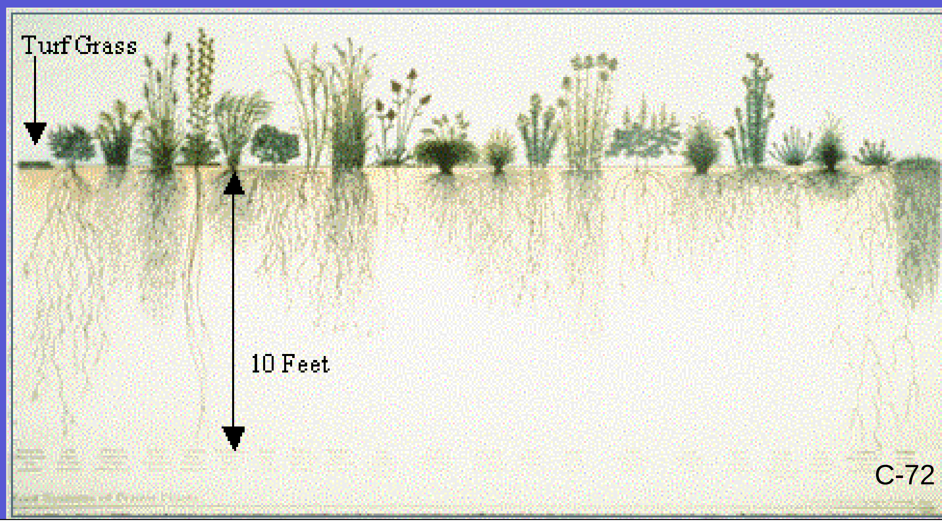
The four species of honeysuckle shrubs planted (Tartarian, Morrow's, Belle and Amur) that cause the more frequently observed invasive problems will be referred to as bush honeysuckle.

Bush honeysuckles grow to heights of 6-20 feet (1.8-6 meters). They are deciduous, with opposite, entire leaves, and often the older branches are hollow. Differences between individual species of non-native honeysuckles are dependent on the presence of pubescence or hair on leaves and flowers and the length of flowers and their stems.

Bush honeysuckles flower during May and June. Flowers of Tartarian honeysuckle are generally pink, but may vary from white to bright red. Amur and Morrow's honeysuckle flowers are white, fading to yellow as they age. Belle honeysuckle is a hybrid cross between Tartarian and Morrow's honeysuckles and has many characteristics of both parents. Fruits may be red or yellow and found in pairs in the axils of the leaves. In addition, there are presently at least 7 other species of bush honeysuckle or hybrids of these species occurring in Illinois.

Bush honeysuckles have a broad tolerance to a variety of moisture regimes and habitats.

Native Prairie Plants



The native prairie plant root systems go down more than 10 feet. The turf grass root system is 4 –6 inches. That is why lawns need constant watering and feeding.

Heidi Natura – Living Habitats

Roots Hold Soil

This property, with erosion is right next door to the previous property. There is no ersosion on the property with the natural landscape.

Energy Conservation / Cooling

Trees can lower energy bills by 25%

AC bills - 15-50%
Heating bills - 25-40%

Air temperature up to 25% cooler under tree

C-75

Shading by trees, shrubs and vines can keep buildings significantly cooler in summer.

DOE stats above are for a house.

Appropriately planted evergreen windblocks can appreciably lower heating costs.

Plants can help cool communities, reduce urban heat island effect.

Roots Hold Water

C-76

This photo was taken in the western suburbs of Chicago after a period of watering restrictions due to drought concerns. The native plants continued to bloom throughout the hot summer and fall, though were not quite as many bloom as other summers with less extreme heat.

Contrast the neighbor with the scorched lawn.

Storm Water Retention

Reduce runoff

Recharge groundwater

- Rain gardens
- Green roofs
- Rain barrels, hardscaping alternatives

C-77

We've already talked about the storage capacity of forests and prairies, increase absorbtion.

Change view of stormwater as a waste that we want to get rid as quickly as possible to a resource that we want to capture.

Slow down rainfall, absorb as much as possible on site prevent flooding and erosion, recharge groundwater.

Create "water gardens" in swales, hollows; vegetative buffers along streams, lakes.

Roof Top Garden

C-78

Chicago City Hall


C-79

Rain Garden

C-80

Maplewood, MN

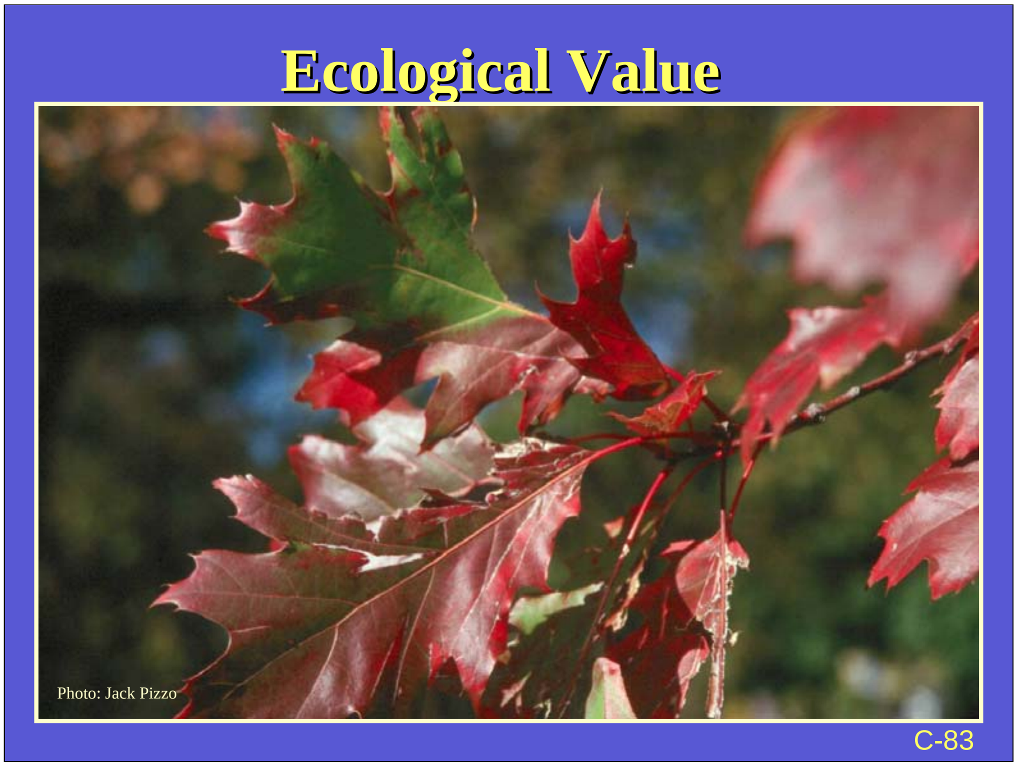
C-81

Ecological Value

Wildlife needs:

- **Food**
- **Shelter**
- **Water**

C-82



The following 4 slides illustrate how you can chose a plant to contribute to the ecological cycle. These slides were taken in October in the Chicago area, just a few weeks before the leaves were going to fall to the ground. The first 3 slides are of trees native to the area. You can see the leaf damage where bugs have feasted. The energy stored in the leaves are transferred to the bugs, and then will be transferred again when the bugs become a meal for a bird, etc.

The last slide is of a Norway Maple. It's leaves are untouched. It continues to store the energy it has gathered all spring and summer, but does not return anything to the insects.

This series of slides is generously shared by Jack Pizzo, Jack Pizzo and Associates.

Red Oak

Ecological Value

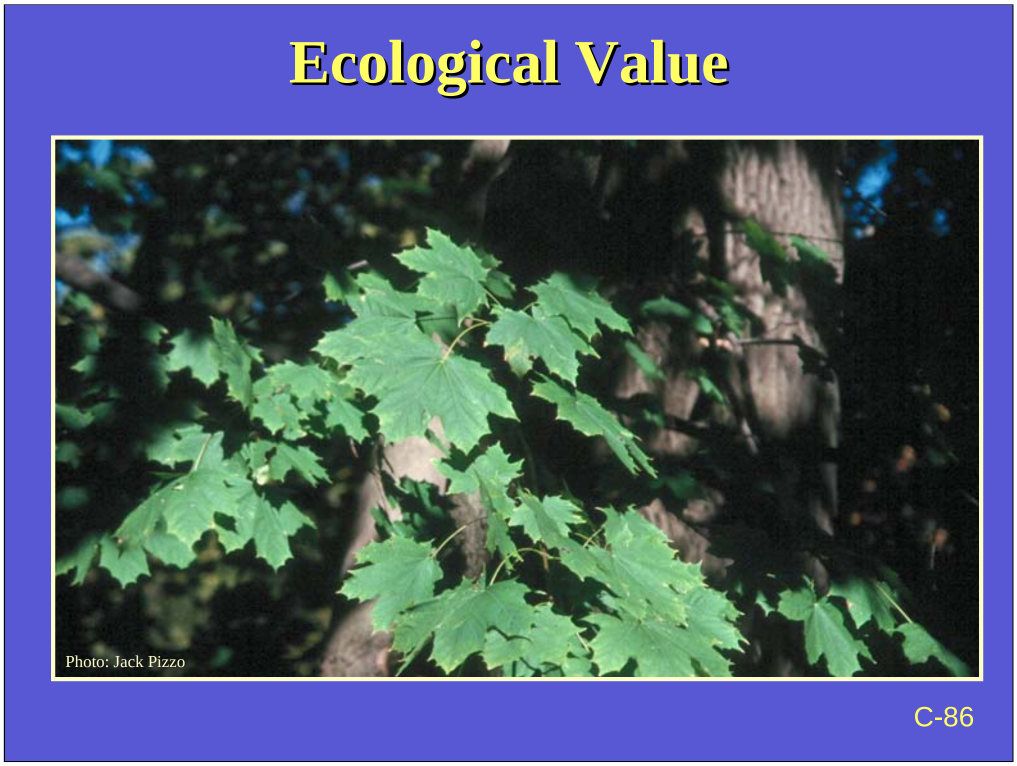
C-84

Walnut

Ecological Value

C-85

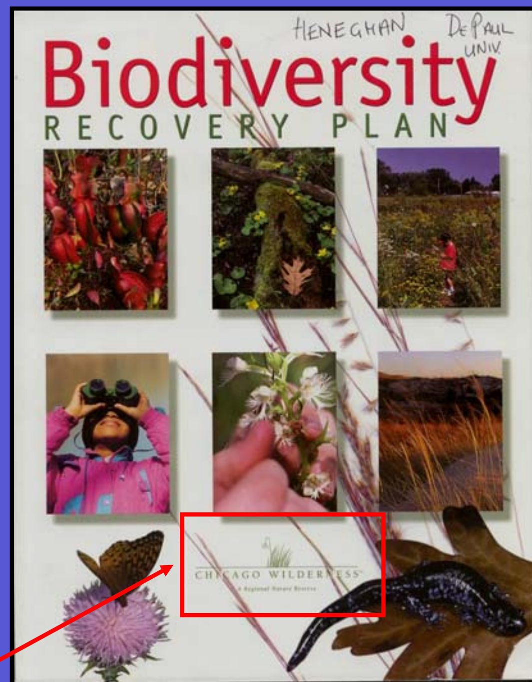
Hawthorne



Norway Maple

Overall Goal

"To protect the natural communities of the Chicago region and to restore them to long-term viability, in order to enrich the quality of life of its citizens and to contribute to the preservation of global biodiversity"



C-87


Landscaping with
Native Plants:
Exploring the Environmental,
Social, and Economic Benefits
December 6-7, 2004

C-88

Quantifying the Benefits of NL

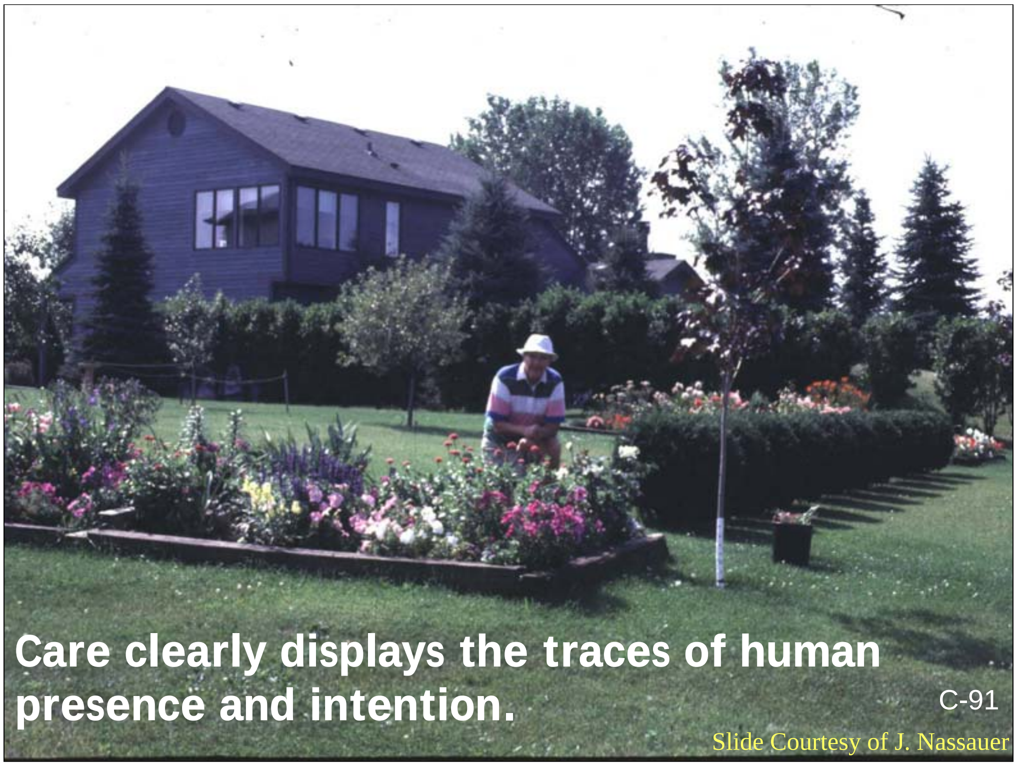
- Air
  - Absorption and filtration
  - Reduced maintenance emissions
  - Controlled burns
- Water
  - Less runoff
  - Better runoff quality
- Carbon Sequestration
- Phytoremediation
- Economics
- Public Perception
- Pesticides and fertilizers

C-89

Native Landscaping

- Converting 1000 acres of corporate land from turf grass to prairie
  – Prevents air pollution –
    - 18 tons per year of VOC emissions
  – Saves Energy (gasoline for mowers)
  – Saves Water (irrigation)
  – Saves $$$ - lowers operating cost

C-90


Care clearly displays the traces of human presence and intention.
C-91
Slide Courtesy of J. Nassauer


Cues to care
C-92
Slide Courtesy of J. Nassauer

By managing formal characteristics, native landscaping can be made consistent with ecological quality.

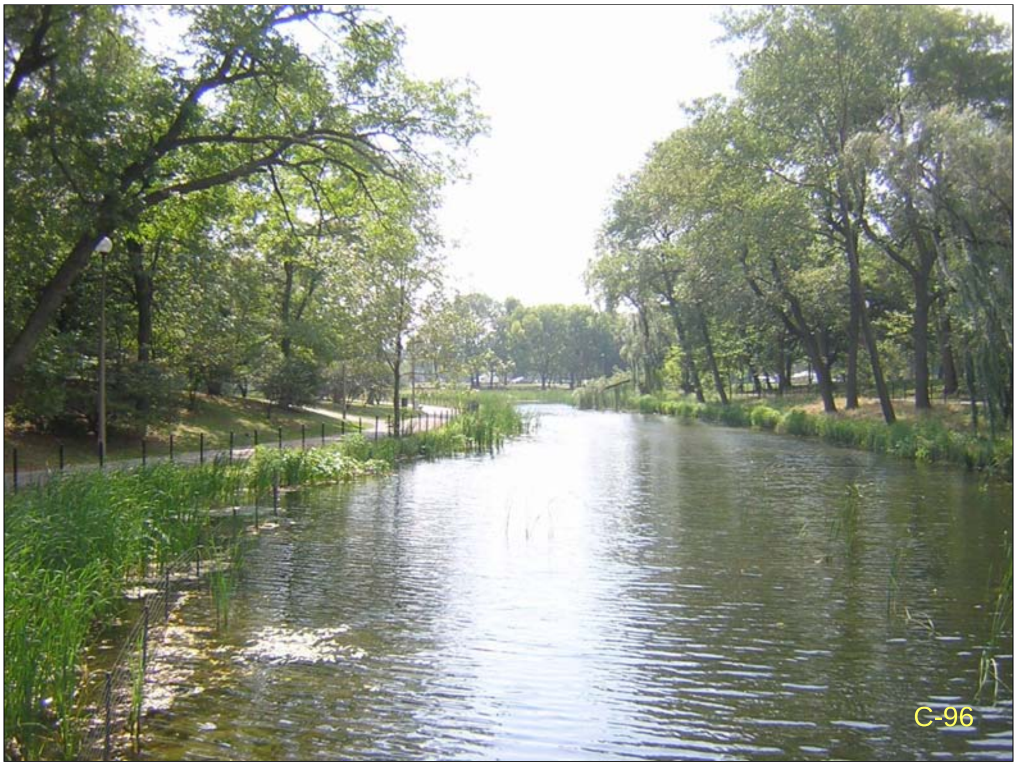
Sustainable native landscapes are *DESIGNED FOR PERCEPTION* not only restored to ecological function.

C-93

Slide Courtesy of J. Nassauer


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CHICAGO WILDERNESS
Conservation and Native Landscaping Awards
C-94


C-95


C-96

Independence Grove, Libertyville, IL (former Superfund site)

C-97

Former Glenview Naval Air Station, IL

C-98

Vernon, Hills, IL
Village Hall

C-99

2005 Conservation and Native Landscaping Awards

Nominees

- Park Districts
- Municipalities
- Homeowner Associations
- Institutions
- Corporations

There are about 60 acres of lakes at the Chicago Botanic Garden. Many of the lakes were suffering from shoreline erosion. A 1998 study of shoreline conditions revealed that 80 percent of the Garden's lakeshores were experiencing moderate to severe erosion. Here is a “before” pictures of some of the shoreline area.

Beginning in June 2000, the Garden began restoring its most critically eroding shorelines.

To date over 250,000 native plants have been used to vegetate 2.5 miles of the Chicago Botanic Garden's lakeshores. There are over 140 native taxa that are part of the project.

Careful planting techniques and a terrific mix of plants has created shoreline systems that are aesthetically pleasing, which are very stable, and which provide excellent habitat. Innovative approaches for creating stable, shallow-water planting "shelves" along the shoreline allow newly-planted native plants to flourish and anchor shoreline soils. Creative uses of interplanted stones and boulders, as well as specialized plastic mesh and webbing materials, further help stabilize the shoreline edge and protect newly installed aquatic plantings.

Wetland habitats along its lakeshores -- previously measured in inches -- now expand out from the lake edge by 30 feet or more!

Each of the shoreline plantings has been carefully documented so that over time, Garden scientists and collaborators can learn more about the plants' ecology and environmental tolerances. Through the School of the Chicago Botanic Garden, courses, workshops, and seminars help landscape and conservation professionals learn from the Garden's experiences. Planting beds include identification labels so that visitors can learn more about the wide diversity of native plants used. Publications, brochures, interpretive signage, and Website information allow the public to expand their knowledge even more.

The plantings at the garden are beneficial for the environment and for wildlife, and visitors to the Garden learn about the plants and experience the beauty of the plantings, and will depart from the Garden thinking about ways they may be able to use native plants at home.

For its outstanding work to restore lakeshore areas and highlight the beauty and benefits of native plants, we would like to recognize the Chicago Botanic Garden with a conservation and native landscaping award. Accepting the award on behalf of the Garden is Bob Kirschner, the Garden’s Director of Aquatic Plant and Urban Lake Studies.

Our next award winning site also involves the stabilization of the shoreline of an open water system, along with the restoration of an oak-hickory savanna. The Madison Club is a residential area in Burr Ridge. Invasive species such as buckthorn, cattails, reed canary grass, and purple loosestrife had taken over much of the open space in this area. The Homeowners Association, instead of just mowing the grass and bemoaning the invasive plants, decided to restore the open water wetland system and other open space areas using native plants.

About 13 acres within this residential area have been restored and enhanced. One of the outcomes, in addition to having peaceful, beautiful setting, is excellent wildlife habitat has been established in the middle of DuPage County.

About 21,000 Native plants were planted at the Madison Club. The pond is better protected from runoff and erosion with the development of a natural wetland buffer. This buffer of wetland plants helps hold the soil in place and filter runoff that may otherwise be carrying large amounts of chemicals into the pond. There are preservation easements covering the natural areas. There is monthly monitoring for insect pests and pathogens. There have been 5 Prescribed fires since 1999, removing brush, recycling nutrients, and promoting growth of native species. The site is very well maintained.

To recognize the sustainable approach planned and carried out for the ecosystem at the Madison Club, EPA and Chicago Wilderness would like to recognize the Madison Club Homeowners Association with a 2005 Conservation and Native Landscaping Award.

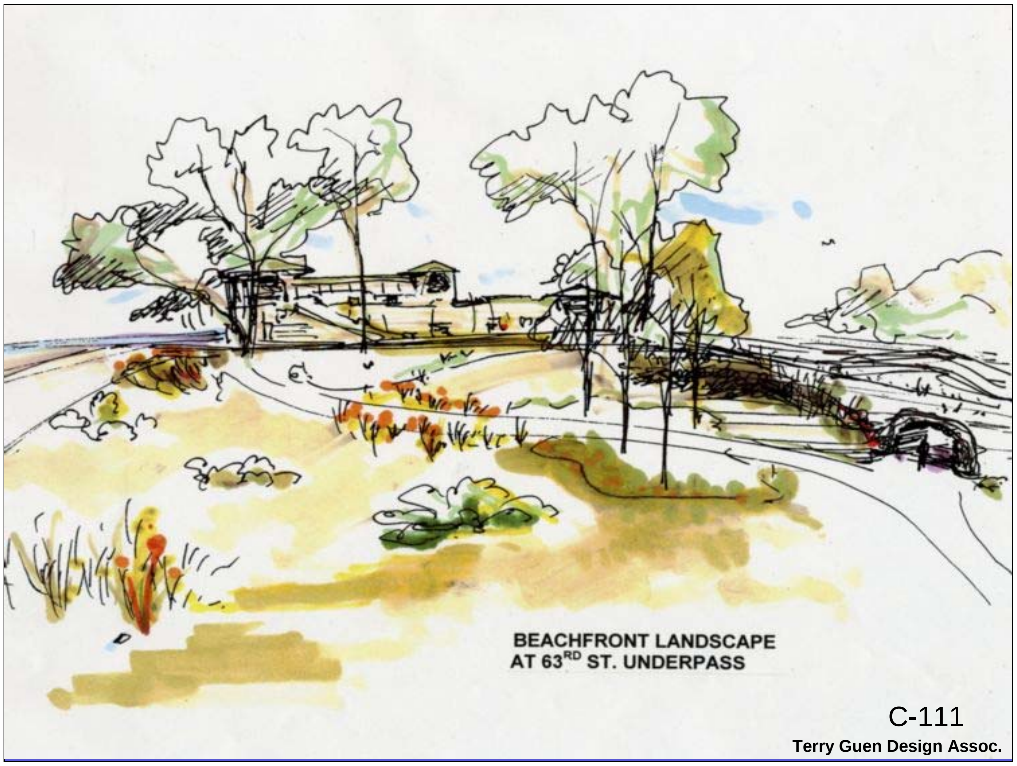
Our next winner is also a property owners association. The Harbor Springs subdivision is within Aurora in Kendall County. Going back several years, most of the area around the pond was turf grass. There were some remnant wetland plants by the pond, but non-native species dominated most of the area.

The wetland provides habitat for Mallard, Barn Swallow, Cormorant, Heron, Egret, Red Wing Blackbird, Woodcock, Killdeer, Green-wing Teal, Blue-wing Teal, Sand Piper, Scalp, Pintails, Redheads, Dragonflies, Monarchs, Muskrat, and many amphibians including Leopard frogs. It also acts as a natural filter within the watershed.

And here is what that area looks like now. The wetland was restored by removing invasive species and planting additional native species. Approximately 6 acres were restored. In addition, 40 birdhouses were installed along with Wood Duck houses and descriptive signs. This site is also very well-maintained. There have been 5 prescribed fires since the plantings. Seeds are collected and dispersed. The results as you can see are very beautiful.


63rd Street Beach Underpass
WEST UNDERPASS:
JACKSON PARK LUSH PARK PLANTING.
ORNAMENTAL TREES, PARK SHRUBS,
GROUNDCOVERS, BULBS, PERENNIALS.
South Lakeshore Drive
EAST UNDERPASS:
BEACHFRONT LANDSCAPING.
GRASSES, JACK PINE, POPLAR, LAWN,
SAND
RECEIVED
JUN 1 2 2001
REVISED 06.14.01
South Lakeshore Drive
Terry Guen Design Assoc.
C-109


63rd Street Beach Underpass
Chicago Department of Transportation
Chicago Park District
Illinois Department of Transportation
C-110
Terry Guen Design Assoc.

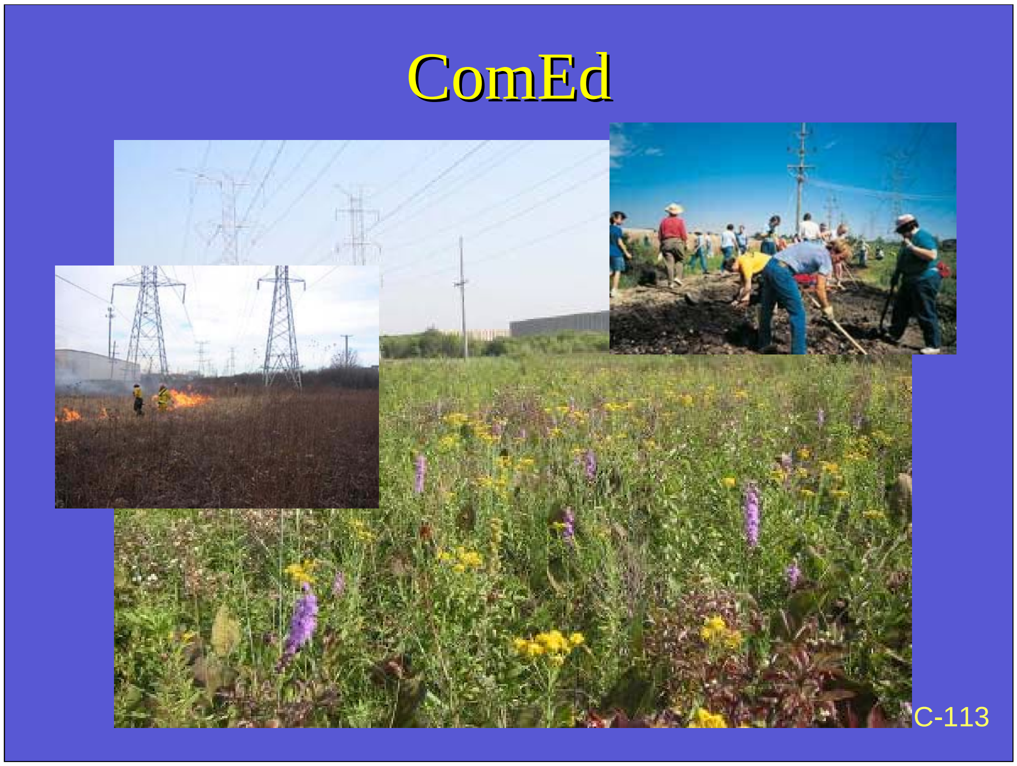

BEACHFRONT LANDSCAPE
AT 63RD ST. UNDERPASS
C-111
Terry Guen Design Assoc.

In the 1980s, volunteers collecting seed from the site for use in nearby prairie restorations recognized its high quality and value. They prevailed upon ComEd to provide greater protections to the prairie, and the company responded. Former ComEd executive Al Heidecke ordered “Preserve” signs to be posted and proposed a lease agreement with volunteers working to restore the site.

Bev Hansen, a Northbrook resident and leader of the Buffalo Grove Prairie Guardians, has supervised a hardy crew of volunteers on workdays each month since the late 1980s. As with most stewardship groups, these volunteers cut brush, pull weeds, collect and sow seeds, apply herbicide to invasive plants, and remove trash.

Over the years, Hansen has seen ComEd undergo a number of reorganizations and changes, but under Richer’s leadership she sees new cause for hope. The group’s request for a prairie burn had been rebuffed over the years. But Richer understood that need immediately when he started with ComEd three years ago. “We had a great big meeting in late 2002,” says Hansen, “with the Illinois Department of Natural Resources, the Army Corps of Engineers, the U.S. Fish and Wildlife Service, ComEd, and the volunteers — and everybody wanted to know how they could help.” Hansen had her outline of priorities. As a result, Richer agreed to have company crews assist with brush cutting, supported a plant inventory at the prairie, and paid for the prairie’s first-ever controlled burn — four acres — in the fall of 2003 by Pizzo and Associates, a firm that had experience burning under power lines.

A plant study conducted at the prairie in 2003 and 2004 by Barbara Johnson showed the beneficial effects of management, including burning. At one study transect, for instance, Johnson observed an abundance of asters, sunflowers, rattlesnake master, and blazing star. “Such a rich forb prairie is extremely uncommon in the Chicago region today,” Johnson wrote, “and its general aspect differs radically from most restorations, which are often dominated by extremely tall grasses and weedy goldenrods. The highest quality portions of remnant prairies tend to exhibit their richness in diversity rather than in height.”



Sara Race, a former organizer of the Mighty Acorns program at The Field Museum, is completing her Masters degree in Environmental Management at Illinois Institute of Technology by developing a biodiversity plan for ComEd. "We want to highlight the work the company is doing," Race explains, "create relationships with non-governmental organizations, and increase stewardship of natural areas." For example, the nuclear division of Exelon, ComEd's parent company, is surveying two sites this year to obtain baseline information of the existing plant and animal life, with plans to survey many more sites over the next two years. "We're trying to look not only at the negative impacts, but the positive ones as well," Race says. "Our biodiversity plan will be part of our whole environmental management system."

Richer recounts with evident pleasure seeing a field of compass plants come up after mowing one site, or discovering a prairie "we didn't know we had." He's looking to scientific research on the carbon sequestration rates of prairie plants to help him make the case for increasing management with native plants. "A lot of studies have been done with trees and the amount of carbon they sequester," Richer says. "We don't know as much about prairie plants, which have their biomass below ground and have very low release rates." To learn more, ComEd has funded a study on carbon sequestration along a right-of-way at Nachusa Grasslands, owned by The Nature Conservancy, in western Lee County, Illinois. Richer is hoping the economics of carbon sequestration — and the offsets through carbon credits that his company may gain — will also drive utilities in the direction of tall grasses instead of turf.

"ComEd keeps telling us, 'This is what we want,'" says Buffalo Grove Guardian Hansen. "Keeping the prairie healthy is really the best use of the property."

Northwest Meadow before retrofit


Motorola - After
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