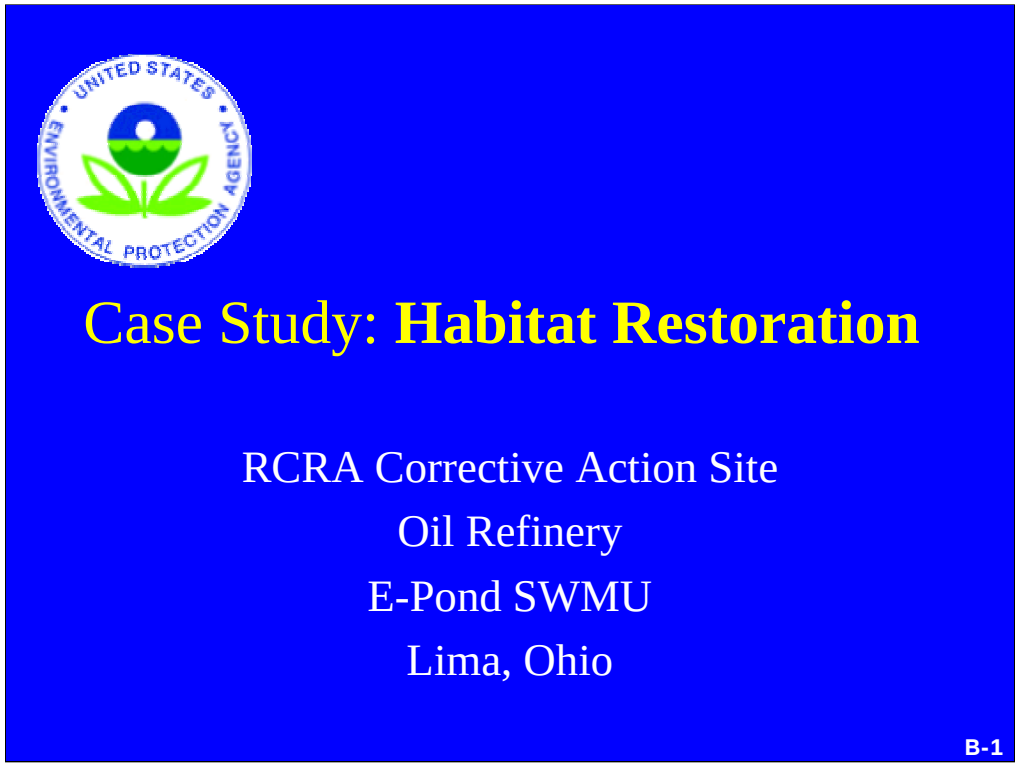


Introduction:

In January 2001, the U.S. EPA issued additional RCRA Cleanup Reforms to accelerate the pace of cleanups in its Corrective Action Program. One initiative of the 2001 Cleanup Reforms is capitalizing on the redevelopment potential of RCRA Corrective Action sites. Many sites are located in areas that are attractive for redevelopment and are poised for community revitalization. These factors may motivate interested parties to pursue an expedited cleanup, even when additional resources may be needed. Other sites are located in areas that are attractive for the redevelopment of native habitat.

Site redevelopment could include industrial reuse, commercial development, recreation use, residential housing, habitat restoration, or a combination of these.

Many companies believe that a contaminated site can be seen as an opportunity to restore wildlife habitat. By using the appropriate tools and remediation, the facility can achieve dual purposes -- cleaning up the site and, at the same time, enhancing the environment. Wildlife habitat restoration includes both market and non-market benefits. Increased property values in areas adjacent to greenways, river buffers, or prairies, are examples of market benefits. Non-market benefits include learning centers, recreational areas for the community, and ecological enhancement.

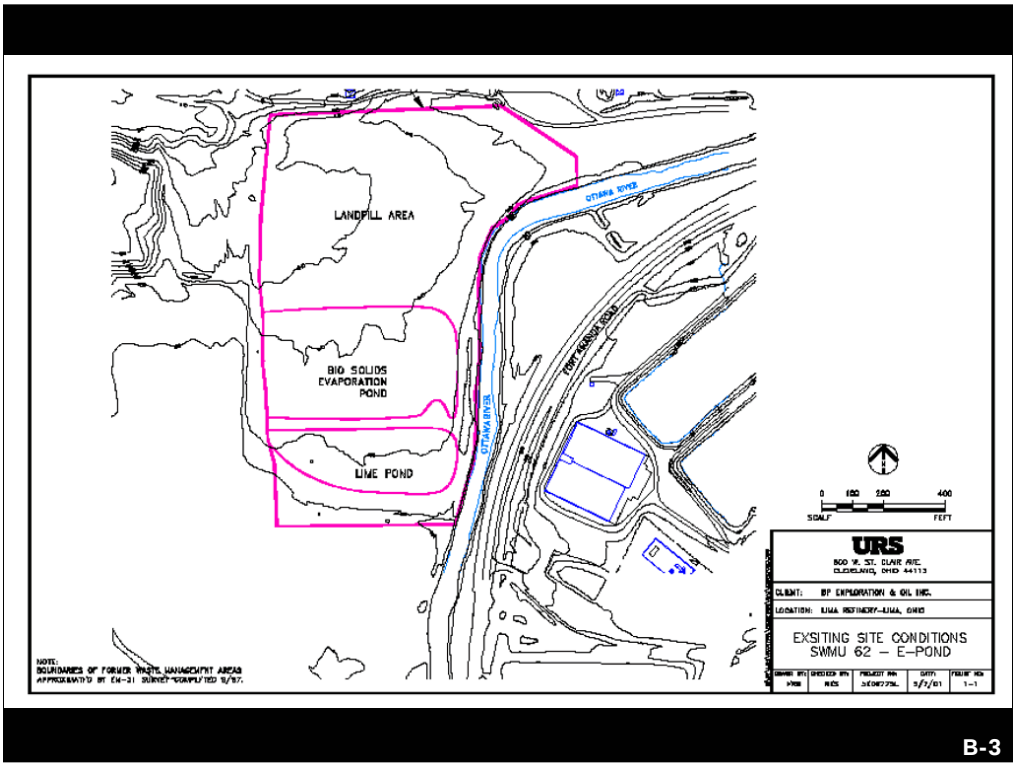
The Region is currently working with several industries to enhance and restore wildlife habitat while cleaning up contamination. One example is working with the steel industry in Northwest Indiana to restore habitat for some endangered species, such as the Karner Blue butterfly and the endangered Lupine plants.

Another example is at a petroleum refinery located in Lima, Ohio, where the company is enhancing and restoring habitat in areas, by creating butterfly gardens, riparian zones, and learning trails for the local citizens.

This is a case study of that habitat restoration project. At an on-going RCRA corrective action site, located at an operating refinery in Lima, Ohio.

This project involves one of the Solid Waste Management Units (SWUMS) that was evaluated during the facility's RCRA Facility Investigation.

The SWMU E-Pond, is located adjacent to the west bank of the Ottawa River, outside of the operational section of the refinery.



E-Pond (SWMU 62) consists of two former ponds and one former landfill that encompass approximately 23 acres.

The northern pond was used to de-water, by evaporation, biosolids that were obtained from an on-refinery stormwater retention basin.

The southern pond was used to dispose of the biosolids from the northern pond after the material was stabilized with soil and fly ash.

The landfill area received refinery wastes and municipal refuse from 1958 to 1973. The refinery wastes placed in the landfill consisted of sludge, emulsion plant vacuum filter cake, acid pond sludge, leaded tank bottoms, API separator sludge, and slop oil emulsions.

Prior to sample collection, early planning is important. Learn about the area.

Scope out the area. What are the surrounding areas like?

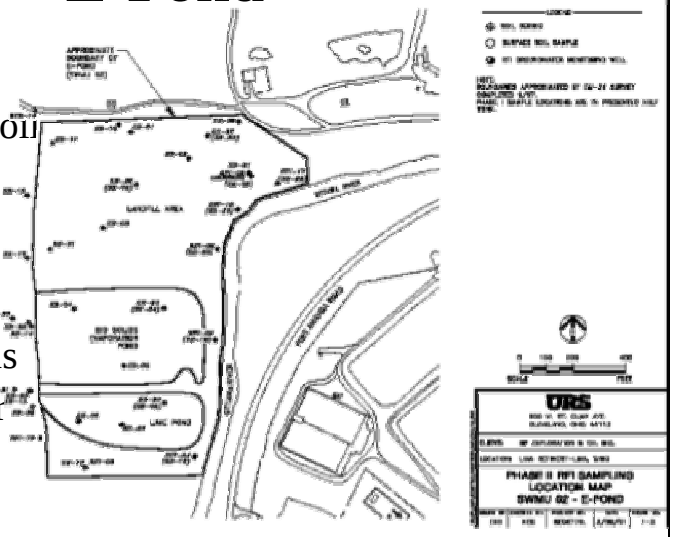
What habitats are present? Could river sediments be a problem?

What are the known problems?

You can then develop a sampling plan.

RFI Media Sampling
E-Pond

- 13 Soil borings
- 29 Subsurface soil samples
- 5 Surface Soil Samples
- 6 Groundwater monitoring wells
- 17 Groundwater samples



B-9

E-Pond was investigated during the RFI. Several samples were collected to provide the necessary information to conduct a risk assessment for both human health and ecological receptors.

It was important to select appropriate laboratory analytical methods that would provide the low method detection limits necessary to evaluate the ecological risk.

E-Pond Risk Assessment Results

- **Ecological** - Unacceptable level of risk to potential receptors due to elevated levels of chromium, antimony, thallium, and PCB-1248 in the ***surface soil.***

- **Human Health** - Cumulative cancer risk for exposure to ***surface soil*** for the hunter/ trespasser is 1×10^{-4}.

B-10

After the investigation was completed, a human health risk assessment was undertaken, as well as a tiered ecological risk assessment. Based on these assessments, it was determined that the surface soils presented risks ecological receptors (soil invertebrate, plants, and wildlife- short-tailed shrew, deer mouse and American robin) and was on the high end of the human health risk range. Therefore, the risk to surface soils had to be addressed.

Hazardous Constituents in Surface Soils

Constituent	Risk for Human or Ecological
Benzo(a)pyrene	Human Health
Dibenz(a,h)anthracene	Human Health
PCB-1248	Both
Chromium	Ecological
Antimony	Ecological
Thallium	Ecological

B-11

The risk assessments identified these constituents as the risk drivers for the risk posed to human health and or the ecological receptors.

Planning for Future Use at E-Pond

- Lisa Appel, Wildlife Habitat Council, tours site.
- "*Opportunities Report for Wildlife Habitat Enhancement at BP Lima's Oil Refinery Properties*" April 2001.
- Integrate habitat opportunities with site conditions.
- Cleanup goals must meet needs of future use plans.

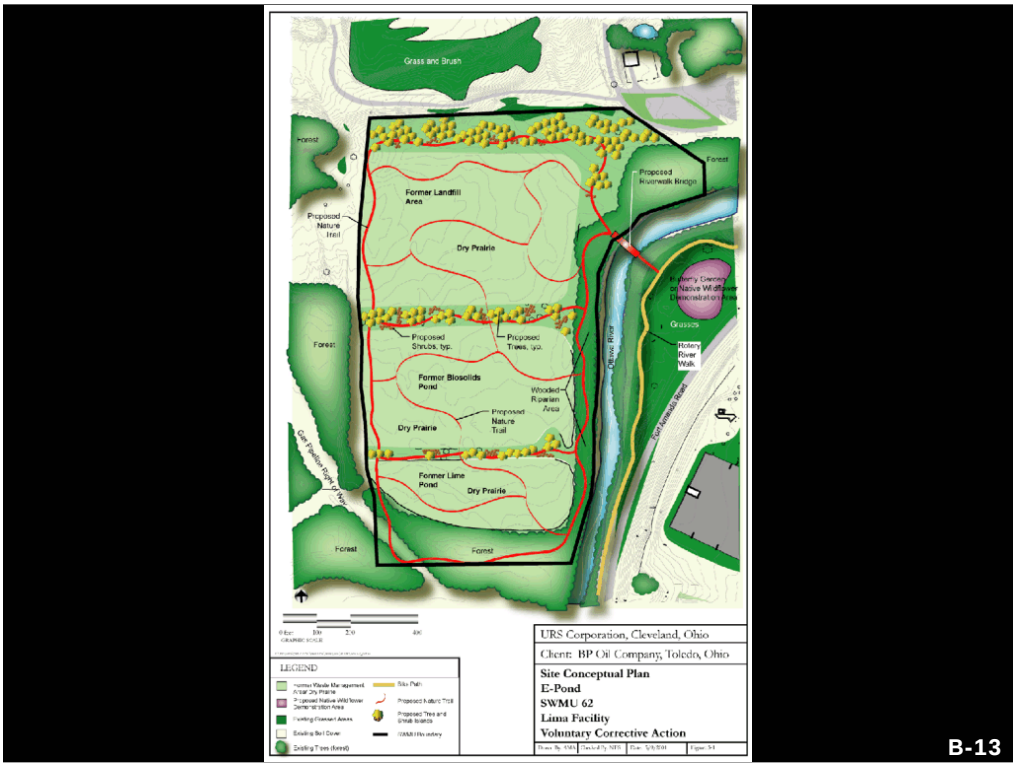
B-12

•The first step towards redeveloping the SWMU began with a site visit from WHC. Lisa Appel, from the Detroit office of WHC toured the site with the company representative and his contractors.

•WHC developed an Opportunities Report for the site, specifically for E-Pond and another off-site area.

•Using the recommendations from the Report, the company was able to propose cleanup remedies that would coincide with those opportunities identified in the report.

•Those cleanup goals were geared towards the proposed redevelopment of this area.



A Site Conceptual Plan was developed, based on the Opportunities Report. Taking into consideration the risk levels at the site.

The plan calls for creation of:

•Prairie habitat consisting of: native grasses and flowers

•Native tree and shrub clusters to provide cover for wildlife

•A butterfly garden

•Interpretive Areas and Educational Opportunities and

•Artificial nesting structures – to be built on the cover settling plates – will help to locate the plates!

E-Pond Corrective Measures

- Protective Cover – due to elevated levels of constituents in the surface soils.
- Groundwater Monitoring – to assure contamination does not migrate off-site.
- Operation and Maintenance Plan – to address the long-term integrity of the cover.

B-14

Based on the results of the risk assessment and the proposed future use, we could then identify the corrective measures necessary to address the risk.

The protective cover will eliminate exposure to the surficial soils, thus mitigating the risk.

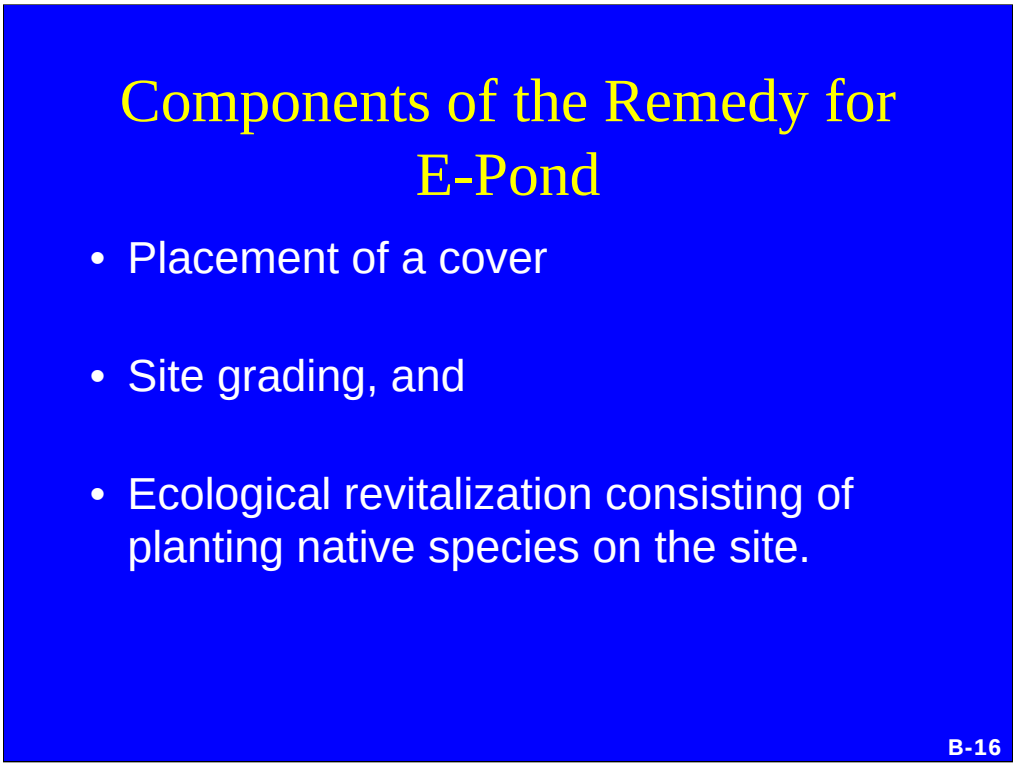
Groundwater monitoring is required when waste is left in place, to protect against contaminate migration off-site.

The O&M Plan will ensure the long-term integrity of of the remedy.

-The synthetic root penetration barrier will inhibit the growth of roots into the waste, thereby eliminating the potential for the plants to uptake the COCs identified at this site and re-release them to the environment (and creating additional exposure pathways). Additionally, the penetration barrier will deter small mammals from burrowing into the waste.

-The 12-inch soil cover will reduce or eliminate the exposure of soil biota, which includes microbes, invertebrates, and small terrestrial mammals, to the soil with elevated levels of COCs, thus reducing risk to acceptable levels.

-Enhance the soils with biosolids from the Lima Wastewaster Treatment plant to augment the organic content of the clean soil.



The Corrective Action ecological remedy and the revitalization strategy proposed for E-Pond

consists of the following components:

• Placement of a soil cover is designed to mitigate ecological surface soil exposure, which consists of a synthetic root penetration barrier and 12-inches of clean soil, including 3 to 4 inches of topsoil suitable for planting native plant species,

•Site grading similar to existing site contours, which approximates sheet flow and minimizes run-off from the site, and

•Ecological revitalization consisting of planting native species on the site, including:

•Native prairie habitat consisting of native grasses and wildflowers,

•Native tree and shrub clusters, and

•Berm with trees in the northern area of the site to provide a barrier between E-Pond and a construction debris landfill that is located to the north.

Original Site Conditions

Clearing Existing Growth

Chipping Woody Material

Installing Root Barrier

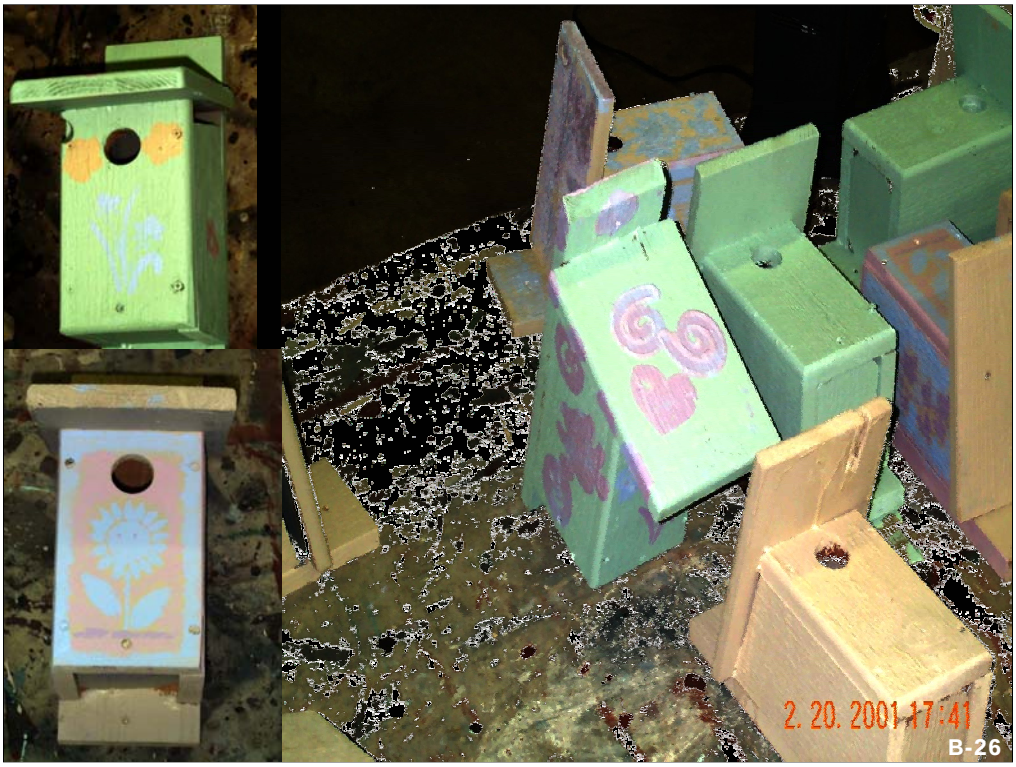
Adding Soil Cover

Adding Biosolids

E-Pond Fall 2001

Site following Spring 2002 Prairie Plantings

During Winter 2001-2002, BP enlisted the assistance of a local Girl Scout troop to paint birdhouses for the project.



Completed birdhouses – to be placed on the settling plate poles in E-Pond.

Late Spring 2002 with birdhouses on the settling poles.

Conclusions

- Plan your investigation to evaluate both human health and ecological risk.
- Cleanup requirements must meet future use needs.
- Mitigate ecological risk.
- Ecological enhancement project should not become an attractive nuisance.

B-28

•Plan your investigation so you can evaluate both human health risk and ecological risk. Evaluating ecological risk usually requires more sensitive laboratory analytical methods. This will allow for lower method reporting levels. Therefore, communicate your needs with the laboratory before you begin to collect samples.

•Your sampling plan should include multiple media, such as; surface soil, groundwater, sediments, and subsurface soils. Contact a qualified ecologist to assist in developing your plan.

•After the investigation is complete and the risk is calculated, consider the future use of the area to determine what cleanup requirements will be needed. Don't forget to consider any residual contamination that may remain after cleanup.

•Will the ecological enhancement project cause more harm to the wildlife because of the residual contamination? (Performing an ecological risk assessment will evaluate the risks and address this concern).

•Develop your remediation strategy to address risk.

Long Term Vision: Wildlife at E-Pond

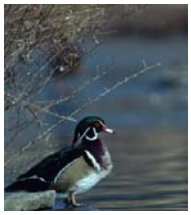
The following images were taken from U.S. Government web pages

New England Aster *(Aster nova-angliae)*

Purple Prairie Clover
(Dalea Purpurea)

Prairie Blazing Star
(Liatris pycnostachya)

Tree Swallow

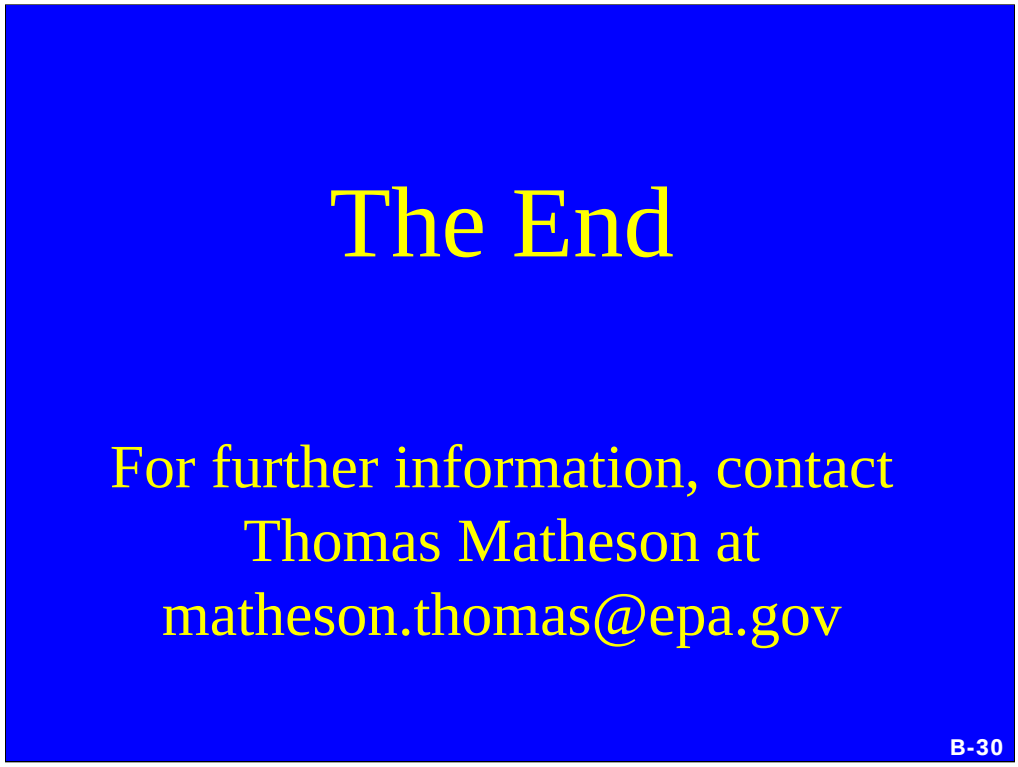


Wood Duck

Eastern Bluebird

1

B-29



For further information, please contact Thomas Matheson at matheson.thomas@epa.gov

Dr. Steven Handel, from University of Rutgers. Woody plants on landfill covers.