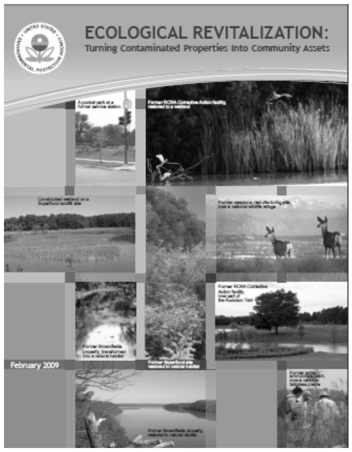
Ecological Revitalization: Turning Contaminated Properties Into Community Assets



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Notes:

- Today's session topic is Ecological Revitalization.
- We have three presenters today:
  - 1. Michele Mahoney
  - 2. Rashnmi Mathur
  - 3. Tom Bloom
- First, I will present information from the newly published EPA document entitled "Ecological Revitalization: Turning Contaminated Properties into Community Assets"

Overview

- Define Ecological Revitalization
- Incorporating Ecological Revitalization into Cleanup Planning and Design
- Technical Considerations for Ecological Revitalization
- Ecological Revitalization Case Studies

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Notes:

- Purpose of the document is to assist cleanup project managers and other stakeholders better understand, coordinate, and carry out ecological land revitalization at contaminated properties during cleanup.
- The document was a cross-EPA cleanup effort and includes considerations for ecological reuse in relation to RCRA, OBLR, FFRRO, UST, CERCLA. This presentation will present the information pertinent to the Superfund program. However, stay tuned for an internet seminar series this fall that will present ecological revitalization information for the other EPA cleanup programs.
- The document provides (1) general information for coordinating ecological revitalization during the cleanup of contaminated properties under various EPA programs, including Superfund and (2) technical considerations for implementing ecological revitalization during cleanup at Superfund and other sites.
- Many case studies are summarized, and a variety of resources are provided for applying ecological revitalization at your site.
  - Appendix A

What is Ecological Revitalization?

- Ecological <u>revitalization:</u> The *technical process* of returning contaminated land to functioning and sustainable habitat

- Ecological <u>reuse:</u> The *outcome* of a cleanup process where proactive measures have been implemented to create, restore, protect, or enhance habitat

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Notes:

- Ecological <u>revitalization</u> returns land from a contaminated state to one that supports a functioning and sustainable habitat. The terms "ecological revitalization" and "ecological reuse" are often used interchangeably. However, there is a subtle distinction between the terms. The process of ecological revitalization of a property can lead to an ecological reuse outcome.

- Ecological <u>reuse</u> is the outcome of a cleanup process. It includes areas where proactive measures are implemented to create, restore, protect, or enhance a habitat for terrestrial or aquatic plants and animals.

- Ecological revitalization can occur on a portion of a cleanup property adjacent to greenspace use (for example, a golf course with native plant species surrounding the course), commercial operations, or industrial use. For example, at the Pease Air Force Base in Portsmouth, New Hampshire, soils and groundwater contaminated with solvents and fuel were remediated. A wildlife refuge was created in addition to a public airport. Further, ecological revitalization can occur at varying degrees; some areas of a property may be restored to relatively pristine, historic conditions, while other areas may be planted with native or other compatible species. Both degrees of ecological revitalization lead to habitat that one may accurately characterize as ecological reuse.

Benefits of Ecological Revitalization:

- Improves soil health and supports diverse vegetation
- Sequesters carbon
- Protects surface and ground water
- Enhances property values and raises tax revenue
- Provides passive recreational opportunities
- Contributes to a green corridor or infrastructure

Before

After

Mill Creek Dump, Pennsylvania

http://www.epa.gov/reg3hscd/super/sites/PAD980231690/index.htm

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Notes:

- There are a variety of environmental, economic, and social benefits of using ecological revitalization, only some of which are presented on this slide.

- At the Mill Creek Dump in Erie, Pennsylvania, a former freshwater wetland that was used as a landfill for foundry sands, solvents, waste oils, and other industrial and municipal waste was capped and flatter slopes were created. The former landfill is now a golf course, and eight acres of wetlands were constructed adjacent to the course.

Benefits a Variety of Stakeholders

- Cleanup Property Managers
- Potentially Responsible Parties
- Local Government
- Local Citizen Groups and Individuals
- Environmental Organizations

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Notes:

- **Cleanup Property Managers.** A restored habitat can reduce long-term operation and maintenance requirements without compromising the effectiveness of the cleanup action. A restored habitat can also help optimize property engineering controls, such as vegetation to reduce surface water infiltration or using wetlands as part of stormwater controls.

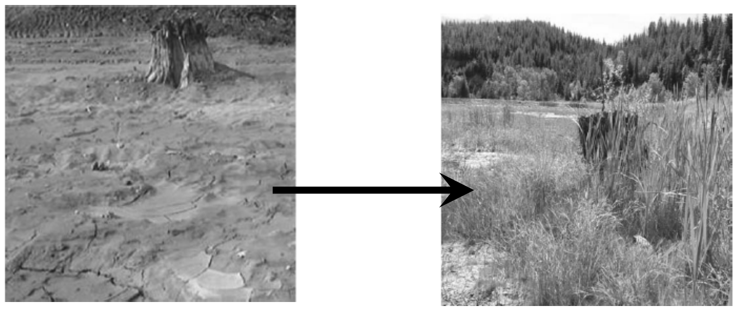
- **Potentially Responsible Parties.** A valuable restored habitat could enhance a company's image and reputation in the community. Getting a property cleaned up and reused can also ease liability concerns, which in turn may have a positive financial impact.

- **Local Government.** An ecological reuse may increase tourism, tax revenues, property values, and quality of life for residents. For example, at the Sequim Bay Estuary in Clallam County, Washington, about 100 creosote-treated pilings were removed along with 350 tons of contaminated soil and 600 tons of solid waste from the shoreline and riparian wetlands. This led to increased revenue from the sale of fish and an expanded tourist area for kayaking and bird watching.

- **Local Citizen Groups and Individuals.** Increasing habitat and passive recreational activities can improve the character of the neighborhood, employment opportunities, and area air and water quality.

- **Environmental Organizations.** Ecological revitalization projects may provide the opportunity to protect or improve local and regional habitats.

Ecological Revitalization Improves Habitat



Bunker Hill Superfund Site in Idaho

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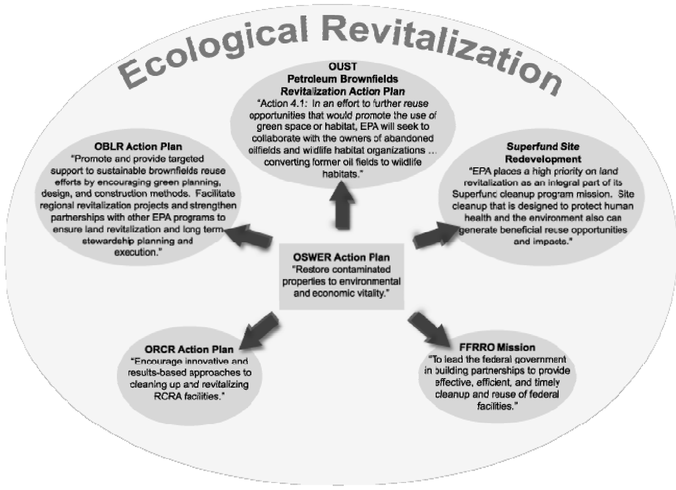
Notes:

- For example, at the Bunker Hill Superfund Site in Idaho lead, zinc, cadmium, and arsenic contamination from a historical milling operation (up to 3% lead and 1.5% zinc tailings) was left on-site and capped with biosolids compost and wood ash as part of the remediation. As the photos indicate, before remediation the swamp showed no evidence of ecosystem function. The remediation and revitalization activities at this time led to a dramatic improvement in habitat at the site.

Ecological Revitalization & EPA Programs



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Notes:

- EPA supports the use of ecological revitalization at sites under all cleanup programs. Ecological revitalization is a component of these programs' action plans, strategic plans, or program policies, as shown by this figure.
- For example, Superfund policy states that "EPA places a high priority on land revitalization as an integral part of its Superfund cleanup program mission. Site cleanup that is designed to protect human health and the environment also can generate beneficial reuse opportunities and impacts."

General Programmatic Considerations

- Protectiveness
- Enhancement
-
- Stakeholder Involvement

Jasper County Superfund Site, Missouri

Before

After

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Notes:

- Whether being addressed under one or several of EPA's cleanup programs, several factors determine whether and how ecological revitalization can be supported at a specific property, including these listed.
  - Protectiveness – Standards of protection are not lowered for a property that will be reused, nor will reuse be allowed to reduce effectiveness of cleanup measures.

  - Enhancement – Most ecological revitalization efforts are not considered enhancements and can be considered and incorporated into property cleanup plans. Costs can be justified if the revitalization is required because of environmental stressors or adverse impacts caused by the cleanup.

  - Stakeholder Involvement – Consider the varied interests, objectives, and requirements of all stakeholders. Successful ecological revitalization efforts result from well-facilitated, open communication among stakeholders

- Ecological revitalization can be used at Superfund sites, where appropriate. For example, biosolids were used during ecological revitalization activities to dramatically improve habitat at the Jasper County Superfund site. The Jasper County superfund site is part of the Tri-State Mining district, one of the largest lead and zinc mining areas in the world.

Ecological Revitalization at a Superfund Site

Jacks Creek/Sitkin Smelting & Refining, Inc.
Superfund Site, Pennsylvania

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Notes:

- Jacks Creek/Sitkin Smelting & Refining, Inc is an example of ecological revitalization activities incorporated into the remediation plan at a Superfund site. At the Jacks Creek. Superfund site in Maitland, Pennsylvania, wetlands were recreated in the riparian corridor along Jacks Creek. There were several buildings, waste piles, and large areas of soil contaminated with lead, copper, zinc, cadmium, and PCBs. Floodplain wetlands onsite and Jacks Creek sediment near the site were contaminated with runoff from the waste piles and soil. Cleanup included dredging contaminated sediment, excavating contaminated soil, and removing underground storage tanks and drums. The floodplain remediation required removal of vegetation in a segment of the riparian corridor of the creek. Because soil excavation impacted existing wetlands on site, wetlands were recreated in the riparian corridor along Jacks Creek. Vernal pools were created in the riparian corridor, woody debris was placed in the wetland as invertebrate habitat, and a wet meadow seed mix was used.

Ecological Revitalization and the Superfund Remediation Process

- Support Studies:
  - ✓ Ecological risk assessments
  - ✓ Natural resource damage assessments
- Superfund Redevelopment Initiative (SRI)
- For more information:
  - ✓ www.epa.gov/superfund/programs/recycle
  - ✓ www.cluin.org/sri

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Notes:

- With careful planning, many Superfund sites can accommodate ecological revitalization while still meeting the requirements under CERCLA and other federal and state regulations. Careful coordination with trustees is necessary early in the process because they may have information and technical expertise about the biological effects of hazardous substances and the location of sensitive species and habitats that can help RPMs evaluate and characterize the nature and extent of site-related contamination. Support studies, including Ecological Risk Assessments and Natural Resource Damage Assessments, support cleanup and ecological revitalization decisions at a Superfund site.
  - ERAs evaluate the likelihood that adverse ecological effects are occurring or may occur because of exposure to contamination at a site. ERAs form the basis for establishing cleanup goals and may contain important information that RPMs, Trustees, and risk assessors can use to evaluate ecological revitalization at a site.
  - NRDAs are conducted by trustees at sites with viable responsible parties, to calculate the monetary cost of restoring natural resources injured by releases of hazardous substances.
- Stakeholders have the greatest reuse flexibility if remediation and reuse plans are coordinated *prior* to cleanup. EPA plays an important role in the planning process by communicating key information about the nature of contamination at the site, remedy options, and long-term protectiveness issues.
  - Superfund Redevelopment Initiative (SRI): Ensures that at every Superfund site, EPA and its partners have the necessary tools and information to return the sites to productive use, including information related to natural resources and ecological revitalization.
  - SRI 10 year anniversary
    - Monthly series of webinars hosted by SRI to celebrate its 10th anniversary

Ecological Revitalization and the Superfund Removal Action Process

- Non-time critical removal actions – Reuse Assessments Directive, OSWER 9355.7-06P
- Time-critical or emergency removal actions – No guidance available

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Notes:

- EPA has prepared a reuse assessment guidance for non-time critical removal actions is provided called Reuse Assessments: A Tool To Implement the Superfund Land Use Directive. The directive presents information for developing future land use assumptions when making remedy selection decisions for superfund sites under CERCLA.
- Currently, there is no guidance available for time-critical or emergency removal actions. The accelerated and time sensitive nature of these cleanups creates a challenge, as removal teams often complete their activities before there is an opportunity to consider reuse. Because the time critical removal process is much faster than the remedial process, implementing reuse planning requires creating a targeted, expedited approach so that reuse can inform the removal action. A good example of a time-critical removal action where ecological revitalization drove the reuse strategy at a site is the Calumet Container Site, as shown on the next slide.

Calumet Container Superfund Site, Hammond, Indiana

Calumet Container Superfund Site, Indiana

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Notes:

- As you will hear later from Tom Bloom, at the Calumet Container Site, EPA conducted a time critical removal action where in addition to contaminated soil removal, the removal action also included restoring wetlands and planting native plants. EPA worked successfully and expeditiously with stakeholders to determine future anticipated use of the site.

Superfund-Specific Tools and Resources

- SRI guidance documents – www.epa.gov/superfund/programs/recycle/tools/index.html
- EcoTools Web site – www.clu-in.org/ecotools
- Green Remediation Web site – www.clu-in.org/greenremediation
- Fact sheets
- EPA Regional BTAGs
- EPA ERT – www.ert.org
- EPA OSRTI – www.epa.gov/tio
- Other agencies

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Notes:

- Although there is no specific guidance for time-critical or emergency removal actions, several the tools and resources can provide information that can be applied to these and other Superfund sites.
  - Frequently asked questions related to ecological revitalization (www.clu-in.org/s.focus/c/pub/i/1399/)
  - Re-vegetating landfills and waste containment areas (www.clu-in.org/s.focus/c/pub/i/1382/)
  - Attractive nuisance issues (www.clu-in.org/s.focus/c/pub/i/1438/)
  - The Use of Soil Amendments for Remediation, Revitalization, and Reuse (http://www.clu-in.org/download/remed/epa-542-r-07-013.pdf)
  - Ecological Revitalization: Turning Contaminated Properties Into Community Assets (http://www.clu-in.org/download/issues/ecotools/Ecological_Revitalization_Turning_Contaminated_Properties_Into_Community_Assets.pdf)
- Other agencies with available resources include USDA Natural Resources Conservation Service, USFWS, NOAA, state environmental departments, etc.

Incorporating Ecological Revitalization into Cleanup Planning and Design

- Amendments
- Regulatory Requirements
- Attractive Nuisance
- Equipment and Utility Location
- Hydrology and Surface Water Management
- Surface Vegetation

California Gulch Superfund Site, Colorado

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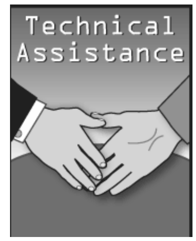
Notes:

- Cleanup technologies can affect ecosystems; so it is important to consider their possible effects. These are some of the general considerations discussed in the document. In some cases, simple planning decisions can greatly reduce an impact to natural resources.
  - **Amendments** – if amendments are planned for a site, RPMs should evaluate their effects in the subsurface, their potential for transport to surface waters, and any possible adverse effects on plant and animal communities.
  - **Regulatory requirements** – federal and state regulations apply to organic amendments; state and local regulations apply to pH-adjusting amendments
  - **Attractive nuisance** – some cleanup technologies designed to prevent contact exposure (covers) are not a barrier against burrowing animals; preventing access through fencing would help keep the remedy intact. For example, at the California Gulch site in Leadville, Colorado, tailings along the Upper Arkansas River had low soil pH and elevated concentrations of metals. Lime was used to amend the soil pH and biosolids were applied to the tailings. A wide range of earthworm, fish, and small mammal testing was conducted to determine whether the revitalized habitat was creating an attractive nuisance. Results showed that the bioavailability of the heavy metals present on the site was dramatically reduced after being treated with soil amendments and wildlife exposure was within acceptable limits.
  - **Equipment and utility location** – place equipment near the edge, rather than in the middle, of a valuable habitat.
  - **Hydrology and surface water management** – over pumping by ground water P&T systems can cause dewatering of wetlands because of the lowering of the water table. Discharging process water can also change surface water and wetland habitat
  - **Surface vegetation** – Using nearby native plant communities to determine species to revegetate a site can increase chances of success. However, vegetation near equipment related to a cleanup technology could prevent access for maintenance.

General Steps When Planning and Implementing an Ecological Revitalization Project

- Determine pre-disturbance and reference conditions
- Conduct a property inventory
- Establish revitalization goals and objectives
- Evaluate revitalization alternatives
- Develop a property-specific ecological design
- Prepare specifications for construction contractors
- Construct habitat features
- Conduct maintenance and monitoring activities



www.cluin.org/ecotools

Click on Technical Assistance for more information on planning and implementing an ecological revitalization project

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Notes:

- These are the general steps taken when planning and carrying out ecological revitalization projects during cleanup planning and implementation. However, the document also includes a table that presents issues associated with the application of various cleanup technologies.

  – **Determine pre-disturbance and reference conditions** – the reference is an actual site or description of a site that can be used as a model for planning ecological revitalization activities.

  – **Conduct a property inventory** – a baseline ecological inventory describes important aspects of biodiversity at a site, including species composition and vegetative community structure, which can be used to guide ecological revitalization planning.

  – **Conduct maintenance and monitoring activities** – in some cases, appropriately designed ecosystem revitalization may be self-sustaining and require little or no maintenance after the initial establishment period. In most cases, though, O&M will be required and depend on the type of cleanup as well as the ecological revitalization component. O&M typically includes inspection, sampling and analysis, routine maintenance and small repairs, and reporting, as necessary.

- These are all things that OSRTI can help with through our technical assistance tool.

Cleanup Planning and Design Issues When Waste is Left on Site

TABLE 3-1: Cleanup Planning and Design Issues When Waste is Left on Site and Other Considerations for Ecological Revitalization

Issue	Property Type[2]	Potential Impact	Solution/Consideration
Attractive Nuisance Issues: An area, habitat, or feature that is attractive to wildlife and has, or has the potential to have, waste or contaminants left on site that are harmful to plants or animals after a property is cleaned up	Landfill Mining Site Brownfield Military Installation Foundry Gas Station Metal Plating Facility Refinery Tannery	• Harm wildlife if (1) an exposure pathway exists from contaminants left on site that could directly harm wildlife or travel up the food chain; or (2) wildlife interfere with the cleanup, thereby creating an exposure pathway	• Consider potential ecological risks throughout the cleanup process • Conduct a thorough ecological risk assessment to avoid potential attractive nuisance issues • Carefully consider plant species and the type of animals that those species will attract; protect newly planted species until they are established • For additional information, refer to EPA's fact sheet titled "Ecological Revitalization and Attractive Nuisance Issues" (EPA 2007c)
Managing Gases: Depending on the waste composition, some containment sites have the potential to generate gas	Landfill	• Provide fuel for fire or explosions • Stress vegetation • Damage cover system • Infiltrate nests or other wildlife homes • Create other health or safety hazards	• Determine ability of waste to generate gas during planning stage (EPA 1991) • Build gas collection systems • Place components where they (1) do not interfere with planned uses, (2) minimize noise and odors, and (3) are not easily accessible to trespassers or wildlife • For additional information, refer to the EPA fact sheet "Reusing Cleaned Up Superfund Sites: Commercial Use Where Waste is Left On Site" (EPA 2002a) and "Landfill Gas Control Measures" (www.atsdr.cdc.gov/HAC/landfill/PDFs/Landfill_2001_ch5.pdf)

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Notes:

- Table 3-1 of the document presents issues that may occur when waste is left in place at a cleanup property, how these issues could affect ecological revitalization, and potential approaches to mitigate these issues.
- As noted in the table, timing is an issue to be considered during ecological revitalization. The longer planning is delayed, the greater the possibility that fewer reuse options will be available. RPMs should begin revitalization planning as early as possible and can begin developing a revitalization project on parts of a property before the cleanup is completed, if possible. A restoration ecologist can be used to determine the proper season to plant native grasses, shrubs, and trees to increase chances of success. RPMs should also consider breeding seasons and other timing issues to avoid affecting sensitive species when scheduling remedial or revitalization activities.

Minimizing Ecological Damage During Cleanups

- Develop and Communicate Ecology Awareness and Procedures
- Design a Property-Wide Work Zone and Traffic Plan
- Minimize Excavation and Retain Existing Vegetation
- Phase Site Work

Rocky Mountain Arsenal, Colorado

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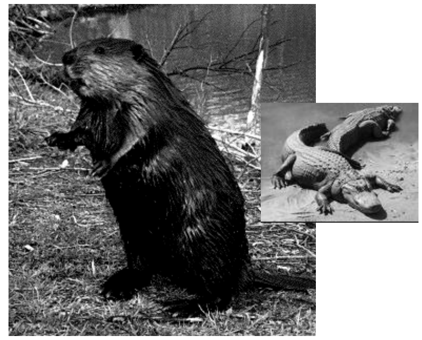
Notes:

- **Develop and Communicate Ecology Awareness and Procedures** – Cleanup project managers can create preservation procedures for everyone involved with on-site activities and incorporate requirements to protect habitat or species into construction plans, specifications, and contracts, as appropriate.
- **Design a Property-Wide Work Zone and Traffic Plan** – Cleanup project managers can delineate staging areas, work zones, and traffic patterns to minimize unnecessary disruption of sensitive areas and existing habitat on or near a site.
  - For example, At the Rocky Mountain Arsenal site, EPA designed a property-wide work zone and traffic plan to preserve habitat and minimize erosion and sedimentation and used existing roads wherever possible. RPMs also suspended cleanup activities during certain seasons to avoid disturbing the nesting and breeding of the bald eagle and other sensitive species. Ground water treatment systems were installed to remediate ground water contaminated with wastes from production of chemical warfare agents, industrial and agricultural chemicals, and pesticides. Congress passed the Rocky Mountain Arsenal National Wildlife Refuge Act, requiring the site to become part of the national wildlife refuge system once cleanup is complete.
- **Minimize Excavation and Retain Existing Vegetation** – Earthmoving and soil compaction can damage tree roots and can be restricted to areas essential for the cleanup. Treatment and monitoring technologies are less invasive cleanup measures than excavation.
- **Phase Site Work** – This can reduce total soil erosion for the entire property and allow for revegetation or redevelopment of some areas immediately after cleanup. Construction can be scheduled to avoid heavy rains or sensitive periods (breeding, nesting) of certain species.

These are all things that OSRTI can help with through our technical assistance tool.

Minimizing Ecological Damage During Cleanups (Continued)

- Consider Property Characteristics
- Protect On-Site Fauna
- Locate and Manage Waste and Soil Piles to Minimize Erosion
- Design Containment Systems with Habitat Considerations
- Reuse Indigenous Materials Whenever Practical



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Notes:

- **Consider Property Characteristics** – To increase chances of successful revitalization, consider characteristics including, existing habitat, biodiversity, contaminant bioaccumulation, and threatened and endangered species.
- **Protect On-Site Fauna** – Consider careful use and parking of construction equipment in sensitive areas to protect snakes, turtles and nesting birds that prefer edge habitat. To relocate beavers and alligators at the French Limited Superfund Site in Crosby, Texas, RPMs reduced their food supply in areas to be treated and increased the food supply in other suitable areas of the property. Remediation included treating soil and groundwater contaminated with VOCs and heavy metals and creating 23 acres of new wetlands.
- **Locate and Manage Waste and Soil Piles to Minimize Erosion** – Structure stockpiles to minimize runoff, locate them away from steep slopes, wetlands, streams, or other sensitive areas.
- **Design Containment Systems with Habitat Considerations** – Avoid features that could damage the containment system or create attractive nuisance.
- **Reuse Indigenous Materials Whenever Practical** – reusing logs, rocks, brush, or other materials found on site can provide logistical and ecological advantages as well as cost savings.

These are all things that OSRTI can help with through our technical assistance tool.

Wetlands Cleanup and Restoration

- Factors to consider if a cleanup will affect a wetland:
  - ✓ Wetland characteristics
  - ✓ Regulatory requirements
  - ✓ Vegetation and hydrology
  - ✓ Wildlife
  - ✓ Maintenance
  - ✓ Additional considerations for treatment wetlands

Wetland Creation at Naval Amphibious Base Little Creek, Virginia

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Notes:

- Wetlands are of particular concern for cleanups because in addition to intercepting storm runoff and removing pollutants, they provide food, protection from predators, and other vital habitat factors for many fish and wildlife species.
- These specific considerations are discussed in the document.
  - Wetland characteristics – such as wetland function and endangered species
  - Regulatory requirements – such as compliance with the Clean Water Act, the Rivers and Harbors Appropriation Act, and the Farm Bill.
  - Vegetation and hydrology – restoring hydrology and re-establishing a previous vegetation association or using a nearby wetland as a reference wetland increases chances of success.
  - Wildlife – factors that help determine effectiveness for wildlife use include (1) wetland size, (2) relationship to other wetlands, and (3) level and type of disturbance.
  - Maintenance – such as invasive species control, protection from wildlife grazing, and monitoring for litter and debris buildup.
  - Additional considerations for treatment wetlands – including conducting an ecological risk assessment and monitoring of the treatment wetland until it meets cleanup goals to help identify any potential attractive nuisance issues. A public-private partnership is installing a series of passive treatment systems, including treatment wetlands, to treat acid mine drainage from abandoned surface and underground coal mines in western Pennsylvania. After passing through a series of limestone-lined ponds to neutralize pH, the water is sent through an aerobic constructed wetland to remove iron hydroxides. The system can even recover metals removed from the water so recovered metal can be sold.

Wetlands Cleanup and Restoration: Naval Amphibious Base Little Creek, Virginia

Before

After

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Notes:

- For example, at Naval Amphibious Base Little Creek in Virginia Beach, Virginia, the Navy, in partnership with EPA and VDEQ, constructed a tidal wetland in the Chesapeake Bay after removing a 1.2 acre landfill. The team used a neighboring marsh as a reference wetland to determine appropriate plants to place along designated elevations to establish tidal wetland vegetation.

Stream Cleanup and Restoration

- Considerations Critical to Successful Stream Cleanup and Restoration:
  - ✓ Stream Channel
  - ✓ Streambank Stabilization
  - ✓ Streambank Vegetation
  - ✓ Watershed Management

Cache La Poudre River Superfund Site, Colorado

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Notes:

- Cleaning up a stream corridor can be complicated, as cleanups often require disrupting the stream flow and habitat.
- Some considerations for (1) designing and implementing cleanups that facilitate ecological restoration of streams and stream corridors and (2) mitigating adverse ecological impacts of constructing cleanup features.
  - After cleanup, reconstruction of the stream channel is usually necessary
  - disturbed or reconstructed streambanks often require temporary stabilization to prevent erosion.
  - preserve existing vegetation when possible and focus on a long-lasting plant community rather than a quick fix to prevent erosion. For example, fast growing non-native species may quickly stabilizea denuded stream bank, but over time, they may end up invading the entire stream corridor to the detriment of desirable native species.
  - effective watershed management, including reducing runoff from other cleanup sites, could eliminate the need for in-stream restoration.

Stream Cleanup and Restoration: Cache La Poudre River Superfund Site, Colorado

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Notes:

- For example, at the Cache La Poudre River Superfund Site in Colorado, EPA implemented an ecological remedy to preserve the riverine habitat and restore the streambank by incorporating boulders and snags into the cleanup.
- Soil, sediments in the Poudre River and groundwater were contaminated with gasoline mixed with coal tar. Cleanup activities included sediment excavation and temporary re-routing of the Poudre River, a vertical sheet pile barrier to stop groundwater flow and groundwater treatment.

Terrestrial Ecosystems Cleanup and Revitalization

- General Revegetation Principles:
  - ✓ Soil Type
  - ✓ Plant Selection
  - ✓ Timing

http://www.nrcs.usda.gov/

http://www.wildlifehc.org/

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Notes:

- Here's some general revegetation principles as well as specific considerations for restoring terrestrial ecosystems, which include prairies and semi-arid and arid areas.
  - Soil amendments can be added to soils without adequate topsoil and compost can be used to help establish vegetation. At the College Park Landfill in Beltsville, Maryland, RPMs used recycled waste materials such as fly ash and animal and plant by-products as land cover as part of the landfill cap. In addition, the vegetative cover will include diverse native plantings.
  - Local native populations of plant and seed usually increases chances of successfully revegetating a site. After seeding, RPMs can protect the seeded area from grazing animals, vehicles, and other disturbances until plants are well established. Techniques for protecting plantings include fencing, clearly marked access roads, animal repellants, and interim surface stabilization methods such as mulching or matting.
  - Seed during the optimum periods for plant establishment, which are site-specific.
- Organizations can provide assistance in revegetating a specific site, including USDA's Natural Resources Conservation Service and Wildlife Habitat Council.
- The Sharon Steel site, which will be discussed later in this session, used soil amendments as a remedy.

Major Components for a Successful O&M Program

- Plan early for long-term stewardship
- Identify and complement general O&M activities
- Establish a monitoring program
- Use Institutional Controls

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Notes:

- Not only is long-term stewardship necessary to ensure protectiveness of the remedy, it can also be used to preserve the functioning of the associated ecosystems after cleanup is completed.
- For example, at the Woodlawn Landfill Superfund Site, long-term stewardship included local volunteers to manage the site. The groundwater has been contaminated with VOCs, primarily vinyl chloride and 1,2-dichloroethane, and with PAHs, pesticides and metals, primarily manganese. A cap was initially installed but was replaced by a vegetative soil cap to help sustain naturally occurring bacteria in the soil that use the waste as a food source. Trees and native wildflowers were planted, and a wildlife habitat called “new beginnings, the woodlawn wildlife habitat area” was created. It is currently used as a nature and science study area by local schools and the Boy Scouts and Girl Scouts of America.

Ecological Revitalization Case Studies

- Property Name and Location
- Property Type
- Cleanup Type
- Revitalization/Reuse Component
- Problems/Issues
- Solutions
- Point of Contact
- Notes/Links

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Notes:

- The Woodlawn Landfill site that was just mentioned as well as many other sites are highlighted as case studies in Appendix A of the document.
- Site information is included as well as cleanup type, how ecological revitalization or reuse was incorporated, any problems or issues that were encountered, and how they were resolved.
- Links to additional information and a point of contact are also included so you can obtain more information on any of the case studies.

Appendix A: Ecological Revitalization Case Studies

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
REGION 1							
Atlas Tack Superfund Site, Fairhaven, MA	Superfund Manufacturing Facility	Ground water contaminated with cyanide and toluene that leached from the site lagoon and soils contaminated with VOCs, heavy metals, pesticides, PCBs, and PAHs were cleaned up by removing buildings, contaminated soil, and sediment.	The cleanup preserved as much of the wetland sediment as possible and provided the necessary mix of fresh and salt water sources to create a functioning wetland, in addition to protecting human health and the environment.	1) The original ROD contained sediment cleanup values that would require complete excavation of the entire marsh. 2) The initial remediation plan included lowering the ground water table to prevent it from flowing through residual contamination.	1) The bioavailability study showed that it was not necessary to remove all sediments, and therefore only necessary sediment was removed, thereby preserving the marsh to the extent possible. 2) The remediation approach was re-evaluated during wetland design, and risks from ground water flowing beneath the site were minimal.	Elaine Stanley, RPM EPA Region 1 1 Congress Street Suite 1100 Mail Code: HBO Boston, MA 02114-2023 617-918-1332 stanley.elainet@epa.gov	http://www.epa.gov/ne/superfund/sites/atlas/
Fort Devens: OU2 Devens Consolidation Landfill, Sudbury, MA	Superfund Military Base	Numerous small historical landfills were remediated and the waste was consolidated in a new state-of-the-art landfill. Soils and debris disposed at the Devens Consolidation Landfill included those contaminated with petroleum, pesticides, PCBs, PAHs, and asbestos. A total of approximately 365,000 cubic yards of waste was disposed of in the new landfill. The historic landfill sites were then backfilled and regraded to restore the sites to pre-construction conditions.	Three of the historic landfills had waste or debris in wetland areas. For these areas, the remedy included waste and debris removal, followed by wetland restoration. The wetlands were restored by backfilling with clean fill and manufactured wetland soil. Materials were stabilized with a custom wetland seed mix, in accordance with a Habitat Restoration Work Plan. The site was monitored and evaluated during the next three growing seasons to ensure it achieved restoration success measures.	Not specified	Not specified	Ginny Lombardo, RPM EPA Region 1 1 Congress Street Suite 1100 Mail Code: HBT Boston, MA 02114-2023 617-918-1754 lombardo.ginny@epa.gov	http://yosemite.epa.gov/r1/npl_pad.nsf/51dc4f173ceef51d85256adf004c7ec8/df7d910ff9a93fab8525691f0063f6c9!OpenDocument&Highlight=0,devens

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Notes:

- This slide shows an excerpt from the case study table in Appendix A of the document. This appendix provides numerous site-specific examples where ecological revitalization has occurred. For more detailed information about the ecological revitalization application at a site, you can click on the information sources link or contact the person whose phone and email is provided as the primary point of contact.
- Sites in this Appendix are being converted into a searchable online database that will be available on the CLUIN web site by the end of summer or early Fall this year.

EcoTools: Tools for Ecological Land Reuse

- Technical information on various ecological revitalization topics
- Archived internet seminars for ecological restoration
- Links to additional EPA information and resources

http://www.clu-in.org/ecotools/

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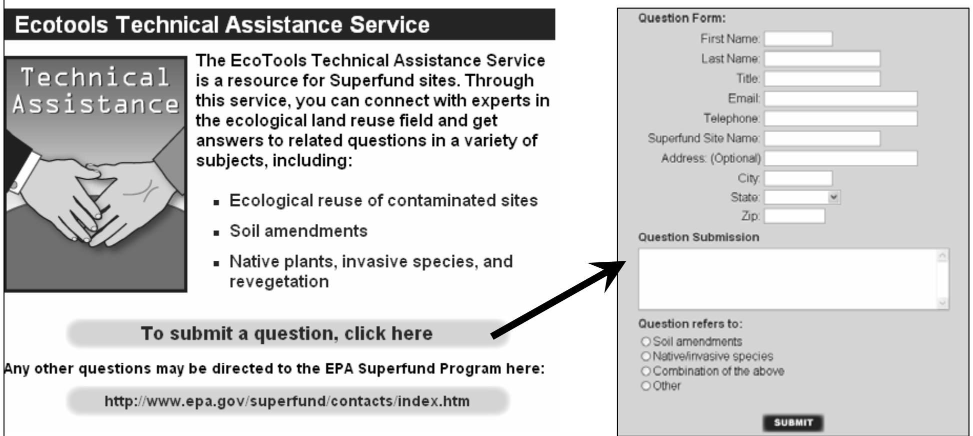
Notes:

- EPA OSRTI has resources available to assist two sites with planning for ecological reuse as part of the remedy and revitalization. Interested RPMs should talk with me.

- Technical information on soil Health, plants and Revegetation, localized info, organizations and Resources is available
- Along with publications and technical assistance.

- Archived internet seminars on
- Ecological Revitalization Resources Available through EPA
- Ecological Revitalization Case Studies
- Understanding and Reconstructing Soil Conditions at Remediation Sites
- Jump-Starting Ecological Restoration
- ITRC Planning and Promoting of Ecological Reuse of Remediated Sites

Technical Assistance Available on EcoTools



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Notes:

- Technical assistance available for Superfund project managers
  - Support provided for site-specific work
  - Connect with experts in the ecological land reuse field
  - Get answers on ecological reuse of contaminated sites, soil amendments, native plants, invasive species, and revegetation.

EPA OSRTI currently has funds available to provide technical assistance at a limited number of sites. If you are interested, please let me know, either at the end of today's session or by emailing me.

Additional EPA Resources

- BTAG
  - ✓ EPA Region 3 – www.epa.gov/reg3hwmd/risk/eco/index.htm
  - ✓ EPA Region 4 – www.epa.gov/region4/waste/ots/index.htm
  - ✓ EPA Region 5 – www.epa.gov/region5superfund/ecology/index.html
  - ✓ EPA Region 8 – www.epa.gov/region8/r8risk/eco.html
- ERT – www.ert.org
- OSRTI – www.epa.gov/tio
  – www.cluin.org

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Notes:

- Biological Technical Assistance Groups – regional groups typically composed of biologists, ecologists, and ecotoxicologists from EPA that can provide technical assistance for Superfund sites
- ERT – provides a variety of utilities and tools to assist OSCs, RPMs, Task Leaders and field personnel in managing and performing their site-related duties: www.ert.org.

Resources Outside EPA

- ITRC – www.itrcweb.org
- USDA NRCS – www.nrcs.usda.gov
- USFWS – www.fws.gov
- NOAA – www.noaa.gov
- State environmental agencies and departments

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Notes:

- Many additional resources are also available outside of EPA, such as ITRC, NRCS, USFWS, NOAA, and state environmental agencies and departments,
- ITRC – a state-led coalition working with the federal government, industry, and other stakeholders to achieve regulatory acceptance of environmental technologies. www.itrcweb.org.

Case Studies

- Sharon Steel Superfund Site: Rashmi Mathur, EPA Region 3
- Calumet Container Superfund Site: Tom Bloom, EPA Region 5

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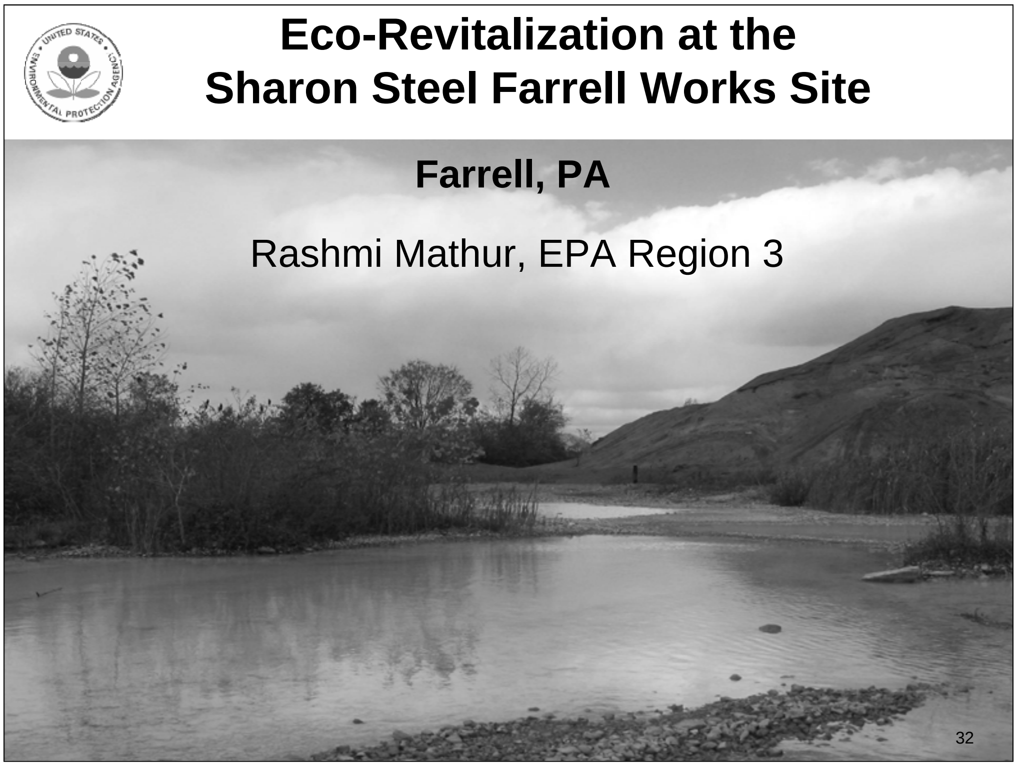
Notes:



Notes:

- Agenda: Superfund Process & Site Status, Background and History, Remedial Investigation, Remedial Investigation Findings, Risk Assessment, Findings, RI Recommendations, Key Remedial Alternatives, EPA's Preferred Cleanup Option, Bench Scale and Pilot Scales, Preliminary Remedial Design for the Cleanup, Questions and Answers
- Site Status – in Remedial Design

Sharon Steel Farrell Works Superfund Site

Notes:

- Remedial Investigation Findings
- Waste slag/sludge: heavy metals, PAHs, pesticides, and PCBs
- Shallow groundwater: metals, PAHs, and volatiles
- Site-related contamination found in Shenango River, wetlands, and animals

Floodplains on Site along side the Shenango River

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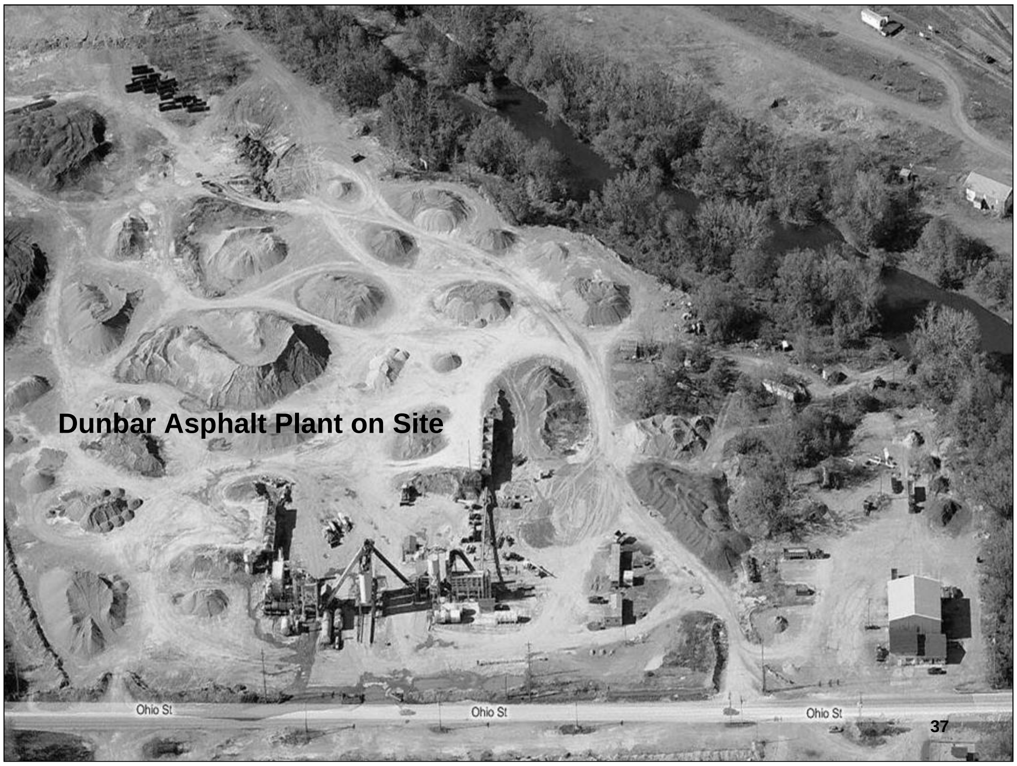
Notes:

- Risk Assessment Findings
- Floodplain and wetland soils:
  - Risks driven by high levels of heavy metals
- Groundwater:
  - No exposure for nearby residents to contaminated groundwater
  - Contamination decreases with depth
  - Shallow aquifers would pose unacceptable health risks if used for drinking purposes due to metals and vinyl chloride
- Off-site Areas:
  - Dust blowing off-site is a potential concern that EPA plans to address

Notes:

Notes:



Notes:

- Risk Assessment Findings
- Waste source (slag/sludge) areas:
- Risks above EPA acceptable levels for future residents, current and future workers and site visitors due to high levels of heavy metals
- ATSDR to assessed that extremely dusty conditions could pose short-term hazards

RI Recommendations

- Minimize dust exposure
- Minimize contaminated slag/sludge exposure

- Eliminate runoff into Shenango River & wetlands
- Reduce contamination into shallow groundwater

- Use of groundwater onsite for non-drinking
- Restore habitat value of barren areas

Notes:

Key Remedial Alternatives

✦ No Action -	$0
✦ Regrading/RCRA-Modified Cap -	$97 Million
✦ Excavation/Treatment/Disposal -	$266 Million
✦ Regrading/Clay/Topsoil Cap -	$55 Million
✦ Regrading & Cement Cap -	$58 Million
✦ Regrading & Biosolid Cap -	$15 Million

Notes:

- BTAG Key Player with the RPM in coming up with a viable cleanup solution.

Why Ecological Revitalization?

- Saving money
- Sharon Steel is a fund-lead site

- Large barren area contaminated w/ metals
- Carbon Sequestration Study - Before & after measurements, reduction in greenhouse gases?

Notes:

- Sharon Steel Site has become a field laboratory in looking at the effects of providing an artificial growing medium of slag, sludge, biosolids, amendments and compost to jumpstart organic material for vegetation to grow.
- Carbon Sequestration Study - Bonus opportunity in measuring how the biosolids and amendments with establishing vegetation is effecting overall carbon footprint.

EPA's Preferred Cleanup Option

Phase 1 Northern Area

- ✦ Stabilize eroded Shenango River banks
- ✦ Plant poplar trees for containment of groundwater
- ✦ Regrade/placement of biosolid cap
- ✦ Create wetlands for storm water control
- ✦ Institutional controls
- ✦ Long-term groundwater monitoring

Phase 2 Southern Area

- ✦ Farrell Slag Operating-2015
- ✦ Biosolid Cover after Mining is Complete

Notes:

- Regrading, contouring, and placement of Biosolid Cap
  - Mix Class A biosolid with native slag material, Reduces the mobility of metals
  - Rapid re-vegetation of barren areas with native grasses and shrubs create open space suitable for small game hunting
  - Once vegetated, minimizes runoff, groundwater infiltration, and dust migration
- Institutional controls
  - IC's-Mining operations, fencing, and groundwater restrictions

Notes:

Sharon Steel Bench Scale Study

- EPA conducted 2006 bench scale study to determine if biosolids:
  - ✓ Reduce mobility of metal contaminants
  - ✓ Reduce bioavailability in the slag/ sludge
  - ✓ Create an adequate growing medium matrix

Notes:

- Tests Conducted from Bench Scale Study:
  - Metal analysis of soil pore water
  - 28 day earthworm toxicity and bioaccumulation test
  - Bench Scale plant bioassays were conducted
- Benchscale Tests to determine Big Picture Questions on Site
- Do biosolids provide enough organic matter to facilitate plant growth?
- Can biosolids amendments result in sustainable revegetation for the Sharon Steel Site?
- When slag or BOF Sludge from the Site are amended with biosolids and contaminants are accumulated by soil invertebrates would an unacceptable risk exist if technology is applied to the Site?
- Does chemical analyses indicate that contaminant mobility is decreased thorough the use of biosolids amendment technology?

Results of the Bench Scale Study

Biosolids:

- ✦ Improved plant nutrition & growth of plants
- ✦ Increased weight of plants by 4 fold
- ✦ Lowest application rate of biosolids that resulted in reduced bioavailability and acceptable plant growth was 10%
- ✦ Earthworms had no adverse results from biosolids

Notes:

- Results of the Bench Scale Study:
  - The soil pore water metal results indicate the biosolid amendment could improve plant mineral nutrition for plants established at the Site
  - At the end of the benchscale plants grown on the slag without biosolids appeared stressed however, plants grown on the biosolids treated slag appeared healthy with vigorous growth
  - The plants grown on the slag with biosolid weighed 4 fold higher than the plants grown on the slag without biosolid
  - The results of seed emergence, plant growth, and biomass production, showed the best treatments for Site revegetation are treatments with a 10% biosolid application. The earthworm toxicity and bioaccumulation tests showed that biosolids at the level used are not toxic to earthworms and did not significantly affect the contaminant bioaccumulation in the earthworms.

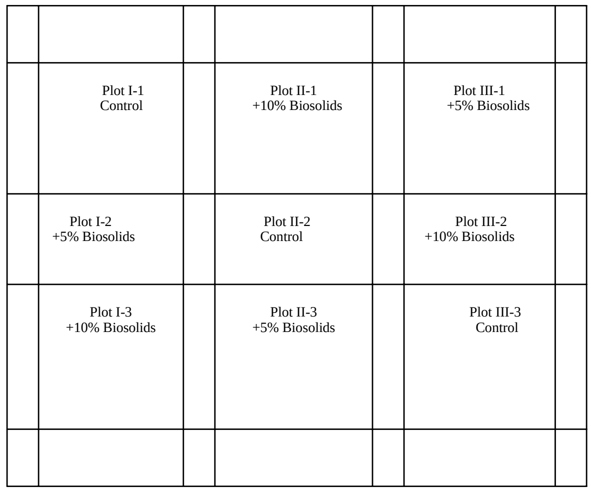
Field Pilot Scale 1

- In 2007 ERT performed a pilot scale to further evaluate the effectiveness of 5% and 10% biosolids in growth of native plants in slag and BOF sludge

Notes:

- Four locations (two locations for slag and two locations for BOF sludge) have been selected from the Sharon Steel Site for the field trial.
- The size of each location is 2597 square feet (53 feet by 49 feet). A randomized block design will be used for each of the four locations
- Application of Biosolid in the Test Plot - The mechanism of mixing the biosolid will be dependent upon the material (slag vs BOF sludge); options include by hand with shovels, roto-tiller, or heavy equipment at hand.
- The amount of biosolids required for each plot will be calculated based on the volume of the top 6 inches soil. After applying the biosolids, the soil in each plot will be prepared again to mix the biosolids with the surface soil.
- Planting Parameters-Planting will be started two to three weeks after the biosolids application. A commercial available seed mixture of native plant species will be used. Because most native plants establish slowly from seed, a fast-growing cover crop, oats (*Avena sativa*), will be used in conjunction with a native seed mix. The cover crop will be seeded at about 10 pounds per acre, along with the native seed mixture.
- It will be necessary to water the plots thoroughly immediately after seeding. Watering may be also needed once a week for the first three weeks following seeding if there is not sufficient precipitation during that period.

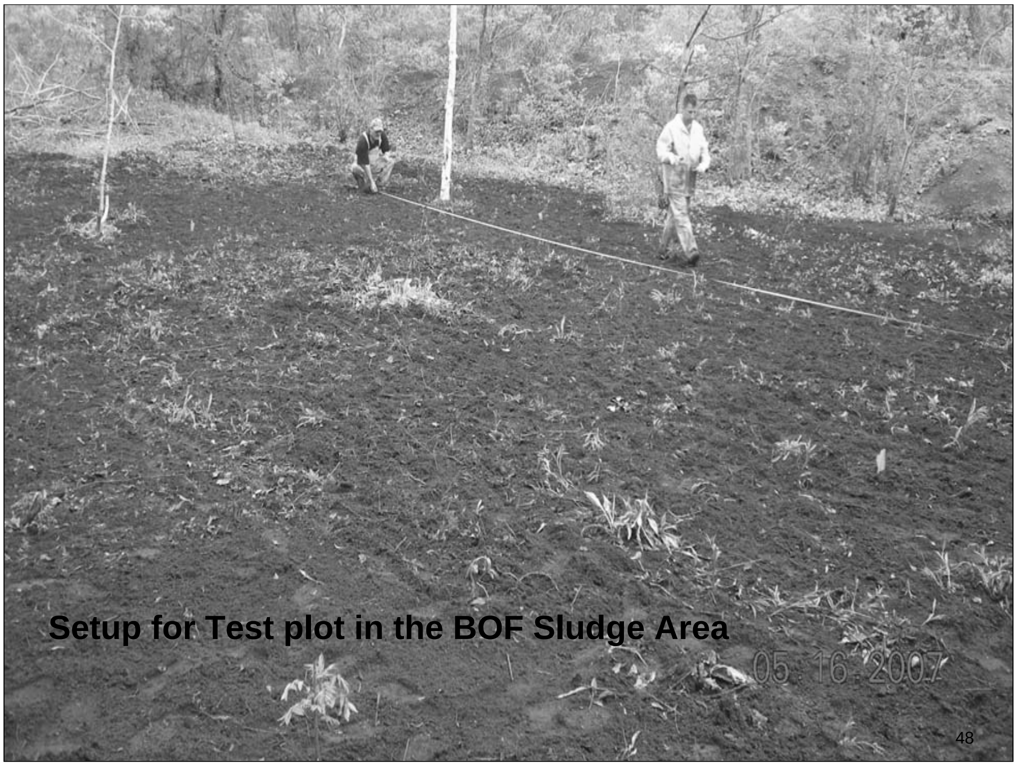
Figure 1. Plot Layout for Each of the Four Locations for 2007 Sharon Steel Pilot-Scale Field Trial



Notes:

- Parameters Measured for Pilot Scale 1:
  - Earthworm Toxicity and Bioaccumulation Test
  - Plant Community Survey
  - Plant Biomass Measurement
  - Soil Sampling and Analysis

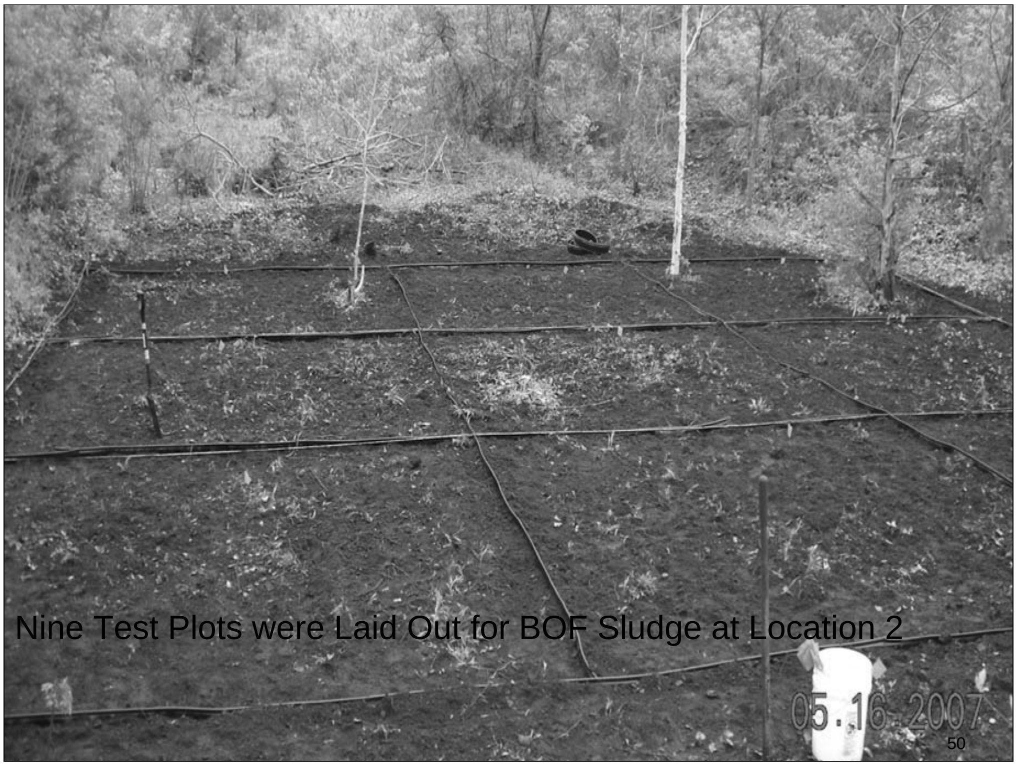
Notes:



Notes:


Install Plastic Sheet into Soil to Divide Test Plots at BOF Sludge Area
49
05 16 2007

Notes:



Nine Test Plots were Laid Out for BOF Sludge at Location 2

50

Notes:

Transport of Biosolids from the Top of the Hill to the Test Plots

Notes:

Notes:


Three Biosolids Levels (0, 5%, 10%) were
Assigned to the Test Plots
05 17 2007

Notes:

Soil Samples were Taken Before Biosolid Application

Notes:

Results of the Pilot Scale 1

- During the pilot scale neither native plant species nor the cover crop of oats was well established in the slag or BOF sludge

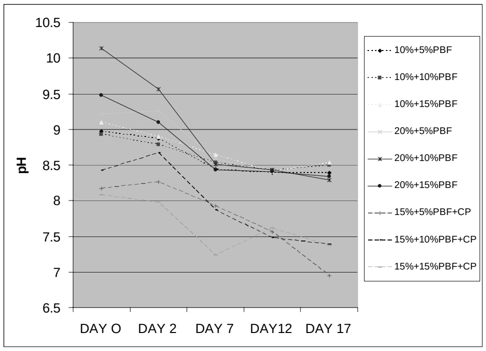
Notes:

Reasoning Behind the Results

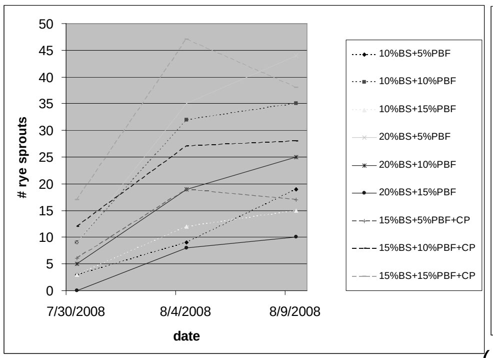
- The inability of the plants to become well established was due to the high pH between 10-12 of the slag materials
- The planting was done late in the growing season
- Very dry year, not enough precipitation

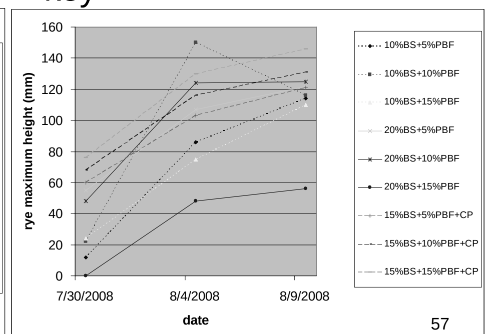
Notes:

Summer 2008 Bench Test Results to Design Pilot Scale 2



Combination of 15% biosolids with compost and pine bark fines appears optimal with compost being key



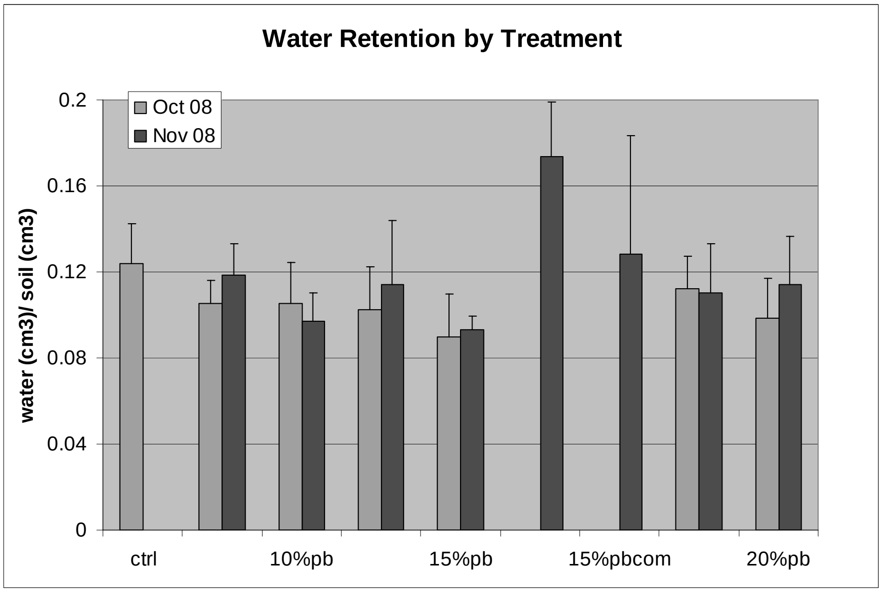


57

(Kathy Patnode, EPA Region 3 BTAG, 2008)

Notes:

- Compost was key for water retention and jumpstarting microbial growth, and compost had to be used in areas close to the River, a state regulation.



(Kathy Patnode, EPA Region 3 BTAG, 2008)

Notes:

Plot Layout for Each of the Thirty Six Locations for 2008 Sharon Steel Pilot-Scale Field Trial 2

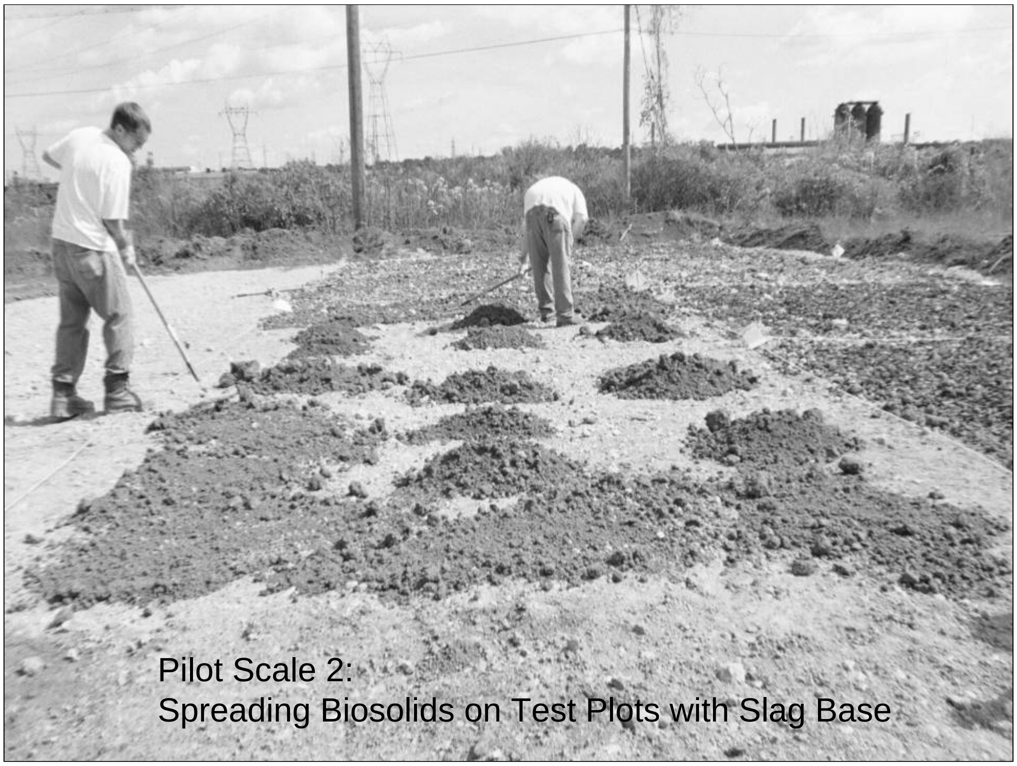
10% biosolid Pine Bark Fall Seeding	10% biosolid Pine Bark Spring Seeding	10% biosolid Fall Seeding	10% biosolid Spring Seeding
Replicate	Replicate	Replicate	Replicate
Replicate	Replicate	Replicate	Replicate

20% biosolid Pine Bark Fall Seeding	20% biosolid Pine Bark Spring Seeding	20% biosolid Fall Seeding	20% biosolid Spring Seeding
Replicate	Replicate	Replicate	Replicate
Replicate	Replicate	Replicate	Replicate

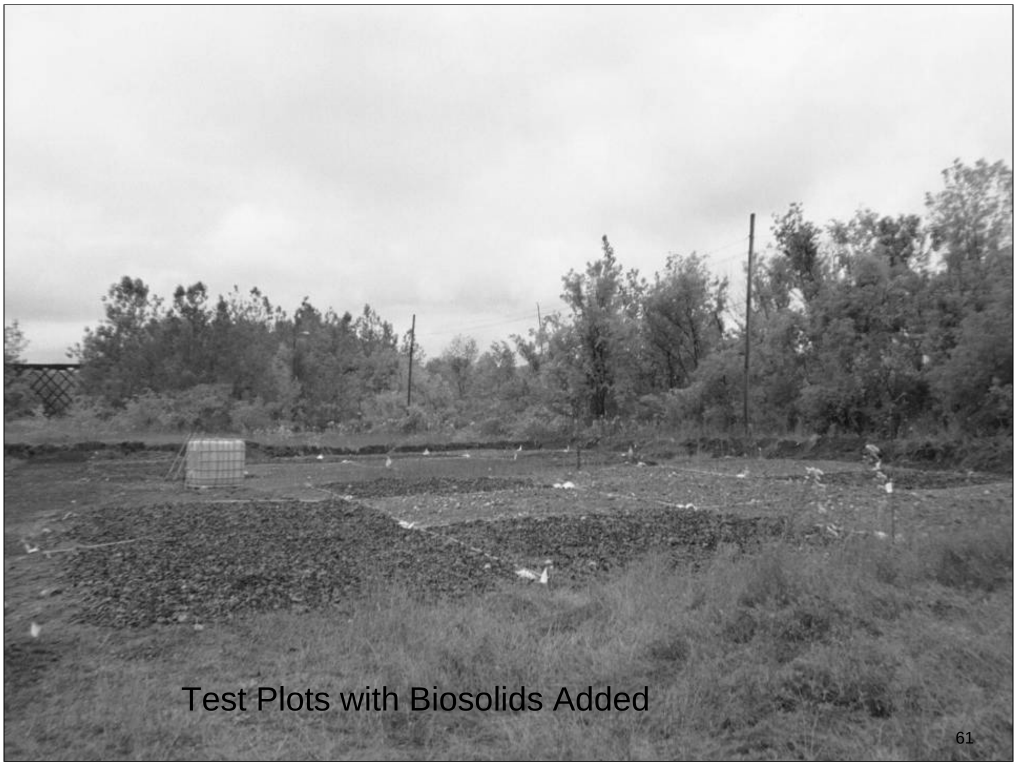
15% biosolid Pine Bark Compost Blanket Fall Seeding	15% biosolid Pine Bark Compost Blanket Spring Seeding	15% biosolid Compost Blanket Fall Seeding	15% biosolid Compost Blanket Spring Seeding
Replicate	Replicate	Replicate	Replicate
Replicate	Replicate	Replicate	Replicate

Notes:

- In May 2008, EPA in consultation with BTAG determined additional data was needed to determine optimal growing conditions for the full scale remedy.
- In reviewing the 2006 Bench Scale Evaluation EPA concluded that a 20% biosolids application would be more favorable in establishing native plants.
- The 20% application rate exhibited a slower emergence rate which more favorable for Site soil conditions.
- The 20% application rate would be likely to increase the moisture holding capacity more than the 10% rate.
- In addition BTAG recommended adding pine bark fines to lower the pH of the soil and adding compost on the top layer to enhance water retention.
- And jumpstart microbial growth.
- Along river compost had to be used, because of state requirement.
- As shown on Figure 2, pilot scale activities will be conducted in the Northern Part of the Site with a total of 36 plots (12 plot types with 3 replicated of each type).
- Each plot will occupy an area of 15 feet by 15 feet and biosolid and seeded with oats in the fall and half of of the plots will be seeded with native grasses in the fall and the other half will be seeded with native grasses in the spring.
- The test plot variables will include: percent biosolids, the season when seeding will occur, whether or not pH amendment will be added, and whether or not a compost layer will be added.


Pilot Scale 2:
Spreading Biosolids on Test Plots with Slag Base

Notes:



Notes:

- Parameters Tested for Pilot Scale 2
- Germination rates of seedlings
- Vegetative cover estimation
- Field pH
- Height and mass of seedlings
- Water holding capacity

Native Grasses Emerging During First Monitoring Event

62

Notes:

Delivery of Compost for Fall Application at Test Plots

63

Notes:

Notes:

- Block 2 - Amendment test plot (plot without compost amendment). Three plots in lower right hand of photo have bark amendment (darker in color; five total visible), lighter colored plots are just biosolid without bark.

Notes:

- First test block. All four amendment options, three apparent (biosolids; biosolids / bark; biosolids / compost - with and without bark)

Future Site Milestones

- June 2009: Pre-design Field Investigation
- September 2009: Completion of Sharon Steel Pilot Study 2
- December 2009: Completion of Remedial Design

Notes:

Carbon Sequestration Study

- EPA Headquarters Office of Solid Waste and Emergency Response is testing a protocol for carbon accounting at the Sharon Steel Site
  - ✓ Sample collection before & after application of carbon-rich soil amendments for remediation
  - ✓ Laboratory analysis and modeling to determine potential terrestrial carbon sequestration

Notes:

- The purpose of this study is 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.

- Parameters Tested for Carbon Sequestration Study on Pilot Scale 2-
  - Soil Carbon and Nitrogen
  - Total carbon
  - Sample pH and Electrical Conductivity
  - Greenhouse Gas Monitoring
  - Soil Bulk Density

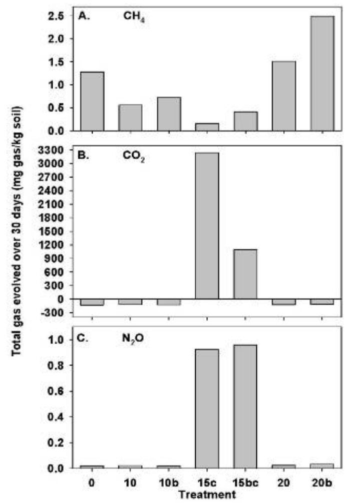
Initial Results from Carbon Sequestration Study

- Despite the coarse nature of the slag material and the very recent applications of most of the treatments, treatment effects are already showing. Once the pH moderates and plants start growing, the effects should become more comparable
- Once the pH stabilizes and plants start growing the effects should be more measurable
- May start tracking soil fertility levels

(E.A. Dayton, S.D. Whitacre, OSU, 2009)

Notes:

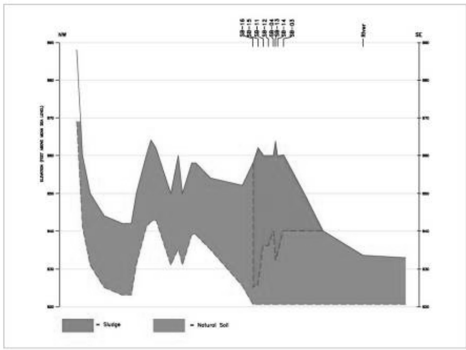
Greenhouse Gasses from Carbon Sequestration Study



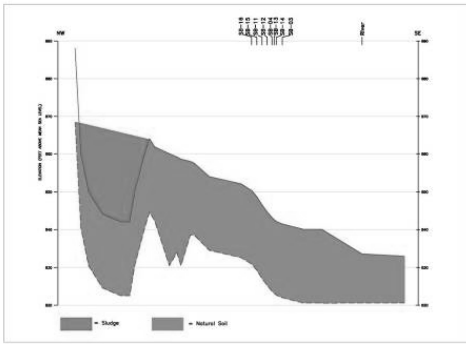
Notes:

Current Cross Section Site Versus Conceptual Cross Section of Cap after Cleanup

Current Cross Section of Site



Cross Section after Cleanup



Native Grasses and Shrubs Create Open Space Suitable for Bird Habitat

Notes:

Factors to Consider for Ecological Revitalization

- Availability and storage of biosolids & finding the right mix of biosolids/compost/amendment
- Can wetlands and vegetation be incorporated as part of the cleanup
- Large barren mining sites and costs of remediation
- Narrow planting season
- Amount of precipitation
- Slopes of areas to be applied with biosolid
- Businesses and operations on site
- Trespassers

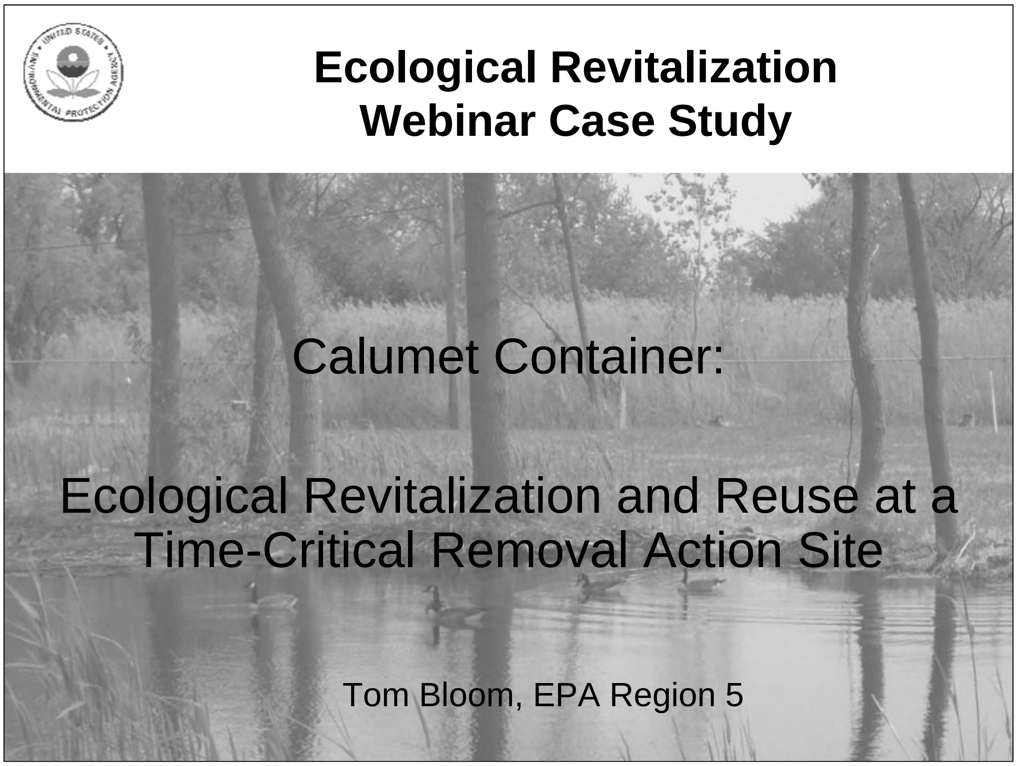
Notes:

- Biosolid availability, what is available near the Site, Sharon Steel was in an industrial area, we found 2 sources of biosolid. Cost of transport of the biosolid is a big factor in determining cost effectiveness. At the Zinc Palmerton Site was in a rural area and they looked at a couple of options for different types of chicken manure, mushroom fertilizer.

For more information

Rashmi Mathur
EPA Region 3
Phone: (215) 814-5234
E-mail: mathur.rashmi@epa.gov

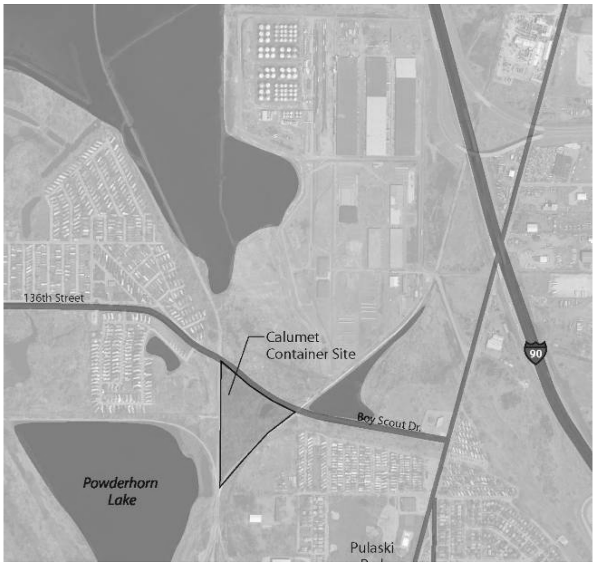
Notes:



Notes:

- The Calumet Container site in Hammond, Lake County, Indiana is one of the two case studies that we are presenting as part of this information session on the eco-revitalization of Superfund sites. The Calumet Container site provides an example of ecological revitalization in the context of a time critical removal action.
- The accelerated and time-sensitive nature of these cleanups creates a challenge, as removal teams often complete their activities before there is an opportunity to consider reuse.
- The cleanup, ecological revitalization, and ecological reuse of the Calumet Container site illustrates that it is not only possible to incorporate ecological revitalization as part of time-critical removal actions, but that reuse planning in this context can lead to enhanced protectiveness and long-term stewardship as well strengthen EPA relationships with communities and site stakeholders.

Site Introduction & Presentation Overview



- Getting Started: Integrating Remedy & Reuse, Enabling Ecological Revitalization
- The Removal Action: Key Moments and Components
- Project Outcomes & Lessons Learned

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Notes:

- Welcome to the Calumet Container site. The site is located in a community context – mixed-use industrial and residential areas – in Hammond, Lake County, Indiana.
- From the 1960s until 1982, drum and pail reconditioning operations at the site caused soil contamination throughout the 11-acre area. Approximately 90 percent of the site lies in Indiana while the remaining 10 percent is located in Illinois. Since 1982, EPA and Indiana's Department of Environmental Management (IDEM) have worked to address on site contamination through a series of removal actions. In September 2005, a time-critical removal action began to address approximately 20,000 cubic yards of contaminated soils.
- Site contaminants: metals – predominantly lead – and organic substances, including di-n-butyl phthalate, methylene chloride, methyl ethyl ketone, bis(2-ethylhexyl) phthalate, toluene, m-xylene and o-xylene.
- Today's presentation will cover the subject areas highlighted on this slide. Before we turn to these subject areas, the next few slides provide a visual introduction to the site prior to its cleanup in 2005.

Site Introduction

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Notes:

- The Calumet Container site is flat, with dry prairie areas and several established tree stands located across the site.

Site Introduction

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Notes:

- Delineated wetlands cover much of the northern portion of the site, including wet prairie areas (*pictured here*).

Site Introduction

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Notes:

- Site wetlands include a National Wetland Inventory pond (palustrine wetland) located on the northeastern portion of the site. Trees around the perimeter were preserved and protected during the site's remediation, and the pond was enlarged.

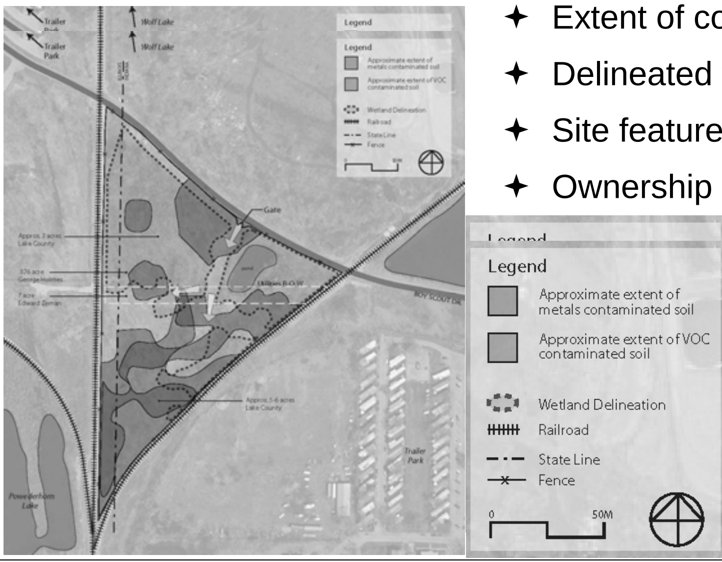
Site Surroundings

78 78

Notes:

- The site is bordered by rail lines to the west and east and by a connector street – Boy Scout Drive – to the north. Trespassing and illegal fly dumping have been issues at the site.

Getting Started: Site Characterization



- Extent of contamination
- Delineated wetlands
- Site features
- Ownership

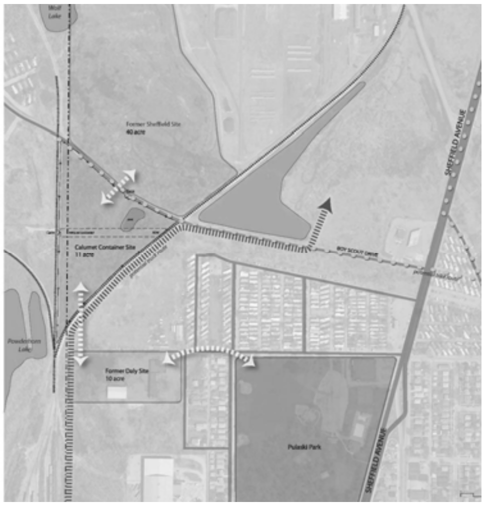
79

79

Notes:

- The site's On-Scene Coordinator (OSC) brought the site to the attention of the Superfund Redevelopment Initiative (SRI) and EPA Region 5 SRI in Summer 2005, at the outset of the removal action process.
- Focused initially on potential mitigation requirements for the site's delineated wetlands, Region 5 SRI quickly recognized that future use considerations could inform removal and restoration activities at the site. Located between two major water bodies, the site had significant potential to support wildlife habitat, and local stakeholders had expressed interest in the site's reuse for habitat and passive recreation.
- Region 5 SRI provided the services of a consultant team (E^2 Inc. and Wildlife Habitat Council) to work with EPA and local stakeholders to develop a reuse framework that would further inform EPA's removal action and wetland restoration plan for the site.
- Step one was the development of a site characterization map. Based on site documents and property parcel information, the map compiled key remedy and reuse information and served as the base map for discussing the cleanup and future use of the site. The map shows the extent of the site's soil contamination (metals and VOCs) and delineated wetlands overlaid with ownership information.

Getting Started: Stakeholder Engagement



- ✦ Stakeholder interviews identified community's interest in recreational uses
- ✦ Targeted research identified local and regional green spaces and trail network initiatives
- ✦ Site identified as key node in open space and habitat network

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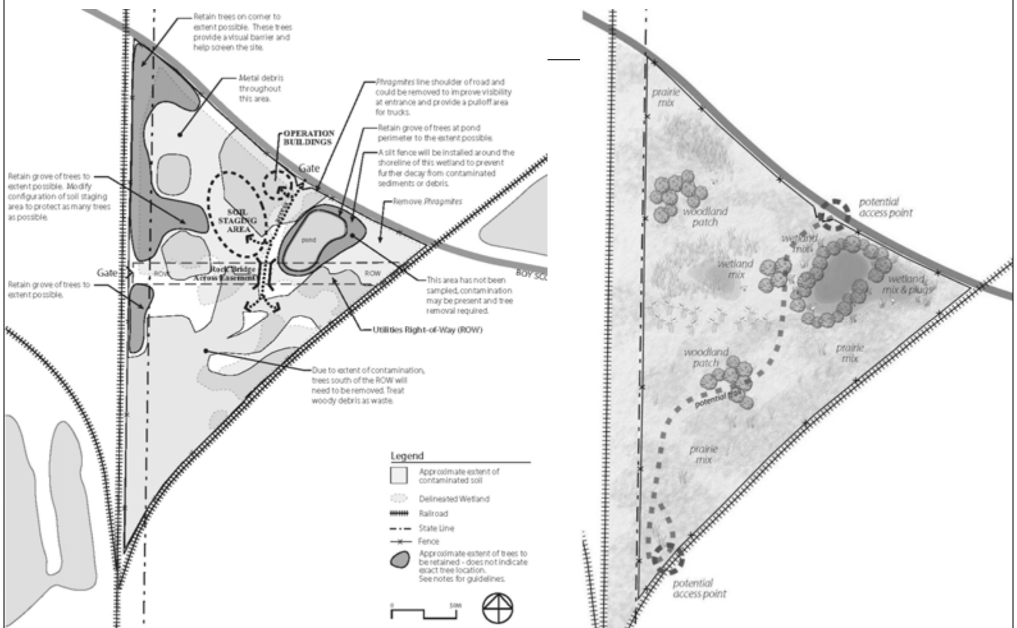
Notes:

- At the same time, the project's consultant team worked with the City of Hammond (a site PRP) and Lake County (the site's owner) to explore potential future land use considerations for the site's remedy.
- Local officials for the City and County reflected the community's interest in returning the site to a passive recreational use. Potential recreational opportunities identified included trails and open space. The site's trails could also connect with other local and regional recreational areas and trail networks.
- This map shows site's connection to other parks, planned green spaces, and bike routes.

Informing the Removal Action: Integrated Mapping



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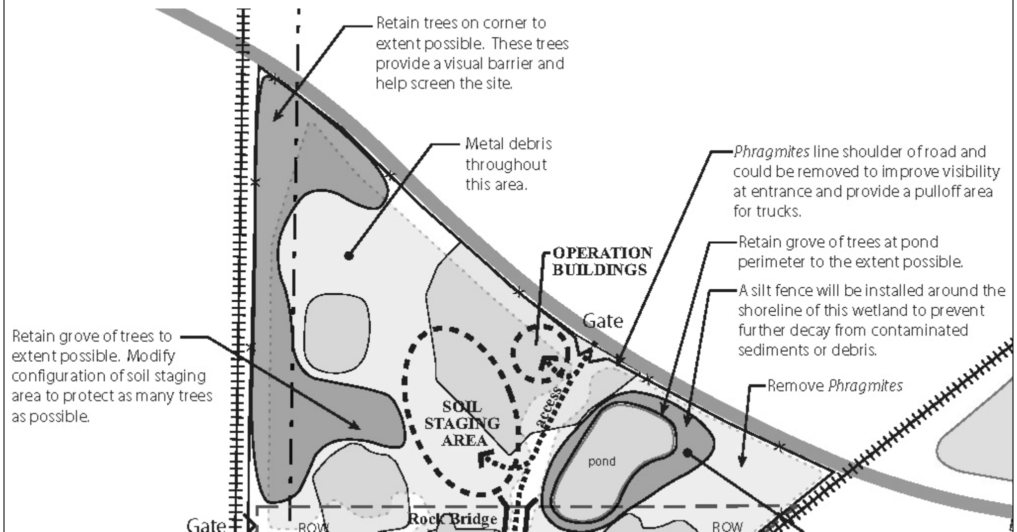
Notes:

- Analysis of the site's base map and findings from the project's stakeholder interviews led to integrated technical maps *(pictured left)* that informed EPA's cleanup plan for the site as well as the site's draft reuse plan *(pictured right).*
- Goals for EPA's ecological revitalization plan included:
  - Wetland mitigation
  - Increased biological diversity
  - Restored diversity of habitats
- Goals for the site's draft reuse plan included:
  - Creation of wildlife habitat, trails and open space at the site
  - Environmental education opportunities
  - Opportunities to connect site trails with local and regional recreational areas and trail networks

Informing the Removal Action: Recommendations



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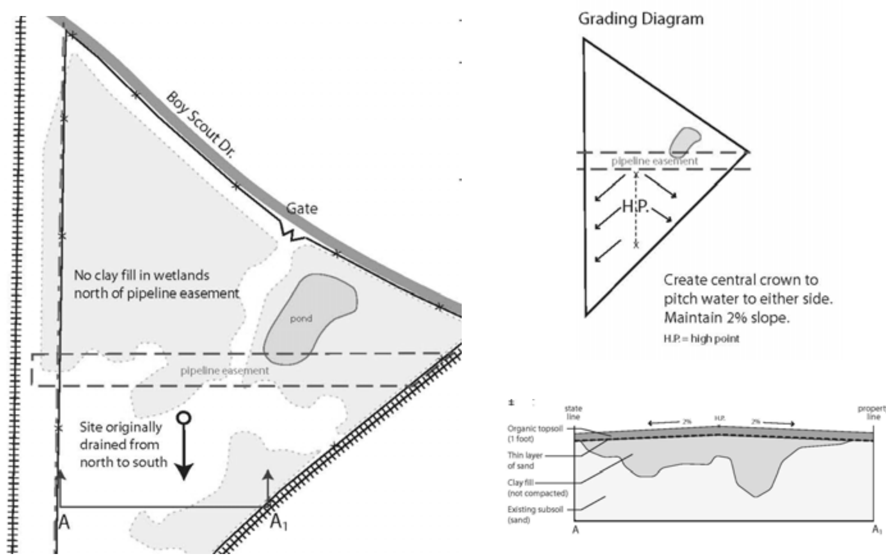
Notes:

- The project's consultant team drafted recommendations to inform the site's removal action, including:
  - Given that the site included significant delineated wetlands, clean up activities could be designed to retain the wetland's features.
  - High-quality habitat areas could be preserved or minimally impacted during the excavation of contaminated soils. While the extent of contamination covered large areas of the site, a few key areas for tree preservation were identified and retained during the removal. These are shown in green on the map.
  - The need to address invasive species (*phragmites australis* and *lythrum salicaria (purple loosestrife*)) and expand the site's pond to ensure the successful establishment and maintenance of the site's restored wetlands.
  - The need for appropriate backfill material and grading. EPA was able to identify a source of replacement fill that would support wetland seed mixes and wetland plugs. Grading was an important consideration to maintain site drainage for wetland features.

Informing the Removal Action: Recommendations



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Notes:

Additional details, as needed, for the fill and grading graphics on this slide:

- No clay fill in wetlands north of site's pipeline easement.
- Backfill excavated pits with clay fill, one foot below grade.
- Add a thin layer of sand on top of clay before adding topsoil. Bury concrete rubble in deepest pits. In order to retain surface and subsurface drainage, avoid heavy compaction of fill area.
- Crown southern portion of the site by creating a small ridge that allows water to sheet flow away from crown.
- Maintain minimum 2% slope to ensure drainage.
- The project's consultant team continued to provide EPA with technical support as needed on excavation and grading from October 2005 through February 2006.

Removal Action: Fall 2005 – Spring 2006

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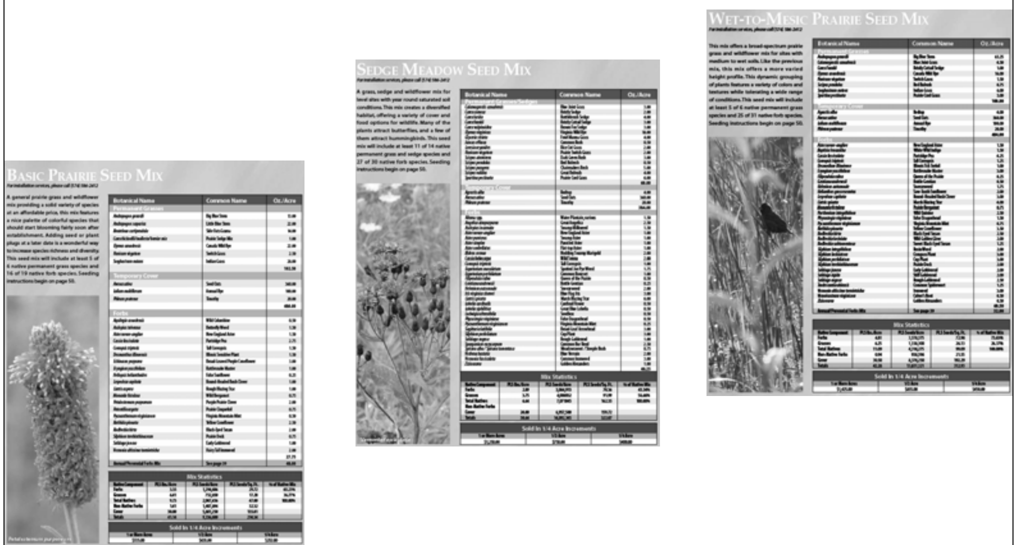
Notes:

- With the removal action underway in Fall 2005 (beginning with tree removal) and the site's wetland mitigation plan in place, EPA and the community's eco-revitalization focus turned to the remainder of the site in early 2006. Significant portions of the site would need to be revegetated following cleanup.
- EPA hosted a stakeholder meeting in February 2006 to provide a site status update and further discuss the community's reuse goals for the site. Community stakeholders indicated that the site's ecological and passive recreational reuse remained a top priority.
- Working with site stakeholders and the project's consultant team, EPA identified that the planting of native plants – prairie grasses – rather than relying on a traditional hydroseeding approach could provide several benefits beyond the site's revegetation.
- While higher-cost in the short run, the prairie planting would:
  - be easier to establish (lower water needs);
  - require less maintenance (infrequent vs. frequent mowing);
  - better resist the infiltration of aggressive exotic species (*phragmites australis* and *lythrum salicaria (purple loosestrife*)) and
  - support two key goals – restored habitat diversity and increased biological diversity – from the site's ecological revitalization plan.
- The prairie planting and wetland mitigation would also enable local schools and community organizations to use the site as an environmental education resource – an outdoor classroom – as well as planning for its reuse as a park and wildlife habitat.

Site Planting & Maintenance Plans: February 2006



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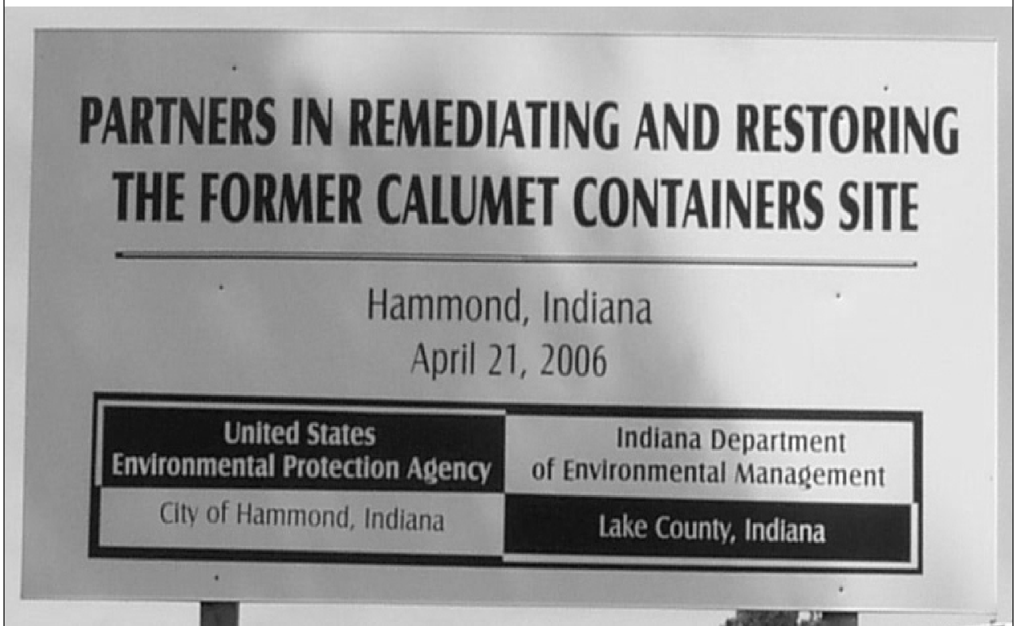
Notes:

- EPA worked with a local contractor (JFNew) to develop a planting plan focused on native plants selected to ensure the site's restoration to a small range of habitats native to northwest Indiana. The seed mix included 7.5 acres of Basic Prairie Mix, 1 acre of Sedge Meadow, and 1 acre of Wet to Mesic Prairie. EPA's reliance on a local contractor helped ensure a rapid selection of appropriate plantings tailored to the physical characteristics of the Calumet Container site.
- Once the planting plan was finalized, EPA's consultant team developed a site maintenance plan. The plan focused on preventing invasive species (*phragmites australis and lythrum salicaria (purple loosestrife*)) from overtaking the site during the early stages of plant development and to keep invasive species to a minimum over the long-term. For most ecological revitalization efforts on contaminated lands, eradication and control of invasive species are essential in order to establish good stands of native species, particularly for the first few years following seeding.

Ecological Revitalization: Spring 2006



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Notes:

- Working with the community, EPA identified that Earth Day (April 21) 2006 could be a well-timed opportunity to recognize the cleanup and ecological restoration of the Calumet Container site. Following the completion of backfilling and grading at the site in March 2006, EPA's contractor (JFNew) planted 1,645 wetland plugs and seeded the remainder of the site with prairie grasses.
- Lake County and the City of Hammond developed a plan for the site's post-closure care, with the City responsible for the maintenance of the site's plantings and fencing.
- As a result, local stakeholders were able to come together with EPA and the Indiana Department of Environmental Management (IDEM) on Earth Day to recognize the cleanup and ecological restoration of the Calumet Container site.

Ecological Revitalization: Summer 2006 - 2009

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Notes:

- Thanks to a mild spring, the site's restored wetlands and prairie plantings were already thriving by early summer, when the Hammond Department of Environmental Management (HDEM) hosted a site tour for a summer school program designed to introduce urban middle school children to local environmental challenges. Today, the site is part of environmental education curriculums in several local schools.
- EPA issued the site's final pollution report in Fall 2006, signing off on the site's cleanup. Since then, the City of Hammond has continued to maintain the site's plantings and fencings. Until last year, the City also removed invasive species from around the site as well. This year, due to budget cuts, maintenance activities surrounding the site have been reduced. EPA is working with the localities to restore these activities.
- Looking to the future, the City of Hammond and Lake County are still planning to establish recreational trails at the site, pending the availability of funding.

Ecological Revitalization Lessons Learned

1. Ecological revitalization and time-critical removal actions can be compatible
2. Straightforward options: revegetate with native plants to restore site ecology
3. Think locally and regionally
4. Short-term costs can provide long-term cost savings
5. No need to go it alone!
6. Looking long-term: site maintenance plan and post-closure care planning

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Notes:

1. Ecological revitalization strategies can be incorporated as part of fast-moving site cleanups. Key ingredients for success include flexibility to incorporate new and changing information, thinking ahead to identify linked remedy-reuse opportunities, and working with local stakeholders to incorporate local expertise.

2. Ecological revitalization can be a straightforward process, with site managers engaging with appropriate technical expertise during a site's cleanup.

3. EPA's reliance on a local contractor helped ensure a rapid selection of appropriate plantings tailored to the physical characteristics of the Calumet Container site. In order to develop an effective ecological revitalization strategy for the site, it was vital to look at the site's regional surroundings, to understand local habitats and water systems, as well as recognize the existence of aggressive exotic species in the area.

4. While the site's prairie planting mix was a higher up-front cost option than traditional hydroseeding, the planting's maintenance requirements resulted in cost savings over the longer-term.

5. Ecological land uses attract interest and support from a diverse range of organizations, including neighborhood associations, environmental groups, local universities, governments, state agencies, site owners, responsible parties, and others. Identify opportunities to leverage the knowledge, resources, and long-term interests of these organizations.

6. Successful ecological revitalization relies not just on site cleanup and restoration, but on having a long-term plan in place to make sure that the site's resources are well-managed and maintained into the future.

Additional Lessons Learned

Considering future use at the site helped:

- Clarify site ownership
- Identify community's interest in future use of site
- Integrate future use considerations into cleanup
- Raise community awareness
- Help address site stigma issues
- Address long term protectiveness
- Establish site maintenance plan and responsibilities for post closure care



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Notes:

- The clarification of site ownership streamlined parts of the removal action for EPA. EPA was able to work with a single land owner, Lake County, after one individual land owner transferred ownership of a site parcel to the locality, and another land owner subdivided their land and transferred ownership of the subdivided area to the locality. EPA was then able to work with the locality as the single site owner to ensure the site's long-term stewardship.

Speaker note:

- Final slide, conclude by asking the audience if they have any questions, or if they have similar experiences that they would like to share.

For more information

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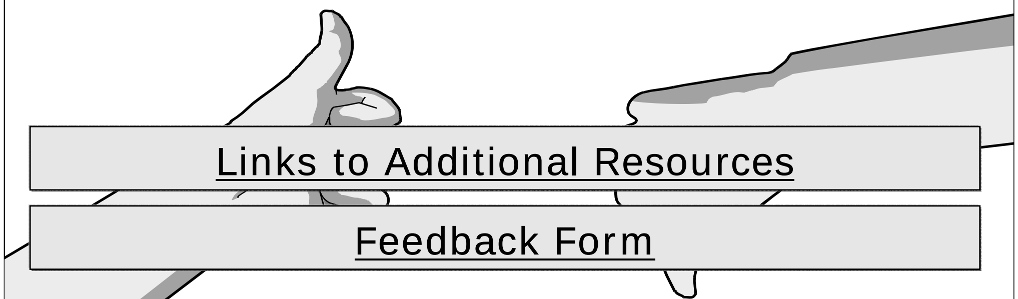
Notes:

Thank You

After viewing the links to additional resources, please complete our online feedback form.



Links to Additional Resources

Feedback Form

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Notes: