About the cover page: Ecological Revitalization in Action

Descriptions are in a clock-wise direction, starting with top right.

1. **Former RCRA Corrective Action facility, restored to a wetland**: Ecological revitalization at the AMAX Metals Recovery Inc. (now Freeport McMoRan) in Braithwaite, Louisiana, where a water retention pond was dewatered to form a wetland that provided a home to alligators relocated due to Hurricane Katrina in 2005.

Office of Solid Waste
and Emergency Response

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http://clu-in.org

Ecological Revitalization: Turning Contaminated Properties Into Community Assets

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Notice and Disclaimer

The U.S. Environmental Protection Agency (EPA) funded preparation of this document under Contract No. EP-W-07-078. It was prepared by EPA's Office of Solid Waste and Emergency Response (OSWER) cleanup programs, including the Office of Superfund Remediation and Technology Innovation (OSRTI), Office of Resource Conservation and Recovery (ORCR) (formerly known as Office of Solid Waste), Federal Facilities Restoration and Reuse Office (FFRRO), Office of Brownfields and Land Revitalization (OBLR), and Office of Underground Storage Tanks (OUST).

This document has undergone EPA and external review by subject matter experts. All web links provided in this document were accurate and valid at the time of publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use. If you have questions about this document, please contact Ms. Michele Mahoney, EPA, by phone at 703-603-9057 or via e-mail at mahoney.michele@epa.gov.

To view or download a portable document format (PDF) version of (EPA 542-R-08-003), visit the Hazardous Waste Clean-up Information (CLU-IN) system Web site at www.clu-in.org/download/issues/ecotools/Ecological_Revitalization_Turning_Contaminated_Properties_into_Community_Assets.pdf. A limited number of printed copies are available free of charge and may be ordered via the Web site, by mail, or by fax from:

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EPA Office of Solid Waste and Emergency Response Organizational Chart

(As of January 2009)

Federal Facilities Restoration and Reuse Office

Innovation Partnership and

Note: Highlighted EPA offices contributed to the development of this document.

For properties where waste is left in place, this document provides solutions and considerations for

1.0 Introduction

Revitalizing properties for ecological purposes helps to achieve U.S. Environmental Protection Agency

Ecological Revitalization Benefits a Variety of Stakeholders

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

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.

An ecological reuse may increase tourism, tax revenues, property values, and quality of life for residents.

Increasing habitat and passive recreational activities can improve the character of the neighborhood, employment opportunities, and area air and water quality.

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

Table 1-1. Cross-Program Revitalization Measures Tracked by Each EPA Cleanup Program

Performance Measures and Indicators	EPA Cleanup Program				
	OSRTI	ORCR	FFRRO	OBLR	OUST
Universe Indicator: The number of contaminated, potentially contaminated, or previously contaminated properties and surface acres for which OSWER's cleanup programs have an oversight role for assessment or response action.	a	b	a	c	d
Protective for People (PFP) measure: The number of acres at which there is no complete pathway for human exposures to unacceptable levels of contamination based on current property conditions.	a	b	a	c	d
Ready for Anticipated Use (RAU) measure: The number of acres at a property that meets the criteria for the PFP measure, as well as (1) all cleanup goals have been achieved for current and reasonably expected land uses and (2) all institutional or other controls have been put in place.	a	b	a	c	d
Status of Use Indicator: How the acres at a property subject to the Universe Indicator are being used at the point in time when the determination is made.	a	**	a	--	--
Type of Use Indicator: For programs, regions, states, local governments, or tribes that are looking for measures they could use to help describe in more detail how contaminated or in T*ir j7(curis7(oc 4.0hey Td[(acres for wh)7(ich)7(OS64tor are bei)6d uses sun t)]TJ)]					

(2) public health and access if the cleanup property is converted to habitat; (3) how ecological revitalization, which can be slower than other reuse alternatives, will impact surrounding areas, and (4) transfer of land and long-term stewardship. Therefore, while ecological revitalization can be considered at all contaminated properties, it may not be appropriate for all properties. There are a variety of considerations needed to ensure protectiveness (further discussed in Section 2), including conducting an ecological risk assessment (ERA), avoiding attractive nuisances (see definition on page 3-2), and bioaccumulation issues. For example, at the Bunker Hill Superfund Site in Idaho (shown in **Figure 1-2**), attractive nuisance issues were taken into account while ecological revitalization was being considered as an option. For additional information on bioaccumulation and EPA's persistent, bioaccumulative, and

Ecological Revitalization Cleanup Standards

Empire Canyon, Daly West Mine Site, Summit County, Utah

A resort development company has proposed the construction of a hotel, spa, and condominium project at the Daly West Mine Site, to be known as the Montage Resort & Spa. The development will contribute to the cleanup of contamination at this former mining site in Park City, Utah. The developer agreed to participate in EPA's Environmentally Responsible Redevelopment and Reuse (ER3) Initiative for contaminated properties. As an ER3 participant, the Montage Resort & Spa will incorporate extensive "green" features into the design, construction, and operation of the development, including several ecological revitalization components. For example, the project involves treatment of ground water collected by foundation drains using a constructed wetland; a native vegetation management plan to improve ecosystem health and reduce the risk of wildfires around the site; and a conservation easement for 2,800 acres of open space to offset additional density from the project. By incorporating sustainable practices and principles into the project, the developer has minimized the impact of the project on the environment without sacrificing profitability.

EPA's GreenScapes Program identifies cost-efficient and environmentally friendly solutions for landscaping. Designed to help preserve natural resources and prevent waste and pollution, GreenScapes encourages companies, government agencies, other entities, and homeowners to make more holistic decisions regarding waste generation and disposal and the associated impacts on land, water, air, and energy use. Visit www.epa.gov/greenscapes for additional information on the GreenScapes Program.

EPA's OSRTI carries out the Superfund Program, which addresses contamination from uncontrolled releases at hazardous waste sites that threaten human health and the environment. EPA manages the Superfund Program under the authority of the CERCLA, 1980, as amended. Under the Superfund Program, abandoned, accidentally released, or illegally dumped hazardous wastes that pose a current or future threat to human health or the environment are cleaned up. To accomplish its mission, EPA works closely with communities, potentially responsible parties, and other federal, state, local, and tribal agencies. Together with these groups, EPA identifies hazardous waste sites, investigates the conditions of the sites, formulates cleanup plans, and cleans up sites to ensure that they are protective of human health and the environment.

Superfund cleanups include both long-term and short-term response actions. Long-term cleanups or remedial actions are conducted on sites that, following an evaluation, are listed on the National Priorities

asked questions related to ecological revitalization, re-vegetating landfills and waste containment areas, and attractive nuisance issues are available online at www.clu-in.org/pub1.cfm (EPA 2006c, d; EPA 2007c). The Green Remediation Web site (www.clu-in.org/greenremediation) provides various resources for cleanup project managers interested in incorporating green remediation strategies into cleanup actions. Resources include information on the use of BMPs; contracting and administrative toolkits; decision-making tools; links to initiatives involving green remediation applications; technical resources; and site-specific case studies. Technical assistance is also available for cleanup project managers in answering general inquiries about green remediation and for Superfund RPMs to build site-specific green remediation strategies. A useful resource available through this Web site is a technology primer on Green Remediation (EPA 2008j) that outlines the principles of green remediation and describes opportunities to reduce the carbon footprint of cleanup activities throughout the life of a project.

BTF(eA-2(oG), addition, groups such as regional Biological Technical Assistance

FFRRO and Interagency Coordination

A Wildlife Refuge at the Rocky Mountain Arsenal in Commerce City, Colorado

EPA is partnering with the Army, Shell Oil, and the Colorado Department of Public Health and Environment to transform the Rocky Mountain Arsenal

BP Former Refinery, Casper, Wyoming

Under a RCRA Corrective Action Consent Decree, BP and the Wyoming Department of Environmental Quality (DEQ) cleaned up this 4,000-acre former refinery located along the banks of the North Platte River and incorporat

The Brownfields Program also provides Training, Research, and Technical Assistance Grants to fund projects that explore innovative ideas in the areas of protection of human health and the environment, sustainable development, and equitable development. Each assistance project will receive between

Pocket Park at a Former Service Station, Chicago, Illinois

A former service station in Chicago was transformed into a small pocket park using native plantings. This pocket park initiative is a joint effort by BP, the City of Chicago, and the local community. The contaminants of concern at the site were benzene, toluene, xylenes, and ethylbenzene (BTEX) at levels above maximum contaminant levels (MCLs) but not at levels that would pose a risk to the surrounding community. Once the site received "no further remediation" letters and was considered cleaned up, the team planted native species to create pockets of habitat for wildlife, expand greenspace for the community, and reduce stormwater runoff by reducing paved surfaces. See Appendix A for more detailed information about this example; this document's covto usingob017-1(m)the lo7(u)TJ-a4s0.2t(exa)7tiintm p
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OUST collaborated across all levels of government and with private industry to develop a Petroleum Brownfields Action Plan that improves stakeholder communications; expands technical assistance to states, tribes, and local governments; explores potential policy changes; and builds upon existing successes by expanding partnerships and testing new and innovative approaches to petroleum brownfields revitalization (EPA 2008d). The Action Plan provides a comprehensive framework for enhancing revitalization efforts at petroleum brownfields and promoting information sharing from both public and private sector efforts to revitalize petroleum brownfields. Four initiatives outlined in the Action Plan cover broad areas and can further EPA's collective efforts to highlight all applicable reuse options. Tasks within three of those initiatives are applicable to ecological revitalization and include the following:

- **Action Item 1.3** provides a basis for developing a "petroleum reuse/options catalogue" that could help compile and update information on reuse options and associated partnerships, as well as provide insights for interested parties to consider when addressing comparable sites.
- **Action Item 2.3** provides a framework to help eligible entities develop voluntary inventories of petroleum brownfields that complement local end use planning efforts.
- **Action Item 4.2** promotes the use of greenspace or wildlife habitat through collaboration with wildlife habitat organizations and property owners (of abandoned oil fields or urban petroleum brownfields) to support converting these properties to wildlife habitats.

OUST does not currently track the indicators listed in **Table 1-1** related to the status and type of end use. However, OUST is committed to tracking the mandatory measures and has developed the OUST Cross-Program Measures commitment memorandum (EPA 2007e). Petroleum brownfields sites are difficult to track and coordinate because of their small size, scattered distribution, variable ownership, and associated uncertainties in cleanup costs and liability. Continued coordination with organizations, such as the WHC, could help to provide a consistent means of tracking site reuse. Revitalizing petroleum sites also remains a local endeavor, and by enhancing public-private coordination, OUST intends to promote the appropriate use of petroleum brownfields sites to help meet community, end user, and stakeholder needs. Ultimately, though, local organizations drive the end use of each site.

Tools and Resources. OUST provides a variety of information resources about its programs, policies, and partners. The following Web sites provide access and information about its resources:

Visit www.epa.gov/swerust1/pubs/index.htm for publications that support the investigation and cleanup of leaking USTs.

Visit www.epa.gov/swerust1/rags/ustfield.htm to learn more about the USTFields Initiative and to access case studies on the pilot projects for examples and lessons learned associated with the reuse of former UST properties.

More information about the issues and opportunities associated with petroleum or UST brownfields cleanups is also available at www.nemw.org/petroleum%20issue%20opportunity%20brief.pdf (Northeast-Midwest Institute 2007; EPA 2008e).

3.0 Technical Considerations for Ecological Revitalization

There are several technical considerations for implementing ecological revitalization while cleaning up a property that are common to each of the cleanup programs discussed in Section 2.0. The objectives of ecological revitalization and those of the cleanup process are best accomplished if they are coordinated carefully. This section summarizes technical considerations for common cleanup and revitalization technologies that stakeholders can use during planning and design with the intent to minimize ecological damage during cleanups. Specifically:

- Section 3.1 presents factors to consider when selecting cleanup technologies for ecological revitalization.
- Section 3.2 addresses issues that may occur when waste is left in place at a cleanup property, how they could affect ecological revitalization, and potential approaches to mitigate these issues.
- Section 3.3 identifies ways to minimize ecological disruptions during cleanups.

When designing and implementing any cleanup action at a contaminated property, it is necessary to consider certain factors related to natural resources or ecological revitalization (see text box below). Numerous cleanup technologies can be used to ensure that contaminated properties are managed in a manner that protects human health and the environment; complies with federal, state, and local cleanup requirements; and allows for safe ecological

When designing and implementing a cleanup action, it is important to consider the following:

- Physical and biological condition of the property and its location in relation to local and regional plant and animal species
- Regulatory requirements governing cleanup and protection or creation of ecologically significant areas
- Temporary and long-term ecological impacts
- Types of habitats that are to be protected, restored, or created at the property

Colorado, the remediation team applied lime and municipal biosolids to reduce the acidity of mine tailings and to reduce the bioavailability of heavy metals at the site (see **Figure 3-1**). For additional information on soil amendments, see the following document: www.clu-in.org/download/remed/epa-542-r-07-013.pdf.

- **Regulatory requirements**: Federal and state regulations may apply to organic amendments such

Rocky Mountain Arsenal, Colorado

At the Rocky Mountain Arsenal, project managers recognized that cleanup-related traffic and road building could have major effects on the existing habitat at the 27-square-mile property. To facilitate reuse of the property as a wildlife refuge, they de

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

Issue	Property Btr.922 Ope

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

Issue	Property Type[2]	Potential Impact	Solution/Consideration
Surface Water Management: Includes a variety of activities that protect the natural functions and beneficial uses of surface waters	Landfill Mining Site Brownfield Military Installation Foundry Gas Station Metal Plating Facility Refinery Tannery	• Affects nearby vegetation, streams, lakes, and wildlife migration routes through erosion or sedimentation • Runoff controls and water diversions implemented as part of a cleanup influence water tables and the rate of flow into streams or wetlands • Erodes the top layer of a cover system • Percolates into a cap	• Design protective caps to prevent precipitation from infiltrating into the subsurface and grade the cap to establish an effective slope (usually 3-5 percent) • Route runoff through settling basins to collect sediment to reduce impacts to property hydrology and construct runoff controls to reduce the volume and rate of runoff to low-lying areas, wetlands, or streams • Use rerouted runoff to create new wetland habitat or enhance existing habitat to provide natural controls and reduce contaminant transport • Build drainage channels and swales and design diversions where possible to minimize changes to natural drainage patterns or the quantity of surface water flows to wetlands or streams • For additional information, refer to EPA's fact sheet titled "Controlling the Impacts of Remediation Activities in or Around Wetlands" (EPA 1993)
Timing: The time at which ecological revitalization is considered during the remedial planning process	Landfill Mining Site Brownfield Military Installation Foundry Gas Station Metal Plating Facility Refinery Tannery	• The longer planning is delayed, the greater the possibility that fewer reuse options will be available	• Begin revitalization planning as early as possible • Begin developing a revitalization project on parts of a property before a cleanup is completed, if possible • Consider advice from a restoration ecologist to determine the proper season to plant grasses, shrubs, and trees • Consider breeding seasons and other timing issues to avoid affecting sensitive species when scheduling remedial or revitalization activities
Utilities: Can include sanitary sewers, water, telecommunications, natural gas, and electricity	Brownfield Landfill Manufacturing Facility Military Installation Foundry Gas Station Metal Plating Facility Refinery Tannery	• Act as a conduit for gas migration • Facilitate water infiltration into a waste containment area • Require excavation into a waste containment area and contaminated material if utility repairs are necessary • Increase the quantity of leachate generated if sewer lines below a waste containment area begin to leak • Can be damaged by settlement	• Include special provisions to ensure utilities do not hinder the effectiveness of the cleanup or ecosystem functions; for example, avoid burying a utility line in a protective cap or placing it in an area where trees will be planted • For additional information, refer to the following EPA report: "Reusing

Importance of Stream Corridors

Healthy stream corridors can provide important habitat for fish populations; erosion and sedimentation control; high-quality water for wildlife, livestock, flora, and human consumption; opportunities for recreationists to fish, camp, picnic, and enjoy other outdoor activities; and support for diverse plant and wildlife species.

Tidal Channels

Stream channel restoration can include tidal channels. After removing contaminated sediment at the Atlas Tack site in Fairhaven, Massachusetts, site managers used coconut coir fiber logs to stabilize the salt marsh tidal channels. S/TT0uPstbbporadd d bemaettson7(a)-2(b)ris-0.018s hie178 Tc -0.0029Tw T*[TD[(divers)6(e (rrudy.f-0.0.914 0.647

control features at the cleanup property), and interim surface stabilization methods such as mulching or matting. Cleanup project managers may need to reseed the area within the planting season to replace damaged vegetation or to achieve the desired plant density. For additional information on seed mixtures and plant selection, visit EPA's GreenAcres Web site (www.epa.gov/greenacres), the Plant Conservation Alliance (PCA) Web site (www.nps.gov/plants

7.0 Long-Term Stewardship Considerations

Cleanups are risk-based and, when waste is left in place, long-term stewardship is necessary to ensure protectiveness of the remedy; therefore, long-term stewardship responsibilities are an integral part of the cleanup process. O&M activities through responsible stewardship protect the integrity of the cleanup and the functioning of the associated ecosystems after cleanup completion. For example, at the Woodlawn Landfill Superfund Site, WHC and Bridgestone Americas Holding, Inc. conducted ecological revitalization activities at the site to create wildlife habitat. Local volunteers manage the site. In addition, Chicago's pocket park project highlighted earlier in Section 2 incorporated (1) ICs and (2) community involvement in site planning and maintenance, which reduced costs and helped ensure the success of ecological revitalization. See Appendix A for case studies regarding these sites.

There are four 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 ICs

Long-Term Stewardship. EPA's co-regulatory partners, including states, local governments, and tribes, have increasing responsibility and oversight for property assessment and cleanup planning. This property knowledge is particularly important for long-term stewardship as state voluntary cleanup programs and property owners typically have primary responsibility for carrying out maintenance of engineering controls and ICs for the long-term. Therefore, it is essential to prepare for safeguarding the effectiveness of the ecological revitalization activities as early in the cleanup planning process as possible. Regardless of who is responsible for O&M, stakeholders can make agreements to have general maintenance tasks as well as those specific to ecological revitalization implemented by property owners, a local government agency, Trustees, or the community. It may be practical to have the same organization undertake general O&M activities as well as those relating specifically to the ecosystem. For example, at the Silver Bow Creek/Warm Springs Ponds Superfund Site in Montana, the Montana Department of Fish, Wildlife, and Parks, a Trustee, conducts many general and specific monitoring and maintenance tasks (see case study in Appendix A).

Stakeholder Collaboration at a Former Refinery in Casper, Wyoming

Stakeholders are successfully achieving cleanup of a BP former refinery in Casper, Wyoming through a collaborative process. The group redeveloped the former refinery into a business park and golf course where the wetland treatment system also functions as a golf course water hazard. To reach agreement on the cleanup, BP worked closely with stakeholders, including the local Audubon Society and the community. The Audubon Society used its local expertise to help determine an appropriate shoreline elevation to maintain the wetlands and mud flats. See Appendix A for a case study regarding this site.

8.0 R

Calumet Ecotoxicology Roundtable Technical Team. 2007. Calumet Area Ecotoxicology Protocol, Protecting Calumet's Plants and Animals. June.

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
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, i9 T2 s				

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Materials Technology Laboratory, Watertown, MA	Superfund Arsenal	Remediation included removal and off-site disposal of contamination sources related to weapons and ammunition manufacture and storage, and demolition and cleanup of the nuclear reactor, including radiological contamination, PAHs, PCBs, and pesticides.	Wetlands restoration was completed adjacent to the redeveloped area. Fifty-five acres of the property have been used to build the Arsenal Mall, Harvard Community Health Center, Arsenal Apartments, a public park with walking and bike trails, and a playground.	Not specified	Not specified	Christine Williams, RPM EPA Region 1 1 Congress Street Suite 1100 Mail Code: HBT Boston, MA 02114-2023 617-918-1384 williams.christine@epa.gov	http://yosemite.epa.gov/r1/npl_pad.nsf/701b6886f189ceae85256bd20014e93d/d98829ad20e19d6f852568ff005adb08!OpenDocument
Pease Air Force Base, Portsmouth, NH	Superfund Air Force Base	Soils and ground water were contaminated with solvents and fuel.	A wildlife refuge was created in addition to a public airport.	Not specified	Not specified	Mike Daly, RPM EPA Region 1 1 Congress Street Suite 1100 Mail Code: HBT Boston, MA 02114-2023 617-918-1386 daly.mike@epa.gov	http://yosemite.epa.gov/r1/npl_pad.nsf/f52fa5c31fa8f5c885256adc0050b631/9E95FBAD0CEC73E0852568FF005ADB09?OpenDocument
Saco Municipal Landfill, Saco, ME	Superfund Landfill	Soil and ground water contaminated from landfill activities were remediated.	A portion of the site adjacent to the redeveloped area was reserved for a wetland. The site is ready for reuse and the City of Saco plans to develop a community recreation area for hiking, biking, ice skating, and soccer.	Not specified	Not specified	Ed Hathaway, RPM EPA Region 1 1 Congress Street Suite 1100 Boston, MA 02114-2023 617-918-1372 hathaway.ed@epa.gov	http://cfpub.epa.gov/supercpad/cursites/csitinfo.cfm?id=0101010
Tibbetts Road Site, Barrington, NH	Superfund Rural/Farmland	Site soils and ground water were contaminated by chlorinated and non-chlorinated solvents. Remediation included source removal, . playground.Not spdtand 61					

Appendix A: Ecological Revitalization Case Studies, continued

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

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Craig Farm Drum, Parker, PA	Superfund Landfill	Ground water and soil were contaminated with resorcinol and VOCs, such as benzene and toluene. Site remediation consisted of excavating and stabilizing contaminated soils onsite from two former waste disposal pits.	Wetlands were built on site to replace a smaller area of wetlands lost during construction of the on-site landfill.	Not specified	Not specified	John Epps EPA Region 3 1650 Arch Street Mail Code: 3HS33 Philadelphia, PA 19103-2029 215-814-3144 epps.john@epa.gov	http://www.epa.gov/reg3hscd/super/sites/PAD980508527/
DeSale Restoration, Butler County, PA	Pennsylvania Department of Environmental Protection Mining Site	A passive treatment system was used to capture and treat acid mine drainage and included an anoxic collection system, vertical flow ponds, a settling pond and wetland complex, and horizontal flow limestone bed.	In addition to creating a treatment wetland complex, 11 miles of streams that were once devoid of life because of acid mine drainage are now teeming with fish.	Not specified	Not specified	Scott Roberts Pennsylvania Deparament of Environmental Protection Office of Mineral Resources P.O. Box 2063 Harrisburg, PA 17105-2063 717-783-5338 jayroberts@state.pa.us	http://www.srwc.org/projects/desale.php
E.I. DuPont Nemours & Co., Inc. (Newport Pigment Plant Landfill), Newport, DE	Superfund Landfill	Soils, sediments, ground water, and surface water were contaminated with various metals. Contaminated sediments were excavated, the two landfills were capped, and soil at the ballpark was removed.	The cleanup is protecting Delaware's natural resources and wildlife habitat. Over 35 acres of wetlands and wildlife habitat have been restored as part of the site's overall cleanup.	Ground water appeared to be seeping over the sheet pile wall in several areas of the north landfill. This created a concern regarding possible vapor intrusion into structures above the contaminated ground water plume.	Evaluation of vapor intrusion potential and appropriate mitigation steps was conducted. Ground water table elevation at the north landfill was continuously monitored; water, soil and/or sediment sampling was conducted; and the need for more recovery wells was evaluated.	Randy Sturgeon EPA Region 3 1650 Arch Street Mail Code: 3HS23 Philadelphia, PA 19103-2029 215-814-3227 sturgeon.randy@epa.gov	http://www.epa.gov/superfund/sites/fiveyear/f0503006.pdf
Former Elf Atochem North America (Bensalem Redevelopment), Cornwell Heights, PA	RCRA Corrective Action Manufacturing Facility Refinery	Site soils and ground water are contaminated with chlorinated organics, PAHs, PCBs, pesticides, and arsenic. Remediation included removing contaminated soil and reusing concrete from demolished buildings as fill for basement areas in buildings that had been razed.	The site is planned to be redeveloped as a mixed-use area with greenspace for passive and active recreation along the Delaware River waterfront.	The property is in an area where many industries have downsized or discontinued operations over the last 20 years. Unemployment rates in the area are among the highest in Bucks County.	The redevelopment authority received a grant and loan from the Brownfields Program to help with the cost of the cleanup. A mixed-use area is planned for the site.	Andrew Clibanoff EPA Region 3 1650 Arch Street Mail Code: 3WC22 Philadelphia, PA 19103-2029 215-814-3391 clibanoff.andrew@epa.gov	http://www.epa.gov/reg3wcmd/ca/pdf/elf_atochem.pdf
Grace Lease Property, Lancaster County, PA	Brownfields	A Phase II Environmental Site Assessment found that no contaminants were present at levels above state standards, so cleanup was not necessary.	The area, previously abandoned and unused, now provides natural habitat and recreational greenspace with hiking trails, picnic grounds, and a scenic overlook of the Susquehanna River. In addition, Bald Eagle nesting sites have reemerged on the land.	Site remediation was not necessary.	Not applicable	Andrew Kreider EPA Region 3 1650 Arch Street Mail Code: 3HS51 Philadelphia, PA 19103-2029 215-814-3301 kreider.andrew@epa.gov	http://www.epa.gov/region03/revitalization/newsletter/spring07/Lorax.html

* Links valid at time of publication.

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
GSA Southeast Federal Center, Washington D.C.	RCRA Corrective Action Manufacturing Facility	Contamination resulted from shipbuilding and ordnance production activities. Eleven of the 14 buildings were decontaminated and demolished; the remaining buildings will be renovated and reused. Contaminated soil was removed, and ground water is being treated to break down gasoline constituents.	Revitalization includes developing a waterfront park that includes wildlife habitat.	Not specified	Not specified	Barbara Smith EPA Region 3 1650 Arch Street Mail Code: 3LC20 Philadelphia, PA 19103-2029 215-814-5786 smith.barbara@epa.gov	http://www.epa.gov/reg3wcmd/ca/dc/pdf/dc8470090004.pdf
Honeywell (Formerly Allied Signal) Baltimore Works Facility, Baltimore, MD	RCRA Corrective Action Industrial Facility	Manufacturing buildings and associated hazardous waste were removed. The containment area was surrounded by a slurry wall and capped, and ground water is being pumped and treated off site. Chromium and PAH-contaminated soil was removed.	A waterfront park will be constructed and is planned to include wildlife habitat.	Not specified	Not specified	Russell Fish EPA Region 3 1650 Arch Street Mail Code: 3LC20 Philadelphia, PA 19103-2029 215-814-3226 fish.russell@epa.gov	http://www.epa.gov/reg3wcmd/ca/md/pdf/mdd069396711.pdf
Jacks Creek/ Sitkin Smelting & Refining, Inc, Maitland, PA	Superfund Metals Reclamation Facility	The former smelting and precious metals reclamation facility contained several buildings, waste piles, and large areas of soil contaminated with lead, copper, zinc, cadmium, and PCBs. Floodplain wetlands on site and Jacks Creek sediment near the site were contaminated with runoff from the waste piles and soil. The cleanup involved dredging contaminated sediment from the adjacent Jacks Creek, excavating contaminated soil, and removing USTss and drums. Contaminated soil, sediment, and waste piles were consolidated and capped. Drums and waste were removed from the site.	The floodplain remediation required removing vegetation in a segment of the riparian corridor of the creek. Because soil excavation affected existing wetlands on site, wetlands were recreated in the riparian corridor along Jacks Creek. RPMs created vernal pools, placed woody debris in the wetland as invertebrate habitat, and used a wet meadow seed mix. A monitoring plan will help document the effectiveness of the created wetland.	Not specified	Not specified	Rashmi Mathur, RPM EPA Region 3 1650 Arch Street Mail Code: 3HS22 Philadelphia, PA 19103-2029 215-814-5234 mathur.rashmi@epa.gov	http://www.epa.gov/reg3hwmd/risk/eco/restoration/cs/JacksCreek.htm
Hopewell Plant (Honeywell), Hopewell, VA	RCRA Corrective Action Manufacturing Facility	This industrial chemical and fertilizer manufacturing facility is being cleaned up to control ground water releases and current human and ecological exposure to contaminated media.	A portion of the facility has been converted to a wildlife habitat area and has been certified as such by the Wildlife Habitat Council.	Not specified	Not specified	Russell Fish EPA Region 3 1650 Arch Street Mail Code: 3LC20 Philadelphia, PA 19103-2029 215-814-3226 fish.russell@epa.gov	http://www.wildlifehc.org/Registry_CertifiedSites/cert_sites_detail2.cfm?LinkAdvID=95327

* Links valid at time of publication.

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Mill Creek Dump, Erie, PA	Superfund Landfill	A former freshwater wetland that was used as a landfill for foundry sands, solvents, waste oils, and other industrial and					

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Palmerton Zinc Pile Superfund Site, Palmerton, PA	Superfund Mining Site	Former smelting operations resulted in soil and shallow ground water contamination by heavy metals, such as lead, cadmium, and zinc, and created a defoliated area on the adjacent Blue Mountain, a cinder bank, and additional defoliation along Stoney Ridge. Heavy metals were being transported to nearby stream segments through erosion. Biosolids were applied to accelerate revegetation of the defoliated areas, to stabilize the area, reduce soil erosion caused by wind and surface water, and increase evapotranspiration to prevent percolation of water and contaminants to the ground water. In addition, a system was installed to divert surface water around the cinder bank and treat leachate before discharge to the creek.	For the Blue Mountain revegetation, site managers constructed a self-sustaining meadowland because of minimum metal uptake from the plants. Also, ree species with high metal uptake were removed. For the cinder bank revegetation, the team used a grass seed mixture that included a nitrogen-fixing legume to maintain nitrogen fertility without the need for fertilizer.	Attempting to establish forestland at the site was extremely challenging because of competition from grasses, animal grazing, and insects. Some grass species were not desirable because of metals uptake. Use of sludge as a soil amendment caused a negative public perception.	Forestland was ultimately abandoned in favor of meadowland. The types of grass seeds were replaced with those having minimal metals uptake. Sludge application was replaced with mushroom compost.	Charlie Root, RPM EPA Region 3 1650 Arch Street Mail Code: 3HS21 Philadelphia, PA 19103-2029 215-814-3193 root.charlie@epa.gov	http://costperformance.org/pdf/20070522_396.pdf
Resin Disposal, Jefferson Borough, PA	Superfund Landfill	The landfill, which accepted industrial waste including benzene and toluene, was covered with multi-layer cap. Leachate was collected and separated, and oil was recycled as fuel for a nearby plant.	The site now contains native wild flowers and is habitat to migratory birds.				

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Seaford Nylon Plant, Seaford, DE	RCRA Corrective Action Site Manufacturing Facility	Wastes include fly ash, corrosives, ignitables, spent halogenated solvents, and discarded commercial chemical products. Ground water contains low levels of metals and VOCs and low pH. Remediation included MNA of ground water with ICs as well as installing a protective cover over solid waste. Fly ash from the site was used as fill at an adjacent golf course.	Reuse includes expansion of the neighboring golf course.	There was concern that the fly ash placed at the golf course may cause a ground water problem.	Evaluations of the ground water at the golf course indicated that the fly ash did not impact the ground water.	Douglas Zeiters Delaware Department of Natural Resources and Environmental Control 89 Kings Highway Dover, DE 19901 302-739-9403 douglas.zeiters@state.de.us	http://www.epa.gov/reg3wcmd/ca/de/pdf/ded002348845.pdf
Site 46 Landfill A, Stump Dump Road, Dahlgren, VA	Superfund Landfill	Ground water and surface water contained contaminants such as cadmium, lead, mercury, and PCBs from municipal waste at the site. Contaminated waste from the site was removed to an appropriate off-site landfill.	The remedial design includes the integration and establishment of tidal wetlands in the low areas of the site.	Uncovering UXO caused a safety issue at the site.	EOD support and screening at all times was required.	Neal Pelter 1314 Harwood St., SE Washington Navy Yard Washington, D.C. 20374 202-68IN.808w 6.24 0 237.401 sid4 reu808w 6.24 0256.23/24 -6.24.mil0 6.48 -6.48 0 117.72 63	anluse Studies, c,

Appendix A: Ecological Revitalization Case Studies, continued

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

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact
Allied Chemical & Ironton Coke, Ironton, OH	Superfund Chemical and Tar Manufacturing Facility	Solid wastes and wastewater including crude tar and ammonia contaminated the ground water at this site. Remediation activities included excavating and disposing of contaminated soil, installing containment systems, and constructing a water treatment plant.	This area is being converted into a wetlands system, taking advantage of its natural flooding conditions and predisposition to wetlands-type vegetation.	Not specified	Not specified	Syed Quadri EPA Region 5 77 West Jackson Boulevard Mail Code: SR-6J Chicago, IL 60604-3507 312-886-5736 quadri.syed@epa.gov
Bowers Landfill, Circleville, OH	Superfund Landfill	Soil, ground water, and surface water contaminated with VOCs and PCBs. Remediation included removing debris and installing a clay cap.	Wetlands were created around the site to protect the cap from flooding.	The nearby Scioto River was prone to flooding, which could affect the landfill cap.	Wetlands were created in the area between the landfill and river, where clay was taken to create the cap, to control flooding.	Sirtaj Ahmed, RPM EPA Region 5 77 West Jackson Boulevard Chicago, IL 60604-3507 312-886-4445 ahmed.sirtaj@epa.gov
Calumet Container Site, Hammond, IN	Superfund Industrial Facility	Remediation consisted of cleaning up soil contamination caused by previous drum and pail reconditioning operations at the site.	The area will be restored as a native habitat area with opportunities for passive recreation, including walking trails, and increasing biological diversity of native plants for prairie and wetland habitats.	Not specified	Not specified	Thomas Bloom EPA Region 5 77 West Jackson Boulevard Mail Code: SE-4J Chicago, IL 60604-3507 312-886-1967 bloom.thomas@epa.gov
Broverman Landfill, Christian County, IL						

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Fernald, Southwest OH	Superfund Uranium Metal Production	Remediation and closure project addressing uranium contamination in soil and ground water. Remediation included treatment and disposal through an on-site disposal facility and off-site disposal. The treated silos and waste pit materials were all disposed of off-site. cere-sitelos a eoduriatotal h7v on-site disposal facility contipse pimarily cContaminated ad eEcolove. Deepn soil andbuildsingdebris.t					

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Industrial Excess Landfill (IEL), Uniontown, OH	Superfund Landfill						

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
DuPont Remington Arms Facility, Lonoke, AK	RCRA Corrective Action Manufacturing Facility	Remediation included excavation and treatment of approximately 6,080 cubic yards of contaminated soils.	Remington Arms continues to manufacture ammunition at the facility. The remaining 731 acres are managed as a wildlife habitat. Ecological revitalization efforts include construction of a 20-acre moist soil impoundment for waterfowl habitat in cooperation with Ducks Unlimited.	Not specified	Not specified	Jeanne Schulze EPA Region 6 1445 Ross Avenue, Suite 1200 Mail Code: 6PD-F Dallas, TX 75202-2733 214-665-7254 schulze.jeanne@epa.gov	http://www.epa.gov/epaoswer/hazwaste/ca/success/rem11-07.pdf
England Air Force Base, LA	RCRA Corrective Action Air Force Base	A portion of the former air force base was cleaned up by removing contaminated soil, incorporating ICs, and instituting MNA of contaminated ground water. The site was designated "ready for reuse."	Areas excavated as part of a remedial action became part of the Audubon Trail, providing habitat and a stopping point for migratory birds, and an expanded 18-hole golf course.	Not specified	Not specified	Louisiana Department of Environmental Quality Public Records Center Galvez Building, Room 127 602 N. Fifth Street Baton Rouge, LA 70802	http://www.epa.gov/region6/ready4reuse/england_rfr.pdf
French, Ltd., Crosby, TX	Superfund Industrial Waste Storage	Remediation included treating soil and ground water contaminated with VOCs and heavy metals and creating 23 acres of new wetlands.	Wetlands and surrounding habitat can be used as recreation for outdoor enthusiasts and as habitat for vegetation and wildlife.	Not specified	Not specified	Ernest Franke, RPM EPA Region 6 1445 Ross Avenue Suite 1200 Mail Code: 6SFRA Dallas, TX 75202-2733 214-665-8521 franke.ernest@epa.gov	http://cfpub.epa.gov/supercpad/cursites/csitinfo.cfm?id=0602498
Heifer International New World Headquarters, Little Rock, AR	Brownfields Industrial Facility	Petroleum contaminated soil was removed from the site.	Activities at the site included the creation of retention ponds and a wetland habitat.	The primary issue at this site was funding.	Support from federal, state, and local sources, along with existing funds allowed cleanup.	Gerald Cound Director of Facilities Management Heifer International 1 World Avenue Little Rock, AR 72202 501-907-2965 gerald.cound@heifer.org	http://www.wildlifehc.org/ewebeditpro/items/O57F5385.pdf
3-D Investments, Inc., Alda, NE	RCRA Brownfields and Superfund Former Gas Station, Battery Cracking and Lead Recovery Facility	The 3.65-acre site was investigated under RCRA authority. The facility went bankrupt and cleanup costs exceeded monies in the facility's trust fund, so EPA RCRA y.ion ceededg wiasite incluageTd-					

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Cherokee County, Galena, KS	Superfund Mining Site	Remediation consisted of burying surface mine wastes contaminated with lead, mercury, and cadmium in abandoned mine pits, subsidence areas, and mine shafts on site; diverting streams away from waste piles; recontouring land surface; and revegetating with native prairie grasses to control runoff and erosion.	Native prairie grassland habitat encouraged the return of wildlife.	Potential for cave-in of filled mine shafts after heavy rain or freezing and thawing cycles.	Avoided development in the areas with potential for cave-in or collapse.	David Drake, RPM EPA Region 7 901 North Fifth Street Mail Code: SUPRFFSE Kansas City, KS 66101 913-551-7626 drake.dave@epa.gov	http://www.epa.gov/superfund/programs/recycle/live/casestudy_cherokee.html
Times Beach, Times Beach, MO	Superfund Contaminated Urban Area	A temporary incinerator was installed to burn soil contaminated with dioxin. The waste ash from the treated soil was buried on site. People were relocated and all homes and businesses were demolished.	A state park now exists on the site and acts as a bird sanctuary.	Numerous problems and issues resulted from this contentious Superfund site. See the Web site provided under "Notes/Links" for more information.	See the Web site provided under "Notes/Links" for more information.	Bob Feild, RPM EPA Region 7 901 North Fifth Street Mail Code: SUPRMOKS Kansas City, KS 66101 913-551-7697 feild.robert@epa.gov	http://cfpub.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701237
Wheeling Disposal Service Co, Inc. Landfill, Amazonio, MO	Superfund Landfill	Soil contaminated with municipal and industrial wastes was remediated by upgrading the existing landfill cap with a clay and soil cover. Ground and surface water were monitored.	During the cleanup, the owner dug a pond and planted native wild grasses and other foliage that would attract birds and wildlife.	Not specified	Not specified	Amer Safadi, RPM EPA Region 7 901 North Fifth Street Mail Code: SUPRMOKS Kansas City, KS 66101 913-551-7825 safadi.amer@epa.gov	http://cfpub.epa.gov/supercpad/cursites/csitinfo.cfm?id=0700780
REGION 8							
BP Former Refinery, Platte River Commons, Casper, WY	RCRA Corrective Action Former Petroleum Refinery	Cleanup included removal of trash and waste from the river to contain the flow of contaminated ground water, excavation of contaminated soils, addition of P&T wells and construction of a wetland treatment system. Nearly 2,000 trees were planted to assist with phytoremediation.	After the river was cleaned up, a recreational kayak course was created. A portion of the site was used to create an 18-hole golf course. Wetlands were incorporated into the golf course design to assist in treating contaminated ground water. Trees were planted for phytoremediation.	Not specified	Not specified	Vickie Meredith WDEQ Solid & Hazardous Waste Division, Hazardous Waste Permitting and Corrective Action Program 250 Lincoln Street Lander, WY 82520 vmered@state.wy.us 307-332-6924 Tom Aalto, EPA Region 8 1595 Wynkoop Street Mail Code: 8P-HW Denver, CO 80202-1129 aalto.tom@epa.gov 303-312-6949	http://www.epa.gov/waste/hazard/correctiveaction/pdfs/casper11-07.pdf

* Links valid at time of publication.

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Cache La Poudre River Superfund Site, Fort Collins, CO	Superfund	Soil and sediments in the Poudre River, and ground water 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 ground water flow, and ground water treatment.	EPA completed an intact but unobtrusive remedy of the Poudre River to preserve the riverine habitat.	Beavers ate about half of the tree plantings.	Site managers used wire on the first 6 to 8 feet of tree plantings, and painted the wire to be easily visible.	Paul Peronard, OSC EPA Region 8 1595 Wynkoop Street Mail Code: 8EPR-SR Denver, CO 80202-1129 303-312-6808 peronard.paul@epa.gov	http://www.clu-in.org/conf/tio/ecocasestudies_080207/
California Gulch Superfund Site, Upper Arkansas River Operable Unit, Leadville, CO	Superfund Mining Site	The mining district's soil, surface water, and sediments were heavily contaminated with lead, zinc, and other heavy metals from mine tailings. Biosolids and lime were applied directly to the tailings along Upper Arkansas River.	The area along the river has been restored and supports vegetation and wildlife, and is available for agricultural use and recreational use such as hiking and fishing.	Tailings could not be excavated because of the risk of tailings entering the river and the difficulty of finding a repository for the contaminated soil. Also, replacement of topsoil would be costly. Mobilizing materials to the site was difficult due to the elevation of the site. Water was also scarce due to low rainfall and high elevation.	Biosolids were spread over the tailings, reducing the potential for tailings to migrate to the river.	Rebecca Thomas, RPM EPA Region 8 1595 Wynkoop Street Denver, CO 80202-1129 303-312-6552 thomas.rebecca@epa.gov Mike Holmes, RPM EPA Region 8 1595 Wynkoop Street Denver, CO 80202-1129 303-312-6607 holmes.michael@epa.gov	http://www.epa.gov/superfund/programs/recycle/pdf/cal_gulch.pdf
East Helena Site, Helena, MT	Superfund Smelting Site	Ground water, surface water, and soil contamination from decades of lead smelting activities was cleaned up by removing waste, treating soil, and capping the area.	In addition to mixed commercial and residential use, portions of the site are being used for a neighborhood park, a baseball field, and some wetlands redevelopment.	Not specified	Not specified	Scott Brown EPA Region 8 Montana Operations Office Federal Building 10 West 15th Street Suite 3200 Mail Code: 8MO Helena, MT 59626 406-457-5035 brown.scott@epa.gov	http://cfpub.epa.gov/supercpa

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Monticello Mill Superfund Site, Monticello, UT	Superfund Former DOE Processing Facility	A cover system was constructed to contain radioactive material removed from the site. The cover design mimics and enhances the natural ground water balance and uses a capillary barrier. Native vegetation was planted to maximize evapotranspiration.	The native vegetation chosen was designed to emulate the structure, function, diversity, and dynamics of native plant communities in the area.	Not specified	Not specified	Mark Aguilar EPA Region 8 1595 Wynkoop Street Mail Code: 8EPR-F Denver, CO 80202-1129 303-312-6251 aguilar.mark@epa.gov	http://www.clu-in.org/PRODUCTS/NEWSLTRS/ttrend/view.cfm?issue=tt0500.htm
Rocky Flats Plant, Golden, CO	Superfund Former DOE Weapons Facility	At one time the site stored more than 14 tons of plutonium. All special nuclear materials were packaged and shipped to licensed repositories. Over 800 structures were cleaned up, as necessary, and removed. 690 tanks were decontaminated and removed, and onsite landfills were covered. Three contaminated ground water plume barriers and passive treatment systems were installed. Finally, wastes and contaminated soils were removed and shipped to permitted facilities.	Part of the site that has been remediated has been transferred from DOE to DOI and the USFWS to manage as a National Wildlife Refuge.	Not specified	Not specified	Mark Aguilar EPA Region 8 1595 Wynkoop Street Mail Code: 8EPR-F Denver, CO 80202-1129 303-312-6251 aguilar.mark@epa.gov	http://www.epa.gov/region8/superfund/co/rkyflatsplant/index.html
Rocky Mountain Arsenal, Commerce City, CO	Superfund Army-Lead Remedial Action Ammunition Plant	P&T 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.	Not specified	Not specified	Greg Hargreaves, RPM EPA Region 8 1595 Wynkoop Street Mail Code: 8EPR-F Denver, CO 80202-1129 303-312-6661 hargreaves.greg@epa.gov	http://www.rma.army.mil/cleanup/clnfrm.html
Silver Bow Creek and Warm Springs Ponds, Butte, MT	Superfund Mining Site	Remediation included excavating sediment contaminated by copper mining activities and installing a water treatment system.	Extensive wetlands are now home to a variety of wildlife. Nesting platforms were built to protect birds. The wetlands are also used for recreation such as fishing, hiking, and biking.	Not specified	Not specified	Ron Bertram, RPM EPA Region 8 1595 Wynkoop Street Mail Code: 8EPR-F Denver, CO 80202-1129 406-441-1150 bertram.ron@epa.gov	http://cfpub.epa.gov/supercpad/cursites/csitinfo.cfm?id=0800416

* Links valid at time of publication.

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Summitville Mine, CO	Superfund Mining Site	Gold mining released cyanide and acidic mine water to the Alamosa River. Cleanup activities include permanently stabilizing the site and reversing the effects of mining on the river.	The Alamosa River and tributaries flow through wetlands, forested and agricultural land, and into the Terrace Reservoir, which supplies irrigation water to livestock and farms. The site has been revegetated with grasses that promote the recolonization of native plants. The river, which was void of life because of contamination, now supports some types of aquatic life.	Not specified	Not specified	Victor Ketellapper, RPM EPA Region 8 1595 Wynkoop Street Mail Code: 8EPR-F Denver, CO 80202-1129 303-312-6578 ketellapper.victor@epa.gov	http://cfpub.epa.gov/supercpad/cursites/csitinfo.cfm?id=0801194
Atlas Asbestos Mine, Fresno County, CA	Superfund Mining Site	The remedy included the removal of contaminated material, stabilization of erosion-prone areas, and structural improvements to clean up the asbestos contaminated soil and water.	The site is a wildlife sanctuary and a popular recreational area for hikers, campers, and hunters.	At the Atlas Mine Area, the road to the Rover Pit/Channel A is likely to fail sometime in the future due to an active landslide. In addition, the road to Pond A may also fail in the future due to erosion.	Alternate access roads to the Rover Pit/Channel A and to Pond A will be identified prior to failure of the existing roads.	Anna Lynn Suer EPA Region 9 75 Hawthorne Street Mail Code: WTR-2 San Francisco, CA 94105 415-972-3148 suer.lynn@epa.gov	http://www.epa.gov/superfund/sites/fiveyear/f2006090001092.pdf
A West Coast Refinery, Location not provided	EPA Research Technology Development Forum Site Refinery Effluent Treatment System	A phytoremediation demonstration was conducted at the site, which was contaminated with hydrocarbons. The remediation also included enhancing and planting wetlands, and installing a vegetation cap.	The site includes a clean stormwater holding basin. Natural vegetation was planted over the 90-acre vegetation cap.				

Appendix A: Ecological Revitalization Case Studies, continued

Property Name and Location	Property Type	Cleanup Type	Revitalization/Reuse Component	Problems/Issues	Solutions	Point of Contact	Notes/Links*
Commencement Bay, Tacoma, WA	Superfund Industrial Activities	Industrial activities resulting in hazardous waste contamination of the waterways within Commencement Bay were addressed.	In addition to navigational improvements to the port, nine acres of wetlands were restored as a result of the cleanup. EPA also worked with Washington Department of Environment to create seven acres of essential mud flats habitat where fish, birds, wildlife, and plant species thrive.	Not specified	Not specified	Chris Bellovary EPA Region 10 1200 Sixth Avenue	

Appendix A: Ecological Revitalization Case Studies, continued

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

A n B: A o a E o o a R a a o R o

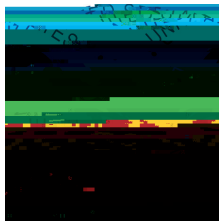
Section 1: Introduction

Section 2: Ecological Revitalization Under EPA Cleanup Programs

Section 5: Stream Cleanup and Restoration

Section 6: Terrestrial Ecosystems Cleanup and Revitalization

Appendix C: Acronyms



Ecological Revitalization:
Turning Contaminated Properties
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