

Communities nationwide are looking for new opportunities to sustain jobs and economic development, protect their natural resources and public health, and strengthen quality of life for all citizens. EPA's mission is to protect the health of all communities and advance environmental protection. Through partnerships, programs and initiatives, the Agency is working to help communities around the country develop in environmentally and economically sustainable ways.

Restoring, revitalizing and bringing economically productive new uses to contaminated lands such as Superfund sites is a vital part of this work. Superfund communities are developing innovative ways to address social, economic and environmental priorities, pursuing opportunities that benefit people, the environment and the bottom line. These fact sheets take a closer look at these approaches, helping communities interested in Superfund Redevelopment save time and money as they plan for the future.

Topics covered include:

- 1) Renewable Energy
- 2) Ecological Revitalization
- 3) Mixed-Use Redevelopment
- 4) Recreation
- 5) Green Infrastructure
- 6) Green Buildings and Landscapes
- 7) Environmental Education

Each page illustrates how communities are using creative strategies to manage their growth in ways that preserve natural lands and critical environmental areas, protect water and air quality, and bring economically productive new uses to previously developed land. Today, hundreds of cleaned-up Superfund sites have been returned to productive use, supporting thousands of jobs with a multi-billion dollar payroll. Innovation can also begin during cleanups. Green remediation strategies can accelerate cleanups, reduce the cost and carbon footprint of cleanup activities, and support local jobs. For more information, visit <http://clu-in.org/greenremediation>.

Getting Started

EPA provides reuse planning support for all of the innovative activities described in these fact sheets.

- EPA's Superfund Redevelopment Initiative (SRI) supports communities' efforts to return Superfund sites to productive use: <http://www.epa.gov/superfund/programs/recycle>.
- More information is available from EPA site teams and regional websites. Visit EPA's Superfund program website: <http://www.epa.gov/superfund/sites>.
- Additional resources are provided at the end of the fact sheets.

Superfund Redevelopment: *Innovation in Action*



Sacramento, California:

The Aerojet solar farm generates six megawatts of power and is one of the largest industrial installations in the United States.



Milltown, Montana:

The Milltown Reservoir Sediments site is the location of one of the nation's largest river cleanup and ecological revitalization efforts.



Midvale City, Utah:

The Bingham Junction mixed-use development supports 600 jobs and increased the site property's value by \$131 million.



Columbia, South Carolina:

Recreational reuses at the Lexington County Landfill include a 9-acre practice facility for the University of South Carolina's golf teams.



Cumberland and Lincoln, Rhode Island:

The Petersen/Puritan site includes a greenway, a National Heritage Corridor bikeway and ball fields.



Tacoma, Washington:

The Center for Urban Waters at the Commencement Bay site has been awarded LEED Platinum certification for excellence in sustainability.



Olathe, Kansas:

In 2012, more than 110 community volunteers established a new community garden and education areas at the Chemical Commodities site.

Renewable energy resources such as wind, solar, biomass and geothermal energy are non-polluting, inexhaustible and increasingly cost-competitive. Renewable energy alternatives can help communities create jobs and diversify their economies. They are an important part of America's energy security and environmental sustainability.

Superfund sites can be well suited for renewable energy production. Sites in urban and rural areas near utilities and transportation networks help keep development costs low. Many sites are located in places with strong wind, solar, biomass and geothermal resources. Nationwide, there are at least 45 Superfund sites in planned or actual renewable energy reuse.

Key Considerations

Renewable energy projects begin with detailed assessments of the energy resource and related factors, including site characteristics, available infrastructure and surrounding land uses.

Renewable energy technologies can be scaled to different needs. They can range from small-scale solar or wind systems for use by homeowners, small businesses, ranchers, farmers and other individual users to large, commercial-scale power generating facilities.

Renewable Energy Projects *in Action*



Gases from buried wastes at the 508-acre Lowry Landfill outside Denver, Colorado, are now productively reused at a gas-to-energy plant. The facility uses four combustion engines to convert 630 million cubic feet of methane gas annually into 3.2 megawatts of electrical power, reducing greenhouse gases and providing electricity for about 3,000 households. *(top image)*



A 40-acre solar farm on the Aerojet General Corporation site near Sacramento, California, generates six megawatts of power; it is one of the largest industrial installations in the United States. The solar panels are currently providing energy for the site's ground water cleanup. Longer-term plans include providing power for development projects and the region's energy grid. *(middle image)*



The Fernald Environmental Management Project Superfund site, a former uranium processing facility, is now the location of the innovative multi-use Fernald Preserve Visitor Center. Recipient of the first Platinum LEED certification for sustainability in Ohio, the center features a geothermal heating and cooling system that has cut its energy consumption in half. The facility is an adaptively reused steel warehouse built as part of the site's cleanup. Site reuses also include trails and wildlife habitat. *(bottom image)*

To learn more, visit <http://www.epa.gov/superfund/programs/recycle>.

Renewable Energy: *At a Glance*

Wind: American wind farms generated 48,611 megawatts of energy as of March 2012 – three percent of the U.S. electricity supply, powering the equivalent of nearly 10 million homes.

Solar: Reports estimate solar energy could meet 10 percent of the nation's power needs by 2025; it currently provides less than one percent of the U.S. electricity supply.

Biomass: Organic material from plants and animals produces biofuels such as ethanol, bioproducts – chemicals for making plastics and other products typically made from petroleum – and bioenergy. Biomass seasonally provides about 1.4 percent of the U.S. electricity supply.

Geothermal: The United States is the global leader in using the Earth's heat as an energy source. Geothermal energy currently generates 15 billion kilowatt-hours of electricity annually, approximately 0.3 percent of the country's electricity supply.

Superfund cleanups protect and restore the environment and protect public health. Before natural systems at Superfund sites can support parks, wildlife habitat, farmland and forests, they often need to be restored to functioning and sustainable use. This process – increasing or improving habitat for plants and animals – is called ecological revitalization.

Restored ecosystems help people live healthier and more enjoyable lives. Ecological revitalization improves soil health and supports diverse vegetation, sequesters carbon, protects air and water quality, and sets the stage for wildlife habitat and recreation opportunities, including hunting, hiking, biking, horseback riding and bird watching, as well as environmental education. Through 2012, more than 100 Superfund sites nationwide are in planned or actual ecological reuse.

Benefits and the Bottom Line

Ecological revitalization translates into dollars and cents for communities. Once restored, natural areas can have a positive effect on nearby property values, tax revenues and tourism, facilitate healthy lifestyles, reduce flood control and stormwater management costs, and improve local air and water quality.

Key Considerations

Ecological revitalization helps restore natural ecosystems and serves as an important part of site cleanup. For example, soil amendments can be used to bind contaminants, build soil and establish plant growth.

- **Soil amendments** include municipal biosolids, manures, sugar beet lime, wood ash, log yard waste and composted agricultural byproducts. They can reduce toxicity and restore soil, providing environmental and economic benefits; materials destined for disposal may be recycled to build soil while reclaiming unusable or devalued land.
- **Revegetation** is often one of the final actions taken at a site. When possible, plant species native to the area should be selected for planting. Native plants often cost less, require less care, provide shelter and food for wildlife, reduce air pollution, and provide greater biodiversity.



Ecological Revitalization in Action

At the Atlas Tack Superfund site in Fairhaven, Massachusetts, EPA and its partners preserved and created fresh and saltwater wetlands as part of the cleanup. Today, the site sustains 14,000 native plant species and provides a thriving estuarine habitat for local wildlife and migrating birds. *(top image)*



The Milltown Reservoir Sediments site in western Montana is the location of one of the nation's largest river cleanup and ecological revitalization efforts. The project's restoration plan relies on diverse native plant communities, side channels and wetlands that mimic natural river systems. Four hundred acres at the site were transferred to the State of Montana for a new state park. *(middle images)*



Ecological revitalization at the Joint Expeditionary Base (JEB) Little Creek–Fort Story site in Virginia Beach, Virginia, created tidal wetland habitat with riparian forest and tidal channels. A walking trail passes the wetlands and handicap-accessible platforms with picnic tables and spotting scopes. *(bottom image)*



Image courtesy of the U.S. Navy

To learn more, visit <http://www.epa.gov/superfund/programs/recycle>.

Many Superfund sites are large enough to support several land uses, enabling communities to address multiple priorities. Smart growth and sustainable development approaches, including mixed-use projects, provide benefits that extend beyond jobs, services and amenities. Mixed-use redevelopment efforts can create walkable neighborhoods, convert renewable energy into power, provide access to public transportation, and strengthen quality of life for everyone.

Superfund sites are often strong candidates for innovative mixed-use projects. They are “well wired,” located near utilities and roads due to prior land uses. Recycling these lands helps retain development in existing communities, revitalizing downtowns and preserving open space, farmland, natural beauty and critical environmental areas. Through 2012, 75 Superfund sites nationwide are in planned or actual mixed reuse.

Key Considerations

Mixed-use redevelopment works best with the involvement of diverse organizations and public and private sector partners, and when local governments play a leading role.

Redevelopment planning and implementation works well during cleanups – integrating remedy and reuse can save time and money. For example, installation of utility corridors and building footers can be coordinated with cleanup activities. Site grading and soil compaction during cleanups can reduce the need for additional site preparation. Communities and developers may fund these activities using a variety of resources and incentives.

Mixed-Use Redevelopment *in Action*



On the Midvale Slag Superfund site in northern Utah, families moved into affordable housing, shopping areas are thriving and companies conduct business in LEED-certified developments that minimize impervious surfaces and recycle rainwater. Riverwalk Park provides access to the Jordan River and a Utah Transit Authority rail station recently opened on site. The development supports about 600 jobs, generates \$1.5 million in annual property taxes and has led to a \$131 million increase in the value of the site property. *(top and middle images)*



Cleanup of vacant lots at the Jacobsville Neighborhood Soil Contamination site in Evansville, Indiana, led to residential reuse, education opportunities and urban gardening. A local nonprofit built a 26-unit residence for homeless and disabled veterans on site. It includes space for meetings and classes, with wireless access provided so residents can pursue employment and training opportunities. At the raised beds of a nearby community garden, children learn about nutrition and the importance of a clean, healthy environment. *(bottom images)*



To learn more, visit <http://www.epa.gov/superfund/programs/recycle>.

Recreation opportunities located on Superfund sites include parks, playgrounds, trails, picnic areas, bird watching, sports fields, fishing ponds, model airplane flying fields, snow tubing, ice rinks and golf courses. Through 2012, more than 200 Superfund sites are in planned or actual recreational reuse.

Innovative “green” designs distinguish some of these reuses. Some designs bring reuse and remedy together during the planning stages, such as recreational trails located on top of wastes that cap materials in place at sites. Other site designs incorporate remedies that are already in place, providing opportunities to enhance protectiveness and harness new sources of energy. In all cases, these approaches seek to maximize public health and environmental benefits for communities.

Key Considerations

Many Superfund sites are located in communities that lack recreation facilities and have limited land to develop such spaces. Recreational reuse of sites can provide pocket parks, playgrounds, open space and other facilities in these high-need areas.

EPA collaborates with several organizations – the Academy of Model Aeronautics, the U.S. Soccer Foundation, the Rails-to-Trails Conservancy and The Trust for Public Land – to support recreational reuse opportunities. To learn more, visit: <http://www.epa.gov/superfund/programs/recycle/activities/organizations.html>.

Recreational Innovation *in Action*

At the Lexington County Landfill Area Superfund site near Columbia, South Carolina, the local government led an innovative cleanup and returned the site to recreational reuse. Lexington County collaborated with the University of South Carolina to redevelop the northern part of the site into “the Coop,” a 9-acre practice facility for the university’s golf teams. *(top images)*

The H.O.D. Landfill Superfund site in Antioch, Illinois, is a major recreation destination. Two multi-million-dollar facilities, McMillen Field and the Tim Osmond Sports Complex, provide sports fields and other community amenities. *(middle images)*

At the Dupage County Landfill Superfund site in Warrenville, Illinois, a 150-foot hill known as Mt. Hoy is the centerpiece of a multi-use recreational area. Local residents now hike the former landfill to bird watch and sled during the winter. The area also provides picnic and camping areas, hiking and cross-country skiing trails, and fishing and boating areas. *(bottom image)*

To learn more, visit <http://www.epa.gov/superfund/programs/recycle>.



Communities nationwide work together to manage their “grey” infrastructure assets – highways, utilities, public transit systems and airports. A region’s natural resources – part of its green infrastructure – are no different. Forests, waterways and wildlife habitat all cross jurisdictional boundaries, naturally managing stormwater, reducing flooding risk, improving air and water quality, and sequestering carbon, helping reduce greenhouse gas emissions.

Green infrastructure thus performs many of the same functions as traditionally built grey infrastructure, often at a fraction of the cost. Additionally, these resources enhance community quality of life, providing clean water, agricultural soils and public parks and trails. Successful projects have demonstrated that an interconnected landscape system also provides a unique sense of place that attracts people, jobs and investment. As Superfund communities plan for future growth, some are undertaking innovative green infrastructure projects that use sites to help link regional natural resources together.

Planning for the Future

At the regional level, green infrastructure is “a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for America’s communities and people.”

– Benedict and McMahon, Green Infrastructure, 2006.

Key Considerations

Green infrastructure planning begins with a detailed assessment of natural resources in the area, including waterways, forests, agricultural areas and wildlife habitat, and the services they provide.

Consideration of community priorities and existing plans is an important part of green infrastructure planning. This requires working with diverse stakeholders locally and regionally to make sure projects identify all linkage opportunities and any potential issues.

Green Infrastructure *in Action*

Communities in Leon Valley, Texas, are implementing a revitalization plan that includes the Bandera Road Ground Water Plume Superfund site. The plan integrates regional sustainability, transportation, stormwater management and economic development. Localities are actively working on protecting natural corridors, planting trees, and developing green streets and regional trail connections. *(top image)*



The Rhode Island towns of Cumberland and Lincoln are working together on a regional green infrastructure project. The towns collaborated with federal, state, local and private organizations to create a greenway with ecological preserves and wetlands that will include the Peterson/Puritan Superfund site and become part of a 17-mile-long riverside park. *(bottom image)*



To learn more, visit <http://www.epa.gov/superfund/programs/recycle>.

Collaboration between EPA and communities has led to innovative green building projects and sustainable landscapes on Superfund sites nationwide. Green buildings showcase design and construction practices that minimize energy and water use and use environmentally friendly materials. Sustainable landscapes restore and recreate natural processes, enabling water conservation, water filtration and irrigation.

Green buildings and landscapes promote healthier living by increasing access to healthy food and safe walking and biking routes; enhancing recreational access and facilities; and engaging communities through education and activities such as gardening. Model projects show how to improve air, soil and water quality. By providing new habitats and reducing use of materials that impact the environment, green buildings and landscapes support biological diversity and site stewardship. Greening formerly contaminated sites also can support economic revitalization and therefore result in new jobs, services, recreational assets and housing.

Key Considerations

Superfund redevelopment projects can incorporate green building and sustainable landscape best practices at different scales. While some features require skilled labor and significant investment, others, such as putting in rain gardens, natural lighting and energy-efficient appliances, are simple to implement and offer significant returns. Reducing impervious areas – conventional pavement and roofs – is a key element of innovative projects. Reducing such surfaces allows rain to soak into the soil, preventing sewer overflows, flooding and stream erosion. The illustration on the next page shows how green building and sustainable landscape features can come together as part of construction and restoration activities.



Green Buildings and Landscapes *in Action*

A vibrant waterfront community is under construction at the Li Tungsten Superfund site in Glen Cove, New York. Following a \$120 million cleanup and infrastructure improvement effort, a public-private partnership is developing a project focused on green buildings and landscape design. The walkable community will include homes, businesses, civic land uses and a ferry port to Manhattan. LEED-certified buildings will be surrounded by restored wetlands and open space. *(top image)*



A public-private partnership and incentives enabled the cleanup and development of a 1.3-million-square-foot open-air shopping center at the Indian Bend Wash Superfund site in Scottsdale, Arizona. Water features, plantings and shade structures provide cooling effects in the warm summer climate. The project brought 4,500 new jobs to the area and generates an estimated \$300 million in annual sales. *(middle image)*

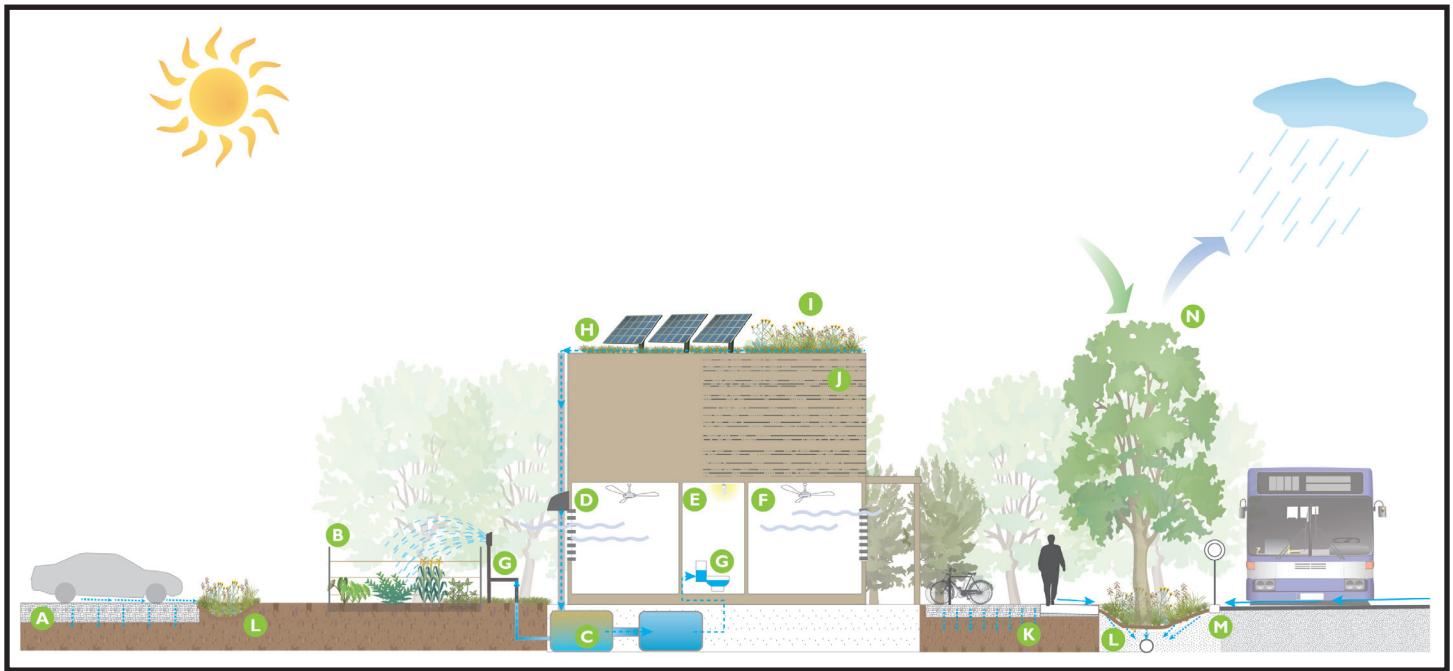


Projects at the Commencement Bay site in Tacoma, Washington, are bringing together green buildings and landscapes. Point Ruston, a 97-acre Built Green® development, includes homes, hotels and stores, 50 acres of open space, and shoreline trails. Nearby on the site, the LEED Platinum-certified headquarters for the Center for Urban Waters reuses rainwater, reducing water use by 46 percent. Other facility features include a green roof, pervious pavement parking, native plantings and use of recycled materials. *(bottom image)*

To learn more, visit <http://www.epa.gov/superfund/programs/recycle>.

Green Buildings and Landscapes: *Bringing It all Together*

This illustration demonstrates how green buildings and landscape features can come together as part of new construction and restoration activities at a site. Some features, such as a vegetable garden, tree and shrub plantings, swales and raingardens, can be easily and inexpensively implemented. Others such as a green roof might require technical assistance.



- A permeable pavement**
allows water to pass through paving and infiltrate
- B neighborhood gardens**
provide fresh produce and a community gathering space
- C cistern and water filtration system**
cleans and stores overflow water for reuse
- D window coverings**
on south and west facing windows provide insulation from the warm sun
- E high-efficiency lighting and appliances**
use energy efficient designs, lighting fixtures and CFL bulbs; maximize natural light
- F ceiling fans**
circulate incoming air to efficiently cool structure
- G graywater system**
recycles water for non-potable reuse such as irrigation and flushing toilets
- H solar panels**
generate and supply energy from sunlight
- I green roof**
absorbs and filters water; insulates structures; absorbs carbon
- J sustainable building materials**
use high-efficiency and environmentally friendly materials from local and regional renewable resources
- K permeable pavement**
allows water to pass through paving and infiltrate
- L planted swales and raingardens**
collect, absorb and filter runoff water
- M LID stormwater infrastructure**
such as sloping streets and sidewalks, curb cuts and other features direct water and reduce runoff
- N tree and shrub plantings**
provide shade, collect and filter water, absorb carbon, and provide habitats for many species

Superfund sites have remarkable stories. Their cleanup and restoration provides a window into environmental science, ecology and how natural systems work. Their history – facilities that were part of day-to-day life, often for decades – is an important part of communities’ heritage.

Many innovative Superfund reuses recognize and incorporate these stories as educational opportunities. Education areas, signage, boardwalks and trails, and interactive teaching materials turn sites into classrooms for local children and other community members. Renovating old buildings and preserving reminders of the past – equipment, tools, materials – brings the history of sites alive. Planting gardens provides education opportunities and increases community access to healthy, nutritious food.

Superfund sites also can attract broader regional and national interest, supporting tourism and economic development, and linking surrounding recreation areas and neighborhoods. Through 2012, environmental education areas are located at more than 30 Superfund sites nationwide.

What Is Environmental Education?

Environmental education teaches children and adults how to learn about and investigate their environment, and to make intelligent, informed decisions about how they can take care of it.

Environmental education is taught in traditional classrooms, in communities, and in settings like nature centers, museums, parks and zoos. Learning about the environment involves many subjects – earth science, biology, chemistry, social studies, even math and language arts – because understanding how the environment works, and keeping it healthy, involves knowledge and skills from many disciplines.



Environmental Education *in Action*

In Jacksonville, Arkansas, collaboration among EPA, the state and the City of Jacksonville transformed the Vertac, Inc. site, a former chemical manufacturing facility, into a valuable educational resource for the community. Next to the city’s new recycling facilities, a Recycling Education Park provides opportunities to learn about composting, recycling and environmental stewardship. School field trips and local residents visit the park, nearby green space and picnic areas where they can view donated artwork made of recycled materials. *(top images)*



In Olathe, Kansas, the community is working with several partners to establish walk-through educational habitat at the Chemical Commodities, Inc. Superfund site. The site will provide habitat for local wildlife while helping the community learn about the importance of pollination. Current plans include pollinator gardens for bees, butterflies and birds, native plants and trees, walking trails and education areas. In September 2012, more than 110 community volunteers helped establish the gardens, planting more than 1,600 native plants. *(middle image)*



Greensgrow Farm is one of the leading urban agriculture projects in the United States. Located on a 1-acre plot in Philadelphia’s low-income Kensington neighborhood, raised beds and greenhouses have taken the place of the Boyle Galvanizing site, a former steel galvanizing factory. The farm provides produce to area restaurants and residents and includes a plant nursery, farm stand and community-supported agriculture program. *(bottom images)*

To learn more, visit <http://www.epa.gov/superfund/programs/recycle>.

Renewable Energy

- The RE-Powering America's Lands Initiative: <http://www.epa.gov/oswercpa>
- EPA-DOE Renewable Energy Program: http://www.epa.gov/oswer/ocpa/maps_incentives.htm
- Clean Energy Programs: <http://www.epa.gov/cleanenergy/index.html>
- The Environmentally Responsible Redevelopment and Reuse (ER3) Initiative: <http://www.epa.gov/oecaerth/cleanup/revitalization/er3/index.html>

Ecological Revitalization

- CLU-IN's EcoTools: <http://www.clu-in.org/ecotools>
- EPA Ecological Revitalization Database: http://www.clu-in.org/products/ecorev/er_search.cfm
- EPA Ecological Revitalization Report: http://www.epa.gov/tio/download/issues/ecotools/ecological_revitalization_turning_contaminated_properties_into_community_assets.pdf

Mixed-Use Redevelopment

- HUD-DOT-EPA Interagency Partnership for Sustainable Communities: <http://www.sustainablecommunities.gov>
- Smart Growth Program: <http://www.epa.gov/smartgrowth>
- Smart Growth Network: <http://www.smartgrowth.org>
- Land Revitalization Program: <http://www.epa.gov/landrevitalization>
- Sustainability Programs: <http://www.epa.gov/sustainability>

Recreation

- Recreational Uses at Superfund Sites: <http://www.epa.gov/superfund/programs/recycle/pdf/recreational-reuse.pdf>
- Webinar – Reusing Superfund Sites for Recreational Purposes: http://www.clu-in.org/conf/tio/sri_111011
- Webinar – Aligning Remedies with Reuse: From Superfund Sites to Soccer Fields: http://www.clu-in.org/conf/tio/sri_012512
- Recreational Reuse Technical Reports: <http://www.epa.gov/superfund/programs/recycle/tools/reusehowto.html>

Green Infrastructure

- Green Infrastructure Programs: <http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm>
- The Green Infrastructure Community of Practice: <http://www.greeninfrastructure.net>

Green Buildings and Landscapes

- Green Building Programs: <http://www.epa.gov/greenbuilding>
- U.S. Green Building Council (USGBC): <https://new.usgbc.org>
- Sustainable Sites Initiative: <http://www.sustainablesites.org>

Environmental Education

- EPA Office of Environmental Education: <http://www.epa.gov/enviroed>
- Superfund Classroom Materials: http://www.epa.gov/superfund/students/class_act/index.htm
- Superfund Community Involvement Program: <http://www.epa.gov/superfund/community/index.htm>