



Ecosystem Services – Benefits and Considerations for the Cleanup of Contaminated Mine Sites

Matt Harwell

Supervisory Research Ecologist

EPA Office of Research & Development

Pacific Ecological Systems Division

Harwell.Matthew@epa.gov

Michele Mahoney

Physical (Soil) Scientist

EPA Office of Superfund Remediation & Tech Innovation

Technology Innovation & Field Services Division

Mahoney.Michele@epa.gov

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Ecosystem Services 101

What are ecosystem services?

Ecosystem Services are the life-sustaining products and benefits people obtain from natural environmental resources and processes, such as clean air and water, timber, and pollination of native and agricultural plants.



Ecosystem Services 101

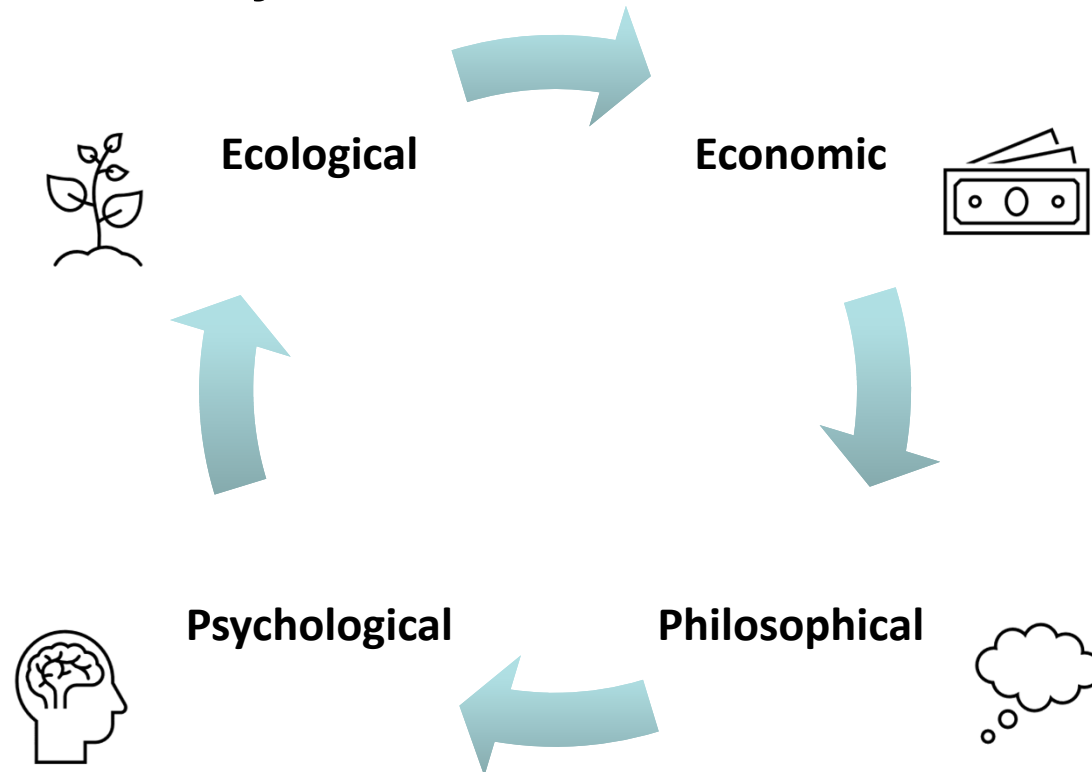
- Climate regulation
- Purification of water and air
- Soil formation
- Carbon storage and sequestration
- Nutrient dispersal and cycling
- Seed dispersal
- Waste decomposition and detoxification
- Crop pollination
- Pest and disease control
- Food, crops, and spices
- Forest products (i.e. timber)
- Pharmaceuticals
- Energy (i.e. hydropower and biomass fuels)

- Recreation
- Scientific discovery and education
- Aesthetic and spiritual value



Ecosystem Services 101

What is the value of ecosystem services?

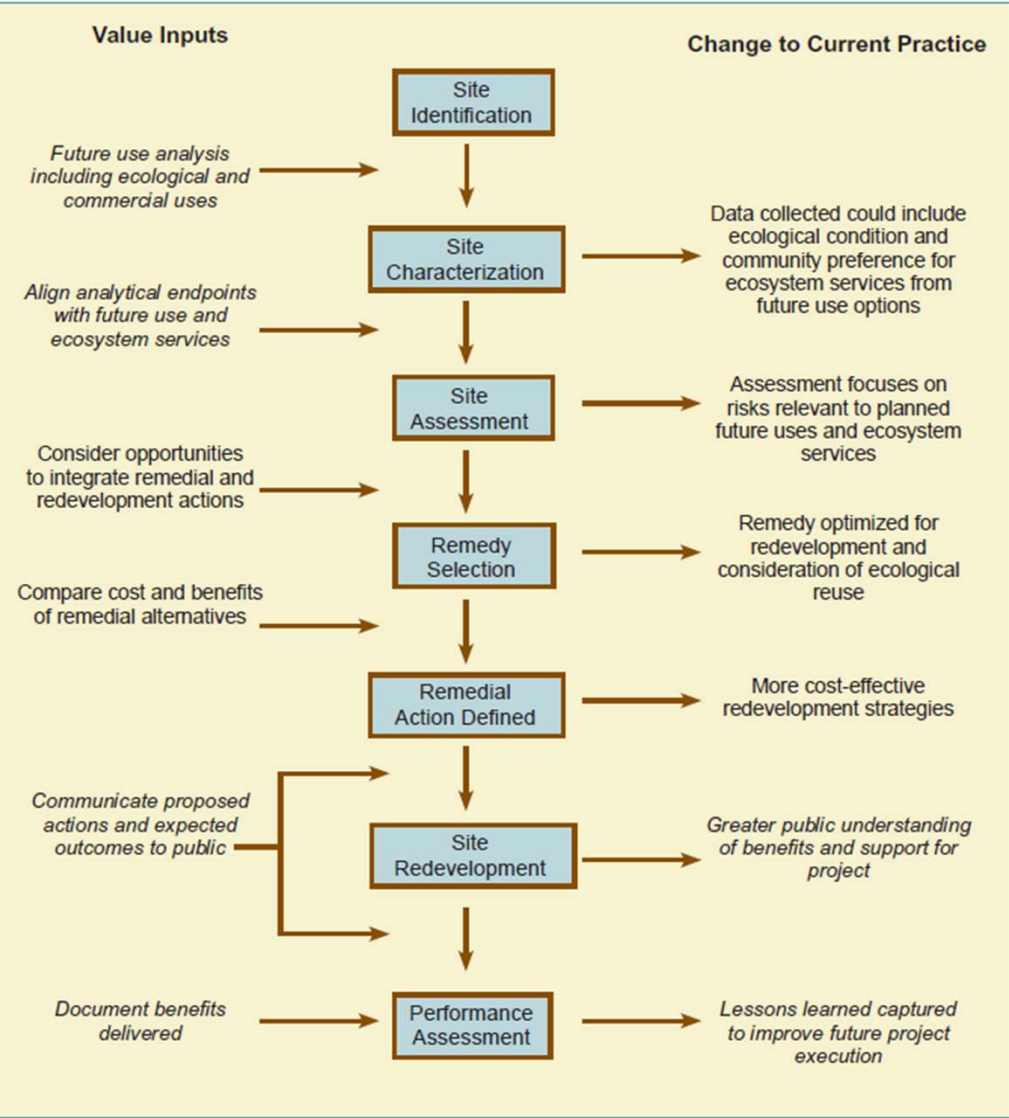


Ecosystem Services and Redevelopment

Integration of valuation information with the traditional remediation and redevelopment process

Valuing the Protection of Ecological Systems and Services: A Report of the EPA Science Advisory Board

[https://yosemite.epa.gov/sab%5Csabproduct.nsf/F3DB1F5C6EF90EE1852575C500589157/\\$File/EPA-SAB-09-012-unsigned.pdf](https://yosemite.epa.gov/sab%5Csabproduct.nsf/F3DB1F5C6EF90EE1852575C500589157/$File/EPA-SAB-09-012-unsigned.pdf)



A monarch butterfly with orange and black wings is perched on a cluster of small yellow flowers. The background is a dense thicket of green foliage.

EXAMPLES OF ECOSYSTEM SERVICES AT MINING SITES

Ecosystem Services Example: Fishing

California Gulch

Leadville, Colorado

- 18-square-mile area
- Heavy metal mining
- Contaminated soils and waterways
- EPA added the site to the National Priorities List (NPL) in 1983
- Cleanup actions across over 80% of the site, including the city of Leadville, are complete



Ecosystem Services Example: Fishing

California Gulch

Leadville, Colorado

- 2014 - Gold Medal Trout Waters designation
- 100,000 anglers in 2012
- Estimated \$7.6 million in total direct economic benefits and \$18.2 million in net economic benefits generated per year



Ecosystem Services Example: Erosion Control

Bunker Hill Mining and Metallurgical Complex

Shoshone County, Idaho

- 21-square-mile area
- Historic mining district
- EPA added the site to the NPL in 1983



Ecosystem Services Example: Erosion Control

Bunker Hill Mining and Metallurgical Complex

Shoshone County, Idaho

- Erosion can fill reservoirs and waterways with sediment, reduce water quality, and damage roads and structures
- Hillsides once devoid of trees
- Cleanup included planting of two million trees over 2,290 hillside acres
- Erosion control and pollinator habitat



Ecosystem Services Example: Pollinators

Palmerton Zinc Pile

Palmerton, Pennsylvania

- Zinc smelting resulted in area wide contamination
- 33 million tons of smelting waste
- Heavy metals contaminated dust, soil, shallow groundwater and surface water
- EPA added the site to the NPL in 1983



Ecosystem Services Example: Pollinators

Palmerton Zinc Pile

Palmerton, Pennsylvania

- 2009 - native insect pollinators in the United States produced crop benefits worth more than \$9 billion
- 450-acre native prairie and Lehigh Gap Nature Center
- Hummingbirds, bees, butterflies and other insects



Ecosystem Services Example: Timber

Black Butte Mine

Cottage Grove, Oregon

- 1880s – 1960s - Mercury mining
- Mining operations, tailings piles left at the site, and erosion from the site contaminated soil, sediment, surface water and groundwater with mercury and other toxic metals
- EPA added the site to the NPL in 2010



Ecosystem Services Example: Timber

Black Butte Mine

Cottage Grove, Oregon

- Site currently used for timber production
- 1997 study - Ecosystem goods and services generated by temperate and boreal forests had an annual global value of \$894 billion
- 2014 - 9,100 private businesses operated in the forestry and logging sector, employing over 38,000 people



Ecosystem Services Example: Water

Milltown Reservoir Sediments

Milltown, Montana

- 1860s until the late 20th century widespread mining activity
- Large areas of mining waste and contamination
- EPA added the site to the NPL in 1983



Ecosystem Services Example: Water

Milltown Reservoir Sediments

Milltown, Montana

- Improved water quality
- Carbon storage opportunities
- Increased resilience in the face of climate change threats
- Reduced risk for invasive species
- Site drinking water supply monitoring continues



Ecosystem Services Conclusion

Ecosystems services generate ecological, economic, philosophical, and psychological benefits.



<https://clu-in.org/ecotools/ecosystem.cfm>