Ecosystem Services: Facilitating Green Cleanups and The Beneficial Reuse of Contaminated Sites

United States Environmental Protection Agency

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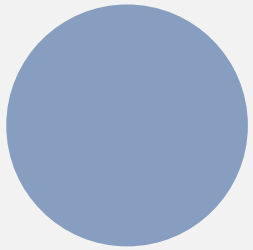
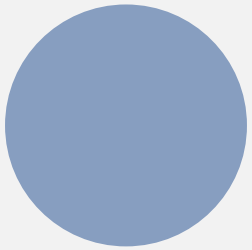
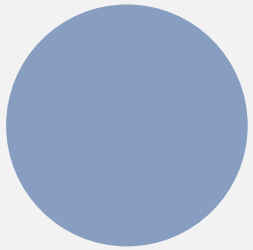
Presentation Overview



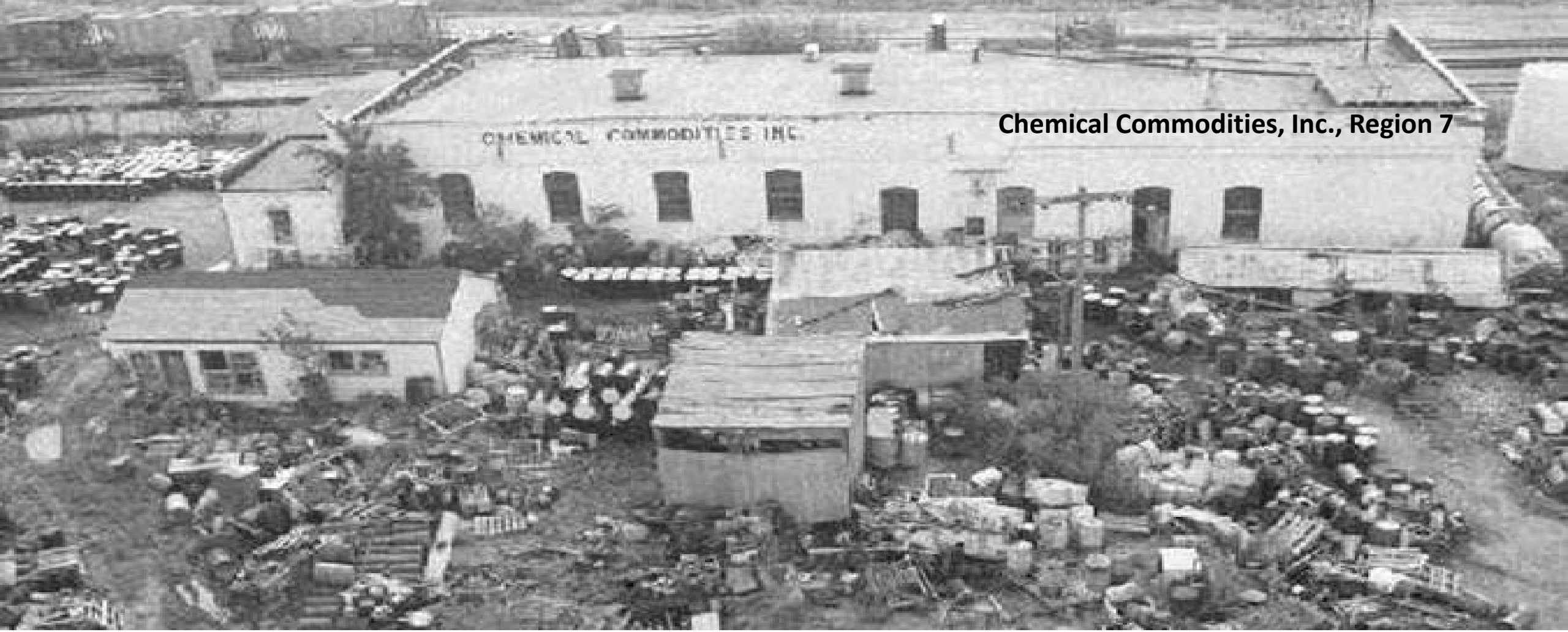
Introduction to EPA's role and mission



Considering ecosystem services as part of contaminated site cleanup



Case Studies on site cleanup and ecological reuse



Chemical Commodities, Inc., Region 7

EPA'S MISSION IS TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT.

Universe of Contaminated Properties

53% of the US population lives within 3 miles of one of these types of contaminated properties

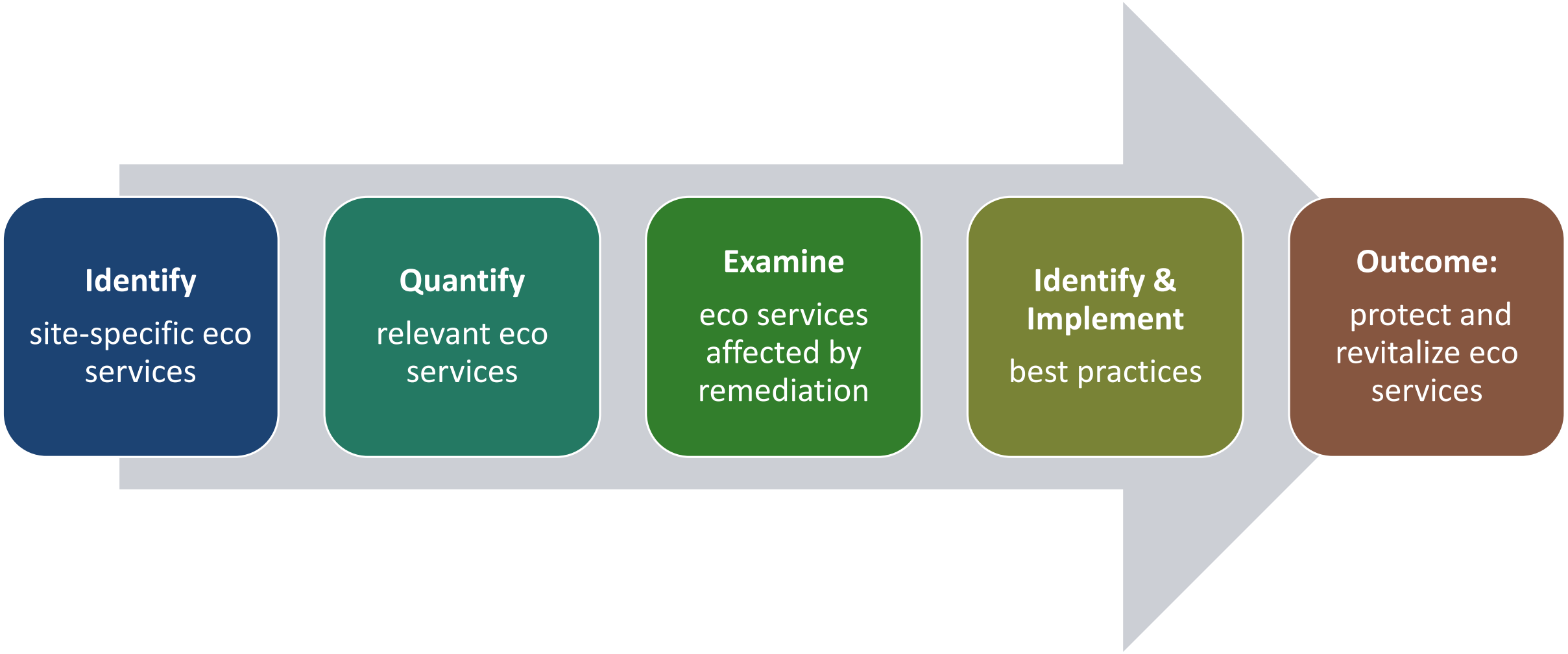
3,700 RCRA Corrective Actions

450,000 – 1 million Brownfields

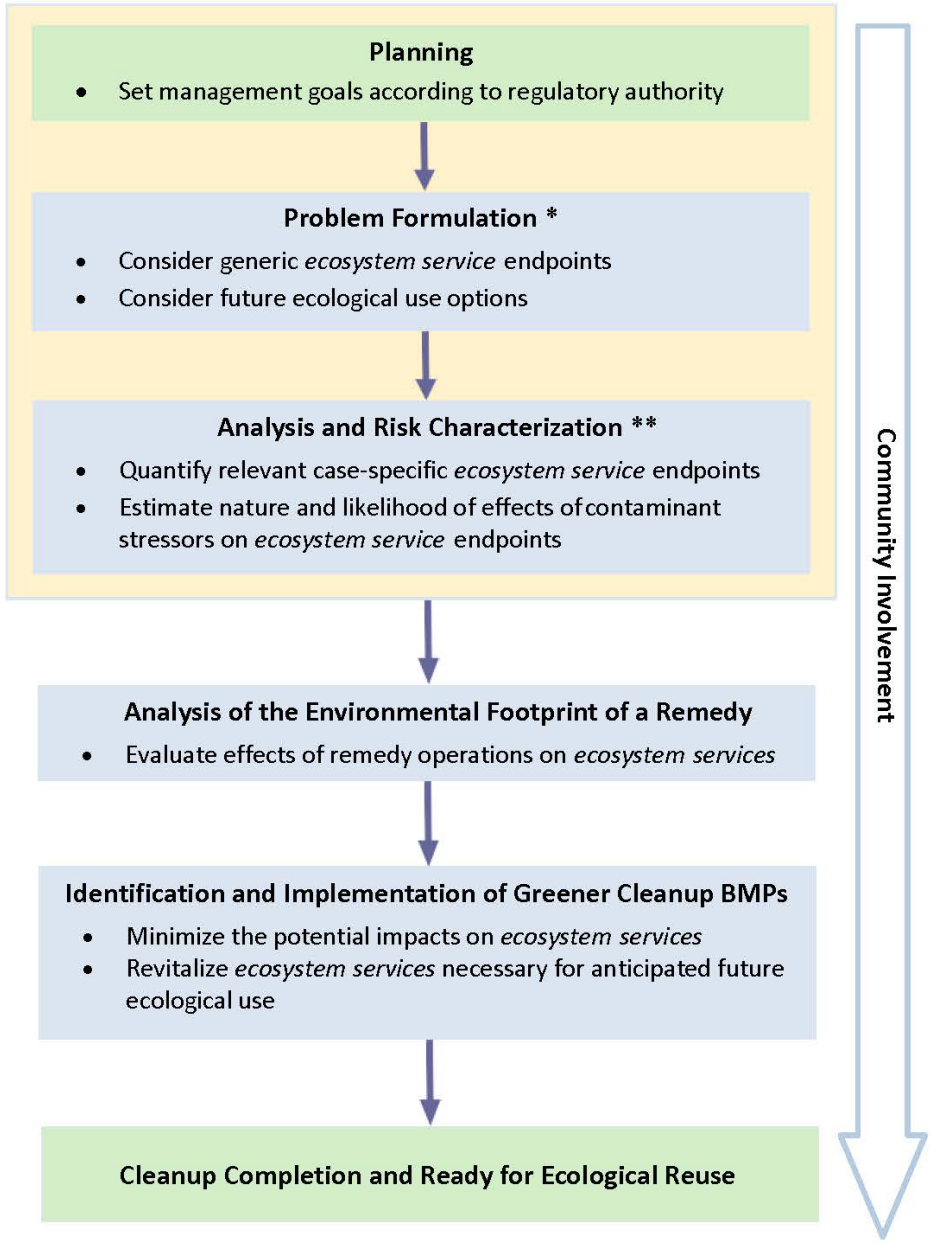
1,618 non-federal Superfund NPL sites

555,000 Underground Storage Tanks

Site Remediation & Ecosystem Services



Evaluation Framework



Incorporating Ecosystem Service Endpoints into the Cleanup Process

	Example Greener Cleanup BMPs	Example Ecosystem Services		
		Habitat	*Erosion Control*	*Recreation*
Site Assessment Phase	Consider and document property characteristics such as habitat connectivity, topography and site access.	✓	✓	✓
Remedial Phase	Design works zones, traffic plans and construction phases to avoid habitat disruption.	✓	✓	✓
	Retain existing habitat and vegetation, especially habitats with high ES value and large trees.	✓	✓	✓
	Eradicate invasive plant species on site and use control measures to prevent invasion of non-native plants.	✓		
	Place mulch and metal grates over traffic corridor surfaces.		✓	
	Construct long-term ecological structural controls such as bio-swales and vegetated riprap.	✓	✓	
	Plant regionally native vegetation and pollinator habitats on bare soil and caps.	✓	✓	✓

Ecosystem Services Tools

- Publicly available tools can be used to document and quantify ES at a cleanup site.
- Many ES evaluation tools exist for different ecosystems, levels of technical expertise, management questions, and anticipated outputs.
- EPA organized some of these tools base don their potential applicability to contaminated sites.
- Tools evaluated are presented in Appendix A of EPA's Issue Paper, "Ecosystem Services at Contaminated Sites"
  - Publicly assessible at no charge
  - Useful in any region of the US
  - Intended for use in land management
  - Outputs to share with general audience

Service Providing Area (SPA) Maps for St Louis River Bay Area of Concern (AOC)

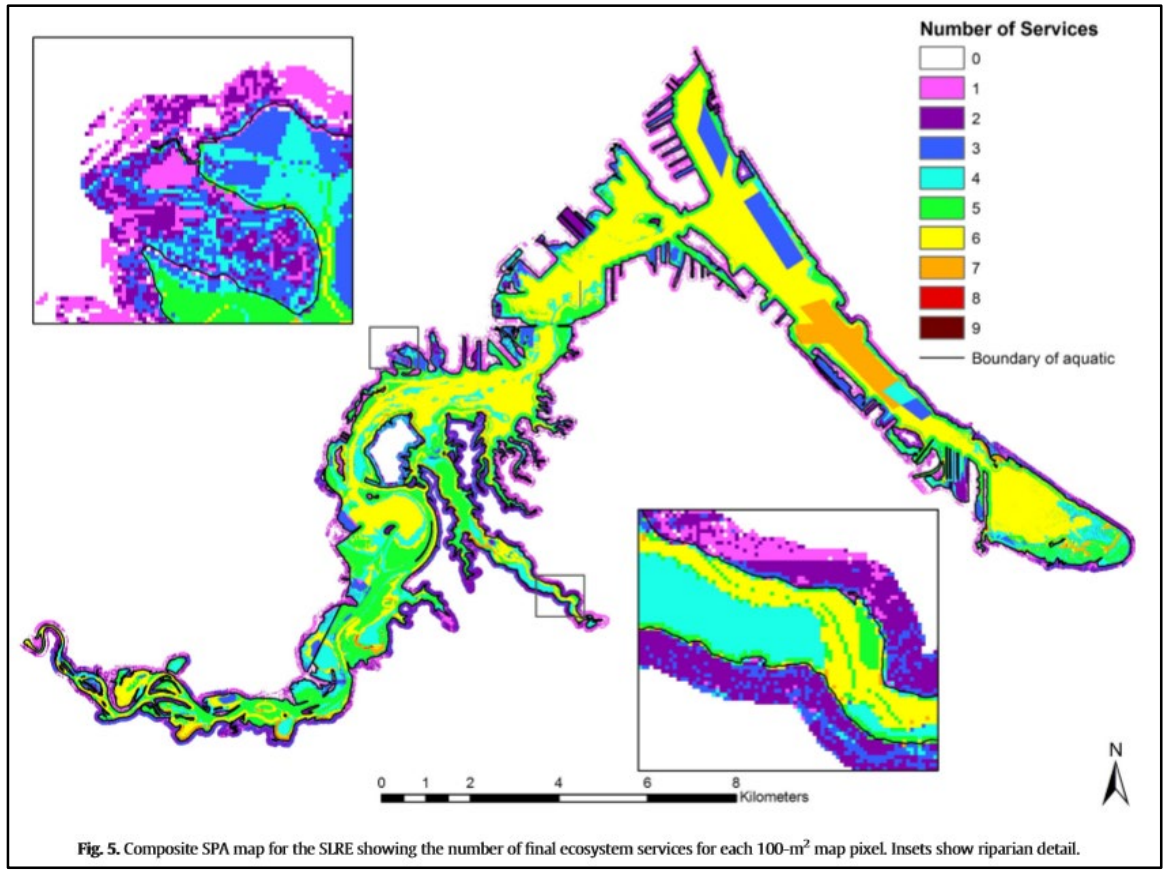


Fig. 5. Composite SPA map for the SLRE showing the number of final ecosystem services for each 100-m^2 map pixel. Insets show riparian detail.

Please cite this article as: Angradi, T.R., et al., Mapping ecosystem service indicators in a Great Lakes estuarine Area of Concern, J. Great Lakes Res. (2016), http://dx.doi.org/10.1016/j.jglr.2016.03.012

Ecosystem Service	Existing SPA (km2)	Alternative 8 SPA (km2)	Alternative 12 SPA (km2)
Bald eagles	0.08	0.02	0.03
Wild rice	0.09	0.08	0.21
Power boating areas	0.04	0.13	0.08
Riparian and semi-aquatic wildlife	0.04	0.04	0.05

Table 7 adapted: Mapped changes in SPA (km2) for ecosystem services responding to biophysical changes resulting from two remedial action alternatives. Angradi et al. 2016

Ecological Revitalization at Bayou Verdine

Co-Benefits of Cleanup

Beneficial Effects

- Reclaims lost land
- Provides important habitat
- Creates green space
- Protects water resources
- Improves property values
- Sequesters carbon
- Helps remove the stigma associated with formerly contaminated lands

Provisioning Services

Energy or materials outputs of an ecosystem that are consumed by humans

Phoenix-Goodyear Airport Area

Goodyear, Arizona

Regulating Services

Regulation of ecosystem processes to keep the environment stable and hospitable for habitation

Bunker Hill Mining & Metallurgical Complex

Shoshone County, Idaho

Cultural Services

Intangible, nonmaterial benefits that people enjoy from ecosystems

Indian Island/Tuluwat Village

Eureka, California

Summary

Evaluation of ES at a contaminated sites may help improve site management, communication with the public, and engagement with stakeholders.

- Engagement with the public and stakeholders about anticipated future ecological use.
- Communication of the societal relevance of ecological risk-based cleanups.
- Transparent documentation of the ecosystem conditions on the site before and after cleanup.
- Replicable, defensible selection of greener cleanup BMPs.

For more information

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Resources

- Technology Innovation and Field Services Division's Ecosystem Services Web area: https://clu-in.org/ecotools/ecosystem.cfm
- Superfund Redevelopment Initiative Ecological Reuse: https://www.epa.gov/superfund-redevelopment-initiative/superfund-sites-green-space-reuse
- Ecosystem Services at Superfund Sites: https://semspub.epa.gov/src/document/11/176440
- Ecosystem Services at Contaminated Site Cleanups: https://www.epa.gov/sites/production/files/2017-09/documents/ecosystem_services_at_contaminated_site_cleanups_ef_issue_paper.pdf