



# Demonstrating the Net Benefit of Site Cleanup: An Evaluation of Ecological and Economic Metrics at Two Superfund Sites

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Emergency Response, Policy Analysis and Regulatory Management Staff

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# Challenges in Assessing Benefits of OSWER Programs

- OAR & OW have legislative mandates
- In OSWER:
  - Data is limited, decentralized programs
  - Multimedia contamination
  - Ambient indicators challenge

# Science Advisory Board Input



- December 2002 SAB review
    - OSWER developed a set of potential methods for assessing costs and benefits of RCRA Subtitle C and waste minimization program, and UST cleanups.
    - Panel provided specific critiques on using standard toxicological benchmarks for assessing health effects, the use of stated preference techniques for valuation of groundwater cleanup, and valuing ecosystem impacts.
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# Additional Activities

- Ecosystem Service Benefits: applying the Millennium Assessment framework for analysis to reveal values of restored land.
- Participated in Wildlife Habitat Council workshop on case studies.
- Support for Committee on Valuing & Protecting Ecosystems (Science Advisory Board).
- Explorations for new benefits methods do not represent a change in policy.

# EPA Study - Benefits of Cleanup

- OSWER needs a way to demonstrate the benefits associated with its cleanup program
- Recent attempts have met with criticism (e.g., job creation) or have not shown benefits (e.g., housing prices)
- OSWER Benefits Quantification Study
  - EPA, CH2M HILL, Spatial Informatics Group, Marstel Day, Ronzone Consulting

# Project Scope

- Post-Remediation (“mature”) Sites
  - Homestead Air Reserve Base (HARB)
  - Rocky Mountain Arsenal (RMA)
  - For several metrics, quantify values for the “with” and “without” remediation condition...a NEBA with two alternatives

# Study Purpose



- Explore the ability of the metrics to demonstrate the benefits of site cleanup
- Identify and quantify new benefit streams
- Identify data gaps that could be addressed in the documentation process at active sites
- Understand more fully how these metric may be used at active sites to identify, prior to remediation, the cleanup and reuse alternatives that provide the greatest net environmental benefit

# Metrics

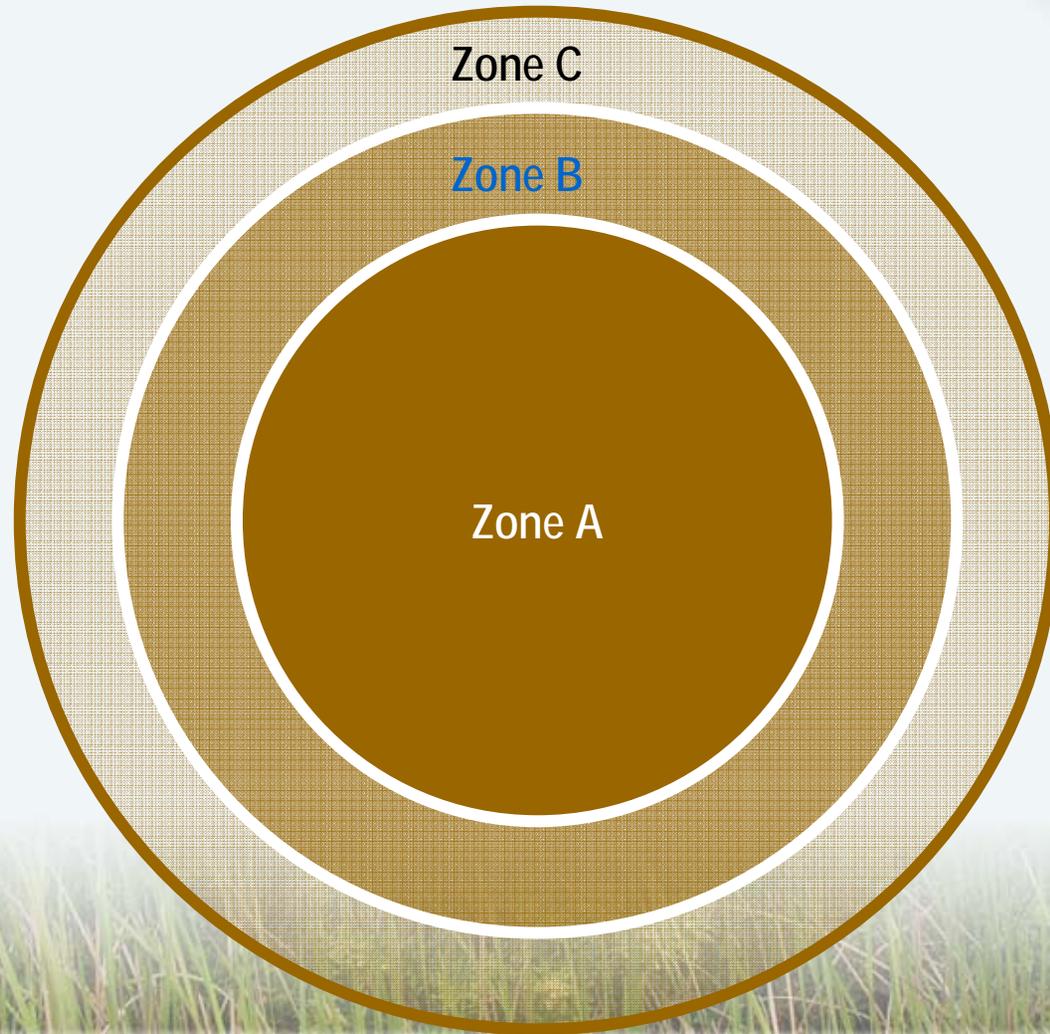


- Human Recreation Use Value - User Days (counts)
- Human Recreation Use Value - \$ (benefits transfer)
- Ecological Service Value - Service Acre Years-SAYs (habitat equivalency analysis-HEA)
- Ecological Service Value - \$ per acre (benefits transfer of habitat and human use values combined)
- Economic Measures - Property values, jobs, taxes, community benefits, secondary development effects

# Study Limitations

- All benefits likely not identified
- Some identified but not quantified
- For others, assumptions based upon professional judgment
- Not designed/conducted to:
  - Justify or debate the appropriateness of the remedies implemented or
  - Enable a comparison of the environmental benefits estimated for each site compared to the remedy costs
- Existence value not quantified

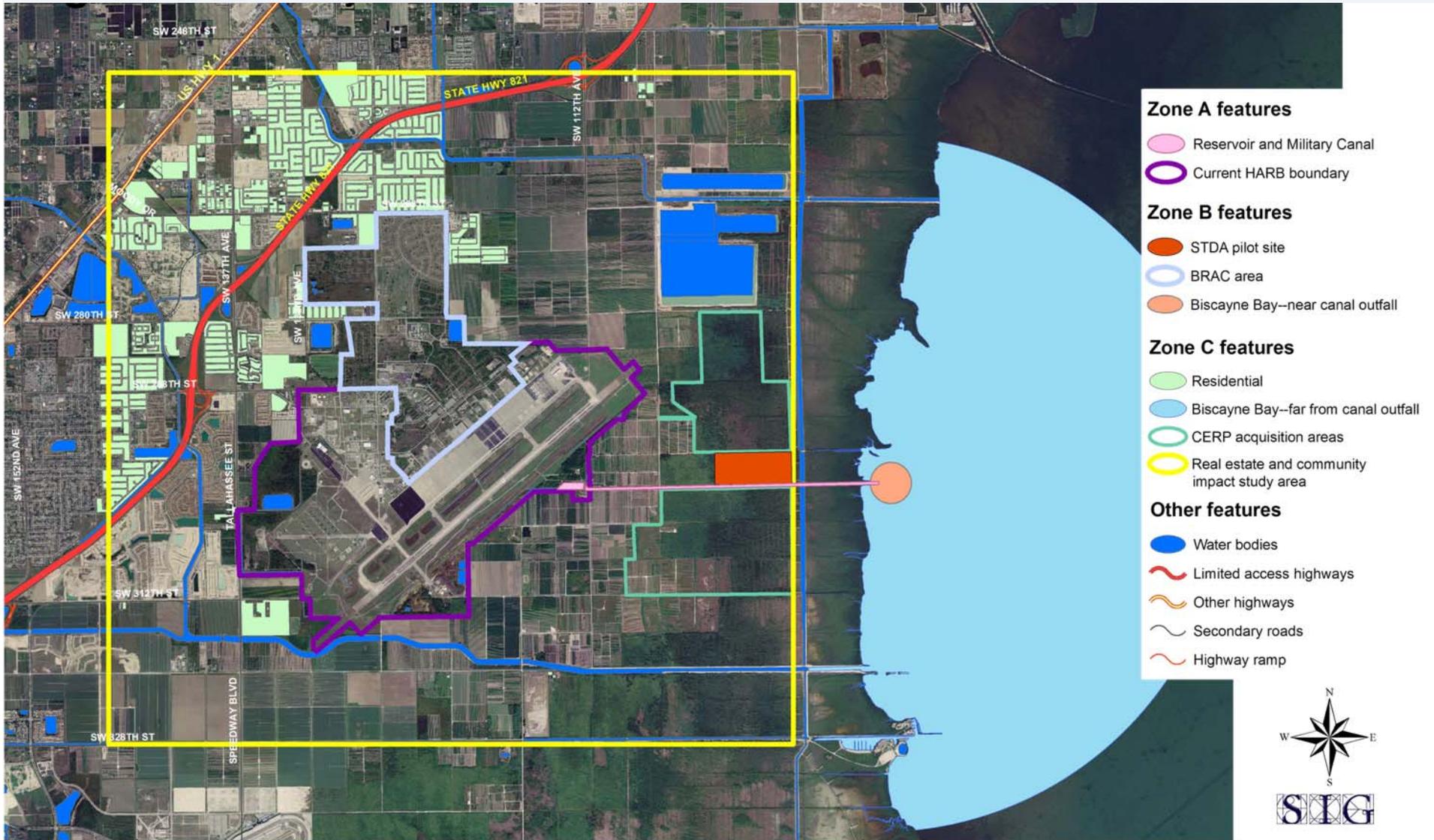
# Benefit Identification



# Homestead Air Reserve Base

- Miami Dade County, FL
- Former Air Force Base
- Currently covers 1,943 acres
- In 1994, ~1,000 acres transferred
- Various contaminated sites  
(POL, metals, sewage sludge ash disposal)
- Stormwater discharges to Biscayne National Park

# HARB



- Zone A features**
- Reservoir and Military Canal
  - Current HARB boundary
- Zone B features**
- STDA pilot site
  - BRAC area
  - Biscayne Bay--near canal outfall
- Zone C features**
- Residential
  - Biscayne Bay--far from canal outfall
  - CERP acquisition areas
  - Real estate and community impact study area
- Other features**
- Water bodies
  - Limited access highways
  - Other highways
  - Secondary roads
  - Highway ramp



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Image U.S. Geological Survey

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5°29'28.54" N 80°21'26.41" W

elev 0 m

2005

Eye alt 3.23 km



# Estimated Net Benefit Values for HARB



## Summary of Results for Homestead Air Reserve Base

Metric	Without Remediation	With Remediation	Net Benefit
Ecological Service Value (dSAYs)	209K	210K	≈1K
Ecosystem Service Value (\$)	\$474M	\$484M	\$9M
Human Recreational Use Value (\$)	\$231M	\$231M - \$242M	\$0.00 - \$12M
Real Estate and Community Impact Value (\$)			
Development Value *	--	--	\$32M
Job Growth and Tax Revenue *	--	--	\$61M

\* Values for with and without remediation were not calculated. Percent attribution to the cleanup was conservatively estimated after current/ projected value was established.

# Benefits Not Quantified

- Existence value
- Reduction in HH risk
- Coastal Everglades Restoration Program
- Future County Park

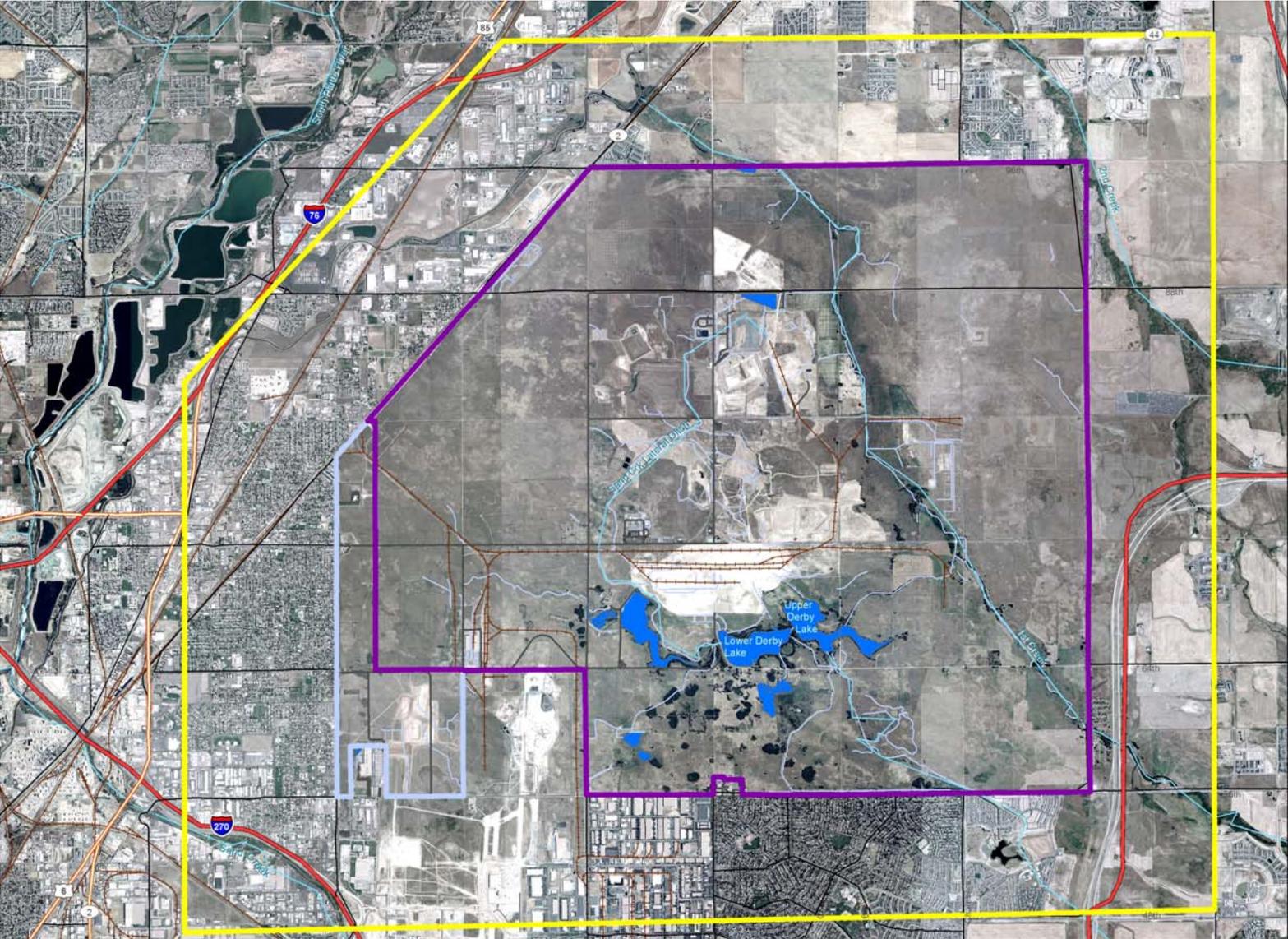


# Rocky Mountain Arsenal

- 10 miles NE of downtown Denver
- Established in 1942 to produce chemical warfare agents and munitions
- Some areas leased for production of pesticides
- 27 square miles
- Has become Rocky Mountain Arsenal National Wildlife Refuge



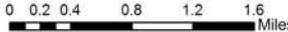
# RMA



- Zone A features**
-  RMA National Wildlife Refuge
- Zone B features**
-  Western Tier Parcel
- Zone C features**
-  Real estate and community impact study area
- Other features**
-  Limited access highways
-  Other highways
-  Secondary roads
-  Railroads
-  RMA roads
-  Streams and ditches
-  Water bodies



map produced by  
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# Estimated Net Benefit Values for RMA

## Summary of Results for Rocky Mountain Arsenal

Metric	Without Remediation	With Remediation	Net Benefit
Ecological Service Value (dSAYs)	132K – 213K	368K – 374K	160K - 237K
Ecosystem Service Value (\$)	\$21M	\$109M	\$88M
Human Recreational Use Value (\$)	\$16M - \$46M	\$189M - \$422M	\$172M – 376M
Real Estate and Community Impact Value (\$)			
Development Value*	--	--	\$540M
Job Growth and Tax Revenue*	--	--	\$350M

\* Values for with and without remediation were not calculated. Percent attribution to the cleanup was conservatively estimated after current/ projected value was established.

# Benefits not Quantified

- Existence Value
- Reduction in HH Risk
- Bison Genetic Preservation
- Transfer of Water Rights
- Perimeter Trail Human Recreational Use



# Metric Evaluation: Usefulness

- Tier I
  - Ecological Services (dSAYs)
  - Human Recreational Use Values (\$)
- Tier II
  - Real Estate and Development Value (\$)
  - Ecosystem Services (\$ per acre)

# Challenges

- The information needed is often collected during the cleanup process but not packaged for easy translation for some metrics
- Baseline habitat values necessary for ecosystem services
- Benefits transfer information for \$ per acre estimates thin for appropriate application
- Real estate and community benefits: hard to break out those values related to cleanup

# Conclusions

- The study was effective in understanding the ability of each metric to quantify the benefits of site cleanup
- The application of the metrics also helped to identify benefit streams and their relation to the remedy
- Translation of value to \$ is not always appropriate

# Important Points

- There is a growing consensus to consider ecosystem services associated with actions
- There is a need to quantify and maximize these ecosystem service values (e.g., demonstrate values to the public)
- Ecological and human use values provide value-added information in selection of alternatives
- NEBA is a tool that can be used to assist EPA in demonstrating transparency, clarity, and consistency in decision-making