**PDHonline Course C395 (3 PDH)**

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# Green Remediation

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**2020**

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## 2008 OSC Readiness Training:

# Opportunities for Green Remediation

Carlos Pachon & Myles Bartos

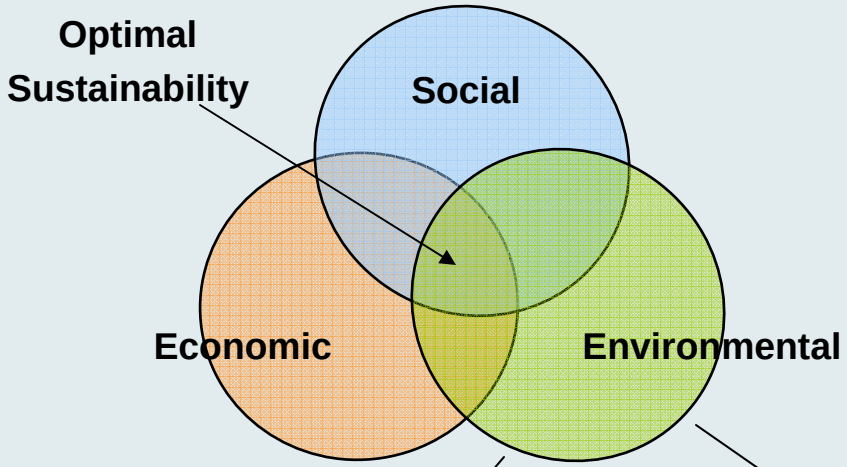
San Diego
February, 2008

# What is “Green Remediation”?

Working/draft definition of the term:

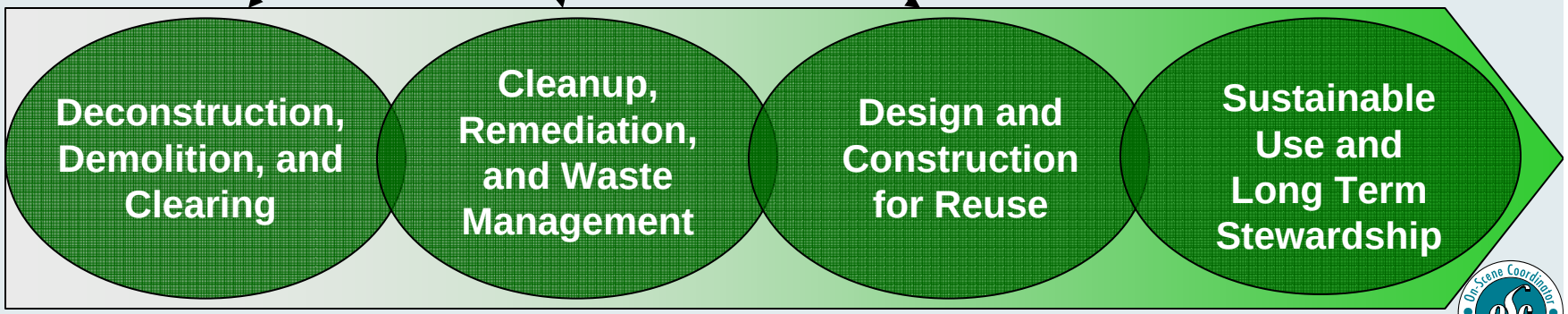
*Green Remediation - The practice of considering the environmental effects of a remediation strategy (i.e., the remedy selected and the implementation approach) early in the process, and incorporating options to maximize the net environmental benefit of the cleanup action.*

# Finding Sustainable Approaches Throughout the Site Cleanup & Revitalization Process

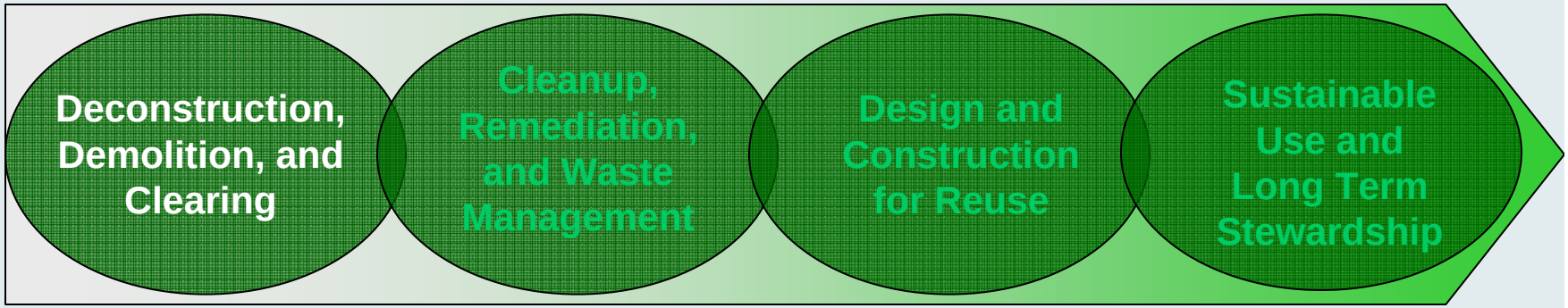



- Use resources wisely
- Consider the big environmental picture
- Integrate cleanup with reuse

**Opportunities to Promote Sustainability Exist in all Phases of Land Revitalization**



# Green Approaches; Deconstruction, Demolition, and Clearing

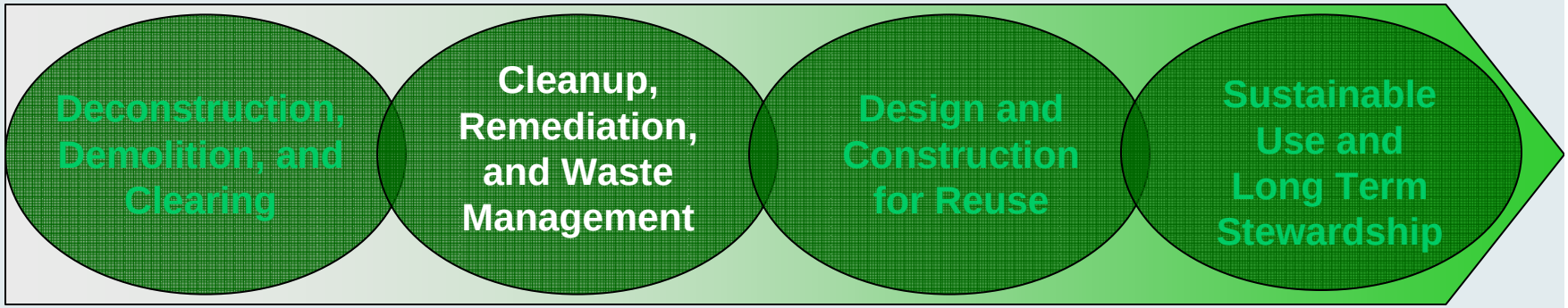



- Reuse/recycle deconstruction and demolition materials
- Reuse materials on site whenever possible
- Consider future site use and reuse existing infrastructure
- Use clean diesel and low sulfur fuels in equipment and noise controls for power generation
- Retain native vegetation and soils, wherever possible

# Green Remediation Approaches; Deconstruction, Demolition, and Clearing

- Ex: Reuse/recycle deconstruction and demolition materials

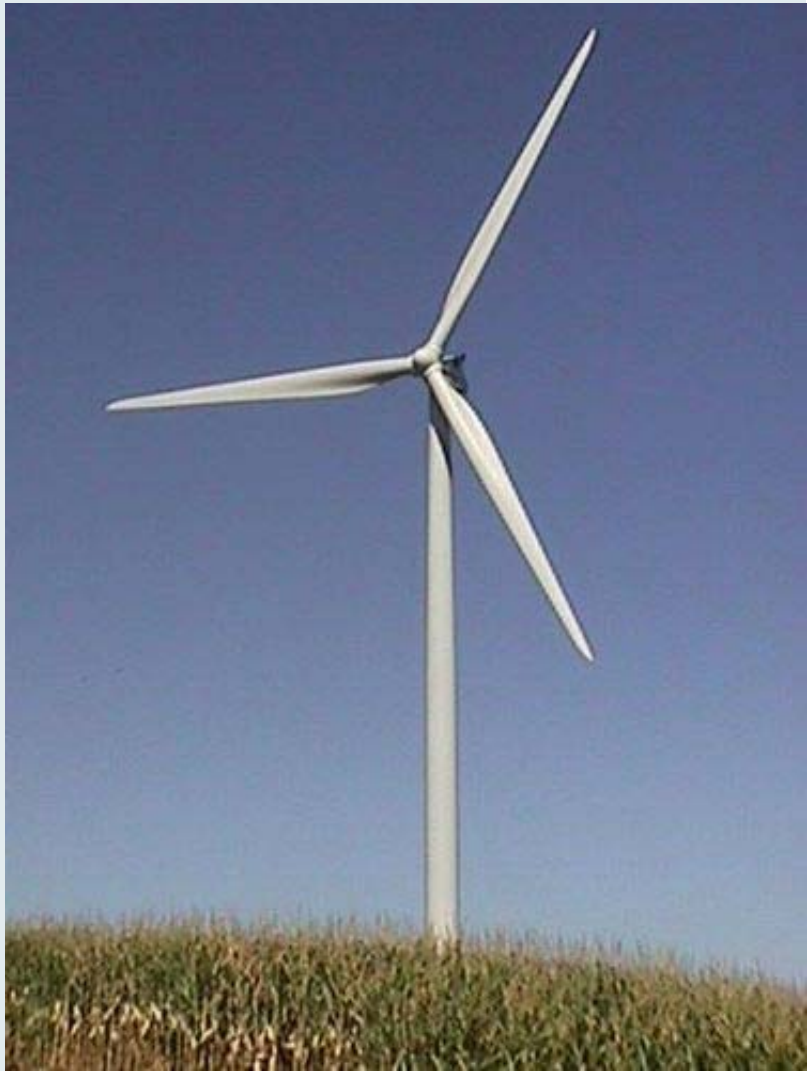
# Green Approaches; Site Cleanup Waste Management



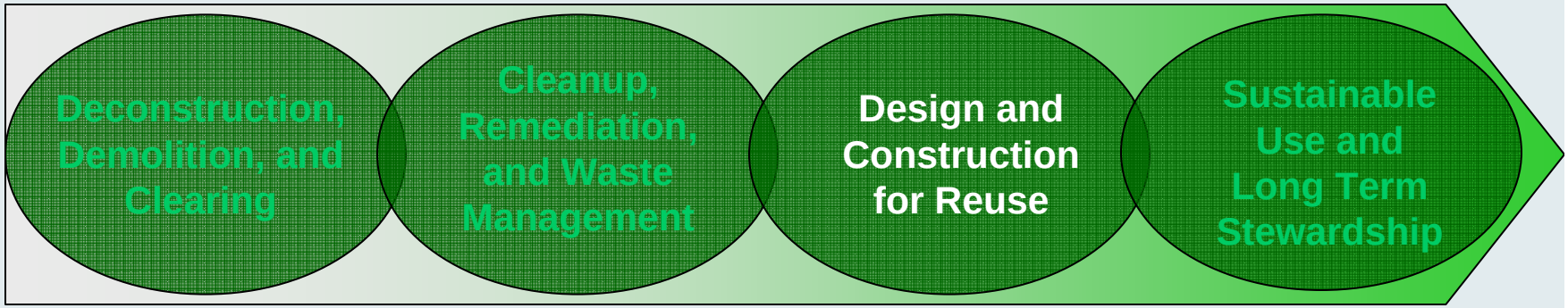

- Power machinery and equipment using cleaner fuels
- Use renewable energy sources, such as solar, wind, and methane to power remediation activities
- Improve energy efficiency of chosen remediation strategies
- Consider remediation approaches that reduce resource use
- Minimize impact on air, water, adjacent lands, and public health
- Incorporate remediation activities that sequester carbon, where applicable

# Green Approaches in Site Cleanup, Remediation, & Waste Management

- Ex: Power remedies with renewable energy, use clean diesel yellow equipment...



# Green Approaches; Design and Construction for Reuse

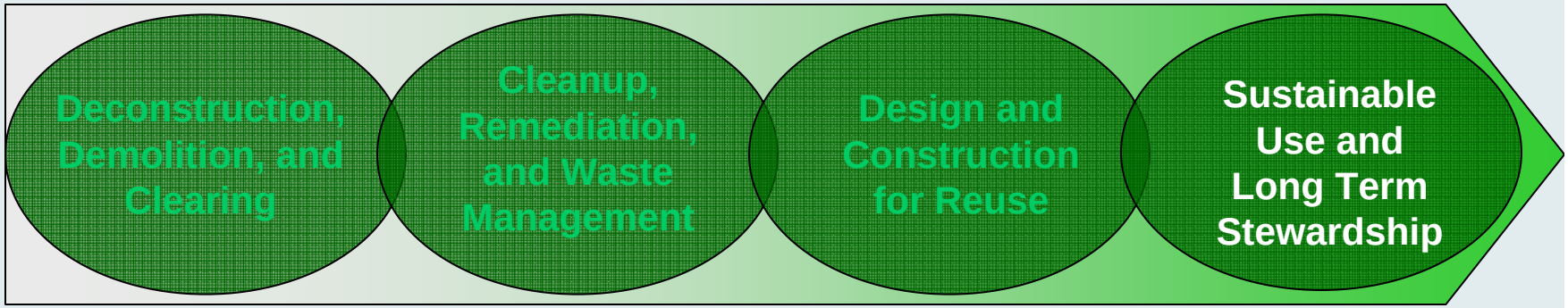



- Use Energy Star, LEED, and GreenScapes principles in both new and existing buildings
- Reduce environmental impact by reusing existing structures and recycling industrial materials
- Use natural systems to manage stormwater, like green roofs, landscaped swales, and wetlands
- Incorporate Smart Growth principles that promote more balanced land uses, walkable neighborhoods, and greater access to public transportation
- Create ecological enhancements to promote biodiversity and provide wildlife habitat

# Green Approaches;
# Design and Construction for Reuse

- Ex: Manage stormwater thru better site design, foster ecorestoration...


# Green Approaches; Sustainable Use & Long Term Stewardship




- Reduce use of toxic materials in manufacturing, maintenance, and use of buildings and land
- Minimize waste generation, manage waste properly, and recycle materials used/generated
- Monitor engineering and institutional controls on site
- Reduce water use by incorporating water efficient systems and use native vegetation to limit irrigation
- Promote energy efficiency and use of renewable energy
- Take appropriate steps to prevent (re)contamination

# EPA's Green Remediation Strategy

- Goal: Foster the adoption of greener remediation practices across cleanup programs

- Strategy
  - Benchmarking: State of the practice.
  - Identifying opportunities: Where can we improve?
  - Capacity building and networking practitioners
  - Creating "enabling" mechanisms

# Superfund Energy & Carbon Footprint Flash Analysis Findings[1]

| Remedy | Estimated energy use per year ($Kwh*10^6$) | Total energy use per year ($Kwh*10^6$) | Total carbon emissions per year[2] (Tons) | Total carbon emissions thru 2030 (Tons) |
|---|---|---|---|---|
| Pump &Treat | 402 | 7,669 | 275,592 | 5,253,256 |
| Soil Vapor Extraction | 16 | 121 | 8,264 | 82,840 |
| Multi-Phase Extraction | 32 | 383 | 16,334 | 262,519 |
| Air Sparging | 23 | 205 | 15,454 | 140,561 |
| Thermal Desorption | 48 | 1,944 | 11,018 | 1,331,790 |
| Total | | 10,322 | 326,662 | 7,070,966 |

1. Based on "average" projects with data from cost& performance case studies at www.frtr.gov among other sources.
2. Based on 1.37lbs of $CO_2$ emitted per Kw/h generated..

# Opportunities for Reducing Energy and Carbon Footprints

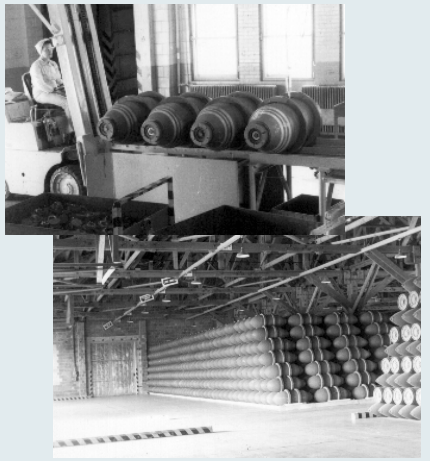
- Maximizing energy efficiency in site remediation projects
  - Optimization of existing treatment systems
  - Design evaluation
  - Upgraded equipment
- Securing alternative sources of energy
  - Solar, wind, landfill gas, biomass, geothermal, tidal/wave, cogeneration
  - Biofuels, as technology and availability evolve
- Benchmarking CO2 emissions
  - Opportunities for carbon credits?
  - Opportunities for carbon offsets?

# Benefits of Green Remediation Strategies

- Reduced impact on local environment, including air, water, and soil
- Increased energy efficiency resulting in lower carbon emissions
- Acceleration of ecosystem and biodiversity restoration
- Reduced long-term maintenance costs
- Immediate savings in utility costs

# Green Remediation Case Study: *Former Nebraska Ordnance Plant*

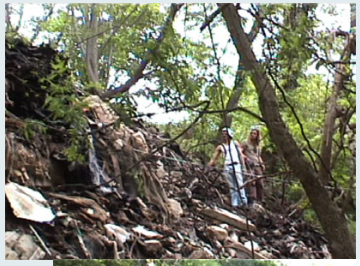
Background: 17,000-acre Superfund site in Mead, NE, that operated from 1942 to 1956 as a munitions production plant. High concentrations of TCE in groundwater.



Greener Remedy: *Integration of alternate source of energy*

- Use of 10-kilowatt (kW) wind turbine to power a groundwater circulation well for treating contaminated groundwater
- Monthly emissions of carbon dioxide averaged between 24 to 32% less during the grid inter-tie phase
- Average daily energy consumption from utilities decreased by 26% during the grid inter-tie phase
- Eliminated need for utility extension to remote area

# Green Remediation Case Study: *Rhizome Collective Inc. Brownfields Site*



http://rhizomecollective.org/node/8

Background: Brownfield in Austin, TX, with 5,000 cubic yards of illegally dumped debris.

Greener Remedy:

- *Green Building and Construction and Demolition (C&D) Practices*: Concrete was consolidated and used as fill for building infrastructure of new park
- *Energy Considerations*: Vegetable-oil fuel powered tractor removing debris
- *Ecological and Natural Remediation Technologies:* Bioremediation and phytoremediation broke down landfill contaminants; Constructed wetlands were installed for waste water treatment and storm water mitigation

# Green Remediation – Coming Soon from EPA

- Green Remediation website – February 2008

  http://cluin.org/greenremediation
- USACE-USEPA MOA GR language – February 2007
- Internet Seminar – April 2007
- Green Remediation Primer – April 2008
- RPM/OSC Toolkit for Green Remediation – June 2008
- Engineering Considerations for Reuse Planning – June 2008
- NARPm Green Remediation training for EPA RPMs – July 2008

# Upcoming BTSC Products

- Green Remediation Primer
  - Compile information on practices, experiences, and new opportunities
  - Encourage discussion early in remedy and redevelopment planning phases
  - Promote use of renewable energy and optimization of remediation systems
- Remedy Engineering Considerations for Reuse Planning Bulletin
  - Leveraging site assessment data collection to support redevelopment engineering data needs
  - Joint remedy engineering design and site reuse design and decisions to increase reuse flexibility, reuse structures, and avoid “re-opening” transition remedies
  - Long term sustainability of remedies & reuse

# Brownfields and Land Revitalization Technology Support Center

## www.brownfieldstsc.org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