

# Environmental Management at Operating Outdoor Small Arms Firing Ranges



**Mark Begley**

**Executive Director**

**Massachusetts Environmental Management  
Commission**

# Overview

---



- ▶ Interstate Technology Regulatory Council **(ITRC)**
- ▶ ITRC Operating Small Arms Range Manual
- ▶ ITRC Operating Small Arms Range Course
- ▶ Additional Resources

# Interstate Technology Regulatory Council Products

---

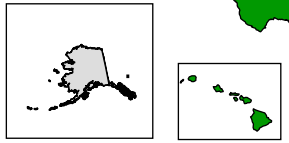
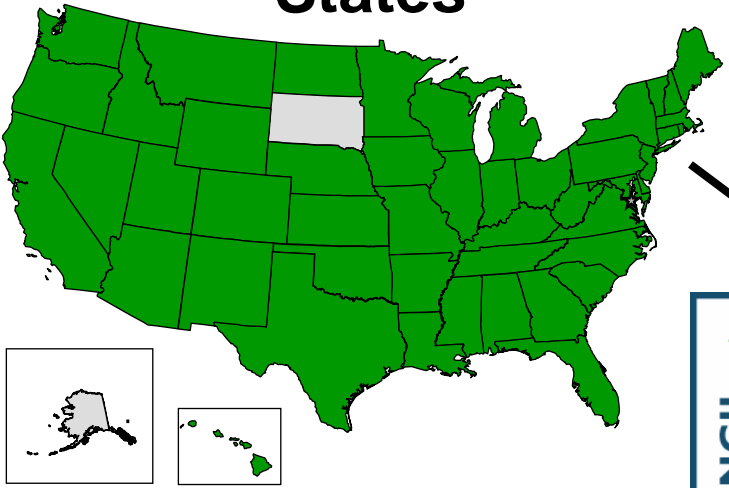


- ▶ Documents
- ▶ Training
- ▶ Information Network

# ITRC (www.itrcweb.org)



## States



■ ITRC Member States

## Federal Partners



DoD



DoE



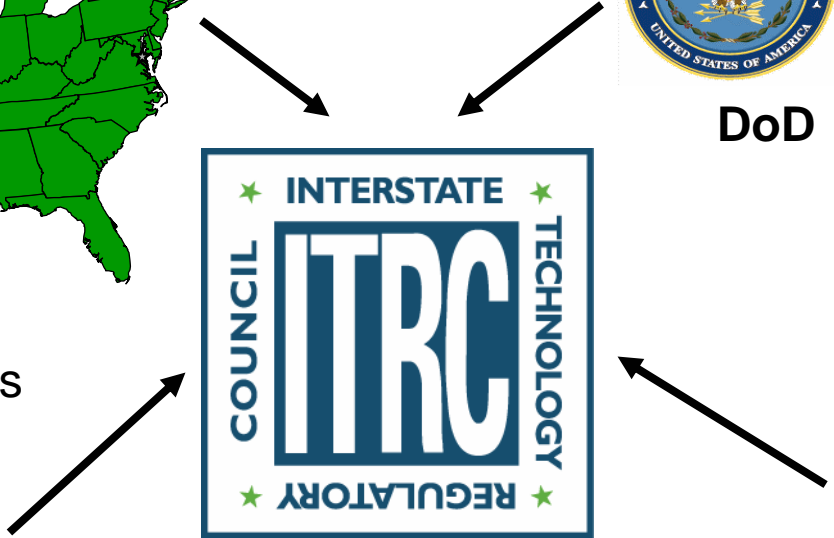
EPA



## Industry



## Stakeholders and Academics



# Management of Active Ranges vs. Remediation of Closed Ranges



- ▶ Two ITRC documents related to small arms ranges
  - **“Environmental Management at Operating Outdoor Small Arms Firing Ranges,” 2005**
  - “Characterization and Remediation of Soils at Closed Small Arms Firing Ranges,” 2003
- ▶ Environmental management of operating ranges and remediation of closed ranges are distinct topics with some shared elements

# Operating Outdoor Small Arms Firing Ranges



## Fact

- ▶ United States ranges
  - DoD - more than 2,000
  - Estimated 9,000 non-military
- ▶ Includes military, public safety, commercial, and recreational small arms ranges (rifle, pistol, and shotgun ranges)
- ▶ International Issue

## Key Concern

- ▶ Lead and other metals if left unmanaged:
  - can be transported into the environment
  - directly discharged into wetlands or water bodies

# Principles of Environmental Stewardship

## Employ practical means to -

- ✓ Minimize potential impact on human health and the environment
- ✓ Protect groundwater, surface water, wetlands, and wildlife
- ✓ Prevent erosion
- ✓ Manage sound

# Environmental Management Planning: Start



## Technical Guideline

### Environmental Management at Operating Outdoor Small Arms Firing Ranges



February 2005

Prepared by  
The Interstate Technology & Regulatory Council  
Small Arms Firing Range Team

**Establish and accept environmental  
stewardship principles**

**Understand your range environment**

**Delineate environmental issues**

**Select best management practices**

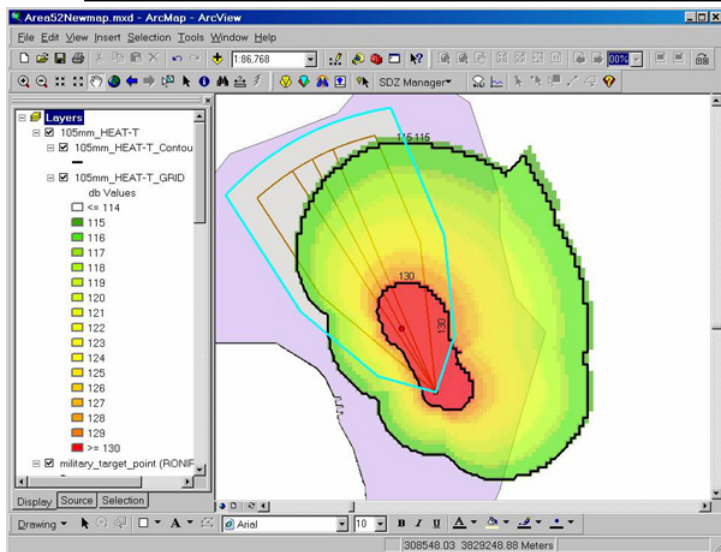
**Prepare and implement an  
environmental management plan**

**Monitor environmental conditions  
and revise plan as needed**

**Document implementation  
of plan activities**



# Environmental Management Planning: Evaluate



Establish and accept environmental stewardship principles

Understand your range environment

Delineate environmental issues

Select best management practices

Prepare and implement an environmental management plan

Monitor environmental conditions and revise plan as needed

Document implementation of plan activities

# Environmental Management Planning: Select & Implement

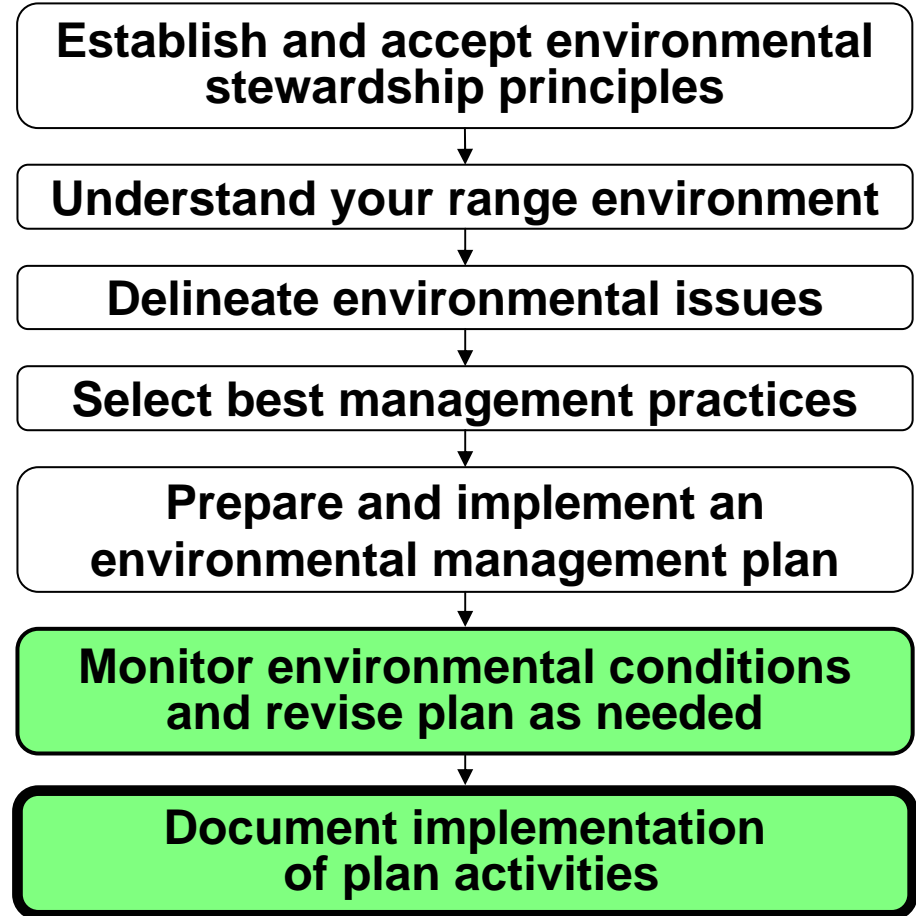
## Checklist for an Environmental Management Plan:

- Document baseline site conditions (photos, maps, descriptions, test results)
- Evaluate best management practices
- Select alternatives
- Schedule & Implementation



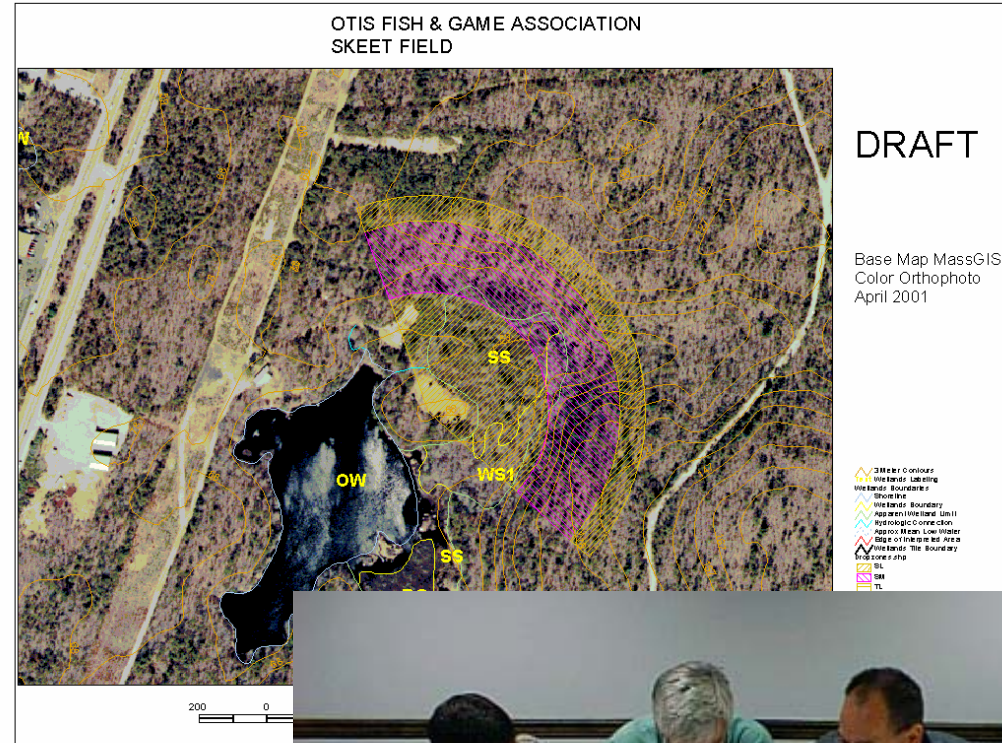
# Environmental Management Planning: Monitoring

- ▶ Monitor and evaluate whether
  - EMP is being implemented effectively
  - Adjustments must be made to the plan to achieve the desired goals
- ▶ Evaluate effectiveness relative to baseline conditions or most recent monitoring
- ▶ Quantitative and qualitative measurements can be used



# Site and Facility Characteristics – Information Relevant to a Baseline Evaluation

- ▶ Geology
- ▶ Soils
- ▶ Vegetation
- ▶ Topography
- ▶ Hydrology
- ▶ Wetland delineation
- ▶ Water quality
- ▶ Number of users, targets, ammunition types, operating hours, years in operation
- ▶ Site layout
  - Property boundaries
  - Target locations
  - Bullet/shot distribution
  - Aerial photographs



# Projectile Distribution

- ▶ Military / Public Safety
  - Range configuration depends on weapons and shooting scenario
  - Fixed distance/pop-up targets
- ▶ Recreational
  - Shotgun
    - Trap, skeet, and sporting clays
  - Rifle and pistol



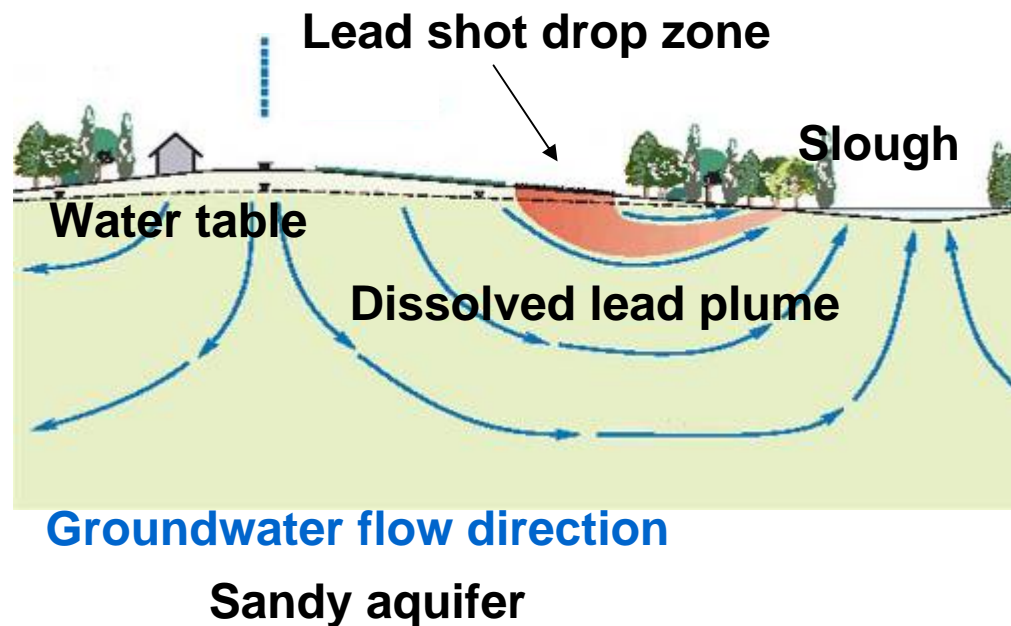
# Fate and Transport

- ▶ Mass
  - How much?
  - How distributed?
- ▶ Physical processes (surface water and air)
  - Bullet fragmentation
  - Wind transport
  - Water transport
- ▶ Chemical processes (principally vertical groundwater)
  - Dissolution - precipitation
    - pH
    - Redox
    - Sorption/desorption/crystallization



# Lead Dissolution

- ▶ Lead
- ▶ Resources potentially impacted
  - Groundwater
  - Surface water/ wetlands
  - Fish and wildlife
- ▶ Factors
  - pH
  - Redox
  - Sorption/desorption/  
crystallization



Taken from Soeder 2003, Groundwater Contamination from Lead Shot at Prime Hook National Wildlife Refuge, Sussex County, Delaware, USGS Water Resource Investigation Report 02-4282 ([http://md.water.usgs.gov/publications/wrir-02-4282/wrir\\_02\\_4282.pdf](http://md.water.usgs.gov/publications/wrir-02-4282/wrir_02_4282.pdf)). Not to scale.

# Identify Best Management Practices





# Proactive Lead/Soil Management

- ▶ Lead removal/recycling
  - Surficial lead build-up creates safety issue
  - Mechanized or hand sifting
  - Grading/slope maintenance
  - Prevent erosion/washout
  - Improve bullet capture
- ▶ Soil pH adjustment
  - Prevents lead dissolution
  - Ideal pH range – 6.5 - 8.5, adjust through amendment addition
- ▶ Chemical stabilization
  - Chemically binds dissolved lead





# Engineered Berms and Bullet Traps

- ▶ Typical soil berm minus rocks
- ▶ Ballistic sand (masonry sand)
  - Uses specifically graded sand
  - Simplifies maintenance
- ▶ Granular rubber
  - Same as ballistic sand, only uses granular rubber as ballistic material
  - Some brands allow tracers, automatic fire, other do not due to flammability of the ballistic media



- ▶ Maintenance consistent with earth berm
  - Periodic restoration to original dimensions
  - Proactive lead management
  - Storm water management

# Decision Tree

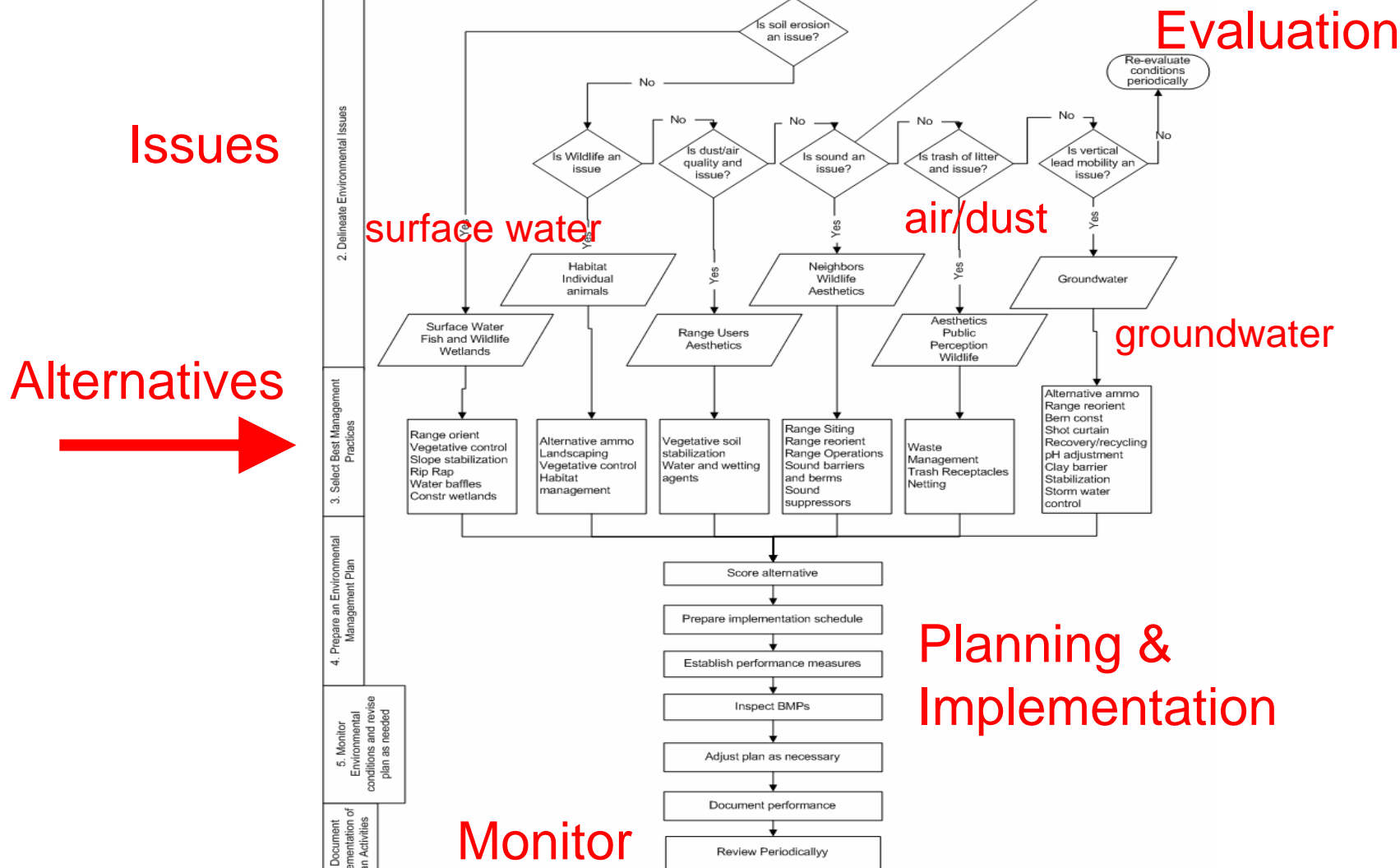


Figure 2-1

# This Environmental Management Approach is supported by:



- ▶ States
- ▶ DoD/Services
- ▶ Sporting Arms and Ammunition Manufacturers' Institute
- ▶ National Shooting Sports Foundation
- ▶ U.S. EPA



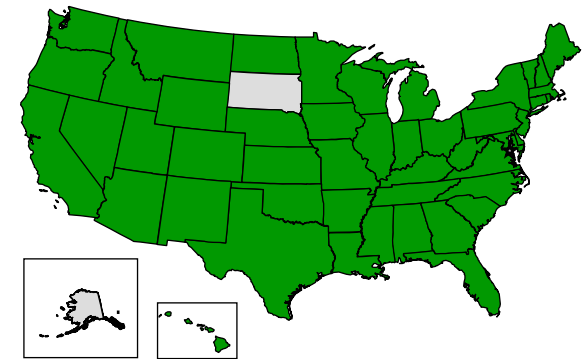
DoD



DoE



EPA



**Stakeholders  
and  
Academics**



# Archive of Training Seminar

---



<http://clu.in.org/live/archive.cfm>

On web page under ITRC; June 2005

Environmental Management Planning on Active Small Arms  
Firing Ranges

Archive of Jun 28, 2005 Seminar:

Three options:

- ▶ View archive online
- ▶ Download archive in PowerPoint® Slide Show format with embedded audio (36.1 MB/PPS)
- ▶ Download audio only in MP3 format (22.9 MB/MP3)

# Resources

---



## ► For More Information

- [www.itrcweb.org](http://www.itrcweb.org)
- Environmental Management at Operating Outdoor Small Arms Firing Ranges ([www.itrcweb.org](http://www.itrcweb.org)) under "Guidance Documents" and "Small Arms Firing Ranges."
- [Mark.Begley@state.ma.us](mailto:Mark.Begley@state.ma.us)  
(508) 968 5127