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Welcome – Thanks for joining us.
ITRC's Internet-based Training Program

Environmental Management at Operating Outdoor Small Arms Firing Ranges

ITRC Guidance for Environmental Management at Operating Outdoor Small Arms Firing Ranges

This training is co-sponsored by the EPA Office of Superfund Remediation and Technology Innovation

Small arms firing ranges are those ranges accepting 50-caliber or smaller non-exploding ammunition. The primary environmental concern is lead; however, there are other associated metals and a few organics to be considered where applicable. Range operators at military, law enforcement, commercial, and private ranges and the appropriate environmental professional who might be hired to manage a ranges' more complicated environmental issues should attend this Internet-based training on Environmental Management at Operating Outdoor Small Arms Firing Ranges (SMART-2, 2005). Government environmental professionals charged with preventing environmental impact and offering technical assistance to the community should also attend this training and refer to the guidance document whenever they encounter small arms range questions. Government environmental professional are encouraged to use the downloadable version of this training and the associated guidelines as an on-site training tool for range operators in their states and communities.

This training teaches the students that environmental management planning at small arms firing ranges is a method for pollution prevention. The training uses a logic diagram to describe the appropriate steps an environmental professional or range manager should use to establish an operational understanding of a range and the impact it can have on the environment if left unattended. It assists the user to define the environmental characteristics at a range that, left unattended, could potentially impact the environment. It lists the appropriate questions range operators should ask when evaluating the potential for environmental impact. As any potential for impact becomes apparent, the training briefly describes a variety of new and conventional technologies and techniques (i.e., 'best management practices') available to prevent environmental impact on the range. Finally, students will be able to understand range operations and monitoring that will, when appropriately designed, enable the range to operate cost-effectively without endangering the environment or the shooting enthusiasts, law enforcement officers, the military, or the public.

This guidance is a follow-up to ITRC's Characterization and Remediation of Soils at Closed Small Arms Firing Ranges (SMART-1, 2003), which addresses the cleanup of closed ranges (the remediation of former ranges so that the locations may be suitable for some other future use). It also includes an easy-to-follow decision process for determining the best remedial alternatives for lead and lead-contaminated soils at closed ranges.

ITRC (Interstate Technology and Regulatory Council) www.itrcweb.org

Training Co-Sponsored by: EPA Office of Superfund Remediation and Technology Innovation (www.clu-in.org)

ITRC Course Moderator: Mary Yelken (myelken@earthlink.net)

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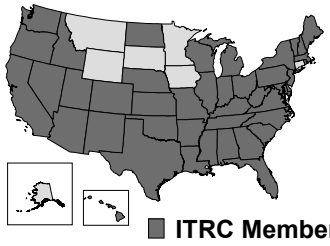
ITRC (www.itrcweb.org) – Shaping the Future of Regulatory Acceptance

- Network
  - State regulators
  - Federal government
  - Industry
  - Consultants
  - Academia
  - Community stakeholders
- Documents
  - Technical and regulatory guidance documents
  - Technology overviews
  - Case studies
- Training
  - Internet-based
  - Classroom

Host Organization ECOS

ITRC State Members



ITRC Member State

Federal Partners DOE EPA DOD

The Interstate Technology and Regulatory Council (ITRC) is a state-led coalition of regulators, industry experts, citizen stakeholders, academia and federal partners that work to achieve regulatory acceptance of environmental technologies and innovative approaches. ITRC consists of more than 40 states (and the District of Columbia) that work to break down barriers and reduce compliance costs, making it easier to use new technologies and helping states maximize resources. ITRC brings together a diverse mix of environmental experts and stakeholders from both the public and private sectors to broaden and deepen technical knowledge and advance the regulatory acceptance of environmental technologies. Together, we're building the environmental community's ability to expedite quality decision making while protecting human health and the environment. With our network approaching 7,500 people from all aspects of the environmental community, ITRC is a unique catalyst for dialogue between regulators and the regulated community.

For a state to be a member of ITRC their environmental agency must designate a State Point of Contact. To find out who your State POC is check out the "contacts" section at www.itrcweb.org. Also, click on "membership" to learn how you can become a member of an ITRC Technical Team.

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•We recommend you check with the local and state laws and experts.

•Although we discuss various technologies, processes, and vendor's products, we are not endorsing any of them.

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ITRC – Course Topics Planned for 2005

New in 2005

- Environmental Manag. at Operational Outdoor Small Arms Ranges
- Guidance for Using Direct-Push Wells
- What's New With In Situ Chemical Oxidation
- Mitigation Wetlands
- Permeable Reactive Barriers: Lessons Learn and New Direction
- Radiation Site Cleanup
- Unexploded Ordnance Site Investigation/Site Remediation
- More in development…….

Popular courses from 2004

- Alternative Landfill Covers
- Characterization and Remediation of Soils at Closed Small Arms Firing Ranges
- Constructed Treatment Wetlands
- Geophysical Prove-Outs
- Performance Assessment of DNAPL Remedies
- Radiation Risk Assessment
- Remediation Process Optimization
- Surfactant/Cosolvent Flushing of DNAPLs
- Triad Approach

Training dates/details at: www.itrcweb.org
Training archives at: http://cluin.org/live/archive.cfm

More details and schedules are available from www.itrcweb.org under "Internet-based Training."

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Environmental Management at Operating Outdoor Small Arms Firing Ranges

Presentation Overview

- Introduction
- Environmental stewardship principles
- Range environment
- Questions and answers
- Environmental issues
- Best management practices
- Environmental management plan, monitoring environmental conditions, and documentation
- Questions and answers
- Links to additional resources
- Your feedback

Logistical Reminders

- Phone line audience
  - ✓ Keep phone on mute
  - ✓ "*6" to mute, "*7" to un-mute to ask question during designated periods
  - ✓ Do NOT put call on hold
- Simulcast audience
  - ✓ Use  at the top of each slide to submit questions
- Course time = 2¼ hours

No associated notes.

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Meet the ITRC Instructors

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Aberdeen Proving Ground, Maryland
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bonnie.packer@aec.apgea.army.mil

Mike Warminsky
AMEC Earth & Environmental, Inc
Somerset, New Jersey
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Elizabeth Callahan is an Environmental Analyst with the Massachusetts Department of Environmental Protection. She has more than sixteen years of experience with in the agency's Bureau of Waste Site Cleanup, where she has managed state funded cleanups of hazardous waste sites and more recently served as the Bureau's policy branch chief, overseeing the development of regulations and guidance for Massachusetts' redesigned site cleanup program. Elizabeth currently coordinates the Massachusetts Lead Shot Initiative, a partnership with the shooting sports community that provides assistance to private and public range managers with implementing Best Management Practices to address environmental issues at shooting ranges. Elizabeth has a B.A. in Biology from Wellesley College and a Masters in Public Policy from Harvard University Kennedy School of Government.

Mark Begley is the Executive Director of the Massachusetts Environmental Management Commission at Camp Edwards on the Massachusetts Military Reservation. He is responsible for assuring that military training at Camp Edwards is compatible with environmental protection standards. Previously, Mr. Begley was Division Director of the hazardous waste site cleanup program at the Massachusetts Department of Environmental Protection. Mr. Begley developed the Massachusetts Lead Shot Initiative and managed the program for its first six years. Mr. Begley served as co-team leader on the ITRC's Small Arms Team and has assisted in the development of several leading publications on environmental issues at shooting ranges. Mr. Begley earned a Masters Degree in Environmental Engineering from the School of Engineering at Northeastern University.

Bonnie Packer has been working as a contractor for the US Army Environmental Center (USAEC) since 1996. She supports the USAEC's Acquisition and Technology Division, where she currently manages several projects for the government: the corrosion of unexploded ordnance in soil environments; munitions residues assessment; small arms range assessments; wear tolerant vegetation for arid training environments; and evaluating perchlorate treatment technologies. Many of her prior projects focused on small arms ranges, including the development of the Range Evaluation Software Tool, the Army Sampling and Analysis Plan for small arms ranges, and demonstration of several lead treatment and management technologies at Fort Rucker, Alabama. Bonnie also participates in the ITRC's perchlorate team. Before working on Army related projects, Bonnie worked on the Department of Energy's Yucca Mountain high-level nuclear waste disposal program, doing various analyses related to the safety of the waste repository. She has a MS (1985) and PhD (1990) in Geology from University of California, Los Angeles Department of Earth and Space Sciences, where her emphasis was on stable isotope geochemistry, stratigraphy and early life.

Michael F. Warminsky, PE., Technical Director and AMEC Range Program Manager, has over 23 years' experience in civil engineering, remediation, and construction. In these roles, he has extensive experience in identifying, developing, and managing multi-disciplinary range projects for Department of Defense (DoD) and law enforcement facilities, with the last 10 years dedicated to range sustainability, maintenance, and remediation. He is a licensed engineer, and holds both a BS/Civil Engineering (1981) and an MBA (1995) from Lehigh University.

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Operating Outdoor Small Arms Firing Ranges (SAFRs)

- Includes military, public safety, commercial, and recreational small arms ranges (rifle, pistol, and shotgun ranges)
- 50 caliber or less, non-exploding ammunition
- SAFRs in the United States
  - DoD oversees more than 3,000
  - In addition, there are an estimated 9,000 non-military SAFRs

No associated notes.

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Management of Active Ranges vs. Remediation of Closed Ranges

- **Today's topic** is environmental management of operating ranges, not the cleanup 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

No associated notes.

8

Key Concern

- Lead and other metals
  - If left unmanaged, can be transported into the environment
  - At some ranges, directly discharged into wetlands or water bodies

No associated notes.

9

What You Will Learn…

- Environmental stewardship principles
- Elements of environmental management
- Technologies and practices that can prevent environmental impacts
- Environmental management planning, implementation, and monitoring are part of routine range operations

No associated notes.

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Who Supports the Environmental Management Approach?

- States
- Military
- Sporting Arms and Ammunition Manufacturers' Institute
- National Shooting Sports Foundation
- U.S. EPA

States – Several states, including MA, FL and MI, are conducting outreach and providing technical assistance to shooting range managers to assist them in implementing environmental management plans.

Military - In April 2000, President Clinton signed EO 13148 "Greening the Government through Leadership in Environmental Management" that established a five-year Environmental Management System (EMS) implementation goal for all Federal Facilities. EO 13148 requires an EMS at all appropriate federal facilities by December 31, 2005. Developing and implementing an EMS is required at all Army installations. Evaluating and resolving environmental concerns associated with small arms ranges would be subject to the installation EMS. The International Organization for Standardization developed the ISO-14001 standard to provide a set of internationally recognized criteria for EMSs. The Army has chosen to use the ISO-14001 standard as a model for implementing EMSs at Army installations.

The Army has developed The Army Training Range Aspect and Impact Methodology to support and be an integral component of the installation-wide EMS. It provides appropriate, range-specific guidance on completing the assessment of environmental aspects and impacts and provides criteria to help characterize their relative significance. The methodology ensures that the installation's EMS addresses range environmental issues while focusing on its mission priorities.

Industry - The shooting sports industry has been one of the driving forces in promoting lead management at ranges. They wrote the first book (1997) on Environmental Stewardship have partnered with environmental agencies on outreach and technology development and have ongoing programs to educate range operators. In 2003, industry leaders (NSSF, NRA) signed a statement of principles on the industry's commitment to promoting environmental stewardship/BMPs at shooting facilities.

EPA – In 2001, EPA region 2 published Best Management Practices for Lead at Outdoor Shooting Ranges. This guidance was later adopted as national guidance by the agency. The guidance promotes the use of BMPs to manage the impact of lead projectiles in the environment.

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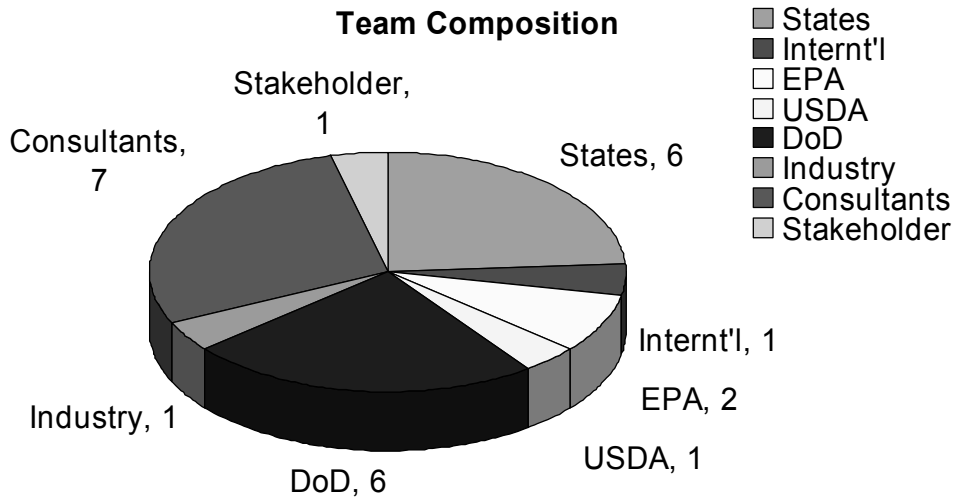
ITRC Small Arms Team Composition



Massachusetts
Washington
New Jersey
Texas
Colorado
Florida

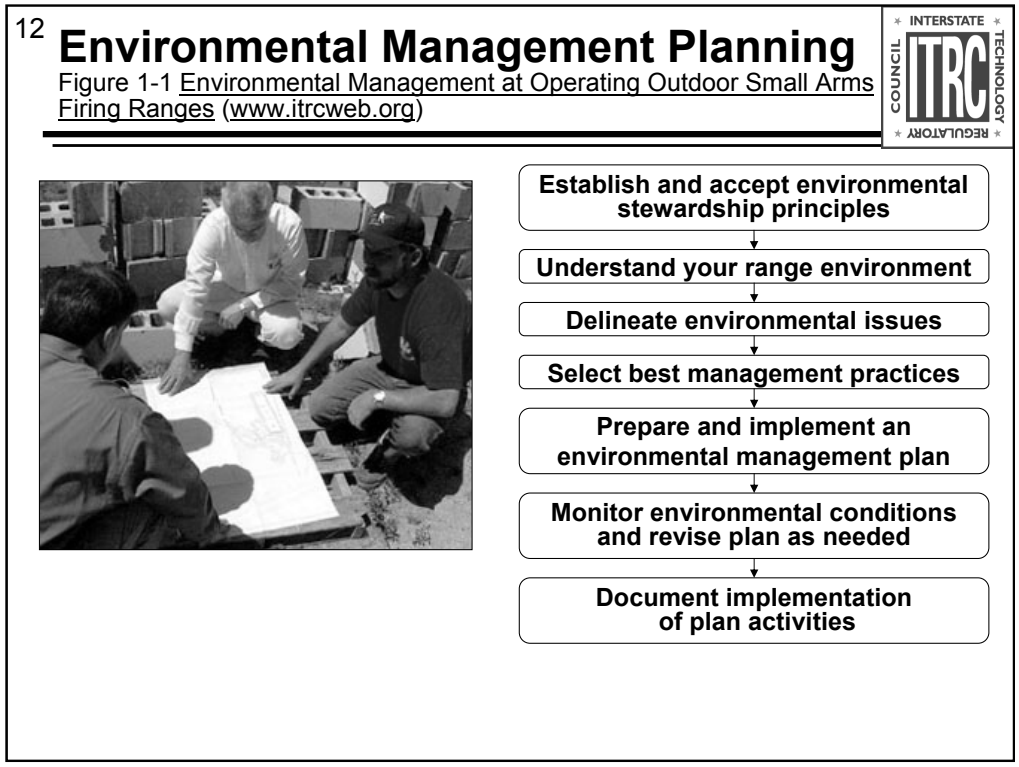


Figure 1-1 from ITRC's Environmental Management at Operating Outdoor Small Arms Firing Ranges (SMART-2, February 2005) available from the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Small Arms Firing Ranges."

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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**

Various states and local government have rules or ordinances controlling noise

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Regulatory Perspective

- Environmental management of SAFRs is pollution prevention
- RCRA applicability
  - At the time lead is discharged, it is not considered a hazardous waste because the lead is being used for its intended purpose
  - Once discharged, *if left unmanaged in the environment*, lead may be deemed "abandoned" and thus subject to RCRA
  - Lead that is recovered and recycled is considered scrap metal, not hazardous waste

EPA 2003 "Best Management Practices for Lead at Outdoor Shooting Ranges" (EPA-902-B-01-001 Revised March 2003 Region 2)

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Regulatory Perspective (continued)

- Other environmental laws
  - Clean Water Act
  - Wetlands protection laws (state)
  - Federal and state superfund laws
- Environmental management that includes effective technologies, practices, and documentation may help ensure that
  - Lead is not considered “abandoned”
  - A range operates in compliance with federal and state environmental laws

No associated notes.

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Potential Contaminants

Table 2-1 Environmental Management at Operating Outdoor Shooting Ranges (www.itrcweb.org)

Constituent	Comment
Lead	Primary projectile constituent
Lead Styphnate/LeadAzide	Primer constituent
Antimony	Increases hardness
Arsenic	Used to increase roundness of small shot
Tin	Increases hardness
Copper and zinc	Jacket alloy metal
Tungsten	Ammunition
Iron	Iron tips on penetrator rounds and steel shot
Cobalt and chromium	Some military rounds
Nickel	Coating improves shot performance; an alloy in center fire ammo
PAHs (Polycyclic Aromatic Hydrocarbons)	In limestone matrix of clay targets used at shotgun ranges

Arsenic – used In the production of small shot it increases the surface tension of dropped lead, thereby improving lead shot roundness

PAHs - Appears to be bound within the limestone matrix of the target. Concentration varies, but may be as high as 1000mg/kg. Manage as solid waste.

ITRC's Environmental Management at Operating Outdoor Small Arms Firing Ranges (SMART-2, February 2005) is available from the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Small Arms Firing Ranges."

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Baseline Range Conditions

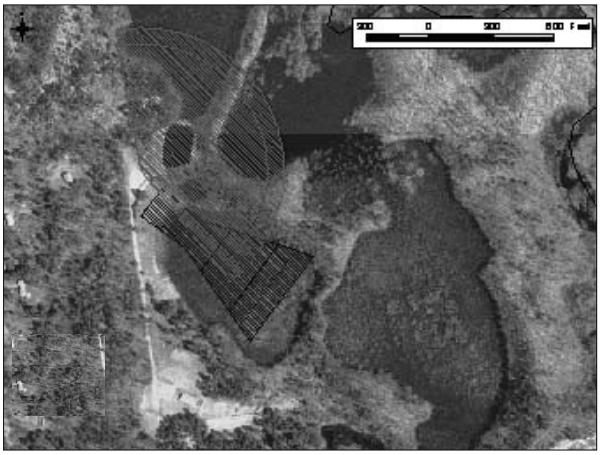
- Range-specific evaluation
- Evaluate
  - Distribution and approximate mass of potential contaminants
  - Fate and transport of potential contaminants
  - Potential exposure pathways and receptors

No associated notes.

18

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



No associated notes.

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Environmental Management Planning

- 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

No associated notes.

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Shot and Bullet Distribution

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

No associated notes.

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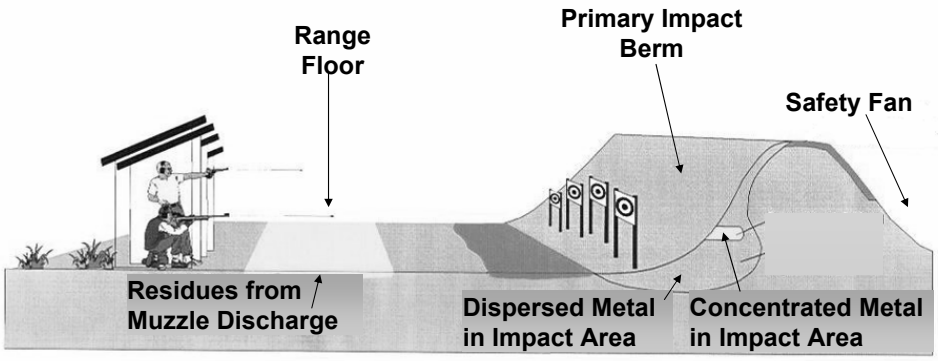
Characterization - Static Rifle and Handgun Range



Lateral Berm Not Shown

Refer to Figure 2-1 in the document

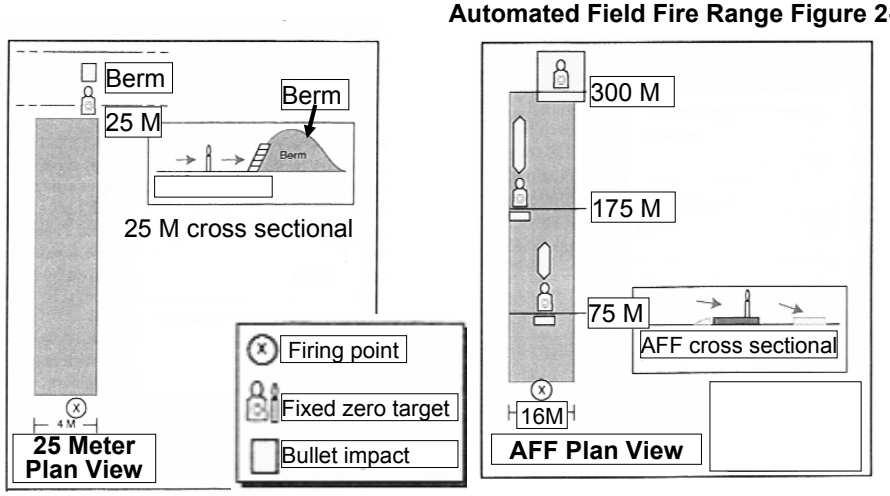
22

Berms, Bullets, and Target Placement

No associated notes.

23

Rifle/Pistol Range



Military 25 Meter Range Figure 2-4

No associated notes.

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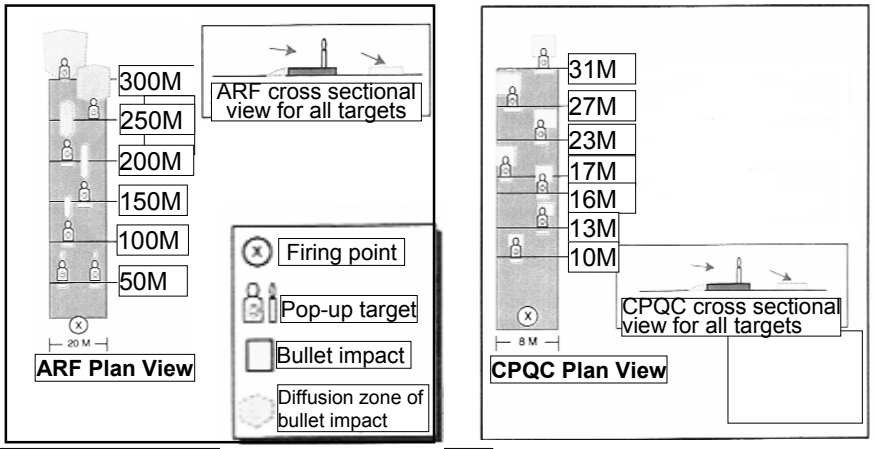
Rifle/Pistol Range (continued)

Combat Pistol Qualification Course Figure 2-7



Automated Record Fire Range Figure 2-6

ITRC's Environmental Management at Operating Outdoor Small Arms Firing Ranges (SMART-2, February 2005) is available from the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Small Arms Firing Ranges."

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Rifle/Pistol Range (continued)

No associated notes.

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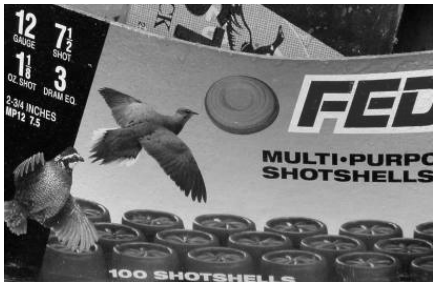
Shotgun Ammunition



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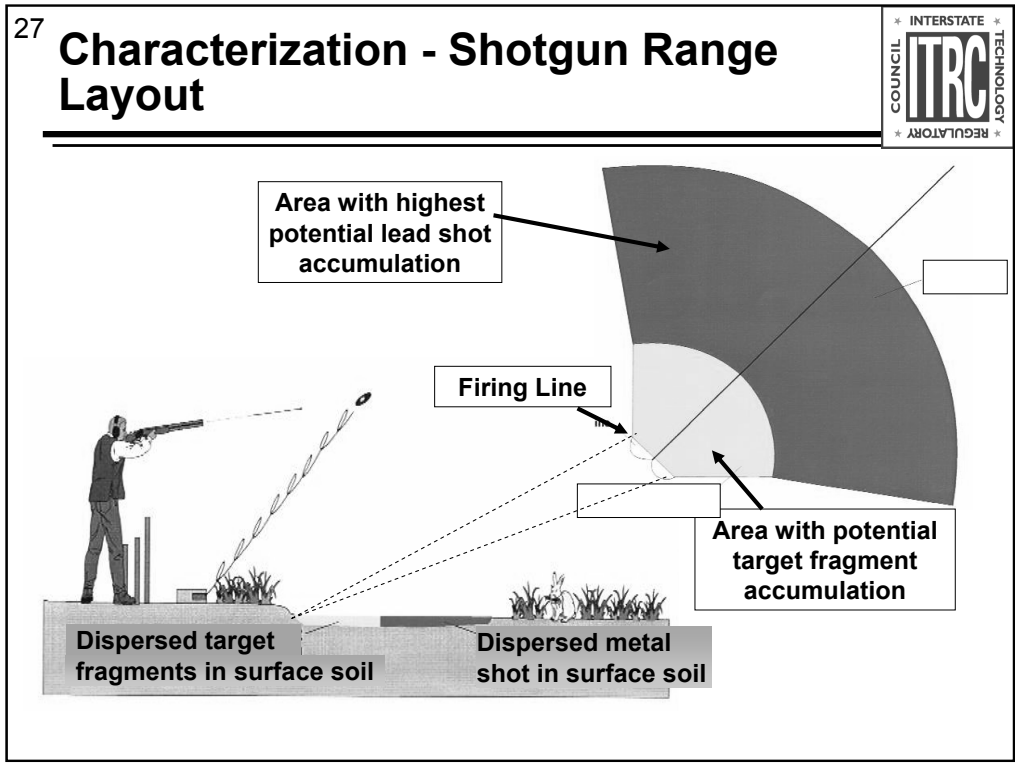

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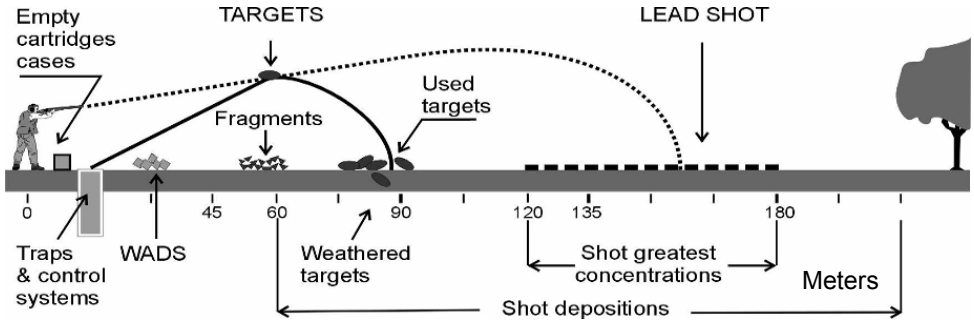
Cartridges, Clay Targets, and Litter



1 meter = 3.28 feet

No associated notes.

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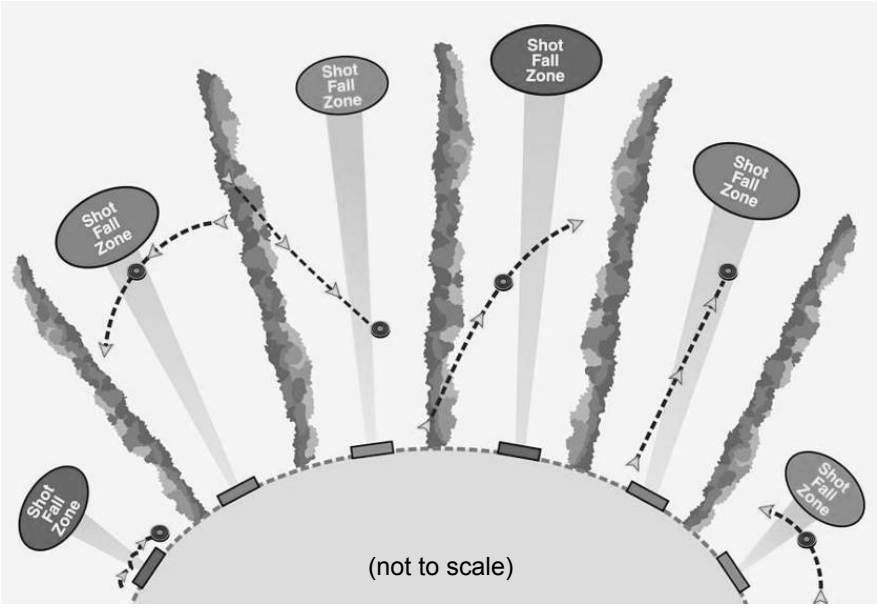
Sporting Clays Configuration (Traditional)



No associated notes.

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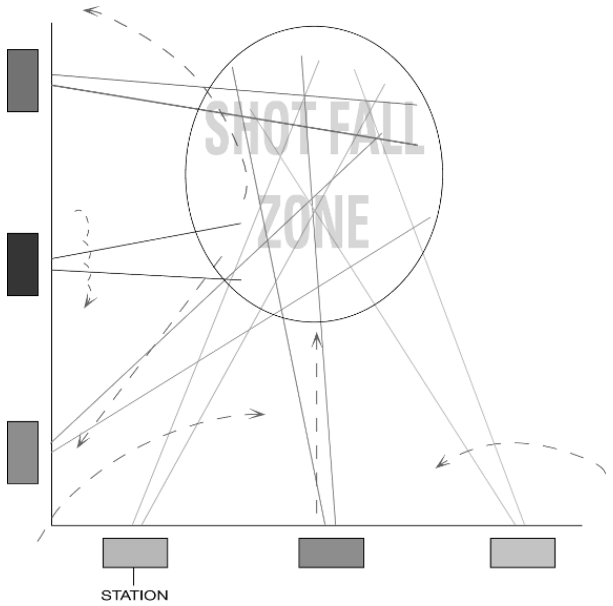
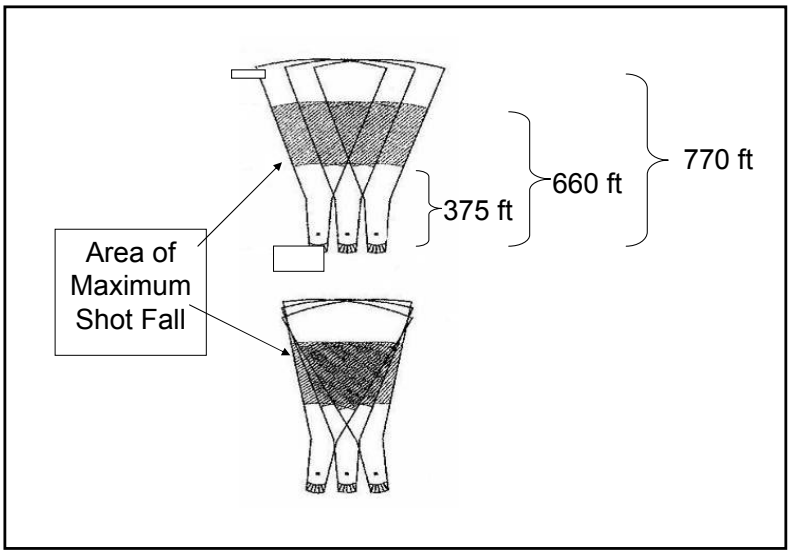
Sporting Clays Configuration (Ideal)



Traditionally Sporting Clays are configured randomly and have not allowed for concentrated shotfall. This diagram depicts retrofitted and new range configurations concentrating the shotfall.

31

Characterization - Trap Range Layout



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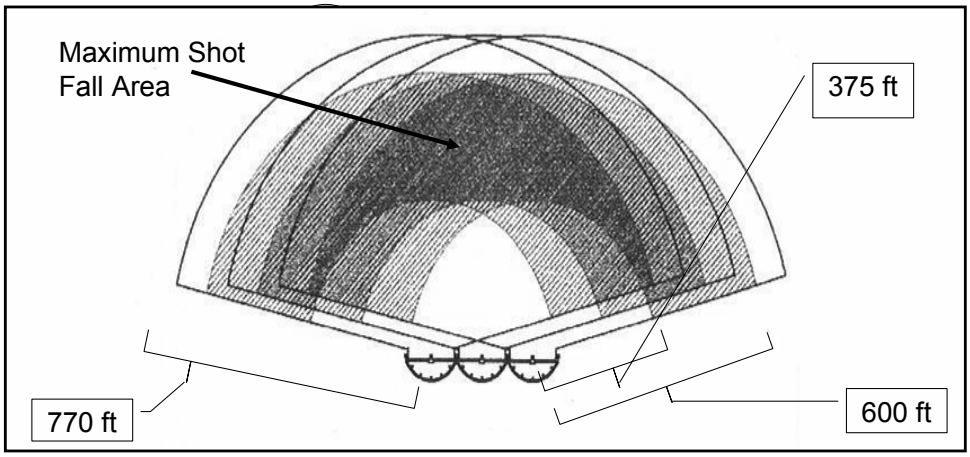
Characterization - Skeet Range Layout



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In Summary

- Range configuration is an important design parameter
- Helps define the range area where potential problems may occur
- Following the question and answer break, you will learn more about the physical and chemical characteristics of potential contaminants on a range

No associated notes.

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Questions and Answers

No associated notes.

35

Environmental Management Planning

- 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

No associated notes.

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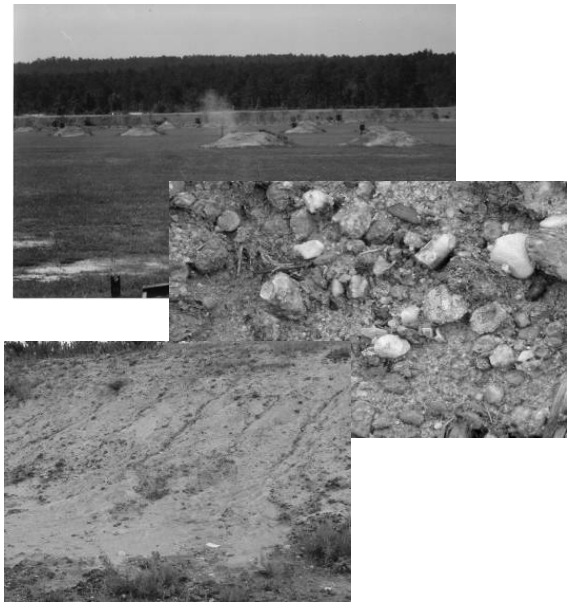
Fate and Transport

- 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



No associated notes.

37

Surface Water Particulate Transport

- Soil and/or lead
- Resources potentially impacted
  - Surface water quality
  - Fish and wildlife habitat
  - Wetlands
- Erosion factors
  - Particle sizes/masses
  - Rainfall intensity/ water velocity
  - Availability of particles to water

No associated notes.

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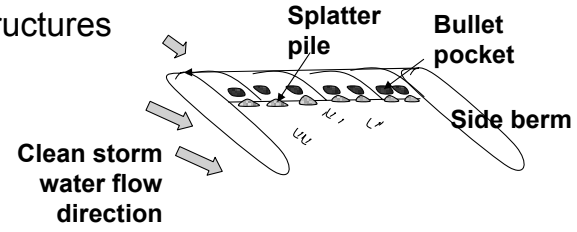
Surface Water Particulate Transport

- Options to manage (may need more than one)
  - Particle availability: vegetative control / soil amendments
  - Velocity: slope, rip-rap, water baffles, settling basing, range orientation, side berms
  - Lead mass by periodic removal
  - Containment structures



No associated notes.

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Air Particulate Transport

- Soil and/or lead
- Resources potentially impacted
  - Surface water quality
  - Grazing and wildlife habitat
  - Aesthetics
  - Range workers
- Erosion factors
  - Particle sizes/masses
  - Air velocity
  - Availability of particles to wind

No associated notes.

40

Air Particulate Transport

- Options to manage (may need more than one)
  - Particle availability: vegetative control / soil amendments
  - Velocity: windbreaks (trees, brush, berms), range orientation
  - Lead mass by periodic removal
  - Containment structures

No associated notes.

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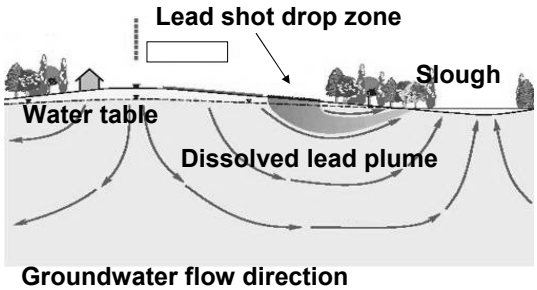
Lead Dissolution

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



Conceptual model of groundwater flow in an area of shallow groundwater, permeable soil and low pH. 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). Not to scale.

No associated notes.

42

Lead Dissolution

- Options to manage (may need more than one)
  - pH amendments: carbonate, phosphate
  - Stabilization
  - Sorption to retard vertical movement: e.g. clay barrier
  - Alternative ammunition
  - Lead mass by periodic removal
  - Containment structures

No associated notes.

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Additional Issues

- Exposure
  - Range workers
  - Patrons/shooters
  - Off-range: plants, foraging animals, waterfowl, grazing livestock

No associated notes.

44

Additional Issues

- Shooting sound
  - Resource impacted: neighbors
  - Management techniques
    - Range orientation
    - Range operations
    - Sound barriers and berms
    - Sound suppressors (military and law enforcement)
- Trash, litter, and debris
  - Resource impacted
    - Aesthetics
    - Public perception
    - Wads may be a source of lead residue
    - Target waste
  - Management techniques
    - Routine collection and disposal
    - Trash receptacles
    - Netting to capture windblown litter
- Unexploded ordnance (UXO) management

No associated notes.

45

In Summary

- Mass
- Surface water
- Groundwater
- Air

- **Control lead and keep it on the ranges**

Mass

- How much?
- Distribution

Surface water

- Rain fall
- Distance from range to a stream
- Orientation/vegetation

Groundwater

- Soil characteristics
- Distance
- pH

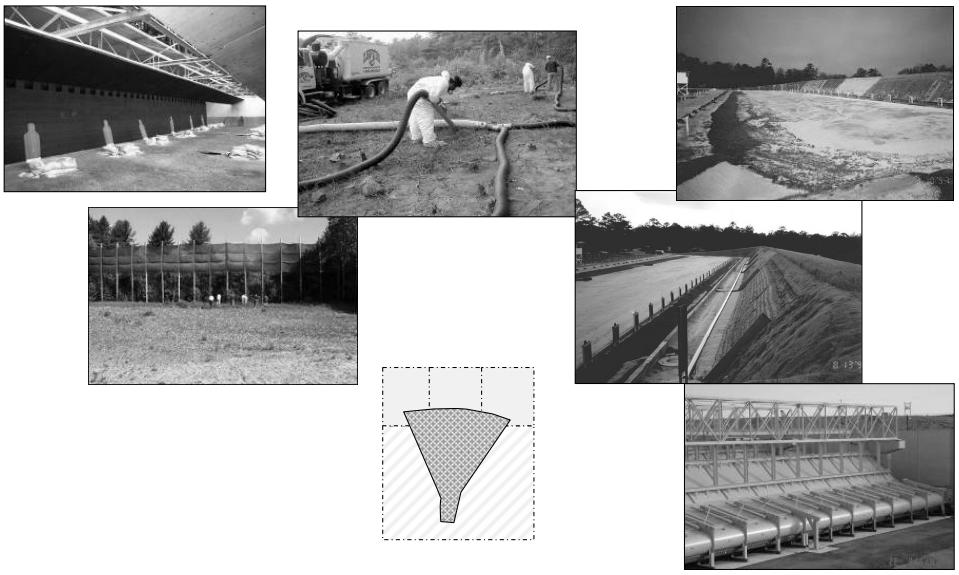
Air

- Wind speed
- Soil type
- Vegetation

Control lead and keep it on the ranges

46

Identify Best Management Practices



No associated notes.

47

Decision Tree

Figure 2-1, Environmental Management at Operating Outdoor Small Arms Firing Ranges, ITRC Smart-2, 2005

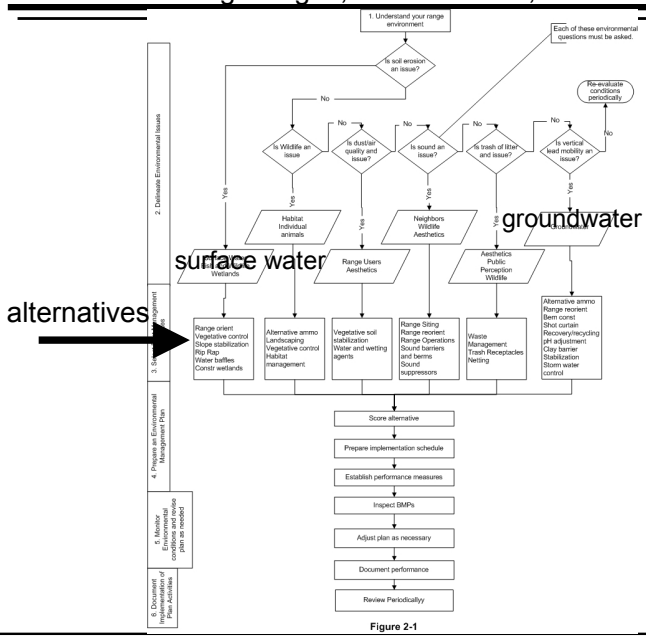


Figure 2-1

- Shot curtain
- Range orientation/ siting
- Vegetative controls
- Slope stabilization
- Alternative ammo.
- Landscaping
- Range siting
- Rip rap
- Recycling/removal
- Clay barriers
- pH control
- Berms/bullet traps
- Storm water management

ITRC's Environmental Management at Operating Outdoor Small Arms Firing Ranges (SMART-2, February 2005) is available from the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Small Arms Firing Ranges."

48

Range Environmental Management Goals

- Range environmental management goal
  - Manage potential impacts posed by range activities on the environment, public health and/or public welfare
- Range environmental management approach
  - Keep lead on-site and in its metallic form
    - "High Speed" – projectiles landing off site
    - "Low Speed" – erosion/dissolution
  - Prevent projectiles from impacting wetlands or surface waters
  - Reduce noise impacts to surrounding properties

No associated notes.

49

Range Environmental Management

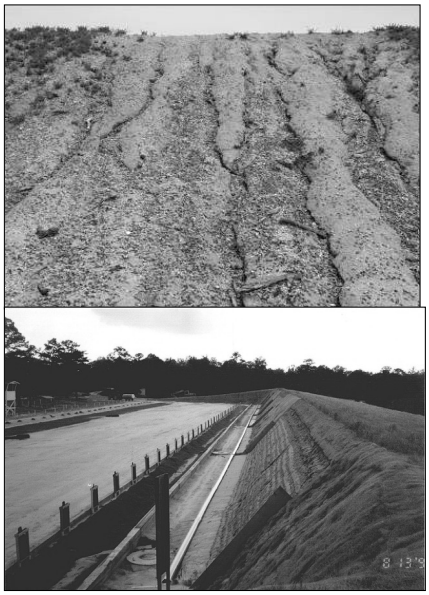
- Options are range specific
- Require a thorough understanding of range's environmental issues
- Understand the possible consequences of unmanaged issues
- Costs effectiveness and scheduling considerations

No associated notes.

50

Proactive Lead Management

- Lead removal/recycling
  - Surficial lead build-up creates safety issue
  - Mechanized or hand sifting (berms, trap, and skeet ranges)
  - Vacuum systems (trap/skeet ranges)
    - See www.itrcweb.org Smart-1
- Grading/slope maintenance
  - Prevent erosion/washout
  - Improve bullet capture



When purchasing treatment additives, the range owner/manager should:

determine the credibility of the vendor,

review the application instructions to determine if the owner/manager has the capabilities to meet the requirements,

review the warranty that accompanies the additive to insure that the owner/manager protected from product failure,

require treatability study using range soil before purchasing.

ITRC's Characterization and Remediation of Soils at Closed Small Arms Firing Ranges (SMART-1, January 2003) is available from the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Small Arms Firing Ranges."

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Proactive Lead Management (continued)

- Soil pH adjustment
  - Prevents lead dissolution ("slow speed")
  - Ideal pH range – 6.5 - 8.5
  - Adjust through amendment addition
- Chemical stabilization
  - Chemically binds dissolved lead
  - Commercially available products
    - Phosphates
    - Sulfates
  - See www.itrcweb.org Smart-1 "Characterization and Remediation of Soils at Closed Small Arms Firing Ranges," 2003

ITRC's Characterization and Remediation of Soils at Closed Small Arms Firing Ranges (SMART-1, January 2003) is available from the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Small Arms Firing Ranges."

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Proactive Lead Management (continued)

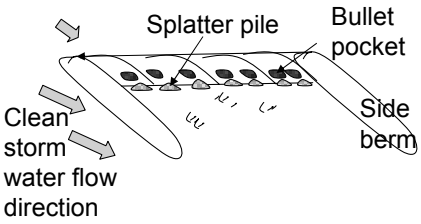
- Non-lead ammunition
  - Bullets
    - Copper, Tungsten
    - Tungsten being reappraised
  - Shot
    - Steel
    - Others
- Advantages
  - Significantly reduces potential exposure to lead
  - May reduce need/cost of other lead management techniques
- Disadvantages
  - Higher cost of ammunition
  - May require more stringent oversight/compliance measures
  - Safety concerns

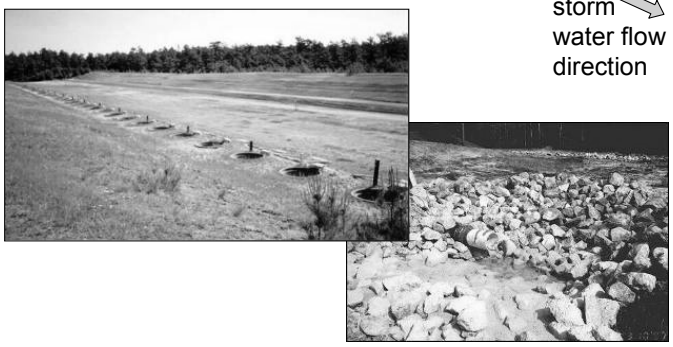
No associated notes.

53

Storm Water Management/Erosion Control

- Storm water management most significant issue in controlling lead migration ("slow speed")
  - Terracing/altering topography
  - Retention ponds
  - End berms





- Erosion control
  - Vegetation
  - Hay bales
  - Rip-rap

Slow and divert water flow around high concentration areas

Regrade range floor to promote slower water flow if necessary

Keep berms and range floor vegetated (rhizome grasses) to prevent erosion and keep splatter pile from migrating

Amend soils on berms and range floor to promote vegetation (organic material, fertilizer, and lime)

Use 2:1 slopes or less on the berm face to discourage high rates of water movement and erosion

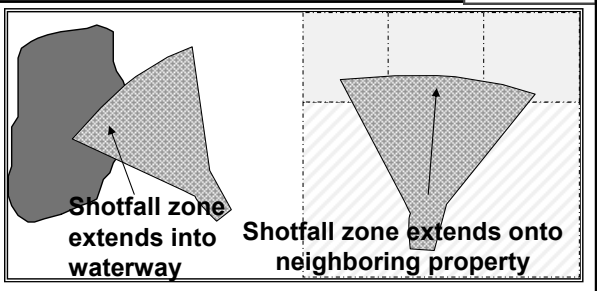
Compact soil in berm rather than use push and dump

Periodic removal of lead from highest concentration areas

54

Management to Prevent Impacts to Surface Water Bodies/Wetlands

- Realign to avoid shooting into them or onto adjacent property
- Containment
  - Shot curtain
  - Berms
- Non-lead ammunition



Alternatives include

- Steel
- Bismuth
- Tungsten alloys
- Copper

Consideration for use of alternatives

- Life-cycle cost
- Ballistics
- Health and environmental risk
- Safety
- Less supporting environmental product research
- Ammunition ban (e.g. not publicly available)

55

Management to Minimize Wildlife Exposure

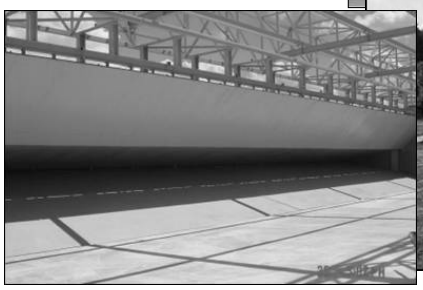
- **Do not** shoot into water
  - Operational planning/Best Management Practices (BMPs)
- Incorporate vegetation that will not attract wildlife
  - Fescue grasses
- Manage other areas **away from** the range to be attractive to wildlife
  - Establish feed plots
- Proactive lead management

No associated notes.

56

Other Lead Management Options

- Engineered berms
  - Ballistic sand
  - Granular rubber
- Bullet traps
  - Steel traps
  - Block traps
    - Rubber/shock absorbing concrete



Typical pathways for migration are overshooting, ricochet, or erosion/runoff

Berms, bullet traps and baffles are all components of a containment system

Containment critical for shooter/public safety

Berm are major components of outdoor rifle and pistol ranges

Berms consist of several types

- Soil Berm – uses site or imported soils
- Engineered Berm – Copius sand trap/Passive Reactive Berm
- Granular Rubber Berm – similar to engineered berm, substituting granular rubber for sand

Managed for both safety and environmental stewardship

- Periodic restoration to original dimensions and removal of the projectiles
- Soil amendments
- Reducing the contact between water and projectiles

57

Engineered Berms

- Typical berm detail
- Ballistic sand
  - Uses specifically graded sand
  - Simplifies maintenance
- Granular rubber
  - Same as ballistic sand, only uses granular rubber as ballistic material
  - Some systems of limited use (no tracers, automatic fire) due to flammability of the ballistic media
- Maintenance consistent with earth berm
  - Periodic restoration to original dimensions
  - Proactive lead management
  - Storm water management

No associated notes.

58

Bullet Traps

- Bullet traps are engineered systems for high-use/small footprint ranges
- Bullet traps consist of several types
  - Steel bullet traps – top/bottom ramp with deceleration chamber
    - May incorporate dust collection/filtration or “wet trap” design
  - Rubber or shock absorbing concrete block trap construction – media blocks stacked to serve as ballistic wall
- Managed for both safety and environmental stewardship
  - Periodic visual inspection of trap
  - Lead recovery and recycling
  - Reducing the contact between water and projectiles
  - Managing storm water runoff

No associated notes.

59

Maintaining a Steel Bullet Trap

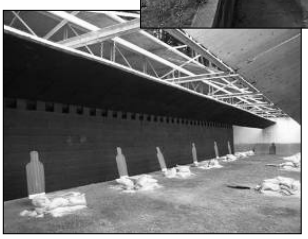
- Trap maintenance
  - Visual inspection
  - Periodic maintenance of conveyance systems
  - Periodic cleaning of filters (if equipped with filtration system)
  - Maintenance of water circulation system for “wet trap” (if equipped with wet system)
- Periodic lead removal
  - Individual buckets
  - Automated auger system
- Maintenance considerations
  - Frequency and duration of range downtime for maintenance
  - Bolt-in wear parts
  - Generally 10 year plus cycle for wear parts

No associated notes.

60

Maintaining a Block Trap

- Trap maintenance
  - Visual inspection
  - Rotate target positions to extend trap life
  - Periodic replacement of “saturated” blocks
- Periodic lead removal
  - Shock absorbing concrete disposed of as non-hazardous waste
  - Rubber blocks recycled at a secondary smelter
- Maintenance considerations
  - Frequency and duration of range downtime for maintenance
  - Weight of blocks
  - Replacement of a block requires removal of all blocks above it in the ballistic wall



No associated notes.

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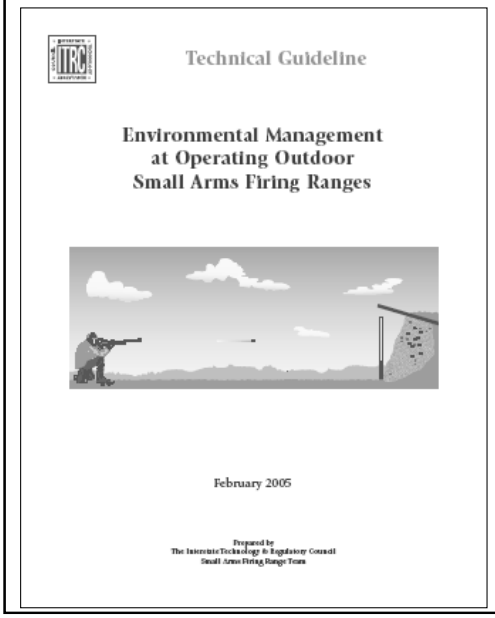
In Summary

- Range management requirements to be considered
  - Size and location of the range
  - Types of weapons/training requirements
  - Number and types of rounds to be fired per lane
  - Targetry system requirements
- Site-specific environmental conditions
  - Static temperature during operations
  - Statutory snow and wind loads (bullet traps)
  - Anticipated rainfall
- Visit an operating range with similar equipment is suggested prior to design/procurement
  - Interview end-user
  - "Kick the tires"
- Get "real" O&M costs and design/procure based on life-cycle cost analysis
  - Range down time needs to be factored into life-cycle costs

No associated notes.

62

Environmental Management Planning



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

No associated notes.

63

Controlling Lead Through Operations and Engineering

	Shotgun Ranges	Rifle/Pistol Ranges
Potential Operational Approaches	Shot recovery and recycling Target recovery Alternative shot materials Chemical soil treatment/amendment	Bullet recovery and recycling Chemical soil treatment/amendment Non-lead bullets
Potential Engineering Approaches	Range siting Clay layers/mixing Physical barriers to shot distribution Shotfall zones designed to be outside of surface water bodies Ranges designed to maximize overlap of shotfall zones while maintaining shooter safety Elimination of depressions that may hold water Storm water management/erosion control	Range siting Clay layers/mixing Bullet containment Baffles/tube ranges Berm construction and maintenance Bullet traps Runoff controls Storm water management/erosion control

No associated notes.

64

Select Best Management Practices

Table 4-2 Environmental Management at Operating Outdoor Small Arms Firing Ranges

Criteria	Weighting Factor	Alternative 1	Alternative 2	Alternative 3
Health and safety impacts				
Erosion prevention				
Wildlife benefits				
Air benefits				
Surface water benefits				
Groundwater benefits				
Soil benefits				
Cost				
Professional assistance level needed				
Range operations impact				
Ease of implementation				
Timing				
Regulatory benefits				
Maintenance				
Reliability				
Total Score				

ITRC's Environmental Management at Operating Outdoor Small Arms Firing Ranges (SMART-2, February 2005) is available from the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Small Arms Firing Ranges."

65

Complete the Environmental Management Plan (EMP)

- However simple or detailed the planned actions may be for a range, it is important to record the basis for decisions and to lay out a guide for future actions in an Environmental Management Plan

No associated notes.

66

Contents of an Environmental Management Plan (EMP)

- Table 4 3in the document contains a checklist for an Environmental Management Plan (EMP)
  - Baseline site conditions (photos, maps, descriptions of range conditions, any test results)
  - Evaluation of best management practices alternatives
  - Justification for selected alternatives
  - Implementation description and schedule
  - Operation and monitoring schedule and results (range conditions during and after Best Management Practice activities)
  - Plan review and modifications

ITRC's Environmental Management at Operating Outdoor Small Arms Firing Ranges (SMART-2, February 2005) is available from the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Small Arms Firing Ranges."

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Implementation Documentation

Table 4-4 Environmental Management at Operating Outdoor Small Arms Firing Ranges

Project or Action	Person or Primary Responsibility	Initial or Recurring	Start Date	Completion Date	Cost

ITRC's Environmental Management at Operating Outdoor Small Arms Firing Ranges (SMART-2, February 2005) is available from the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Small Arms Firing Ranges."

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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

No associated notes.

69

In Summary

- Put an Environmental Management Plan together
  - Identify baseline conditions: disposition of lead/other metals, impacts
  - Identify appropriate Best Management Practices
  - Select and implement
  - Review periodically, revise plan as needed and implement
  - Document, document, document

No associated notes.

70

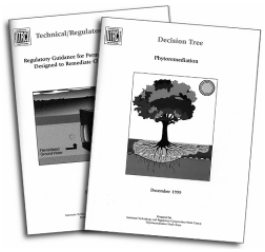
Questions and Answers

No associated notes.

71

Thank You for Participating

Links to additional resources



For more information on ITRC training opportunities and to provide feedback visit:
www.itrcweb.org

Links to additional resources:

http://www.clu-in.org/conf/itrc/smartemp/resource.cfm

Your feedback is important – please fill out the form at:

http://www.clu-in.org/conf/itrc/smartemp

The benefits that ITRC offers to state regulators and technology developers, vendors, and consultants include:

Helping regulators build their knowledge base and raise their confidence about new environmental technologies

Helping regulators save time and money when evaluating environmental technologies

Guiding technology developers in the collection of performance data to satisfy the requirements of multiple states

Helping technology vendors avoid the time and expense of conducting duplicative and costly demonstrations

Providing a reliable network among members of the environmental community to focus on innovative environmental technologies

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Join an ITRC Team – with just 10% of your time you can have a positive impact on the regulatory process and acceptance of innovative technologies and approaches

Sponsor ITRC's technical team and other activities

Be an official state member by appointing a POC (State Point of Contact) to the State Engagement Team

Use ITRC products and attend training courses

Submit proposals for new technical teams and projects