

# Training Range Environmental Evaluation and Characterization System (TREECS) Development and Application

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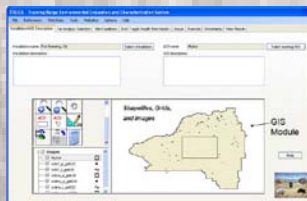
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## ABSTRACT

Active military ranges contain munitions constituents (MC) and metal contamination that affect the usability and functionality of training facilities. Residues and disturbances from range operations can adversely impact the environment, including human and ecological health, which require a variety of assessment tools to evaluate. Such impacts can also affect environmental compliance and range sustainment. Most Army live-fire training and testing ranges also have unique environments in which low-order and dud munitions may cause random and highly uncertain sources of MC contamination. Additionally, these ranges are under increased regulatory scrutiny, which in extreme cases has resulted in limitations being placed on training. The Training Range Environmental Evaluation and Characterization System (TREECS) has been developed by the Engineer Research and Development Center (ERDC) to assist Army analysts in managing ranges in such a manner that comply with environmental quality (EQ) objectives for toxic constituent stressors. The system hosts environmental characterization, risk management and evaluation tools and integrates the results for ease-of-use and reliability for MC. Specifically, the system automates conceptual model formulation and model parameter population across scales and pathways; formulates and couples first principle MC fate/transport-transformation-sequestration models with hydraulic models; and provides a single tool that bridges the gap between migration assessment and risk management and range sustainment. TREECS is currently being tested for use in the Army's Operational Range Assessment Program (ORAP). This presentation will discuss the overall TREECS framework and capabilities along with a case study demonstrating those capabilities.

## TREECS Components

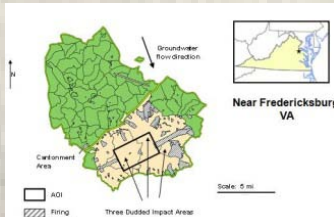
- Framework for Tier 1 and 2 assessments
- Constituent databases
- Health Benchmark database
- Munitions database
- MC residual mass loading module based on munitions use or user-specified
- GIS module
- Hydro-geo-characteristics toolkit (HGCT) for estimating input parameters
- Models for soil, surface water, vadose zone, and groundwater
- Simplified user input interfaces for models (GUIs)
- Viewers for results
- Sensitivity and uncertainty module for Tier 2 assessments



## GIS Functions/Tools

- For opening individual GIS files
- For saving individual GIS files
- For resampling a grid
- For zooming into an area in the workspace
- For zooming out of an area in the workspace
- For panning in the workspace
- For creating a rectangular AOI shapefile in the workspace
- For creating a polygon AOI shapefile in the workspace
- For measuring length and area in the workspace
- For converting a shapefile to a grid
- For extracting a subset of a grid
- For creating slope grid from DEM and performing simple arithmetic operations on a grid

## Fort A.P. Hill Tier 2 Application



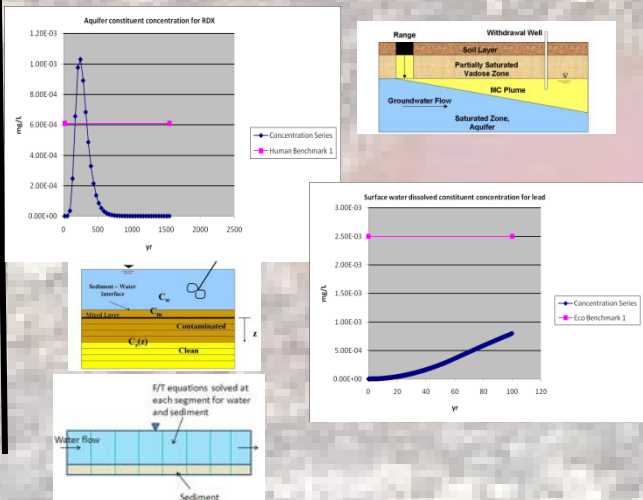
## General Inputs

- Site dimensions and physical characteristics for AOI, lake, GW well
- AOI soil characteristics (texture, bulk density, porosity, field capacity, sat. conductivity, org. carbon, pH)
- Hydrologic characteristics (precip., temp., infiltr., soil erosion, Darcy vel.)
- F/T parameters for soil, vadose, GW, surface water
- Chemical-specific properties
- MC residual loadings

## Estimated annual MC loadings

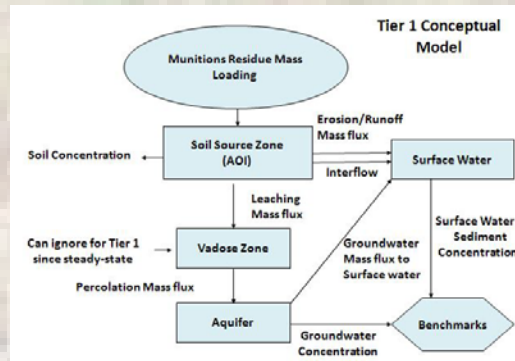
MC	Loading, g/yr
TNT	60,729
RDX	15,201
Lead	50,000,000
Copper	30,000,000
Potassium perchlorate	74

## Results from 60 years of Loading



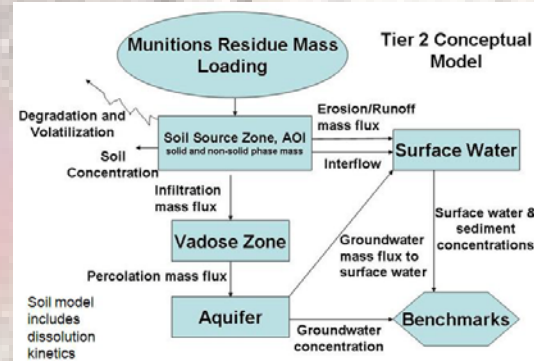
## Tier 1 (screening)

- Steady-state, no degradation, worse case, highly conservative
- Requires little data
- Can be applied very quickly
- Indicates whether a problem could ever potentially exist; if so, proceed to Tier 2



## Tier 2 (more comprehensive)

- Time-varying, much more realistic and accurate
- Requires more data
- Requires more time to set up and apply, but still can be done relatively quickly
- Can be used to determine when benchmark exceedance may occur
- Useful for evaluating range management strategies



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