

Determining Ecological Effects of Dust Suppressant Chemicals on Terrestrial and Aquatic Resources : An Approach





USGS is new to this specific research area, but not new to the assessment of environmental contamination.

- Irrigation Drainwaters
- Abandoned mine lands in the west
- Development of acceptability criteria for applications of biosolids and treated waters
- Methods for ranking the relative importance of TMDL issues
- Industrial contamination



Columbia Environmental Research Center





CERC Facilities



- 33-acre Site
- 2 1,100 ft. Water Wells
- Experimental Ponds
- Experimental Streams

- High & Medium Hazard Testing Buildings
- Environmental Technology Center
- Mobile Research Labs
- Greenhouse facility



Scientific Expertise at CERC



- Toxicologists
- Ecologists
- Biologists
- Fisheries Biologists
- Aquaculturists
- Biochemists

- Physiologists
- Organic Chemists
- Inorganic Chemists
- Microbiologists
- Wildlife Biologists
- Aquatic Entomologists
- Behavioral Ecologists
- Geographers
- Geomorphologists
- Hydrologists
- Geographic Information Systems Specialists
- Statisticians/Biometricians
- Database Managers







Biochemistry and Physiology Branch





- Embryotoxicity
- Chemical Effects on Fish Sexual Differentiation and Development
- Detoxification Enzymes
- Immunoassay
 Development
- Contaminant
 Interactions in Food
 Chains









Toxicology Branch

- Sediment Toxicology
- Endangered Species
 Sensitivity to Contaminants
- Fish and Invertebrate Culture
- Development of Innovative Toxicity Test Methods









Ecology Branch

- UV-B Radiation Effects
- UV / Contaminant Interactions
- Behavioral Toxicology
- Biomonitoring Acid Mine Drainage Remediation
- Endangered Species
- Environmental Implications of Fire Chemicals
- Risk Assessments
- Ecological Restoration





Environmental Chemistry Branch

- Chemical Fate and Transport
- Chemical Degradation
- Forensic Chemistry
- Methods development
- Food web dynamics



Goal of Proposed Work

To provide a scientific basis for DOI land management bureaus to determine the most ecologically appropriate dust suppressants to apply across a range of habitat types found throughout the National Wildlife Refuge System

Evaluate the responses of different organisms to a range of chemical classes of dust suppressant chemicals



What is the General Approach ?



• Laboratory Studies

• Field Investigations





Laboratory Studies

- Aquatic Toxicity Tests
- Terrestrial Toxicity Tests





Standard Tests with *Standard* Organisms Invertebrates



Water borne toxicity Daphnia magna Ceriodaphnia



Aquatic Sediment Toxicity Amphipods

> **Terrestrial Soils** Earthworms



Standard Tests with Standard Organisms Vertebrates



Fish Fathead minnow Rainbow trout



Mammals Field mouse



Birds Starlings Blackbirds Swallows Kestrels



Major routes of exposure

Water, Sediment, or Air Dietary Dermal

Critical Endpoints or Measurements

Survival Growth Reproductive Success Development Behavior



National Wildlife Refuge System







Will non-standard organisms respond similarly?

Freshwater mussels

Amphibians

Sturgeon

Pupfish

Habitat-specific organisms



Use existing information plus new information to evaluate biological injury and complete an ecological risk assessment.

Consider models to evaluate runoff in different substrates and compare with measured data.

Evaluate risk of individual components as well as mixtures.







Why do we need this information?



Ecological Issues

Management Issues

Legal Issues



Parallel to Wildland Fire Chemical Situation in the late 1980s

No consistent specifications Wide spread application and use Possible and probable accidental spills Potential issues with persistence and runoff



Authorization of the Endangered Species Act



Similar to what we heard on the Deicing Chemicals

Identified a focal point for responsibility and coordination Developed efficacy standards Set specific requirements for chemicals by developing and using standard tests for : • Corrosion • Degradation

- Effectiveness
- Toxicity





Develop a strategy to standardize the application and use of dust stabilization and suppressant chemicals

Develop consensus on the most meaningful and appropriate acceptability criteria

Develop protocols for consistent monitoring

Look to the processes already developed for guidance

≊USGS



