Ecological Risk Assessments in Texas

Margaret Roy

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Purpose of Risk Assessment

- Protect Human Health and the Environment!

- Develop risk estimates for site conditions in the absence of a remedial action.
- Develop health protective clean up levels (risk-based).

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History of ERAs

- 1992 – EPA's Framework
  - Problem formulation
  - Analysis
  - Risk Characterization
- 1997 – EPA's Guidance for Superfund
  - 8 Step process
  - Steps 1-2 = Screening
  - Steps 3-8 = Site Specific Studies

Texas History

- Ecological Work Group
  - 1996 – present
  - ERAGs first published in 2001 (updated in 2006)
  - TRRP - 1999
- Participants included industry, TCEQ eco risk assessors, consultants and Natural Resource Trustees

…and the Environment

- Ecosystem – TX guidance lists 7 different ecosystems (upland forest, tallgrass prairie, shortgrass prairie, shrub/scrub, desert, wetland, estuarine)
- Representative species (plants, invertebrates, birds, mammals)
- Estimate dose
- Compare to “safe” dose

Compare and Contrast

- Human Health
  - 1 species
  - Exposure Factors
  - Toxicity Factors
  - Fate and Transport Models
- Ecological
  - Minimum of 2 communities, 1 mammal, 1 bird
  - Special Status Species or habitats

Ecological Exposure

- 1993 Wildlife Exposure Factors Handbook
  - For Red-Tailed Hawk three studies listed for territory size (1946, 1956 and 1989 in Colorado, California and Michigan) range from 400 to 2,500 ha over 3 different seasons.
  - Food and water ingestion rates estimated using BW and equations by Nagy, 1987
  - Soil/Sediment ingestion from Beyer, 1994
- Open Literature sources

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Compare and Contrast cont.

- Uptake Factors
  - Regression models based on soil concentration, but the higher the soil concentration the lower the uptake
- Toxicity Reference Doses
  - EPA'S Soil Screening Level Documents
  - No avian TRVs for PAHs…..
- Ecologically relevant endpoints
  - Survival, reproduction, growth

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Texas Eco Risk Documents

- ERAGs 2006
  - General approach
- TRRP-24 Determining PCLs for SW/Sed
  - Dilution factors
- TRRP-15E Determining representative concentrations
  - Hot spots and sediment to fish pathway
- Surface water rule (307)
  - Segment hardness

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Texas Eco Risk Process

- Tier 1 Exclusion Criteria Checklist
  - Simple checklist
  - Reasoned Justification
- Tier 2 Screening Level ERA
  - Desktop screening model
  - Conservative/Less-conservative
  - PCL development
- Tier 3 Site Specific ERA
  - Reduce uncertainty/increase PCLs
  - Determine “true” toxicity

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Expedited Stream Evaluation

- Moves the SLERA to the valuable habitat
- GW to intermittent creek to Llano River
- Determined SW not an issue, left with bioaccumulative COCs
- Negotiated limited COC list
- Sampled sediment in river
- Bald Eagle concern
- NFA

Llano River

Ecological Services Analysis (ESA)

- Risk Management Option under TRRP Remedy Standard B – described in 350.33(a)(3)(B)
- Final Ecological Risk Assessment (Tier 2 or 3)
  - Ecological PCLs and affected property defined
  - Request approval to pursue and ESA as part of ERA
- Considers ecological services of the affected property as well as beneficial and/or detrimental effects on services associated with potential response actions to address ecological risk

ESA Key Tenents

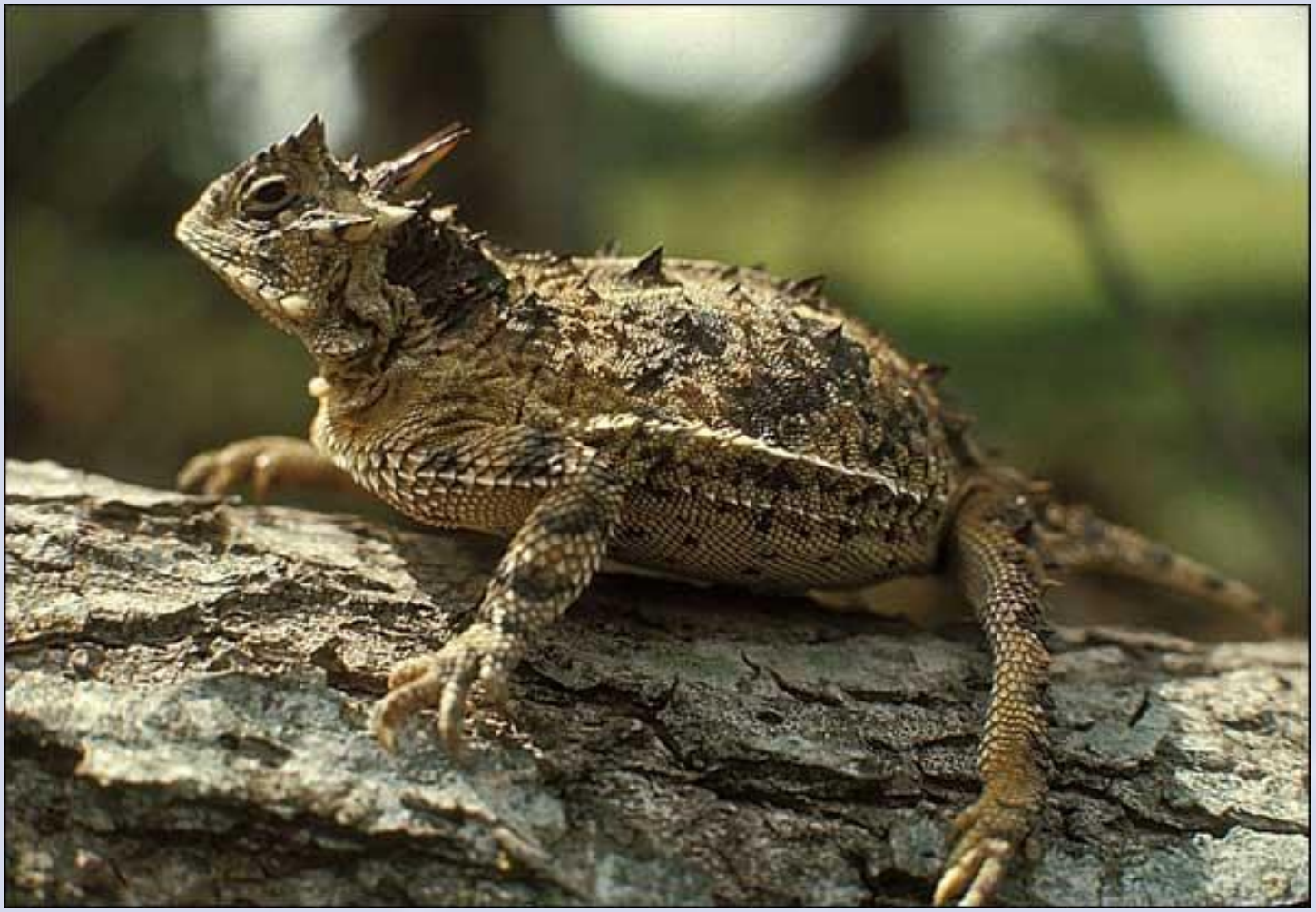
- Even impaired habitats can provide valuable ecological services
- An ecosystem can extend beyond the perimeter of an affected property
- Reduction in services provided by habitat in one location can be offset by a corresponding increase in services elsewhere within the same ecosystem
- Net environmental gain
- Lower cost than remediation

Mabel Davis On site Pond

ESA – Lessons Learned

- Ecological Risk Assessment is the foundation for definition of risk and ecological services
  - Begin strategy on ecological areas as soon as possible
- Trustees are not risk assessors
- Engage trustees early and often
- Consider long term placement of compensation project(s)
  - Trustees will need some assurance of long term effectiveness
  - ESA area will require deed recordation
- NRDA (past damages) are possible

Texas Horned Lizard



Source: Texas Parks and Wildlife

Texas Horned Lizard

- Soil Exposure is primary pathway
- Limited to no water ingestion
- Main food source is the red harvester ant
- Fire ant invasion and displacement of harvester ants is also a threat to the lizard.

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Red Harvester Ants

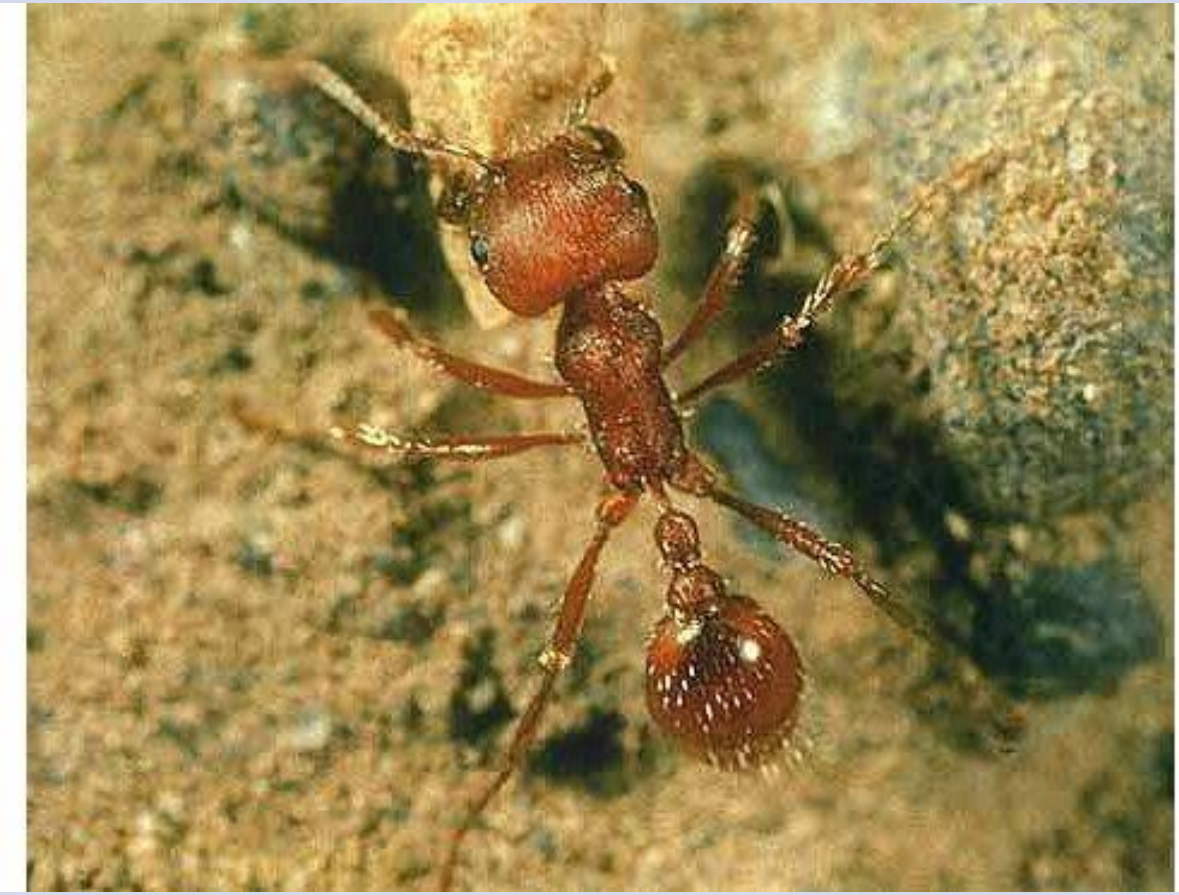

Photo Source: Western Exterminator Company

Red Harvester Ants - Nest


Nest of red harvester ants

Photo Source: Bart Drees, Texas A&M University

Malone Superfund Site

- Desktop model used to end assessment of terrestrial areas; PRGs were calculated; Cap planned for remediation
- Tier 3 for aquatic areas
  - On-site freshwater pond and ditches
  - Off-site salt marsh
  - Toxicity testing
  - Tissue sampling (fish and invertebrates)
- No PRGs for aquatic system

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Some Thoughts on Tier 3

- Limited by small sample size – $$
- Bioaccumulation studies require sufficient mass of tissue and exposure time
- Use at least two test species for toxicity testing – consistency or inconsistency between species is important
- Use the Tier 2 SLERA to minimize complexity of the Tier 3 BERA
- Cost/benefit analysis

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Eco Risk Strategy

- Eco is a part of TRRP
  - Eco-based PCLs can become the critical PCLs
  - Soil depth = 0-6 inches
  - If developing an APAR, don't wait till the last minute to figure out if you have eco-PCLs
  - Presence of T&E species can be critical
  - What is the future land use? (reasoned justification)

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Eco Risk Strategy Cont.

- Keep it Simple
- Transparency in assumptions and inputs
- Don’t work in a vacuum. Involve the whole project team and regulators
  - Work Plan Development
  - Consistency across a facility
- Competent Regulators

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Technical Areas under Development

- Exposure beyond ingestion
  - Dermal
  - Inhalation
- Toxicity Reference Doses
  - Expand avian data set
- Reptiles and Amphibians

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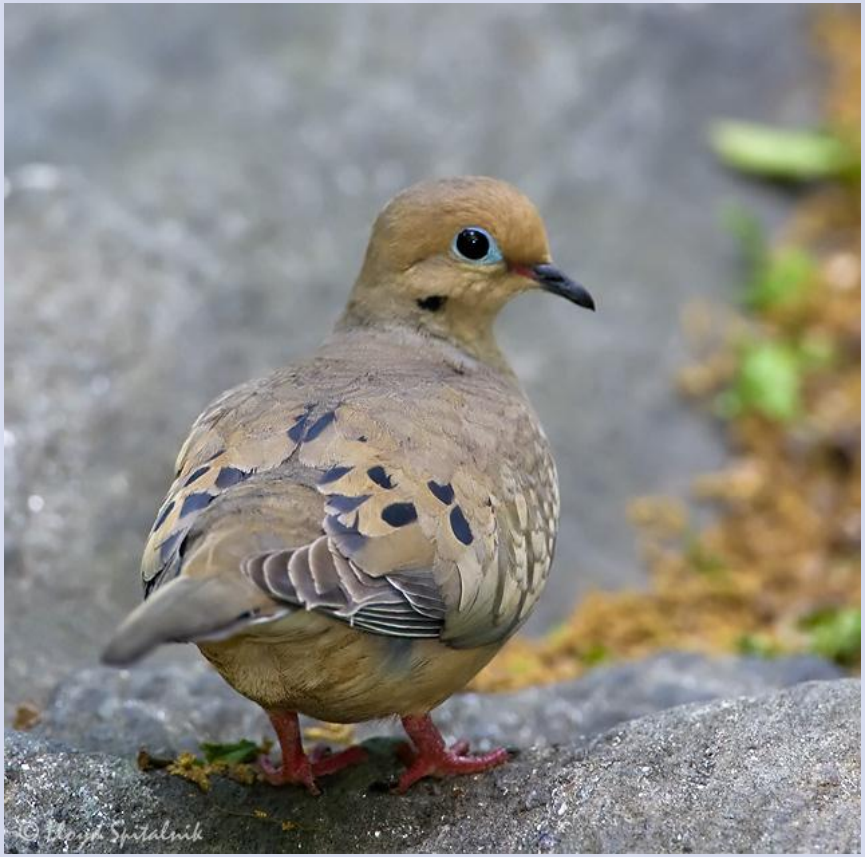
Questions or Comments

Mourning Dove



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