SUSTAINABLE SEDIMENT MANAGEMENT AND DREDGING SEMINAR

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GALVESTON, TX

Upland plant and animal bioaccumulation and toxicity evaluations

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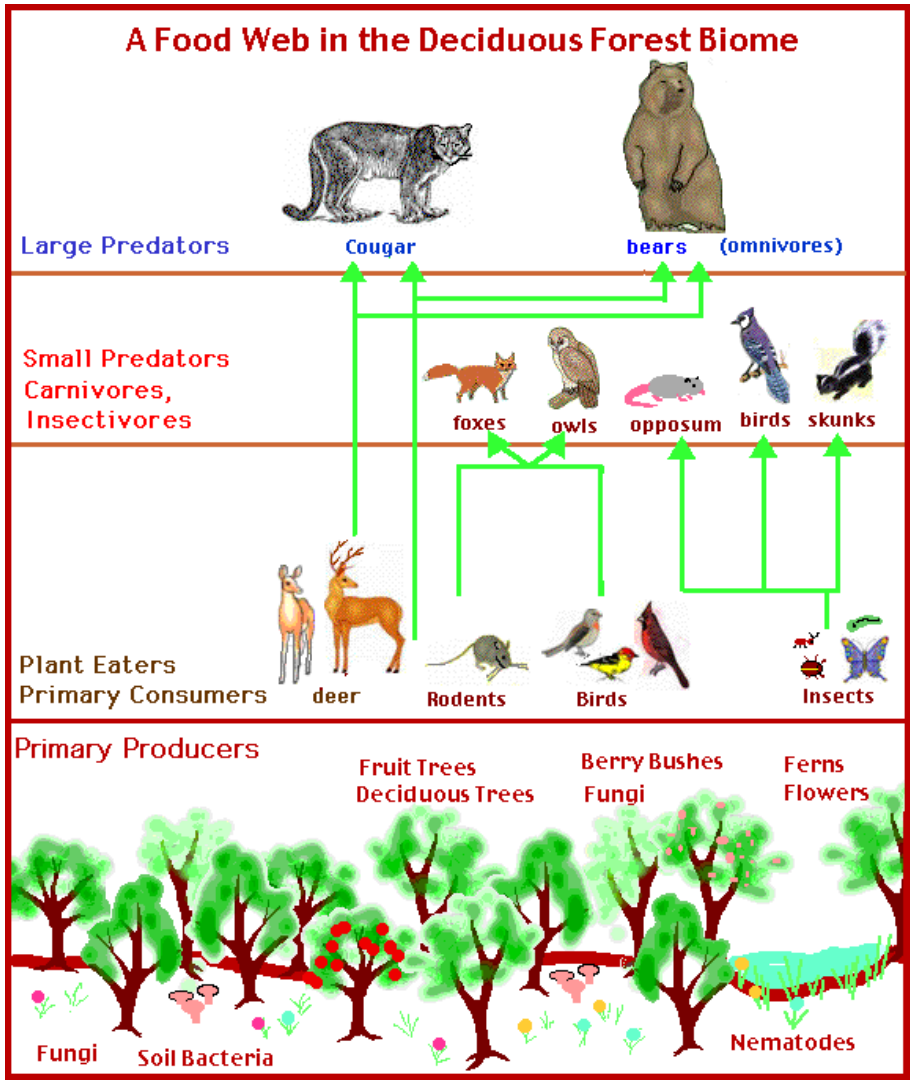
Upland placement

- **Regulatory overview**
  - **CWA (effluent and surface runoff) and NEPA provide strong mandates for placement in CDFs and nearshore beneficial use**
  - **When dredged sediment will be placed in an upland setting outside of the authority of the CWA, state authority is the sole authority for permitting upland beneficial use not regulated under CWA**

Terrestrial food web

- Potential for contaminants of concern from dredging material to bioaccumulate in tissues of plants and soil invertebrates, with further dietary transfer to herbivores and predators
- COCs can be passed up the food chain within and outside placement sites as wildlife migrate in and out of area
- Humans and threatened and endangered species may be receptors of concern (ROC)



Evaluation overview

- **Determine the need for contaminant evaluation (applicable exclusionary criteria)**
- **Define complete routes of exposure and receptors of concern**
- **Select upland disposal COCs**
  - **For plants, metals are more relevant than organic chemicals**
- **For beneficial use sites, consider receptors inhabiting the placement site.**
  - **Evaluate toxicity, as successful colonization is desired**
- **For confined disposal sites, consider only potential for bioaccumulation in offsite receptors**
  - **Do not evaluate direct toxicity as unsuccessful colonization generally means lower bioaccumulation in offsite receptors**
  - **Bioaccumulation is evaluated in regard to toxic effects to wildlife and**
- **If warranted, conduct pre-screening procedures**
- **If warranted, conduct upland plant and soil invertebrate evaluation**

Initial Evaluation (Tier I)

- **Beneficial use**
  - **Develop a conceptual site model** (define complete exposure routes)
  - **Comparison to background: If the dredged material does not contain statistically significant higher concentrations of a constituent than what already would be expected at the placement site (or refence site outside area of contamination), that constituent generally does not need further evaluation**
- **Confined disposal facility**
  - **Evaluate existing information**
  - **Develop a conceptual site model**

Screening Evaluations (Tier II)

- **Soil invertebrate bioaccumulation evaluation**
  - **Predict nonpolar organic COC bioaccumlation using TBP**
- **Plant bioaccumulation evaluation**
  - **Predict metal bioaccumulation for freshwater placement using the diethylenetriaminepentaacetic acid (DTPA) extraction procedure and the Plant Uptake Program (PUP), a computerized program**
  - **Compare the DM and reference sediment (or soil) results**
- **Comparison with ecological soil screening levels (Eco-SSLs)**
  - **Eco-SSLs are screening values protective of ecological receptors (e.g., birds and mammals that consume plants and soil invertebrates).**
  - **Should be used to identify the COPCs that require further evaluation.**
  - **Should be used with caution as they were not developed using dredged materials (i.e., sediments)**

Plant bioassay (Tier III)

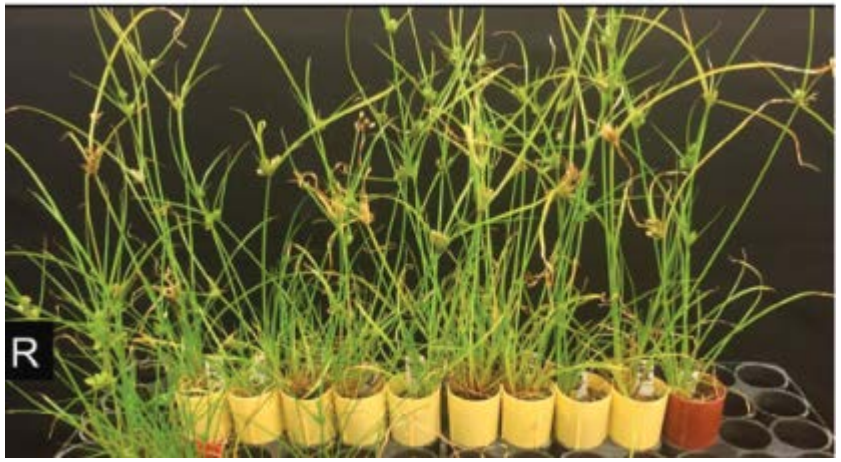
- *Cyperus*: saltwater terrestrial, freshwater wetland, and freshwater terrestrial habitat; 45-day exposure
- *Spartina*: saltwater wetland habitat; 90-day exposure
- Or other species relevant to placement site habitats or intended use (e.g., grass for use in a soccer field) using stakeholder input

Cyperus esculentus
(yellow Nutsedge)

Spartina alterniflora
(smooth cordgrass)

Results & Data Interpretation

- Assess survival and growth endpoints for determination of toxicity (beneficial use only)
- Determine COC bioaccumulation
- Compare results between dredging material and reference
- Evaluate potential impacts to ROC



Soil invertebrate bioassay (Tier III)

- **Earthworm *Eisenia fetida* 28-day exposure**
- **Aquatic infaunal invertebrate if aquatic (e.g, submerged wetland habitats)**

Results & Data Interpretation

- **Assess survival endpoint for determination of toxicity (beneficial use only)**
- **Determine COC bioaccumulation**
- **Compare results between dredging material and reference**
- **Evaluate potential impacts to ROC**

Eisenia fetida

Summary

- Evaluation different for CDF disposal and beneficial use
  - Toxicity is relevant for most beneficial use options
- Assess applicable exclusionary criteria
- Develop conceptual model
- Perform pre-screening procedures
- Perform plant and earthworm bioassays
- Compare results between dredging material and reference
- Evaluate potential impacts to plants and soil invertebrates (beneficial use only) and to wildlife
- Assess the need for management and controls

THANK YOU!

QUESTIONS?

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