Phase II Validation Study & Phase III Impact Assessment

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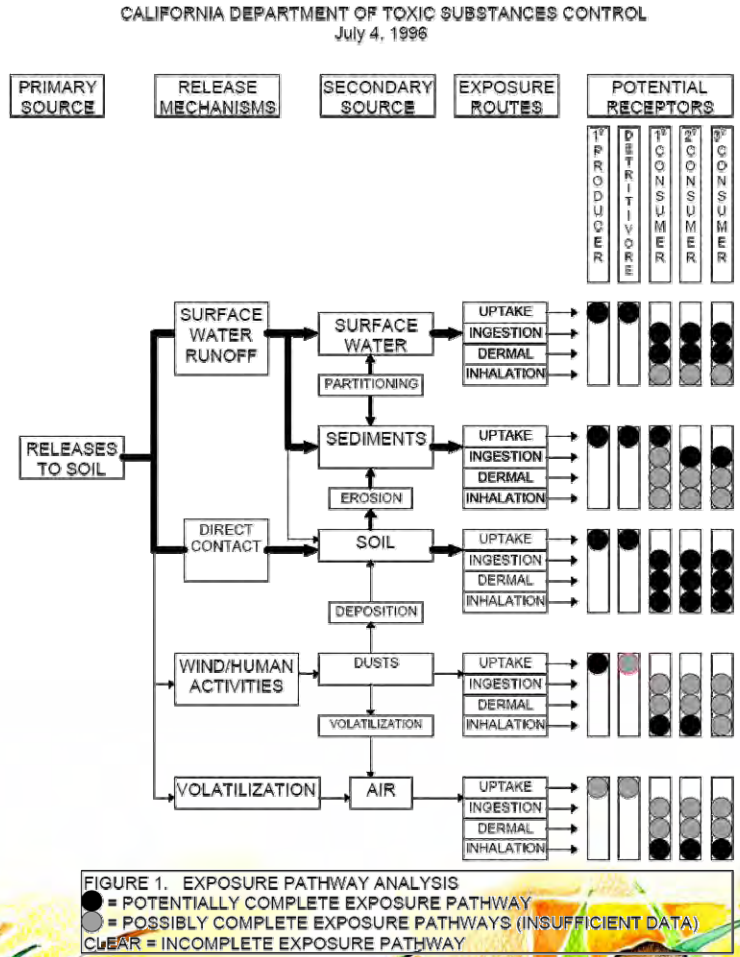
Validation Study / Impact Assessment Interface

- Validation of Ecological Transfer Factors
- X-ray Fluorescence (XRF) Inorganic Screening
- Validation of plant toxicity
- Site Use
  - Habitat Suitability Index (HSI) Approach
  - Actual Use monitoring
- Off-site mitigation (replacement)

Conceptual Site Model



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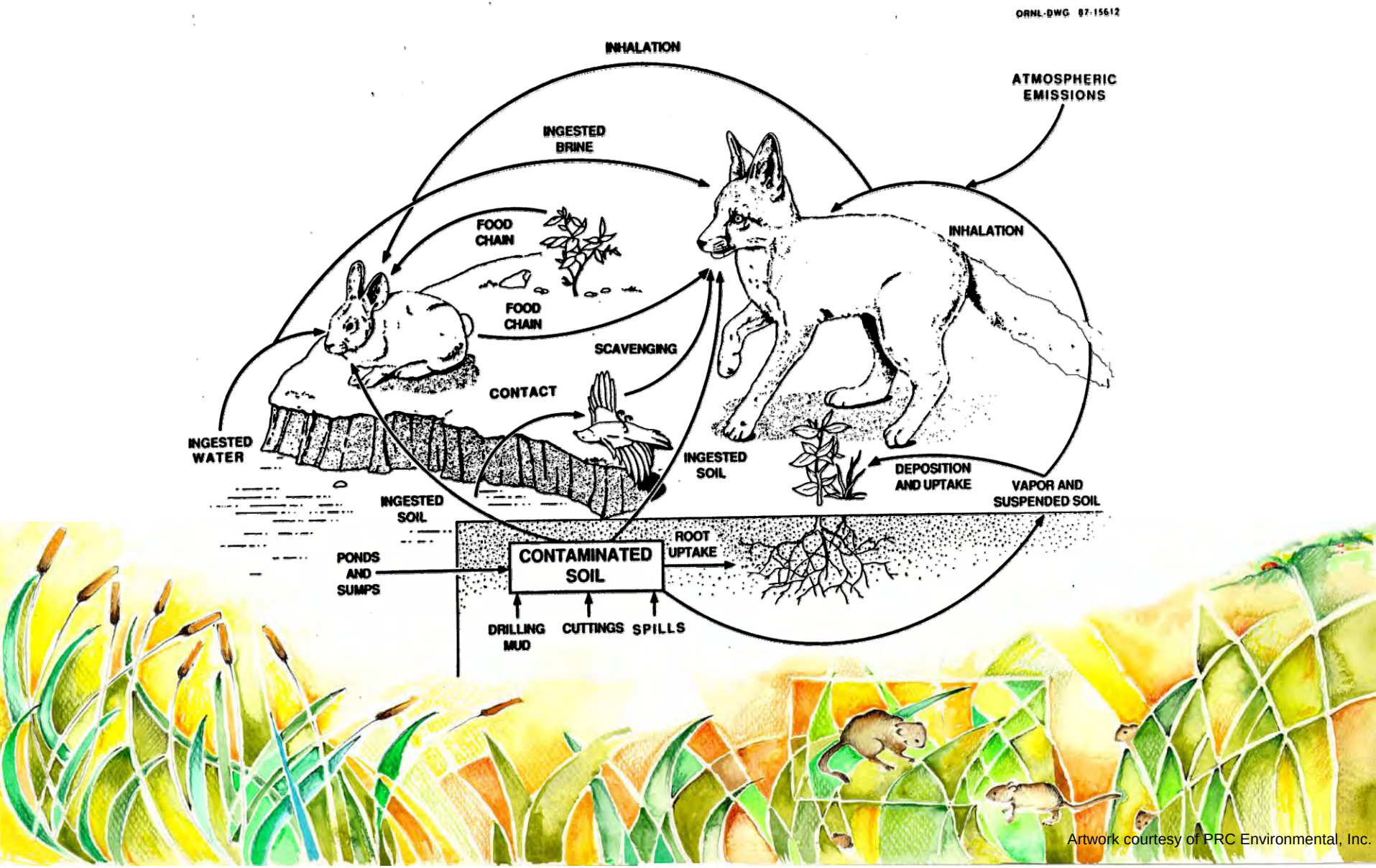
Figurative Conceptual Site Model



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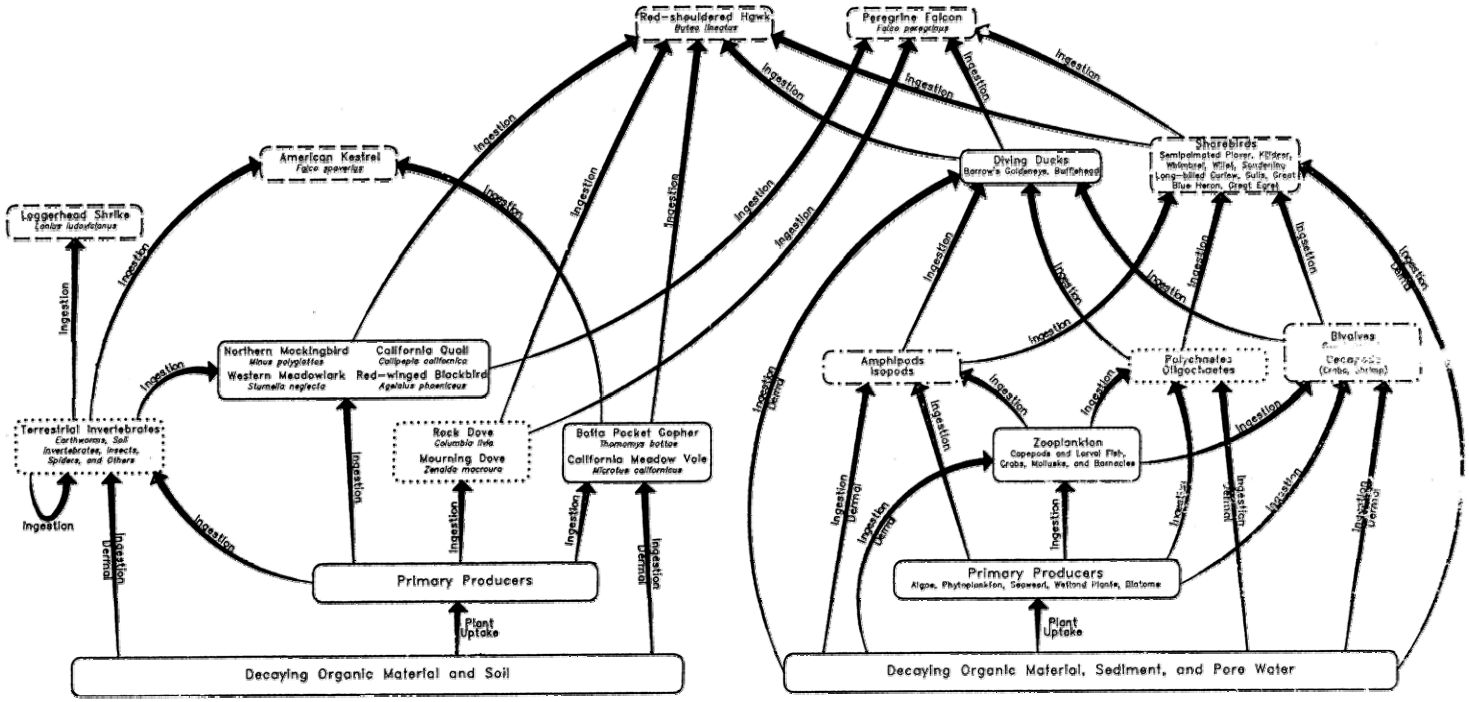
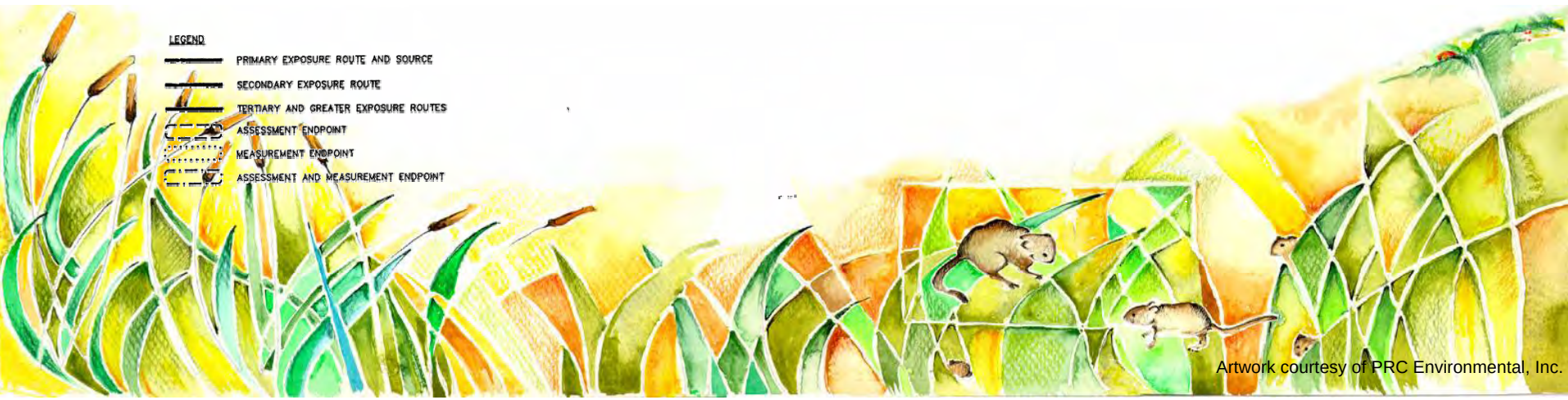
Typical Conceptual Site Model





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ERA Phase I/Phase II Process

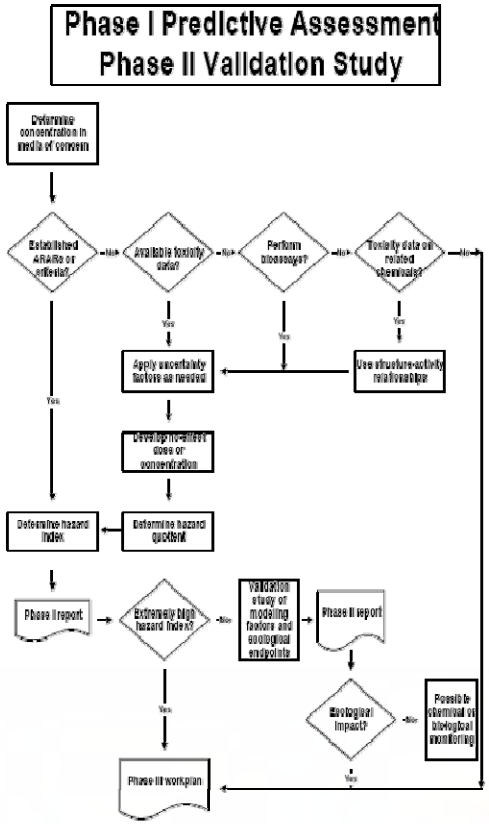

Figure A-2 Phase I Predictive Assessment and Phase II Validation Study Flow Chart.

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ERA Phase III Process

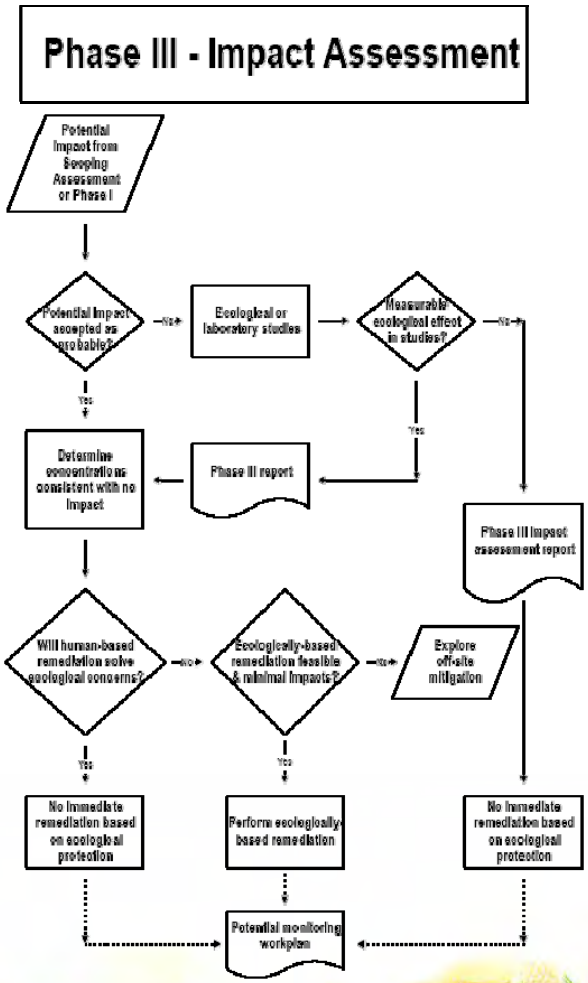

Figure A-3. Impact Assessment Flow Chart.

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Phase III Impact Assessment Participants

- California Department of Fish and Game
- Regional Water Resources Control Board
- U.S. EPA Region 9
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Fish and Wildlife Services (FWS)
- U.S. Department of Interior (Migratory Birds)

ERA Phase I/Phase II Process

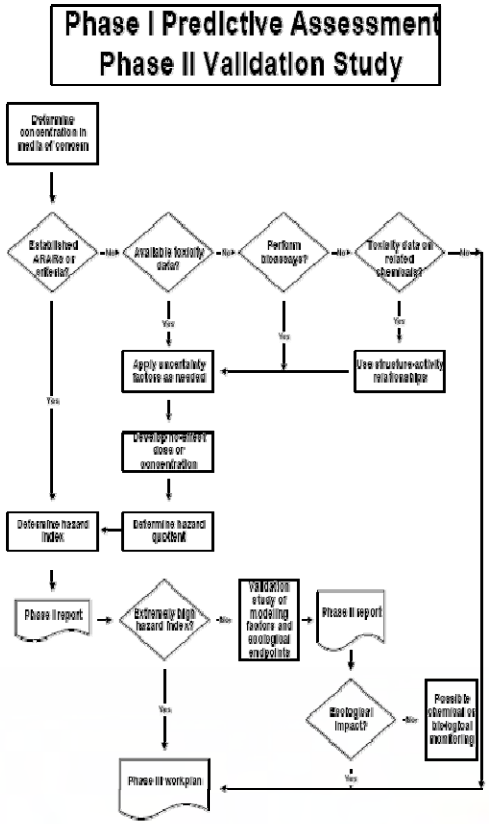

Figure A-2 Phase I Predictive Assessment and Phase II Validation Study Flow Chart.

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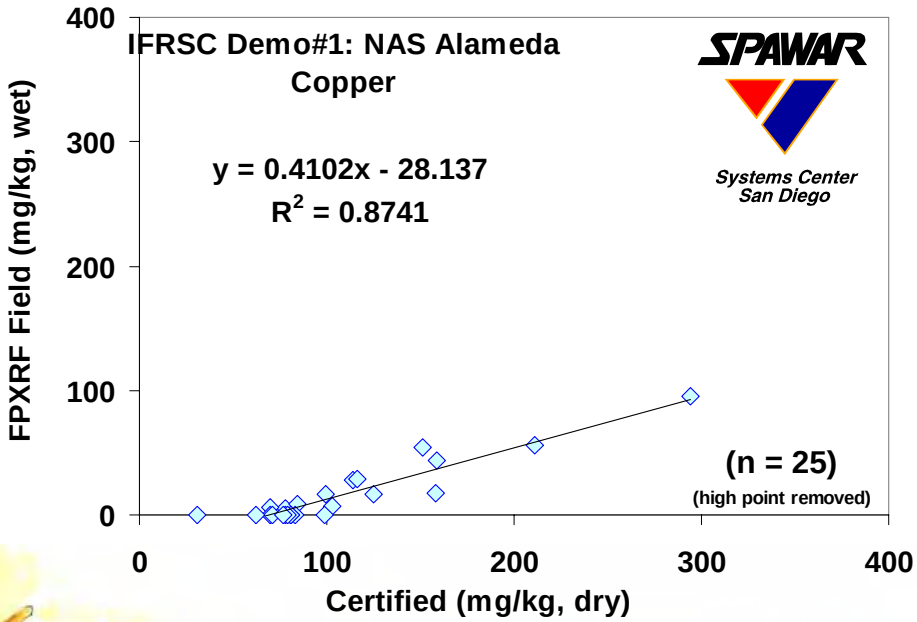
Validation of Ecological Transfer Factors
Terrestrial Soil to Plant

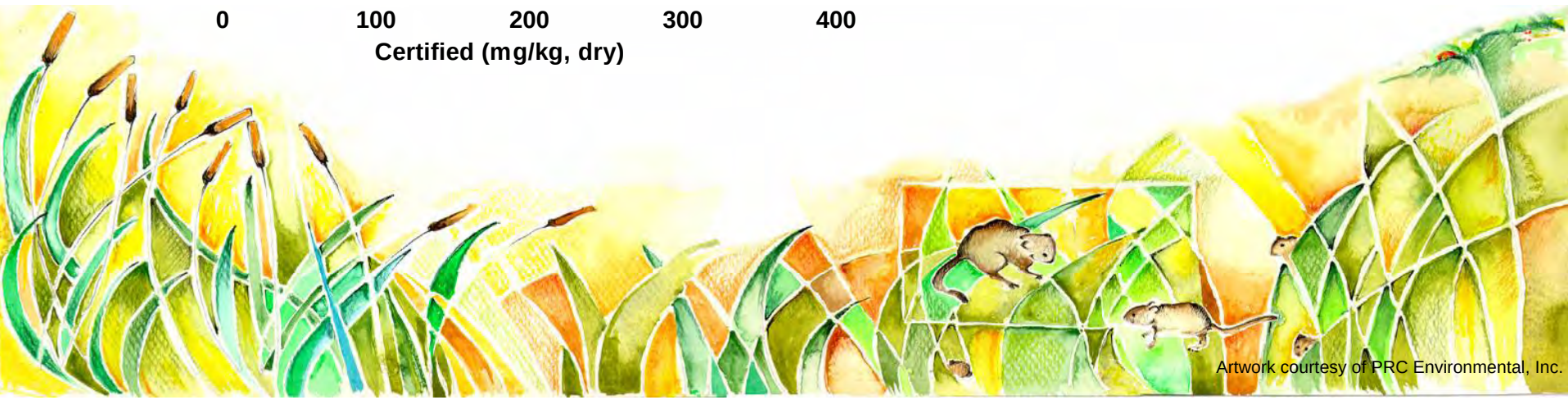
	Estimated	Measured
Aluminum	0.016	0.031
Copper	0.026	0.66
Lead	0.034	0.274
Zinc	0.26	1.04

Determine Area of Concern

X-ray Fluorescence (XRF) Screening



- Metals data (Cu, Pb, Zn) show good correlation to lab data (r^2 from 0.7 to 0.9)
- Similar results at other sites with copper, lead and zinc



ERA Phase III Process

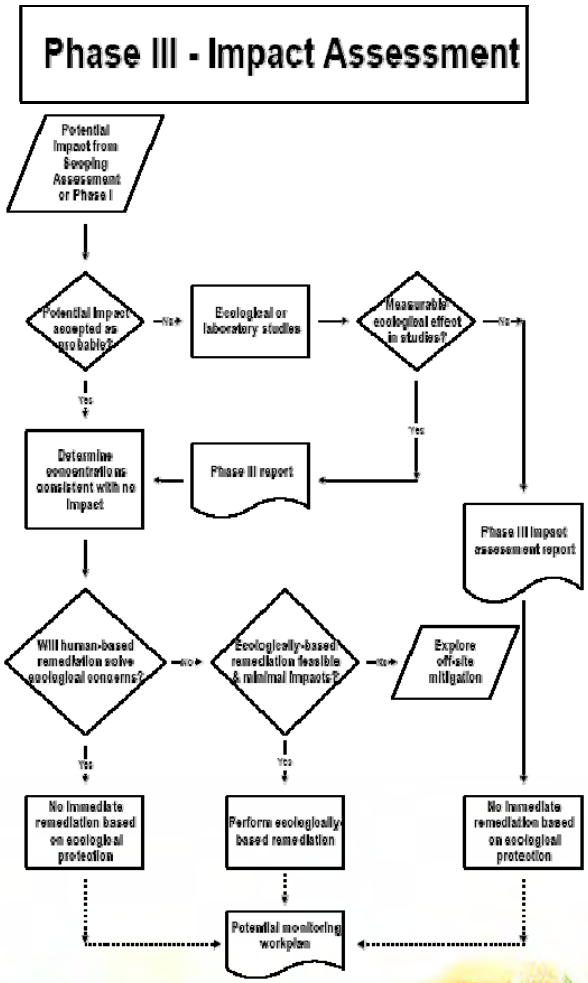


Figure A-3. Impact Assessment Flow Chart.

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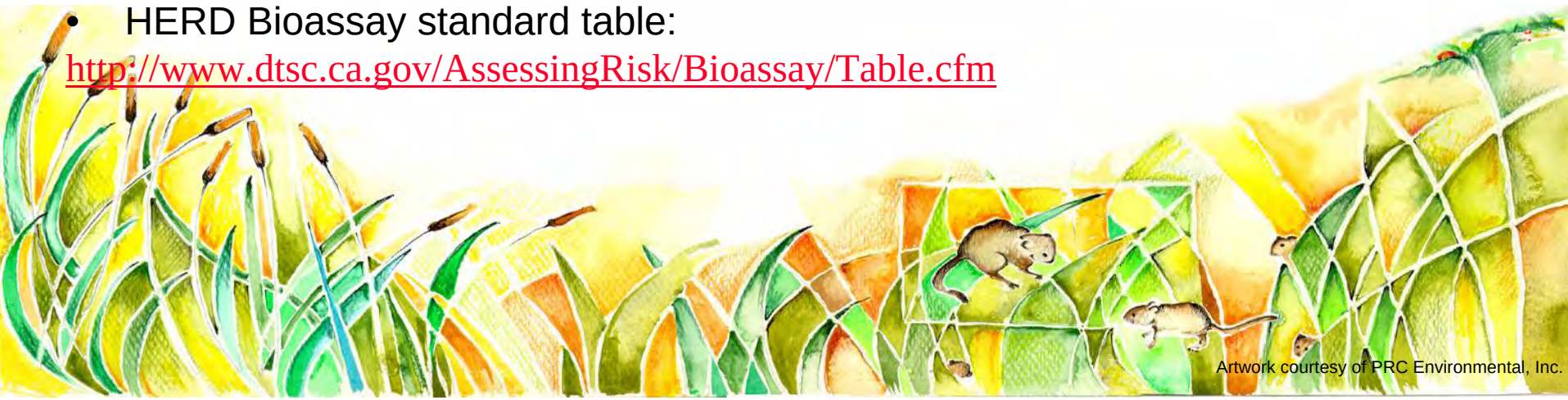
Plant Toxicity Testing

- American Society for Testing and Materials [ASTM]: E 1598-94 (1994) Standard Practice for Conducting Early Seedling Growth Tests.
- Quantitative Test Endpoints (measurable):
  - Number of seedlings that emerge.
  - Time of seedling emergence.
  - Percent survival (to a particular exposure or emergence time).
  - Plant height.
  - Radicle (root) length.
  - Dry weight (total, above ground vegetation and below ground vegetation).
- Qualitative Endpoints (Severity of phytotoxicity):
  - Severity (statements or ranking)
  - Abnormal growth or development (percent or ranking)
  - Abnormal morphology (percent or ranking)
- HERD Bioassay standard table:

http://www.dtsc.ca.gov/AssessingRisk/Bioassay/Table.cfm



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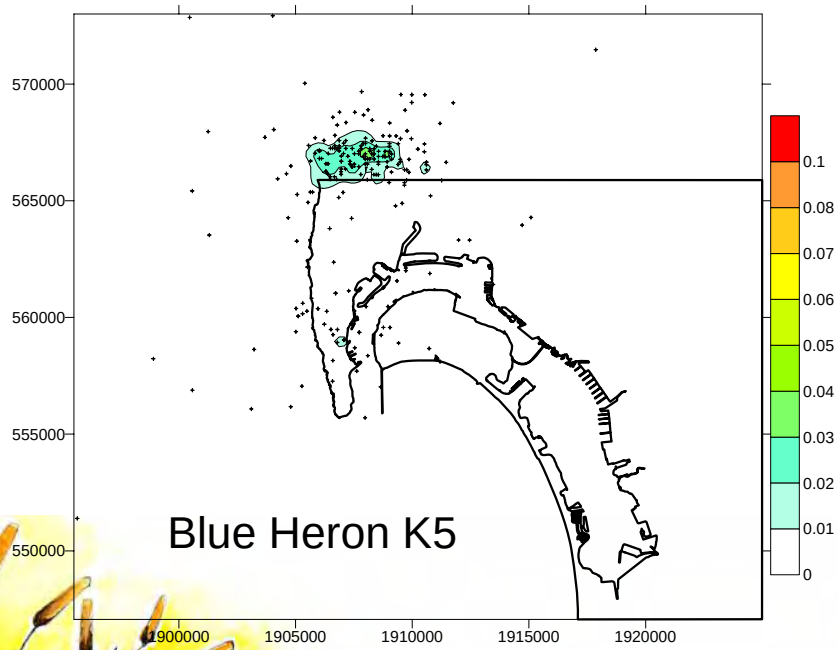
Blue Heron Site Use San Diego

Fraction of site use, based on GPS data



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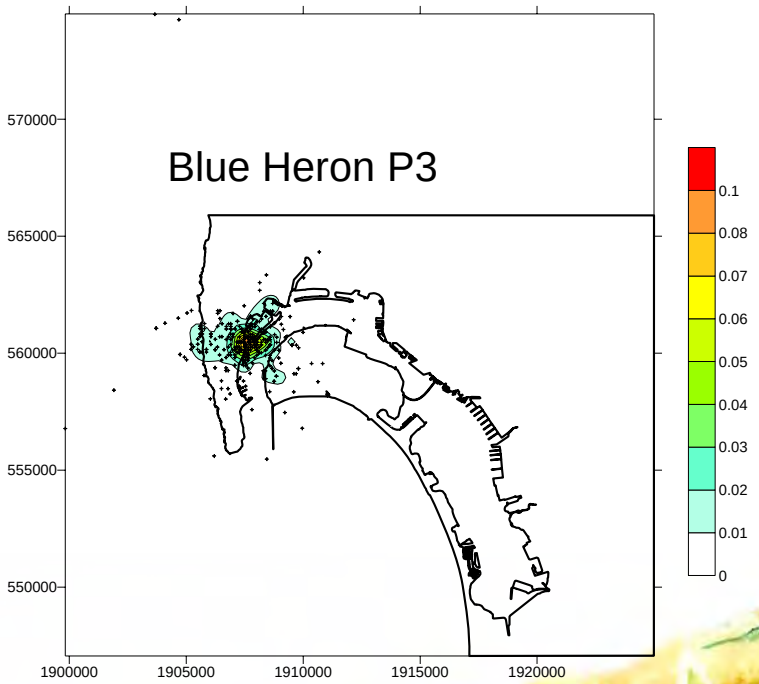

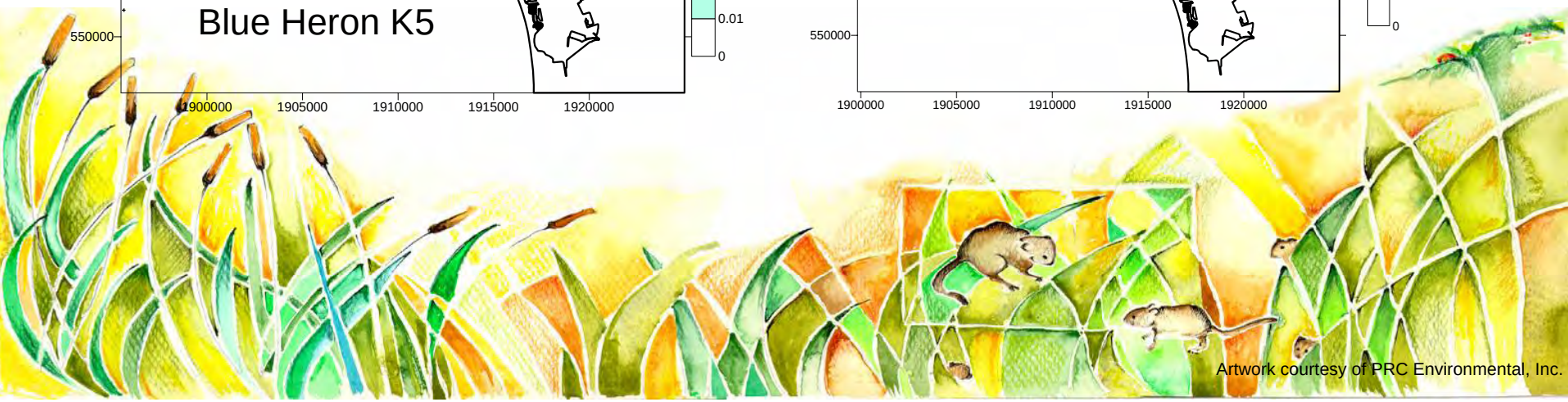

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Habitat Suitability to Assess Site Use

- USFWS Habitat Suitability Index (HSI) developed as part of Habitat Evaluation Procedures
- Quantitative relationships between environmental variables and habitat suitability for key species
- Downy woodpecker (riparian habitat) HSI:

V1 = Basal area of trees

V2 = Density of snags with greater than 15 cm dbh

HSI = minimum of SI_{V1} or SI_{V2}

ERA Phase III Process

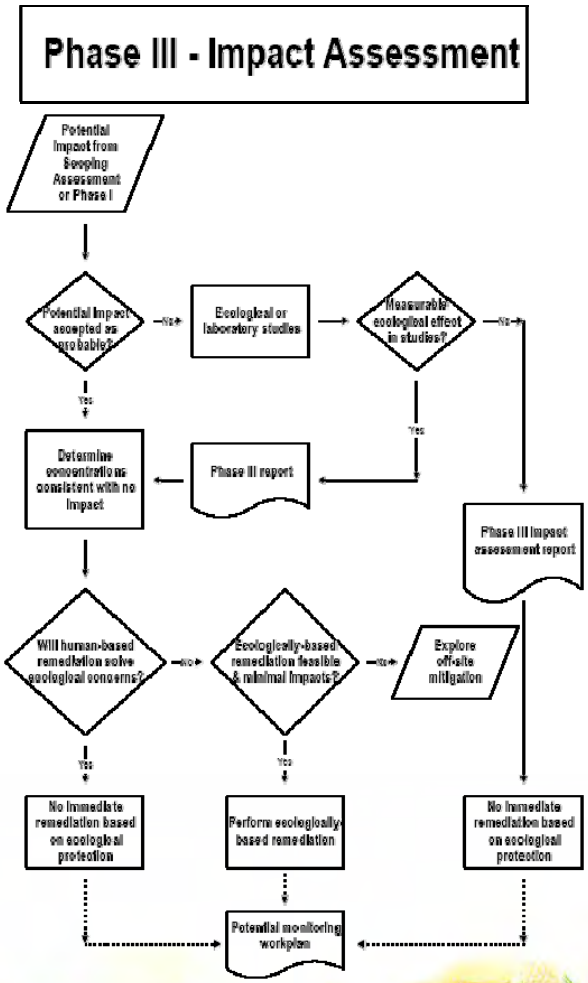

Figure A-3. Impact Assessment Flow Chart.

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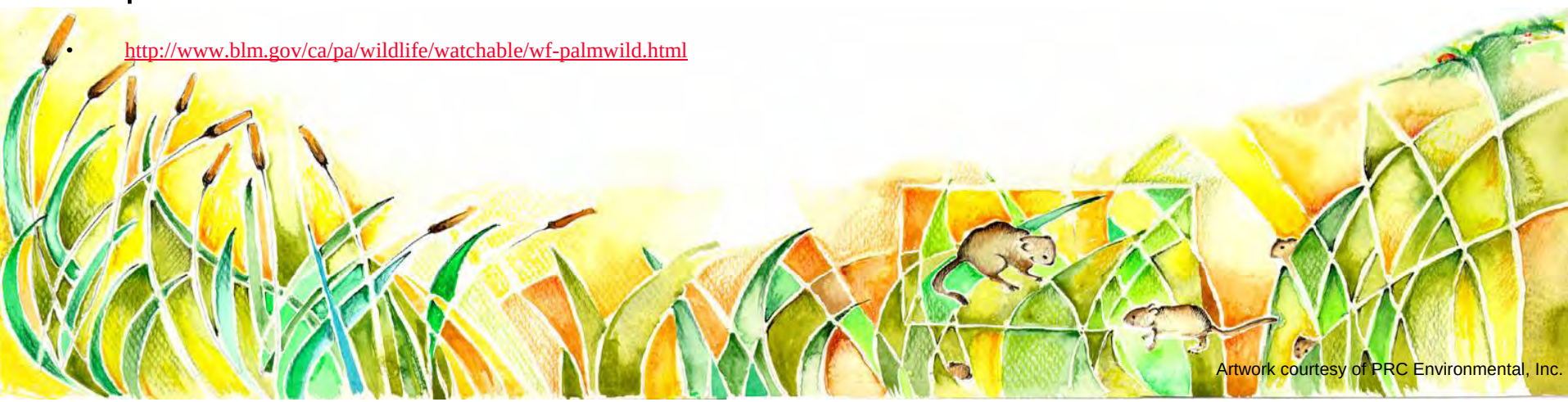
Remediation with minimal impact?

- Soil DDT at depth with HQ>1 for avian receptors
- Streambed susceptible to storm erosion
- Least Bell's Vireo breeding area (*Vireo bellii pusillus*)
- California endangered species in 1980 / USFWS 1986
- Loss of habitat and cowbird parasitism

- http://www.blm.gov/ca/pa/wildlife/watchable/wf-palmwild.html



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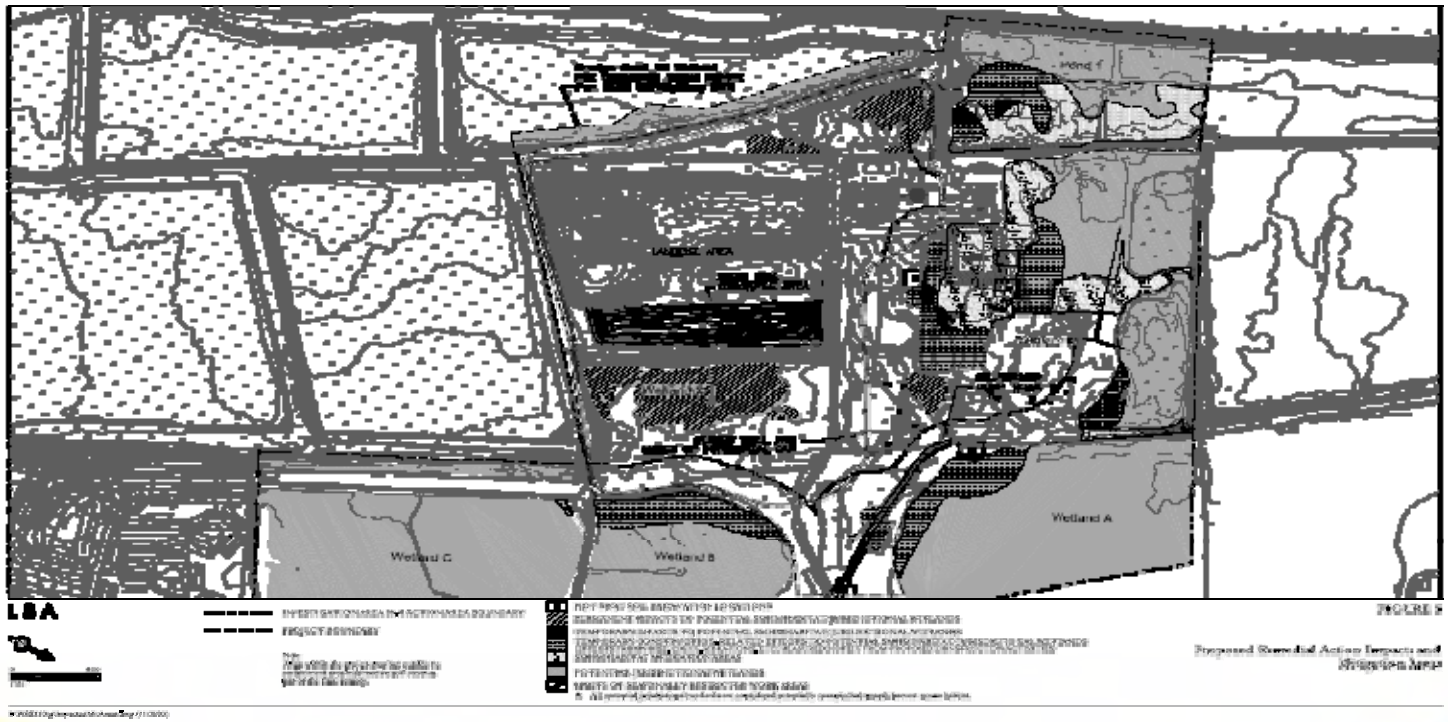
Potential Off-site Mitigation



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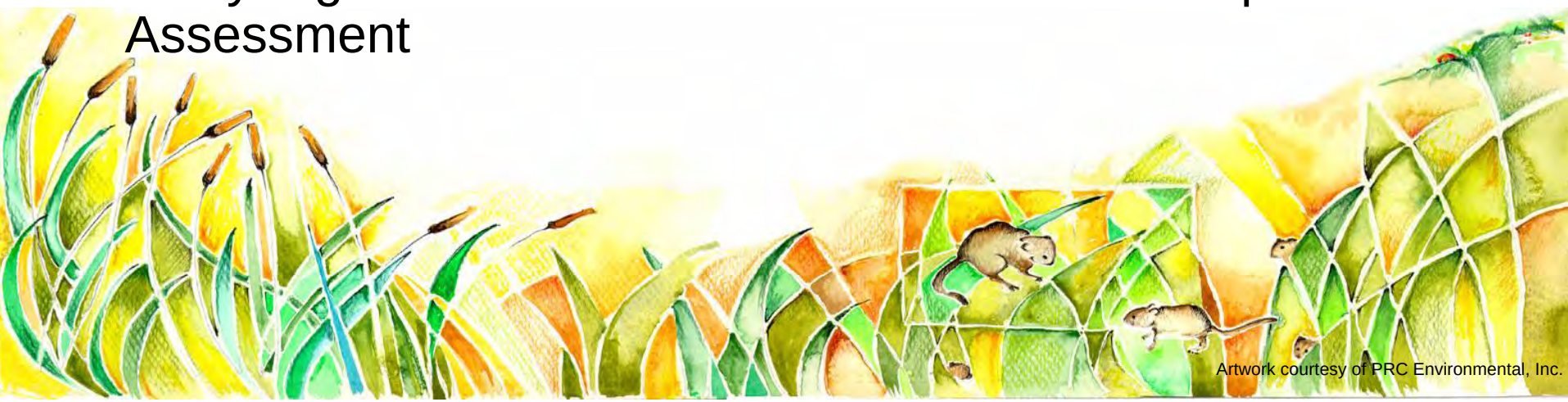
Summary for Phase II/Phase III

- Simple verification experiments available for some trophic groups (example, plants) where HQ>1
- Chemical concentration of food items likely candidate for Phase II Validation Study
  - Soil to invertebrate transfer factor important for inorganic elements such as copper, lead and zinc
- Simple methods available to determine extent of contamination with some inorganic elements (XRF)
- Simple methods available to support Site Use Factor
- Many organizations involved in true Phase III Impact Assessment