Supplemental Data Collection in Support of the OU-3 Ecological Risk Assessment

Pine River TAG

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Acknowledgments

46 Landowners

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USEPA Definition of Ecological Risk

The likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more site-related stressors

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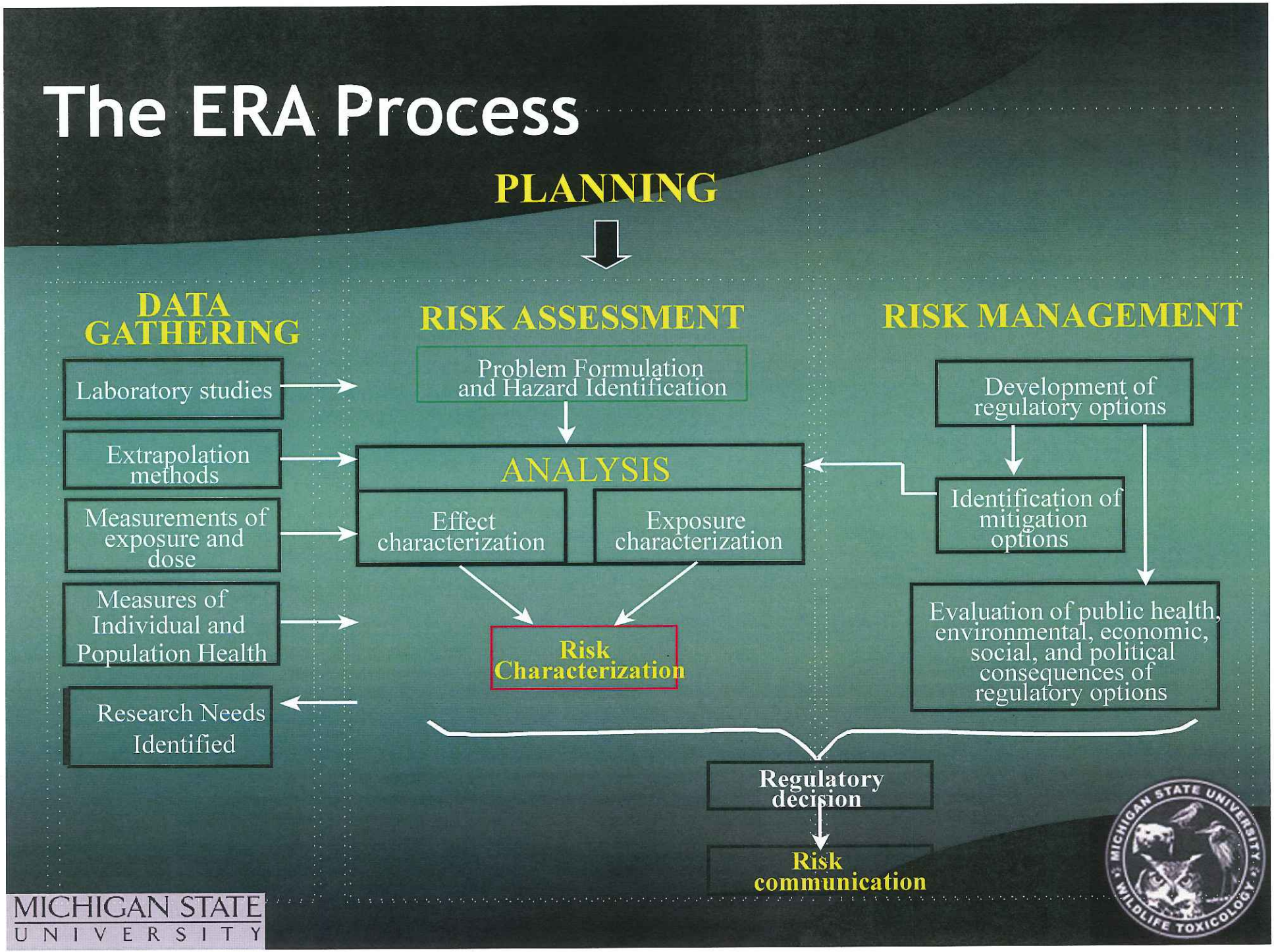
The ERA Process



OU-3 ERA

- Includes Pine River sediments, surface water, and floodplain soils downstream of the St. Louis Dam. To the confluence with the Chippewa River
- Data collection began in 2003
- Pine River Ecological Risk Assessment, The Velsicol Chemical Superfund Site (OU-3), St. Louis, Michigan, Revised Final Report Dec. 2014

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OU-3, What We Know

- COC nature and extent is well defined in sediments and floodplain soils
- COCs include a complex mixture of contaminants
- Most COCs are bioavailable
- The potential for adverse impacts of OU-3 COCs to apex aquatic based assessment endpoints cannot be ruled out
- OU-3 COCs have the potential adversely impact many of the terrestrial food web based assessment endpoints

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OU-3 ERA Uncertainties

- HBB
  - ✓ Limited information related to toxicity
  - ✓ Limited information related to OU-2 biota exposure
- Complex COC mixtures
  - ✓ Eco-chemodynamics
  - ✓ Toxicological potency

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Approach to Address Uncertainties

- Focus on measurement endpoints directly related to assessment endpoints
  - ✓ Individual and Population Health
- Quantify the toxicological potency for biota specific COC mixtures
  - ✓ Tox-cast
- Establish COC eco-chemodynamics
  - ✓ Feeding guild
  - ✓ Trophic status (stable isotopes)

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Assessment Endpoints:

- Explicit expressions of the value that is to be protected. These are the ultimate focus in risk characterization and are linked to community goals and the risk management process.

  example - population sustainability and reproductive success of passerines

Assessment Endpoints (EPA Guidelines)

- Societal value - T&E species, recreationally important, community valued
- Susceptible to the stressor or stressors
- Ecologically relevant
- Unambiguous

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Measurement endpoints should have:

- Diagnostic ability
  - ✓ Direct relationship with Assessment endpoint
  - ✓ Quantifiable
  - ✓ Adequate sample size
- Relevance to an assessment endpoints
  - ✓ Individual and population health
  - ✓ Integrate outcomes of exposure over all stressors of concern and time and space
- Assess indirect effects

Direct Measures of Individual and Population health (Effects Assessment)

- productivity data
  - ✓ clutch size (avian)
  - ✓ hatching success (avian)
  - ✓ Fledging success (avian)
  - ✓ Placental scars (mammalian))
- Nest attentiveness (neurological)
- Nestling growth curves
- Abundance
- Demographics
- Individual organism health (histology,nutritional status,biomarkers)

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To Streamline Studies, Select Specific Species or Recptors

- ✓ intensity of exposure
- ✓ appropriateness as a surrogate species
- ✓ ecological function
- ✓ time spent on-site
- ✓ ease or difficulty of conducting field studies with the organisms
- ✓ size and types of the contaminated habitat
- ✓ relative sensitivity to contaminants

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Receptors (Study Animal

- Song birds
  - Shrews
  - Raptors
  - Mi

Uncertainties Associated with the Toxic Potency of COC Mixtures

- Traditional ERA approaches do not address exposures to more than one chemical at a time
- Assessment endpoints residing within different levels of the food web are exposed to differing COC mixtures
  - ✓ Tox-cast
    - Mechanism based toxic potency
      - Endocrine disruption
      - Neurotoxicity
      - AhR based toxicity

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Establish COC eco-chemodynamics

- Why?
  - ✓ COC mixture exposure differs by feeding guild
  - ✓ Relationships among feeding guilds and with primary floodplain soils and sediments will be required for sustainable management decisions
- How?
  - ✓ Quantify biota concentrations by feeding guild for COCs and primary matrices on within temporally and spatially relevant boundaries
  - ✓ Verify trophic status of feeding guild through stable isotope analysis

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Site-Specific Food Web data

Items collected from within 3 collection grids

Items

- Soil
- sediment
- Plants (Aquatic, Terrestrial, edible portions)
- Benthic Invertebrates (a minimum of 3 orders per grid)
- Terrestrial Invertebrates (a minimum of 3 orders per grid)
- Crayfish
- Earthworms (depurated and non-depurated)
- Fish (forage, Northern Pike, Bowfin, Channel Catfish)
- Frogs (green frogs)
- Small mammals (moles, voles, mice, shrews)
- Passerines (House Sparrow, House Wren, Tree Swallow, American Robin)
- Waterfowl (woodduck, Hooded merganser)

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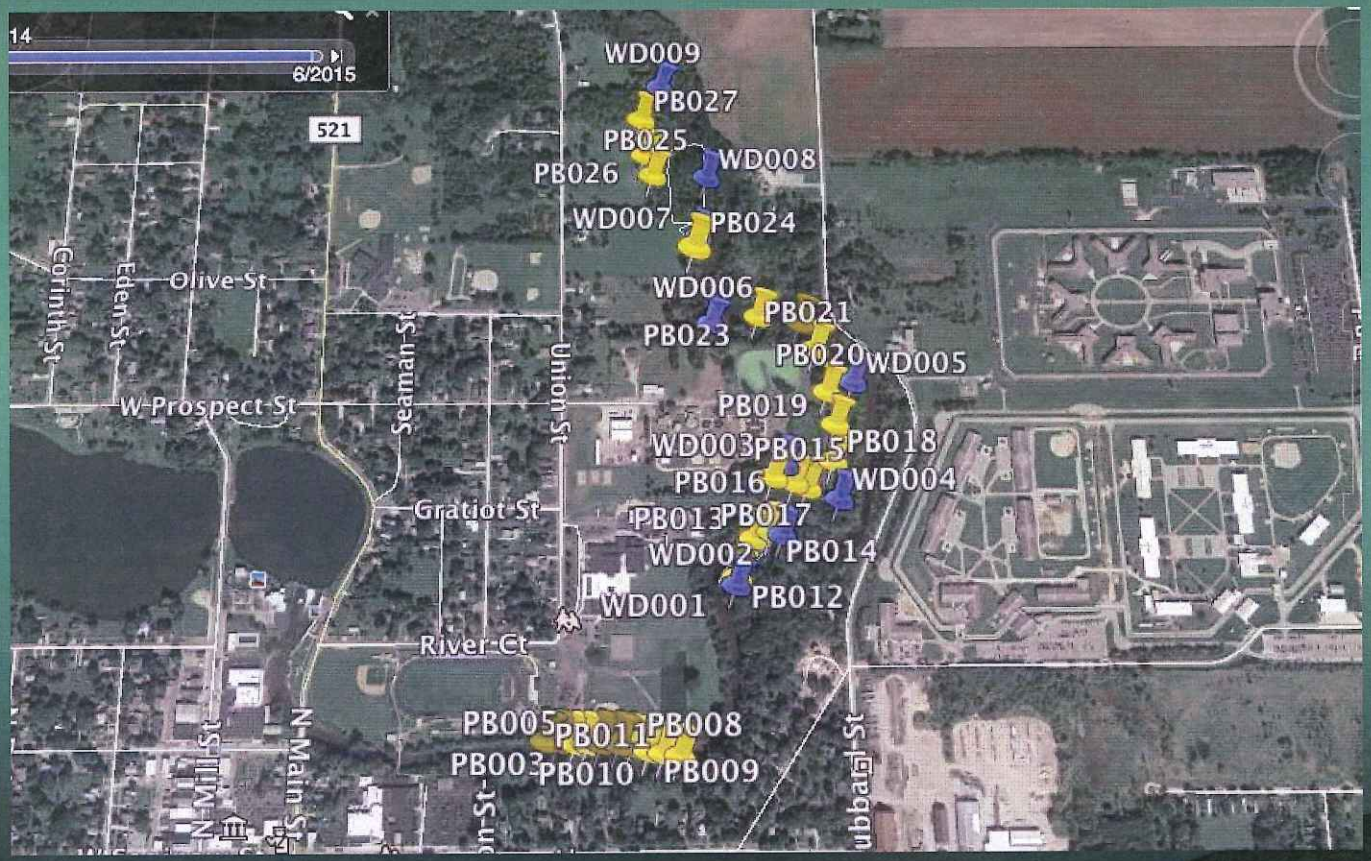
Spatial Boundary

3 Food Wed Sampling Grids, 110 Passerine Boxes, 15 Waterfowl boxes



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End Game

- Combine all relevant data from 2003 to present to test pre-specified, assessment endpoint directed hypothesis
- Apply a weighted multiple lines of evidence approach to establish conclusions and associated uncertainties

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