Biological Resources (Con’t.)

- Aquatic Systems
- Wetlands
- Threatened & Endangered Species

Assessing Impacts to Aquatic Systems

- Identify Source of Potential Impacts
  - Changes in Water Quality
  - Change Hydrology (de-water/flood)
  - Placement of Fill
  - Shading
  - Changes in Aquatic Vegetation (invasive species)
- Determine Study Area
  - Generally areas of direct impact
- Determine Existing Conditions
  - Field Visit for Habitat
  - Species Likely to Occur
  - Fish Surveys (electroshocking/seines/traps)
  - Macroinvertebrates Surveys
  - HEP/HES
- Identify Standard
  - Usually none except for E & T species

Aquatic Systems (cont.)

- Impact Prediction
  - Direct Taking
  - Change in Hydrology
  - Shading
  - Water Quality Effects
  - HEP/HES
  - Invasive Species
- Assess Significance of Impacts
  - Percentage/Professional Judgment
  - Unique Characteristics/ Sensitive Species
  - Economic Value
- Mitigation
  - Avoid/Minimize Sensitive Areas
  - Enhance Habitat (HEP/HES)
  - Control Invasive Species
Habitat Evaluation System (HES)

- Assumes abundance of species is determined by presence of habitat.
- 2 Aquatic Systems (streams and lakes)
- 5 Terrestrial Systems
- Steps of HES
  - Derive Habitat Quality Index (HQI) scores
  - Derive Habitat Unit Values
  - Calculate Difference With and Without Project
  - Use to Determine Mitigation

Assessing Impacts to Wetlands

- Identify Source of Potential Impacts
  - Placement of Fill
  - Change Hydrology (de-water)
  - Shading
  - Toxic Substances
  - Spills
  - Mining
  - Non-indigenous Species
- Determine Study Area
  - Generally Areas of Direct Fill or Changes to Hydrology
- Determine Existing Conditions
  - Aerial Photographs
  - Field Visit
  - Wetland Delineation
  - Wetland Evaluation Technique (WET)
  - Hydrogeomorphic Approach (HGM)

Wetlands (cont.)

- Identify Standard
  - Federal/State Permits
    - Nationwide
    - Individual
- Impact Prediction
  - Direct Taking
  - Change in Hydrology
    - Shading
    - WET/HGM
- Assess Significance of Impacts
  - Individual Permit
    - Percentage/Professional Judgment
    - Unique Characteristics/Sensitive Species
- Mitigation
  - Avoid/Minimize Sensitive Areas
    - Compensate (WET/HGM)
    - Banking
Wetland Basics

Definition: Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. (US Army Corps of Engineers, 1977)

Wetlands Basics (cont.)

Transitional Wetlands
Depressional Wetlands

Wetland Functions

Abiotic Functions
- Flood Mitigation
- Storm Abatement
- Aquifer Recharge
- Water Quality
  - Nutrient retention
  - Sediment trapping
- Bank Stabilization

Biotic Functions
- Wildlife Habitat
- Aquatic Habitat
- Food Chain Support

Human Functions
- Active Recreation
- Passive Recreation
- Resource Harvest
Wetland Evaluation

- Wetland Evaluation Technique (WET)
  - 11 Functions
  - Evaluated on:
    - Social Significance
    - Effectiveness
    - Opportunity

- Hydrogeomorphic Analysis (HGM)
  - Wetland Group by:
    - Geomorphic setting
    - Water source
    - Hydrodynamics
  - Groups have different functions
  - Functional capacity models for region
  - Reference wetlands
  - Functional capacity units

HGM Wetland Classification

<table>
<thead>
<tr>
<th>Hydrogeomorphic Class (geomorphic Agent)</th>
<th>Water Source (important)</th>
<th>Hydrogeomorphic Dominant</th>
<th>Examples of Regional Subclasses</th>
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<tbody>
<tr>
<td>Emergent</td>
<td>Overstory tree islands</td>
<td>Driftwood and flotsam</td>
<td>Riparian forest islands</td>
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<tr>
<td>Floodplain</td>
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<td>Meandering</td>
<td>Meandering</td>
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<td>Organic sediments</td>
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<td>Saturated mires</td>
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<tr>
<td>Lacustrine</td>
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</table>

HGM Computations

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<th>Region</th>
<th>Value</th>
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<th>After</th>
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<td>Delta</td>
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<td>0.3</td>
</tr>
</tbody>
</table>

| Capacity Index | 0.5 | 0.8 |

*Values may vary and should be interpreted with caution.*
Assessing Impacts to Species of Concern (T&E, Rare)

- Identify Source of Potential Impacts
  - Clearing and Grubbing
  - Change Hydrology (de-water/flood)
  - Toxic Substances
  - Spills
  - Placement of Fill
  - Shading
  - Noise
  - Human Contact
  - Non-Indigenous Species

- Determine Study Area
  - Generally Areas of Direct

- Determine Existing Conditions
  - Consultation with US Fish & Wildlife service
  - Habitat for Species Likely to Occur
  - Field Visit for Habitat
  - Survey for Species

Species of Concern (cont.)

- Identify Standard
  - Jeopardy

- Impact Prediction
  - Biological Assessment
    + Direct Taking
    + Habitat Alternation
  - Biological Opinion

- Assess Significance of Impacts
  - Affect on Wildlife Species of Concern
    + No Jeopardy
    + Jeopardy

- Mitigation
  - Avoid/Minimize Sensitive Areas
  - Enhance Habitat
  - Move Species
ESA Consultation Process