Riparian Habitat Assessment Database (RHAD)

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Geog 575 - Digital Compilation and Database Design.

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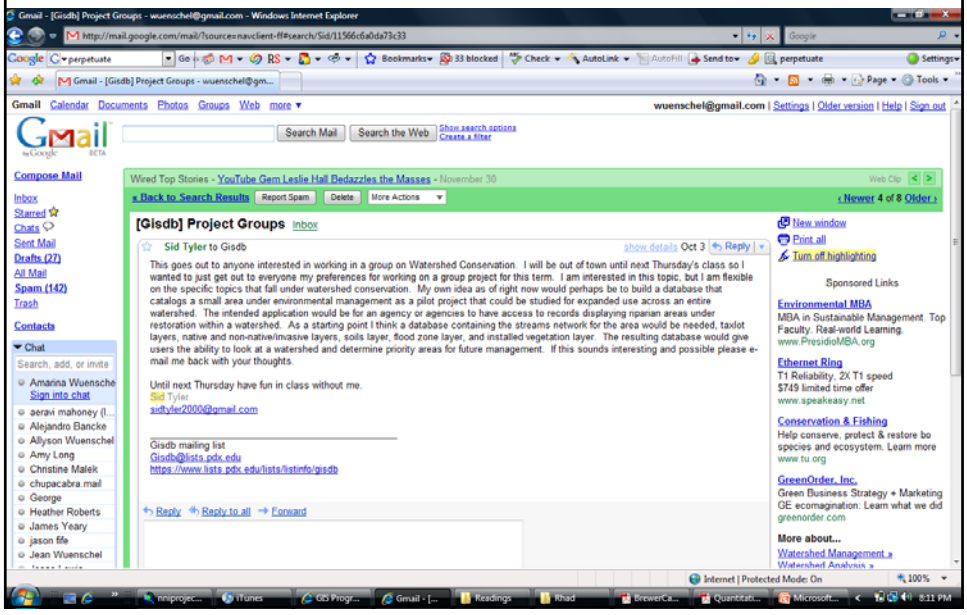
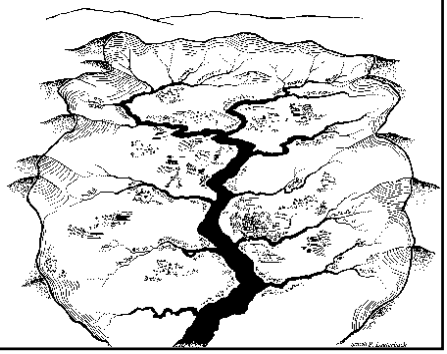
Sid's Vision

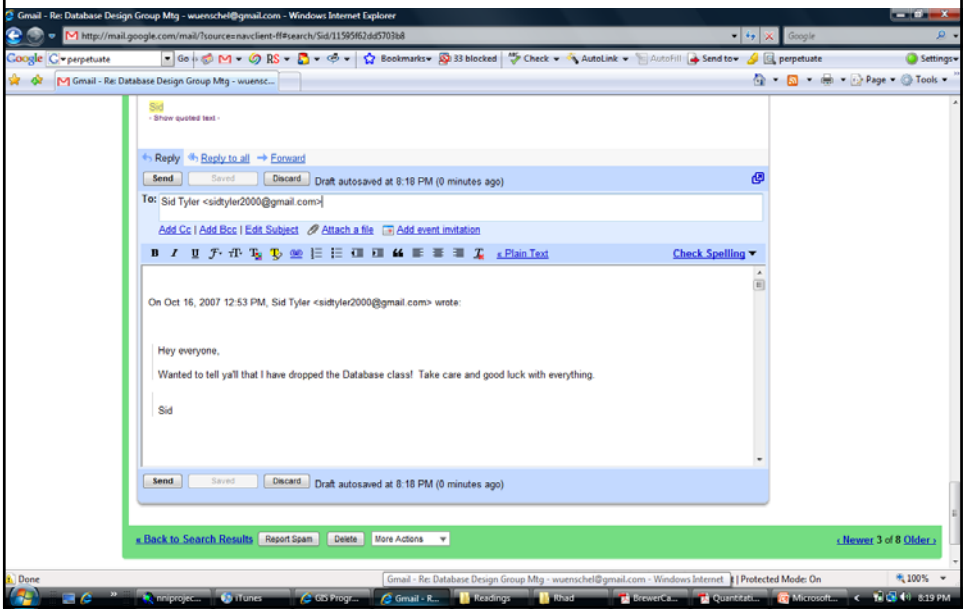


The RHAD$_{est}$ Database

- Predictive modeling of potential restoration sites
- Transferable to different places and different scales
- Include a socio-political component

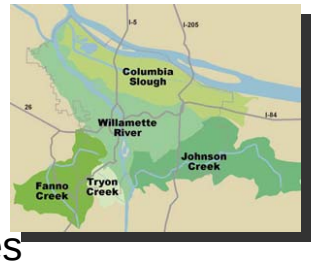


Sid's Goodbye



Fanno Creek Study Area

Fanno Creek Facts



- Watershed area is 20,259 acres
- About 309 acres, or 7% of the watershed, is parks or open space
- About 15% designated within environmental protection and conservation zones
- There are 23 miles of open stream channel, about 5 miles in culverts or piped
- Impervious surfaces comprise nearly 1,500 acres, or 33%, of the watershed

Data Sources

- City of Portland Bureau of Environmental Services
- METRO RLIS
- Oregon Water Resources Department
- Puget Sound LiDAR Consortium
- USDA NRCS Soils
- USGS/EPA National Hydrography Dataset
- Clean Water Services

Literature Review

The Role of GIS in Selecting Sites for Riparian Restoration Based on Hydrology and Land Use

Gordon D. Russell[1,4]
Charles P. Hawkins[2,3]
Michael P. O'Neill[3]

Abstract

Successful long-term wetland restoration efforts require consideration of hydrology and surrounding land use during the site selection process. This article describes an approach to initial site selection in the San Luis Rey River watershed in southern California that uses watershed-level information on basin topography and land cover to rank the potential suitability of all sites within a watershed for either preservation or restoration. This approach requires the use of a geographic information system (GIS) to map relative wetness and land cover within a watershed. Relative potential wetness values were derived from U.S. Geological Survey (USGS) 30-m digital elevation models by calculating the flow that would potentially accumulate at all 30-m × 30-m pixels within the watershed. Land cover was derived from a Landsat scene covering the 1500 km² study area. We ranked sites (contiguous groups of pixels ≥ 1 ha with similar land cover) in terms of their potential for restoration or preservation based on their wetness values (low, medium, and high), size, and proximity to existing riparian vegetation. Sites with medium or high wetness values and extant vegetation were identified as potential preservation sites. Agricultural or barren sites with medium to high wetness were identified as potential restoration sites. Approximately 5900 ha (5.67% of the total watershed) were prioritized for preservation or restoration.

Introduction

The overall purpose of this study was to develop an approach to selecting and prioritizing sites for riparian wetland restoration. The need for such a methodology stems primarily from the growth of wetland restoration and creation driven by mitigation for unavoidable losses due to development. Examination of existing restoration projects reveals that there is much room for improvement in how wetland mitigation projects are designed, developed, and implemented (Kentula et al. 1992). A coherent, consistent methodology for site selection that considers the physical and biological ability of sites to support wetland function may contribute to greater success in restoration efforts. Any such methodology should be simple, flexible, and expedient, and should have general applicability.

Defining and delineating wetlands is almost always inherently problematic. Smith (1980) said that wetlands are a "halfway world between terrestrial and aquatic ecosystems and exhibit some characteristics of each." They often form a continuous gradient between uplands and open water. In general, wetlands are areas where saturation or inundation with water is the primary factor determining the nature of soil development and the types of biotic communities existing therein (Nilan & Frayer 1980).

There are several distinctly different classes of wetlands. This study focuses only on riparian, or "river-influenced" wetland environments, and does not address other major wetland habitats, such as marine, estuarine, or lacustrine, as described by Cowardin et al. (1979). Within this classification system, riparian wetlands can be categorized as palustrine (floodplain) environments.

The success of riparian wetland mitigation efforts depends on many factors. Foremost, objectives of the effort must be clearly defined (Jensen & Platts 1990). Once the goals have been identified, the issue of site selection can be addressed. Selection of sites with the highest potential for successful restoration/creation is a logical component of the effort to attain restoration goals. The term "mitigation" is used herein to include the restoration and creation of riparian wetland habitats.

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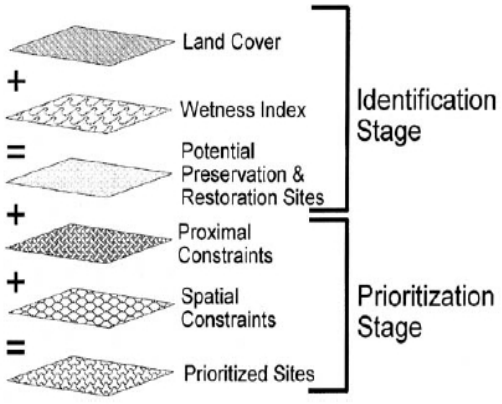
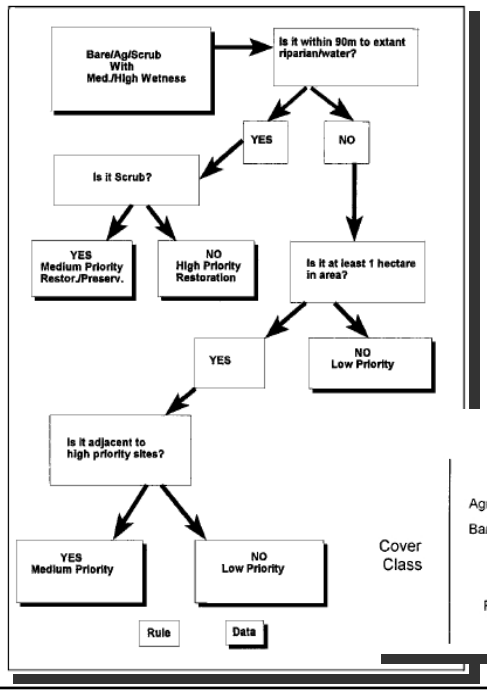
How are Riparian Restoration Sites Selected?

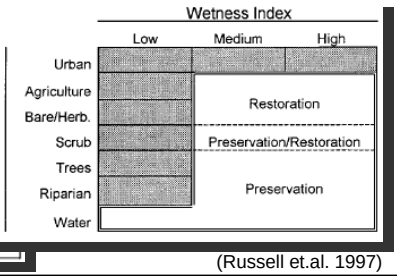
- Existing Models Use:
  - Biophysical Factors
    - Land Cover
    - Soils
    - Hydrology
  - Spatial Factors
    - Size
    - Proximity
    - Connectivity





Restoration Prioritization

Restoration vs. Preservation



(Russell et.al. 1997)

How are Riparian Restoration Sites Selected?

- Our Model Also Includes:
  - Socio-political Factors
    - Land Ownership
    - Zoning
    - Impervious Surfaces
      - Roads
      - Urban Development
      - Residential Development
    - Vegetation Land Cover
    - Water Rights
      - Points of Diversion
      - Places of Use

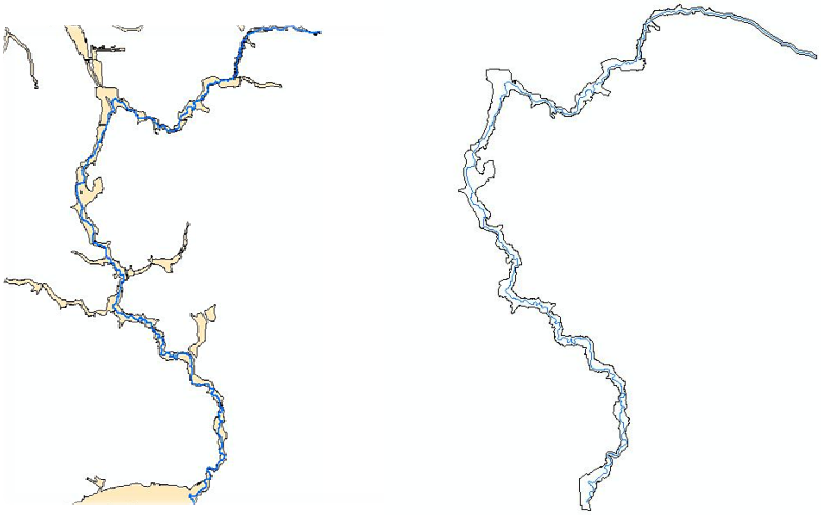
New Model

HABITAT	**IDENTIFICATION** *(biophysical)*	**PRIORITIZE** *(spatial)*	**PRIORITIZE** *(socio-political)*	**MONITOR** *(biological)*
RIPARIAN	Aerial Photography Land Cover Stream Buffer		Land Ownership Land use Impervious surfaces Roads Zoning Water Rights	Aquatic/Avian Species Ground truth Water quality
WETLAND	Aerial Photography Land Cover Soils Topography Floodplain		Land Ownership Water Rights Land use Impervious surfaces Roads Zoning Water Rights	Avian Species Ground truth Water Quality
ANALYSIS	Intersection	Connectivity Size Proximity	Potential Existence	Abundance
OUTPUT	Habitat	Ordered list of suitability	Ordered list of feasibility	

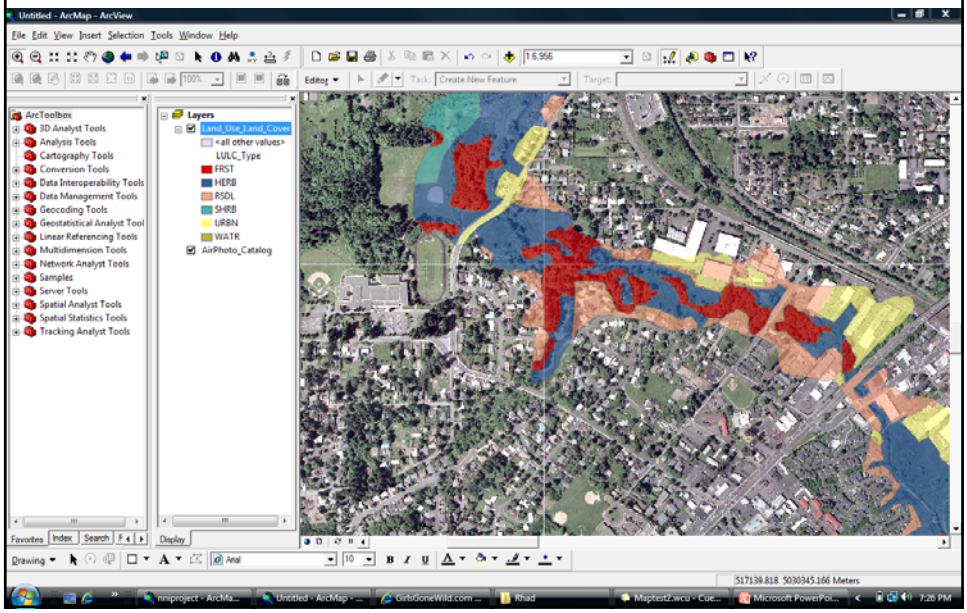
Data Processing/Database Design

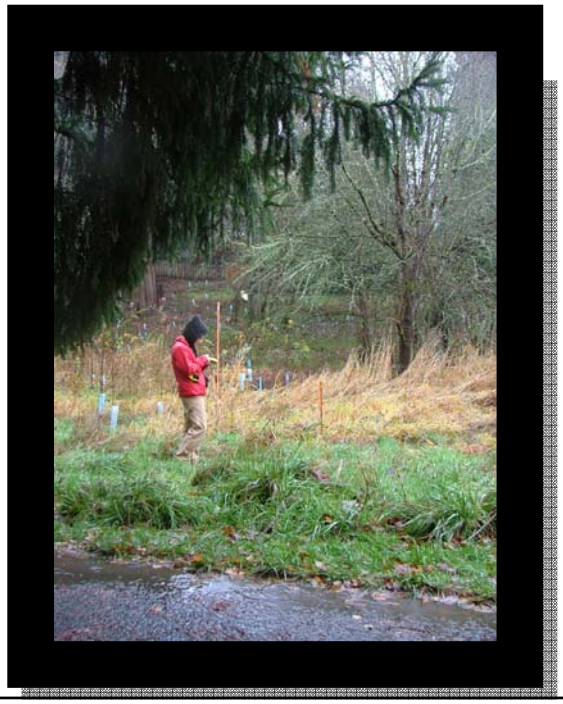
- Processing: Project, Query, Buffer, Clip, Intersection
- Development: Digitize aerial photography, Field survey with GPS
- Integrity: Attribute Domains, Topology
- Behavior: Relationships, Subtypes, Terrain Dataset, Linear Referencing

Processing: Area of Interest



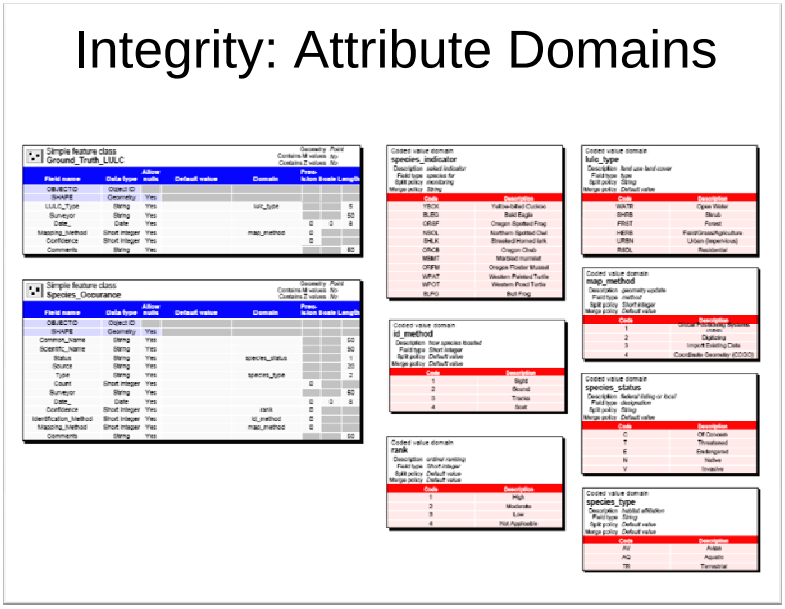
Development: LULC Digitizing



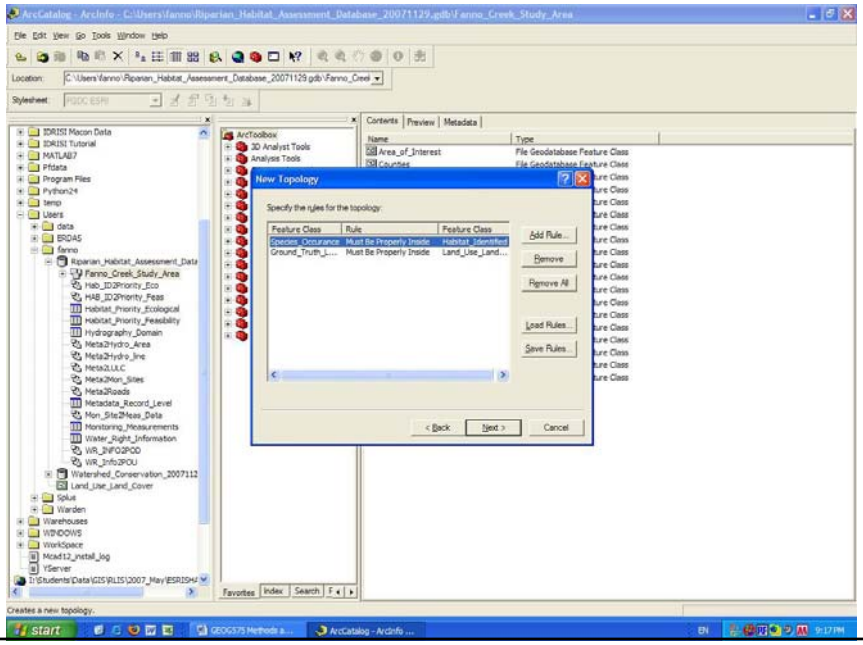


Ground Truthing

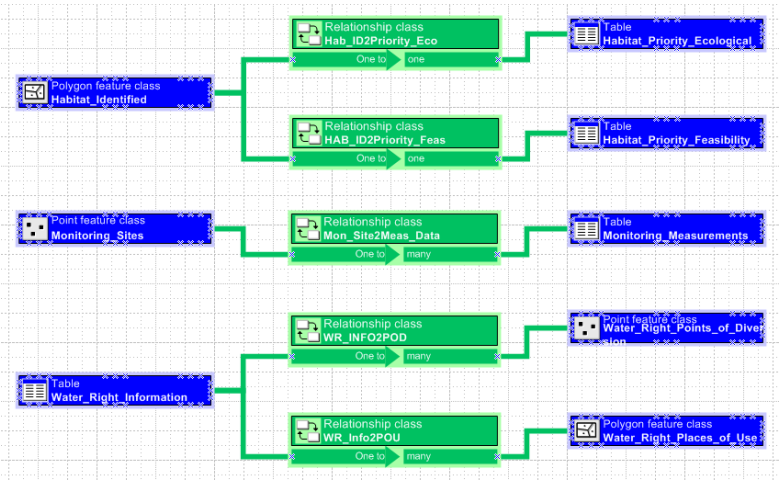
Integrity: Attribute Domains

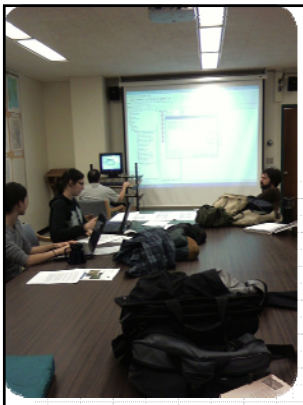


Integrity: Topology



Behavior: Relationships

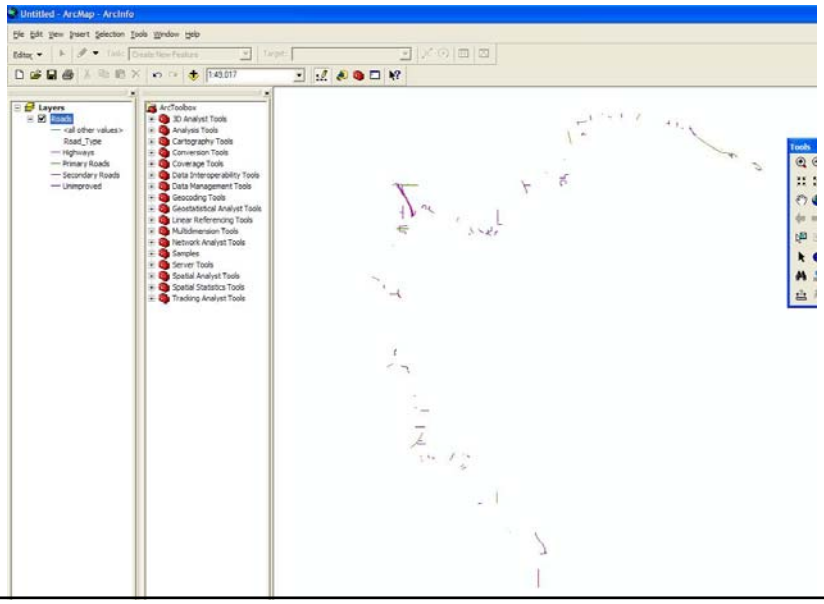


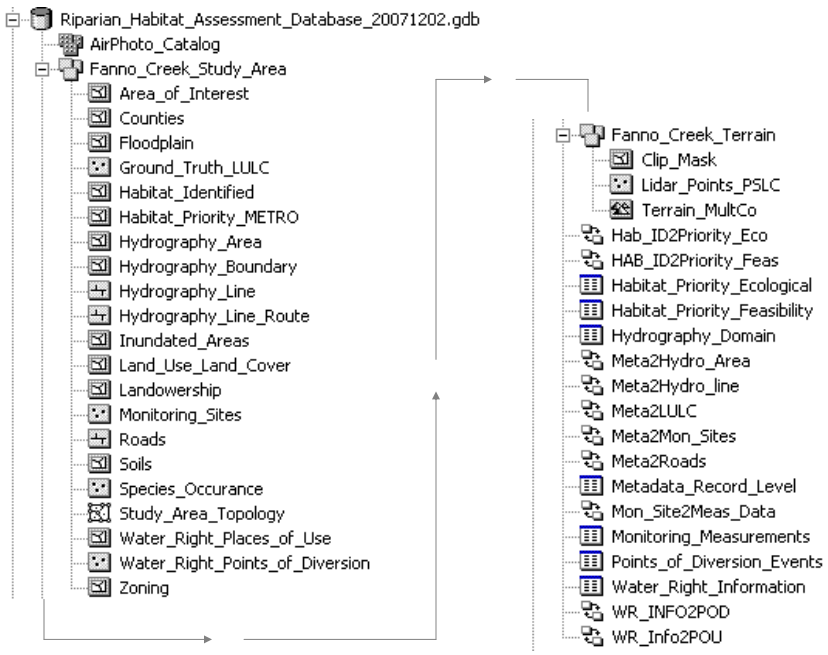


Building Relationships

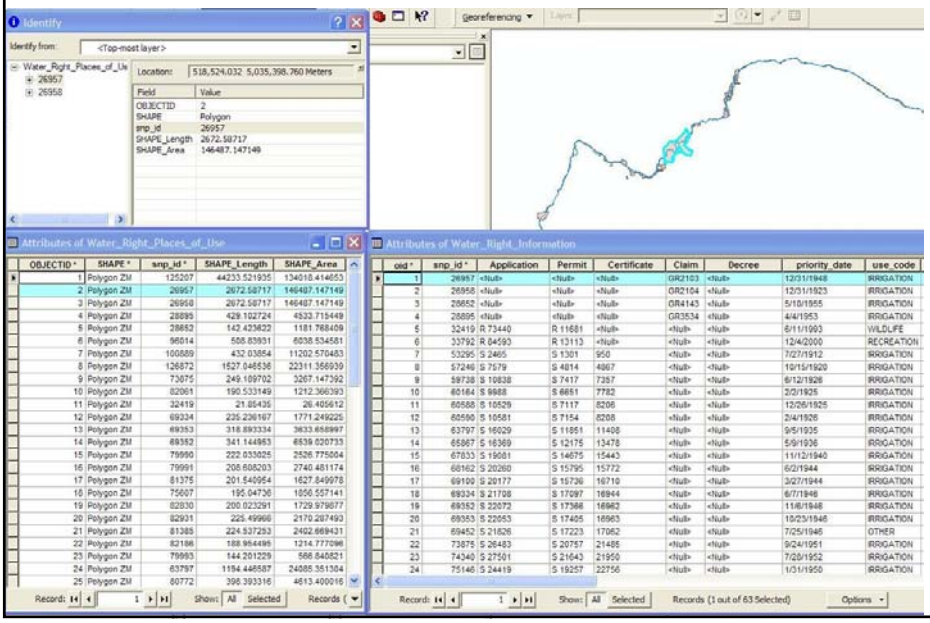
Primary / foreign key = "meta_ID"

Behavior: Subtypes



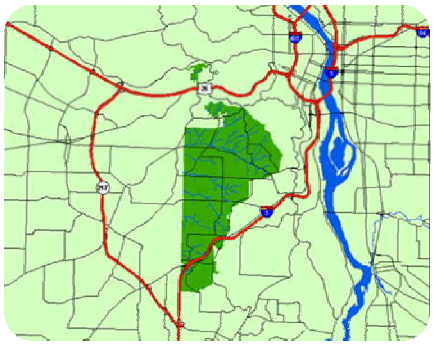


ArcMap Example: Query



ArcMap Example: 'Predictive' Map

Limitations and Quality Statements



- Resolution of data not high enough to work with such small areas
- Different data from different counties
- Shape Considerations
- Small Study Area

What's Next?

<u>Future Uses</u>

- Private Land Owner Census
- Integration of Data between Agencies and Public Advocacy Groups
- Future Monitoring

What's Next

Developing the Model

- Use short integers for domains to be sub-typed
- Flow accumulation modeling
- Ground Truth Data

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