Update and Extend SALMOD

Dr. Thomas B. Hardy (Texas State University)

Thomas Shaw (USFWS)

Dr. Sam Williamson (USGS)

Update and Extend SALMOD

- Objectives
  - Extend SALMOD from Scott River to the Estuary
  - Extend SALMOD from Iron Gate Dam Upstream to Keno Dam
  - Revise Underlying Computational "Habitat" Unit Representation
  - Update the Habitat versus Flow Relationships and other model parameters

Extension of SALMOD

- Utilized the meso-habitat mapping conventions
  - Low Slope
  - Moderate Slope
  - Steep Slope
  - Pool
    - These were further delineated based on
      - Main Channel
      - Split Channel
      - Side Channel (~ 25 percent of less of river flow and not necessarily permanent)
- Added two new mesohabitat features
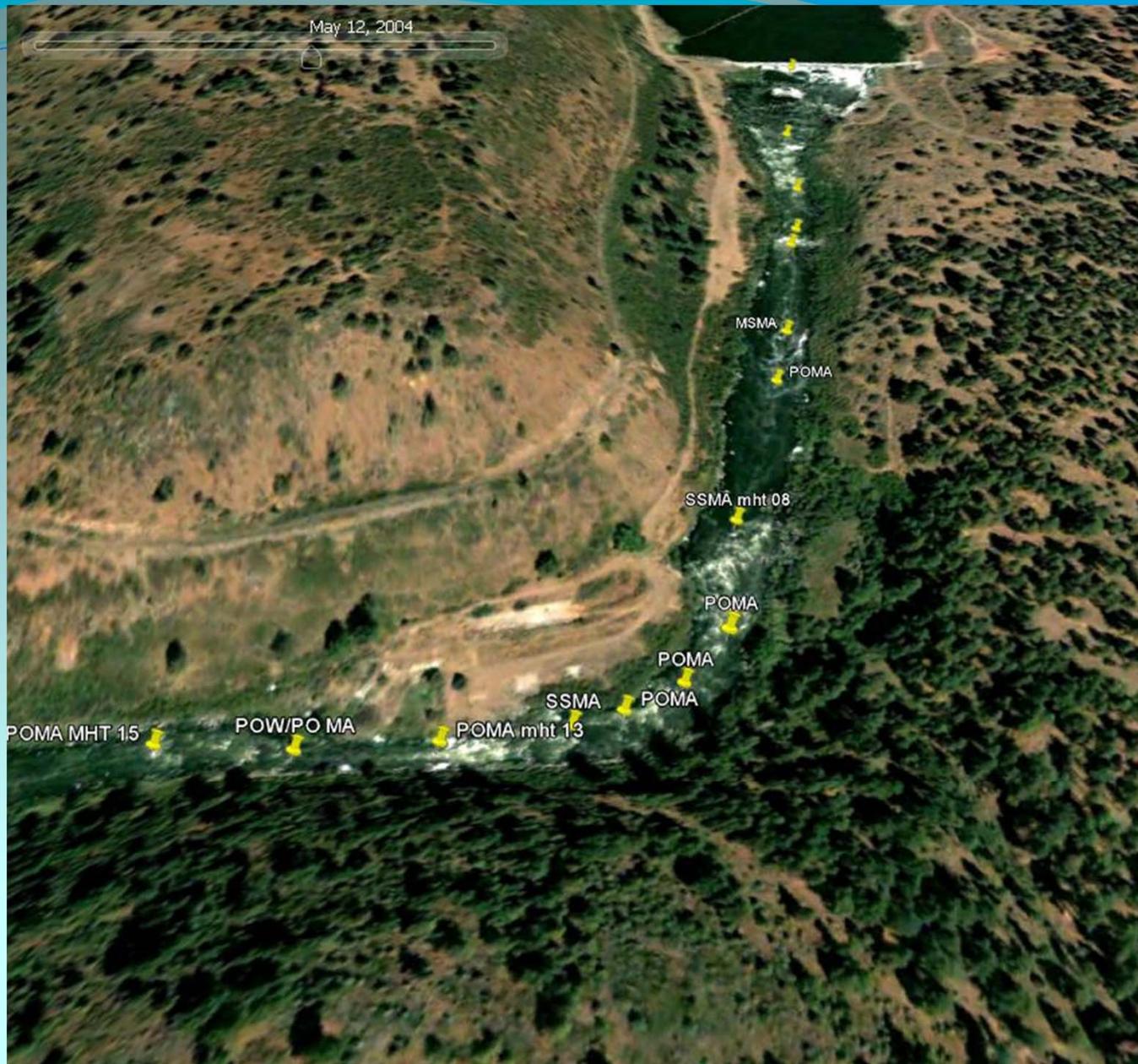 - Split Channel Island Complex
  - Side Channel Island Complex

Basic Approach

- Resolve Habitat Unit Type (Mapping data and/or Photography) for length and width
- Assign "Geomorphic Reach" designation
  - Result is Reach and Habitat Type
    - SESSMA
      - Seiad + Steep Slope + Main Channel
- Assign habitat relationship from nearest representative habitat type
  - SPISL01
    - SEPOMASP Seiad + Pool + Main Channel with Split Channel
    - SEMSSP Seiad + Moderate Slop in Split Channel

# Converting Mapping to SALMOD Computational Units

- Utilized the FWS/USGS/Tribes empirical based ground mapping of mesohabitat units from Iron Gate to the Estuary
- Utilized Google Earth to examine the Klamath from Iron Gate to the Estuary and delineated:
  - Spilt channel island complexes
  - Side channel island complexes
    - Measured length and width of main channel and side channel or split channel features
    - Mesohabitat types were cross checked between field notes and historical imagery

Island Complexes

- Island complexes were 'assembled'
  - Main channel and split/side channel mesohabitats were derived as the arithmetic average of the specific mesohabitat versus flow relationships
  - The mesohabitat versus flow relationships from the source site were adjusted to the target site by the hydro-geo-scalar (i.e., width)
  - The source habitat versus flow relationships were standardized to a common discharge range in order to facilitate their use in the extrapolation process
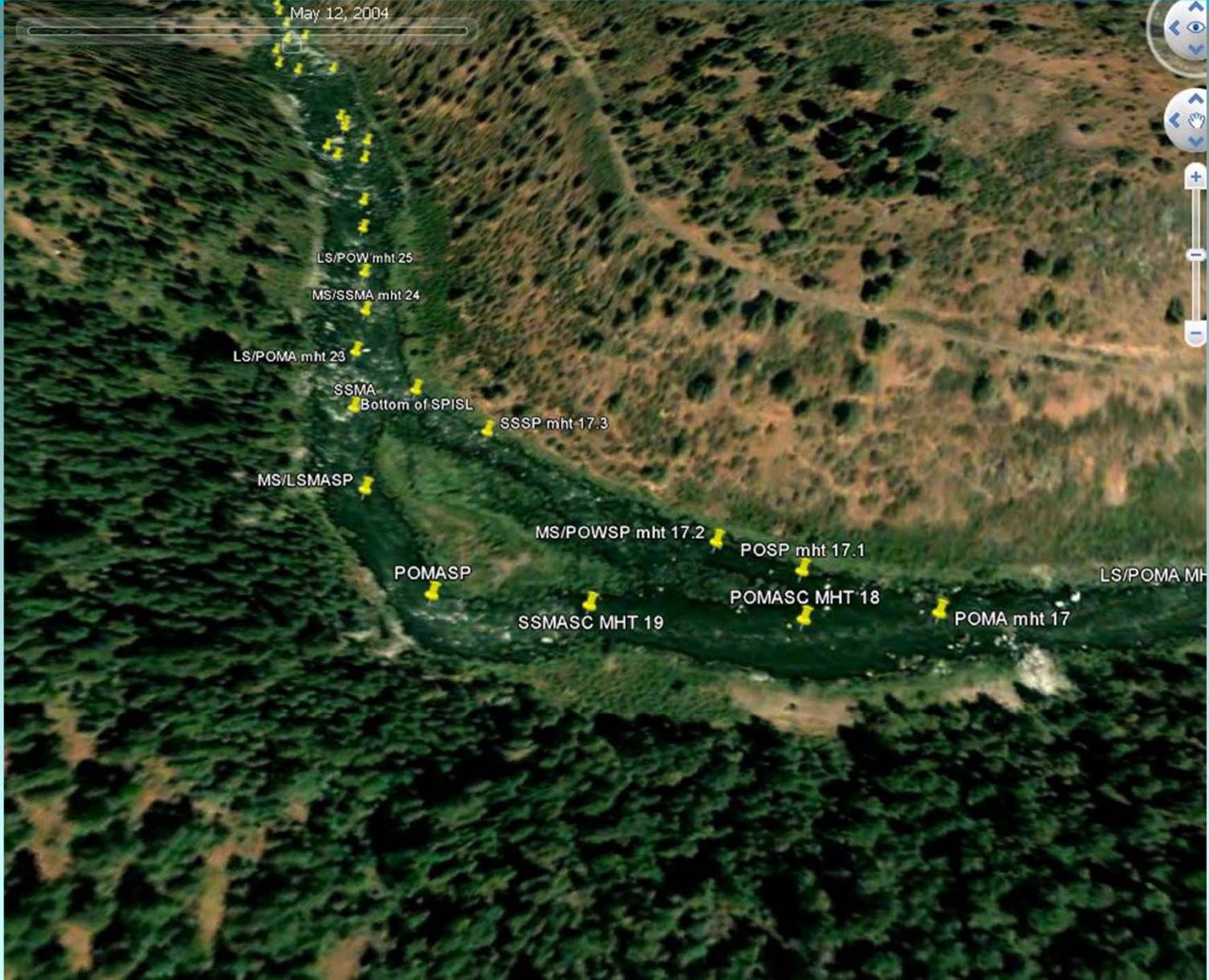
Extending SALMOD Upstream of Iron Gate Dam

- Utilized the mesohabitat conventions from downstream including the island complexes.
- Utilized PacifiCorp ground based habitat mapping data in conjunction with
  - Historical pre-dam aerial photography
  - Google Earth Imagery

Iron Gate and JC Boyle Reservoir

- Utilized historical pre-dam aerial imagery to physically measure each mesohabitat type under the reservoir
  - Type
  - Length
  - width

Copco Reservoir

- Utilized 1912 engineering drawing of reservoir to delineate all mesohabitat types

Bypass and Peaking Reaches

- Generally converted the PacifiCorp ground based mesohabitat mapping to down river conventions
  - Checked against Google Earth imagery
  - Broke out and/or added Split Channel and Side Channel complexes

Development of Habitat versus Flow Relationships by Mesohabitat Type

- The Hardy Phase II data sets were reanalyzed with the specific goal of the use in SALMOD
  - This included such factors as
    - Modified life stage designations to be compatible with SALMOD
    - Evaluation of smolt movement requirements
    - Normalization of relationships by specific mesohabitat types as required by SALMOD

Extrapolation of Habitat Relationships to Mesohabitat Types

- Google Earth was used to define Geomorphic Reaches based on existing study sites
  - For unmeasured mesohabitat types, professional judgment was used to assign the replacement habitat versus flow relationships that most closely approximated channel conditions
- The same basic approach was used to extrapolate relationships to above Iron Gate Dam
  - Closest analog geomorphic characteristics to down stream study sites