What Is Salmonid Habitat Intrinsic Potential (IP) Modeling

An Overview of Fundamental Aspects

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Salmonid IP Models Are Spatially Explicit Habitat Potential Models

IP Models relate habitat preferences to landscape features

- The landscape features are stream **reaches**
- Salmonid life cycle habits define **habitat preferences**

IP Models estimate **potential** habitat quality and quantity

- Score for each **habitat suitability curve** in a set
- Combined **IP score** assigned to each stream reach
- Scored reaches analyzed using GIS software or other means

IP Models Relate Habitat Preferences to Stream Reaches

Influences, characteristics, properties, and parameters can be

- **Intrinsic** -Difficult to change, innate
- **Extrinsic** - Easy to change, ephemeral

Stream reaches are identified by intrinsic properties

- Characteristics are built from geomorphic, hydrologic, topologic and climate influences
- Characteristics determine properties of reaches
- Examples: channel width, gradient, and mean annual flow
- This hierarchy is intended as a guide for understanding the underlying structural relationships of model **parameters**

IP Models Relate Habitat Preferences to Stream Reaches

Spawning, rearing, migration, or other life cycle habits are selected for modeling

- More than one **may** be modeled

Habitat preferences are represented as **suitability** and are scored against **parameters** on a curve

- Parameters are composed of **one or more** reach properties
- Range of **parameter values** on **x-axis** of curve
- Range of **suitability scores** on **y-axis** of curve
- **Break points** are created where a suitability score is plotted against a parameter value

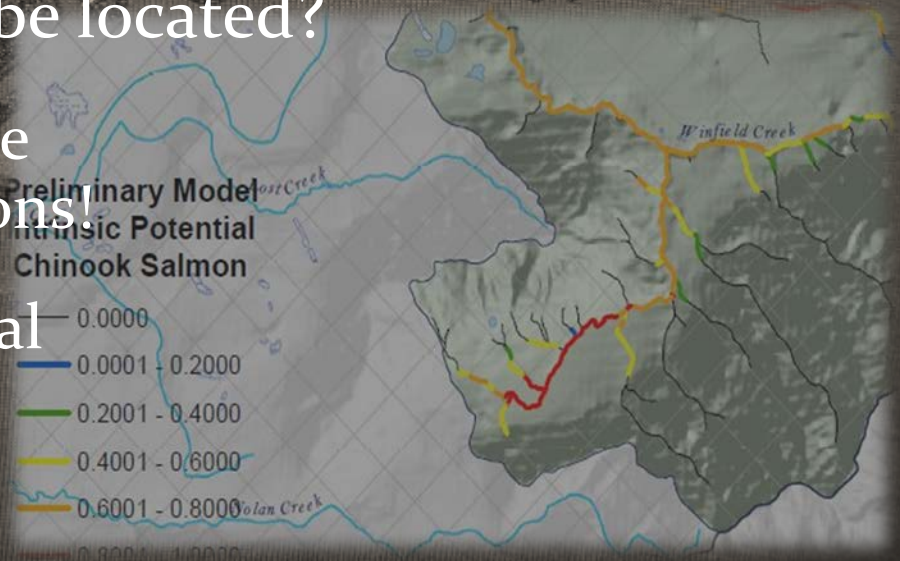
IP Models Hypothesize About Potential Habitat Suitability

What would the **current** river system be like if human influences were removed?

- Barriers such as culverts and dams
- Pollutants such as nonpoint and sewer discharge
- Impacts such as clear cuts and development

Where would the best habitat be located?

- IP Models do **not** simulate historical habitat conditions!
- They **do** simulate potential future habitat conditions!



Salmonid IP Models Identify Priorities

What salmon restoration projects would be most effective?

- Which ones would provide more "bang for the buck"?
- Which ones would have the widest impact?

What fish management strategies would be most effective?

- Where and when should they be applied?

What conservation efforts would be most effective?

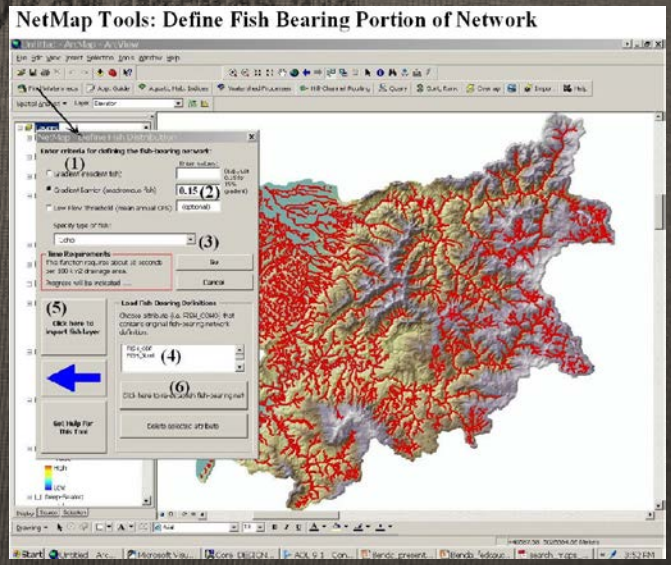
- Where should they be applied?

IP Models provide well grounded data to any cost / benefit analyses.

Setting The Stage: Constructing the Fish Bearing Network

Cutoff variables limit the fish bearing network

- Define upstream limits
  - Elevation, channel width, maximum gradient
- Define downstream limits
  - Tidal elevation, salinity
- Define local natural limits
  - Natural barriers
- May be proxies for other less accessible variables



Relating Reaches To Habitat Preferences: Building Intrinsic Parameters

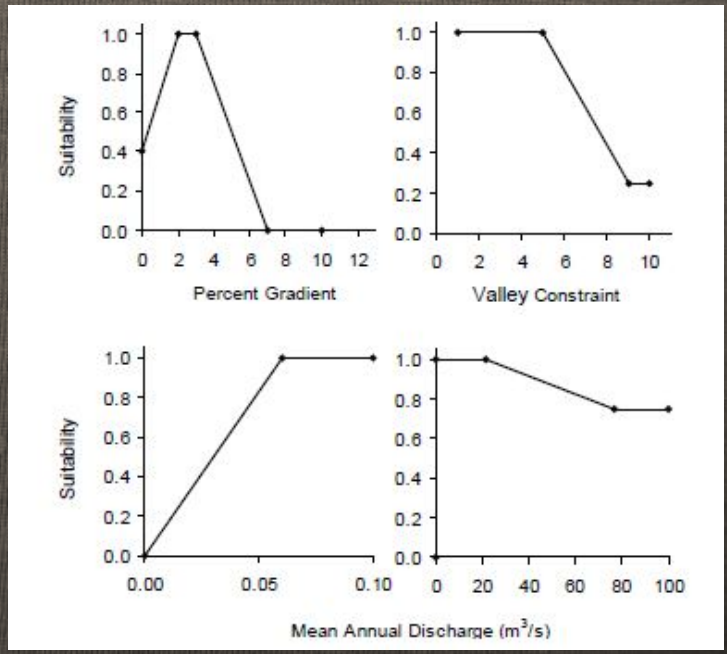
Intrinsic parameters are constructed by fish biologists

- Deemed most important factors affecting habitat suitability
- Composed of one or more reach properties
  - Example: channel confinement is ratio of floodplain width to channel width
  - Example: gradient as reach property and intrinsic parameter
- Maybe be proxy for other parameters
  - Proxy for stream complexity (not well suited for reach based analysis)

Generating Habitat Suitability (HS) Curves

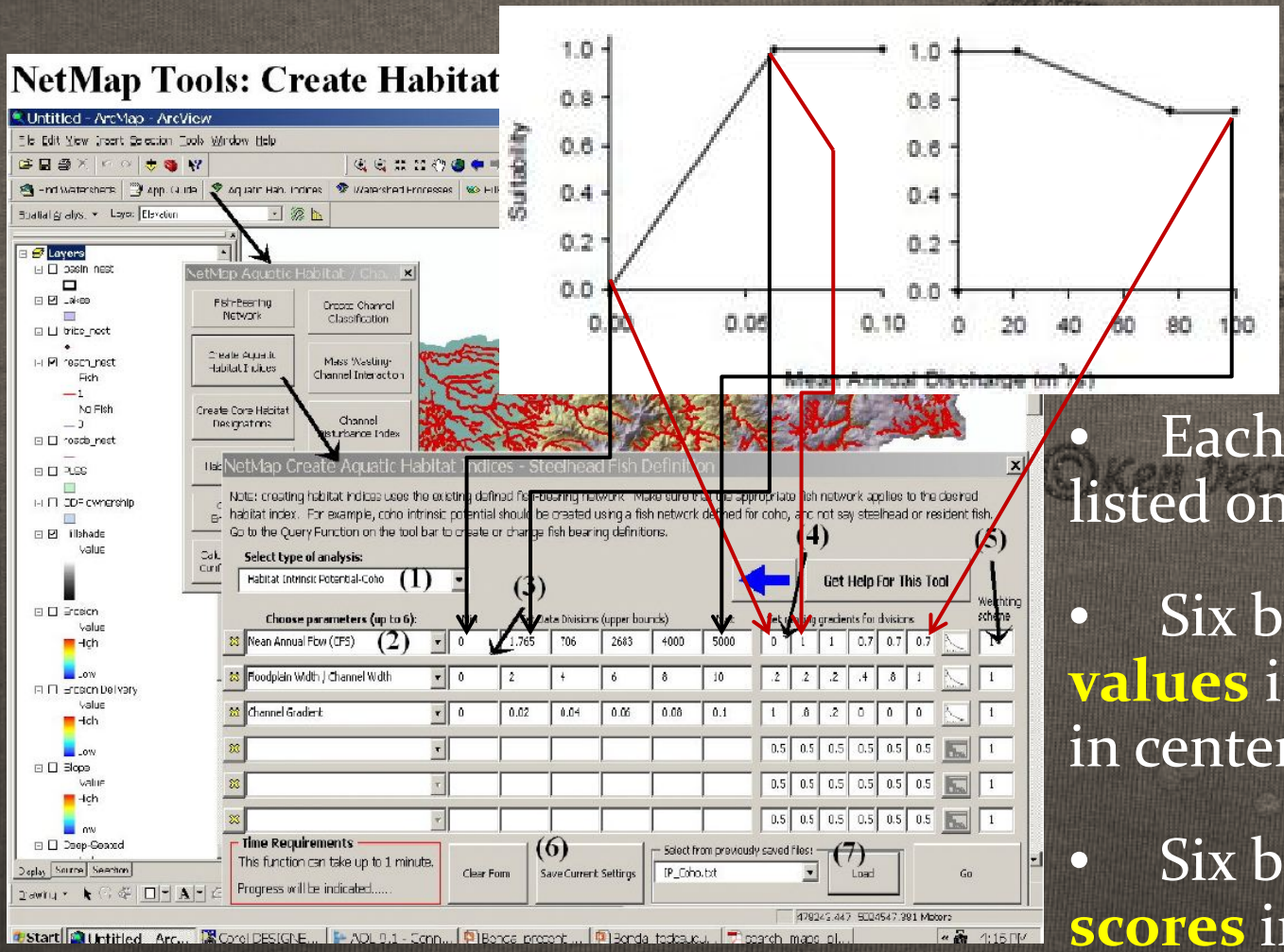
HS curves depict how habitat suitability scores change across a range of intrinsic parameter values

- Suitability index is on **y-axis**
  - value ranges from **zero** (unsuitable) to **one** (best possible)
- Parameter range is on **x-axis**
  - Minimum (usually zero) to maximum limit
- Biologists estimate impact on habitat suitability at each step in the parameters' range
  - Break points make up the curve



Loading HS Curves Into NetMap

Six break point **x** parameter values and **y** suitability scores on the curve for each parameter are loaded into NetMap.



- Each parameter is listed on the left (2)
- Six break point **x values** in **black** entered in center (6)
- Six break point **y scores** in **red** entered at right (7)

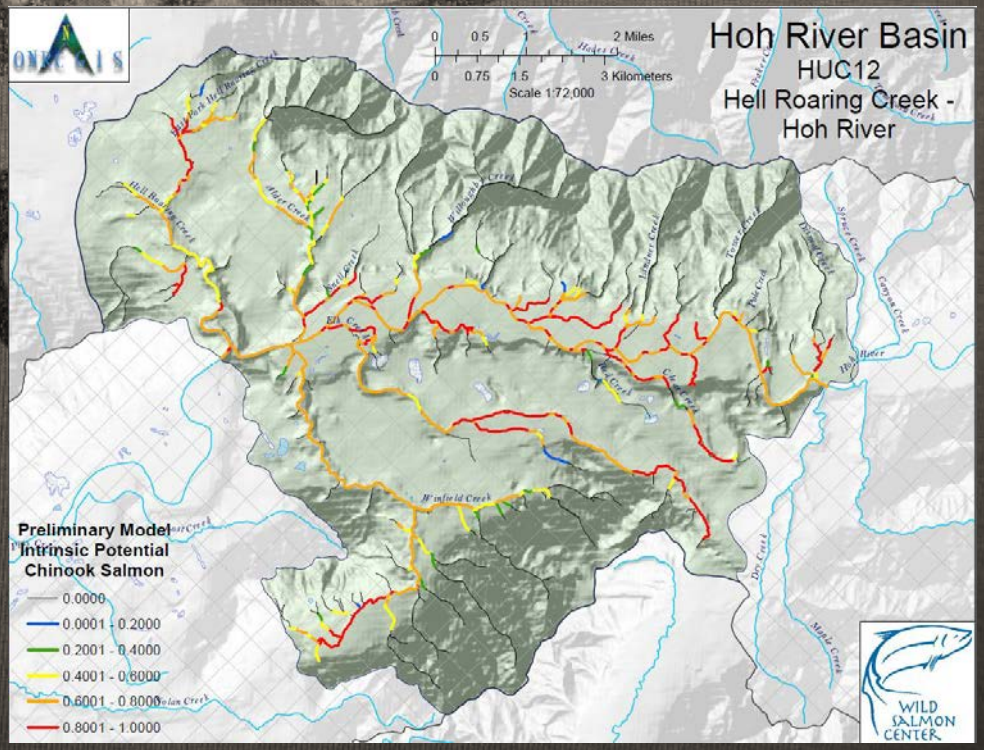
Running The NetMap Model

In NetMap, the model is run on the fish bearing network which defines the spatial extent.

- Model generates spatial data with **Intrinsic Potential (IP)** scores for each reach
- Fish biologists and local experts use field knowledge to critique results

Example is model output for one level 6 subwatershed

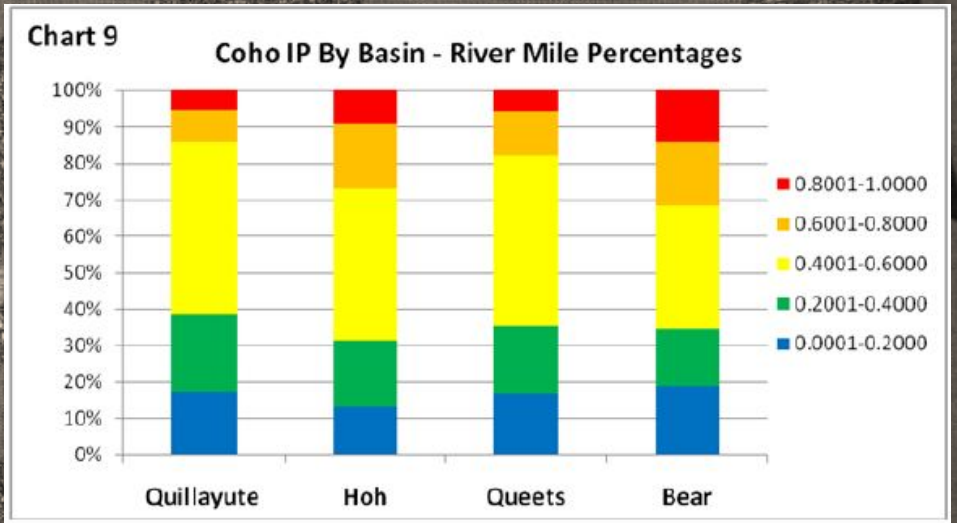
- Note five categories or **bins** for IP scores plus zero
- **Binning** distinguishes gradations of IP scores
- Each species may require a different binning scheme

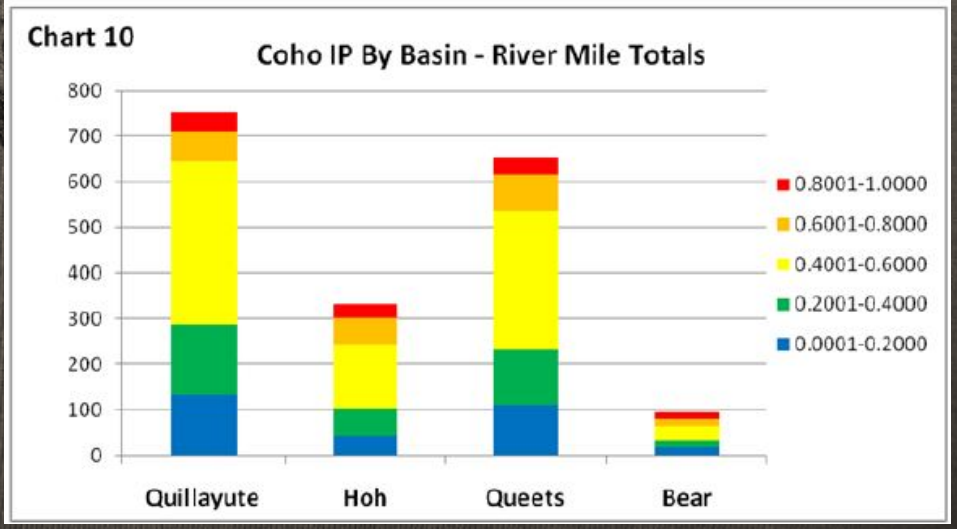


Analyzing The Model Results: Binned Values

A typical analysis of habitat quality by watershed

- Top chart: share of total river miles in each watershed by binned IP value
- Bottom chart: river mile totals for each binned IP value by watershed





Tasks for IPM Peer Review

- Review of break points for each HS curve in set
  - Current HS curve sets are default, may not be appropriate
  - Review for Chinook, Chum, Coho and Steelhead
- Define high, medium, and low IP values for each species
  - Current default binning scheme simple 5 step
  - Review for Chinook, Chum, Coho and Steelhead
- Determine if sub-regional models are needed
  - Current model applied to the entire OWC study area
  - Review for Chinook, Chum, Coho and Steelhead

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Background Image