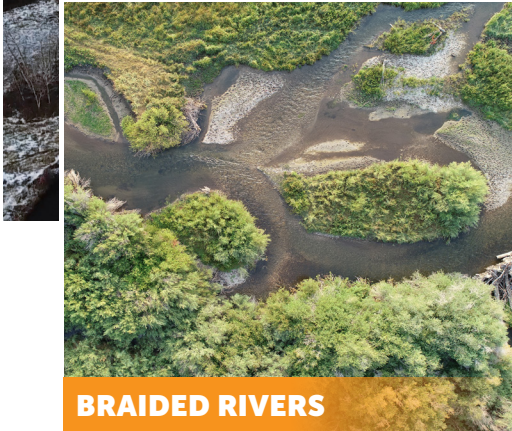


SPECIALISTS IN IDENTIFICATION SOLUTIONS



**Biomark**

# PREDICTING ABUNDANCE ALONG DENDRITIC NETWORKS



**BRAIDED RIVERS**



**CONFLUENCES**



**MANGROVE NETWORKS**

Measuring individual and population movement throughout branching systems (e.g., river networks, mangrove systems) can be time intensive, costly, and at times not possible given limited access to remote field sites. Biomark researchers specialize in modeling movement using patch-occupancy models and Bayesian inference to address these common considerations. Re-sightings of uniquely identified animals (by a variety of tagging technologies, photo-ID, etc.) are used to estimate the probability of individuals moving past detection sites. In combination with an estimate of total population abundance, movement probabilities are leveraged to estimate escapement or abundance throughout a branching network and at a variety of spatial scales. This approach overcomes a multitude of sampling challenges to provide actionable data for population monitoring.

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# FEATURED PROJECT

## DAM ADULT BRANCH OCCUPANCY MODEL (DABOM)

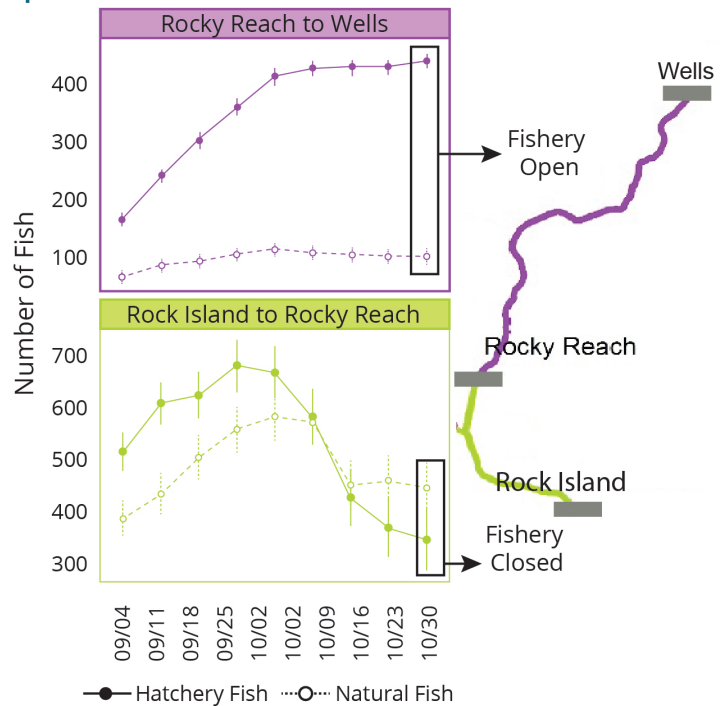
In the Columbia River Basin, estimates of adult abundance in spawning tributaries are crucial to evaluating the status and trends of salmonid populations. Biomark researchers have developed DABOM to estimate the probability of fish movement through an array of PIT tag detection sites in the river network. Raw data from In-stream PIT tag Detection Systems (IPTDS) are processed into observation histories using the Biomark R package PITcleanr. After undergoing data reduction and QA/QC, DABOM employs movement and detection probabilities to estimate adult salmonid movement, scalable from the tributary to population level. To date, we have employed this model for steelhead and Chinook salmon in the Snake River basin, the Upper Columbia basin and the Yakima River. The addition of automated processing in DABOM supports reach-specific analysis of wild and hatchery salmonid abundance, in near real-time, allowing managers to better direct harvest or monitor depleted wild populations. These modeling techniques are applicable to most branching networks with the ability to leverage animal re-sightings to predict movement probabilities throughout a system.

Biomark researchers collaborated funding groups and partners including the Bonneville Power Administration, Washington Department of Fish and Wildlife, Nez Perce, Idaho Fish and Game, National Oceanic and Atmospheric Administration, and Yakima Nation to turn animal observation data into meaningful management metrics.

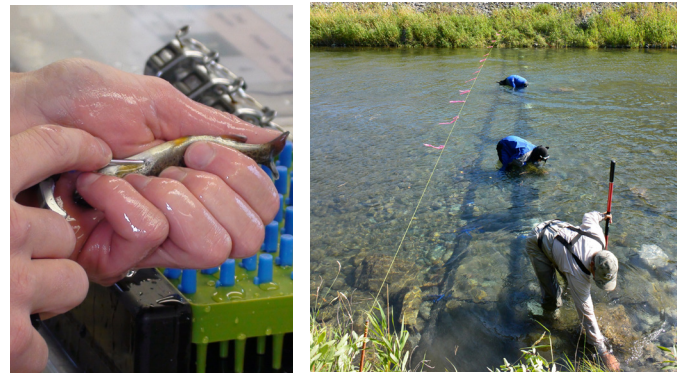
Biomark products and services used in this project include:

- **Study Design**
- **Data Reduction, QA/QC**
- **Patch Occupancy Modeling**
- **Detection Probability Analysis**
- **Instream PIT Tag Detection Systems**
- **High performance PIT Tags**
- **HPR Plus**
- **BP Lite**

### Real-time Escapement Estimations for Recreational Fishery Management



Snapshot of a password protected application to estimate the abundance of hatchery and wild fish for a set of reaches in order to more effectively manage recreational fisheries.



Fish are PIT tagged to track their movement and abundance throughout a network of IPTDS in the Columbia River Basin.

# OTHER PROJECT APPLICATIONS

