



Air, Water and Aquatic Environments Science Program

Rocky Mountain Research Station



Focus: Bull Trout Monitoring



Research

Technology Transfer

Science Application

Key Findings:

- **Bull trout is an MIS and ESA listed species that requires monitoring.**
- **Traditional monitoring approaches based on abundance estimates are costly to apply to extensive USFS lands. Monitoring that focuses on species distributions is more efficient and may also be more informative for land management.**
- **A GIS can be used to stratify a stream network into suitable and unsuitable habitats, significantly reducing the area where field sampling occurs.**
- **Random sampling within suitable habitats provides statistically reliable information to assess status and trends of bull trout populations from local to forest scales using a variety of analytical techniques.**
- **As data are collected, models of sampling detection efficiency and species occurrence can be developed to refine future sampling efforts.**

Challenge

Bull trout are native to much of the Pacific Northwest, and although the species remains widely distributed, population declines have prompted listing under the Endangered Species Act. As part of the recovery process, monitoring of bull trout populations for determination of status and trend is required. Within the USFS, similar impetus for monitoring exists because bull trout are a Management Indicator Species.

Context

The extensive lands managed by the USFS require monitoring that can be applied rapidly and inexpensively, yet provide powerful and accurate trend detection. Monitoring has traditionally focused on tracking site level abundance, but this approach is costly to apply and is being replaced in some instances by distributional monitoring. Distributional monitoring focuses primarily on temporal patterns of occurrence within suitable habitats and requires less intense sampling at individual sites, which makes it possible to sample larger and more representative areas relevant to land management.

Actions

Researchers at the Boise Aquatic Sciences Laboratory have adapted general distributional monitoring approaches developed by MacKenzie et al. (2006) for application to bull trout. Monitoring of bull trout distributions consists of several steps: 1) stream network delineation in the area of interest using automated GIS routines, 2) filtering of the stream network based on ecological criteria to delineate suitable habitat patches, 3) selection of random sampling sites within suitable patches, 4) sampling to determine patterns of bull trout occurrence within and among suitable patches, 5) resampling at 5–10 year intervals to assess changes in distribution. As data are collected, models of sampling detection efficiency and species occurrence can be developed and used to refine future sampling efforts.

Results

A pilot project to test application of the protocol was initiated in 2006 with the Payette National Forest. The study site was the 64,000 ha Secesh River Watershed in central Idaho. Stream network delineation and filtering produced 24 patches of suitable habitat for bull trout that reduced the total stream network by 63%. Three two-person crews worked 4 days and sampled 64 random sites in eight of the patches. Bull trout were detected in all patches, but invasive brook trout had eliminated bull trout from some sites. Sample sites were geo-referenced and now provide a baseline for later comparisons. Similar monitoring protocols are being applied by the Boise National Forest and Sawtooth National Recreation Area. A USFS report describing the monitoring protocol is under development (Isaak et al., In review) and a short course is available for training.



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Photo: Bart Gamett

Bull Trout Monitoring

Figure 1. Stream network prior to stratification into suitable and unsuitable bull trout habitat (panel a). Suitable habitat occurs within a subset of the network after criteria for stream temperature, size, and gradient are applied (blue lines within red polygon; panel b). Green circles indicate locations of random sampling sites.

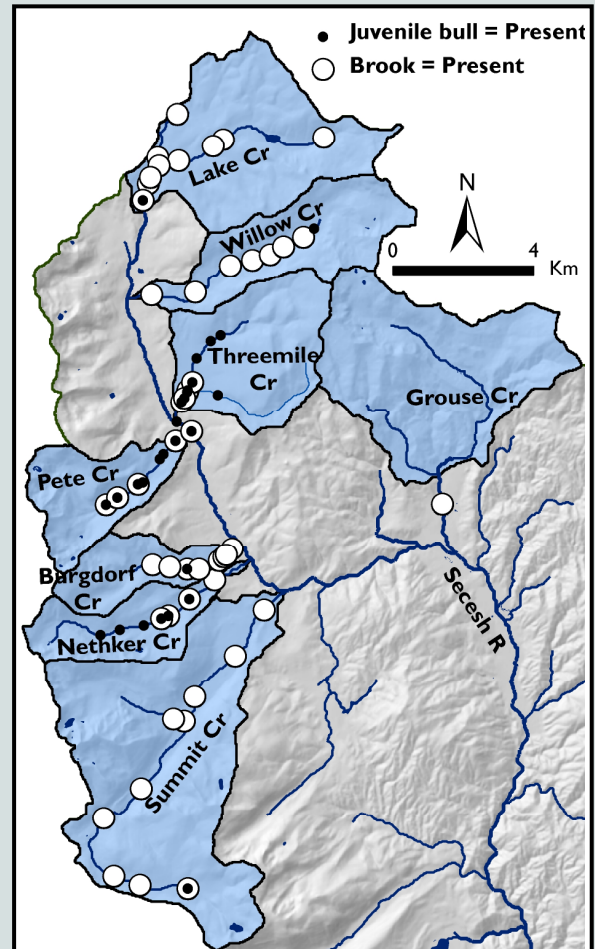
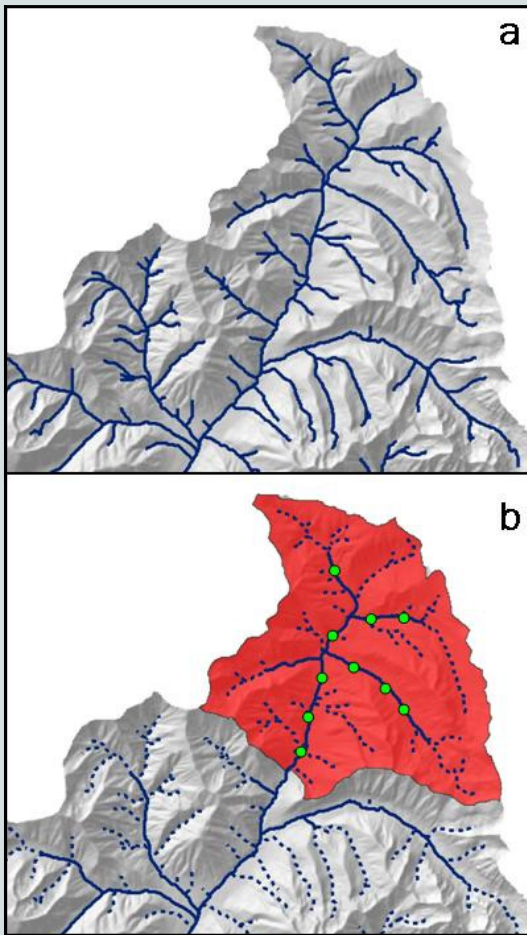


Figure 2. Distributions of bull trout and invasive brook trout at randomly selected locations within eight suitable habitat patches in the Secesh River Watershed. Repeated distributional assessments allow bull trout distributions within and among suitable patches to be monitored.

Publications and Presentations

Isaak, D., B. Rieman, and D. Horan. 2009. [A watershed-scale monitoring protocol for bull trout](#). Gen. Tech. Rep. RMRS-GTR-224. Fort Collins, CO: U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station. 25 p.

MacKenzie, D. I., J. D. Nichols, J. A. Royle, K. H. Pollock, L. L. Bailey, and J. E. Hines. 2006. [Occupancy estimation and modeling](#). Academic Press, New York.

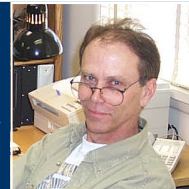
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