



Review of trap-and-haul for managing Pacific salmonids (*Oncorhynchus* spp.) in impounded river systems

Tobias J. Kock · John W. Ferguson · Matthew L. Keefer · Carl B. Schreck

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Abstract High-head dams are migration barriers for Pacific salmon *Oncorhynchus* spp. in many river systems and recovery measures for impacted stocks are limited. Trap-and-haul has been widely used in attempts to facilitate recovery but information from existing programs has not been synthesized to inform improvements to aid recovery of salmonids in systems with high-head dams. We reviewed 17 trap-and-haul programs regarding Pacific salmon to: (1) summarize information about facility design, operation and biological effects; (2) identify critical knowledge gaps; and (3) evaluate trap-and-haul as a current and future management tool. Existing programs are operated to address a range of management goals including restoring access to historical habitats, temporarily

reducing exposure to dangerous in-river conditions, and reintroducing ecological processes upstream from dams. Information gathered from decades of operation on facility design criteria and fish handling protocols, and robust literature on fish collection and passage are available. While many aspects of trap-and-haul have been evaluated, effects on population productivity and sustainability remain poorly understood. Long-term and systematic studies of trap-and-haul outcomes are rare, and assessments can be confounded by concurrent management actions and broad ecological and climatic effects. Existing data suggest that performance and effectiveness vary among programs and over various time scales within programs. Although critical information gaps exist, trap-and-haul is an important management and conservation tool for providing Pacific salmonids access to historical habitats. Successful application of trap-and-haul programs requires long-term commitment and an adaptive management approach by dam owners and stakeholders, and careful planning of new programs.

T. J. Kock (✉)
U.S. Geological Survey, Western Fisheries Research
Center, 5501A Cook-Underwood Road, Cook,
WA 98605, USA
e-mail: tkock@usgs.gov

J. W. Ferguson
Anchor QEA, LLC, 1201 3rd Avenue #2600, Seattle,
WA 98101, USA

M. L. Keefer
Department of Fish and Wildlife Sciences, College of
Natural Resources, University of Idaho, 875 Perimeter
Drive, Moscow, ID 83844-1136, USA

C. B. Schreck
Department of Fisheries and Wildlife, Oregon State,
University, Corvallis, OR 97331, USA

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