GROWTH AND MOVEMENT OF RESIDENT RAINBOW TROUT TRANSPLANTED BELOW BARRIERS TO ANADROMY.

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In common with several other salmonid species, rainbow trout *Oncorhynchus mykiss* is a polytypic species characterized by populations of resident, adfluvial, and fluvial rainbow trout and anadromous steelhead (Behnke 1992). The genetic vs. environmental basis underlying the migratory polymorphism is poorly understood. The migratory polymorphism may result from phenotypic plasticity within a single gene pool or from fixed differences between sympatric but reproductively isolated populations. Reproductive isolation between life history morphs has been identified in some locations for sockeye salmon and kokanee (Wood et al 1999) and Atlantic salmon (Vespoor and Cole 1989). However, Nordeng (1983) demonstrated, through rearing experiments of controlled pairings of anadromous and resident parents, that resident and migratory Arctic char were from the same gene pool and that migration was environmentally controlled.

Whether resident and anadromous forms constitute a single randomly mating gene pool or exhibit reproductive isolation between life history forms has significant implications for the study and management of steelhead populations in California, which have undergone precipitous decline in recent years. I propose a simple transplantation experiment to determine if resident rainbows isolated above long-standing barriers will exhibit migratory behavior when relocated to downstream reaches. Such an experiment can provide valuable information on whether populations above barriers should be included in ESU's and whether these populations offer potential for recovery of below-barrier populations. The need to determine whether anadromous progeny can arise from resident parents and the importance of this behavioral plasticity to the persistence of steelhead was specifically targeted for recommended future research in the Steelhead Restoration and Management Plan for California (State of California, The Resources Agency Department of Fish and Game 1996).

Freshwater Creek in coastal northern California offers an ideal location for an experiment of this type because:
1) it offers two barriers to anadromy with resident rainbow trout populations above the barriers; 2) a semi-permanent weir operated by the Humboldt Fish Action Council (HFAC) is situated close to the river mouth and allows escapement to be tracked; and 3) an on-going full-life cycle salmonid monitoring program at the watershed scale conducted by California Department of Fish and Game staff and volunteers increases the probability of detecting transplanted individuals.

The objective of the proposed project is to determine if resident rainbow trout isolated above long-standing barriers in Freshwater Creek will exhibit migratory behavior when transplanted below the barriers, and to compare growth rates between transplanted individuals and above-barrier residents.

Transplantation Experiment: Juvenile rainbow/steelhead will be captured by electrofishing above the two barriers to upstream. All age 1+ rainbow will be weighed and marked with individually numbered Passive Integrated Transponder (PIT) tags directly into the body cavity. Fish measuring 69-100 mm in fork length will be implanted with 11.5 mm long Full Duplex (FDX) tags. Fish greater than 100 mm will be marked with 23 mm long tags. This larger size allows detection of fish at a much larger range. Half of the tagged individuals will be relocated below the barrier, leaving an equal number of tagged fish above the barrier. Fish remaining above the barriers will be re-sampled seasonally to allow estimation of growth rates. Attempts to locate and recapture transplanted individuals will take advantage of a variety of sampling methodologies and installations currently in place within the basin. Portable PIT-tag readers will be used to scan the water surface in the vicinity of the release. Transplanted individuals may be captured during the summer basin-wide juvenile surveys (modified Hankin-Reeves, conducted on 6 tributaries and upper and middle sections of the mainstem). They may be detected upon passage through one or more of the 6 locations in the basin where stream-wide PIT interrogation systems are continuously operated. Individuals may be captured in one of the seven downstream migrant traps in the basin that operate from March through June. Finally, any transplanted individuals that migrate to sea may be captured as a returning adult at the HFAC weir. Once detected and captured, transplanted individuals will be weighed, status determined (parr, pre-smolt, smolt, or adult), and released.

Data will be analyzed to determine the direction and extent of movement by transplanted individuals, and to compare growth rates between tagged individuals above and below barriers. Habitat structure above the barriers will be characterized and compared with existing below-barrier habitat data to evaluate the contribution of habitat effects to any observed differences in growth. Habitat characterization will include mapping of riffle:pool ratios, coverage of large woody debris, extent and composition of riparian cover, and substrate embeddedness.

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