Stray Steelhead in the Deschutes River

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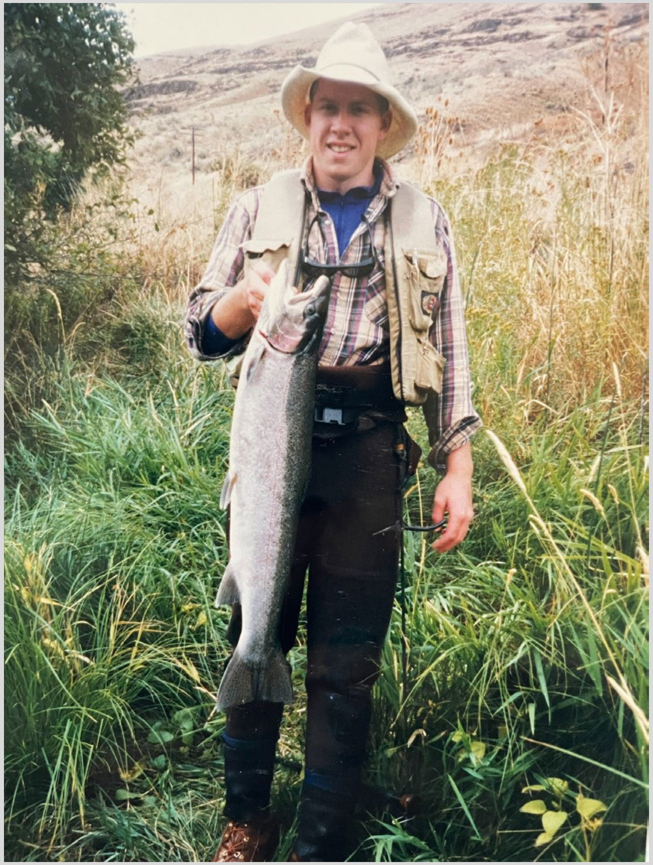


Oregon Fish & Wildlife

Permanent Straying-Context and Drivers

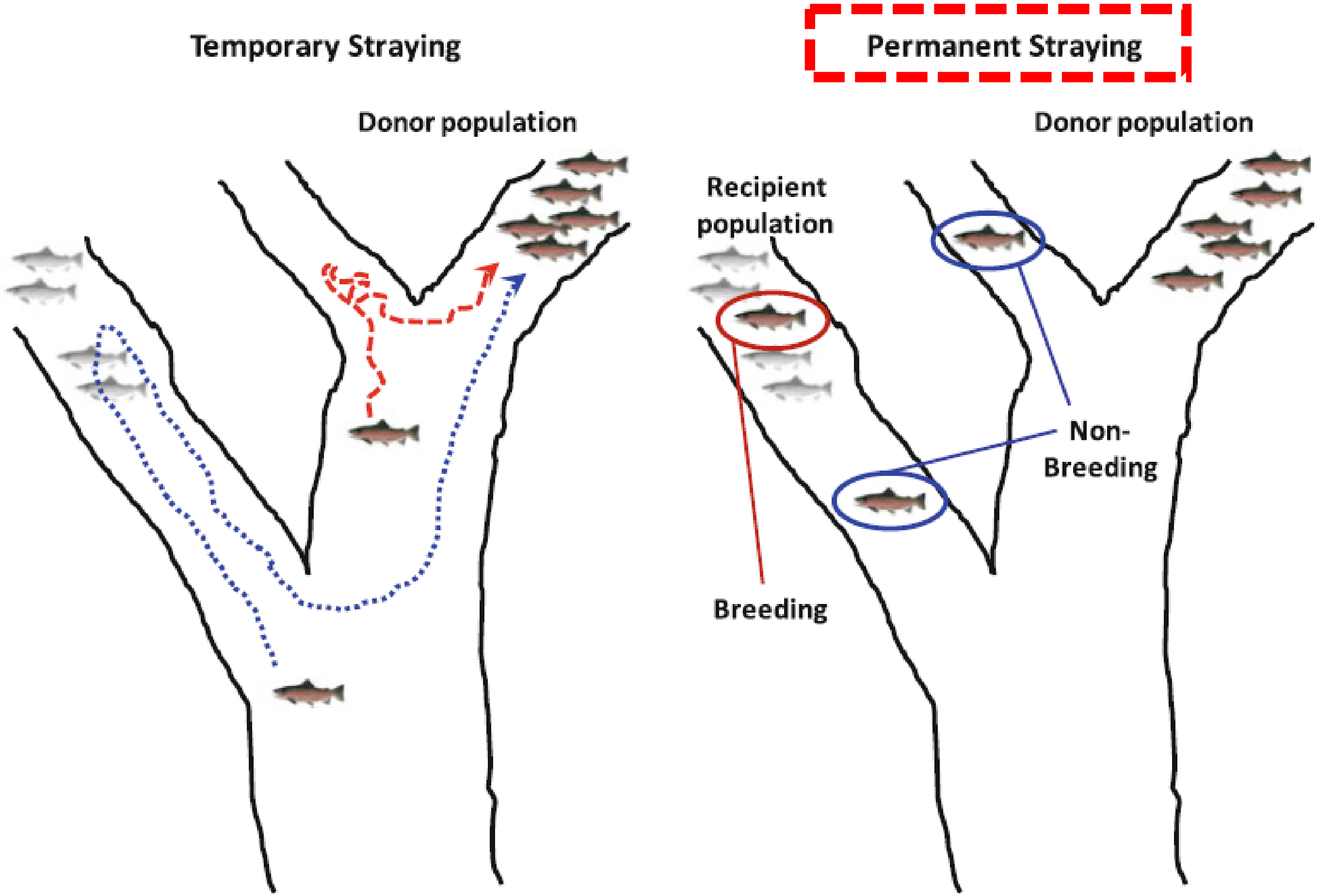
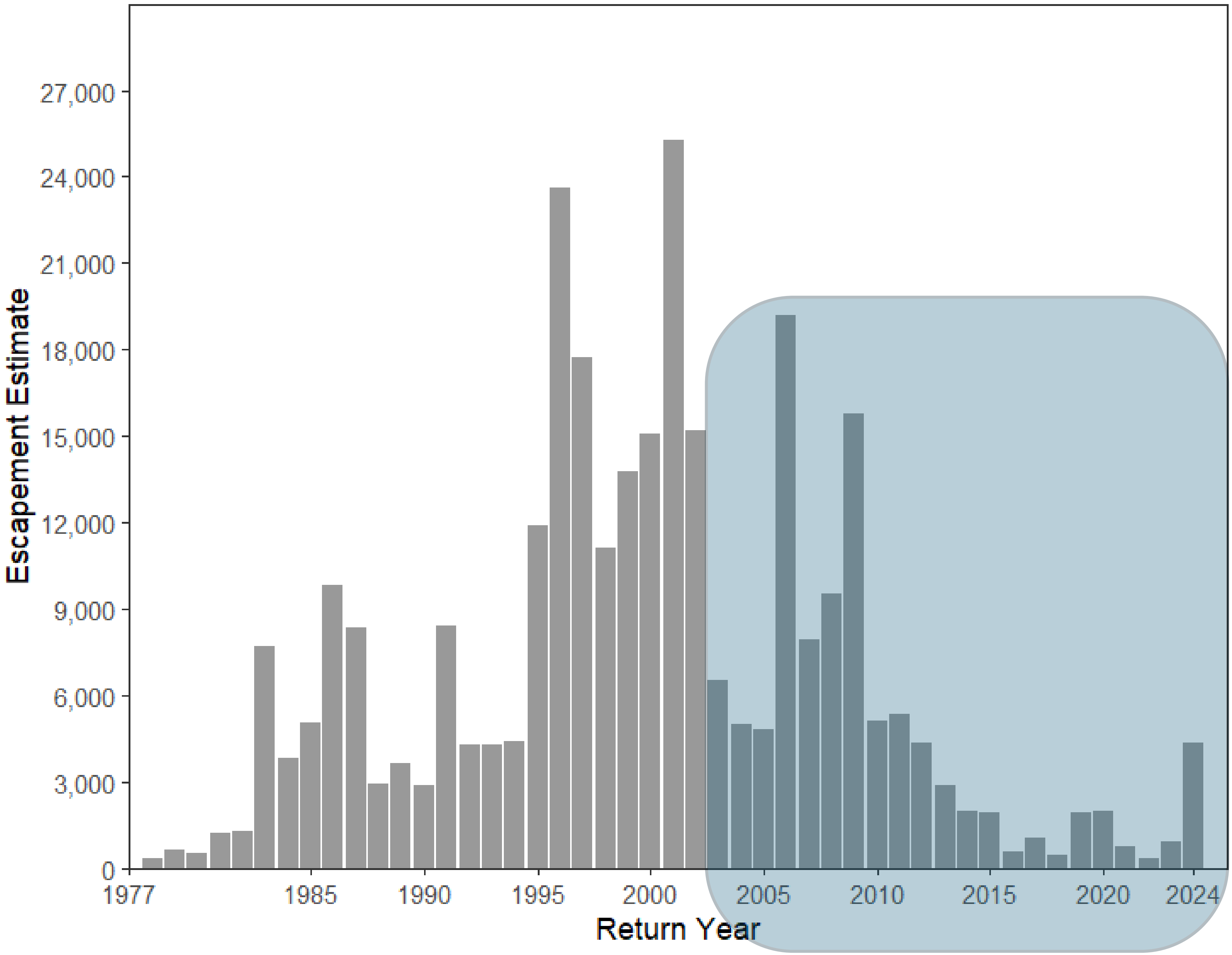
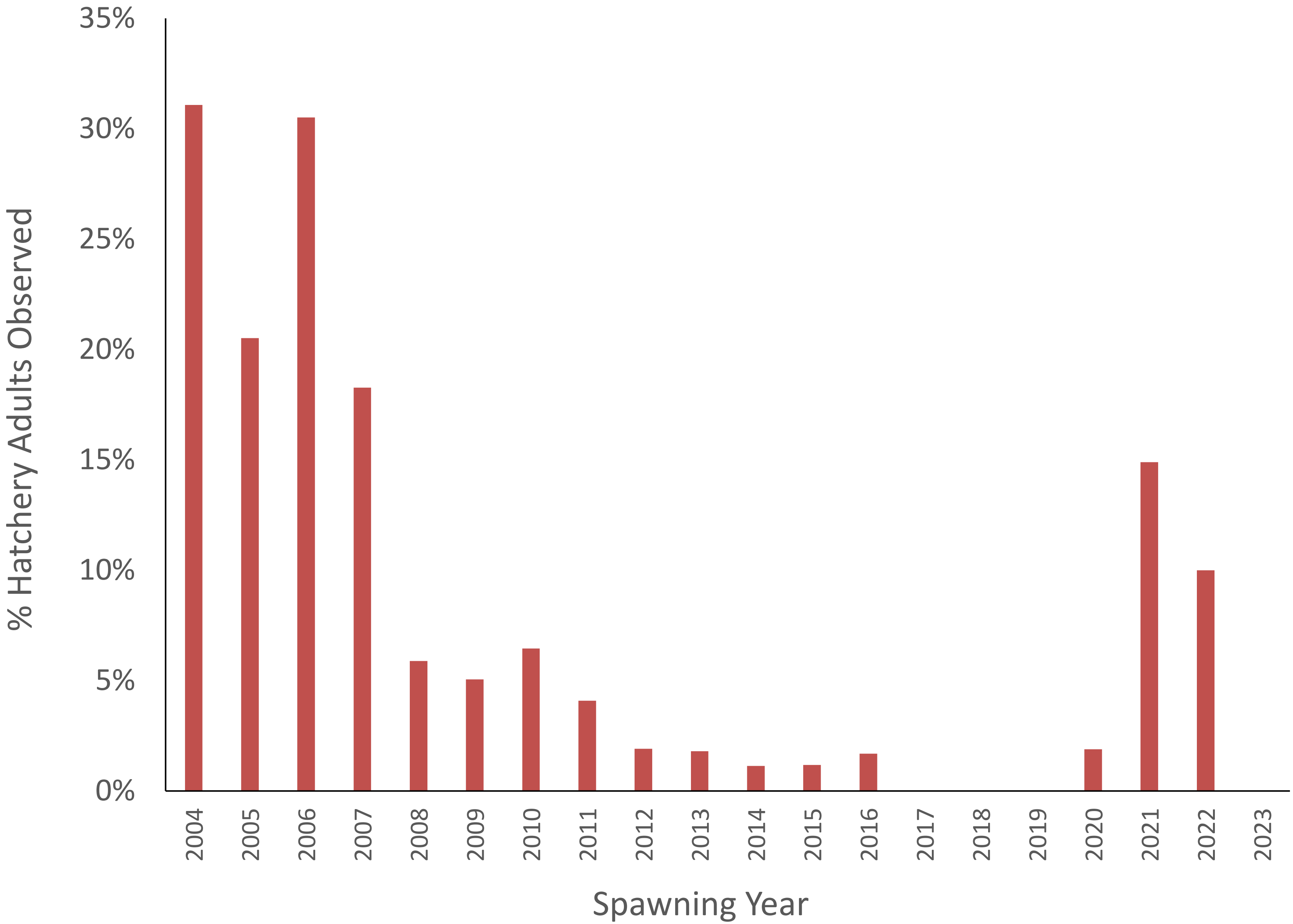


Fig. 3 Adult migrants show a variety of 'temporary' (*left panel*) and permanent (*right panel*) straying behaviors. Temporary straying may be exploratory searching for mates or spawning sites or may be stimulated by environmental conditions such as water temperature. Permanent straying can result in either inter-breeding with the recipient population, colonization, or reproductive failure. Permanent strays are always a demographic loss from the donor population and may be a demographic gain for the recipient population. Straying versus homing status can be ambiguous for fish captured at non-natal hatchery facilities or in fisheries in non-natal sites

Deschutes River-Permanent Strays (Hatchery Origin)



John Day River-Permanent Strays (Hatchery Origin)



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ARTICLE

Smolt Transportation Influences Straying of Wild and Hatchery Snake River Steelhead into the John Day River

- Changes in John Day River pHOS track changes in Snake River steelhead smolt transportation
- Only 1 permanent stray which was not transported as a smolt
- *No significant difference in straying probability between origin (wild or hatchery) when transported*

Fish transportation

Moving fish safely past the big dams on the lower Snake and Columbia rivers is one of the most difficult and controversial challenges the dam operators face. It is a problem that vexed dam planners and operators ever since the first dams were built in the 1930s — in fact, even before they were built. In the late 1930s as Bonneville Dam was being constructed, the U.S. Army Corps of Engineers fretted over how to safely pass migrating fish both upstream and downstream at the dam.

The challenge for dam operators, then and today, is to get as many fish past the dams safely as possible. Fish ladders are effective for passing adult fish, but juvenile fish passage is more problematic. There are four ways juvenile fish can pass a hydroelectric dam. First, and least desirable, fish can be swept through turbines. This is the most lethal passage alternative. Second, fish bypass systems can channel some fish away from the turbines into a series of pipes and channels that carry the fish through the dam and deposit them on the downstream side. Third, the spill gates can be opened, creating a waterfall for the fish. Or fourth, the fish can be collected and transported downstream in barges or tank trucks operated by the Corps of Engineers.

Each of these has problems. Not all fish can be deflected away the turbines into bypass systems. Nonetheless, diversion screens have been installed in front of the turbines at all but The Dalles Dam, where experimentation showed that because of the configuration of the dam, screens would be less effective than spilling fish or diverting them through the dam's ice and trash sluiceway (at The Dalles, juvenile fish passage involves a combination of spill and sluiceway passage, and the result is that about 72 percent pass via spill, 13 percent via the sluiceway, and 14-15 percent go through the turbines). Spillway passage is effective but can expose fish to bubbles of nitrogen in the frothy water immediately below the dams when there are high volumes of spill. Also, fish can be injured as they tumble down the concrete spillways. In either instance, the fish are susceptible to predators below the dams, such as sea gulls, Caspian terns and northern pikeminnow. Barging or trucking (far more fish are barged than trucked) is effective but creates an

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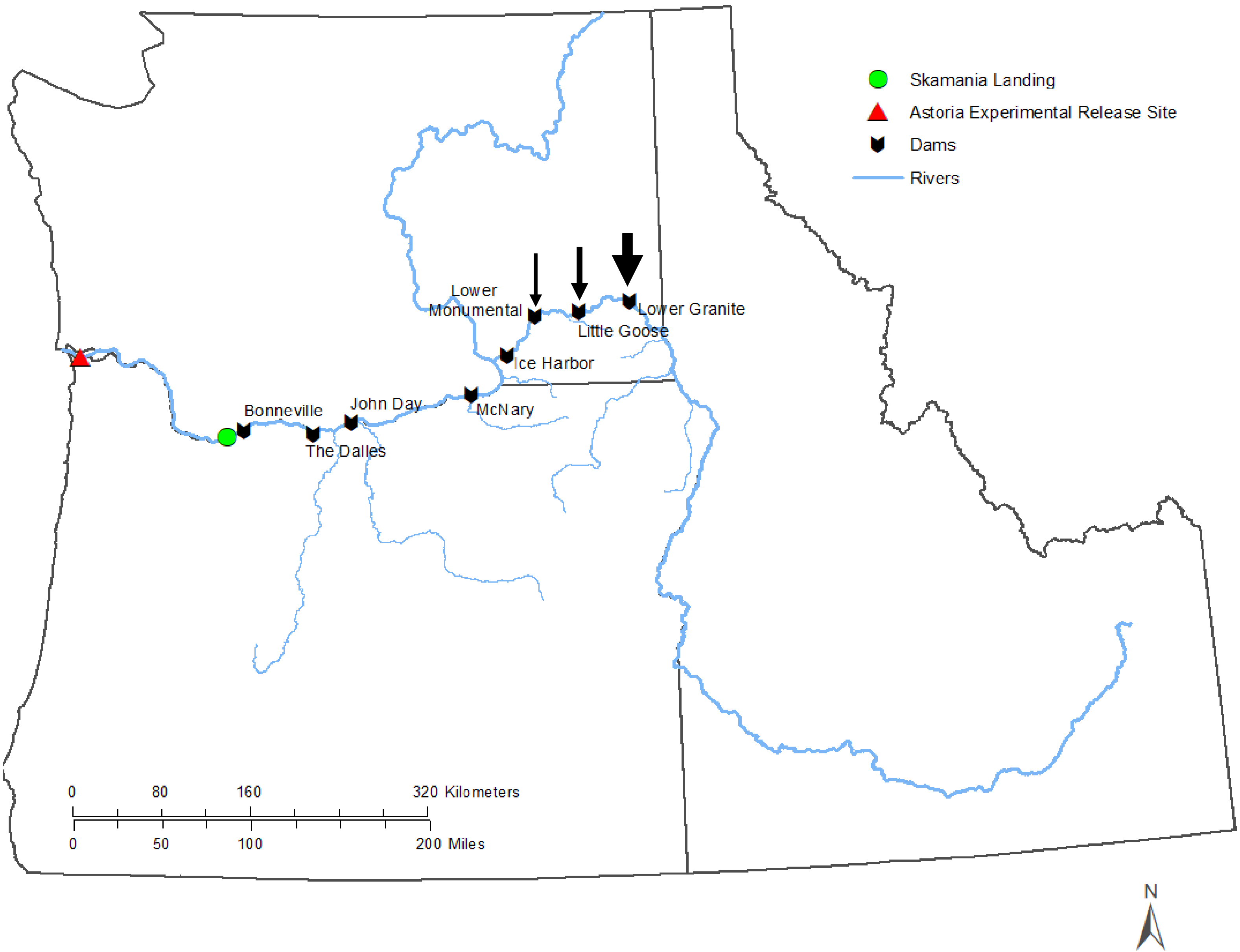
Photo: U.S. Army Corps of Engineers.

This page is part of the Columbia River History project, a collection of pages on the history of the Columbia Basin and housed at the Council's website for archive and educational purposes.

- 1977 start of transport

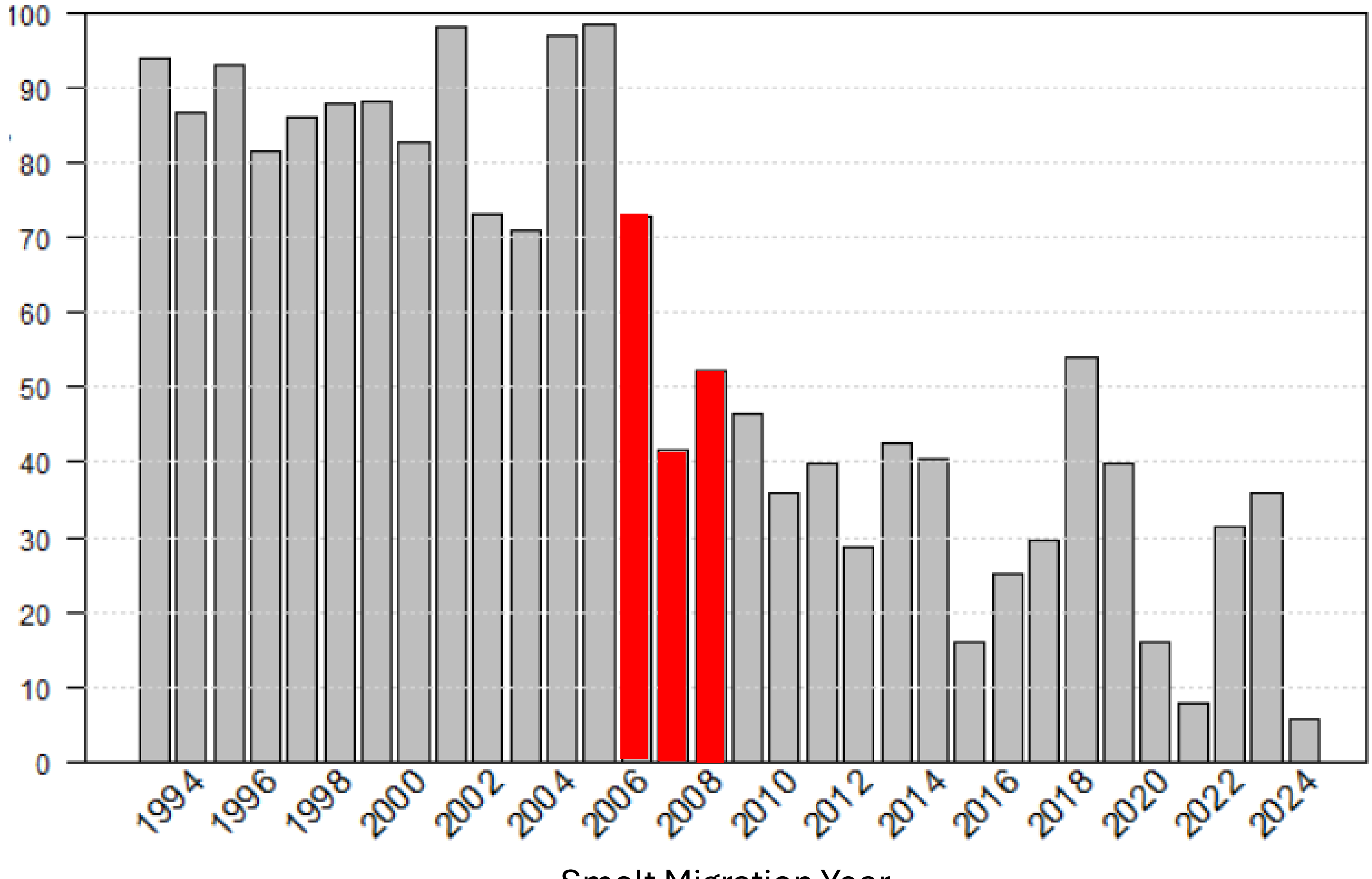
Smolt Transportation



Factors Influencing Permanent Strays in the Deschutes River

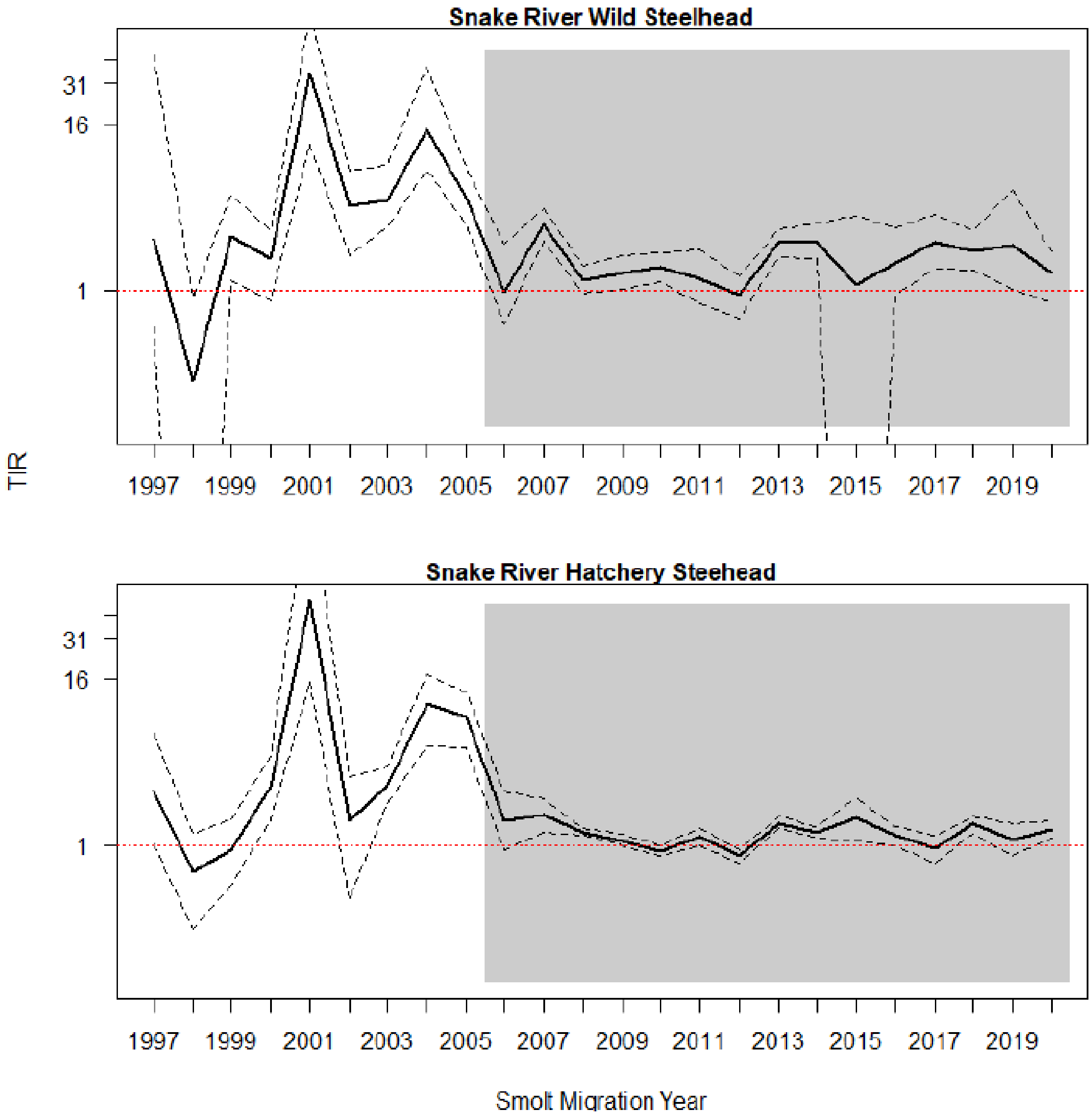
- Transport “signature” in the adult return
    - Percent of smolts transported
    - Relative survival of Transported v. In-River
- Individual Propensity to stray on return
    - Transport history
    - Adult migration timing – temperature

“Transport Signature” - Percent of Smolts Transported

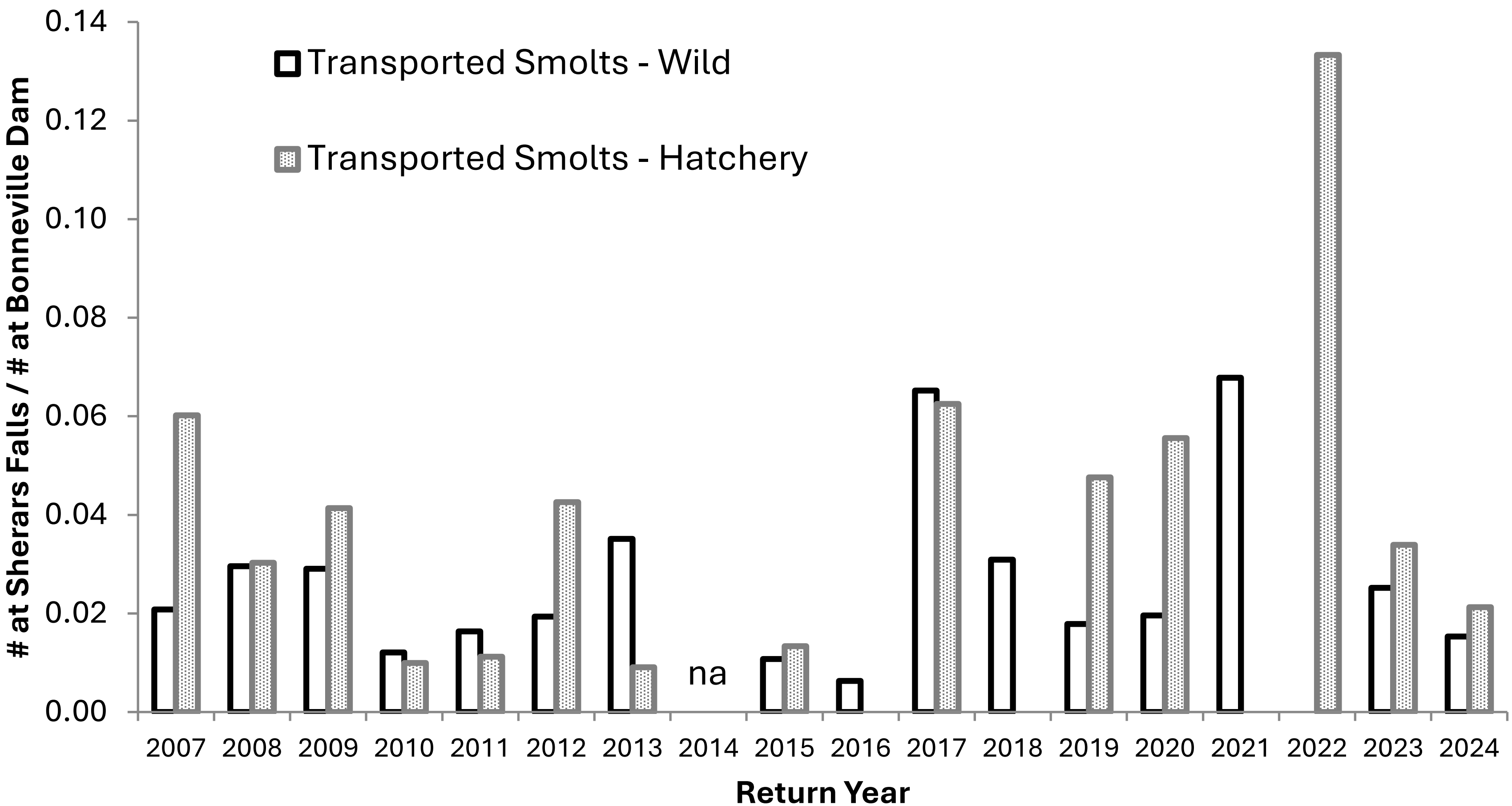


NOAA, 2024 Survival Memo

“Transport Signature” - Relative Survival



“Individual Propensity” - Transported Steelhead at Sherars Falls



Temporary Straying for Thermal Refuge?

Rev Fish Biol Fisheries

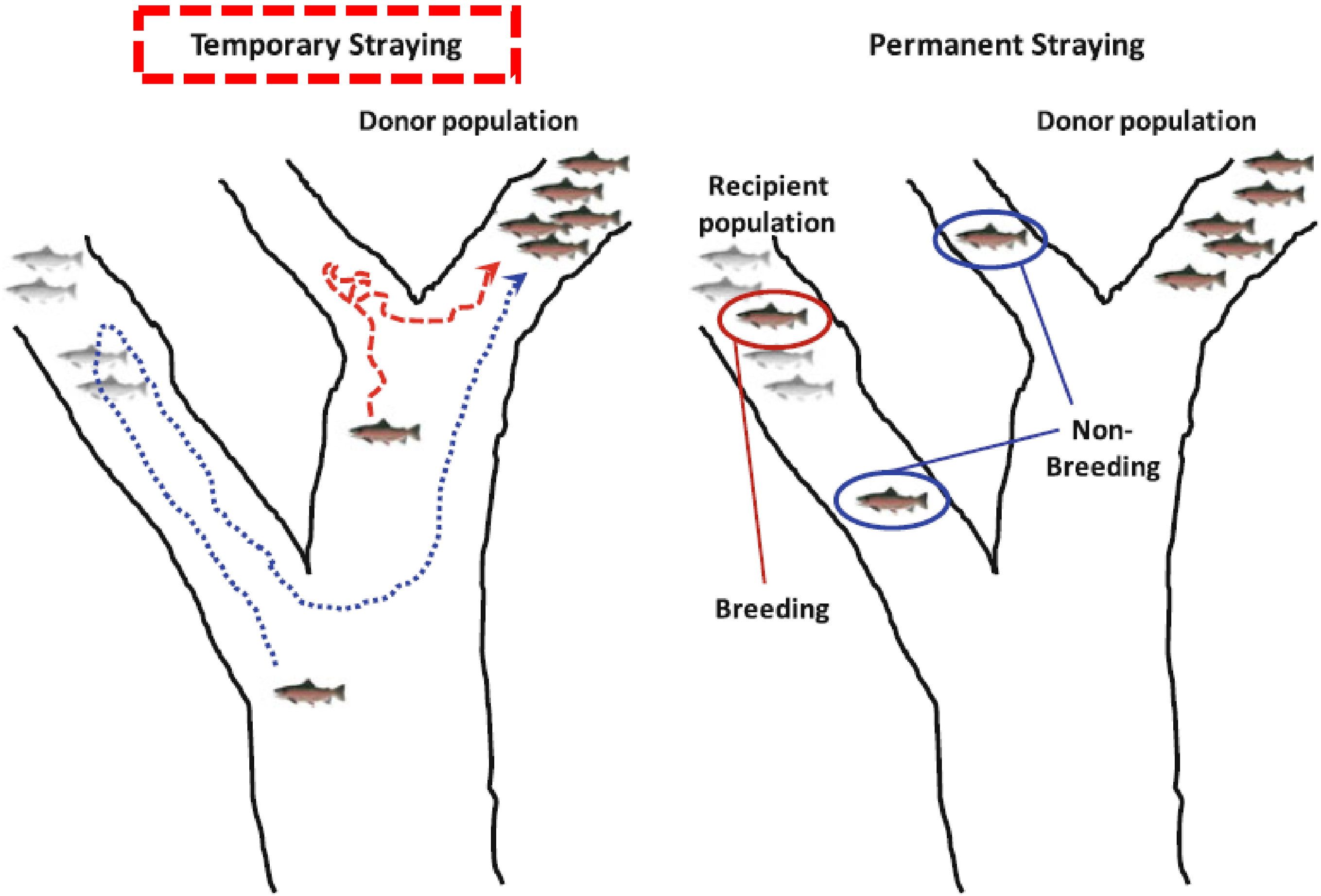
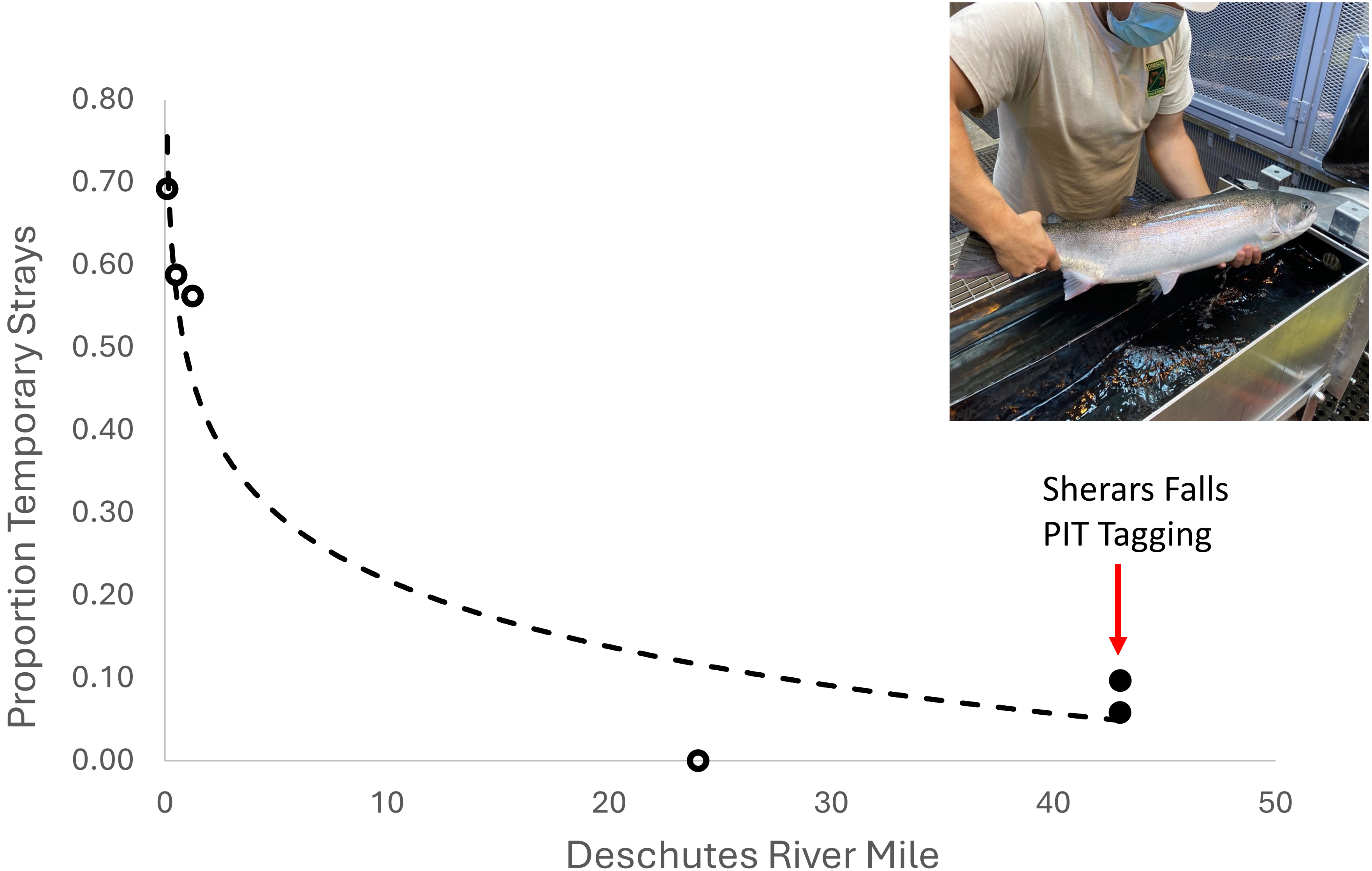
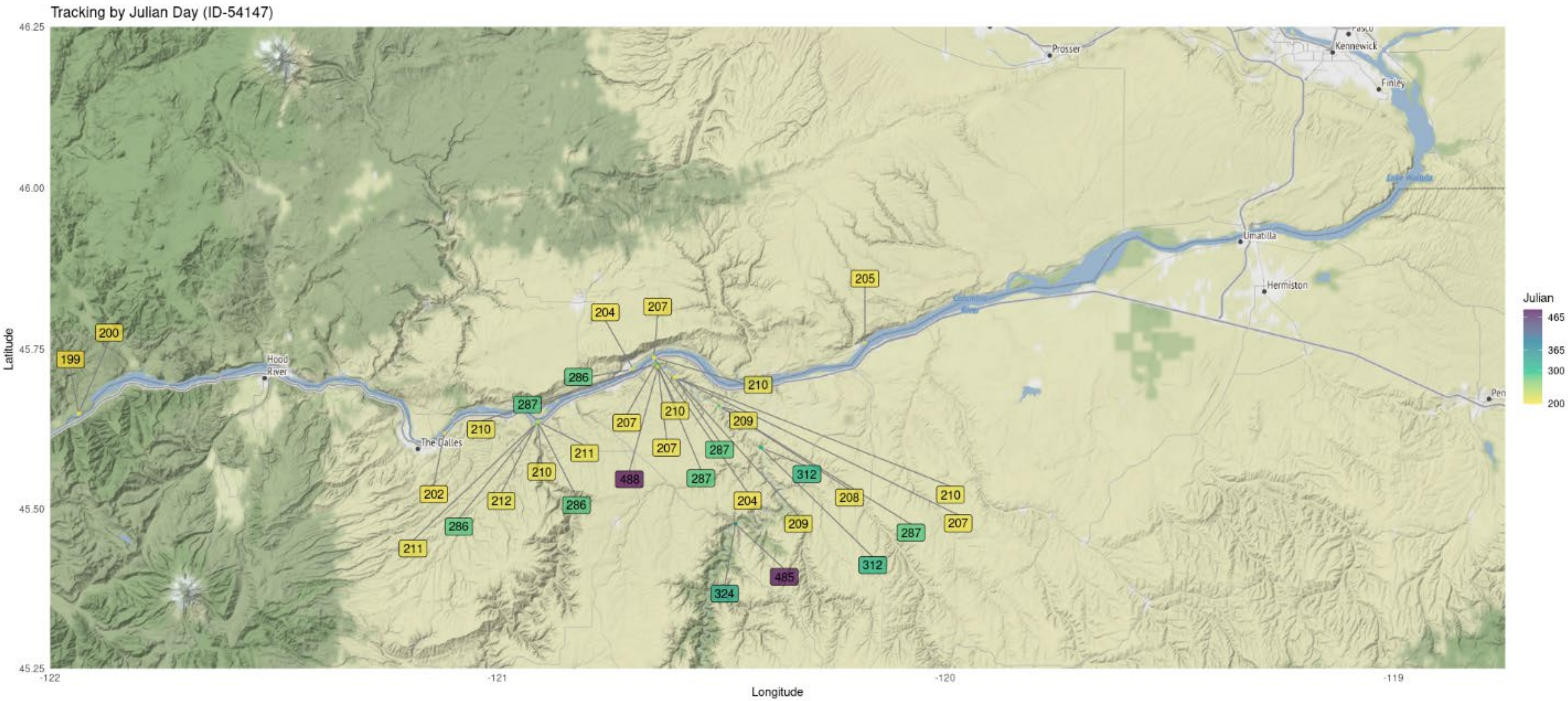


Fig. 3 Adult migrants show a variety of 'temporary' (*left panel*) and permanent (*right panel*) straying behaviors. Temporary straying may be exploratory searching for mates or spawning sites or may be stimulated by environmental conditions such as water temperature. Permanent straying can result in either inter-breeding with the recipient population, colonization, or reproductive failure. Permanent strays are always a demographic loss from the donor population and may be a demographic gain for the recipient population. Straying versus homing status can be ambiguous for fish captured at non-natal hatchery facilities or in fisheries in non-natal sites

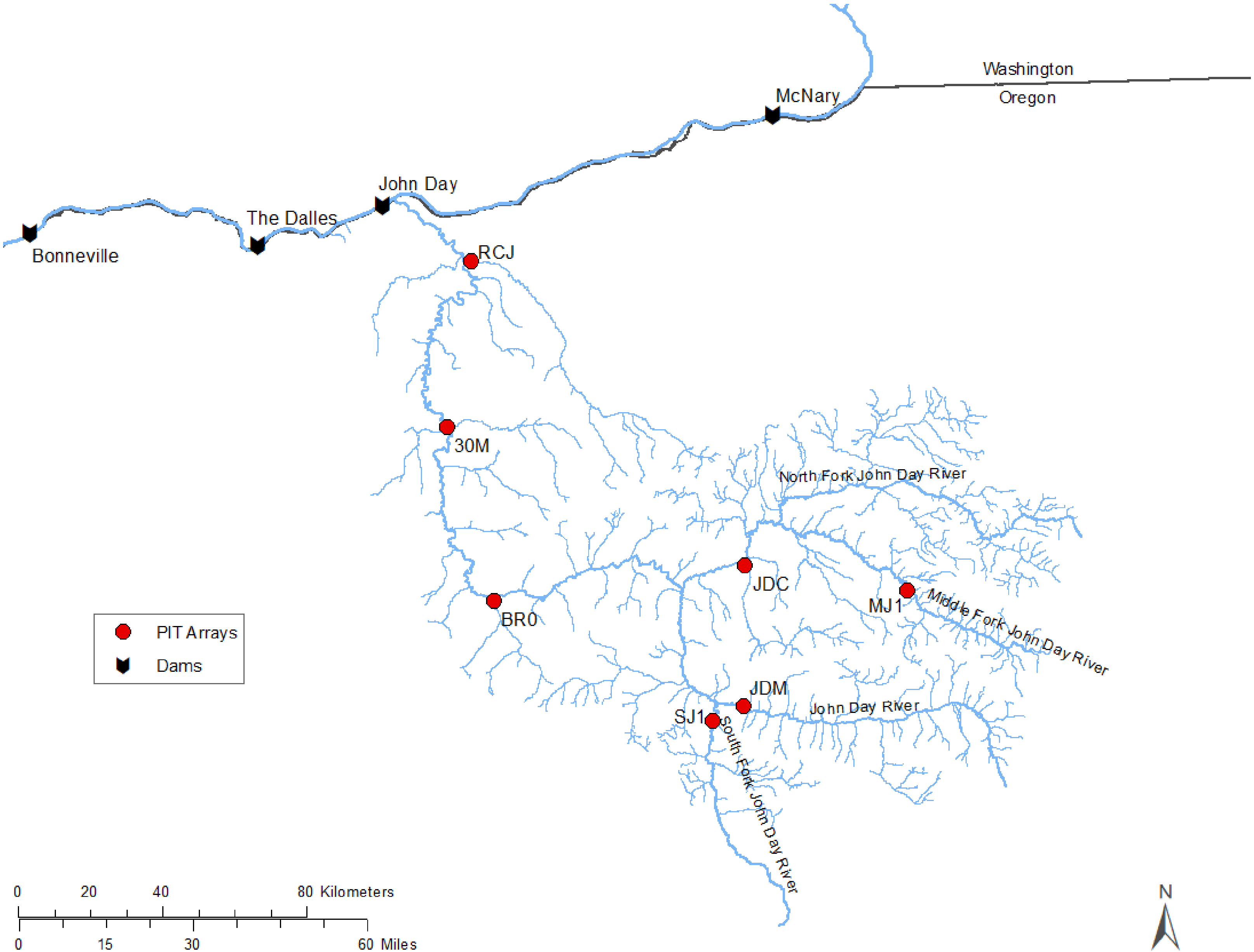
Temporary Strays-Wild Steelhead Tagging at Bonneville



Temporary Stray – from John Day River



Homing Ability



Homing Ability: John Day River

Adult Detection Location	Location of Juvenile Tagging: Upper Mainstem	Middle Fork	South Fork	Bridge Creek	Rock Creek	Thirtymile Creek	Cottonwood Creek
Upper Mainstem	12	0	0	0	0	0	0
Middle Fork	0	93	0	0	0	0	0
South Fork	0	0	232	0	0	0	0
Bridge Creek	0	0	**1**	197	0	0	0
Rock Creek	0	0	0	0	16	0	0
Thirtymile Creek	0	**1**[1]	0	0	0	16	0
Cottonwood Creek	0	**1**	0	0	0	0	1

3 / 570 = 0.5%   *not a true donor stray rate*

Conclusions

- The propensity of transported steelhead to stray to Sherars Falls appears little changed through time, but the ‘transport signature’ is dramatically lower, which results in fewer permanent strays

- Temporary strays are continuing to utilize the Lower Deschutes-likely complex interaction among run timing and temperature patterns

Conclusions

- Smolt transportation obfuscated our understanding of adult steelhead homing ability and created false hypotheses about steelhead ecology prior to individual marking-detection studies

- Steelhead have very high homing ability, except when we interfere with their migration routes

Conclusions

- Reductions in permanent straying are regionally beneficial to steelhead recovery—salmonids that home are more productive than those that stray

SCIENCE ADVANCES | RESEARCH ARTICLE

ECOLOGY

Home ground advantage: Local Atlantic salmon have higher reproductive fitness than dispersers in the wild

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A long-held, but poorly tested, assumption in natural populations is that individuals that disperse into new areas for reproduction are at a disadvantage compared to individuals that reproduce in their natal habitat, underpinning the eco-evolutionary processes of local adaptation and ecological speciation. Here, we capitalize on fine-scale population structure and natural dispersal events to compare the reproductive success of local and dispersing individuals captured on the same spawning ground in four consecutive parent-offspring cohorts of wild Atlantic salmon (*Salmo salar*). Parentage analysis conducted on adults and juvenile fish showed that local females and males had 9.6 and 2.9 times higher reproductive success than dispersers, respectively. Our results reveal how higher reproductive success in local spawners compared to dispersers may act in natural populations to drive population divergence and promote local adaptation over microgeographic spatial scales without clear morphological differences between populations.