

OPTIONAL SUPPORTING MATERIALS

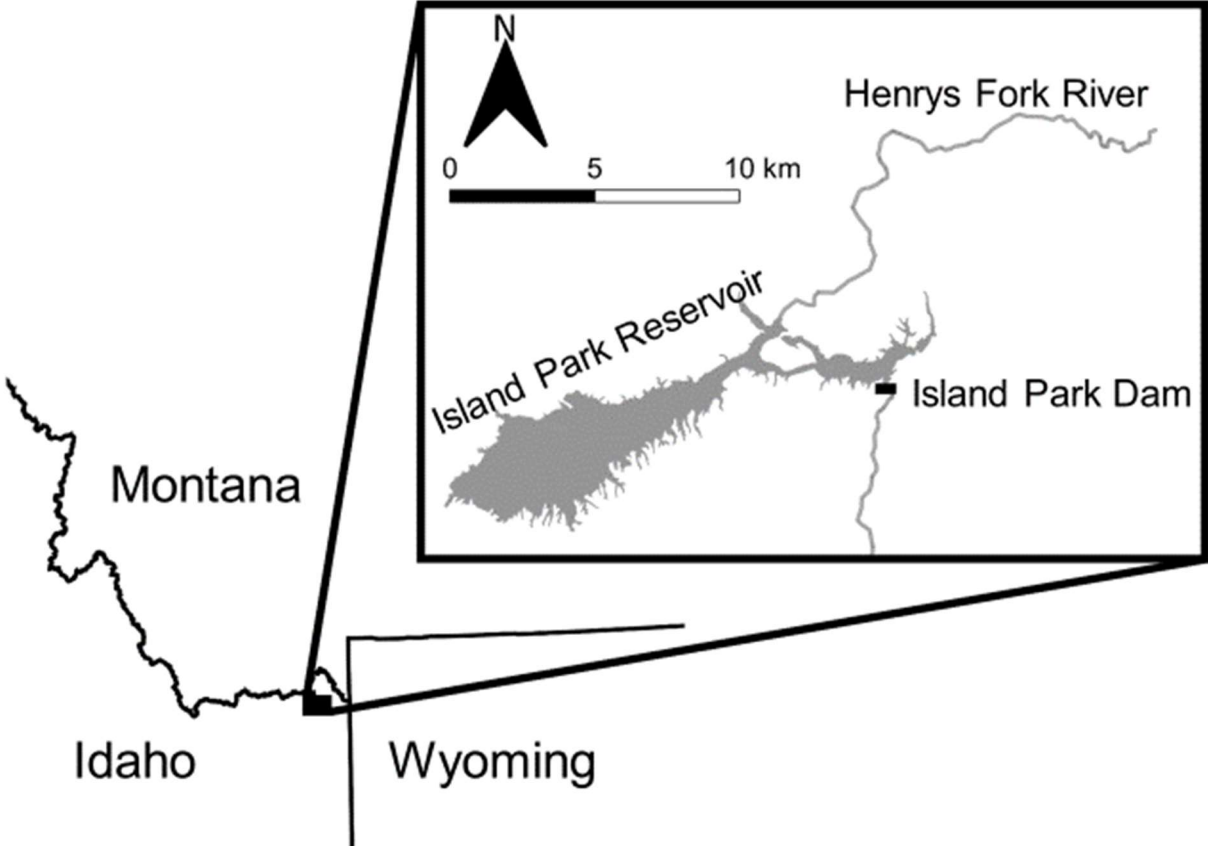


Figure 1: Proposed project area: Island Park Reservoir and the Henry's Fork of the Snake River watershed from Big Springs to Mesa Falls, Fremont County, Idaho, USA.

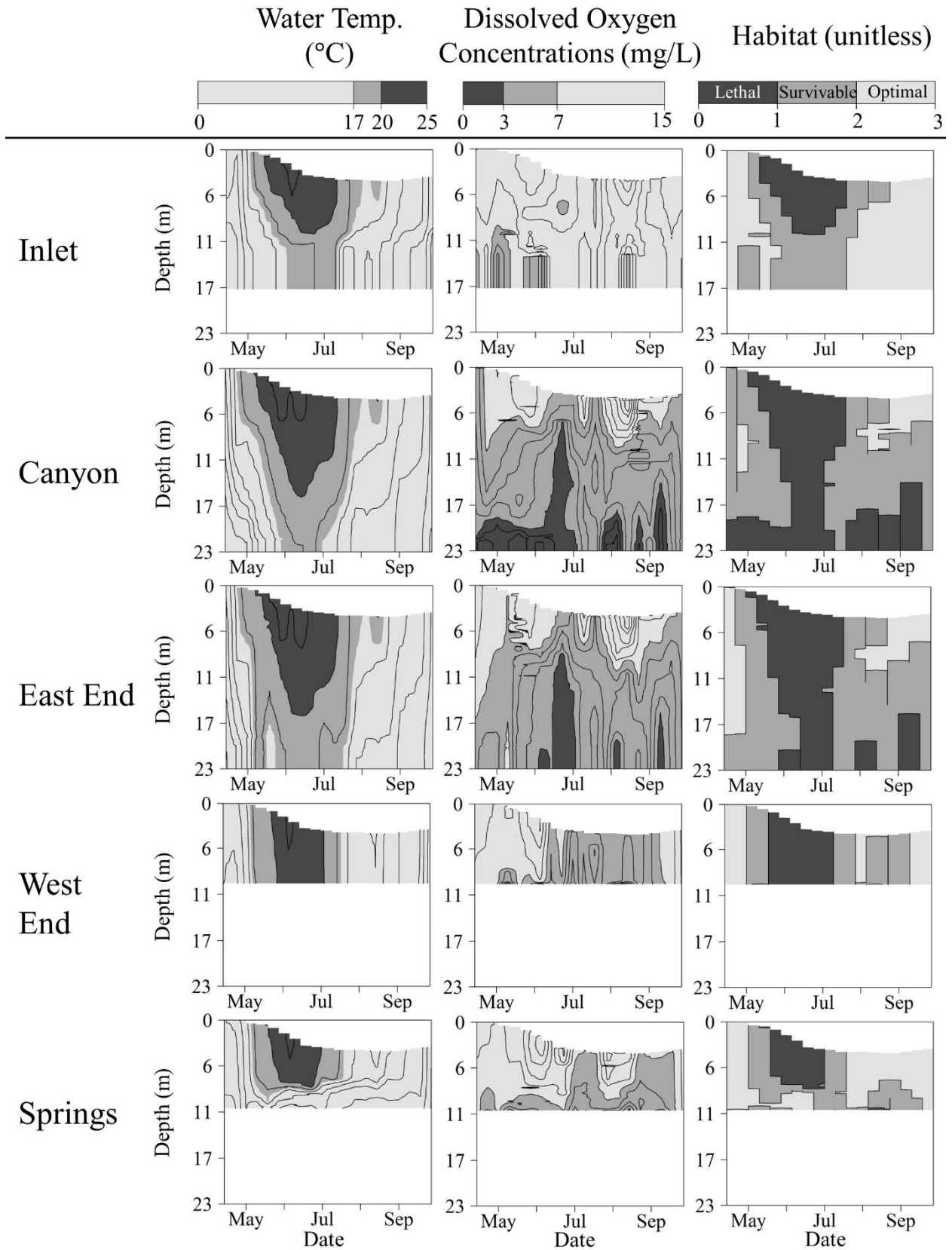


Figure 2: Interpolated water temperature ($^{\circ}\text{C}$, left column), dissolved oxygen concentration (mg/L , middle column) and total habitat availability (unitless, right column) from May to October 2021 in Island Park Reservoir. Rows represent each of the five habitat units in Island Park Reservoir. Isoleth lines for the left column represent water temperatures at 2°C intervals. Isoleth lines for the middle column represent dissolved oxygen concentrations at 1 mg/L intervals. Shading highlights kokanee habitat criteria in all graphs, with dark gray indicating lethal conditions ($>20^{\circ}\text{C}$, $<3\text{ mg/L O}_2$), medium gray indicating survivable conditions ($<20^{\circ}\text{C}$, $>3\text{ mg/L O}_2$), and light gray indicating optimal conditions ($<17^{\circ}\text{C}$, $>7\text{ mg/L O}_2$). The top of the shaded area represents the surface of the water, whitespace at the top of each panel shows water level loss due to drawdown at each location. Habitat availability is a derived variable acquired by overlaying plots of water temperature and dissolved oxygen concentration.

Henry's Fork of the Snake River from its headwaters at Big Springs to Mesa Falls, Fremont County, Idaho, USA.

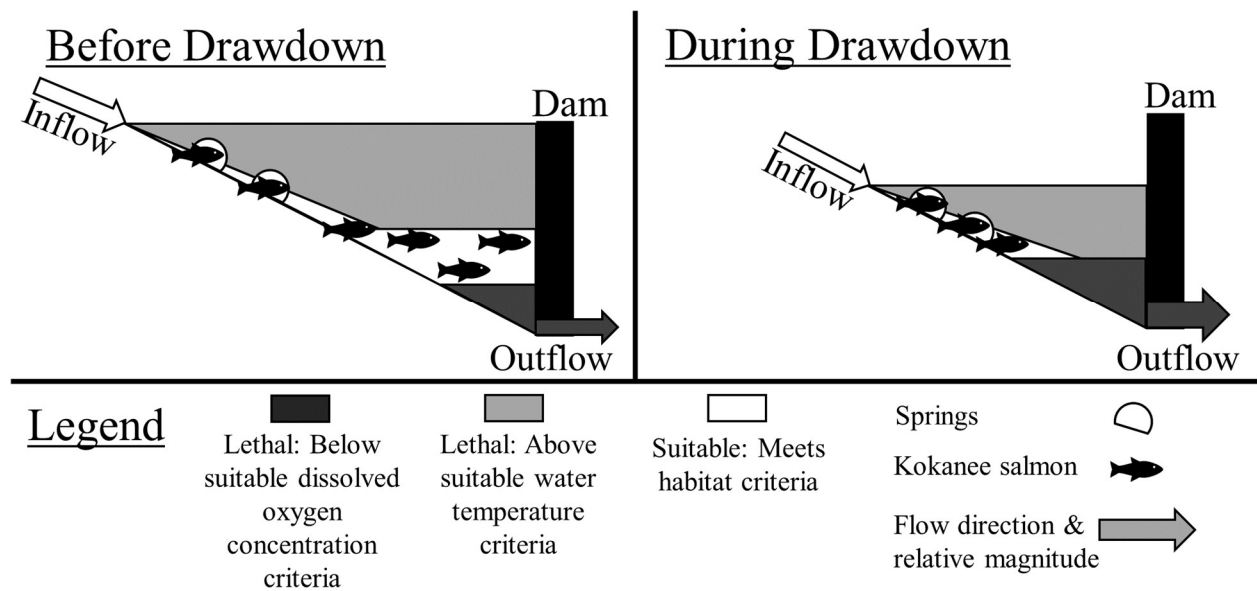


Figure 3: Cross-sectional conceptual model of Island Park Reservoir illustrating how drawdown in Island Park Reservoir is hypothesized to alter salmonid habitat and populations. During drawdown, outflows are greater than inflows. Thus, hypolimnetic outflows will evacuate hypolimnetic water downstream faster than replacement from cool, oxygenated inflows. The hypolimnion will be replaced by the warm, organic matter-rich epilimnion, resulting in temperature increases and dissolved oxygen decreases, reducing oxythermal habitat. Oxythermal habitat loss concentrates salmonids in spring-fed thermal refugia, where they may be susceptible to density-dependent processes such as predation, competition, or escapement.

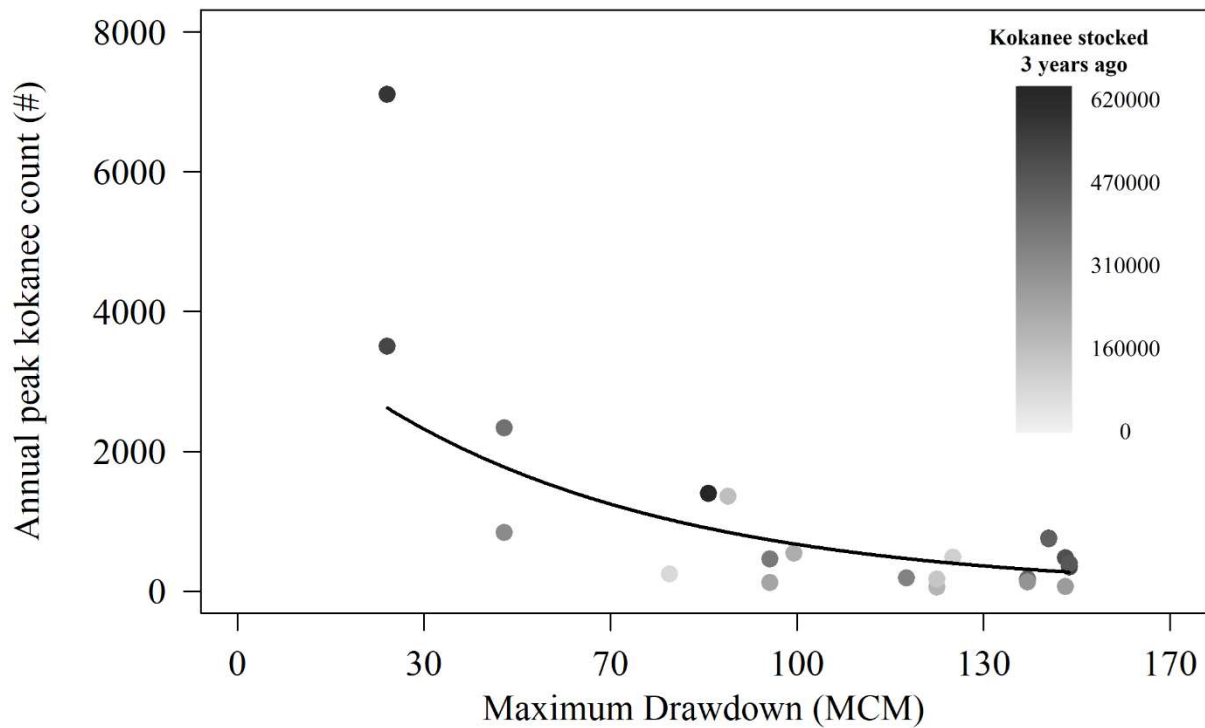


Figure 4: Annual peak kokanee spawner counts in Henrys Lake Outlet (#) and stocking (#) across maximum drawdown volumes (million m³ or MCM) in Island Park Reservoir in the two years previous to each kokanee observation. The curve depicts the AICc averaged model vs. drawdown at mean stocking, mean air temperature, and mean observations per year.

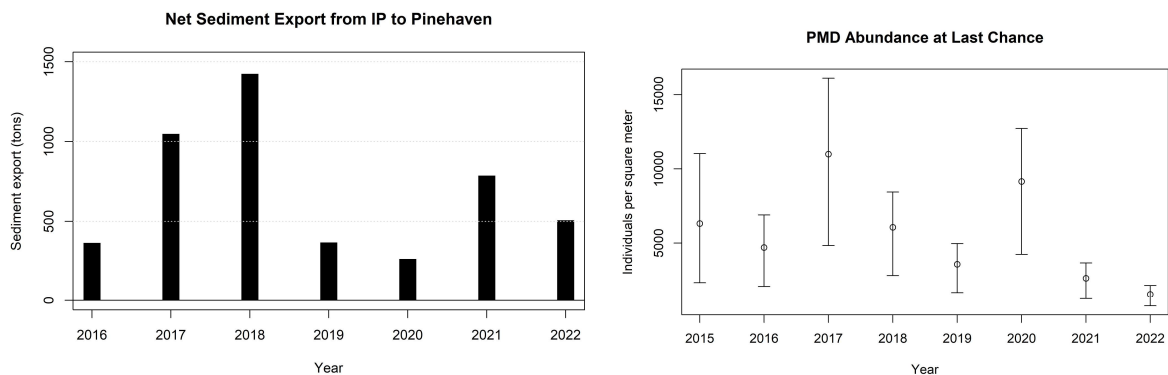


Figure 5: Left-hand panel depicts total annual net sediment export from the Henry’s Fork downstream of Island Park Reservoir across years. The right-hand panel depicts the annual abundance of Pale Morning Duns (PMDs) a sediment-intolerant mayfly species important to fish and anglers in the Henry’s Fork downstream of Island Park Reservoir across the same time period. Sediment export is high when clean flows from Island Park Reservoir move sediment out of the Henry’s Fork and flush it downstream. Sediment export from the Henry’s Fork is low

when sediment from Island Park Reservoir's USBR gates is released and deposits in the river. There is a clear correlation between low PMD abundance and low net sediment export.