



What can invertebrates, fish, and birds tell us about the condition of Walker Lake?

As part of understanding the overall condition of Walker Lake it is important to identify key categories of “indicator species.” As salinity levels of the lake fluctuate with rising or falling lake elevation, the health of indicator species can be used to determine the overall condition of the lake ecosystem.

The National Fish and Wildlife Foundation provided funding to The Nature Conservancy (TNC) to identify key indicator species, assess their present conditions, and determine ecological expectations as lake levels vary. TNC worked with the U.S. Fish and Wildlife Service, the Nevada Department of Wildlife and other research scientists to complete the assessment.

The three key indicator categories identified for evaluating Walker Lake are:

INVERTEBRATES

Invertebrates, which include insects such as damselflies, midges and alkali flies, are one of the most important ecological indicators of the health of the lake’s ecosystem. They need to maintain a constant balance of salt despite changes in the salinity of their environment. Therefore, they must expend energy to maintain that balance, which creates stress for the insects as salinity levels rise.

The numbers of invertebrates can be monitored over time to provide a measure of changing conditions in the lake. Invertebrates are also a critical food source for the native fishes and many migratory waterbirds, so as the number of invertebrates drops so does the overall food supply for other key indicator species.

NATIVE FISH

Fish species native to Walker Lake are the Lahontan cutthroat trout (LCT), Tahoe sucker, and tui chub.

Once numerous in Walker Lake, Lahontan cutthroat trout have not been observed in the lake since 2010. The continued decrease in lake volume has led to an increase in salinity and water temperature. These conditions decrease the amount of oxygen dissolved in the water and leads to challenges for LCT survival.

The Tahoe sucker has not been common in Walker Lake since 1982 when salinity levels first approached 10,000 mg/liter (NDOW, 2010). The return of a naturally sustaining population, however, would signal a significant conservation achievement in the reduction of salinity levels.

The tui chub population in Walker Lake is genetically different from other populations of tui chub throughout the Walker, Carson and Truckee river basins, and has robust genetic diversity. The tui chub is a schooling fish capable of surviving in both deep and shallow parts of Walker Lake. Recently tui chub populations have also seen a decline.

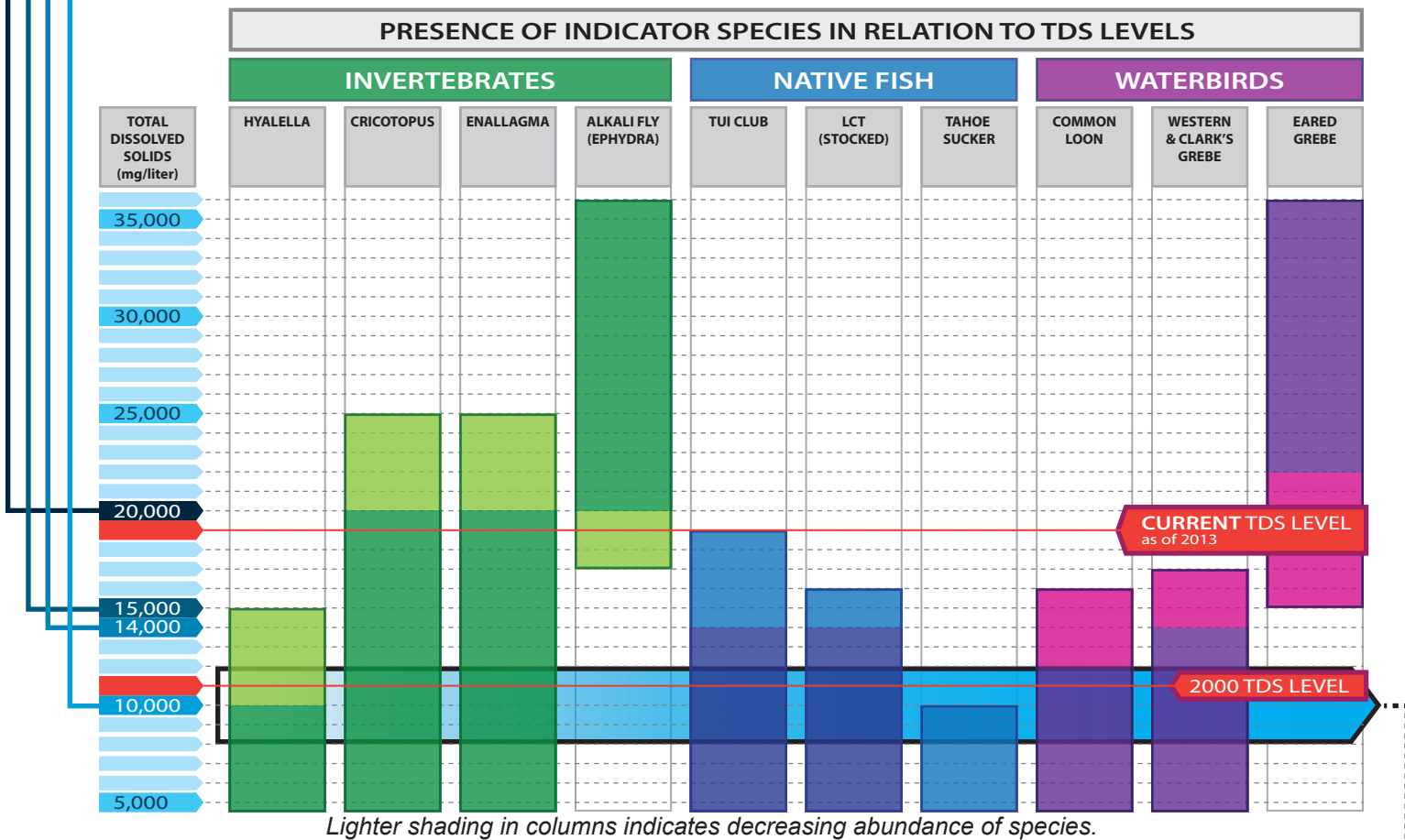
WATERBIRDS

Waterbirds common to Walker Lake include the American white pelican, double-crested cormorant and a number of waterfowl species such as gadwall, teal, redhead, scaup and bufflehead. Some of these birds seek large bodies of open water in the region that support common fish food species such as LCT and tui chub while others rely more on the lake’s aquatic insects and/or plants for food.

A diversity of fish sizes is needed if many of these waterbirds are to effectively feed. When native fish are unable to breed or survive, the variation in the sizes of the fish does not exist. For example, as salinity levels have risen over time, common loons, and western and Clark’s grebes have decreased in abundance at Walker Lake since the smaller size classes of tui chub are no longer available for them to eat. Similarly, when insect populations decline due to stress, birds relying on this food source struggle to survive.

► Impact of Total Dissolved Solids Levels (a measurement of water salinity) on Lake Health

TDS above 20,000 mg/l	Significant declines in most insect populations with an increase in alkali flies and birds such as the Eared Grebe which rely on this fly as a food source. A complete loss of the tui chub in Walker Lake is also likely when TDS levels near the 20,000 mg/L threshold.
TDS below 15,000 mg/l	Allows for acceptable survival rates of acclimated stocked Lahontan cutthroat trout and the return of some invertebrate food sources for trout.
TDS below 14,000 mg/l	Tui chub would be expected to breed again which in turn would provide a food source for birds such as the common loon and western and Clark's grebes. Stocked LCT would grow bigger and survive longer as TDS levels continue to drop.
TDS below 10,000 mg/l	A diverse community of aquatic invertebrates would exist in the lake and these would support the native fish and birds that would use the lake under conditions most similar to what the lake would be today without stream diversions.



A Total Dissolved Solids level of 8,000 – 12,000 mg/l is needed for optimal lake health conditions.

► **This is accomplished by increasing the quantity and quality of freshwater inflows to the lake.***

TDS Level Desired (mg/L)	Supplemental Increased VOLUME NEEDED (acre-ft)	Supplemental Ongoing INFLOW NEEDED (acre-ft/yr)	Resulting Lake-surface Elevation
12,000	700,000	26,000	3,952 ft
10,000	1,200,000	36,000	3,965 ft
8,000	2,000,000	53,000	3,986 ft

* USGS Scientific Investigations Report 2009-5157