

Harvey Lake

Background, Long Term Issues & Trends

- Harvey Lake was initially established by the Department of Parks and Recreation (DPR) in the 1950's after garnering the needed water rights to sustain it.
- The primary water source is Clear Creek water diverted from Golden through the Agricultural Ditch to Ward Reservoir #5 and then to Harvey.
- The lake was last renovated in 1995-96, which is when the islands were added and possibly the last time sediment was removed, or re-distributed.
- Because the inflow and outflow are closely positioned on the west half, much of the lake has poor water exchange.
- The lake vegetative community has been dominated by phytoplankton (floating microscopic algae) the past decade, driven by limited inflows, poor water exchange, warm-shallow water, and excessive nutrient input.



Developing Issues

Water supply via the Agricultural Ditch through Ward Reservoir (#5) was greatly diminished in 2015 and discontinued in 2017 and 2018 due to allowable use agreements. The primary problem is that Denver can only be allotted this water for Harvey if they utilize it for irrigation—maintenance of the park landscape. The water had originally been used for that purpose, but was discontinued in the 1970's or 80's. DPR is now (spring 2019) modifying the park and lake infrastructure to incorporate irrigation from the lake.

Due to other infrastructure and administrative issues up-pipe of Harvey, water delivery has been limited since at least 2015. This has left the lake one to two feet below bankfull and with virtually no water exchange. This is the primary reason for the recent decline in Harvey's water quality. In 2018, several parameters were measured at the highest (*chlorophyll-a, pH, temperature, conductivity, metal parameters, and nutrients*) or lowest (*lake depth, water clarity*) levels over the past 20 years. Aeration was installed in 2018 to help mitigate some of the negative aspects of limited inflows and stagnation as a result of limited to no inflows.

Maintenance of the swimming pool operations had included discharge of backwash to the lake. This was mitigated in 2017 and should not be re-instated.

Habitat, Fish, and Wildlife

Habitat: The in-lake habitat includes mudflat-transition from the island perimeter to the deeper water, as well as intermittent cattail and bulrush stands around the shoreline and island perimeters. However, the islands provide good nesting, resting, and feeding opportunities for some birds. The islands have aged trees and shrubbery, with some new trees replacing the older ones. Some of the snags that have gone down around the island perimeter provide good loafing habitat. There is a slim band of trees and limited brush around the perimeter. Other than random years when rooted vegetation becomes established, there is limited structural habitat in the lake for fish.

Fish: Channel catfish and shad (feeder fish) were stocked in 2018. Harvey had provided adequate water quality for warmwater fish up until 2015 when inflows were greatly restricted. The limited water supply left the lake well below bankfull driving temperatures up to the degree that could inhibit fish health and productivity (Fig 1). The shallow

Location: 2120 S Tennyson Way
Surface Area: 5.2 acres
Max Depth: ~7ft
Primary Source Water: Clear Creek via Agricultural Ditch and Ward Reservoir #5 (private lake on Salisbury Lateral)

Intended Lake Uses:

Aesthetics, wildlife habitat, fishing, irrigation (2019)

Current Regulatory Issues^{1/}:

Iron (monitoring & evaluation list)

1/ Conditions exceeding state water quality standards.

Updated April 2019; questions to: alan.polonsky@denvergov.org

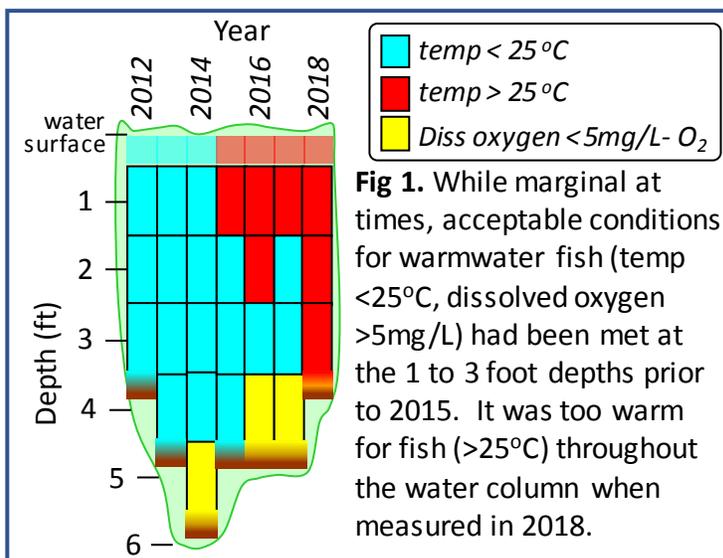


Fig 1. While marginal at times, acceptable conditions for warmwater fish (temp <25°C, dissolved oxygen >5mg/L) had been met at the 1 to 3 foot depths prior to 2015. It was too warm for fish (>25°C) throughout the water column when measured in 2018.

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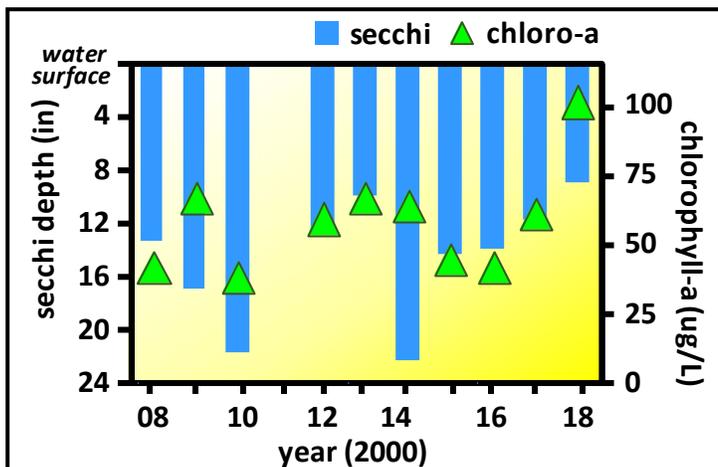


Fig 2. Secchi depths and chlorophyll-a concentrations (2008–2018). Note that secchi depth has been steadily decreasing (turbidity increasing) while chlorophyll-a has been increasing since 2016. The 2018 readings were the poorest quality on record over the past 20 years.

depth also further enhances sediment/water disturbance which makes suspended materials more prevalent in the water column. This includes nutrients, which further promote algae growth, and contribute to diminishing water clarity as measured by secchi depths (Fig 2 and 3).

Wildlife: While the bookend islands in Harvey provide good habitat potential, there are generally low numbers and diversity of birds observed at the lake during mid-summer sampling. Birds typically noted include Red-winged blackbirds, Canada geese, cormorants, and occasionally one or two egrets and/or pelicans. Ducks and short-legged wading birds have been limited the past few years. It seems that while there is some good habitat amenities for birds, the sparse wetland vegetation and small lake size don't provide adequate buffer from human and pet dis-

turbance to attract more use. Other wildlife such as bullfrogs and turtles have been noted over the years.

Issues Summary & Upcoming Actions

Water Supply: The Denver Department of Parks and Recreation (DPR) will renovate the park and lake in 2019 to install infrastructure to accommodate pumping for irrigation. Lake sediment removal will be an additional objective of the renovation so as to accommodate water storage needs. DPR is also working with their up-pipe neighbor to address other obstacles holding back inflows.

Water Quality: The water quality of the lake will benefit significantly when water inflows are re-stored to at least 2014 levels and bankfull lake depth is increased. Pumping water for irrigation coupled with adequate inflow to maintain bankfull conditions will increase water turnover as well. These actions could slow algal growth due to several factors (cooler water temperatures, decrease re-suspension of sediment and associated nutrients, higher water turnover).

Recommendations

- Most of the lake is left stagnant by the current inflow-outflow path (Fig 4). When the lake is renovated, place the pump intake in a position that enhances water mixing throughout the lake. This would entail putting the pump-intake as far from the lake inflow as possible. Multiple inflow/outflow options would provide even more water exchange.
- As is logistically feasible, re-position aeration units to maximize mixing of stagnant portions of the lake.
- Work with DPHE-Environmental Management Operations Section to assure swimming pool maintenance does not include protocol that negatively impacts the lake.
- Incorporate fish habitat structures & consider options to enhance perimeter vegetation for other wildlife.

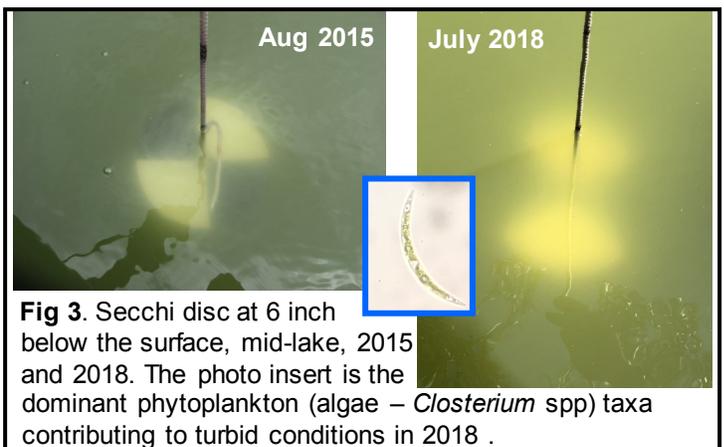


Fig 3. Secchi disc at 6 inch below the surface, mid-lake, 2015 and 2018. The photo insert is the dominant phytoplankton (algae – *Closterium* spp) taxa contributing to turbid conditions in 2018.

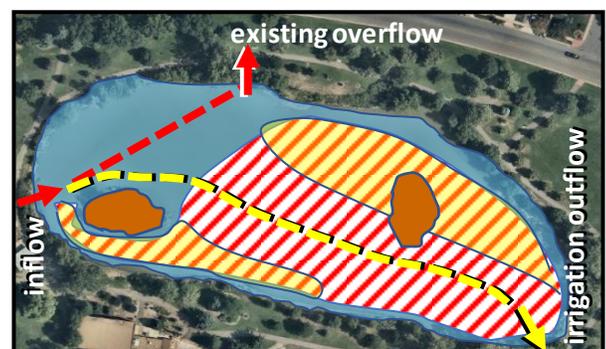


Fig 4. Estimated stagnant water based on current inflow/outflow path (red hash & red dash line) and after the new (2019) irrigation outflow (yellow area and yellow dash line) is operational. The new outflow should improve water exchange (decrease stagnant areas) and water quality.