Tahoe Science Advisory Council (TSAC)

Executive Briefing on Lake Tahoe Clarity and Associated Conditions

June 2021

Lake Tahoe's clarity remains a key indicator of ecosystem health, and scientific understanding about factors affecting lake clarity continues to evolve. The purpose of this briefing memorandum is to summarize the status of clarity metrics and drivers of change discussed in the 2021 TSAC Data Synthesis and Analysis report.

Notably, the concentration of fine particles in the upper 30–40 meters remain particularly important to lake clarity. These particles are clays and fine silts from the watershed as well as small phytoplankton produced within the lake, all of which are influenced by activities within the watershed.

Additionally, climate change is affecting other factors relevant to clarity and lake ecology, which include annual deep mixing, precipitation, and stratification in the upper water column.

Main Highlights

- The long-term rate of change in clarity is a more meaningful metric of the lake's health than year-to-year variations.
- Both management and data analysis efforts should remain focused on dominant drivers of trends rather than on individual data points.
- The decline in annual average Secchi depth ended around twenty years ago, and has not changed significantly since that time.
- Summer average clarity (Jun-Sep) continues to decline at a rate of 0.62 feet per year (0.19 m/y).
- Winter average clarity (Dec-Mar) does not currently show a trend of increasing or decreasing clarity.
- Fine sediment particles and small *Cyclotella* diatom species have accounted for 61% of Secchi depth variation from 2011 through 2020. This supports continuing efforts to control fine sediment and nutrient inputs to the lake.
- The relative impact of factors influencing lake clarity is variable over time. Lake and stream fine particle concentrations have been elevated since 2017, whereas *Cyclotella* concentrations exerted more influence on clarity from 2011 through 2016.
- Monitoring programs are the foundation of successful resource management. The data generated are necessary to quantify trends, assess relative influence of important drivers, inform the development of predictive models, discover changes in system function, and to inform discussions that identify opportunities for management actions.
- This project has demonstrated the value of agency-science collaboration for lake clarity assessment and management. The Science Council anticipates advancing its analysis and reporting schedule to provide a release of clarity results in the spring of each calendar year going forward.

Information summarized here is discussed further in the Tahoe Science Advisory Council (TSAC) Data Synthesis and Analysis report (2021), the TSAC Lake Tahoe Seasonal and Long-Term Clarity Trend Analysis report (2020), and the annual State of the Lake reports produced by UC Davis Tahoe Environmental Research Center.

Respectfully submitted, TSAC Data Synthesis and Analysis Committee:

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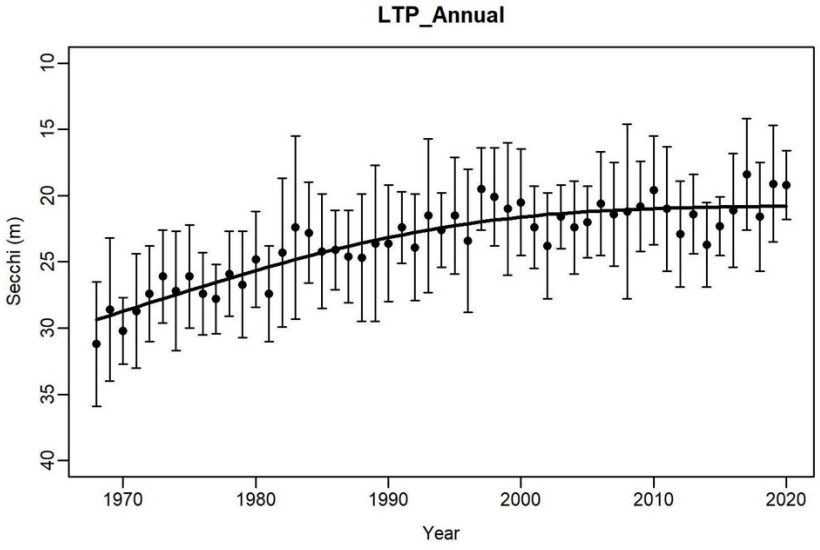

Figure 1. *Annual average Secchi depth measurements from 1968–2020. Measurements are averaged from the calendar year (CY) rather than the water year (WY). Vertical lines indicate the standard deviation of all measurements taken each year.*

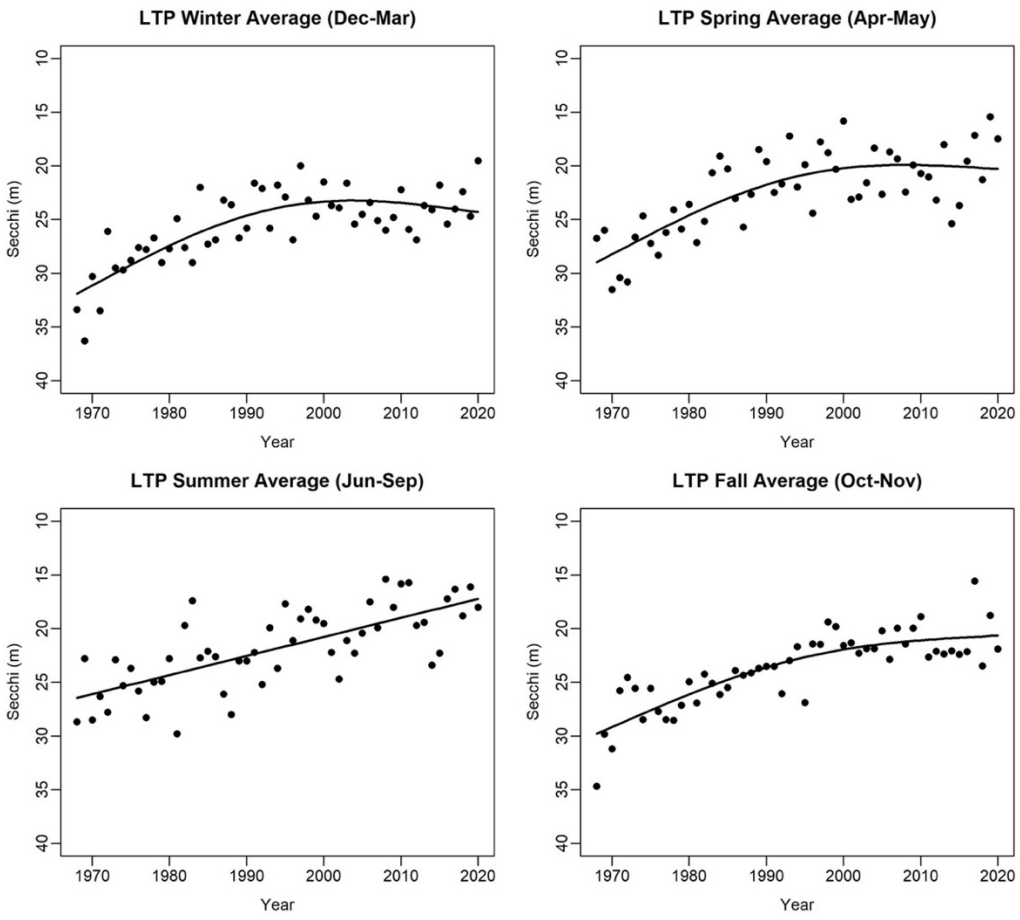

Figure 2. *Seasonal average Secchi depth clarity. Winter average clarity includes December from end of the preceding calendar year. Best fit lines are estimated from a generalized additive model.*

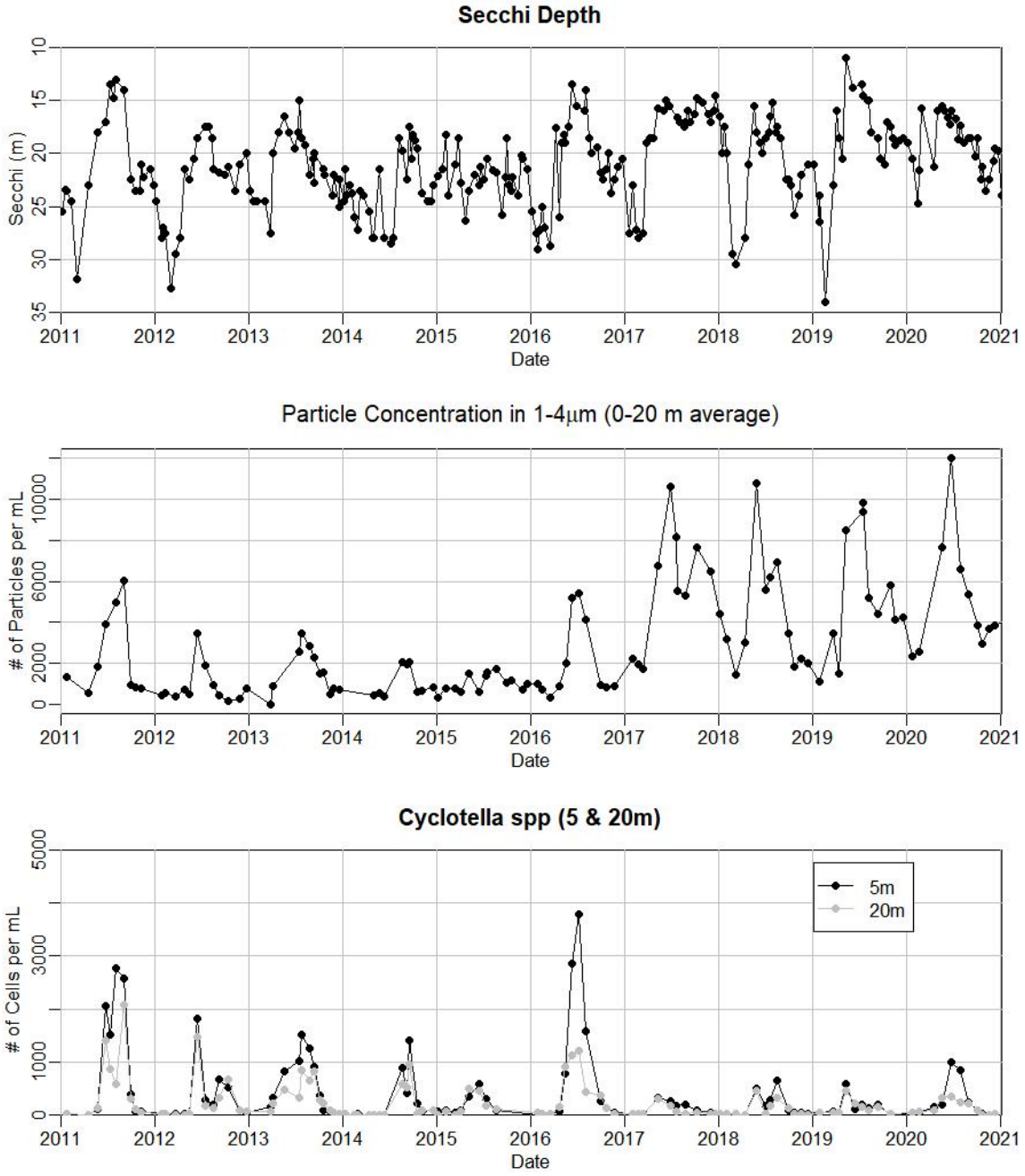

Figure 3. *Secchi depths, fine particle (1-4 µm) and Cyclotella concentrations at LTP site (CY 2011-2020). Samples analyzed for fine particle concentrations were collected at 0, 2, 5, 10, 15, and 20 meters. These results were linearly interpolated at one-meter intervals and then averaged.*