

Alaska Department of Environmental Conservation

Waterbody Field Report

Fairbanks Elodea Project, Fairbanks, Alaska



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Abstract

The invasive aquatic *Elodea* plant has been detected in numerous waterbodies throughout interior Alaska. The Fairbanks Elodea Steering Committee developed a plan to use aquatic herbicides to eradicate *Elodea*, and the Department of Environmental Conservation (DEC) conducted in situ water quality monitoring at four treatment sites during summers 2015 – 2021. Bacteria monitoring for fecal coliform and *Escherichia coli* was also conducted at two sites in 2020 and 2021. In-situ water quality measurements were within expected ranges for dissolved oxygen, pH, specific conductance, and turbidity. Temperature exceeded 15 degrees Celsius during warm months likely due to shallow sampling locations. Bacteria was relatively low overall, with the exception of one day at Birch Lake in August 2021 when fecal coliform and *E. coli* were 520 cfu/100ml and 579 MPN/100ml, respectively. The field crew noted the presence of dog waste and ducks on this date.

Basic Waterbody Information

Table 1. Basic Waterbody Information

| | |
|--------------------------------|---|
| Assessment Unit ID | AK_R_8030609_004_001 |
| Assessment Unit Name | Chena Slough |
| Location description | Tributary to the Chena River that flows through the North Pole area. |
| Hydrologic unit code 12 | 190803060904 |
| Water Type | Freshwater, Slough |
| Area sampled | Five sites along Chena Slough: <ol style="list-style-type: none"> 1. Mission: between Old Mission Rd and Wyatt Rd on Mission 2. Airway: Between Badger Rd and Free Wright Ln on Airway Dr 3. Plack: Between Garnet Dr and Monica Dr on Plack Rd 4. Peede: Between Peede Rd and Koch Ave on Persinger Dr 5. Persinger: Between Old Badger Rd and Minerva Ct on Persinger Dr |
| Time of year sampled | June - September |

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| | |
|--------------------------------|--|
| Assessment Unit ID | AK_L_8030609_003 |
| Assessment Unit Name | Chena Lake |
| Location description | Lake in North Pole that lies between Chena River and Chena Slough. |
| Hydrologic unit code 12 | 190803060901 |
| Water Type | Freshwater, Lake |
| Area sampled | Shallow (photic zone) at shore near the southeast parking lot |
| Time of year sampled | June - September |

| | |
|--------------------------------|--|
| Assessment Unit ID | AK_L_8030710_001 |
| Assessment Unit Name | Bathing Beauty Pond |
| Location description | Small pond at the southwest corner of the Richardson Hwy and Eilson Farm Rd intersection near Moose Creek. |
| Hydrologic unit code 12 | 190803071008 |
| Water Type | Freshwater, Pond |
| Area sampled | Shallow (photic zone) near the parking lot on the east shore |
| Time of year sampled | June - September |

| | |
|--------------------------------|--|
| Assessment Unit ID | AK_L_8030709_001 |
| Assessment Unit Name | Birch Lake |
| Location description | Lake near Salcha and the Tanana River, off of the Richardson Hwy, and southeast of Harding Lake. |
| Hydrologic unit code 12 | 190803070908 |
| Water Type | Freshwater, Lake |
| Area sampled | Shallow (photic zone) near rest area on the south shore |
| Time of year sampled | June - September |

Water Quality Evaluation

Background

Elodea is an aggressive non-native invasive aquatic plant that was first detected in the Chena River system in 2010 (FSWCD 2011, Larsen et al. 2010). Surveys conducted by the Fairbanks Elodea Steering Committee² in 2011 revealed that a 10 mile reach of Chena Slough was infested with *Elodea*, as well as Chena Lake and parts of the Chena River. Further surveys found *Elodea* downstream in Totchaket Slough off the Tanana River, Bathing Beauty Pond, Birch Lake, Manley Hot Springs Slough, and in nine lakes on Eilson Air Force Base.

² In 2010, shortly after the discovery of *Elodea* in Chena Slough, the Fairbanks Elodea Steering Committee was formed to address the threat. The committee includes members from AK Dept. of Environmental Conservation, AK Dept. of Fish & Game, AK Dept. of Natural Resources, City of Fairbanks Public Works Dept., Fairbanks Soil & Water Conservation District, National Parks Service, US Fish & Wildlife Service.

In Alaska, *Elodea* infestations in waterbodies can be expected to increase sedimentation, displace native vegetation, reduce biodiversity, degrade sensitive fish habitat, and interfere with safe river travel. *Elodea* can be spread readily via boats and floatplanes, and because it reproduces vegetatively, a single fragment is all that is needed to start a new infestation.

The Fairbanks Elodea Steering Committee developed a plan³ and obtained permits to use aquatic herbicides (fluridone) to eradicate the aquatic invasive plant *Elodea* in the locations listed above. Applications began in summer of 2017. Previously herbicide treatment to control invasive species was limited to non-flowing waterbodies such as lakes. Since this was the first known use of an aquatic herbicide in a river environment in Alaska at the time the project began, DEC initiated water quality monitoring in Chena Slough to determine whether there were changes in water quality before, during, and after treatment. DEC later began monitoring Chena Lake, Bathing Beauty Pond in 2019, and Birch Lake in 2020, at the same time fluridone treatment began at those sites.

The Fairbanks Elodea Steering Committee plans to continue *Elodea* surveys and treatment in 2022 and future years.

Objectives

The objectives of this project are (1) to provide monitoring of basic water quality parameters before, during, and after application of herbicide in Chena Slough, and (2) to monitor water quality at additional sites being treated with the herbicide including Chena Lake, Bathing Beauty Pond, and Birch Lake.

The monitoring is being conducted concurrently with macroinvertebrate sampling and fish monitoring conducted by members of the Fairbanks Elodea Steering Committee. DEC also sampled bacteria at CS-5 and Birch Lake during summers 2020 and 2021.

Methods

Chena Slough was the first site identified for treatment with the aquatic herbicide, and the only site at which water quality monitoring began in 2015 before herbicide treatment (Table 2). Water quality monitoring continued in summers during herbicide treatment, which began in 2017. Due to high rainfall and higher water flow rates, additional herbicide spot treatments were applied during summers 2020 and 2021. Herbicide treatment began at additional sites in subsequent years (Table 2).

Water quality parameters (pH, dissolved oxygen, turbidity, specific conductivity, and temperature) were measured at five locations along Chena Slough (Table 3; Fig. 1), with three sites upstream (CS-1, CS-2, and CS-3) of the *Elodea* infestation, and two sites with *Elodea* present (CS-4 and CS-5). Starting in 2020, water quality parameters were also measured at one site along the shores of each: Chena Lake (Fig. 2), Bathing Beauty Pond (Fig. 3), and Birch Lake

³ Fairbanks *Elodea* Steering Committee. Integrated Pest Management Plan for Eradicating *Elodea* from Interior Alaska, 2017.

(Fig. 4). Prior to 2020, measurements were taken in situ with a handheld YSI multimeter and Hach 2100P turbidimeter. Starting in 2020, an In-Situ Aqua TROLL 500 sonde was used.

Fecal coliform and *E. coli* grab samples were collected five times within a 30-day period in each 2020 and 2021 at Chena Slough (CS-5) and Birch Lake (BL-1). Samples were collected using sterile bottles and kept on ice to return to the laboratory for analysis within an eight-hour holding period.

Table 2. Timeline

| Site | Water Monitoring began | Herbicide treatment began |
|---------------------|-------------------------------|----------------------------------|
| Chena Slough | 2015 | 2017 |
| Chena Lake | 2020 | 2019 |
| Bathing Beauty Pond | 2020 | 2019 |
| Birch Lake | 2020 | 2020 |

Table 3. Site Locations

| Site ID | Site Name | Latitude | Longitude |
|----------------|--------------------------|-----------------|------------------|
| CS-1 | Chena Slough (Mission) | 64.754001 | -147.327106 |
| CS-2 | Chena Slough (Airway) | 64.769453 | -147.342894 |
| CS-3 | Chena Slough (Plack) | 64.776714 | -147.353345 |
| CS-4 | Chena Slough (Peede) | 64.8207563 | -147.439097 |
| CS-5 | Chena Slough (Persinger) | 64.8347753 | -147.4875692 |
| CL-1 | Chena Lake | 64.76878 | -147.21403 |
| BB-1 | Bathing Beauty Pond | 64.714109 | -147.193159 |
| BL-1 | Birch Lake | 64.304966 | -146.666855 |

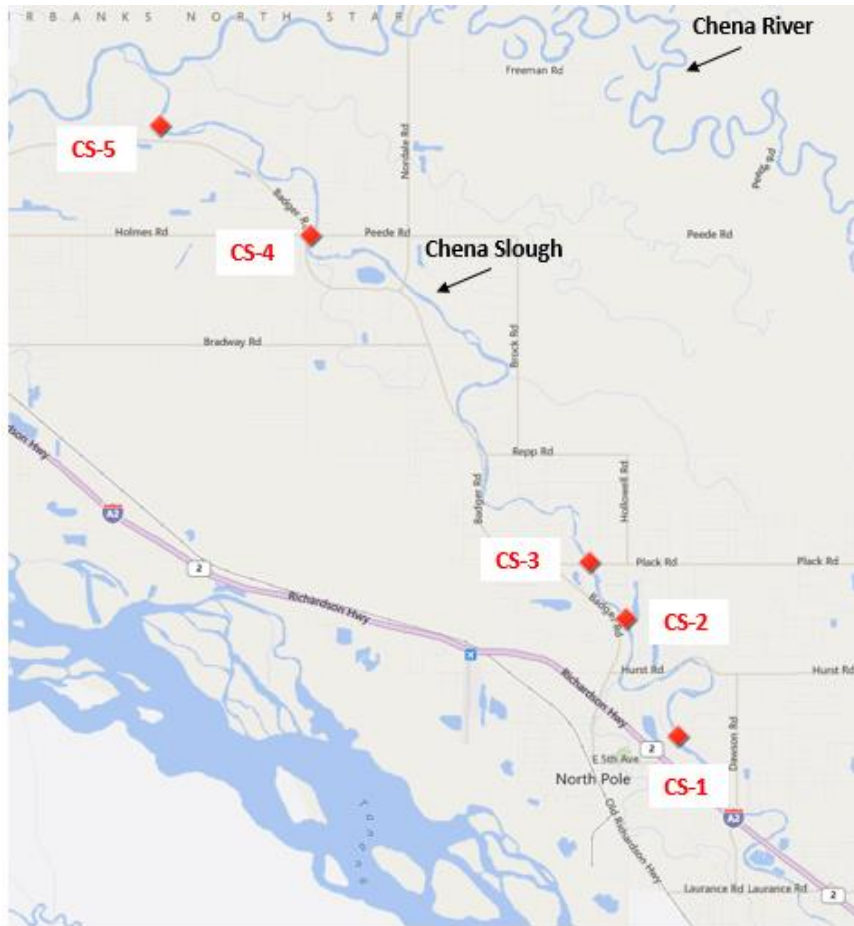


Figure 1. Chena Slough water quality monitoring sites CS-1 through CS-5.

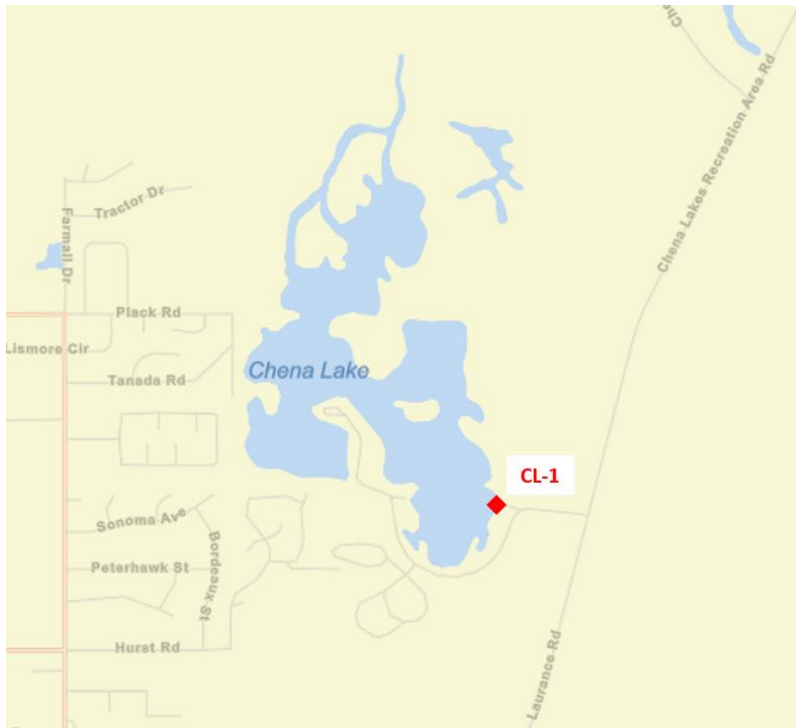


Figure 2. Chena Lake water quality monitoring site.

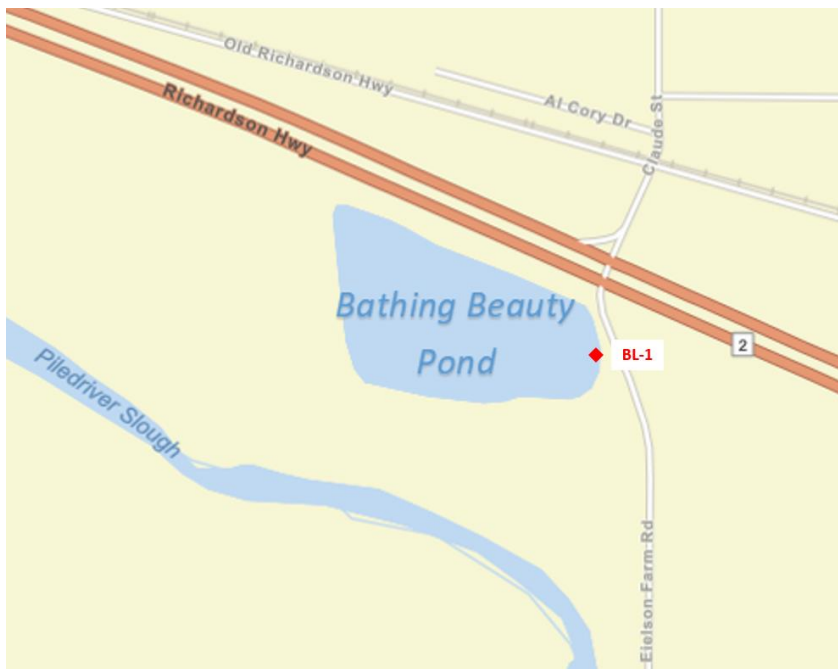


Figure 3. Bathing Beauty Pond water quality monitoring site.

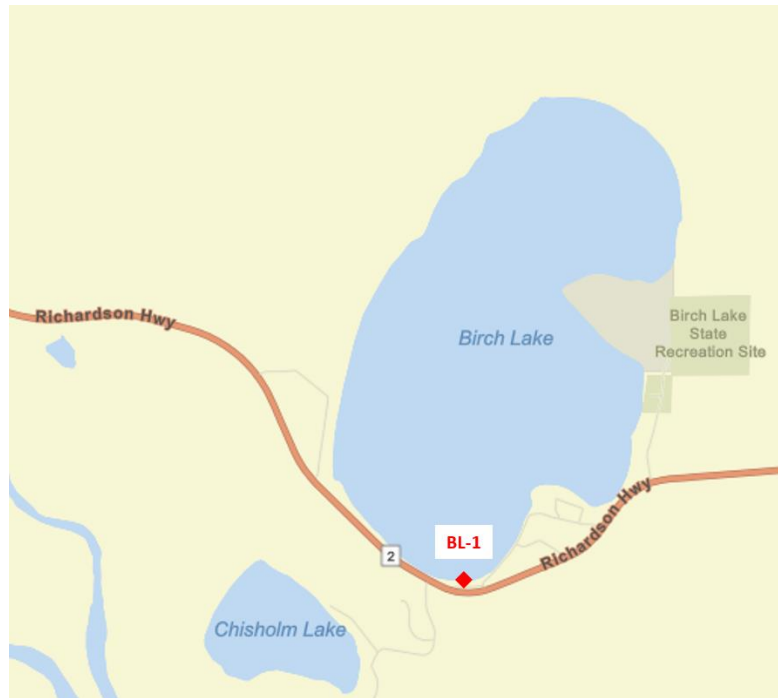


Figure 4. Birch Lake water quality monitoring site.

Quality Assurance Review

Water quality measurements were collected at least 1 – 2 times per month during the summer months (generally June – September) as outlined under the protocols in the approved Quality Assurance Project Plan (QAPP). Bacteria samples were taken five times within 30 days in summer 2021 and summer 2022 (total of 10 sampling days at each site over both summers).

Prior to 2020, the YSI and Hach turbidimeter were calibrated and verified according to the QAPP. In 2020, the Aqua TROLL 500 sondes were calibrated and verified, using known standards, each day of sampling. In 2021, sondes were calibrated weekly and verified daily on sampling days. The manufacturer was consulted between 2020 and 2021 sampling seasons and noted that calibrating too often could affect results, which is why calibration frequency decreased in 2021.

Measurement periods for turbidity that recorded “0” for the majority of the period were removed from the dataset because of sampling error (the sonde was mistakenly used without the cap attached to the sensor guard on some sampling days). For spikes in turbidity that were greater than 50 NTU between consecutive measurements (every two seconds), results were rejected and flagged as “OUT – Result value is defined as an outlier by data owner” and “RC – See result comment” because the increase in turbidity was not gradual and therefore assumed to be due to something like moss or debris passing by and not a true representation of water turbidity. Specific conductance measurements less than 10 $\mu\text{S}/\text{cm}$ (three data points) and pH

values greater than 10 (one data point) were flagged as outliers and rejected. The pH sensor did not record on 8/11/21 at BP-1 (reason unknown).

For fecal coliform and *E. coli* samples, one duplicate was sampled during each set of five samples at each site, except for Birch Lake which was missing a duplicate sample in 2020. Relative Percent Difference (RPD) was expected to be < 60% as defined by the QAPP, and all bacteria samples met this threshold except for one sample from Chena Slough in 2020, which exceeded the threshold due to very low bacteria concentrations (4 and 12 cfu/100mL; results verified by QA Officer).

Results and Conclusions

All parameters were relatively similar across sampling years in Chena Slough from 2015 – 2021 (Fig. 5). Conductivity and dissolved oxygen were at expected stream water levels to support diverse aquatic life. Some pH values fell below the aquatic life criteria, but this may be a natural condition due to groundwater or wetland inputs. Some measurements of temperatures were at levels that could cause stress to aquatic life at the peak of the summer. This may be due to multiple road crossings restricting flow and increasing urban runoff. The slough was clear and turbidity measurements were consistently low.

Parameters were also relatively similar across sites in 2020 and 2021. Dissolved oxygen, conductivity, and pH were at levels expected to support diverse aquatic life at all sites (Fig. 6) and turbidity was consistently low. Temperatures in Chena Lake, Bathing Beauty Pond, and Birch Lake were above 15 degrees C, which could cause stress to aquatic life, but this is likely because measurements were taken in shallow water near the shore due to logistical constraints.

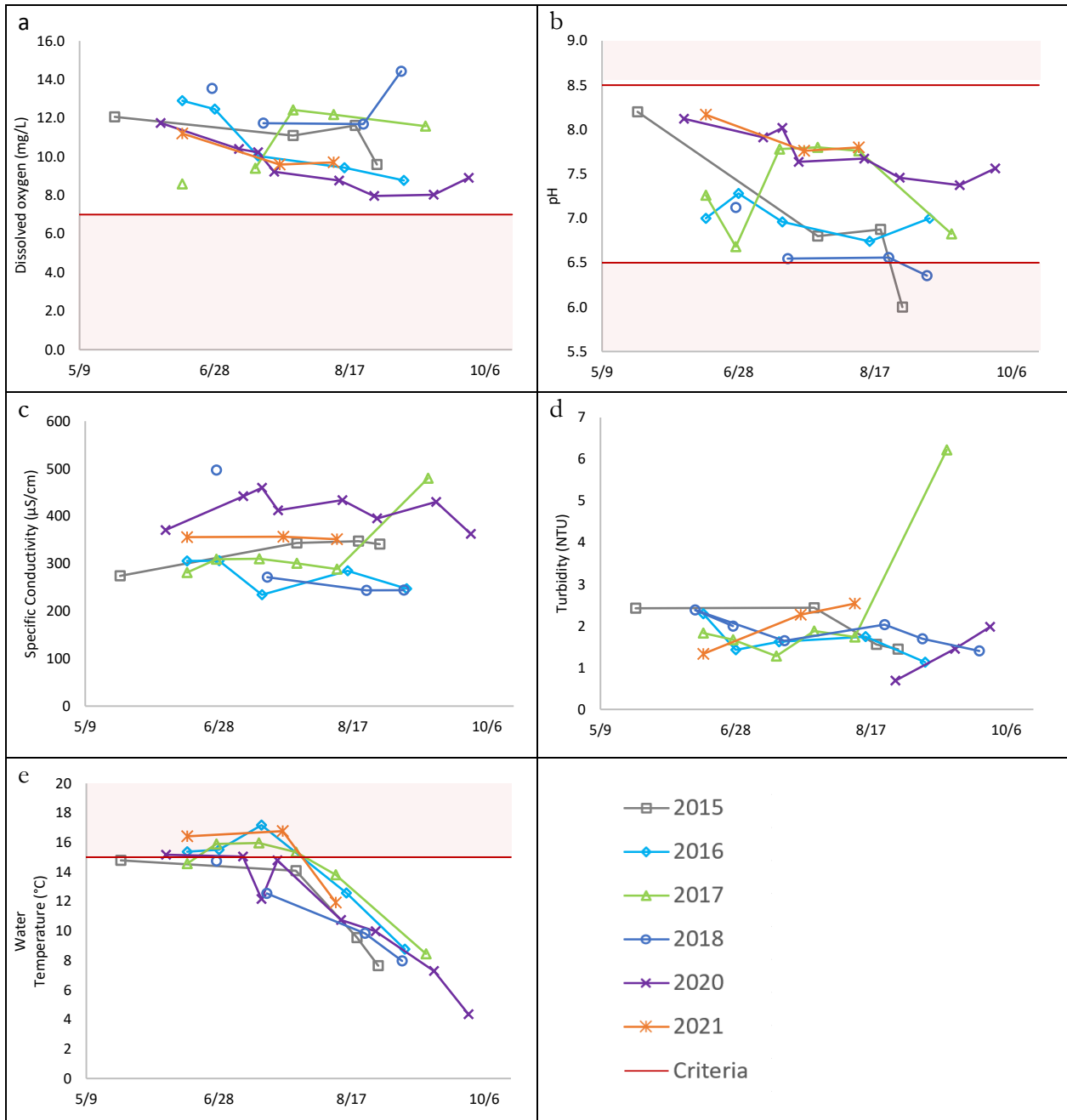


Figure 5. Daily average (a) dissolved oxygen, (b) pH, (c) specific conductivity, (d) turbidity, and (e) water temperature at Chena Slough across all sites from 2015 – 2021 (no monitoring occurred in summer 2019).

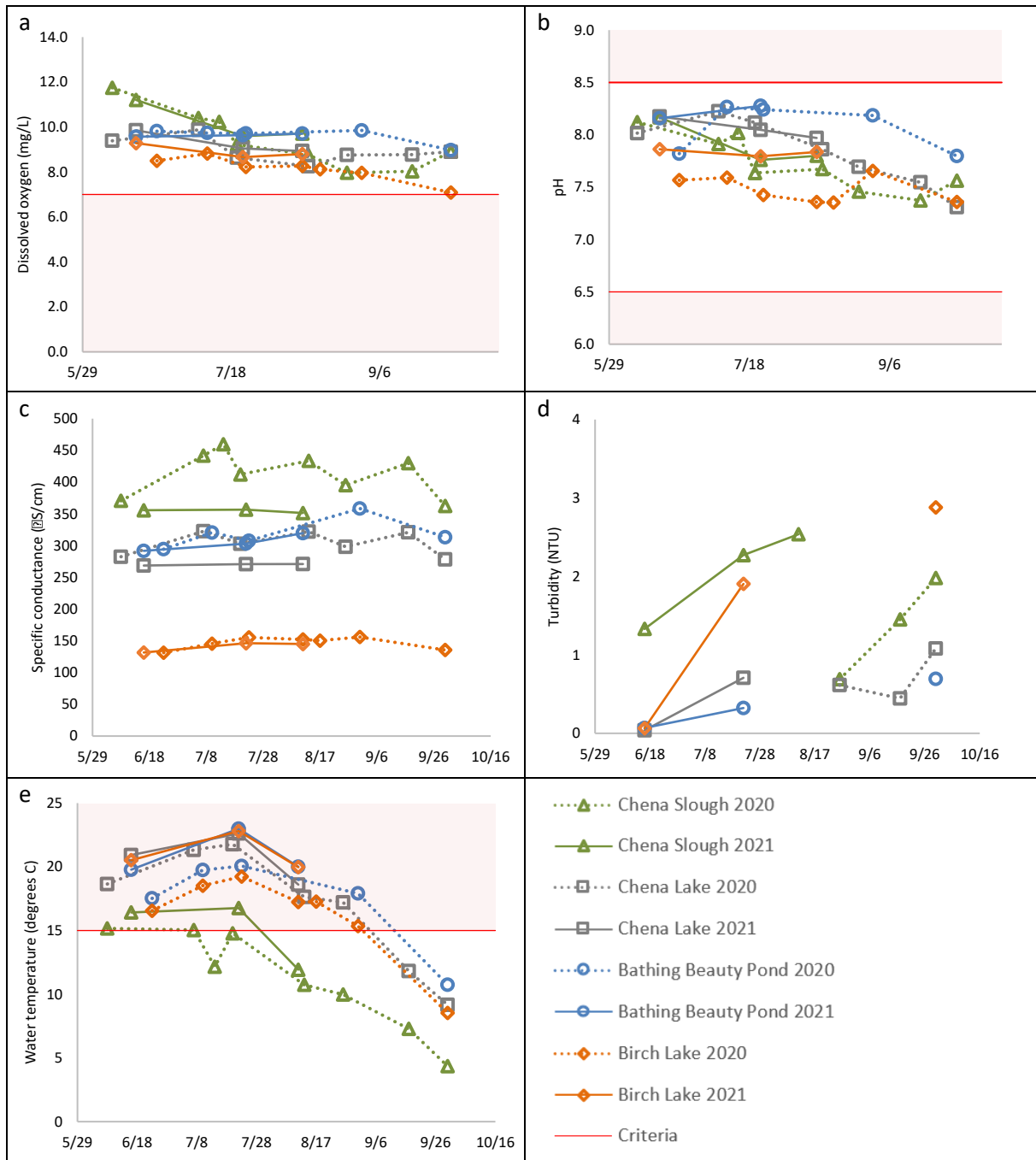


Figure 6. Daily average (a) dissolved oxygen, (b) pH, (c) specific conductivity, (d) turbidity, and (e) water temperature at Chena Slough, Chena Lake, Bathing Beauty Pond, and Birch Lake in 2020 (dotted lines) and 2021 (solid lines).

The 30-day geomeans for fecal coliform exceeded the drinking water criterion threshold of 20 cfu/100 ml at both Chena Slough and Birch Lake in 2021 (Table 4). All 30-day geomeans for *E. coli* were below the contact recreation criterion threshold of 126 cfu/100ml. In 2020, Microbial Source Tracking (MST) samples were collected on 7/20/20 and 8/17/20 at Chena Slough and Birch Lake. Samples were analyzed for fecal host identification of bird, dog, and human source DNA markers. Bird was identified as a host at both sites on both sampling days, and human was not detected at either site on either day. Dog was not detected at either site on 7/20/20, and was detected but not quantified at both sites on 8/17/20. The field crew noted the presence of ducks on most sampling days at both sites, and the Birch Lake sampling site was near a rest stop where people are likely to walk their dogs near the lakeshore.

Table 4. 30-day geomean fecal coliform (cfu/100ml) and E. coli (MPN/100ml) in 2020 and 2021.

| Site | Year | Fecal coliform (cfu/100ml) | <i>E. coli</i> (MPN/100ml) |
|--------------|------|-------------------------------|-------------------------------|
| Chena Slough | 2020 | 16 | 25 |
| Chena Slough | 2021 | 28 | 30 |
| Birch Lake | 2020 | 3 | 2 |
| Birch Lake | 2021 | 40 | 34 |

Since herbicide application does not appear to be affecting water quality, DEC is not planning to continue water quality monitoring in future years at these sites, but will continue partnering with the Fairbanks Elodea Steering Committee and consider future monitoring if environmental conditions change. DEC may continue collecting bacteria samples at these sites if they are determined to be exceeding water quality standards during further analysis.