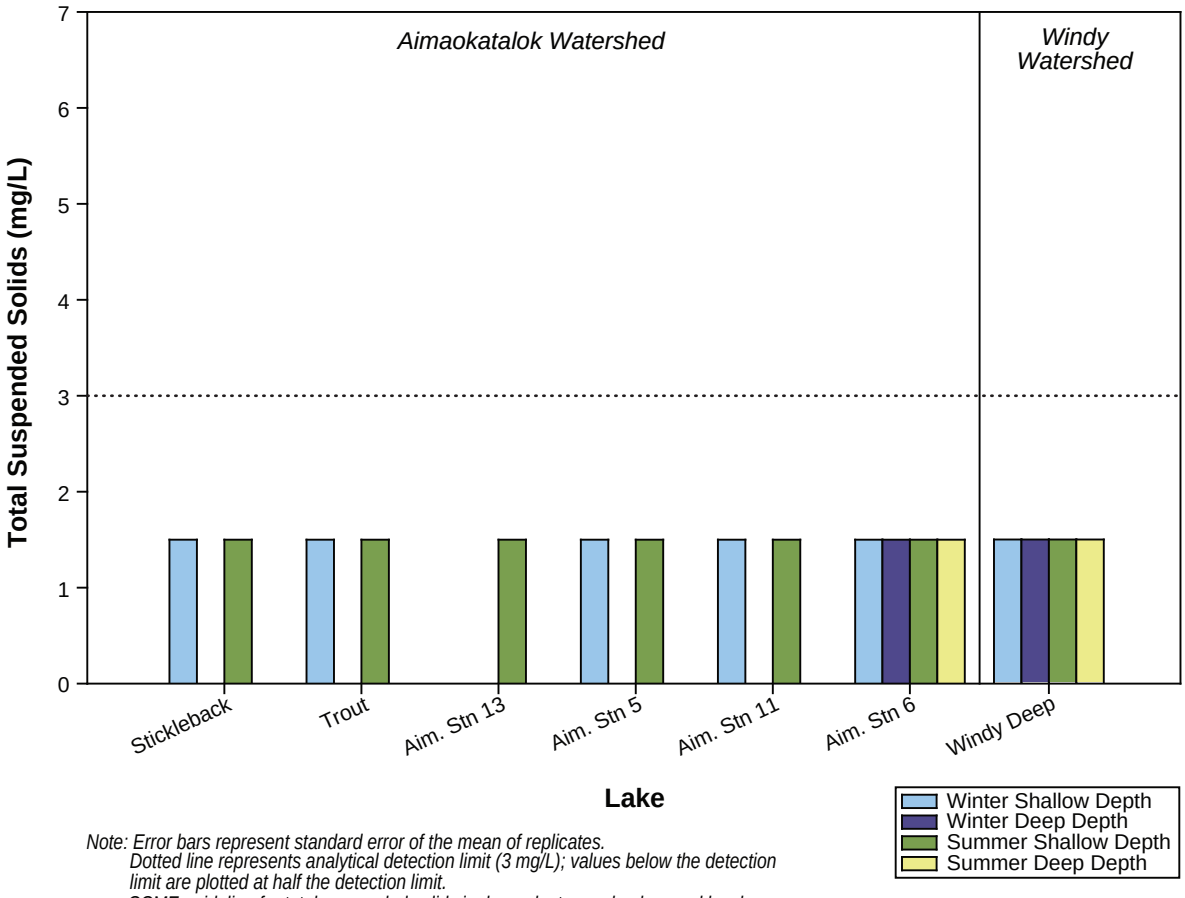

Note: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (3 mg/L); values below the detection limit are plotted at half the detection limit.
CCME guideline for total suspended solids is dependent upon background levels.

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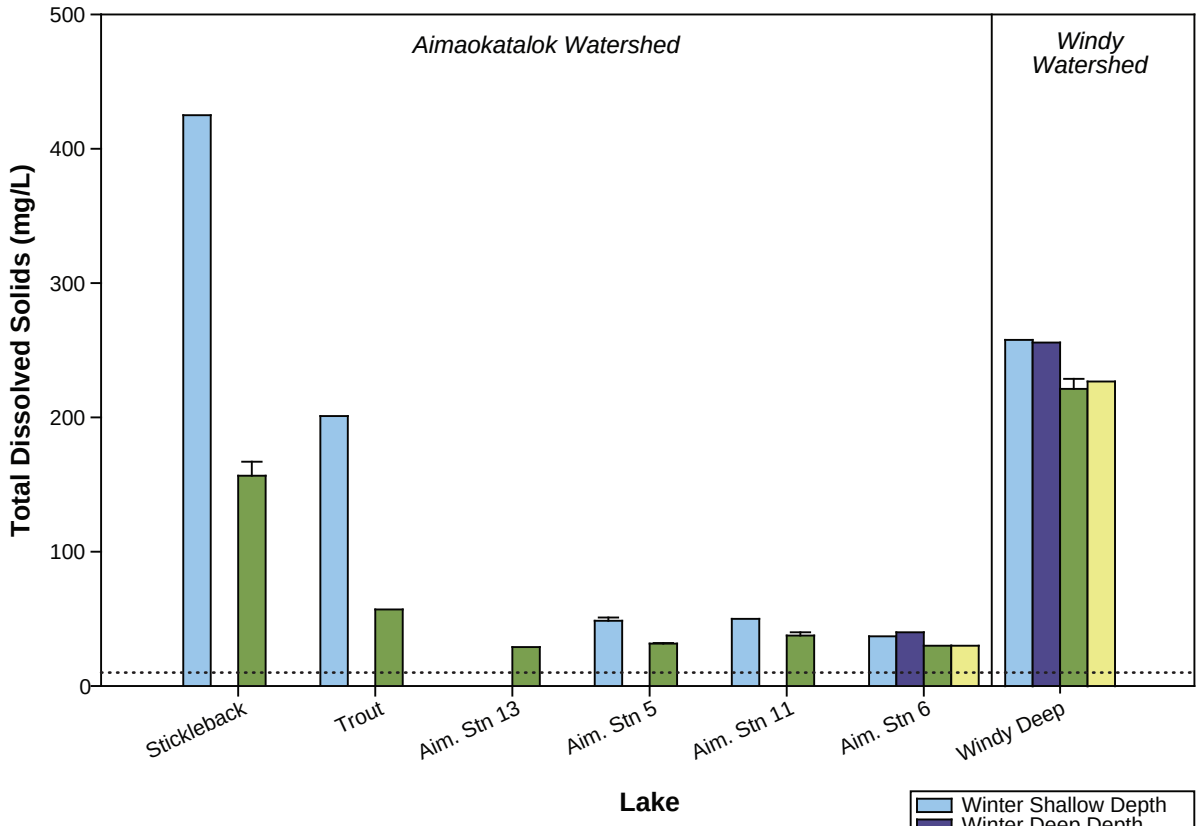
Total Suspended Solids Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1d

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (10 mg/L).
Total dissolved solids were not measured in Doris South, Doris North, and Little Roberts lakes.
There is no CCME guideline for total dissolved solids.

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Total Dissolved Solids Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1e

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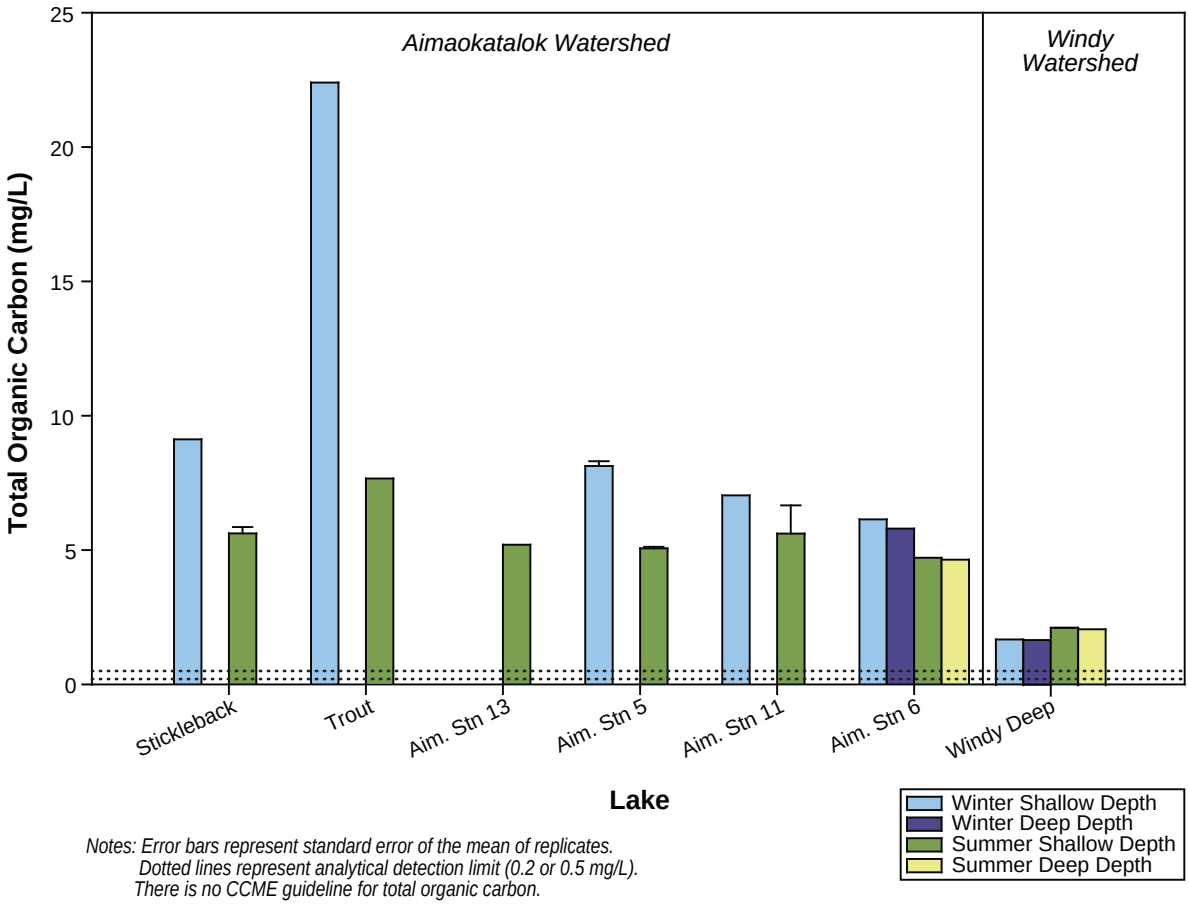

Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.2 or 0.5 mg/L).
There is no CCME guideline for total organic carbon.

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Total Organic Carbon in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1f

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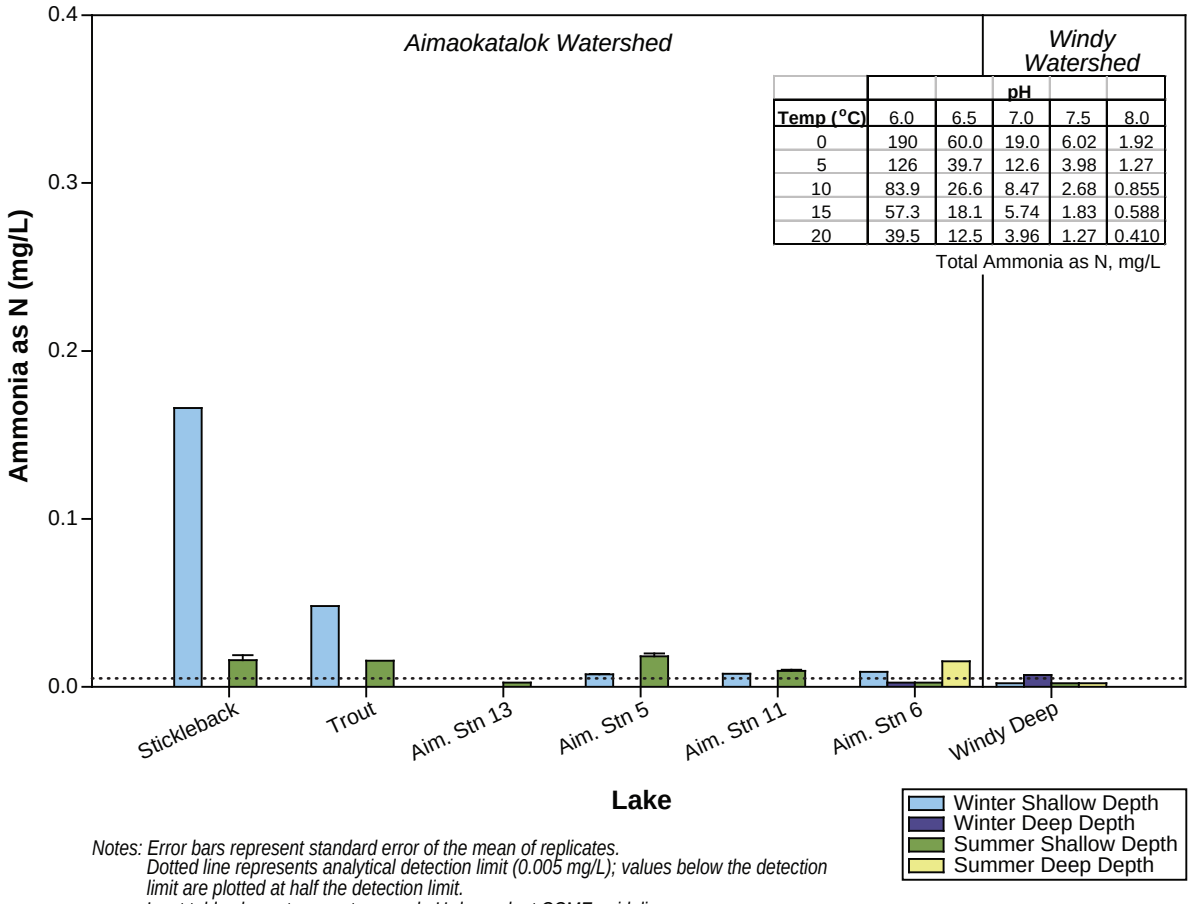

	pH				
Temp (°C)	6.0	6.5	7.0	7.5	8.0
0	190	60.0	19.0	6.02	1.92
5	126	39.7	12.6	3.98	1.27
10	83.9	26.6	8.47	2.68	0.855
15	57.3	18.1	5.74	1.83	0.588
20	39.5	12.5	3.96	1.27	0.410

Total Ammonia as N, mg/L

Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.005 mg/L); values below the detection limit are plotted at half the detection limit.
Inset table shows temperature- and pH-dependent CCME guideline.

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Ammonia Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1g

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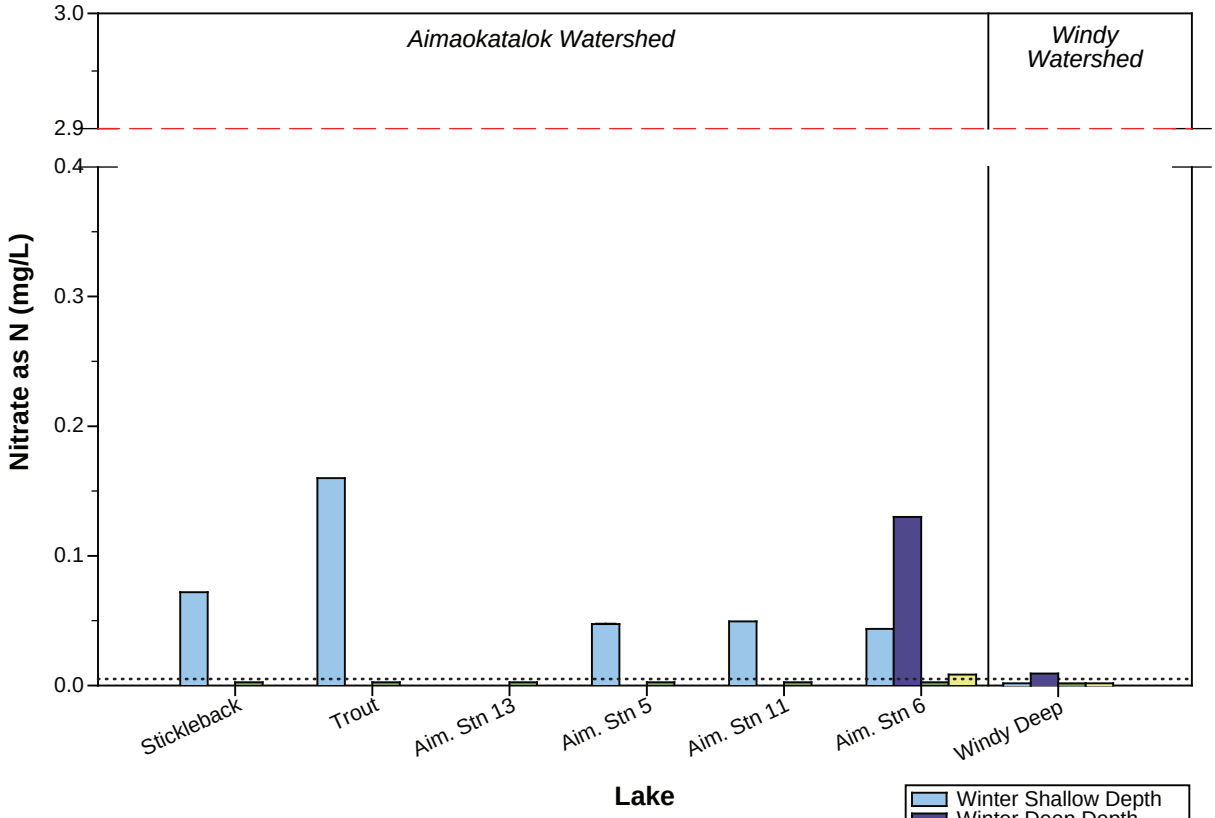

Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.005 mg/L);
values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (2.9 mg/L).

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Nitrate Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1h

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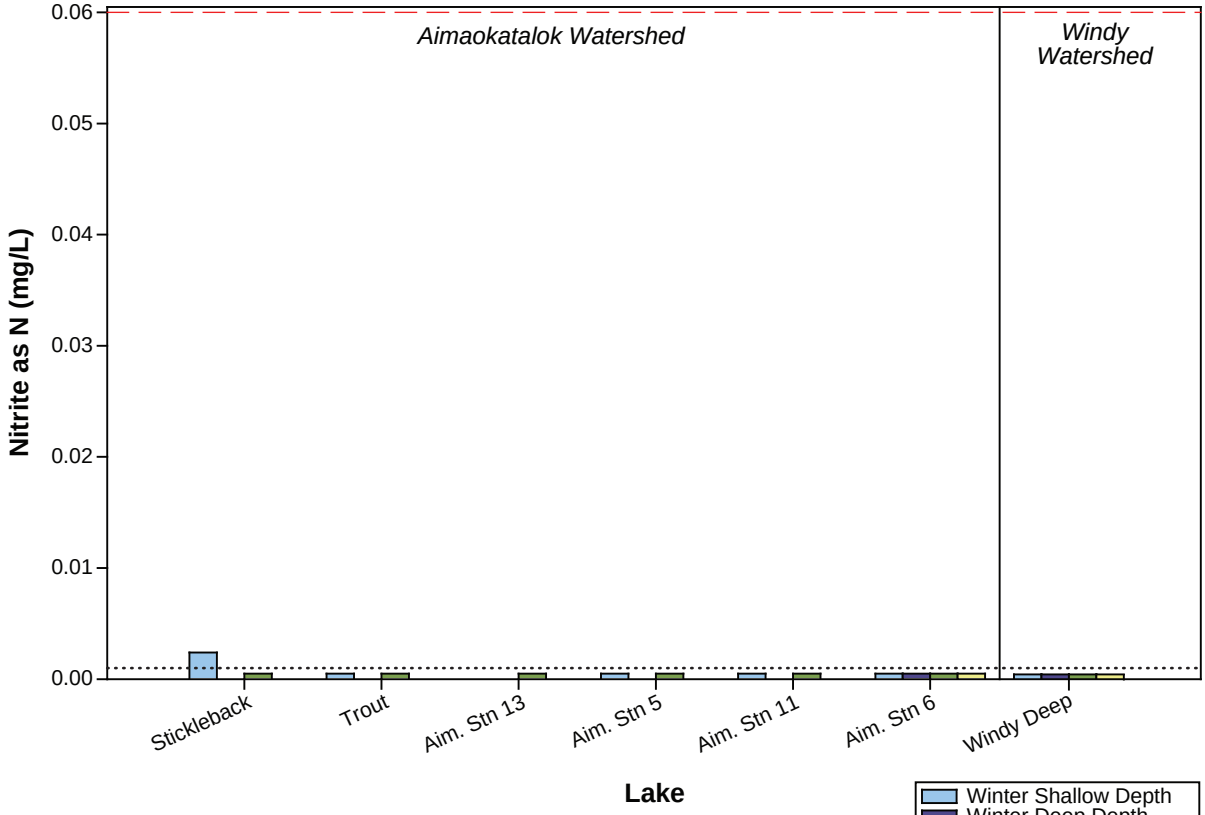

Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.001 mg/L);
values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.06 mg/L).

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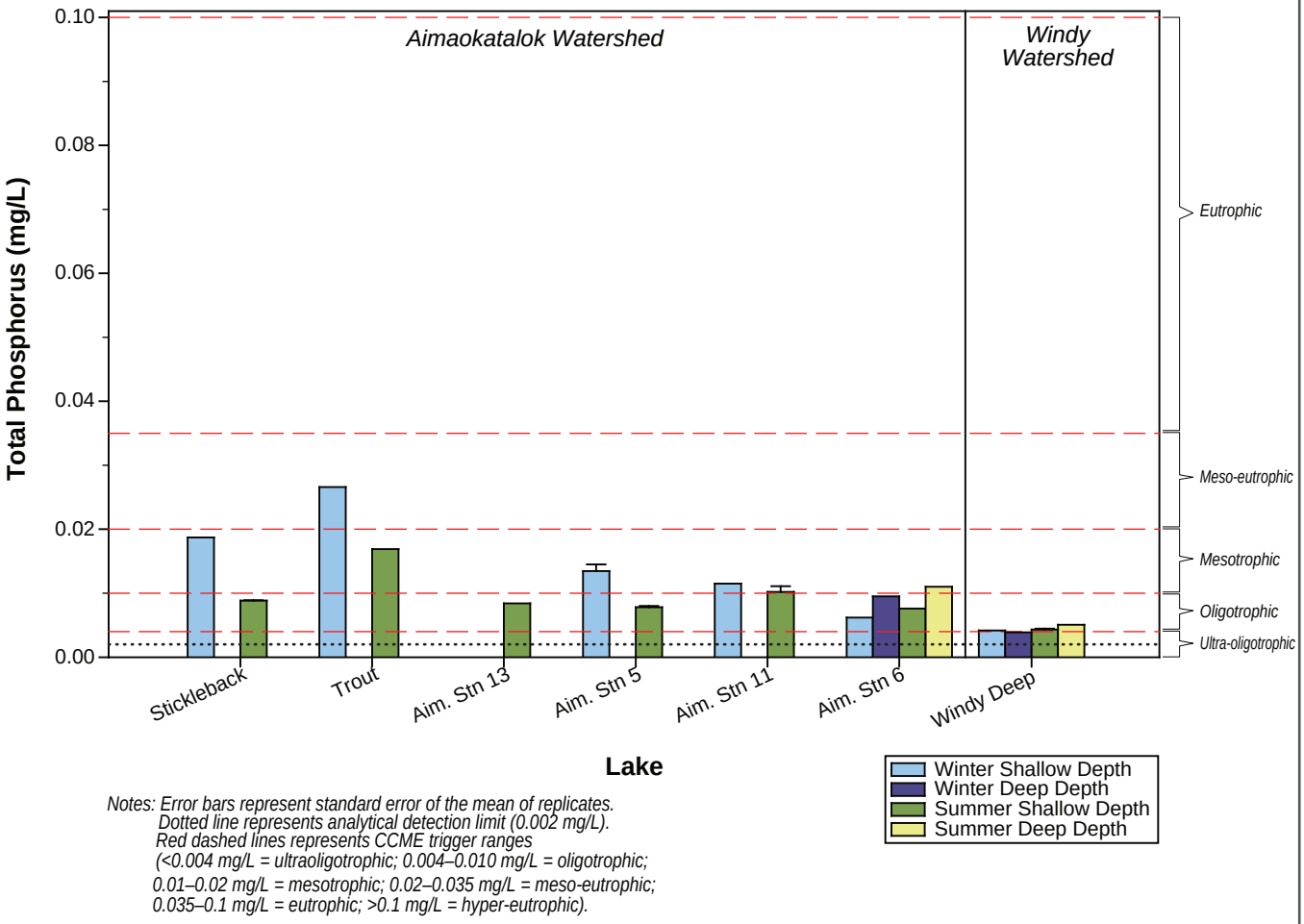
Nitrite Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1i

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.002 mg/L).
Red dashed lines represents CCME trigger ranges
(<0.004 mg/L = ultraoligotrophic; 0.004–0.010 mg/L = oligotrophic;
0.01–0.02 mg/L = mesotrophic; 0.02–0.035 mg/L = meso-eutrophic;
0.035–0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic).

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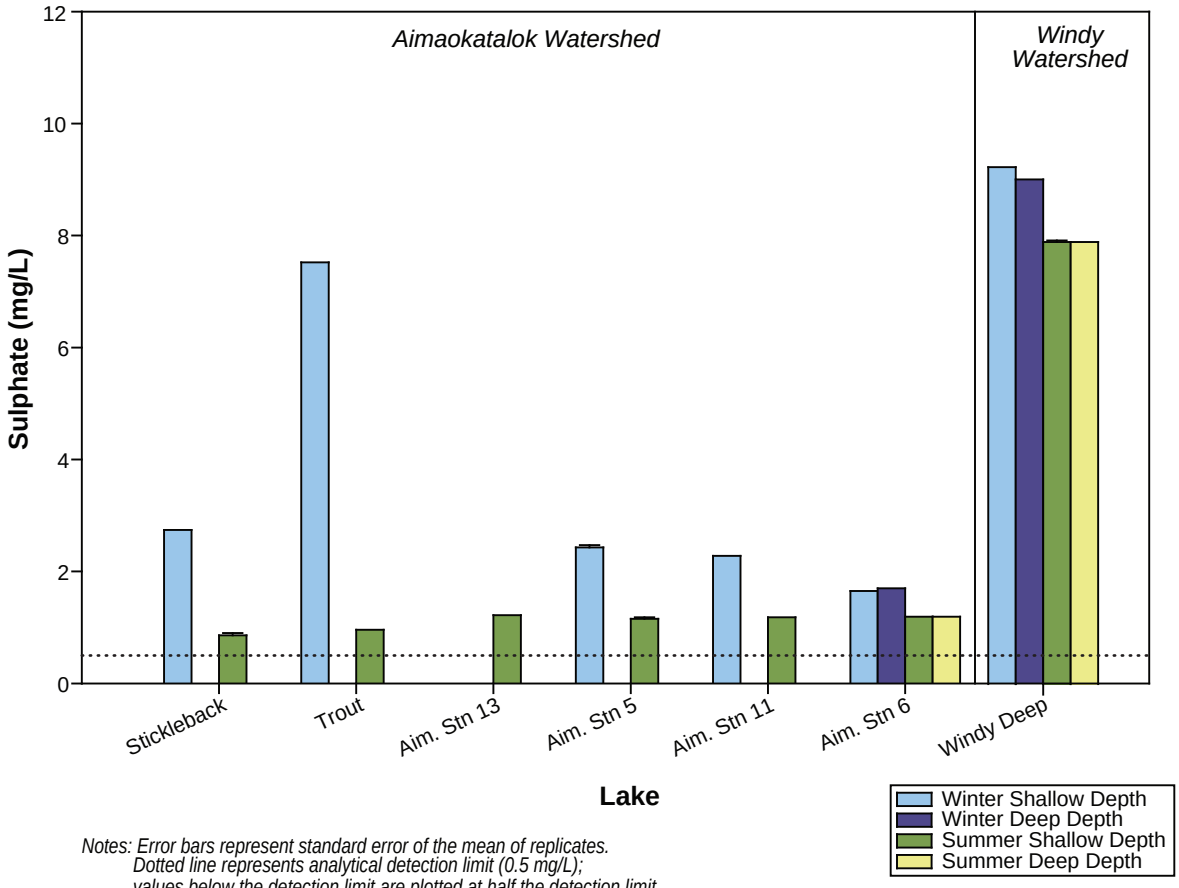
Total Phosphorus Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1j

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.5 mg/L);
values below the detection limit are plotted at half the detection limit.
There is no CCME guideline for sulphate.

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Sulphate Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1k

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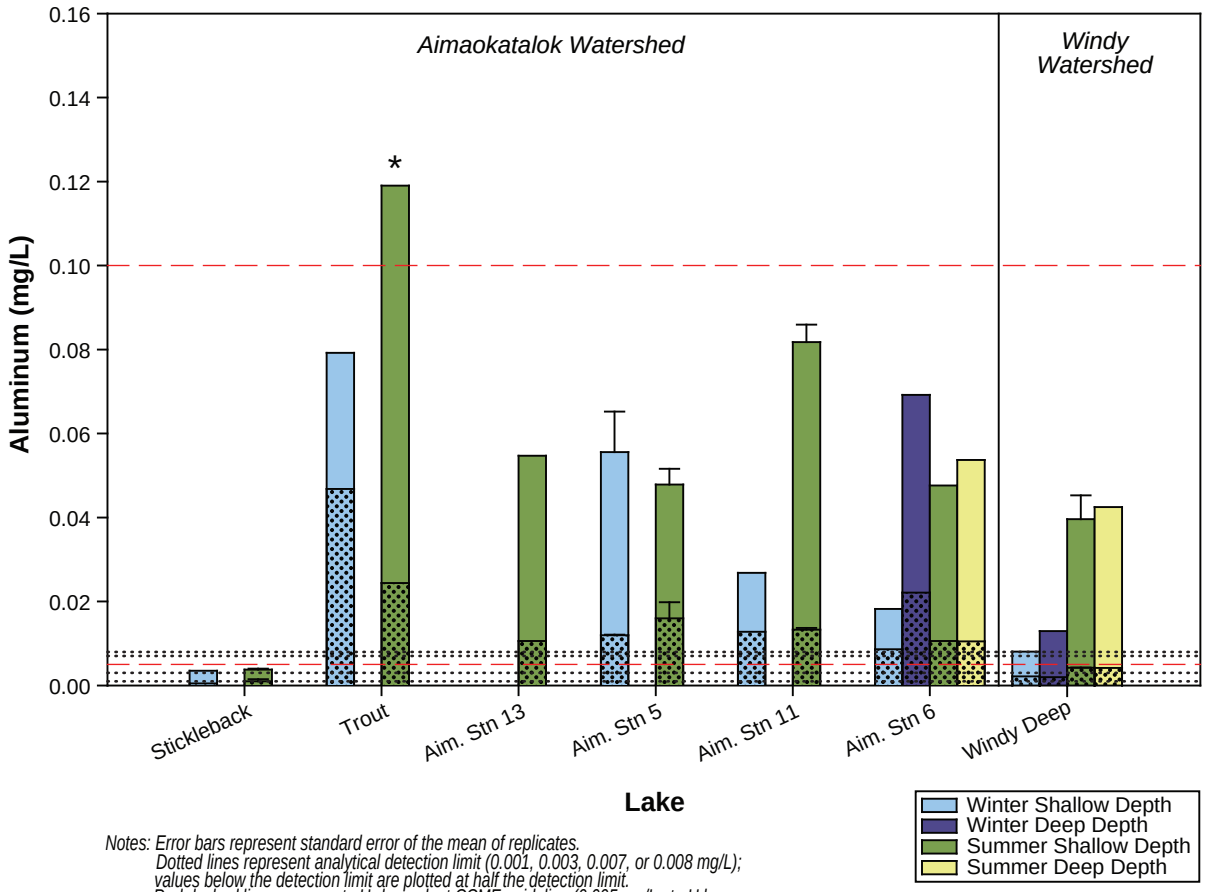

Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.001, 0.003, 0.007, or 0.008 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed lines represent pH-dependent CCME guideline (0.005 mg/L at pH less than 6.5; 0.1 mg/L at pH greater than or equal to 6.5).
pH was greater than 6.5 in all samples.
Solid columns represent total aluminum and superimposed dotted columns represent dissolved aluminum.
** Indicates average total aluminum values that are higher than CCME guideline.*

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Aluminum Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1l

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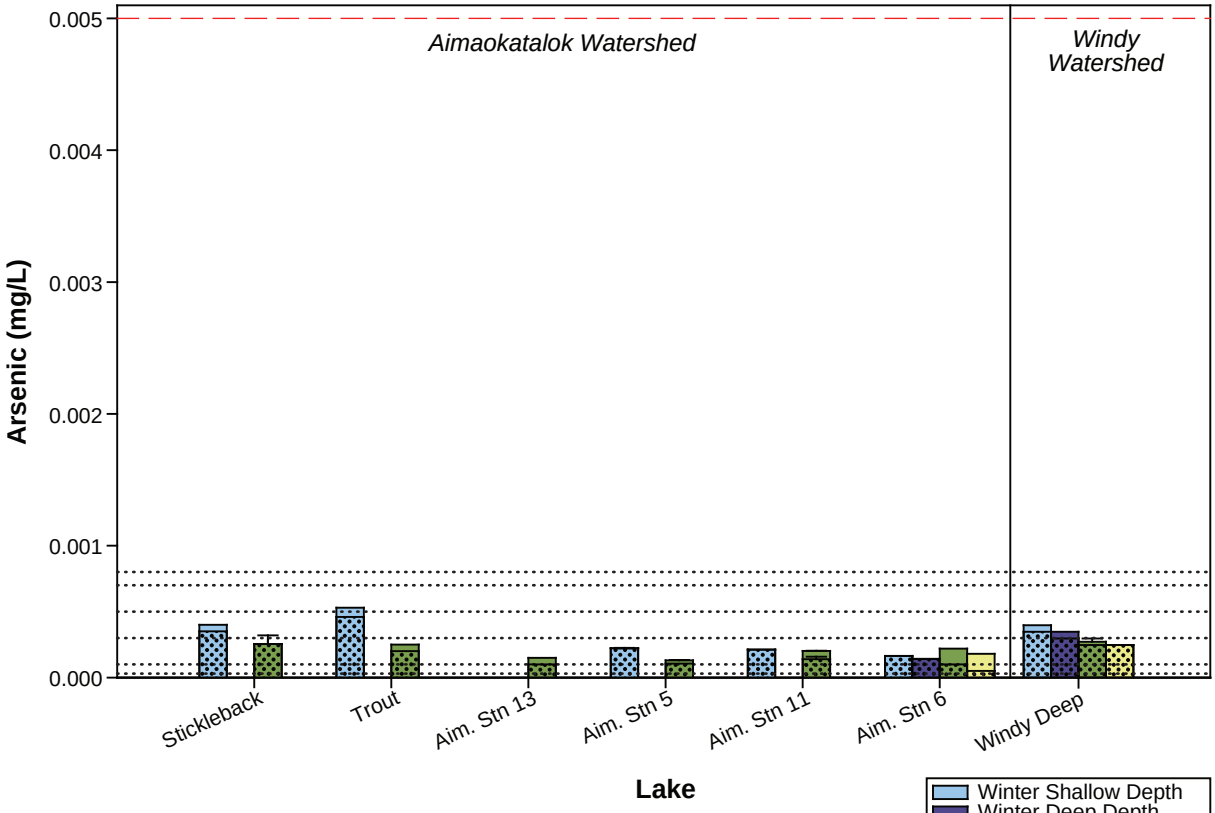

Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.00003, 0.00005, 0.0001, 0.0003, 0.0005, 0.0007, or 0.0008 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.005 mg/L).
Solid columns represent total arsenic and superimposed dotted columns represent dissolved arsenic.

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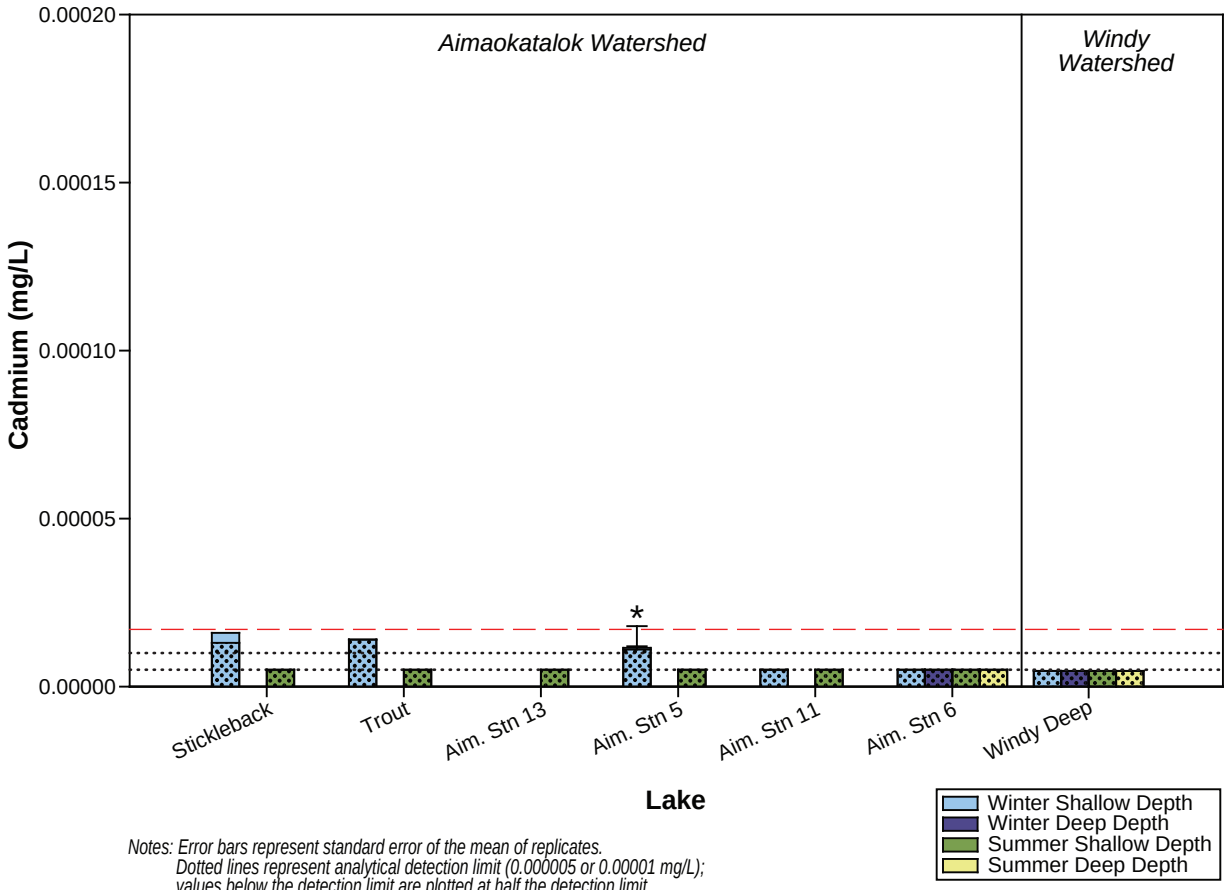
Arsenic Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1m

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.000005 or 0.00001 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.000017 mg/L).
The equation for correcting this guideline for hardness is: $10^{[0.86(\log(\text{hardness})]-3.2]}/1000$.
Solid columns represent total cadmium and superimposed dotted columns represent dissolved cadmium.
** Indicates average total cadmium values that are higher than hardness-corrected CCME guideline.*

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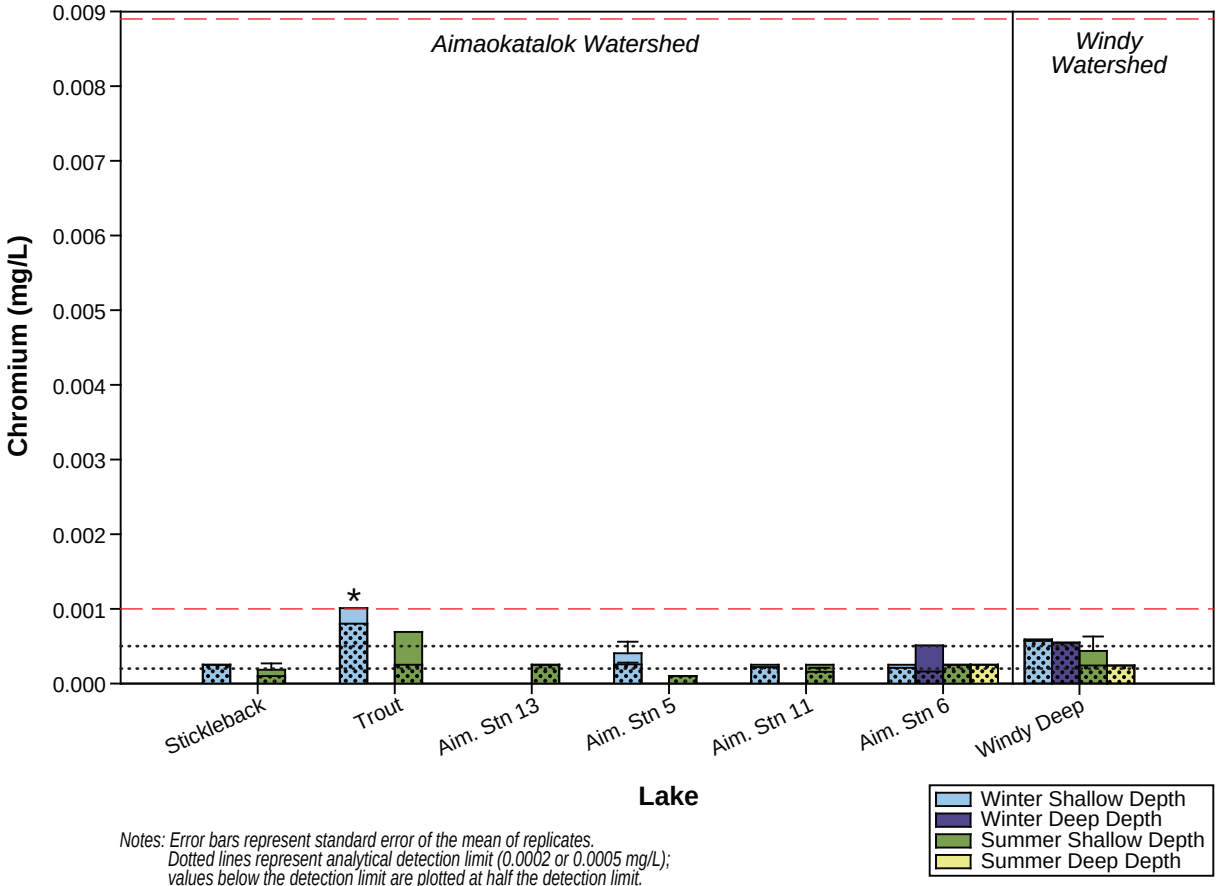
Cadmium Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1n

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0002 or 0.0005 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline for hexavalent chromium (0.001 mg/L) and interim guideline for trivalent chromium (0.0089 mg/L).
Solid columns represent total chromium and superimposed dotted columns represent dissolved chromium.
** Indicates average total chromium values that are higher than CCME guideline for hexavalent chromium.*

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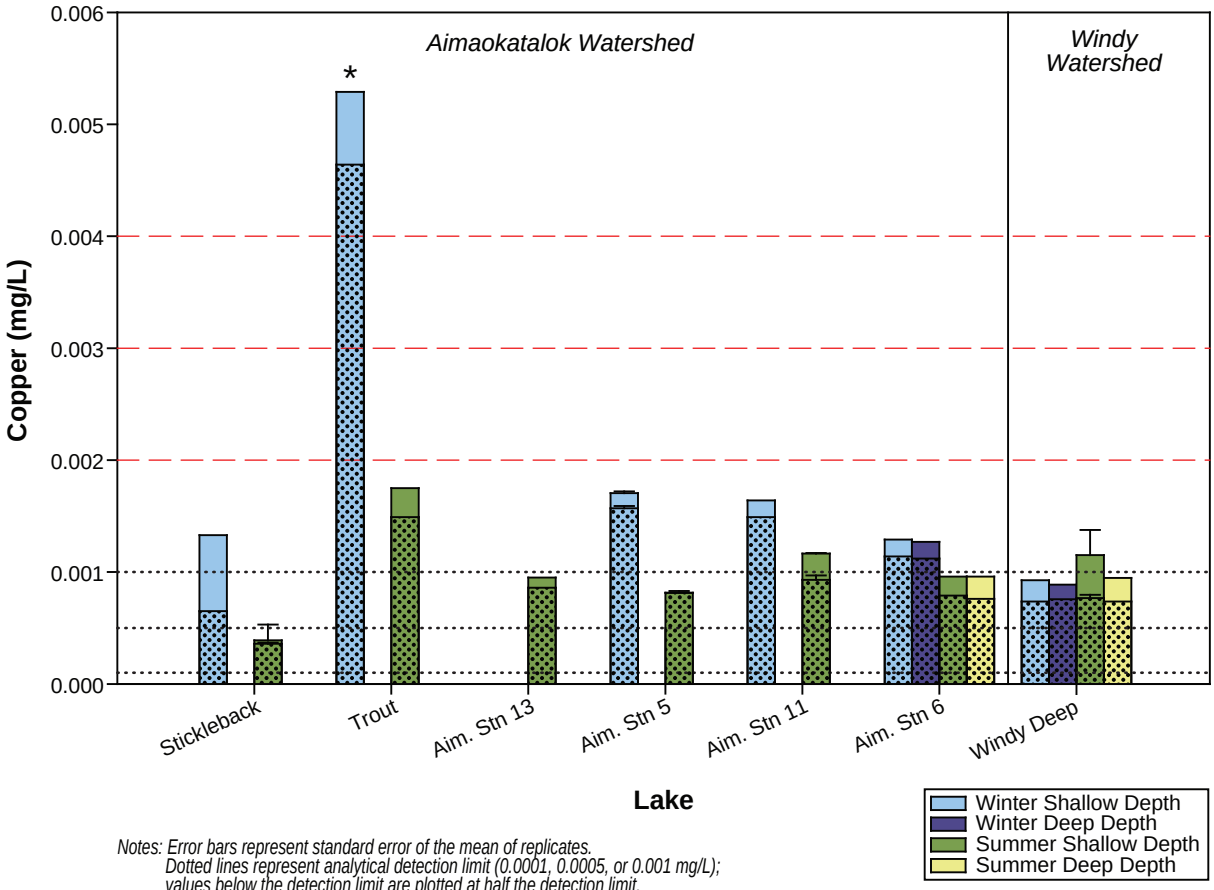
Chromium Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1o

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001, 0.0005, or 0.001 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed lines represent hardness-dependent CCME guideline (0.002 mg/L at [$CaCO_3$] = 0–120 mg/L; 0.003 mg/L at [$CaCO_3$] = 120–180 mg/L; 0.004 mg/L at [$CaCO_3$] = >180 mg/L). Hardness [as $CaCO_3$] in lakes ranged from 11 to 181 mg/L.
Solid columns represent total copper and superimposed dotted columns represent dissolved copper.
** Indicates average total copper values that are higher than CCME guideline.*

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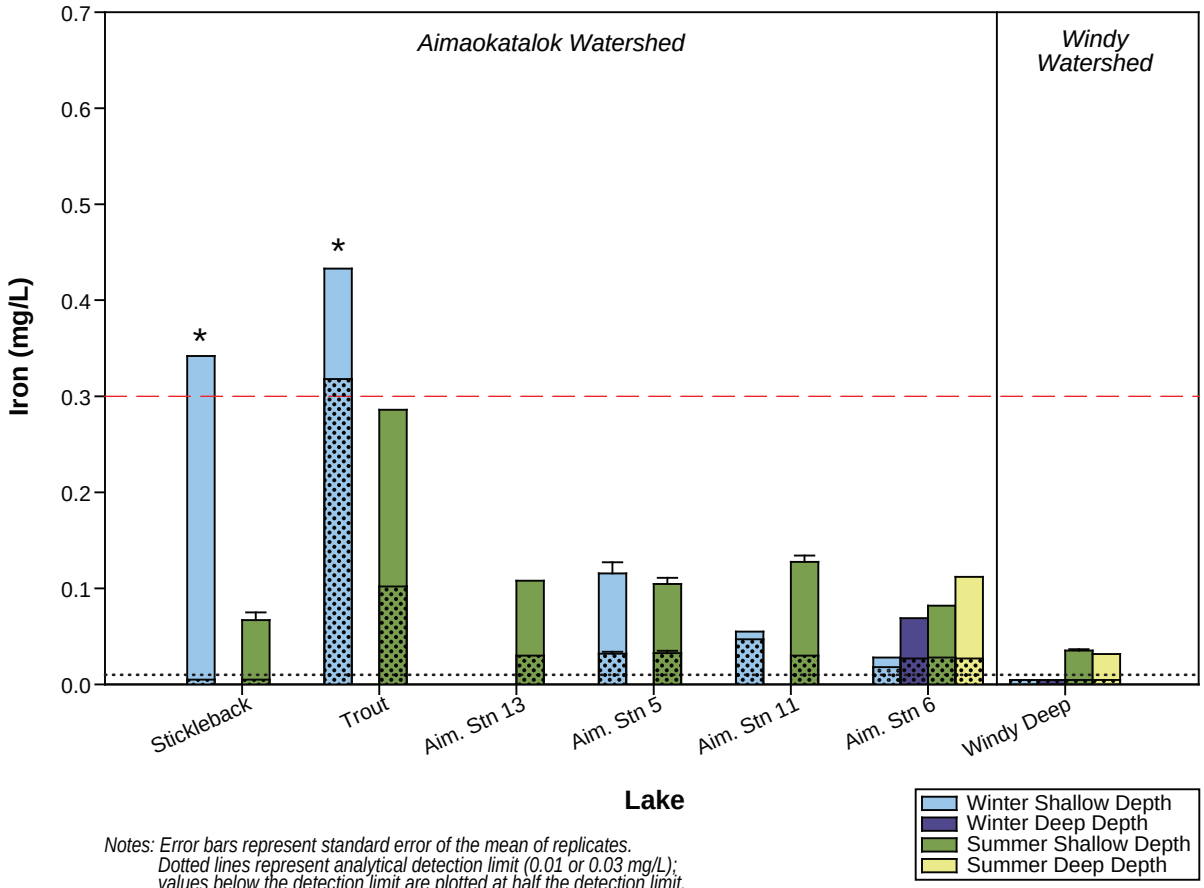
Copper Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1p

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.01 or 0.03 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.3 mg/L).
Solid columns represent total iron and superimposed dotted columns represent dissolved iron.
** Indicates average total iron values that are higher than CCME guideline.*

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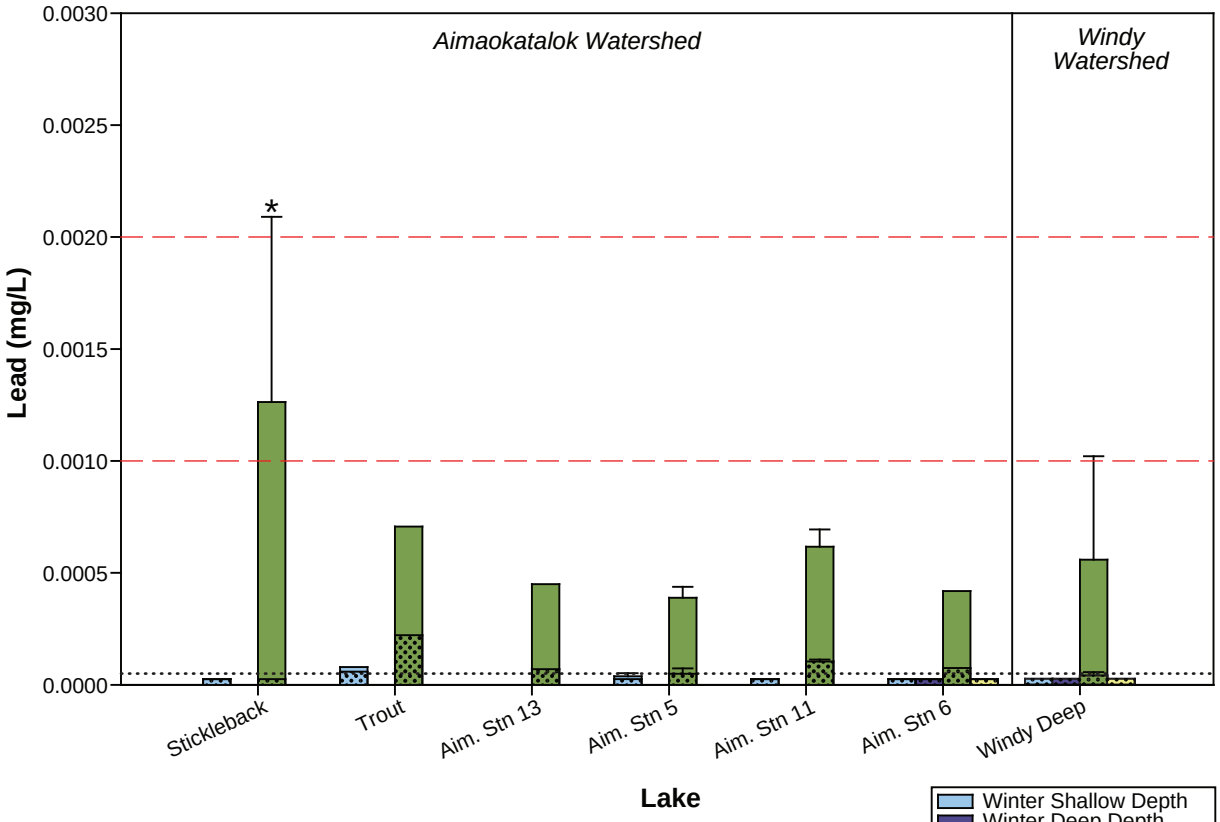
Iron Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1q

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.00005 mg/L);
values below detection limit are plotted at half the detection limit.
Red dashed lines represent CCME guideline (0.001 mg/L at [$CaCO_3$] = 0–60 mg/L; 0.002 mg/L at [$CaCO_3$] = 60–120 mg/L;
0.004 mg/L at [$CaCO_3$] = 120–180 mg/L [not shown]; 0.007 mg/L at [$CaCO_3$] = >180 mg/L [not shown]).
Hardness [as $CaCO_3$] in lakes ranged from 11 to 181 mg/L.
Solid columns represent total lead and superimposed dotted columns represent dissolved lead.
** Indicates average total lead values that are higher than CCME guideline.*

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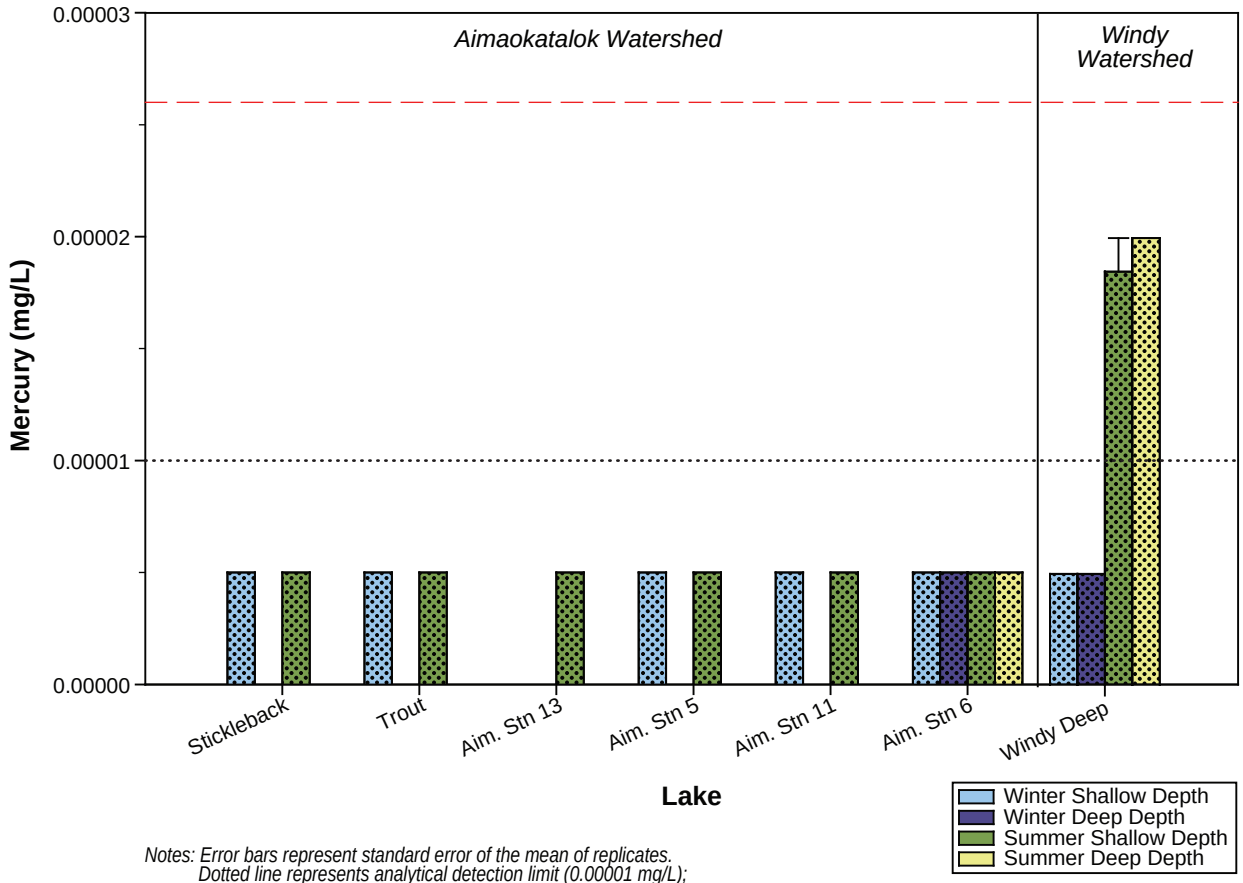
Lead Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1r

Rescan Engineers & Scientists



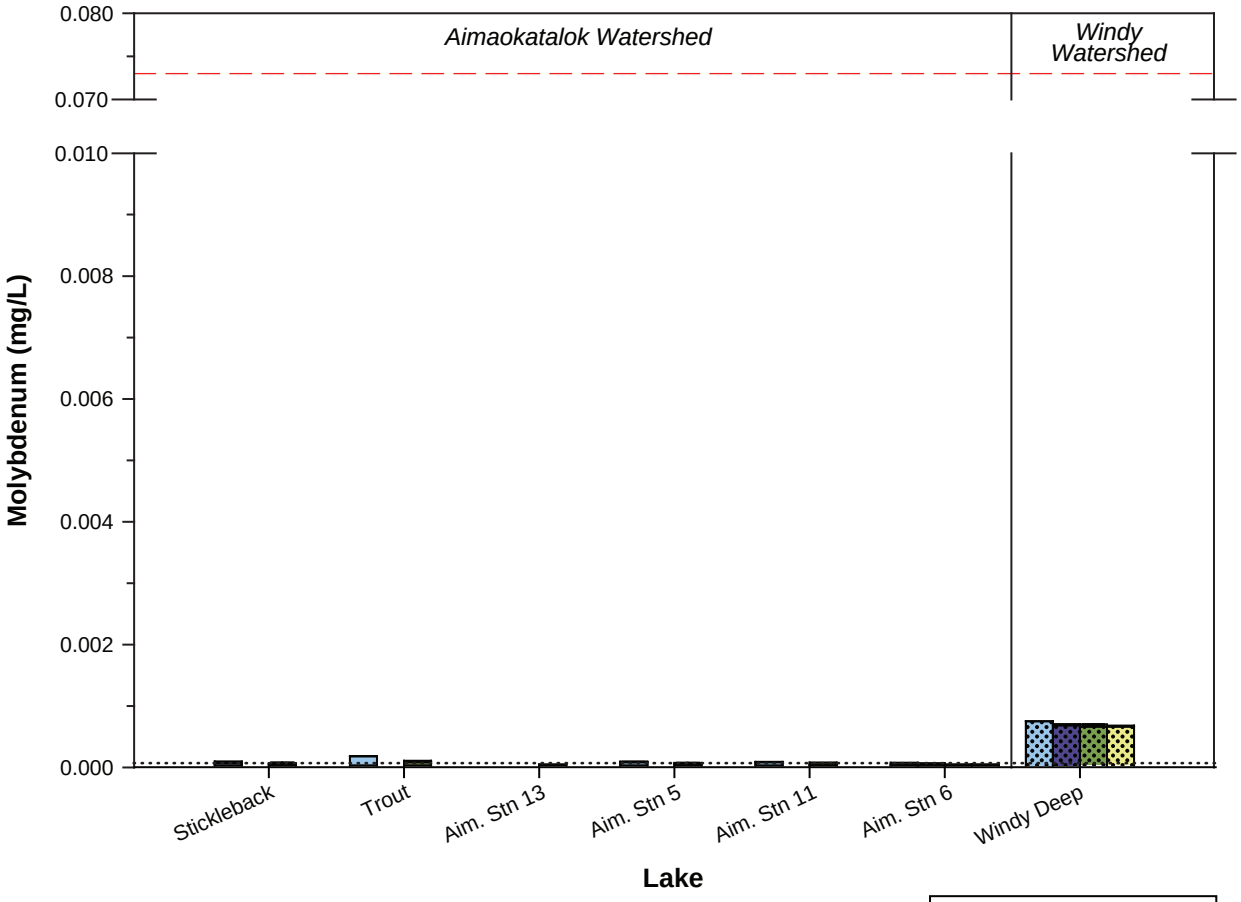
Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.00001 mg/L); values below detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline for inorganic mercury (0.000026 mg/L); the interim CCME guideline for methylmercury (0.000004 mg/L) is not shown.
Solid columns represent total mercury and superimposed dotted columns represent dissolved mercury.

NEWMONT NORTH AMERICA

Mercury Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1s

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted line represents analytical detection limit (0.00005 mg/L);
values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.073 mg/L).
Solid columns represent total molybdenum and superimposed dotted columns represent dissolved molybdenum.

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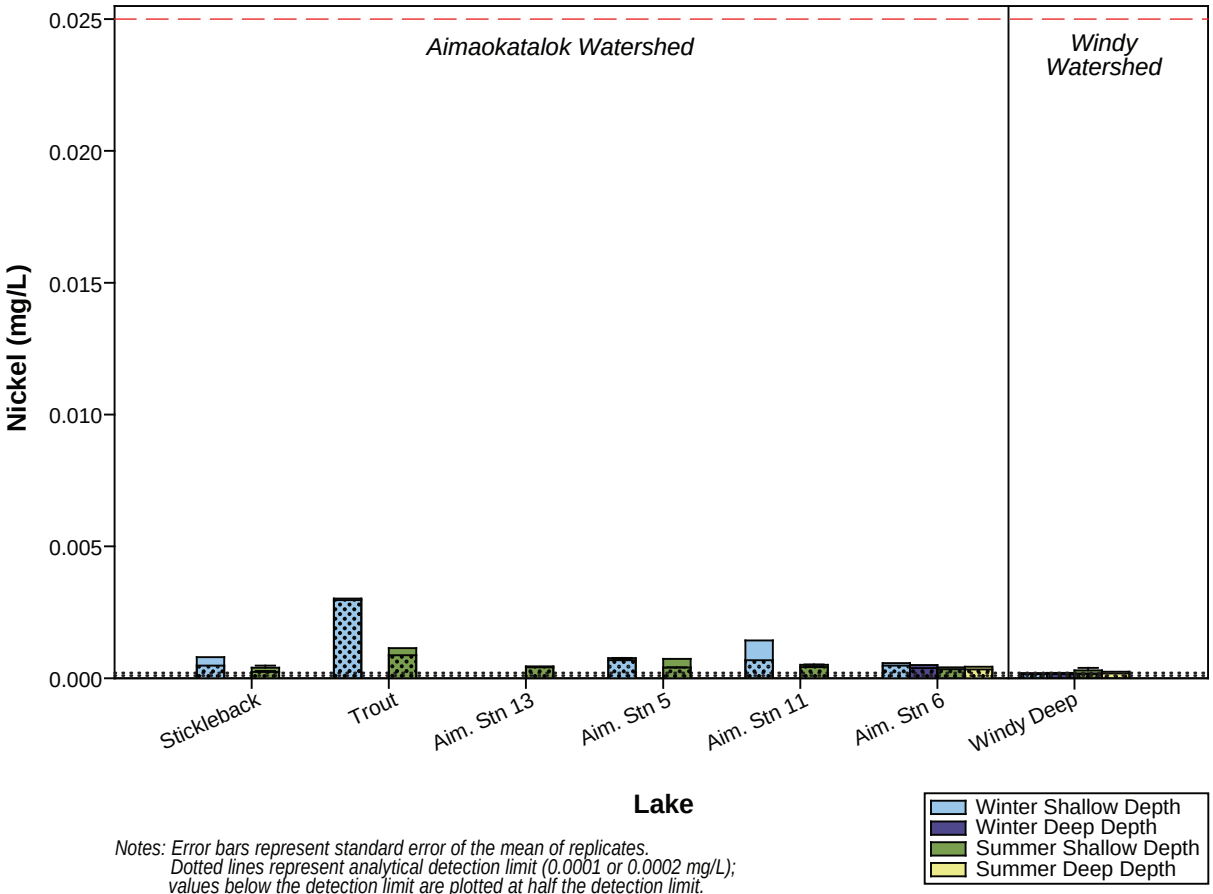
Molybdenum Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1t

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001 or 0.0002 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed lines represent hardness-dependent CCME guideline (0.025 mg/L at [$CaCO_3$] = 0–60 mg/L; 0.065 mg/L at [$CaCO_3$] = 60–120 mg/L [not shown]; 0.110 mg/L at [$CaCO_3$] = 120–180 mg/L [not shown]; 0.150 mg/L at [$CaCO_3$] = >180 mg/L [not shown]).
Hardness [as $CaCO_3$] in lakes ranged from 11 to 181 mg/L.
Solid columns represent total nickel and superimposed dotted columns represent dissolved nickel.

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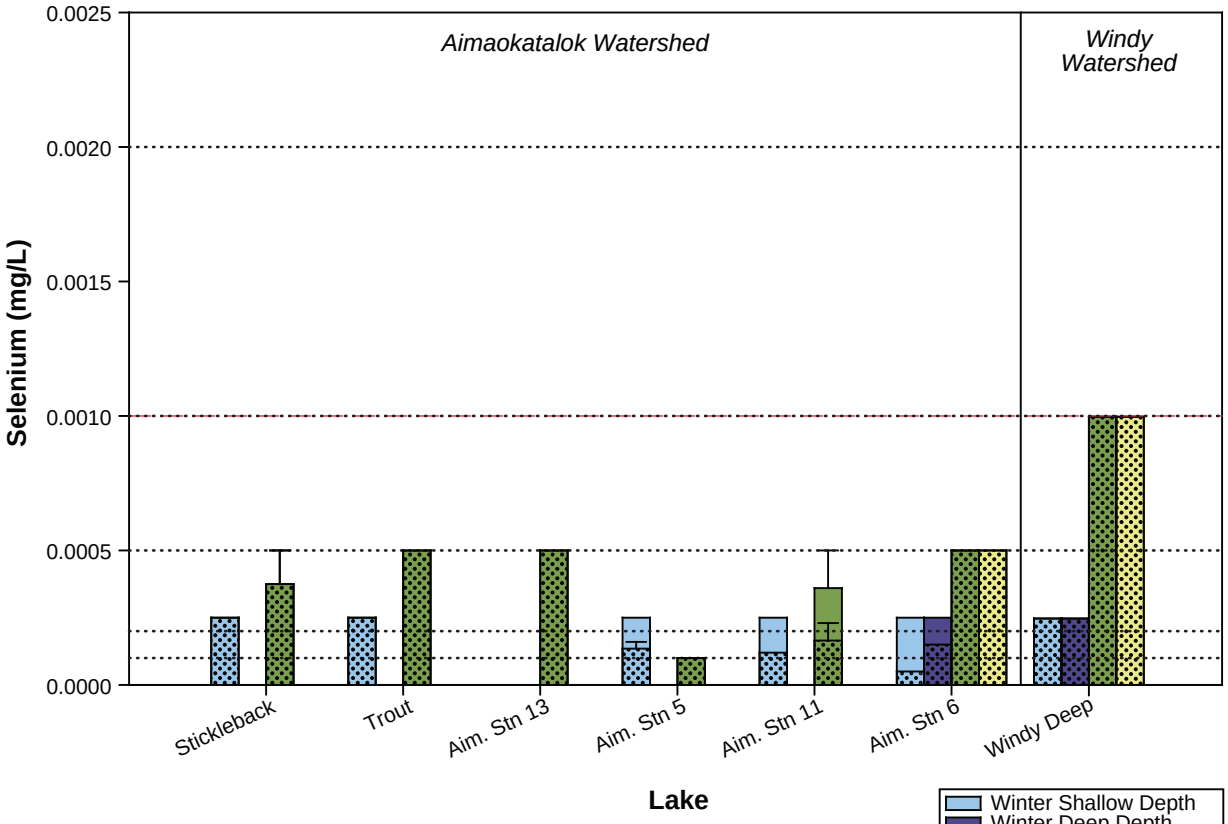
Nickel Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1u

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001, 0.0002, 0.0005, 0.001, or 0.002 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.001 mg/L).
Solid columns represent total selenium and superimposed dotted columns represent dissolved selenium.

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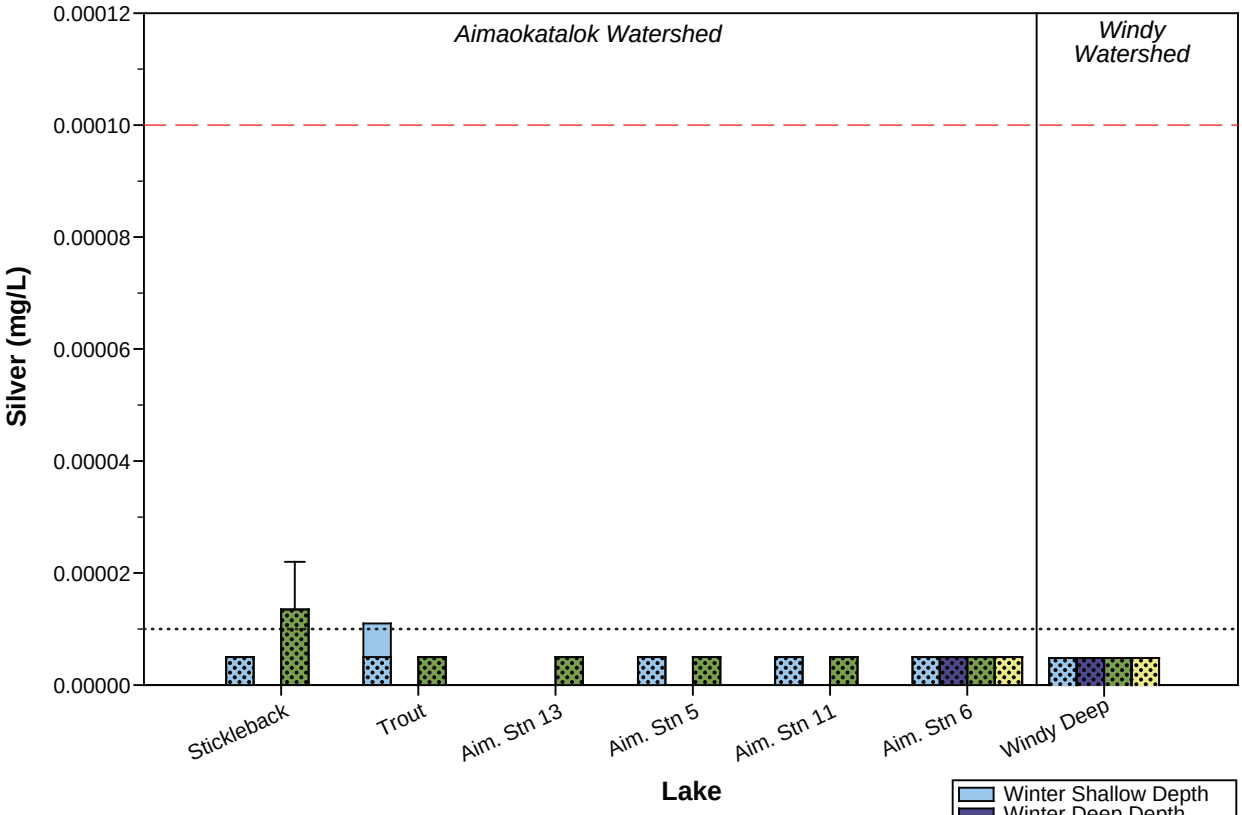
Selenium Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1v

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.00001 or 0.000005 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.0001 mg/L).
Solid columns represent total silver and superimposed dotted columns represent dissolved silver.

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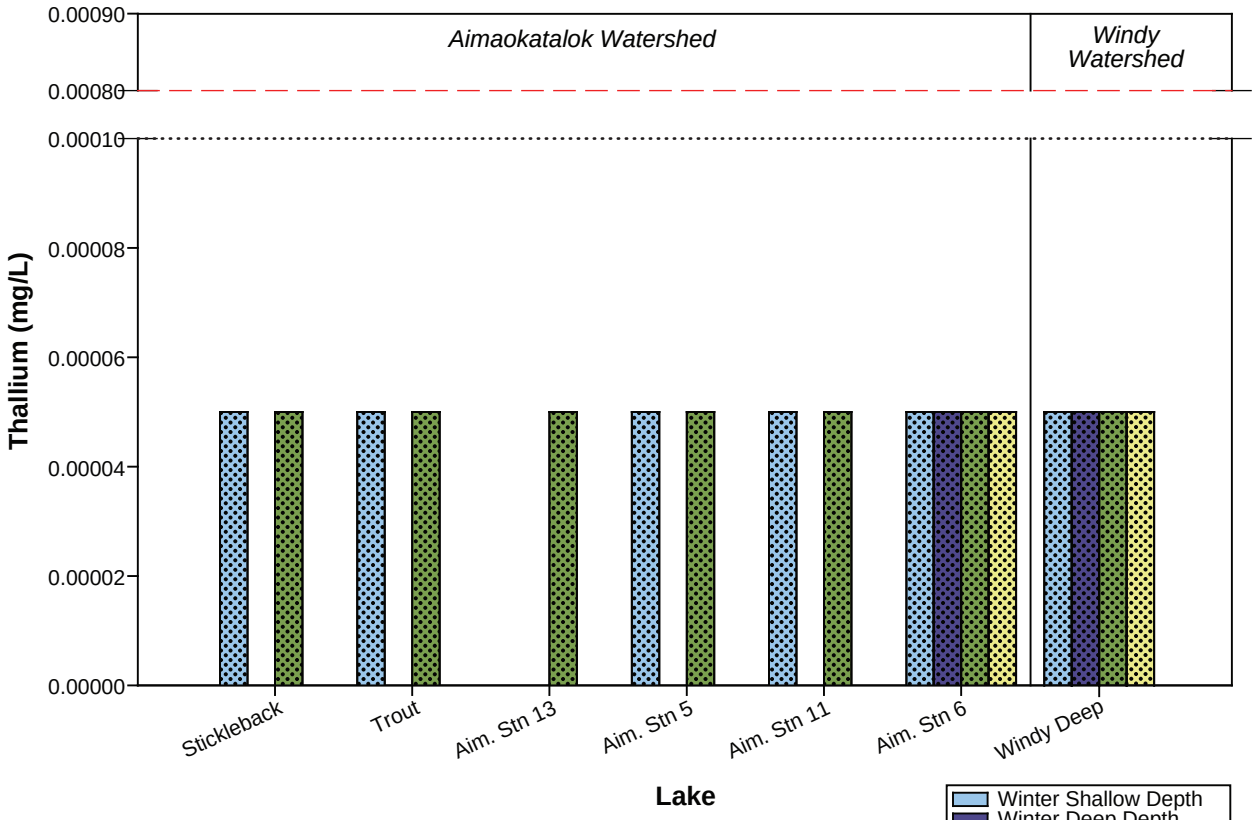
Silver Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1w

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.0001 or 0.000002 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.0008 mg/L).
Solid columns represent total thallium and superimposed dotted columns represent dissolved thallium.

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Thallium Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1x

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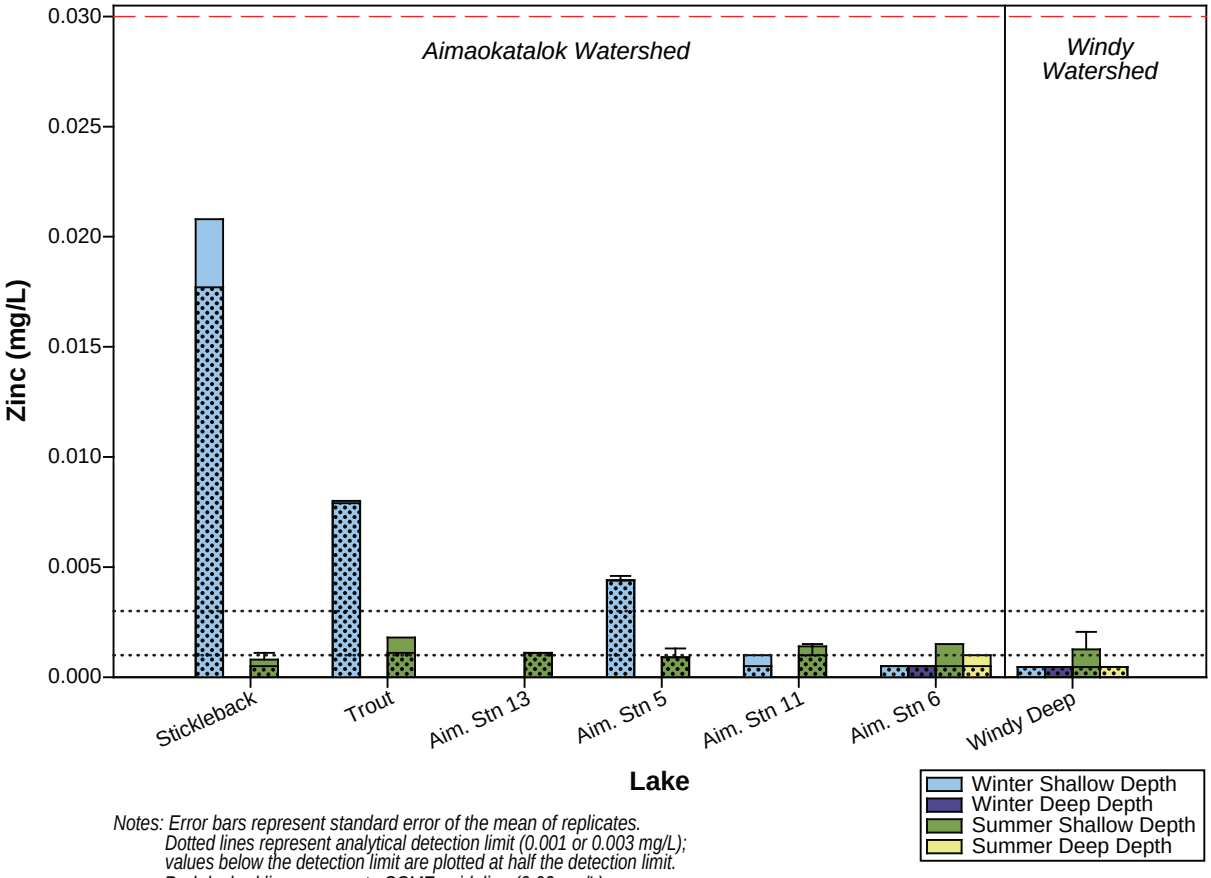

Notes: Error bars represent standard error of the mean of replicates.
Dotted lines represent analytical detection limit (0.001 or 0.003 mg/L); values below the detection limit are plotted at half the detection limit.
Red dashed line represents CCME guideline (0.03 mg/L).
Solid columns represent total zinc and superimposed dotted columns represent dissolved zinc.

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Zinc Concentration in Lakes, Hope Bay Belt Project, 2010

Figure 3.2-1y

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Nitrate concentrations were mainly higher in bottom than in surface waters, which is consistent with algal update of this nutrient in well-lit surface waters (Figure 3.2-1h). Aluminum concentrations also tended to be highest in deep waters (Figure 3.2-1l). Lead showed the opposite trend, as surface waters in August consistently contained higher lead concentrations than deep waters (Figure 3.2-1r).

3.2.2 Seasonal Variation

Water column concentrations of nutrients, metals, and other parameters can be higher during the winter due to natural processes, including solute exclusion during ice formation, changes in redox chemistry, and decreased biological uptake, particularly in the surface layer where phytoplankton are light-limited during the winter months due to shorter photoperiods. Samples collected in April reflect the late winter 'worst case scenario' for under-ice water quality, when oxygen concentrations are at their lowest and metal and nutrient concentrations are potentially at their highest.

In the lakes sampled, winter levels of some general parameters, nutrients, and metals were higher than summer levels. This trend was particularly apparent for nitrate (Figure 3.2-1h), as summer nitrate concentrations were below detection limits (<0.005 mg/L) in all lakes except Aim. Stn 6, where concentrations were 0.0084 mg/L (Figure 3.2-1h). In comparison, winter nitrate levels were often several times higher than summer, with detectable concentrations ranging from 0.01 to 0.16 mg/L. This trend was also evident for hardness (Figure 3.2-1b), total dissolved solids (TDS; Figure 3.2-1e), ammonia (Figure 3.2-1g), sulphate (Figure 3.2-1k), copper (Figure 3.2-19p), and zinc (Figure 3.2-1y).

Turbidity and total suspended solids (TSS) showed the opposite trend, as these parameters were often higher in summer than in winter. This is likely due to summer increases in wind-driven mixing and re-suspension of sediments, direct inputs from riverine sources, and elevated phytoplankton biomass. Aluminum (Figure 3.2-1l) and lead (Figure 3.2-1r) concentrations were also higher in the summer than in the winter. These may have been associated with the higher TSS levels seen during summer.

3.2.3 Spatial Variation

Stickleback, Trout, and Aimaokatalok lakes are in the Aimaokatalok Watershed, and Windy Lake is in the Windy Watershed (Figure 2.1-1, 2.1-2, 2.1-3).

Lake pH levels ranged from near neutral, 6.8 (Aim. Stn 6 in winter, deep depth), to slightly basic, 8.1 (Windy in winter, shallow depth; Figure 3.2-1a). Hardness levels varied between lakes, as Aimaokatalok Lake generally contained softer water (i.e., lower hardness) than other lakes (Figure 3.2-1b). Turbidity ranged from 0.29 to 2.38 NTU, and TSS concentrations were consistently below the detection limit in all lakes (<3.0 mg/L; Figures 3.2-1c and 3.2-1d). Average TDS concentrations ranged from 29 mg/L in Aim. Stn 13 during summer to 425 mg/L in Stickleback Lake during winter (Figure 3.2-1e). Aimaokatalok Lake had the lowest TDS levels, with all sites at or below–50 mg/L. Patterns in TDS closely reflected patterns in hardness (Figure 3.2-1b). Average total organic carbon (TOC) concentrations generally ranged from 1.71 mg/L (Windy in winter, deep depth) to 9.12 mg/L (Stickleback in winter, shallow depth); however a particularly high TOC concentration of 22.4 mg/L was measured in Trout Lake in winter (Figure 3.2-1f).

Nitrate and ammonia were the major forms of inorganic nitrogen in the lakes, while nitrite concentrations were generally below detection limits (<0.001 mg/L; Figure 3.2-1i). Average ammonia concentrations ranged from below detection (<0.005 mg/L) in several lakes to 0.166 mg/L in Stickleback Lake during winter (Figure 3.2-1g). Average nitrate concentrations ranged from below detection (<0.005 mg/L) in nearly all samples collected during summer to 0.16 mg/L in Trout Lake during winter (Figure 3.2-1h).

Average total phosphorus concentrations ranged from 0.0039 mg/L (Windy Lake in winter, deep depth) to 0.027 mg/L (Trout Lake in winter, Figure 3.2-1j). Based on the CCME's trophic categorizations for total phosphorus levels (CCME 2004), Stickleback Lake, Trout Lake, and Aimaokatalok Lake would be considered oligotrophic to meso-eutrophic; and Windy Lake would be considered ultra-oligotrophic to oligotrophic based on their average (April and August) total phosphorus concentrations.

Sulphate concentrations ranged from 0.86 mg/L (Stickleback in summer, shallow depth) to 9.25 mg/L (Windy in winter, shallow depth). Windy Lake sulphate concentrations were consistently higher than other lakes, particularly during the summer (Figure 3.2-1k).

Average metal concentrations varied among sites (Figures 3.2-1l to 3.2-1y). Concentrations of metals typically associated with suspended sediments (e.g., aluminum, copper, iron, and zinc; Milburn and Prowse 1996), were often highest in the shallower lakes: Stickleback and Trout. Total and dissolved molybdenum concentrations were consistently at least four times higher in Windy Lake than in any other lake, but were orders of magnitude lower than the CCME guideline for molybdenum (Figure 3.2-1t). Windy Lake was also the only site that had detectable concentrations of dissolved mercury (ranging from 0.000017 to 0.000020 mg/L; Figure 3.2-1s). However, these concentrations were very close to the detection limit of 0.000010 mg/L, and total mercury concentrations in the same Windy Lake samples were below the detection limit (<0.000010), suggesting that there may have been an analytical error in the analysis of dissolved mercury (dissolved concentrations should always be lower than or equal to total concentrations). Although there were some exceptions, total and dissolved cadmium (Figure 3.2 1n), chromium (Figure 3.2-1o), mercury (Figure 3.2-1s), selenium (Figure 3.2-1v), silver (Figure 3.2-1w), and thallium (Figure 3.2-1x) concentrations were frequently below analytical detection limits in the lakes sampled.

3.2.4 Comparison with CCME Guidelines

The majority of water quality parameters measured in the lakes were below CCME guidelines for the protection of freshwater aquatic life (2007), with the following exceptions: total aluminum, total cadmium, total chromium, total copper, total iron, and total lead. Each of these metals exceeded applicable CCME guidelines in at least one sample collected at Stickleback, Trout, or Aim. Stn 5 in 2010. Table 3.2-1 presents the percentage of lake water quality samples in which parameter concentrations were higher than CCME guidelines, and Table 3.2-2 provides the factor by which average 2010 concentrations were higher than CCME guidelines.

In Stickleback Lake, the total iron concentration in a single sample collected during winter (0.342 mg/L) slightly exceeded the CCME guideline of 0.3 mg/L. Similarly, the total lead concentration in a single sample collected during summer (0.00209 mg/L) was slightly higher than the hardness-dependent lead guideline of 0.002 mg/L. For both total iron and total lead, the average concentrations of these metals including all summer and winter samples collected at Stickleback Lake in 2010 were below applicable CCME guidelines.

In Trout Lake, a single water quality sample was collected in April, and a second sample was collected in August. Concentrations of total copper (0.00529 mg/L), and total iron (0.433 mg/L) in the April sample exceeded applicable CCME guidelines. The April sample had a total chromium concentration of 0.00101 mg/L, and the CCME guideline for hexavalent chromium (Cr(VI)) is 0.001 mg/L and the interim guideline for trivalent chromium (Cr(III)) is 0.0089 mg/L). In the August sample, the total aluminum concentration (0.119 mg/L) slightly exceeded the CCME guideline of 0.1 mg/L.

Table 3.2-1. Lake Water Quality, Percent of Samples in which Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010

Lake	Total Number of Samples Collected	CCME Guideline Value[a]:	pH	Ammonia (as N) temperature- and pH-dependent	Nitrate (as N)	Nitrite (as N)	Total Phosphorus	Aluminum (Al)-Total	Arsenic (As)-Total	Cadmium (Cd)-Total	Chromium (Cr)-Total
			6.5-9.0		2.9 mg/L	0.06 mg/L	Trophic Status[b]	0.005-0.1[c] mg/L	0.005 mg/L	0.000017[d] mg/L	0.001[e] mg/L
Aimaokatalok											
Stickleback	3		0	0	0	0	Oligotrophic to Mesotrophic	0	0	0	0
Trout	2		0	0	0	0	Mesotrophic to Meso-eutrophic	50	0	0	50
Aim. Stn 13	1		0	0	0	0	Oligotrophic	0	0	0	0
Aim. Stn 5	4		0	0	0	0	Oligotrophic to Mesotrophic	0	0	25	0
Aim. Stn 11	3		0	0	0	0	Mesotrophic	0	0	0	0
Aim. Stn 6	4		0	0	0	0	Oligotrophic to Mesotrophic	0	0	0	0
Windy											
Windy Deep	5		0	0	0	0	Oligotrophic	0	0	0	0

Lake	Total Number of Samples Collected	Copper (Cu)-Total	Iron (Fe)-Total	Lead (Pb)-Total	Mercury (Hg)-Total	Molybdenum (Mo)-Total	Nickel (Ni)-Total	Selenium (Se)-Total	Silver (Ag)-Total	Thallium (Tl)-Total	Zinc (Zn)-Total
		0.002-0.004[f] mg/L	0.3 mg/L	0.001-0.007[g] mg/L	0.000026[h] mg/L	0.073 mg/L	0.025-0.150[i] mg/L	0.001 mg/L	0.0001 mg/L	0.0008 mg/L	0.03 mg/L
Aimaokatalok											
Stickleback	3	0	33	33	0	0	0	0	0	0	0
Trout	2	50	50	0	0	0	0	0	0	0	0
Aim. Stn 13	1	0	0	0	0	0	0	0	0	0	0
Aim. Stn 5	4	0	0	0	0	0	0	0	0	0	0
Aim. Stn 11	3	0	0	0	0	0	0	0	0	0	0
Aim. Stn 6	4	0	0	0	0	0	0	0	0	0	0
Windy											
Windy Deep	5	0	0	0	0	0	0	0	0	0	0

All values represent percentages of 2010 samples that are both higher than the CCME guidelines and above analytical detection limits.

a) Canadian water quality guidelines for the protection of aquatic life (CCME 2007)

b) <0.004 mg/L = ultra-oligotrophic; 0.004 - 0.010 mg/L = oligotrophic; 0.01 - 0.02 mg/L = mesotrophic; 0.02 - 0.035 mg/L = meso-eutrophic; 0.035 - 0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic

c) 0.005 mg/L at pH <6.5; 0.1 mg/L a pH ≥6.5

d) The equation for correcting this guideline for hardness is: $10^{\{0.86[\log(\text{hardness})]-3.2\}} / 1000$

e) Guideline concentration for hexavalent chromium. No concentrations were higher than the CCME guideline for trivalent chromium (0.0089 mg/L)

f) 0.002 mg/L at water hardness of 0-120 mg/L (as $CaCO_3$); 0.003 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.004 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

g) 0.001 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$); 0.002 mg/L at water hardness of 60-120 mg/L (as $CaCO_3$); 0.004 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.007 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

h) Guideline concentration for inorganic mercury

i) 0.025 mg/L at water hardness of 0-60 mg/L (as $CaCO_3$); 0.065 mg/L at water hardness of 60-120 mg/L (as $CaCO_3$); 0.110 mg/L at water hardness of 120-180 mg/L (as $CaCO_3$); 0.150 mg/L at water hardness of > 180 mg/L (as $CaCO_3$)

Table 3.2-2. Lake Water Quality, Factor by which Average Concentrations are Higher than CCME Guidelines, Hope Bay Belt Project, 2010

Lake	Total Number of Samples Collected	CCME Guideline Value[a]:	pH 6.5-9.0	Ammonia (as N) temperature- and pH-dependent	Nitrate (as N) 2.9 mg/L	Nitrite (as N) 0.06 mg/L	Total Phosphorus Trophic Status[b]	Aluminum (Al)-Total 0.005-0.1[c] mg/L	Arsenic (As)-Total 0.005 mg/L	Cadmium (Cd)-Total 0.000017[d] mg/L	Chromium (Cr)-Total 0.001[e] mg/L
Aimaokatalok											
Stickleback	3		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-
Trout	2		-	-	-	-	Mesotrophic to Meso-eutrophic	-	-	-	-
Aim. Stn 13	1		-	-	-	-	Oligotrophic	-	-	-	-
Aim. Stn 5	4		-	-	-	-	Oligotrophic to Mesotrophic	-	-	1.18	-
Aim. Stn 11	3		-	-	-	-	Mesotrophic	-	-	-	-
Aim. Stn 6	4		-	-	-	-	Oligotrophic to Mesotrophic	-	-	-	-
Windy											
Windy Deep	5		-	-	-	-	Oligotrophic	-	-	-	-

Lake	Total Number of Samples Collected	Copper (Cu)-Total 0.002-0.004[f] mg/L	Iron (Fe)-Total 0.3 mg/L	Lead (Pb)-Total 0.001-0.007[g] mg/L	Mercury (Hg)-Total 0.000026[h] mg/L	Molybdenum (Mo)-Total 0.073 mg/L	Nickel (Ni)-Total 0.025-0.150[i] mg/L	Selenium (Se)-Total 0.001 mg/L	Silver (Ag)-Total 0.0001 mg/L	Thallium (Tl)-Total 0.0008 mg/L	Zinc (Zn)-Total 0.03 mg/L
Aimaokatalok											
Stickleback	3	-	-	-	-	-	-	-	-	-	-
Trout	2	1.76	1.20	-	-	-	-	-	-	-	-
Aim. Stn 13	1	-	-	-	-	-	-	-	-	-	-
Aim. Stn 5	4	-	-	-	-	-	-	-	-	-	-
Aim. Stn 11	3	-	-	-	-	-	-	-	-	-	-
Aim. Stn 6	4	-	-	-	-	-	-	-	-	-	-
Windy											
Windy Deep	5	-	-	-	-	-	-	-	-	-	-

All values represent the factor by which 2010 lake averages are higher than CCME guidelines (using the average concentration of each parameter within a lake site across various depths and seasons).

Even though a percentage of samples may be higher than a guideline amount, the calculated lake average may not be higher than CCME guidelines.

Dashes represent averages that are not higher than guidelines

a) Canadian water quality guidelines for the protection of aquatic life (CCME 2007)

b) <0.004 mg/L = ultra-oligotrophic; 0.004 - 0.010 mg/L = oligotrophic; 0.01 - 0.02 mg/L = mesotrophic; 0.02 - 0.035 mg/L = meso-eutrophic; 0.035 - 0.1 mg/L = eutrophic; >0.1 mg/L = hyper-eutrophic

c) 0.005 mg/L at pH <6.5; 0.1 mg/L a pH ≥6.5

d) The equation for correcting this guideline for hardness is: $10^{\{0.86[\log(\text{hardness})]-3.2\}} / 1000$

e) Guideline concentration for hexavalent chromium. No concentrations were higher than the CCME guideline for trivalent chromium (0.0089 mg/L).

f) 0.002 mg/L at water hardness of 0-120 mg/L (as [$CaCO_3$]); 0.003 mg/L at water hardness of 120-180 mg/L (as [$CaCO_3$]); 0.004 mg/L at water hardness of > 180 mg/L (as [$CaCO_3$])

g) 0.001 mg/L at water hardness of 0-60 mg/L (as [$CaCO_3$]); 0.002 mg/L at water hardness of 60-120 mg/L (as [$CaCO_3$]); 0.004 mg/L at water hardness of 120-180 mg/L (as [$CaCO_3$]); 0.007 mg/L at water hardness of > 180 mg/L (as [$CaCO_3$])

h) Guideline concentration for inorganic mercury

i) 0.025 mg/L at water hardness of 0-60 mg/L (as [$CaCO_3$]); 0.065 mg/L at water hardness of 60-120 mg/L (as [$CaCO_3$]); 0.110 mg/L at water hardness of 120-180 mg/L (as [$CaCO_3$]); 0.150 mg/L at water hardness of > 180 mg/L (as [$CaCO_3$])

Among all the samples collected at various stations within Aimaokatalok Lake during 2010, a single sample collected at Aim. Stn 5 in April contained a slightly elevated total cadmium concentration (0.000018 mg/L) that exceeded the hardness-dependent CCME guideline for cadmium. All other total cadmium concentrations measured in Aimaokatalok Lake sites were below the detection limit (<0.00001 mg/L). All other water quality parameters in Aimaokatalok samples were below CCME guidelines.

3.2.5 Drinking Water Quality

Doris, Aimaokatalok and Windy lakes are potential drinking water sources in the area. Untreated water quality samples collected from these lakes were therefore screened against Health Canada's Guidelines for Canadian Drinking Water Quality (Health Canada 2010). In all lakes, turbidity values exceeded the drinking water quality guidelines (Table 3.2-3). However, the turbidity guideline apply to filtered water, and the samples collected were raw, untreated lake water. For camp use, water is particulate filtered and undergoes ozonation and ultraviolet treatment. Drinking water also undergoes reverse osmosis at the tap. No other parameters analyzed exceeded drinking water guidelines (Table 3.2-3).

3.2.6 Quality Assurance/Quality Control

In total, 8 travel blanks, 12 field blanks, and 4 equipment blanks (accounting for 20% of lake and stream samples collected) were processed as part of the 2010 lake and stream water quality program. Slight ammonia contamination was apparent in some field blanks; however, ammonia concentrations in lakes and streams were generally near or below the detection limit, and all concentrations were well below the pH- and temperature-dependent CCME guideline for the protection of aquatic life. Aside from ammonia, there were no obvious signs of contamination in travel, field, and equipment blanks (Appendix 3.2-2).

3.2.7 Annual Variation

Only historical sampling locations that were also sampled in 2010 were included in the comparison of annual water quality data shown in Figures 3.2-2a to 3.2-2y. Note that historical sampling locations may not correspond exactly with those sampled in 2010, and this, in addition to methodological differences, may contribute to variability observed among years (see Table 2.14-1 and Figures 2.14-1a to 2.14-1c for historical sampling methodologies and locations). Differences in the timing of sample collection can also affect annual averages for many parameters. For example, under-ice water samples can contain higher metal and nutrient concentrations than those collected in the summer. Comparisons between years are further complicated by differences in analytical detection limits.

Some general trends were apparent in the historical dataset (Figures 3.2-2a to 3.2-2y). Lake hardness and TDS concentrations were generally lowest in Aimaokatalok Lake compared to other lakes (Figures 3.2-2b and 3.2-2e). Total phosphorus concentrations tended to be highest in Trout Lake (Figure 3.2-2j). Sulphate concentrations tended to be highest in Windy Lake (Figure 3.2-2k). Trout Lake tended to have the highest concentrations of several metals, including total aluminum (Figure 3.2-2l), total copper (Figure 3.2-2p), and total iron (Figure 3.2-2q). Molybdenum and selenium concentrations have historically been higher in Windy Lake than in other lakes (Figure 3.2-2t and 3.2-2v). Several parameters have historically had concentrations that were close to or exceeded CCME guidelines, including total aluminum, total cadmium, total chromium (when compared to the most conservative speciation guideline), total copper, total iron, total lead, and total selenium.

Table 3.2-3. Comparison of Raw Lake Water to Drinking Water Quality Guidelines, Hope Bay Belt Project, 2010

Site		Health Canada	Windy Lake		Doris Lake (North and South)		Aimaokatalok Lake (Stations 5, 6, 11, 13)	
Date Range		Guideline for Canadian	April to August 2010		April to September 2010		April to August 2010	
	Units	Drinking Water Quality[a]	Min	Max	Min	Max	Min	Max
Physical Tests								
pH	pH	6.5-8.5*	7.55	8.08	7.55	7.91	6.82	8.01
Total Dissolved Solids	mg/L	500*	214	258	NC	NC	29	51
Turbidity	NTU	0.3/1.0/0.1[b]	0.25	1.06	1.87	8.03	0.29	1.53
Anions and Nutrients								
Chloride (Cl)	mg/L	250*	94.8	113	61.9	80.6	7.35	16.2
Fluoride (F)	mg/L	1.5	0.074	0.080	0.047	0.057	<0.020	0.033
Nitrate (as N)	mg/L	10.2	<0.0050	0.0100	<0.0050	0.107	<0.0050	0.130
Nitrite (as N)	mg/L	0.973	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulphate (SO_4)	mg/L	500*	7.88	9.25	2.62	3.36	1.13	2.47
Cyanides								
Cyanide, Total	mg/L	0.2	N/A	N/A	0.0038	0.0055	N/A	N/A
Total Metals								
Aluminum (Al)	mg/L	0.1/0.2*[c]	0.0083	0.0455	0.0055	0.0898	0.0182	0.0859
Antimony (Sb)	mg/L	0.006	<0.00010	<0.00010	0.000014	0.000043	<0.00010	0.00033
Arsenic (As)	mg/L	0.010	<0.00050	<0.00080	0.000233	0.000329	0.000129	0.00022
Barium (Ba)	mg/L	1	0.00236	0.00261	0.00296	0.00361	0.00199	0.00378
Cadmium (Cd)	mg/L	0.005	<0.000010	<0.000010	<0.0000050	0.000193	<0.000010	0.000018
Chromium (Cr)	mg/L	0.05	<0.00050	0.00064	<0.00050	0.00079	<0.00050	0.00056
Copper (Cu)	mg/L	1*	0.00089	0.00138	0.00146	0.00285	<0.0010	0.00172
Iron (Fe)	mg/L	0.3*	<0.010	0.037	<0.030	0.179	0.028	0.134
Lead (Pb)	mg/L	0.01	<0.000050	0.00102	<0.000050	0.000253	<0.000050	0.000694
Manganese (Mn)	mg/L	0.05*	0.000929	0.00203	0.00318	0.0384	0.000855	0.0101
Mercury (Hg)	mg/L	0.001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Selenium (Se)	mg/L	0.01	<0.00050	<0.0020	<0.00020	<0.00020	<0.00050	0.00022
Sodium (Na)	mg/L	200*	51.4	65.6	31.0	40.0	3.90	8.12
Uranium (U)	mg/L	0.02	0.000171	0.000203	0.000032	0.000041	0.000022	0.000043
Zinc (Zn)	mg/L	5*	<0.0010	0.0021	<0.0030	<0.0030	<0.0010	0.0041
Organic Parameters								
Microcystin	µg/L	1.5[d]	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Shaded cells indicate values that are both above analytical detection limits and exceed Health Canada drinking water quality guidelines.

Doris Lake samples were collected as part of the 2010 AEMP program.

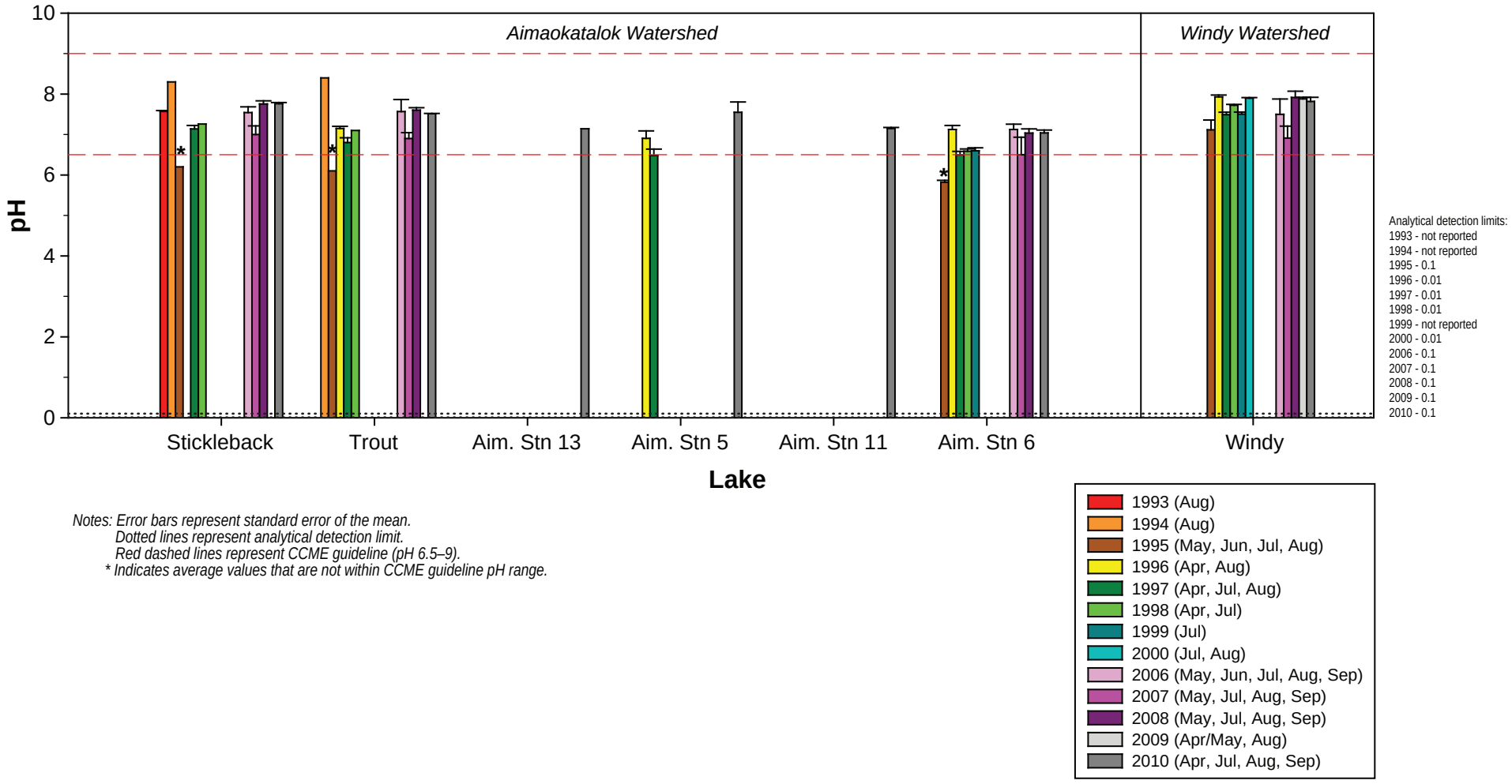
NC - not collected

a) Guidelines for Canadian drinking water quality, Health Canada (2010). All guidelines are health-based maximum acceptable concentrations, except for guidelines marked with an asterisk (*) which are based on either aesthetic or operational considerations.

b) 0.3 NTU for chemically assisted filtration, 1.0 NTU for slow sand or diatomaceous earth filtration, and 0.1 NTU for membrane filtration. Turbidity guideline is based on both health and aesthetic considerations.

c) Operational guideline that applies only to drinking water treatment plants using aluminum-based coagulants. The guideline level of 0.1 mg/L applies to conventional treatment plants, and 0.2 mg/L applies to other types of treatment systems.

d) The maximum acceptable concentration of microcystin-LR in drinking water.



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit.
Red dashed lines represent CCME guideline (pH 6.5–9).
** Indicates average values that are not within CCME guideline pH range.*

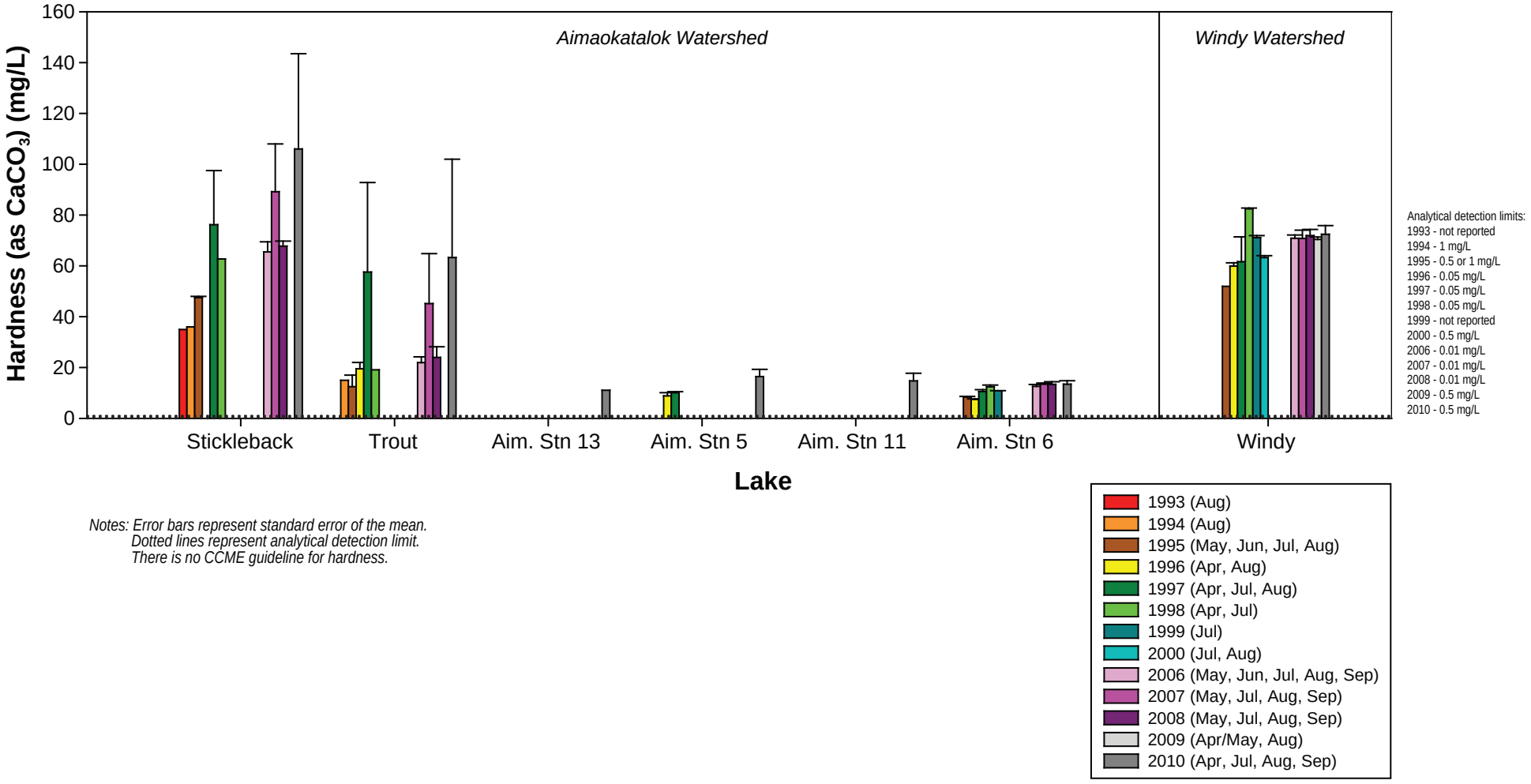
Figure 3.2-2a

NEWMONT NORTH AMERICA

Average Annual pH in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2a

Rescan™ Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit.
There is no CCME guideline for hardness.

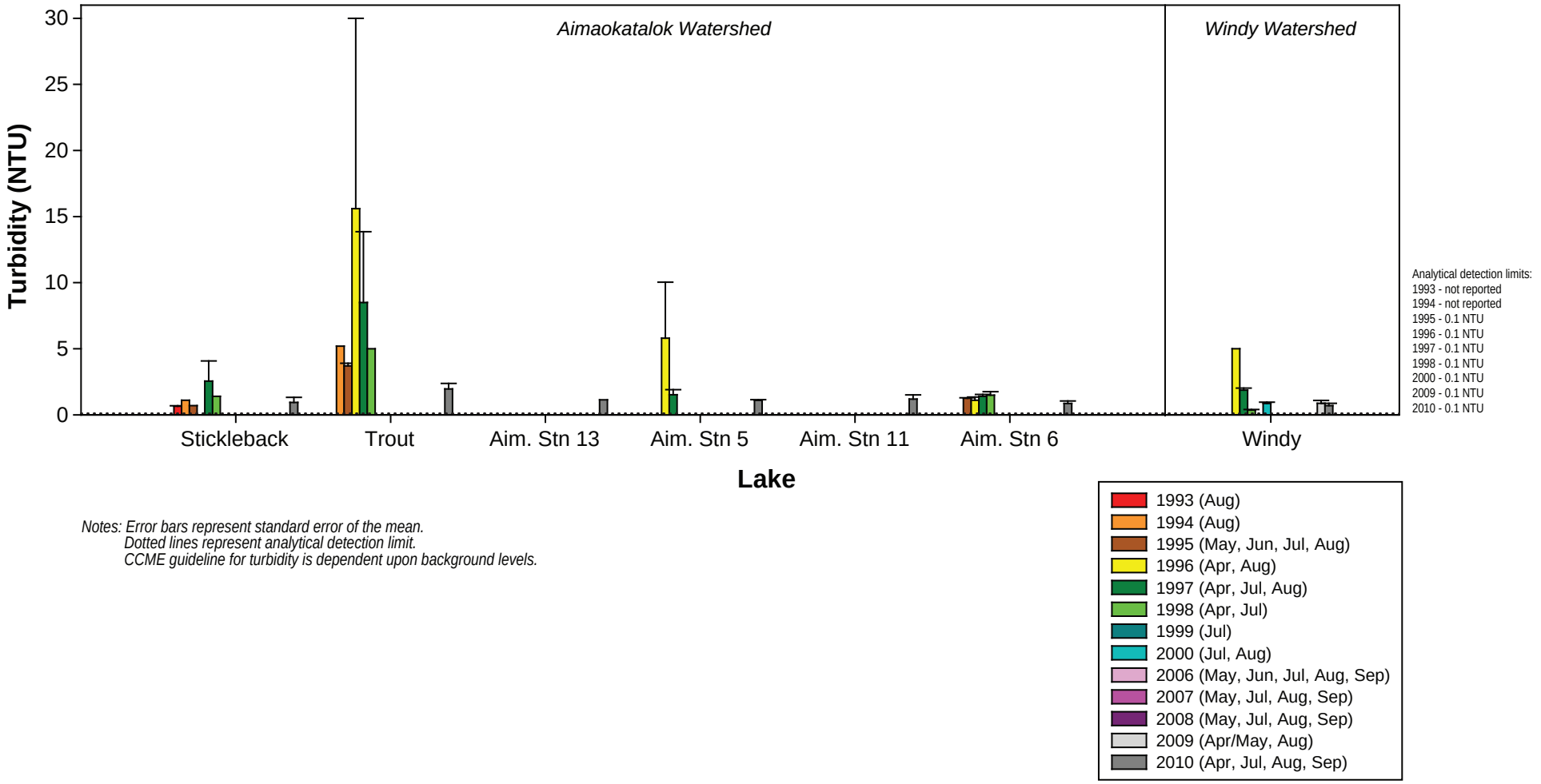
Figure 3.2-2b

NEWMONT NORTH AMERICA

Average Annual Hardness in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2b

Rescan Engineers & Scientists



Notes: Error bars represent standard error of the mean.
Dotted lines represent analytical detection limit.
CCME guideline for turbidity is dependent upon background levels.

Figure 3.2-2c

NEWMONT NORTH AMERICA

Average Annual Turbidity in Lakes, Hope Bay Belt Project, 1993-2010

Figure 3.2-2c

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