APPENDIX 1A

Summary of Site Characteristics in Core and Secondary Parks

Table 1A-1. Summary of Physical Attributes of the Lake Catchments in Core Parks

Park	Site	Latitude (dd)	Longitude (dd)	Bathymetry Source	Elevation (m) (from NPS)	Lake Elevation (m) (from drg*)	Lake Surface Area (ha)	Lake Volume (m^3)	Lake Max Depth (m)	Mean Depth (volume/ surface area)	Shoreline length (km)	Shoreline Development*	Watershed Area (ha)	Watershed Elevation - lowest (m) (from drg*)	Watershed Elevation - highest (m) (from drg*)	Watershed Area/ Lake Volume (m^2/m^3)	Annual HRT* Based on ET* (y)	Fish Species
NOAT	Burial	68.43	159.18	vaga/j605	427	429.8	65.5	5297945.2	24.1	8.1	3.1	1.07	264.9	429.8	535.2	0.50	24.559	Lake Trout
GAAR	Matcharak	67.75	156.21	vaga/j605	488	502.3	300.7	21889008.3	20.4	7.3	10.7	1.74	2388.3	502.3	1162.2	1.09	7.643	Lake Trout
DENA	Wonder	63.48	150.88	scan	610	605.0	265.6	77653853.3	70	29.2	9.7	1.68	3212.4	605.0	876.3	0.41	6.836	Lake Trout
DENA	McLeod	63.38	151.07	vaga/j605	609	563.9	35.9	1847704.4	13.5	5.2	3.2	1.53	236.8	563.9	731.5	1.28	4.131	Burbot, Round Whitefish
GLAC	Snyder	48.62	113.79	landers/j700	1600	1597.2	2.6	38297.5	3.5	1.5	0.7	1.24	303.7	1597.2	2761.5	79.30	0.005	Westslope Cutthroat Trout
GLAC	Oldman	48.5	113.46	landers/j663	2026	2025.7	18.2	1266062.9	17	7.0	1.8	1.17	230.3	2025.7	2811.8	1.82	0.235	Westslope Cutthroat Trout
OLYM	PJ	47.95	123.42	landers/j663	1433	1383.8	0.8	19099.3	6.4	2.5	0.3	1.08	56.2	1383.8	1904.1	29.41	0.003	Brook Trout
OLYM	Hoh	47.9	123.79	vaga/j605	1384	1379.2	7.7	396198.1	14.9	5.2	1.1	1.09	43.9	1379.2	1684.0	1.11	0.107	Brook Trout
MORA	Golden	46.89	121.9	scan	1372	1368.6	6.6	689577.5	23.9	10.4	1.0	1.07	106.1	1368.6	1720.6	1.54	0.067	Brook Trout
MORA	LP19	46.82	121.89	scan	1372	1371.6	1.8	99878.6	12.1	5.4	0.5	1.11	44.9	1371.6	1652.0	4.49	0.024	Brook Trout
ROMO	Mills	40.29	105.64	landers/j597	3030	3029.7	6.1	78251.1	9	1.3	1.3	1.46	1208.9	3029.7	4344.9	154.49	0.009	Rainbow, Cutthroat Trout
ROMO	Lone Pine	40.22	105.73	vaga/j605	3024	3017.5	4.9	128324.6	9.7	2.6	0.8	1.07	1830.0	3017.5	3998.4	142.61	0.012	Brook Trout
SEKI	Pear	36.6	118.67	scan	2904	2907.8	7.3	578000	27	7.9	1.3	1.31	142.0	2907.8	3453.1	2.46	0.251	Brook Trout
SEKI	Emerald	36.58	118.67	scan	2800	2810.3	2.5	160000	10	6.3	0.6	1.12	121.3	2810.3	3439.4	7.58	0.087	Brook Trout

Notes:

*drg (digital raster graphic) lake boundaries used for calculations; except lake volume for Pear and Emerald from Sickman and Melack, 1989

*shoreline length/2*square root of (pi * surface area)

***HRT** = Hydraulic Residence Time of lake based on **ET** = Evapotranspiration in % of precipitation

Table 1A-2. Summary of Chemical Attributes of the Lake Catchments in Core Parks

Park	Site	WACAP No	Date Collected	pH Value	Specific Conductance (µS/cm)	ANC Value (µeq/L)	Turbidity (NTU)	Total Suspended Solids (mg/L)	Color (APHA Pt-Co Units)	DOC (mg/L)	DIC (mg/L)	NH_4-N (mg/L)	SiO_2 (mg/L)	Total N (mg/L)	Total P (µg/L)	Cl (mg/L)	NO_3 (mg N/L)	SO_4 (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Zn (mg/L)	Se (µg/L)	Chl-*a* (µg/L)
NOAT	Burial	46003	8/04/2004	7.57	35.08	272.98	0.32	1.4	10	3.32	3.27	0.01	0.28	0.23	9.06	0.18	0.00	1.46	4.50	1.15	0.36	0.40	0.03	-0.38	0.81
GAAR	Matcharak	46000	8/2/2004	8.31	248.10	1967.03	0.35	72.2	10	4.71	23.18	0.01	3.39	0.28	1.09	0.87	0.00	27.02	37.30	6.37	4.14	0.52	0.03	0.86	0.96
DENA	Wonder	46005	8/14/2004	8.18	190.10	1693.60	0.34	0.5	15	2.10	20.29	0.00	2.95	0.11	0.50	0.12	0.00	14.31	32.00	4.24	1.08	0.71	0.01	-0.04	0.49
DENA	McLeod	46008	8/10/2004	7.24	8.41	51.02	0.29	-0.6	5	2.25	0.90	0.01	0.17	0.13	1.04	0.11	0.01	0.26	0.95	0.16	0.15	0.31	0.03	0.11	0.61
GLAC	Snyder	56009	8/25/2005	6.42	16.80	162.08	0.64	1.7	10	0.65	4.41	0.01	1.41	0.10	2.67	0.06	0.02	0.51	1.85	0.74	0.36	0.13	0.01	-0.24	4.73
GLAC	Oldman	56006	8/21/2005	8.24	159.10	1573.73	0.35	-0.8	2	0.70	19.98	0.01	1.88	0.07	0.55	0.09	0.00	3.65	21.17	8.00	0.26	0.21	0.00	-0.53	0.77
OLYM	PJ	56014	9/14/2005	8.14	127.40	1092.95	0.36	1.2	5	1.05	12.18	0.02	4.24	0.09	2.78	0.31	0.00	9.03	21.33	1.84	1.61	0.32	0.00	-0.08	1.77
OLYM	Hoh	56011	9/11/2005	7.52	63.69	512.45	0.39	0.8	7	0.74	5.71	0.01	2.57	0.06	1.16	0.67	0.02	4.15	10.50	0.70	1.15	0.12	0.00	0.13	0.83
MORA	Golden	56004	8/14/2005	6.47	10.08	69.05	0.52	0.2	4	1.88	1.18	0.01	5.51	0.07	0.60	0.63	0.02	0.38	0.64	0.17	0.85	0.14	0.01	-0.55	0.35
MORA	LP19	56001	8/10/2005	6.63	10.72	80.14	0.31	0.0	8	1.37	1.32	0.01	6.61	0.07	0.92	0.55	0.00	0.38	0.91	0.17	0.91	0.26	0.00	-0.43	0.60
ROMO	Mills	36004	9/11/2003	6.61	12.04	50.81	0.55	0.2	5	1.55	1.01	0.01	1.84	0.38	3.33	0.18	0.23	1.00	1.27	0.15	0.51	0.13	0.04	-2.13	3.02
ROMO	LonePine	36006	9/14/2003	6.67	14.02	91.52	0.31	0.2	5	1.74	1.44	0.01	2.95	0.17	2.70	0.16	0.06	1.40	1.74	0.19	0.64	0.14	0.02	-2.13	1.95
SEKI	Pear	36003	8/26/2003	6.10	4.02	23.99	0.23	0.0	0	0.82	1.13	0.02	1.43	0.11	0.59	0.18	0.05	0.33	0.34	0.02	0.21	0.11	0.03	-1.97	0.64
SEKI	Emerald	36001	8/25/2003	6.22	5.42	26.34	0.26	0.3	0	0.94	1.04	0.01	2.28	0.17	1.47	0.18	0.07	0.31	0.39	0.04	0.38	0.13	0.05	-1.95	0.62

Table 1A-3. Summary Characteristics of Vegetation and Air Sampling Sites in Core and Secondary Parks (for key, see last page)

Site Name	Media	Lat.	Long.	Elev. (m)	Ann. Temp. (°C)	nn. Ppt. (cm)	Canopy Cover (%)	Landform	Lichen N % dw	Lichens collected	Conifers collected	Location	Habitat
Park: Bandelier National Monument, New Mexico (BAND) **Ag Intensity Index:** 2.5 ; **IMPROVE AmmNO3:** 0.25 µg/m^3; **IMPROVE AmmSO4**: 1.00 µg/m^3 **North American Biome: EPA Ecoregion 3** – Northwestern Forested Mountains: Southern Rockies													
BAND1	Vegetation	35.7279	-106.2745	1854	10.5	34	43	Flatland	1.79	*Xanthoparmelia*	*Pinus edulis*	S terminus of mesa between Lummis and White Rock Canyon, where Burro Trail descends into Lummis Canyon.	One-seed juniper woodland with scattered oak and two-needle piñon on a moderately steep W-facing slope. Ground is rocky with some large outcrops. Almost all piñon were dead along mesa on hike in (cause could be drought and/or bark beetles).
BAND2	Vegetation	35.7989	-106.2846	2076	9.9	39	34	Flatland	1.58	*Usnea*	*Pinus edulis*	On the mesa just NW of Juniper Campground	One-seed juniper woodland with oaks and two-needle piñon on a mesa. Most of the pines were dead as a result of past drought and bark beetles. *Usnea* and *Xanthoparmelia* are abundant here. Nitrophilous lichens abundant on some trees.
BAND3	Vegetation	35.8241	-106.3611	2348	8.1	47	36	Toe slope	1.58	*Xanthoparmelia*	*Pinus ponderosa*	On the lower e slopes of Frijoles Peak ~ 1.6 km along trail from Ponderosa group camp.	*Pinus ponderosa* stand with Oregon white oak and low-growing *Ceanothus* species in the understory. Fire came through within the last few decades (fire scars on bark and an open canopy). Ground cover is grassy with open gravel/mineral soils.
BAND4	Vegetation	35.8262	-106.3893	2576	6.4	55	72	Mid-slope	1.26	*Usnea*	*Pinus ponderosa*	Lower SW slope of Cerro Grande, accessed from 1.6 km hike on Apache Spring trail.	Ponderosa pine/Douglas-fir stand on the edge of a SE-facing drainage. Fire came through recently (burn scars on bark and little vegetation in understory). Mostly duff and gravelly soil.
BAND5	Air, vegetation	35.8642	-106.4178	2926	5.4	62	36	Upper slope	1.56	*Usnea*	*Pinus ponderosa*	On the saddle SW of Cerro Grande Peak at the W edge of the meadow.	On the edge of a Douglas-fir forest with some ponderosa pine, Engelmann spruce, and quaking aspen bordered by a large open meadow. Nitrophilous lichens were observed.
Park: Big Bend National Park, Texas (BIBE) **Ag Intensity Index:** 0.5; **IMPROVE AmmNO3:** 0.26 µg/m^3; **IMPROVE AmmSO4**: 2.82 µg/m^3 **North American Biome: EPA Ecoregion 3** – North American Deserts: Southern Deserts													
BIBE1	Air, vegetation	29.1870	-102.9718	560	21	26	3	Valley				Rio Grande Village in cottonwood/ grass area near hot springs trailhead; ~60 m from picnic area parking lot and 60 m from the hot springs road.	Cottonwood woodland bordered by dense mesquite shrublands.
BIBE2	Air, vegetation	29.3079	-103.1828	1067	18.6	34	0	Flatland				76 m at 354° from the water tank along the road to K-Bar Camp near Panther Junction.	Desert shrubland with honey mesquite, yucca, and cacti.
BIBE3	Air, vegetation	29.2850	-103.2799	1608	17.5	47	23	Mid-slope			*Pinus cembroides*	N side of Panther Pass along Chisos Basin Rd. (~90 m E of road) in Green Gulch Creek drainage basin.	Mexican piñon/oak woodland on a low-grade N-facing slope. The ground is rocky and the cover is mostly bunch-grass.
BIBE4	Air, vegetation	29.2534	-103.2979	1920	16.7	52	65	Mid-slope	1.40	*Usnea*	*Pinus cembroides*	Pinnacles campground	Mixed Mexican piñon/drooping juniper/juniper/oak stand; on a bench on the NW mountain slope. Dry, many large boulders; deciduous and evergreen oaks in understory.
BIBE5	Vegetation	29.2465	-103.3049	2316	16.7	52	59	Upper slope	1.56	*Usnea*	*Pinus cembroides*	On the N slope of Emory Peak on saddle below peak.	On a steep N-facing slope bordering the ridge top. Vegetation is dominated by Mexican piñon and evergreen oak. The nitrophilous lichen, *Teloschistes,* is abundant on oaks.
Park: Crater Lake National Park, Oregon (CRLA) **Ag Intensity Index: 4.2; IMPROVE AmmNO3:** 0.11 µg/m^3; **IMPROVE AmmSO4**: 0.43 µg/m^3 **North American Biome: EPA Ecoregion 3** – Northwestern Forested Mountains: Cascades													
CRLA1	Vegetation	42.8364	-122.1459	1798	4.2	155	74	Toe slope	0.66	*Letharia vulpina*	*Abies magnifica*	W of the Lodgepole picnic areas and just SE of Bear Bluff on SW side of Rd. 62, ~122 m from the road.	Lodgepole pine stand; regeneration layer is almost entirely fir (esp. red fir) and mountain hemlock. The ground is mineral soil with pumice stones and a thin layer of pine needle duff. Lupine dominates herb layer.
CRLA2	Vegetation	42.8821	-122.1914	1859	3.5	160	49	Mid-slope	0.59	*Letharia vulpina*	*Abies concolor*	~120 m NW of Rd. 62 and NE of Whitehorse Pond.	Mixed conifer stand (white fir, lodgepole pine and mountain hemlock) of multiple age classes. The site is a bench on rocky ground; ground cover is mostly bearberry manzanita and grouse huckleberry.
CRLA3	Vegetation	42.9346	-122.1776	2043	3.4	164	31	Upper slope	0.62	*Letharia vulpina*	*Abies magnifica*	Meadow bench just off Lightning Springs trail, ~0.4 km W of Rim Drive.	Meadow with clumps of old Shasta fir and mountain hemlock. The landform is a W-facing flat bench; the soil is sandy and dry; cover is mostly grass and buckwheat.
CRLA4	Vegetation	42.9194	-122.0289	2423	3.5	108	21	Upper slope	0.62	*Letharia vulpina*	*Pinus albicaulis*	On the SW side of Mt. Scott, ~1.6 km up Mt. Scott trail, on downhill side of trail.	Whitebark pine stand with some mountain hemlock and red fir. Slopes are steep and rocky with very little vegetation.
CRLA5	Air, vegetation	42.9233	-122.0162	2713	3.5	108	0	Ridgetop			*Pinus albicaulis*	Top of Mt. Scott on NE side of fire lookout.	Gently sloping rocky summit ridge vegetated by clumps of small whitebark pine and some high-elevation herbs (pasque flower, paintbrush, *Penstemon* and bunch grasses).
Park: Denali National Park and Preserve, Alaska (DENA) **Ag Intensity Index:** 0 **IMPROVE AmmNO3:** 0.042 µg/m^3 **IMPROVE AmmSO4**: 0.36 µg/m^3 **North American Biome: EPA Ecoregion 3** – Taiga: Interior Forested Lowlands and Uplands (DENA1)**;** Northwestern Forested Mountains: Alaska Range (DENA2-6)													
DENA1	Vegetation	63.7740	-151.0194	221	-2.6	41	0	Flatland	0.41	*Flavocetraria cucullata*	*Picea mariana*	Moose Creek, ~ 23 km N of Wonder Lake.	Black-spruce dominated taiga and peatlands.
DENA2: Wonder	Air (2), fish, lake water, snow, sediments, vegetation	63.4538	-150.8720	655	-2.6	66	69	Toe slope	0.44	*Flavocetraria cucullata/ Masonhalea richardsonii*	*Picea mariana*	SW end of Wonder Lake on hillslope facing lake ~ 60 m downhill from water tower.	Black and white spruce woodland on gentle, NE-facing hillslope. Ground cover is matted blueberry, dwarf birch, grass, bryophytes, and lichens interspersed with willows and alder. Trees are open-grown with branches to ground level.

Site Name	Media	Lat.	Long.	Elev. (m)	Ann. Temp. (°C)	nn. Ppt. (cm)	Canopy Cover (%)	Landform	Lichen N % dw	Lichens collected	Conifers collected	Location	Habitat
DENA3: McLeod	Fish, lake water, snow, sediments, vegetation	63.3696	-151.1003	579	-2.4	70	16	Flatland	0.36	*Flavocetraria cucullata/ Masonhalea richardsonii*	*Picea mariana*	S side of McLeod Lake, ~ 15 km sw of Wonder Lake.	Black spruce peatland/taiga sloping to shoreline. Trees are open grown, most to 4.5 m tall, others to 9 m.
DENA4	Vegetation	63.5520	-150.9670	975	-2.9	68	5	Upper slope	0.43	*Masonhalea richardsonii*	*Picea mariana*	On ridge W of Wickersham dome.	Transition zone from black spruce forest; tundra on a S-facing slope near ridgetop. Small clumps of willow shrubs and a few scattered spruce trees; mostly dwarf willows, crowberry, other heaths, and lichens.
DENA5	Vegetation	63.1648	-151.3599	1296	-4.7	122	0	Upper slope	0.43	*Flavocetraria cucullata/ Masonhalea richardsonii*		Upper Birch Creek, NW footslopes of the Alaska Range below Peters Dome glacier.	Riparian zone above tree line above Birch Creek, a stony, braided stream. 1.2 m high willows along stream bank, most browsed but not this year (new growth > 2.5 cm long and untouched). Above stream is tundra on gentle hillslope, with dwarf willow.
DENA6	Vegetation	63.1386	-151.3221	1753	-6.9	178	0	Ridgetop	0.29	*Thamnolia*		NW side of Alaska Range on plateau at foot of Westermere Glacier on Peter's Dome; ~ 18 km NW of Mt. McKinley Peak.	High-elevation, graveled plateau, ~ 50% vegetated (~4 in. tall) and 50% gravels. Mostly sedges and moss, with trace amounts of other tundra plants. *Thamnolia* and sparse amounts of other lichens (mainly *Stereocaulon*) present.
Park: Gates of the Arctic National Park and Preserve, Alaska (GAAR) **Ag Intensity Index:** 0; **IMPROVE AmmNO3:** 0.05 µg/m^3; **IMPROVE AmmSO4**: 0.42 µg/m^3 **North American Biome: EPA Ecoregion 3** – Tundra: Brooks Range													
GAAR1: Matcharak	Air, fish, lake water, snow, sediments, vegetation	67.7529	-156.2323	505	-8.6	43	0	Flatland	0.48	*Flavocetraria cucullata/ Masonhalea richardsonii*		Matcharak Lake, birch-covered side slope, W side of lake.	Small side slope with dwarf birch and bryophytes.
Park: Glacier National Park, Montana (GLAC) **Ag Intensity Index:** 21.6; **IMPROVE AmmNO3:** 0.29 µg/m^3 **IMPROVE AmmSO4**: 0.84 µg/m^3 **North American Biome: EPA Ecoregion 3** – Northwestern Forested Mountains: Canadian Rockies													
GLAC1	Vegetation	48.6208	-113.9058	961	5.4	74	128	Lake basin	1.26	*Platismatia glauca*	*Tsuga heterophylla*	W side Continental Divide, past McDonald Ranger Station to trailhead at end of road; lake is SE of trail, ~ 0.2 km from trailhead.	Area on other side of trail away from lake was burned 1-2 years ago; trail acted as fire line, preventing burning along lake edge. Plot was downslope from trail, toward lake, and was not affected by the fire.
GLAC2	Vegetation	48.6757	-113.8096	1089	2.9	85	164	Toe slope	0.94	*Platismatia glauca*	*Tsuga heterophylla*	W side Continental Divide, ~ 0.6 km on Avalanche Lake Trail from trailhead at Avalanche Campground on NE side of Avalanche Creek.	On NE edge of creek, with areas of full exposure along creek edge, and partly shaded areas in forest.
GLAC3: Snyder	Air, fish, lake water, snow, sediments, vegetation	48.6261	-113.8031	1609	2.5	178	31	Lake basin	0.82	*Platismatia glauca/Alectoria sarmentosa*	*Picea engelmanii*	W side Continental Divide, Snyder Lake trail to Snyder Lake; in forest on SW edge of lake across from food preparation area.	In a lake valley, mid-valley slope.
GLAC4: Oldman	Air, fish, lake water, snow, sediments, vegetation	48.5104	-113.4552	2024	2.9	85	34	High elevation lake basin	0.97	*Letharia vulpina*	*Picea engelmanii*	E side Continental Divide, trail from Two Medicine Campground to Oldman Lake; site is S of trail where it meets the lake and along the stream from the lake.	Lake surrounded by many small, little-used foot trails. Stream flowing from lake.
GLAC5	Vegetation	48.6924	-113.5170	1353	2.9	121	114	Valley	1.16	*Letharia vulpina/ Hypogymnia physodes*	*Pseudotsuga menziesii*	E side Continental Divide, St. Mary Lake; road across from Rising Sun campground to picnic area; site is 100 m SW toward stream and along lake.	Abundant quaking aspen along stream and lake, with sparse lichens and Douglas-fir.
Park: Glacier Bay National Park, Alaska (GLBA) **Ag Intensity Index:** 0 **IMPROVE AmmNO3:** 0.04 µg/m^3 **IMPROVE AmmSO4**: 0.46 µg/m^3 (2005 Data from PETE1 in Petersburg, SE AK) **North American Biome: EPA Ecoregion 3** – Marine West Coast Forest: Coastal Western Hemlock-Sitka Spruce Forests													
GLBA1	Air, vegetation	58.6022	-135.8831	8	4	261	79	Toe slope	0.79	*Platismatia glauca*	*Picea sitchensis*	In forest near shore of N end of Beartrack Cove at toe-slope of SW ridge.	Sitka spruce stand near the beach. The forest floor is entirely covered in moss with 5-leaf bramble mixed in. Some devilsclub and *Aruncus* shrubs in understory, and western hemlock in the regenerating stand.
GLBA2	Vegetation	58.6061	-135.8801	168	4	261	106	Mid-slope bench	0.51	*Sphaerophorus globosus*	*Picea sitchensis*	On first knob on SW ridge of Beartrack Mountain.	Sitka spruce stand that appears ~ 100-150 years old. The regenerating stand is almost entirely western hemlock. The ground is covered in a dense thick carpet of moss. Some huckleberry, *Aruncus*, and strawberry-leaf raspberry.
GLBA3	Vegetation	58.6093	-135.8724	457	4	261	117	Mid-slope	0.57	*Sphaerophorus globosus*	*Picea sitchensis*	On SW slope of Beartrack Mountain ~200 m E of first major stream. Just below glacial trim line.	Late-seral mountain hemlock/Sitka spruce stand on a steep SW-facing slope. The forest is dense and the understory has a high cover of huckleberry; the ground is mossy.
GLBA4	Vegetation	58.6121	-135.8714	625	4	261	18	Upper slope	0.39	*Alectoria sarmentosa*	*Picea sitchensis*	Treeline at the headwaters of first major creek W of Beartrack Mountain's SW ridge.	Krumoltz mountain hemlock with a few Sitka spruce with high cover of heather, copperbush, and deer cabbage. Some ferns and *Sphagnum*.

Site Name	Media	Lat.	Long.	Elev. (m)	Ann. Temp. (°C)	nn. Ppt. (cm)	Canopy Cover (%)	Landform	Lichen N % dw	Lichens collected	Conifers collected	Location	Habitat
Park: Great Sand dunes National Park and Preserve, Alaska (GRSA)													
Ag Intensity Index: **IMPROVE AmmNO3:** 0.20 µg/m^3 **IMPROVE AmmSO4**: 0.82 µg/m^3													
North American Biome: EPA Ecoregion 3 – Northwestern Forested Mountains: Southern Deserts (GRSA1); Northwestern Forested Mountains: Southern Rockies (GRSA2-5)													
GRSA1	Vegetation	37.7258	-105.5323	2469	5.3	32	18	Valley			*Pinus edulis*	Near park headquarters, ~ 60 m SW of autoshop	Two-needle piñon/Rocky Mountain juniper woodland on valley floor bordering a large grassland. Grass dominates the ground cover with scattered but abundant prickly-pear cactus. Very windy.
GRSA2	Vegetation	37.7308	-105.4874	2774	4.3	48	5	Mid-slope	1.46	*Xanthoparmelia*	*Pinus edulis*	Mosca Pass trail, midway to pass on a steep slope on the N side of the trail.	Two-needle piñon/alderleaf mountain mahogany woodland. Steep SW-facing slope with many rocks and rocky outcroppings.
GRSA3	Vegetation	37.7338	-105.4602	2941	3.9	58	46	Upper slope			*Pinus flexilis*	Mosca Pass, just down-slope from radar tower.	Meadow dominated by quaking aspen with some limber and ponderosa pines.
GRSA4	Vegetation	37.7223	-105.4699	3109	4.3	48	59	Mid-slope	0.77	*Xanthoparmelia*	*Pinus flexilis*	On the N slope of Carbonate Mtn ~ 0.8 km upslope; use the drainage ~1.6 km W of Mosca Pass for access.	NW-facing slope in a quaking aspen/ Engelmann spruce forest with yellow lupine and branch litter. High cover of nitrophilous lichens, esp. *Xanthoria*.
GRSA5	Air, vegetation	37.7149	-105.4704	3338	4.3	48	36	Ridgetop			*Pinus flexilis*	On N-facing ridge of Carbonate Mtn; grassy bench just below snag-ringed knob, benchmark 3,435 m.	NE-facing slope bordering the ridgetop in a grassy opening with patchy Engelmann spruce/quaking aspen forest with some limber pine. Very windy with winds blowing up the W-NW slope. High nitrophilous lichen (*Xanthoria*) cover on spruce.
Park: Grand Teton National Park, Wyoming (GRTE)													
Ag Intensity Index: 10.2 **IMPROVE AmmNO3:** 0.22 µg/m^3 **IMPROVE AmmSO4**: 0.58 µg/m^3													
North American Biome: EPA Ecoregion 3 – Northwestern Forested Mountains: Middle Rockies													
GRTE1	Vegetation	43.7307	-110.7389	2073	2.2	80	36	Valley	0.99	*Usnea*	*Pinus contorta*	W edge of Lupine Meadows, just off trail; ~ 0.53 km from Lupine Meadows trailhead.	On valley floor at edge of a subalpine meadow. Lodgepole pine is dominant tree with subalpine fir, quaking aspen, and Engelmann spruce. Many snags and dying trees. Some nitrophilous lichens (esp. *Xanthoria*).
GRTE2	Vegetation	43.7256	-110.7601	2362	2.2	80	76	Mid-slope	0.99	*Letharia vulpina*	*Abies lasiocarpa*	Slope above Bradley Lake on trail to Amphitheatre Lake; off second switchback.	Subalpine forest dominated by subalpine fir and Douglas-fir. S-facing slope with dense herb groundcover.
GRTE3	Vegetation	43.7264	-110.7657	2591	1.1	106	66	Mid-slope	0.88		*Pinus flexilis*	On the SE-facing slope below Amphitheater Lake; mid-slope half-way between Amphitheater Lake and Valley floor just up trail from the Garnet Canyon Junction.	SE-facing slope in subalpine forest dominated by subalpine fir. Ground cover mostly grasses with some heaths and a few large boulders (lots of marmot scat on boulders).
GRTE4	Vegetation	43.7276	-110.7713	2804	1.1	106	47	Mid-slope			*Pinus flexilis*	~0.5 km E of Surprise Lake, just off trail where the slope steepens and switchbacks shorten.	On a steep E-facing slope in a mixed conifer stand. Ground has a high cover of thinleaf huckleberry and grouse whortleberry and large granite outcrops.
GRTE5	Air, vegetation	43.1300	-110.7800	3048	2.2	68	21	Ridgetop			*Pinus albicaulis*	S rim above Amphitheater Lake.	On an E-facing ridge above a glacial cirque. Trees are patchy mixed pine, fir, and spruce. On a glacier cut and mostly all granite with some alpine herbs. No lichens, a few crusts.
Park: Katmai National Park and Preserve, Alaska (KATM)													
Ag Intensity Index: 0 **IMPROVE AmmNO3:** 0.10 µg/m^3 **IMPROVE AmmSO4**: 0.50 µg/m^3 (Data from monitor at Tuxedni Wilderness, USFWS)													
North American Biome: EPA Ecoregion 3 – Tundra: Bristol Bay-Nushagak Lowlands (KATM1-5); Marine West Coast Forest: Alaska Peninsula Mountains (KATM6)													
KATM1	Vegetation	58.5459	-155.7836	36	2.2	50	16	Flatland	0.52	*Hypogymnia physodes*	*Picea glauca*	~ 2 km from Brooks camp on road to Three Forks Overlook.	Forest uneven age with fallen conifers interspaced hardwoods. Height of dominant trees is 18-21 m.
KATM2	Vegetation	58.5686	-155.7937	213	1.9	54	107	Toe slope	0.71	*Hypogymnia physodes*	*Picea glauca*	Dumpling Mountain trail on small knoll facing Naknek Lake.	Scattered white spruce 6-12 m tall on steep sloped knob with Sitka alder and deep moss mats. Oldest trees probably 100-200 years old. Collected over larger area, including a meadow and slope on far side of the meadow. Meadow had black cottonwood and *Calamagrostis.*
KATM3	Air, vegetation	58.5711	-155.8036	370	1.9	54	16	Mid-slope	0.97	*Hypogymnia physodes*	*Picea glauca*	Dumpling Mountain at 370 m.	Vegetation dominated by 3 m Sitka alder, heavily infested and defoliated by inch worms.
KATM4	Vegetation	58.5718	-155.8421	563	1.4	68	3	Upper slope	0.46	*Flavocetraria cucullata*	*Picea glauca*	On S face of Dumpling Mountain 180 m below peak, downhill from trail overlooking Naknek Lake, Brooks River, and Brooks Lake.	At tree line, scattered short spruce (up to 1.2 m tall) among tundra vegetation, dominated by crowberry and other heaths.
KATM5	Vegetation	58.5793	-155.8558	724	1.4	68	3	Ridgetop	0.44	*Flavocetraria cucullata*	*Picea glauca*	Top of Dumpling Mountain; SE-facing slope	Tundra on gently sloping top of Dumpling Mountain. Spruce needles were collected from very short trees (up to 0.4 m) widely scattered on mountain top.
KATM6	Vegetation	58.4715	-155.4901	1112	0.1	83	0	Upper slope	0.52	*Flavocetraria cucullata*		W slopes of Mt. Katolinat, accessed from Iliuk Arm of Naknek Lake, ~ 610 m below peak.	Alpine tundra, gently stone and gravel slope with thin soils near uppermost NW slopes of Mt. Katolinat.
Park: Lassen Volcanic National Park, California (LAVO)													
Ag Intensity Index: 7.4; **IMPROVE AmmNO3:** 0.20 µg/m^3; **IMPROVE AmmSO4**: 0.61 µg/m^3													
North American Biome: EPA Ecoregion 3 – Northwestern Forested Mountains: Sierra Nevada													
LAVO1	Vegetation	40.5568	-121.5315	1829	7.4	103	3	Mid-slope	0.59	*Letharia vulpina*	*Abies concolor*	At Sunflower Flat ~120 m SW of main park road.	A nearly flat ponderosa pine, western white fir woodland with some shrubby manzanita and chinquapin. Some boulders from adjacent rocky slope; ground cover mostly grasses. Several downed trees in various decay states.
LAVO2	Vegetation	40.5314	-121.5342	2012	6.6	109	62	Upper slope	0.51	*Letharia vulpina*	*Abies concolor*	~2.4 km on Chaos Crags trail from trailhead.	Late-seral, mixed pine and white fir woodland. W-facing rocky slope with a dense covering of bearberry manzanita, and older fir trees have dense cover of the wolf-lichen, *Letharia*.
LAVO3	Vegetation	40.4550	-121.5399	2271	4.1	303	76	Upper slope	0.85	*Letharia columbiana*	*Abies magnifica*	Just below the Ridge Lakes Basin ~ 0.8 km up Ridge Lakes Trail.	In a California red fir/mountain hemlock stand bordered by a creek and wet meadow on the N side and dry meadow (lily and waterleaf) on the S side. Very little ground vegetation in the forested section, mostly duff and branch litter with some lupine.

Site Name	Media	Lat.	Long.	Elev. (m)	Ann. Temp. (°C)	nn. Ppt. (cm)	Canopy Cover (%)	Landform	Lichen N % dw	Lichens collected	Conifers collected	Location	Habitat
LAVO4	Vegetation	40.4392	-121.5576	2499	4.8	254	18	Upper slope	0.87	*Letharia vulpina*	*Abies magnifica*	On S slope of Brokeoff Top Mtn, ~3.2 km up trail.	In a mountain hemlock stand on a mild sloping rocky bench. The herb layer is almost all lupine and wolf-lichens (*Letharia* spp.) are abundant.
LAVO5	Air, vegetation	40.4476	-121.5662	2713	4.8	254	21	Ridgetop	0.94	*Letharia vulpina*	*Abies magnifica*	Near summit of Brokeoff Top Mtn, on NW ridge.	On a mountain top with nearly krumholtz mountain hemlock and some California red fir. The slope is W-facing and rocky with some bearberry and manzanita. The lichen community consisted of mostly of the wolf lichens, *Letharia vulpina* and *L. columbiana*.
Park: Mount Rainier National Park, Washington (MORA) **Ag Intensity Index:** 6; **IMPROVE AmmNO3:** 0.20 µg/m^3; **IMPROVE AmmSO4**: 1.11 µg/m^3 **North American Biome: EPA Ecoregion 3** – Northwestern Forested Mountains: Cascades													
MORA1	Vegetation	46.7433	-121.8915	654	6.4	197	77	Valley	0.63	*Alectoria sarmentosa*	*Tsuga heterophylla*	Along Tahoma Creek, off Rd. 706.	Silver fir/western hemlock/Douglas-fir stand along creek. Average dbh <53 cm, age 200+ years, but some young trees (1.5 m) present also.
MORA2	Vegetation	46.7697	-121.7893	985	3.5	244	91	Mid-slope	0.47	*Alectoria sarmentosa*	*Tsuga heterophylla*	Ricksecker Point Picnic Area; trail from rear of parking lot, past restrooms, towards river behind outhouse.	Woodland/riparian area, with old Douglas-fir (200+ years) and an understory of mostly Pacific silver fir, western hemlock, mountain hemlock, and a few pines. Many paths through site to river edge.
MORA3: LP19	Air, fish, lake water, snow, sediments, vegetation	46.8239	-121.8953	1372	4	222	85	Lake basin	0.42	*Alectoria sarmentosa*	*Abies amabilis*	Unnamed lake LP19 vicinity; 80-90 degrees up steep slope above St. Andrews Creek drainage, NE of Puyallup Lakes.	Stand 300+ years old, with mature Douglas-fir, 10-100-year-old Pacific silver fir. Fir most abundant, but 100-200-year-old western and mountain hemlock also present in low abundance. Red huckleberry and oval-leaf blueberry cover 50-75% of forest floor.
MORA4: Golden	Air, fish, lake water, snow, sediments, vegetation	46.8878	-121.8987	1369	4.6	220	36	Lake basin	0.54	*Alectoria sarmentosa*	*Abies amabilis*	N side Golden Lake.	Site is on a bench on high mountain. Woodland, age 150+ years, with tall Douglas-fir and Pacific silver fir in understory. Much *Vaccinium* in understory, and lots of moss near lake. *Alectoria* dominant lichen at site.
MORA5	Vegetation	46.8006	-121.7831	1809	2.4	260	36	Upper slope			*Abies procera*	Mildred Point; in middle of flat area.	Flat bench at base of Mt. Rainier glacier overlooking steep and deep glacial drainage. Stand has noble fir and Alaskan yellow cedar with very few lichens. Pacific silver fir and mountain hemlock also present in low abundance.
Park: Noatak National Preserve, Alaska (NOAT) **Ag Intensity Index:** 0 ; **IMPROVE AmmNO3:** NA µg/m^3; **IMPROVE AmmSO4**: NA µg/m^3 **North American Biome: EPA Ecoregion 3** – Tundra: Arctic Foothills (NOAT1, NOAT3); Tundra: Brooks Range (NOAT5)													
NOAT1	Vegetation	68.2847	-161.4657	227	-7.4	41	0	Toe slope	0.38	*Masonhalea richardsonii*		Knoll above Middle Kugururok River.	Dwarf birch on tundra-covered knoll.
NOAT3: Burial	Air, fish, lake water, snow, sediments, vegetation	68.4063	-159.2223	388	-8.8	39	0	Flatland	0.53	*Masonhalea richardsonii/ Flavocetraria cucullata*		Burial Lake; gravel drainage to lake.	Dwarf birch in well-drained area.
NOAT5	Vegetation	68.4625	-161.4612	675	-8.8	50	0	Upper slope	0.35	*Masonhalea richardsonii*		SW of Copter Peak.	Alpine *Dryas* tundra with mountain heather.
Park: North Cascades National Park, Washington (NOCA) **Ag Intensity Index:** 3.7; **IMPROVE AmmNO3:** 0.13 µg/m^3; **IMPROVE AmmSO4**: 0.78 µg/m^3 **North American Biome: EPA Ecoregion 3** – Northwestern Forested Mountains: North Cascades													
NOCA1	Vegetation	48.6493	-121.3070	198	8.6	207	74	Toe slope	0.34	*Alectoria sarmentosa*	*Pseudotsuga menziesii*	On Thornton Creek, just below single-lane bridge (off dirt road to Thornton Lake trailhead), 60 m from road.	Steep, granite outcrop on the E side of a major perrenial creek. Forest is dominated by Douglas-fir and regeneration is mostly red cedar. Ground vegetation is almost all salal.
NOCA2	Vegetation	48.6420	-121.3370	614	8.6	206	84	Mid-slope	0.52	*Platismatia glauca*	*Tsuga heterophylla*	Lower S slope of Mt. Triumph, 4 km up Thornton Lake Rd., 90 m N of road.	E slope in a western hemlock forest which was logged <100 years ago; oldest stand found at this elevation in area. Ground is mossy with some scattered herbs and shrubs.
NOCA3	Vegetation	48.6641	-121.3266	945	8.3	243	92	Mid-slope	0.50	*Alectoria sarmentosa*	*Abies amabilis*	SE slope of Mt. Triumph ~ 4 km up the Thornton Lakes trail.	SE slope in a western hemlock forest with Pacific silver fir as the regeneration stand. Ground is mossy; thinleaf huckleberry and beard lichens abundant.
NOCA4	Vegetation	48.6716	-121.3187	1228	8.7	205	97	Upper slope	0.37	*Alectoria sarmentosa*	*Abies amabilis*	Upper SE slope of Mt. Triumph, off Thornton Lakes trail just below the park boundary sign.	SE slope in an old-growth, mixed-conifer stand (western hemlock, Alaska yellow cedar and Pacific silver fir). Ground is mossy; thinleaf huckleberry and beard lichens abundant.
NOCA5	Air, vegetation	48.6824	-121.3217	1600	8.2	205	47	Ridgetop	0.48	*Alectoria sarmentosa*	*Abies amabilis*	S ridge of Trappers Peak, near treeline, above lower Thornton Lake.	Site is on a S-facing ridgeline (rim of glacial cirque) and at tree-line. Forest of Alaska yellow cedar, mountain hemlock and Pacific silver fir. Slope is steep and rocky with open soil, alpine herbs and thinleaf huckleberry.

Site Name	Media	Lat.	Long.	Elev. (m)	Ann. Temp. (°C)	nn. Ppt. (cm)	Canopy Cover (%)	Landform	Lichen N % dw	Lichens collected	Conifers collected	Location	Habitat
Park: Olympic National Park, Washington (OLYM)													
Ag Intensity Index: 2.2; **IMPROVE AmmNO3:** 0.39 µg/m^3; **IMPROVE AmmSO4**: 0.99 µg/m^3													
North American Biome: EPA Ecoregion 3 – Marine West Coast Forest: Puget Lowlands (OLYM1); Marine West Coast Forest: Coast Range (OLYM2), Northwestern Forested Mountains: North Cascades (OLYM3-5)													
OLYM1	Vegetation	48.0926	-123.4338	137	9.4	92	85	Valley		*Lobaria oregana*	*Tsuga heterophylla*	Outskirts of Port Angeles; Peabody Creek Loop Trail, along w side of creek, ~ 2/3 way around the loop.	Mature mixed conifer/deciduous forest bordering urban area. Douglas-fir dominant, with western hemlock in understory.
OLYM2	Vegetation	47.9535	-123.8381	518	6.7	360	94	Valley		*Alectoria sarmentosa*	*Tsuga heterophylla*	~ 3.2 km SE of Sol Duc Hot Spgs Resort on N side of Sol Duc River, ~0.4 km from junction with Canyon Creek.	Old-growth western hemlock forest along Sol Duc River. Floodplain of river is approximately 61 m wide with mainly rounded stones and small boulders with islands of alder and willow. Forest understory has low moss cover, and some blueberry, ferns.
OLYM3: Hoh	Air, fish, lake water, snow, sediments, vegetation	47.8973	-123.7831	1448	6.9	458	31	Upper slope	0.36	*Alectoria sarmentosa/ Bryoria fuscescens*	*Abies lasiocarpa*	NW slope above Hoh Lake.	NW-facing slope above a subalpine lake. Stand is mixed mountain hemlock and subalpine fir with a high cover of blueberry.
OLYM4: PJ	Air, fish, lake water, snow, sediments, vegetation	47.9463	-123.4136	1392	4.9	216	101	Lake basin	0.44	*Platismatia glauca/ Bryoria fuscescens*	*Abies amabilis*	SW side of PJ Lake; ~0.8 km e of Hurricane Ridge Rd. to Obstruction Point, and 0.8 km N of Eagle Point.	Mixed fir/red cedar old-growth forest adjacent to meadow with willow. Willow also present along lake shore. Little understory, site has deep snow cover in winter. Lake has significant algal growth.
OLYM5	Vegetation	47.9307	-123.4105	1850	4.9	216	38	Ridgetop	0.63	*Alectoria sarmentosa/ Bryoria*	*Abies lasiocarpa*	Ridgetop approximately 100 m E of Hurricane Ridge Rd. to Observation Point, and ~ 1 km S of Eagle Point.	Ridgetop with mature old-growth stand of subalpine fir in subalpine habitat. Site is wind-blasted from the E and W, high cover of lichens on large trees in most sheltered areas.
Park: Rocky Mountain National Park, Colorado (ROMO)													
Ag Intensity Index: 14.4; **IMPROVE AmmNO3:** 0.35 µg/m^3; **IMPROVE AmmSO4**: 0.83 µg/m^3													
North American Biome: EPA Ecoregion 3 – Northwestern Forested Mountains: Southern Rockies													
ROMO1	Air, vegetation	40.2381	-105.7995	2560	1.7	65	92	Valley			*Picea engelmanii*	W side of Continental Divide, S of East Inlet trailhead, near creek.	Flat floodplain forested with lodgepole pine and Engelmann spruce. Much willow and some aspen in understory. Grasses abundant; most herbs have withered. Evidence of moose in area: lots of browsed willow and pellets.
ROMO2	Air, vegetation	40.2305	-105.7611	2720	1.2	79	36	Mid-slope			*Abies lasiocarpa*	W side of Continental Divide, halfway between Cats Lair Camp and Lower East Inlet Camp; East Inlet Trail, on slope above falls.	Steep, dry, rocky slope with a lodgepole pine dominated stand. Quaking aspen is dominant hardwood, a few willow shrubs present.
ROMO3: Lone Pine	Air, fish, lake water, snow, sediments, vegetation	40.2310	-105.7310	3018	0.1	104	21	High elevation lake basin			*Abies lasiocarpa*	W side of Continental Divide, on S shore of Lone Pine Lake.	Meadow on the s shore of a subalpine lake with a few large groves of willow; bordered by an Engelmann spruce forest.
ROMO4	Air, vegetation	40.2300	-105.7130	3232	-0.4	116	18	Mid-slope			*Abies lasiocarpa*	W side of Continental Divide, on S-facing rock outcrop plateau above Lake Verna.	Rock outcrop plateau with sparse forest of subalpine fir and Engelmann spruce. No other vegetation, only rock.
ROMO5	Vegetation	40.3916	-105.6867	3451	1.4	92	16	Ridgetop			*Abies lasiocarpa*	W side of Continental Divide, near Ute Crossing on Sundance Mountain.	Rocky ridgetop with patchy forest of subalpine fir; some krumholtz and small patches of willow.
ROMO6: Mills	Air, fish, lake water, snow, sediments, vegetation	40.2916	-105.6438	3042	1.3	113	62	High elevation lake basin	1.2	*Xanthoparmelia*	*Picea engelmanii*	E side of Continental Divide, on NW corner of Mills Lake, on large flat rock at outlet.	High-elevation Engelmann spruce/subalpine fir with limber pine. Large, smooth, rocky outcrops covered with crustose lichens. Krumholtz conifers present.
Park: Sequoia and Kings Canyon National Parks, California (SEKI)													
Ag Intensity Index: 16.6; **IMPROVE AmmNO3:** 2.19 µg/m^3; **IMPROVE AmmSO4**: 1.98 µg/m^3													
North American Biome: EPA Ecoregion 3 – Mediterranean California: Southern and Central Chaparral and Oak Woodlands (SEKI2); Northwestern Forested Mountains: Sierra Nevada (SEKI3-7)													
SEKI2	Air, vegetation	36.5762	-118.7862	1573	16.9	36	88	Valley	2.23	*Letharia vulpina*	*Abies concolor*	Marble Fork of the Kaweah River, just upstream from Crystal Cove Drive overpass.	Mature forest of pine, incense cedar, and California red fir along boulder-filled, granite riverbed ~ 25 m wide bordered by willow.
SEKI3	Vegetation	36.5536	-118.7492	2071	10.3	100	78	Mid-slope bench	1.59	*Letharia vulpina*	*Abies concolor*	Crescent Meadow.	Meadow and nearby stand along Crescent Creek. Vegetation is diverse and in good condition. Tree cover is clumped.
SEKI4	Air, vegetation	36.5985	-118.7212	2332	5.3	108	31	Mid-slope bench	1.56	*Letharia vulpina*	*Abies magnifica*	Wolverton Creek Meadow.	Meadow of sedges surrounded by tall California red fir and open-grown lodgepole pine encroaching on meadow. Vegetation appears healthy. Site is on a bench on a mid-slope.
SEKI5: Emerald	Air, fish, lake water, snow, sediments, vegetation	36.6005	118.6789	2816	3.4	89	47	High elevation lake basin	1.53	*Letharia vulpina*	*Abies magnifica*	Emerald Lake Basin, Topokah valley watershed.	Mixed red fir/pine stand with Labrador tea understory; many granite boulders.

Site Name	Media	Lat.	Long.	Elev. (m)	Ann. Temp. (°C)	nn. Ppt. (cm)	Canopy Cover (%)	Landform	Lichen N % dw	Lichens collected	Conifers collected	Location	Habitat
SEKI6: Pear	Air, fish, lake water, snow, sediments, vegetation	36.6040	-118.6690	2911	2.4	75	34	High elevation lake basin			*Pinus contorta*	Outflow area of Pear Lake.	Drainage area for alpine lake, but currently dry. Pine stand with willow on granite slabs. Algal and aquatic moss lines indicate that the lake floods widely over the granite slabs in some places.
SEKI7	Air, vegetation	36.5165	-118.8017	630	14.5	76	49	Valley				Potwisha Campground n of highway on Deep Canyon Creek.	Creek with one main channel and granite boulders on either side. Tree canopy overhangs river and provides intermittent shade.
Park: Stikine-LeConte Wilderness, Tongass National Forest, Alaska (STLE) **Ag Intensity Index:** 0.1; **IMPROVE AmmNO3:** 0.04 µg/m^3; **IMPROVE AmmSO4**: 0.46 µg/m^3 (2005 IMPROVE data from PETE1, Petersburg SE AK). **North American Biome: EPA Ecoregion 3** – Marine West Coast Forest: Pacific Coastal Mountains													
STLE1	Air, vegetation	56.7910	-132.5110	0	4.5	318	31	Marine beach	0.49	*Platismatia glauca/ Alectoria sarmentosa*	*Picea sitchensis*	Bussy Creek outlet NE side of creek in upper beach meadow 60 -75 m from inter-tidal flats.	Upper beach meadows with scattered Sitka spruce. Vegetation samples were collected from open-grown spruce and along forest edge.
STLE2	Air, vegetation	56.8047	-132.5317	254	3.6	378	119	Mid-slope	0.49	*Platismatia glauca/Lobaria oregana*	*Picea sitchensis*	Bussy Creek drainage on lower slopes at 254 m following ridge line between the N and S main tributaries.	Old growth mixed coniferous forest of Alaska yellow cedar and western hemlock. Canopy cover ~80%. Understory of mixed forms and shrubs with high moss ground cover. Area slopes steeply facing Bussy Creek drainage.
STLE3	Air, vegetation	56.8095	-132.5407	567	3.6	378	34	Mid-slope	0.39	*Alectoria sarmentosa*	*Picea sitchensis*	SE of small lake above Bussy Creek. In long, narrow Muskeg bench parallel to and overlooking drainage on long edge.	Muskeg bench with scattered shorepine (*Pinus contorta*) on SE-facing slope of Thunder Mountain overlooking Bussy Creek drainage.
STLE4	Air, vegetation	56.8250	-132.5715	815	2.7	488	3	Ridgetop	0.37	*Platismatia glauca/ Alectoria sarmentosa*	*Picea sitchensis*	Ridgetop knob on Wilderness boundary ~ 0.4 km NW of Bussy Lake and 0.4 km due W of small lake beside Wilderness. To NW a prominent cliff face overlooks headwaters of the Muddy River.	Small knob with several scattered ponds. Subalpine heath with clumps of old mountain hemlock.
STLE5	Vegetation	56.8180	-132.6090	1064	3.6	431	5	Ridgetop	0.45	*Platismatia glauca/ Cladina arbuscula*	*Picea sitchensis*	Top of Thunder Mountain.	Alpine mountain peak dominated by sedges, avues, and dwarf heath.
Park: Wrangell-St. Elias National Park and Preserve, Alaska (WRST) **Ag Intensity Index:** 0; **IMPROVE AmmNO3:** 0.04 µg/m^3; **IMPROVE AmmSO4**: 0.46 µg/m^3 (2005 data from PETE1, Petersburg SE AK) **North American Biome: EPA Ecoregion 3** – Marine West Coast Forest: Pacific Coastal Mountains (WRST1); Northwestern Forested Mountains: Copper Plateau (WRST2-3); Northwestern Forested Mountains: Interior Highlands (WRST4-5)													
WRST1	Vegetation	60.0476	-141.3066	7	3.1	312	101	Marine beach	0.51	*Hypogymnia apinnata*	*Picea sitchensis*	Kageets Point on E shore of Icy Bay, ~ 0.4 km S of landing strip, in Sitka spruce/alder forest at shoreline.	Oblong collection area along beach fringe. Recently deglaciated (50-100 years ago) forelands, ~ 30 m into the Sitka spruce forest from the beach. Age class of trees varying depending on distance from the shore and isostatic rebound.
WRST2	Vegetation	61.5219	-144.4002	219	-1.9	31	16	Valley			*Picea glauca*	S side of McCarthy Rd. along silt bluffs over looking confluence of Chintina and Copper Rivers ~0.8 km from road and campground.	Edge of forest along river bluff, multiple age class of white spruce. Many old dead trees of possibly black spruce. Collected along forest edge at bluff.
WRST3	Air, vegetation	61.3856	-143.6014	648	-1.7	62	85	Toe slope			*Picea glauca*	From highest point along Crystalline Hills trail on N side McCarthy Rd., just E of marble grotto, take uphill side trail ~23 m to highest point, scale small cliff, and go uphill another 60 m.	Steep, mostly treeless slope with scattered clumps of quaking aspen and white spruce.
WRST3B	Vegetation	61.3844	-143.6063	607	-1.7	62	31	Toe slope	0.60	*Hypogymnia physodes*		Crystalline Hills loop trail at 607 m.	White spruce/quaking aspen woodland regenerating from fire.
WRST4	Vegetation	61.4964	-142.8684	1020	-2.2	85	43	Mid-slope			*Picea glauca*	Trail to Bonanza Mine from Kennicott, W side of trail at 1,020 m; exposed to the Kennicott Valley, glaciers.	Conifers from 2 to 12 m tall, declining in health. Area gets 2.5 - 3 m snow in winter. Exposed to Kennicott glacier and Kennicott, Nizina, and Chitna River valleys with views to Chugach Mountains ~80 km distant.
WRST5	Vegetation	61.5014	-142.8381	1421	-2.7	127	3	Upper slope	0.49	*Flavocetraria cucullata/ Cladina arbuscula-mitis*	*Picea glauca*	On trail to Bonanza Mine below pass between Bonanza ridge and Porphyry Mountain, ~2.5 km E of Kennicott.	Dwarf ericaceous vegetation with *Dryas*, moss and willow. Slope is exposed to Kennicot glacier, river headwaters, and basin.
Park: Yosemite National Park, California (YOSE) **Ag Intensity Index:** 13.8; **IMPROVE AmmNO3:** 0.46 µg/m^3; **IMPROVE AmmSO4**: 0.98 µg/m^3 **North American Biome: EPA Ecoregion 3** – Northwestern Forested Mountains: Sierra Nevada													
YOSE1	Vegetation	37.6783	-119.7541	661	12.1	82	36	Valley	1.35	*Xanthoparmelia*	*Pinus sabiniana*	Yosemite National Park on Hwy. 140 at turnout on left side of road just inside SW park boundary on N bank of river.	Large boulders with canyon live oak and poison oak; a few foothill and ponderosa pines present.
YOSE2	Vegetation	37.7150	-119.6801	1433	10.7	86	39	Mid-slope	0.98	*Letharia vulpina*	*Pinus ponderosa*	On N-facing slope of Turtleback Dome.	Dry, rocky slope; mixed conifer forest (pine, cedar, and Douglas-fir), with abundant manzanita in the understory. All conifer species in the regeneration layer. Wolf -lichen (*Letharia vulpina)* abundant; some nitrophilous lichens (*Xanthoria)* on oaks.
YOSE3	Vegetation	37.7237	-119.5336	1829	10.3	98	77	Mid-slope	1.12	*Letharia vulpina*	*Pinus lambertiana*	On top of Nevada Falls on the Merced River ~30 m S of falls off trail.	Incense cedar-dominated stand with multiple conifer species present. Gentle NW-facing slope with branch litter, a thin layer of duff, and two herbs (western rattlesnake plantain and Pacific Rhododendron).

Site Name	Media	Lat.	Long.	Elev. (m)	Ann. Temp. (°C)	nn. Ppt. (cm)	Canopy Cover (%)	Landform	Lichen N % dw	Lichens collected	Conifers collected	Location	Habitat
YOSE4	Vegetation	37.7506	-119.3631	2713	4.2	110	21	Mid-slope			*Pinus contorta*	On Lewis Creek near confluence with trail around Cony Crags into the Lyell Forte Basin.	Lodgepole pine woodland on slab granite; a few young western hemlock and California red fir and scattered shrubby chinquapin and western brackenfern. Some pines with charred trunk bases.
YOSE5	Air, vegetation	37.7744	-119.3371	3048	3.1	108	16	Upper slope			*Pinus contorta*	Valley at head of Lewis Creek watershed at the confluence of Gallison Lake Outlet Creek.	Alpine meadow with pine woodland; willow-lined creek runs through site center.

Key to Table:

Park = name, state and acronym of the park or wilderness.

Ag Intensity = agricultural intensity in a 150 km radius around the park, see methods section for more details.

IMPROVE AmmNO3 and **AmmSO4 =** mean annual nitrate and ammonium sulfate concentrations in micrograms per cubic meter in ambient fine particulates under 2.5 um in diameter sampled for 24 hours, air is sampled every 3rd day at IMPROVE monitors located in WACAP parks and wilderness, if no IMPROVE site exists for the park then data is from the nearest IMPROVE site and the name of that site is given, value is the 1998-2004 mean for annual data that meets IMPROVE quality assurance criteria, see methods section for more details.

Biome = Level three US EPA ecological region in which the site is located, see http://www.epa.gov/wed/pages/ecoregions/ecoregions.htm for general information.

Long. = latitude and longitude of site center in decimal degrees, mapping datum WGS84, sites were approximately 1 ha.

Elev. (m) = elevation in meters, derived from site location on USGS topographic 15' quadrangles.

Ann. Temp. and **Ann. Ppt.** = mean annual temperature in degrees Celsius and mean annual precipitation in centimeters estimated from the PRISM climate model—see Chapter 3 for details.

Canopy Cover (%) = field ocular estimate of the canopy cover of dominant and co-dominant trees on the site as a percentage of total site area.

Landform = physiographical feature on which the site was located, determined from USGS 15' topographic quadrangles.

Lichen N % dw = mean nitrogen concentration in lichen thalli collected on the site as percent of dry weight, if more than one species was collected, species N concentrations were averaged after averaging laboratory and field replicates.

Lichens collected = lichens collected for nitrogen, sulfur, metals and SOC analysis.

Conifers collected = conifer species collected for SOC analysis. If vegetation was collected, but both "conifers collected" and "lichens collected" fields are blank, then leaves or bark of deciduous shrubs were collected and results are not reported.

Location = site location description.

Habitat = ecological characteristics of the collection site.