DENALI NATIONAL PARK AND PRESERVE

CENTRAL ALASKA NETWORK

Vegetation Monitoring Program

Summary Trip Report: Birch Bend Mini-grid

28 July to 5 August, 2008

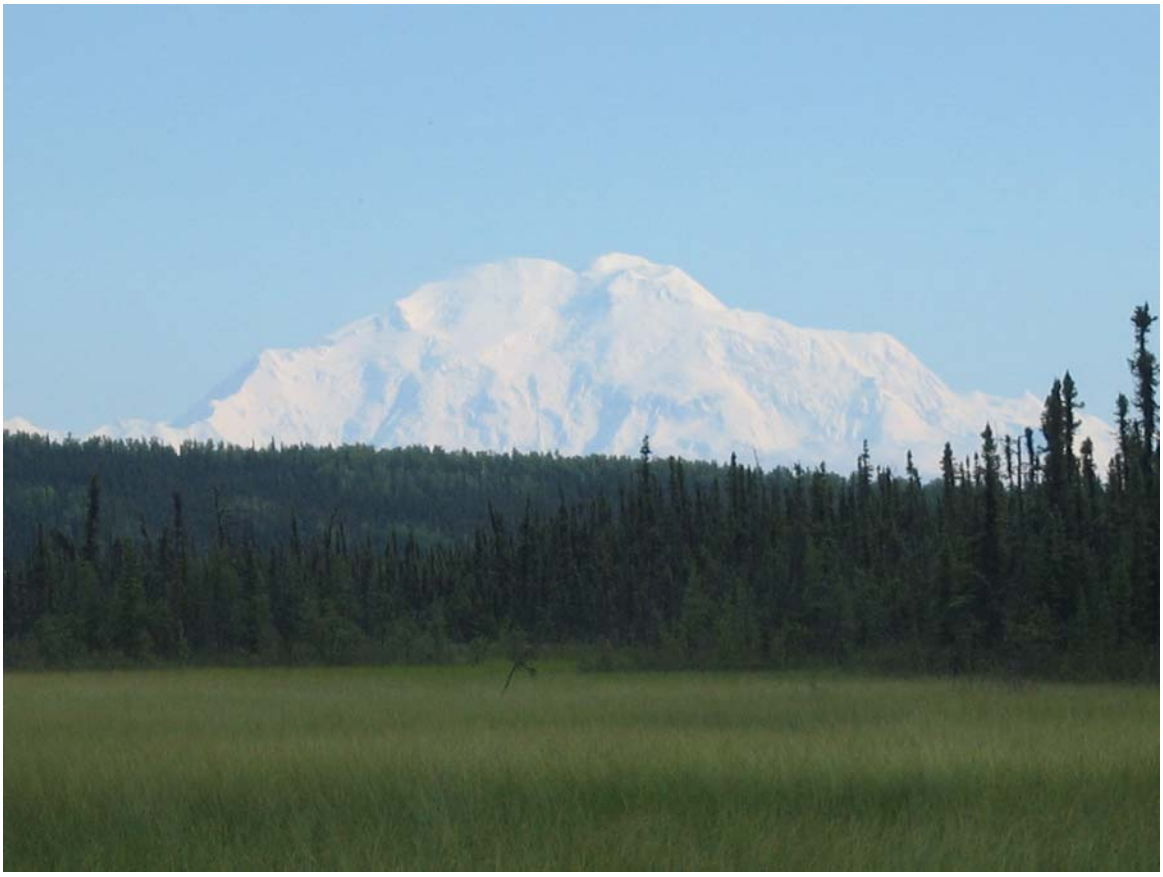


Photo 1.Denali looms over a wet sedge meadow near point 8 in the Birch Bend mini-grid.

Lead Author: Richard Tate
Contributors: Peter Nelson and Carl Roland
Photos by Peter Nelson unless otherwise noted

September, 2008

PURPOSE:

The intention of this initial sampling visit to the Birch Bend Mini-grid was to install permanent plot markers at each of the 25 points of the mini-grid. Additionally, our crew collected vascular and non-vascular plant, soils, and general plot data in accordance with the protocols established by the Long-Term Ecological Monitoring Project (LTEM). The crew succeeded in placing the monuments and collecting data from 23 of the 25 points of the mini-grid. Two points, #10 and #20, fell in areas of deep water and could not be sampled or have monuments installed. The sampling period took place between the dates of July 28 and August 5, 2008.

PERSONNEL:

Carl Roland -- Crew leader, metaplot data collection, transects, vascular plant species composition and collections, vascular plant cover estimates
Peter Nelson -- Navigation, plot setup, photography, transects, non-vascular plant species composition and collections, non-vascular plant cover estimates, aided with soil depths
Richard Tate -- Plot setup, soils collections, soil depths, weather and trip notes, aided with transects and vascular plant species composition and cover estimates

ACCESS TO MINI-GRID & CAMPSITE LOCATION:

The Birch Bend Mini-Grid lies far from the park road, in the remote northwestern portion of the park. It is so named because it centers around a distinctive S-shaped bend in Birch Creek, a large tributary of the Kantishna River. The only reasonable way to access the location is via helicopter. On July 28th, 2008 at ~0900, Carl Roland and Richard Tate flew in helicopter 191 with a portion of the sampling gear from the airstrip near Park Headquarters to Kantishna, pausing briefly to refuel before heading to the mini-grid. Due to weight restrictions of the helicopter, Peter Nelson rode in a park vehicle with Denali's Red Team botany crew to Kantishna, arriving at that western airstrip some time after the others had refueled and departed.

As most of this grid was either wooded or swampy, finding a place for the helicopter to touch down took some reconnaissance. Ultimately a sandbar on the north bank of Birch Creek was selected as the spot to offload, due to its proximity to the center of the grid and access to good camping. There was a touch of trepidation at the thought that the creek could rise (either from rains or glacier melt) and inundate the sandbar, preventing our extraction at the end of the sampling bout, but we were reassured by our pilot, Shane Herron, that he could "land the helicopter in the water," provided it wasn't too deep. Our fears allayed somewhat, Shane departed to pick up Peter at Kantishna. Carl and I entered the woods a short distance, searching for some high ground to set up camp. We found good camping in the woods north of the creek, which provided some shelter from the rain in the form of large overhanging trees. We kept our bear barrel cache and cooking area on the banks of the river, about 50 m apart from each other. Shane returned in about an hour, dropping off Peter and the rest of the gear before bidding is farewell.

As Birch Creek is partially fed by glaciers of the Alaska Range, it was feared that the water of the stream might clog our filtration devices. Not knowing if there would be other water nearby our camp, we carried along 4 ten-gallon blue jugs of water with us for drinking. It turned out that there was a deep puddle in a former channel just north of our camp that contained plenty of clear water for filtering, but this source is ephemeral and not to be relied upon in the future. Water from the stream did turn pretty silty when water levels rose and sediment load increased, but we used it nevertheless for cooking and washing.

HIKING:

Birch Bend's main geographical feature is Birch Creek, a large, deep waterway that cuts the minigrid in to a northern and western "L" shape and another rectangular chunk of points south and east of this. Distinct habitat types are predicated on their proximity to the creek. Near the creek, in a bordering strip perhaps 100-150 m (sometimes deeper) on either side, there was mature *Picea glauca* forest, harboring large trees, many woodland species of plants and a thick carpet of *Pleurozium* and *Hylocomium* feather mosses. Beyond this, away from the creek, the ground becomes wetter, less well-drained. *Picea mariana* takes over as the dominant tree type, with scattered *Larix laricina* sometimes being found, and bogs and wetlands become common. *Eriophorum* tussock fields appear in open areas void of trees. A variety of lakes and marshes dot the landscape, especially in the northwestern portion of the grid, where a smaller stream winds northward. There is very little in the way of hills or even rolling landscape within the grid proper- it is mostly flat, with only minor, gradual changes in elevation.

Despite a relative lack of topographical change, hiking and navigating around the Birch Bend grid is no cakewalk. One major challenge is fording the creek itself, which is far too substantial to attempt to cross by simply rolling up the pant legs, strapping on the sandals, and plunging into the water. Six of the grid's 25 points (1, 6, 7, 12, 13, and 14) lay on the east bank of the river, the remainder on the west. This obstacle was neutralized by employment of a small pack raft, which we used to ferry ourselves and our packs across the stream. A fortuitously placed sandbar allowed us to wander halfway across the stream before a deeper channel necessitated getting into the raft. Carl would cross over first while Peter or Rich held a length of rope. Upon making landfall, the crew member manning the raft would (hopefully) strap the oar into the raft, at which point the boat could be pulled back across the stream to where the other members of the team waited in the calf-deep water. Unfortunately, a few days of rain swelled the river, increasing its' breadth and flow rate and making it impossible to cross even with the help of a raft. After doing the majority of points on the east bank during the first two days of sampling, we had to wait until the final day before we were able to cross again and finish up the remaining two points.

The presence of water within the grid proved to make navigation difficult as well. From benign-looking puddles that turned out to be boot-overtoppers to large lakes and marshlands that required a major change in route and direction, water hazards played hell with our navigation. The old aerial photos and topographical maps did not necessarily accurately portray the location of these bodies of water, making route selection largely a gambit.

The homogeneity of the terrain was another confounding factor to navigation. The black spruce forest and bog land looked largely similar in much of the grid, and one had to be constantly vigilant so as not to get disoriented, even when at a plot. The land remained largely mysterious, as there were no elevations from which to gain a vantage point on the landscape. Fields of *Eriophorum* tussocks, some reaching thigh-high, tested our flexibility and the durability of our knee and ankle joints.

One major advantage we stumbled upon was the presence of substantial game trails that followed the course of the creek on the both banks. Following these routes allowed us to reach the southern and western portions of the grid in far less time and with far less stress than would have been possible by simply charging across the black spruce bogs and tussock fields. These trails, especially the one on the west bank of the creek, became our main thoroughfares, and we would use them to access even close points. A feeling of relief was felt when we got back to the trail at the end of the day, knowing that the walk back to our camp would be well-marked, possess minimal obstacles, and guide us back to the vicinity of our camp. Of course, walking along a corridor used extensively by wildlife is not without its' danger, and we were careful to make lots of noise as we proceeded along.

WEATHER AND ENVIRONMENTAL CONDITIONS:

Although this grid lies in prime mosquito habitat, the sampling period occurred late enough in the season that the fierce flies were on the wane. This is not to say that they didn't appear when conditions were acceptable to them, but luckily (?) for us, many of the days were wet and cold, and the insects had more sense than to come out from their resting places. There were a few nice afternoons and pleasant days, but most of the days we were on site we overcast and saw at least a little precipitation.

SAFETY CONSIDERATIONS:

See comments at end of report under "Conclusion and Future Considerations".

ACTIVITIES:

Monday, July 28

As stated above in the "Access to Mini-grid…" section, we were flown to the area of the mini-grid in a helicopter. Once we were all assembled and had set up camp, we crossed the river using our raft setup. Working the bugs out of this procedure took a little longer than anticipated, but once we were all on the opposite bank, we headed for the southeastern corner of the grid and point 1. Heading away from the creek, we began to move through the gnarled stunted trees and soggy shrubbery of the black spruce bog land that typified much of this grid.

Working our way around and through marshes, we arrived at the location of point 1 around 1400. The vegetation here possessed most of the major players of the black spruce bog environment: twisted scraggly *Picea mariana* growing over tussocks of *Eriophorum*

vaginatum and heaths of *Ledum decumbens* and *Vaccinium ulignosum.* Very few forbs grew in the thin layer of sodden, largely undecomposed soil that lay over the permafrost, an exception being the cloudberry (*Rubus chamaemorus).* Dense mats of various species of the moss *Sphagnum* thrived in the wet environment. The day was waning quickly by time we completed the point, so it was decided that we would head back to camp and return again to the eastern shore of Birch Creek the following morning.

Weather: AM: Rain @ HQ, Kantishna, overcast en route to Birch Bend. PM: Some sunbreaks, wind, overcast. Excellently sunny by evening.

Tuesday, July 29

Following a few somewhat comedic episodes ferrying across the creek, including the oar getting stuck on one side of the river while the boat drifted back to the other bank (quick tip: paddles aren't extremely aerodynamic, and can't be thrown very far), Green Team was again on the eastern bank of the creek. Sampling on this day began with point 6, a black spruce-dominated site very similar to point 1 from the day before. Point 6, however, boasted clumps of two species of alder, *Alnus viridus* and *A. tenuilfolia.* The small ericaceous shrubs *Andromeda polifolia* and *Oxycoccus microcarpa* grew over the hummocks of moss and *Carex bigelowii.* The presence of fireweed, *Epilobium angustifolium,* and *Ranunculus lapponicus* swelled the rosters of the forb contingent.

We headed 500 m to the west and reached point 7, most of which occurred under a closed canopy of mature white spruce (*Picea glauca*), aspen (*Populus tremuloides*) and paper birch (*Betula neoalaskana*). The site was moderately diverse, a result of being at the edge of a clearing and the presence of an old stream channel within 10 meters of the southern edge of the site. Many shade-tolerant woodland forbs grew below the trees, including *Pyrola asarifolia* and the orchid *Goodyera repens.* A plant more commonly associated with streambanks and waterways, *Wilhelmsia physodes,* offers evidence that perhaps this plot was perhaps wetter in the past. Taller shrubs in the understory included *Viburnum edule* and *Rosa acicularis.* The plot center fell under a large fallen tree caught in the branches of its' still-living neighbors. It seemed relatively secure and not in danger of falling, despite creaking loudly in the wind.

The last point of the day, 13, was another that fell in the mature *Picea glauca* forest, and features some large trees. A thick layer of *Hylocomium splendens* feather moss covered most of the ground, out of which *Equisetum arvense* frequently protruded. *R. acicularis* and *Ribes triste* bushes were prominent in the understory, with *Spirea stevenii* and *Ribes hudsonianum* appearing in quadrants B and C, respectively. Starflower, *Trientalis europea,* was found here as well. With the evening light fading fast in the dense forest, we finished up the plot and headed back to our ford on Birch Creek.

Weather: AM: Cool, windy, mostly cloudy PM: Overcast, rain began ~1600, lasted all night.

Wednesday, July 30

Awaking to find that rains from the night before had increased the river's flow to a point where it was no longer feasible to cross in the pack raft. Instead, we turned out attentions to the north and aimed to take out the majority of the points on the northern border of the mini-grid.

Photo 2. Peter Nelson attempts to set up a transect line in a bog at point 23.

Our morning began at plot 23 (photo 2). Unfortunately, only the northernmost portion of this plot stood on "dry" land, the rest being composed of a floating *Sphagnum*/ *Carex* bog that was more than X-tra Tuff deep. The plot center monument was placed in the mat of floating vegetation, and it will be interesting to see if it lasts in its' location until this plot is re-sampled. The sampling had be to modified somewhat, as only 3 arms of the transect tapes (W,N,E) could be set up, and only the northern and western transects could be performed due to deep water. Quadrats could only be assessed for species composition in quadrants A, C, and D. Some of the majority plants included *Chamaedaphne caliculata* and *Andromeda polifolia* in the wetter portions of the area, with a few *Larix laricina* trees and *Eriophorum* tussocks in the drier edge of the plot.

Plot 22 was in a very flat, shallow floating *Sphagnum* bog. Smaller *Picea mariana* and *Larix* trees were scattered around, and most of the large larches were dead, a trend that was noted throughout the grid. Carl hypothesized that this was due to an outbreak of a sawfly infestation occurring about 10 years prior that resulted in the mortality of most large larches in this region of Alaska. Younger larch that sprouted after this event seemed to be healthy and growing well, but larger trees were almost entirely wiped out. Interesting carnivorous plants *Drosera rotundifolia* and *Pinguicula villosa* occurred here as well, already in fruit.

The center of plot 21 was in an inundated *Carex / Eriophorum* meadow, but the southern third of the plot rose out of the standing water of the bog and into a slightly elevated woodland covered in lichen, black spruce and larch trees. Main lichens in this area included *Cladina stellaris* and many species of *Cladonia*. Other species of the high and dry included *Ledum* sp. and *Vaccinium uliginosum*. Tussocks of *Eriophorum angustifolium* and mats of *Sphagnum* afforded us the opportunity to walk on the wetter portion of the plot.

Weather: AM: Overcast, light rain. PM: Overcast, breaks of sun in the evening.

Thursday, July 31

Birch Creek came up further in the night, covering what was previously our cooking and leisure area. We moved our equipment and barrels up the stream bank in preparation for further rising of the water levels, then set out for the northwestern corner of the mini-grid. Along the way, we had to cross the smaller northern-flowing stream mentioned above in the "Hiking Conditions…" section.

Plot 24 was a particularly non-diverse plot (14 vascular plant species total) in tussocky black spruce taiga. Its' permafrosted soil contained most of the common members of this community (*Picea mariana, Vaccinium uliginosum, Eriophorum vaginatum, Carex bigelowii,* etc.), and also included *Salix pulchra* and *Empetrum nigrum.* There is, however, a very nice lunch area near a large, slow-moving stream just to the west of the plot. There was much beaver sign and trails along the stream between points 24 and 25, a route that required a degree of backtracking and scouting in order to find a clear route between deep bogs and watercourses.

Point 25 stood on the edge of a *Carex/Eriophorum* marsh. There were many *Larix* seedlings growing up in the shrubbery and graminoids, but as stated above, all of the taller trees of these species were dead, victims of the sawfly. There were many ripe berries on the dense *Vacciunium uliginosum* bushes, and the aromatic shrub *Myrica gale* grew in the sodden soil. Sedge diversity included *Carex rotundata* and *Carex aquatilis*, found growing in the marsh at the edge of the plot.

We were unable to sample point 20, as its' plot center landed in the deep water of a lake (photo 3). The species composition of this site would have been interesting, too- *Menyanthes trifoliata,* a large member of the gentian family that grows in marshlands, was present, as was the larger-leaved sundew *Drosera anglica*. Evidence of wildlife included two large beaver lodges in the lake, their drag trails coming out of the lake to beaver-chewed woods, and a pair of trumpeter swans on the wing to the west of us. Leaving this vicinity, we hiked towards point 19 and saw a juvenile hawk owl on the way.

Photo 3. Peter Nelson attempts to find plot center at point 20. It turned out to be in the deep water beyond the vegetation.

Plot 19 was in a young birch (*Betula neoalaskana*) grove. Many of the young trees sported conks indicative of a fungal infection, and some vector had killed off the larger trees at some point in the last 3 decades. Heavy shrub covers of *Chamaedaphne caliculata* and *Ledum groenlandica* obscured a very dense layer of *Vaccinium vitus-idaea.*

Walking back to camp, we happened upon a young black bear galloping through the woods. As we formed into a line and began to call, it stopped to check us out for while, sniffing the air, and eventually decided that we probably weren't edible. It then faded into the woods and was gone.

Weather: AM: Early rain, overcast & windy by work time. PM: Overcast, windy, light rain. HEAVY rain by 2100.

Friday, August 1

Using the creekside trail to hasten our travel, we set out this morning for point 15. It turned out to be located in an very flat, open tussock field hosting only seedlings of black spruce and larch. The vegetation was what rapidly becoming "the usual" for this type of site: few forbs, shrubs including *Alnus viridis*, *Vaccinium uliginosum* and *Ledum decumbens*, and of course *Eriophorum vaginatum*.

Point 10 was the other point we were not able to sample in this grid, as it occurred in a large lake. We could only walk to within about 50 meters of its' center before the water reached the top of our boots. Dead *Larix* were visible, however, as were inundated tussocks of *Eriophorum vaginatum*. Judging by the surrounding vegetation, water levels look particularly high this year in much of the grid. Future crews may find that points such as 10, 20, and 23 will be accessible when the gird is resampled.

A very arduous trek across sometimes thigh-high tussocks brought us to point 5, occupying a slightly elevated crest between the *Eriophorum vaginatum* wasteland to the north and a

swampy, *Equisetum paluste*-dominated swamp to the south. Large, living larches grew at this point, a notable exception to what was seen in the rest of the grid, and some core samples were taken. The crest was covered in dense *Ledum groenlandica* and *Betula nana.* The southern section of the transect line fell in the horsetail swamped, shared by a population of *Caltha palustris*. Two northern harriers flitted on the breeze to the south of us.

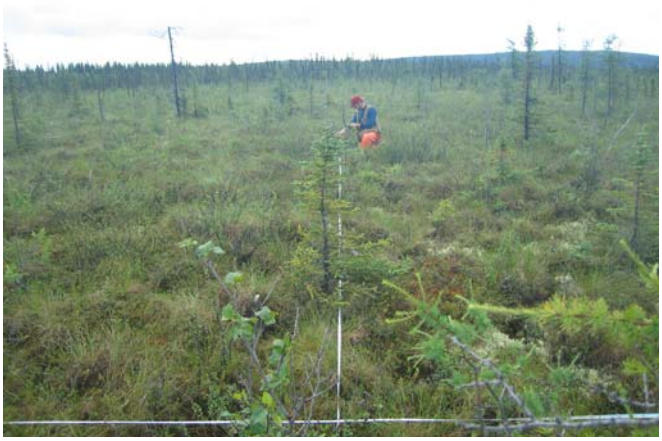


Photo 4. Typical plot in open *Eriophorum* field with scattered trees.

Point 9 fell in a dense stand of black spruce, the forest floor thickly covered in lichens. *Equisetum sylvaticum* was a notable forb in a plot that did not show much diversity beyond the common array (*Eriophorum vaginatum, Vaccinium vitus-idaea, Ledum decumbens, Rubus chamaemorus, Betula nana, Vaccinium uliginosum, Ledum groenlandicum, Larix laricina, Salix pulchra, Oxycoccus microcarpus*). *Spirea stevenii* was also present.

Eating dinner that evening, we saw a beaver motorboating in the river and heard the powerful slaps of their tails against the water.

Weather: AM: Overcast, windy, with sun breaks. Fast-moving clouds. PM: More sunny, wind, clear view of Mt. McKinley. NICE!

Saturday, August 2

A porcupine had a near miss with Carl's tent this morning as it sauntered through our campsite. We caught up with it as we headed out of camp, and it climbed a tree to avoid trouble. We hiked along the wildlife trail on our long hike to point 2, describing the curve of Birch Bend along the way.

Point 2 lay close to the river in a mixed white spruce / paper birch grove. Although it was not a very speciose plot, a number of forbs were noted, including *Cornus canadensis, Aconitum delphinium,* and *Equisetum arvense.* Many downed trees lay in the plot, and a dense layer of *Vaccinium vitis-idaea* battled with feather mosses for ground cover superiority.

A large pile of berry-filled bear scat made us wary as we proceeded into the black spruce bog land to point 3. The plot encompassed an inundated *Eriophorum vaginatum* tussock bog. Larch and black spruce trees grew over common shrubs such as *Vaccinium uliginosumI, Betula nana* and *Chamaedaphne calyculata*. The uncommon member of the cyperaceae *Trichophorum alpinum* was noted along with the ubiquitous *Carex bigelowii.* Interesting forbs included the carnivorous butterwort *Pinguicula villosa* and the heretofore unseen *Iris setosa*, already in fruit.

It rained very hard on us at the otherwise undistinguished point 4, which landed in an open *Eriophorum vaginatum* tussock land. Only a few *Larix* saplings reached breast height. The vegetation was again composed of the common plant community of the open tussock bog (please see point 9, above).

Weather: AM: Overcast, windy. PM: Rain began ~1200. Rained hard 1600-1700.

Sunday, August 3

Point 17 fell in drier black spruce forest with a dense cover of lichen on the forest floor. ERIVAG tussocks were present to a degree, and *Vaccinium vitus-idaea* grew in a thin layer over much of the site. Many young *Picea mariana* saplings tested the durability of our calipers. *Pinguicula villosa* and *Drosera rotundifolia* were present in every quadrat.

Site 16 was much like 17, but possessed more water. There was quite a bit of *Rubus chamaemorus* bearing fruit and a number of *Larix* seedlings. Lichens found here included the beautiful *Cladina stellaris.* While we were engrossed in our sampling, a running black bear came into sight just maters from the end of our northern transect. Seeming as surprised to see us as we were to see it, it casually observed our best attempts at dissuasion, continuing to nibble berries, sniff the air and seeming in no real hurry to depart. Suddenly it walked away as quickly as it had come, bothering us no more.

Point 11 was in the strip of closed canopy *Betula neoalaskana/Picea glauca* forest close to the creek on the north side. The moss *Hyloconium splendens* densely covered the ground, dotted here and there by the woodland orchid *Goodyera repens. Calamagrostis canadensis* played the role of the token graminoid in the assemblage. Large white spruce trees were cored at this plot.

Weather: AM: Clear, sunny, air still. PM: Still nice, sunny, more wind.

Monday, August 4

We completed the last remaining points on the west bank of the river on this day, the eastern bank still being unreachable due to high water in the creek. Occurring in the transition zone between the white spruce band near the river and more distal black spruce bog land, point 18 harbored both species of *Picea* found in the park. There were also a fair number of *Betula neoalaskana* saplings, some larger larches, and even some *Betula occidentalis* individuals.

Again we followed the game trail around the curve of Birch Creek to the south, seeking point 8. Most of the plot was a shrubby woodland, but the southern portion of it transitioned into a *Trichophorum/Equisetum* wetland marsh. As many as six species of *Carex* lived in this wet portion of the plot, also home to the carnivorous bladderwort, *Utrichularia intermedia* and *Menyanthes trifoliata*. Two wood frogs were sighted on this day, one en route to point 8 and one on the return trip to camp.

Weather: AM: Overcast, slightly rainy early. Heavier rain ~1100. PM: Heavy rain until ~1600, overcast with clearing in the evening.

Tuesday, August 5

The level of the river had fallen enough this morning to allow for a crossing of the creek in the pack raft. Our second-to-last point, 12, was in the closed canopy *Betula neoalaskana/Picea glauca* forest, littered, in this case, with large fallen *Populus balsamifera.* This seems indicative of the successional state of the plot. The point featured a woodland-type understory of *Rosa acicularis*, large *Alnus viridus*, and *Viburnum edule* bushes over common forbs like *Cornus canadensis* and *Moehringia latifolia.*

Photo 5. A view looking northwest at plot 14, laying on the banks of Birch Creek.

The final point of the day and the grid was 14, landing on the eastern bank of Birch Creek (photo 5), hosted many interesting willows and graminoids. Thickets of *Salix alaxensis* and *Alnus viridis* lay on the eastern border of the plot. Three species of *Equisetum* were found in the sandy soil, along with *Triglochen palustris*, a member of the Juncaginaceae. Look for its' sausage-shaped fruits. The willow *Salix lasiandra* ssp. *lucida* also made an appearance. The diminutive grass *Agrostis scabra* showed up for the first time in the grid.

While we were sampling this point, word came over the radio that there was a chance we could be extracted this day, a day earlier than anticipated. After some logistical deliberation, we decided to go for it. Upon completing the plot, we made for pack raft, paddled back across the Birch Creek, and broke camp. I disassembled my tent completely, while Carl and Peter left theirs standing on the off-chance the helicopter could not pick them up that day.

Pilot Shane Herron would be approaching the limit of his duty day, 2200, by the time he made his way out to us for the second trip. He arrived for the first pickup at about 2000. I rode with most of the gear to Kantishna, where I rendezvoused with the previously extracted Red Team. We loaded up into a Suburban and headed east for park headquarters, finally arriving just after midnight. Meanwhile, Shane returned to Birch Bend and extract Peter, Carl and the remainder of the gear. They then flew directly back to headquarters, arriving about 2145. Thus ended our time at Birch Bend and the 2008 field season.

Weather: AM: Rain early, clearing by 0930. PM: Nice, sunny.

CONCLUSION AND FUTURE CONSIDERATIONS:

The natural pathways of the area can be a great timesaver and will save wear-and-tear on the knees. However, extra caution should be used when walking along the creekside game trails and in this area of the park in general. It seemed as those the animals here had little or no experience interacting with humans, and thus did not know what to make of us. This is especially the case with the bears, who, while by no means violent, did not exactly turn and run from us. Keep the bear spray accessible and call out often.

Walking in the tussocky terrain can be perilous. Slow and steady definitely wins the race here, as trying to move too fast through the undulating, unpredictable landscape is to invite sprained ankles and tweaked knees. The rubber boots that the wet environment of this grid necessitate also have little ankle support, so individuals with troublesome ankles may want to consider a brace or ankle wraps before doing battle with the tussocks.

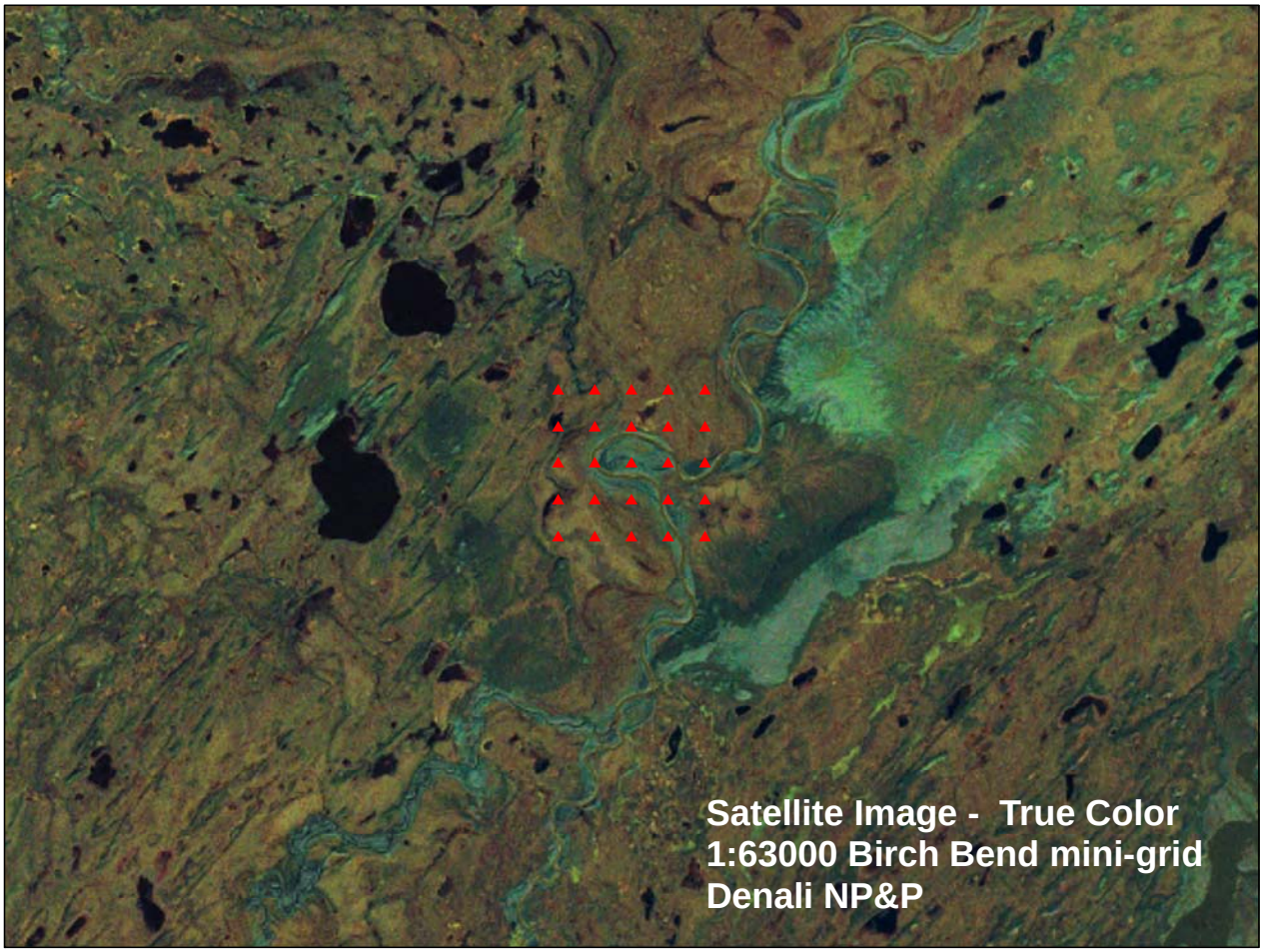
Despite being somewhat inaccurate, aerial photographs and topo maps (even the GPS) can give you an idea of large water hazards to circumambulate and routes across the terrain.

Future crews should bring longer ropes (at least 50 m each) to attach to both the front and rear of the raft. With this method, once one person gets on the distant shore, the remaining crew can pull the raft back to the far side while a rope is held on the other bank. Crew members can be shuttled back and forth using the ropes, eschewing the need for everyone to paddle. Also, this would prevent (or minimize the possibility of losing the paddle, something that almost happened to us at least twice. Mr. Peter Nelson deserves big kudos for sacrificing physical comfort in order to save the paddle and thus the expedition. Unfortunately this would remove the opportunity for each crew member to paddle across, which turned out to be a fun activity.

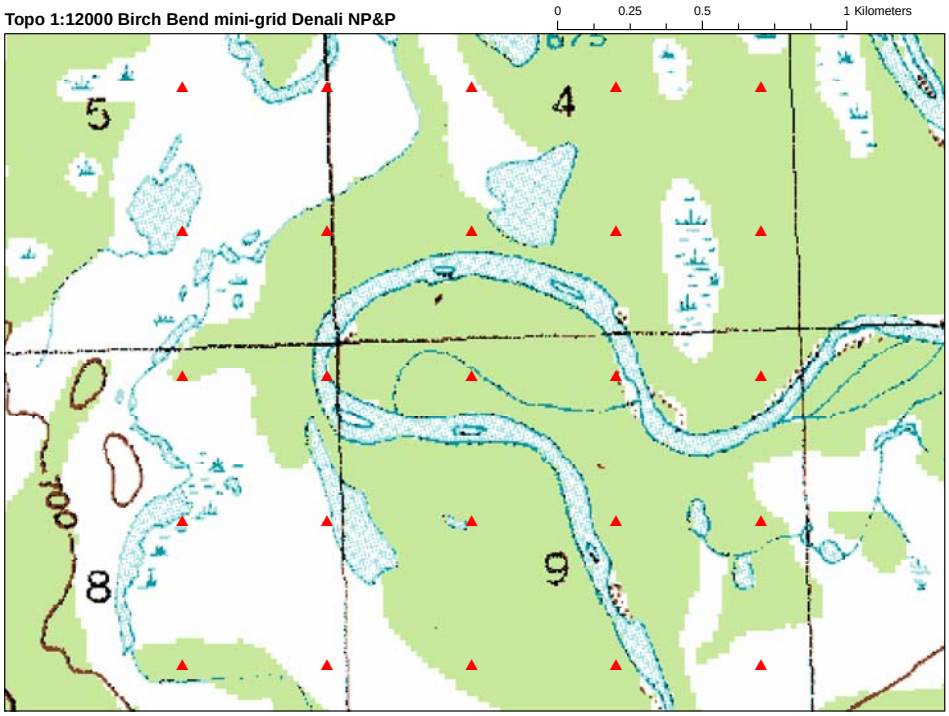
Trying to finish all the points on the east bank of the river in two days would be a good idea. Minimizing time spent crossing the river maximizes sampling time. Also, be sure to time your river crossing days when the creek is low. It can rise in a matter of hours, so marking the shallow sand bars and such with large vertical sticks is good idea if you want to relocate them.

If a crew gets in a bind and runs out of fresh water, filling an empty jug with creek water and allowing it to settle for a day or two works well. This way you won't clog your filter with sediment when you pump water.

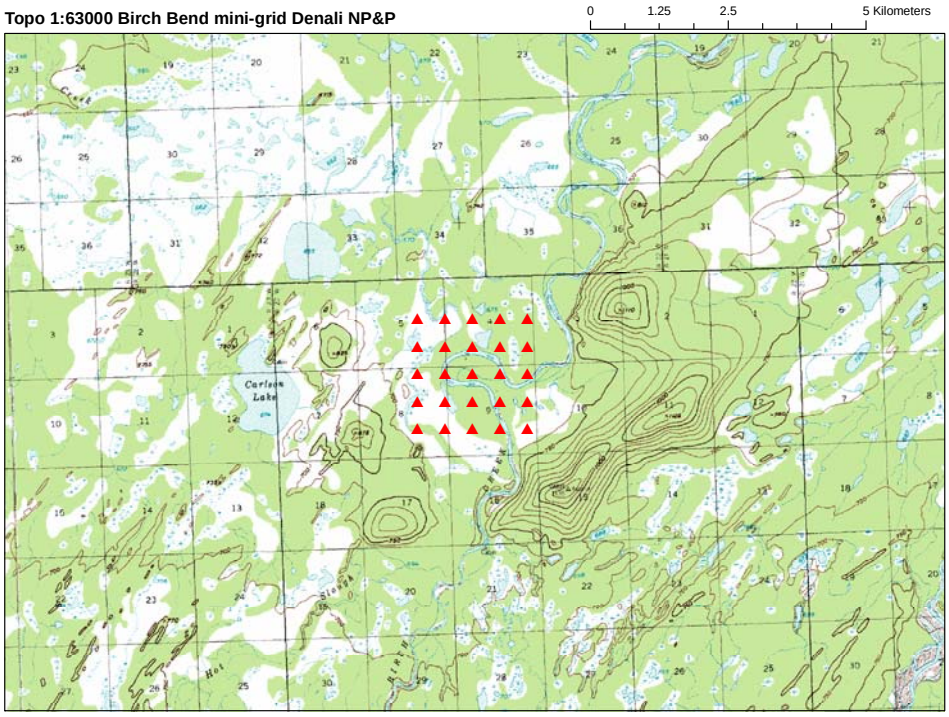
As always, be prepared for all sorts of weather and bring extra clothes. If you're concerned that you're not bringing enough gear, you're probably not! This is a fly-in grid, and although the copters do have a weight limit, you definitely get away with bringing extra pairs of socks and rubberized raingear. Try to get a tent spot under the mature white spruce, as they can block the majority of the rain from falling on your tent and coming home to a dry shelter is FAR more desirable than the alternative.



Map 1. Satellite Image True Color 1:63K of Birch Bend mini-grid.



Map 2. Topo map 1:12K of Birch Bend mini-grid.



Map 3. Topo map 1:63K of Birch Bend mini-grid.