Bonanza Creek LTER Renewal Proposal

Helicopter Request, 12/03/2021

We propose to establish and sample sites in thermokarst areas, wetlands, burned wetlands, and recent fire scars across Interior Alaska that are only accessible via helicopter. We will use 31 days of helicopter support per year in years 1 through 5 and 37 days in year 6 (see table below).

To access thermokarst sites, we will use 10 days of helicopter time each year. These sites will be near the Toklat River, which is ~40 miles one way from the Denali Airport, where we will fly to and from each day of sampling. The crew will spend the day on the ground at one site for each trip. We will have ~3 people (3 small or 2 large) in each helicopter trip that will have about 10 kg of field and personal gear each. The crew will have approximately 20 kg of soil and water on the final return trip of the day. [Lindsay, is there the potential to have multiple shuttle trips from the airport to the field site in one day so that we can have a larger field crew?]

For wetland sampling, we will use 5 helicopter days in each year. We will sample sites for 3 days in Minto Flats and 2 days in Tanana Flats. Flights will be out of Fairbanks, with an approximate travel distance one way of about 20 miles for these sites. The field crew will need to be shuttled between sites throughout the day, and on some days, they may need multiple trips from Fairbanks to bring out additional crew members. Three people will be deployed on each trip, they are likely to have 20 kg of equipment and personal gear each, and there will be approximately ~20 kg total of soil on the final return trip.

For burned wetland sampling, we are requesting 10 days of helicopter time in years 1 and 2 and four days of helicopter time in years 3 through 6. In years 1 and 2, we will split the days evenly between Minto Flats and Tanana Flats, with three days of site reconnaissance and two of sampling for each area. Site reconnaissance will require flying and looking at burned areas identified in satellite imagery. The ~3-person crew will assess the burned wetland from the air, and if it looks promising, touch down briefly to confirm that the wetland could be sampled (but no samples will be taken). The crew will have only personal safety gear for this flight. For the remaining 2 sampling days in each area, the crew will return to the promising sites and sample. They will have ~10 kg of sampling and personal gear per person. We anticipate that on each of these 2 sampling days, the crew will sample ~3 sites and will need approximately 1 hour on the ground per site, and they will collect approximately 10 kg of soil and water per site for a total of 30 kg by the end of the day. In years 3 through 6 we will spend two days in Minto Flats and 2 days in Tanana Flats re-sampling these same sites. As before, each day will consist of the crew flying to three sites and spending approximately 1 hour on the ground per site. They will primarily sample soil water, so they will have approximately 2 kg of water collected per site for a total of 6 kg of samples per day. Flights will be out of Fairbanks, with an approximate travel distance one way of about 20 miles.

For sampling new wildfire scars and revisiting them to monitor change over time, we will use six days of helicopter time in years 1 and 2, 12 days in years 3 through 5, and 18 days in year 6. For this work we will be based out of Central, Manley, or Fairbanks, with fire scars within 100 miles of each airport. These sites have yet to burn but based on past patterns of fire frequency in our research domain, we expect that there will be ample new burn sites for us to carry out this experimental design. It does make the helicopter planning more ambiguous. It may be that in one year, we can access all sites from Fairbanks. In another year, we may need to fly out of Central or Manley for efficiency. We have used Central, Manley and Fairbanks as airports for past projects, so we know that these hubs should allow us to access adequate territory. Our crew has vehicles to drive to these airports, or they could shuttle from Fairbanks with the helicopter on a daily basis. Our sampling plan has two main components that we will detail below: initial sampling new fire scars every year and returning to monitor those fire scars at 3 and 6 years after fire.

New fire scars: Each year we will use remotely sensed data to choose three new fire scars (i.e., burned the previous fire season). In each site we will establish 6 individual sites for future monitoring. We will allocate two days of sampling for each fire scar during its first sampling year, so we will have at total of 6 days of new scar sampling each year of the project. For new scar sampling, we propose to fly to the scar and sample at three independent sites that are approximately ~5-10 km apart. The crew will be on the ground approximately 1.5 hours for each site and will need the helicopter to move it among sites. Each crew will consist of 3 small or 2 large people, they will carry about 12 kg of gear per person, and they will collect ~5 kg of soil per site for a final cooler load of approximately 15 kg, when they will return to the closest airport or to Fairbanks.

Each site that is established in our new fire sampling will be visited 3 and 6 years post-fire for monitoring. This means that in years 2025-2027, monitoring activities will require 6 additional helicopter trips per year to monitor sites established in previous years. In year 2028, we will require 12 additional trips to monitor sites. The fully complete this decadal experimental design, we will also require 6 monitoring days in 2029, which will be part of the next BNZ LTER renewal proposal. Each monitoring day trip will leave from either Fairbanks, Manley or Central, will carry 2-3 people, and will not return with soils, so their initial weight should be predictive of their final weight. Each trip will take the crew to 3 sites that are approximately 5-10 km apart.

Table. Helicopter days per year for the Bonanza Creek LTER renewal proposal.

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| --- | --- | --- | --- | --- | --- | --- |
| Project | Year | | | | | |
| *2023* | *2024* | *2025* | *2026* | *2027* | *2028* |
| Wildfire | 6 | 6 | 12 | 12 | 12 | 18 |
| Thermokarst | 10 | 10 | 10 | 10 | 10 | 10 |
| Wetlands | 5 | 5 | 5 | 5 | 5 | 5 |
| Burned wetlands | 10 | 10 | 4 | 4 | 4 | 4 |
| **TOTAL** | **31** | **31** | **31** | **31** | **31** | **37** |