

Gates of the Arctic National Park & Preserve

HUMAN IMPACT SITE INVENTORIES

Arrigetch Creek and Kuyuktuvuk Creek

Final Report

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## INTRODUCTION

The 1996 field season at Gates of the Arctic National Park & Preserve (Gates) marked the field test of the new Human Impact Site (HIS) Inventory process as adapted from Emers & Reitz Recreational Impact Studies at Arctic National Wildlife Refuge (1994). Vegetation transects were initiated in 1982 to document selected impacted sites at Gates. Refinements of the HIS Inventory process were made in 1986 to standardize the methodology (Van Alstine 1989). Van Alstine (1988) reported on the status of this system and Shea (1995) made further HIS data summaries by experimenting with the use of a remote sensing system to document the onset/or rapid change in visitor use sites at Gates.

Continued monitoring of HIS provides baseline data on current conditions to justify or support management actions. The HIS Inventory is an attempt to manage for acceptable levels of environmental change (Limits of Acceptable Change) while balancing public desires for recreation without irreversible losses to wildland resources (Hammit & Cole, 1987).

The goal of this project is to quantitatively document the current state of impacted sites and to assess future effects of human use or site recovery. The objectives of this study are:

- 1) Determine levels of impacts in high use recreational areas;
- 2) Establish new study sites/revisit established sites to detect changes over time; and
- 3) Provide a baseline for determining limits of acceptable change (LAC) in high use areas.

## STUDY AREA

The study areas consisted of the Arrigetch Creek drainage and the Kuyuktuvuk River drainage in Gates of the Arctic National Park & Preserve (Map 1 & 2). Recreational visitors of the Arrigetch Peaks area consist of mountaineers and backpackers. Alatna River floaters stop at the Arrigetch Creek confluence to hike up, and others fly into Circle Lake to begin their hike. There is also the occasional backpacker who hikes in from the Walker Lake area. The Kuyuktuvuk Creek users are mainly backpackers who access the area from the Dietrich River confluence or further up the Dietrich River from the saddle East of Oolah Pass.

The vegetation in the Arrigetch Creek valley consists of boreal trees and shrub thickets, with an understory of Potentilla fruticosa, Vaccinium vitis-idaea, Vaccinium uliginosum, Dryas integrifolia, Ledum palustre, and Epilobium latifolium. Between Circle Lake and Arrigetch Creek (along the Alatna River) are boggy meadows with two feet high tussocks (Eriophorum spp.), a mixture of alder (Alnus crispa), willow (Salix spp.), dwarf birch (Betula glandulosa), and white spruce (Picea glauca). Species noted but less common are; Black spruce (Picea mariana), Balsam poplar (Populus balsamifera) and paper birch (Betula papyrifera). Alpine tundra species dominate the upper Arrigetch Creek area, which also consists of white spruce trees, and shrub thickets of willows and alder. The tundra consists of Boykinea Richardsonii, Salix spp., cotton grass (Eriophorum spp.), Carex spp., Equisetum palustre, and mosses.

The lower Kuyuktuvuk Creek consists of boreal forest dominated by white spruce trees and shrub thickets that include alder, willow and dwarf birch. The main Kuyuktuvuk Creek Valley has sparse clumps of both black spruce and white spruce trees with an occasional balsam poplar. The upper Kuyuktuvuk Creek and the numerous tributaries are above treeline, where only willows, alder, and arctic tundra vegetation are found. The area is a well-drained alluvium, subject to seasonal flooding as noted by the extensive sand and gravel observed near the confluence with the Dietrich River.

**METHODS**

We visited the established HIS Inventory sites along the Arrigetch Creek drainage pre- and post-summer. Backcountry ranger Bob Maurer and I flew into Circle Lake with OAS Pilot Buster Points on Cessna 185 (17F) to conducted the first field trip (June 21-28, 1996). Our hike started from Circle Lake, up the Arrigetch Creek to the Arrigetch Creek Forks and back down to Circle Lake. The post-summer HIS Inventory field trip (August 22-29, 1996) also started at Circle Lakes and followed the same route up to the Arrigetch Creek Forks but the return trip went through Hot Springs Creek and down the Alatna River to Takahula Lake. Buster Points transported park volunteer Lisa Popovics and I with the Park's Cessna 185 17F on this trip (See Map 1).

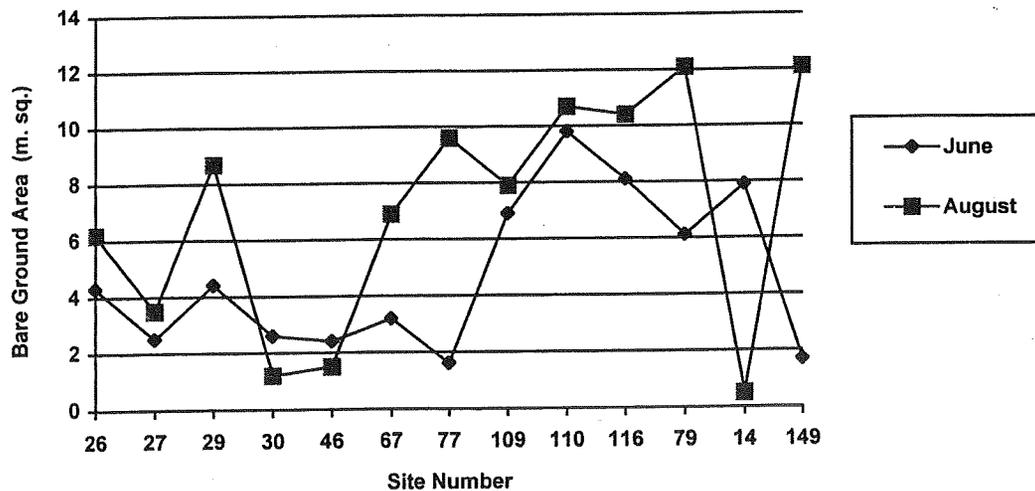
We located the HIS Inventory sites in the Arrigetch Peaks region from maps of the sites monitored since 1986 (Van Alstine 1988). The site observations were recorded on the HIS Inventory form as shown in Appendix I.

Biological technician Donna DiFolco and I drove from Fairbanks along the Dalton highway to Mile 224 where we began the Kuyuktuvuk Creek trip (August 8-16, 1996). The HIS inventory visits along this drainage were an attempt to locate new, developing sites along the Dalton Highway corridor. We hiked up the Kuyuktuvuk drainage and visited all of its tributaries looking for new campsites on tundra benches and along the floodplain (See Map 2).

**RESULTS**

**Arrigetch Creek**

We visited 13 HIS Inventory sites on both the June and August trips to the Arrigetch Creek area. An additional site was visited at Hot Springs Creek in the August trip. A majority of the sites recorded an increased in bare ground area as shown in Figure 1 below. Minimal increases in bare ground area were observed on sites at Circle Lake. There was no sign of crushed vegetation or even an increase in bare area in sites 30 and 46 at Circle Lake. A dramatic increase in bare ground area at the "spruce grove site" (#29, table 1), indicates that campers may have preferred this site of all the Circle Lake sites (#26, 27, 29, 30, 46), likely due to the site's enclosed cover from the weather. The changes in loss of vegetative cover of mosses and an increase in exposed mineral soil at site #29 indicate heavy use during the summer season.



**Figure 1. Area of bare ground recorded at Human Impact Sites along Arrigetch Creek, Gates of the Arctic National Park & Preserve, Alaska, June and August 1996.**

**Table 1. Net change in Human Impact Sites at Arrigetch Creek, Gates of the Arctic National Park & Preserve, AK, June & August 1996.**

Site Number	June Bare Ground Area (m. sq.)	August Bare Ground Area (m. sq.)	Change in Area (m. sq.)
26	4.3	6.2	1.9
27	2.5	3.5	1.0
29	4.4	8.7	4.3
30	2.6	1.2	-1.4
46	2.4	1.5	-1.1
79	6.1	12.1	6.0
109	6.9	7.9	1.0
067	3.2	6.9	3.7
077	1.6	9.6	8.0
110	9.8	10.7	0.9
116	8.1	11.4	3.3
014	7.9	0.5	-7.4
149	1.7	12.1	10.4
201	-----	9.4	-----

The thick willows and rough, rocky uneven terrain of the lower Arrigetch Creek limits campsites to the lichen knolls. As expected, the vegetation impacts from camping at these lichen knolls (Sites 67 & 77) increased over the summer season as observed in the August HIS Inventory visits (See Figure 1 and Table 1). The remaining lichen knolls that did not show considerable increase in bare ground area (Sites 109, 110 & 116) recorded a larger bare ground area in the June visit. These larger, heavily, impacted sites show a smaller increase in bare area than the smaller sites, which could indicate that the sites have reached maximum disturbance. Site # 149 recorded a large increase in bare ground area probably because it is the site where the Arrigetch Peaks become visible for the first time. The scenic vista of the site may encourage camping, as the networks of four trails onsite indicate excessive use. The growth of the tundra vegetation at the barrel site (#14) indicated either minimal use and/or vigorous vegetation growth.

In the June trip, we contacted two people at the Arrigetch Creek forks near the headwaters of Arrigetch Creek. We also contacted a group

of three hikers who were coming out of Arrigetch Creek in the August trip. Upon further discussion with this group, we found that another group of four had just traversed over to Hot Springs Creek on their way down to Takahula Lake.

#### **Kuyuktuvuk Creek**

Hiking was easy along the Kuyuktuvuk Creek bottom and on the high alpine tundra on the side benches. We noted multiple footprints along the river bottom, and observed two places with crushed vegetation where there may have been a campsite. One site was along Trembley Creek and the other was at Oolah Pass. There was no indication that these were established sites because there was no bare area observed and the impact edges appeared minimal.

Possible campsite locations were numerous throughout the Kuyuktuvuk Creek drainage. Recreationists could easily disperse their campsites on gravel bars and open willow patches of the floodplain. Minimal visitor use combined with the wide valley may account for limited sign of human impact sites. We contacted two people hiking out of Trembley Creek who had apparently hiked to Blarney Creek and over to the upper Hammond River. A lone hiker passed us on the Trembley Creek drainage on his way to Blarney Creek Pass. We later met him again at Oolah Pass. He had hiked from Trembley Creek, through Kinnorutin Pass, up the North Fork Koyukuk River, over to upper Itkillik River, through Oolah Pass and down Kuyuktuvuk Creek to the Dalton Highway. Both parties indicated that they had not seen other hikers on their trips.

## DISCUSSION

The original intent of the pre-season visit followed by the post-season visit was to determine the level of 1996 summer recreational use by measuring the changes in bare ground area in each site. We may be measuring the changes of vegetation growth instead of human impacts by visiting HIS sites too early in the summer season. Perhaps an early July visit to the area may be more appropriate to measure changes in human use throughout the summer season.

The differences in terrain and vegetation of the upper Arrigetch Creek (alpine tundra) to the Alatna River valley (open boreal forest) with variances in the ecological components in each site or groups of sites (e.g., vegetation, soils, water, slope, aspect) makes it difficult to determine the ecological carrying capacity of Arrigetch Creek valley. The boggy vegetation of the Circle Lake area may be resilient to recreational use, while the lichen knoll sites along the lower Arrigetch Creek may already have irreversible impacts. The enclosed valley of the upper Arrigetch Creek may also hinder the growing season of the tundra vegetation, which makes those sites susceptible to impacts from minimal camping.

I found it easy to feel crowded because of the single access route of the Arrigetch Peaks through the Arrigetch Creek valley. I can see how visitors can feel crowded in this valley, especially if they meet more than one group. The lack of good campsite locations in the lower Arrigetch Creek probably concentrates use on the lichen knoll sites. These sites had high bare ground areas in the pre-season June visits, indicating the sites are susceptible to recreational use and have experienced excessive use in the past.

The Kuyuktuvuk Creek valley is dominated by arctic tundra and does not appear to have any human impact sites yet. There is minimal visitation with dispersed use in this area because of the Dietrich River crossing necessary to access this valley. Lack of parking spots along the Dalton Highway may also limit access to Kuyuktuvuk Creek. There is only one parking spot along the Dalton Highway at mile 224 (to access the lower Kuyuktuvuk Creek valley), which is several miles South of the access route to the upper Kuyuktuvuk valley.

It is difficult to determine the amount of recreational use to any given area based on site conditions. Therefore, our HIS monitoring efforts must continue to focus on deviations from wilderness conditions. The social and ecological carrying capacities of wilderness areas are not well understood, so efforts may be better spent by close and frequent observation of site conditions (or drainages) that are approaching critical impact levels (Washburne 1982). Vegetation response is a good indicator of resource conditions but may be too complex for recreational use predictions. For instance, damage to vegetation at a campsite does not increase at a constant rate with numbers of visitors; such damage depends on characteristics of the site itself and on the behavior of the various visitors, as well as the amount, timing, and type of use (Cole 1981).

MANAGEMENT RECOMMENDATION

The geographical location of some sites (i.e., lichen knolls) at the lower Arrigetch Creek may make them more susceptible to increased camping pressures. These sites need special attention since they are sensitive to recreational use based on the high measurements of bare ground area observed in both the June and August visits. As noted in the Gates GMP(1986), we must "determine and only allow levels of human use that park resources can withstand without impairing their integrity or condition." There may not be much we can do with site rehabilitation, so we should stabilize these highly impacted sites to limit soil erosion. Encouraging dispersal, campsite rest-rotation, and permanent closures would only divert use to previously unused sites, increasing the number and total area of impacted sites (Cole 1981).

I recommend a three to four year interval of HIS Inventory visits to high use areas like the Arrigetch Peaks. In areas with a perceived lower use, we can use a minimum five year monitoring interval. HIS work in 1997 should concentrate on the Noatak River, as that drainage is a high use area. Other drainages that need intensive observation are; North Fork Koyukuk River, Tinyagak River, and the upper Kobuk River region (including Walker Lake). We must also continue collecting baseline data of recreational use by searching for the development of human impact sites along the Dalton Highway. We should continue monitoring established human impact sites along the Hammond River, including sites at Chimney Lake (upper Clear River) and Jenny Lake (lower Hammond River).

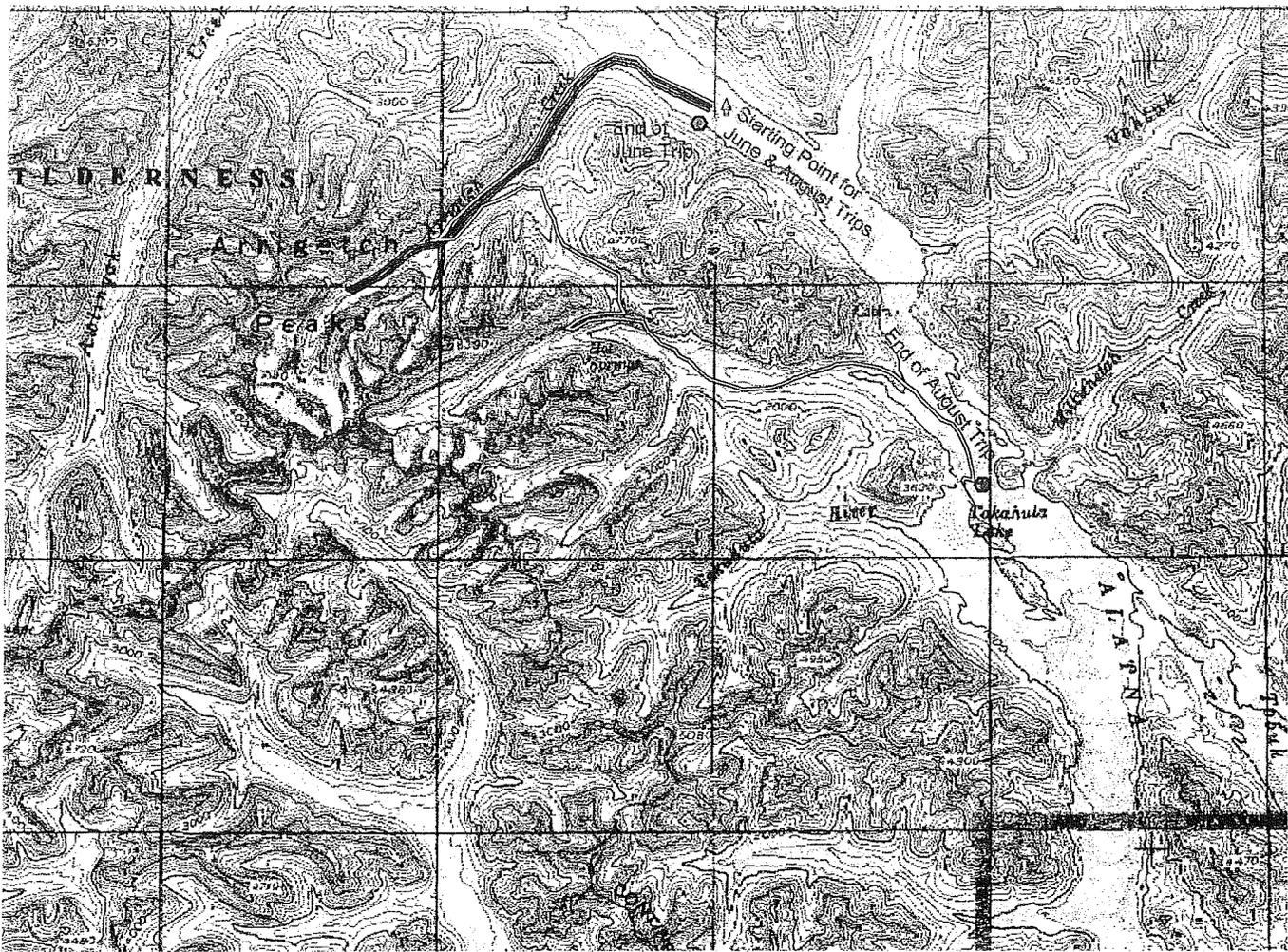
It may be more appropriate to begin the HIS monitoring in early July instead of late June, to allow the alpine vegetation to begin its vigorous growth. The early HIS Inventory visits may only be a measurement of vegetation growth, not human impacts.

The collection of HIS data by the ranger staff must be encouraged to obtain anecdotal information of all observed sites at Gates. They will need to fill out the first two pages of the HIS form to provide qualitative information by documenting the locations, disturbance and cleanliness of impact sites (See Appendix I).

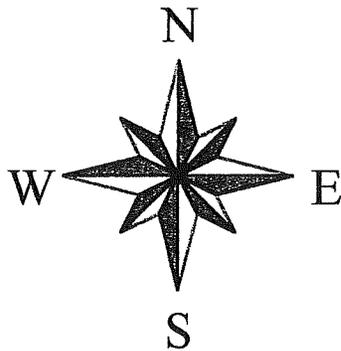
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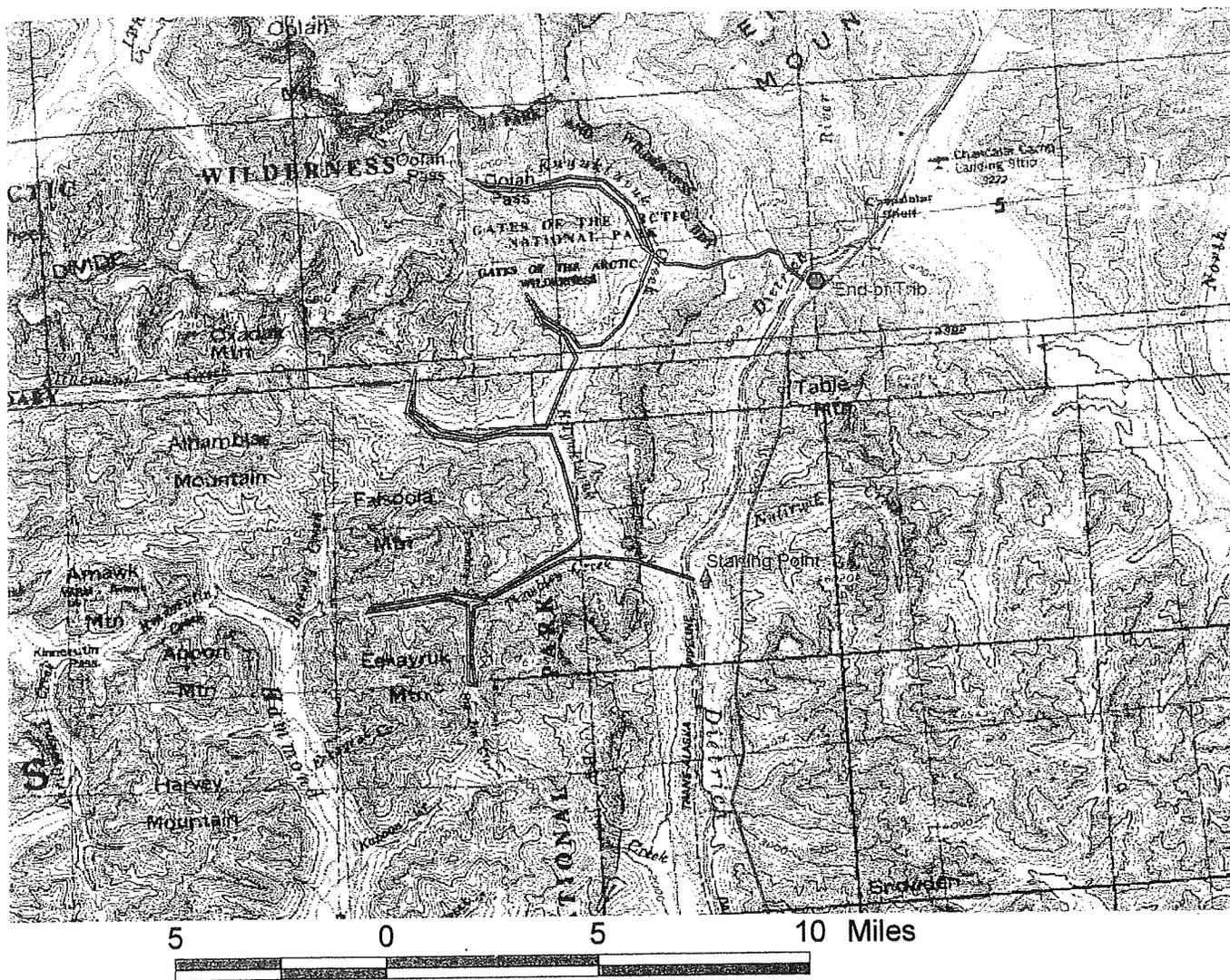
Washburne, Randel F. 1982. Wilderness Recreational Carrying Capacity: Are Numbers Necessary?  
Journal of Forestry. 101: pp. 726-728.



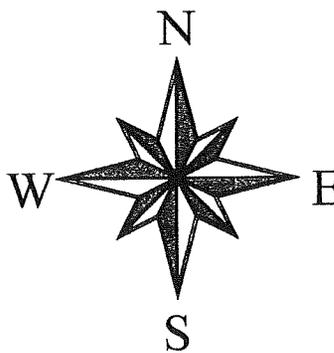
- June Trip Route
- August Trip Route



**Map 1. Survey routes for June and August Human Impact Site Inventory trips to Arrigetch Peaks, Gates of the Arctic National Park & Preserve, Alaska, 1996.**



- August Trip Route
- Towns
- Roads
  - Primary
  - - - Secondary
  - · · Proposed
  - · - Ferry, auto
- Park Boundary
  - ▭ Park
  - ▨ Preserve
  - ▩ Park and Wilderness
- Rivers
  - ▬ Double line, shoreline
  - Centerline
  - - - Single line, perennial
  - ~ ~ ~ Braided streams
  - centerline in water body



**Map 2. Trip route for Human Impact Site Inventory fieldwork on Kuyuktuvuk Creek, Gates of the Arctic National Park & Preserve, Alaska, 1996.**

Date: \_\_\_/\_\_\_/\_\_\_ Observers \_\_\_\_\_ Site No. \_\_\_\_\_

Site Type \_\_\_\_\_ Site Name/Description \_\_\_\_\_  
(campsite, viewpoint, landing point etc.)Location Type: \_\_\_\_\_ GPS Latitude: \_\_\_\_\_ GPS Longitude: \_\_\_\_\_  
(i.e. floodplain, terrace, tundra bench)

Quad: \_\_\_\_\_ Township: \_\_\_\_\_ Range: \_\_\_\_\_ 1/4 Section: \_\_\_\_\_

**DISTURBANCE**

Ground Cover w/in impacted area (i.e. mosses, lichen, grasses, etc.)

- |   |                          |
|---|--------------------------|
| 0 | No observable impact     |
| 1 | < 10% reduction in cover |
| 2 | 10 - 50% reduction       |
| 3 | > 50% reduction          |

Organic/Mineral soil exposed from disturbance

- |   |               |
|---|---------------|
| 0 | None observed |
| 1 | 1 - 25%       |
| 2 | 26 - 50%      |
| 3 | > 50%         |

Shrub damage (i.e. willows, alders, etc.)

- |   |   |
|---|---|
| 0 | None  |
| 1 | < 10% show damage (such as broken limbs, crushed appearance). |
| 2 | 10 - 30% show damage: 1 or 2 shrubs show reduced vigor.       |
| 3 | > 30% show damage: >2 show reduced vigor or are dead.         |

Dwarf shrub damage (Dryas, blueberry, labrador tea, cranberry, etc.).

- |   |   |
|---|---|
| 0 | None  |
| 1 | < 10% show damage (such as broken limbs, crushed appearance). |
| 2 | 10 - 30% show damage: 1 or 2 show reduced vigor.              |
| 3 | > 30% show damage: >2 show reduced vigor or are dead.         |

yes/no Damaged/Abraded Roots? (i.e. poplar, spruce trees, etc.)

Trails Development

- |   |  |
|---|--|
| 0 | none or not obvious.   |
| 1 | 1 trail from main site, no spurs                                 |
| 2 | 2-3 trails, side trails or spurs developing.                     |
| 3 | > 3 trails and side trails developed, trails beginning to merge. |

Trail Depth

- |   |                    |
|---|--------------------|
| 0 | Crushed Vegetation |
| 1 | Mottled Vegetation |
| 2 | Vegetation Removed |
| 3 | Below surface ruts |

Shoreline or Bank Disturbance

- |   |   |
|---|---|
| 0 | No disturbance.   |
| 1 | Slight erosion and trampling on terrace.                            |
| 2 | Trail up bank obvious and some erosion: some bare spots on terrace. |
| 3 | Bank eroding; terrace devegetated.                                  |

Firerings - # Firerings found \_\_\_\_\_  
yes/no Firewood pile?

Rock displacement

- |   |  |
|---|--|
| 0 | none   |
| 1 | 1-5 rocks  |
| 2 | > 5 rocks  |
| 3 | > 5 rocks; tables, seats, and other items construc |

**CLEANLINESS**

Trash

- |   |                     |
|---|---------------------|
| 0 | none                |
| 1 | < 5 pieces of trash |
| 2 | > 5 pieces          |

Human waste and TP

- |   |                       |
|---|-----------------------|
| 0 | none                  |
| 1 | evidence of one event |
| 2 | 2 - 4 events          |
| 3 | > 4 events            |

**OVERALL RATINGS**

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**DISTURBANCE**

(No disturbance)

0    0+    1-    1    1+    2-    2    2+    3-

(Heavily disturbed)

3    3+

**CLEANLINESS**

(Clean)

0    0+    1-    1    1+    2-    2    2+    3-

(Trashed, eventful)

3    3+

**Management Action Taken**

**Future Management Action Needed**

- 1 No Action
- 2 Destroyed fire signs
- 3 Cleaned up
- 4 Dismantled "improvements"
- 5 Other - (Specify)

- 1 No Action
- 2 Destroy fire signs
- 3 Clean up - minor
- 4 Clean up - major
- 5 Dismantle "improvements"
- 6 Other - (Specify)

**COMMENTS:**

Site Location Sketch (indicate geographical features)

