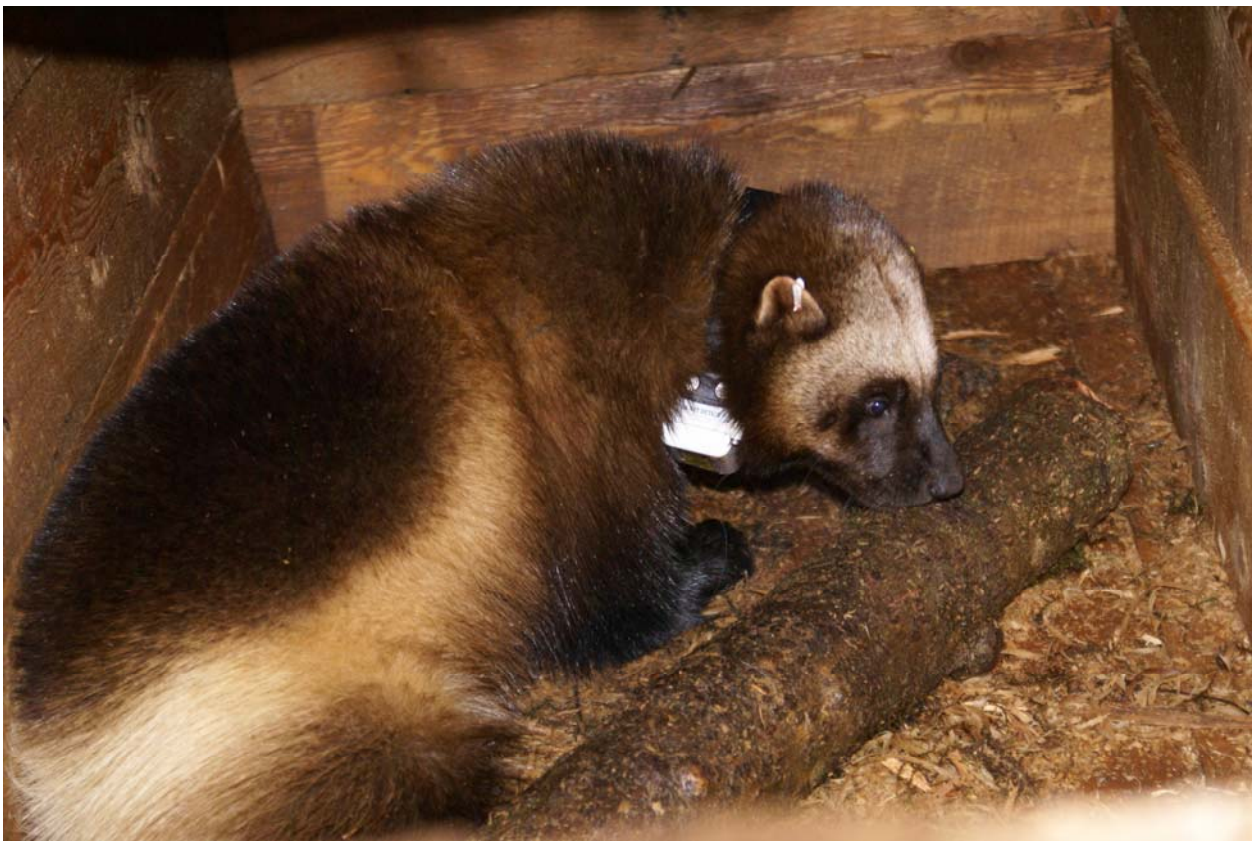
Wildlife Research Progress Report

Wolverine Population Ecology in Berners Bay, Alaska



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Introduction

Background

The wolverine (*Gulo gulo*) is one of the rarest and least-known carnivores in North America (Banci 1994, Ruggiero et al. 2007). Wolverines occur at low densities and tend to be found in areas removed from human influence (Banci 1994, Aubry et al. 2007). Because of this, relatively little was known about wolverine ecology until recently (Banci 1994, Squires et al. 2007). Research has shown that wolverines are susceptible to human disturbance (Krebs et al. 2007), that suitable denning habitat is a critical habitat component for wolverine population persistence (Magoun and Copeland 1998), and that harvest is an additive mortality that can significantly affect population demographics and cause local extirpation of wolverine populations (Hornocker and Hash 1981, Krebs et al. 2004, Squires et al. 2007).

Wolverines are managed as a commercial furbearer in Alaska for which trapping and hunting is allowed. Based on sealing records from southeast Alaska, 19 wolverines (on average) were harvested in Units 1 – 4 over the last 12 years; 42% of these were taken from Units 1C and 1D in northern southeast Alaska. Over that time, 0-4 wolverines were harvested in the Berners Bay area annually. Although sealing provides managers with some useful information on each animal sealed (e.g., sex and general location of harvest) and general trend of harvest, it provides no information about the wolverine ecology or insight about current or future population levels.

In southeast Alaska, access during the winter trapping season is logistically challenging because of limited road access to wolverine habitats. Near Juneau Alaska, the Alaska Department of Transportation and Public Facilities (ADTPF) is planning to construct an all-season highway that will extend the existing highway from Juneau approximately 50 miles northwest (ADTPF 2006). This road will pass through habitats occupied by wolverines and

provide significantly increased access to these areas. Increased access to wolverine habitats, provided by this road, will likely increase exploitation rates. In addition, this road could provide snow machine access to habitats used by female wolverines for denning and kit rearing (Magoun and Copeland 1998), potentially resulting in conflicts between female wolverines at their dens and recreational snow machine riders.

Knowledge of wolverine ecology and population dynamics is limited and field studies are needed to fill critical information gaps (Ruggiero et al. 2007). This is especially true in coastal areas like southeast Alaska (Magoun et al. 2007). Information on basic ecology, including home-range size and habitat use, movements and dispersal characteristics, and diet are needed to determine factors affecting wolverine abundance and ultimately to ensure sustainable populations (Krebs et al. 2004, Lofroth and Ott 2007). By learning the role and relative importance of these factors, we will be able to appropriately manage this species in a responsible manner per the Alaska Department of Fish and Game, Division of Wildlife Conservation's mission to "Conserve and enhance Alaska's wildlife and habitats and provide for a wide range of public uses and benefits".

Study Objectives

This research is designed to investigate the ecology of wolverines in the Berners Bay area of northern southeast Alaska. The specific objectives are to: 1) Determine spatial-use patterns (i.e., home range, movements) and habitat selection of wolverines in the Juneau Access study area; 2) Derive a wolverine population estimate for the Juneau Access study area; and, 3) Investigate wolverine food habits in the Juneau Access study area.

During this first field season of the project, our objectives were to: 1) capture up to 6 wolverines, attach GPS collars, and monitor their activity; 2) investigate and experiment with

techniques to generate a population estimate for wolverines in the study area; and 3) collect sample for genetic and stable isotope analysis from live captured and trapped wolverines from Berners Bay and the surrounding area. This report provides a summary of project activity from December 2007 – September 2008.

Study Area

We studied wolverines in the watershed complex associated with Berners Bay (58º 46' N, 134º 56' W; 60 km north of Juneau, Alaska; Figure 1). Four large rivers (Antler, Berners, Gilkey, and Lace) and several smaller watersheds drained into Berners Bay. Elevation within the study area ranged from sea level to >1900 m. The area had a maritime climate with cool, wet summers and relatively warm, snowy winters. Summers temperatures averaged 13.9°C while winter temperatures averaged -3.2°C (Haines, AK; National Weather Service, Juneau, AK; http://www.arh.noaa.gov/clim/climDataSearch.php?stnid=ahna2). Annual precipitation at sea-level averaged 140 cm. Higher elevations (800 m) typically received around 100 cm of snow annually.

Berners Bay is an intensely glaciated landscape. The study area contains rugged topography interrupted in a few areas by river valleys and glacial outwash plains. The mountains have moderate to steep forested slopes, interrupted by raised benches, bare rock cliffs, and steep avalanche chutes.

The terrestrial habitat in Berners Bay consists mostly of coastal coniferous rainforest dominated by western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*), and some scattered mountain hemlock (*T. mertensiana*), Alaska or yellow cedar (*Chamaecyparis nootkatensis*), and red alder (*Alnus rubra*). These forests typically extend from sea level to an elevation of approximately 750 m, with subalpine and alpine habitats at higher elevations.

Deciduous forest or mixed deciduous/needleleaf forest communities, dominated by black cottonwood (*Populus balsamifera*), are found in limited areas, primarily in association with floodplains of larger rivers. Interspersed within the forest are open, poorly drained areas, including muskeg and bog communities. The subalpine and alpine areas, with steep slopes and limited soil, support low shrub and dwarf shrub communities, and a variety of grasses, wildflowers, ferns, and mosses; above this, glaciers and snowfields dominate.

Potential wolverine prey in Berners Bay include moose (*Alces alces*), mountain goats (*Oreamnos americanus*), Sitka black-tailed deer (*Odocoileus hemionus sitkensis*), beaver (*Castor canadensis*), hoary marmot (*Marmota caligata*), porcupine (*Erethizon dorsatum*), and various smaller rodents. Many streams in the study area support spawning Pacific salmon (*Oncorhynchus* spp.) during the late summer and fall. Larger predators include brown (*Ursus arctos*) and black bears (*U. americanus*), wolves (*Canis lupus*), coyotes (*Canis latrans*), and lynx (*Lynx canadensis*).

Methods

Wolverine Capture and Handling

We captured wolverines using log box-traps (Figure 2) and modified box-traps (Figure 2; Copeland et al. 1995) and experimented with a portable, plastic barrel-type trap (Figure 2). During early winter 2007, we felled red alder trees (15 – 20 cm diameter) and cut them to length (~ 183 cm) on site for transport to our storage location. We used approximately 5 trees per trap and collected enough wood for 4 traps. We obtained scrap sections of rough-cut 15-cm × 20-cm western hemlock for 2 traps and purchased rough-cut, 15-cm × 20-cm hemlock from a local timber mill for 5 traps. We prepared materials for trap construction (e.g., cut sections to length)

at our storage location and deployed trap material with the aid of a helicopter to sites for construction. We constructed traps (183 cm long, 102 cm wide, 86 cm high) on site and felled 1 tree at each site for the lid lever-arm and support (Figure 1).

We situated traps to intercept travel routes of wolverines, usually along riparian corridors or at the base of valley-side slopes, or to target sites with natural attractants (e.g., winter-killed goat carcasses). We constructed traps beneath the canopy of a large tree to reduce snow accumulation on the trap lid.

We baited traps with parts from beaver, mountain goat, black-tailed deer, and salmon carcasses. We looped wire around or through the bait and pulled it snug against the back of the trap. We placed a layer of conifer boughs on the trap floor to prevent bait from freezing to the floor and to provide bedding for captured animals. We stapled a 91-cm × 91-cm piece of plastic tarp on the lid at the back of the trap to provide additional shelter from rain or melting snow for animals in the trap.

Wolverine capture season coincided with the time when brown and black bears were denning and thus would not molest traps (roughly December – April). We began trap placement and construction in January of 2008 and continued to construct traps throughout the season (Table 1), ending when bear sign appeared at traps. We used a VHF trap-site transmitter (TBT-500, Telonics, Mesa, AZ) on each trap to monitor trap success daily. We checked traps regularly for excessive snow and ice buildup on the lid and trigger mechanism, visiting them at least once every 7 days.

We followed capture and handling guidelines presented by the American Society of Mammalogists (Gannon et al. 2007) and approved by the Alaska Department of Fish and Game's Animal Care and Use Committee (ACUC # 07-20). We visually estimated the weight of

captured wolverines by opening the lid and shinning a flashlight on the animal and used that weight estimate to gauge the amount of drugs for immobilization. We immobilized wolverines using as mixture of ketamine (8 mg/kg) and medetomidine (0.3 mg/kg) administered with a jab-stick (Zoolu Arms of Omaha, Omaha, NE). We outfitted each animal with a store-on-board GPS collar (GPS_3300S; Lotek Wireless, Inc. Newmarket, Onterio) and a small (5cm x 0.5cm) colored ear tags (Minitag, Dalton ID Systems, Ltd., Oxon, United Kingdom) in each ear. We collected hair, blood, and tissue for genetic identification and stable isotope analysis. We recorded gender, weight, body measurements, and physical condition. We attempted to age animals based on tooth wear and took a set of photographs of each animal's teeth to compare with known-aged specimens. We examined mammary glands of females for evidence of current or previous lactation. Once processing was complete, we returned the animal to the trap and administered atipamezole (0.2 mg/kg) to reverse the medetomidine. We secured the trap door open and allowed the animal to vacate the trap site on their own. Non-target animals were allowed to vacate on their own by securing the door open and leaving the vicinity of the trap.

GPS Collars

We utilized Lotek GPS_3300S store-on-board GPS collars, which are small enough to be worn by a wolverine. Their small size results in limited battery life and thus, restrictions in the number of GPS fixes you can gather. Software available with the Lotek collars allowed flexibility in collar programming, enabling us to change the fix rate from 12 fixes / hr (1 fix every 5 min) to 0.2 fixes / hr (1 fix / 6 hours). In addition, we could change the length of time the collar looked for satellites during each fix attempt. We experimented with different fix schedules and search times in an attempt to maximize the time over which the collar would collect locations while minimizing the length of time between fixes (i.e., the fix rate). We

deployed collars with a programmable, remote-release mechanism set to come off the animal 24 weeks after capture. Collars need to be recovered to access data.

Study Animal Monitoring

All marked animals were monitored periodically with VHF telemetry to maintain contact with each animal and to check for dropped collars. We used standard aerial radiotelemetry to locate animals monthly. We attempted to retrieve all dropped collars on the ground as conditions permitted.

Spatial Data Analysis

A comprehensive analysis of wolverine habitat use and movement patterns is planned but will not be completed until all GPS location information is collected. However, a descriptive assessment of broad-scale habitat use and movements was conducted based on data opportunistically downloaded from GPS collars on recaptured wolverines or recovered from the field.

Population Estimation

During this first field season, we did not attempt to make a population estimate. We researched different potential techniques to generate a population estimate.

Food Habits

Hair and blood was collected from live-captured and hair and tissue was collected from harvested wolverines. After the second field season, samples will be used for stable isotope analysis and comparison with known isotopic signatures of a suite of potential prey species (Ben-David et al. 1997). We will also send a portion of collected blood for stable isotope analysis to understand the diet just previous to capture because stable isotope analysis of hair describes the diet while that hair is growing (i.e., late summer and fall).

Results and Discussion

Trap Placement and Construction

We began trap construction in January. We built 1 prototype trap near the end of the existing road system. Later in January, parts for 8 traps were slung to preselected sites around Berners Bay (Figure 3). We constructed these 8 traps in late January and February. We slung and built 2 additional traps in April and experimented with 2 portable, plastic traps in late March (Table 1).

Based on last year's trap results, we plan to reuse most of the existing traps. Any traps we do not use will either be deconstructed and moved or destroyed on site.

Capture and Handling

From January to April 2008, we captured 4 individual wolverines (2 males and 2 females) 9 times during 701 trap nights resulting in a capture rate of 1.28 captures/100 trap-nights (Tables 1, 2). We had a capture rate for individual wolverines of 0.57 individual captures/100 trap-nights. All wolverines were captured in log or modified log box traps; no animals were captured in the portable plastic traps. All captures took place away from the beach edge of Berners Bay (Figure 3).

We anesthetized wolverines each time they were caught in our traps. We collared each wolverine upon initial capture. Upon recapture, we downloaded GPS collars for wolverines that retained them (M1 twice, F1 once) and deployed a new collar on wolverines that had dropped their original collar (F1 and F2; Table 2). Male wolverines weighted 14 – 15 kg and females weighted 8 – 9 kg.

Wolverines escaped from traps 2 times because of a malfunction in the bait attachment. A modified carbineer was used to connect the trigger wire to the wire surrounding the bait. In both cases, the animal was able to free the bait from this carbineer without triggering the trap and escape with the bait. After this occurred, all carabineers were removed and replaced with a locking connector that could not be unlatched by an animal.

Non-target species captured included American marten (*Martes americana*) and a domestic dog (*Canis familiaris*; Table 1). In addition, brown and black bears tripped traps but did not get caught or were able to escape (identified by tracks at site). Two traps were partially destroyed by bears on the last day of trapping; the traps will be reconstructed for reuse.

Monitoring

Wolverine M1 was collared originally on 3/21/2008. He was recaptured on 3/29/2008 and retained his collar. We downloaded his collar at that time. He was recaptured a third time on 4/22/08. He still had his collar and we downloaded it and replaced the battery. On 6/25/2008 his collar was located from the air in 'recovery' mode, implying that it had been dropped and that the GPS battery was dead. However, upon attempting to retrieve this collar we learned that he was still wearing it. It is set to come off on 10/7/08 and will be located and retrieved after that.

Wolverine F1 was captured and collared on 4/15/2008. She was captured again on 4/20/2008 and her collar was downloaded. On 4/29/2008, F1 was captured a third time but had lost her original collar and was given a new collar. On 4/30/2008, F1 dropped her second collar. On 5/3/2008, we attempted to collect both of F1's dropped collars. We found her second collar in a small cave formed by snow drifting over a large rock on a steep slope (Figure 4). There were signs of porcupine roosting in the cave. The collar was found wedged between the rock

and snow (Figure 4). We located F1's first collar in a band of cliffs but determined that it was in a deep cleft in the cliffs and was unreachable at the time. F1's status at this time is unknown.

Wolverine F2 was first captured and collared on 4/18/2008 (Table 2). She was recaptured on 4/28/08 without that collar and was given a new collar at that time. She was last located on 6/25/2008 but has not been heard since that flight. Her first collar was located on 6/25/2008 but had not been recovered to date because of its remote location and difficult weather. Her second collar was retrieved and downloaded on 9/11/2008. F2's status at this time is unknown.

Wolverine M2 was captured and collared on 4/22/2008 (Table 2). He has not been located since his capture despite several attempts to listen for his collar throughout the bay. We will continue to search for him and will conduct a thorough aerial search once his collar releases on 10/7/2008.

GPS Location Data

We downloaded collars 3 times from captured animals (M1 and F1; Table 2). We have recovered and downloaded 2 collars that animals dropped prematurely (F1 and F2; Table 2). Four collars remain in the field; 2 still on animals (M1 and M2), 1 yet to be retrieved (F2's first) and 1 that is irretrievable (F1's first).

We programmed collars with different fix rates to attempt to optimize the number of points acquired while maximizing battery life. The initial schedule on M1 yielded a 12% fix rate (20 fixes over 171 attempts; 70 sec max time) over 8 days (3/21 – 3/29). The second schedule on M1 yielded a 19% fix rate (105 fixes over 549 attempts; 120 sec max time) over 24 days (3/29 – 4/22). F1's collar yielded a 36% fix rate (39 fixes over 108 attempts; 120 sec max time). F1's collar 2nd fix rate was 38% (35 fixes over 93 attempts; 120 sec search time). F2's 2nd collar yielded a 31% fix rate (88 fixes over 283 attempts; 120 sec search time). Once we retrieve the

remaining collars, we will determine which fix rate met our needs and will use that for animals collared his coming field season.

Movement

Based on GPS location data from 1 male and 2 female collars, we calculated a 100% minimum convex polygon for each animal (Figure 5).

During 3/21/2008 – 5/2/2008, M1's home range area was 263 km^2. During this time, he made repeated circuits of his home range, regularly covering the approximately 26 km length of this area in a day or two and crossing the approximately 1500 m ridge that runs the length of this area on several occasions (Figure 5). Many of his locations were in habitat used by wintering mountain goats during winter (White et al. 2007; K. White, pers. comm.).

F1's collars were only worn for 8 days, during which she traveled over an area of 42 km^2 (Figure 5). During this time, she stayed in the valley bottoms mostly, never climbing higher than 800 m.

During 4/28/2008 – 5/10/2008, F2's home range area was 65 km^2. She spent most time on the mountain range between the Berners and Lace Rivers, with 1 foray across the Berners River valley to investigate a mountain goat carcass (collared mountain goat that died over the winter, K. White, pers. comm.). During the 2 weeks she wore her collar, she covered this area 3 times, including crossing the 1100 m ridge on several occasions.

Food Habits

We collected hair and blood sample from 4 wolverine live-captured during this study. In addition, we collected 6 samples from wolverines lethally trapped in the Berners Bay area. We will collect samples from all captured and trapped wolverines from Berners Bay this winter and send those in for stable isotope analysis examine their diet.

Future Field Work

Fall 2008

Collar Monitoring and Retrieval – Collars that are still in the field are scheduled to come off in October. We will attempt to locate the 2 remaining collars via aerial telemetry to determine if they are still on the animals or have been dropped. We will attempt to retrieve all collars using a helicopter to get in the vicinity and then honing in on the collar using standard radio telemetry techniques.

Trap Movement and Construction – During Fall of 2008, we will evaluate each trap site and determine which will be reused for the upcoming trapping season. Some traps will be deconstructed and move further up into the bay for reconstruction. In addition, trap material for 4 more traps will be slung into place for construction.

Winter 2009

Trapping – Pre-baiting of traps will begin near the beginning of December and traps will be set in mid-December. Trapping will continue until mid-late April; trapping may be intermittent during this time. We will attempt to collar up to 10 wolverines throughout Berners Bay and the Katzehin River area.

Camera Population Estimation – We will use remote digital cameras to photograph the ventral markings on wolverine chest, throat, and chin (Magoun et al. 2007; A. Magoun pers. comm.). We will use these photographs to determine the minimum number of wolverines using the study area. In addition, we will attempt to collect hair for genetic analysis and stable isotope analysis of diet at camera sites.

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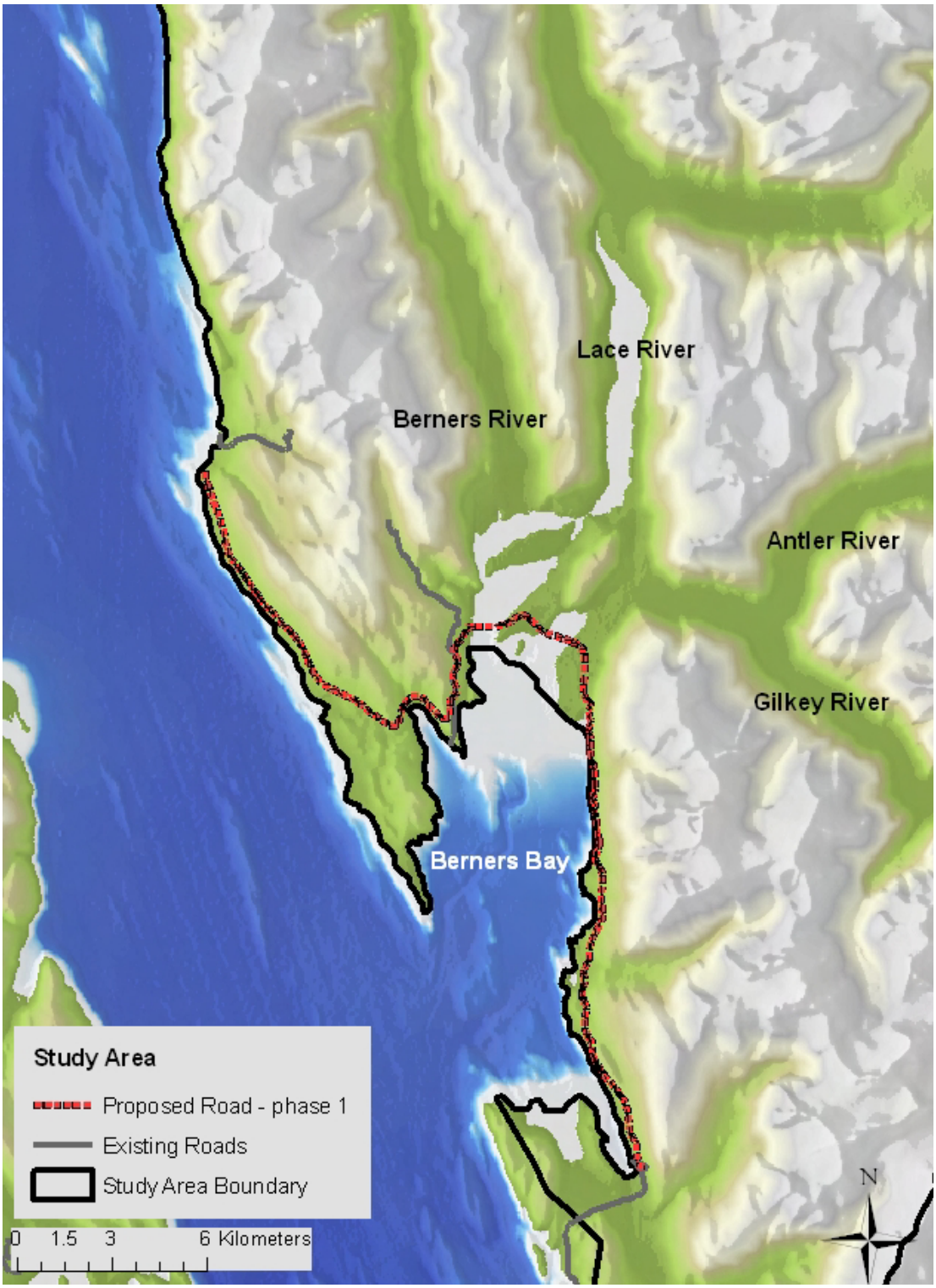

Figure 1. Juneau Access study area in northern Southeast Alaska, showing proposed and current road routes.

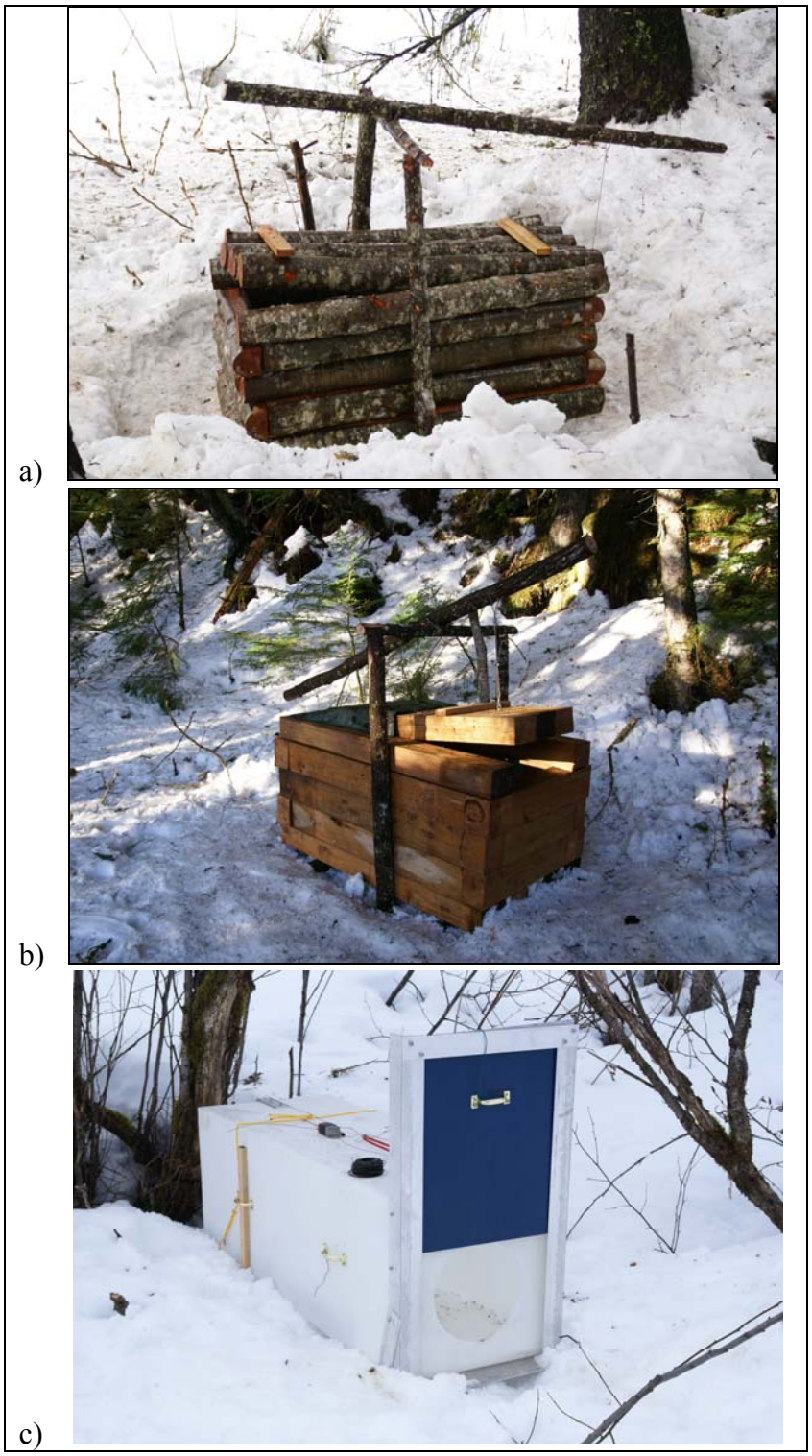

Figure 2. Wolverine traps used during winter 2007-2008, Berners Bay, Alaska; a) Trap made from red alder logs ; b) trap made from rough-cut western hemlock; c) Portable trap made from plastic water tank.

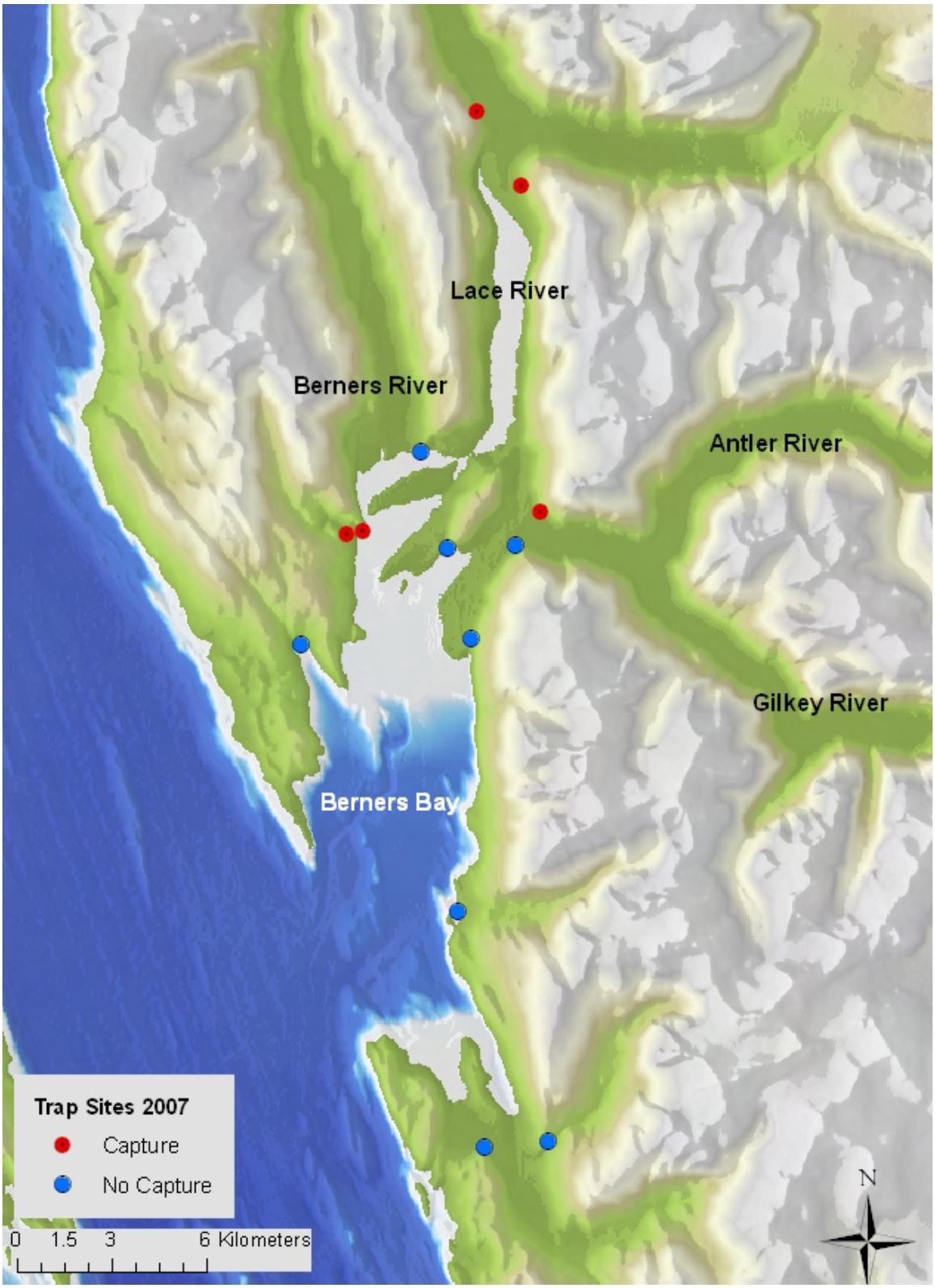

Figure 3. Wolverine trap locations in Berners Bay, Alaska, 2008.

a)  b) 

Figure 4. Location of wolverine F1's second dropped GPS collar, Berners Bay; a) shows hole in snow bank in which collar was found; b) collar wedged under rock outcrop and snow.

Figure 5. Home range of 3 wolverines in Berners Bay, Alaska; polygons generated from points collected from 3/21/08 to 5/10/08.

Table 1. Trapping results for 13 wolverine traps set in Berners Bay, winter 2008.

Trap Name	Trap Type	Date Set	Trap Nights	Wolverines Captured (individuals)	Capture Rate	Other Captures
Kowee	Alder	1/14/08	113	0	0.00	Dog
Davies	Hemlock	1/25/08	102	0	0.00	
Sawmill	Hemlock	2/02/08	83	0	0.00	
Slate	Hemlock	2/20/08	66	0	0.00	Marten
Hump	Alder	2/20/08	65	0	0.00	
Berners	Alder	2/21/08	57	0	0.00	
Back of Bay	Alder	2/21/08	58	2 (2)	3.45	
Johnson Mouth	Hemlock	2/22/08	60	1 (1)	1.67	Marten
Johnson Meadow	Hemlock	2/22/08	62	1 (1)	1.61	
Pygmy Owl	Hemlock	4/07/08	21	1 (1)	4.76	
Chutes	Hemlock	4/10/08	14	4 (3)	28.57	Marten
Slough	Plastic	3/18/08	42	0	0.00	
Lower Gilkey	Plastic	4/10/08	22	0	0.00	

Table 2. Capture results for 4 wolverines caught 9 times in Berners Bay, winter 2008.

Animal ID	Sex	Capture Event	Capture Date	Collar Information
M1	Male	1	3/21/2008	1st collar attached
		2	3/29/2008	Collar downloaded
		3	4/22/2008	Collar downloaded; battery replaced
F1	Female	1	4/15/2008	1st collar attached
		2	4/20/2008	Collar downloaded
		3	4/29/2008	1st collar lost; 2nd collar attached
F2	Female	1	4/18/2008	1st collar attached
		2	4/28/2008	1st collar lost; 2nd collar attached
M2	Male	1	4/22/2008	Collar attached