# HB

# 105

<TARGET><BILL>HB 105</BILL><SUBJECT>HB
105</SUBJECT><COMM>SRES30</COMM></TARGET>

# ALASKA STATE LEGISLATURE

## REPRESENTATIVE ANDY JOSEPHSON

**Sponsor Statement**

*HB 105 – Denali Wolf Buffer Zone*

To protect wolves for future Alaskans and visitors, HB 105 would prohibit wolf hunting and trapping in two areas adjacent to Denali National Park & Preserve: The Wolf Townships (AKA The Stampede Trail) and the Nenana Canyon.

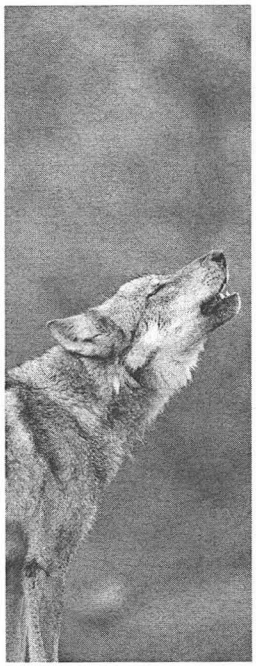
Visitors consistently tell Park managers that they want to see wild wolves, but few people get to see the iconic predators in Denali these days. Wolf sightings have declined dramatically.

For many years, Denali National Park had been known as one of the best places in the world to view wild wolves—and this pumped money into Alaska's economy. In 2016, Denali hosted 599,822 visitors who spent approximately $604,800.

The Board of Game established a buffer zone on the park's eastern boundary in 2000, but they eliminated that buffer in 2010. In 2014, less than 6% of park visitors were able to see wolves, a decrease from 45% from 2010. Wolf population in DNP&P has declined from 116 in spring 2006 to 50 in spring 2014.

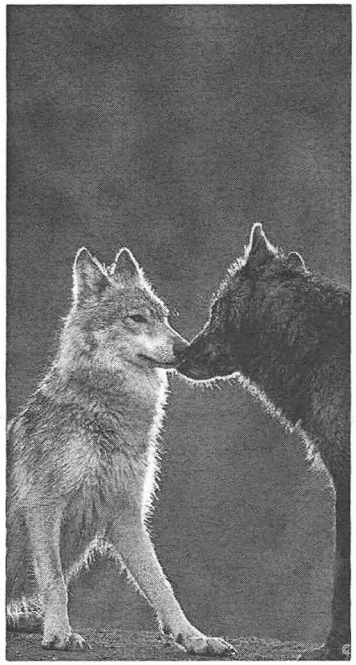
House Bill 105 helps to correct these trends. This entire state benefits from Denali National Park & Preserve, our most important tourism asset. Please join me in assuring that Alaskans and visitors for generations to come can be moved by seeing wild wolves there.

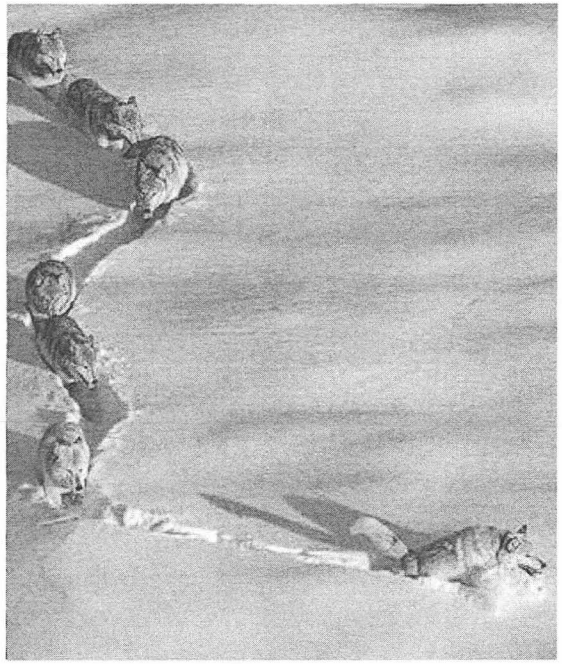
State Capitol – Juneau, Alaska 99801 – (907) 465-4939 – 1(800) 465-4939 – Fax (907) 465-2418
Rep.Andy.Josephson@akleg.gov – Facebook.com/RepAndyJosephson – Twitter.com/RepAndyJ



# Denali Wolf Buffer

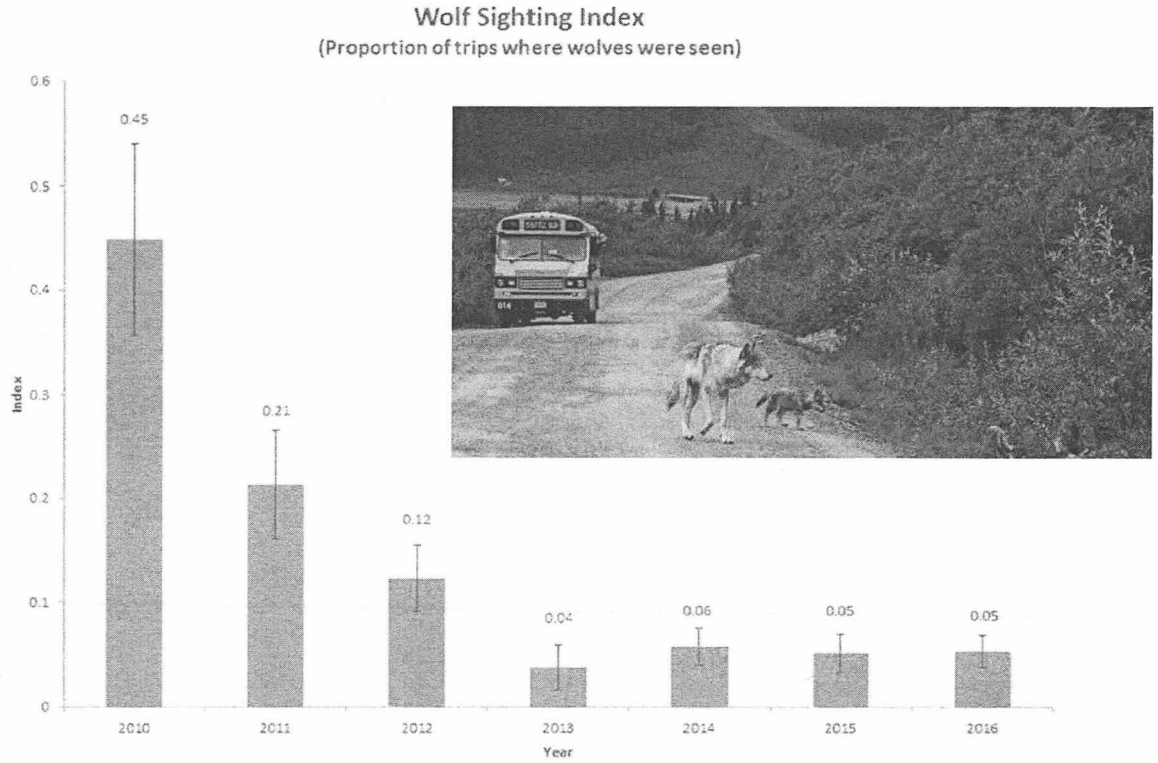
HB 105





# Wolves in Denali

- Wolf sightings are a major tourist draw to the area.
- The Board of Game established a buffer zone on Denali's eastern boundary in 2000, but this was eliminated in 2010.
- In 2014, less than 6% of park visitors were able to see wolves, a decrease from 45% from 2010.
- Wolf populations in Denali have declined from 116 in spring 2006 to 50 in spring 2014.

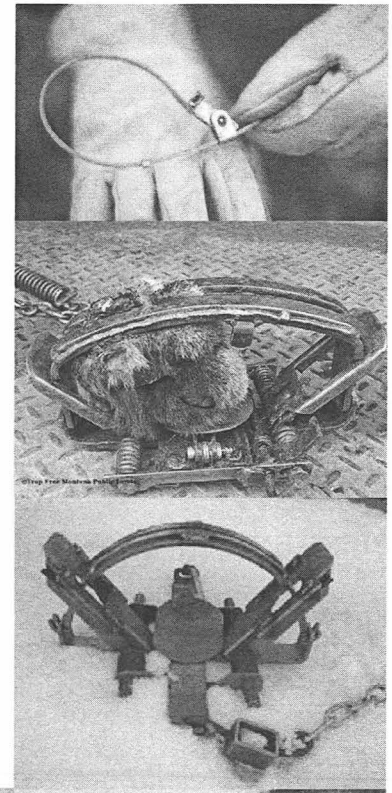


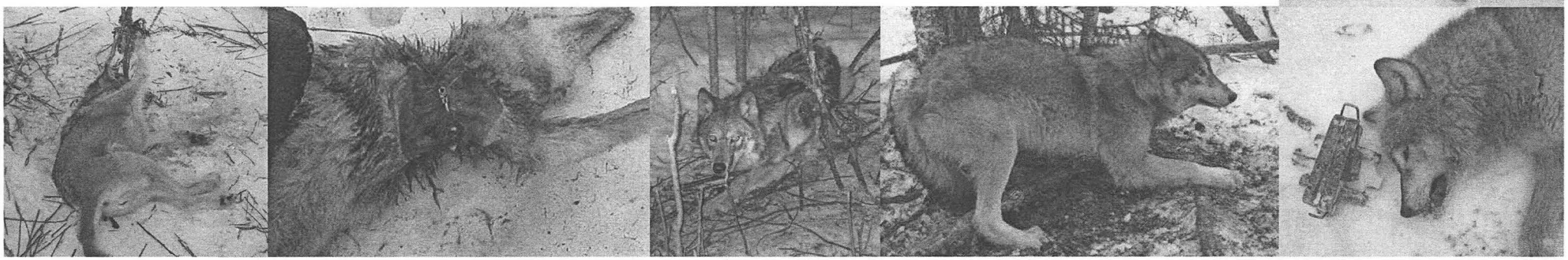

...why is this a problem? Economics.

Source: National Park Service

# The Issue

- **5 collared wolves** from Denali packs have been killed outside the park so far this winter (2017-18).
  - Riley Creek male harvested in Stampede corridor; collar destroyed
    - This wolf was commonly seen along the park road & had a role in 2017's higher viewing rate.
  - 2 wolves from Comb Pack harvested in Stampede corridor
  - 1 wolf from Eagle Creek Pack harvested in Nenana Canyon
  - 1 dispersed wolf from Iron Creek Pack harvested near Delta





# Economic Benefit of Wildlife Viewing

- Total direct expenditures by wildlife viewers in the USA were $54.9 billion in 2011.

**Table 1. Summary of National Economic Impacts of Wildlife Watching: 2011**

| | |
|---|---|
| Wildlife Watchers | 71,776,000 |
| Total Expenditures[1] | $54,890,272,000 |
| Total Industrial Output[2] | $142,147,057,177 |
| Jobs | 1,379,282 |
| Salaries and Wages | $53,036,586,430 |
| State and Local Tax Revenues | $10,277,128,026 |
| Federal Tax Revenues | $10,818,805,399 |

**Figure 1. Wildlife Expenditures by Major Category: 2011**
(Total Expenditures: $54.9 billion)

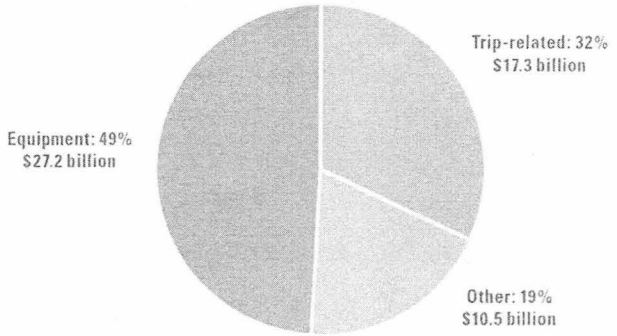
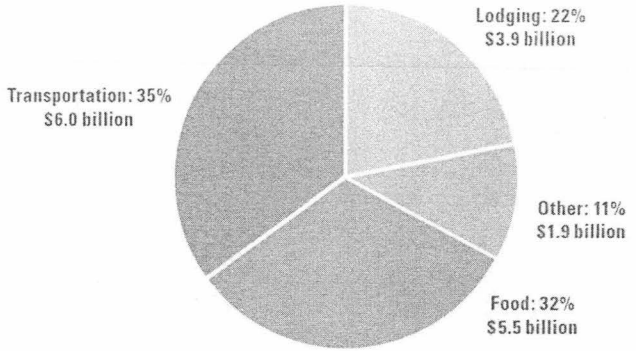



**Figure 2. Trip Expenditures for Wildlife Watching: 2011**
(Total Trip Expenditures: $17.3 billion)




Source: US Fish & Wildlife Service

## Table 6. Economic Impact of Wildlife Watching by State in 2011

| *State* | *Expenditures*[1] | *Total Multiplier Effect*[2] | *Jobs* | *Salaries and Wages* | *State and Local Tax Revenues* | *Federal Tax Revenues* |
|---|---|---|---|---|---|---|
| Alabama | $734,204,000 | $1,337,607,738 | 18,513 | $500,676,304 | $103,558,967 | $99,922,934 |
| Alaska | $2,058,996,580 | $3,368,780,475 | 40,493 | $1,553,658,942 | $311,271,218 | $254,559,696 |
| Arizona | $935,879,000 | $1,596,262,256 | 18,728 | $623,664,259 | $133,611,118 | $126,287,964 |
| Arkansas | $216,073,000 | $326,790,800 | 4,586 | $116,418,502 | $29,001,941 | $23,172,913 |
| California | $3,777,674,000 | $7,335,913,459 | 76,941 | $3,018,306,584 | $647,645,341 | $617,700,656 |
| Colorado | $1,432,082,000 | $2,650,114,899 | 31,157 | $1,114,213,845 | $228,240,368 | $228,244,417 |
| Connecticut | $934,703,000 | $1,623,177,206 | 15,961 | $654,844,506 | $118,313,266 | $145,270,697 |
| Delaware | $169,787,000 | $280,425,899 | 3,315 | $119,052,667 | $26,987,225 | $23,612,521 |
| Florida | $3,041,333,000 | $5,423,619,174 | 60,984 | $2,189,951,245 | $436,326,174 | $464,074,516 |

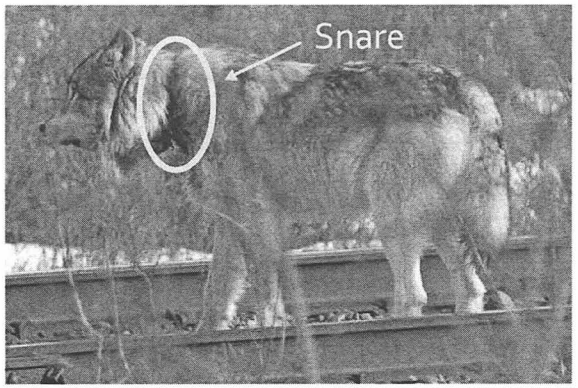
## Table 4. Top Ten States Ranked by Economic Output: 2011

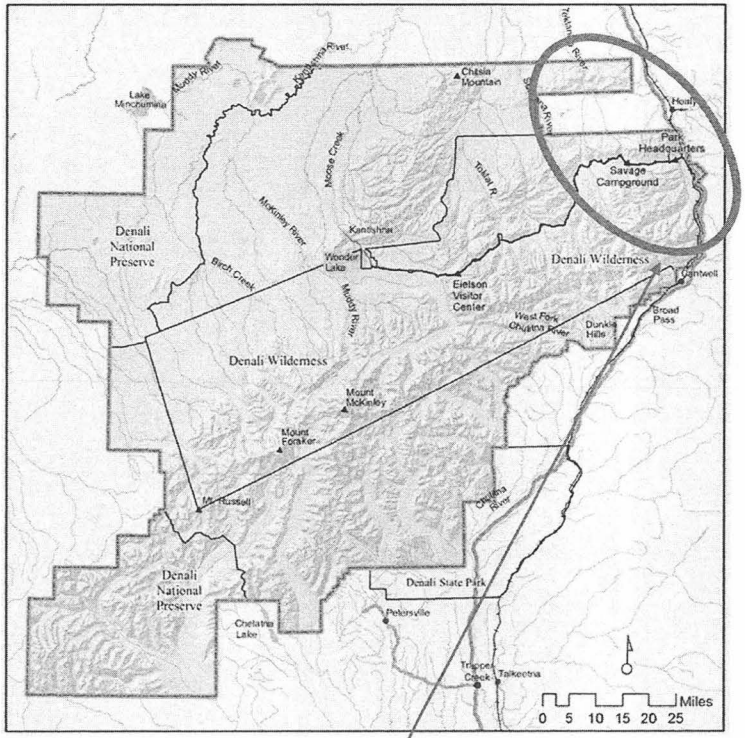
| *Rank* | *State* | *Economic Output* | *Wildlife Watchers* |
|---|---|---|---|
| 1 | New York | $4,151,793,000 | 4,239,000 |
| 2 | California | $3,777,674,000 | 6,733,000 |
| 3 | Washington | $3,173,373,000 | 2,168,000 |
| 4 | Florida | $3,041,333,000 | 4,308,000 |
| 5 | Alaska | $2,058,996,580 | 640,000 |
| 6 | Texas | $1,823,759,000 | 4,376,000 |

Source: US Fish & Wildlife Service

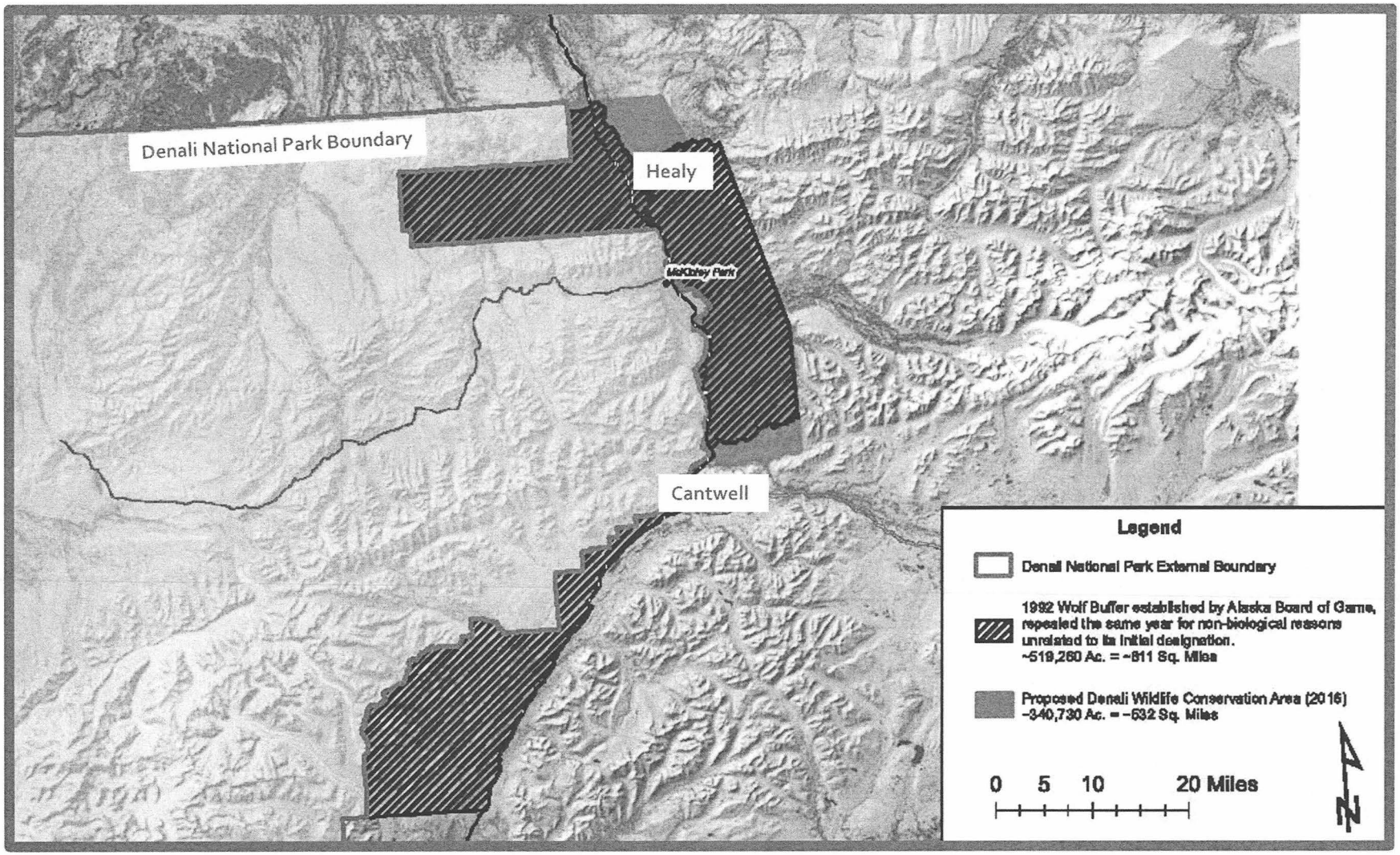
# The Buffer Zone

- To protect wolves for future Alaskans & visitors, HB 105 would **prohibit wolf hunting & trapping** in two areas adjacent to Denali National Park & Preserve:
  - Wolf Townships (aka Stampede Trail)
  - Nenana Canyon




The proposed buffer zone


Denali National Park Boundary
Healy
McKinley Park
Cantwell
Legend
Denali National Park External Boundary
1992 Wolf Buffer established by Alaska Board of Game, repealed the same year for non-biological reasons unrelated to its initial designation.
~519,260 Ac. = ~811 Sq. Miles
Proposed Denali Wildlife Conservation Area (2016)
~340,730 Ac. = ~532 Sq. Miles
0 5 10 20 Miles
N

# Support...

By: Van Lawrence
Introduced: 08/25/2016
Adopted: 08/25/2016

FAIRBANKS NORTH STAR BOROUGH

RESOLUTION NO. 2016–39

A RESOLUTION URGING GOVERNOR WALKER TO CLOSE AREAS ADJACENT TO DENALI NATIONAL PARK AND PRESERVE TO THE TRAPPING AND HUNTING OF BEARS, WOLVES AND WOLVERINES

WHEREAS, Over a half a million annual visitors from around the world come to Denali National Park and Preserve, in large part, to see the iconic wolves and bears of the Park; and

WHEREAS, Both the Park and commercial tour companies advertise Denali National Park and Preserve as the best place in the world to see wolves within their natural habitat; and

WHEREAS, A large percentage of these visitors come to Fairbanks because of our proximity to the Park; and

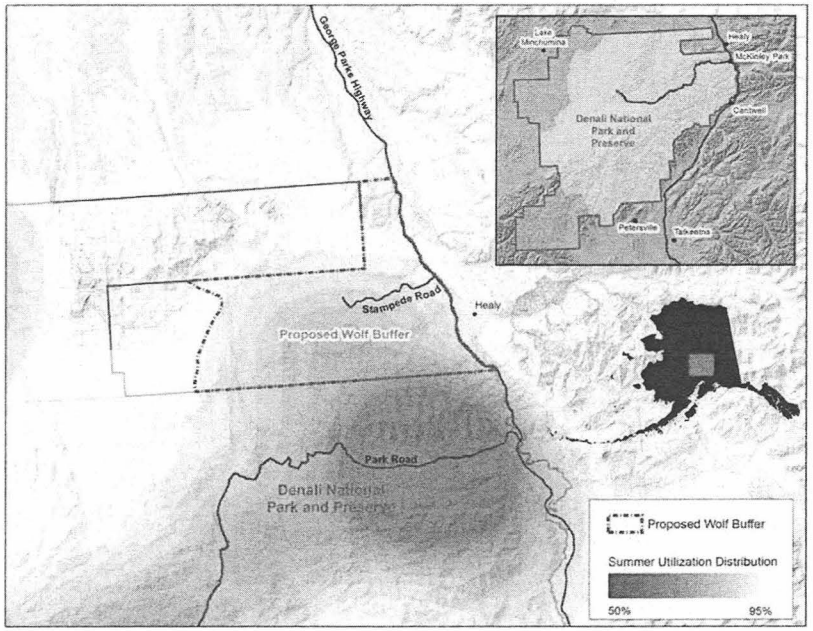



Figure 2. Density of radio collared wolf locations during May - September, 2004-2015 in the northeast corner of Denali National Park and Preserve in interior Alaska, USA.

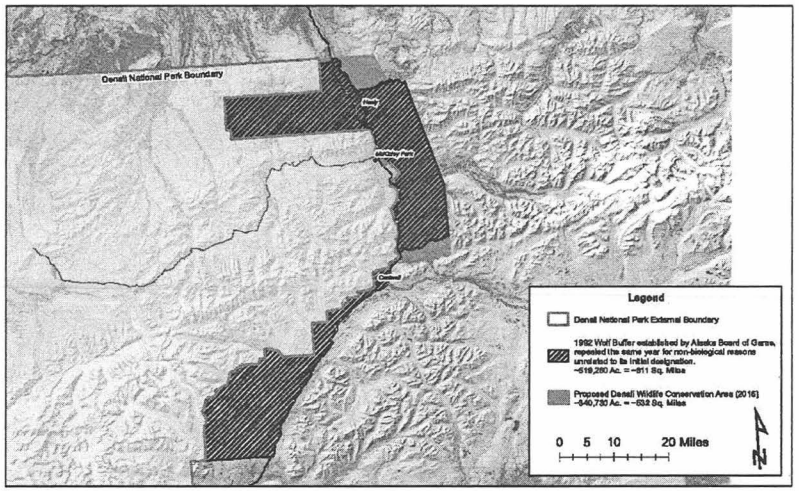
National Park Service 2017 buffer proposal:

Prohibit taking of wolves in portion of Game Management Unit 20C, per above. Close wolf hunting from Feb 1 - Jul 31 and trapping from Feb 1 - Oct 31 .

# Section 1: Adds new section to 16.05 (Fish & Game Code)

- Prohibits taking of wolves & use of certain traps & snares in specific areas adjacent to Denali National Park & Preserve.

  - A person may not take a wolf or use a cable snare with a diameter greater than 3/32" or a leg-hold trap with a jaw-spread greater than 5" within the boundaries described.
  - Nothing in this section may be construed to prevent the department from taking, or authorizing the taking of, wolves that present a danger to the health or safety of local residents.
  - A person who negligently violates (a) of this section is guilty of a class A misdemeanor.



# Thank you.

# Fiscal Note

State of Alaska
2017 Legislative Session

| | |
|---|---|
| Bill Version: | CSHB 105(RES) |
| Fiscal Note Number: | 3 |
| (H) Publish Date: | 3/22/2017 |

Identifier: HB105-DNR-MLW-2-8-17
Title: DENALI WOLF SPECIAL MANAGEMENT AREA
Sponsor: JOSEPHSON
Requester: (H) RES

Department: Department of Natural Resources
Appropriation: Fire Suppression, Land & Water Resources
Allocation: Mining, Land & Water
OMB Component Number: 3002

**Expenditures/Revenues**

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

| | FY2018 Appropriation Requested | Included in Governor's FY2018 Request | Out-Year Cost Estimates | | | | |
|---|---|---|---|---|---|---|---|
| **OPERATING EXPENDITURES** | **FY 2018** | **FY 2018** | **FY 2019** | **FY 2020** | **FY 2021** | **FY 2022** | **FY 2023** |
| Personal Services | *** | | *** | *** | *** | *** | *** |
| Travel | | | | | | | |
| Services | | | | | | | |
| Commodities | | | | | | | |
| Capital Outlay | | | | | | | |
| Grants & Benefits | | | | | | | |
| Miscellaneous | | | | | | | |
| **Total Operating** | *** | **0.0** | *** | *** | *** | *** | *** |

**Fund Source (Operating Only)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| None | | | | | | | |
| **Total** | *** | **0.0** | *** | *** | *** | *** | *** |

**Positions**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Full-time | | | | | | | |
| Part-time | | | | | | | |
| Temporary | | | | | | | |

**Change in Revenues**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| None | | | | | | | |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

**Estimated SUPPLEMENTAL (FY2017) cost:** 0.0 *(separate supplemental appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**Estimated CAPITAL (FY2018) cost:** 0.0 *(separate capital appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**ASSOCIATED REGULATIONS**

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? Yes
If yes, by what date are the regulations to be adopted, amended or repealed? 12/31/19

**Why this fiscal note differs from previous version:**

Not applicable; initial version.

| | | | |
|---|---|---|---|
| Prepared By: | Brent Goodrum, Director | Phone: | (907)269-8625 |
| Division: | Division of Mining, Land & Water | Date: | 02/08/2017 04:30 PM |
| Approved By: | Andrew T. Mack, Commissioner | Date: | 02/08/17 |
| Agency: | Department of Natural Resources | | |

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2017 LEGISLATIVE SESSION

## Analysis

The bill proposes to create the Gordon Haber Denali Wolf Special Management Area under AS 41.21 to protect wolves from hunting and trapping in the area adjacent to Denali National Park.

Department of Natural Resources (DNR) assumes this bill is intended to maintain current authorities and responsibilities of the State of Alaska Department of Natural Resources (DNR), Board of Game, Alaska Department of Fish and Game, Alaska Department of Transportation, and Alaska Department of Public Safety, which respectively make, implement, and enforce decisions in the area. This would include the management authority assigned to the Denali Borough for its approved municipal entitlement selections within the area.

If DNR is only to manage its existing authorities and responsibilities for state-owned land within the area, then the fiscal impact of this bill is indeterminate as DNR does not currently have sufficient information on the anticipated costs, or the expertise, to revise its land management plans and land management regulations to facilitate the intent of the proposed legislation to protect wolves from hunting and trapping. Under this proposed legislation, DNR would be required to revise its land use regulations to provide for wolf protection measures on DNR-managed state land. To accomplish this, DNR will need to conduct a broad scale scoping effort to gather relevant facts and information to determine appropriate amendments to the Yukon Tanana Area Plan and regulatory measures that would be necessary to tailor the land use authorizations issued within the proposed special management area to implement the intent of the bill.

If the intent of the bill is to transfer responsibilities and authorities to the Department of Natural Resources to complete the control, development, and maintenance that is currently conducted by other agencies, then the fiscal impact of this bill is indeterminate as Department of Natural Resources does not have sufficient information on the anticipated costs to control, develop, and maintain the identified area under the proposed legislation, in addition to costs addressed above.

# Fiscal Note

State of Alaska
2017 Legislative Session

| | |
|---|---|
| Bill Version: | CSHB 105(RES) |
| Fiscal Note Number: | 2 |
| (H) Publish Date: | 3/22/2017 |

Identifier: HB105-DPS-AWT-02-07-17
Title: DENALI WOLF SPECIAL MANAGEMENT AREA
Sponsor: JOSEPHSON
Requester: (H) RES

Department: Department of Public Safety
Appropriation: Alaska State Troopers
Allocation: Alaska Wildlife Troopers
OMB Component Number: 2746

**Expenditures/Revenues**

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

| | FY2018 Appropriation Requested | Included in Governor's FY2018 Request | Out-Year Cost Estimates | | | | |
|---|---|---|---|---|---|---|---|
| **OPERATING EXPENDITURES** | **FY 2018** | **FY 2018** | **FY 2019** | **FY 2020** | **FY 2021** | **FY 2022** | **FY 2023** |
| Personal Services | | | | | | | |
| Travel | | | | | | | |
| Services | | | | | | | |
| Commodities | | | | | | | |
| Capital Outlay | | | | | | | |
| Grants & Benefits | | | | | | | |
| Miscellaneous | | | | | | | |
| **Total Operating** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

**Fund Source (Operating Only)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| None | | | | | | | |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

**Positions**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Full-time | | | | | | | |
| Part-time | | | | | | | |
| Temporary | | | | | | | |

**Change in Revenues**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| None | | | | | | | |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

**Estimated SUPPLEMENTAL (FY2017) cost:** 0.0 *(separate supplemental appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**Estimated CAPITAL (FY2018) cost:** 0.0 *(separate capital appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**ASSOCIATED REGULATIONS**

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? No
If yes, by what date are the regulations to be adopted, amended or repealed?

**Why this fiscal note differs from previous version:**

Not applicable, initial version.

| | | | |
|---|---|---|---|
| Prepared By: | Kelly Howell | Phone: | (907)465-4336 |
| Division: | Administrative Services | Date: | 02/07/2017 11:30 AM |
| Approved By: | Walt Monegan | Date: | 02/07/17 |
| Agency: | Public Safety | | |

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2017 LEGISLATIVE SESSION

## Analysis

This legislation amends AS 41.21 by adding a new section establishing a special management area (buffer zone) near the border of Denali National Park and Preserve to protect wolves from hunting or trapping.

Passage of this legislation is not expected to have a significant impact on the enforcement efforts of the Alaska Wildlife Troopers. Therefore, a zero fiscal note is being submitted.

# Fiscal Note

State of Alaska
2017 Legislative Session

| | |
|---|---|
| Bill Version: | CSHB 105(RES) |
| Fiscal Note Number: | 1 |
| (H) Publish Date: | 3/22/2017 |

Identifier: HB105-DFG-DWC-02-07-2017
Title: DENALI WOLF SPECIAL MANAGEMENT AREA
Sponsor: JOSEPHSON
Requester: (H) RES

Department: Department of Fish and Game
Appropriation: Wildlife Conservation
Allocation: Wildlife Conservation
OMB Component Number: 473

**Expenditures/Revenues**

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

| | FY2018 Appropriation Requested | Included in Governor's FY2018 Request | Out-Year Cost Estimates | | | | |
|---|---|---|---|---|---|---|---|
| **OPERATING EXPENDITURES** | **FY 2018** | **FY 2018** | **FY 2019** | **FY 2020** | **FY 2021** | **FY 2022** | **FY 2023** |
| Personal Services | | | | | | | |
| Travel | | | | | | | |
| Services | | | | | | | |
| Commodities | | | | | | | |
| Capital Outlay | | | | | | | |
| Grants & Benefits | | | | | | | |
| Miscellaneous | | | | | | | |
| **Total Operating** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **Fund Source (Operating Only)** | | | | | | | |
| None | | | | | | | |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |
| **Positions** | | | | | | | |
| Full-time | | | | | | | |
| Part-time | | | | | | | |
| Temporary | | | | | | | |
| **Change in Revenues** | | | | | | | |
| None | | | | | | | |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

**Estimated SUPPLEMENTAL (FY2017) cost:** 0.0 *(separate supplemental appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**Estimated CAPITAL (FY2018) cost:** 0.0 *(separate capital appropriation required)*
*(discuss reasons and fund source(s) in analysis section)*

**ASSOCIATED REGULATIONS**

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? Yes
If yes, by what date are the regulations to be adopted, amended or repealed? 07/01/18

**Why this fiscal note differs from previous version:**

Not applicable; initial version.

| | | | |
|---|---|---|---|
| Prepared By: | Bruce Dale, Director | Phone: | (907)861-2101 |
| Division: | Wildlife Conservation | Date: | 02/07/2017 12:00 PM |
| Approved By: | Carol Petraborg, Director of Administrative Services | Date: | 02/07/17 |
| Agency: | Alaska Department of Fish and Game | | |

FISCAL NOTE ANALYSIS

STATE OF ALASKA
2017 LEGISLATIVE SESSION

## Analysis

The bill establishes the Gordon Haber Denali Wolf Special Management Area (GHDWSMA) adjacent to Denali National Park.

The department will continue to monitor wolves and other wildlife within the GHDSWMA and we anticipate no changes to our normal survey and inventory activities and, therefore, there will be no additional costs associated with wildlife management in the Special Management Area.

This fiscal note assumes that costs associated with control, development and maintenance of the lands and waters underlying the GHDWSMA, including maintenance on the stretch of Parks Highway running through the new Special Management Area, will continue to be borne by the state agencies currently responsible for those functions.

The department will identify any regulations that are inconsistent with the statute, and the Board of Game will adopt, amend, and repeal existing regulations to reflect the statutory changes.

ECONorthwest

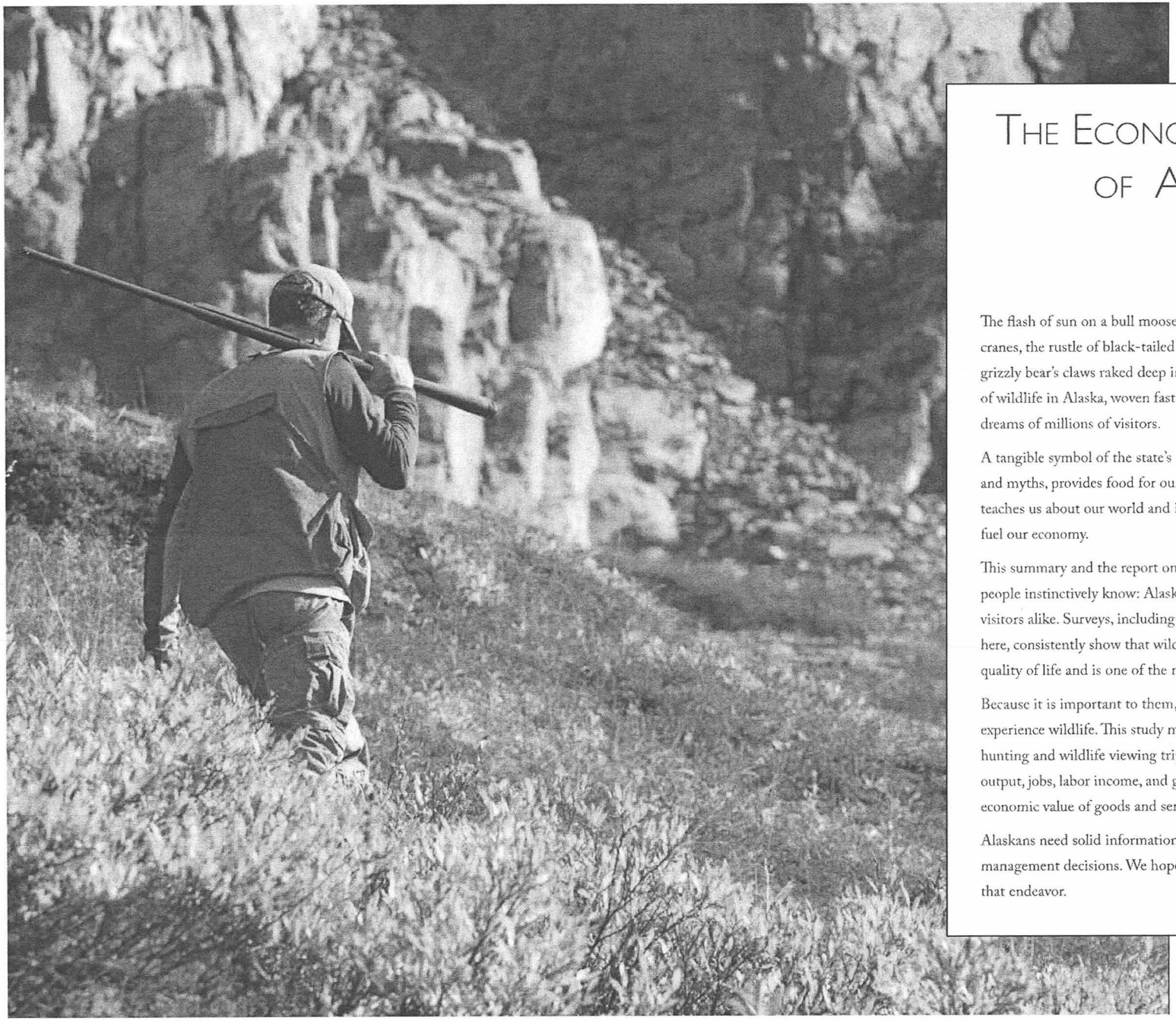
Natural Resource Economics

dhm RESEARCH

# The Economic Importance of Alaska's Wildlife in 2011

## Summary Report

March 2014



# The Economic Importance of Alaska's Wildlife in 2011

The flash of sun on a bull moose's rack, the bugling of passing sandhill cranes, the rustle of black-tailed deer in a dripping forest, scars from a grizzly bear's claws raked deep into the bark of an aspen. Such are scenes of wildlife in Alaska, woven fast into the fabric of Alaskans' lives and the dreams of millions of visitors.

A tangible symbol of the state's natural wealth, wildlife inhabits our legends and myths, provides food for our table, recreation for our leisure, and teaches us about our world and its workings. Furthermore, wildlife helps fuel our economy.

This summary and the report on which it's based demonstrate what most people instinctively know: Alaska's wildlife is important to Alaskans and visitors alike. Surveys, including those conducted in the research reported here, consistently show that wildlife contributes significantly to residents' quality of life and is one of the main reasons people visit Alaska.

Because it is important to them, people spend money to hunt, view, and experience wildlife. This study measures resident and visitor spending on hunting and wildlife viewing trips; analyzes the impacts on economic output, jobs, labor income, and governmental revenue; and estimates the economic value of goods and services in the state.

Alaskans need solid information to make the best possible wildlife management decisions. We hope this report is an important contribution to that endeavor.

## Participation in Hunting and Wildlife Viewing Activities

Almost 1 million households—residents and visitors—took at least one trip in 2011 to hunt or view wildlife in Alaska. Of those, more than 110,000 households, 86 percent of them Alaska residents, went hunting. More than 868,000 households, 77 percent of them visitors, went wildlife viewing.

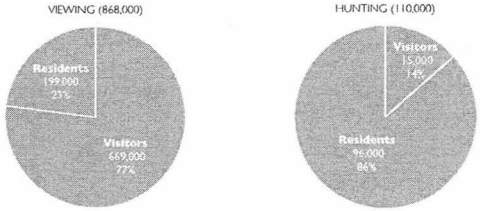
About 37 percent of all resident households took at least one hunting trip, and they averaged 11 trips during the year. About 2 percent of the visitor households hunted, with most taking only one trip.

About 77 percent of all resident households took at least one trip to view wildlife, and they averaged 30 trips during the year. About 86 percent of visitors participated in wildlife viewing and averaged 1.4 trips per household.

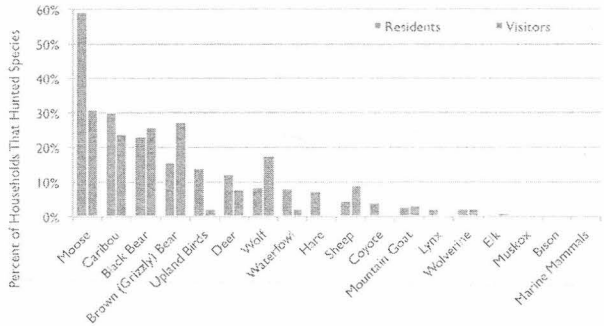
Hunters most commonly targeted moose, caribou, black bear, and brown bear. Wildlife viewers, especially visitors, also wanted to see those species. Seabirds, birds of prey, and marine mammals were also popular.

Definition of a Trip - Each survey respondent was asked to provide information about a hunting or wildlife viewing trip, defined as an "outing that begins from home or from another place of lodging, such as a vacation home, hotel, or a relative's home. A trip may last an hour, a day, or multiple days." The analysis of economic activity supported by hunting and viewing-related spending excluded trips that respondents would have taken even if they had not planned to hunt or view wildlife.

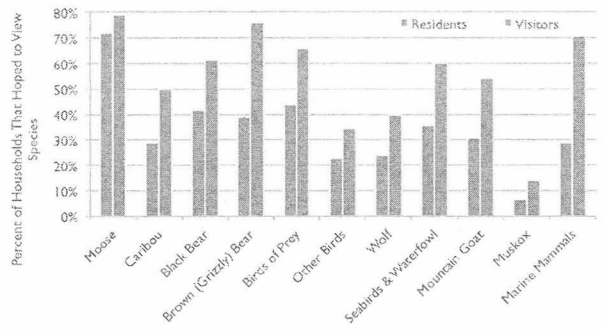
**Households that Participated in Hunting or Viewing Trips**




**Species Sought by Hunters**




**Species Sought by Viewers**

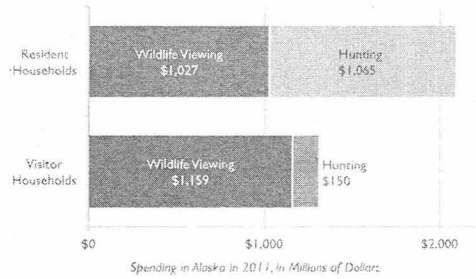




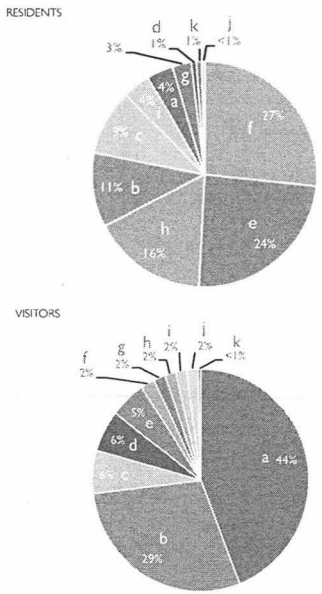

## Spending on Hunting and Wildlife Viewing

Residents and visitors spent $3.4 billion in Alaska on hunting and viewing activities in 2011, supporting the economic activity described on pages 4 and 5. Resident households spent about $2 billion of that, spread equally between hunting and viewing. Visitor households spent about $150 million on hunting and $1.2 billion on wildlife viewing.

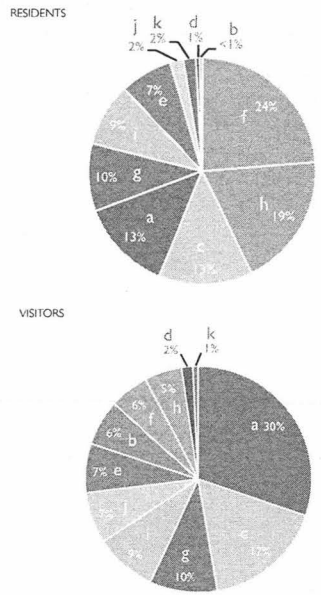
**Spending by Residents and Visitors**




**Hunting-Related Spending, by Category**




**Viewing-Related Spending, by Category**




- a Trip-Package Spending
- b Guide, Outfitter, Charter, and Transporter Fees
- c Transportation Fees or Tickets
- d Licenses, Tags, and Fees
- e Gear and Equipment Purchases
- f Fuel for Vehicles
- g Lodging
- h Groceries, Food, Liquor Purchased at Stores
- i Meals Purchased at Restaurants and Bars
- j Souvenirs and Gifts
- k Equipment Rental

Photo by Jim Dau

## Economic Activity Supported by Spending on Hunting and Wildlife Viewing

Spending on wildlife, whether by individuals, businesses, organizations, or government agencies, supports in-state economic activity and can be measured four ways:

1. **Economic output** – the total economic activity generated by spending on wildlife-related activities. This is equivalent to wildlife's share of Alaska's Gross Domestic Product (GDP).

2. **Jobs** – the total number of full-time and part-time jobs supported by spending on wildlife-related activities.

3. **Labor income (earnings)** – salaries, wages, employee benefits, and proprietors' profits stimulated by spending on wildlife-related activities.

4. **Governmental revenue** – the total personal and business tax revenues earned by local, state, and federal governments that are generated by spending on wildlife-related activities.

Spending on hunting and viewing in 2011 supported about 8 percent of Alaska's total economic output, 6 percent of its total employment, and 5 percent of the earnings of all workers. It supported about $343 million in revenue for local and state governments.

Economic activity associated with hunting and wildlife viewing occurred primarily in the service sector (guides, lodging, etc.), followed by the trade sector (shops selling groceries, binoculars, etc.) and transportation (gas stations, car dealers, etc.). Manufacturing, construction, and government also experienced hunting- and viewing-related economic activity.

Residents and visitors, like hunters and wildlife viewers, all have distinct spending patterns that affect the patterns of economic activity in Alaska differently. Residents, who took more hunting and wildlife viewing trips than visitors, spent less per trip than visitors and directed a greater proportion of that spending to goods, such as gear and equipment. Visitors, who took more viewing than hunting trips, tended to spend more on services provided by Alaskans. Consequently, visitor spending had a big impact on Alaska's economy since a dollar spent in the labor-intensive service sector typically generates more in-state jobs and labor income than a dollar spent in the trade sector, which often involves the sale of goods produced outside the state.



### Economic Activity in Alaska Supported by Spending on Hunting and Wildlife Viewing

| | Hunting | Viewing | Total[1] | Percent of State Total[2] |
|---|---|---|---|---|
| Output (millions) | $1,326 | $2,750 | $4,077 | 8 |
| Jobs | 8,400 | 18,820 | 27,220 | 6 |
| Labor Income (millions) | $457 | $976 | $1,434 | 5 |
| Government Revenue (millions) | $112 | $231 | $343 | |

[1] Dollars are rounded to the nearest million, and jobs are rounded to the nearest ten.
[2] Totals for Alaska's Gross Domestic Product, employment and earnings of Alaska's labor force from www.bea.gov.

The amounts in these tables come from taking the spending reported by survey respondents, extrapolating to estimate total spending by hunters and viewers, then inserting those total estimates into a model that traces how money circulates through the state's economy.

### Average Spending per Trip and per Household

| | Residents | | Visitors | |
|---|---|---|---|---|
| | Hunting | Viewing | Hunting | Viewing |
| Trip-Package Expenditures (per trip) | $52 | $137 | $5,441 | $1,014 |
| Guide, Outfitter, Charter, and Transporter Fees (per trip) | $108 | N/A[1] | $2,843 | N/A |
| Other Trip Expenditures (per trip) | $840 | $819 | $1,911 | $2,053 |
| Licenses and Fees (per household) | $81 | $28 | $594 | $28 |
| Gear and Equipment (per household) | $2,686 | $383 | $527 | $122 |

[1] N/A means spending is included in other categories.

### How Spending on Hunting and Wildlife Viewing Generates Economic Activity And Jobs

Spending on hunting and viewing totaled $3.4 billion in 2011 but generated $4.1 billion in economic activity in the state, over 27,000 jobs, and $1.4 billion in labor income. How does that work?

Two moose hunters leave their homes in Fairbanks and head to the local sporting goods store where they buy hunting licenses, ammunition, new hunting boot insoles, a spotting scope, and some game bags. They grab sandwiches and sodas at the local grocery store and fill their trucks and 4–wheeler tanks with gas. Early the next morning, they put their 4-wheelers in their truck beds and drive to their secret spot to begin their search for moose.

A couple visiting from Ohio decide to go brown bear viewing on a remote river near Juneau. After securing seats on a float plane, they buy a pack lunch from the hotel and new rain hats and a waterproof camera bag from a local sporting goods store. After a great day viewing bears, they leave a generous tip with their pilot guide.

The money the hunters and wildlife viewers spend goes to work almost immediately. It goes to pay the wages of the sporting goods store sales clerk, for example, who in turn spends some of those wages at a local restaurant and some more to pay his utility bill. The pilot pays her rent and buys a new parka for the upcoming ski season.

Spending by the clerk and the pilot helps support still other jobs as the money our hunters and wildlife viewers spent ripples outward in many directions through the local economy, even to sectors not directly related to hunting or viewing. The cycle continues until all the initial hunting and viewing spending eventually leaks out of the economy.

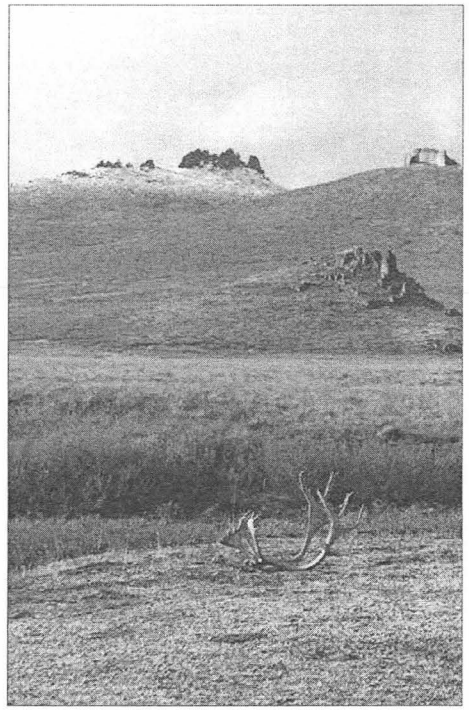



Photo by Kim Titus

## Total Economic Value of Wildlife-Related Trips

One measure of the economic value of wildlife is the amount of money, or the market price, a person pays for a hunting or viewing trip. While we know that a person who buys the trip is willing to pay at least the market price, his or her willingness to pay could be greater. That amount added to the market price constitutes the total value of the trip for that person.

For some survey respondents, the amount spent on a hunting or wildlife viewing trip in 2011 adequately measured the trip's full value. Many people, however, were actually willing to pay more than the market price. In fact, most respondents said the trip's value exceeded what they spent on it. The additional amount a person would have been willing to pay, above what he or she actually paid, represents a net benefit to the person.

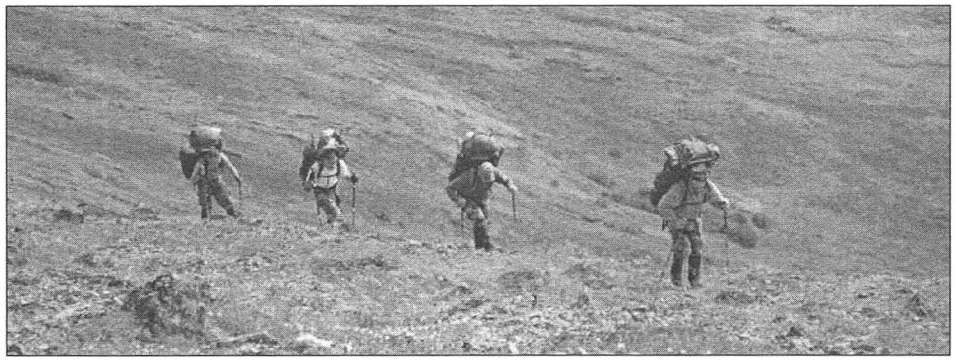
The charts on the right illustrate that resident households receive a fairly large net benefit when hunting or viewing in Alaska. That is, residents report being willing to pay, on average, 34 percent more than they actually paid for a hunting trip and 25 percent more for a viewing trip; so that the net benefit was 26 percent and 20 percent of the total value for hunting and viewing trips respectively.

Visitors, who already paid quite a bit more than residents to hunt or view in the state (including the cost of traveling from out-of-state), report being willing to pay 7 percent more than they actually spent for a hunting trip and 14 percent more for a viewing trip.

### Contingent Valuation

This study used a method called contingent valuation to estimate the amounts households would have been willing to pay for wildlife-related goods and services, beyond what they actually paid. This method has been employed for decades and natural resource economists generally agree that contingent valuation can yield a reliable estimate of what the public is willing to pay for wildlife-related goods and services. This study employed techniques that comply with widely accepted recommendations and guidelines for this type of research.

Respondents were asked if they still would have made the hunting or viewing trip if the cost of the trip had been higher. The extent to which respondents were willing to pay more than they actually paid for the trip reflects the net economic benefit of the trip. Adding this additional amount to the actual spending for the trip reflects the trip's total value to the person.

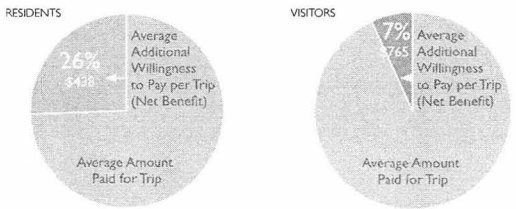




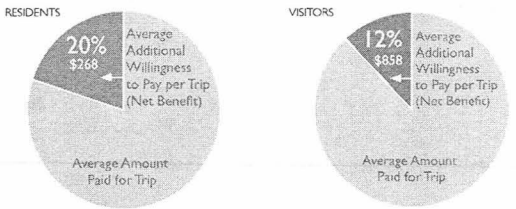
## Net Economic Benefit of Hunting and Viewing Trips

Visitor households, on average, realized a per-trip net economic benefit of $765 for hunting trips and $858 for viewing trips. Resident households, on average, enjoyed somewhat smaller per-trip net economic benefits: $438 for hunting trips and $268 for viewing trips. These values, multiplied by the number of trips taken in 2011, yield the total net economic benefit, shown in the table below. Accounting for the number of hunting and viewing trips taken per household in 2011 yields the average net benefit households received from hunting and wildlife viewing trips in 2011, also shown in the table below.

**Net Benefit of Hunting Trips**

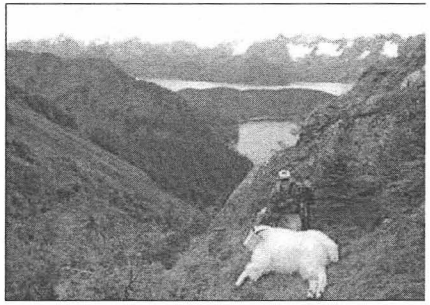


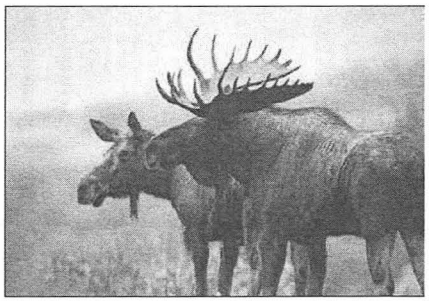

**Net Benefit of Viewing Trips**




**Net Economic Benefit of Hunting and Viewing Trips**

| | Residents | | Visitors | |
|---|---|---|---|---|
| | Hunting | Viewing | Hunting | Viewing |
| Total Net Benefit (Millions) | $461 | $1,605 | $12 | $833 |
| Average Net Benefit per Household | $4,828 | $8,050 | $765 | $1,244 |
| Average Net Benefit per Trip | $438 | $268 | $765 | $858 |





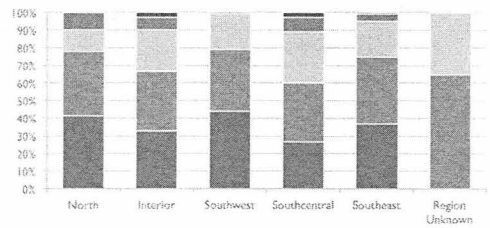
## Wildlife's Contributions to Alaskans' Quality of Life and Decision to Live in Alaska

Wildlife makes an essential contribution to the quality of life for most Alaskans:

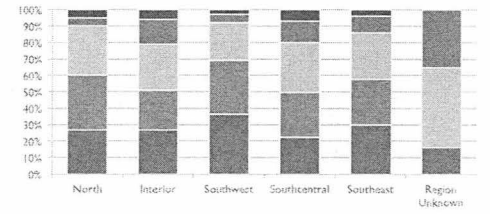
- For 65 percent of Alaskans, wildlife's contribution to their quality of life is either "extremely important" or "very important."
- Nearly 98 percent of Alaskans who participated in wildlife viewing activities in 2011 enjoyed seeing wildlife near their homes and in their daily lives.

Some of this contribution comes from the net economic benefit Alaskans enjoy from hunting and viewing activities, and from the jobs, income, and other aspects of economic activity supported by expenditures associated with these activities. Other parts of the contribution occur outside the monetary sector of the economy. These include the cultural or non-material goods and services Alaskans obtain from wildlife and their habitats through spiritual enrichment, cognitive development, knowledge systems, social relations, and perceptions of aesthetic pleasure.

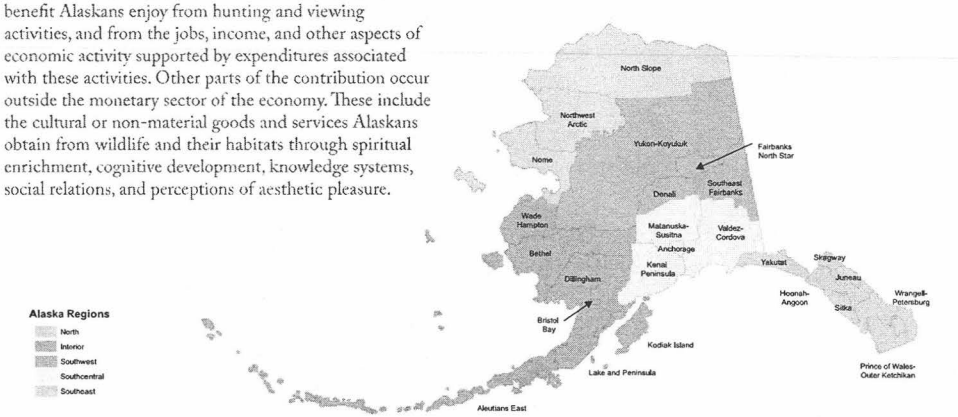
**Importance of Wildlife to Alaskans' Quality of Life**

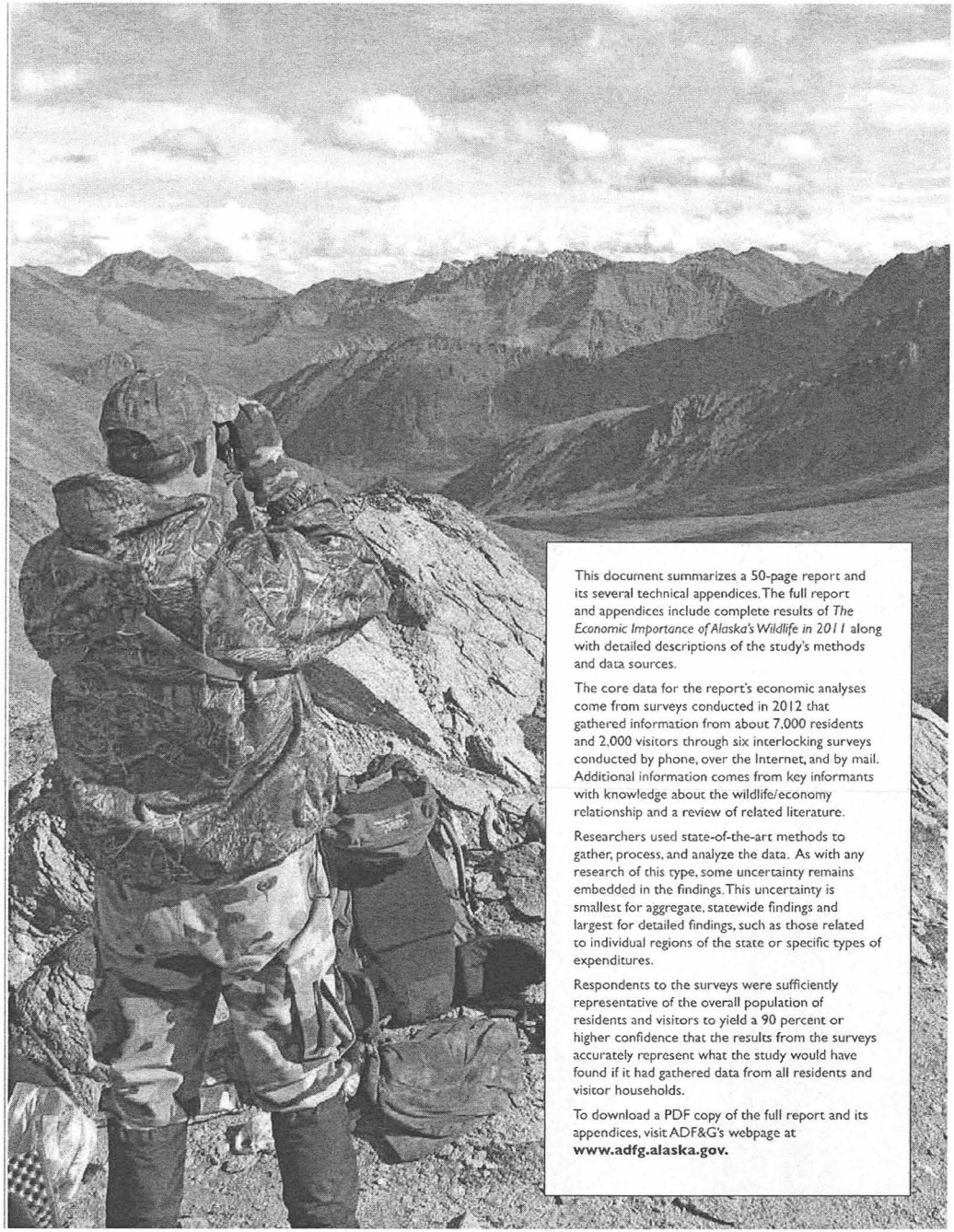



**Importance of Wildlife to Alaskans' Reasons for Living in Alaska**







This document summarizes a 50-page report and its several technical appendices. The full report and appendices include complete results of *The Economic Importance of Alaska's Wildlife in 2011* along with detailed descriptions of the study's methods and data sources.

The core data for the report's economic analyses come from surveys conducted in 2012 that gathered information from about 7,000 residents and 2,000 visitors through six interlocking surveys conducted by phone, over the Internet, and by mail. Additional information comes from key informants with knowledge about the wildlife/economy relationship and a review of related literature.

Researchers used state-of-the-art methods to gather, process, and analyze the data. As with any research of this type, some uncertainty remains embedded in the findings. This uncertainty is smallest for aggregate, statewide findings and largest for detailed findings, such as those related to individual regions of the state or specific types of expenditures.

Respondents to the surveys were sufficiently representative of the overall population of residents and visitors to yield a 90 percent or higher confidence that the results from the surveys accurately represent what the study would have found if it had gathered data from all residents and visitor households.

To download a PDF copy of the full report and its appendices, visit ADF&G's webpage at **www.adfg.alaska.gov.**

## A Message From The Director

We have long known that wildlife is important to Alaskans and to people who visit our state. But quantifying wildlife's economic importance in our vast state—including direct and indirect spending, jobs, and associated economic activity—is not a trivial task. We contracted with ECONorthwest to provide these data and are pleased to see the summary findings presented in this publication.

The Division of Wildlife Conservation is proud to do its part in ensuring that wildlife populations remain healthy and strong for present and future generations. We are proud that our work helps sustain the wildlife populations on which hunters and viewers depend. In 2011, they spent over $3.4 billion in Alaska to hunt and view wildlife here plus additional dollars out-of-state on gear and other goods supporting those activities. Visitors reported that wildlife is indeed one of the main reasons they visited Alaska, and residents articulated how wildlife contributes to their quality of life and reasons for living here.

By improving the quality of life, wildlife also attracts talented workers. The increase in workforce and in households' spending attracts businesses to the state and creates jobs and income for other workers. Through its contribution to Alaskans' quality of life, wildlife shapes the industrial composition of Alaska's economy and the geographical pattern of development.

We hope you find this report a useful addition to understanding the many ways wildlife contributes to the economy and enriches our lives. On behalf of the department, I want to express my deep appreciation to everyone who completed the survey and took the time to tell us about their hunting and viewing experiences in Alaska.

Doug Vincent-Lang, Director, Division of Wildlife Conservation

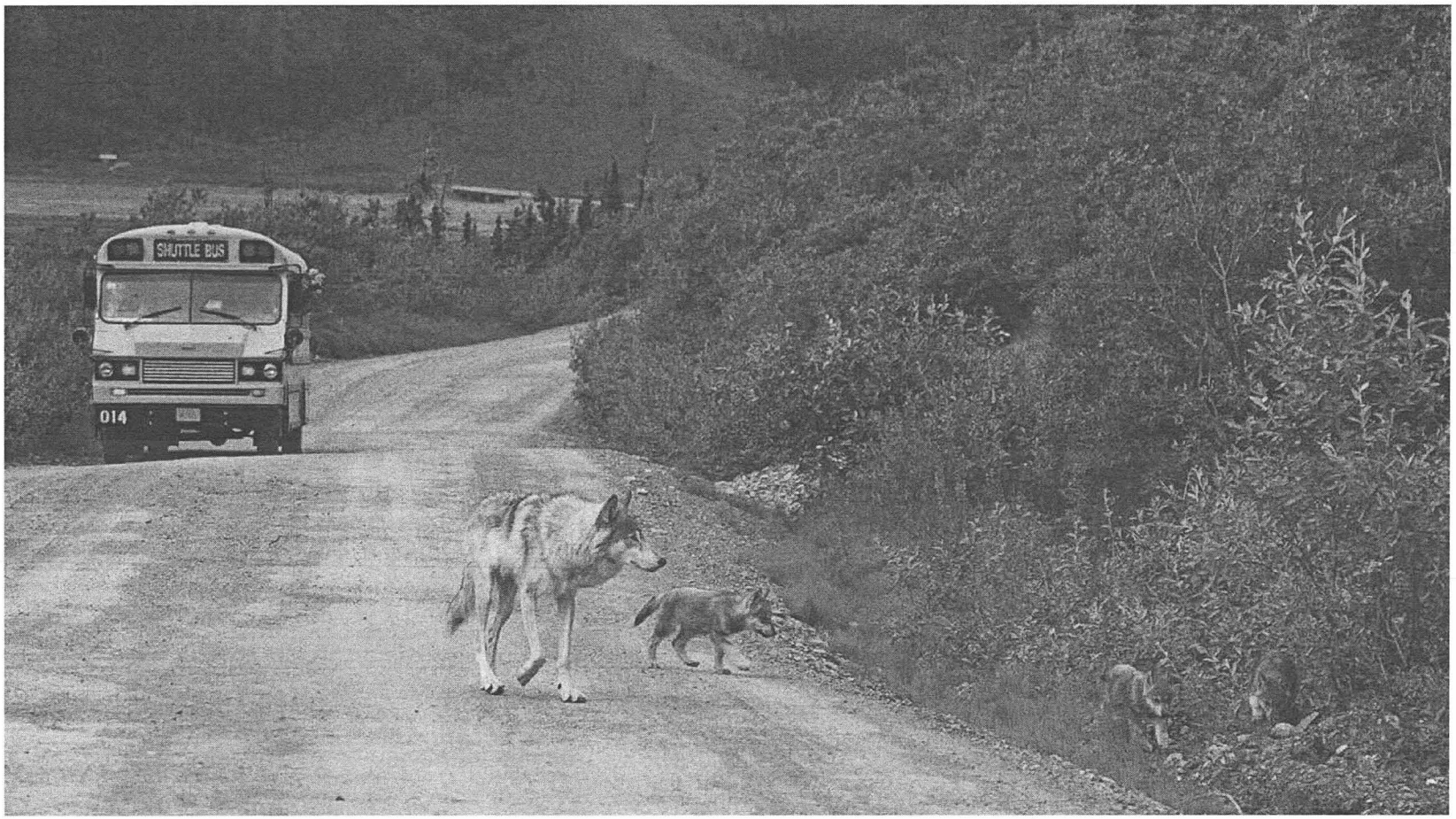

## Acknowledgments

The research team gratefully thanks each of the many Alaskans and others who patiently provided information to assist this research. We particularly appreciate the patience, knowledge, and insights provided by staff of the Alaska Department of Fish and Game, Division of Wildlife Conservation, especially Maria Gladziszewski, Assistant Director, Division of Wildlife Conservation, who served as Project Manager. Other staff who contributed to the project include Scott Brainerd, Mark Burch, Bruce Dale, Kristen Romanoff, and Anne Sutton.

Citation: ECONorthwest. 2014. *The Economic Importance of Alaska's Wildlife in 2011*. Summary report to the Alaska Department of Fish and Game, Division of Wildlife Conservation, contract IHP-12-052, Portland, Oregon.


For more information about this study, please contact:


Dr. Mark Buckley, Senior Economist and Managing Director
ECONorthwest
222 SW Columbia Street, Suite 1600
Portland, OR 97201
503-222-6060
buckley@econw.com


SHUTTLE BUS
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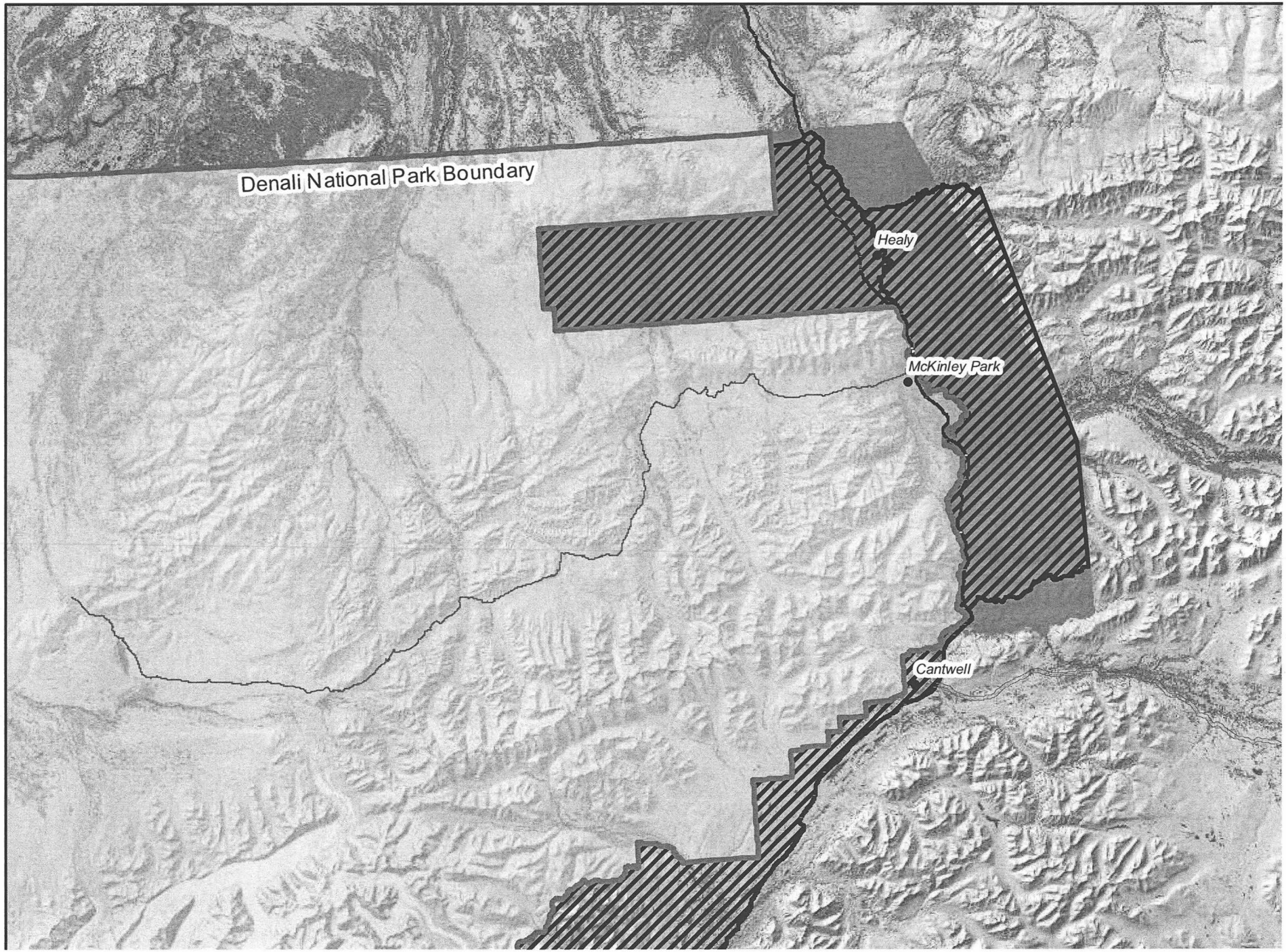

Denali National Park Boundary
Healy
McKinley Park
Cantwell

**From:** Patricia O'Brien [mailto:patriciaobrien@gci.net]
**Sent:** Wednesday, February 15, 2017 9:16 AM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
**Subject:** HB 105 (establishing a wolf protection area on the northeast boundary of Denali National Park)

Dear Representative Josephson,

Thank you for introducing HB 105. I sent the below information to each member of the Resources Committee.

From February *National Geographic* one year ago:

*In 1999 Wallace shot a collared alpha female in the Grant Creek pack, which had been highly visible to visitors on the Park Road. In 2005 he caught the East Fork pack's alpha female in a trap set just outside the park boundary. In 2012 he dragged a horse carcass to a site where wolves were active and set traps and snares around it. When he returned a few days later, he'd trapped a pregnant female belonging to the East Fork pack. The kill, documented by a neighbor and later confirmed by Wallace, landed him in the Los Angeles Times and generated both death threats and a boost for his guiding business. That same year Wallace caught the only remaining breeding female in the Grant Creek pack, which often roamed just outside the park boundary. The pack consequently produced no pups and fell from 15 members to 3.*

*"That was the third time I ruined millions of people's Denali National Park viewing experience," Wallace quips.*

Please take action to protect wolves near the Park Road where both Alaskan's and out of state visitors may see and photograph them.

Thank you for considering this request.

Patricia OBrien

(907) 789-9405

**From:** akwildlifeimages [mailto:akwildlifeimages@gci.net]
**Sent:** Wednesday, February 15, 2017 9:56 AM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
**Subject:** HI 105

Dear Rep. Josephson
Please note my support for creating a permanent buffer zone around Denali National Park. Wolf numbers have dropped greatly since the Board Game dropped it in 2010. Less than 1 handful of trappers work that corridor yet are allowed to completely go against what 100s of thousands of tourists and residents come to see....wildlife...specifically wolves. I do not believe the Board has the where with all to do the right thing.
Thank you

Didier Lindsey
Alaskan

Sent from my Samsung Galaxy smartphone.

February 9, 2017
Alaska State Legislature
Re: HB 105

Members of the Alaska House Resource Committee:

Please support HB 105, to establish the Gordon Haber Denali Wolf Special Management Area. I am a resident of Healy and cabin/land owner in the Wolf Townships. Having lived in this area for the last thirty years, I assure you that such a designation will be welcomed by many in our community. This includes those who rely on tourism for their livelihood and those who are put off by the incessant arrogance of a few guides to deprive millions of visitors the opportunity to see wolves. Many of us enjoy living in a place where there are wild wolves, sadly it is rare to see a wolf in the area anymore.

I have worked in Denali for many years, and for the last six years, I have worked in one of the front country visitor centers. I see the sense of disappointment amongst visitors when they have not seen wolves on their trip into the park, especially when they expected to. The disappointment expressed is especially profound when folks learn why viewing has declined. Most folks except the fact that natural factors can limit a population but are disparaged to realize that the decline is caused by hunting and trapping right on the boundary, only a few miles away. To hear a local guide boast about killing wolves directly on the park boundary flies in the face of sensibility and ethics.

This past season, I heard many tourists complain that they wished they had gone to Yellowstone instead of Denali. As lawmakers, you can protect Denali's reputation as a place to watch wolves interact and know their history. This is valuable to watch and the importance to the ecosystem.

There is no dispute that killing wolves along the park boundary has caused a dramatic decline in the park wolf population. This is well backed up by the science that clearly shows a connection between park wolf decline and the loss of certain members of their groups. The complicated dynamics have been studied for a long time. We know that wolves require large territories to survive in this rugged environment. Congress, Alaska Railroad and land managers have long known that wolves need be protected in the Wolf Townships. One just needs to look at the map.

Finally, it is fitting to honor Dr. Gordon Haber in naming this important area. His work and data have continued to be a vital resource to many studying wolf behavior and prey relationships. Like his predecessor, Adolph Murie, he endured similar trials. Like Murie, his legacy has had a profound impact on the way we look at wolves and their importance, not just to healthy prey populations, but the entire web of life. (#Trophic Cascades)

Please support HB 105. It makes sense.

Thank you,

Barbara Brease

PO Box 549, Healy Alaska 99743

To the House Resouces Committee
:

HB 105 will help Alaska's economy and one of the best ways we can go about that is enhancing the wildlife tourism industry. We should be doing everything we can to support the Alaska economy.
which is
a $2.7 billion/year industry, and visitor spending at Denali over $567 million/year, much driven by wildlife viewing in the park.

HB 105 also supports the State Constitution. The principle of equity, fairness and common ownership of all resources (including wildlife) by all Alaskans, is embodied in: Article 8, Sections 2 and 3 All of us guaranteed equal access to, and use of, the wildlife of Denali, including all 70,000 Alaskans who visit the park each year wanting to see them alive -- not just the 2 or 3 individuals who hunt and trap them along the NE boundary. HB 105 is the fix.

I have attached a photo that illustrates the immeasurable value of live wolves in Denali National Park.

And one trapper/shooter on the park boundary can ruin that experience for so many:

Please support HB 105

. Thank you..

Barbara Brease

PO Box 549

-----Original Message-----
From: Tim Lescher [mailto:timlescher@hotmail.com]
Sent: Wednesday, February 15, 2017 2:23 PM
To: House Resources <lhsres@akleg.gov>; Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
Subject: HB 105 and HB 40

Dear Representative Josephson,
I waited today in the Anchorage LIO for the opportunity to give testimony in support of HB 105 for over an hour. I understand you needed to move on to HB 40, which I also support. I will instead submit via email, I hope this reaches the rest of your committee as well.

I work with gray wolves at the Alaska Zoo. I probably spend more time around wolves than 99% of the Alaskan population. This doesn't mean I think I know more about wolves, because the more you learn about these animals, the more questions you have. I also care for the caribou, and moose calves (so I like to think I am unbiased). There were several great points made during the testimonies I heard, but what I think sometimes gets lost is that wolves are very intelligent, social animals, and they are affectionate too. I have seen the effects a wolf dying has on our pack at the zoo. They mourn. This may sound anthropomorphic, but it is not. You need to see it.

I would like to invite you and the rest of your committee members to visit the Alaska Zoo and meet out gray wolves up close in person. I am happy to give you and any legislators who will be voting on HB 105 a personally guided behind the scenes tour with the wolves free of charge. I think seeing them and meeting them will give you and the committee insight into this important issue, and you will come away from the experience with additional knowledge of wolves to make a more informed decision on this important bill.

Thank you for your service, and please take me up in this offer. My contact information is below.

Sincerely,

Tim Lescher
Lead Wolf Keeper
The Alaska Zoo
907 230-3661
timlescher@hotmail.com

Sent from my iPhone

*[HB 105 - Testimony on behalf of AWA]*

Thank you to co-chairs Representative Josephson and Representative Tarr, and members of the Resources Committee for this opportunity to testify.

My name is Connie Brandel. I am a staff member and the secretary/treasurer of the Alaska Wildlife Alliance, and I am speaking on behalf of the organization. Briefly, the Alaska Wildlife Alliance is a non-profit organization based in Anchorage and founded more than 35 years ago. We advocate for healthy ecosystems, scientifically managed to protect our wildlife for present and future generations.

The Alaska Wildlife Alliance asks you to support HB 105.

For years AWA and other groups have tried asking, pleading, demanding, all but begging the Alaska Board of Game to re-establish a no hunting/trapping buffer for the Wolf Townships, the area addressed in this bill. To date the Board of Game has steadfastly and single-mindedly maintained its priority of representing only the interests of consumptive users of wildlife.

To briefly summarize the situation: hunters/trappers use the Wolf Townships area to target wolves as they cross the park boundary; radio-collar telemetry shows wolves frequent this area in winter and spring in search of prey. As Dr. Steiner noted in his testimony during the Feb. 10 public hearing, research confirms the loss of a single breeder wolf can - and has - caused the entire pack to disburse. This compounds the effects of hunting and trapping far beyond the killing of individual wolves. The Denali wolf population, according to the park's own count, remains low.

The Wolf Townships area is situated just north of the park road, meaning the wolves targeted for killing are the same animals that are – or would be – the most easily viewed by the more than half a million people who visit Denali annually. Let me emphasize: when these wolves were protected by a buffer, 45 percent of visitors were lucky enough to spot a wolf along the park road. Since the last buffer was removed in 2010, only about 5 percent of visitors have been able to spot a wolf.

Let me compare another set of numbers:

Only 2 or 3 individuals trap within the Wolf Townships. That's all. If this area is closed, they are of course free to utilize the next-closest lands, the hundreds of thousands of acres to the north, east and south of the park boundaries. Let's compare 2 or 3 to, conservatively, 500,000 visitors per year who come to Denali, virtually every one of whom hopes to see the park's iconic grizzly bears and wolves. Why does this handful of trappers have more of a "right" to these wolves than others?

Dr. Steiner has offered a very detailed and compelling presentation of the link between Denali wildlife, tourism, and revenue to the state. I won't attempt to repeat or re-analyze the data. AWA wholeheartedly concurs with the conclusions he presented.

I would like to thank Representative Josephson for offering a simple, logical, and easily workable solution to this situation. I hope that this committee, and the House and Senate will listen to the majority of residents who for years have wanted this area set aside to protect these wolves protected. I hope you will agree with us that this management area will create many, many important benefits for the state for years to come.

I will conclude on the topic of money, which we seem to be talking about a lot in Alaska these days. Variations of this have been said many, many times, but I believe it goes to the heart of the Denali wolf issue:

A wolf can be killed and cash – at most a few hundred dollars - collected for its pelt only once. That same wolf alive can be photographed, recorded, sketched, tracked and just simply watched and enjoyed perhaps thousands of times during its lifetime. I wouldn't attempt to calculate how much one live wolf might "earn" for the state in visitor dollars per year – that's too hypothetical for me. But I sincerely believe that a living, wild wolf able to be seen by hundreds of thousands of people has to be worth its weight in gold for Alaska.

I ask that you please vote in favor of HB 105, the Gordon Haber Denali Wolf Special Management Area. Thank you very much.

Written testimony in support of HB105

Dear Committee Members,

Thank you very much for the opportunity to testify in support of HB105. My name is Yasuhiro Ozuru, an Anchorage resident. I am in strong support of this Bill that provide protection to wolves in Denali national park, whose population has been declining rapidly. I am in support of this bill for two reasons: one moral and the other economic. First, providing a necessary protection to wolves in Denali national park is our moral responsibility to both citizen of Alaska and the world beyond. Denali is one of the very few places in the world where visitor has some chance of observing wild wolves. But, recently the chance has declined significantly. We, Alaskan, are proud of having such a beautiful national park that embraces true wilderness in our own backyard, and we publicly express such a pride. Then, we should act responsibly to protect the intrinsic value (not just economic value) of such a wonderful place. Providing necessary protection to maintain the quality of Denali national park is also consistent with us Alaskan's special regards of the Denali, which is often considered to be scared mountain and space among Native Alaskan. Protection is also important for economic reason, I have heard that the chance of seeing wolves is larger in Yellowstone National park in Wyoming these days than in Denali. The spread of such information may change potential tourists mind such that they would rather go to Yellowstone than Denali. This would mean that we lose some significant revenue to the state economy, which is already suffering from low oil price. In this sense, it is extremely important to maintain the attractiveness of Denali National Park to potential tourists who contribute to Alaskan economy in very significant ways. This bill is a significant step to provide necessary protection to Denali wolves that are important for both moral and economic reasons for our beautiful state.

**From:** Philip Marshall [mailto:pmarshall@acetekk.com]
**Sent:** Friday, February 10, 2017 9:43 AM
**To:** LIO Fairbanks <Lio.Fairbanks@akleg.gov>
**Subject:** Support HB 105

Dear Staff,

Please forward to Rep. Josephson:

We support HB 105 to recreate a Denali wild animal, and especially wolf, buffer zone on the northeast side of Denali National Park. It would reestablish a more effective balance of the ecosytem and address the public clamor for more wildife in this critical area. Thank you for attempting this alternative route to policy change since we are stymied by the Alaska Board of Game and the Governor. Having written letters, petitioned and testified, we know.

All the best,

Sincerely,

Philip Marshall and Janet Lokken Marshall

1300 Skyline Drive

Fairbanks, Alaska 99712

Tel: (907) 457-3895

E-mail: pmarshall@acetekk.com

Web: www.polhavnwoodfabrik.com

Dear Mr. Josephson,

Thanks so much for your common-sense-based promotion and support of these issues, which benefit all Alaskans--even those who don't know it. I am out of state currently but will try to call in to testify. Meanwhile, just in case I don't make it, here is a written statement in support of HB 105 specifically. As a longtime subsistence user (I lived in Inupiaq villages in the upper Kobuk 20 years and was an active hunter) and wolf advocate (I was co-sponsor of Ballot Measure 2 in 2008 on predator control) and a full-time professional wildlife photographer and writer who has photographed and written about wolves in Denali NP) and a regular presenter on Princess Cruises who encounters Alaska visitors constantly who hope to see wolves in Denali, or are deeply disappointed because they tried and did not) I do have strong feelings on this matter.

Nick Jans
Alaska writer-photographer
HC 60 Box 2628
Haines AK 99827

-----Original Message-----
From: Mei Mei Evans [mailto:m2evans@alaskapacific.edu]
Sent: Friday, February 10, 2017 8:33 AM
To: Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>; Rep. Geran Tarr <Rep.Geran.Tarr@akleg.gov>
Subject: save Denali's wolves

Dear Andy Josephson and Geran Tarr:

I write in support of Denali's wolves. We now have an opportunity with HB 105 to protect them from the hunting and trapping that has so endangered their numbers. I hope you will both champion its cause among your legislative colleagues.

Thank you.

Mei Mei Evans, Ph.D.

**From:** Nina Faust [mailto:aknina51@gmail.com]
**Sent:** Thursday, February 09, 2017 6:53 AM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>; Rep. Geran Tarr <Rep.Geran.Tarr@akleg.gov>
**Cc:** Paul Seaton <Representative_Paul_Seaton@akleg.gov>; Gary Stevens <Senator_Gary_Stevens@akleg.gov>
**Subject:** HB 105 "An Act establishing the Gordon Haber Denali Wolf Special Management Area."

P.O. Box 2994
Homer AK 99603

House Resources Committee
Alaska State House
Juneau AK

Dear Committee Members:

Denali National Park is one of the crown jewels of Alaska's National Parks, one that is on most visitors' list of "must see" places to watch wildlife, especially wolves. However, due to a lack of buffer around Denali National Park, a few local trappers have been allowed to trap in areas that were once protected, decimating Denali's highly visible wolf packs during the winter when they wander into these areas just outside the Park boundaries.

Wildlife viewing is a huge economic engine for Alaska. These wolves are far more valuable to Alaskans alive so that they can roam areas near the Park roads where visitors in buses can easily see and photograph them. Viewing opportunities have dropped significantly since the packs were trapped so heavily recently in the area designated in HB 105 as the "Gordon Haber Denali Wolf Special Management Area." Protecting this area from trapping and hunting of wolves will bring more visitor revenue to Alaska as the wolf packs rebuild and are once again available for viewing.

Establishing this special area will not greatly change hunting opportunities for many hunters, but it will have a huge impact on the health of wolf packs and the eventual improvement of wolf viewing within the park. This is a good idea that has already proven its worth when the area was protected in the past. It makes good economic sense to reinstate a protective buffer for wolves on the park boundary. I urge the Resources Committee to vote in favor of this bill.

Sincerely,

Nina Faust

**From:** millimom@xyz.net [mailto:millimom@xyz.net]
**Sent:** Thursday, February 09, 2017 9:33 AM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
**Subject:** HB 105

Dear Representative Josephson,

Thank you, Thank you for introducing HB 105, to permanently protect that part outside Denali Park that needs protection for the wolves of the park. I had not been to the Park in many years, but visited last year. Our summer visitors come to see wolves and other wildlife, including my guests. The other wildlife was there, but not the wolves. I still recall taking my grandson about 12 years ago, and we saw wolves and he was so thrilled.

I strongly support this bill and hope it will pass the Committee.

Again, thank you.

Sincerely,

Milli Martin
PO Box 2652
Homer, AK 99603
907-235-6652

**From:** Elizabeth Cuadra` [mailto:cuadra@gci.net]
**Sent:** Thursday, February 09, 2017 10:42 AM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>; Rep. Geran Tarr <Rep.Geran.Tarr@akleg.gov>
**Subject:** Please Support HB 105

Denali wolves need the protection of HB 105. Alaska needs the tourism income, too. With a Board of Game that is so anti-wolves, it takes an act of the Legislature to get the right thing done.

Dorothy E. Cuadra, cuadra@gci.net

Resident at 9151 Skywood Lane, Juneau, AK (Alaskan since 1977)

**From:** Sean Cahoon [mailto:sean.cahoon@gmail.com]
**Sent:** Thursday, February 09, 2017 12:11 PM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>; Rep. Geran Tarr <Rep.Geran.Tarr@akleg.gov>
**Subject:** Support for HB 105

Dear Reps. Josephson and Tarr,

I am writing to express my support for HB 105 to establish a no-harvest buffer zone adjacent to Denali National Park and Preserve (DNPP). Under the current policy, wolves are under major threat of extirpation which could lead to cascading effects on ecosystem and landscape dynamics. Removal of wolves in other locations (Yellowstone NP) has rippled through the ecosystem and should be a warning of the harmful effects a declining population of keystone predators can have on landscape processes and ecosystem services. In addition to the ecological consequences, the chances of wolf sightings in DNPP has plummeted since the buffer zone was removed, reducing the quality of visitor experiences which could eventually lead to declining attendance and tourism-generated revenue. Wolves should be preserved for the benefit of all, not just a handful of hunters and trappers.

I look forward the advancement of this bill and hope you will prioritize this valuable and sustainable resource.

Sean Cahoon

**From:** Daniel Bissinger [mailto:dan.bissinger@gmail.com]
**Sent:** Friday, February 10, 2017 5:54 AM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
**Subject:** HB 105 - comment

Thank you for considering my comment on this important subject.

I would like to extend on my comment to the Board of Game I submitted on 2/2/17 apropos the comment period on the same topic:

Studies conducted by eminent biologists (Murie, Haber, Mech, Ripple and countless others, I'm sure) have shown that wolves have inhabited Denali National Park and interior Alaska for at least a thousand years. The work of a handful of hunters, trappers and wolf control programs have dismantled the right of wolves to live, and park visitors to view them in their natural habitat, in a matter of decades. In doing so, we as a people have demonstrated our inability to live in wilderness without destroying it.

HB 105 will likely configure the values of hiking, photography, camping, and enjoyment of wolf sightings to the preservation of wolf habitat. Perhaps even the wolf as a genetic reserve will be assessed, "a scientific yardstick by which we may measure the world in its natural balance against the world and its manmade imbalance" as Wallace Stegner once described in his "Wilderness Letter" regarding the role of our natural world.

Not only have we surrendered our synergy with wilderness, but we have also surrendered the "Wilderness Idea" as Stegner put it; 'a resource in itself... spiritual and mystical but perhaps incomprehensible to the practical minded who may regard anything that can't be moved with a bulldozer to be mystical'. Untampered wilderness, though, is every bit as spiritual and mystical as church; a place where we may recharge, find sanity, and feel insignificant, competent, vertical in the world, and look a long way. This is the same idea that human beings can live with other creatures without destroying them -- that we can assign value to wilderness beyond their economic uses and that we as people benefit from wilderness 'even if for ten years we never set foot in it, simply because it is there' and the knowledge that there is still perhaps something left untamed on Earth. We need wilderness as much as wilderness needs us, and we cannot have wilderness in parts. It exists only in whole with minimal human disturbance. When one species is eradicated, the entire ecosystem is imbalanced.

Trophic cascade is highly pertinent to ecosystems inhabited by wolves; the studies conducted in Yellowstone over the past 20 years have demonstrated this. They show us that animals are best managed by themselves, devoid of human involvement and most especially devoid of archaic predator control programs which were invalidated as effective management strategies several decades ago. There is absolutely no scientific basis for contemporary command-and-control programs. Studies have shown, for example, ("The Case Against Wolf and Bear Control In Alaska" Haber, 2006) that wolves have negligible effects on moose, caribou, and sheep

populations in Alaska and most often prey on the weakest animals -- half of the time not hunting but scavenging on carcasses from animals aged, diseased, or weakened by harsh winters. The predator-prey relationship keeps respective populations in check -- what Haber called "systems management". There are high biological, scientific, and ethical costs of killing wolves (Ibid.). By establishing a no hunting/trapping buffer adjacent to Denali National Park where wolves often travel and den, wolves can better serve the ecosystems they are entitled to inhabit, park visitors can enjoy them, and the 'Wilderness Idea' may be upheld.

Alaskans can do better.

We can live with wolves, enjoy them, and respect ourselves and appreciate life more fully. We can do this simply because of the knowledge that wolves exist and that we had a choice to exterminate them, again, but didn't.

Thank you for taking the time to read my comment and for your work spearheading the Haber Buffer.

--

(302) 383-5876
danbissinger@gmail.com

**From:** selowe [mailto:selowe@gci.net]
**Sent:** Thursday, February 09, 2017 1:08 PM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
**Subject:** I support HB 105 to protect wolves.

Hello Rep. Josephson:

I enthusiastically support HB 105 that would establish a no hunting/trapping area on state land adjacent to the northeastern boundary of Denali Park where wolves are targeted. It is shameful that Alaskans have allowed wolves to be persecuted for so long. We humans are not the only valid residents of our state that deserve respect. Our wild animals are a national and international treasure that draw millions of people throughout the world just to view them. I wish you every success in seeing this bill into action. Sharon Lowe

-----Original Message-----
From: Josh Klauder [mailto:ravensong@mtaonline.net]
Sent: Thursday, February 09, 2017 3:41 PM
To: Rep. Geran Tarr <Rep.Geran.Tarr@akleg.gov>; Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
Subject: Support for HB 105

Dear Representatives Josephson and Tarr,

Because I live remote, I will be unable to attend the hearing on this bill in person, at an LIO, or by phone.

Thus I am emailing to express my very strong support of this bill.

I live near Talkeetna. Our economy here is heavily dependent on tourism, and is intertwined with visitation to Denali by road, train, and air.

There are many good reasons for the establishment of this buffer, but the economics alone would appear to make it a simple and obvious choice.
Do we allow a small handful of trappers - who have lots of other options for places to trap- to continue to undermine the wildlife viewing opportunities for hundreds of thousands of visitors to our area who support our economy? The current situation is foolish and shortsighted in the extreme.

Please continue to do everything possible to create this conservation area.

Thank you,
Josh Klauder
Talkeetna

Dear House Resources Committee:

I am writing to urge you to vote in support of House Bill 105 which would establish a no hunting/trapping area on state land adjacent to the northeastern park boundary where wolves are targeted.
This area roughly overlaps the Wolf Townships/Stampede Corridor.
Since the Board eliminated a buffer in 2010, wolf mortality in this area has been linked to a sharp decline in the Denali Park wolf population. The number of visitors lucky enough to see a wolf also plummeted, to a miniscule 4 percent. If passed into law this bill would supersede the Board's inaction and end its single-minded pro-hunting decisions that have been so detrimental to the park's wolf population.

The protected area would be designated the Gordon Haber Denali Wolf Special Management Area, in honor of the world-renowned wolf biologist and zealous advocate who died in a 2009 plane crash while tracking wolves in Denali.

Safeguards for these wolves are critical, and long overdue.
Please support this bill!

Most Alaskan's support this buffer zone. Please listen to your constituants and act appropriately. Vote for this buffer zone.
Sincerely,
Janie Taylor
Anchorage, Alaska resident for 34 years

Dear Legislators,

I am writing to voice my support on HB 105, the "Denali Wolf Buffer." This should be an easy, unanimous pass, a bill that all of you should support, as it has many benefits for the majority of Alaskans; very few hunters and trappers will be affected negatively.

You are all facing difficult decisions this session in a time of huge budget shortfalls, but this bill overwhelmingly helps the Alaskan economy in a positive way. Wildlife tourism is a $2.7 billion dollar per year industry; most of the visitors to the park say that seeing wolves and bears are at the top of their list of animals to see. As things stand now, with wolves and bears being trapped and shot right over the park boundary, those wolves and bears that would be the most visible to park visitors have almost been eliminated, along with it the incentive for many visitor to come visit Denali. Word gets around, and many wildlife viewing visitors know it is more likely that they will see wolves in Yellowstone than in Denali. We have literally shot ourselves in the foot by allowing the Alaska Board of Game's denial of the Wolf Buffer to continue. We need to pass this bill in order to allow the wolves to regenerate their numbers in this area.

This bill supports the State Constitution and the principles of equity, fairness and common ownership of *all* resources embodied in:

**Article 8, Sections 2 and 3** of the Alaska Constitution, as shown in:

**Section 2:** *The Legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State, including land and waters,* ***for the maximum benefit of its people.***

**Section 3**: Common Use: *Wherever occurring in their natural state, fish, wildlife, and waters are reserve* ***to the people for common use.***

HB 105 will correct an egregious situation in which a very few hunters and trappers (2 or 3) along the North East boundary of the Park, are killing off wolves and bears that wander out of the park in pursuit of their prey. If the State Constitution works, and I *hope* it does, why should these very few people have more rights and access to wildlife than the more than 70,000 Alaskan citizens who would like to see their wildlife alive in Denali?

For over a decade, an overwhelming majority of citizens have testified and written to the Alaska Board of Game, with these very same statistics, only to be ignored and shut out with years-long denials of hearing on this issue by the Board of Game. Your approving of this bill will right this wrong. It should be a clear choice constitutionally, economically and in the majority of public interest.

Thank you,

John Breiby
5280 E McDowell Rd.,
Wasilla, AK 99654

Dear Sirs:

Please vote yes on HB 105 allowing a no kill border around the northeast section of Denali National Park.

Tourism is a very large revenue generator for Alaska, bringing in 2.9 Billion dollars per 2011 state study. Tourism in Denali Park brings in $567 million and thousands of jobs. The state of Alaska needs these jobs and revenue in light of the down turn in the oil industry.

Alaska also needs to preserve its natural resources for future generations to maintain tourism and the way of life in ALASKA as we know it. Eco-tourism is growing rapidly while sport hunting is decreasing and does not bring in the money we think it does. There are more Alaska residents 70,000 coming to Denali and over 600,000 out of state visitors that contribute significantly to the local income.

We need the border around the northeast side of Denali to prevent pregnant alpha females and alpha males from getting shot at bait stations like in 2012 and 2015 and 2016. The visitor viewing rate of wolves have decreased along the Denali road from 49% to 5% due to these "sport" kills by a handful of hunters. Data from NPS. We as a state need to think about how natural resources are used appropriately and where.

Please vote for HB 105.

Thank you,
Roy Catalano

Roy Catalano
P.O.Box 3536
Denali, Alaska 99755
roycatalano@gmx.com

Please send the following message to the members of the House Resource Committee:

I AM A 56-YEAR RESIDENT OF ALASKA, AND OWN LAND IN THE PROPOSED BUFFER ZONE AREA. I URGE YOU TO VOTE YES ON THIS BILL, WHICH WOULD ESTABLISH THE DENALI WOLF SPECIAL MANAGEMENT AREA. THANKS.

Frank Keim
2220 Penrose Lane
Fairbanks, AK 99709

***"When the world seems to be falling apart, stick to your own trajectory; hang on to your own ideals and find kindred spirits."***
Joseph Campbell: An Open Life

Dear Sirs,

I am writing to express my support for HB 105 that would provide a Denali NP wolf protection buffer. Wolves and other predators in this area are important for tourism, and also important to the wildness and ecological integrity of the Park. Please support this bill.

Sincerely,

Roger Kaye

**From:** Wayne Hall [mailto:shadow@matnet.com]
**Sent:** Thursday, February 09, 2017 9:41 PM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
**Subject:** HB105

Dear Representative Josephson,

I have lived in Alaska since 1978 and have always supported a more balanced wildlife management in Alaska. I support HB105 to establish an area closed to the hunting and trapping of wolves in the area northeast of Denali National Park. The hunting and trapping of wolves in that area is by only a few people. Yet the excessive killing of wolves there impacts not only the Denali National Park ecosystem but also the non-consumptive use by thousands of Alaska residents and visitors. Even if it is only viewed from an economic perspective, which has certainly become more an issue to the State of Alaska, the far more beneficial use of wolves in that area is through the revenue generated by visitation rather than the comparatively tiny income derived by one or two individuals eliminating wolves from the area. The sheer national and international bad will created by the treatment afforded wild predators by the State of Alaska statewide will only increase over time. To allow wolves of such importance to be eliminated from the Denali ecosystem only accelerates and adds to the negative impact on an important source of revenue. Far better for the State to act to protect wolves in the area. The Alaska Board of Game, as it has been contrived for decades on behalf of hunting and trapping special interests, will never reinstate the buffer zone. I am glad to see you have initiated this positive action to do it thrugh legislation instead.

I would like to request my comments here to be entered as part of the record of the hearing before the Resources Committee.

Thank you very much for this opportunity.

Wayne Hall

Anchorage

**From:** Scott Chesney [mailto:musher@talespinmedia.com]
**Sent:** Wednesday, February 15, 2017 11:39 AM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
**Cc:** Rep. Geran Tarr <Rep.Geran.Tarr@akleg.gov>; Rep. David Guttenberg <Rep.David.Guttenberg@akleg.gov>; Rep. Scott Kawasaki <Rep.Scott.Kawasaki@akleg.gov>; Rep. David Talerico <Rep.David.Talerico@akleg.gov>
**Subject:** RE: HB 105

Representative Josephson:

I am writing to voice my support for HB 105, which would establish the Gordon Haber Denali Wolf Special Management Area.

For too long, the Board of Game has decreed that arbitrary man-made boundaries are the boundaries which the wolves in the area must observe or die. The impact of this war on predators has been devastating for the packs whose territories are near the BOG's arbitrary boundary, and indeed, has affected wolf populations throughout Denali National Park. Passing HB105 would help to insure that the charismatic apex predators which tourists expect to see when they visit Alaska have a fighting chance to recover their population. I shouldn't need to point out that given Alaska's budget woes, passing this bill would boost the Denali borough and state's economies, with little impact to anyone save less than a handful of trappers.

In short, if passed, this bill would be a win for wolves, a win for tourism and the Denali borough and the State with a minimal downside. It deserves to pass.

Respectfully,

Scott Chesney

P.O. Box 84396

Fairbanks, AK, 99708

Patricia Cue
35360 Robinwood Dr.
Soldotna, AK 99669

State of Alaska House Resources Committee
RE: HB 105

February 15, 2017

I am writing to urge you to vote in support of HB 105. There are several reasons why I support this legislation. As a 28 year resident of Alaska, I value the role predators in maintaining a healthy ecosystem. As a resident who owns a tourist related business, I am impacted directly by tourists and the revenue they bring to the state.

The buffer zone is an important way to protect the Denali wolf population. Please support HB 105.

Patricia Cue

**From:** scherrgirl@aol.com [mailto:scherrgirl@aol.com]
**Sent:** Wednesday, February 15, 2017 1:02 PM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
**Subject:** HB 105 & HB 40

To Who It May Concern,
As an Alaskan, Education Director and Mother, I am desperately asking for two things.
Please establish the Gordon Haber Denali Wolf Special Management Area (HB 105) as it protects not just wolves, but the future of wildlife of Denali, something of true value that we owe to future generations. Please make sure to represent the majority of Alaskans (and tourists that are highly economically important in Alaska), and not just the game guides, hunters and trappers.
I am in support of HB 105, and I ask that you are too.
Please also do not allow traps near trails (HB 40) as this is simply dangerous for those that use the trails, campsites, beaches, scenic sites, etc. Public safety should be priority, not traps. This is common sense.
I am in support of HB 40 and I ask that you are too.
Thank you for allowing my input and taking the time to serve Alaskans equally.

Stephanie Hartman
Anchorage, AK 99504
509-951-8123

**From:** Chelsea Lindquist [mailto:chelserin@gmail.com]
**Sent:** Wednesday, February 15, 2017 1:31 PM
**To:** Rep. Geran Tarr <Rep.Geran.Tarr@akleg.gov>; Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
**Subject:** HB 105

Rep. Josephson and Rep. Geran,

I am writing in support of Denali's wolves. We now have an opportunity with HB 105 to protect them from the hunting and trapping that has so endangered their numbers. Alaska is known for it's natural beauty and wildlife and our wolves are an iconic symbol of our state. I urge you both to be champions of Denali's wolf population and show your support for HB 105.

Thank you,
Chelsea Vukovich
99516

**From:** Francis Mauer [mailto:fmauer@mosquitonet.com]
**Sent:** Thursday, February 16, 2017 2:04 PM
**To:** Rep. Andy Josephson <Rep.Andy.Josephson@akleg.gov>
**Subject:** HB 105 testimony

Dear Andy,

Thanks for the opportunity to testify as an invited participant at yesterday's hearing on HB 105. I sincerely appreciate all of your efforts and work to address several wildlife conservation issues that have been largely neglected until now. Your chairmanship of the Resources Committee represents a fresh new hope for those of us who want to see better and balanced stewardship of our wonderful wildlife.

For your reference, please see my comments below.

Fran Mauer

791 Redpoll Ln

Fairbanks, AK 99701

907-455-6829

**Testimony by Fran Mauer Before the**
**Alaska House Resources Committee**
**Regarding HB 105 February 15, 2017**

I am a 46 year resident of Alaska having worked as a wildlife biologist here for nearly 30 years.

I support HB 105 which would establish a special management area to protect wolves from hunting and trapping on State lands adjacent to the northeast corner of Denali National Park. This area is sometimes referred to as the "Wolf Townships."

Dr.Steiner and Dr. Van Ballenberghe have already explained to the Committee about how this area is important for Denali Park wildlife, especially wolves. They have also described how hunters and trappers have used extreme methods such as bait stations with animal carcasses to lure Denali wolves to their death. These actions have decimated Denali wolf families, especially those that are frequently viewed by Park visitors.

Ecologists refer to situations such as this as "population sinks," in that annual mortality of these Denali wolf families exceeds their annual reproduction. This is exactly what is occurring in the proposed Special Management Area. I can tell you with high certainty that the population sink effect will continue to decimate Denali wolves as long as these extreme killing practices are allowed. This problem will not go away unless the taking of these wolves is stopped.

I would like to respond to the testimony that you just heard from the Director of the Division of Wildlife Conservation, Mr. Bruce Dale. What you heard was that the wolf population is not in jeopardy, that wolves quickly repopulate areas where they have been exploited and mix frequently with other packs to avoid in-breeding, suggesting that this is not a serious problem. By speaking at a broad regional population level, he avoided addressing the specific acute nature of continued exploitation of the same wolf territories year after year. The population sink concept is valid and is occurring in the case of these Denali wolves. Mr. Dale avoided the actual circumstances at work here and gave you only the "party line."

The Board of Game seems incapable of solving this problem because it only looks out for the interests of hunters and trappers. You have already been told how this situation in the Stampede area gives Alaska a "black eye" and this too will only get worse over time.

We need to foster a responsible wildlife viewing program that is a renewable economic benefit for all Alaskans. HB 105 would assure this and I urge you to pass the bill soon.

Thank You.

**Thanks to House for wolf buffer bill, a decision based on science**

Kudos to Rep. Josephson and the state House for trying to reinstate the Denali Park wolf buffer (which would prohibit trapping in the Stampede Road "inholding" of the park).

The buffer existed until 2010. The Alaska Board of Game rejected it again in 2016, claiming science doesn't support it, which is wrong. Wolf populations overall seem healthy (good), but that isn't the only fact. The National Park Service is required to manage both wildlife and visitor experience. And everyone agrees that trapping will reduce local wolf populations. Wolf sightings from the park road are already down 90 percent.

The Game Board only listened to trappers. But the Alaska Constitution gives all Alaskans the right to enjoy wildlife, and visitors are included on federal lands. Trappers too, but let's get some balance here.

Now the Game Board says it's their business — the Legislature should not be involved. Oh, come on! The Game Board is not doing its job. And the Legislature can, and does, pass laws on wildlife management.

*— Vivian Mendenhall, Ph.D., certified wildlife biologist*
*Anchorage 4600 Rabbit Creek Road 345-7124*

Printed in the Alaska Dispatch News May 22, 2017

CENTER for BIOLOGICAL DIVERSITY Because life is good.

April 27, 2017

***Sent Via First-Class Mail and E-mail***

Representative Andy Josephson
Alaska State Legislature
State Capitol Room 102
Juneau AK, 99801
rep.andy.josephson@akleg.gov

***Comments in Response to H.B. 105: "An Act establishing the Gordon Haber Denali Wolf Special Management Area."***

Representative Andy Josephson,

Thank you for inviting discussion on H.B. 105: "An Act establishing the Gordon Haber Denali Wolf Special Management Area." These comments are submitted on behalf of the Center for Biological Diversity and our members and activists throughout the United States, including Alaska. We support the adoption of H.B. 105, which aims to create a buffer zone on the northeastern side of Denali National Park Preserve (Denali) where wolves could not be hunted. As you note in your Sponsor Statement, the opportunity to view wolves in Denali is a major attraction that draws tourism to Alaska.

A 2014 study conducted by the Alaska Department of Fish and Game (ADFG) demonstrates that the economic benefits of wildlife viewing significantly outweigh those of hunting.[1] According to the study, the economic benefits of wildlife viewing — in terms of government revenue, labor income, job creation, and overall economic output — are over double those of hunting. These numbers can compound astronomically over the lifetime of a wolf, making wolves much more valuable alive then dead. But beginning with the Board of Game's decision to remove the buffer in 2010, there has been an ongoing pattern of State action that serves only those minor interests in favor trapping and hunting.

As you are aware, large carnivores have wide home ranges that often exceed the boundaries of Denali. Once outside of the protected park boundaries, wolves are subject to human-caused mortality. The trapping and hunting of wolves near park boundaries has the potential to decrease wolf numbers, alter wolf behavior, and decrease opportunities for wolf

[1] *The Economic Importance of Alaska's Wildlife in 2011*, March 2014, *available at* https://www.adfg.alaska.gov/static/home/news/ongoingissues/pdfs/the-economic-importance-of-alaskas-wildlife-in-2011-summary-report.pdf.

viewing by park visitors.[2] The 2000-2010 trapping and hunting buffer was associated with increased wolf sightings in Denali, compared to 2011-2013 and 1997-2000 when no buffer was in place.[3] The majority of sightings occur along the park road, which is located near the 2000-2010 buffer area.[4] The presence of the buffer may have protected pack members that lived close to the park road when they left the park boundaries.[5]

Denali receives hundreds of thousands of visitors annually, both Alaskans and non-Alaskans, most of whom come to view the park and its wildlife.[6] On the other hand, the Stampede Corridor has only 1-3 active trappers in any given year.[7] The obvious conclusion is that wolves are of far greater value as a living, viewable natural resource. Thank you for sponsoring H.B. 105 and working to ensure that Alaskan's constitutionally protected common ownership of all natural resources including wildlife, embraces the right to view these majestic animals in their natural habitat.

Sincerely,

Dune Lankard

Dune Lankard
Senior Alaska Representative
The Center for Biological Diversity
(907) 952-5265
dlankard@biologicaldiversity.org

[2] Borg et. al., *Implications of Harvest on the Boundaries of Protected Areas for Large Carnivore Viewing Opportunities*, April 28, 2016, *available at* https://doi.org/10.1371/journal.pone.0153808.
[3] *Id.*
[4] National Park Service, PROPOSAL: 5 AAC 92.510. Areas closed to hunting; and 5 AAC 92.550. Areas closed to trapping, *available at* https://www.nps.gov/dena/learn/nature/upload/Wolf-Buffer-Proposal-2017.pdf.
[5] *Id.*
[6] Fix, P. J., Andrew Ackerman and Ginny Fay, 2013, 2011 Denali National Park and Preserve Visit Characteristics. Natural Resource Technical Report NPS/AKR/NRTR—2013/669. National Park Service, Fort Collins, Colorado.
[7] National Park Service Proposal, *supra* note 4.

Dear Representative Seaton,

I write to urge you to give your full hearted support to HB 105. If adopted, it would establish a controlled use area in the Stampede road area on the north side of the old Denali National Park boundaries. As drafted, the taking of wolves in the controlled use area would be prohibited except for purposes of protecting public health and safety. The proposed controlled use area is often referred to as a "Denali Buffer".

This is a "people" bill, and not a "wildlife" bill. I say that because more than 200,000 people ride the Park buses every summer, looking for wildlife and scenery. The people trapping for wolves in the affected area number less than five. To me, it seems a simple choice: the greatest benefit for a large number of people; or the donation of a public resource to a tiny minority.

A Denali buffer has been a contentious issue for at least 17 years. I speak from experience, since I was a member of a Board of Game subcommittee which was directed to attempt to reach consensus on this issue. That was in 2000-2001, as best I recall.

A buffer was approved by the BOG at about that time, and in the following years, sightings of wolves was common from the Park buses. I believe the National Park Service determined that about 44% of these people saw wolves during the years the buffer was in effect.

In 2010 the Board of Game eliminated the buffer. Wolf sightings declined dramatically as a handful of people trapped and shot the same wolves viewed by people on the buses. In the last year for which data is available only 4% of the people riding the Park buses saw wolves.

For 17 years I have listened to, read, and considered most of the arguments given as to why a handful of individuals should take from hundreds of thousands of people of the opportunity to view wolves. Those arguments are excuses. No person can honestly say that the value of trapping wolves by 1 - 5 individuals outweighs the value of viewing opportunity for more than 200,000 people, every year.

I listened to the recent deliberations of the members of the Board of Game as they once again rejected all proposals for a buffer. That was in March, 2017. The discussion by BOG members was about trappers, exaggerations by advocates for a buffer, whether the number of tourists was increasing or decreasing, and whether the wolf population would recover. NOT ONCE did I hear mention of the enjoyment that people get from seeing a wolf.

Let me state loudly and clearly: I find it thrilling and wonderful to see a wolf, or several wolves. I visit Denali National Park, often. When an individual takes a Park wolf in the Stampede Road area, something of value is taken from me. I am a citizen of this state. I have lived and worked here for 42 years. The same is true of many of the people on those buses.

The buffer area will consist of less than one tenth of 1% of the State's public lands. HB 105 is about wildlife viewing; and that means it's about people: including Alaskans like me.

I urge you to enthusiastically support and push for the passage of HB 105.

Very truly yours,
Kneeland Taylor

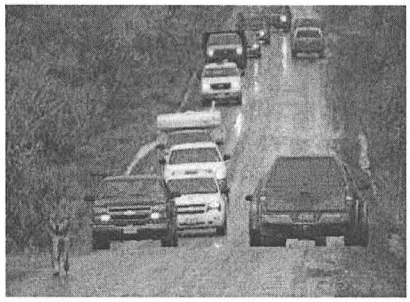
**Wildlife** **4:01 PM** WED NOVEMBER 27, 2013

# Latest Numbers Show Decline in Wolf Sightings Along Denali Park Road

**By EMILY SCHWING**

Fairbanks, AK - Environmental groups are asking the state and the federal government to exchange or purchase land to create a permanent wildlife buffer along the eastern border of Denali National Park. The request comes in response to numbers released by the park service that show a decline in the number of wolves viewed by visitors.

Listen
4:11



(http://mediad.publicbroadcasting.net/p/kuac/files/201311/denali_wolf_0.jpg)

*Credit National Park Service*

5,841 bus trips took place along the road inside Denali National Park this summer. The Park Service sampled less than one-and-a-half percent of those trips to find out how often visitors spot wildlife. Wolves, in particular, were only sighted on three occasions out of 80 trips sampled. Don Striker is the Denali National Park Superintendent. He says wildlife viewing is something visitors have come to expect. "I think the ability to experience wolves in the wilderness on their own terms is an amazing and often times transformative experience for people," says Striker. Wolves that have been spotted along the Denali Park Road in the past are likely members of the Grant Creek Pack. "The Grant Creek Pack breeds right near the road," says Striker. "So they offered the best opportunity for people to be able to see wolves. They sort of grew up with buses going by." But in May of 2012, the Park Service reported the pack's dispersal. A breeding female was trapped and killed that year. Striker says the loss of the pack means there are fewer wolves to spot in the area, but he doesn't think those numbers are an indicator of larger changes in overall population"In no way, shape or form would I suggest that this data suggests that we have a problem with respect to the viability of the wolf population in Denali," says Striker.

"There's not necessarily a link between how many wolves are seen in the park and how many are there," Says Cathy Harms. She is a Wildlife Biologist with the Alaska Department of Fish and Game. For the most part, she and Don Striker agree. "A specific wolf taken by a trapper was the breeding female in a pack commonly viewed and it did disrupt viewing, but it didn't disrupt overall wolf numbers in the park," says Harms.

But environmental groups argue hunting and trapping outside the park is affecting the population inside the boundary. Last spring, the Park Service counted 55 wolves, down from 143 in 2007. It's the lowest count since the Park started keeping track of wolves in 1986. Rick Steiner is a conservation biologist and wolf advocate. "We don't know all the causes of the decline," says Steiner, "but without question it is indisputable that take of park wolves when they cross the invisible boundary park on the east side by

trapping and hunting has contributed to the decline of wolves in the park and certainly in viewing success," he says.

In 2010, the Board of Game voted to eliminate a buffer zone that protected wolves that crossed cross the northeastern park boundary. Since then, Steiner and others have made multiple efforts to reinstate the buffer without success. But Cathy Harms says harvest numbers in the area where the buffer used to exist are too low to significantly impact the population. "In the area formerly known as the buffer zone, the maximum number of wolves taken per year has been four wolves and often it's zero to two so there's no correlation between trapper and a decline in wolf population in the park," say Harms.

Rick Steiner says both the state and the federal government are focused on numbers when they should be looking at wolf behavior. "It's not just about numbers," says Steiner. "It's about family groups and pack integrity and the actual cultural behavioral characteristics that they develop over years."

In a letter to US Department of Interior Secretary Sally Jewell and Alaska Governor Sean Parnell, Steiner has requested that the state and federal government negotiate an easement exchange or land purchase to secure a permanent buffer to protect Denali area wolves. Neither office has responded, but the Governor's staff is reviewing the document. The Park Service is still compiling numbers from this year's fall counts.

TAGS: Denali National Park (/term/denali-national-park) wolves (/term/wolves) Rick Steiner (/term/rick-steiner) National Park Service (/term/national-park-service) wolf (/term/wolf)

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**Outdoors/Adventure**

# Game Board again shoots down Denali wolf trapping buffer zone

Author: Craig Medred Updated: July 6, 2016 Published January 11, 2013

Once more the Alaska Board of Game has refused to reinstate a wolf buffer zone around Denali National Park and Preserve, wherein trapping is banned.

Moose that inhabit the area, which generally supports the highest concentration of the big ungulates in the 6-million-acre federal reserve, might be happy, but environmentalists are howling mad.

They say continued trapping threatens wolf-viewing opportunities in the park. Denali wolves are most often seen from the park road. And wolves particularly like the area near the east entrance to the park because moose often congregate just to the north.

In a prepared statement, Jim Stratton, the Alaska director for the National Parks Conservation Association called the board's action "the latest blow from an agency that has forgotten that watching wildlife is every bit as important to Alaskans as killing it.

"The Board of Game's decision comes on the heels of the agency denying multiple emergency requests by the National Parks Conservation Association and a host of other concerned Alaska citizens last summer and fall, urging it to reinstate the buffer zone. We raised the alarm upon reviewing initial data from the National Park Service, showing a 66-percent decline in the chances of seeing wolves on Denali Park Road since the buffer zone was eliminated in 2010.

"Park service researchers also counted the lowest population of wolves in 25 years last October: only 57 wolves, down from a high of 143 wolves in 2007. Viewing wolves in Denali National Park not only provides visitors unforgettable memories; there are serious economic benefits associated with visitors traveling to Alaska with the sole purpose of seeing – not killing – wolves and other wildlife."

Park Service officials say they don't know why they counted only 57 wolves in October. They suspect the count missed some, and they note that Denali isn't home to enough moose, caribou and Dall sheep to support many wolves. Wolf densities in the park since 2010 have hovered in the range of wolf densities in the park in the mid-1980s.

The numbers are significantly lower than the peak wolf years of the early 1990s, but biologists note wolf populations vary widely over time. The population of the nation's most studied wolves -- those that live totally protected on Isle Royale National Park in Lake Superior -- has over the years ranged from 50 to 10. The Denali population swings pale in comparison.

The state Game Board says it is in a position of mediating between various wildlife interests in Alaska. Wolf trapping provides some income in the Parks Highway community of Healy, and some year-round residents of the area are supportive of trapping because low wolf numbers help keep moose numbers higher. And moose are an important source of meat in rural parts of Alaska.

*Contact Craig Medred at craig(at)alaskadispatch.com*

Alaska | News | Tourism | Denali National Park And Preserve | National Park Service | Biology | Trapping | Animal Rights | Article | Sightseeing | Buffer Zone | Wolf Trapping | Wolf Biology

**About this Author**

**Craig Medred**

**Wildlife**

# Are hunting and trapping to blame for a drop in wolf sightings in Alaska's Denali National Park?

Author: Alex DeMarban Updated: September 28, 2016 Published November 28, 2013

Wolf viewings by tourists are down dramatically in Denali National Park and Preserve, and conservation groups are blasting a 2010 decision by Alaska game managers to allow wolf hunting and trapping on a chunk of state-owned land outside the park.

The National Park Service didn't voice that same accusation so clearly. But in a press release about the drop in viewings, the agency highlighted the decreased wolf population and the state's policy.

Ted Spraker, the Alaska Board of Game chairman who has voted against allowing the hunting and trapping in the area, said the drop in wolf numbers appears to be related to a drop in prey in the park -- moose, caribou and sheep.

"It has nothing to do with trapping and the fact that a buffer is not there," he said.

For years, the state did not allow hunting and trapping in a 122-square-mile buffer at the northeast edge of the park that is "most frequented by wolves," the park service said.

In 2010, the park service asked the state Board of Game to expand that buffer zone. That would have banned "hunting and trapping in additional areas where many of the most-viewed wolves winter, the agency said.

But the Board of Game rejected the expansion and went even further, eliminating the buffer zone, the statement noted.

The possibility of wolf viewings in Denali is considered an important draw for the park's 400,000-plus annual visitors, meaning it's also important for a state economy that's partially dependent on tourism.

But the chances of seeing a wolf from a bus ride through the park -- the way the vast majority of visitors travel -- have plummeted, the park service reports.

In a random sample of 80 bus trips this summer, wolves were seen on three occasions, or about 4 percent of the trips. By contrast, in the three previous years the likelihood was 12 percent (2012), 21 percent (2011) and 44 percent (2010), the park service said.

The number of wolves counted in the park and preserve north of the Alaska Range during the spring has fallen from 66 in 2012 to 55 in 2013. That's the lowest level since 1986, but the wolf population remains viable, the park service said.

Trapping as well as hunting for sport and subsistence remain legal in certain areas of the federally owned land, but the "documented wolf harvest is quite small."

The decrease in wolf numbers has not led to higher numbers of prey in the park and preserve, such as caribou or moose. And while populations of moose, caribou, sheep and bears vary annually, those animals have not undergone the "steady decline found with wolves," the agency said.

Spraker said he has twice voted to support the buffer. But as a board member, he said he supports the body's decision, which will be reconsidered in 2016.

He said wolf numbers have fallen across the park, not just the area near the buffer, another indication that the hunting and trapping outside the northeast boundary is not to blame.

"We need to have more science and less emotion involved in this discussion because once it gets to this state you have these circular arguments," he said.

A statement from Public Employees for Environmental Responsibility said the drop in wolf numbers was even sharper and blasted the state's policy.

"In 2010, the Alaska Board of Game, comprised of hunters and trappers, eliminated this no-take wolf buffer altogether," said a statement from PEER. "The wolf population across the 6 million acre park and preserve has declined from 143 in fall 2007 to just 55 in spring 2013 -- a drop by more than half in just six years."

The PEER statement said the cooperative spirit between state and federal wildlife managers has "broken down completely" under Gov. Sean Parnell, who became governor in summer 2009 after Sarah Palin quit.

PEER board member Rick Steiner said the game board's 2010 decision hurts tourism.

"The State of Alaska should understand the simple economics of this," he said. "In places like Denali, wolves are worth far more alive than dead. Removing the buffer benefits two or three trappers, but costs thousands of park visitors the opportunity to watch wolves in the wild, and thus costs the Alaskan economy."

Spraker, who said he enjoys wolf trapping though he doesn't take many, said a potential solution may be a land exchange with the federal government. An exchange would allow the feds to increase the park's

holdings. If the trade is fair for the state, perhaps the federal government could trade for a much larger area than the current buffer. That's a decision that would be made at a higher level than the Game Board, most likely the Legislature.

"The board is understanding and sympathetic to the viewing public," he said. "But we feel hunting and trapping and viewing can be done at the same time if done properly."

PEER laid out its concerns in a letter to Gov. Parnell and Interior Secretary Sally Jewell.

The park service and Spraker agreed the problem is complex.

"We are just beginning to learn about the factors, such as pack disruption, that play a role in magnifying the impacts of individual wolf losses on viewability," said Philip Hooge, assistant superintendent for Resources, Science, and Learning with the park.

The issue will be explored more deeply in a peer-reviewed paper expected to be released in the spring.

*Contact Alex DeMarban at alex(at)alaskadispatch.com*

**About this Author**

**Alex DeMarban**

Alaska News

# Petition seeks to limit hunting, trapping of Denali wolf packs

Author: Kim Murphy Updated: September 29, 2016 Published September 6, 2012

The wolf pack that has enchanted thousands of visitors at Denali National Park did not produce any pups this year and its members have dispersed widely throughout the park, says a petition seeking to ban hunting and trapping along the park's northeastern boundary, where a female wolf was fatally snared this year.

Visitors are likely to have substantially fewer chances to see wolves, which habitually denned close to the main road through the 6 million-acre park, says the petition, filed by the Alaska Wildlife Alliance, the National Parks Conservation Association and other groups.

"To me, and I know probably 400,000 other people who visit Denali, these wolves are way more valuable alive than dead. I don't know what they get for a wolf pelt, but it's not much," said Valerie Connor, conservation director for the Alaska Center for the Environment, which also joined in the petition.

The proposal to the Alaska Board of Game for a hunting and trapping buffer on state lands around Denali has been a point of friction for years between conservationists and the board, which became so weary of the issue that it put a moratorium on any further consideration for the next several years.

But the deaths of the Grant Creek pack's two main breeding females this spring -- one from the trapper, the other from natural causes -- raised concerns that have been partially realized.

Bridget Borg, a biologist at the park, said the 15-member pack split up and the chief monitored group is down to five or six wolves. After not producing any surviving pups, she said, they abandoned the den that put the pack in viewing range.

She said biologists had not determined that the pack has no breeding females and that there was a chance the pack could join up again over the fall and reproduce next spring.

Marybeth Holleman, who is writing a book on Denali's wolves and joined in the petition, said she traveled to the Grant Creek pack's den over the summer and found no wolves there.

"The Grant Creek pack was the most visible pack in the park. People saw them hunting along the road. A bus driver told me about having the pups sitting in the road howling right in front of the bus -- incredible sights," Holleman said. "This summer, we saw one lone wolf near the visitors center. It was a solo wolf, out hunting by itself."

The problem, the petitioners say, is that pups are what hold a pack together: Some wolves remain at the den site to tend the young, while others make hunting forays and return to the den with food.

"The loss of just one important breeding animal can lead to catastrophic impacts over the long term," Alaska conservation biologist Rick Steiner, who led the drafting of the petition, said in a statement.

The Alaska Department of Fish and Game rejected Steiner's initial request for an emergency ban on hunting and trapping on state lands east of the park, prompting conservationists this week to appeal directly to the Alaska Board of Game.

Douglas Vincent-Lang, head of Fish and Game's Division of Wildlife Conservation, said the loss of a few wolves from one pack is of little concern biologically when overall the wolf population in that area of Denali is healthy.

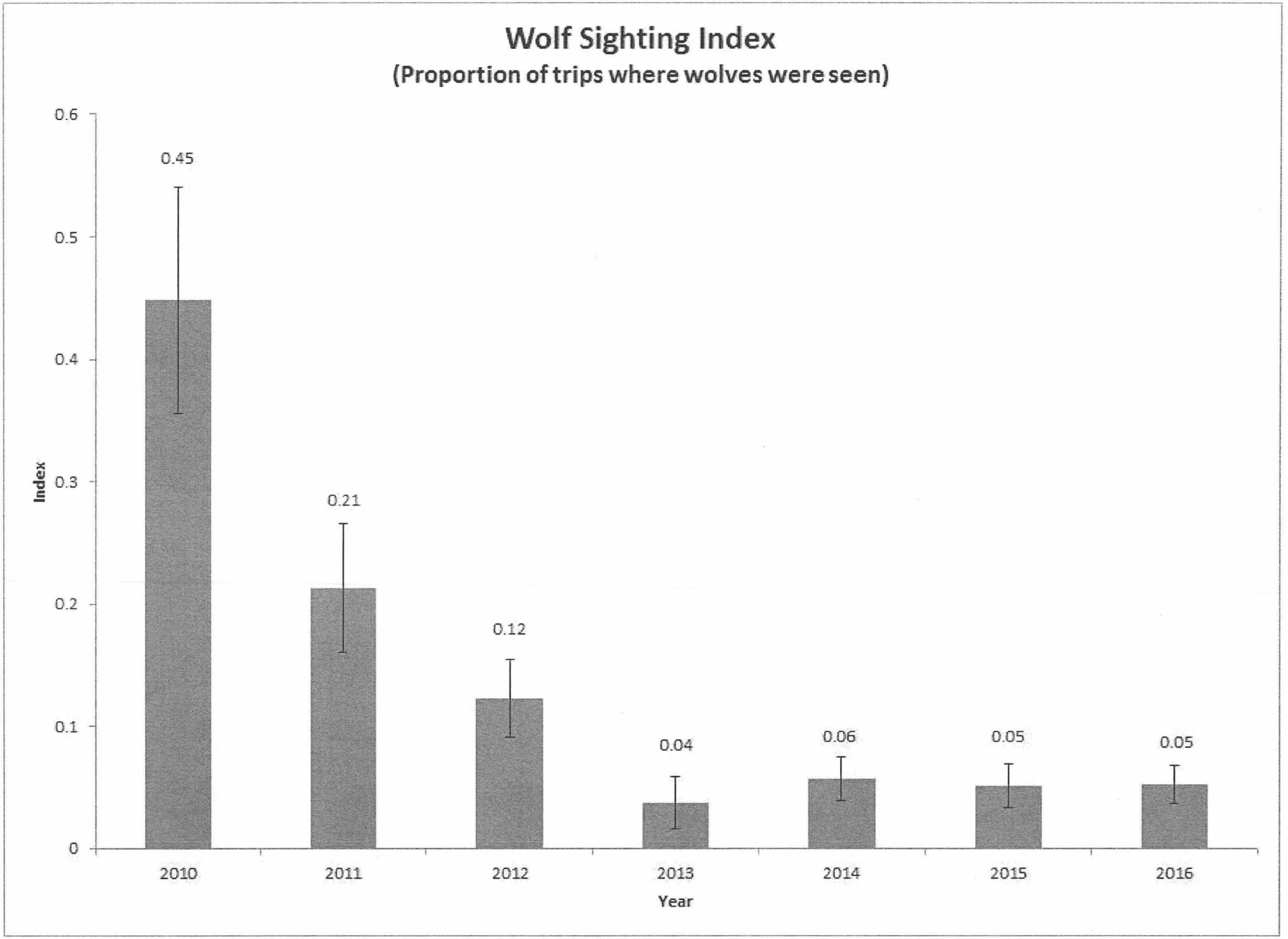
By Kim Murphy

Los Angeles Times

**About this Author**

**Kim Murphy**

Kim Murphy is a reporter at the Los Angeles Times.


Wolf Sighting Index
(Proportion of trips where wolves were seen)
Index
0.6
0.5
0.4
0.3
0.2
0.1
0
0.45
0.21
0.12
0.04
0.06
0.05
0.05
2010
2011
2012
2013
2014
2015
2016
Year

## Wolf Survey Data, Spring (approx. 15 March) and Fall (approx. 1 October), Denali National Park and Preserve, 1986-2016

| YEAR | NUMBER OF PACKS MONITORED | | TOTAL WOLVES COUNTED | | MEAN PACK SIZE | | COMBINED AREA OF MONITORED PACKS (square kilometers) | | ESTIMATED DENSITY: WOLVES/1000KM2 | | POPULATION ESTIMATE INSIDE THE PARK* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SPRING | FALL | SPRING | FALL | SPRING | FALL | SPRING | FALL | SPRING | FALL | SPRING | FALL |
| 1986 | 4 | 4 | 26 | 22 | 6.5 | 5.5 | 7,380 | 8,180 | 3.52 | 2.69 | 61 | 46 |
| 1987 | 8 | 9 | 37 | 70 | 4.6 | 7.8 | 12,125 | 13,150 | 3.05 | 5.32 | 53 | 92 |
| 1988 | 14 | 14 | 69 | 121 | 4.9 | 8.6 | 15,355 | 14,670 | 4.49 | 8.25 | 78 | 142 |
| 1989 | 13 | 11 | 98 | 127 | 7.5 | 11.5 | 16,810 | 15,240 | 5.83 | 8.33 | 101 | 144 |
| 1990 | 10 | 11 | 106 | 136 | 10.6 | 12.4 | 13,930 | 13,930 | 7.61 | 9.76 | 131 | 169 |
| 1991 | 13 | 13 | 111 | 137 | 8.5 | 10.5 | 14,275 | 14,275 | 7.78 | 9.6 | 134 | 166 |
| 1992 | 15 | 15 | 103 | 120 | 6.9 | 8 | 13,620 | 13,620 | 7.56 | 8.81 | 131 | 152 |
| 1993 | 12 | 12 | 68 | 93 | 5.7 | 7.8 | 9,900 | 9,900 | 6.87 | 9.39 | 119 | 162 |
| 1994 | 10 | 12 | 61 | 72 | 6.1 | 6 | 11,145 | 11,145 | 5.47 | 6.46 | 95 | 112 |
| 1995 | 12 | 11 | 59 | 80 | 4.9 | 7.3 | 12,120 | 12,045 | 4.87 | 6.64 | 84 | 115 |
| 1996 | 11 | 11 | 69 | 104 | 6.3 | 9.5 | 12,640 | 12,776 | 5.46 | 8.14 | 94 | 141 |
| 1997 | 11 | 12 | 78 | 75 | 7.1 | 6.3 | 13,080 | 12,808 | 5.96 | 5.86 | 103 | 101 |
| 1998 | 12 | 12 | 61 | 68 | 5.1 | 5.7 | 13,121 | 12,578 | 4.65 | 5.41 | 80 | 93 |
| 1999 | 13 | 15 | 69 | 80 | 5.3 | 5.3 | 12,699 | 12,699 | 5.43 | 6.3 | 94 | 109 |
| 2000 | 17 | 18 | 71 | 112 | 4.2 | 6.2 | 14,378 | 14,554 | 4.94 | 7.7 | 85 | 133 |
| 2001 | 16 | 18 | 87 | 91 | 5.4 | 5.1 | 13,802 | 13,802 | 6.3 | 6.59 | 109 | 114 |
| 2002 | 15 | 14 | 73 | 86 | 4.9 | 6.1 | 13,026 | 12,226 | 5.6 | 7.03 | 97 | 121 |
| 2003 | 18 | 11 | 75 | 84 | 4.2 | 7.6 | 11,682 | 11,682 | 6.42 | 7.19 | 111 | 124 |
| 2004 | 14 | 14 | 78 | 78 | 5.6 | 5.6 | 16,061 | 14,630 | 4.86 | 5.33 | 84 | 92 |
| 2005 | 15 | 15 | 66 | 106 | 4.4 | 7.1 | 14,630 | 15,367 | 4.51 | 6.9 | 78 | 119 |
| 2006 | 15 | 17 | 103 | 111 | 6.9 | 6.5 | 15,367 | 17,439 | 6.7 | 6.37 | 116 | 110 |
| 2007 | 16 | 20 | 93 | 147 | 5.8 | 7.4 | 17,439 | 17,757 | 5.33 | 8.28 | 92 | 143 |
| 2008 | 20 | 14 | 99 | 86 | 5 | 6.1 | 17,757 | 16,607 | 5.58 | 5.18 | 96 | 89 |
| 2009 | 16 | 15 | 65 | 89 | 4.1 | 5.9 | 16,607 | 17,061 | 3.91 | 5.22 | 68 | 90 |
| 2010 | 12 | 11 | 59 | 88 | 4.9 | 8 | 17,061 | 17,994 | 3.46 | 4.89 | 60 | 84 |
| 2011 | 10 | 8 | 71 | 75 | 7.1 | 9.4 | 17,994 | 17,994 | 3.95 | 4.17 | 68 | 72 |
| 2012 | 10 | 9 | 70 | 57 | 7 | 6.3 | 18,340 | 18,340 | 3.82 | 3.11 | 66 | 54 |
| 2013 | 11 | 12 | 49 | 67 | 4.5 | 5.6 | 15,473 | 15,473 | 3.19 | 4.33 | 55 | 75 |
| 2014 | 10 | 11 | 51 | 55 | 5.1 | 5.1 | 17,640 | 17,640 | 2.89 | 3.12 | 50 | 54 |
| 2015 | 12 | 11 | 52 | 62 | 4.3 | 5.6 | 18,820 | 18,820 | 2.76 | 3.29 | 48 | 57 |
| 2016 | 9 | 10 | 49 | 76 | 5.4 | 7.6 | 17,153 | 17 | 2.86 | 4.43 | 49 | 77 |

******Population estimate inside the park*** =calculated wolf density estimate across an estimated 17,270 square km of potential habitat within park boundaries, north of the Alaska Range

NPark Service

# HB 105: "An Act prohibiting the taking of wolves and the use of certain traps and snares in certain areas adjacent to the Denali National Park and Preserve."

## Testimony in Support

Rick Steiner, Professor and Conservation Biologist,
Oasis Earth (www.oasis-earth.com), Anchorage

Alaska Senate Resources Committee Hearing
March 23, 2018

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## Introduction

I appreciate the opportunity to provide testimony in support of HB 105, and look forward to any questions you may have after my oral testimony.

For the record, I am a conservation biologist in Anchorage, and I was a professor with the University of Alaska from 1980–2010, stationed in Kotzebue, Cordova, and Anchorage. Today, I consult globally on conservation issues.

As Senators, you face many difficult decisions this session, but HB 105 is not one of them. This bill should be an easy "YES." It passed the House last session, and I would respectfully urge your committee's unanimous "YES" vote to move the bill to a floor vote of the full Senate.

There are two simple criteria with which to judge this bill:

**1. Does it help the Alaska economy? YES.** HB 105 is an overwhelming economic positive. In these challenging economic times the state needs to do everything possible to support the Alaska economy. One of the easiest and most cost-effective measures lawmakers can take to enhance our economy is to do everything possible to enhance the wildlife tourism industry – a $2.7 billion/year industry in Alaska, and Denali is one of Alaska's top economic resources (I will elaborate more on that below); and

**2. Is it consistent with the State Constitution? YES.** In particular, the principle of equity, fairness and common ownership of all resources (including wildlife) by all Alaskans, embodied in **Article VIII**, Sections 2 and 3:

> 2. General Authority
>
> *The legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State, including land and waters, for the maximum benefit of its people*

3. Common Use

*Wherever occurring in their natural state, fish, wildlife, and waters are reserved to the people for common use.*

The Alaska constitution guarantees that wildlife are to be used *for the maximum benefit of [Alaska's] people*, and *reserved to the people for common use.*

Thus, all Alaskans have equal legal access to, and use of, the wildlife of Denali, including the 70,000 Alaskans who visit the park each year wanting to see them alive -- not just the few individuals who hunt and trap these animals along the NE boundary of the park.

Approving this bill is the clear economic choice, and clear constitutional choice. It is indeed the only rational choice you can make. It is difficult to imagine how a "NO" vote on this bill can be reconciled with these two criteria – the need to support the state economy and the common use/maximum benefit clauses of the state constitution.

Denali National Park & Preserve (DNPP) is one of the top economic resources in Alaska, and seeing wildlife is one of the main reasons visitors come to the park.

Last year marked the 100th anniversary of this iconic tourism destination. Many Alaskans feel this is a good time to finally resolve the century-old problem of conserving park wildlife along the park's eastern boundary. HB 105 goes a long way toward doing just that.

## Wolf Townships History

In 1906, when hunter-naturalist Charles Sheldon explored the Denali area, he noted that commercial hunters selling Dall sheep meat to railroad workers and miners were decimating local wildlife populations. Sheldon went to Washington D.C. and, along with the Boone and Crockett Club, advocated establishment of Mt. McKinley National Park as a "game refuge." President Woodrow Wilson signed the original 2 million acre park into law on Feb. 26, 1917. But the precise boundaries necessary to protect park wildlife were unclear, imperfect, and continued to be debated. In particular, lands northeast of the original park boundary, where park wildlife migrate seasonally, were considered by many to need park protection as well.

Subsequently, there have been many unsuccessful attempts to add lands along the northeast boundary, now known as the "Wolf Townships" and "Stampede Trail," into the park to protect park wildlife:

1922 – AK Railroad proposes to include Wolf Townships in McKinley Park to protect Park wildlife.

1965 – State selects Wolf Townships, but cites need to expand Park to protect

caribou, and that existing Park boundary is "an arbitrary line."

1969 – Johnson administration considers, but declines, to add Wolf Townships into Park.

1978 – Carter administration considers Wolf Townships worthy for inclusion in Denali National Monument, but lands had been selected by State.

1980 – Although this area was not included in ANILCA (as it had been state-selected), the Senate report accompanying ANILCA made it clear the expectation was for the wolf townships to eventually become part of Denali:

> *The prime resource for which the north addition is established is the critical range necessary to support populations of moose, wolf, and caribou as part of an integral ecosystem. Public enjoyment of these outstanding wildlife values would thus continue to be assured.*
>
> Senate report 96-413, 1980, page 166
>
> *In the northeast portion of the area, near the existing headquarters, there are some 3 townships of state lands which are critical for sheep, caribou, and wolf habitat and should eventually become a part of the park. ... The Committee recognizes that these areas are important to the park and recommends that the Secretary seek land exchanges with the State of Alaska that would serve to bring these areas into the Park.*
>
> Senate report 96-413, 1980, page 167.

1985 – State (Sheffield admin.) proposes to bring Wolf Townships into Park in exchange for Kantishna/Dunkle Mine being excluded from Park.

1992 – Alaska Board of Game establishes 811 square mile wolf buffer on Wolf Townships and along entire eastern boundary of the park, but rescinds buffer two months later in political retaliation for Gov. Hickel's suspension of wolf control programs elsewhere.

1995 – State (Murkowski admin.) proposes a rail line through Wolf Townships, and NPS plan cites need to protect area affected by rail line as Park.

2000 – Board of Game reestablishes small no-kill wolf buffer, expands it in 2002 to 122 sq. mile (western part of Stampede Trail and Nenana Canyon).

2001 – State (Knowles admin.) proposes to convey Wolf Townships to UA to then sell to Park.

2008 – Alaska scientists propose that ADFG Commissioner use Emergency Order authority to expand existing buffer to 530 sq. mile – denied.

2010 – Four Alaska groups independently propose to Board of Game significant expansions of the existing wolf buffer – Denali Citizens Council, DNPP, Defenders of Wildlife, and the Anchorage Fish & Game Advisory Committee. The Board denied the buffer expansion proposals and, with unusual contempt for public process, instead eliminated the existing buffer entirely, and adopted a legally questionable moratorium on considering any further Denali buffer proposals for 6 years.

2010-2013 – Alaska citizens groups (including Alaska Wildlife Alliance, Denali Citizens Council, National Parks Conservation Association) file three Emergency Petitions asking Board of Game to reestablish the buffer (two in 2012, one in 2015) - all denied.

Alaska citizens repeatedly petitioned the ADFG Commissioner to use emergency closure authority to close the area. Except for one 2-week closure ordered in May 2015 only after the pregnant female of the East Fork wolf family group was killed in the area - all petitions have been denied. Alaska citizens proposed in 2013 that the Board of Game lift its 6-year moratorium - denied. And despite the moratorium, Alaska citizens propose to Board of Game a wolf buffer in GMU 13, along south Denali boundary - denied.

2017 -- It has become obvious that the Board of Game will not and cannot provide a lasting solution to the Denali watchable wildlife problem. Even if the Board were to enact a closed area, the closure would not be permanent and could easily be removed by subsequent Board action. As example, the initial wolf buffer established by the Board in 1992 was then removed by the same Board only 2 months later, due to unrelated political issues.

None of these efforts throughout the park's 100-year history have succeeded. Thus to restore and enhance the valuable wildlife viewing resource of DNPP, an authentic and durable solution is needed -- HB 105.

## Denali wolf viewing decline

Today, against the wishes of many Alaskans, the state continues to permit hunting and trapping of Denali wildlife along the northeast park boundary. While this lethal take is relatively limited (ADFG reports a total of roughly 25 bears, wolves, lynx, and wolverines / year, taken by a few individuals), it has had a significant impact on wildlife viewing in the park.

For instance, just since the wolf buffer was eliminated in 2010, park visitor viewing success for wolves plummeted from 45% to only 5%, remained at this low level for 4 years, and last year recovered slightly to 16% - still far below the 45% viewing success in 2010 (the year the buffer was eliminated), and below wolf viewing success at Yellowstone, which ranges from 45% - 85% success. The viewing decline at Denali means that thousands of visitors each year are deprived the opportunity to view wolves in the park.

Natural factors (e.g. low snowfall, etc.) may play a role in the wolf population and viewing decline, but it is clear that trapping/hunting take of important breeding individuals on state lands northeast of the park is also a significant contributing factor. And while wildlife managers can't do much about natural causes, they can and should help to restore the population by minimizing additional losses from trapping/hunting. This aligns with old adage: Change the things you can, accept the things you can't, and know the difference.

The science is crystal clear. Studies confirm that killing Denali wolves along the park boundary has reduced the park wolf population, denning near the park road, and visitor viewing success (see 2 NPS studies in your packet). "We are all entitled to our own opinions, but not our own facts." And these are the facts, not "alternative facts."

With only on average 4–5 wolves taken/year along NE boundary, the reason for the significance of the impact is what wildlife biologists call the "Breeder Loss Effect."

Breeder loss effect: If significant breeding individuals in family groups are killed, their loss can cause a cascade of losses and disintegration of the family group. For example in Denali:

Grant Creek 2012: This occurred with the Grant Creek wolf family group in 2012, after the last breeding female was trapped along the park boundary, leading to the disintegration of the family group from 15 to only 3 wolves that year. Denning = social cohesion of group. Viewing success in the park plummeted that year alone from 21% to 12%, due primarily to the trapping take of the one Grant Creek female.

East Fork (Toklat) 2015/2016: This effect occurred once again when the pregnant female of the East Fork family group was shot by an out-of-state hunter at a bear bait station just outside the park in 2015. Just as with the Grant Creek in 2012, the East Fork group in 2015 then failed to pup or den, dispersed and declined from 15 to only 2 the following winter. In May 2016, the sole remaining East Fork male (collar designation GM1508) was shot by a hunter also at a bear baiting station, leaving one lone female survivor of this long-studied (70-year) Denali wolf family group. The surviving female denned and had two pups, but all have since disappeared. This long studied wolf family group – one of the longest studied mammal groups in scientific history – is almost certainly now be gone, due to the hunting take of two breeding members along the park boundary. This is an unnecessary and unfortunate loss to science.

And as the National Park has a mandate to protect the ecosystem in a natural, undisturbed condition, it has been unable to fulfill this mission due to state-permitted wildlife take along the boundary and within the park.

## Economic value of wildlife viewing in Denali

One of the primary reasons visitors come to Alaska is to view wildlife. A 2011 study sponsored by ADFG estimated that wildlife viewing in Alaska (attached) supported

over $2.7 billion in economic activity - over twice that generated by hunting. Wildlife viewing supports an estimated 18,820 sustainable jobs in Alaska (with visitor spending per trip averaging $6,000), while hunting supports 8,400 jobs.

For the many Alaska visitors who don't venture from the road system, Denali is their best chance to view wildlife. Studies confirm that a majority of Denali visitors cite wildlife viewing as the main purpose of their trip, and that viewing large carnivores, particularly wolves and grizzly bears, is a main indicator of a satisfying visitor experience in Denali.

The economic value of Denali wildlife viewing is enormous, and dwarfs the economic value of hunting/trapping these park animals.

Denali is one of Alaska's most visited national parks, with over 650,000 visits each year, 70,000 of who are Alaska residents.

Visitor spending generated by Denali in 2015 was estimated at $567 million (exceeding Yellowstone and Yosemite), supporting some 7,300 jobs (NPS, 2016; https://www.nps.gov/subjects/socialscience/vse.htm). In fact, Denali is the 4th largest revenue generating national park in the nation (exceeded only by Blue Ridge Parkway, Smoky Mountains, and Grand Canyon). And a great deal of this revenue comes into Anchorage and Fairbanks.

Much of this economic value of DNPP is driven by wildlife viewing.

Regarding the value of wildlife viewing, an interesting comparison is at Yellowstone where, with an average visitor viewing success for wolves at 45% - 85%, the value of wolf viewing alone is estimated at $35 million/year.

In fact, some Alaskans who want to view wolves in the wild now go to Yellowstone, not Denali. It is easy to imagine the potential value of restoring wolf viewing in Denali to such levels.

While the economic value of hunting and trapping of Denali wildlife is minimal, on the order of a few thousand dollars / year, the value of reallocating these animals to sustainable wildlife viewing in the park is orders of magnitude greater - in the millions of dollars/ year. The rational economic choice here is clear.

## Denali Wolf Special Management Area

At this point it may be difficult to transfer title to these state lands into the national park, but the goal of protecting park wolves can be achieved simply by the state establishing a Special Management Area (SMA) east of the park, leaving land title in current ownership. I would note that this would be similar to the Governor of Montana's establishment of a 300,000-acre bison conservation area along the boundary of Yellowstone in 2016.

The question we often hear - "Isn't 6 million acres enough?"- is answered by the simple fact that actually only 2 million acres of Denali is closed to hunting/trapping -- 4 million acres is open to hunting/trapping as provided by ANILCA. In fact, less than 3% of all land in Alaska is closed to wolf take.

The few hunters/trappers that would be displaced by HB 105 would retain access to millions of acres of state and federal lands to the north, east and south. And the 70,000 Alaskans and 600,000+ out-of-state tourists visiting the park each year, wanting to see these same animals alive, would benefit. This is a simple and rational reallocation of the 25 or so animals killed each year by a few locals, to remain alive as watchable wildlife for hundreds of thousands of paying visitors. **HB105 does NOT represent a "gift" to the National Park Service or federal government, but rather a long-overdue gift to the people and economy of Alaska.**

The passage of HB 105 will get us part way there in fulfilling the century-long effort to protect park wildlife along the NE boundary of the Park.

## Public support

Thousands of emails and other communiqués have been sent to the Governor, ADFG Commissioner, and the Board of Game in support of permanent protection for Denali wildlife along the park boundary.

An on-line citizens petition in support of a Denali wildlife conservation area has over 330,000 signatures, from over 100 countries, all U.S. states, and many from Alaska:

http://www.thepetitionsite.com/423/700/229/halt-the-killing-of-denali-national-park-wolves/

And in 2016, the Fairbanks North Star Borough adopted Res. 2016-39: "A Resolution Urging Governor Walker To Close Areas Adjacent to Denali National Park & Preserve To The Trapping and Hunting of Bears, Wolves, and Wolverines." (attached in your packet).

Clearly, Denali's watchable wildlife is one of the most important tourism assets in Alaska, and the economic benefit of protecting park wildlife on state lands east of the park is overwhelming and clear.

Many Alaskans hope that the Legislature will rise to this historic opportunity, and give Alaskans, Americans, and the world a long-overdue birthday present for Denali's centennial, by passing HB 105. Again, it may well be the easiest decision you will have to make this session!

Thank you for your consideration, and I'd be glad to answer any questions the Committee may have.

# ALASKA STATE LEGISLATURE

REPRESENTATIVE ANDY JOSEPHSON

**Summary of Changes**

*HB 105 – Denali Wolf Buffer Zone*

The original version of this bill created the "Gordon Haber Denali Wolf Special Management Area" within Title 41 (Public Resources), Chapter 21 (Parks and Recreational Facilities). Provisions under this section are administered by the Department of Natural Resources, which has a general mandate to manage natural resources *exclusive of wildlife.*

DNR indicated that, since it did not have existing expertise in wildlife management, the original bill could incur a substantial department expense.

The Department of Fish and Game suggested several possibilities for prohibiting wolf hunting and trapping around Denali, including establishing a refuge, sanctuary or critical habitat area. But the most cost effective approach is simply to close it to taking wolves.

The purposes of the bill remain unchanged: to protect wolves for future generations of Alaskan residents and visitors, and to bolster the economy of the state's most important tourism asset through statistically valuable wolf sightings.

State Capitol – Juneau, Alaska 99801 – (907) 465-4939
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# Denali 2017 Fact Sheet

National Park Service
U.S. Department of the Interior

Denali National Park and Preserve, Alaska

**Superintendent** Don Striker

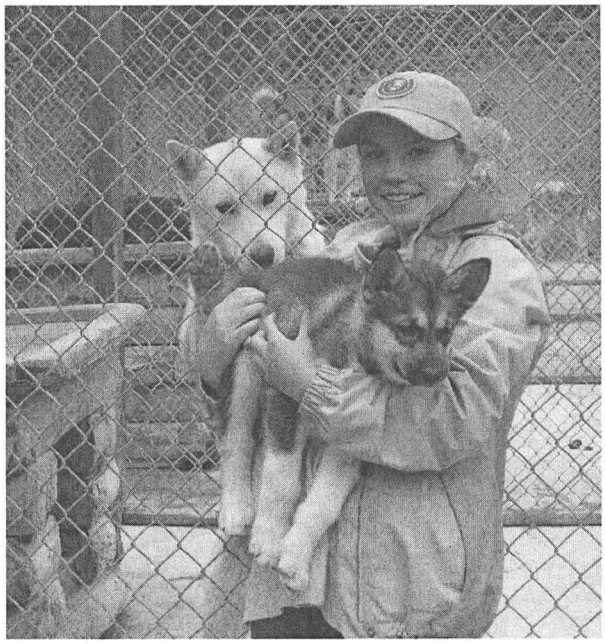
**Established**
Feb. 26, 1917 (as Mount McKinley National Park)
Dec. 2, 1980 (increased in size and name changed to Denali National Park and Preserve)
Aug. 28, 2015 (name of mountain officially changed from Mount McKinley to Denali)

**Size**

| | | | |
|---|---|---|---|
| Park | 4,704,911.16 acres | 7,407.7 sq. miles | 1,917,808 hectares |
| Preserve | 1,334,117.80 acres | 2,084.5 sq. miles | 539,896 hectares |
| | *6,075,028.96 acres* | *9,492.2 sq. miles* | *2,457,704 hectares* |

For comparison, New Hampshire = 9,351 sq. miles and Massachusetts = 10,555 sq. miles
Wilderness designation (99 percent of original Mount McKinley National Park):

- 2,146,270 acres
- 3,353.6 sq. miles



**Visitation**
2016: 599,822
2015: 589,450
2014: 531,315

**Effects of 2016 Visitor Spending**
Spending: $604.8 million
Jobs: 7,744
Economic Output: $864.4 million

**Base Budget** $14.3 million

**NPS Staffing**

| | |
|---|---|
| Permanent: | 113 |
| Term: | 27 |
| Seasonal: | 170 |
| Volunteers: | 1,061 (56,863 hours) |

**Campgrounds**

| | |
|---|---|
| RVs or tents: | 3 campgrounds (232 sites) |
| Tents only: | 3 campgrounds (42 sites) |

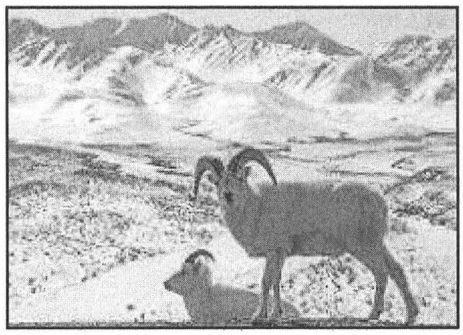
**Roads and Trails**

| | |
|---|---|
| Length of Denali Park Road | 92 miles 148 kilometers |
| Paved section | 14.8 miles 23.8 kilometers |
| Constructed trails | 35.5 miles 57.1 kilometers |

**Landmarks and Elevations**

| | Elevations above sea level | |
|---|---|---|
| Denali Visitor Center | 1,746 feet | 532 meters |
| Polychrome Overlook | 3,700 | 1127 |
| Highway Pass | 3,980 | 1213 |
| Eielson Visitor Center | 3,733 | 1138 |
| Wonder Lake Campground | 2,055 | 626 |
| Mount Foraker | 17,400 | 5303 |
| Lowest point (Yentna River at boundary) | 223 | 68 |
| **Denali** | | |
| -South Peak | 20,310 | 6190 |
| -North Peak | 19,470 | 5934 |





**Wildlife Species**

| | |
|---|---|
| Amphibians | 1 (wood frog) |
| Mammals | 39 |
| Birds | 160 species recorded, 123 documented as breeding, and 15 recorded as accidental |
| Fish | 14 (including three salmon species) |
| Reptiles | None |

**Flora**

Vascular plants: 758 species documented
Tree species: 8
Approximately 600 species of mosses, lichens and liverworts currently listed
*Erioderma pedicellatum*, a lichen discovered in 2007, was previously known only from limited areas in Scandinavia and southeastern Canada. It is currently classified as Critically Endangered.

**Paleontology**

Paleontologists found the first dinosaur bones in Denali National Park and Preserve during an expedition in July 2016. Thousands of trace fossils (tracks, foot or body prints) have been found since the first discovery of dinosaur prints in 2005, all dating from 65-72 million years ago. They include theropods, hadrosaurs, ceratopsians, and pterosaurs. *Myirospirifer breasei*, a species of extinct marine brachiopod that has been found only in Denali, is named after Phil Brease, park geologist from 1986 until his death in May 2010.

**Lakes and Streams**

There are approximately 12,206 lakes and ponds in the park and preserve; and 18,679 miles of streams
Largest is Chilchukabena Lake: 2.6 miles long, 2 miles wide, 2,056 acres
Wonder Lake: 2.7 miles long, 1/2 mile wide, 649 acres, 280 foot maximum depth

**Glaciers**

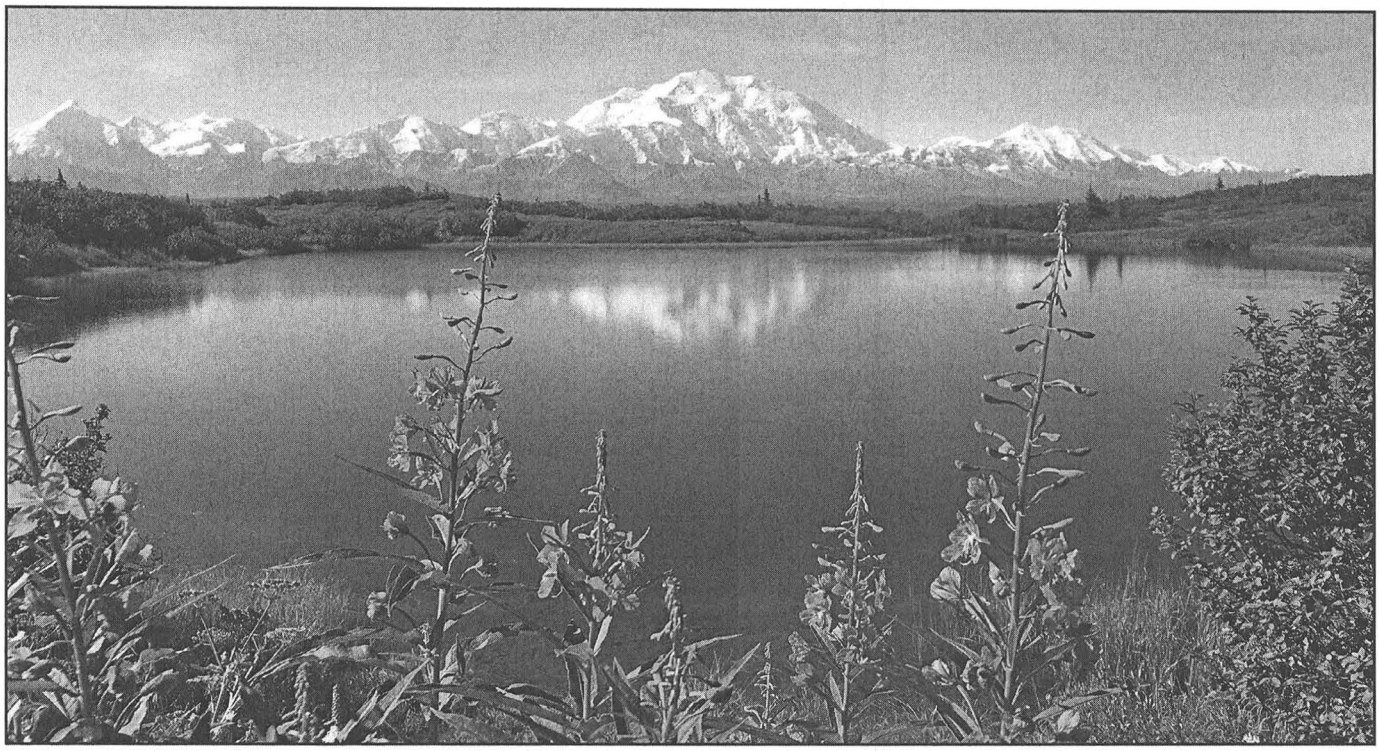
15.5 percent of park's land area is covered with glaciers
Largest: Kahiltna Glacier on the south side of Alaska Range (45 miles/72.4 km long)
Largest on north side of Alaska Range: Muldrow Glacier (34 miles/54.7 km long)
Deepest measured glacier: Ruth Glacier, 3,805 feet or 1160 meters

**Permafrost**

Permanently frozen soils underlie about 50 percent of the park's landscape, and most of the low elevation northern portions of the Park and Preserve host continuous permafrost. Recent modelin (Panda et al. 2014) suggest that a warming climate over the next 100 year will reduce the extent of permafrost coverage to less than 1 percent of of the landscape.

**Weather**

Average annual precipitation = 15 inches / 380 mm (park headquarters)
Wettest months are July, August, and June (in that order)
Average annual snowfall = 79 inches/201 cm (park headquarters)
Coldest temperature recorded at headquarters: -54° F/-48° C, Feb. 5, 1999
Coldest year on record: 1956
Highest temperature recorded at headquarters: 91° F/33° C, June 22, 1991
Warmest year on record: 1926
Average January temperature: 2.0° F/-17° C
Average July temperature: 55° F/13° C
Shortest day (Dec. 21): 4 hours, 21 minutes of daylight
Longest day (June 21): 20 hours, 49 minutes of daylight



**Earthquakes**

Average number per year within park boundaries: about 3,000
Depth: 60 percent between 0-20 km — the deepest are at approximately 200 km
Largest recent earthquake is magnitude 5.2 (Jan. 23, 2011)
A 7.9 magnitude quake on Nov. 3, 2002 is the largest recorded earthquake in the interior of Alaska
Most events occur within the Kantishna seismic cluster, in the foothills north of Denali

**Sled Dog Kennels**

Total number of dogs: 34 (18 males and 16 females)
Miles patrolled by sled per winter: 3,000
The kennels building was constructed in 1929 and sled dog demonstration began in 1939
2016 kennels visitation: 65,133

**Denali Mountaineering Statistics 2016**

Number of climbers: 1,131
Number that reached top or summit: 675
Summit percentage: 60 percent (Avg. = 52 percent)
Rescues: 11
Fatalities: 2 (total number since 1932 = 125)

**Notable Ascents**

First summit of South Peak (***true summit***): W. Harper, H. Karstens, H. Stuck, R. Tatum, June 7, 1913
First summit of North Peak: Pete Anderson and Billy Taylor, April 3, 1910
First woman to summit: Barbara Polk Washburn, June 6, 1947
First solo ascent: Naomi Uemura, Aug. 26, 1970
First winter ascent: Dave Johnston, Art Davidson and Ray Genet, Feb. 28, 1967
First successful winter solo ascent: Vern Tejas, March 7, 1988
Oldest person to summit: Tom Choate (age 78), June 28, 2013
Youngest person to summit: Galen Johnston (age 11), June 17, 2001

## Wolf Monitoring

**By Steve Arthur**

Denali National Park and Preserve's wolves have been studied by researchers since 1939. Population estimates were not very accurate until 1986, when a large-scale wolf research project was initiated by David Mech and others. This project provided basic information necessary for effective wolf management. The current monitoring program consists of maintaining one or two radio-collared wolves in each known pack inhabiting the park north of the Alaska Range. Radio-collared wolves are located about twice per month, with additional locations during late September to early October to determine fall pack sizes and to count pups, and during March to determine late winter pack sizes. In recent years, the use of GPS/ARGOS collars that upload locations daily or even more often has greatly increased the number of locations available for most collared wolf packs. Telemetry locations acquired over one year (April—March) are used to determine the area of each pack territory. Counts of wolves in these packs and the area encompassed by the combined pack territories are used to estimate abundance and density of wolves. In addition, monitoring data are used to determine wolf movements, den locations, mortality factors, behavior, and population dynamics.

During 2013-2014, we monitored a total of 17 wolves from 10 packs with territories at least partly within Denali (Figure 1). In March 2014, these packs included 51 wolves, and their combined territories covered an area of 17,640 square kilometers. This produced an estimated density of 2.9 wolves per 1,000 square kilometers, which is the lowest density since monitoring began in 1986 (Table 1). During the past 10 years, we have increased our use of GPS collars, which locate the wolf automatically and much more frequently than our twice-monthly tracking flights. This has improved our ability to estimate territory size, and increased the size of our estimate of the combined area occupied by wolves. This is partly why the current density estimate is low. However, it seems likely that the population has declined from levels seen during 2001-2003 (5.6 – 6.4 wolves per 1,000 square kilometers), likely influenced by low snowfall during the past several winters, which has reduced the vulnerability of caribou and moose to wolf predation.

At least 6 of the 10 collared packs denned during 2014, and produced a minimum of 14 pups that survived until fall. Seven collared adult wolves died during 2014; one was killed by other wolves, one died of apparent old age, one drowned, one starved, one was legally shot by a trapper outside the park, and cause of death could not be determined for two wolves. One additional wolf died during late February 2015, after becoming caught in a snare set outside the park. The wolf was able to break free from the snare's anchor wire and return to the park, but subsequently died due to blood loss caused by the snare.

As of March 15, 2015, there were 10 wolf packs in Denali with collared wolves, and tracks indicated the presence of one additional pack with no collared wolves. One lone male wolf was collared in early March; this wolf will be monitored during 2015 to determine if it is a resident or transient wolf. Two types of collars were used. One wolf wore a conventional VHF radio collar. Another 16 wolves carried GPS collars that determine the animal's location once or more times per day, store the data, and upload it through the ARGOS satellite system. An additional 5 wolves were captured during March 2015 and equipped with newly-developed collars that

include three-dimensional accelerometers, enabling researchers to more precisely determine the animals' activity (e.g., running, walking, resting) as well as their locations.

## Wolf Viewing Project

**By Bridget Borg**

From 2000 until 2010, the State of Alaska prohibited wolf hunting and trapping in two areas bordering the park, the Stampede and Nenana Canyon Closed Areas, in order to protect two of the park's three most-commonly viewed wolf packs. At the spring 2010 meeting of the Alaska Board of Game, the National Park Service submitted a proposal to extend the eastern boundary of the Stampede Closed Area. Instead, the Board of Game decided to eliminate both closed areas and allow hunting and trapping wolves in all areas bordering the park.

In 2010, Denali National Park and the University of Alaska Fairbanks, with the cooperation of the Alaska Department of Fish and Game, began a study of wolf movements, wolf survival, and wolf viewing opportunities along the Denali Park Road. This study is investigating a variety of factors that might influence sightings of wolves on the park road including;

- Wolf abundance
- Harvest of wolves outside of park boundaries
- Den location
- Pack size and composition (adults, pups, etc.)
- Individual behavior
- Pack social structure
- Pack proximity to the road

During the course of the study in 2012, the death of a breeding female from a pack that lived along the Denali Park Road was followed by a drop in wolf sightings. This was one of several instances where the death of an individual wolf, from legal trapping or hunting, sparked widespread media attention and concern in recent years. In order to improve our understanding of the implications of breeder mortality, we looked at changes in wolf pack fate, reproduction, and population growth following the death of breeders using data collected on 70 packs during the long-term study of wolves in Denali National Park. We published our findings in *Journal of Animal Ecology:*

> Borg, B.L., Brainerd, S.M., Meier, T.J. & Prugh, L.R. (2015) Impacts of breeder loss on social structure, reproduction and population growth in a social canid. Journal of Animal Ecology, 84, 177–187

We found that breeder loss preceded or coincided with most documented cases of wolf pack dissolution (when a pack disbanded or was no longer found). However, the death of a breeding individual did not always lead to the end of a pack. In approximately two out of three cases where a breeder died, the pack continued. The sex of the lost breeder and the pack size prior to

loss were important factors explaining pack fate following the death of a breeder as the probability of a pack continuing was less if a female died or if the pack was small prior to the death. The analysis also suggested that the death of a breeder had a greater influence if the wolf died during the pre-breeding or breeding season. Human-caused mortality rates were highest during the winter and spring, which correspond to the pre-breeding and breeding seasons for wolves such that harvest may lower the odds of pack survival because of this timing, especially when pack sizes are small. However, higher rates of breeder mortality and pack dissolution did not correspond to lower population growth, indicating that the wolf population was resilient to the loss of breeding individuals at a population level. Wolves may compensate for the death of breeders in a variety of ways, such as rapid replacement of breeders or increased reproductive success the following year.

Additionally, as part of this study, we developed and report an annual wolf sighting index, which is a measure of how often observers on westbound trips to Eielson Visitor Center saw a wolf in a given year. We present the index in recent years using only trips by experienced observers (Table 1). We believe that changes in this index are a good indicator of how overall chances of seeing a wolf might change over time; however, these rates should not be interpreted as a direct estimate of a visitor's chances of seeing a wolf in any given year.

## Table 1. Wolf Survey Data, Spring (approx. 15 March)
### Denali National Park and Preserve, 1986-2015

| YEAR | NUMBER OF PACKS MONITORED | TOTAL WOLVES IN PACKS MONITORED | MEAN PACK SIZE | COMBINED AREA OF MONITORED PACKS ($KM^2$) | ESTIMATED DENSITY: WOLVES / 1000 $KM^2$ | POPULATION ESTIMATE INSIDE THE PARK* | WOLF VIEWING INDEX** |
|---|---|---|---|---|---|---|---|
| 1986 | 4 | 26 | 6.5 | 7,380 | 3.523 | 61 | |
| 1987 | 8 | 37 | 4.6 | 12,125 | 3.052 | 53 | |
| 1988 | 14 | 69 | 4.9 | 15,355 | 4.494 | 78 | |
| 1989 | 13 | 98 | 7.5 | 16,810 | 5.830 | 101 | |
| 1990 | 10 | 106 | 10.6 | 13,930 | 7.609 | 131 | |
| 1991 | 13 | 111 | 8.5 | 14,275 | 7.776 | 134 | |
| 1992 | 15 | 103 | 6.9 | 13,620 | 7.562 | 131 | |
| 1993 | 12 | 68 | 5.7 | 9,900 | 6.869 | 119 | |
| 1994 | 10 | 61 | 6.1 | 11,145 | 5.473 | 95 | |
| 1995 | 12 | 59 | 4.9 | 12,120 | 4.868 | 84 | |
| 1996 | 11 | 69 | 6.3 | 12,640 | 5.459 | 94 | |
| 1997 | 11 | 78 | 7.1 | 13,080 | 5.963 | 103 | |
| 1998 | 12 | 61 | 5.1 | 13,121 | 4.649 | 80 | |
| 1999 | 13 | 69 | 5.3 | 12,699 | 5.433 | 94 | |
| 2000 | 17 | 71 | 4.2 | 14,378 | 4.938 | 85 | |
| 2001 | 16 | 87 | 5.4 | 13,802 | 6.303 | 109 | |
| 2002 | 15 | 73 | 4.9 | 13,026 | 5.604 | 97 | |
| 2003 | 18 | 75 | 4.2 | 11,682 | 6.420 | 111 | |
| 2004 | 14 | 78 | 5.6 | 16,061 | 4.856 | 84 | |
| 2005 | 15 | 66 | 4.4 | 14,630 | 4.511 | 78 | |
| 2006 | 15 | 103 | 6.9 | 15,367 | 6.703 | 116 | |
| 2007 | 16 | 93 | 5.8 | 17,439 | 5.333 | 92 | |
| 2008 | 20 | 99 | 5.0 | 17,757 | 5.575 | 96 | |
| 2009 | 16 | 65 | 4.1 | 16,607 | 3.914 | 68 | |
| 2010 | 12 | 59 | 4.9 | 17,061 | 3.458 | 60 | 0.45 |
| 2011 | 10 | 71 | 7.1 | 17,994 | 3.946 | 68 | 0.21 |
| 2012 | 10 | 70 | 7.0 | 18,340 | 3.817 | 66 | 0.12 |
| 2013 | 11 | 49 | 4.5 | 15,473 | 3.187 | 55 | 0.04 |
| 2014 | 10 | 51 | 5.1 | 17,640 | 2.891 | 50 | 0.06 |
| 2015*** | 12 | 52 | 4.3 | Unavailable | Unavailable | Unavailable | Unavailable |

*Population estimate = wolf density x available habitat.

**Viewing index = proportion of westbound trips where wolves were observed.

***Preliminary data.

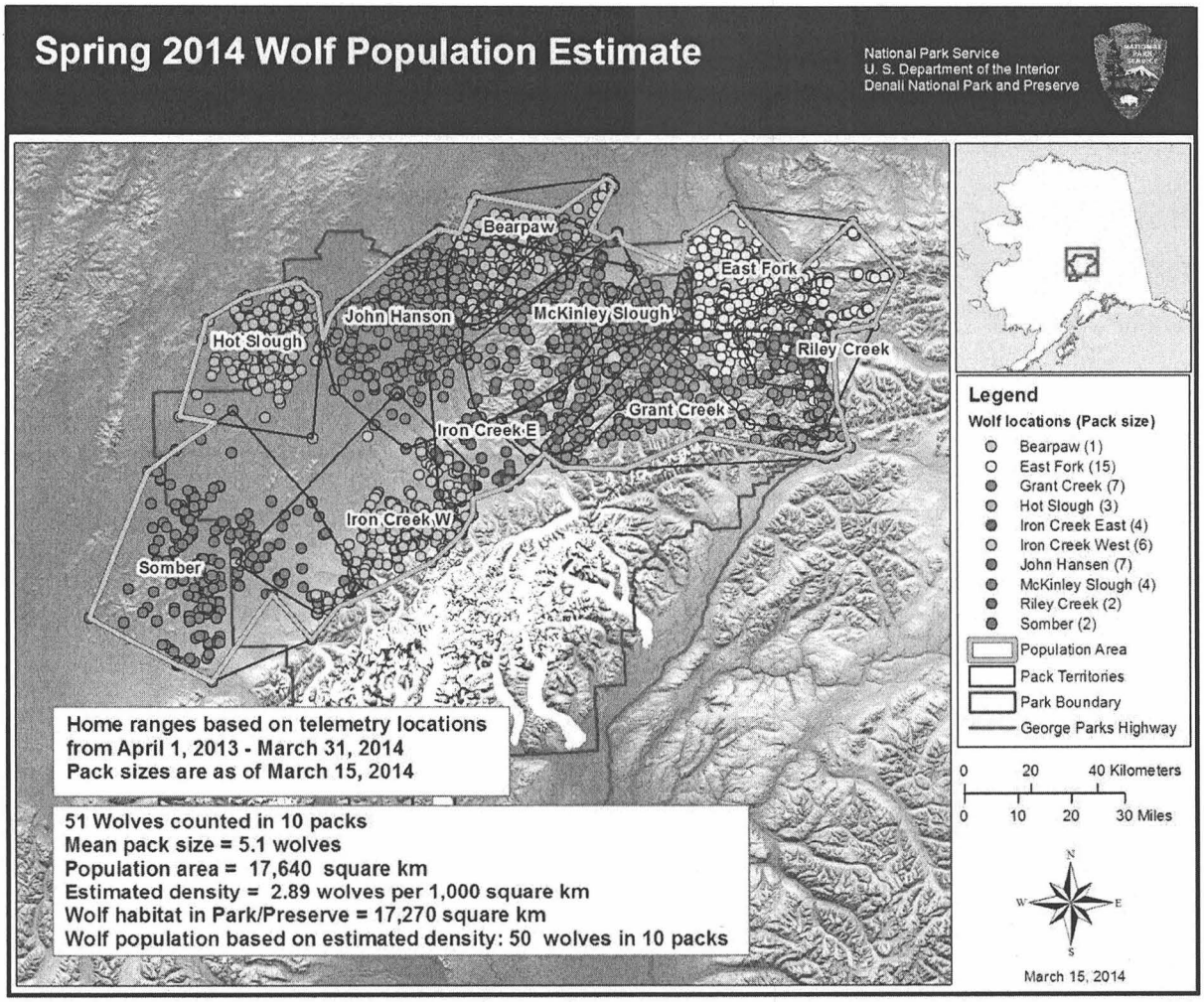



Figure 1. Wolf pack territories in Denali National Park and Preserve, March 2014.

# Comment on HB 105, creating a Denali Buffer Zone

## A Denali Park Buffer Zone, near the area where tourists are most likely to observe wolves, is a timely and smart idea.

House Bill 105 would create a buffer zone on the northeast side of Denali Park, similar to a buffer that Alaska's Board of Game dissolved in 2010. The area in question, near a road in Denali Park, historically meant significant opportunity for tourists to have a high value viewing: wolves. The bill has passed the House. The Alaska Senate now has an opportunity to support gleaning the financial benefits to Alaskans, as we deal with a downturn in our economy.

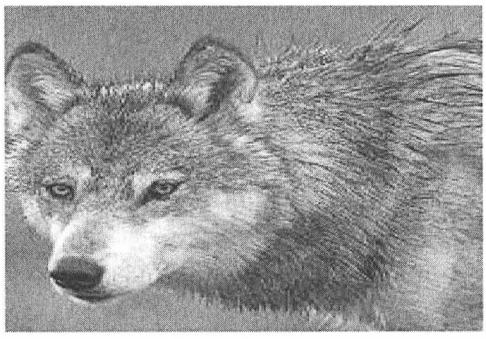
It should not be necessary to spell out the huge benefits Alaskans receive from the tourism industry. Studies show that Alaska's major wildlife predators, along with moose, are at the top of wildlife viewing opportunities.

Tourism is a major economic benefit to Alaskans and not just to those in guiding outfits. Alaskans working in hotels, restaurants, transportation, gift shops, and as artists, photographers, writers, researchers and others who feature wildlife in their work all benefit. The dollars trickle into the pockets of Alaskan families.

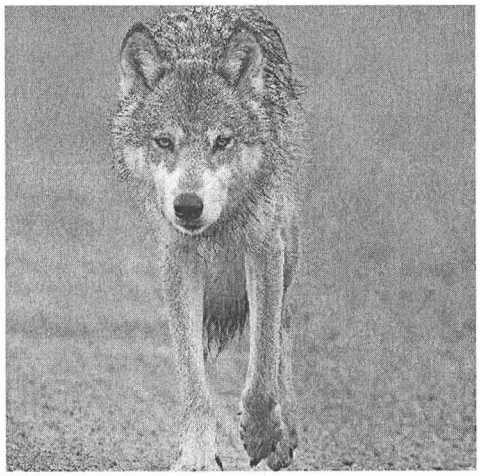
Sponsor Josephson's argument is spot on: "*In 2013, Denali had 530,921 visitors who contributed $513,355,000 to Alaska's economy. The opportunity to view wolves is a big incentive to visit the park*," he wrote. "*Unfortunately, wolf viewing success has declined dramatically.*" ... *Hunters and trappers kill about four wolves per year in the proposed buffer zone area*... The Alaska House of Representatives ultimately passed the bill.

It is now up to the Senate to act on this bill. Thank you, Senator Giessel, for scheduling this bill. Best wishes to members of the Senate Resources Committee as you consider the value of this bill to Alaskans.

Patricia OBrien - Juneau, Alaska



*Credit: National Park Service Photos* A telephoto lens helps capture a close up view of a wolf, even far from the park road



Wolf near Wonder Lake

Wolves can occasionally be seen right on the park road

Dear Senator Giessel,

Please Support HB 105
I have lived and worked, built a home and raised a family in the Denali area for nearly 30 years. I work as a private naturalist guide, Science instructor for Alaska Geographic, have been on the Middle Nenana River Fish and Game Advisory Committee for 14 years and on the Board for Denali Citizens Council for 20 years. I am asking for your support of HB105, The Wolf Buffer Zone adjacent to Denali National Park and Preserve. This area should have been included in the original park boundary. The archaic use of bear bait stations in this area is not only unethical but has led to the recent demise of wolf packs and other important wildlife members of the Denali ecosystem. The importance of tourism and its dependence on wildlife viewing opportunities in Denali can not be overstated. In all my years on the Fish and Game AC I have been perpetually frustrated at the lack of consideration other members of the AC and the Board of Game give to other non-consumptive users of wildlife in this State. Please consider this issue important for wildlife and the tourism economy.

Thank you,

Nan Eagleson

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I am an Alaska resident who supports HB 105 - to create a buffer zone in the Stampede Trail to prohibit trapping and shooting wolves in the Stampede Trail. The wolf population is declining and is an important part of the ecosystem which is imperative to Alaska's tourism industry. We need to protect our resources. As someone who has worked in the tourism industry for 10 years, it is an issue that is close to my heart. Our glaciers are melting at a rapid rate, let us not get rid of our animals too - a big draw of visitors to Alaska. Our economy depends on tourism. Lets pass this bill!

Cheers,

Crystal Jones

Nelchina, Alaska

---

I support HB105 which proposes creating a buffer zone in the Stampede Trail to prohibit trapping and shooting wolves in the Stampede Trail. Tourism rather than hunting will ultimately bring more dollars into our economy, and tourists love seeming wild wolves!

Janice Berry
Sierra Club member
Anchorage, AK 99515

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Please support a no-take wolf buffer area next to Denali National Park. I am a children's book author/illustrator who has studied the issues around this subject extensively in order to write a balanced book. I am convinced that the buffer is essential.

Thank you

Elizabeth Hatton

ANCHORAGE 99516

Dear Senator Giessel,

My husband and I are long time Denali Borough locals with a combined 58 years of residency. We own property in the Wolf Townships/Stampede Corridor and live year round in Healy.

Since the elimination of a protective buffer zone in 2010 we have seen a drastic increase in Denali's wolves being deliberately and successfully targeted and killed, including animals wearing tracking collars as part of the National Park Service's longest research program.

It is not in our state's best interest to let a handful of unethical trappers purposefully decimate a resource that more than half a million visitors annually come here to see. Our local economy greatly depends on the $600 million annual tourism revenues from Denali NP. The few park wolves left are worth a lot more alive and deserve protection. Hunters and trappers have millions of acres of accessible land with healthy wolf populations available to them right here within our borough, they do not need to kill Denali's wolves for their fur.

As a retired Alaska guide with over 20 years of experience in the tourism industry, I can attest to Denali visitors' high priority of seeing a park wolf.

Thank you for your time

Sincerely,

Anja & Roger Phenix

Healy, AK 99743

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Dear Madame Chair and Members of the Senate Resources Committee, I wish first to thank Chairwoman Giessel for granting the hearing on proposed HB105.

This is an important among many important resource and economic issues that make up the economic and cultural landscape of our state that is struggling to develop a sustainable economic future for us all who live here, therefore, your consideration with hearing time is important, appropriate and greatly appreciated.

I offer this statement of support for HB105 " Denali Wolf Buffer Zone" on behalf of Alaskans FOR Wildlife, an organization devoted to supporting Alaskan wildlife initiatives and policy with a membership primarily of Alaskans.

You of the committee and chair will have or already have received considerable input and information concerning the wisdom of passage of this bill which proposes protection for one of the wildlife species that is by its presence a major feature among the wildlife of Denali National Park, the presence of which is sought over recent years by millions of park visitors.

You are also apprised of a history of on again-off again protection for, in particular, park wolves that are lured by baiting onto a finger of state land known as the Stampede Trail that juts into the park, where this wildlife is mostly legally destroyed by trapping and hunting by a few local individuals.

You are abundantly apprised of the need to reestablish a no kill buffer for straying park wolves, a protection once offered and then withdrawn by the Alaska Board of Game (BOG) You are likely also made aware that the BOG repeatedly has refused subsequent justification with proposals to reestablish this earlier protective buffer.

And you surely can thus conclude the BOG will not deal in any way with the damage current policy poses for park wolves.

To support HB105 and pass on though the senate process is a move that is wise and prudent and is something for all Alaska.

It's a true "Alaska thing" if you will in all respects, principally in that it, a living Alaska wildlife experience, represents an extremely potent building block in Alaska's economic future.

Predictably there will be reasons offered to cast this effort aside.

Similarly, there are multitudes of reasons already made obvious to look ahead, to move forward in support.

We ask that you cast aside the negatives and look to the many positives in support of a state initiative to establish a protective management area where a board of game steadfastly absolutely refuses to act.

The economics are already abundant in this consideration.

We Alaskans have a world class national park, unique - that's one-of-a-kind - which offers a wildlife and wild lands experience to an exploding urbanized world demographic who in a near future may be standing in line awaiting their turn to visit and experience what is a wildland, wilderness wildlife landscape that will or already does, rival anything like it.

Protective consideration for Denali wolves should be paramount in any deliberation over policy over which the State of Alaska can weigh in or, in this case, actually promulgate and enact legislatively.

We cannot and should not stand around and argue and dismiss the opportunity to set this straight.

Please act now and give enthusiastic support for the legislative proposal, HB105.

I and we are most grateful for this opportunity to speak and to ask for support.

We are also willing to consider any suggestions for actions that we can take to help make a Denali Wolf Buffer Zone a workable, desired, high value reality.

Sincerely,

Jim Kowalsky

Chair

Alaskans FOR Wildlife

Fairbanks, AK. 99708

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Sen. Giessel

We are writing to sincerely request that your committee vote favorably to report out HB 105 regarding the protection of Denali National Psrk's iconic wolves when they range east of the Park boundary onto state land.

Thank you.

Tom and Jane Macham

Anchorage

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Senate Resources Committee Members

I am a 56-year resident of Alaska, and own land next to the proposed Denali Wolf Special Management Area proposed in HB 105. I urge you to support this bill in order to protect Denali's high value population of wolves from a few renegade trappers and hunters who presently legally bait and kill large numbers of them that stray onto adjacent State lands.

After originally establishing a protective wolf buffer zone, the Alaska Board of Game later (2010) rescinded this protection and has stubbornly refused to reinstate it ever since. As a result, the number of wolves in Denali National Park has dropped so dramatically that tourists who come to the Park specifically to view wolves and other live wildlife now seldom see them. So, I believe a wolf buffer zone established with legislation (HB 105) by the Alaska State Legislature is the only way we're going to protect this extremely valuable resource.

Thank you.

Frank Keim

Fairbank, AK 99709

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Dear Members of the Senate Resources Committee:

I'm writing to urge you to support HB 105. The bill prohibits hunting and trapping of wolves on Stampede Trail, which is immediately adjacent to Denali National Park. It's the only road into the Park and hunting and trapping have caused a 45% decrease in National Park visitor sightings of wolf from 2010. The wolf population has declined from 116 to 50 in 2014. Visitors now see more wolf in Yellowstone then Denali. Alaska's tourism industry as well as conservation of species, depends upon a robust number of wildlife in our State. Please vote to support HB 105.

Sincerely,

Libby Stortz

Sitka, Alaska

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Alaska Resources Committee Members -

I am writing to urge you to support H.B.105 to prohibit hunting and trapping of wolves in the Stampede Trail corridor. There are many other areas in Alaska for hunters and trappers, but there is only one Denali National Park. Denali is a premiere destination for tourists and residents, most of whom visit to see wildlife. in 2014, less than 6% of park visitors saw wolves, down from 45% in 2010. Since 2006 the park wolf population has declined more than 50%. Please legislation to protect the wolf packs of Denali.

Sincerely,

Deb Ward

Anchorage, AK 99516

---

Hello,

I am asking you to support HB 105. I think it's wrong to bait animals and then kill them. Alaska is one of the last places with space and a little freedom for some animals. Please give this your support.

Thank you,

Aimee S. Bibb

---

Please support this zone to prevent rogue trappers and hunters for blowing away every wolf that steps over the Park boundary. People come to Denali from all over the world to see these wonderful animals and they do now stand a chance if this buffer zone is not created.

Thank you very much.

Jerri Roberts

Denali Park

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Support this bill. The wolves in the Eastfork area are iconic reasons that Denali was protected in the first place. The value of this wildLIFE to the visitors to the park and the tourist industry that supports them far exceeds that of a few wolf pelts to some trappers in the Stampede area.

John Davies

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Dear Senator Giessel:

Thank you for scheduling HB105 - Denali wolf buffer/closed area bill - in Senate Resources this Friday, March 23. I would like to add my voice to the many other Alaskans in support of this bill, and ask that your committee move the bill out of committee to the full Senate for a floor vote.

HB105 is supportive of Alaska's valuable wildlife viewing economy, and in particular will help restore the wolf viewing resource of Denali National Park. You are aware of the decline in that resource since the small buffer was removed by the state in 2010, and the science is perfectly clear that a small closed area along the boundary of the Park, as is proposed in HB 105, will restore and enhance this valuable economic resource.

The closed area would only shift the hunting/trapping activities of 2 or 3 people to further from the park boundary, but it would benefit over 70,000 Alaskans and over half a million outside tourists who visit the park each summer, many hoping to view wolves. The benefit/cost of this bill is strongly in favor of Alaskans statewide, as well as our wildlife viewing economy.

I have lived in Alaska for over 30 years, have raised my son here, and the first time he saw wolves was in Denali National Park. It was a childhood experience that every Alaska child deserves.

Sincerely,

Marybeth Holleman

Anchorage, Alaska

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Please Support HB 105
I have lived and worked, built a home and raised a family in the Denali area for nearly 30 years. I work as a private naturalist guide, Science instructor for Alaska Geographic, have been on the Middle Nenana River Fish and Game Advisory Committee for 14 years and on the Board for Denali Citizens Council for 20 years. I am asking for your support of HB105, The Wolf Buffer Zone adjacent to Denali National Park and Preserve. This area should have been included in the original park boundary. The archaic use of bear bait stations in this area is not only unethical but has led to the recent demise of wolf packs and other important wildlife members of the Denali ecosystem. The importance of tourism and its dependence on wildlife viewing opportunities in Denali can not be overstated. In all my years on the Fish and Game AC I have been perpetually frustrated at the lack of consideration other members of the AC and the Board of Game give to other non-consumptive users of wildlife in this State. Please consider this issue important for wildlife and the tourism economy.

Thank you,
Nan Eagleson
Denali Park, AK 99755

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Dear Senator Giessel,

I am writing to ask you to support HB 105, protecting the wolves of Denali National Park. With tourism being the basis of our economy here in the Denali Borough, we will soon lose those tourists who come to see the wild animals of Denali if they are so rare as to be scarcely seen. The buffer zone, since it was reopened, has been the scene of opportunistic trappers, who bear bait and leave dead animals there to attract the wolves. There have been too many of the Denali wolves killed in this way. Please reinstate the Buffer Zone! Thank you.

Dianne Herman Cantwell, AK 99729

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I am writing in support of this bill. Personally, I find the idea of baiting wild animals to make for easy pickings for hunters abhorrent in general, anyway. How is that actually a "hunt"? There's neither hunting nor skill required. Beyond that, however, wolves are a vital and positive part of the ecosystem and we need to protect them instead of lure them into territories to eradicate them.
Thank you,
Stephanie Warnock
Anchorage 99508

---

I strongly support HB 105 and urge you to allow it to move forward for a vote by the full senate.

Thank you,

Edward A Schmitt MD

Soldotna, AK

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Please support HB 105. I have lived thirty-five years in Alaska. I will never forget the one time I saw a wolf in Denali Park.

Mary Kancewick

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I am writing to express my support of the buffer zone bill to reduce trapping of wolves and other predators in Denali. Wolves are a resource and deserve equal protection under park rules, not exploitation at the edges of the park. The benefit thousands of Alaskans get from tourists visiting Denali should outweigh the benefit of the few who trap at the edge of the park.

Please support HB105 to stop the decline in wolf populations and sustain the economic value of Denali to Alaskans.

Thanks,

Julia York

Fairbanks, AK 99709

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Senator Giessel;

I'm writing in support of HB105 because of bear baiting in the area as the carcasses used in the traps attract wolves which are then targeted by hunters. A half million visitors visit Denali National Park per year. The economic value of "wildlife viewing" is enormous to the State of Alaska and should be supported by the Legislature.

Steve Turner

Anchorage, Alaska

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Dear Senator Giessel,

I support HB105 creating buffer zone to prohibit trapping, shooting wolves near Denali National Park. A half million visitors visit the park yearly which has high tourism economic value.

Thank you for this opportunity to comment.

Joan McBeen

Tenakee Springs, AK 99841

---

PLEASE support HB105 which proposes creating a buffer zone in Denali Park to prohibit trapping and shooting wolves near the Stampede Trail.

This is an area that juts into the northeast boundary of Denali national Park. Hunters, hunting guides and trappers place bear baiting stations laced with hog carcasses. These rotting hog carcasses attract wolves, bears, and wolverine to the bait stations, resulting in killing of wolves. - the results is the rapid decline in wolf population in Denali National Park.

A half million visitors visit Denali National Park per year.

Thus the economic value of "wildlife viewing" is enormous to the State of Alaska..

HB105 (creating a buffer zone in the Stampede Trail) which would prevent hunting and trapping of wolves in that area, passed the House last year in May, 2017.

It is now in the Senate Resources Committee.

I hope i can count on your support for the wolves and Denali park -two incredible resources for our tourism industries.

Thank you,

William Moody

Chugiak, AK

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Subject: I support HB105

Thank you,

Regina Robbins

Anchorage, AK

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Dear Senator Giesel,

Please support HB 105 to restore the buffer zone for Denali wolves. We have seen what has happened to this valuable resource in the last several years and steps need to be taken to bring it back. Tourism brings in more money than trapping, as you must know.

Thank you,

Linda Johnson

Anchorage

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Dear Senator Giessel,

Please list myself and my family as very much in favor of HB105.

We are 50 year residents and appreciate the opportunity to view wildlife in our great State.

Having hunted for years when we lived in Southeast, I also understand the love of the sport for many Alaskans however,the majority of the hunters, like myself, hunt for food, The impingement to Trophy Hunters is far less than the certain loss of the healthy wolf population in the area. I thank you for your consideration.

Best regards,

Jim Ridgway

---

I support HB105 to create a buffer zone for wolves in Denali National Park. The park belongs to the wildlife who live there as much as or more than the people who visit there. But if we can only think about it from a human viewpoint, let's not forget the economic value of the park relies on the presence of active and healthy wildlife, most certainly including wolves.

Thank you for your consideration of my comments.

Ann Yates

Anchorage AK

---

I strongly support the establishment of a buffer zone on the Stampede Trail to reduce the toll on wolves due to bear baiting. Wolves in Denali are an essential part of the ecosystem and are a source of revenue to Alaskans in the tourist industry for viewing.

Please vote for the passage of this bill.

Paul E Turner Ph.D.

Kenai AK 99611

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Dear Rep Geissel,

Writing you in favor of HB 105. A buffer zone around Denali is a good idea. Baiting attracts a lot of other predators beside wolves , drawing them out of the park. Denali is a world class park and I think we can give it the protection it deserves for the good of all of us.

Thanks. Don Dumm

---

Dear Senator

I appreciate your regular news letters and your efforts to make living in Alaska good for all people. I'm writing you today to ask your support HB105 (creating a buffer zone in the Stampede Trail) which would prevent hunting and trapping of wolves in that area, passed the House last year in May. 2017. Where did do you stand on this topic?

Seeing as how this price of land hits into Denali Park, and that the trappers intentionally bait there, it seems obvious that the park is a haven for animals. It has been shown in many instances that when populations are allowed to grow in such places, they spread out. So in the future there could be wolves coming out of the park for the hunters. But if we decimate the current population, that won't happen.

Plus a half million visitors visit Denali National Park per year. Thus the economic value of "wildlife viewing" is enormous to the State of Alaska.

Thank you

Stefanie Tatalias

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Dear Senator Giessel and Staff:

Just writing to let you know I support passage of HB 105, which would expand the buffer zone of no wolf hunting or trapping off of the Stampede Trail north of Denali NP.

Though I do live in Homer, I'm a property owner in the Healy area, about 5miles as the crow flies from the Stampede Trail. I'm a hunter too and another lifetime ago, as a teenager, I was once a trapper as well, so I'm not inherently opposed to either activity.

But sometimes our wildlife resources really do have value above and beyond that of a pelt, as hundreds of thousands of annual visitors to Denali National Park can attest. As an Alaskan, I'm proud to send visitors to that Park and know they have a really good chance of seeing an eye-popping view of our state's signature wildlife species, wolves among them. I think expanding the buffer area around the Park is key to maintaining a viewable, viable wolf population in the Park itself.

Randy Wiest

---

I understand there is a bill to create a buffer zone around Denali. Please support this. Wolves are being killed much faster than they are breeding in Denali. We need some balance.

Thank you

Judy Engh

Anchorage

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Dear Senator Giessel,

I am writing in support of HB 105 which would create a buffer zone in the Stampede Trail for wolves. The Wolves of Denali are a great resource for Alaska. Many tourists come to AK primarily to see wildlife, and Denali is a major destination for this. The wolf population has declined dramatically in recent years due to trapping just outside the park boundary. It is now an extremely rare occurrence to see a wolf in Denali. In the first several years after moving here 15 years ago, we saw wolves on every trip to Denali. Recently I've had many years of Denali trips with NO wolf sightings.

Please vote in support of HB 105 to help increase to Denali wolf population—It'll benefit the wolves and our state through tourists visiting.

Thank you,

Mary Blenkush, MD

Eagle River AK

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Dear Senator Giessel,

I am writing this email to support HB105 "An Act prohibiting the taking of wolves and the use of certain traps and snares in certain areas adjacent to the Denali National Park and Preserve."

My name is Yasuhiro Ozuru, an Anchorage resident. I am a outdoor person who enjoys hiking, fishing, and photography. I really love living in this great state because of access to unspoiled wilderness. Even though I was born in Japan, I proudly say that I am Alaskan now because of my love of this state. One specific concerns that I have is steadily declining wolf population in Denali national park, - even though I have visited the Denali National Park 3 times in the past, I have never seen wolves. - I heard that, by now chance of seeing wolves in Denali, is significantly lower than one in Yellowstone. This is embarrassing symbolically, as Alaskan, and also economically concerning as we may be losing a lot of potential tourists to Yellowstone even though Denali offer much better experience as a whole. HB105 hits the right balance between protection of wolf from accidental kill and hunters on the one hand, and hunters/trappers right to legally take the game in the area adjacent to Denali National park. I believe there is almost no cost associated with this bill except for very small number of people (hunters and trapper); on the other hand, there is enormous benefit - public perception to Park visitors that the state is actually interested in protecting wolves in the park, possible increase in the wolf sighting that would results in larger number of tourists. Given the current economic situation in the state, I believe this is one of inexpensive measure to maintain state economy from further falling by providing support to tourism.

Thank you for your consideration.

Best regards

Yasuhiro Ozuru

---

I support HB105. This is an area that juts into the NE boundary of Denali national Park. Hunters, hunting guides/trappers place bear baiting stations laced with hog carcasses. These rotting hog carcasses attract wolves, bears, and wolverines to the bait stations, resulting in killing of wolves. The results is the rapid decline in wolf population in Denali National Park.

A half million visitors visit Denali National Park per year thus making the economic value of "wildlife viewing" enormous to the State of Alaska..

HB105 (creating a buffer zone in the Stampede Trail) which would prevent hunting/trapping of wolves in that area, passed the House last year in May. 2017. It's now in the Senate Resources Committee.

Thank you for your consideration in this matter.

Sincerely, Faith Moeller, Kotzebue, AK 99752

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I am writing in support of HB 105, the Denali Wolf buffet zone. The Denali wolves are the most viewed and studied wolves in the world and deserve and need the added protection of a buffer zone alone the parks NE boundary. That we now do not afford them this protection at this time is a travesty. There are only a handful of hunters and trappers that have had a huge negative impact on this population within this proposed buffer zone when thousands of Alaskans and Alaska's visitors come to Denali to view them. The time is now to permanently establish this area to better protect one of Alaska's greatest assets.

Please vote to establish this buffer zone.

Juliette Boselli

Denali Park, Alaska

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Dear Senator Giessel,

I work as a seasonal naturalist in Denali National Park and Preserve. The Stampede corridor adjacent to NE section of Denali National Park has been in contention since the incorportion of the Park. The animals have been suffering that long also. We need HB105 passed to protect the animals.

The caribou migrate out in that corridor for winter, the wolves follow for food, the wolves get shot. They are just doing what they need to do to make a living. Moose, brown bear, and lynx do the same since that area is best for food in the winter and protections. There are only a handful of hunters that hunt there but millions of visitors to Alaska that come during the summer to see these animals. The money brought in by the tourist far outweigh the money made by trappers or hunters with these animals. The community around Denali fare even better by the tourist dollars.

We would like to see the animals survive the winter, the eco-tourist see the animals and spend money, and the community thrive around Denali. This is a small section of land that needs just be prohibited from hunting wolves. It is not a take over by the federal government or pushing private land owners out. We want to protect the small group of wolves that give the Park a name for coming to visit.

VOTE for HB105 and thanks for the hearing this Friday.

Roy Catalano

Colorado Springs, CO 80918

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I would like to see the buffer zone near Denali reinstated due to the major decline in the wolf population since the buffer zone went away. Since the zone was dissolved, the wolf population has declined drastically, and that affects tourist dollars.

Robert Cowell

PO Box 549
Healy Alaska 99743

March 20, 2018

Alaska Senate Resource Committee:
Re: Support Denali Wolf Buffer

To Members of the Alaska Senate Resource Committee:

As a resident of Healy and Stampede cabin owner for the last 35 years, I strongly support HB 105 which will establish a protective Denali Wolf Special Management Area buffer for park wolves, Denali's wolves desperately need this protection since their territories include lands within the "Wolf Townships." A few hunters and trappers have caused a dramatic decline in the wolf population, enabled by the Alaska Board of Game. Those of us that live and work in Denali are calling on you to implement HB 105, a common sense measure.

Of Denali Park & Preserve's 6 million acres, 4 million acres are open to legal hunting and trapping under state regulation; **HB105 adds no acreage to Denali National Park or the NPS** but merely establishes a state special management area that protects wolves. Furthermore, the departments of Public Safety and Fish & Game indicate there will be no additional cost to the state for the buffer area.

The Wolf Townships are a sliver of state land to the northeast adjacent to the Denali National Park. The boundary is literally only a few miles away from the park road campground and headquarters. The habitat of the Wolf Townships is critical to park wildlife because it is lower in elevation and preferential to caribou. The rivers flow north and create natural corridors from the park into the Wolf townships for the wolves to follow the caribou into their wintering grounds.

We know that wolves require large territories to survive in this rugged environment. U.S. Congress, Alaska State Senate, Alaska Railroad and land managers have long known the importance of protecting wolves in this area:

> *Senate report 96-413, 1980, page 166: In the northeast portion of the area, near the existing headquarters, there are some 3 townships of state lands which are critical for sheep, caribou, and wolf habitat and should eventually become a part of the park. ... The Committee recognizes that these areas are important to the park and recommends that the Secretary seek land exchanges with the State of Alaska that would serve to bring these areas into the Park*

I have worked, hiked and skied in Denali for many years and have seen wolf numbers plummet. In 2000, we were pleased that the Alaska Board of Game (AK BOG) created a small no kill wolf buffer within the Wolf townships. While it was small, it did make a difference. When the rebellious board eliminated the policy in 2010, wolf numbers and sightings steadily plummeted.

The last few years I frequently hear visitors express disappointment about lack of wolf sightings on their expensive bus trips through the park. Increasingly, I hear discussions among them that Yellowstone is the park to see wolves now, no longer Denali.

The very high turnover amongst Denali's wolves has been influenced by hunting and trapping. Dr. Briget Borg's research tells us that the death of certain individuals in the pack can (i.e. the mother) destroys the family glue. As lawmakers, you can protect Denali's reputation as a place to watch wolves interact and know their history.

**The Alaska State Constitution**

Measures that protect Denali's wolves also protect the interest of the 70,000 Alaskans, who visit Denali each year to see living wolves. The right to see and experience wolves in Denali is addressed in the The Alaska State Constitution. Article VIII, Section 2 :
*"The Alaska constitution guarantees that wildlife are to be used for the maximum benefit of [Alaska's] people, and reserved to the people for common use."*

HB 105 guarantees Alaskan's rights under the Alaska State Constitution. It is not fair to Alaskans that a few hunters and trappers (including guides and their out-state-clients) can deprive us, the opportunity to see live wolves when we visit our park. All Alaskans have equal legal access to, and use of, the wildlife of Denali including those who want t want to experience and intact ecosystem.

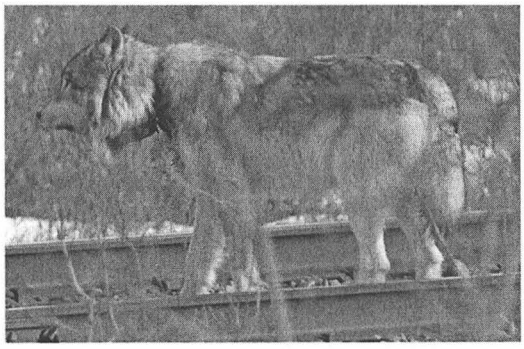
*Article VIII in the Alaska Constitution Sections 3*
*"The legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State, including land and waters, for the maximum benefit of its people."*

Research and has shown links between wolves, mesopredators, prey populations, vegetation and landscape. In so many places throughout the world, wolves have experienced declines and decimation. There are compelling scientific studies to show that these declines are causing outcomes that result in ecological and human costs (#Trophic cascades, #mesopredator release,). If the legislature is charged with conserving and protecting natural resources, it is essential to consider the impacts of wolf hunting and trapping.

It is promising to see some pro-wildlife legislation and I am pleased that HB 105 in the House. Representative Josephson is reaching out to understand and represent all Alaskans. Please consider the impacts that are the result of a consumptive, trophy hunt mentality paradign. Alaskans support HB 105. It makes sense for Alaskans

Thank you,

Barbara Brease



A wolf with a trapper's snare deeply embedded in his neck as it walks along railroad tracks in Denali National Park. Photo by Gordon Haber, 2008.

THE ALASKA WILDLIFE ALLIANCE
"LETTING NATURE RUN WILD"

March 22, 2018

Members of the Senate Resources Committee:

On behalf of the Alaska Wildlife Alliance and its supporters, I am asking that the Senate Resources Committee members vote **IN FAVOR OF CSHB 105**, which would establish a no-hunting buffer zone adjacent to Denali National Park.

The Alaska Wildlife Alliance speaks for more than 1,500 supporters of non-consumptive uses of wildlife. AWA is a non-profit organization based in Anchorage, founded more than 35 years ago. We advocate for healthy ecosystems, scientifically managed to protect our wildlife for present and future generations.

The Alaska Wildlife Alliance strongly urges you to support CSHB 105.

For years AWA and other groups have asked the Alaska Board of Game to re-establish a no wolf hunting/trapping buffer for the Wolf Townships, the area addressed in this bill. For years those requests have fallen on deaf ears at the Board: they were always summarily defeated. To date the Board of Game has steadfastly and single-mindedly maintained its mission to represent only the interests of consumptive users of wildlife – i.e., hunters and trappers.

AWA concurs with the expert testimony to be offered before the Committee for CSHB 105 by Dr. Richard Steiner, Biologist Vic Van Ballenberge and others. The need for the buffer will be well-stated and supported by those experts - I will not restate the basic issue here.

A few brief points in favor of HB 105:

1. 45 percent vs. 5 percent. The Wolf Townships (proposed buffer area) is situated just north of the Park road, meaning the wolves killed there are the same animals that would be the most easily viewed by the more than half a million people who visit Denali annually. National Park Service statistics confirmed this: when these wolves were protected by a buffer, 45 percent of visitors annually were

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lucky enough to spot a wolf along the Park road. Since the last buffer was removed in 2010, only about 5 percent of visitors have been able to spot a wolf.

2. More than 500,000 vs. two or three. Only approximately two or three individuals hunt/trap within the Wolf Townships. That's all. If this area is closed, they are of course free to utilize adjacent state lands where hunting/trapping is allowed, on the hundreds of thousands of acres to the north, east and south of the park boundaries. Why should this mere handful of trappers have more of a "right" to these wolves than others?

3. Zero cost vs. potentially millions in addition revenue to Alaska businesses. It is important to note that while establishing this buffer area will cost the state nothing, "wildlife viewing" is consistently listed among the top reasons for coming to Alaska – particularly Denali - by visitors. Knowing that Alaska values these wolves enough to set aside a miniscule parcel of land to protect them, thereby greatly increasing their viewability, will surely pay financial dividends for Alaska for many years to come.

A wolf can be killed and cash – at most a few hundred dollars - collected for its pelt *only once*. That same wolf alive can be photographed, recorded, sketched, tracked and just simply watched and enjoyed perhaps *thousands of times* during its lifetime. A living, wild wolf able to be seen by hundreds of thousands of people has to be worth its weight in gold for Alaska.

Finally, I would like to thank Rep. Andy Josephson for offering a simple, logical solution to this situation. I sincerely hope that this committee will listen to the majority of residents who for many, many years have wanted this area set aside to protect wolves. I hope you will listen to their voices and recognize the many benefits the state will reap.

Again, on behalf of the Alaska Wildlife Alliance and our supporters I ask that you please vote in favor of CSHB 105, Taking Wolves Near Denali National Park.

Thank you very much.

Yours truly,

Edward A. Schmitt

Edward Schmitt
Executive Director

Dear Senate Resources Committee-

I write in support of HB 105.

Some background: I first started coming to Alaska in the mid 1970s. Denali became my destination of choice with the opportunity to observe and photograph wolves and bears as the main attractant. Though I loved my visits, I felt obliged to honor the tourism boycotts called for by NGOS to protest the state's wolf management policies.

I retired from my federal job and moved to Fairbanks in 1990. In 2001, I opted to return to the workforce as a Natural Resource Manager with the Alaska Department of Natural Resources. After 11 1/2 years, I returned to the ranks of the retired. While with the federal government, I worked closely with both federal and state agencies in Alaska. I always kept in mind that all of us agency personnel worked for the citizens. In the case of the feds, all of the country's citizens, including Alaskans, and in the case of the state, Alaska residents. I felt that knocking heads and creating roadblocks between agencies created inefficiencies and ill-served the public that we were hired to work for. Consequently, while recognizing each agency is governed by its own laws and mandates, my goal was always to reach equitable solutions that were consistent with individual agency needs. As a state employee working with federal agencies, I followed the same policies. I bring this up because the current situation with the stampede area has resulted from churlish attitudes and actions by the Board of Game.

In January, 2000, I testified before the Board in Fairbanks supporting the establishment of the buffer in the Wolf Townships. The Board, in a wise decision, established the buffer, thereby bringing peace to the issue and serving the larger public interest. A few years subsequently, the Board, apparently prodded by groups like the AOC, Safari Club International, and the notorious Coke Wallace, elected to ignore the public interest and remove the buffer zone to poke a finger in the eyes of the feds and show them who's boss.

In addition to the the spiritual value provided by the Stampede wolves, they are constitute a major economic benefit to the state and to the Healey/ Glitter Gulch area. There are not many places in the world where a visitor can reasonably expect to see a wild wolf. Denali Park was such a place, until its most observable pack was extirpated. I ask that you compare the value of a trapped or shot wolf pelt to its harvester to that of a living animal that can be seen and photographed thousands of times over.

My brother and his wife came to visit several years ago and one of their visit highlights was seeing a wolf next to our tour bus.

A simple look at the map clearly demonstrates the cause of the problem. The Wolf Townships jut like an invading finger into the surrounding parklands. Effectively managing wildlife entails managing on an ecosystem basis. In the winter, caribou head out of the park to their winter habitat and the wolves follow. Unfortunately, the winter habitat lies outside park boundaries.

Killing habituated animals raises significant ethical issues. Eventually, public attention will again focus on this issue, giving the state a black eye and possibly commencing a boycott.

Hunting is a declining activity, while recreation and wildlife viewing are growing. As a hunter, I object to being made vulnerable to public vituperation and scorn due to the unethical actions of the few in the Stampede area, one of whom delights in aggravating the public. Hunters as group are poorly served by this situation.

We have made several trips to Africa and are hugely impressed by the enjoyment of seeing the myriad of animals we observed and impressed by the economic benefits brought to the residents there by virtue of the foresight exercised through their wildlife conservation policies.

As a manager with the Alaska DNR, I had to ensure that all of our decisions were in the best interest of the state. The buffer proposed by HB 105, costs little and returns much. It is overwhelmingly beneficial and clearly meets the constitutional mandate to manage the state's resources in the best interest of its people.

Leadership is exercised when tough decisions are made. I urge you to ignore the caterwauls of the handful of individuals affected negatively in the Stampede area and to rise above the short-sighted obstinate positions of some of the hunting groups, by correcting the churlish and puerile action of the Board of Game. HB 105 is a reasonable and innocuous solution to a problem begging to be resolved. I strongly urge you to exercise the leadership required to do what is definitely in the broader and long-term best interest of the state and pass this out of committee for a floor vote and to pass it on the floor.

Thank you for your consideration.

SENATE RESOURCES COMMITTEE, WRITTEN TESTIMONY ON HB 105

BY VIC VAN BALLENBERGHE, MARCH 23, 2018

I AM VIC VAN BALLENBERGHE AND I LIVE IN ANCHORAGE. I AM A WILDLIFE BIOLOGIST AND I SERVED ON THE BOARD OF GAME THREE TIMES BETWEEN 1985 AND 2002.

IN 2002 I WAS A BOARD OF GAME MEMBER WHEN IT CREATED A BUFFER ADJACENT TO THE NORTHEAST CORNER OF DENALI NATIONAL PARK TO PROTECT PARK WOLVES FROM HUNTING AND TRAPPING WHEN THEY VENTURED OUT OF THE PARK DURING WINTER. SEVERAL TIMES IN PREVIOUS YEARS WOLF PACKS WERE SEVERELY REDUCED OR ELIMINATED IN THIS AREA BY LEGAL AND ILLEGAL HUNTING AND TRAPPING THEREBY REDUCING THE OPPORTUNITY OF PARK VISITORS TO EXPERIENCE WOLVES. THE BOARD RECEIVED HUNDREDS OF WRITTEN COMMENTS ALONG WITH ORAL TESTIMONY STRONGLY URGING CREATION OF THIS BUFFER. WE THOROUGHLY DEBATED THE PROPOSAL, AMENDED AND PASSED IT.

PREVIOUS BOARDS CREATED OTHER BUFFERS STARTING IN 1992 INCLUDING IN THE AREA NORTH OF THE PARK ALONG THE STAMPEDE TRAIL, BUT DURING 2002-2010 WOLVES CONTINUED TO BE TAKEN, PACKS WERE DISRUPTED AND VIEWING OPPORTUNITIES WERE REDUCED. IT WAS GENERALLY RECOGNIZED THAT THE BUFFERS WERE TOO SMALL. IN 2010 THE NATIONAL PARK SERVICE SUBMITTED A PROPOSAL TO ENLARGE THE NORTHERN BUFFER AS DID CONSERVATION ORGANIZATIONS WITH ADDITIONAL PROPOSALS. DESPITE STRONG PUBLIC SUPPORT, THE BOARD NOT ONLY REJECTED THESE PROPOSALS, BUT RESCINDED THE EXISTING BUFFERS.

DURING THE PAST SEVEN YEARS WITH NO BUFFERS IN PLACE, THE PROBLEMS HAVE WORSENED WITH SIGHTINGS OF WOLVES ALONG THE PARK'S ROAD DROPPING GREATLY. KEY PACKS WERE OFTEN DISRUPTED INCLUDING THE APPARENT ELIMINATION OF AN INTERNATIONALLY KNOWN PACK WITH A 77-YEAR HISTORY OF RESEARCH AND ONE OF THE MOST FREQUENTLY SEEN PACKS IN THE PARK.

DESPITE THIS, THE GAME BOARD REJECTED SEVERAL PETITIONS REQUESTING EMERGENCY CLOSURES TO PROTECT THE FEW REMAINING WOLVES. AFTER ADOPTING A 6-YEAR MORITORIUM IN 2010 ON NEW BUFFER PROPOSALS, IN FEBRUARY, 2017 THE GAME BOARD FINALLY AGAIN CONSIDERED THE ISSUE OF CREATING BUFFERS BUT FAILED TO ACT. HAD THE BOARD ACTED, THE BUFFER LIKELY WOULD HAVE BEEN TOO SMALL AS IT WAS IN THE PAST, AND FUTURE BOARDS COULD RESCIND IT.

THERE ARE MULTIPLE BIOLOGICAL, SOCIOLOGICAL AND ECONOMIC REASONS WHY A BUFFER IS NEEDED. THE SUPPORTING DOCUMENTS FOR HB 105 OUTLINE NUMEROUS JUSTIFICATIONS. YOU WILL CERTAINLY HEAR OTHERS TESTIFY IN DETAIL ABOUT THEM. AND PUBLIC SUPPORT FOR A BUFFER HAS BEEN VERY STRONG EVERY TIME THE ISSUE WAS BEFORE THE GAME BOARD DURING THE PAST DECADES, YET THE BOARD REFUSED TO ACT.

IT IS TIME TO FINALLY RESOLVE THIS ISSUE WITH A PERMANENT SOLUTION BY MOVING FROM THE GAME BOARD ARENA TO THE LEGISLATURE. HB 105 WILL ACCOMPLISH THAT. I STRONGLY SUPPORT THIS BILL AND URGE THE COMMITTEE MEMBERS TO FULLY ENDORSE IT AND TO RECOMMEND ITS PASSAGE.

THANK YOU FOR THE OPPORTUNITY TO PROVIDE WRITTEN COMMENTS ON THIS IMPORTANT BILL.

March 21, 2018

To: Senator Cathy Giessel

From: Denali Fish and Game Advisory Committee

Re: House Bill 105

Dear Senator Giessel,

The Denali Fish & Game Advisory Committee, at our March 19, 2018 meeting, voted unanimously 9-0 to oppose House Bill 105. Committee members feel that there are no scientific or biological reasons for the creation of the Gordon Haber Denali Wolf Special Management Area. HB 105 will reduce trapping, hunting, and subsistence opportunities for local residents. Denali Fish & Game Advisory Committee would like for this decision to be left to the Board of Game. Historically, Denali Fish & Game Advisory Committee has opposed any sort of buffer zone. Therefore, please vote no to HB 105.

Respectfully,

Denali Fish & Game Advisory Committee

Gordon Carlson, Chair 907-378-7624

Lance Williams, Vice-Chair 907-460-7258

Al Barrette

380Peger Rd.

Fairbanks, AK. 99709

907-452-6047

28 April.2017

HB 105 version J

Co – Chairs and members of the committee.

I would ask you not to support HB 105 version J

If passed this would affect subsistence wolf opportunities. Do you support subsistence? Does an Alaskan induvial subsistence user have the same protection under law (AS 16.05.258), as those of a group or community of subsistence users? That is what this bill is asking you. HB 105 is asking you to support taking away several Alaskans lawful right to participate in a subsistence opportunity to trap wolves. I do not think this is a correct way of proceeding or should be enacted.

I base my reasons/logic with the intent, Alaska Supreme Court rulings and commentary of the Alaskan Constitution Article 8 Sec. 3 and 4 and AS 16.05.258 Subsistence Law.

I have inserted "Alaska's Constitution, a citizen's guide. 5th editions commentary" and AS 16.05.258 for your review and study. That shows an induvial Alaskan subsistence user has the same protections as groups or communities of subsistence users.

**Article 8 Section 3. Common Use**

**Wherever occurring in their natural state, fish, wildlife, and waters are reserved to the people for common use.**

*This section enshrines in the Alaska Constitution the common law doctrine that natural resources must be managed by the state as a public trust for the benefit of the people as a whole, rather than for the benefit of the government, corporations, or private persons. Sections 15 and 17 of this article reinforce the public trust doctrine of natural resource management in Alaska, and they work in harmony with this section to prohibit the state from granting to any person or group privileged or monopolistic access to the wild fish, game, waters, or lands of Alaska. Sections 3, 15, and 17 are known as the "equal access clauses" of the natural resources article. The Alaska Supreme Court has said that "although the ramifications of these clauses are varied, they share at least one meaning: exclusive or special privileges to take fish and wildlife are prohibited" (McDowell v. State, 785 P.2d 1, 1989). Allegations of a violation of this section typically involve an allegation of a violation of the other two as well.*

*Tension exists between the equal access clauses and other provisions of this article that require natural resource management to honor principles of conservation (Sections 2 and 4) and that expect "preferences among beneficial uses" (Section 4). Regulating the harvest of fish, game, and other resources in the interest of conservation involves limiting access to them in some manner, as for example with bag limits and closed seasons. Where is the line that separates legitimate regulatory measures from unconstitutional denial of access guaranteed by Sections 3, 5 and 17? This is a question that is often before the courts.*

*The Alaska Supreme Court has upheld traditional regulatory tools of fish and game management such as registration requirements and limitations on the means and methods of taking. For example, the court upheld designation by the Board of Fisheries of "superexclusive" fishing districts in which people who register to fish are barred from other districts (State v. Herbert, 803 P.2d 863, 1990). It upheld designation by the Board of Game of urban areas as "nonsubsistence areas" in which no priority may be given to subsistence hunting (State v. Kenaitze Indian Tribe, 894 P.2d 632, 1995). It has also upheld regulations that selectively ban certain equipment in the taking of fish and game. For example, it upheld a ban on spotter airplanes in the Bristol Bay salmon fishery (Alaska Fish Spotter Assn v. State, 838 P.2d 798, 1992), and it upheld a ban on airplanes and airboats as a means of access to certain areas for hunting (Interior Alaska Airboat Association v. State, 18 P.3d 686, 2001).*

*The courts have also upheld regulations of the Alaska Board of Fisheries that allocate resources among user groups. For example, the supreme court upheld an allocation of salmon among commercial and recreational fishermen (Kenai Peninsula Fisherman's Co-op Association v. State, 628 P.2d 897, 1981). The court of appeals upheld an allocation among commercial fishermen using different types of fishing gear (Meier v. State Board of Fisheries, 739 P.2d 172, Alaska Ct. App., 1987). The supreme court upheld a fixed quota of king salmon to commercial trollers that was challenged by sportsmen who claimed the quota amounted to a special privilege and limited the ability of the vast majority of the public to fish for king salmon (Tongass Sport Fishing Assn v. State, 866 P.2d 1314, 1987).*

*To be free of constitutional problems, resource laws and regulations must have adequate justification; they must have a reasonable basis for distinctions they make among various users; they must put everyone on an equal footing within a group of users; and they may not prevent anyone from belonging to a particular user group. A regulation may make access to a resource more convenient for some people and less so for others, but convenience of access is not protected by the constitution.*

*However, a law or regulation in the name of conservation may treat groups unfairly or convey a special privilege in violation of the common use and anti-monopolistic safeguards of Sections 3, 15, and 17. One such law was a subsistence measure adopted by the legislature in 1986 that made access to subsistence uses of fish and game dependent upon place of residency. According to the law, people who lived in areas determined to be urban were denied access to subsistence activities, and those who lived in areas determined to be rural were permitted access. In a decision with far-reaching political impact, the Alaska Supreme Court said the state could legally allocate subsistence resources among different groups if necessary to protect the resource, but it could not use place of residency as criterion for making that allocation (McDowell v. State, 785 P.2d 1, 1989). As a consequence of this decision, the federal government found that state management of fish and game on federal land failed to conform to provisions of the federal Alaska National Interest Lands Conservation Act of 1980, which requires that rural residents have a subsistence preference, and took from the state control of fish and game management on federal land in Alaska.*

***Section 4. Sustained Yield***

***Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses.***

*This section bolsters the commitment to conservation found in Section 2. The principle of sustained yield management is a basic tenet of conservation: the annual harvest of a biological resource should not exceed the annual regeneration of that resource. Maximum sustained yield is the largest harvest that can be maintained year after year. State law defines maximum sustained yield as "the achievement and maintenance in perpetuity of a high level annual or regular periodic output of the various renewable resources of the state land consistent with multiple use" (AS 38.04.910). At the time of the constitutional convention, stocks of Alaska's salmon had been reduced to a sad remnant of their past bounty by neglect of the sustained yield maxim. The qualifying phrase "subject to preferences among beneficial uses" signals recognition by the delegates that not all the demands made upon resources can be satisfied, and that prudent resource management based on modern conservation principles necessarily involves prioritizing competing uses.*

*In a challenge to the legality of the state's predator control program, which sought to reduce the number of wolves and bears in certain areas so that more moose and caribou would be available to hunters, the Alaska Supreme Court determined that the constitutional mandate to manage wildlife on a sustained yield basis applied to predators as well as game animals, and that the phrase "subject to preferences among beneficial uses" allowed the board of game to give priority to prey over predators (West v. State, Board of Game, 248 P.3d 689, 2010). In this case, the court ruled that the plaintiffs failed to show that the department of fish and game had ignored considerations of sustained yield.*

Per the Alaska Supreme Court rulings, Alaska legislature created **AS 16.05.258 Subsistence use and allocation of fish and game.**

*(a) Except in nonsubsistence areas, the Board of Fisheries and the Board of Game shall identify the fish stocks and game populations, or portions of stocks or populations that are customarily and traditionally taken or used for subsistence. The commissioner shall provide recommendations to the boards concerning the stock and population identifications. The boards shall make identifications required under this subsection after receipt of the commissioner's recommendations.*

*(b) The appropriate board shall determine whether a portion of a fish stock or game population identified under (a) of this section can be harvested consistent with sustained yield. If a portion of a stock or population can be harvested consistent with sustained yield, the board shall determine the amount of the harvestable portion that is reasonably necessary for subsistence uses and*

*(1) if the harvestable portion of the stock or population is sufficient to provide for all consumptive uses, the appropriate board*

*(A) shall adopt regulations that provide a reasonable opportunity for subsistence uses of those stocks or populations;*

*(B) shall adopt regulations that provide for other uses of those stocks or populations, subject to preferences among beneficial uses; and*

*(C) may adopt regulations to differentiate among uses;*

*(2) if the harvestable portion of the stock or population is sufficient to provide for subsistence uses and some, but not all, other consumptive uses, the appropriate board*

*(A) shall adopt regulations that provide a reasonable opportunity for subsistence uses of those stocks or populations;*

*(B) may adopt regulations that provide for other consumptive uses of those stocks or populations; and*

*(C) shall adopt regulations to differentiate among consumptive uses that provide for a preference for the subsistence uses, if regulations are adopted under (B) of this paragraph;*

*(3) if the harvestable portion of the stock or population is sufficient to provide for subsistence uses, but no other consumptive uses, the appropriate board shall*

*(A) determine the portion of the stocks or populations that can be harvested consistent with sustained yield; and*

*(B) adopt regulations that eliminate other consumptive uses in order to provide a reasonable opportunity for subsistence uses; and*

*(4) if the harvestable portion of the stock or population is not sufficient to provide a reasonable opportunity for subsistence uses, the appropriate board shall*

*(A) adopt regulations eliminating consumptive uses, other than subsistence uses;*

*(B) distinguish among subsistence users, through limitations based on*

*(i) the customary and direct dependence on the fish stock or game population by the subsistence user for human consumption as a mainstay of livelihood;*

*(ii) the proximity of the domicile of the subsistence user to the stock or population; and*

*(iii) the ability of the subsistence user to obtain food if subsistence use is restricted or eliminated.*

*(c) The boards may not permit subsistence hunting or fishing in a nonsubsistence area. The boards, acting jointly, shall identify by regulation the boundaries of nonsubsistence areas. A nonsubsistence area is an area or community where dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area or community. In determining whether dependence upon subsistence is a principal characteristic of the economy, culture, and way of life of an area or community under this subsection, the boards shall jointly consider the relative importance of subsistence in the context of the totality of the following socio-economic characteristics of the area or community:*

*(1) the social and economic structure;*

*(2) the stability of the economy;*

*(3) the extent and the kinds of employment for wages, including full-time, part-time, temporary, and seasonal employment;*

*(4) the amount and distribution of cash income among those domiciled in the area or community;*

*(5) the cost and availability of goods and services to those domiciled in the area or community;*

*(6) the variety of fish and game species used by those domiciled in the area or community;*

*(7) the seasonal cycle of economic activity;*

*(8) the percentage of those domiciled in the area or community participating in hunting and fishing activities or using wild fish and game;*

*(9) the harvest levels of fish and game by those domiciled in the area or community;*

*(10) the cultural, social, and economic values associated with the taking and use of fish and game;*

*(11) the geographic locations where those domiciled in the area or community hunt and fish;*

*(12) the extent of sharing and exchange of fish and game by those domiciled in the area or community;*

*(13) additional similar factors the boards establish by regulation to be relevant to their determinations under this subsection.*

*(d) Fish stocks and game populations, or portions of fish stocks and game populations not identified under (a) of this section may be taken only under nonsubsistence regulations.*

*(e) Takings and uses of fish and game authorized under this section are subject to regulations regarding open and closed areas, seasons, methods and means, marking and identification requirements, quotas, bag limits, harvest levels, and sex, age, and size limitations. Takings and uses of resources authorized under this section are subject to AS 16.05.831 and AS 16.30.*

*(f) For purposes of this section, "reasonable opportunity" means an opportunity, as determined by the appropriate board, that allows a subsistence user to participate in a subsistence hunt or fishery that provides a normally diligent participant with a reasonable expectation of success of taking of fish or game.*

Section (b) of this Bill should also raise some concern. As it states ***"reserved from all uses incompatible with its primary function to protect wolves from hunting and trapping".*** The Bill's author claims subsistence trappers will still be allowed to trap in the prescribed area for other fur bearers than wolves.

Let me point out what I feel will happen if this language is codified. Animal traps and snare are indiscriminate when it comes to capturing game. There are vast, vast examples of wolves being caught in a trap or snare that were not intended for a wolf. (It happens every year in the state)

So the first time a wolf is "incidental caught". I perceive the law will prevail, and all trapping will be closed in this area to "protect wolves from being trapped". With an exception maybe to martin trapping.

I must also point out. That not allowing subsistence trapping of wolves in this area, would affect those individual subsistence trappers, "reasonable opportunity" and "economy of effort and cost" (AS 16.05.258(f) and 5 AAC 99.010(3)). This would even further impact subsistence trapping if the entire prescribed area was close to all trapping, because a wolf or two was incidentally trapped. Making those individuals trapping in the prescribed area. Having to move to move outside the prescribed area, to have their subsistence needs meet. Costing those trappers time, money and effort. Thus it would affect and impact existing subsistence opportunity to those who have established trap lines outside the prescribed area currently. (Snowball effect)

The prime merit of HB 105 stated by the Bill's sponsor and invited guests, is that of tourism. Dollars to the State.

This is not a viable argument. State Parks and Recreational Division reported/testified to House Resource Committee this month. That State Parks and Recreational had 5 million visitors this last year. That is more than 5 times the amount of Alaskan residents.

Also if you could take a moment and visit the web site for Denali National Park.
https://www.nps.gov/dena/learn/management/statistics.htm

You will see persons vising the park (DNP) have only increased for the last 20 years. Having a buffer zone or not, did not affect people wanting to visit it, according to visitation statistics.

With DNP visitation exceeding record attendance and predicting more visitation this year.

It would pose the questions that should be asked in the next hearing.

What is DNP visitor's capacity? Annually and daily. 2. How many days is the park full and visitors have to wait or not be able to go in the park at all?

We also know driving into the park is limited already to drawing permits only. So there is a capacity of visitors using motor vehicles.

Furthermore there has been tens of millions of privet dollars invested in or around the area just outside the park entrance, including Healy, in the last decade to present. Commonly known as Glitter Gulch. I asked some of the business owners why they were investing their monies in this area? Number one answer, people visiting. More people visiting in the future. I also asked them, "how did all the wolf issues effect your decision to invest in area"? Number one answer. Not at all. They told me business owners/investors rely on numbers of people. Not the politics of wolf management.

Tourism has impacted the Alaska economy. For the positive and for the future with or without wolf issues. Clearly from the tens of millions of privet dollars invested in this small part of Alaska. And the 5 million visitors to State Parks, Alaska has a lot to offer to visitors coming to Alaska.

It was noted, by the sponsor and guests "this is an easy decision". If the issue has been around for 100 years and they could get not an area they wanted. What has changed? Wolf populations? Wolf populations change all the time, they go up in great habitat and decline with habitat. Sightabilty wolves? This concept of seeing wolves in DNP has only been documented in the past 20 years. With more emphases the last decade. For political and fact comparing. Like comparing DNP wolf sightings to Yellow Stone National Park. Just look at how many roads Yellow Stone has in compresence to the one road DNP has! What about the habitat. Yellow Stone has white tail, mule deer, elk, antelope, and sheep for large ungulates. DNP has only sheep, caribou, and moose, currently all down in population and densities estimates. This directly effects wolf population and densities.

Scientists and the sponsor have claimed a certain historical wolf pack is gone because of trapping or hunting. They are miss leading you. The wolves that may have been using that denning area last, may be gone, true. But the genealogy still exists. This can be verified by DNA samples.

End closing, the sponsor nor invited guests can show you any data on how many potential tourist the state may have lost, or may lose in the future. But entrepreneurs have shown you clearly, they are

investing in are going to continue to invest in Alaska. Not because of the one egg in the basket (wolves) but because all the grand juries our State has to offer. Wolves made it thought the days of Frank Glacier and government trapping and poising, and they will continue to exist without buffer zones.

Dear Senate Resources Committee Members ~ I would like to express my wholehearted support for reinstatement of the Denali Wolf Buffer in HB 105.

I've lived in Fairbanks for 44 years now. When I first arrived in this Great State, I was fortunate to get to view wolves in their native habitat every so often and felt one of the privileged few. It's been years since the last time that happened. I have many people come to visit. I am the Wildlife Gardening Chair of National Garden Clubs, Inc. - we have almost 200,000 members across the nation. I'm always bragging about Alaska and consider this one of the last great frontiers. It is basically impossible to get to see wolves in the wild now except within the park boundaries - our State Board of Game is made up entirely of hunters and guides and only 18% of Alaska residents have hunting licenses. The rest of us live to enjoy our wild animals and we are not represented in our State Game Board at all. Entire wolf packs are being killed - not all humanely, I'm afraid to say. As you know, this is causing a great imbalance in the hunter and prey balance in our State - now causing seasons to be open for our moose cows and calves. We no longer see our wildlife on a regular basis. Enough is enough!

One of our largest income producing industries is now tourism. However, since the Buffer Zone was reversed in 2010, the wolf population is at a dangerous low and only a very few tourists get to see them even in the park anymore.

Please do your duty for the majority of Alaskans who want our wild animals to be left wild and alive!, and our hundreds of thousands of tourists who visit our State every year and want to view them, especially our wolves. Please protect our Denali wolves by reinstating the wolf buffer zone proposed by HB105.

Thank you, Becky Hassebroek,

Becky Hassebroek

National Garden Clubs Wildlife Gardening Chair

National Wildlife Federation Representative

Fairbanks, AK 99701

DATE: March 23, 2018

TO: The Honorable Cathy Giessel
Chair, Senate Natural Resources Committee
Alaska State Senate

FROM: Wallace and Jerryne Cole
Denali National Park, AK 99755

RE: HB 105

We are writing to encourage the passage of HB 105 out of the Senate Resources Committee.

We are longtime residents of the Denali area and are retired from a business in the center of the park that caters to extended-stay visitors to Alaska who come to observe and photograph its wildlife, whether viewed from along the park road or while hiking Denali's backcountry. From our experience, rare opportunities to observe wolves in the wild are more significant to many park visitors than are more predictable sightings of grizzlies.

Inevitably, wolves potentially visible to park visitors do meander onto state lands north and east of the park's boundaries. Wolf hunting and trapping in those areas are a direct threat to Denali's viewable wildlife. Further, disruption of entire packs can occur when breeding wolves are killed during critical denning and mating times. The seasons are long and bag limits are large, so the risk to viewable wolves can be significant.

We believe that the state's interests would be well-served to:

1. Provide as much opportunity for viewable wildlife in places where they can readily be observed, such as Denali National Park.

2. Promote the best possible science in the wolf research program that has continued since the 1930s with collaboration between both state and federal employees.

3. Conserve predators where there is a particular benefit to Alaskans with diverse interests. Such a consideration comports with the state constitution and the roles and responsibilities of the state legislature.

3. Treat HB 105 as a business-friendly concept on behalf of those of us who are involved in tourism in one of the state's most popular destinations.

Thank you for the opportunity to submit our perspective as part of the Committee's record.

**Fairbanks**
**Fish and Game**
**Advisory Committee**

***Interior Region***
***Fish and Game Advisory Committees***

***Virgil Umphenour***
*Chairman*
*878 Lynnwood Lane*
*North Pole, AK 99705*

Central
Delta Junction
Eagle
Fairbanks
GASH
Koyukuk River
McGrath
Middle Nenana River
Middle Yukon River
Minto-Nenana
Ruby
Tanana-Rampart-Manley
Upper Tanana/Fortymile
Yukon Flats

To: Senate Resources

From: Fairbanks Fish and Game Advisory Committee (FAC)

RE: HB 105

Madam Chair Senator Giessel and members of the committee,

The FAC voted last year not to support HB 105 when it was going through the House. The FAC continues to oppose HB 105.

We believe that the Board of Game and the Department need flexibility of regulations to manage our wildlife resources and not strict inflexible statutory law or conflicts with other laws. For example, in the bill it states:

**"18 (b) Nothing in this section may be construed to prevent the department from**
**19 taking, or authorizing the taking of, wolves that present a danger to the health or safety**
**20 of local residents."**

This language would not allow the Division of Wildlife Conservation (DWC) to take wolves that are infected with dog lice as part of a control project to stop the spread of a non-indigenous aversive parasite, which has been detected in the area and surrounding areas. Also, if this were to pass, the DWC would not be able to take wolves in this area if in the future there needed to be an Intensive Management (IM) program. Moose in both Game Management Units 20C and 20A have a positive IM finding, as well as caribou in 20C. This bill if passed would thus conflict with existing IM law.

This Bill also conflicts with subsistence law, as it would eliminate an opportunity for subsistence hunters and trappers to take wolves in the prescribed area when there is a harvestable surplus. Furthermore, the bill restricts the size of leg hold traps that a subsistence trapper may use to no greater than 5" jaw spread. This would be a hardship for those subsistence trappers to replace traps that have a jaw spread greater than 5". Traps commonly known as Number 4's (which are widely used for trapping lynx, coyote, and wolverine) have greater than 5" jaw spread. This would also impact the subsistence user to be less successful harvesting and potentially harming or maiming other fur

bearers with lesser traps, such as lynx, coyote and wolverine. Trappers use the most efficient and effective equipment available to them. Limiting them to insufficient and less effective traps is not advisable from anyone's perspective.

The FAC also believes that the few wolves taken from the harvestable surplus by subsistence users in this area does not impact the economy in the region or the visitation to the park. It is well documented that visitation to the park has been at record levels. The tourism industry has also been very profitable at the same time.

March 23, 2018

Senator Cathy Giessel, Resources Committee Chair
Senator Click Bishop, Resource Committee Member
Senator John Coghill, Resources Committee Member

Dear Senators Giessel, Bishop, and Coghill:

Please do not pass HB 105. This bill is unnecessary because it pretends to solve an imaginary problem, abolishes subsistence opportunity, extinguishes the livelihood of some Alaskans, and is driven by emotional wolf worship rather than ANY science. This bill, contrary to what its supporters suggest, is not beneficial to the state economically or in any other way. There are no scientific facts nor is there a conservation concern to justify such a buffer zone. HB105 is nothing more than an emotionally-driven "theological" giveaway.

Do you recall under Governor Murkowski the green lobby's blackmail threat to invoke a tourist boycott to Alaska if the Denali wolf buffer zone wasn't implemented? Well, the buffer zone went away, but did the tourists? No. And their numbers are increasing every year. The suggestion that tourism will increase based simply on the existence of a wolf harvest exclusion zone is pure fantasy. Tourists don't come to Alaska just to see wolves. Wolves are an "also-ran" on a tourist's wish list, and even if a buffer zone existed, the likelihood of seeing wolves is still almost zero. I've never seen one.

Subsistence opportunity to hunt and trap on state land would be shut off if the buffer zone is established. So would the livelihoods of other Alaskans who depend on that land to feed their families directly or indirectly. Legalizing the buffer zone would take money out of the pockets and food off the table of Alaskans. This bill is dishonorable and has no redeeming outcomes. Creating a "stage" to showcase wolves which won't likely "perform" as desired is simply ridiculous and a clear bait and switch plan to end hunting in the area. Tourists are merely the token shill to "save" wolves.

Denali National Park already has boundaries. To cut off hunting or trapping around the borders of the Park on state land is essentially creating more de facto federal land where Alaskans can't hunt or trap. Too much of Alaska is already off limits to Alaskan hunters because of ANILCA.

The boundaries already exist. Let them do their job and please do not pass HB105.

Thank you very much for the opportunity to comment, and thank you for your service.

Karen Gordon
Fairbanks

By: Van Lawrence
Introduced: 08/25/2016
Adopted: 08/25/2016

FAIRBANKS NORTH STAR BOROUGH

RESOLUTION NO. 2016–39

A RESOLUTION URGING GOVERNOR WALKER TO CLOSE AREAS ADJACENT TO DENALI NATIONAL PARK AND PRESERVE TO THE TRAPPING AND HUNTING OF BEARS, WOLVES AND WOLVERINES

WHEREAS, Over a half a million annual visitors from around the world come to Denali National Park and Preserve, in large part, to see the iconic wolves and bears of the Park; and

WHEREAS, Both the Park and commercial tour companies advertise Denali National Park and Preserve as the best place in the world to see wolves within their natural habitat; and

WHEREAS, A large percentage of these visitors come to Fairbanks because of our proximity to the Park; and

WHEREAS, Hunters and trappers are allowed to use bait in the 22 mile long corridor, commonly referred to as the Wolf Townships or Stampede Trail corridor, to lure bears and wolves out of Denali National Park and Preserve and kill them; and

WHEREAS, The East Fork Pack was the most famous, the most studied and most viewed wolf-pack in the world and has now been decimated by hunters and trappers using bait to draw them just outside the Park boundary; and

WHEREAS, When this area was closed to hunting and trapping the East Fork Pack numbered 22; but has now been reduced to a single female wolf trying to raise pups alone; and

WHEREAS, When the Wolf Townships/Stampede Trail was closed to hunting there were 140 wolves in Denali National Park and Preserve and 49% of visitors saw wolves. Now the East Fork Pack has been almost wiped out and the total number of wolves within Denali stands at 48 - an all-time low - and the number of visitors who see wolves, for the last three years, is only 4%, also an all-time low; and

WHEREAS, This incredible and unique resource is being squandered for the satisfaction of just a handful of individuals; and

WHEREAS, The Alaska economy cannot survive unless we have a diversified economy that promotes tourism and other industries besides oil.

NOW THEREFORE BE IT RESOLVED the Fairbanks North Star Borough urges the Governor, through the Commissioner of Fish and Game to close the areas adjacent to Denali National Park and Preserve to the trapping and hunting of bears, wolves and wolverines.

BE IT FURTHER RESOLVED copies of this resolution shall be distributed to Governor Walker and Alaska Department of Fish and Game Commissioner Sam Cotten.

PASSED AND APPROVED THIS 25TH DAY OF AUGUST, 2016.

John Davies
Presiding Officer

ATTEST:

Nanci Ashford-Bingham, MMC
Borough Clerk

Yeses: Sattley,Westlind, Lawrence, Quist, Dodge, Davies
Noes: Cooper, Roberts, Hutchison
Other: None

# Economic Values of Wolves in Denali National Park and Preserve (DNPP): Concepts, Literature Synthesis, Data Gaps and Study Plan

**March 3, 2016**

**Dr. John Loomis***
**Dept of Agricultural and Resource Economics**
**Colorado State University**
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NPS Photo/Woodward

*Views expressed in this report are those of the author and do not necessarily represent the views of Colorado State University.

Acknowledgements: I wish to thank Bridget Borg, Dave Schirokauer, Patricia Owen, Lynne Koontz, Bret Meldrum and Leslie Richardson, National Park Service for the many references provided as well as valuable comments and suggestions on the draft report. Any errors or omissions are the sole responsibility of the author.

# Economic Values of Wolves in Denali National Park and Preserve (DNPP): Concepts, Literature Synthesis, Data Gaps and Study Plan

**Dr. John Loomis**
**Dept of Agricultural and Resource Economics**
**Colorado State University**
John.Loomis@colostate.edu

## EXECUTIVE SUMMARY

This report identifies what is currently known about economic values of wolves in Denali National Park and Preserve (DNPP) to visitors, Alaska residents and residents of the rest of the United States (U.S.). Our literature review and synthesis found that little is known specifically about the economic value of wolf viewing in DNPP and about visitors that come to DNPP primarily to view wolves (Iverson and Borg, 2012).

However, wildlife viewing is clearly a source of socio-economic value in the state of Alaska. Wildlife viewing is a driver of tourism for DNPP (Stynes and Ackerman 2010) and the state of Alaska. For example, wildlife viewing activities in Alaska supported over $2.7 billion in economic activity in 2011 (ECONorthwest 2014a). In 1997, non-resident visitors who came to Alaska primarily to view wildlife had average expenditures of $6,000 per trip (Miller and McCollum, 1997). The benefits per trip in excess of their expenditures were on the order of $700 to $900 (Miller and McCollum, 1997). From economic valuation questions found in Alaska wildlife viewing literature, it can be inferred that a non-resident visitor may have an additional value in the range of $200-$300 per wildlife viewing trip to Alaska if a wolf is seen on their trip.

Based on our literature review, there is currently nothing known about the non-use/passive-use values (sometimes called existence and bequest values) of wolves in Alaska to Alaskan and other U.S. residents. What little literature exists on the passive-use values of wolves pertains to reintroduction of wolves in Yellowstone National Park (YNP) and wolf habitat protection in Minnesota (Chambers and Whitehead, 2003). Surveys of U.S. households indicated passive-use values were about $14 per U.S. household for wolf reintroduction into YNP (Duffield, et al. 1993). Similar values were published in the United States Fish and Wildlife Service Environmental Impact Statement on wolf reintroduction into YNP and Central Idaho (U.S. Fish and Wildlife Service, 1994). Minnesota household's passive-use values for wolf habitat protection range from $7 to $31 per household, with the value depending on the region of Minnesota. With millions of households in the U.S., these small passive-use values per household add up to a sizeable amount of total economic value.

The state of Alaska is mandated to provide for consumptive uses of wildlife, and harvest of wolves can provide significant economic benefits as well (National Research Council 1997). However, there is minimal information on the economic value of consumptive uses of wolves, including the value procured from hunting and trapping (harvest) in the region surrounding DNPP (Borg, personal communication). However, in 2011, hunting throughout Alaska supported over $1.3 billion dollars in economic activity (ECONorthwest 2014a).

Managers tasked with making decisions regarding wildlife management need accurate information on the economic values of wolves to viewers, hunters, trappers and the general public to make well informed decisions regarding management of wolves and their prey(NRC, 1997). Wolf management is particularly contentious in the areas surround DNPP (Borg 2015) and data are needed on the specific magnitude of revenues and other economic values derived from wolf harvest around DNPP. Specifically, data is needed that will support an analysis of existence value (or non-use value) of wolves in DNPP area that can be brought in as a direct comparison for the market values brought to local subsistence and sport hunters. In Alaskan culture, hunting and trapping have a high intrinsic value as cultural signifiers. Trapping practices of wolves also acts to maintain traditional and modern trapping knowledge specifically ("Alaska Trappers Association" 2015). Additionally, there are associated costs of limiting wolf harvest, given not only the revenue generated from hunting (Treves 2009; ECONorthwest 2014a) but also the potential of wolf harvest to increase land owner's acceptance of large carnivores (Treves 2009). Likewise, the non-consumptive economic value of wolf viewing in DNPP and the existence values of wolves in DNNP of the U.S. and wider public are predicted to bring significant "alternative" wolf value to bear on the market, given the findings of other wolf viewing valuation studies (CITE) and ongoing social science research in DNPP regarding wolf viewing tourism.

Luckily, there are well established methods for filling all these data gaps regarding hunter and viewer use values, as well as the general public's passive-use values of wolves in and around DNPP. In 1997, the NRC (1997) suggested a coordinated social science research program to address similar data gaps regarding consumptive and non-consumptive uses of wolves in Alaska. Our report provides many of the details of such a research program. In particular, our report provides details and examples of the economic methods for quantifying wolf related visitor spending and benefits, hunter spending and benefits, and passive-use values. This report also outlines several study plans to provide these values that are needed for informing local and regional wolf management strategies.

## TABLE OF CONTENTS

# Economic Values of Wolves in Denali National Park and Preserve (DNPP): Concepts, Literature Synthesis, Data Gaps and Study Plan

## I. Study Purpose

Wolf management has proven controversial, whether in Alaska or in the lower 48 states of the U.S. (Huey, 2016). The controversy in Alaska resulted in the Natural Research Council (part of the National Academy of Sciences), evaluating wildlife management in Alaska in the 1990s with particular attention to wolves and their prey (NRC, 1997). The overall conclusion of the committee with regard to economics was that there are several information gaps that need to be filled before a complete economic analysis of wolf management can be performed. In the intervening years, wolf management has continued to be a source of often heated debate with many different stakeholders. Specifically, management of wolves at the boundaries of protected areas, such as National Parks and Preserves, has been subject to on-going debate and attention with ample rhetoric, but there has been a lack of quantitative evidence regarding economic valuation to inform management decisions (Borg 2015). The purpose of this study is to define specific data gaps related to wolf economic values in and around Denali National Park and Preserve and present a plan for addressing the current data gaps. Therefore, this study does the following: (1) describes the types of economic values associated with wolves in the Denali National Park and Preserve area (DNPP) area; (2) describes the methods available to measure these values; (3) defines the current state of empirical knowledge on these values; (4) identifies data gaps that need to be filled in order to quantify economic trade offs in wolf management in and adjacent to DNNP, and (5) proposes study plans to estimate the most relevant economic values of wolves in DNPP and the surrounding area.

## II. Types of Economic Values and Methods for Quantifying Them

### A. Types of Economic Values

*Willingness to pay and Consumer Surplus*

Benefits are defined in benefit-cost analysis as what a consumer or producer would pay to have or retain access to a private or public good. Economists call this *net willingness to pay* (WTP), or willingness to pay over and above costs. This concept is also known as *consumer surplus* and *producer surplus* (USWRC, 1983; OMB, 1992; 2000; EPA, 2000; Freeman, 2003). *Price* is the willingness to pay for one more unit of the good. The absence of price does not mean absence of value; if a good provides a person (not necessarily everybody) with enjoyment/satisfaction and is scarce, it has an economic value (Schuhmann and Schwabe, 2000:4). As Office of Management and Budget (1992:7) notes, "[P]rices sometimes do not adequately reflect the true value of a good to society." This is certainly the case of many natural resources, which are purposely non-marketed. For example, the fact that wildlife is not privately owned but held in public trust by government agencies does not diminish the fact that these species have an economic value to people. In the case of wildlife, the general concept of net WTP or consumer surplus applies, since the market price is zero for many species, or prices exist for just one attribute of the species (e.g., meat or fur or license).

While WTP is the measure of benefits to the user (hunter, viewer), there may also be spin-off economic effects in terms of jobs in a local community related to wildlife viewing, hunting, or trapping. Economists refer to these as local or regional *economic impacts*. The term local can be a community, county or borough when the data are available at that level of detail.

In some cases, the term regional indicates a substantial part of a state. In some cases, economic impact analysis can be conducted for an entire state.

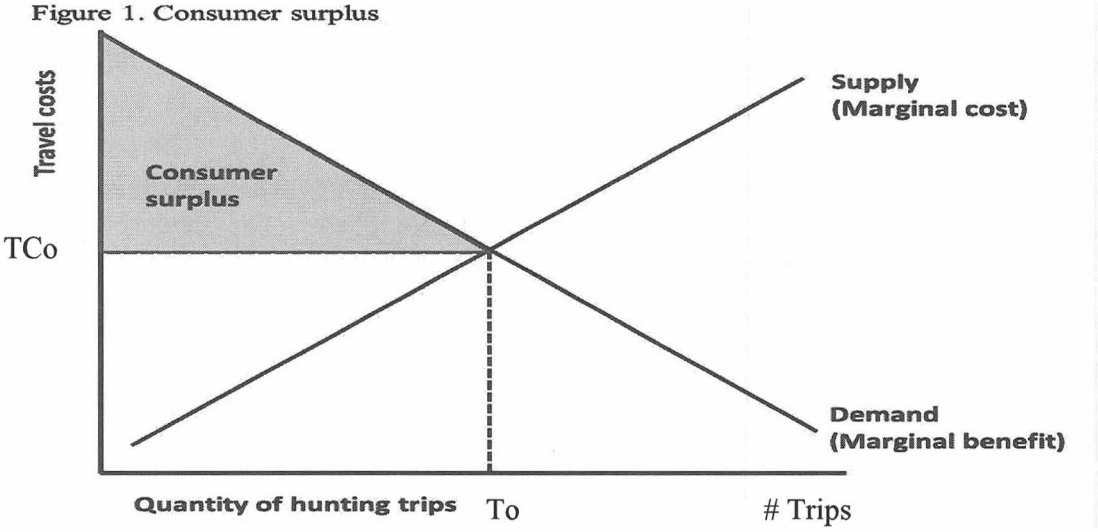
While much past economic analysis performed by federal agencies such as the United States Department of Agriculture Forest Service (USFS) or National Park Service (NPS) has emphasized economic impacts, these agencies are broadening their analysis to include net WTP for non-market resources as well. One of the reasons for this has been an increasing emphasis on valuing ecosystem services. The economic value of ecosystem services is the consumer surplus or cost savings arising from the benefits that an ecosystem provides people. Wildlife viewing and harvest of wildlife (hunting and trapping) are considered ecosystem services of wildlife. A complete economic analysis will consider an economic impact analysis to a regional or state economy **and** a benefit cost analysis of the benefits to the users themselves. In a sense there are two beneficiaries of wildlife management: (a) tourism related businesses—guides, hotels, etc. and (b) the hunters/trappers and viewers themselves. A complete economic analysis will include both.

*Use Values: The economic value of market goods and recreational resources*

For decades, people have recognized that many wildlife species provide direct use values to hunters and non-consumptive wildlife viewers (Loomis, et al. 1984). These benefits are measured by their net WTP or consumer surplus. As can be seen in Figure 1, which uses hunting as an example, the demand curve represents the incremental or marginal benefits to a hunter from additional hunting trips. As described in the methods section below, the major "price" of a trip is the travel costs to the site (especially for residents where the license cost is low and the license allows for numerous trips).

The amount the hunter would pay over and above the actual travel costs incurred is a measure of their consumer surplus. Essentially, they would have been willing to pay a higher cost on the first trip rather than not go hunting (much like most coffee drinkers would pay a great deal more than the price for the first cup of coffee in the morning than for the second or third cup). Each additional trip has less and less consumer surplus, until the travel cost of the trip equals the incremental (marginal) benefit of another trip. At that point they stop taking trips as the cost of another trip exceeds their benefit.

Figure 1. Consumer surplus




The amount the hunter actually spends (travel cost (TCo) times the number of trips (To)), is the expenditure used in a regional economic model to estimate jobs and wages resulting from the hunter expenditures. [1]

[1] The regional economic model used to convert hunter/viewer spending into regional income and employment is known as an input-output model. A commonly used input-output model is named IMPLAN for Impact Planning since estimating regional income and employment is known as economic impact analysis as distinct from economic efficiency analysis which is used in benefit-cost analysis.

*Existence/Passive-Use/Non-Use Values*

As first noted in 1967 (Krutilla, 1967) and empirically demonstrated beginning in the early 1980s (Brookshire, et al. 1983), wildlife also has an *existence value* to people who may never see the species in the wild. These people are often willing to pay for protection of these species. Other people would pay for protection of habitats for wildlife species to keep the wildlife species protected for future generations. This is known as *bequest value*. Evidence of existence and bequest values may be expressed in donations to conservation groups such as the World Wildlife Fund as well as donations to numerous state "Non-Game Wildlife check-offs" on State Income Tax forms. These *passive-use values* are recognized in federal natural resource damage assessment, when the U.S. District Court of Appeals in 1997 termed existence and bequest values "*passive-use values*" (*Ohio v. U.S. Department of Interior*, 880 F. 2d. 432, 444 (D.C. Cir. 1989)). Also called *non-use values*, these values are considered compensable damages arising from environmental damages (e.g., old hardrock mines) under the Superfund legislation as well as oil spills under the Oil Pollution Act of 1990.

In the case of wolves, research summarized below, indicates that people living hundreds of miles away from wolf habitat (e.g., southeastern U.S.) would still pay something to know there is a viable population of wolves today and that protection of this population and its habitat would provide wolf populations for future generations.

**B. Methods for Quantifying Economic Values**

*Travel Cost and Valuation Methods*

Economists have developed several methods for estimating the use and passive-use values of wildlife. In this section we review each of these methods in detail. The first method

reviewed (*the travel cost method*) is based on actual visitor travel behavior and is used to estimate recreation use benefits. Specifically, the travel cost method (TCM) uses variations in visitor travel costs and their associated trips taken to trace out a demand curve like the one shown in Figure 1. Once the demand curve is estimated, the net WTP or consumer surplus is calculated. TCM is a preferred method for estimating **current** use values because it is based on visitors actual travel behavior (travel cost and travel time incurred) to obtain their **current** wildlife experience. However, future visitor benefits might change with potential wildlife management alternatives that have not yet been implemented. The benefits of the future scenarios are difficult to quantify with TCM. In this case the *contingent valuation method* (CVM) may be a better tool in these cases where management actions may change the populations of wildlife and hence the magnitude of use value of wildlife. This method (described in more detail below) constructs a simulated market to ask visitors what the maximum amount they would pay (WTP) for each scenario associated with a potential management alternative. For example, visitors might be presented a "payment card" that has ten alternative increases in trip costs to visit an area where they could view twice as many wolves as they might typically see now. The visitor would be asked to circle the dollar amount that represents the maximum <u>additional</u> amount they would pay to visit this area where they could see twice as many wolves. Although the TCM and CVM approaches are very different techniques for estimating WTP, both TCM and CVM provide comparable estimates of WTP. In a review of more than a hundred recreation studies where both TCM and CVM were used, Carson, et al. 1996 found that the WTP derived from TCM and CVM were not statistically different from one another.

*Details of the Travel Cost Method (TCM) for Estimating Recreation Benefits*

Travel Cost Method (TCM) is a method that uses variations in travel costs incurred by visitors living at different distances from the site and their corresponding number of trips taken to statistically estimate a *demand curve* like that shown in Figure 1. From the demand curve, the consumer surplus or net WTP beyond the current cost is calculated (see Loomis and Walsh, 1997 for details). The strength of this method is that it uses actual trips taken and actual travel costs to trace out the demand curve. Hence the measures of net WTP reflect actual behavior. Application of TCM can sometimes be accomplished using existing data (e.g. hunter zip codes found on hunting permits), but is typically performed using a short survey of hunters or viewers. This survey can be administered by the state fish and game agency during its post-season hunter survey. For example, in Idaho, this interagency approach was implemented by the Idaho Fish and Game in cooperation with the U.S. Forest Service (Donnelly, et al. 1985). TCM is a well established methodology as it has been used in nearly a hundred valuation studies of hunting and wildlife viewing conducted in the U.S., including many by state fish and game agencies, such as those in Alaska, California, and Idaho (Peterson, et al. 1992; Loomis, et al. 1989; Donnelly, et al. 1985).

*Details of the Contingent Valuation Method (CVM)*

CVM can provide information about the potential economic consequences of alternative possible management plans. CVM (and choice experiments) are the only methods that can estimate the non-visiting public's WTP for existence/non-use or passive-use values. Since those not visiting have no trips and incur no travel costs, their WTP has to be ascertained by asking them in a constructed market or simulated voter referendum.

CVM measures the use values of hunting, trapping and viewing of wildlife by employing simulated or constructed market. The simulated or constructed market provides a well defined description of the good to be valued (e.g., a specific increase in harvest success rate or a specific increase in number of animals a viewer would see) and a means by which the hunter or viewer would pay for this improvement. The simulated or constructed market then gives the hunter or viewer an opportunity to "use the market" and indicate their willingness to pay (if any) for the improvement. Using the example of the payment card described above, a hunter would circle the maximum amount they would pay for a specific increase in harvest success rate next year. Likewise a wildlife viewer would circle the maximum they would pay to see a specific increase in the number of animals. The dollar amount circled would reflect their maximum WTP or consumer surplus for the specific increase presented in the survey.

CVM is also more appropriate than TCM if visitors are on multiple destination trips in Alaska, where the travel cost to Alaska is not attributable to visiting just a single site or activity. In fact, most non-resident wildlife viewing tourists to Alaska may visit many different areas during their trip from home. This is especially true of visitors from the lower 48 states. Trying to attribute the travel cost to Alaska to any one site becomes problematic and hence the TCM is difficult to apply to wildlife viewing trips in Alaska.[2]

Thus, in the case of multiple destination trips a CVM scenario can be developed that allows the researcher to focus on just the wildlife viewing experience for a particular species in a specific area. For example, a visitor to DNPP could be asked if they would pay a given amount more for the trip they have taken to DNPP if they could see twice as many wolves as they saw on

[2] However, for big game hunting, many hunters do come to Alaska to hunt a specific species in a particular area. In this case the TCM would be applicable since the entire travel costs of the trip are attributable to hunting a particular species in a particular area. For hunters that come to Alaska to hunt multiple species in several different locations, then the CVM as described for wildlife viewing would be equally applicable to these multi-species hunters.

their current trip. This could be asked using the payment card that was described above, or a more preferred method the *dichotomous choice* approach. With this approach the dollar amount of the increase in trip cost is varied across the sample of visitors. For example, 10% of the sample could be asked if they would pay $10 more for a trip where they would see twice as many wolves, a different 10% of the sample could be asked $15 more per trip, and so on, until the last 10% of the sample might be asked $150 more per trip. The range of the dollar amounts presented would be pretested to make sure it covered the likely range of the visitor's maximum WTP. By analyzing the percentage of visitors that would pay the differing dollar amounts, a quasi-demand curve or marginal benefit function similar to Figure 1 can be estimated. From this curve, the net WTP or consumer surplus can be calculated. The reason the dichotomous choice method is the preferred method is that a dichotomous choice WTP question format mimics a market: the person is simply asked if they would "buy" the good at the price stated like people actually do in nearly all markets in the U.S. Asking a person to circle the most they would pay for a good, as is done in a payment card format, is unusual in most markets, although it is used by many charities such as United Way, or conservation organizations.

*Methods for estimating Existence Values*

Another strong feature of CVM is its ability to measure the monetary amount of existence values for maintaining a specific number of animals in a particular location. With CVM, a simulated or constructed referendum is often used to ask non-visiting households whether they would vote to pay for a well-defined change in the population of a given wildlife species. The general public is sampled usually via a mail survey using an USPS address based sample to

ensure a random sample of whatever geographic area is being sampled.[3] The reason that a mail survey is needed is that individuals must be provided with sufficient information on the species they are being asked about so as to provide an informed valuation. This information would include a map showing where the species of interest is located, and what the management action would be to "produce" an increase in the number of animals or to reverse a decline in their population. How wide a geographic area of households to sample is often determined by whether the species is only of state significance (i.e., it is found in many other states) or of national significance (i.e., it is found in few other places in the U.S.). Species that are federally listed T&E species or found on federal public lands suggest that a survey of the entire U.S. be done because the resource "belongs" to everyone in the U.S. Further, management of the species will likely be paid from federal appropriations financed by national taxes such as an income tax. Loomis (2000) summarizes several empirical studies that estimate how WTP values change with increasing distance to where the wildlife resource is located. This research suggests that WTP can be significant even at a distance of 1,000 miles from the resource.

Even though the dollar amounts stated by people in response to a CVM survey are not actually paid, the method has shown to be reliable in test-retest reliability studies (Loomis, 1990; Reiling et al., 1990). Richardson and Loomis (2009) provide a listing of these passive-use value studies of wildlife and a meta-analysis of them as well.

Chambers and Whitehead (2003) provide an example of using a CVM scenario to estimate the existence value of preserving wolves. In their survey a Wolf Management Plan (WMP) is described to the household in the following way: the plan "*...would include*

[3] A combination mail and internet survey is also used, where the address based sample is given the option of filling out the survey on-line via a URL in their letter. Our experience in two different surveys (one of the U.S. population and one of New Jersey households with solar panels) indicates that only about 20% of the households offered the option of both survey modes choose the internet survey option.

*monitoring the population and health of wolves and preserving their habitat and that of their primary prey*." The respondents were informed that if the plan was passed, a stable wolf population goal of 1600 wolves would be sustained, and wolves would not be returned to the Threatened and Endangered species list in the near future. Respondents were asked if they would pay a one-time tax increase (of specified amount, $A) to fund this plan:

> *"These management activities are expensive. New state money would be needed to fund the management plan. Suppose that a one-time tax increase of $A would be required from each Minnesota household to support and fund the wolf management plan. Would you be willing to pay the one-time tax increase of $A to fund the Wolf Management Plan?"*

As the researchers described in the study:

> *"The values of this tax increase were varied across surveys. Some respondents were asked if they would be willing to pay $5, others $25, $50, $75 or $100. The question was followed by three answer categories: yes, no, and don't know."*

Past research has shown recoding the "don't know responses" to 'no responses" increases the accuracy of the resulting WTP estimates (Loomis, 2014; Champ, et al. 1997; Champ et al. 2009). Chambers and Whitehead estimated the benefits to two different communities in Minnesota within the range of the wolves. Ely households would pay between $4.43 and $4.77 (about $7 in $2014). St. Cloud residents were willing to pay between $20.15 and $21.49 (about $31 in $2014).

*Details of Choice Experiments*

In the last 15 years a number of economists have embraced a method called *Choice Modeling* (CM) or *Choice Experiments* (CE) or *Attribute Based Modeling* (Holmes and

Adamowicz, 2003). The method originated in the marketing literature, where it was called *Conjoint Analysis*. Conjoint Analysis had been used for more than three decades by market researchers to determine which characteristics of proposed products were most desired by consumers. Jordan Louviere was one of the pioneers in the marketing field, and his expertise has been applied in the application of non-market valuation as well (see Louviere, et al. 2000).

The primary distinction between CE and CVM is how respondents are asked about their WTP. In contrast to a CVM survey where a WTP question is asked for a single "management action" program or policy, a CE survey presents the respondent with a set of alternative programs or management actions, each characterized by multiple attributes or characteristics (which can be thought of as different features) of a particular program. One characteristic of each alternative program is the cost of that program. Each respondent is typically asked to choose their most preferred alternative from a set of management alternatives. Each choice set has a "no change/current condition/status quo" alternative usually placed adjacent to one or more proposed management action alternatives. The alternative chosen by the respondent is assumed to yield the highest benefits to the respondent. Much like CVM, the range of program costs or "prices" varies across the sample. However, unlike CVM, in a CE survey, the non-price characteristics or attributes of each alternative management program also changes across the sample. Because one of the attributes included in each alternative management program is a price or cost for the management program, the monetary value for each of the program's attributes can be calculated. Thus with a CE survey, the analyst knows not only the total WTP for a possible management action but also how each feature (attribute or characteristic) is valued by the respondent.

It is easiest to visualize the CE approach with an example. Figure 2 presents an example of a CE for valuation of river restoration on the Pawtuxet River in the state of Rhode Island. It is

a single choice task that would be presented to the respondent. A single survey might have two or three individual choice tasks. There are seven attributes for the choice task illustrated in Figure 2 (which is probably the upper limit on the number that most general public respondents can handle). Prior to this choice task, each of these attributes were explained to the respondent in more detail than is shown in the choice task table (Figure 2). Maps were provided to show what stretches of the river could be restored.

The first alternative is to maintain the current status of the river with no restoration and has zero cost to the household. The other two alternatives show different levels of restoration and annual taxes and fees that a household would pay for the action.

Figure 2. Example of a Choice Task for River Restoration

**Question 6. Projects A and B** are possible restoration projects for the Pawtuxet River, and the **Current Situation** is the status quo with no restoration. Given a choice between the three, how would you vote?

| Effect of Restoration | Current Situation (no restoration) | Restoration Project A | Restoration Project B |
|---|---|---|---|
| Fish Habitat | 0%<br>0 of 4347 river acres accessible to fish | 10%<br>450 of 4347 river acres accessible to fish | 5%<br>225 of 4347 river acres accessible to fish |
| Migratory Fish | 0%<br>0 out of 1.2 million possible | 33%<br>395,000 out of 1.2 million possible | 20%<br>245,000 out of 1.2 million possible |
| Catchable Fish Abundance | 80%<br>116 fish/hour found out of 145 possible | 80%<br>116 fish/hour found out of 145 possible | 70%<br>102 fish/hour found out of 145 possible |
| Fish-Dependent Wildlife | 55%<br>20 of 36 species native to RI are common | 80%<br>28 of 36 species native to RI are common | 65%<br>24 of 36 species native to RI are common |
| Aquatic Ecological Condition Score | 65%<br>Natural condition out of 100% maximum | 80%<br>Natural condition out of 100% maximum | 70%<br>Natural condition out of 100% maximum |
| Public Access | Public **CANNOT** walk and fish in area | Public **CANNOT** walk and fish in area | Public **CAN** walk and fish in area |
| $<br>Cost to your Household per Year | $0<br>Increase in Annual Taxes and Fees | $5<br>Increase in Annual Taxes and Fees | $5<br>Increase in Annual Taxes and Fees |
| HOW WOULD YOU VOTE? (CHOOSE ONE ONLY) | ☐ I vote for **NO RESTORATION** | ☐ I vote for **PROJECT A** | ☐ I vote for **PROJECT B** |

While this example has three alternatives (one "no action"—referred to as the Current Situation", and two "action" alternatives—Project A or Project B), there are some advantages of having just one "action" alternative paired with the "no action" alternative. The levels assigned to each attribute reflect a realistic range of that attribute for the location and management actions being proposed. This range is determined by discussion with scientists and managers to encompass what is feasible to attain, and what is credible to respondents (as determined in focus groups and pretests). The number of levels for each attribute are chosen to allow for estimation of a regression coefficient of the attribute. However, there is a trade-off between the number of levels desired and the associated number of survey versions required. For example, if there are three non-price attributes with five levels each, seven levels of the cost attribute then there are 24 survey versions that have to be printed and tracked. However, having a large number of cost levels is often critical to ensure enough variation in cost to estimate a statistically significant cost coefficient. If the cost coefficient is not significant, then the monetary values of the other attributes are non meaningful. Thus for survey implementation, 24 different versions of a survey would be printed.

Printing costs may influence how the choice experiment is designed, whether to use CVM and the type of CVM WTP question to be used. For example, printing 24 versions of a choice experiment survey can be expensive (especially if color is used) as compared to printing just seven versions of a CVM dichotomous choice survey or just one version of the survey if a CVM payment card is used. With the payment card everyone gets the same survey, so the economies of scale at the printer lower the cost of printing surveys as well as simplifying the

mailing process. With a choice experiment not only must 24 versions of the survey be printed but there is complexity of tracking which person got which of the 24 choice experiment versions when doing follow up/repeat mailing to non-respondents.

*Advantages and Disadvantages of CE versus CVM*

The primary advantage of CE for non-market environmental valuation is its ability to provide more detail of respondents' valuation of the components of a particular policy or program than with CVM. CE can show the relative importance assigned to characteristics and derive estimated values associated with various levels of characteristics. The total value of a particular policy or program can also be calculated from a CE. This flexibility is particularly useful when policy makers or resource managers are uncertain about the final details of the program or policy at the time the survey is designed and implemented. As long as the likely range of the attribute levels are included in the survey versions, the value for any particular program can be calculated after the fact. There are two primary disadvantages of the CE approach: (a) survey implementation is more costly and complex due to the number of versions of the survey that need to be produced; (b) the available empirical evidence suggests that estimates of WTP from CE are greater than from CVM, a potentially worrisome problem (Stevens, et al. 2000; Richardson and Loomis, 2009).

## III. Uses and Users of DNPP

### A. Visitor Use of DNPP

In 2014, over a half million visitors (531,315) came to DNPP. This is a significant increase in the last few years over the slightly more than 400,000 visits recorded in 2011 (Stynes and Ackerman 2011). About 2% of the visitors were local Alaskans living in the area, 7% were Alaska residents living elsewhere and 91% were non-residents (U.S. and International). An increasing sub-demographic of international visitors is apparent in DNPP, and particularly, those focused on wolf viewing, as demonstrated by a preliminary study of visitor behavior and preferences in 2016 (Keller/NPS NRDS XX/2106). Visitors in this study are asked to allot preferences to wildlife viewing across an ungulate and meso-carnivore spectrum, as well as rank their importance to experiencing the "wilderness character" DNPP has to offer its backcountry visitors. Qualitative content analysis of structured interview material with these same surveyed visitors yields a primary theme of dissatisfaction of *not* seeing wolves. Deploying this theme as a factor in ANOVA yields especially significant loadings ($r = .77$; $p < 0.1$) with individual's relative rating of the importance of wolves for their overall DNPP wilderness experience. This preliminary study points to the need of including visitors to DNPP both on and off the shuttle and tour buses in a wolf viewing valuation study.

### B. Visitor Interest in Wildlife Viewing in General and Wolves

*Wildlife Viewing*

Wildlife viewing is one of the two primary reasons people come to DNPP. The exact percentages vary from study to study and depend on the residence of the visitors. According to Fix, et al. (2013), only 20% of Alaskan residents cited wildlife viewing as the main reason for

visiting DNPP (sightseeing and hiking were equally important at about 20% each). In comparison, they found that over half of the rest of U.S. visitors and international tourists cited wildlife viewing as the main purpose of their trip. When analyzing NPS Visitor Services Project (VSP) data Mani, et al. (2012) found that the most common activities in DNPP were viewing scenery (88%) and viewing wildlife (80%). These two percentages are similar for first time and repeat visitors, indicating that wildlife is a factor drawing people back to DNPP. Manning and Hallo (2010) found that the single most important experience for visitors on the Denali National Park road was seeing wildlife (70%). Related to this, visitors thought not seeing "enough wildlife" and "too few animals along the road" were a problem (50%, and 53%, respectively). This suggests that the quality of the visitor experience ***is*** influenced by the number of animals seen regardless of whether the animals seen were one of the "Big 5" species (grizzly bears, wolves, caribou, Dall sheep and moose).

*Wolves*

Just how important is wolf viewing to visitor satisfaction? A 2012 survey in DNPP found that, while wolves were seen by about 26% of the visitors, seeing a wolf was a statistically significant contribution to wildlife viewing satisfaction (Skibins, et al. 2012). However, the contribution of wolves toward wildlife viewing satisfaction was not statistically different than was the contribution of moose, despite the fact that moose were seen two-thirds of the time.

## IV. Economic Impacts Associated with DNPP and Wildlife Viewing

Economic impact analyses evaluate the direct and indirect effects of spending by visitors living outside the economic impact area. Specifically, positive economic impacts arise when visitors living

outside the geographic impact area, visit the economic impact area and spend money inside the economic impact area. In essence, these visitors living outside the impact area inject "new" money into the impact area by their spending in the impact area.

There have been two economic impact studies of DNPP in recent years. The first was the economic impact study by Stynes and Ackerman (2010) which was based on 2008 visitation data (432,309 visitors). This study evaluated two impact areas: (a) the State of Alaska as a whole; (b) the DNPP region. To evaluate the positive economic impact that visitors to DNPP have on the State of Alaska economy as a whole, the study focused on the spending of non-Alaskan resident visitors (rest of the U.S. and international) while visiting DNPP. In 2008 these non-resident visitors' spending supported 2,319 jobs with $77.4 million in wages and an additional $48.52 million in other income (profits, rents and indirect business taxes) in the State of Alaska.

Stynes and Ackerman also estimated the economic impact of DNPP visitor spending to just the Denali Region (defined as the Denali Borough). For this analysis, Alaska resident spending inside the Denali Region represents new money injected into the Denali Region because nearly all Alaska residents live outside the Denali Region. In 2008, spending by Alaskan residents, rest of U.S. residents and international tourists supported an estimated 1,491 jobs in the Denali Region. This was associated with $45.4 million in wages and $26 million in other income (profits, rents and indirect business taxes).

A more recent study using the much higher 2014 visitation rate to DNPP numbers (531,315 visits)[4] and improved economic impact modeling calculated significantly higher positive economic impacts. Specifically, the results indicated that visitor spending supported 6,800 jobs with $249.4

[4] 2014 visitation data from http://www.nps.gov/dena/learn/management/statistics.htm

million in labor income and an additional $231 million in other income (profits, rents and indirect business taxes (Cullinane, et al. 2015).

*Total Economic Impacts Attributable to Wolves*

As noted by Iverson and Borg, "Currently, there is no accurate assessment of how many people visit the park primarily for the purpose of viewing wolves". This is an important data gap to fill because even if a few percentage points of the Denali Borough jobs or the State of Alaska jobs were directly related to visitors coming primarily to see wolves, it could amount to several hundred jobs.

## V. Economic Benefits (WTP) Associated with DNPP Wildlife Viewing

In terms of economic values, McCollum, et al. (1998) found that visitor benefits (as measured by WTP) increased with wildlife viewing success. In particular, WTP rose from $47.58 per person per day trip ($70 in $2014) to $63.49 ($94 in $2014) when a trip involved the visitor seeing all of the Big 5 species (Grizzly bear, caribou, Dall Sheep, moose and wolf), and when the number of individual Big 5 animals seen increased from an average of 6 individual Big 5 animals to 21 individual Big 5 animals. This suggests that the probability of seeing a species such as a wolf and the number of wolves seen likely has a significant effect on wildlife viewing benefits.

## VI. The Importance of Wildlife and Wolves in Alaska

Given the very limited information on the economic impacts and values of wolves in DNPP we synthesized the economic information on wolf values in the entire state of Alaska.

### A. Uses of Wildlife in Alaska

ECONorthwest (2014b) surveyed Alaskan residents and found that well over 50% of respondents felt that wildlife was either "extremely important or very important" to their reason for living in Alaska and their quality of life. Alaskans interact with wildlife through hunting (about 100,000 participants) and wildlife viewing (about 200,000 participants). Of the residents that hunt, slightly less than 10% hunt wolves (moose are the most commonly hunted species). Of the visitors coming to hunt in Alaska, about 20% come to hunt wolves (ECONorthwest, 2014b). However, the vast majority of visitors (90%) that come to Alaska do so to view rather than hunt wildlife. Among Alaska residents and visitors to Alaska, 25% of residents and 40% of non-residents wanted to see wolves on their wildlife viewing trips.

The ECONorthwest (2014b) report briefly summarized what is known from secondary sources about trapping in Alaska, as too few residents participated in trapping to make a survey feasible. In particular, less than 1% of hunters in Alaska are trappers (ECONorthwest, 2014b:29). The ECONorthwest (2014b:30) report also indicates that Alaska contains plentiful areas for traplines. Data obtained by ECONorthwest (2014b:30) indicated that the total estimated value of fur trapping in Alaska in 2010-2011 was $1.54 million with lynx representing about half the value, and wolves representing about $175,000.

Dorendorf (2015) conducted a mail survey of trappers in the interior of Alaska (the geographic area spanning Delta Junction, McGrath, Fairbanks and Fort Yukon). Across the entire sample of 344 active trappers who returned surveys Dorendorf (2015:30) noted that "Outdoor recreation formed the most important motivation to trap in interior Alaska." He also noted that "...economic and subsistence uses of wildlife scored the least important motivations to trap in this study." (Dorendorf, 2015:31). In contrast to EcoNW (2014b), perceptions of interior Alaska trappers in Dorendorf's survey reported that finding access to land for trapping was difficult.

To further investigate the motivations of trappers, Dorendorf performed a cluster analysis of his data. This analysis statistically grouped trappers based on their primary motivations for trapping. Dorendorf found there were four types of trappers: (1) a recreation group (by far the largest group at 40% of the sample); (2) a solitary group (the second largest group); (3) a subsistence group; (4) a wildlife management group. The recreation group is distinguished by their desire to participate in trapping as a way to get exercise and appreciate nature. In contrast, trapping was part of a lifestyle to the subsistence trappers. Dorendorf (2015: 34) noted that in small remote villages, fur was used for "...cultural crafts and ceremonies as well as a source of income in the winter". The "solitary" trappers were distinguished by trapping as an individual activity (as opposed to group or social activity) with

solitude as the primary motivating factor. Finally, the wildlife management group of trappers was motivated in part by the desire to reduce predators for the species the trappers hunted (e.g., moose and caribou). In sum, trappers are not a homogenous group. For many, trapping is a means to other ends, is not heavily dependent on the abundance of the target species.

**B. Economic Impacts of Wildlife Viewing and Hunting in Alaska**

Miller and McCollum (1997) studied non-resident visitor expenditures and net WTP of visitors beyond their expenses. These authors used a diary survey of non-resident visitors including those that were taking trips for multiple purposes (i.e., for some visitors wildlife viewing was only a secondary trip purpose). Given the topic of our study, we focused on the subset of non-resident visitors that came to Alaska primarily to view wildlife. The total trip expenditures of non-resident visitors who came to Alaska primarily to view wildlife were $3,982 in 1994 ($6,361 in $2014).

ECONorthwest (2014a,b) performed a survey of both Alaska residents and non-resident visitors to Alaska about their use and spending related to hunting and wildlife viewing. The economic activity associated with wildlife viewing and hunting was measured in these studies by resident and non-resident visitor spending. Economic impacts were measured by jobs supported by the activity. Hunting expenditures by residents and non-resident visitors supports $457 million in wages associated with 8,400 jobs statewide (Table 1). This hunting activity also provides $112 million in various types of revenue to local and state governments in Alaska. Wildlife viewing provides $976 million in wages to 18,820 workers statewide (Table 1). In addition $231 million in revenues are provided to various levels of government in the State of Alaska.

**Table 1. Economic Activity Associated with Wildlife Viewing and Hunting in Alaska and Denali National Park and Preserve (Denali NP&P), Alaska.** There are several blank cells as not all the studies reported economic activity or economic impacts consistently.

| Area/Activity | Per Visitor Spending per Trip | Total Jobs | Reference |
|---|---|---|---|
| **Alaska** | | | |
| Wildlife Viewing | | 18,820 | (ECONorthwest, 2014a) |
| Wildlife Viewing | $6,361 | | Miller & McCollum (1997) |
| Hunting | | 8,400 | (ECONorthwest, 2014a) |
| **Denali NP & P** | | | |
| Wildlife Viewing | | 2,319 | Stynes & Ackerman (2010) |

### C. Economic Values of Non-Resident's Wildlife Viewing and Hunting in Alaska

Miller and McCollum (1997) surveyed non-resident visitors after their trips to Alaska were completed and asked if the trip was worth more than what they spent. The average additional WTP of a primary purpose wildlife viewing trip in Alaska was estimated (Miller and McCollum (1997: page C-21) at $422 in 1997 ($674 in 2014 dollars). The net WTP dropped to $310 ($495 in $2014) for those that saw no big game (but did see other species such as birds). For those that saw at least one wolf, the net WTP was $539 ($861 in $2014). A simplified comparison of the value of seeing a wolf might be the difference in trip value from seeing a wolf and not seeing any big game. Using this simplified comparison, the additional value from seeing a wolf on a non-resident trip taken primarily for wildlife viewing would be $238 ($366 in $2014).

The survey also asked non-residents about the economic value of a future trip *"...where you could expect to see a pack of wolves either from the ground or from an airplane."* (Miller and McCollum, 1997: page E-11). A dichotomous choice CVM WTP question was designed to elicit an *ex-ante* future

WTP, similar to what economists would call an option price for future viewing use. The net WTP per trip to see a pack of wolves on a future trip was $212 ($339 in $2014). The authors termed this value a gross WTP and used it to measure the potential demand for future wildlife viewing activity. This value per trip is similar to what was calculated above as the additional value of seeing a wolf on a wildlife viewing trip. Using a CVM survey, ECONorthwest, (2014b) estimated that non-residents' net WTP was $765 for a hunting trip and $858 for a wildlife viewing trip to Alaska.

**D. Economic Values of Alaska Residents for Wildlife Viewing and Hunting in Alaska**

ECONorthwest (2014b) used CVM to estimate residents' net WTP of $438 per trip for hunting trips and $268 per trip for viewing trips. While the value per trip to Alaska residents is smaller than for non-residents cited in the prior section, the larger number of trips taken by Alaska residents results in annual resident hunting benefits of $4,828 and $8,050 for viewing, quite a bit larger than non-resident's annual values. The National Research Council (NRC, 1997: 150), using unpublished data, reports that Alaskan residents' net WTP specifically for wolf hunting was $1500 ($2,212 in $2014). This is notably greater than the value of moose hunting of $181 ($273 in $2014) and $168 ($253 in $2014) for caribou hunting.

An additional CVM question was asked by ECONorthwest (2014b) to estimate how much respondents' economic value of a wildlife viewing trip would increase if they could visit an area specifically managed for wildlife, such that they would be assured of seeing one or more species particularly important to them. While the authors of the report indicate the question was not as precise and concrete as would have been desirable, they felt it was indicative of the extra value of a "successful" wildlife viewing trip for species of importance to the respondent. The additional WTP beyond the current trip was $400 per household for non-resident visitors and $150 more for Alaskan

residents. It would seem that this type of question is particularly relevant for valuing improved wildlife viewing in Denali NP & Preserve. While the specific question scenario and wording could be improved, the refined question could be included in future Visitor Service Project (VSP) surveys in Alaska national parks.

As part of the survey, ECONorthwest (2014b) asked about general willingness to pay into a wildlife conservation fund to maintain current wildlife populations and their habitat in Alaska. Their report acknowledged that the question did not specify the decline in wildlife populations that would occur in absence of this payment. But the authors felt the results nevertheless provided some sense of the values of wildlife conservation in general. The survey responses indicated that Alaskan residents would pay $59 per year to maintain wildlife in general, while non-resident visitors would pay $32 per year. Alaska residents were also asked if they would pay for wildlife conservation to maintain the current population and habitat for four types of wildlife (Brown Bears, Seabirds, Caribou and Moose). Alaska residents indicated they would pay $40 a year for Brown bears, $90 a year for seabirds, $53 per year for caribou, and $46 per year for moose. The results provide some information on relative values of these four different types of wildlife. To increase the usefulness for economic analysis the WTP questions could be improved upon, and wolves included as a species in future surveys.

**E. Summary of Resident and Non-resident Values for Viewing and Hunting in Alaska**

Table 2 summarizes studies to date on economic values of viewing wildlife and wolves, as well as big game hunting, and wolf hunting. While non-resident hunting and viewing values are similar, resident hunting values per trip are substantially larger (Table 2). However, as noted in the text, there are twice as many wildlife viewers than hunters (ECONorthwest, 2014b:15). Wolf hunting by residents has a very high value per trip, but the total number of hunters is quite limited.

**Table 2. Economic Values of Wildlife or Wolf Viewing and Hunting in the State of Alaska and Denali National Park and Preserve, Alaska, USA. ($2014)**

| Area/Activity | Per Visitor WTP/Trip | Reference |
|---|---|---|
| **Alaska** | | |
| Non-resident Viewing | $674 | Miller & McCollum |
| Non-resident Viewing | $858 | (ECONorthwest, 2014b) |
| Resident Viewing | $268 | (ECONorthwest, 2014b) |
| Residents Wolf Viewing | $288 | NRC Report |
| Non-resident Wolf Viewing | $339 | Miller & McCollum |
| Resident Hunting | $438 | (ECONorthwest, 2014b) |
| Resident Hunting | $247 | NRC Report |
| Non-resident Hunting | $765 | (ECONorthwest, 2014b) |
| Non-resident Hunting | $650 | NRC Report |
| Residents Wolf Hunting | $2,212 | NRC Report |
| Non-resident Wolf Hunting | $518 | NRC Report |
| **Denali NP & P** | | |
| Wildlife Viewing | $94 | McCollum, et al |

## VII. Visitation and Economic Impacts of Wolf Viewing in Yellowstone National Park (YNP)

The only studies that have estimated the economic impacts associated with wolf viewing itself (as distinct from wildlife viewing in general) have taken place in Yellowstone National Park (YNP). Duffield, et al (2008) estimated that 1.5% of spring visitors to YNP and 5% of fall visitors specifically came to view wolves in YNP. Applying this percentage of visitor use to YNP total visitation and multiplying by average visitor spending in YNP yields $35 million annually. However, even among visitors who come to YNP for reasons other than to view wolves, Duffield et al's (2008) visitor data from the summer of 2005 indicates that 44% of the general visitors stated that wolves were one of the animals they most wanted to see on a trip to YNP. Wolves ranked as the second most important species to view (slightly below grizzly bears).

In a 1993 U.S. Fish and Wildlife Service (USFWS) study for the Final EIS on wolf reintroduction, a contingent behavior or intended behavior question was used to estimate the increase in visitation (if any) from a recovered wolf population in YNP. The study found that reintroduction would result in an estimated 10% average increase in visitation to YNP by residents of MT, ID and WY and 4.8% increase in visitation among those visitors living outside of the three states.

## VIII. Visitors' Use and Existence Value of Wolves in YNP

Duffield et al (1991) and Duffield (1992) conducted surveys of visitors to estimate their Total Economic Value (composed of use and existence values) for wolves in YNP. This section reviews the Total Economic Value (TEV) of visitors and the next section reviews the TEV of non-visiting households. Duffield's two studies utilized the contingent valuation method (CVM) to estimate the existence value portion of a visitor's value. He used visitors' willingness to pay (WTP) for a lifetime membership in a trust fund (what he also refers to as a donation) to support wolf reintroduction in YNP. The visitors are told that wolf recovery may reduce populations of deer, elk, bison and moose in YNP so they are informed of this trade off when answering the CVM WTP question for wolves.

The particular type of CVM used was a dichotomous choice method, where a visitor answers either "Yes, I would pay that amount for a membership" or "No, I would not". The dollar amount of the membership was varied across the sample, so essentially a quasi-demand curve for wolf recovery was estimated. The use of the dichotomous choice method was a strong feature of this study. However as was common at the time, the survey told respondents that the scenario was a hypothetical situation. In the last 10 years CVM researchers no longer use the term hypothetical, but rather emphasize that the respondent's answer could have real consequences to policy decisions made and the likelihood of actual payment in the future. Telling respondents that the survey is hypothetical has the potential to result in increased hypothetical bias in the form of inflated WTP estimates (Carson and Groves, 2007). Thus the reader should keep in mind this concern when interpreting the absolute magnitude of the WTP estimates.

The results of the Duffield et al. (1991) study estimated that median WTP (the amount that 50% of the visitors would pay) was $15.38 ($27.86 in $2014) for visitors living in MT, ID and WY and $20.27 ($36.71 in $2014) for visitors living in the rest of U.S. However, some of these visitors have

relatively higher values for wolf reintroduction, and this is reflected in a higher mean WTP. Even truncating the upper end of the WTP distribution at the highest dollar amount asked in the survey ($300), the mean WTP was $62 ($112 in $2014) for visitors from MT, ID and WY and $97 ($176 in $2014) for visitors from the rest of the U.S.

Using two different innovative methods to separate TEV into use and existence value, Duffield et al. (1991) found that MT, ID, and WY visitors' existence value for wolves ranged between 46% and 61% of their TEV. Using the same procedures, the existence value of out-of-region visitors ranged from 74% to 75% of their TEV for wolves. The fact that much of the TEV is existence value, even for visitors, suggests the importance of including existence value for wolves and not just focusing on visitor use values when calculating the societal or national benefits of maintaining and protecting wolf populations.

Duffield (1992) did a follow up CVM study of visitors to YNP the following year using basically the same procedure as the year before except for one important difference. An innovative feature of the Duffield (1992) study of the divisive issue of wolf reintroduction was to the tailor the CVM WTP question to whether the respondent initially indicated they were in favor of or opposed wolf reintroduction. If they favored it, they were asked what they would pay into a trust fund to **support** wolf recovery. If they opposed it, the respondent was asked what they would pay into a trust fund where the money would be used to **oppose** wolf reintroduction.

In this CVM study Duffield (1992) estimated that YNP visitors **favoring** wolf recovery/reintroduction have a median WTP into the trust fund of $23 ($40 in $2014) to aid wolf recovery. Those visitors **opposed** to wolf recovery/reintroduction had a median donation of $1.68 ($2.82 in $2014) to a trust fund for a policy effort to stop wolf reintroduction. Given that there were nearly three times as many visitors that would purchase a wolf recovery membership (i.e., donate to

the pro-wolf trust fund) as there were visitors who opposed, the overall median WTP is quite similar to the $40 in 2014 dollars. Once again, the mean WTP was substantially higher than the median WTP. In particular, those favoring wolf reintroduction would pay on average $65 ($113 in $2014) while those opposing would pay $21.24 ($37 in $2014). Consistent with the previous summer survey, about three-quarters of the overall visitor TEV was existence value, once again illustrating the importance of including existence values. The conclusion of these economic studies that ask respondents either WTP to support wolf recovery or WTP to oppose wolf recovery is that while there is certainly a segment of visitors that do not favor wolves, in the aggregate, the benefits to those that want wolves are substantially large than those that do not. Specifically, the mean WTP of visitors favoring wolves is three times larger compared to those opposed to wolves ($65 versus $21), and there are three times as many visitors favoring wolves than opposing wolves. Taken together, the aggregate WTP of visitors favoring wolves is nine times that of those opposed to wolves. Thus the benefits to those visitors favoring wolves outweigh the reduction in benefits to those visitors opposed to wolves.

## IX. Use and Existence Value of U.S. Households for Wolves

### A. Yellowstone NP Wolf Reintroduction Program

Duffield, et al. (1993) conducted a phone CVM survey of households in the Greater Yellowstone Area (GYA)—made up of the counties in ID, MT and WY contiguous to YNP (the primary area of the wolf reintroduction). As part of the same study, the same CVM survey was conducted on a sample of U.S. households living outsides of the GYA. The same structure of CVM WTP questions were asked of households as was done for visitors: those who stated they were in favor of wolf reintroduction were asked their WTP for it, and those opposed were asked what they would pay to prevent wolf reintroduction. As in the visitor survey, households were told the CVM WTP questions

were hypothetical, something no longer done in CVM surveys. Thus, the reader should keep in mind that there is a potential for the absolute magnitude of the WTP estimates to be somewhat higher than would otherwise be the case had respondents not been told the survey was hypothetical.

Given this CVM study design with two geographic areas (GYA and rest of the U.S.) and two WTP questions (one for those respondents favoring wolf reintroduction and one for those opposing wolf reintroduction), there are four WTP estimates. The estimates are:

a. GYA local residents WTP **for** wolf reintroduction of $22.69 ($38 in $2014), with an n=189.

b. GYA local resident WTP to **oppose** wolf reintroduction of $2.63 ($4.45 in $2014), with an n=212.

c. Rest of U.S. households WTP **for** wolf reintroduction of $8 ($13.50 in $2014), with an n=753.

d. Rest of U.S. households WTP to **oppose** wolf reintroduction of 16 cents with an n=368.

As can be seen in these four estimates of WTP, those in favor of wolf reintroduction have a WTP that is nearly ten times higher than those opposed. While the number of households in the GYA are nearly evenly split for and against, in the rest of the U.S. there is nearly a two to one split in favor of wolf reintroduction. Combining the respective WTP's and sample proportions, the aggregate benefits are overwhelmingly positive. The aggregate benefits range from at least $12 million ($20 million in $2014) to $38 million ($64 million in $2014), with the range dependent on different aggregation assumptions made by Duffield, et al.

A slight re-analysis of the Duffield et al. (1993) CVM study results were used by the USFWS in its Final EIS on the reintroduction of gray wolves into Yellowstone National Park and Central Idaho. The inclusion of households use and passive-use/non-use values in the EIS provides evidence that federal agencies feel the CVM methodology in general, and its specific implementation in the wolf study, contributes valuable information to the wolf management policy decisions.

**B. Wolf Habitat Protection in Minnesota**

Chambers and Whitehead (2003) estimated the benefits of protecting wolf habitat for two different communities in Minnesota within the range of the wolves by using a CVM survey of households (this study was described in detail in the prior section entitled Methods for Quantifying Economic Values). The results indicated that Ely, Minnesota households would pay between $4.43 and $4.77 (about $7 in $2014) "*... for protecting wolf habitat and that of wolves primary prey.*" St. Cloud, Minnesota residents were willing to pay between $20.15 and $21.49 (about $31 in $2014) for the same public good.

Table 3 summarizes the Total Economic Values in the literature reviewed above. As might be expected, visitor values are substantially about household values. Values of households that live nearer wolves are higher than households that live away from wolves.

**Table 3.** Total Economic Values (use and non-use/existence and bequest values) that the visitors and households would pay to either reintroduce wolves into the GYE or protect wolf habitat and their prey to maintain stable wolf populations in Minnesota **($2014)**

| Location | One time WTP | Authors |
|---|---|---|
| **Yellowstone NP** | | |
| Visitors living near GYE* | $112 | Duffield, et al. 1991 |
| Visitors living in rest of US | $176 | Duffield, et al. 1991 |
| Visitors living in rest of US | $113 | Duffield 1993 |
| Households living near GYE | $38 | Duffield, et al. 1993 |
| Households in living in rest of US | $13.50 | Duffield, et al. 1993 |
| ***Minnesota*** | | |
| Ely MN Households | $7 | Chambers & Whitehead |
| St. Cloud Households | $31 | Chambers & Whitehead |

* GYE is Greater Yellowstone Ecosystem, generally counties in Idaho, Montana and Wyoming contiguous to Yellowstone National Park.

**C. Summary of Data Gaps**

While the report to this point indicates that some information exists on the economic value of wolves in 2 areas in the lower 48, and for Alaska in general, little is known about the economic value of wolves in and around DNPP. Wolves in and around DNPP are likely to provide economic benefits to: (a) an unknown number of visitors coming to the DNPP primarily to view wolves; (b) the general public of the U.S. through existence values of a self sustaining wolf population in DNPP; (c) wolf hunters around DNPP and (d) trappers around DNPP. In the following sections we identify the types of studies needed to quantify the economic benefits that wolves provide to these four different stakeholder groups.

*A.* **Data Gaps About Visitors to Denali NP and Preserve (DNPP)**

i. What percent and how many visitors to DNPP come for the primary purpose of viewing wolves?

ii. What expectations did people bring to DNPP about viewing wolves?

iii. What basic knowledge do visitors have regarding the wolf population in DNPP? In Alaska? In the U.S.?iv. What are the expenditures of these visitors in the DNPP region and State of Alaska?

v. Did these visitors see a wolf, and if yes, how many?

vi. If they saw a wolf, what are these visitors' net WTP for their experience?

vii. If they did not see a wolf, what are these visitors' net WTP to be certain they would see at least one wolf?

viii. How would their trips to DNPP change if they could see a specific increase in the number of wolves?

ix. How would their net WTP increase if they could see a specific increase in the number of wolves?

x. How do visitors divvy preferences for wolf and other wildlife viewing?

xi. How do visitors perceive the notion of *paying* for wolves?

xii. What is the intrinsic value of wolves for visitors to DNPP? And broadly, in the U.S.?

**D. Data Gaps about Big Game Hunting and Trapping around DNPP**

*Hunters*

As noted by NRC (1997) little is known about big game (caribou and moose) hunters around DNPP. In particular it would be important to know what percentages of hunters' motivations are primarily: (1) harvesting for meat; (2) trophy hunts; (3) to be with family and friends; or (4) to be in the out of doors. This information would provide insights into how important the abundance of big game is for the decision to (1) purchase a big game hunting license; and (2) make multiple hunting trips.

*Trappers*

While ECONorthwest (2014b) indicated that not a great deal is known about Alaska trappers, that data gap has narrowed with the thesis of Dorendorf (2015) in August of 2015. This thesis provides significant amounts of information on motivations for trapping and determinants of trappers' behavior. However, this effort covers Interior Alaska broadly, so segmenting Dorendorf's data down to the geographic areas of interest (around the boundaries, particularly eastern boundary of DNPP would be needed to determine if the thesis contains sufficient data or a more localized survey is required).

### C. Data Gaps about Household Use and Existence Values

In its review of the Alaska predator control program the National Research Council (NRC is part of the National Academy of Sciences), stated that values of wolves include not only use values such as viewing, hunting, and fur but also non-use or passive-use or existence values to households that may never see a wolf in the wild (NRC, 1997:9). The NRC (1997: 9) states that the current magnitude of the existence values for wolves is not known because the necessary studies have not been conducted in Alaska or for the Alaskan wildlife species. The NRC indicates that the Contingent Valuation Method (CVM) is one of the only methods capable of estimating these existence values. The absence of information on existence values of wolves is an important gap to fill to improve wildlife management in Alaska. Along these lines the NRC (1997:12) recommends more social science research in Alaska is needed to support management decisions related to wolves.

## XI. Study Plan to Fill Data Gaps

### A. Visitor Surveys at Denali NP and Preserve

The most straightforward approach to address existing data gaps would be to conduct a survey of visitors to DNPP. This survey will target three major visitor groups: those on a tour, those using a shuttle bus to camp or day hike, and those trekking overnight in the backcountry. The shuttle buses should be canvassed, to capture the diversity of day hikers, wildlife viewers, bikers, and international groups that populate the shuttles. The overnight backcountry users should be sampled due to the different expectations, especially regarding wilderness experience, they bring to DNPP. Finally, the tour buses should be canvassed for the dominant tour user type of higher income, age, American (non-Alaskan) and white. Following the design of prior DNPP wildlife surveys (McCollum, et al. 1998), we recommend distributing surveys during the last leg of the bus tour back to the entrance Visitor

Center. This time of survey distribution would: (a) minimize inconvenience to visitors' experience; (b) provide the most reliable responses since they will have just experienced their trip so that recall bias would be at a minimum; (c) obtain a very high response rate (which is necessary if this survey must go through OMB); (d) be a relatively cost effective survey approach (as more than a dozen surveys, one to each group/family of visitors, could be obtained at one time on a single bus); (e) allow some degree of external validity of the surveys by comparison with wildlife viewing records kept by the bus driver. Ideally the surveys would be conducted throughout the summer, including weekdays and weekends (to increase the odds of intercepting an Alaskan resident).

*1. The type of questions to be asked to fill data gaps*

a. What were the primary and secondary purposes of their trip to DNPP? One of the response categories for primary purpose and secondary purposes would be "viewing wolves". Collectively responses to this question would provide data on what percent and how many visitors to DNPP come for the primary purpose and secondary purposes of viewing wolves.

b. Whether they saw a wolf, and if yes, how many.

c. What is the visitor's WTP for their current trip. To obtain WTP, a dichotomous choice CVM question for the visitor's current trip into DNPP would be asked. We would statistically test if the economic value of a trip to DNPP is significantly affected by whether they saw a wolf, and if yes, by the number of wolves they saw. An increase in trip cost would be the payment vehicle.

d. For visitors who reported they did not see a wolf, they would be asked a second CVM WTP question to estimate their value of a trip in which they would be certain to see a wolf. This question will test the relative importance of wolves in the visitor's economic benefits from a trip to DNPP. We would also ask if they would take more trips if they could be certain they would see

a wolf on each trip. This question tests the responsiveness of trips taken (and hence visitor spending) to presence of wolves in DNPP.

e. For visitors who reported they did see at least one wolf, they would be asked their WTP to see some reasonable (to be determined) increase in the number of wolves. This would allow us to estimate how the benefits of the trip change with the abundance of wolves seen. We would also ask if they would take more trips if they would see some reasonable increase in the number of wolves. To obtain a better understanding of whether wolves play a critical role in determining whether to visit DNPP, we could ask if they would have made their trip to DNPP if they did not expect to see any wolves.

f. Trip expenditures in and around DNPP (disaggregated by spending category) would be asked so that we would know if the visitor spending is significantly different among those visitors who came to view wolves versus general DNPP visitors.

g. Attitude questions regarding wildlife, wolves, hunting, and trapping would be asked to obtain an understanding of what DNPP visitors think of consumptive uses of wildlife in general, and wolves in particular.

h. Demographics (zip code, age, education, membership in conservation organization, race/ethnicity, and income). This information will help provide a demographic profile of visitors who came to view wolves in contrast to the general DNPP visitors.

i. On other factor that may be worth recording are weather conditions, which may influence visitor satisfaction.

2. *Prepare Office of Management and Budget (OMB) Survey Clearance Package*

If the survey is funded by an agency of the Federal government (e.g., NPS) then Office of Management and Budget (OMB) clearance would be needed even before conducting pretests. The

clearance process begins with filling out two packages of information for OMB for approval. The two packages include the agency's need for the information to be obtained by the study, and the entire study design. The study design and survey design would start with the prior survey of McCollum, et al. 1998. The study team would revise the survey with feedback from Dr. McCollum, and input from NPS staff at DNPP. Specifically, the study design would address procedures for implementing the survey, the survey design (with justification for each question being asked), sample design including sample size determination, and statistical analysis procedure. Several months of review and revision is typically required before OMB usually approves the survey.

*3. Pre-test the survey*

The approved survey would be pretested over the course of two weeks with a total of 30 people completing their bus tour. The pre-test would occur at a NPS facility such as the Visitor Center at the end of their trip. A monetary incentive (typically $80 per person) is usually required to get people to sit down and take about an hour to go over the survey. In order to have a good representation of visitors, one person from each returning bus would be invited to participate in the pre-test. The selection of buses would alternate between the Shuttle Bus going only to Eielson Visitor Center and those buses going to Wonder Lake, as well as a bus from the Tundra Wilderness Tour. Each section of the questionnaire would be read, questions answered and then discussed to ensure that the visitor interpreted the questions as they were intended by the survey designers. A complete "debriefing" would also be conducted to obtain feedback on the skip patterns, question response categories, and overall layout of the survey.

*4. Revise the survey with feedback from the pre-test*

A second small pretest of 10 people (also paid $80) would be required to make sure any issues raised in the original pre-test have been completely resolved and that no new issues have arisen.

*5. Sample frame and selecting a representative sample*

Before discussing the sample size, it is important to discuss how the sample would be selected in order to ensure the sample is representative of visitors at DNPP. First, we define the sample frame as "those visitors riding buses into the park" as these are visitors most likely engaged in sightseeing and wildlife viewing in DNPP. In particular, visitors on the Shuttle Bus, the Tundra Wilderness Tour and Kantishna Experience Tour will all be sampled. However, they will be sampled in proportion to their share of the total amount of visitor use. In addition, one adult person from each group/family will be sampled so as not to double-count trip expenditures. This person can of course consult with other family or group members to determine their answers. The group size will be reported as part of the survey. One weekend day (alternating between Saturday and Sunday) and four week days (selected at random) would be sampled.

*6. Sample size*

A relatively large sample is needed because a dichotomous choice WTP question will be used, and because visitors who do not see wolves will get a different WTP question from those who did see wolves. Guidance from Dillman (2000) for surveys in general, and Champ (2003) for CVM, suggests that a population of 100,000 requires a minimum of 383 completed surveys would be sufficient to obtain a ±5% sampling error (95% confidence interval in a conservative 50/50 population split). Given that there are three major types of buses (shuttle bus, and two types of tour buses) each of which have different prices and may attract different types of visitors, I recommend 380 surveys be collected from each of the three types of buses. This will ensure the composition of the final combined sample will represent a cross section of the three different types of busvisitors to DNPP. Special attention should be given to the tour bus, Tundra Wilderness Tour, because it is set aside from the other tour and shuttle bus offerings as a specifically "wildlife viewing safari" tour.

As previously mentioned, visitors to DNPP that are trekking overnight into the Park must be surveyed to capture the effective variance of visitor demographics, and their assumed divergent recreation goals and expectations.

*7. Printing final survey booklets*

Following Dillman (2000), the survey questions would be contained in an eight page survey booklet. The booklet would consist of an interesting cover, 6 pages of questions (with demographics being the last inside page), and a blank back cover for the visitor to write comments. The surveyors will conduct non-response checks, especially focused on residency, so as to develop an appropriate weighting mechanism regarding the oversampling that will occur of non-Alaskans. Additionally, an Alaska specific survey will be mailed to a random selection of households in the greater Denali area to compare responses of visitors to non-visitors to DNPP.

*8. Implement survey over the summer season*

Starting Memorial Day weekend and going through Labor Day, 2 people would be employed to hand out surveys on the return trip back to the visitor entrance. One employee would ride the Shuttle Bus and one would ride one of the Tour Buses each sampling day. Each employee would also maintain a count of the types of wildlife and number of wildlife seen to corroborate visitor counts of wildlife sightings. Each employee would work 4 week days and 1 weekend day. One person from each group or family on the bus would be selected to answer the survey for their family or group. A target of 10 visitors per bus per day to hand out surveys to would be ideal.

*9. Data Entry and Error Checking*

Data entry would occur via spreadsheet for compatibility with statistical packages. Two forms of data error checking would occur: (a) screening data for maximum and minimum values to ensure data is within ranges allowed for in surveys (e.g., 0, 1 for dichotomous variables like gender), and that there

are no outliers; and (b) a small subsample of surveys would be re-keyed and compared to the original surveys to determine the accuracy of the original coding.

The non-response checks mentioned above will be coded and combined with the compiled visitor survey dataset, in order that a split-halves reliability check is feasible and accurate in testing the independence of recorded observations, and a heteroskedastic distribution of error terms.

*10. Statistical analysis*

Descriptive statistics for the three types of bus trips and for the overall sample for all variables would be presented either in tabular form in the main report or in an appendix. The dichotomous WTP questions would be analyzed using logistic regression model. A two part model may be employed to better estimate the actual dollar value visitors (and later Alaskan, and U.S. households) attribute to wolves, as the a 2-part model first models the likelihood of visitor type to have an expectation of wolves, and then, based on their expectation, how much in dollars they would be willing to pay to fulfill these wolf viewing expectations. The mean and median WTP would be calculated for the three types of bus trips and the overall sample. The sample WTP results would be scaled up to the population using the number of visitors riding each type of bus over the summer.

*11. Draft report writing*

A draft report presenting the methodology employed, sample design, sample implementation, descriptive statistics, WTP results, and providing interpretation of what these results imply about wolf viewing would be written.

*12. NPS review of draft report*

*13. Report revision in response to NPS review comments and final report.*

**Costs Associated with the Visitor Study**

There are two major types of costs associated with this study:

*Fixed costs to design, prepare OMB package and pretest the survey*

This would require Ph.D. level social scientist/economist with training and experience in conducting visitor non-market valuation surveys. Depending on whether the person is an NPS employee or external to NPS (e.g., academic's or consulting firm employees), the labor costs would be on the order of $45,000. The travel costs for scoping out the logistics of the survey and pretesting would be in the range of $10,000 given the high expense in traveling to and staying in the area around DNPP. The actual pre-testing participant costs would be $3,200. I assume a NPS facility would be available free of charge to conduct the pre-test interviews.

*Variable costs of conducting the survey*

Printing: about 1200 survey booklets, cover letter and envelopes: $3,600

Labor for sampling days: Assume a GS-9 level employee working 10 hours a day (due to the length of typical bus rides) and being paid $28 an hour for eight hours and $40 an hour for two hours overtime, the cost per day would be $304. With 60 sampling days this would be $18,240 without benefits.

Data entry: Assume the same GS-9 level employee for data entry, 20 minutes to input data for each survey and 1200 surveys is 400 hours for a total data entry cost of $10,400.

Statistical analysis: this would be conducted by a Ph.D. social scientist/economist. The cost is estimated to be $30,000 given there are three sub-samples to analyze plus a total sample.

Draft report writing: this would be conducted by a Ph.D. social scientist/economist. The cost is estimated to be $30,000.

Final report writing: this would be conducted by the same Ph.D. social scientist/economist who wrote the draft report. The cost is estimated to be $15,000 to make the revisions and finalize the report.

Thus an estimated direct cost of the entire effort would be $165,440 without employee benefits and any overhead. Table 4 summarizes the budgetary costs of the study.

Table 4. Summary of Estimated Costs for DNPP Visitor Survey

| Cost Element | Est. Cost |
|---|---|
| **Labor** | |
| Study/Survey Design | $ 11,250 |
| Prepare OMB Pkg | $ 11,250 |
| Pretesting Survey in AK | $ 11,250 |
| Revise & Finalize Survey | $ 11,250 |
| Visitor Sampling | $ 18,240 |
| Data Entry | $ 10,400 |
| Statistical Analysis | $ 30,000 |
| Draft Report Writing | $ 30,000 |
| Revise & Finalize Survey | $ 15,000 |
| **Subtotal Labor** | **$ 148,640** |
| **Travel** | |
| Pretesting travel to DNPP | $ 10,000 |
| **Other Expenses** | |
| Participant Incentives | $ 3,200 |
| Survey Printing | $ 3,600 |
| **Total Study Costs** | $ 165,440 |

## Study Timeframe

The time from needed for the initial overall study design, initial survey design, and preparation of OMB package would be three months. There would be about 4 months of waiting for and engaging with OMB to obtain their approval (only about 1 work month required during this time for engaging with OMB and revising study plan and OMB package). Depending on the timing of the OMB approval, this could determine whether the survey would be implemented during the summer of 2017 or 2018. The actual survey pre-testing, implementation, analysis and report writing would be about 8 months. Thus the total work time would be about 11 months with an additional 1 month of conference calls and OMB package revisions for a total of 12 months of work if all goes well at OMB. These 12 work months might stretch over two years however, depending on the timing of the OMB review relative to the summer visitor sampling season.

**B. Hunter Surveys**

To fill the data gaps identified for hunting we would ideally work with Alaska Dept of Fish and Game (ADFG) to obtain a list of big game hunters (caribou, moose) in Game Management Unit #20. The particular units to sample are 20A (on the eastern boundary of the Denali National Park), and 20C (which includes Denali National Park and areas to the north of the Park). In addition, a list of hunters engaged in wolf hunting would need to be obtained. Then a mail survey of hunters in the region around DNPP would be undertaken to fill the data gaps identified by NRC. In particular, the surveys would ask about their harvest success rate, expenditures and net WTP for their current hunt. Then questions would be asked regarding how their number of trips and net WTP would change with a specified (perhaps varying across the sample) lower harvest success rate. In addition, a question would be asked regarding whether the possible lower harvest success rates would reduce their likelihood of

buying a hunting license for the next season (e.g., if the lower success rate were expected next hunting season for their target species, would that influence their decision to buy a license?).

If it is not possible to obtain licensing information for these two Game Management Units directly from ADFG in the near term, there are two other options that are possible (pers comm T. Brinkman):

1. Partner with Dr. Todd Brinkman to develop a proposal to ADFG to perform the survey described above as Dr. Brinkman has good working relationships with ADFG.

2. Develop a working relationship with the local Advisory Committee (AC) made up of local hunters (and anglers) who develop recommendations for the Alaska Board of Game. In particular, the Minto/Nenana Advisory Committee would be the relevant one for the Game Management Units around DNPP. The goal would be to develop a shared vision of the types of data gaps that need to be filled by the survey, types of questions to be asked to fill those data gaps, and the mechanics of performing the survey. If the Advisory Committee were to recommend hunters surveys for Game Management Units 20A and 20C, Dr. Brinkman suggested that the Alaska Board of Game and then ADFG might honor that request and provide hunter license lists for those two Game Management Units. Such a collaboration with the Minto/Nenana Advisory Committee is a long term option. This hunter survey would also need to be coordinated with ADFG's post harvest season surveys to clearly differentiate them in the minds of hunters and not have the surveys go out at the same time.

At this time it is premature to go into details on sample size and other study details. We do know that if a survey can be accomplished it would likely be a mail survey given that we want hunters to:
(a) indicate on a map of the Game Management Unit roughly the general area where they hunt;
(b) provide detailed information on hunter expenditures in and around the Denali Borough;
(c) respond to willingness to pay questions.

**C. Household Total Economic Value Surveys (TEV)**

A survey of a random sample of Alaskan and rest of the U.S. households regarding the amount they would pay to maintain a stable population of wolves in DNPP would be a more significant undertaking than the visitor and hunter surveys. While nearly all households in Alaska and the rest of the U.S. are certainly aware of wolves, it can be challenging to communicate with the lay public the ecological importance of wolves to the DNPP ecosystem, a possible management plan, and an equitable means of paying for the management plan. The study design would involve 11 steps.

*1. Draft Initial Survey*

A team of Ph.D. economists and social scientists would start with the prior TEV surveys for wolf reintroduction in YNP, and re-orient the survey to fit the situation in DNPP with input from Dr. Duffield who conducted the YNP surveys (and who is recommended to serve as a consultant on this study). The general survey outline would include: (a) background on DNPP, wildlife and wolves; (b) questions about attitudes toward National Parks, wildlife, hunting, wildlife viewing, and wolves; (c) current wildlife management issues; (d) proposed management program to address the problem (e.g., land acquisition, easements, compensation payments, etc); (e) how the Program would be funded (e.g., federal income tax); (f) willingness to pay question, protest response question for those stating they would not pay their "bid amount"; (g) demographics including gender, age, education, ethnicity, zip code, whether they hunt, membership in wildlife, conservation and environmental organizations and income.

2. *Circulate the survey to NPS DNPP staff and wolf biologists, conduct conference calls and revise the survey accordingly.*

*3. Prepare Office of Management and Budget (OMB) Package*

Since the survey is funded by an agency of the Federal government (e.g., NPS) then Office of Management Budget clearance would be needed even before conducting the focus groups with the general public. This involves filling out two packages of information for OMB for approval. The two packages include the agency need for the information contained in the survey, and the entire study design. Specifically, the OMB package would present procedures for conducting the focus groups, the survey design (with justification for each question being asked), sample design including sample size determination, and statistical analysis procedure. Several months of review and revision is typically required before OMB usually provides approval.

*4. Conduct Focus Groups*

Organize two focus groups of the general public in Alaska, and 4 general household focus groups in the lower 48. These focus groups are essential to establish face validity of the survey. Specifically, to determine whether respondents understand the survey materials and questions they are reading as intended by the researcher. This face validity check can be done in the focus group by introducing each section of the survey separately, having the participant read that section, and answer the questions, and then a group discussion of the material. This is repeated until all the pages of the survey have been reviewed. The team then takes the marked up survey sheets and points from the discussion (as recorded on flip charts) and revises the survey. This process repeats itself sequentially through the series of focus groups over the course of several months. Usually, it is most effective to start the focus group process with a relatively knowledgeable population, in this case, Alaska residents. If the survey is not clear to knowledgeable Alaska residents it will not be clear to those in the lower 48 who are less familiar with wolves and Denali NP and Preserve. Scheduling of the focus

groups would be sequential with 1-2 weeks between each focus group to allow the team to revise the survey prior to the next focus group.

*5. Survey Pretesting*

After the focus groups, formal pre-tests can be conducted to refine the range of the dollar amounts households will be asked to pay in the survey. The pre-tests can be a phone recruitment followed by a mailed survey followed by a phone discussion of each part of the survey. About 30 of these are needed in different places in the U.S. After the first 10 pre-tests refinement of the survey could be made, then the other 20 pre-tests conducted.

*6. Finalize Mail Survey Package*

(a) draw an address-based sample (total n=6,000); I would propose that a minimum sample of 2,000 Alaska residents be made so that we have an adequate subsample of Alaska residents to compare to the lower 48 states where n=4,000; with an expected 25% response rate, this would provide 500 Alaska resident responses and 1,000 lower 48 responses. Both of these samples are over the n=380 recommended by Dillman (2000) and Champ (2003) to provide ±5% error; (b) write an advanced cover letter; (c) finalize survey booklet mailing with new cover letter, postage paid return envelope and a $2 bill; (d) write reminder postcard; (e) write second survey mailing cover letter to non respondents of survey, print replacement surveys and postage paid return envelope; (f) do phone reminders for the portion of the non respondents with phone #'s; (g) perform non-response follow up check questions of a sample of non-respondents using added survey incentive.

*7. Data Entry and Error Checking*

Data entry would occur via spreadsheet for compatibility with statistical packages. Two forms of data error checking would occur: (a) screening data for maximum and minimum values to ensure data is within ranges allowed for in survey questions (e.g., 0, 1 for dichotomous variables like gender), and there are no outliers; (b) a small subsample of surveys would be re-keyed and compared to the original surveys to determine accuracy of original coding.

*8. Statistical analysis*

Calculate descriptive statistics for the subset of Alaska residents and the lower 48 sample for all the variables. The results would either be presented in a tabular format in the main report or in an appendix. The dichotomous choice WTP questions would be analyzed with a logistic regression model. The mean and median WTP would be calculated for Alaska residents and the lower 48. The sample WTP results would be scaled up to the population using the total number of households in the respective populations.

*9. Draft Report Writing*

A draft report presenting the methodology employed, sample design, sample implementation, descriptive statistics, WTP results, and providing interpretation of what these results imply about wolf management options would be made.

*10. NPS Review of draft report*

*11. Report Revision in response to NPS comments and final report.*

**Costs Associated with the TEV Study**

*1. Survey Development Costs*

a. Personnel Costs: There are fixed costs to design the survey, develop the OMB package and respond to OMB, conduct six focus groups, revise surveys after each focus group, and conduct pretests of the

survey. The personnel involved in these tasks should ideally be Ph.D. level social scientists and economists with training and experience in conducting household non-market valuation surveys. The labor costs can range from $60,000 to $80,000 depending on the number of people involved and their pay rate (GS level, academic rank, etc.).

b. Six Focus Group Costs: Focus groups can be held at hotels or professional focus group facilities. When the focus groups are held at a hotel conference room and each respondent is paid a $90 participation fee then the total "out of pocket" cost is about $2,500 per focus group. This covers focus group participant recruitment, conference room fees, coffee, and focus group supplies (flip charts). Focus groups at professional facilities cost about $5,000 each but they recruit and pay participants, provide light refreshments, flip charts, etc. These professional facilities offer the possibility of video links for off-site observers or recording the focus group on DVD's. Thus the decision of whether to use a "do it yourself" focus group in a hotel or a professional facility depends on how involved the other members of the team want to be in the focus groups and the available budget. Thus the costs of six focus groups range from $15,000 for hotel focus groups to $30,000 for professional facilities. Of course half the focus groups could be at hotels and half at professional facilities, which would make the costs $22,500. Travel for the two focus group moderators is a total of $2,000 to $3,000 per focus group depending on the location, so total travel cost for six focus groups is $12,000 to $18,000.

c. Pre-test Costs: The primary costs are participant incentives ($90 per person), minimal printing and mailing costs ($10 per survey express mail).

d. Peer review of survey and report: About $10,000 should be budgeted for a peer reviewer to help in developing and peer reviewing the survey and the results in the report.

*2. Variable Costs of Conducting the Survey*

a. Printing: printing the 5,000 surveys for the initial mailing of the color 8 page survey booklets, cover letters and outgoing and return envelopes would be $30,000 for the first mailing.

b. Survey response incentive: A $2 survey participant response incentive has been found to be very effective at increasing survey response rates and is recommended by Dillman (2000). The survey participant incentive would cost $12,000.

c. Postage: First class postage out 10x12 envelope and first class back ($3.60) so first mailing postage is $20,000.

d. Follow up mailings: Second mailing to 85% of the initial sample (assumes a 15% initial response rate) is $25,500. Postage is A third mailing for a survey non-response check to a subset of 500 non-respondents by special mail (USPS Express Mail @$6.50 plus first class return of $1.50, for a total of $8) is $4,000.

e. Data entry: Assuming 20 minutes to input data for each survey and 1,500 returned surveys is about 500 hours for a total data entry cost of $10,000 based on $20 per hour wages.

*3. Statistical Analysis*

This would be conducted by a Ph.D. social scientist/economist. Given the two subsamples (one for Alaska, one for lower 48), the cost is estimated to be $20,000 to $30,000 depending on GS level or academic rank of analyst.

*4. Draft report writing*

Writing would be conducted by a Ph.D. social scientist/economist. The cost is estimated to be $30,000 to $40,000 depending on GS level or academic rank of writer.

5. *Final report*

A final report would be written which incorporates responses to NPS comments. The cost is estimated to be $15,000 to $25,000 depending on the GS level or academic rank of writer.

Thus an estimated cost of the entire effort would range from $270,800 to $346,800 without employee benefits and any overhead. The lower range assumes two Ph.D. social scientists/economists leading the design and the OMB submission as well as all six focus groups at hotels without video streaming or DVD. The upper level assumes three Ph.D. social scientists/economists and all six focus groups at professional focus group facility with video streaming or DVD of focus group. Table 5, presents a summary of the TEV study costs.

Table 5. Estimated Costs of TEV Study

| Cost Element | Min Estimate | Max Estimate |
|---|---|---|
| **Labor** | | |
| Study/Initial Survey Design | $ 7,750 | $ 11,000 |
| Prepare OMB Pkg | $ 7,750 | $ 11,000 |
| Conduct 6 Focus Groups | $ 14,400 | $ 21,600 |
| Revise survey after Focus Groups | $ 5,400 | $ 7,200 |
| Pretesting Survey | $ 13,500 | $ 18,000 |
| Revise & Finalize Survey | $ 11,200 | $ 11,200 |
| Data Entry | $ 10,000 | $ 15,000 |
| Statistical Analysis | $ 20,000 | $ 30,000 |
| Draft Report Writing | $ 30,000 | $ 40,000 |
| Revise and Finalize Report | $ 15,000 | $ 25,000 |
| Labor Subtotal | $ 135,000 | $ 190,000 |
| **Travel** | | |
| 6 Focus Group | $ 12,000 | $ 18,000 |
| Presentation of Results | $ 3,000 | $ 3,000 |
| Travel Subtotal | $ 15,000 | $ 21,000 |
| **Other Expenses** | | |
| Focus Group Cost (facility, fees) | $ 15,000 | $ 30,000 |
| 30 Pre-tests Participant Fees | $ 2,700 | $ 2,700 |

| | | |
|---|---|---|
| 30 Survey Express Mail | $ 300 | $ 300 |
| Peer Review of survey, analysis | $ 10,000 | $ 10,000 |
| Printing surveys, envelopes | $ 59,500 | $ 59,500 |
| Postage 1st & 2nd mailings | $ 33,300 | $ 33,300 |
| Other Expenses Subtotal | $ 120,800 | $ 135,800 |
| **Estimated Total Costs** | $ 270,800 | $ 346,800 |

### Time Needed for the TEV Study

The time for initial study design would be about three months to do initial survey design and sample design, one month to develop OMB package for submission, four months waiting and responding to OMB (only about one month of work), six months of final survey development work (focus groups and pretesting), four months of data collection (with data entry occurring as surveys are returned), two months data analysis and two months of reporting, one month report review and one month report revision. Thus a total of a minimum of 21 months of work spread over as much as 24 months (two years) from start to finish.

## XII. Conclusion

There is no doubt that wolves are a high profile species, and one whose management has been controversial (Huey, 2016). Yet, at present there is insufficient economic information to inform wolf management decisions at a regional level (National Research Council--NRC, 1997; Iverson and Borg, 2012). While there is data and literature about the economic values of general wildlife viewing in Alaska, there is little known about wolf viewers' economic benefits and their trip spending in the DNPP region specifically. Likewise, little is known about wolf, caribou and moose hunter and wolf trapper expenditures. To my knowledge there is nothing known about wolf trapper economic benefits. This may be due in part, to the possibility there are very few wolf trappers, especially in the region near DNPP.

Nothing is known about the non-use (existence and bequest) values of wolves in DNPP to Alaska residents and to lower 48 populations.

A coordinated social science research program is needed to fill the data gaps related to wolf management in Alaska (NRC 1997) and inform management of wolves in and around DNPP specifically (Iverson and Borg, 2012). Established methods exist to fill all of these data gaps and have been used in other regions of the U.S. for economic valuation of wolves and for other species in Alaska. Our report detailed the types of methods and studies that would need to be conducted to fill the identified data gaps.

Visitor surveys of wolf viewers and hunters can be conducted in a fairly straightforward manner. Nonetheless, survey development, the OMB approval process, pretesting, data collection, and statistical/economic analysis require careful thought, adequate time (8-14 months for viewer survey) and budget for implementation (about $165,000 for viewer survey—see text for detailed budget). The U.S. (Alaska and lower 48) household non-use value surveys are more challenging in terms of time and budget to design and implement, and would take up to two years from start to finish, and cost in the range of $270,800 to $346,800 . However the general household survey can be done at any point in the year. The visitor surveys would need to be implemented during the summer season. The hunter surveys would need to be implemented after the hunting season, and no doubt after, Alaska Department of Fish and Game does its post-harvest survey. In sum, filling the economic data gaps to inform wolf management in and around Denali National Park and Preserve is amenable to research and can help provide a quantifiable comparison of the economic values of wolf viewing, hunting, wolf trapping and passive-use/non-use benefits.

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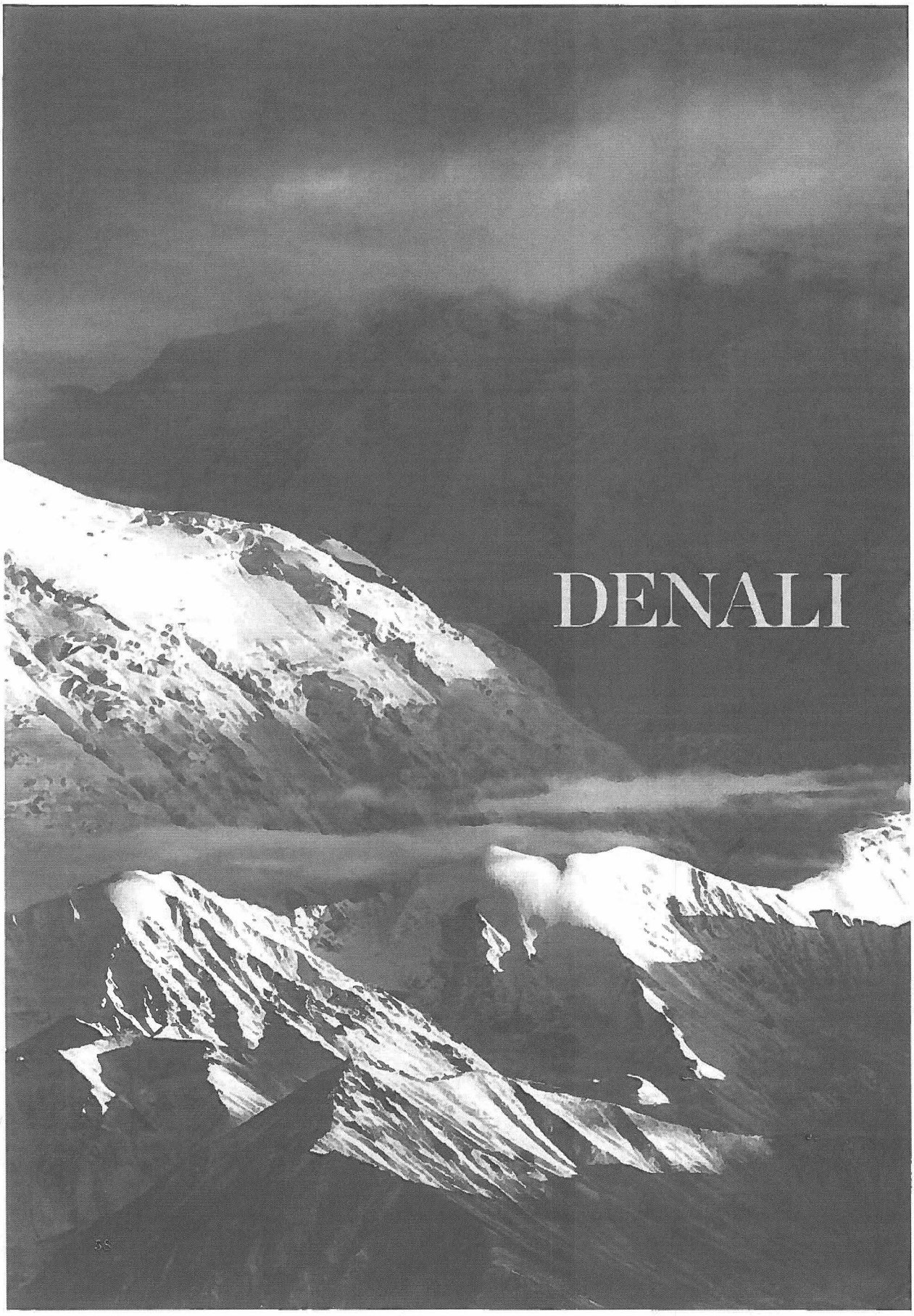
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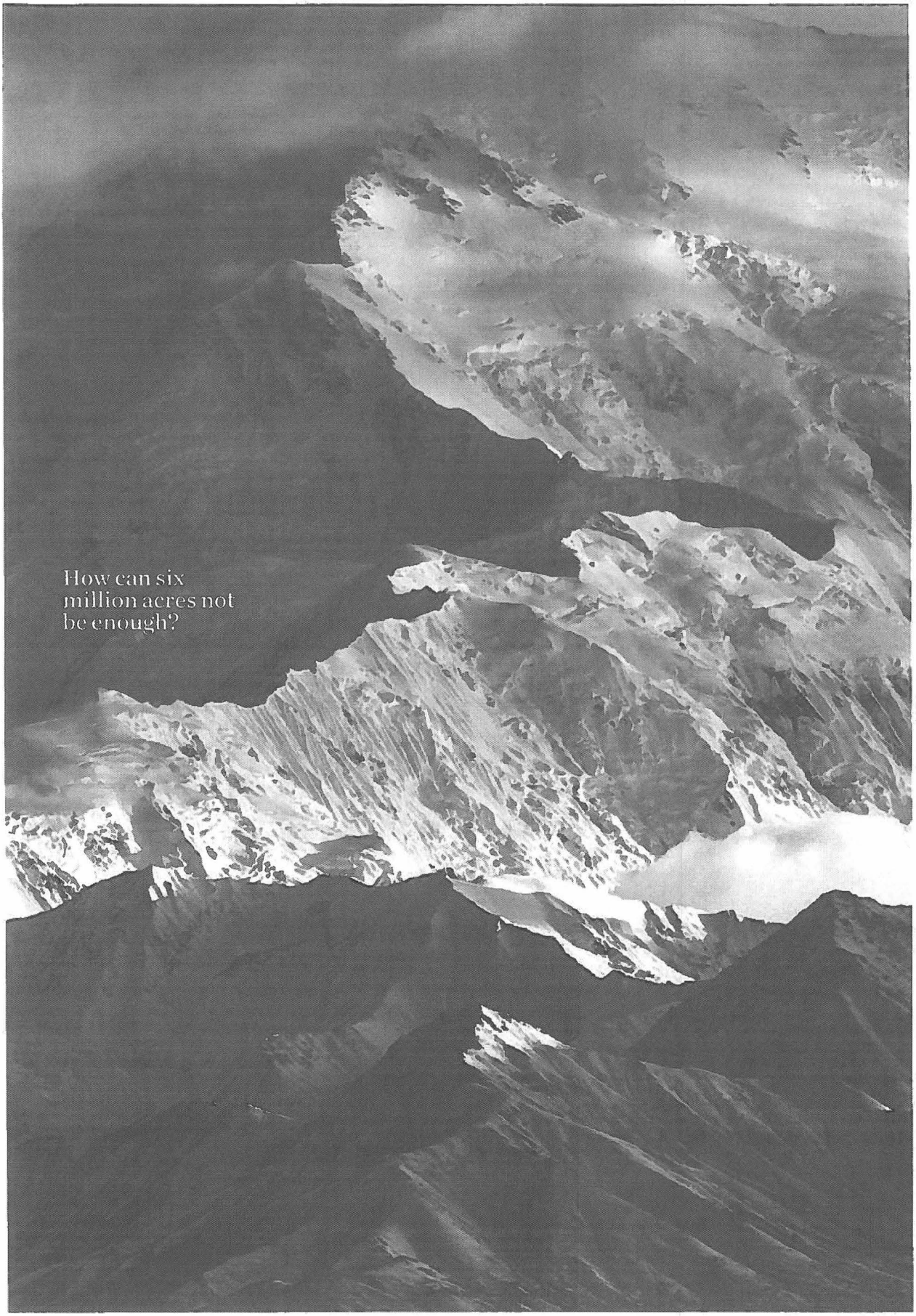
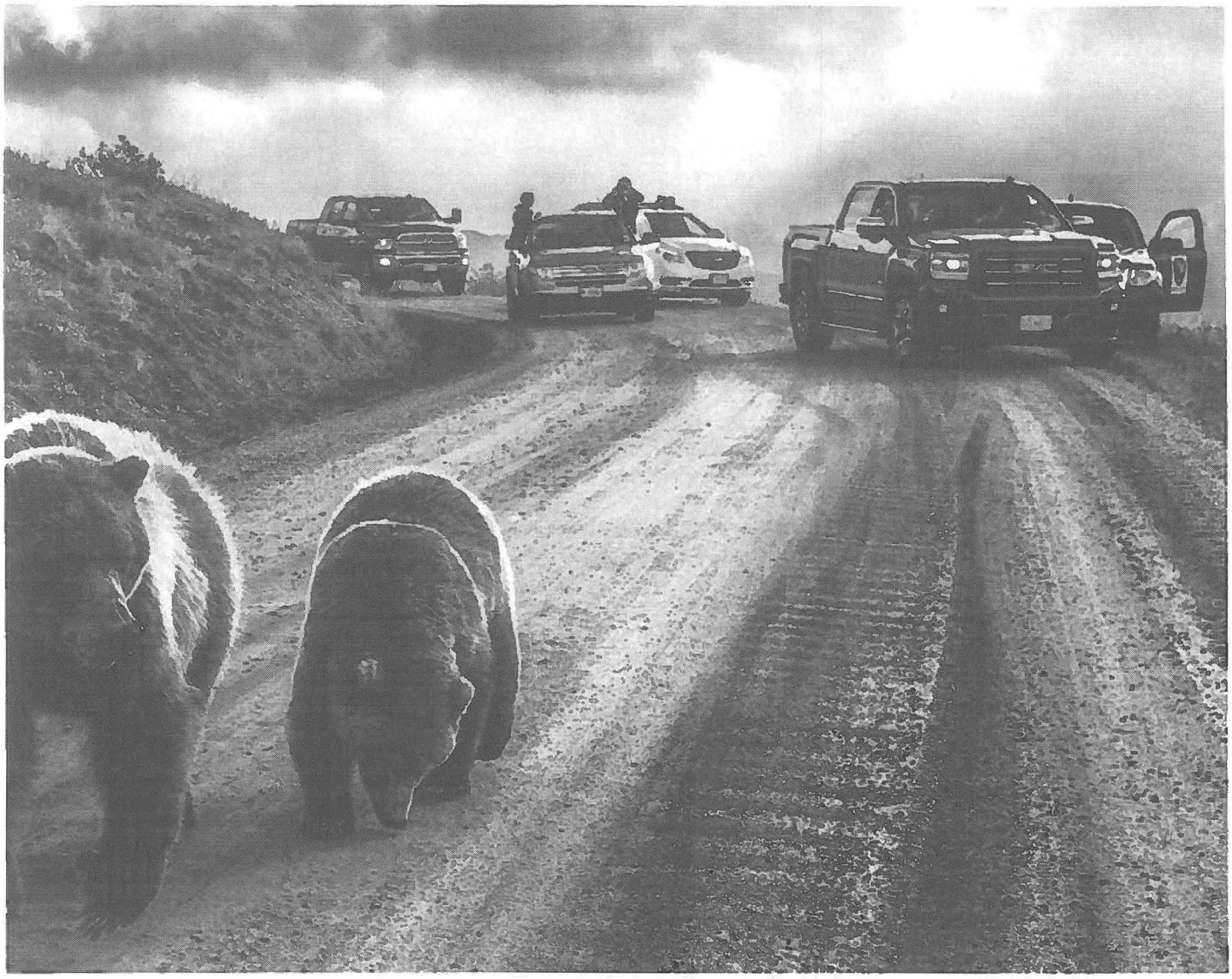
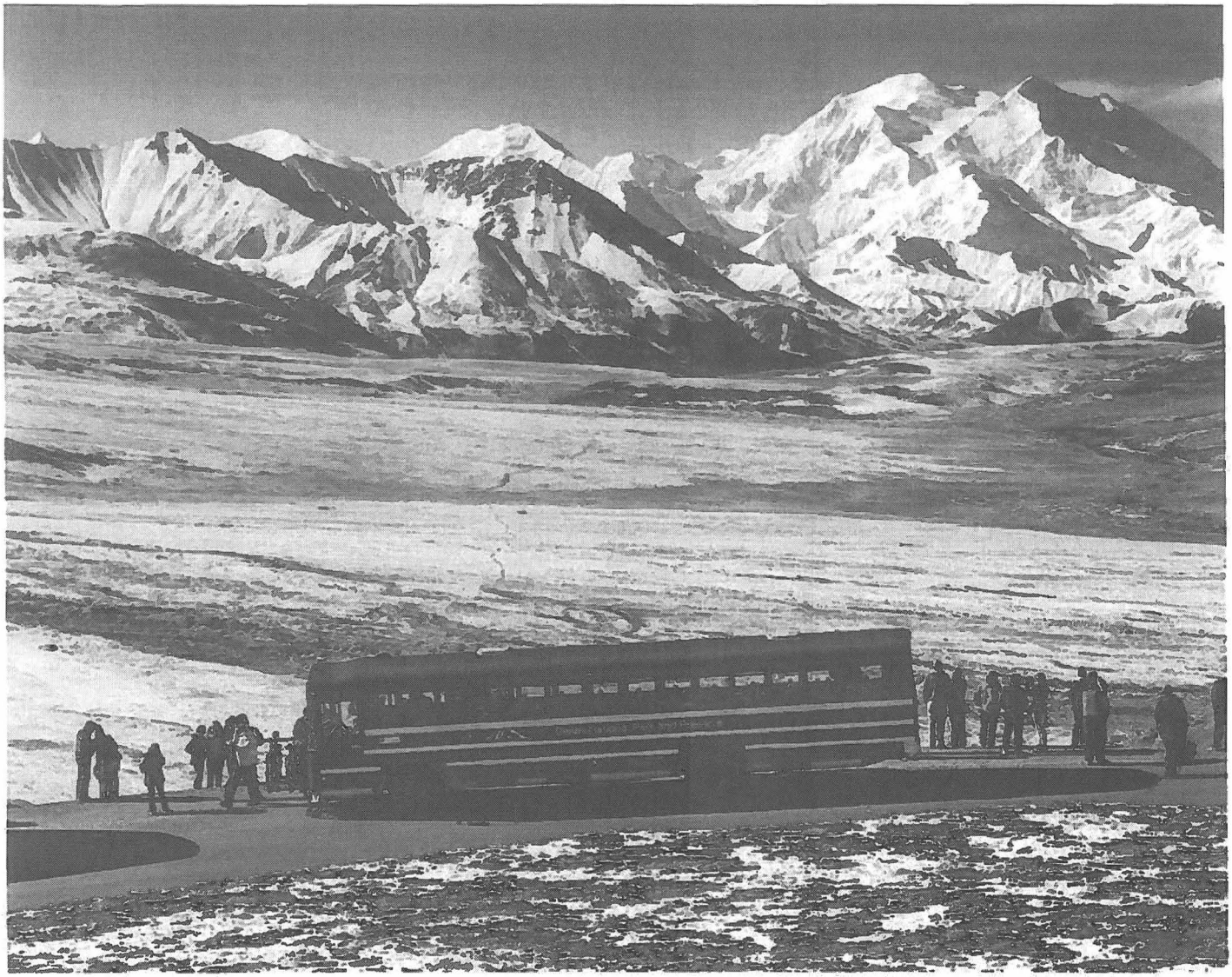
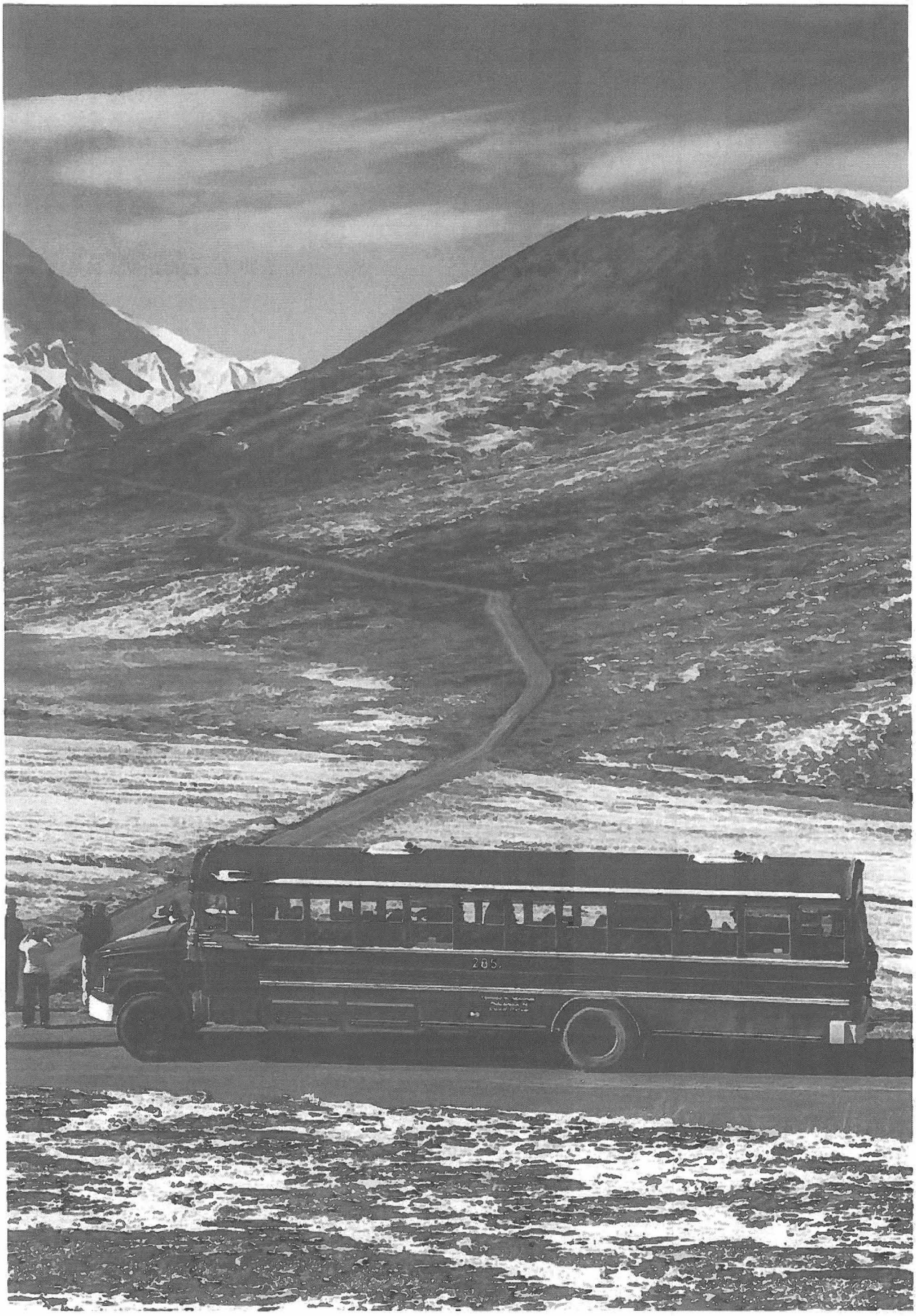

How can six
million acres not
be enough?

A mother grizzly and her cubs cause a "bear jam" on Denali's 92-mile-long Park Road, open to private vehicles only five days each summer. Most visitors travel the route by Park Service bus (following pages), frequently spotting wildlife but rarely catching a cloudless glimpse of the park's namesake peak (preceding pages).



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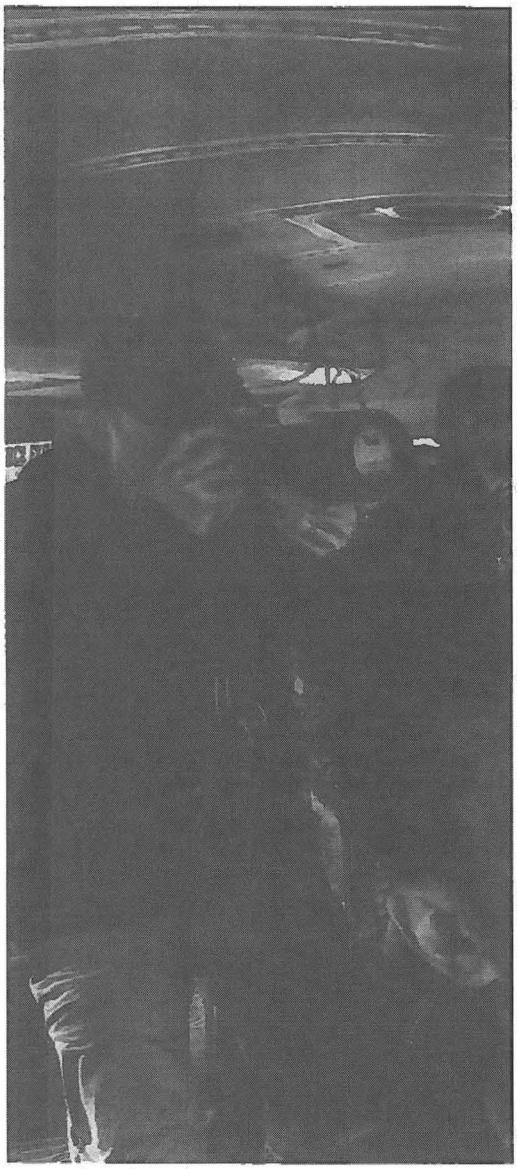


*By Tom Clynes*
*Photographs by Aaron Huey*

Park rangers here call the high season—from June through early September, when Denali National Park and Preserve hosts the majority of its 500,000 annual visitors—the "hundred days of chaos." Indeed a midsummer morning at the park's Wilderness Access Center, located at the start of Denali's fabled 92-mile-long Park Road, can feel a bit like rush hour at Manhattan's Port Authority Bus Terminal. Loudspeakers announce bus boarding times, and visitors from many nations crowd the ticket counter.

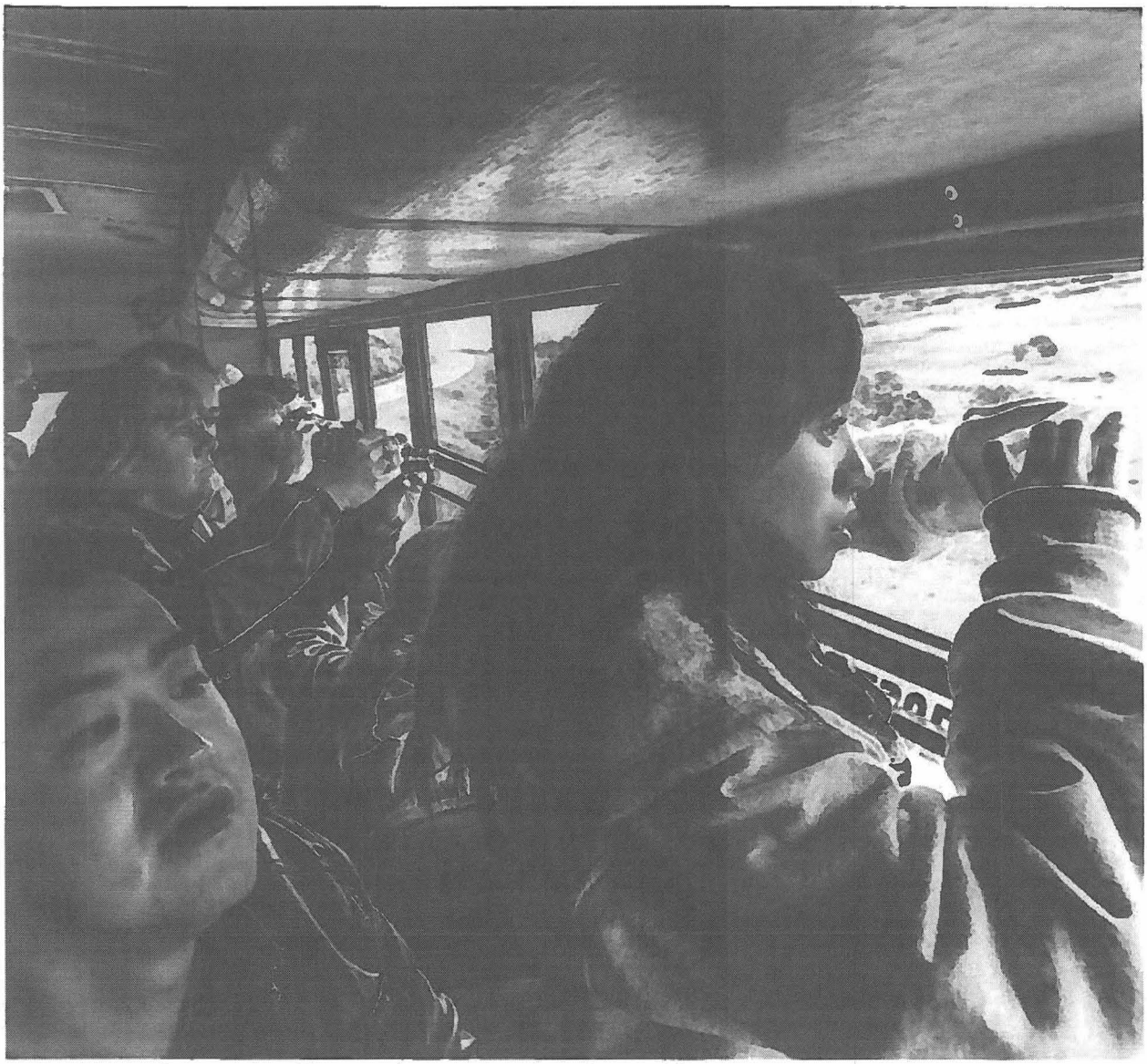
Most of Denali's visitors are cruise ship passengers who see the park and its prolific wildlife largely through bus windows. "But if you're seeking solitude, it's not hard to find," says ranger Sarah Hayes, who helps backpackers and hikers prepare for their adventures. "We've got six million acres of mostly trailless lands where wild animals roam undisturbed. And it's accessible to anyone who hops off the bus."

As my bus rolls out, noses press against windows, hands clutch cameras, and people speaking half a dozen different tongues excitedly speculate about wildlife sightings. I ask several passengers what's on their wish list. "A moose!" "A grizzly!" "Caribou!" "A wolf!"

At the five-mile mark we spot our first animal. "Squirrel!" a kid yells, bringing the bus to laughter. After the 15-mile mark, the road turns to dirt and empties of cars. A few miles farther along the trees disappear. As the distant peaks of the Alaska Range come into view, the scale of this kingdom of nature becomes apparent. The driver slows down.

"It's been hiding for two weeks now," he says, wheeling the vehicle through a tight turn. "But there's a pretty good chance that today..." As the towering mountain comes into hazy view, a dozen voices sing out, "Denali!"

Rising 20,310 feet above sea level, North America's tallest peak is a stunning sight,



Hefting cameras and calling out in a multitude of accents, park visitors entreat bus drivers to stop when wildlife comes into view: moose, bears, caribou, sheep—and, ever more rarely, wolves.

although in warm weather its slopes are often shrouded in clouds. The mountain was a big part of the legend and lore of the Athabaskan-speaking people who gave it the name Denali, meaning Tall One. In 1896 gold prospector William Dickey renamed it Mount McKinley in honor of Ohio politician William McKinley, a staunch champion of the gold standard who one year later would become the nation's 25th president. For decades Ohio's congressional delegation successfully blocked attempts to rename the mountain. Then last summer the Obama Administration used its executive power to restore the original name.

Seeing the mountain, spotting a grizzly, or catching a glimpse of a wolf are the top three reasons people give for coming to Denali. As recently as 2010, a visitor stood a better chance of seeing a wolf in the wild than seeing the elusive Tall One, which is visible on just one in three summer days. But since 2010 the number of wolf sightings has plunged. According to a study of wildlife viewing opportunities along

the Park Road, observers recorded wolf sightings on only 6 percent of trips in 2014—down from 45 percent in 2010. Park biologists report that the number of wolves inside the park has dropped from more than 100 a decade ago to fewer than 50 last year. I came to Denali, in part, to discover why.

"I HATE TO CALL the weatherman a liar, but there's no way it was 30 below zero down there," pilot Dennis Miller says, as our ski-plane climbs away from the snowy airstrip at park headquarters. Bundled in half a dozen layers and wedged behind him in the tiny cockpit, I watch Miller shake his head. "I'll be surprised if it gets that warm all day," he says.

A few minutes later we hear the day's first radio-collared wolf in our left headphones, as an antenna on the plane's left side picks up its signal. Miller turns the aircraft and the beeps equalize, left and right. The chirping gets louder as we cross the park boundary and fly over the Stampede corridor, a notch of state, borough, and private land also known as the Wolf Townships.

"That'll be the female in the East Fork pack," Miller says. "Back in November we counted at least 15 wolves, but we found the collared male dead two weeks ago, on March 6. I've only seen a single set of tracks since then."

Following the signal, Miller descends and zigzags through a river valley where a lone wolf track heads into the trees. He throws the plane over on its left wingtip and peers down. "I'm just going to make one pass," he says, pulling the plane tighter into the turn and squinting toward the ground. "Some of the guys in these houses here, if they see me circling, they'll come out and try to find what I'm looking at and shoot it."

I've spent the previous four days flying with Miller and National Park Service biologists, whose focus turns to wolves during the snowy, light-filled days of March. Each time they've spotted a wolf inside the park that they want collared, they've called in a helicopter team to swoop down and dart it. With the animal tranquilized, biologists fit it with a collar. They also take blood and hair samples, hoping to fill some of the many gaps in what we know about the health, behavior, and genetics of one of the world's most misunderstood animals.

The research is an extension of the pioneering work of ecologist Adolph Murie, one of the first scientists to study Denali's wolves in the wild. In 1939, when Murie made the first of his many expeditions to what was then Mount McKinley National Park, wolves were considered vermin, and Park Service rangers had a history of shooting them on sight. Murie's research showed that wolves and other top predators play an essential role in healthy habitats, and he argued that we should manage parks to protect entire ecosystems rather than individual species.

Other influential scientists and thinkers would follow Murie to Denali, whose wide-open and mostly treeless mountainscapes are ideal for observing wildlife. This sprawling swath of still wild America would inspire and anchor many of the lofty ideals now considered part of the DNA of the National Park Service and incite great shifts in thinking on the role of parks and their protectors. It was here that many of the now accepted values of environmental protection and science-based decision-making gestated. The Wilderness Act has roots here, and the seeds of some of the nation's most influential environmental initiatives were planted here.

Denali has also had an outsize impact on the hundreds of thousands of nonscientists who arrive each year with dreams of a thrilling wildlife encounter and depart with a much deeper connection with the natural world. "We see it all the time," says Park Superintendent Don Striker. "They come here to snap a few pictures and get some bragging rights about being 50 feet from a grizzly. In the course of experiencing this natural drama, something clicks. They go away wanting to protect places like this."

Yet Denali has always been an uneasy paradise. The park was created in 1917 as a refuge for Dall sheep and other game animals, and its first rangers found themselves chasing poachers who supplied meat to miners and railroad builders. This tug-of-war between use and preservation would become the fundamental tension

of the national parks. Even today there are few places where it's felt as intensely, or dealt with as creatively, as it is here. The tension extends from Denali's sometimes crowded summit to its remote traplines. It reaches from the skies surrounding the mountain, which often buzz with sightseeing flights, down to the ears of solitude seekers in the trailless valleys below.

"A lot of things about this park are confusing to people," says ranger John Leonard. "It's wilderness, but then people are landing planes in some places and hunting and trapping in

## THIS TUG-OF-WAR BETWEEN USE AND PRESERVATION WOULD BECOME THE FUNDAMENTAL TENSION OF THE NATIONAL PARKS.

others. That's the difference with Denali—it's not locked up. And that's what makes it so challenging to manage."

"WAS THAT YOU FLYING around the other day in a red-and-white Super Cub?" Coke Wallace asks when we meet outside his home on Stampede Road. "We thought maybe you guys were radio tracking a wolf. I almost went over to see if there was anything I could shoot."

Wallace is a trapper, hunter, guide, and self-described "extreme right-wing redneck." As he shows me his extensive collection of traps and snares and a very large wolf hide stretched over a drying rack, he gets a call on his mobile phone. Its ringtone is a wolf's howl.

"Contrary to popular opinion, I don't hate wolves," he tells me. "In fact, I think they're cool as hell. Only problem is, every five to seven years I catch the wrong wolf."

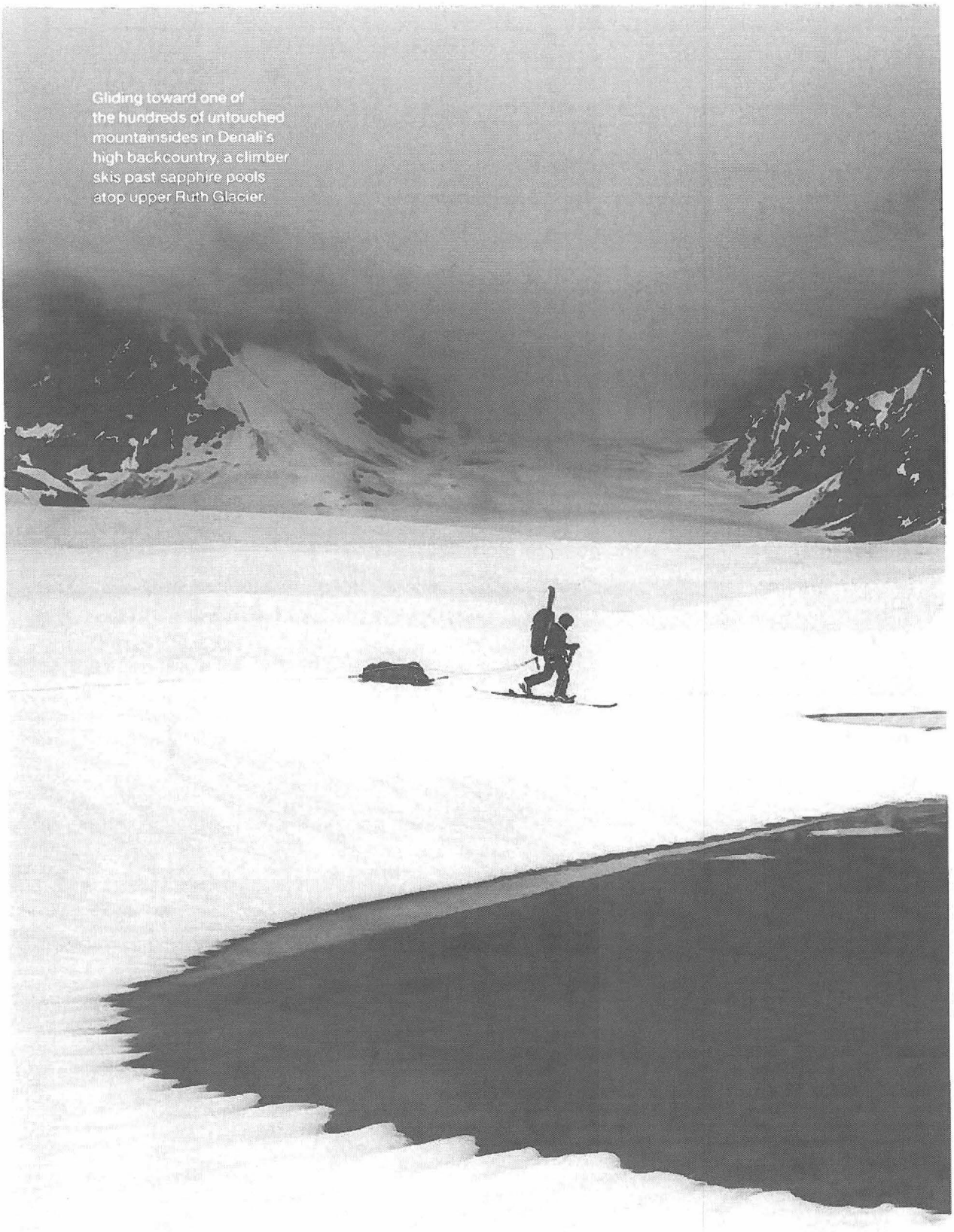
In 1999 Wallace shot a collared alpha female in the Grant Creek pack, which had been highly visible to visitors on the Park Road. In 2005 he caught the East Fork pack's alpha female in a trap set just outside the park boundary. In 2012 he dragged a horse carcass to a site where wolves were active and set traps and snares around it. When he returned a few days later, he'd trapped a pregnant female belonging to the East Fork pack. The kill, documented by a neighbor and later confirmed by Wallace, landed him in the *Los Angeles Times* and generated both death threats and a boost for his guiding business. That same year Wallace caught the only remaining breeding female in the Grant Creek pack, which often roamed just outside the park boundary. The pack consequently produced no pups and fell from 15 members to 3.

"That was the third time I ruined millions of people's Denali National Park viewing experience," Wallace quips.

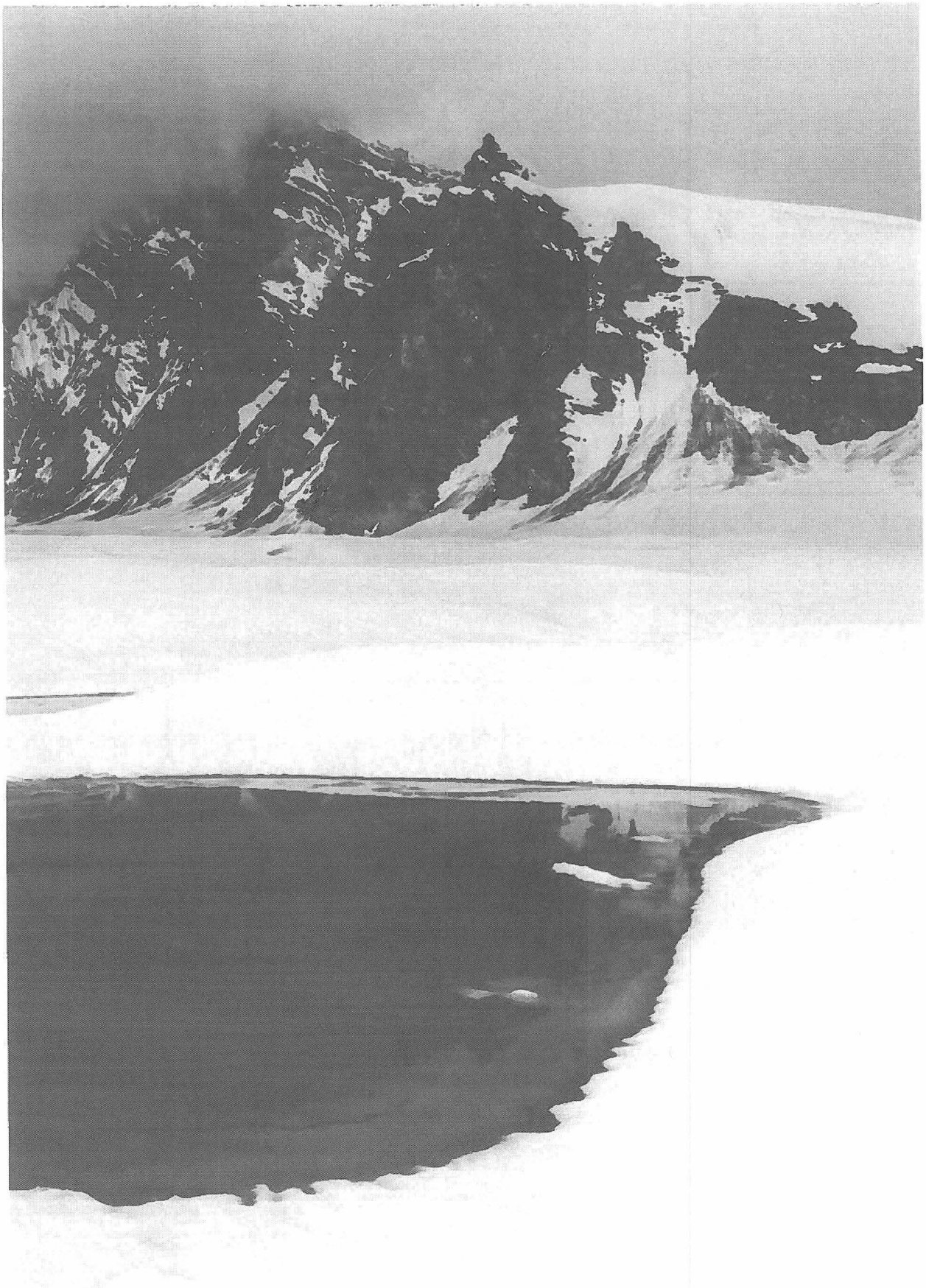
Until a few years ago a wolf that strayed near Wallace's turf would have been off-limits. But Denali's most vulnerable wolf packs are at the center of some ugly politics. In 2000 Gordon Haber, the celebrated and outspoken wolf biologist who continued Adolph Murie's research, observed trappers laying snares along the park's boundary. He joined with others and persuaded the Alaska Board of Game to establish a no-kill buffer zone along the Stampede Trail and in the Nenana Canyon area. After Haber died in a plane crash in late 2009, the Park Service requested an expansion of the protected area. The board responded by eliminating it completely, making wolves vulnerable to trapping and hunting all around the park boundary.

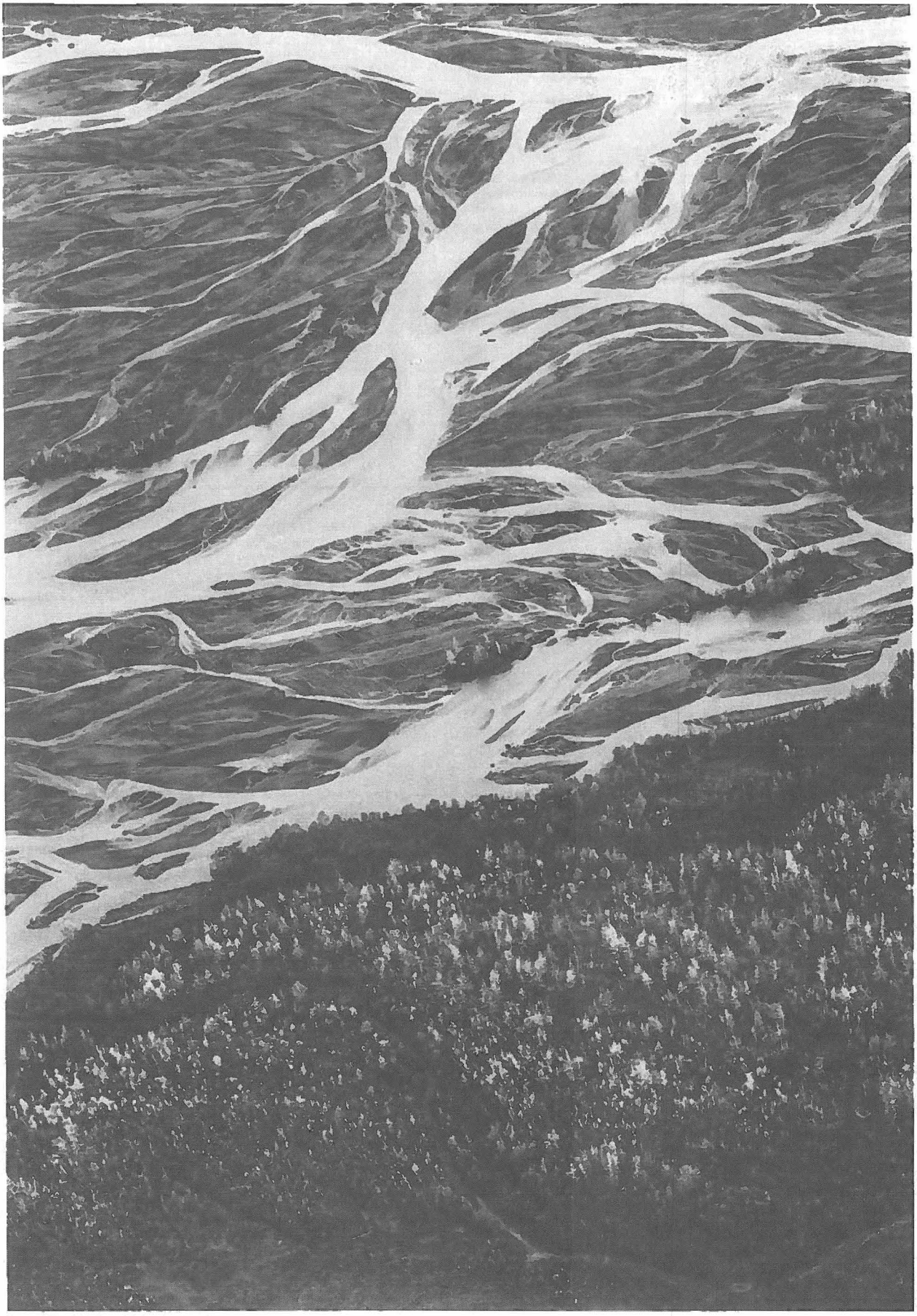
"We increased it twice, but it was never big enough," explains Sam Cotten, commissioner of the Alaska Department of Fish and Game. "The last proposal was for another significant increase, and the feeling was that the federal government created that border and that's the line. So we went back to a harder boundary."

Although the Park Service halted its predator control decades ago, *(Continued on page 82)*



Gliding toward one of the hundreds of untouched mountainsides in Denali's high backcountry, a climber skis past sapphire pools atop upper Ruth Glacier.





Spreading through its broad valley in ever-shifting braids, the McKinley River carries meltwater and silt down from the continent's highest mountain range.

# Wolf Crossing

Denali National Park is one of the few places where people can see gray wolves in their natural habitat. Visitors can try to spot them from the shuttle buses along the 92-mile Park Road, but wolf numbers have dropped over the past decade. Contributing factors could be lower snowfalls, which help prey evade wolves, and trappers just outside park boundaries.


**1896**
Gold prospector William Dickey names the area's highest peak Mount McKinley.

**1902**
Geologist Alfred Brooks organizes the first mapping expedition in the mountain area.

**June 7, 1913**
A team led by Harry Karstens and Hudson Stuck is the first to summit Mount McKinley's south peak.

**February 26, 1917**
Congress creates Mount McKinley National Park. 1,591,897 acres

**1923–1938**
The NPS constructs the 92-mile Park Road.

**1960**
Bradford Washburn publishes the first topographic map of Mount McKinley.

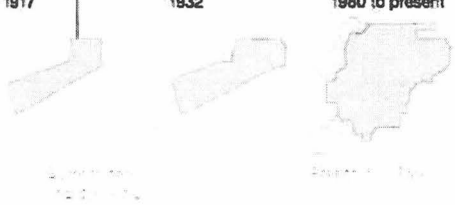
**June 1972**
The NPS closes Park Road to cars and institutes a shuttle-bus system to safeguard the wilderness.

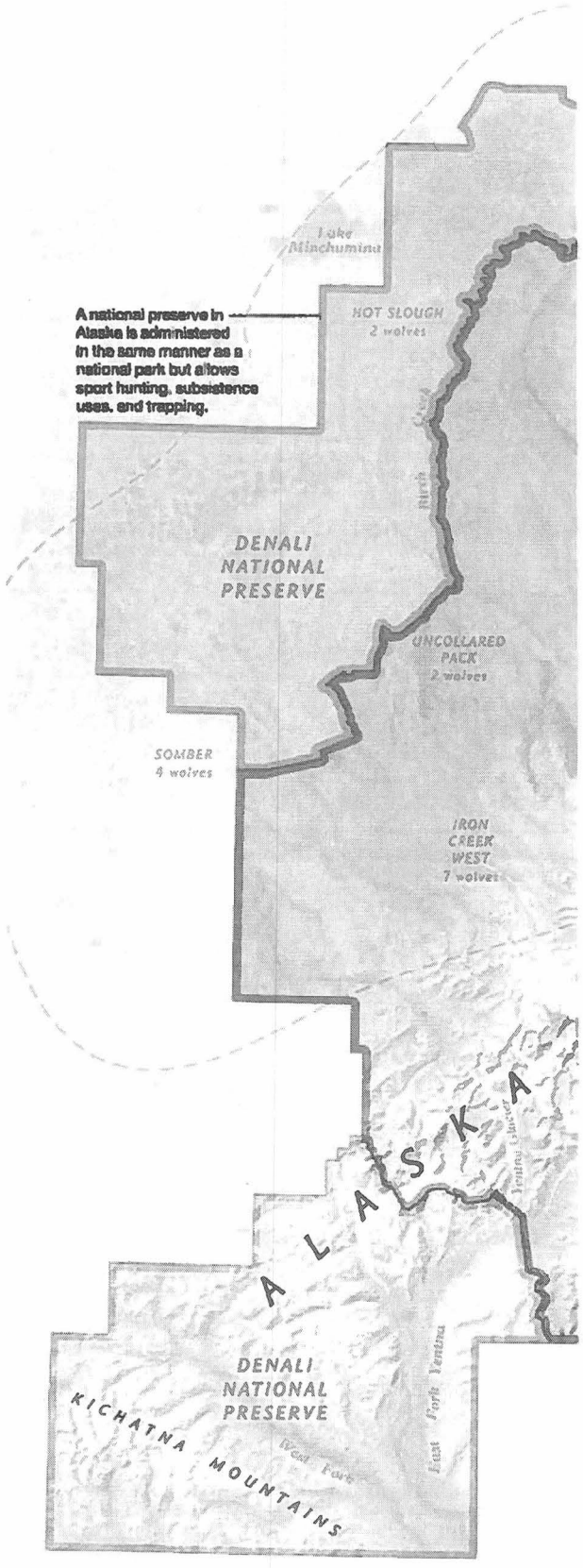
**December 1, 1978**
President Jimmy Carter establishes Denali National Monument. 3,890,000 acres

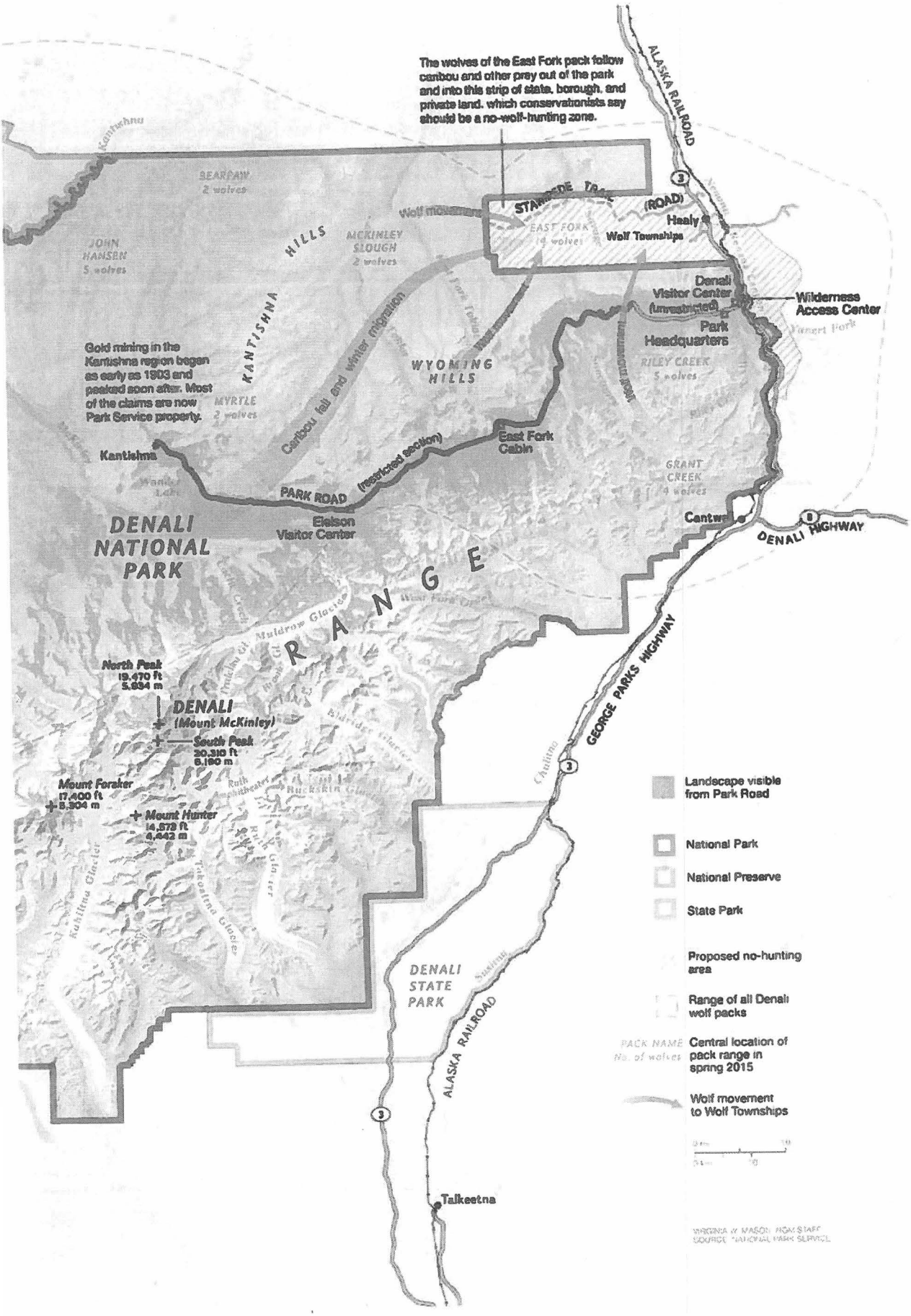
**December 2, 1980**
Congress enlarges Denali National Park and creates the Denali National Preserve. 6,075,030 acres

**August 28, 2015**
Mount McKinley is officially renamed Denali.

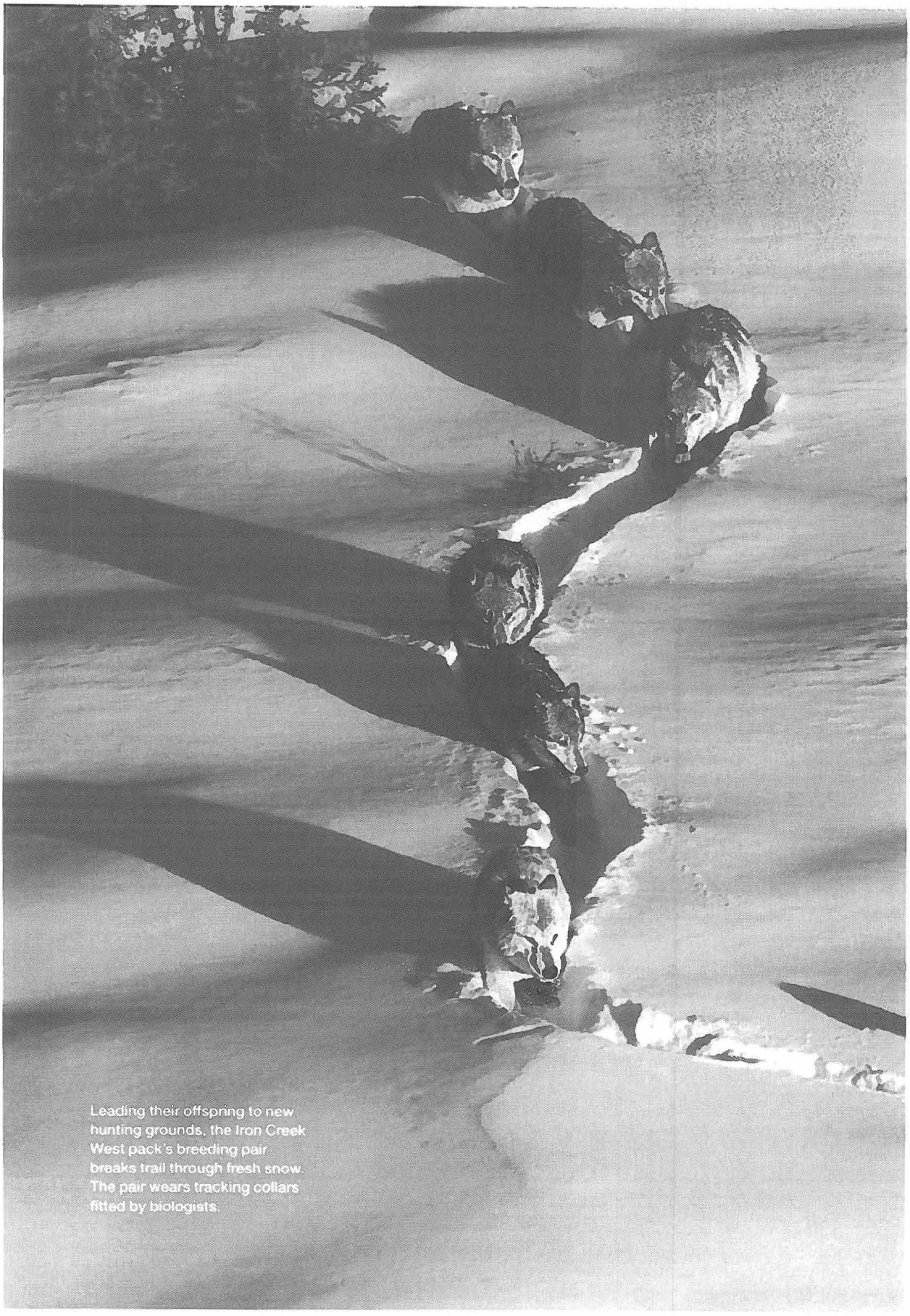
**Park boundary evolution**



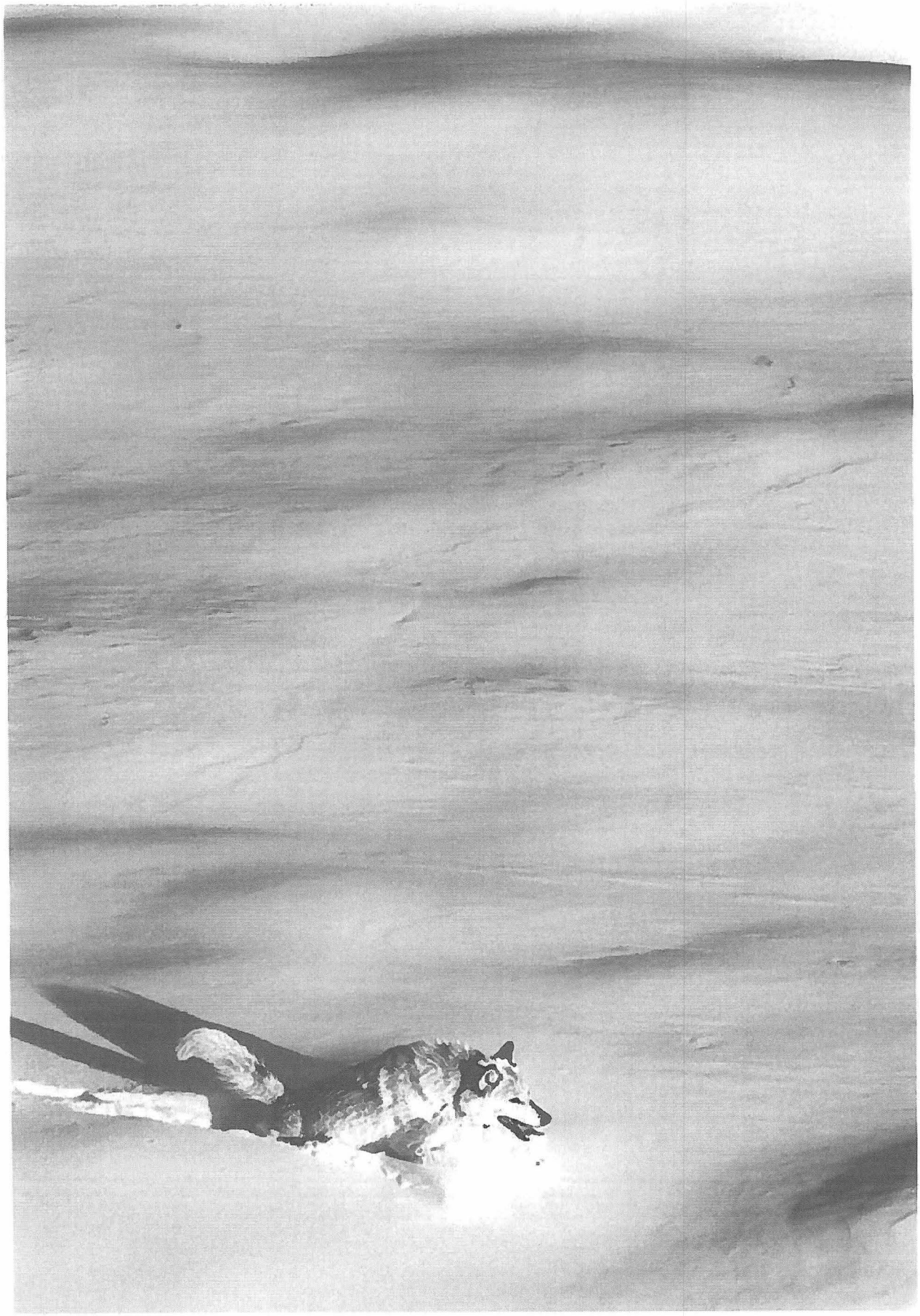





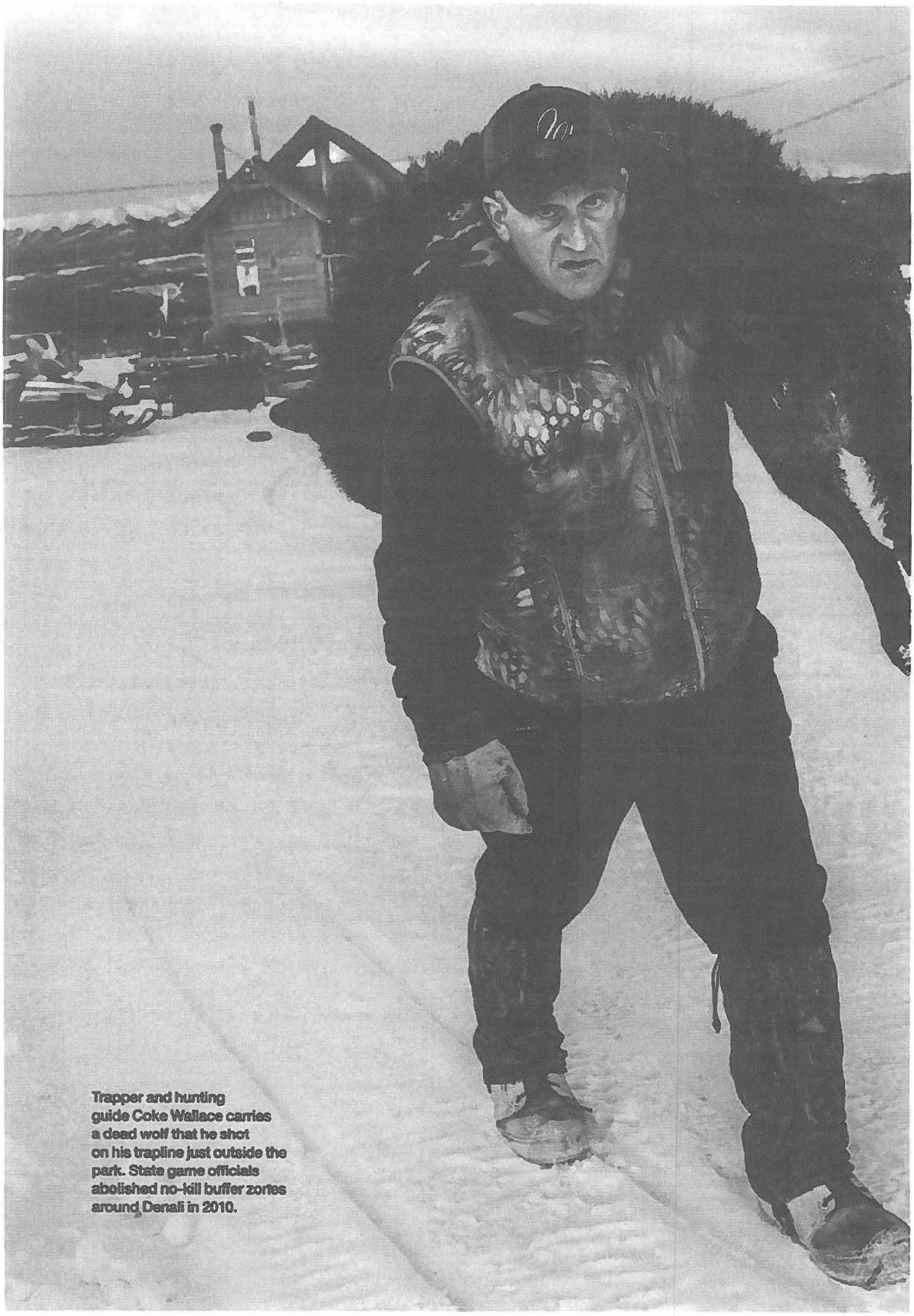

VIRGINIA M. MASON, NPCA STAFF
SOURCE: NATIONAL PARK SERVICE



Leading their offspring to new hunting grounds, the Iron Creek West pack's breeding pair breaks trail through fresh snow. The pair wears tracking collars fitted by biologists.




Wolves may stay near
a kill site—the deer herd
is modern—for several
days. Packs that cross
park boundaries in search
of prey are vulnerable to
hunting and trapping.



Trapper and hunting guide Coke Wallace carries a dead wolf that he shot on his trapline just outside the park. State game officials abolished no-kill buffer zones around Denali in 2010.

the state has ramped up its wolf reduction program in some areas in an effort to boost caribou and moose populations.

"Food security for our subsistence users is a primary driver," says Cotten. "When we don't meet objectives for populations of ungulates like moose and caribou, we have to consider culls of predators."

In 2013 and 2014 state predator-control agents and authorized private hunters, shooting from aircraft, killed dozens of wolves just outside Yukon-Charley Rivers National Preserve. The cull reduced the preserve's wolf population by more than half and killed several collared wolves that had been part of a decades-long Park Service study. Although Cotten says the wolf-culling programs are based on sound science, some data undermine the premise that killing wolves leads to increased prey populations, particularly in the long term.

> 'IT'S GOOD POLITICS TO HATE THE PARKS AND TO OVERLOOK ALL THE GOOD THEY'VE DONE FOR THE STATE.'
>
> **Park Superintendent Don Striker**

To Wallace, the wolf culls and the removal of Denali's buffer zones were long overdue. "It's the state standing up to an overreaching federal government and libtard environmentalists," he says. "I liked the park much better as McKinley National Park, when it was for sheep. Then the feds crammed that whole ANILCA thing down our throats."

In 1980 the U.S. Congress passed the Alaska National Interest Lands Conservation Act. It designated 104 million acres as national parks, forests, and preserves and protected 50 million more acres as wilderness. Mount McKinley National Park was renamed Denali National Park and Preserve, and expanded from 2 million acres to 6 million. Property rights were retained throughout the preserve, as were hunting and trapping rights in some sections.

ANILCA is widely considered among the most important conservation victories in U.S. history, but many Alaskans saw it as the culmination of years of federal overreach. Wallace was a teenager in Fairbanks when protesters there burned an effigy of President Jimmy Carter, who in 1978 elevated 56 million acres in Alaska to national monument status. In 1979 residents of towns near the park organized the Great Denali Trespass, marching into the park to shoot guns, light fires, and commit other acts of protest.

"Every other place I've been, they love their national park," says Superintendent Striker, who managed five parks in the lower 48 before coming to Denali. "But here the relationship is so poisoned by the past. People don't realize this was always federal land—it was never the state's. It's good politics to hate the parks and to overlook all the good they've done for the state, especially economically."

THE DEBATE—and everything else—seems far away when I poke my head through the tent flap at a campsite near Cache Creek in mid-March. It's the third morning of a mushing expedition and also the third morning with temperatures of minus 20 degrees Fahrenheit. I think about retreating back under the canvas, but Denali—visible most days in winter—catches my eye. Above the valley rays of sunlight splash the Tall One's summit and northeastern flanks with a dazzling orange glaze.

When I finally muster the gumption to emerge from the tent, heads turn. Thirty or so sled dogs that had been yawning in their dug-out nests of snow rise and begin to yelp and howl eagerly. Dog teams are still an integral part of backcountry management here during the winter, patrolling the park's boundaries, supporting wildlife research, and hauling supplies

for cleanups and cabin restorations. And Denali's hands-on summer kennel show is the most popular demonstration program offered by the park's staff.

"The dogs connect people to history and to an experience most people will never have," says kennel manager Jennifer Raffaeli. "In the winter they're the most reliable and reasonably safe way to move around parts of the park. Unlike a snowmobile, they're always ready to start up. They also have a survival instinct, which is something no machine can ever have."

That afternoon the cold snap breaks, and we mush in a caravan of three dog teams to the ranger station at Wonder Lake. At 2 a.m. we step outside our cabins to catch a dazzling show of the aurora borealis as the dogs sleep nearby.

"A lot of Denali is untouchable to most people, but with the dogs, traveling like this, you can touch it," Raffaeli tells me as we stare in awe at the curtains of multicolored light flowing across the sky. "The sense of peace you get here in the winter is so intense it's almost beyond belief."

THREE MONTHS LATER, in late June, I experience a completely different Denali. It's 8 p.m. on the Park Road, and I'm stuck in a traffic jam. As a moose cow and two calves make their way languidly along the tree line, drivers stop in the middle of the road to point cameras.

In the 1960s Adolph Murie fought hard against plans to pave a highway into the heart of the park. He achieved a partial victory when the Park Service decided to pave only the first 15 miles. But as visitor numbers increased, the narrow road became more crowded and dangerous, and concerns grew about the impact of traffic on wildlife. In 1972 Denali became one of the first of America's national parks to set up a mass transit system to reduce the number of cars—an approach that has since been copied at other parks.

I spend a week roaming through Denali's summer backcountry, soaking up the clarifying power of wilderness. Toward the end of my trek I score a short stay in the East Fork Cabin, Murie's base while he researched the relationship between wolves and sheep. For the young ecologist, it was a dream come true. He had solitude and the chance to study animals with the simplest of tools: binoculars, a camera, notebooks, and strong legs. His focus was an extended family of wolves ranging near the cabin at the east fork of the Toklat River.

Murie's bosses in Washington, D.C., may have expected a dry research monograph. What he gave them instead was *The Wolves of Mount McKinley*, a classic work of natural history. Published in 1944, the book-length report brought the Toklat-East Fork pack to the world's attention. Murie described, for the first time, wild wolves' life cycles and relationships and the workings of an entire ecological network. Realizing that the interactions were more complicated than anyone had imagined, Murie began working to change policies that called for the eradication of predators such as wolves, mountain lions, and coyotes.

That stance made him unpopular both inside and outside the Park Service. But the more he wrote about the subjects of his research in magazines and journals, the more popular the "First Family" of American wolves became. Wildlife lovers began to travel up from the lower 48 to see them, and wolves became one of Denali's signature attractions.

On my way to the cabin the bus driver asked her passengers, "Back home, how many of you feel like every hour is rush hour?" I didn't raise

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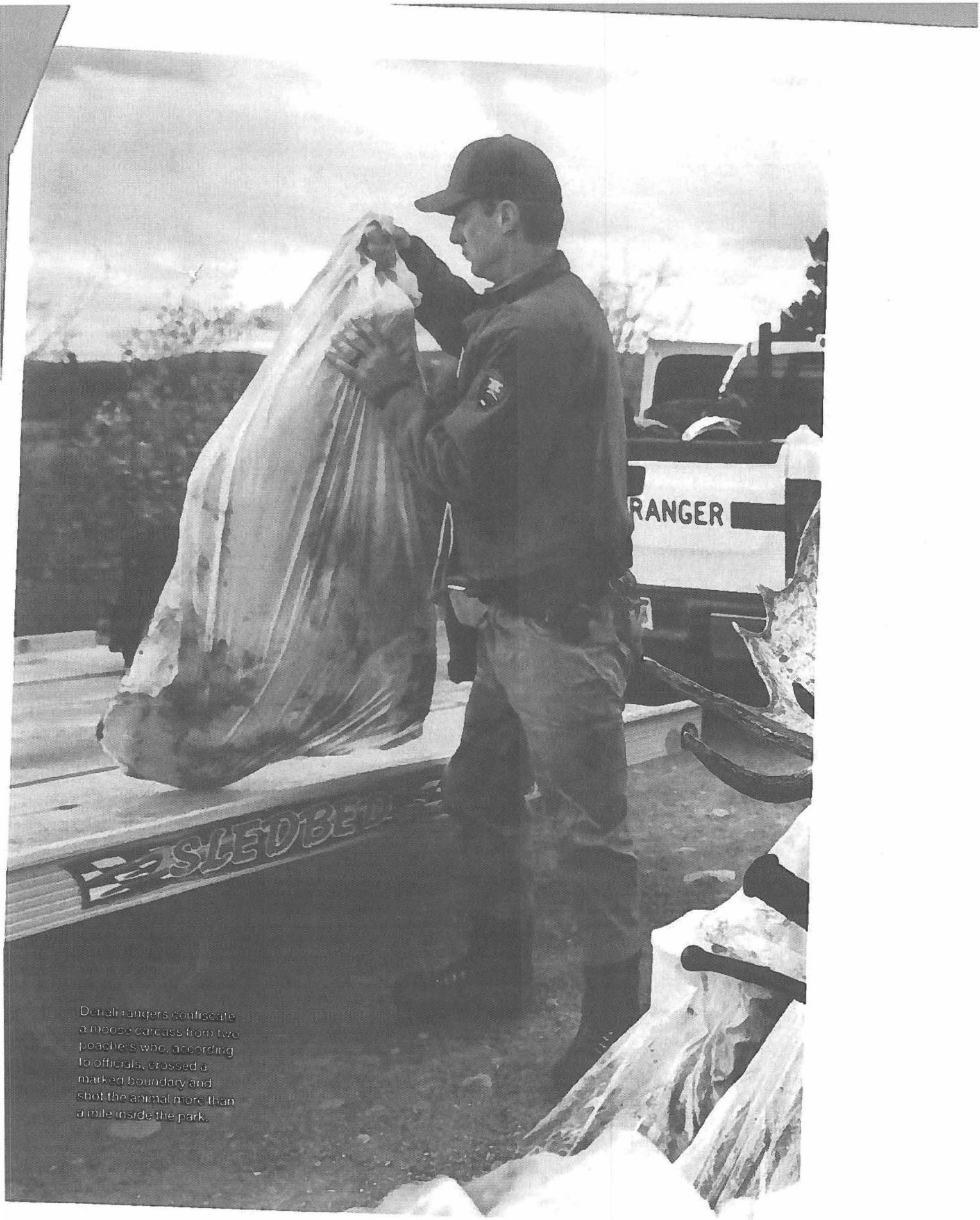
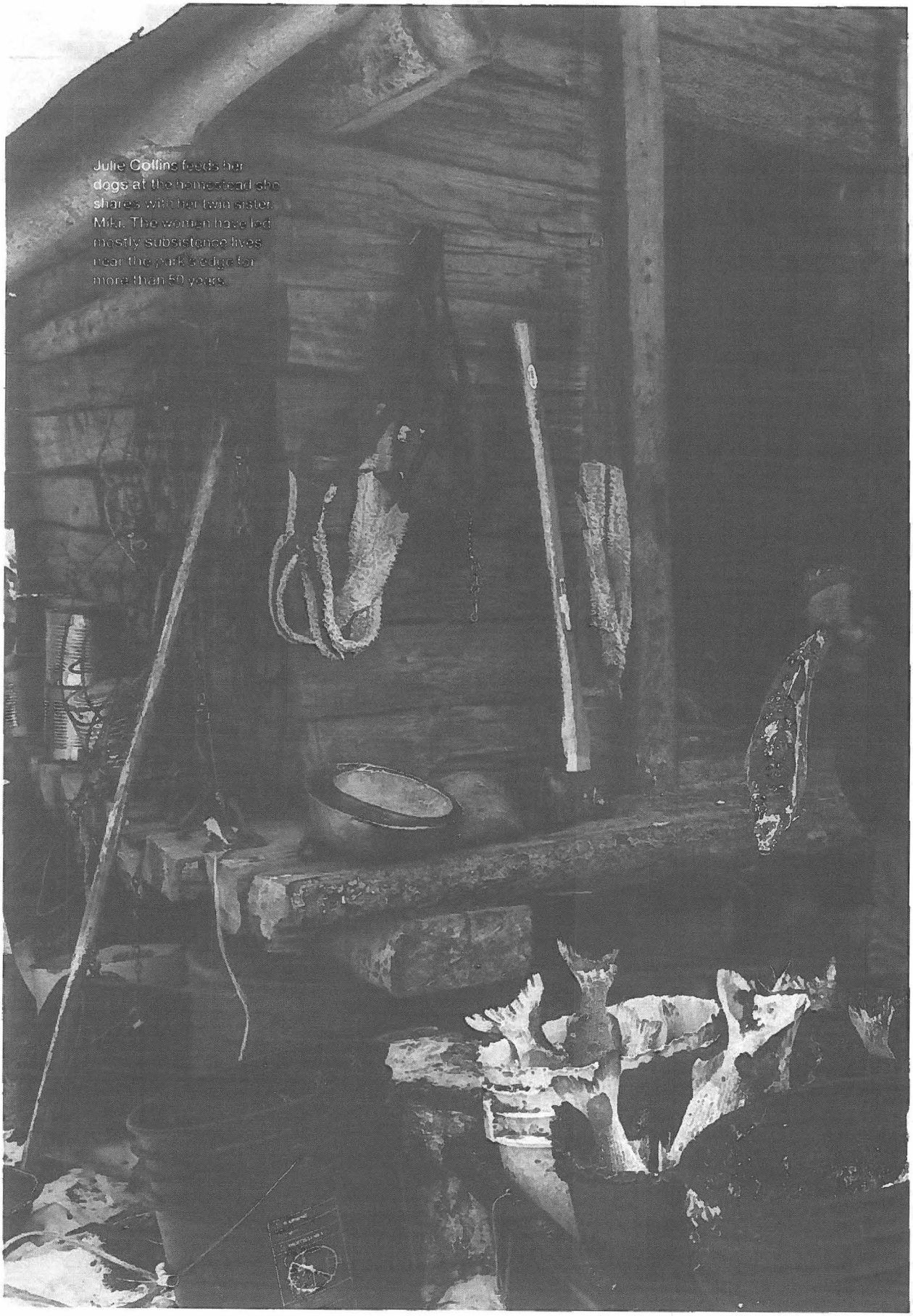
BEN MOON

A frequent *National Geographic* contributor, photographer **Aaron Huey** has trekked up Mount Everest, visited the Georgian Caucasus, and explored Indian reservations in the United States for the magazine.

**While photographing in Denali, did you face any precarious situations?** We skied across Ruth Glacier, which meant going over fragile snow bridges and occasionally avoiding deep ice tunnels filled with water. For safety the team was tied together with a rope for all of our travel.




Denali rangers confiscate a moose carcass from two poachers who, according to officials, crossed a marked boundary and shot the animal more than a mile inside the park.



Julie Collins feeds her dogs at the homestead she shares with her twin sister, Miki. The women have led mostly subsistence lives near the park's edge for more than 50 years.

PLOS | ONE

RESEARCH ARTICLE

# Implications of Harvest on the Boundaries of Protected Areas for Large Carnivore Viewing Opportunities

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## Abstract

The desire to see free ranging large carnivores in their natural habitat is a driver of tourism in protected areas around the globe. However, large carnivores are wide-ranging and subject to human-caused mortality outside protected area boundaries. The impact of harvest (trapping or hunting) on wildlife viewing opportunities has been the subject of intense debate and speculation, but quantitative analyses have been lacking. We examined the effect of legal harvest of wolves (*Canis lupus*) along the boundaries of two North American National Parks, Denali (DNPP) and Yellowstone (YNP), on wolf viewing opportunities within the parks during peak tourist season. We used data on wolf sightings, pack sizes, den site locations, and harvest adjacent to DNPP from 1997–2013 and YNP from 2008–2013 to evaluate the relationship between harvest and wolf viewing opportunities. Although sightings were largely driven by wolf population size and proximity of den sites to roads, sightings in both parks were significantly reduced by harvest. Sightings in YNP increased by 45% following years with no harvest of a wolf from a pack, and sightings in DNPP were more than twice as likely during a period with a harvest buffer zone than in years without the buffer. These findings show that harvest of wolves adjacent to protected areas can reduce sightings within those areas despite minimal impacts on the size of protected wolf populations. Consumptive use of carnivores adjacent to protected areas may therefore reduce their potential for non-consumptive use, and these tradeoffs should be considered when developing regional wildlife management policies.

**Competing Interests:** The authors have declared that no competing interests exist.

## Introduction

Large carnivore conservation relies heavily on sustaining populations within protected areas [1], and protection within these regions provides the majority of viewing opportunities for these species [2]. The desire to see iconic, free ranging large carnivores is a driver for wildlife tourism around the globe and may improve acceptability of their presence by the general public and contribute to conservation goals ([3] but see [4]). However, large predators are wide-ranging and seldom confined within the boundaries of protected areas, creating difficult trans-boundary management issues. Outside and even inside of protected areas, conflict with humans is the single most important cause of mortality for large carnivores [5–7]. Yet the link between human-caused mortality of carnivores adjacent to protected areas and viewing opportunities within a protected region has not been evaluated quantitatively.

In North America, gray wolves (*Canis lupus*) are emblematic of management issues occurring at the borders of protected areas. Protection of wolves in National Parks, such as Yellowstone National Park (YNP) and Denali National Park and Preserve (DNPP), provides the opportunity for thousands of visitors to see wolves each year, but these wide-ranging carnivores often travel across park boundaries onto other public or private lands. Mortality of individual wolves from frequently viewed packs due to hunting or trapping outside these parks has sparked widespread controversy and prompted concern regarding the impact of these losses on population and pack dynamics. Although harvest (hunting or trapping) occurring outside park boundaries may not have population-level effects, harvest of particular individuals can lead to the decline or dissolution of entire packs [8,9]. If the packs or individuals most susceptible to harvest are those that provide the majority of viewing opportunities to visitors of protected areas, then harvest may influence wolf sightings even if harvest levels are too low to reduce population size. Similar impacts of harvest may affect carnivore sightings in other regions as well. In Africa, for example, the desire to see lions (*Panthera leo)* and cheetahs (*Acinonyx jubatus*) in their natural habitat is the main reason tourists visit the continent's reserves, but these species are also the most vulnerable to threats such as human hunting adjacent to reserves [10].

The main objective of this study was to assess effects of harvest adjacent to protected areas on wildlife sightings, using wolves in Yellowstone National Park (YNP) and Denali National Park and Preserve (DNPP) as a case study. Agencies responsible for managing protected areas often have mandates to provide opportunities for visitor enjoyment. In the United States, the National Park Service is mandated to provide opportunities for visitor enjoyment of which wildlife viewing is an important component. Viewing large carnivores, particularly wolves and grizzly bears (*Ursus arctos*), is cited by visitors as one of the main reasons they come to YNP [11] and is a main indicator of a satisfying visitor experience in DNPP [12]. Additionally, in Alaska where wolves are among the most desired species for viewing [13], state wildlife management includes mandates to provide for multiple uses, including non-consumptive uses such as wildlife viewing [14]. In Montana, wildlife watching is listed by visitors and state residents as one of the primary activities in the state [15]. Wildlife viewing also brings an important socio-economic benefit to the states. Wolf watching activities in YNP following the reintroduction of wolves in 1995 brings an estimated $35 million annually to the states of Idaho, Montana and Wyoming [11]. Wildlife viewing is a driver of tourism for DNPP [16] and the state of Alaska [15,17] and wildlife viewing activities in Alaska supported over $2.7 billion dollars in economic activity in 2011 [17].At the same time, states are also mandated to provide for consumptive uses of wildlife, and harvest of wolves can provide significant economic benefits as well [18]. In 2011, statewide revenue in Montana from the purchase of wolf tags alone was over $400,000 [19] while hunting in Alaska supported over $1.3 billion dollars in economic activity [17].

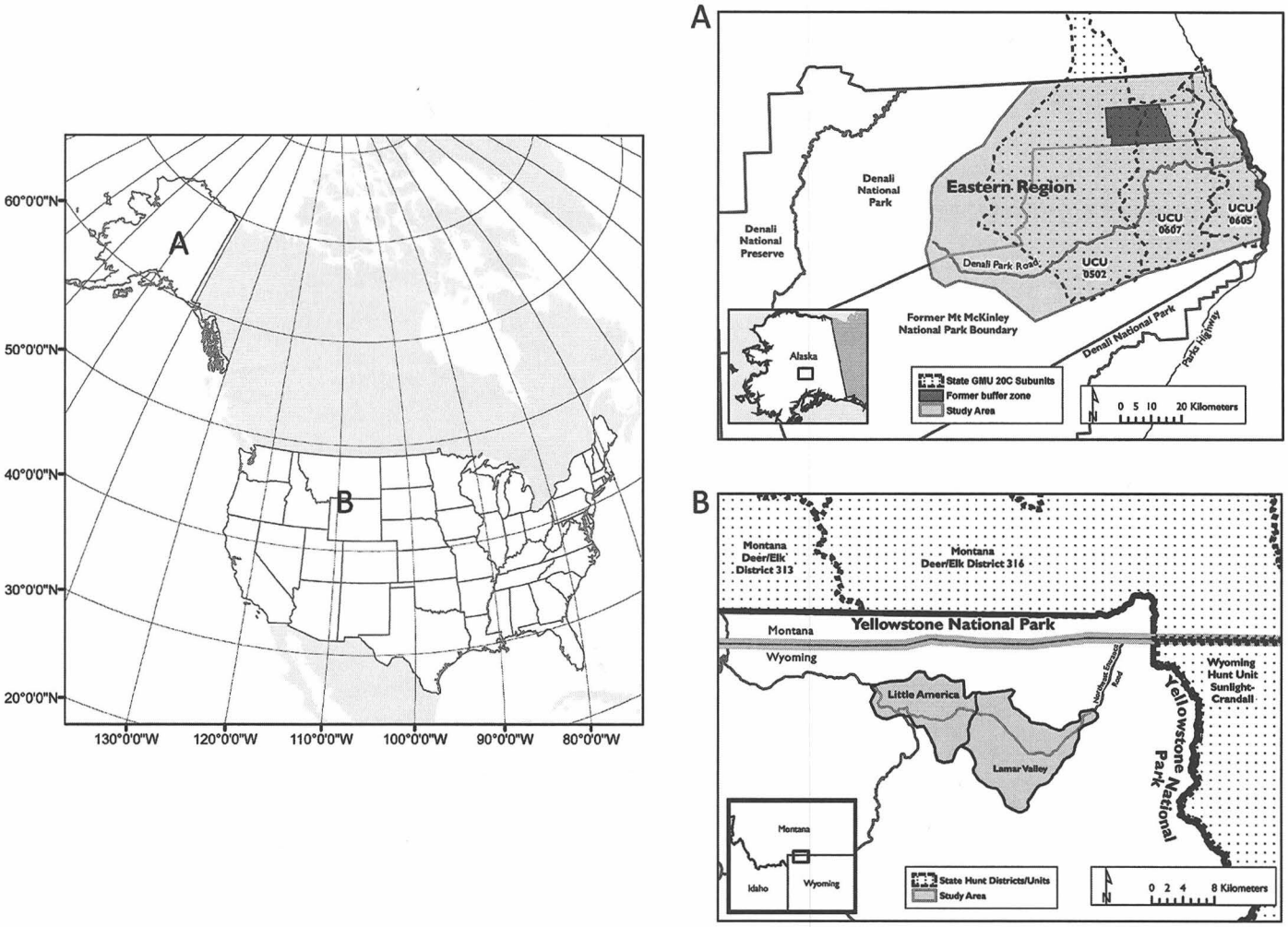


**Fig 1. Map of study areas for monitoring wolf sightings in the United States**: A) Denali National Park and Preserve study area with Uniform Coding Units (UCUs) within Game Management Unit 20C and former buffer zone where wolf hunting and trapping was prohibited from 2000 to 2010 shown and, B) Yellowstone National Park study area within the Northern Range with adjacent state hunt districts/units shown.

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As part of the delisting process for gray wolves in Montana, Wyoming and Idaho, each state has developed wolf management plans that include wolf hunting seasons (for details on state management: www.westerngraywolf.fws.gov), prompting concern that hunting may impact wolf viewing opportunities in YNP [20]. In DNPP, a buffer zone prohibiting the trapping and hunting of wolves was established in key regions bordering DNPP from 2000 to 2010 (Fig 1). The buffer was abolished in March 2010 and viewing rates in DNPP subsequently declined [21], raising concerns that harvest of wolves near park boundaries might have been responsible.

To examine the effect of harvest on wolf sightings, we first examined levels of wolf harvest adjacent to each park and the composition of harvested wolves to determine whether breeding and collared wolves were more or less susceptible to harvest. Concurrent analyses showed that breeding wolves were more likely to be near the Denali Park Road than non-breeding wolves [22], indicating that breeding wolves may contribute disproportionately to sightings. However, we anticipated that less experienced (younger, non-breeding) wolves would be more likely to

be harvested than the generally more experienced breeding wolves ([22], but see [23–25]). If this was the case, we expected that harvested wolves may be relatively unimportant to sightings, thereby reducing the potential effect of harvest on viewing opportunities. However, in YNP, the presence of radio-collars on wolves, regardless of breeding status, may increase sighting opportunities for visitors because NPS staff routinely scans for signals from collared animals to assist in locating and viewing wolves. Therefore, if there was disproportional harvest of collared wolves (regardless of breeding status), harvest could decrease viewing opportunities, especially in YNP.

We analyzed data on wolf sightings, pack sizes, den site locations, and harvest adjacent to DNPP from 1997–2013 and YNP from 2008–2013 to evaluate the relationship between harvest of wolves and wolf viewing opportunities. We hypothesized that changes in wolf population size and den site proximity to park roads are the main drivers of wolf sightings and that additionally, the presence of harvest (or absence of the harvest buffer) would reduce wolf sightings. Alternatively, changes in wolf population size and den site proximity to park roads could be the main drivers of wolf sightings, and harvest could have comparably negligible effects.

## Methods

### Study areas

Our study area encompassed two national parks in North America (Fig 1, Table 1). The DNPP study area encompassed 6,350 $km^2$ of the eastern region of the park and adjacent areas north of the Alaska Range (Fig 1). Elevation ranges from 150–3,000 m and contains habitat patches of boreal forest, high alpine, braided rivers, and willow-lined creeks. The diversity of habitat types supports populations of caribou (*Rangifer tarandus*), Dall's sheep (*Ovis dalli*), and moose (*Alces alces*) which constitute the main prey base for wolves in the region. The YNP study area encompassed approximately 1,000 $km^2$ of the Northern Range within and adjacent to the park (Fig 1). Elevation ranges from 1,500–2,400 m, with lower elevations characterized by large open meadows and shrub steppe vegetation and higher elevations characterized by coniferous

**Table 1. Metrics summarizing wolf sighting datasets in Denali (Denali National Park and Preserve, Alaska, USA) and Yellowstone (Yellowstone National Park, Wyoming, USA).** Table entries for wolf population size, road pack population size, number of road packs (packs whose home range overlapped park roads), and the annual probability of sighting are mean values, with the range among years in parentheses.

| Metric | Denali | Yellowstone |
|---|---|---|
| Study Period | 1997–2013 | 2008–2013 |
| Length of road | 88.5 km | 42.3 km |
| Relevant Harvest Periods | Area closed to harvest adjacent to park: 2000–2010 | Harvest Open: Idaho and Montana: 2009, 2011, 2012 Wyoming: 2012 |
| Hunting Season | Mid-August to end of April or May | Varied by state |
| Hunting Limits | Bag limit range: 5 to 10 wolves | Varied by state |
| Trapping Season | November 1 to April 30 | Varied by state |
| Trapping Limits | No bag limits | Varied by state |
| Wolf Population Size | 40.8 (23–74) | 45.7 (33–84) |
| Road Pack Population Size | 32.8 (12–47) | 27.4 (12–43) |
| Number of Road Packs | 5.4 (3–9) | 3.1 (2–5) |
| Annual Probability of Sighting | 00.21 (0.04–0.45) | 0.70 (0.45–0.85) |

doi:10.1371/journal.pone.0153808.t001

forests [26]. Elk (*Cervus elaphus*) are the main prey for wolves in this region, but wolves also prey secondarily on mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), and bison (*Bison bison*).

## Data collection

**Population and pack counts.** Biologists have radio-collared wolves in the DNPP study region since 1986 [27] and within YNP since the reintroduction of wolves in 1995 [28]. Each year, 6–22 wolves from 10–20 packs were fitted with radio collars in DNPP [29] and 10–20 wolves from 5–12 packs were collared in YNP ([28], see [29] for handling protocols). Wolf project staff in both YNP and DNPP used a combination of aerial and ground monitoring techniques to collect data on wolf locations, numbers of pack members, pack composition, active den site locations and use, breeding status of individual wolves and timing and suspected causes of mortality [27,30]. Capture and handling protocols were approved by the National Park Service Institutional Animal Care and Use Committee and were in accordance with recommendations from the American Society of Mammalogists [31]. Work was conducted under annual National Park Service permits, annual State of Alaska Department of Fish and Game scientific permits, and the University of Alaska permit (253217–3).

**Harvest.** All areas outside the DNPP boundary were open to hunting and trapping under state regulation, with the exception of a closed area established by the Alaska Board of Game in 2000, expanded in 2001 and 2002 (Fig 1), and abolished in 2010. Although the closed area was relatively small (75 $km^2$ in 2000, 233 $km^2$ from 2002–2010), it included areas that supported high seasonal densities of caribou and associated wolf activity [27]. In Game Management Units (GMU) 20A and 20C adjacent to the park's boundaries, the hunting season ranged from mid-August to the end of April or May with a bag limit ranging from 5–10 wolves, and the trapping season spanned November 1– April 30 with no bag limits for either unit. Subsistence and sport hunting and trapping were permitted in the Preserve and new park additions of DNPP, but all harvest was prohibited in the area of the original Mt. McKinley National Park (Fig 1). Outside YNP, wolves were hunted in 2009, 2011 and 2012 in Idaho and Montana, and in 2012 in Wyoming, with open seasons and limits that varied among hunting units within states. Wolves were not harvested in 2010 due to relisting under the Endangered Species Act. The numbers of wolves harvested from regions adjacent to park boundaries were obtained from state harvest records and mortality of collared wolves.

**Harvest of collared and breeding wolves.** To examine whether collared and breeding wolves were harvested disproportionately, we used chi-squared and Fisher exact tests to compare the proportion of collared and breeding wolves harvested in areas surrounding each park with their proportions in each park population. In DNPP, we used mortality records to determine the number of collared wolves that were shot or trapped in Uniform Coding Units (UCU) adjacent to DNPP (UCUs 605, 607, and 502) from 1996 to 2012 (Fig 1). We included all recorded wolf harvest within UCUs 605 and 607 in analyses because these UCUs were within the buffer zone or immediately adjacent to DNPP (Fig 1). UCU 502 extended north beyond DNPP and we therefore attempted to include only instances of wolves harvested in UCU 502 that occurred within the former buffer zone using information on the location of harvest. Instances of harvest with unknown locations within UCU 502 were included in the count of harvested wolves in the region. In YNP, we consulted with state agencies to estimate the number of collared and/or breeding wolves and the total number of wolves harvested outside of YNP that were from packs that lived predominantly in YNP. Harvested wolves that were uncollared were judged to have originated from YNP packs if the ages, colors, and sexes matched wolves recently missing from YNP.

We pooled data across years with wolf harvest (1996–2012 for DNPP and 2009, 2011, and 2012 for YNP). We calculated the proportion of collared wolves in the population as the number of individuals collared in or before year *t* that were still alive by August of year *t* divided by the fall population estimate. Similarly, we determined the proportion of breeders in the population as the number of collared individuals identified as breeders divided by the fall population estimate. We restricted our analysis to collared breeders because identification of uncollared breeders in the harvest was not always possible. We determined the proportion of collared or breeding wolves in the harvest as the number of collared/breeding wolves harvested divided by the number of wolves harvested in surrounding UCUs (DNPP) or from YNP packs.

**Sighting data.** Each study area is bisected by a road (Denali Park Road in DNPP and Northeast Entrance Road in YNP, Fig 1) providing visitor access to the region and wolf viewing opportunities. Traffic along the portion of the road where wolf observations were collected in DNPP was limited to 10,512 vehicle trips per summer season as per DNPP management plans [32]. Although there were slight variations, the traffic was essentially kept at a consistent level for the duration of the study period. According to traffic counts from the north and northeast entrance stations at YNP, traffic into the park gradually increased during the study period [33].

**DNPP.** We used data on wildlife sightings along the Denali Park Road collected during bus trips into the park from the Savage River entrance station at mile 15 (24.1 km) to Eielson Visitor Center at mile 66 (106.2 km) from 1997–2013. Data were collected by bus drivers as written observations or on panels installed on buses and by park staff as written observations or on handheld devices. Observers recorded all sightings of wolves during all westbound trips (see S1 Appendix for more details).

**YNP.** From 2008 to 2013, YNP staff (R. McIntyre) traveled through the Lamar Canyon and Little America region (Fig 1) every morning (from approximately 0430 or 0500 to 1100 or 1200 hours) and consistently recorded all direct sightings of wolves. These 6 years represent a sample of years with and without harvest, consistent monitoring of sightings, and a relatively stable wolf population. We reviewed the daily field notes and recorded the start and end time of each daily observation period and attributes of every wolf sighting (location and duration of sighting, number of wolves seen, pack affiliations) in June, July and August.

**Annual probability of sightings metric.** We calculated the annual probability of sighting metric in DNPP as the proportion of bus trips where at least one wolf was seen (S1 Table). In YNP, we calculated this metric as the number of days with direct sightings of wolves in Lamar Valley or Little America (Fig 1) divided by the number of days in the observation period (i.e. number of days in June, July and August), corrected for effort:

$$YNP\ P_{sighting} = \frac{S_t}{O_t} \times \frac{E_t}{E_{max}}$$

where $S_t$ is the number of days with sightings in year *t*, $O_t$ is the number of days in the observation period, $E_t$ is the hours of effort in year *t*, and $E_{max}$ is the maximum number of hours in the field from sampled years (S2 Table).

We predicted that the annual probability of sighting for a wolf was positively related to wolf population size and den site proximity to the roads and negatively related to the number of wolves or breeders harvested. We examined 2 metrics of population size: spring estimates of total wolf population size in each study area (TotalPop), and a metric that combined the estimated size of packs whose home range overlapped park roads (road packs) with distances from den sites to the nearest road (the Pack Near Road Index, or PNRI, Table 2). TotalPop represented a simple and potentially useful metric that could be calculated in spring prior to denning while PNRI was a metric that combined a spatially-explicit measure (den site distance from the

**Table 2. Explanatory variables used to model annual probability of sighting rates in Denali National Park, Alaska, USA.** Prediction column describes the predicted change in the response variable (annual probability of sighting) to an increase in the explanatory variable.

| Variables | Description | Prediction |
|---|---|---|
| ***Wolf Population*** | | |
| TotalPop | Spring estimates of total wolf population in each study area | Increase |
| PNRI | Pack Near Road Index. Metric combining the estimated size of road packs with distances of pack den sites to road | Increase |
| ***Wolf Harvest*** | | |
| WolfHarv | Number of wolves harvested adjacent to park boundaries prior to sighting year | Decrease |
| BreedHarv | Binary, if a breeding wolf from a road pack was harvested in year prior to sighting year | Loss of breeding wolf: decrease |
| Buffer | Binary, presence or absence of hunting and trapping buffer zone | Presence of buffer zone: increase |

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road) with a population measure (road pack size). We initially investigated a separate covariate for road pack size alone (S1 and S2 Figs, S6 Table) and found that the metric that combined road pack size and den distance (PNRI) explained more variance in sightings. We therefore used PNRI in our final model set.

TotalPop was obtained by compiling spring wolf pack counts for packs in each study area. We used ArcGIS 10.0 (Environmental Systems Research Institute, Redlands, CA) to assess home range overlap with park roads. PNRI was calculated using pack size and den site distance for road packs. Wolf management plan objectives require closing areas around known den sites to hikers [34]. Thus, den site locations and use were closely monitored for wolf packs in areas along the road corridors. We determined the distance of den sites to the nearest location on the road using the "near" tool in ArcGIS version 10.2 (ESRI 2011, ArcGIS Desktop: Release 10. Redlands, CA: Environmental Systems Research Institute). For all road packs in the sighting year, we divided the pack size by the distance from the pack's den or rendezvous site to the nearest road and defined the PNRI as the sum of these measures for all packs in the sighting year. In cases where there was more than one den or rendezvous site used by a single pack, we used the mean of the distances of multiple den or rendezvous sites as the value for that pack. Thus, an increase in pack sizes or numbers of packs, or a decrease in distances of pack activity centers from the road, would cause PNRI to increase.

For DNPP, we evaluated three metrics describing wolf harvest: number of wolves harvested in the region (WolfHarv), harvest of breeding wolves (BreedHarv) and the presence/absence of a wolf trapping buffer (Buffer) located outside of DNPP (Fig 1).WolfHarv was the number of wolves harvested in Uniform Coding Units (UCUs) 605 and 607 (Fig 1) in the regulatory year prior to the sighting year (July 1 of year t-1 to June 30 of year t). BreedHarv was a binary factor describing if a breeding wolf from a road pack was harvested prior to the sighting year. The trapping buffer was present from 2000–2010 and absent 1997–1999 and 2011–2013 (Table 1). In YNP, we obtained information on the number of wolves harvested outside of YNP from Yellowstone Wolf Project staff in collaboration with state wildlife agency professionals in Montana, Wyoming, and Idaho.

## Effect of harvest on sightings

We evaluated factors that influenced annual wolf sightings in DNPP using a suite of generalized linear models and Akaike information criterion corrected for sample sizes and an estimate

**Table 3. Candidate model set and model selection criteria evaluating factors potentially affecting probability of wolf sightings along Denali Park Road in Denali National Park and Preserve, Alaska, USA.**

| Model | K[a] | QAICc | ΔQAICc | Model Likelihood | QAICc Weight |
|---|---|---|---|---|---|
| PackNearRoad[b]+Buffer[c]+WolfHarv[d] | 4 | 41.70 | 0.00 | 1.00 | 0.33 |
| PackNearRoad+Buffer | 3 | 42.15 | 0.44 | 0.80 | 0.27 |
| PackNearRoad | 2 | 43.42 | 1.71 | 0.43 | 0.14 |
| PackNearRoad+WolfHarv | 3 | 44.68 | 2.98 | 0.23 | 0.07 |
| Buffer | 2 | 45.92 | 4.22 | 0.12 | 0.04 |
| TotalPop[e]+Buffer | 3 | 45.95 | 4.25 | 0.12 | 0.04 |
| PackNearRoad+Buffer+BreedHarv[f] | 4 | 46.13 | 4.43 | 0.11 | 0.04 |
| PackNearRoad+BreedHarv | 3 | 46.55 | 4.85 | 0.09 | 0.03 |
| TotalPop+Buffer+WolfHarv | 4 | 47.84 | 6.14 | 0.05 | 0.02 |
| TotalPop+Buffer+BreedHarv | 4 | 47.92 | 6.21 | 0.04 | 0.01 |
| TotalPop+BreedHarv | 3 | 49.17 | 7.47 | 0.02 | 0.01 |
| TotalPop | 2 | 50.77 | 9.07 | 0.01 | 0.00 |
| TotalPop+WolfHarv | 3 | 54.10 | 12.40 | 0.00 | 0.00 |
| WolfHarv | 2 | 59.19 | 17.49 | 0.00 | 0.00 |

[a] Number of parameters in the model

[b] Pack Near Road Index

[c] Buffer is a factor indicating the presence/absence of a wolf hunting and trapping buffer

[d] WolfHarv is the number of wolves harvested in the prior year

[e] TotalPop is the population size

[f] BreedHarv is a factor indicating if breeders were or were not harvested from road packs in the prior year.

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of overdispersion (QAICc) to rank models [35]. We used the glm function in Program R (R Core Team 2013) to model wolf sightings using a binomial distribution with the response variable as the annual probability of wolf sightings, weighted by the number of trips per year to account for sample size. Predictor variables consisted of the 2 population and 3 harvest metrics described above (Table 2), and our model set consisted of 14 models selected a-priori that included 1–3 predictors per model (Table 3). We used the MuMIn package in R [36] for model selection and derived untransformed parameter estimates and associated standard errors from the top ranked model.

We used a variance partitioning procedure to quantify how much of the variation of the top-ranked model was explained by the pure effect of each explanatory variable and the interaction of the variables [37–39]. We compared estimates of population size between years with and without the buffer zone using a one-tailed t-test. We used nonparametric Mann-Whitney-Wilcoxon tests to compare PNRI and annual probability of sightings between these periods because these variables did not meet the assumptions of t-tests.

We lacked sufficient years of data in YNP to construct quantitative models of sightings including all covariates. Therefore, we visually examined patterns in the annual sighting metric in relation to TotalPop and PNRI. We compared annual probability of sightings in years with and without harvest of wolves from packs in the prior regulatory year using a one-tailed t-test.

## Results

### Harvest of collared and breeding wolves

**DNPP.** Wolves were harvested on state land adjacent to DNPP in 16 of the 17 years in our dataset (1996–2012). Across all 17 years, on average 5 (SD 3.5) wolves were harvested each

year (S3 Table). Pooled across all years with harvest, neither the proportion of collared wolves in the harvest (0.25) nor the proportion of known (collared) breeding wolves in the harvest (0.16) were significantly different than expected given their frequency in the population (collared wolves in population: 0.29, $\chi 2 = 0.610$, df = 1, $P = 0.44$, collared breeders in population: 0.17, $\chi 2 = 0.072$ df = 1, $P = 0.79$).

**YNP.** In 2009, 4 park wolves were harvested from the study area. In 2011, 2 wolves ranging primarily within YNP but not considered members of a road pack were shot close to the park boundary. In 2012, 9 wolves that primarily lived within the Northern Range study area were harvested and a total 12 wolves that lived in the entire YNP were harvested. The proportion of collared wolves in the harvest (0.53) was greater than expected given the proportion of collared wolves in the Northern Range population (0.24, Fisher's exact test: $P = 0.03$). Similarly, in the entire YNP region, the proportion of collared wolves in the harvest (0.56) was greater than expected given the proportion of collared wolves in the YNP population (0.26, Fisher's exact test: $P = 0.01$, S4 and S5 Tables). The proportion of collared breeding wolves in the harvest (0.21) was not significantly different than the proportion of collared breeders in the Northern Range (0.17, 2-sided fisher's exact test, $P = 0.37$).

## Annual Probability of Sighting

**DNPP.** We used sighting data from 2062 trips along the Denali Park Road from 1997–2013. One or more wolves were observed on 307 of the 2062 trips (S1 Table). Both the number of wolves denning near the road and wolf harvest influenced the mean probability of viewing wolves in DNPP. The top ranked model included the Pack Near Road Index (PNRI), the presence of the wolf harvest buffer, and the number of wolves harvested (Table 3). The number of wolves denning near the road was positively associated with the probability of viewing wolves (Table 4). The presence of the buffer was also positively associated with the probability of viewing wolves. The number of wolves harvested in the prior year was negatively associated with the probability of viewing a wolf, although the effect was not significant as the confidence intervals overlapped zero (Table 4).

The pure effects of PNRI, the presence of the buffer, and the number of wolves harvested in the prior year explained 53%, 42.3%, and 15.1%, respectively, of the variation in the top-ranked model. The combined effect of the variables PNRI, buffer presence, and the number of wolves harvested in the prior year explained the largest proportion of variation in the top-ranked model (61.7%).

The annual probability of sighting appeared to roughly follow the trend of the annual PNRI and spring population size, with peaks in sightings coinciding with peaks in either PNRI or total population size (Fig 2, see S1 Fig for figure with road pack size). Population size, PNRI

**Table 4. Model-averaged parameter estimates for annual probability of sighting model evaluating factors potentially affecting probability of wolf sightings along Denali Park Road in Denali National Park and Preserve, Alaska.**

| | β | SE | 95% CL | |
|---|---|---|---|---|
| | | | Lower | Upper |
| (Intercept) | -2.70 | 0.488 | -3.660 | -1.748 |
| PNRI[a] | 22.84 | 8.455 | 6.264 | 39.408 |
| Buffer (Presence)[b] | 0.96 | 0.448 | 0.082 | 1.838 |
| WolfHarv[c] | -0.10 | 0.057 | -0.211 | 0.013 |

[a] PNRI is the Pack Near Road Index

[b] Buffer is the presence of a wolf hunting and trapping buffer

[c] WolfHarv is the number of wolves harvested in surrounding regions.

doi:10.1371/journal.pone.0153808.t004

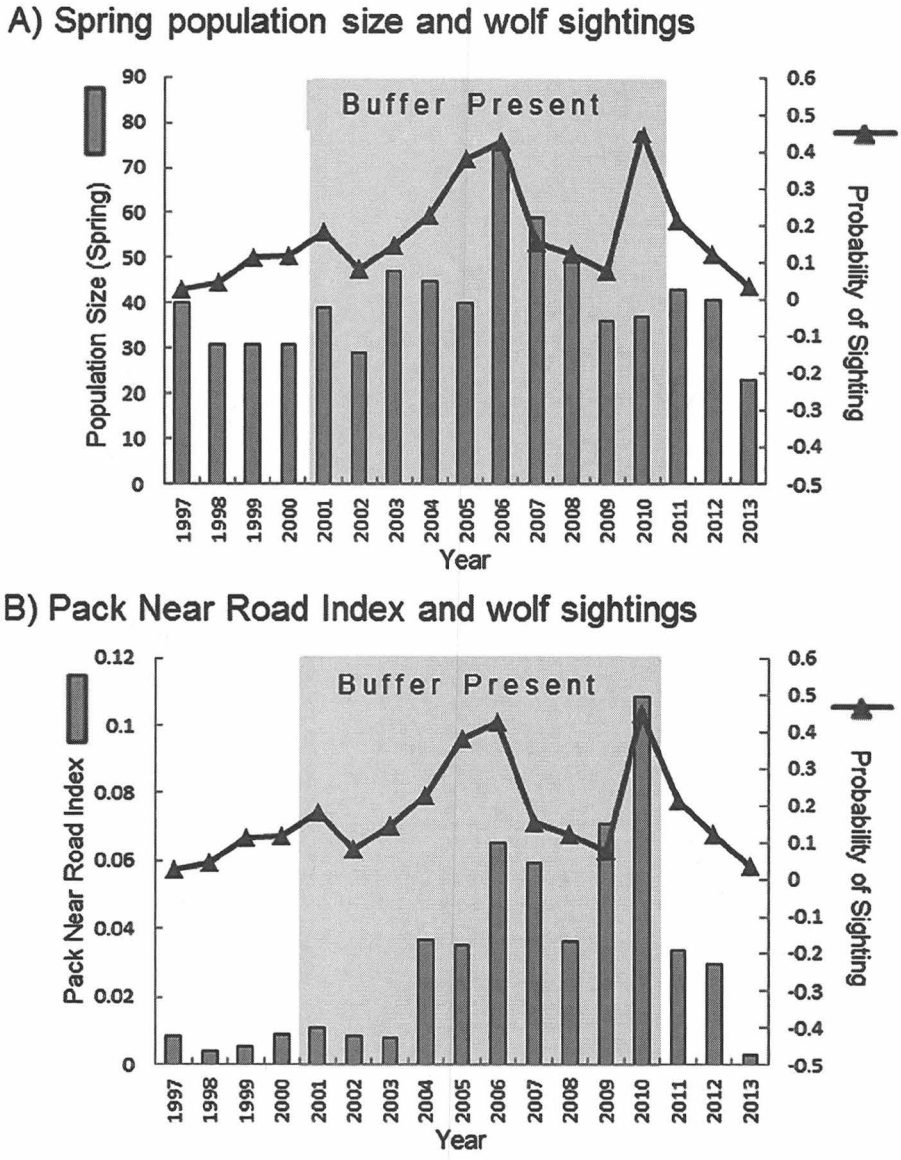


**Fig 2. Probability of wolf sighting along the Denali Park Road from 1997 to 2012 (black triangles)** in relation to A) spring population size (gray bars) and B) the Pack Near Road Index (number of wolves in road packs divided by den distances from the road, gray bars) in Denali National Park and Preserve, Alaska, USA. Shaded areas indicate the time period (2000–2010) when a harvest buffer zone adjacent to the park was in effect.

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and the probability of sighting were significantly higher in years when the buffer zone was in place (Table 5, Fig 3).

**YNP.** We used sighting data from 552 days in YNP from 2008–2013. One or more wolves were observed during 436 of the 552 days (S2 Table). There were 2 years of sighting data following harvest from YNP road packs (2010 and 2013) and 4 years with no prior road pack harvest (2008, 2009, 2011 and 2012). The annual probability of sighting metric for YNP appeared to roughly mirror spring population size and PNRI, but sightings were lower in years following

**Table 5. Comparisons of the annual probability of wolf sighting, wolf population, and Pack Near Road Index (PNRI) for years following the presence (2001–2010) and absence (1997–2000, 2011–2013) of a hunting and trapping buffer adjacent to Denali National Park and Preserve, AK, USA.** Table entries are the mean values (SE), test statistics (*t* for t-test and *W* for Mann-Whitney-Wilcoxon test), and associated probability for each metric.

| | Buffer | No Buffer | Test Stat | *P*-value |
|---|---|---|---|---|
| Population | 45.5 (4.11) | 34.3 (2.73) | $t_{15} = -2.27$ | 0.039 |
| Sightings | 0.22 (0.045) | 0.10 (0.025) | $W = 57$ | 0.033 |
| PNRI | 0.04 (0.010) | 0.01 (0.005) | $W = 60$ | 0.014 |

doi:10.1371/journal.pone.0153808.t005

harvest of wolves from road packs than in years with similar population size (Fig 4, see S2 Fig for figure with road pack size). The mean probability of sighting was lower following years with harvest of road pack wolves (0.54 ± 0.127 SE) than in years without harvest of a road pack wolf (0.78 ± 0.084 SE, $t_4 = 2.88$, $P = 0.02$, Fig 4). If we consider 2012 as a post-harvest year (based on the harvest of 2 non-road pack wolves in 2011), the mean probability of sighting was not significantly different between years following harvest (0.64 ± 0.040 SE) and years without harvest (0.76 ± 0.086 SE, $t_4 = 0.92$, $P = 0.21$).

## Discussion

This study provides the first quantitative evidence that harvest of wildlife adjacent to protected areas can reduce wildlife sighting opportunities. Harvest of wolves was associated with reduced sightings in both Denali and Yellowstone National Parks. The probability of viewing a wolf was 45% greater in YNP following years with no harvest of a wolf from a road pack, and sightings in DNPP were more than twice as high in years with the presence of a wolf harvest buffer (Fig 4). There was a trend indicating that sightings decreased as the number of wolves harvested adjacent to DNPP increased, although the relationship was weak. These findings imply a trade-off between harvest (i.e., consumptive use) of large carnivores and the non-consumptive viewing opportunities and associated economic benefits. Additionally, we found that population size, pack size and den site location were strong drivers of sighting opportunities for wolves within these protected areas. These findings suggest that harvest is likely to have particularly strong effects on sightings when harvest reduces population size or affects breeding behavior within protected regions.

Human-caused mortality of large carnivores adjacent to protected areas can lead to population declines within the protected region [40–42] which our research indicates has the largest potential to decrease viewing opportunities. Although harvest of wolves in our study systems may not have occurred at rates generally considered sufficient to reduce population size (reviewed in [43]), harvest may influence sightings through other mechanisms. Behavioral avoidance of humans by wolves following exposure to hunting or trapping could reduce sightings. Although wolves show preference for linear travel corridors [44] and roads with low levels of traffic [8,45], wolves will avoid of high levels of human activity [46–48]. The presence of hunters is known to affect large carnivore behavior and movements [49]. However, the direct link between exposure to harvest and subsequent behavioral avoidance leading to reduction in sightings was not explicitly tested in our analysis and warrants further investigation. Monitoring behavior of large carnivores that survive negative encounters with humans is needed to determine the strength of these anti-predatory responses.

Selection for behavioral traits may be another method by which harvest of carnivores could decrease sightings. In our study systems, a small number of wolves may contribute to a large number of wolf sighting opportunities. Harvest can selectively target 'bold' individuals [50, 51], thereby removing bold individuals and over time, the trait, from populations. Indeed,

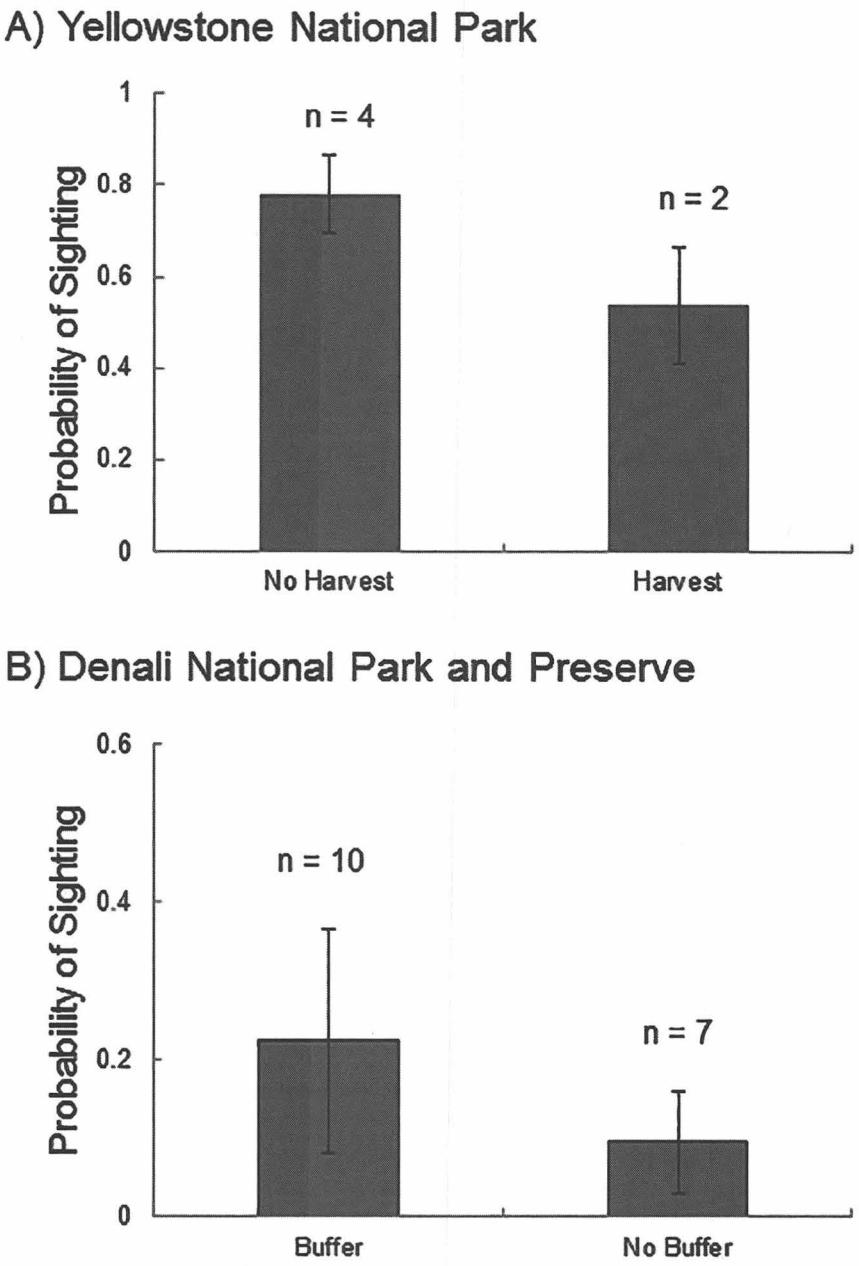


**Fig 3. Mean probability of sighting for wolves** A) in Lamar Valley and Little America following years with and without harvest of pack wolves, Yellowstone National Park, Wyoming, USA and B) along the Denali Park Road following years with and without the presence of a buffer zone prohibiting the trapping and hunting of wolves outside of Denali National Park and Preserve, Alaska, USA. Standard error bars and sample sizes (number of years) are shown.

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phenotypic changes driven by human harvest can outpace selection of traits driven by other forces [52]. As large carnivores that are less wary may contribute disproportionately to viewing opportunities, sightings could decrease if harvest selects these individuals.

We hypothesized that harvest of breeding wolves would disproportionately influence sightings, because these individuals play an important role in pack continuity and reproduction [9,

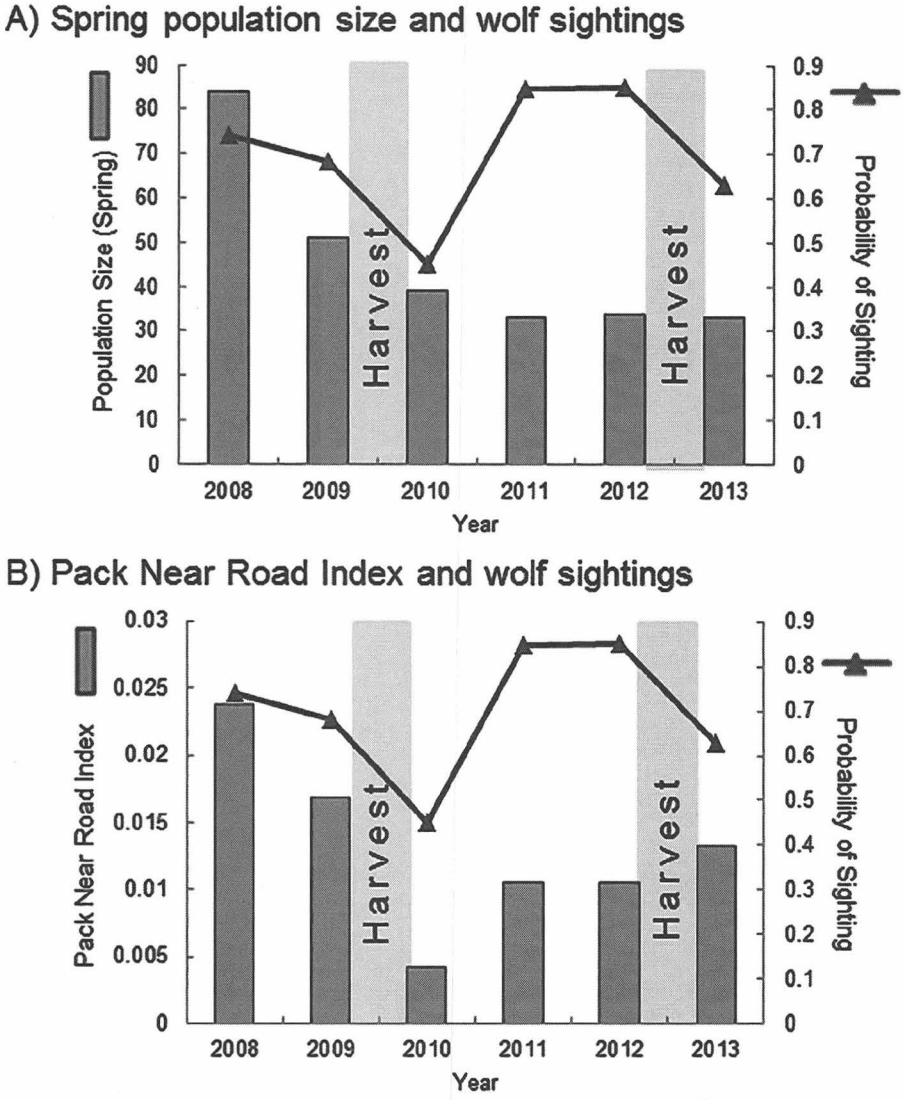


**Fig 4. Probability of wolf sighting in Little America and Lamar Valley from 2008–2012 (black triangles)** in relation to A) spring population size and B) Pack Near Road Index (number of wolves in road packs divided by den distances from the road) in Yellowstone National Park, Wyoming, USA. Shaded areas indicate years following harvest of wolves from packs. Two non-pack wolves were harvested prior to 2012.

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53] and were more likely to be near the road than non-breeding wolves [22]. Although harvest reduced sightings, the breeding status of harvested wolves was not identified as an important factor in our analyses (Table 1). Instead, our results suggest that harvest of wolves from road packs may have a larger influence on sightings than harvest of other wolves. Sightings were not reduced in YNP following the harvest of 2 wolves that were not members of road packs. These wolves resided in the park but likely contributed little to sightings as they did not live along the road corridor. However, we caution that our results from YNP were based on a limited sample size. We recommend continued monitoring of carnivore sightings and increased emphasis on identifying age, reproductive status and social group affiliation for carnivores harvested adjacent to protected areas to increase our understanding of these influences on sightings.

Collared wolves made up over half of the harvest adjacent to YNP but were only approximately a quarter of wolves in the YNP population, whereas collared wolves were harvested in proportion to their occurrence in the DNPP population. A major difference between these parks is that harvest near YNP is through hunting whereas harvest near DNPP is primarily through trapping. Although both harvest methods have the potential to act as selective forces on behavioral traits (i.e. bold or unwary individuals), hunting involves more active selection by humans whereas trapping passively selects wolves. This distinction could explain why there was disproportional harvest of collared wolves adjacent to YNP and not adjacent to DNPP if hunters targeted collared wolves. It is important to note that results from YNP were based on three years of data, and longer term analysis could yield different results. Still, the disproportional harvest of collared individuals may be a mechanism by which sightings decrease following harvest, as the presence of collared individuals aids in locating individuals (R. McIntyre, pers. obs.) or understanding behavioral patterns [54] thereby creating viewing opportunities.

In both parks, the number of identified breeders that were harvested was not different than expected given their proportion in the population. We expected that breeders would be less likely to be harvested, particularly when trapping was the primary source of harvest, as in DNPP [23]. It is possible that the benefit of experience and age in avoiding trapping may be offset in protected regions by habituation to human activity and use of linear travel corridors during the summer months [8]. Given that the primary source of harvest was hunting, the result in YNP is consistent with previous findings [23–25].

The presence of the trapping and hunting buffer zone was associated with increased wolf sightings in DNPP. Both the wolf population size and PNRI, which were strongly associated with increased wolf sightings, were also greater during the period when the buffer zone was in place. Thus, the presence of the buffer may have influenced local population size and the likelihood that wolves would den near the park road. Alternatively, the increase in sightings may have been a result of coincidental peaks in population size or PNRI as a result of variables not measured or explicitly included in our models. Two variables generally considered to be strong drivers of wolf population dynamics are prey density and snow conditions, which influence prey vulnerability to wolf predation [27]. However, during the period of the study, prey densities were relatively consistent [55–57]. Similarly, although snow conditions varied among years, there has been no statistically significant trend in the annual snowfall data for park headquarters over the past 20 years [58]. Traffic levels, managed at a consistent level during the study period, likely did not influence annual trends in sightings. Similarly in YNP, there was a decrease in sightings during years with harvest that did not appear to be explained by a change in wolf population size or change in the size of packs near the road (Figs 3 and 4). Although our sample size was low, the decrease was statistically significant. Neither climatic conditions nor prey base were thought to significantly alter wolf population dynamics in YNP during the study period. The elk population was stable during the study time period, and although snow depth in winter 2010–2011 was above average, the other winters were within the average range for snowfall and temperature [59]. Although there was an increase in visitation in YNP during the study period, there was no indication that annual wolf sighting trends were influenced by this pattern in visitation [33].

The opportunity to view free ranging large carnivores is an important driver for wildlife tourism worldwide, and the National Park Service mission in particular emphasizes the preservation of wildlife resources in their natural condition for the non-consumptive benefit and enjoyment of the public. Thus, factors that influence sightings of iconic wildlife such as wolves are important to track and understand. Here, we have shown that consumptive use of a large carnivore reduces opportunities for non-consumptive use in protected areas. Limiting harvest of large carnivores along the boundaries of protected areas may provide a strategy to

increase sighting opportunities for visitors to these areas and the associated economic benefits to adjacent communities. However, there are associated costs of limiting harvest, given the revenue generated from hunting [17, 19, 60] and the potential of harvest to reduce threats to livestock and increase land owner's acceptance of large carnivores [61, 62]. Cross boundary movements will continue to make large carnivore management an on-going source of debate. Wolf viewing and harvest opportunities are 2 of the many issues surrounding cross boundary wolf management. There are many stakeholders, including state and federal management agencies, private land owners, trappers, hunters, non-profit agencies, environmental advocates, and the general public Effective management in areas where cross boundary movements are common requires knowledge of complex system dynamics, in addition to understanding and defining the objectives of stakeholders, and quantifying the associated costs and benefits of management actions.

## Supporting Information

**S1 Appendix. Recording Wildlife Sightings in Denali National Park and Preserve.**
(DOCX)

**S1 Fig. Wolves in road packs and the probability of wolf sightings along the Denali Park Road, Alaska, USA.** Cumulative count of wolves in road packs in the eastern region of Denali National Park and Preserve (grey bars) and the probability of wolf sightings along the Denali Park Road (black triangles) from 1997 to 2012. Shading indicates years with a harvest buffer zone adjacent to the park in effect.
(TIF)

**S2 Fig. Wolves in road packs and the probability of wolf sightings in Yellowstone National Park, Wyoming, USA.** Cumulative count of wolves in road packs in the Northern Range of Yellowstone National Park (grey bars) and probability of wolf sightings in Little America and Lamar Valley (black triangles) from 2008–2012. Hashed bars indicate years preceded by harvest of wolves from road packs. Light gray shading indicates years preceded by harvest of non-pack wolves.
(TIF)

**S1 Table. Annual probability of sighting index for Denali National Park and Preserve, Alaska, USA.** Sample size (in number of trips), number of trips with wolf sightings, and annual probability of sighting index for wolves along the Denali Park Road from 1997 to 2013.
(DOCX)

**S2 Table. Annual probability of sighting index for Yellowstone National Park, Wyoming, USA.** Sample size (in number of days within the observation period), number of days with wolf sightings, relative effort for each year (calculated as hours of effort in the given year divided by the maximum number of hours in the field from sampled years), and annual probability of sighting index for wolves in the Lamar Valley and Little America region of Yellowstone National Park from 2008 to 2013.
(DOCX)

**S3 Table. Summary of wolf harvest for the Eastern Region of Denali National Park and Preserve, Alaska, USA.** Population size estimates, number of collared wolves, number of collared breeding wolves, and their proportions in the population and harvest included. Population size, number of collared wolves, and number of collared breeders were pre-hunt numbers.
(DOCX)

**S4 Table. Summary of wolf harvest for Northern Range packs (including Mollie's pack) in Yellowstone National Park, Wyoming, USA.** Population size estimates, number of collared wolves, number of collared breeding wolves, and their proportions in the population and harvest for Northern Range packs (including Mollie's pack) included. Population size, number of collared wolves, and number of collared breeders were pre-hunt numbers.
(DOCX)

**S5 Table. Summary of wolf harvest for wolf packs in Yellowstone National Park, Wyoming, USA.** Population size estimates, number of collared wolves, number of collared breeding wolves, and their proportions in the population and harvest included. Population size and number of collared wolves were pre-hunt numbers.
(DOCX)

**S6 Table. Model selection table evaluating factors potentially affecting probability of wolf sightings in Denali National Park and Preserve, Alaska, USA (including the factor RoadPop).** Candidate model set includes the factor RoadPop. K is the number of parameters in the model, PNRI is the Pack Near Road Index, TotalPop is the wolf population size, RoadPop is the number of wolves in packs that overlap the Denali Park Road, Buffer is a factor indicating the presence/absence of a harvest buffer, WolfHarv is the number of wolves harvested in the prior year and BreedHarv is a binary factor describing if breeders were or were not harvested from road packs in the prior year.
(DOCX)

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## Author Contributions

Conceived and designed the experiments: BB LP. Performed the experiments: BB RM. Analyzed the data: BB NB KC LP. Contributed reagents/materials/analysis tools: BB SA NB KC RM DS LP. Wrote the paper: BB SA NB KC RM DS LP.

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# Impacts of breeder loss on social structure, reproduction and population growth in a social canid

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## Summary

**1.** The importance of individuals to the dynamics of populations may depend on reproductive status, especially for species with complex social structure. Loss of reproductive individuals in socially complex species could disproportionately affect population dynamics by destabilizing social structure and reducing population growth. Alternatively, compensatory mechanisms such as rapid replacement of breeders may result in little disruption. The impact of breeder loss on the population dynamics of social species remains poorly understood.

**2.** We evaluated the effect of breeder loss on social stability, recruitment and population growth of grey wolves (*Canis lupus*) in Denali National Park and Preserve, Alaska using a 26-year dataset of 387 radiocollared wolves. Harvest of breeding wolves is a highly contentious conservation and management issue worldwide, with unknown population-level consequences.

**3.** Breeder loss preceded 77% of cases ($n$ = 53) of pack dissolution from 1986 to 2012. Packs were more likely to dissolve if a female or both breeders were lost and pack size was small. Harvest of breeders increased the probability of pack dissolution, likely because the timing of harvest coincided with the breeding season of wolves. Rates of denning and successful recruitment were uniformly high for packs that did not experience breeder loss; however, packs that lost breeders exhibited lower denning and recruitment rates. Breeder mortality and pack dissolution had no significant effects on immediate or longer term population dynamics.

**4.** Our results indicate the importance of breeding individuals is context dependent. The impact of breeder loss on social group persistence, reproduction and population growth may be greatest when average group sizes are small and mortality occurs during the breeding season. This study highlights the importance of reproductive individuals in maintaining group cohesion in social species, but at the population level socially complex species may be resilient to disruption and harvest through strong compensatory mechanisms.

**Key-words:** *Canis lupus*, den fidelity, gray wolf, grey wolf, harvest mortality, hunting pack dynamics, reproductive heterogeneity, social organization, social species, trapping

## Introduction

Many species have evolved complex social systems in which only a few individuals within a social group reproduce. For example, reproduction among subordinates can be suppressed or delayed in eusocial animals (e.g. Wilson 1971), a number of bird species (Arnold & Owens 1998), and in social carnivores (Kleiman 1977; MacDonald 1983). The importance of specific individuals may be especially variable for social species that exhibit reproductive suppression of subordinates, because this suppression creates skewed heterogeneity in the reproductive value of individuals (e.g. Stahler *et al.* 2013). Population models are particularly sensitive to variation in reproductive performance among individuals or age classes (Kendall *et al.* 2011; Lindberg, Sedinger & Lebreton 2013). However, the impact of reproductive individuals on the population dynamics of species with complex social structure remains poorly understood. Mortality of reproductive individuals may disproportionately affect population growth, unless other reproductively viable individuals are able to take their place with little disruption. In this study, we examine the

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effects of mortality of reproductive individuals ("breeders") on grey wolf (*Canis lupus*) social structure, reproduction, and population growth using a 26-year data set from Denali National Park and Preserve (DNPP) in interior Alaska.

As long-lived canids with a family-based social system (Mech 2000), grey wolf pack and population dynamics may be highly sensitive to the fate of breeders. Breeders and/or dominant individuals play an important role in pup survival (Brainerd *et al.* 2008), hunting behaviour and efficiency (Sand *et al.* 2006; MacNulty *et al.* 2011) and interpack competitions (Cassidy 2013). However, early models of wolf population dynamics ignored this source of individual variation (Soule 1980, 1987; Keith 1983; Fuller 1989; Boyce 1990) and generally failed to predict dynamics accurately (Fuller, Mech & Cochrane 2003). More recent models have accounted for wolf social structure (Haight & Mech 1997; Vucetich, Peterson & Waite 1997; Haight, Mlandenoff & Wydeven 1998; Cochrane & Fitts 2000; Haight *et al.* 2002; Fuller, Mech & Cochrane 2003), but we still lack an adequate understanding of how the loss of breeding individuals affects pack and population dynamics. Better understanding of how social structure relates to population viability and the fitness of wolves has been identified as a priority for wolf management and conservation (Stenglein *et al.* 2011).

There is growing recognition of the importance of explicitly considering sources of heterogeneity in harvest management of vertebrates (Lindberg, Sedinger & Lebreton 2013), because harvest of individuals with high reproductive value can have a greater effect on population dynamics than harvest of individuals with low reproductive value (Kokko 2001; Hauser, Cooch & Lebreton 2006). Understanding the consequences of breeder mortality on wolf population dynamics is increasingly important as wolves recolonize areas of North America and Europe (Wabakken *et al.* 2001; USFWS 2007; Wydeven *et al.* 2009). Wolves have recently been delisted from the Endangered Species Act (ESA) in several of the United States and are currently subject to hunting and trapping in regions of the United States and Europe. Scientists, policy makers and the public continue to debate what constitutes a sustainable level of harvest for these wolf populations. Progress in resolving this debate is hindered in part because the effect of breeder loss on the population dynamics of social species such as wolves remains largely unknown.

Wolf populations have typically been viewed as highly resilient to harvest (reviewed in Fuller, Mech & Cochrane 2003; Adams *et al.* 2008), but recent studies suggest wolf populations may be less resistant to harvest impacts than previously thought (Smith *et al.* 2010; Creel & Rotella 2010; Sparkman, Waits & Murray 2011; but see Gude *et al.* 2012). We hypothesize that the level of sustainable wolf harvest may depend on the breeding status of harvested wolves and the timing of harvest. For example, removal of a breeding female, especially if timed during the breeding season, may induce reproductive failure for the pack that year (Brainerd *et al.* 2008; Stahler *et al.* 2013). If individuals of high reproductive value, such as breeding wolves, are selectively harvested or disproportionately vulnerable to harvest, the level of harvest that can occur without population level impacts may be lower than commonly accepted thresholds (Lindberg, Sedinger & Lebreton 2013).

In a previous analysis of breeder loss in wolves, Brainerd *et al.* (2008) found that pack fate (i.e. whether a pack persisted or dissolved) depended on pack size prior to breeder loss and whether one or both breeders died. However, the effect of breeder loss on population growth was not assessed. Additionally, the importance of other factors that could moderate the effects of breeder loss on pack maintenance or population growth, such as the timing and cause of mortality, remains unknown.

We evaluated the impacts of anthropogenic and natural mortality of breeders on wolf pack maintenance, reproduction and population growth using data on 387 radiocollared wolves in 70 packs. We hypothesized that the sex of breeder lost, pack size prior to loss and the timing of loss would influence pack fate, denning behaviour, pup recruitment and population growth. Anticipating high overlap between anthropogenic mortality and the breeding season, we also expected cause of death to affect pack fate. We hypothesized that loss of breeders and packs could reduce population growth primarily by reducing the reproductive capacity of the population (Mech *et al.* 1998; Fuller, Mech & Cochrane 2003). Alternatively, breeders could be replaced with negligible impact or even a positive effect on population growth. Pack dissolution may create opportunities for existing packs to usurp old territories, allow new pairs to set up territories where packs have dissolved, or packs may subdivide existing wolf territories with the effect of increasing wolf densities locally (Ballard & Stephenson 1982; Meier *et al.* 1995; Mech *et al.* 1998; Mech & Boitani 2003).

## Materials and methods

### STUDY AREA

The study area encompassed *c.* 17 270 km$^2$ of wolf habitat primarily north and west of the Alaska Range in and adjacent to DNPP (Fig. 1). The eastern region of DNPP contains habitat patches of high alpine, open gravel river bars, and willow-lined creeks. The western region of the park is more homogenous, dominated by relatively flat, lowland black spruce (*Picea mariana*) forest and long meandering rivers and wetlands. The diversity of habitat types in the eastern region of the DNPP supports caribou (*Rangifer tarandus*), Dall's sheep (*Ovis dalli*), and moose (*Alces alces*) populations. The western lowlands support lower densities of ungulates (primarily moose), and salmon are an important food source for wolves in this region (Mech *et al.* 1998; Adams & Roffler 2009; Owen & Meier 2009; Adams *et al.* 2010).

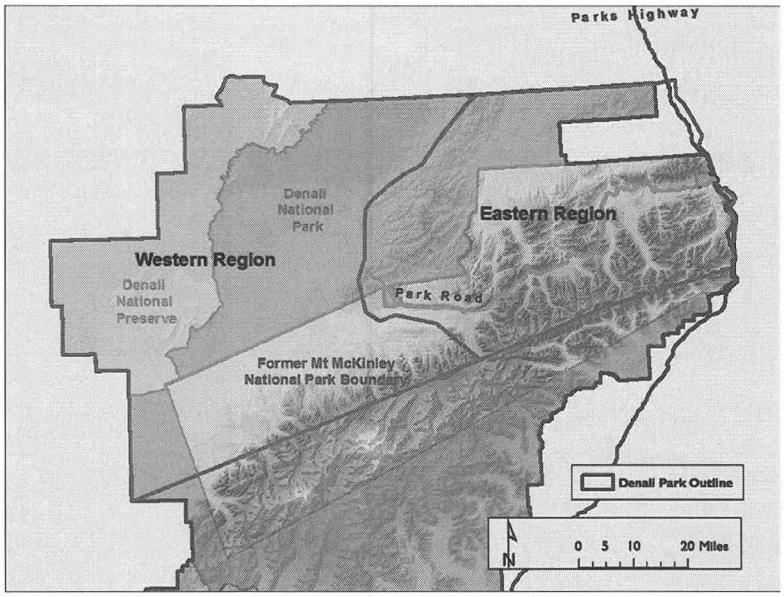


**Fig. 1.** Map of study area and geographical regions for long term monitoring of grey wolf packs in Denali National Park and Preserve, Alaska, USA.

## DATA COLLECTION

Wolf population monitoring efforts in DNPP and use of radiotelemetry for tracking and monitoring packs began in 1986 (Mech *et al.* 1998). From 1986 to 2012, 387 individual wolves were radiocollared with very high frequency (VHF) collars (Meier 2011). From 2003 to 2012, 30 of the VHF collars were equipped with GPS (Telonics, Mesa, CA, USA) which provided daily locations uploaded through the Argos satellite system (Meier *et al.* 2009). Wolves were immobilized by darting from helicopters and collared following protocols described in Meier *et al.* (2009).

Researchers gathered annual wolf population and composition data in early and late winter (November–December and February–March respectively). Radiocollared wolves were located by VHF signal from fixed-wing aircraft. Approximately 10–20 wolf packs were monitored annually in the study area and efforts were made to maintain collars on two or more individuals in each pack whose home range was mostly within DNPP boundaries. Wolf location, number of pack members, pelt colours and estimated age classes (if distinguishable) were recorded. Observers also recorded detailed information on mortality, den site location/use and pack affiliation (Mech *et al.* 1998; Meier *et al.* 2009).

Wolf mortalities were noted during aerial tracking and observation and through weekly GPS data checks. Cause of death was determined through a field necropsy or by wildlife veterinary staff at the University of Alaska Fairbanks (UAF) or the Alaska Department of Fish and Game (ADF&G). When carcasses were too decomposed to determine cause of death or both laboratory and field evidence were inconclusive, cause of death was recorded as "unknown natural".

All areas outside of the DNPP boundary were open to hunting and trapping under state regulation, with open seasons and bag limits (i.e. the number of wolves that could be harvested per person) managed by ADF&G. In Game Management Units (GMU) 20A and 20C adjacent to the park's boundaries, the hunting season was August 10–April 30 from regulatory year 1996–1997 through 2005–2006 and extended until May 31 starting in 2006–2007. The bag limit was 10 wolves until 2001–2002 and was then decreased to five wolves per season. The wolf trapping season spanned November 1 to April 30 in GMUs 20A and 20C, with no bag limits for either unit. Subsistence and sport hunting and trapping were permitted in the Preserve and new park additions of DNPP, but all hunting and trapping was prohibited in the area of the original Mt. McKinley National Park (Fig. 1).

## PACK SIZE AND PACK FATE

We examined the size and fate of all packs monitored in DNPP from 1986 to 2012. Pack size during spring and fall was defined as the maximum count observed during surveys within each season. We defined pack formation as occurring the season (spring or fall) and year of the first pack count recorded for the associated pack name. We defined pack dissolution as the reduction of a pack of ≥3 wolves to zero or one wolf the subsequent season. Because the exact fate of remaining pack members was often unknown (i.e. they may have died, dispersed or remained present but undetected), the concept of pack persistence in this study is analogous to "apparent survival" in capture–mark–recapture studies (Lebreton *et al.* 1992). Pack life span was calculated as the number of years from pack formation (or from the start of monitoring) to pack dissolution.

For analyses of breeder loss effects on pack maintenance and reproduction, we included only established packs that were monitored or known to exist for ≥1 year. Packs were considered to have dissolved following breeder loss if the dissolution occurred the season following or during the same season as the breeder loss. In the absence of collars, observers used colour composition and number of associated individuals or distinguishing features to determine if individuals or groups found within the former territory were original pack members, neighbouring pack members or previously unknown wolves. Pack dissolution rate for the population was calculated as the number of packs dissolving in a year divided by the total number of packs monitored.

## BREEDER LOSS

Biologists generally targeted dominant members of packs for collaring by observing the behaviour of pack members during

aerial tracking and collaring operations (Meier *et al.* 2009), but subordinate wolves were sometimes collared. The breeding status of individuals was determined through observation of leadership behaviour, attendance at den sites, observation of nursing pups (for females) during aerial tracking, and/or through testes and nipple measurements during collaring (Mech 1999, 2000; Peterson *et al.* 2002; Meier *et al.* 2009). However, breeding status or dominance status was not recorded for all wolves in the data set.

We used a heuristic method to identify likely breeders from the dataset of all collared wolves in DNPP from 1986 to 2012. We censored wolves from our dataset that were: (i) <2 years old when they died, (ii) dispersing or had dispersed out of the study area at the time of death, (iii) classified as pups or yearlings when captured, unless these were later classified as "alpha", "breeder" or "paired" in the capture or aerial tracking data, or (iv) had an unknown fate due to collar failure or dispersal. We performed additional review to corroborate our method of breeder classification in two ways: (i) we compared wolves identified as breeders by our method to a subset of breeders from 1986 to 1993 identified and used for analysis by Brainerd *et al.* (2008), and (ii) classification of individuals monitored from 1995 to 2012 was verified by reviewing capture, mortality and aerial tracking information from the corresponding time period.

We classified breeder mortality as occurring in one of four equal length seasons. Season breakpoints were determined primarily based on wolf breeding cycles in interior Alaska. Wolves in DNPP typically come into oestrus in March (Mech *et al.* 1998) and give birth in early May following a 2 month gestation (Hayssen & van Tienhoven 1993). There is a prolonged period of proestrus in grey wolves of about 6 weeks (Asa & Valdespino 1998) during which the mated pair spends time together coordinating their activity, and this period appears important for the formation and maintenance of the pair bond (Mech & Knick 1978; Rothman & Mech 1979). We therefore defined spring as February–April (breeding season), summer as May–July (pup-rearing season), fall as August–October, and winter as November–January. Cause of mortality was classified as natural (including intraspecific strife, starvation, accident and unknown natural causes) or anthropogenic (trapped, shot, vehicle strikes or capture-related mortality). We evaluated the proportion of natural and anthropogenic mortalities of identified breeders that occurred within each season to assess seasonal patterns in cause of mortality.

For analysis of the probability of pack maintenance, we censored cases of breeder loss where (i) pack persistence was unknown following the loss of the breeder, (ii) pack size prior to the loss of the breeder was unknown, (iii) packs were monitored or existed for less than a year after wolves were collared, or (iv) groups were identified as pairs rather than reproductive packs.

## RECRUITMENT AND DEN FIDELITY

We examined cases of pack denning and recruitment from 1997 to 2012 for packs in the eastern region of DNPP (Fig. 1). Data on den site use and reproduction prior to 1997 were not accessible and therefore excluded from analysis. We collated locations from collared wolves by pack and created minimum convex polygons that bounded the territory for each wolf pack by year using the program ArcGIS 10.0 (Esri, Redwoods, CA, USA). Packs were designated as belonging to the eastern or western region when the centre of the pack territory was located within the corresponding geographical region. DNPP wolf management plan objectives require closing areas around known den sites to hikers (National Park Service 2007). Thus, den site locations and use were closely monitored for wolf packs in the eastern region, which includes the areas of higher potential backcountry recreational use in DNPP. This close monitoring provided more accurate data on denning status and presence of pups in fall (recruitment) in the eastern region than in the western region.

Wolf packs were recorded as having successfully reproduced using one of three methods: (i) one or more visual observations of attendance at known or suspected den sites during the denning season (April through mid-August), (ii) clusters of GPS points at a known or suspected den locations, or (iii) detection of pups during aerial tracking flights. Denning status was assumed to be an indication of reproduction. Early denning behaviour that failed to produce surviving pups may have been missed and classified as no known denning or unknown denning status.

Den site fidelity was recorded for each pack each year; packs that used the same den in year $n + 1$ as in year $n$ had fidelity, whereas packs that changed locations between years did not. Den site tenure was defined as the number of consecutive years that a pack used the same den site.

Recruitment was categorized as successful or failed based on: (i) visual observations of pups during the summer or early fall counts when pups were easily distinguished from adults, or (ii) an increase in estimated pack sizes from spring to fall. We censored cases with increases in pack size of one or two individuals without corresponding visual observation of pups, because these cases could be explained by possible immigration or adoption of individuals. Recruitment was recorded as failed when packs either did not den or pups were never observed and pack size did not increase as described. We censored cases of newly formed pairs (those that formed after or during the breeding season) in our analysis because newly formed pairs have a lower probability of successful reproduction and recruitment (Mech *et al.* 1998). We evaluated denning and recruitment for packs that experienced breeder mortalities that occurred during the breeding season, pup-rearing season or the prior winter. Cases where packs dissolved or were maintained following breeder loss were both included.

## STATISTICAL ANALYSES

### *Factors affecting pack maintenance following breeder loss*

We hypothesized that pack maintenance would depend on the sex of breeder lost (male, female or both), pack size prior to breeder loss, season of breeder loss and cause of mortality (anthropogenic or natural). We used the glm function in Program R (R Core Team 2013) to create generalized linear models with all four main effects and all nested models with no interaction or higher order terms ($n = 15$ models). We used Akaike information criterion corrected for small sample sizes ($AIC_c$) to rank models, and we calculated pseudo-$R^2$ to estimate explained variance (Veall & Zimmerman 1992). We used the modavg function in R package AICcmodavg (Mazerolle 2013) to obtain model-averaged parameter estimates for factors that were included in models with $\Delta AIC$ <2 (Burnham & Anderson 2002). For ease of interpretation of parameter estimates, we transformed the parameter estimates ($\beta$) into odds ratios such that the odds ratio was equal to $e^{\beta}$.

### *Effect of breeder loss on recruitment and den site fidelity*

We used chi-squared tests of independence to test the hypotheses that breeder loss (loss of a male, female or both breeders) would (i) reduce rates of denning, (ii) reduce successful recruitment and (iii) reduce den site fidelity.

### *Effect of breeder loss on population growth*

The annual population growth rate, or finite rate of increase ($\lambda$), for year $n$ was calculated as the spring population size in year $n + 1$ divided by the spring population size in year $n$. Breeder mortality rate was calculated as the number of breeder mortalities from May 1 in year $n$ to April 30 in year n + 1, divided by two times the number of packs monitored in year $n$ (to correspond to the estimated number of breeders in the population). If a different number of packs were observed during the spring and fall population counts, the larger number of packs was used as the number of packs monitored during the year.

We examined the relationships between the breeder mortality rate and $\lambda$ and between the pack dissolution rate and $\lambda$ using linear regression. To examine the immediate and longer term effects of breeder loss on population growth, relationships were modelled with and without a 1-year time lag (i.e. effect of breeder mortality or pack dissolution in year $n$ on the population growth rate in $n + 1$). We censored the first 3 years of the study (1986–1988) due to the low number of packs that were tracked during those years.

## Results

### PACK FATE AND BREEDER LOSS

From 1986 to 2012, wolves from 70 packs were monitored in DNPP (Table S1). Eight packs were censored because the pack fate was unknown due to limited monitoring, and nine packs continued to be monitored at the end of the study period in 2012. Of the remaining 53 packs, there were 41 cases (77%) where breeder mortality preceded or coincided with the end of the pack, and 12 cases (23%) where either there was no breeder mortality prior to the end of the pack or breeder mortality was not documented.

We identified 163 cases of breeder mortality from 1986 to 2012. Our heuristic method correctly identified 27 of the 31 (87%) collared breeder mortalities from 1986 to 1993 identified by Brainerd *et al.* (2008). The four breeders that were missed by our selection were all individuals that were captured as pups ($n = 2$) or yearlings ($n = 2$) and later became breeders in their own pack ($n = 2$) or dispersed and became breeders in another pack ($n = 2$). Some breeders that were collared as pups or yearlings and later became breeders may be missing in our data set if there was no corresponding note in the capture, mortality or aerial tracking data to indicate that the individual was a breeder.

After censoring (see Methods), we used 94 cases of breeder loss for our analysis of factors affecting pack fate (Table 1). We found that packs dissolved the season following breeder loss in 31 cases (33%) and remained intact following breeder loss in 63 cases (67%). Roughly equal proportions of yearly breeder mortality occurred in spring, fall and winter, with 29·8%, 29·8%, and 30·9% of mortalities occurring in these seasons respectively. The remaining 9·5% of mortalities occurred during summer. Anthropogenic mortality represented 11% and 14% of total mortality during summer and fall, respectively, while in spring and winter anthropogenic mortality represented 39% and 34% of total mortality (Fig. 2). Harvest (trapping or hunting) was the source of 21 of 26 (81%) of anthropogenic mortalities; the other five cases (19%) were capture related.

Sex of lost breeders and pack size were the most important predictors of pack persistence following breeder mortality (Table 2). A pack was 14·9 times more likely to persist if only the male was lost and 3·4 times more likely to persist if only the female was lost compared to cases where both breeders were lost (Table 3). The odds of a

**Table 1.** Cases of grey wolf pack persistence and dissolution following breeder mortality in Denali National Park, Alaska, USA, 1986–2012

| Breeder mortality | Pack persist | Pack dissolve |
|---|---|---|
| Both | 5 | 11 |
| Female | 27 | 14 |
| Male | 31 | 6 |
| All breeder mortality | 63 | 31 |

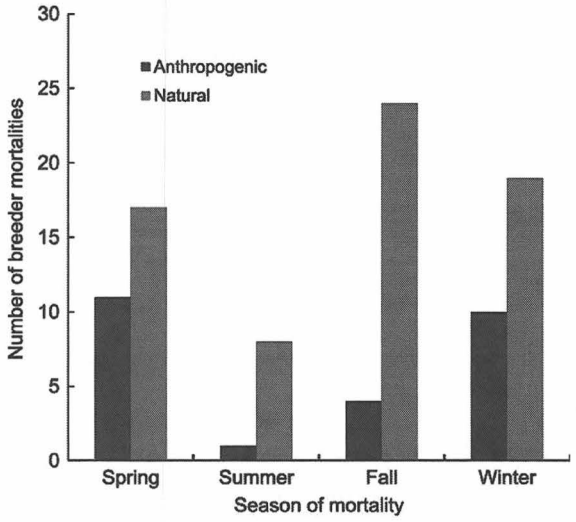


**Fig. 2.** Total number of mortalities of breeding grey wolves by season and type of mortality in Denali National Park, Alaska, USA, 1986–2012 ($n = 94$). Spring = February–April, Summer = May–July, Fall = August–October, Winter = November–January. Anthropogenic mortality includes hunting, trapping and capture-related deaths; natural mortality includes intraspecific strife, starvation, injuries and accidents.

**Table 2.** Candidate model set and model selection criteria evaluating factors potentially affecting grey wolf pack maintenance following breeder mortality in Denali National Park, Alaska, USA, 1986–2012. M-Z Pseudo-$R^2$ estimates the amount of deviance in the data explained by each model

| Model | # Parameters | AICc | ΔAICc | Model likelihood | AICc weight | M-Z Pseudo-$R^2$ |
|---|---|---|---|---|---|---|
| PP[a] + Sex[b] | 4 | 103·44 | 0·00 | 1·00 | 0·49 | 0·33 |
| PP + Sex + Mort[c] | 5 | 104·84 | 1·40 | 0·50 | 0·24 | 0·34 |
| PP + Season[d] + Sex | 7 | 105·41 | 1·97 | 0·37 | 0·18 | 0·39 |
| PP + Season + Sex + Mort[e] | 8 | 107·64 | 4·20 | 0·12 | 0·06 | 0·39 |
| Sex | 3 | 111·59 | 8·14 | 0·02 | 0·01 | 0·18 |
| Season + Sex | 6 | 113·60 | 10·16 | 0·01 | 0·00 | 0·25 |
| Sex + Mort | 4 | 113·61 | 10·17 | 0·01 | 0·00 | 0·18 |
| PP + Season | 5 | 114·74 | 11·30 | 0·00 | 0·00 | 0·25 |
| PP | 2 | 115·44 | 12·00 | 0·00 | 0·00 | 0·13 |
| Season + Sex + Mort | 7 | 115·93 | 12·49 | 0·00 | 0·00 | 0·25 |
| PP + Season + Mort | 6 | 117·02 | 13·58 | 0·00 | 0·00 | 0·25 |
| PP + Mort | 3 | 117·22 | 13·78 | 0·00 | 0·00 | 0·14 |
| Season | 4 | 121·43 | 17·99 | 0·00 | 0·00 | 0·09 |
| Mort | 2 | 123·29 | 19·85 | 0·00 | 0·00 | 0·00 |
| Season + Mort | 5 | 123·48 | 20·04 | 0·00 | 0·00 | 0·10 |

[a]Pack size prior to breeder loss.
[b]Sex of breeder loss.
[c]Cause of mortality: natural or anthropogenic.
[d]Season of breeder loss: spring, summer, fall or winter.
[e]Global model.

pack dissolving decreased with pack size (Fig. 3). The probability of pack maintenance was <0·5 if both breeders were lost in packs with ≤11 members or a female was lost in packs with <6 members.

Cause and season of mortality were included in the top-ranked models ($\Delta AIC_c$ <2). The model-averaged odds ratios indicated the probability of pack persistence was 1·6 times higher when breeders were lost due to natural causes rather than anthropogenic mortality, and mortality that occurred in spring or winter decreased the probability of pack maintenance, whereas mortalities that occurred during the summer increased the probability of pack persistence relative to mortalities that occurred in the fall (Table 3).

**Table 3.** Parameter estimates for factors included in the top-ranked models ($\Delta AIC_c$ <2) predicting the probability of pack maintenance following breeder mortality in Denali National Park, Alaska, USA, 1986–2012. See Table 2 for all models. Pack-Prior is the pack size prior to breeder loss

| Parameter | β (Model averaged) | SE | 95% CL Lower | 95% CL Upper | Odds ratio (Model averaged) |
|---|---|---|---|---|---|
| (Intercept) | −2·42 | 1·07 | −4·52 | −0·33 | 0·09 |
| PackPrior | 0·24 | 0·08 | 0·07 | 0·4 | 1·27 |
| Sex (F)[a] | 1·22 | 0·71 | −0·17 | 2·61 | 3·39 |
| Sex (M)[a] | 2·7 | 0·77 | 1·19 | 4·22 | 14·88 |
| Cause mortality (Natural)[b] | 0·48 | 0·62 | −0·73 | 1·69 | 1·62 |
| Season (Spring)[c] | −1·12 | 0·73 | −2·54 | 0·31 | 0·33 |
| Season (Summer)[c] | 0·18 | 1·00 | −1·79 | 2·14 | 1·20 |
| Season (Winter)[c] | −1·16 | 0·71 | −2·56 | 0·24 | 0·31 |

[a]β and odds ratio estimates relative to mortality of both breeders.
[b]β and odds ratio estimates relative to anthropogenic cause of mortality.
[c]β and odds ratio estimates relative to mortalities that occur in fall.

## BREEDER LOSS AND POPULATION GROWTH

Breeder loss did not affect population growth in the current year, $\lambda_n$, or the following year, $\lambda_{n+1}$ ($\lambda_n$: $\beta = -0{\cdot}64$,

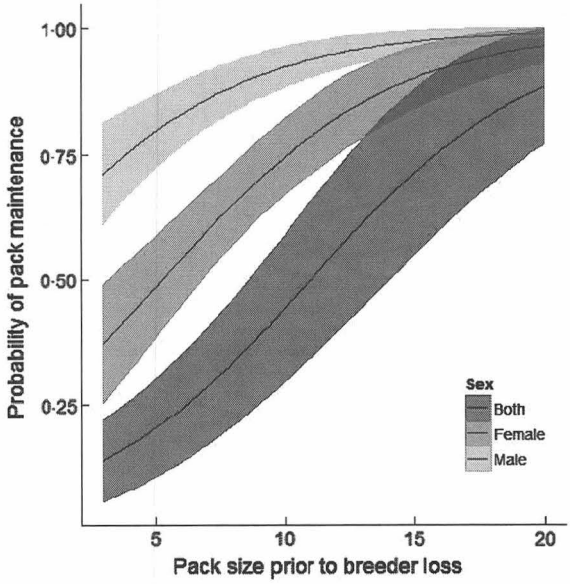


**Fig. 3.** Effect of pack size prior to breeder loss and sex of breeder(s) lost on the probability of grey wolf packs remaining intact in Denali National Park, Alaska, USA, 1986–2012. Shaded areas show 95% confidence intervals around predicted probabilities.

$F_{1,21} = 1{\cdot}87$, $P = 0{\cdot}19$, $R^2 = 0{\cdot}08$, $n = 23$, Fig. 4a; $\lambda_{n+1}$: $\beta = 0{\cdot}23$, $F_{1,20} = 0{\cdot}23$, $P = 0{\cdot}63$, $R^2 = 0{\cdot}01$, $n = 22$, Fig. 4b). Pack dissolution had a marginal negative effect on population growth in the current year but no effect the following year ($\lambda_n$: $\beta = -0{\cdot}81$, $F_{1,21} = 3{\cdot}10$, $P = 0{\cdot}09$, $R^2 = 0{\cdot}13$, $n = 23$, Fig. 4c; $\lambda_{n+1}$: $\beta = 0{\cdot}71$, $F_{1,20} = 2{\cdot}11$, $P = 0{\cdot}16$, $R^2 = 0{\cdot}10$, $n = 22$, Fig. 4d).

### RECRUITMENT AND DEN FIDELITY

We determined pack denning status in 79 cases from 1997 to 2012. Packs denned in 72 cases (91%) and successfully reared pups in 63 of the 72 cases (88%; Table 4). For packs that did not lose breeders, rates of denning (96%, $n = 54$) and successful recruitment (94%, $n = 52$) were uniformly high. Packs that experienced breeder loss had significantly lower denning and recruitment rates than packs that did not experience breeder loss (denning: 80%, $\chi^2 = 3{\cdot}896$, d.f. = 1, $P = 0{\cdot}049$, $n = 79$, recruitment: 70%, $\chi^2 = 5{\cdot}697$, d.f. = 1, $P = 0{\cdot}017$, $n = 72$).

Breeder loss did not significantly affect den site fidelity ($\chi^2 = 1{\cdot}90$, d.f. = 1, $P = 0{\cdot}17$, $n = 48$). Packs used the same den site in consecutive years in 20 of 37 cases (54%) when no breeder loss occurred between breeding seasons and in 10 of 16 cases (63%) following breeder loss when the pack continued following the breeder loss (Table 4). Packs used the same den for an average of three consecutive years (range = 1–13 years, $n = 10$ packs).

## Discussion

Our results show that the mortality of breeding individuals in social groups can often lead to social group dissolution, but population growth can be resilient to the effects of breeder mortality. Although breeder loss preceded or coincided with most documented cases of wolf pack dissolution, packs remained intact in approximately two of every three cases of breeder loss (Table 1). Population growth rates were largely unaffected by breeder loss and pack dissolution despite reduced reproductive rates, indicating that

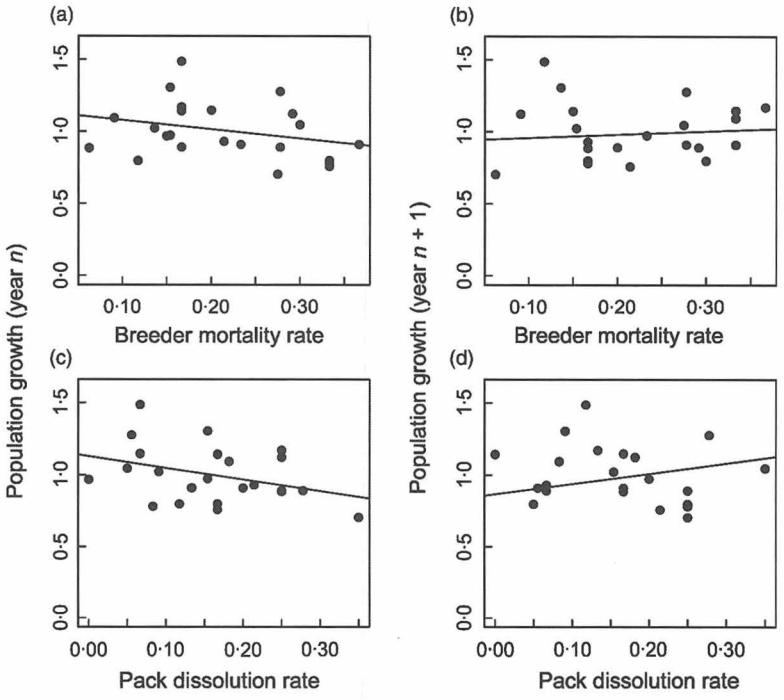


**Fig. 4.** Effect of breeder mortality and pack dissolution on annual population growth of grey wolves in Denali National Park, Alaska, USA, 1986–2012 with and without a time lag. Effect of breeder mortality rate in year $n$ on population growth rate in (a) year $n$ and (b) year $n + 1$. Effect of pack dissolution rate in year $n$ on population growth rate in (c) year $n$ and (d) year n + 1. Non-significant regression lines are displayed.

**Table 4.** Cases of pack denning (reproduction), successful recruitment and den site fidelity in relation to breeder mortality for grey wolf packs in Denali National Park, Alaska, USA, 1997–2012

| Breeder mortality | Denning | No denning | Recruitment | No recruitment | Den fidelity[a] | New den | No denning |
|---|---|---|---|---|---|---|---|
| Both sexes | 2 | 3 | 2 | 0 | 2 | 0 | 4[b] |
| Female | 10 | 0 | 6 | 4 | 4 | 1 | 0 |
| Male | 8 | 2 | 6 | 2 | 4 | 1 | 2 |
| Total | | | | | | | |
| Breeder mortality | 20 | 5 | 14 | 6 | 10 | 2 | 6 |
| No breeder mortality | 52 | 2 | 49 | 3 | 20 | 16 | 1 |

[a]Den fidelity data are a subset of denning data for which we have information on denning in the prior year.
[b]Includes two cases of pack dissolution following breeder mortality.

strong compensatory mechanisms can reduce the negative impacts of breeder loss in socially complex species such as wolves.

While the effects of breeder loss on wolf population dynamics in DNPP appear to be minor in general, our findings indicate the availability of replacement breeders and timing of mortality can moderate the consequences of breeder loss. The importance of the cause and timing of mortality indicates the value of reproductive individuals in social species may be context-dependent and characterized by strong seasonal heterogeneity. Our results suggest that reproductive value of individuals increases as they approach parturition such that mortality of breeders during this time can destabilize social groups and lead to reproductive failure. The effects of variable reproductive value among age classes can alter population dynamics (Francis *et al.* 1992), and our results imply that seasonal variation in addition to reproductive status can affect social and population dynamics.

Although direct causes of pack dissolution were generally not known, dissolution followed or coincided with the loss of one or both breeders in at least 77% of the cases. This rate was likely underestimated because not all breeders were collared, and thus not all breeder mortality events were observed. Breeders may thus contribute disproportionately to the social stability of groups (Mech & Boitani 2003) in addition to having high reproductive values. The importance of breeders in this socially structured species highlights the need to explicitly consider the effects of harvest of these individuals, especially when harvest overlaps the breeding season.

Anthropogenic mortality has been shown to impact social structure in grey wolves, such that harvested populations tend to have smaller packs (Ballard, Whitman & Gardner 1987) and harvest may reduce genetic relatedness (Rutledge *et al.* 2010 but see Lehman *et al.* 1992). We found that packs were less likely to be maintained when breeders were killed by humans than when mortality resulted from natural causes. Although this finding supports previous research, it is still surprising given that the cause of mortality should not necessarily affect pack fate per se. We suspect the timing of anthropogenic mortality in relation to breeding season may partially account for the observed effects on pack fate. Anthropogenic harvest mortalities were concentrated in spring breeding and winter pre-breeding seasons (Fig. 2). Mortalities during spring in particular leave little time for replacement of breeders and may have a disproportionate effect on pack persistence. Our results indicate that harvest of breeding wolves has the potential to impact pack persistence and reproduction, and these impacts are likely to be greatest when pack sizes are small (<6) and harvest overlaps the breeding season.

The role of individual breeders in maintaining pack cohesion appears moderated by the availability of replacement breeders as indicated by the effect of pack size. Consistent with the findings of Brainerd *et al.* (2008), our analysis indicates that large packs are more likely to persist following breeder mortality than small packs (Fig. 3). Large packs are more likely to have multiple breeders, unrelated adoptees or reproductively viable related individuals present as replacement breeders (Meier *et al.* 1995; Mech & Boitani 2003), whereas small packs are more likely to have young of only the previous year (Mech 1999). Heterogeneity in the reproductive value of individuals in social groups may therefore depend on group size, such that the reproductive value of a single breeder in a small group is higher than the reproductive value of individual breeders in large groups.

The availability of replacement breeders may increase with the overall size of the population as well as pack size. Brainerd *et al.* (2008) found that breeder replacement in wolf packs occurred more quickly in saturated versus recolonizing populations. Thus the effects of breeder loss on pack fate could be moderated by the availability of replacement breeders not only within the pack, but in the population and surrounding areas. The wolf population in DNPP is generally considered to be a saturated population at or near carrying capacity (Mech *et al.* 1998), and therefore our results may represent the minimum impacts that breeder loss can have on pack and population dynamics.

We found that packs that lost both breeders were more likely to dissolve, as did Brainerd *et al.* (2008). However, loss of both breeders confounded the influence of sex of breeder loss with the numeric impacts of the loss of two individuals. The influence of female versus male loss was more explicit, and as expected, mortality of a female breeder destabilized packs more often than the loss of a male breeder. Female parturition and the care of neonates and young pups are essential to pack reproduction and recruitment. Thus mortality of female breeders, especially when timed during the breeding season, has disproportional impacts on pack fate and may represent a loss of the reproductive capacity for the entire pack for that year.

Overall, most packs maintained cohesion and reproduced despite breeder loss, indicating a high degree of resilience and rapid replacement of breeders. These high reproductive rates imply that either successful replacement of the lost breeder occurred prior to the breeding season, or that multiple breeders were present in the pack which mitigated the loss of one breeder. Interestingly, intact wolf packs in the eastern region of DNPP exhibited high den site fidelity, regardless of whether a pack experienced lost breeders or not. Den site fidelity may thus be related to pack persistence or other factors rather than breeder continuity. However, reproductive success was substantially reduced for packs that experienced breeder loss and remained intact. This result supports findings from other species that found reductions in reproductive capacity following disruption of the social group. For example, female African elephants (*Loxodonta africana*) from disrupted groups had a significantly lower reproductive output than

females from intact social groups (Gobush, Mutayoba & Wasser 2008).

Although not explicitly considered in our analysis, additional sources of heterogeneity in individual breeders such as body mass, age or even coat colour may also affect reproductive success (Mech 1995; Stahler *et al.* 2013). Breeder age and experience may be particularly important, because younger individuals and those breeding for the first time have lower reproductive success (Anderson 1986; Stacey & Koening 1990; Mech *et al.* 1998; Heinze & Schrempf 2012). Thus, even if lost breeders are replaced by subordinates, recruitment success could be reduced. If replacement breeders tend to be younger than breeders that died, age effects may reduce the ability of populations to compensate for breeder losses.

Pack dissolution rates appeared to have weak negative effects on population growth of wolves in DNPP. However, population growth rates following years of high breeder loss and pack dissolution did not remain low, indicating that strong compensatory mechanisms buffered against longer term population level impacts. Because our regression analyses did not account for sampling and measurement variance in the population estimates, results should be interpreted with caution.

Annual rates of human-caused mortality in DNPP wolves ranged from 3 to 7% during 1986-2002 (Adams *et al.* 2008), well below the level expected to reduce rates of population growth (reviewed in Fuller, Mech & Cochrane 2003; Adams *et al.* 2008). Despite these low harvest rates, we found that anthropogenic mortality of breeders increased the probability of pack dissolution. Harvest may be a largely additive source of mortality for wolves rather than a compensatory one (Adams *et al.* 2008; Murray *et al.* 2010; Sparkman, Waits & Murray 2011), especially in small, isolated or recolonizing populations. The influence of breeder loss in small, isolated or recolonizing populations may be greater than reported in our study of a saturated wolf population, because the time for breeder replacement and subsequent reproduction is increased in those populations (Brainerd *et al.* 2008). Therefore, the loss of breeders in regions with higher harvest rates or in low density or unsaturated populations may have lasting negative effects on population growth.

Our study is the first to explicitly link the effects of breeder loss to population growth rates in wolves, and further research on these relationships is needed to quantify the importance of breeders within low density or unsaturated populations. With grey wolf recovery and delisting from the Endangered Species Act, wolf management plans in several states (Idaho, Michigan, Minnesota, Montana, Wisconsin and Wyoming) include public harvest seasons that overlap with the wolf breeding season. For regions with recovering wolf populations, and those with small average pack sizes, harvest that occurs during the breeding season could have disproportionate impacts on pack fate and population growth, indicating that wolf recolonization into new areas could be slower than expected. The implications of these findings extend to other socially structured species with reproductive suppression of subordinates and to species where harvest coincides with breeding season. In such cases, we may expect impacts on social structure and population growth beyond those anticipated by population models that ignore the role of reproductive individuals.

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## Data accessibility

All data are collected, maintained and archived by the National Park Service. Data can be accessed at the Integrated Natural Resource Applications Portal https://irma.nps.gov/ Reference code: 2210948

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## Supporting Information

Additional Supporting Information may be found in the online version of this article.

**Table S1**. Pack life spans for gray wolf packs monitored in Denali National Park, Alaska, USA, 1986–2012.

# Delineating a Protective Buffer Zone for Eastern Denali Wolves

Gordon C. Haber

October 2002



## Introduction

Full protection from hunting and trapping has long been advocated for the two major "road corridor" groups of wolves in Denali National Park and Preserve. The 63-year-old or older Toklat (East Fork) family lineage and at least four successive groups occupying the adjacent eastern area – Savage, Headquarters, Sanctuary, and Margaret - have provided more viewing opportunities and scientific insight than wolves anywhere else in the world. Yet they are not accorded full protection from hunting and trapping, and losses continue with serious harm to their world-class scientific and viewing values and despite legitimate ethical concerns (Haber 1996, 2002a). Three successive eastern groups - Savage, Headquarters, and Sanctuary – have been terminated over the past 20 years (in 1983, 1995, and 2001) due largely to hunting and trapping, and Toklat has been hit hard at least several times.

In November 1992, the Alaska Board of Game created a no-wolf-hunting/trapping buffer zone of approximately 600 square miles along the northeast and east park boundaries of Denali National Park, to better protect the eastern Denali wolves. However, the Board rescinded this buffer two months later after Gov. Walter Hickel suspended several proposed wolf control programs the Board had wanted for other areas. In November 2000, the Board again agreed that a buffer

was justified but designated only 29 square miles along the northeast park boundary for this purpose. In May 2001 it expanded this to about 90 square miles.

In this report, I consider why the present Board of Game should restore a buffer virtually identical to the one the Board created in 1992 (widened somewhat on its northern end, narrowed on its southern end). The proposed buffer, shown in Figure 1, should eventually also include about 300 square miles of the 1980 national park addition, but this will require separate federal action.

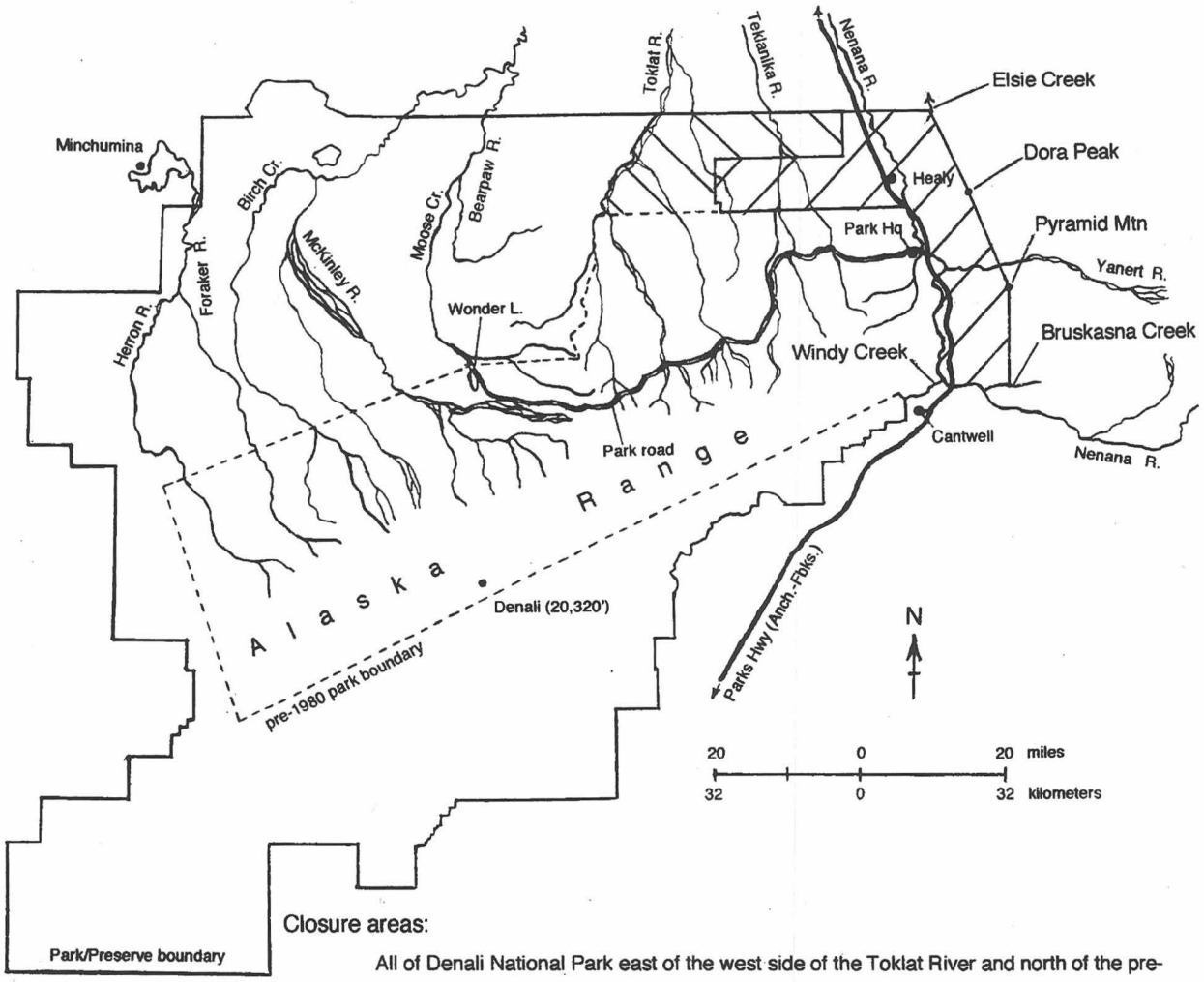
As of this writing (early October 2002), the new eastern group – Margaret – consists of four adult wolves and the six pups they produced in May 2002. I will not know Toklat's status for certain until completing intensive radio tracking surveys in late October. My current observations indicate Toklat's five 2002 pups probably died, due to unknown natural causes, and that there are 4-5 adults at present.

Wolf movements

To understand why a buffer is needed and how it should be delineated, it is necessary to distinguish among three types of movements: (a) the more-or-less routine, recurring movements that define the "territory" of each group, (b) the unpredictable *extraterritorial forays* by each group well outside these areas, and (c) dispersals, during which certain individuals – most commonly 2-3-year-olds – leave a group (depending on its size and other variables) and do not return, usually because they form/join a new group or die in a distant area.

The third type of movement, (c), is not relevant to the buffer objective; dispersers are "lost" from the original groups with or without a buffer. The two others, (a) and (b), are relevant. Figures 2-6 show the winter radio-tracking locations that I recorded for Toklat, Sanctuary, and Margaret involving these two types of movements from 1995-2002. Table 1 summarizes similar data that I recorded for Savage (a Sanctuary and Margaret predecessor) and Toklat during the same two kinds of movements from 1969-1974. In Figures 2-6, each location represents all radio-collared wolves that were present - e.g., two radio-collared wolves of the same group tracked to the same location at the same time are represented by one dot, not two. Two or more locations are plotted together only if I found the wolves there on separate dates, successive or otherwise. In some cases I tracked the wolves represented by these locations over extended routes for up to 7-10 days; this information is not shown in Figures 2-6. I emphasize that all of the outlying locations shown in Figures 2-6 represent forays from which the wolves returned, usually within a few days to a week; no dispersals are included.

The Table 1 data (Table 37 of Haber 1977) are derived from much longer, continuous sampling intervals, during which I followed and observed each group daily for up to three weeks at




Closure areas:

All of Denali National Park east of the west side of the Toklat River and north of the pre-1980 north park boundary (approx. 63° 48.00′N)

All other lands abutting the east and northeast boundaries of Denali National Park, within the following boundaries: Commencing at the far northeast corner of Denali National Park and Preserve (at approx. 64° 00.00′N, 149° 13.00′W), thence due east until intersecting Elsie Creek (at approx. 64° 00.00′N, 148° 53.00′W), thence southeastward along a straight line to the top of Dora Peak (at approx. 63° 49.20′N, 148° 41.00′W), thence southeastward along a straight line to the top of Pyramid Mountain (at approx. 63° 38.40′N, 148° 31.00′W), thence due south until intersecting Bruskasna Creek (at approx. 63° 27.00′N, 148° 31.00′W), thence westward (downstream) along the north side of Bruskasna Creek to its confluence with the Nenana River (at approx. 63° 26.10′N, 148° 37.80′W), thence westward (downstream) along the north side of the Nenana River to its confluence with Windy Creek at the east park boundary (at approx. 63° 27.90′N, 148° 49.00′W).

Figure 1. Proposed Denali no-wolf-hunting/trapping buffer zone. Cross-hatching indicates areas that would be closed to wolf hunting and trapping: right = areas outside park lands, left = inside.

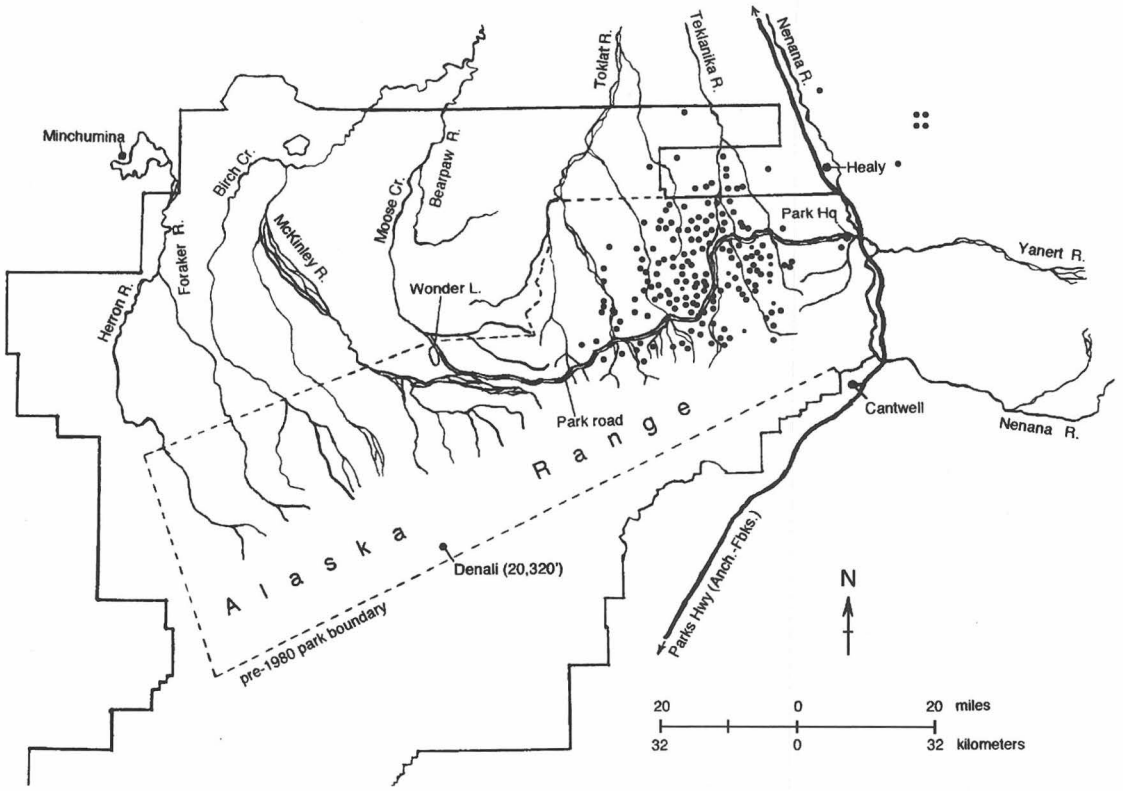



Figure 2. Toklat winter locations, October 1995-April 2001 (171).

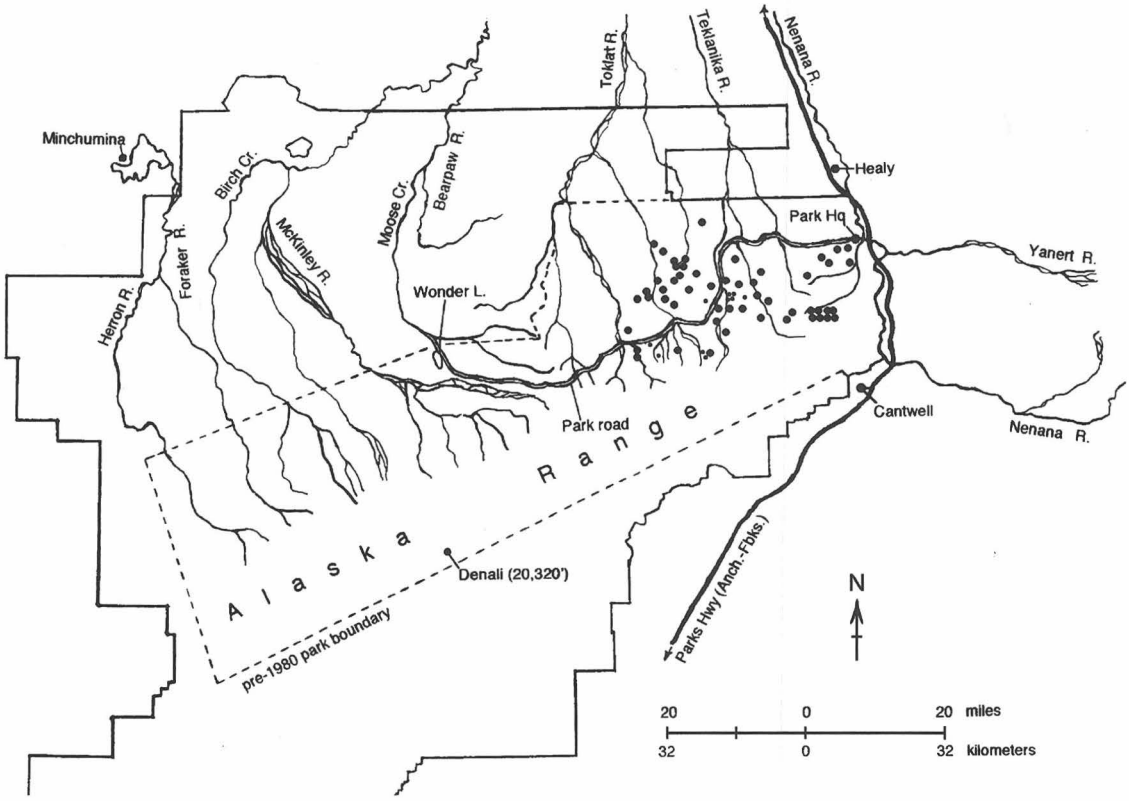



Figure 3. Toklat locations, May 2001-April 2002. Large dots=Oct-April (53), small=May-Sept (10).

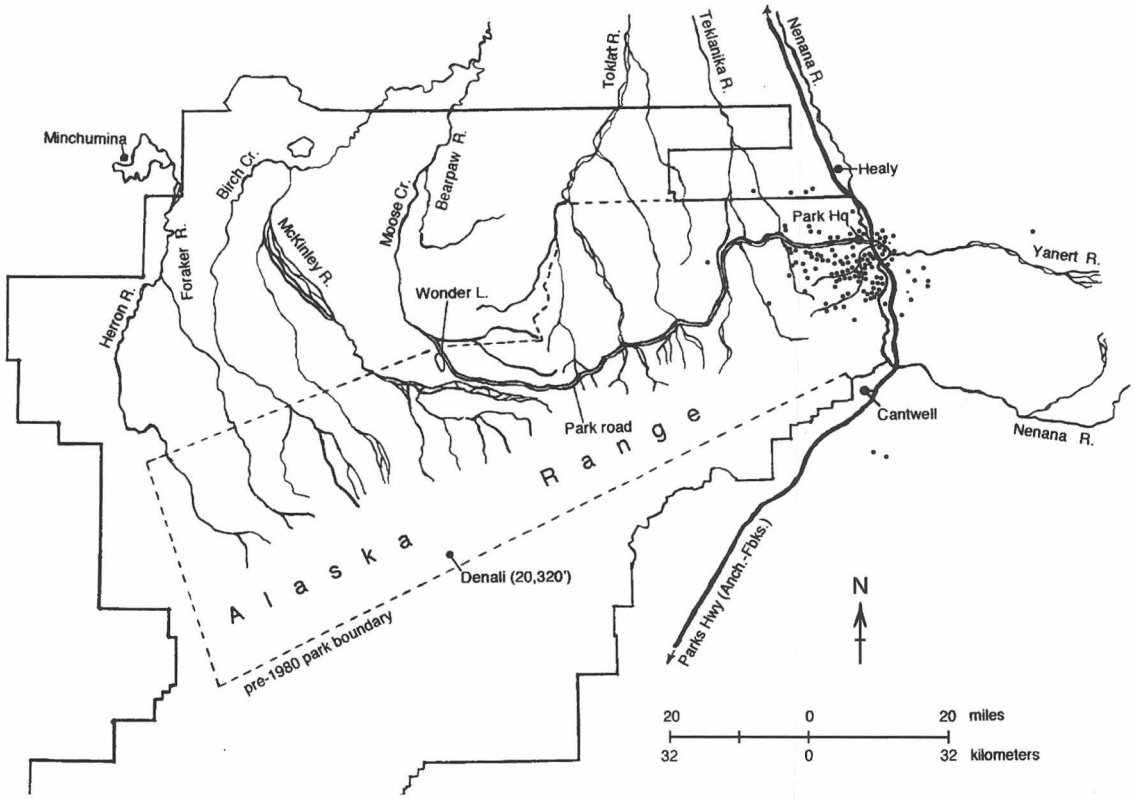



Figure 4. Sanctuary winter locations, October 1995-April 2001 (119).

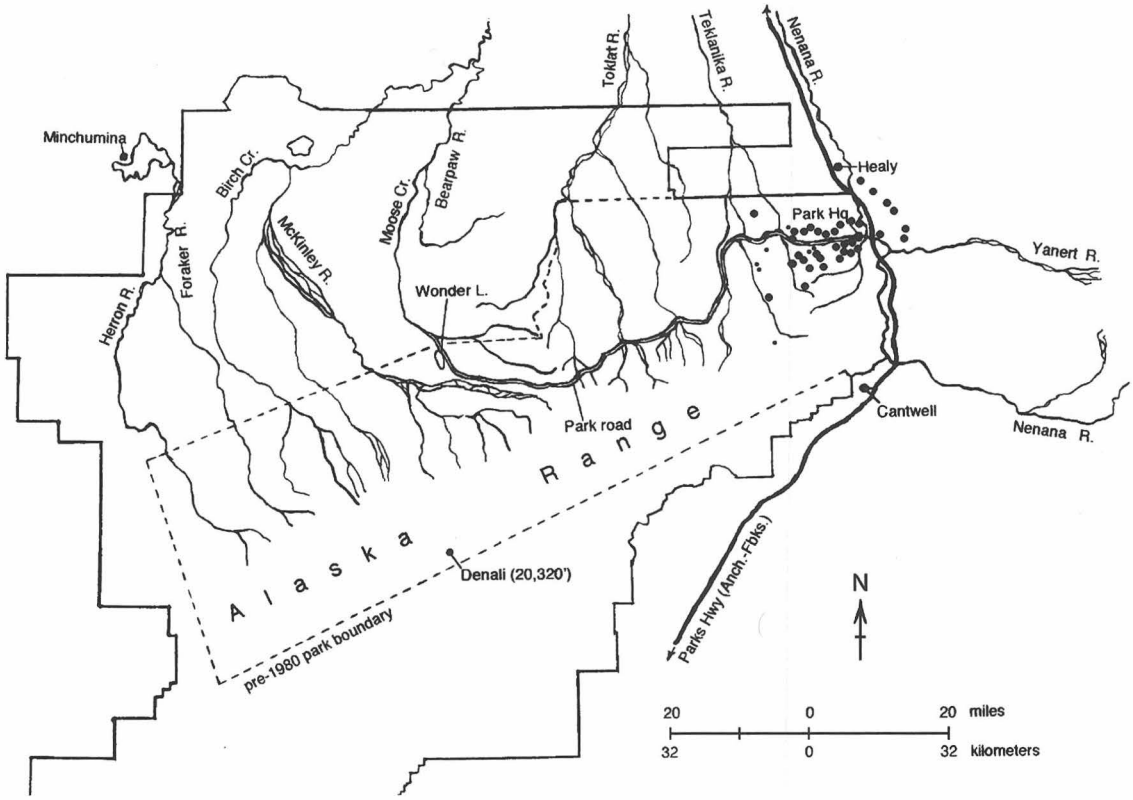



Figure 5. Margaret locations, May 2001-April 2002. Large dots=Oct-April (34), small=May-Sept (7).

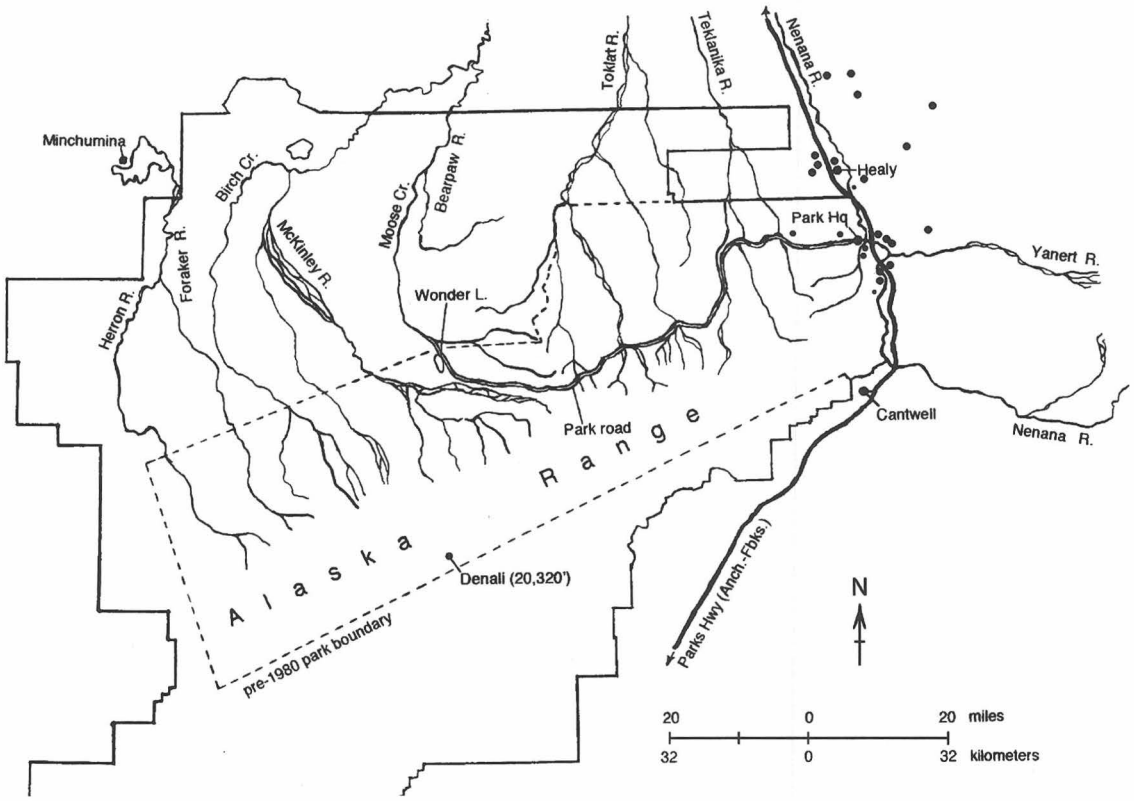



Figure 6. Sanctuary survivor locations, May 2001-March 2002. Large dots=October-March (17), small=May-September (6).

Table 1. Savage and Toklat winter travel mileages, 1969-1974 (Table 37 of Haber 1977).

| | Savage – miles traveled | | | | Toklat – miles traveled | | | |
|---|---|---|---|---|---|---|---|---|
| Winter | Inside territory | Outside | Total | Miles per day | Inside territory | Outside | Total | Miles per day |
| 1969-70 | 269.3 | 0 | 269.3 | 17.3 | 210.7 | 48.3 | 259.0 | 25.4 |
| 1970-71 | 452.2 | 16.6 | 468.8 | 7.2 | 169.1 | 7.9 | 177.0 | 13.2 |
| 1971-72 | 288.3 | 128.7 | 417.0 | 10.8 | 68.1 | 9.5 | 77.6 | 7.9 |
| 1972-73 | 294.6 | 1.2 | 295.8 | 10.3 | 316.4 | 21.8 | 338.2 | 22.3 |
| 1973-74 | 254.2 | 6.3 | 260.5 | 12.5 | 102.6 | 0 | 102.6 | 20.2 |

a time via aerial snow tracking, the method used by researchers and aerial wolf hunters at that time (radio tracking was not yet available).

I have not included most of the summer data from either period of research, because of the wolves' much different routines at that time of the year. During summer, wolves base their activities at dens and rendezvous sites, whereas during winter they range more-or-less continuously as a single group or in varying subunits without any fixed bases. Combining summer and winter data disproportionately weights the overall sample within central areas (where most of the dens and rendezvous sites are located) and thus produces a misleading portrayal of the relationship between central and outlying movements during the winter, when most of the problems occur. There is some travel outside the park boundaries during summer, but this is generally negligible and much less than during winter.

Although the Figures 2-6 vs. Table 1 data are not strictly comparable, both samples illustrate an important aspect of behavior that is critical toward designating buffer zone boundaries: A relatively small but significant and widely-varying portion of the wolves' winter travel, excluding dispersals, is outside their established territories. During these extraterritorial forays, which range from a few miles to 40-50 miles or more and last from 1-2 days to a week or two, an entire family group or a temporary subunit hunts, explores, and/or aggressively pursues wolves from other groups (Haber 1977; Mech et al 1998). Table 1 indicates that from 1969-1974 - a five-winter sample covering a wide range of snow conditions - 9% of all travel (in miles) observed for *both* Toklat and Savage was outside their established territories but with wide variation in the winter-to-winter percentages: 0-19% for Toklat and 0-31% for Savage. Figures 2-4 indicate that from 1995-2002, 13-15% and 13% of my winter radiolocations for Toklat (n=224) and Sanctuary (n=119), respectively, were outside their established territories. The outside-location winter-to-winter variation was 0-32% for Toklat and 7-45% for Sanctuary. Sanctuary's successor, Margaret, recolonized approximately the northern half of the Sanctuary vacancy as of its first winter there (Figure 5). About 18% of its winter radiolocations (n=34) were outside the established (Sanctuary) territory. A female Sanctuary pup survived on her own for 12 months after the other Sanctuary wolves were gone, obviously without much knowledge of the established territory. 65% of my winter radiolocations for her during this period (Figure 6; n=17) were outside the established Sanctuary territory, although she ultimately returned to its eastern area and was trapped there in March 2002.

Figures 2-6 provide an indication of the importance of buffer areas to the two eastern groups relative to the total area that each uses. Buffer usage consists of routine, fairly regular movements within each of the two ("core") territories where these extend somewhat outside the protected park areas *and* sporadic extraterritorial forays (above) further into and through the buffer.

Combining the Figures 2-6 winter radiolocations from both kinds of movements produces overall "buffer-use indices" of 8-9% for Toklat (n=224), 20% for Sanctuary-Margaret (n=153) excluding the Sanctuary pup's locations, and 27% for Sanctuary-Margaret (n=170) including the pup locations.

These indices could change substantially over the next year or two, given that so far Margaret has recolonized only the northern half of the Sanctuary vacancy and much of the rest still seems open to dispute. Toklat's increased eastward probes in winter 2001-02 (Figs. 3 vs. 2) suggest that it may be in the running for a portion of the Sanctuary vacancy. On several of these forays Toklat wolves were within an easy 1-2 hour jaunt of crossing central and southern segments of the east park boundary, into areas of high hunting and trapping danger where at least two successive eastern groups (Headquarters and Sanctuary) were eliminated. This serves as a reminder as to how easily Toklat can get to these dangerous east boundary areas and how closely its safety from hunting and trapping is tied to what happens to the eastern group. Note from Figure 2 the Toklat radiolocations well to the north and east of Healy - in the Ferry, Jumbo Dome, and Usibelli coal mine areas, illustrating that its extraterritorial forays not only can but *do* take it into and through seemingly distant areas of the proposed buffer. Data from earlier years and decades on Toklat, Savage, Headquarters, and other Denali groups show much the same (Haber 1977 and unpubl.; Mech et al 1998), including forays into and beyond southern sections of the proposed buffer.

Hunting-trapping risk and buffer protection

It does not follow that drawing a protective buffer around *most* of the Toklat and Sanctuary-Margaret radiolocations shown in Figures 2-6 will eliminate *most* of the hunting-trapping risk for these wolves. The level of risk is not determined only by where the wolves go. It is determined by where they go *with respect to* hunting-trapping access. There are fewer outlying locations, but most of these represent known extraterritorial forays into northeast and eastern areas where the risk increases dramatically because of much higher human activity and easier hunting-trapping access.

The buffer area shown in Figure 1 includes Healy and extends southward almost to Cantwell. Between these two communities and west of Healy there are major residential subdivisions, commercial developments, and numerous individual residences. All of this is tied together along the east park boundary by the Parks Highway and Alaska Railroad, and west of Healy by the Stampede Trail/Road. Snowmachine and ATV access is enhanced by the Anchorage-Fairbanks Electrical Intertie right-of-way, major trails up the Yanert valley, secondary roads and trails in the Dry Creek-Healy-Usibelli-Ferry areas, other roads and trails, the gravel bars of numerous rivers and creeks, and large expanses of open tundra in the northeast boundary area, i.e., the so-called Wolf Townships. The Stampede Trail/Wolf Townships, Yanert valley, and Cantwell areas have become

major snowmachining and dog-mushing destinations, complete with accommodations and weekly snow-condition reports in the Fairbanks Daily News-Miner.

Extraterritorial forays can take Toklat and Margaret unpredictably in almost any direction from their core territories. However, when they cross the northeast and east park boundaries - which becomes more likely because of the lure of traditional caribou wintering activity, the high human activity and easy hunting-trapping access gives special urgency to protecting them. It is relatively easy to identify from Figures 2-5 where the two core territories extend across the park boundaries but impossible to know where, beyond these cores, Toklat and Margaret will go on their next extraterritorial forays. Toklat's next trip outside its established territory might be five miles to the north for two days, or it might be 30 miles to the northeast for a week or two (as in 1999, when all six of the Toklat wolves went northeast to Jumbo Dome [northeast of Healy], then southward through the Usibelli area and to Montana Creek before re-entering the park near the main Parks Highway entrance). Margaret's next foray outside its territory might be 5-10 miles northward to the Healy area (as in March 2002) or 25 miles eastward up the Yanert valley.

The only way to reasonably ensure protection in the face of this unpredictability is to incorporate all of the developed and easily accessible northeast and eastern areas within the buffer, in a way that permits relatively easy field identification of the boundaries. Hence the buffer proposed in Figure 1, which the Board of Game first designated for these reasons (in nearly the same form) in 1992.

There will be continued risk for Toklat and Margaret when they venture north and east of the proposed buffer. However, the buffer is delineated so that it includes the bands of heavy development and easy access along and extending from the Parks Highway and Stampede corridors. The wolves will be legally protected while passing through these areas, and when they exit the north or east sides of the buffer the human activity and hunting-trapping access will have decreased just as dramatically as it increased when they entered on the opposite sides.

Mobile protection

The objective is to protect the Toklat and Margaret wolves from hunting and trapping. This can be done primarily with the Figure 1 no-wolf-hunting/trapping buffer. Nevertheless there should be additional flexibility when the buffer is not enough and there is an opportunity to do more. The Board should give the Commissioner of Fish and Game authority to take immediate emergency action to protect Toklat and Margaret (or any successor group) when they are on *any* unprotected state or private lands.

Toklat and Margaret are monitored regularly via aerial radio tracking. It will often be known when they are beyond protected areas. It should often be possible to watch them closely when this happens (as I am already doing). If they are radio tracked to an unprotected area where there is current snowmachine or aerial-assisted trapping activity, the Commissioner should have the authority to issue an immediate emergency order protecting them from shooting and new ground or aerial trapping. If any are caught in previously set traps or snares, the Commissioner should have the authority to immediately release them and provide whatever on-scene veterinary assistance is needed to help ensure recovery from trap or snare injuries. There could be a provision to pay the trapper above market value for wolves thus released, but the key would be fast action and hence authority for the Commissioner to act before the usually difficult process of identifying and contacting the trapper.

These will be rare occurrences. It will be possible to confirm the identity of the wolves and determine that they are not simply dispersing. Hence this kind of mobile protection is unlikely to be "abused" or result in a serious burden for anyone.

Pitfalls and misconceptions

It is often assumed that separate buffers can be considered for Toklat vs. Margaret – one buffer along the northeast park boundary for Toklat and another along the east park boundary for Margaret. This is a serious mistake. Per above, the unpredictable extraterritorial forays of each group can extend in both directions. In addition, although Margaret's recent territorial (vs *extra*territorial) movements haven't extended into the northeast area yet, they likely will as recolonization of the Sanctuary vacancy continues. Both the Sanctuary (Fig. 4) and Savage (Haber 1977) territories extended into this area as well as outside the east park boundary. Indeed, Margaret's original territory – for about a year and a half prior to the Sanctuary vacancy – was "wedged" between the Toklat and Sanctuary territories and extended further to the north. Thus, whether the concern is for Toklat, Margaret, or both groups, a buffer including both areas (northeast and east) is needed for effective protection against hunting and trapping.

As also emphasized earlier, it is not possible to delineate an effective buffer based on the *core* radiolocations, because of the disproportionately much higher hunting-trapping risk associated with the outlying locations, however fewer in number they are. This was the flawed reasoning behind the delineation of a 90-square-mile northeast boundary "Toklat buffer" in 2001. The 2001 buffer has also enabled vindictive trappers to focus their revenge along a north-south line (lower Savage River – the east side of the 2001 buffer) right through the middle of a traditional caribou wintering area, where Toklat (and other groups) have hunted in past winters. I monitored a trapline

along lower Savage River in winter 2001-02 but there was unusually low caribou activity. This and Toklat's eastward probes into the Sanctuary vacancy were among the lucky circumstances that forestalled Toklat trapping losses in the lower Savage area for at least one winter.

The Board declined to add any east boundary areas to the buffer in 2001 largely because it felt this would result in heavy habituation of the eastern Denali wolves and problems for east boundary residents. However, most of the contact that these wolves have with people takes place well *inside* the park, such that any additional "habituation" outside is likely to be of secondary importance. More to the point, the bold behavior of Denali wolves around people is typical of what is "natural" and "wild" for this species, probably results much less from habituation than is generally assumed, and has characterized these wolves for at least four decades without evolving into dangerous aggression (Haber 2002b).

An argument often heard in opposition to a Denali buffer is that wolf family groups disappear regularly due to natural causes, and that these mortalities essentially "swamp out" and render insignificant the effects of human-caused mortality. I challenged this argument in detail in Haber (1996, 1998, 1999, 2002a). But perhaps the most obvious counter to it is Toklat's long history, Savage's 17+ years, and the well-documented role of hunting and trapping in the succession of eastern turnovers. In other words, absent hunting and trapping, persistence would more likely be the rule than the exception in eastern Denali. Wolf family lineages ("packs") are the fundamental biological units of a wolf population. There are good scientific, esthetic, ethical, and viewing reasons why, at least in eastern Denali, these should be allowed to survive for however long – years, decades, or longer - natural circumstances alone may dictate in each case.

Another frequent argument is that the buffer is a back-door attempt to expand the park. Park entrance areas inherently attract people, development, and easy access. This usually creates sharp lines of demarcation, with natural conditions prevailing on the inside and development and access just outside. Resident wolves and other wildlife will continue using natural habitats close to the park boundary. Thus it is inevitable that their forays, migrations, etc will take them into areas of human activity and easy hunting-trapping access. The purpose of the proposed buffer is nothing more than to neutralize the negative impacts of this entrance-area activity and access on two especially vulnerable and valued park wildlife groups. The buffer is a response to a problem generated largely by human activity and access, not a back-door attempt to expand the park. It is a logical way to counter resulting hunting-trapping impacts and help to preserve what attracted most of the entrance-area human activity in the first place.

Opponents often imply that there is local subsistence dependency on wolf hunting and trapping in the proposed buffer area. To the contrary, most if not all of the wolf killing within this

area is opportunistic and/or recreational. It is done primarily by a handful of local residents from households with one or more wage earners – not uncommonly earning more than $50,000 – and by weekend hunters/snowmachiners from Fairbanks and Anchorage. I am a resident of the proposed buffer and know most of the locals who trap or shoot wolves well enough to debunk the notion that any of them will suffer a significant lifestyle or income change if they cannot kill wolves in this area.

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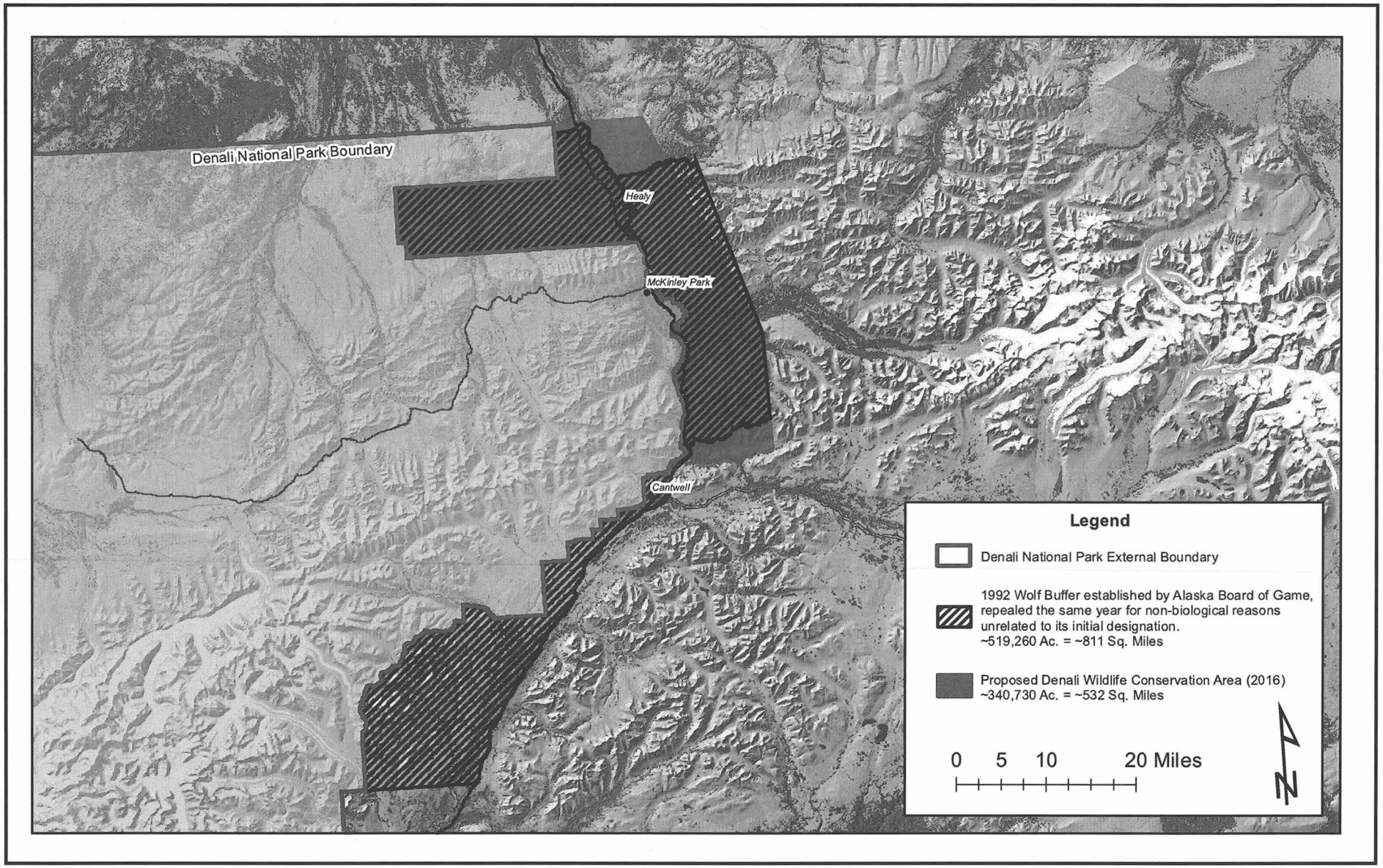
Denali National Park Boundary
Healy
McKinley Park
Cantwell
Legend
Denali National Park External Boundary
1992 Wolf Buffer established by Alaska Board of Game, repealed the same year for non-biological reasons unrelated to its initial designation.
~519,260 Ac. = ~811 Sq. Miles
Proposed Denali Wildlife Conservation Area (2016)
~340,730 Ac. = ~532 Sq. Miles
0 5 10 20 Miles
N

By: Van Lawrence
Introduced: 08/25/2016
Adopted: 08/25/2016

FAIRBANKS NORTH STAR BOROUGH

RESOLUTION NO. 2016–39

A RESOLUTION URGING GOVERNOR WALKER TO CLOSE AREAS ADJACENT TO DENALI NATIONAL PARK AND PRESERVE TO THE TRAPPING AND HUNTING OF BEARS, WOLVES AND WOLVERINES

WHEREAS, Over a half a million annual visitors from around the world come to Denali National Park and Preserve, in large part, to see the iconic wolves and bears of the Park; and

WHEREAS, Both the Park and commercial tour companies advertise Denali National Park and Preserve as the best place in the world to see wolves within their natural habitat; and

WHEREAS, A large percentage of these visitors come to Fairbanks because of our proximity to the Park; and

WHEREAS, Hunters and trappers are allowed to use bait in the 22 mile long corridor, commonly referred to as the Wolf Townships or Stampede Trail corridor, to lure bears and wolves out of Denali National Park and Preserve and kill them; and

WHEREAS, The East Fork Pack was the most famous, the most studied and most viewed wolf-pack in the world and has now been decimated by hunters and trappers using bait to draw them just outside the Park boundary; and

WHEREAS, When this area was closed to hunting and trapping the East Fork Pack numbered 22; but has now been reduced to a single female wolf trying to raise pups alone; and

WHEREAS, When the Wolf Townships/Stampede Trail was closed to hunting there were 140 wolves in Denali National Park and Preserve and 49% of visitors saw wolves. Now the East Fork Pack has been almost wiped out and the total number of wolves within Denali stands at 48 - an all-time low - and the number of visitors who see wolves, for the last three years, is only 4%, also an all-time low; and

WHEREAS, This incredible and unique resource is being squandered for the satisfaction of just a handful of individuals; and

WHEREAS, The Alaska economy cannot survive unless we have a diversified economy that promotes tourism and other industries besides oil.

NOW THEREFORE BE IT RESOLVED the Fairbanks North Star Borough urges the Governor, through the Commissioner of Fish and Game to close the areas adjacent to Denali National Park and Preserve to the trapping and hunting of bears, wolves and wolverines.

BE IT FURTHER RESOLVED copies of this resolution shall be distributed to Governor Walker and Alaska Department of Fish and Game Commissioner Sam Cotten.

PASSED AND APPROVED THIS 25TH DAY OF AUGUST, 2016.

John Davies
Presiding Officer

ATTEST:

Nanci Ashford-Bingham, MMC
Borough Clerk

Yeses: Sattley,Westlind, Lawrence, Quist, Dodge, Davies
Noes: Cooper, Roberts, Hutchison
Other: None

## Rationale for boundary of proposed *Denali Wildlife Conservation Area* (DWCA)

Knowles, Steiner; Nov. 2016

1. The area within the DWCA needs to be sufficient to achieve the joint state/federal goal -- **To restore, sustain, and enhance the valuable wildlife viewing resource of Denali National Park & Preserve**. Based upon decades of radio collar data, the proposed Area would protect most animal (predator) transits in-and-out of the Park (note: this will not provide 100% protection, but perhaps 80% - 90% of predator transits in-and-out of the Park will be protected). This is the minimum conservation area needed to reasonably meet the joint state/federal goal.

2. The proposed DWCA area (340,000 acres) represents a reasonable compromise between the 1992 buffer established by the Alaska Board of Game (519,000 acres), and the 2000-2010 buffer, also established by the Board of Game (80,000 acres). In addition, the proposed DWCA is comparable in size to the bison conservation area established earlier this year along the boundary of Yellowstone National Park by the Governor of Montana.

3. Landmarks along the proposed boundary of the DWCA – Elsie Creek, Dora Peak, Pyramid Mountain, Nenana River, etc. - are easily recognizable from the ground or air. Thus even without a GPS unit, it will be easy to tell whether one is in the Conservation Area or not, thereby simplifying compliance and enforcement.

4. The proposed DWCA area is precisely the same area that was proposed as a buffer in 2010 by the Anchorage Fish & Game Advisory Committee to the Board of Game (Proposal #58), based on recommendations by wildlife biologists studying Denali wildlife migration along the northeast boundary of the Park. (The proposal, along with several others to expand the small existing buffer, was declined, and the existing buffer was eliminated in its entirety).

5. Establishing the DWCA is seen as a one-time opportunity – there should be no additional such requests in the future. Thus, it is important to establish boundaries appropriate to the joint state/federal goal at this time.

6. The boundaries of the Area will displace activities of only a few predator hunter/trappers, thus having minimal impact on overall wildlife use patterns in the region. ADFG reports annual predator take within the proposed Area averages approx. 7 grizzly bears, 5 lynx, 4 wolves, 4 wolverine, and 2 black bears. And, the Conservation Area will benefit over 70,000 Alaskans visiting Denali each summer hoping to view these same animals in the Park, along with another 600,000 paying out-of-state tourists also hoping to view these animals.

7. The proposed DWCA boundary excludes the area south of Cantwell/south of the Alaska Range, which had been protected in the 1992 Board of Game buffer, as it is felt that this area may be less critical to the protection and restoration of wildlife viewing along the Park road, north of the Alaska Range.

**Description of *Denali Wildlife Conservation Area* Boundary:**

All lands abutting the east and northeast boundaries of Denali National Park & Preserve (the Park), within the following boundaries: Commencing at the far northeast corner of the Park (approx. 64° N, 149° 13' W), thence due east until intersecting with Elsie Creek (approx. 64° N, 148° 53' W), thence southeastward along a straight line to the top of Dora Peak (approx. 63° 49.20' N, 148° 41' W), thence southeastward along a straight line to the top of Pyramid Mountain (approx. 63° 38.40' N, 148° 31' W), thence due south until intersecting Bruskasna Creek (approx. 63° 27' N, 148° 31 W), thence westward (downstream) along the north side of the Nenana River to its confluence with Windy Creek at the east boundary of DNP (approx. 63° 27.90' N, 148° 49' W).

**Map of Proposed *Denali Wildlife Conservation Area***
(Blue area)