

FIRE HISTORY AND WILDLIFE HABITAT ON THE KENAI PENINSULA: AN ECOLOGICAL PERSPECTIVE

Elizabeth Bella,
PhD

Ecologist, Kenai
National Wildlife
Refuge

907-260-2831

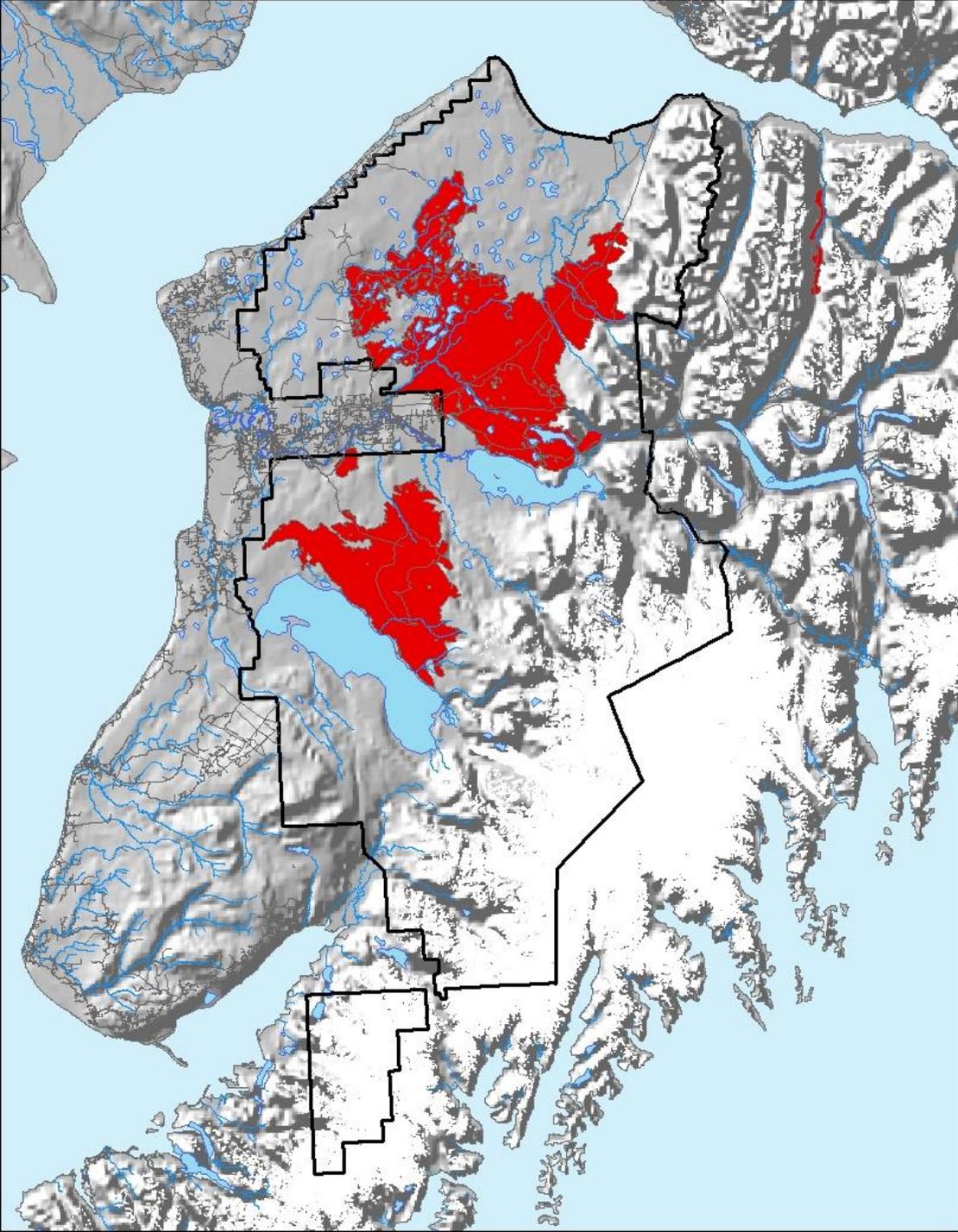
elizabeth_bella@
fws.gov



INTRODUCTION

- Early settlement and infrastructure development on KP
 - Road building and increased population
 - Homesteading era
 - Fire regime changes
 - Decrease of caribou, increase of moose
- Land management approach change over time
 - Kenai Moose Range, then Kenai Refuge
 - Oil & gas development
 - Increased recreation use, hunting heritage
 - Prescribed fires, vegetation control
 - Habitat studies
- Ecological study on the KP
 - Long term ecological studies
 - Current and future directions



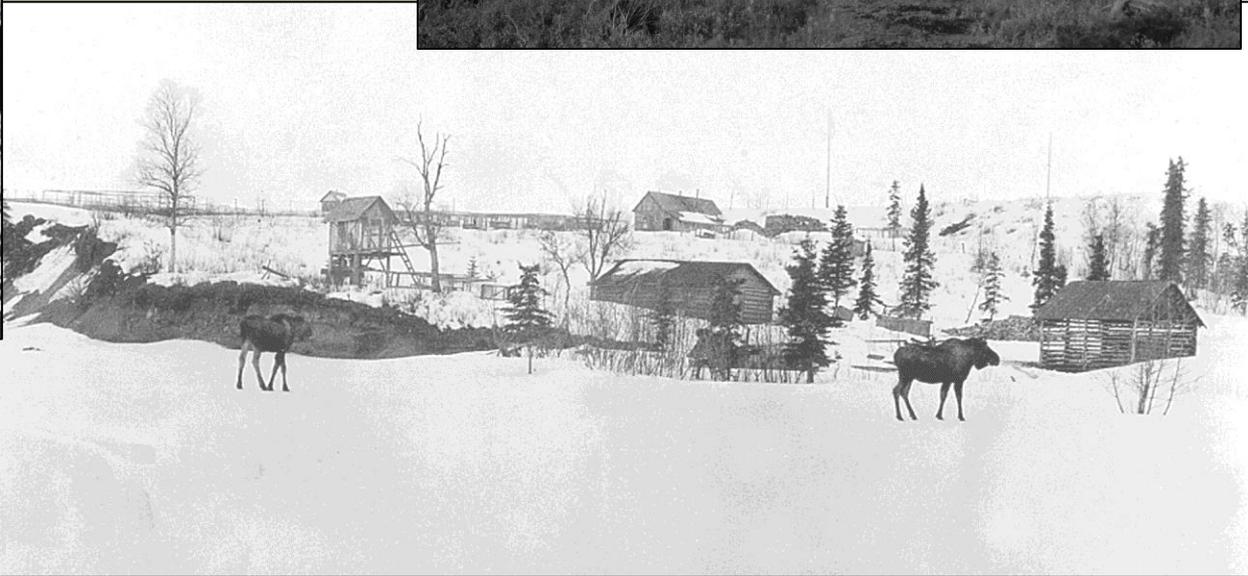


WILDFIRE, KENAI PENINSULA

1708-1920

EARLY SETTLEMENT

- Salmon fishing, canneries
- Fur trade - fox farms
- Mining for coal and gold



FIRE REGIME CHANGE

- Prior to this past century, major fires of unknown origin took place in 1871, 1883, 1891, and 1910, burning much of the Tustumena Benchlands
- Post-settlement, many fires occurred along roadways and towns



WILDLIFE

- Historical record of caribou on the KP
- Also, long historical record of moose on the KP from archeological records and oral tradition of Alaska Natives
 - Known for extraordinary size
 - Dall de Weese from CO was first well-known hunter in late 1800s

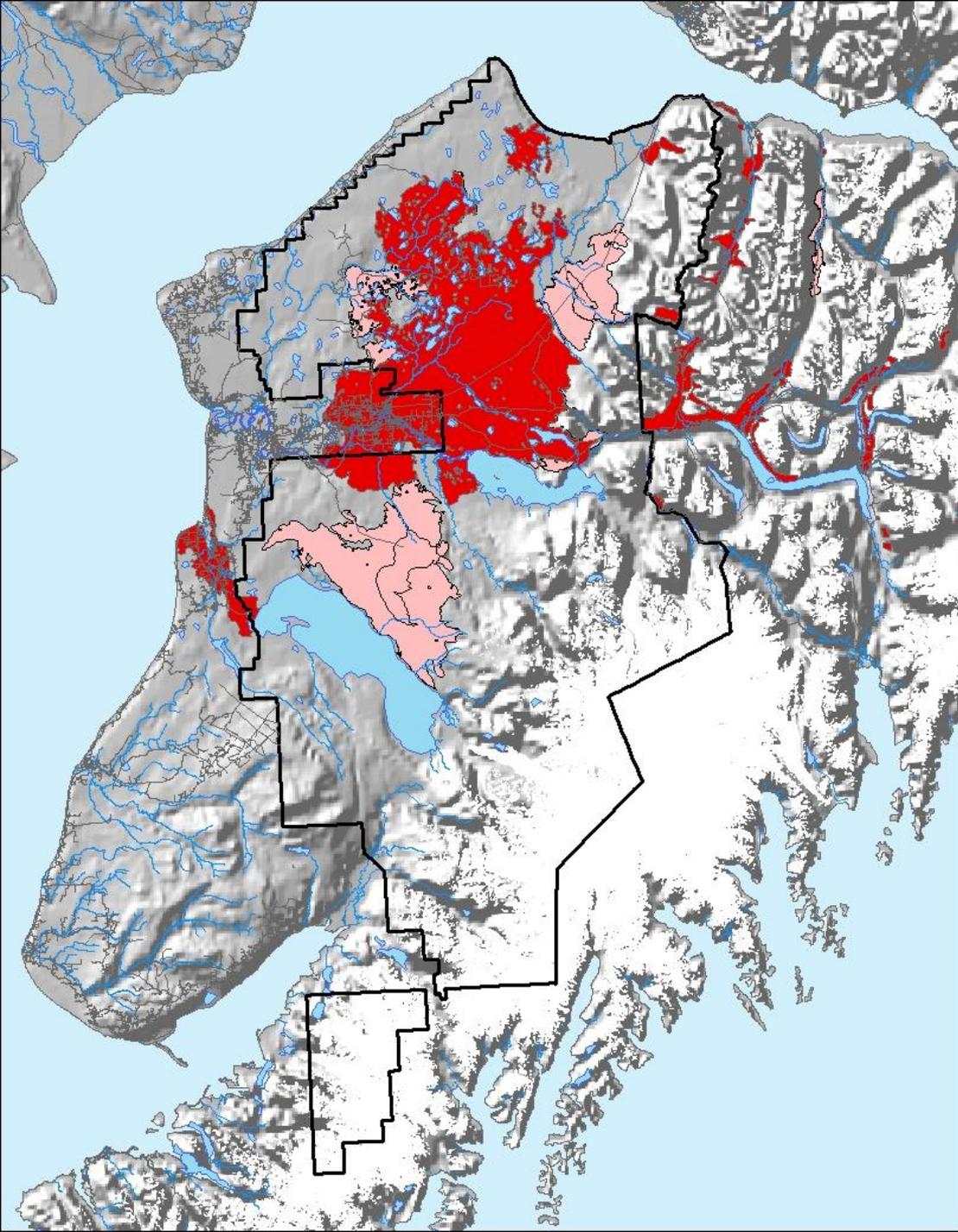






WILDLIFE SHIFTS

- **The last indigenous caribou was sighted around 1915**
 - Overhunting, habitat loss due to human-caused fires
 - The giant moose of the KP became famous, leading to lobbying Congress for a special reserve for moose for sport hunting
- **Moose became the dominant ungulate**
- **The Kenai National Moose Range was established in 1941**



WILDFIRE, KENAI PENINSULA

1708-1920

1920-1955

POST WWII GROWTH

- Homesteading and population increased dramatically following WWII
- Demand for roads, schools, businesses, food production, domestic animals & forage
- Homesteading for agricultural production did not work well due to climate, and it was cheaper to import food from Outside locations

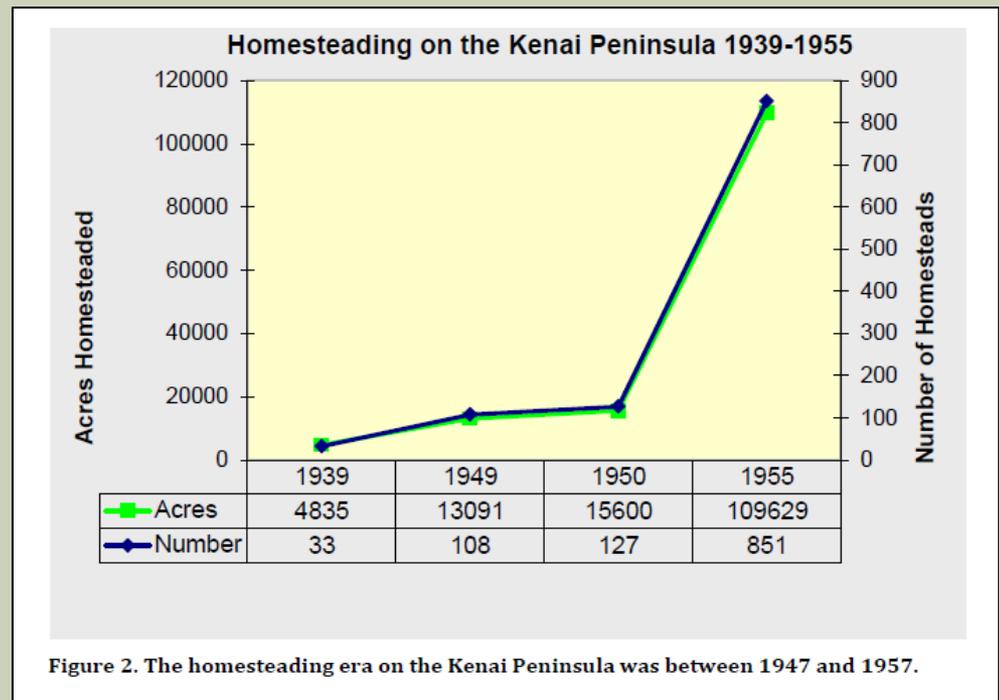


Figure 2. The homesteading era on the Kenai Peninsula was between 1947 and 1957.

INFRASTRUCTURE DEVELOPMENT

- 1951 sees completion of Sterling Highway
 - paved from Anchorage to Soldotna by 1954
- HEA began producing power in Homer in 1950
 - by 1957 had extended to Kenai & Soldotna
- 1957 was first discovery of oil and development of refineries
 - Seismic line exploration
 - Gas line installation



Moose Range Headquarters in Kenai



A PROUD HUNTING LEGACY

More Than 7,400 Moose Now Roam National Range

During the course of 1965, moose surveys on the Kenai National Moose Range were conducted by the Bureau of Sports Fisheries and Wildlife of the Department of the Interior, to determine the population trend, composition of the herd and reproductive success.

Aerial surveys flown, said Will A. Troyer, refuge manager, over the extensive moose calving grounds in late June revealed that 19 per cent of the moose population consisted of newly born calves. These surveys are conducted during the early morning daylight hours when moose are feeding in the open meadows. Most cows had single calves; a few twins and one set of triplets was observed.

A new method has been used the past two years in making the winter moose population trend counts. The Moose Range is divided into square-mile plots. A percentage of these plots are then thoroughly covered by aerial observers and the moose in each plot are tallied. By submitting these findings to detailed statistical analysis, the total population can be determined. This year's surveys indicated a moose population of over 7400 on the Kenai Moose Range.

Another important duty of staff

the percentage of the lambs in the population and the number of trophy rams. This entails hiking and camping in much of the mountain regions.

This past year the rare trumpeter swan showed a sudden increase on the Moose Range. Thirty-nine nests, the greatest number ever recorded, were counted. A total of 204 cygnets were hatched and clutches varied from one to nine. One swan family with nine cygnets was the largest ever seen in Alaska.

A cooperative program was undertaken with the Alaska Department of Fish and Game in sampling various lakes on the Range. These surveys were conducted on lakes near the Swanson River and Swan Lake Roads. They revealed species of fish found within lakes, their relative abundance and potential. This information will be utilized in future planning for the location of new recreational facilities.

Sheela's News, Jan. 14, 1966.

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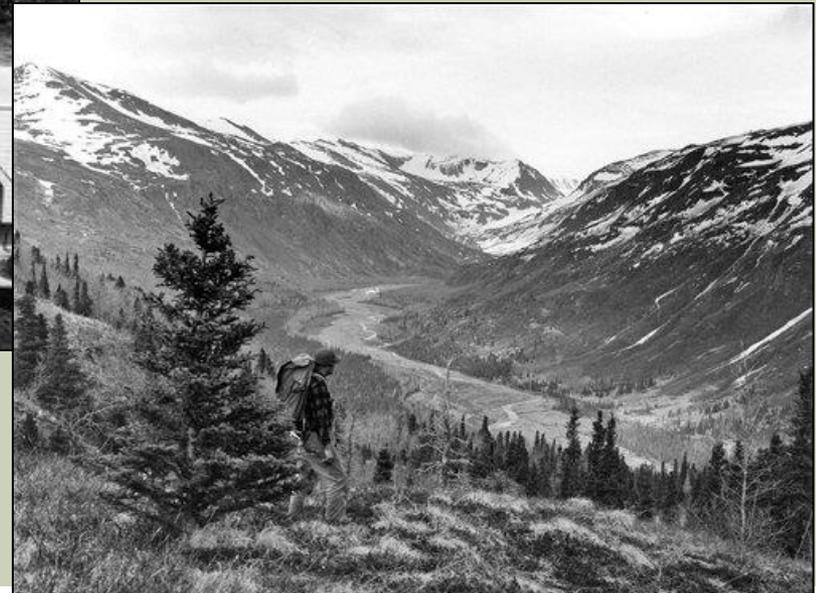


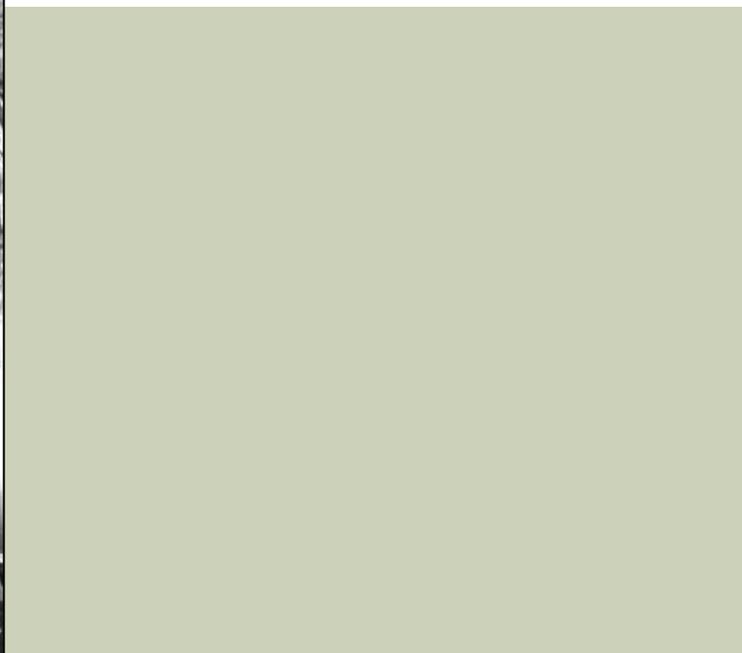
BULL MOOSE BAGGED ON THE KENAI PENINSULA





RECREATIONAL USE INCREASE







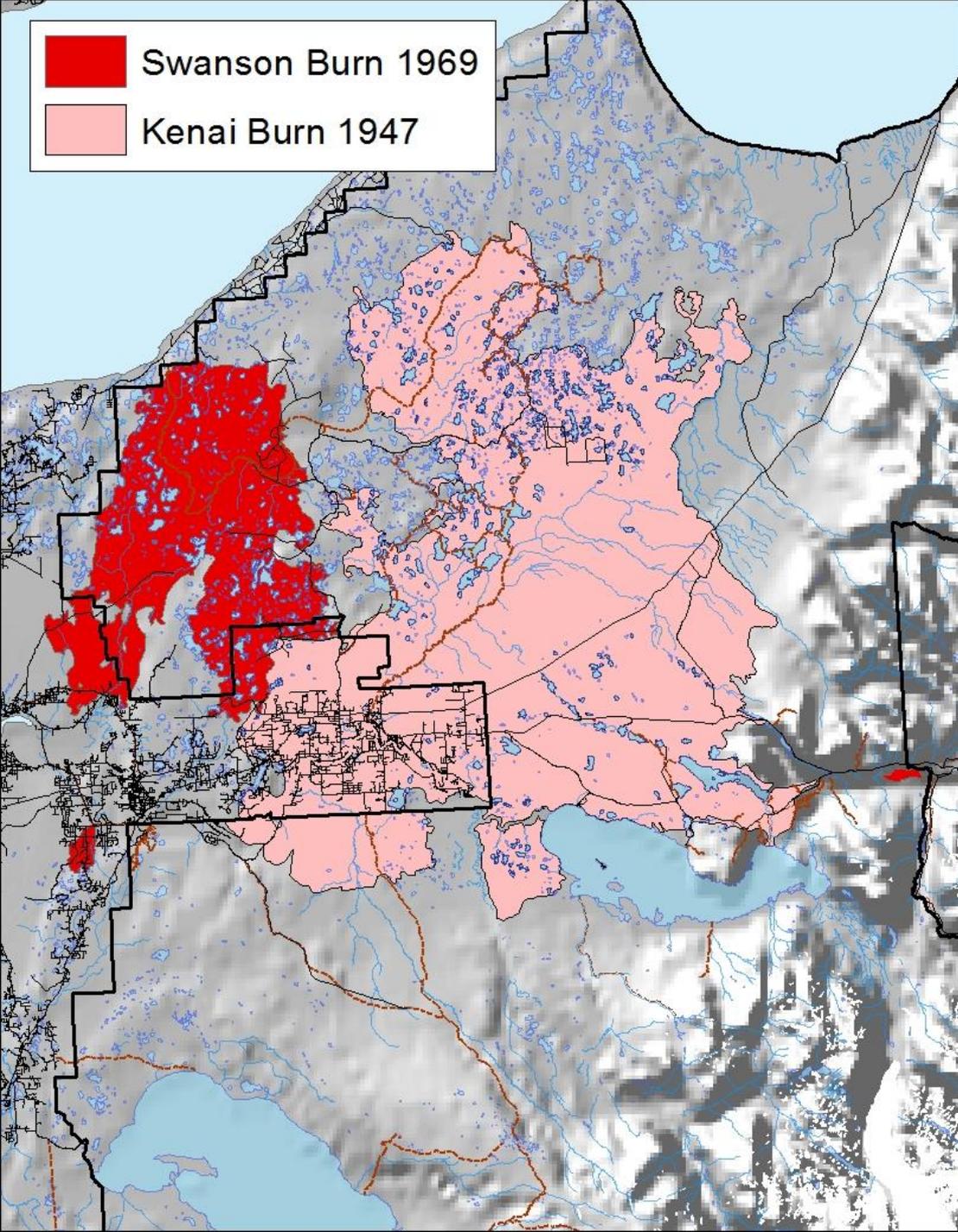
ECOLOGY-CHANGING FIRES

- In 1947 and 1969, two large human-caused fires burned 310,000 acres and 86,000 acres, respectively, in the Kenai Lowlands, converting much of the mostly mature black spruce forest to birch and aspen
 - 1947 fire associated with road construction - originated along highway approximately 16 miles west of Kenai Lake.
- The 1969 massive burn occurred during a summer of drought and high temperatures, leaving few unburned patches
 - severe fire burned off all the duff and litter layers of the forest, leaving bare mineral soil ideal for hardwood regeneration
 - Hardwood stands that developed have been an important source of winter browse for decades for both moose and hares

1969 Burn



Swanson Burn 1969
Kenai Burn 1947



LARGE HISTORICAL BURNS

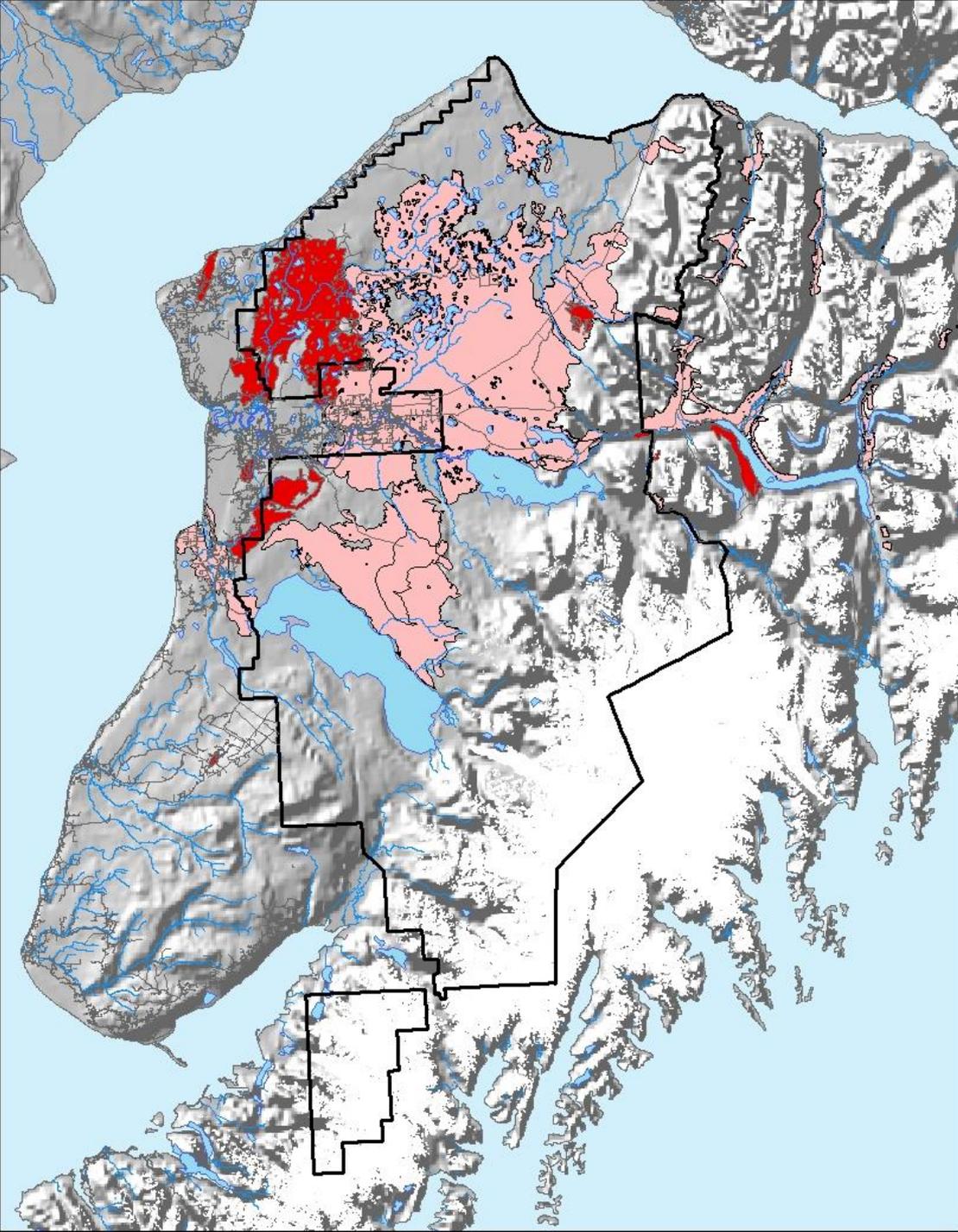
1947 Kenai
Burn

1969 Swanson
Burn

REGULATIONS

- Managers recognized pressures inherent with growing population
- Oil exploration recognized as another threat to moose populations
- By 1967, Bureau of Sport Fisheries and Wildlife reported damage from oil pollution and development activities to moose habitat
- Standards were adopted to safeguard wildlife resources





WILDFIRE, KENAI PENINSULA

1708-1920

1920-1955

1955-1990

WILDLIFE STUDIES

- Mandate to manage the range for maximum moose production, initiating extensive habitat studies by 1950
- Moose continued to thrive, and were well studied



DEPARTMENT OF THE INTERIOR Fish and Wildlife Service Regional Information

March 27, 1968

BUREAU OF SPORT FISHERIES AND WILDLIFE

Name: Willard A. Troyer
Telephone: 283-7563
Station: Kenai National Moose Range
Address: P.O. Box 500, Kenai, Alaska 99611
Release Date: Immediate

INTENSIVE MOOSE STUDIES UNDERWAY

Moose are about to undergo intensive studies according to biologists of the Alaska Department of Fish and Game and the Bureau of Sport Fisheries and Wildlife. Recently four fenced pens each one-square mile in size were constructed on the Kenai National Moose Range near the end of the Swan Lake Road. The first two pens were stocked with ten moose each in January. These two populations will be allowed to increase naturally and their food supply will be closely watched and studied by federal and state biologists.

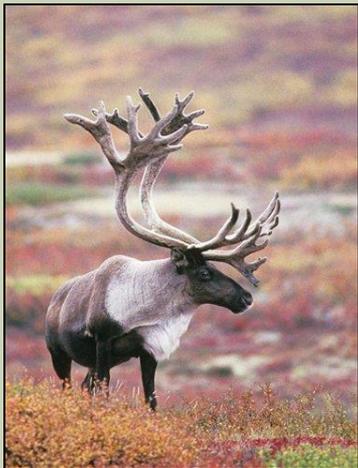
The project was conceived by the Alaska Interagency Moose Committee, an organization of all federal and state agencies in Alaska concerned with moose management. The committee found the only way to determine the long-range effects moose have on their environment is by confining a known number of moose in large pens where they could be closely monitored.

MOOSE RESEARCH CENTER



WILDLIFE REINTRODUCTIONS

- Caribou were reintroduced in the 1960s and in the 1980s.
- Currently there are four herds (Kenai Mountain, Kenai Lowland herds, and Killey River and Fox River herds)
 - Caribou require later-successional lichen habitat for food



24 Anchorage Daily Times Thursday, May 5, 1966

State Puts More Caribou On Kenai Land

Another step in the re-establishment of caribou on the Kenai Peninsula was made last week when 29 animals were released at Watson Lake, 12 miles east of Sterling.

The caribou were captured from the Nelchina herd at Chistochina and airlifted to their new home, the Alaska Department of Fish and Game reported.

Under the guidance of Terry McGowan, biologist in charge of caribou studies, 26 cows and 3

bulls were released. Eleven of the cows were pregnant.

Using helicopters, cargo aircraft and tranquilizing drugs, the animals were delivered to their new range in healthy condition, McGowan said. All animals were also tested for disease prior to being released.

McGowan stated this second transplant was made to augment the initial release of 18 animals made during May last year.

"During the past year we have had several reported sightings

of animals from the first transplant," he said, "and because several of the cows were sighted with young calves, it appears the restocking has a good chance of being successful."

Because the exposed parts of its legs contain bloodless tendons, the chickadee need not be concerned about freezing its feet. On a cold day its body temperature might register 100 degrees while the temperature of its legs are down around 30 degrees.

Caribou were last reported to be on the Kenai in the early 1900's. McGowan said the shrinking herds of caribou vanished from the Kenai 65 years ago probably because fires destroyed their food supply. "Now it appears," he added, "the lichens and sedge have recovered sufficiently that the area will again support the nucleus of a caribou population."

Approximately 18 million hunters in America spend about 1.5 billion a year, most of it for travel, food, clothing and gear.

VEGETATION MANAGEMENT

- Moose browse & fire effects interaction studies expanded on earlier work on moose habitat
- Studies examined successional development of vegetation after fire





FRIDAY, JUNE 17, 1966

Moose Browse Spray Project Set for June 20

The U. S. Forest Service and the Game Advisory Board, Unit 7, at Seward, participated in a Wildlife Show-me-trip on June 17. The group inspected the planned Forest Service moose browse spray project in the Quartz Creek area.

The object of the spraying is to kill back tree crowns of overgrown moose browse plants and encourage browse sucker growth on the ground level.

John Crupper, supervisor, Chugach National Forest; John Galea, Kenai District ranger and Hadley Roberts, forester, represented the U. S. Forest Service. Game board representatives and guests included Bill Vincent, Barbara Shea, Galen Albertson, and Pete Kellering all of Seward, and Glenn Miller, Moose Pass.

Bob Wade, Bureau of Sport Fisheries and Wildlife, of Kenai assisted the Forest Service in the field program.

The actual spray project will take place this coming June 20.



VEGETATION CONTROL



**Mystery Creek
Crushing**



Tree crusher August 1971



#1A46 Senator Stevens (Alaska) visited the tree crusher operations and observed this rehabilitation first hand. Photo by Seemel.

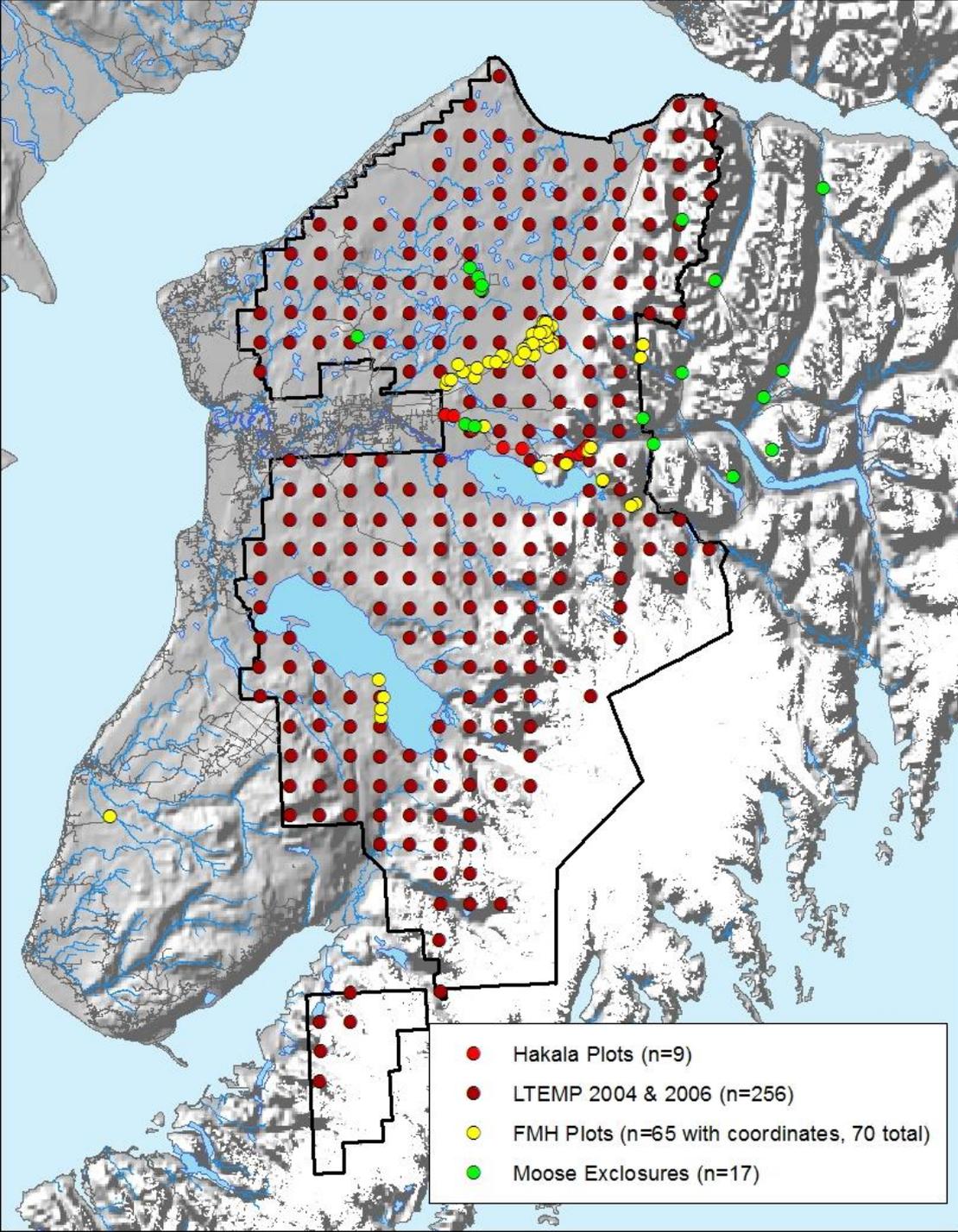


UNDERSTANDING ECOLOGY

- Ecology on the Kenai National Wildlife Refuge incorporates an understanding of:
 - fire regime
 - vegetation dynamics
 - climate change
 - wildlife habitat
 - insect outbreaks and invasions
- Many interacting factors driving vegetation pattern and process on the Kenai Peninsula are well documented in terms of composition, structure, and function through sets of legacy and modern data

LONG TERM STUDIES

- The Refuge has a lengthy history of biological data collection, including several types of legacy plots installed at different time periods for different studies:
 - Moose exclosure plots
 - Hakala post-fire monitoring plots
 - FMH plots
 - LTEMP/FIA Plots
- Each set of legacy data provide a link to historical conditions, and contributes to our understanding of vegetation dynamics, wildlife movement, and fire risk across the Refuge and the KP



LEGACY PLOTS ON THE KENAI PENINSULA

Hakala Plots

LTEMP Plots
(Long Term
Ecological
Monitoring
Program)

FMH Plots (Fire
Management
Handbook)

Moose
Exclosures

MOOSE EXCLOSURE PLOTS

- Installed to better understand the interactions of fire, climate, moose browse, and tree regeneration
- In the 1960s, when moose densities were high after the big 1947 burn, several were installed as a long-term experiment to understand differences in hardwood and shrub growth between non-browsed and browsed sites
- Later construction, in post-1969 burn areas and in the 1980s, reflected a desire to continue to understand the role of fire interacting with browse in determining forest composition and structure



Hope Exclosure (breached)

Skilak West Exclosure



MOOSE EXCLOSURE PLOTS

- Most are still sturdy enough to last for many years, and two were reconstructed in 2012
- Documenting sites (Dr. Ed Berg) was an intriguing mix of talking to locals and long-time staff members, reviewing limited old records, and serendipitous discovery by staff doing other field work
- In a few locations, existing records were difficult to interpret as roads have been widened or changed, trails re-routed, or streams have migrated

Russian River Exclosure Repair



MOOSE EXCLOSURE PLOTS

- Vegetation data collection in 2012 showed forest structure inside of and outside of the two exclosures was dramatically different, ecologically speaking.
 - Inside Quartz Creek fence was thick and abundant tall birch forest, with huge willows overtopping the sides; just outside was a dark spruce forest, with small willow patches
 - Russian Lakes - showed a more subtle contrast, inside were tall, healthy birches, while just outside were heavily browsed seedlings and saplings, and shorter birches mixed in with spruce



HAKALA POST-FIRE PLOTS

- Early Moose Range biologists understood the importance of early successional vegetation stages for moose winter survival
- In 1950, 9 permanent plots were set up to monitor vegetation succession following the big 1947 burn.
 - John Hakala was a graduate student who later became the Refuge manager – so plots became known as the Hakala Plots.
 - Located along what is now Skilak Loop Road, on the old Sterling Highway.
 - Plots were selected to represent a wide range of stand types and degrees of burn severity.



1950 Plot Setup

HAKALA POST-FIRE PLOTS

- Each plot was carefully measured and photographed by Hakala and his coworkers in 1950, 1955, 1961, and 1965.
 - Every single tree stem of every size was counted within the plots (sometimes thousands on some plots!)
- Resurveyed in 1955, 1961, 1965, 1995, 2000, 2005, and 2010
- Extraordinary dataset detailing forest succession after fire on the KP



1955 Remeasure

FIRE MONITORING HANDBOOK PLOTS

- Refuge ecologists installed a set of 71 fire monitoring plots between 1994 to 2000, mainly in unburned areas slated for prescribed burns, with a few plots added in post-burn locations
- Detailed data collection included measures of fuel loads, burn severity, herbaceous vegetation and shrub cover, and seedling and tree metrics



Dr. Ed Berg at a Mystery Creek FMH Plot, 2004

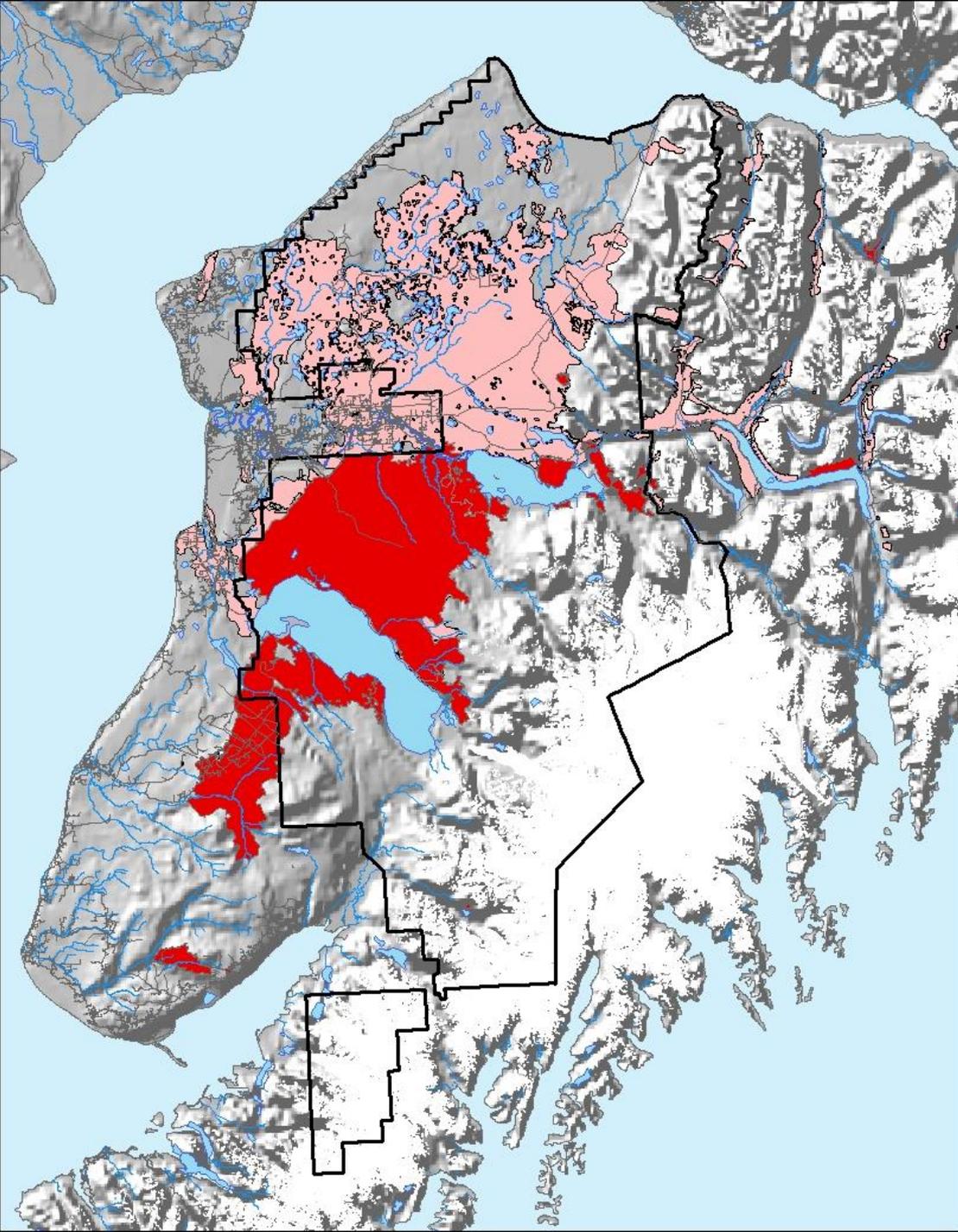
FIRE MONITORING HANDBOOK PLOTS

- Results intended to help assessing the effects of past fires and the appropriateness of potential management actions
- Documented potential changes in fuel loads, abundance of browse species, and species richness at the Mystery Creek and Windy Point study areas



LTEMP PLOTS

- Long Term Ecological Monitoring Program
 - In cooperation with Forest Service's Forest Inventory & Analysis Program
 - 257 permanent plots, remeasured every 10 years
 - 100% inventory – birds, wildlife, vegetation, lichens, moss, insects, invertebrates, sound quality, visual quality, etc.
 - 30 occur in Funny River fire – will be interesting to go monitor them next year!!



WILDFIRES, KENAI PENINSULA

1708-1920

1920-1955

1955-1990

1990-2014

FIRE REGIME CHANGE

- The historic fire regime has been well studied on the Kenai Peninsula...and it appears to be changing
- Lightning caused the 2005 Irish Channel fire that burned 1,100 acres of mountain hemlock, an event so rare in this forest type that charcoal evidence of a historic fire regime has not been detected

Fox Creek
Fire 2005



FIRE REGIME CHANGE

- Since the 1990s, approximately 140,000 acres of mature and beetle-killed white and Lutz spruce have burned in several fires around Skilak Lake and south of Tustumena Lake
- The Funny River Fire of 2014 added another 200,000 of burned acres, but fire severity was patchy
 - Most recent fires (2000 onward) tend to be early grassland spring fires, rather than summer drought fires
- Unexpected patterns in recent Funny River Fire

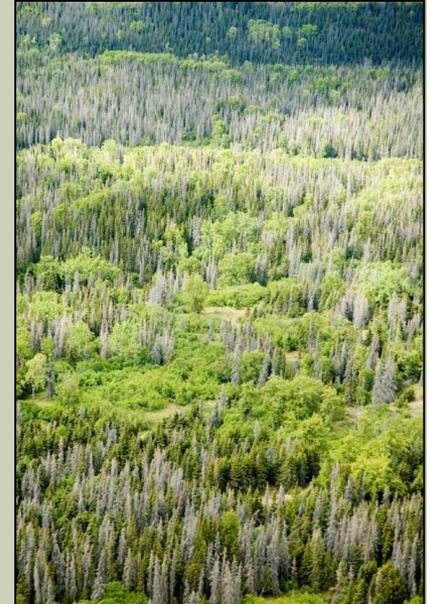


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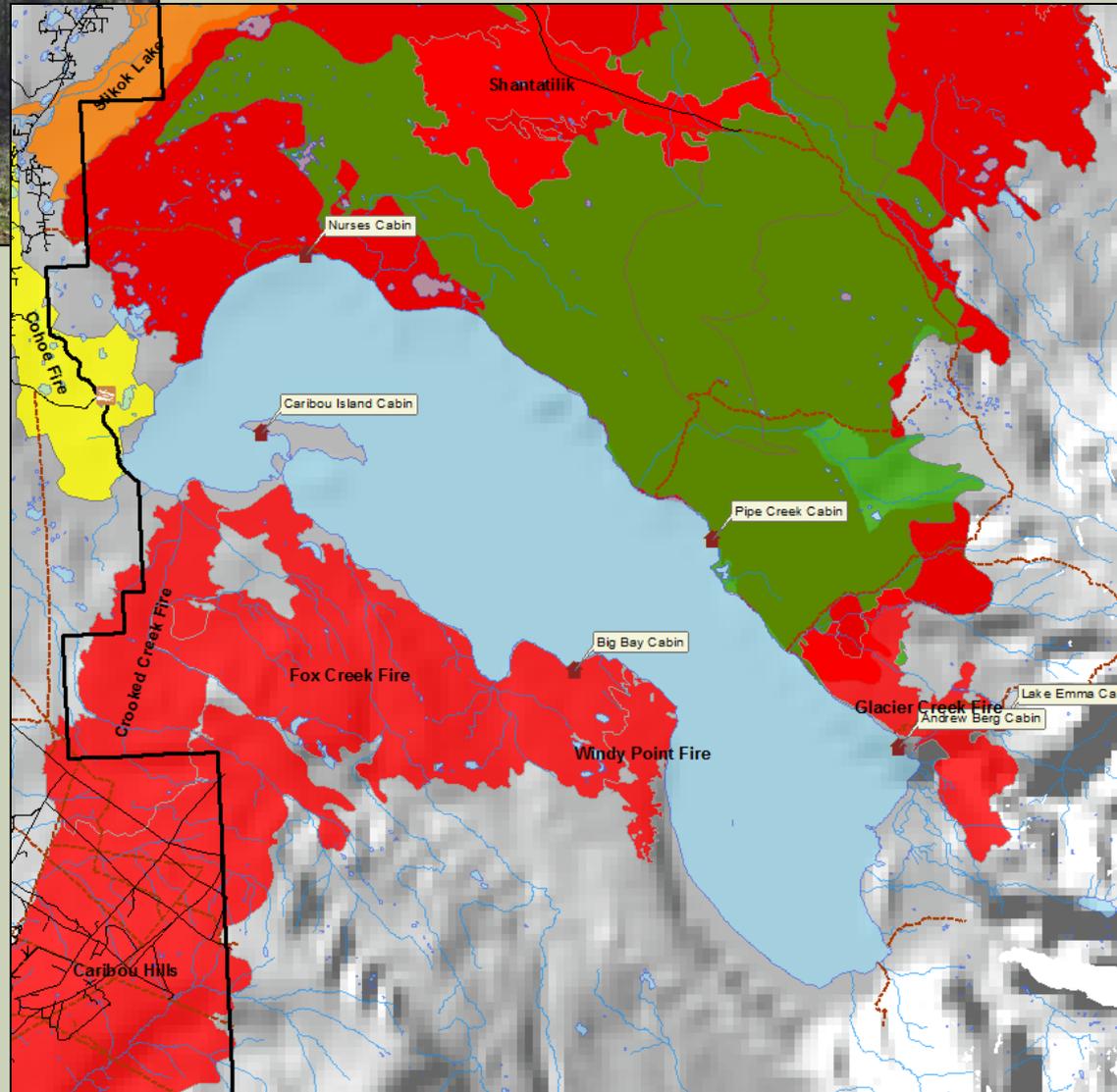
SPRUCE BARK BEETLE

- A run of warm summers since 1987 created a huge spruce bark beetle outbreak
 - Three major fires with high rates of spread occurred in recently beetle-killed timber have occurred
- 1 million acres of beetle-killed spruce forest on the Kenai Peninsula made everyone nervous
- With a warming climate and increasing human use of the landscape, fire and beetle kill may be more closely associated...but Funny River Fire didn't burn much in beetle-killed areas





**Saving the Big Bay cabin
in the Fox Creek Fire**



ECOLOGICAL CHANGES

- Conversion of softwood to hardwood due to more frequent and hotter fires
- Rising treeline (primarily mountain hemlock) with concurrent loss of alpine tundra



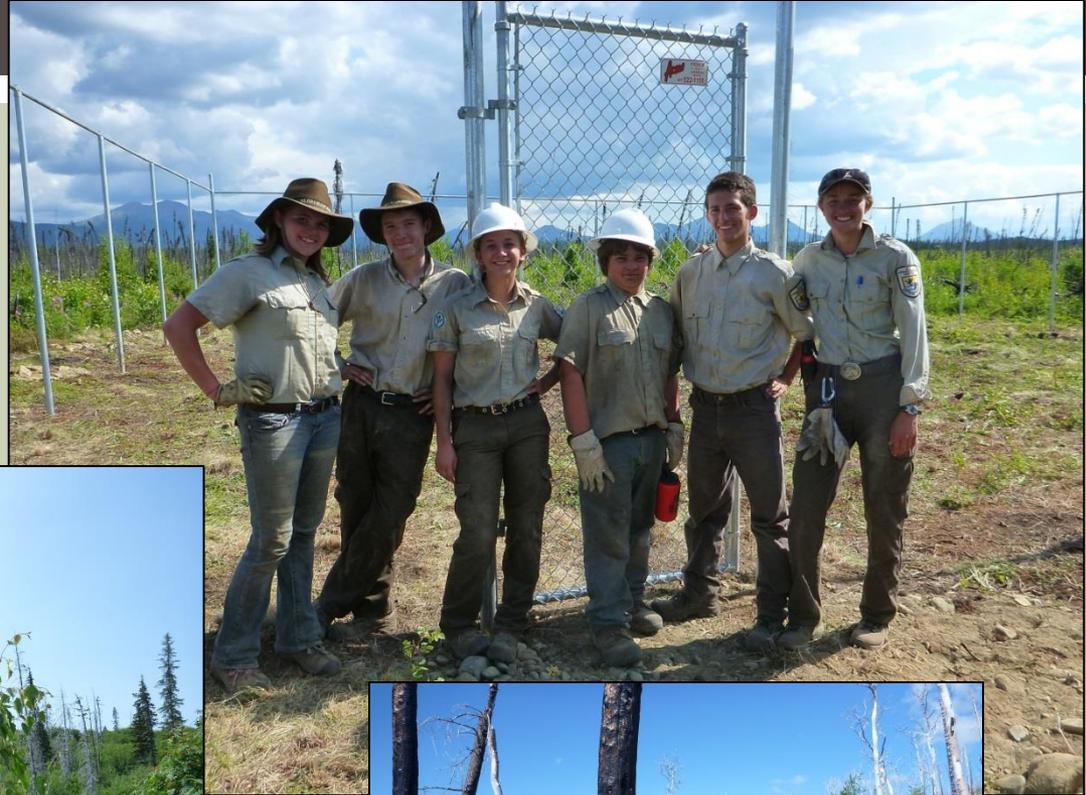
ECOLOGICAL CHANGES

- Increasing herbaceous cover (grasslands) particularly south of Caribou Hills
 - Parcelization and the resulting deforestation also increases grasslands
- Loss of old growth softwood forests
 - Consecutive above-average summer temperatures will keep spruce bark beetles sustained metabolically
 - Sitka, white and Lutz spruce won't mature in the foreseeable future



CURRENT AND FUTURE STUDIES

- Common garden studies to check new genetic tree options
- Fire regeneration studies
- Continued LTEMP monitoring



A LASTING LEGACY



ACKNOWLEDGEMENTS

- Kenai Refuge Staff, past and present (and future)
- Catherine Cassidy & Gary Titus photos
- Kenai Peninsula Historical Photo Repository (KPC)

