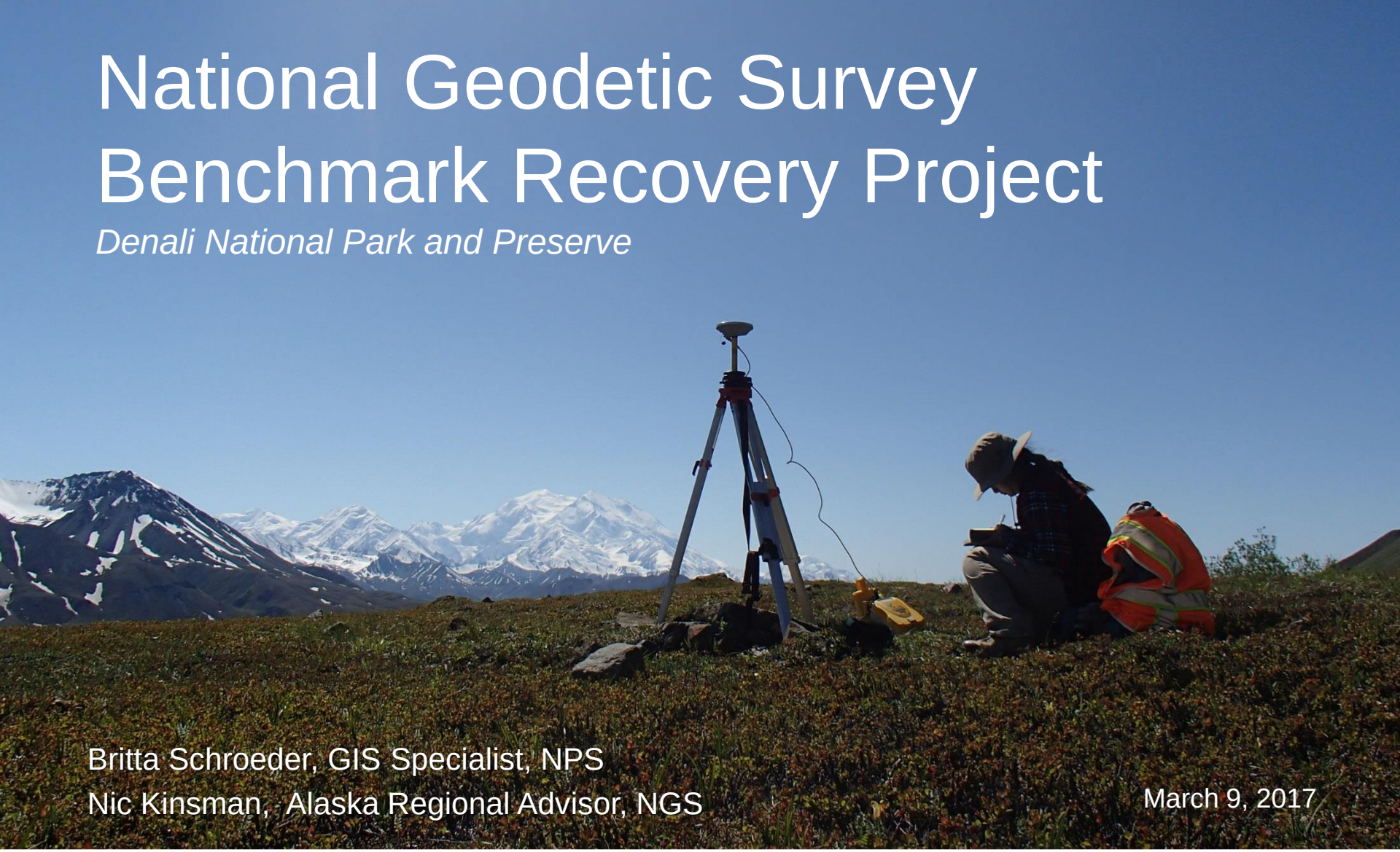
National Geodetic Survey Benchmark Recovery Project

Denali National Park and Preserve



Britta Schroeder, GIS Specialist, NPS
Nic Kinsman, Alaska Regional Advisor, NGS

March 9, 2017

FIND YOUR PARK

NOAA & The Preserve America Initiative

2016 National Park Service CENTENNIAL

Outline

- History of Benchmarks
- Importance of Benchmark Recovery
- GPS on Benchmarks
- Outreach and Education
- Next Level

National

Statewide

Denali

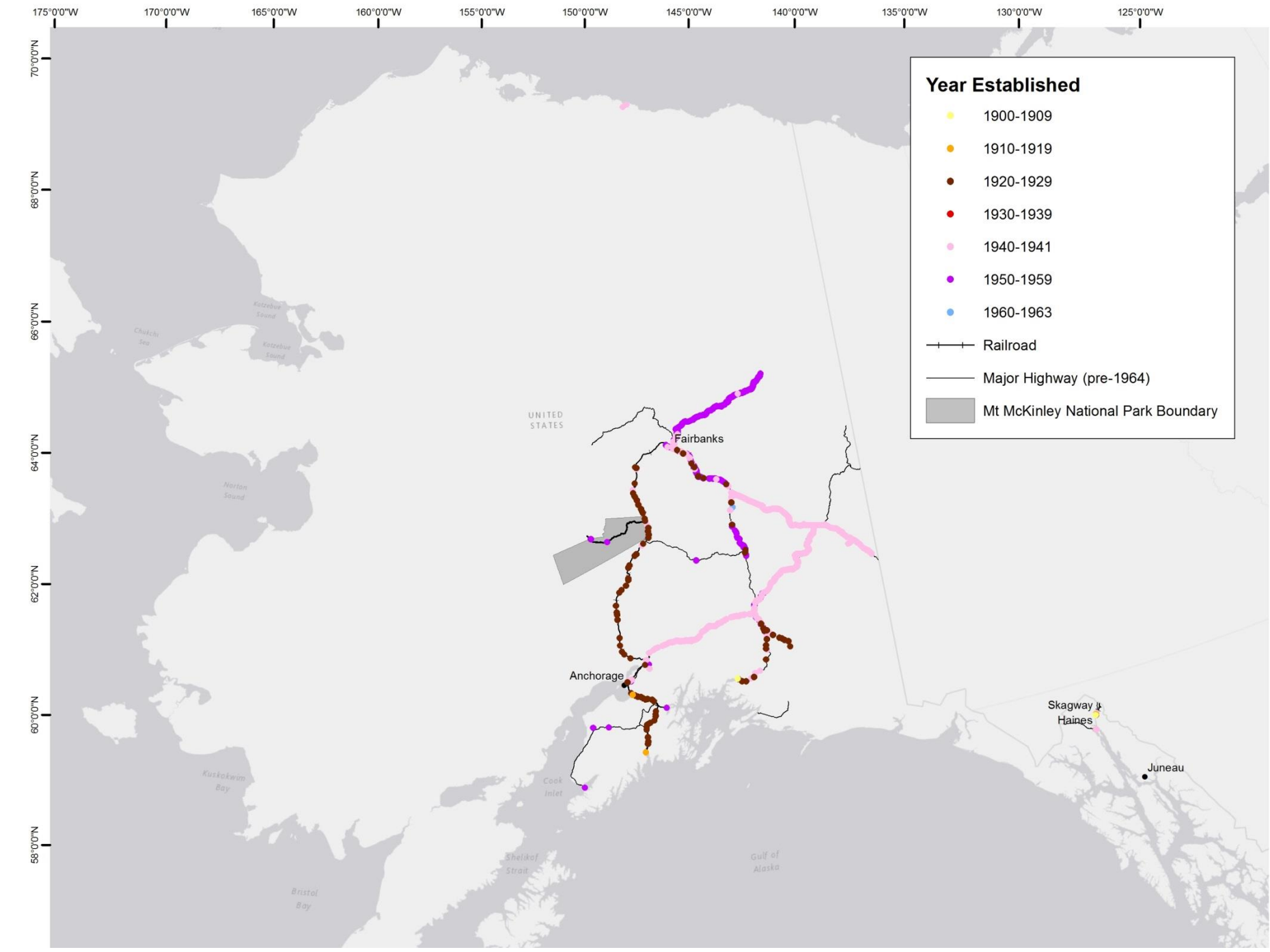
HISTORY

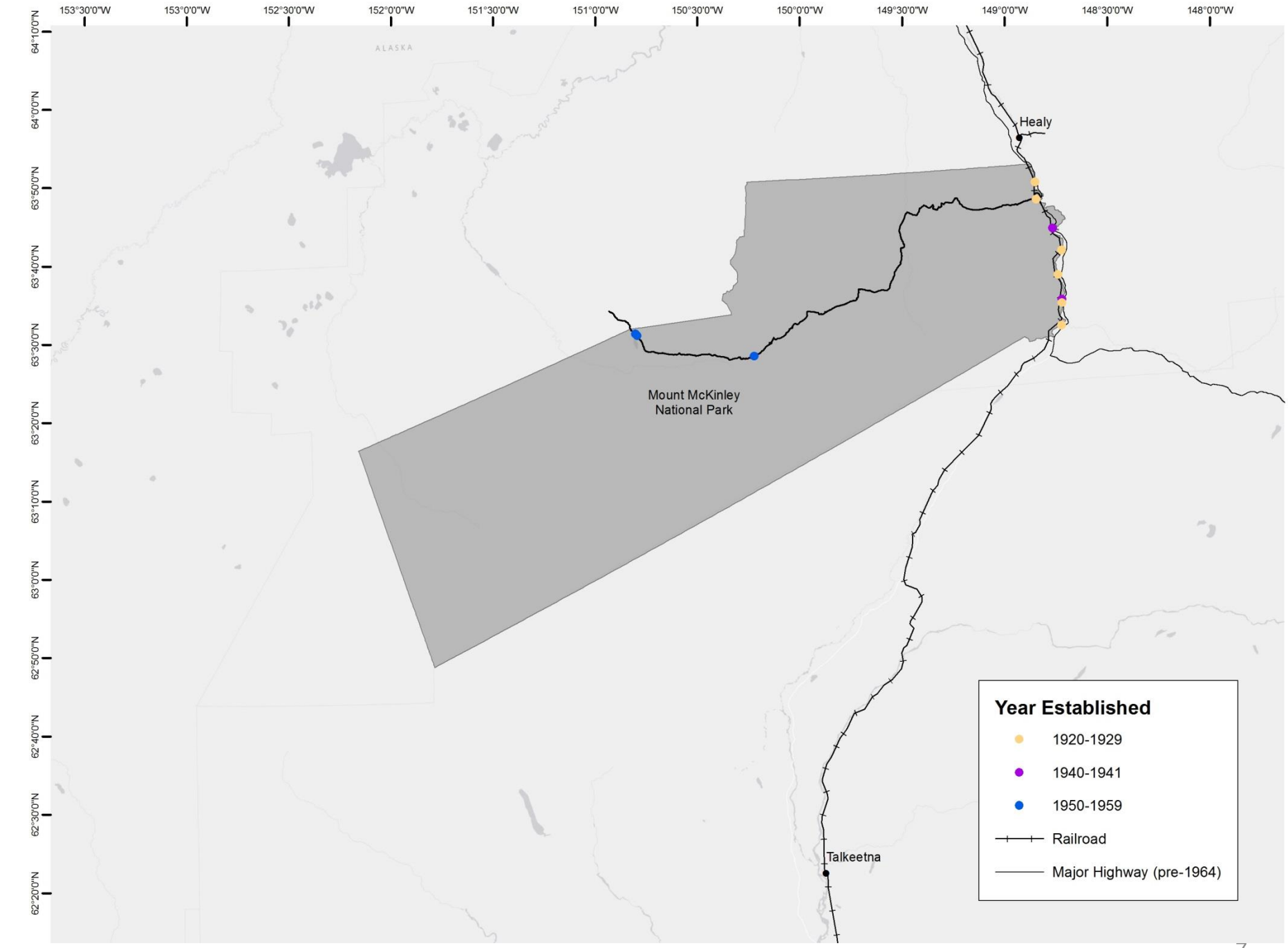
What is NOT a benchmark?

Pre-2015

Current


U.S. COAST & GEODETIC SURVEY
TO THE DIRECTOR, WASHINGTON, D.C.
FOR INFORMATION WRITE
OR IMPRISONMENT FOR DISTURBING THIS MARK. $250 FINE
M 124
1965
BENCH MARK


Year Established
1900-1909
1910-1919
1920-1929
1930-1939
1940-1941
1950-1959
1960-1963
Railroad
Major Highway (pre-1964)
Mt McKinley National Park Boundary
Fairbanks
Anchorage
Skagway
Haines
Juneau
UNITED STATES
175°0'0"W
170°0'0"W
165°0'0"W
160°0'0"W
155°0'0"W
150°0'0"W
145°0'0"W
140°0'0"W
135°0'0"W
130°0'0"W
125°0'0"W
70°0'0"N
68°0'0"N
66°0'0"N
64°0'0"N
62°0'0"N
60°0'0"N
58°0'0"N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152°30'0"W
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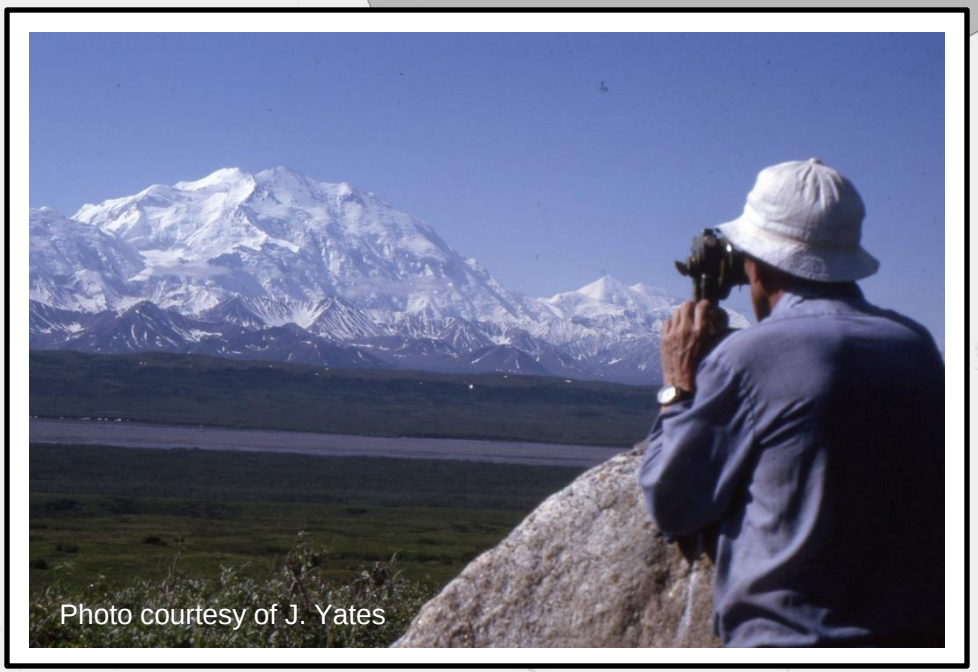
63°40'0"N
63°30'0"N
63°20'0"N
63°10'0"N
63°0'0"N
62°50'0"N
62°40'0"N
62°30'0"N
62°20'0"N
ALASKA
Healy
Mount McKinley
National Park
Talkeetna
Year Established
1920-1929
1940-1941
1950-1959
Railroad
Major Highway (pre-1964)



Mount McKinley National Park

Healy

Talkeetna

Year Established

- 1920-1929
- 1940-1941
- 1950-1959
- Railroad
- Major Highway (pre-1964)

Healy

Mount McKinley National Park

Talkeetna

Year Established

- 1920-1929
- 1940-1941
- 1950-1959
- Railroad
- Major Highway (pre-1964)


Earthquake Picture Story Told On Inside Pages
EXTRA
Anchorage Daily Times
EXTRA
CITY RALLIES FROM QUAKE
SHOCKWAVE ONE OF MIGHTIEST


45


BAR
D & D
CAFE
TV
SHOW
SPORTSMAN'S
CLUB
AMUSEMENTS
ARCADE
CAFE
LOAN CO.
LOANS
WE SHIP
COD
OUR TOWN


DENALI
B ST
RESTAURANT
RESTAURANT

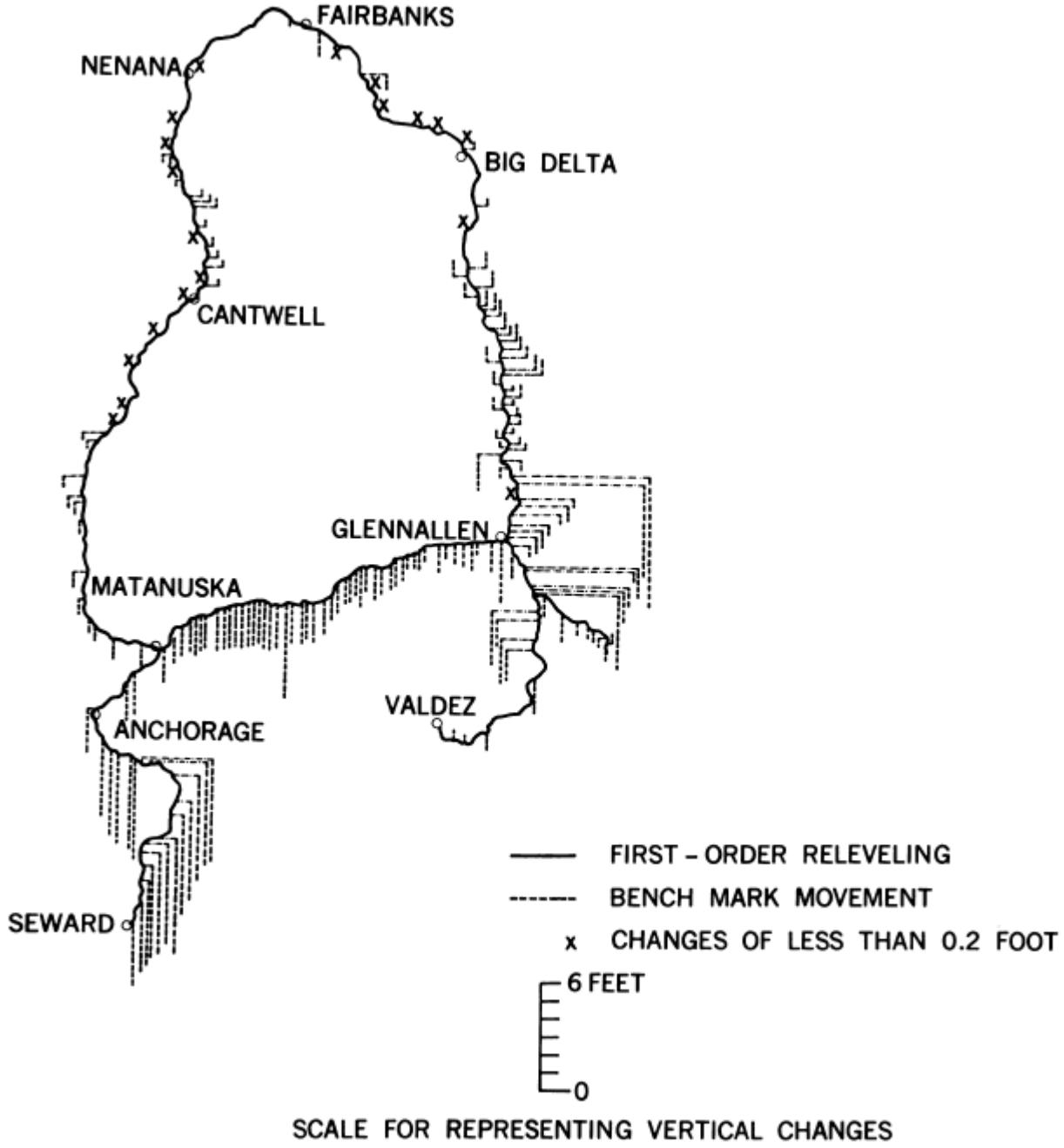


FIGURE 9.—Movement of bench marks as shown by releveling of 1964 and 1965.

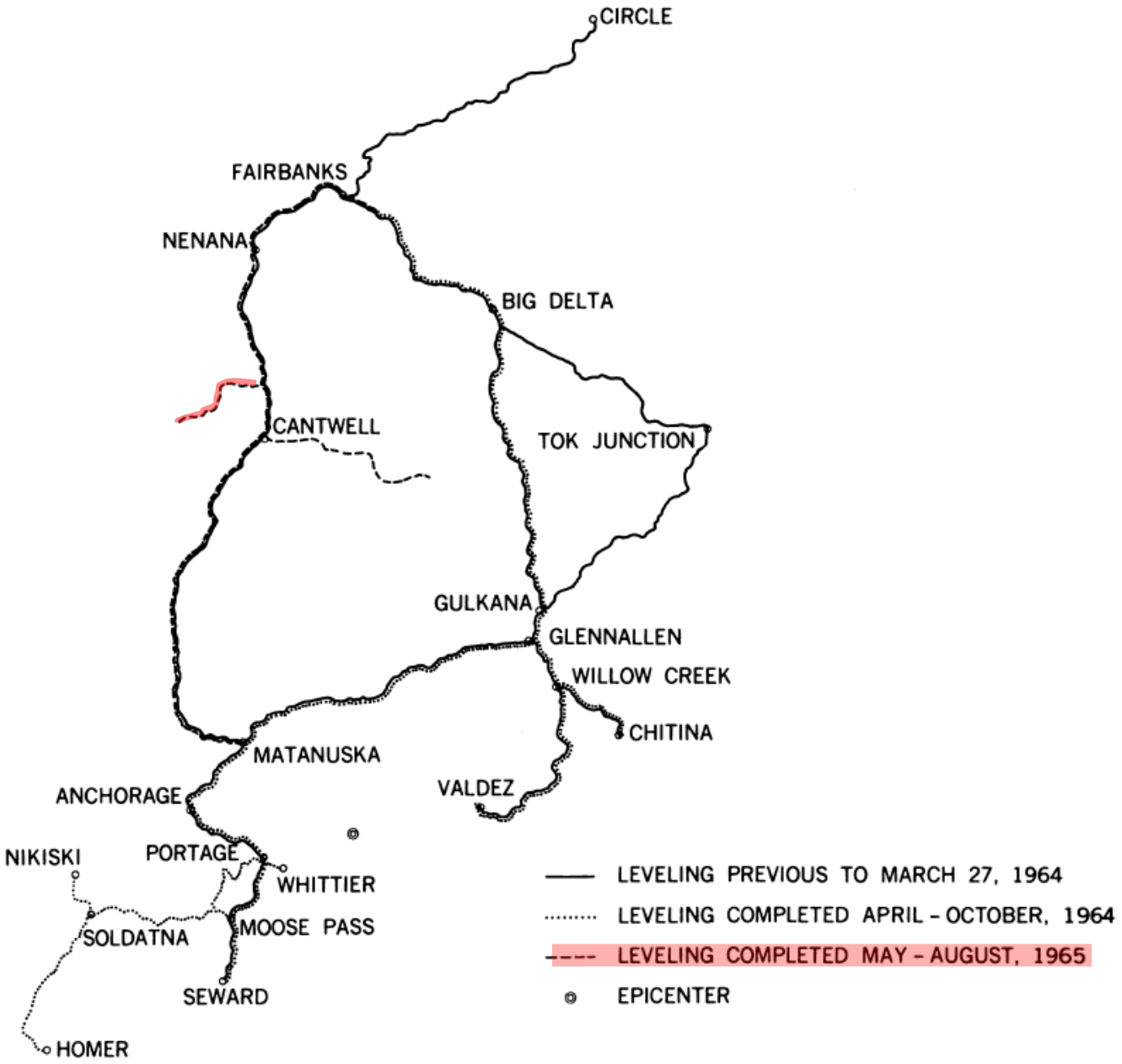
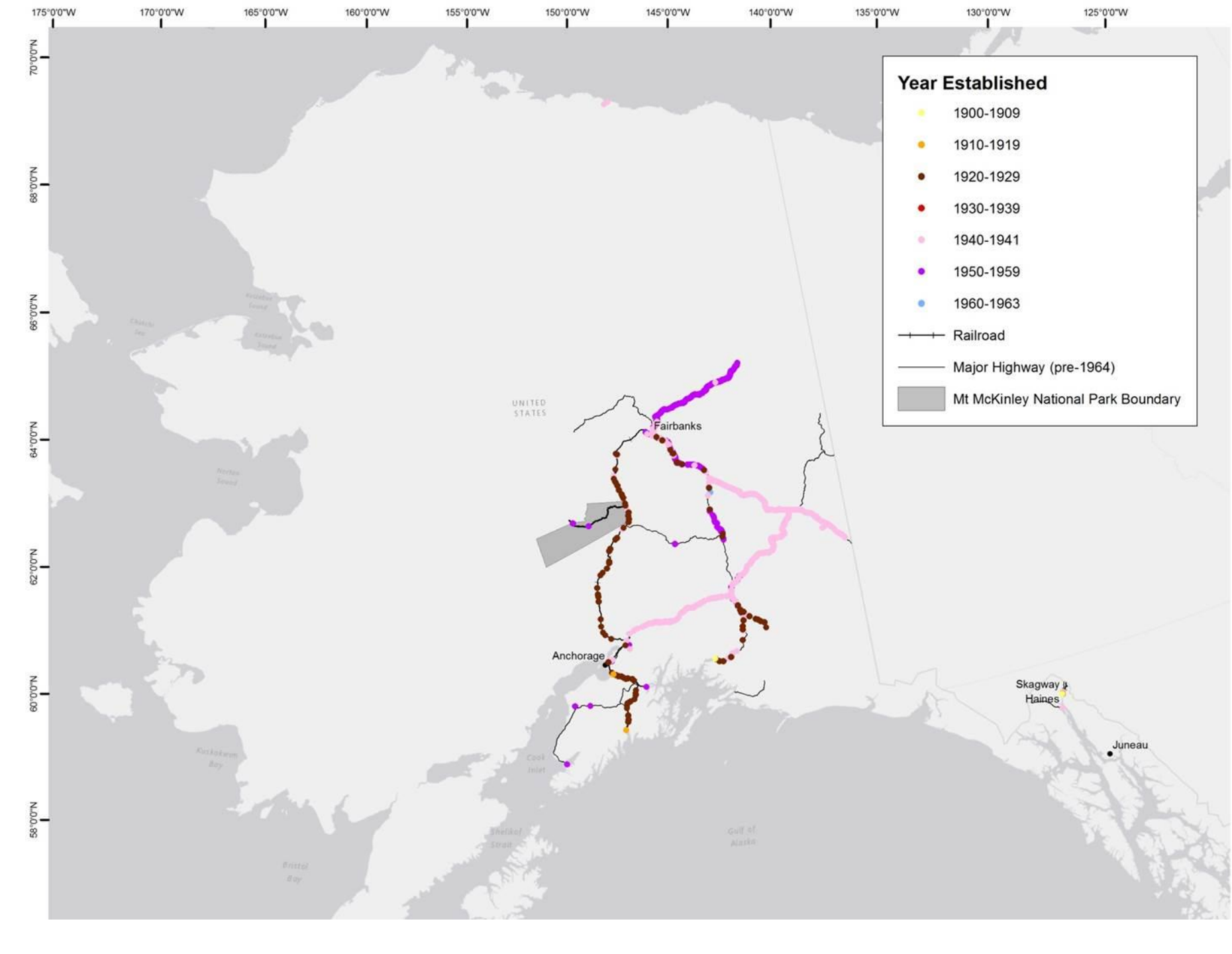


FIGURE 6.—Level net of Alaska and releveling of 1964–1965.


175°0'0"W
170°0'0"W
165°0'0"W
160°0'0"W
155°0'0"W
150°0'0"W
145°0'0"W
140°0'0"W
135°0'0"W
130°0'0"W
125°0'0"W
70°0'0"N
68°0'0"N
66°0'0"N
64°0'0"N
62°0'0"N
60°0'0"N
58°0'0"N
Year Established
1900-1909
1910-1919
1920-1929
1930-1939
1940-1941
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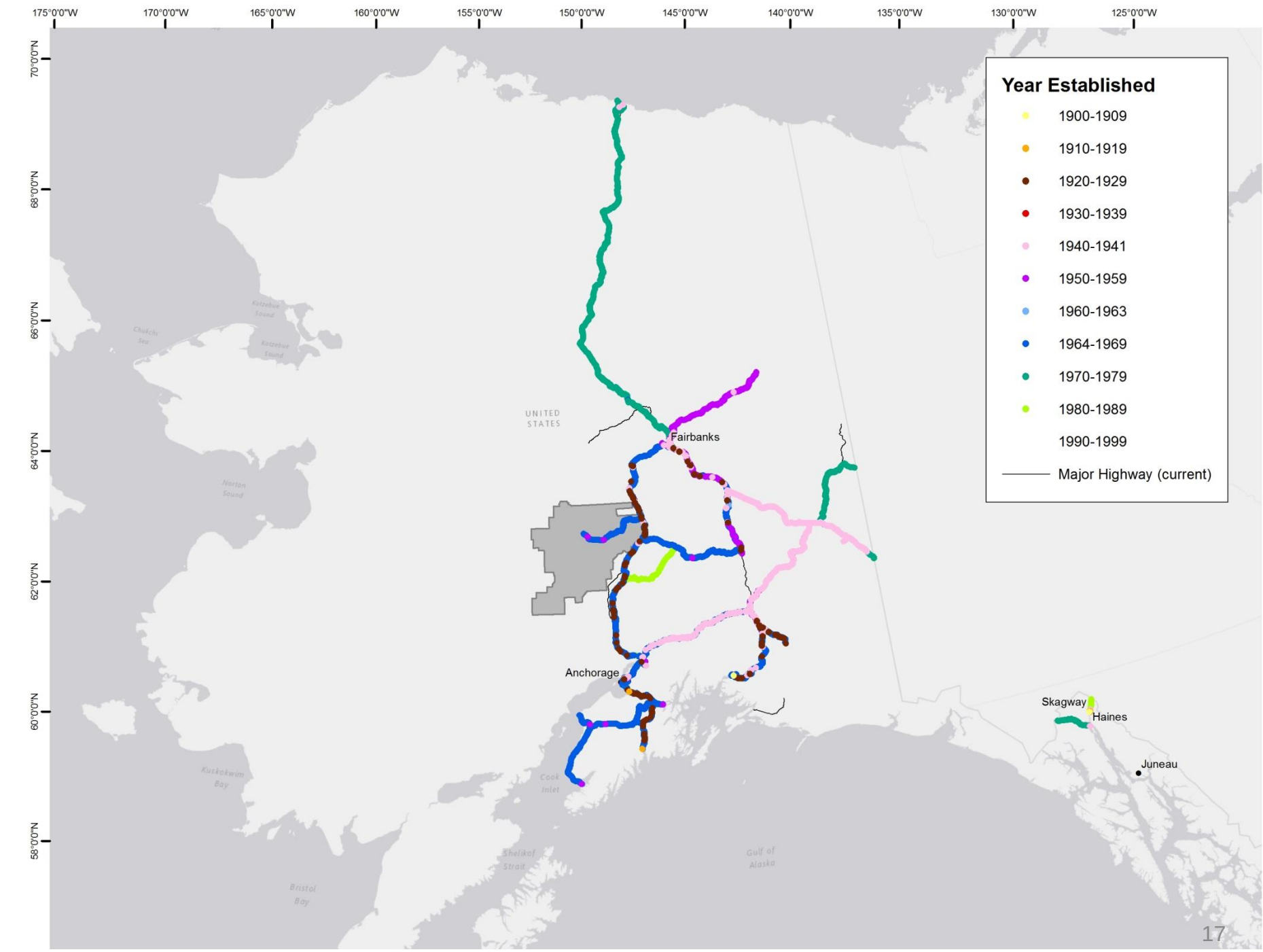
1960-1963
Railroad
Major Highway (pre-1964)
Mt McKinley National Park Boundary
UNITED STATES
Fairbanks
Anchorage
Skagway
Haines
Juneau
Kotzebue Sound
Norton Sound
Kuskokwim Bay
Cook Inlet
Shelikof Strait
Gulf of Alaska
Bristol Bay


Year Established
1900-1909
1910-1919
1920-1929
1930-1939
1940-1941
1950-1959
1960-1963
1964-1969
1970-1979
1980-1989
1990-1999
Major Highway (current)
Fairbanks
Anchorage
Skagway
Haines
Juneau
UNITED STATES
175°0'0"W
170°0'0"W
165°0'0"W
160°0'0"W
155°0'0"W
150°0'0"W
145°0'0"W
140°0'0"W
135°0'0"W
130°0'0"W
125°0'0"W
70°0'0"N
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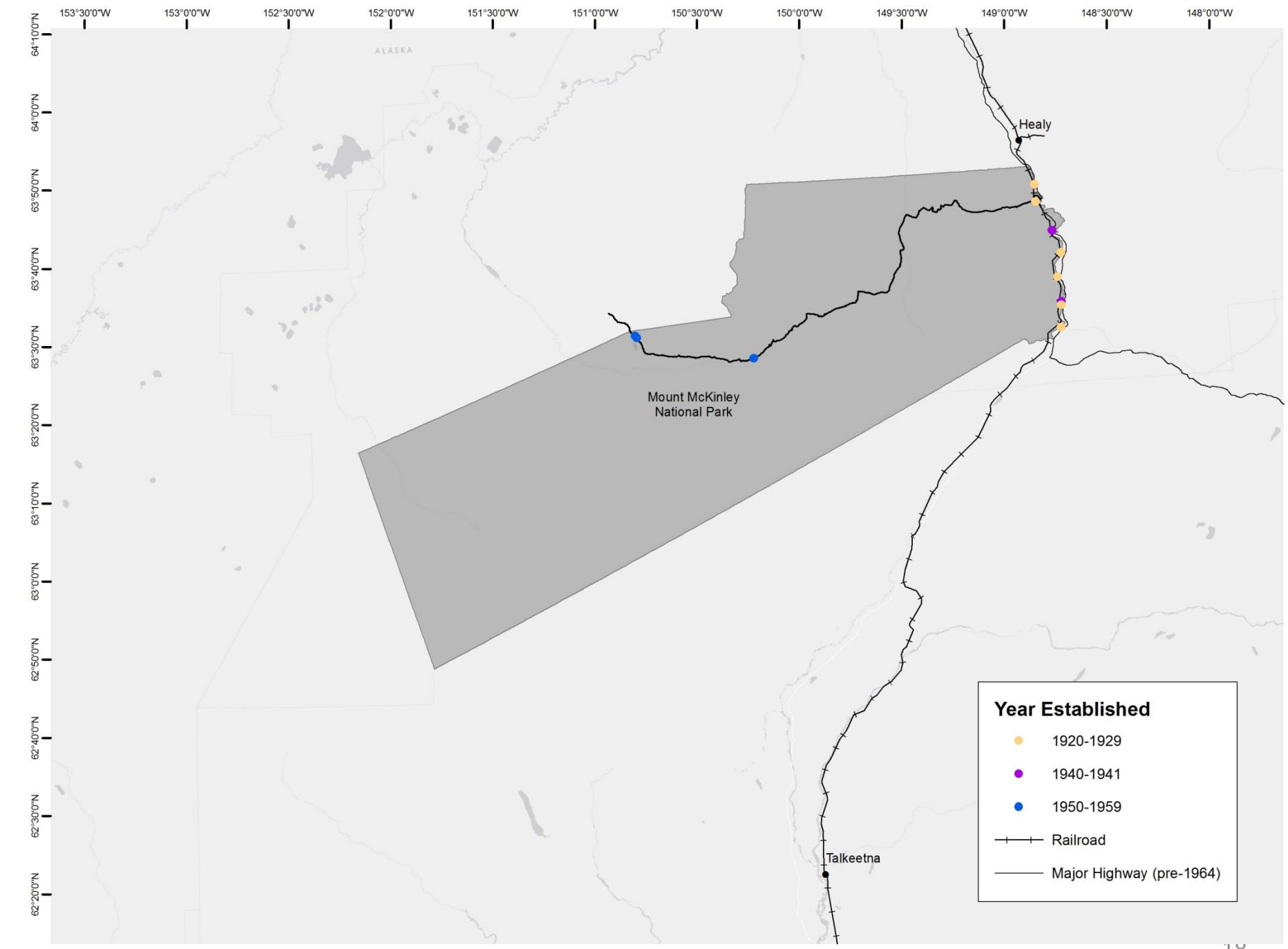
62°0'0"N
60°0'0"N
58°0'0"N


153°30'0"W
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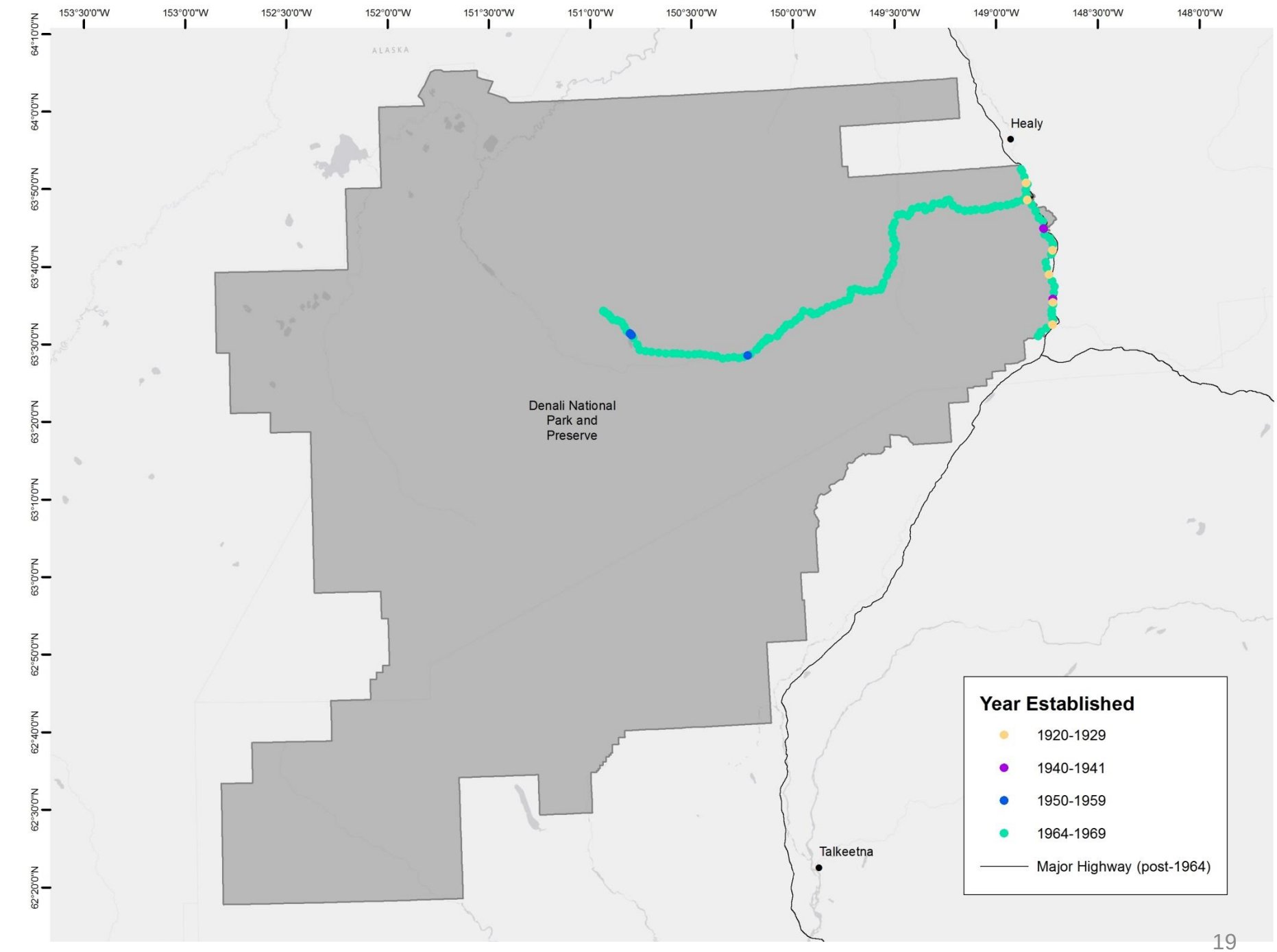
150°0'0"W
149°30'0"W
149°0'0"W
148°30'0"W
148°0'0"W
64°10'0"N
64°0'0"N
63°50'0"N
63°40'0"N
63°30'0"N
63°20'0"N
63°10'0"N
63°0'0"N
62°50'0"N
62°40'0"N
62°30'0"N
62°20'0"N
ALASKA
Healy
Mount McKinley
National Park
Talkeetna
Year Established
1920-1929
1940-1941
1950-1959
Railroad
Major Highway (pre-1964)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63°0'0"N
62°50'0"N
62°40'0"N
62°30'0"N
62°20'0"N
ALASKA
Healy
Denali National Park and Preserve
Talkeetna
Year Established
1920-1929
1940-1941
1950-1959
1964-1969
Major Highway (post-1964)

National Spatial Reference System

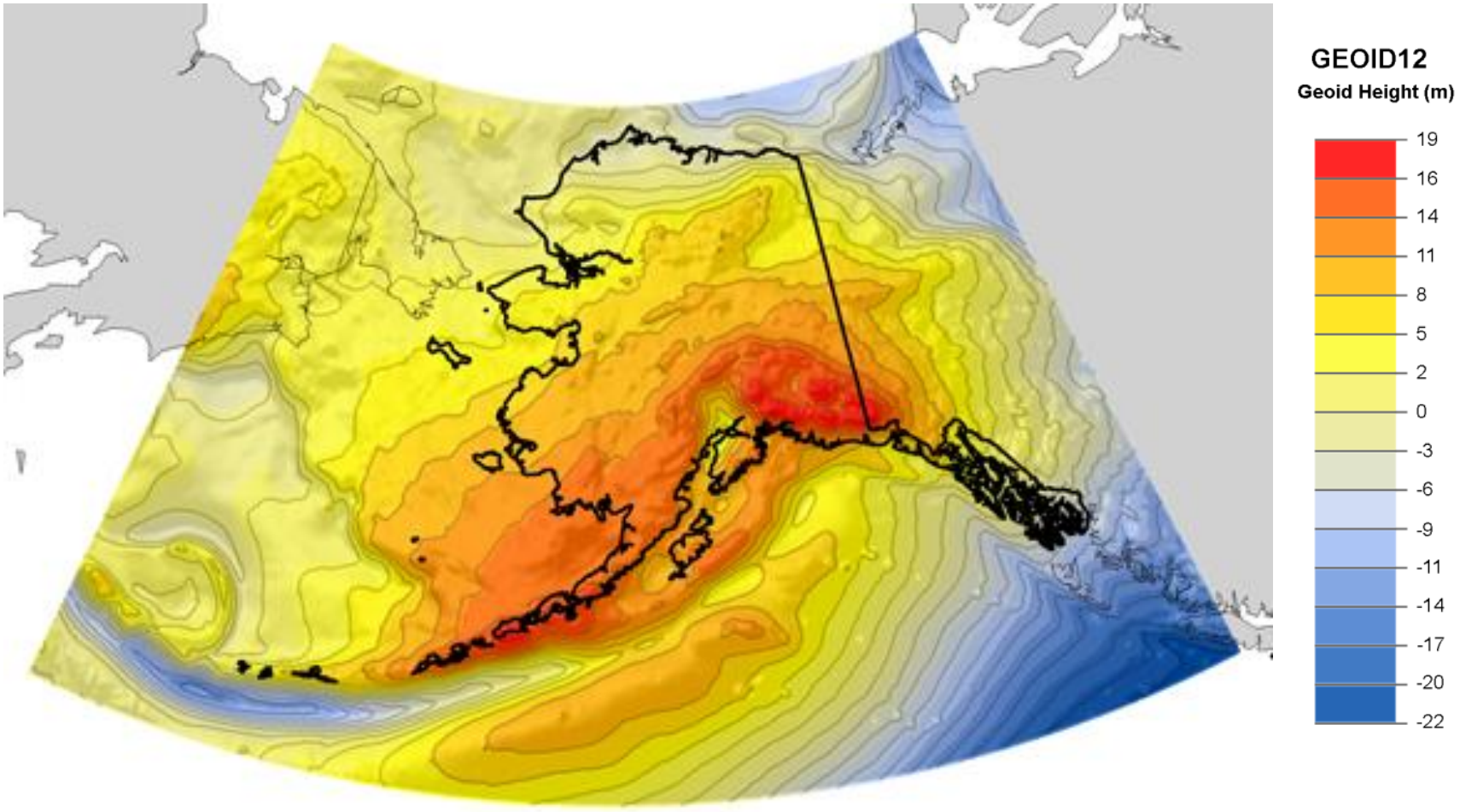
Local to Global Coordinates

Installations

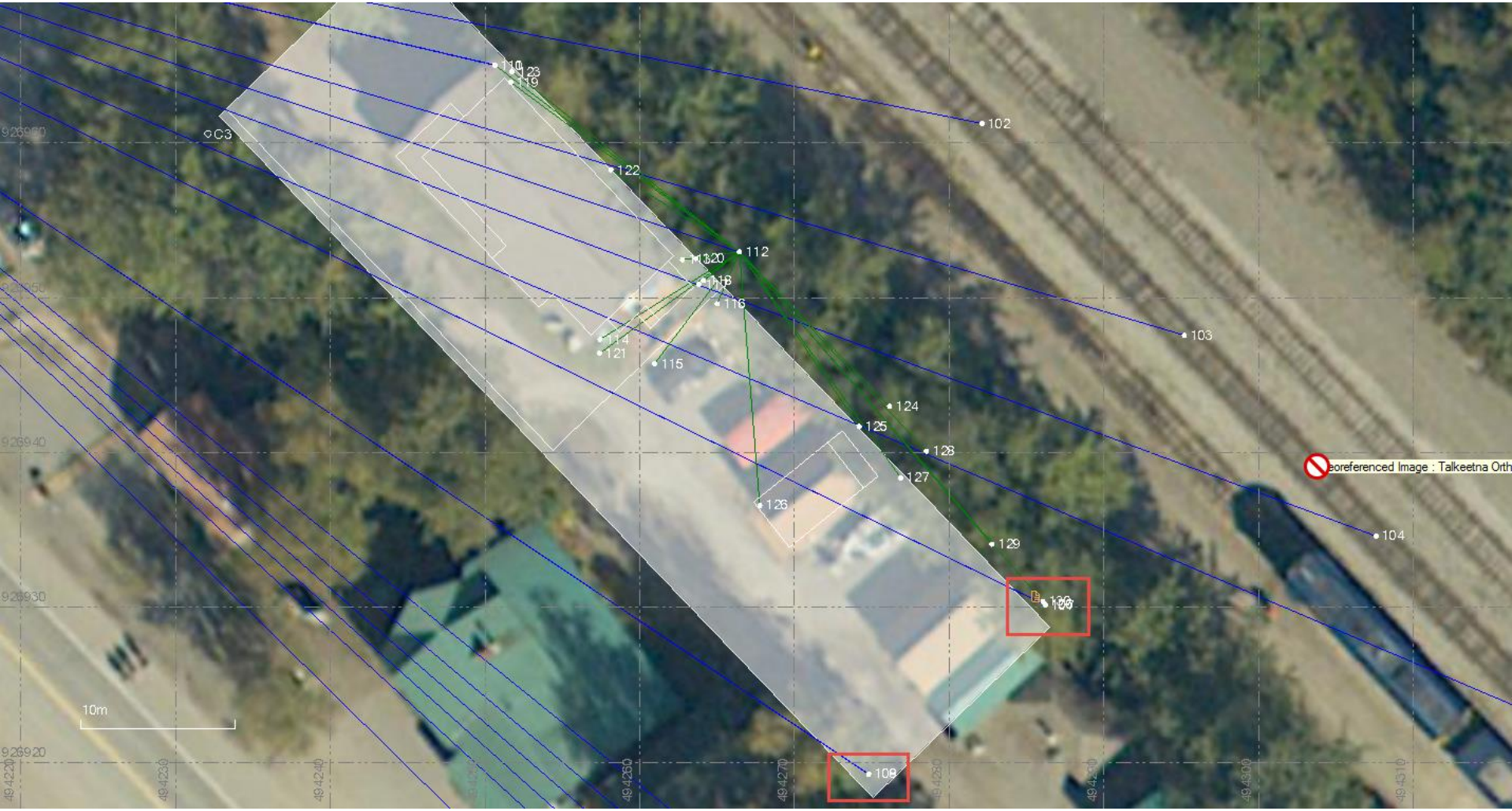
Cultural

SIGNIFICANCE

National Spatial Reference System



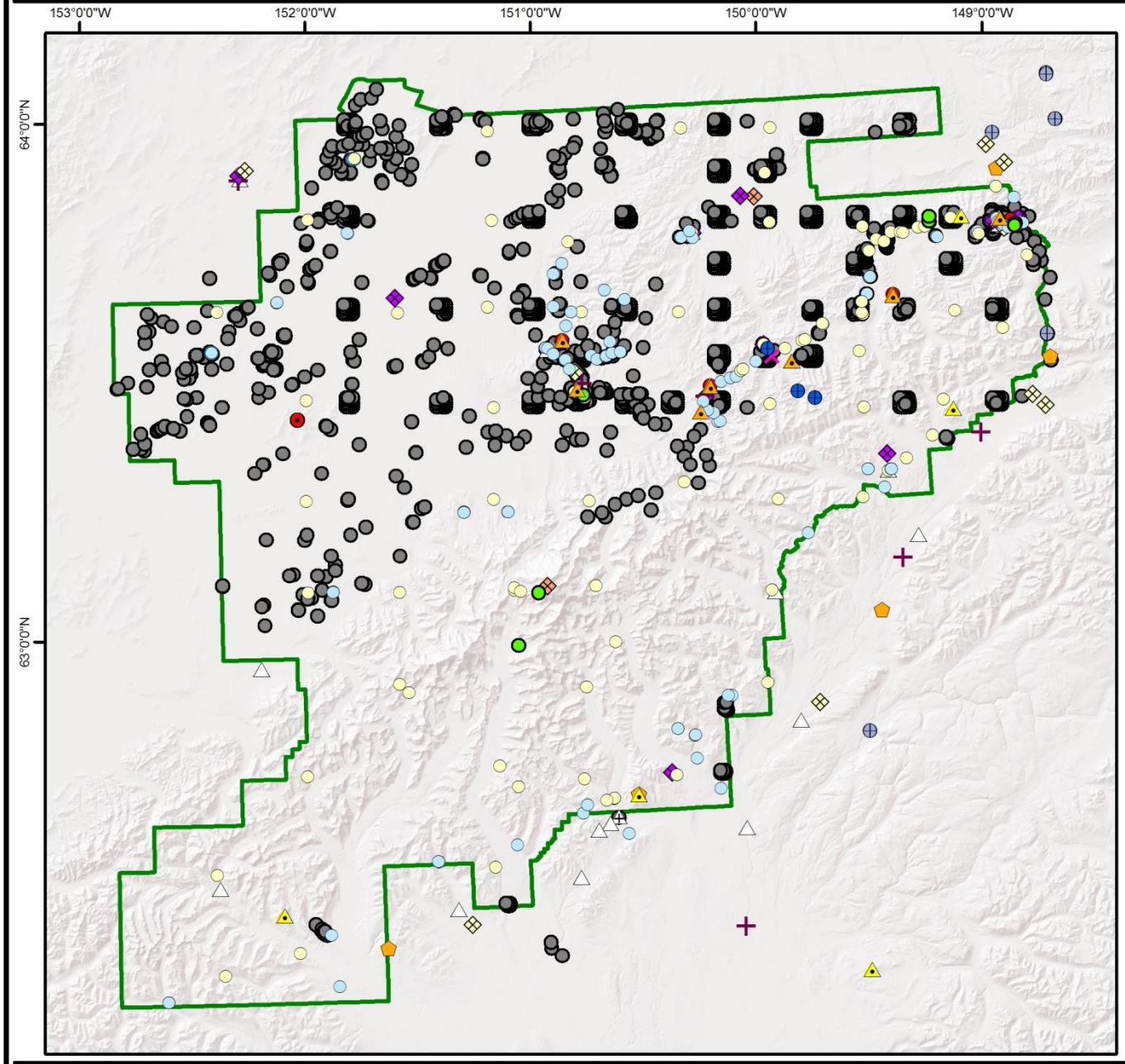
Local and Global Coordinates



Installations

Denali National Park and Preserve

Alaska Region
National Park Service
U.S. Department of the Interior



Communication Installations

- Radio Reapter
- Wireless Repeater

Generic Installations

- Generic Installation

Instrumentation Installations

- Water Level Pressure Transducer
- Water Level Stream Gage
- Water Temperature Array
- Other Hydrologic
- Still Camera
- Web Camera
- Acoustic Monitoring Device
- Continuous GPS Station
- Seismic Station
- SNOTEL Station
- Snow Course Station
- Weather Station (COOP)
- Weather Station (Other)
- Weather Station (RAWS)

Marker Installations

- Survey Monumentation
- Resource Marker

FIND YOUR PARK

FIND YOUR MARK

Recover

Observe

Report

GPS ON BENCHMARKS

Recover

Print benchmark datasheets

Load datasheet coordinates into GPS units

Observe

All recoveries

- Gather GPS coordinates
- Take photos
- Assess as candidate for base survey

Base Surveys

- Collect 4+ hours of survey-grade GPS data
- Take photos
- Measure HI

Report

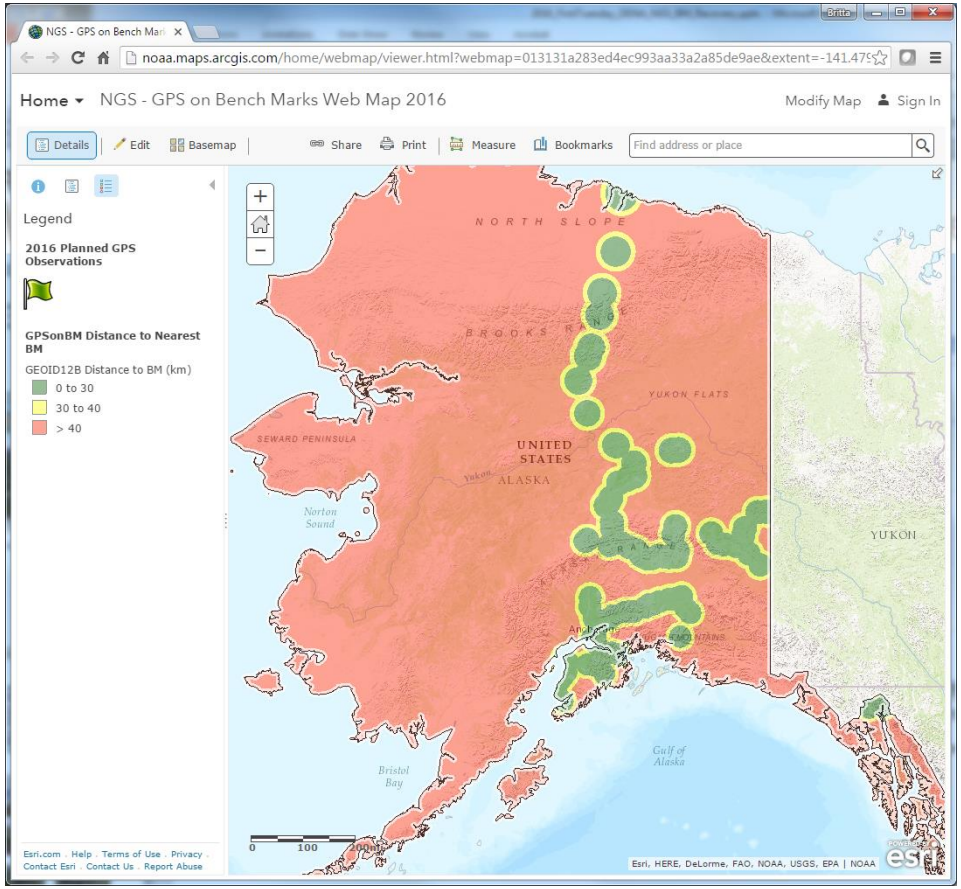
All recoveries

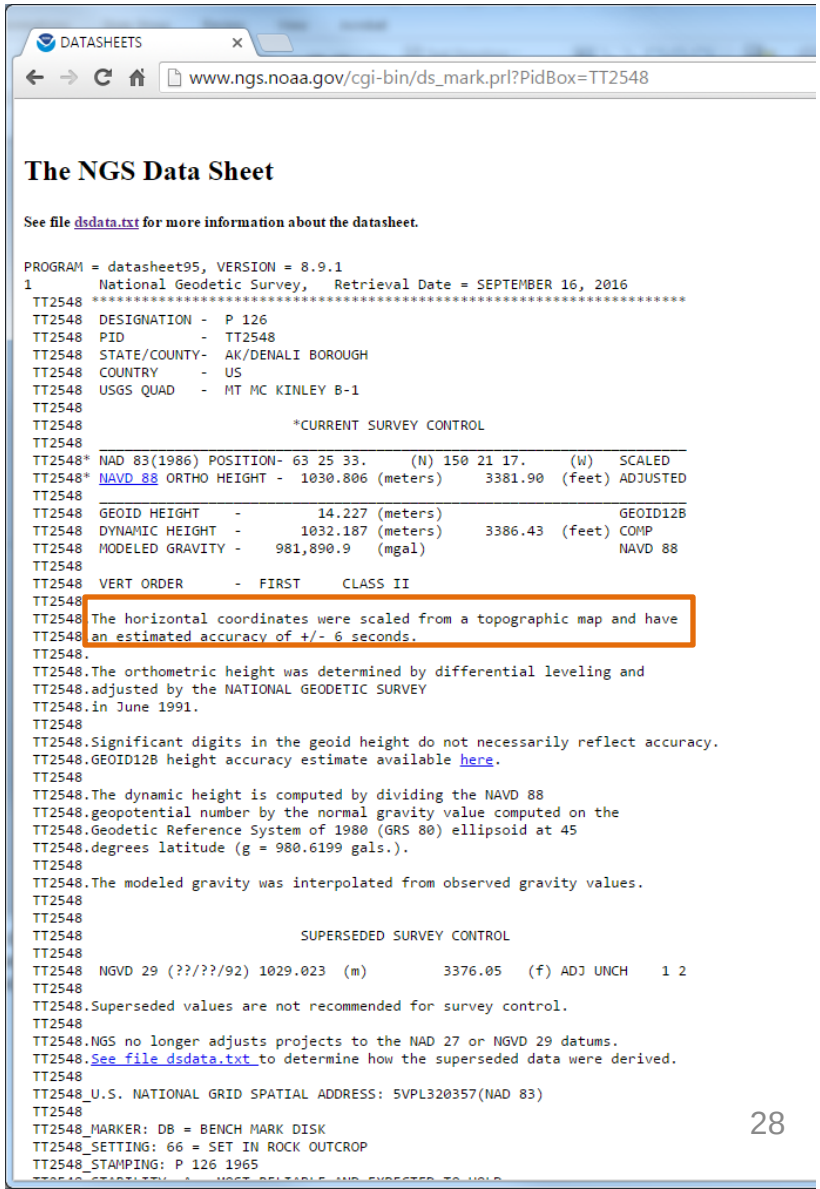
- Submit mark survey form to NGS

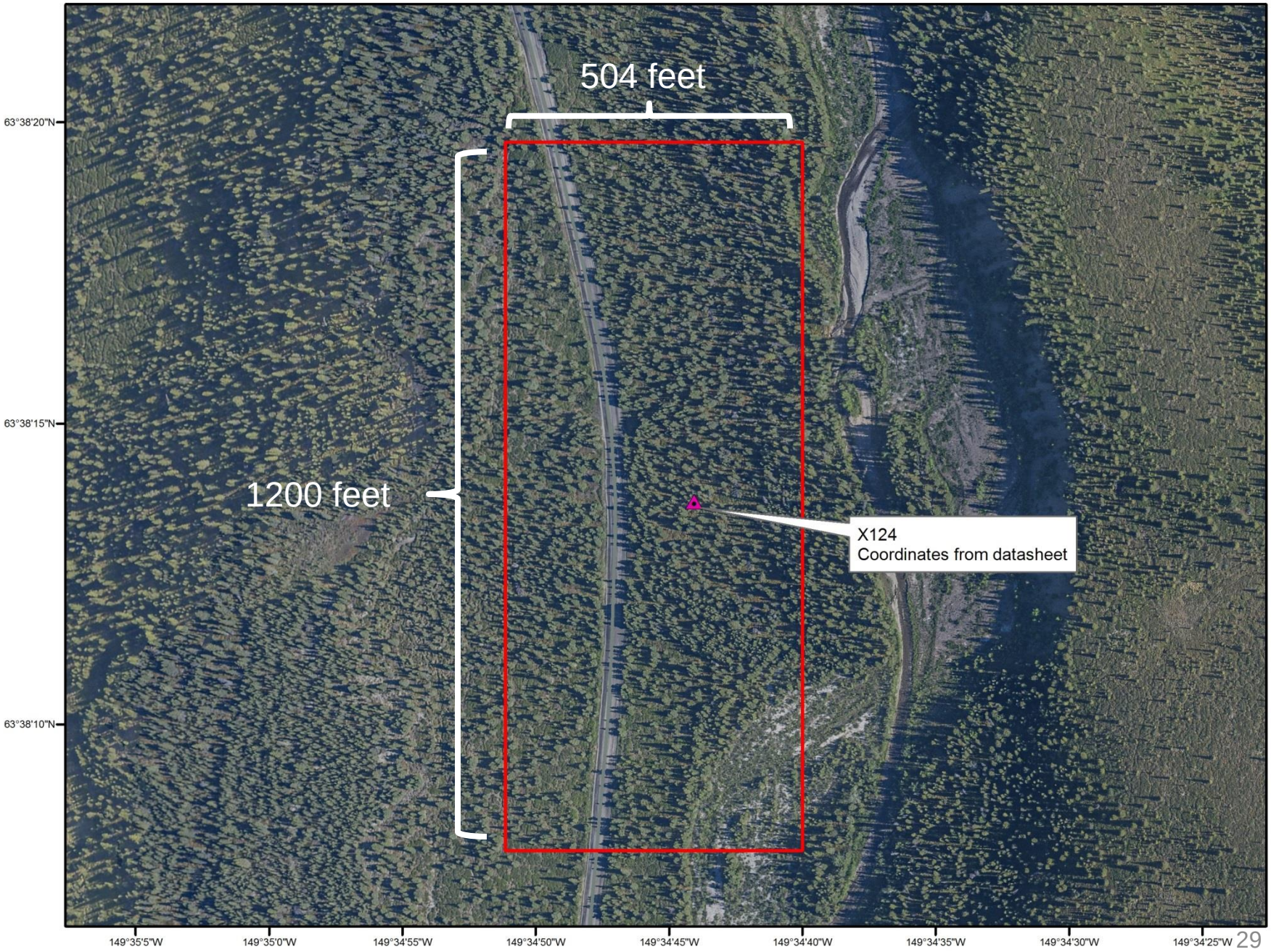
Base Surveys

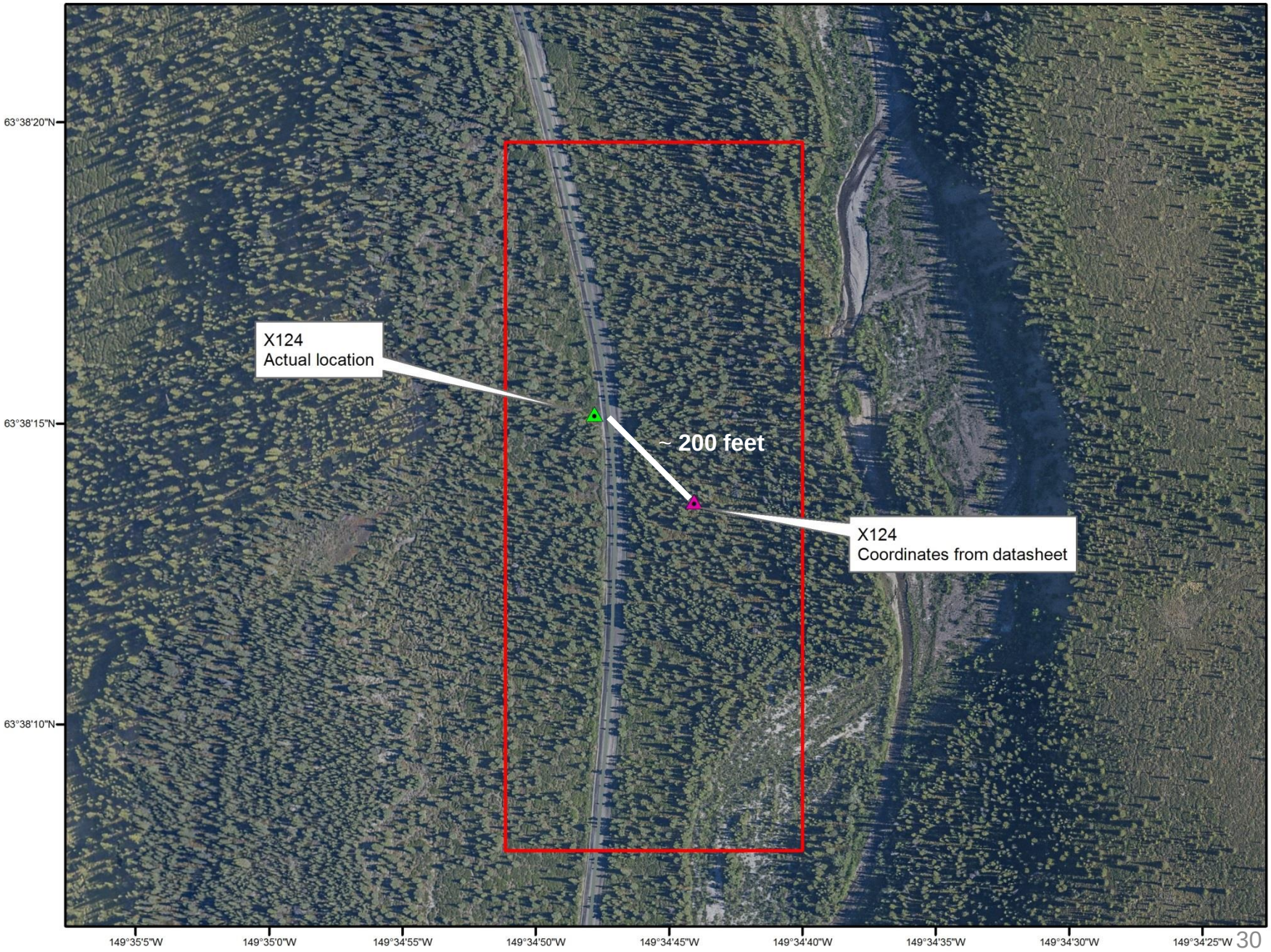
- Submit survey data to OPUS Shared Solutions

Reconnaissance and Recovery



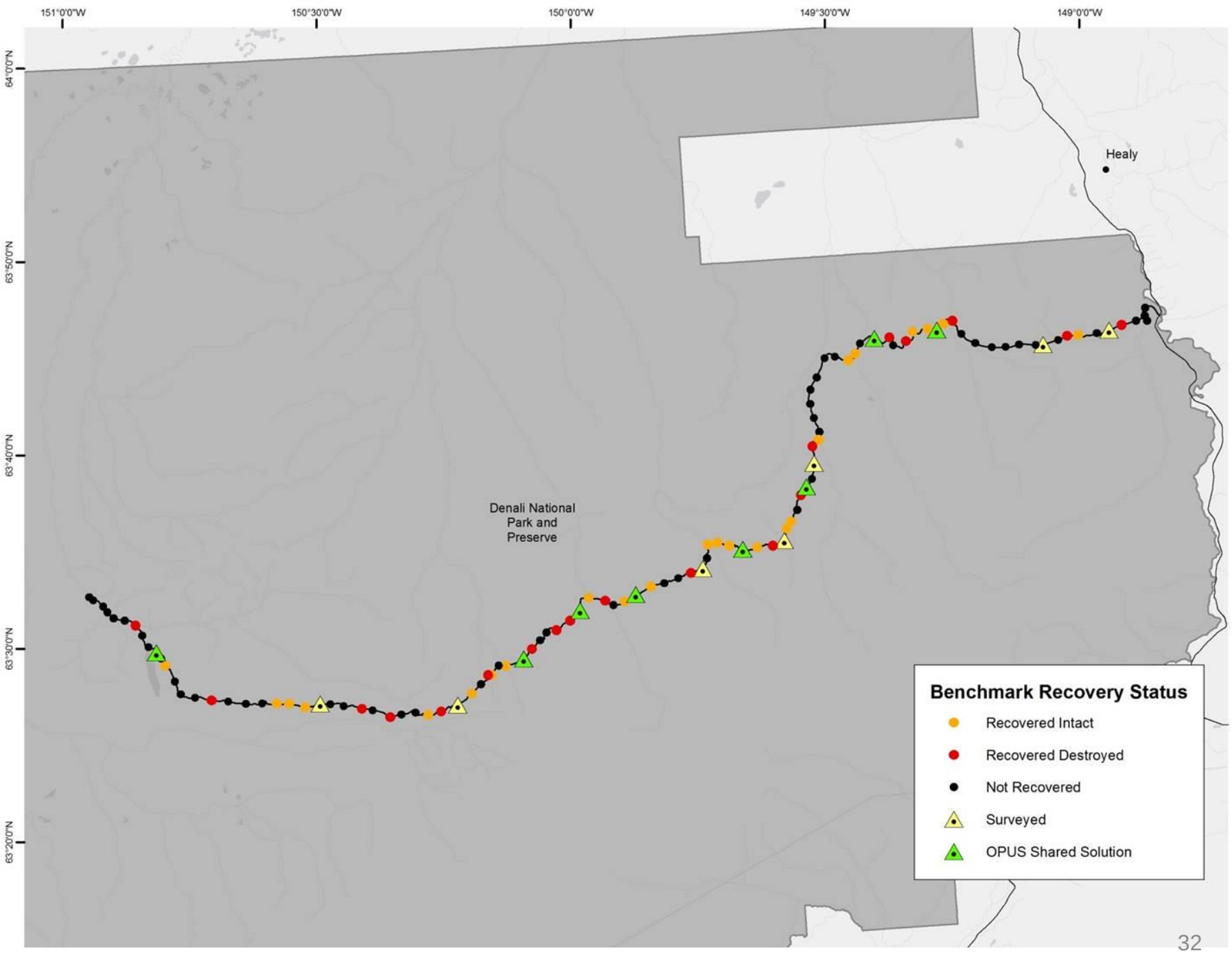



504 feet
1200 feet
X124
Coordinates from datasheet
63°38'20"N
63°38'15"N
63°38'10"N
149°35'5"W
149°35'0"W
149°34'55"W
149°34'50"W
149°34'45"W
149°34'40"W
149°34'35"W
149°34'30"W
149°34'25"W


63°38'20"N
63°38'15"N
63°38'10"N
X124
Actual location
~ 200 feet
X124
Coordinates from datasheet
149°35'5"W
149°35'0"W
149°34'55"W
149°34'50"W
149°34'45"W
149°34'40"W
149°34'35"W
149°34'30"W
149°34'25"W

Observe


GEOSCIENTISTS-IN-THE-PARKS
NATIONAL PARK SERVICE
Geologic Resources Division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64°0'0"N
63°50'0"N
63°40'0"N
63°30'0"N
63°20'0"N
Healy
Denali National Park and Preserve
Benchmark Recovery Status
Recovered Intact
Recovered Destroyed
Not Recovered
Surveyed
OPUS Shared Solution

U.S. COAST & GEODETIC SURVEY
FOR INFORMATION WRITE TO THE DIRECTOR, WASHINGTON, D.C.
$250 FINE OR IMPRISONMENT FOR DISTURBING THIS MARK
BENCH MARK
V 124
1965
E 126
L 125
X 125
F 126
E 125
L 126
C 125
M 126
Z 12
J 127
FEDERAL HIGHWAY ADMIN
13506
2013
VANCOUVER, WA
WONDER
TRIANGULATION

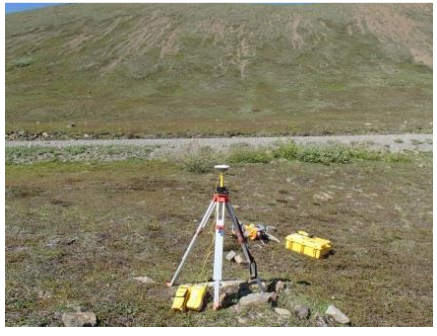
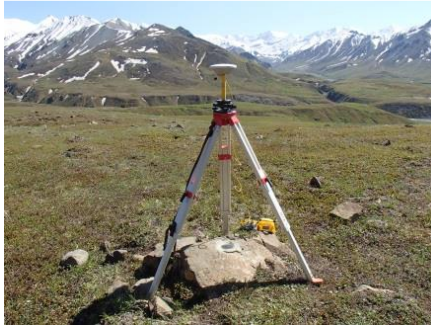
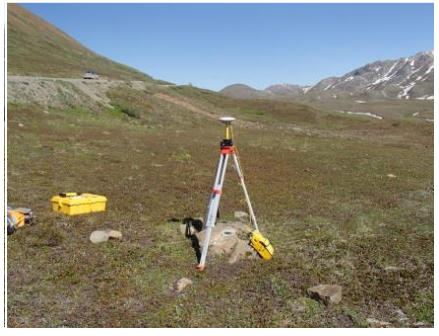
Equipment






Photos




Report

OPUS: Online Positioning User Service

National Geodetic Survey

NGS Home | About NGS | Data & Imagery | Tools | Surveys | Science & Education

OPUS menu

upload
about OPUS

projects
shared solutions

support / feedback

frame change to IGS14 begins with orbits

Orbits have been upgraded by IGS to their new IGS14 reference frame (**29 Jan 2017**.)
As other sources remain in IGS08 for now, we expect no significant impact to OPUS users.
A fully IGS14-based OPUS should be available in beta later this year.

OPUS mark list

Click on PID to view a Shared solution

PID	Designation	County, State	Submitter	Load Date
TT2530	Y 125	Denali Borough,AK	britta_schroeder@nps.gov	112916
TT2536	E 126	Denali Borough,AK	britta_schroeder@nps.gov	112916
TT2428	C 124	Denali Borough,AK	britta_schroeder@nps.gov	112916
TT2507	Z 124	Denali Borough,AK	britta_schroeder@nps.gov	112916
TT2525	T 125	Denali Borough,AK	britta_schroeder@nps.gov	112916
TT2434	J 124	Denali Borough,AK	britta_schroeder@nps.gov	011217
TT2570	WONDER	Denali Borough,AK	britta_schroeder@nps.gov	011217
TT2515	H 125	Denali Borough,AK	britta_schroeder@nps.gov	011217

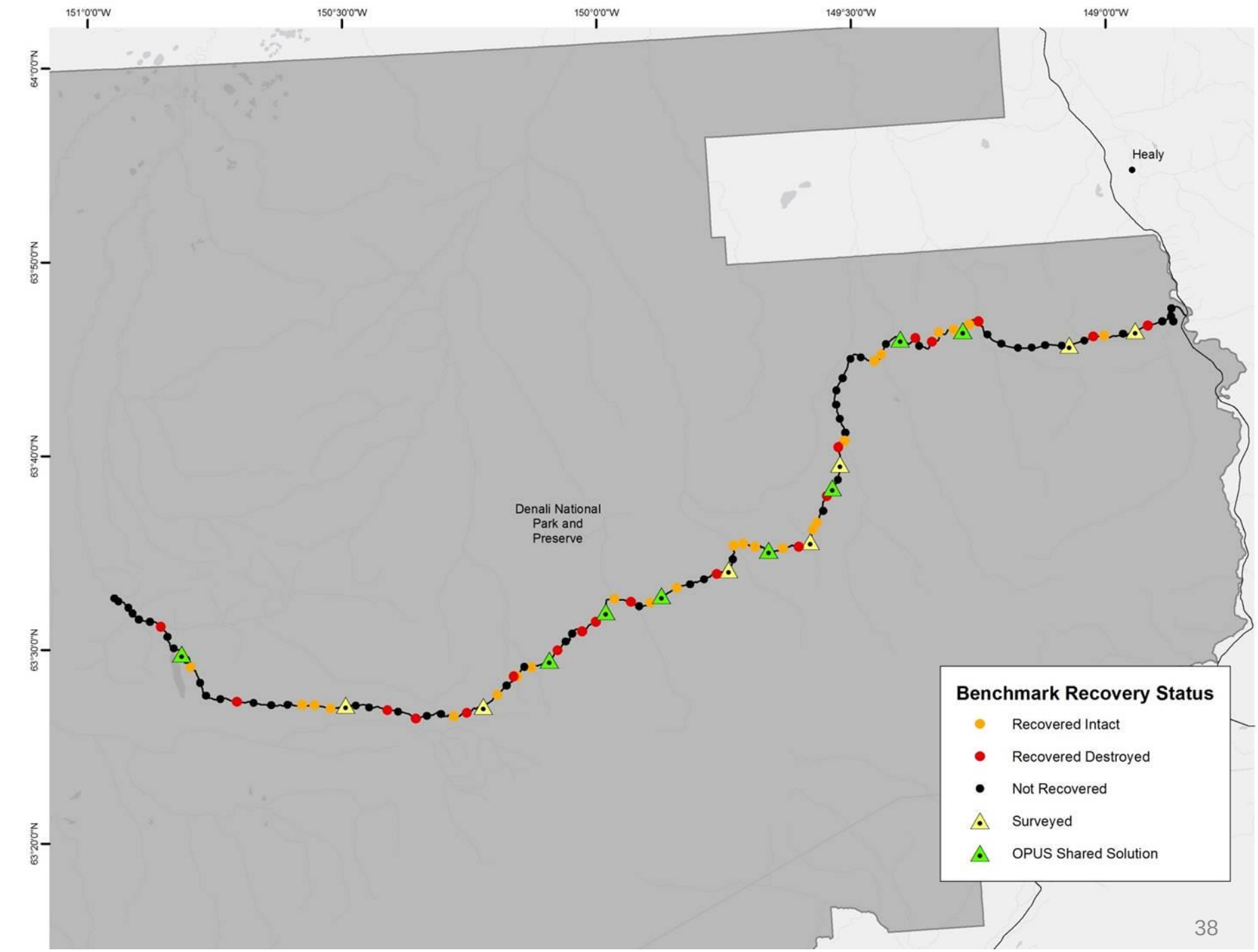
This search retrieves OPUS Solutions only. See also **NGS Datasheets**

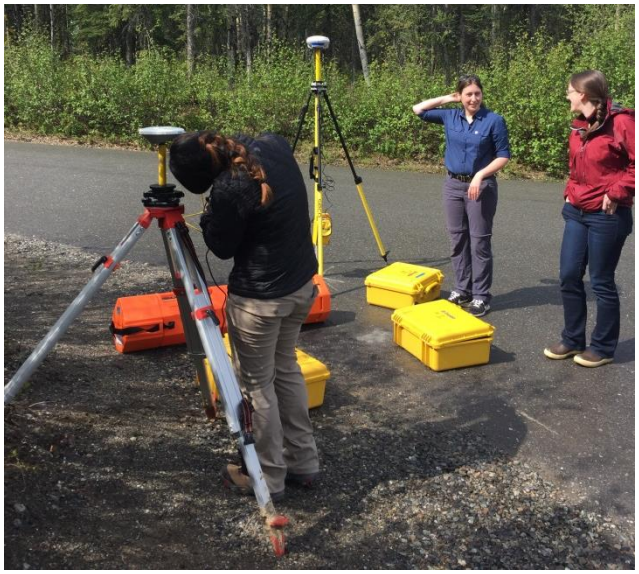
Geospatial Youth Events

Volunteers

Partners

OUTREACH AND EDUCATION


151°0'0"W
150°30'0"W
150°0'0"W
149°30'0"W
149°0'0"W
64°0'0"N
63°50'0"N
63°40'0"N
63°30'0"N
63°20'0"N
Healy
Denali National Park and Preserve
Benchmark Recovery Status
Recovered Intact
Recovered Destroyed
Not Recovered
Surveyed
OPUS Shared Solution



151°0'0"W
150°30'0"W
150°0'0"W
149°30'0"W
149°0'0"W
64°0'0"N
63°50'0"N
63°40'0"N
63°30'0"N
63°20'0"N
Healy
Denali National Park and Preserve

Benchmark Recovery Status

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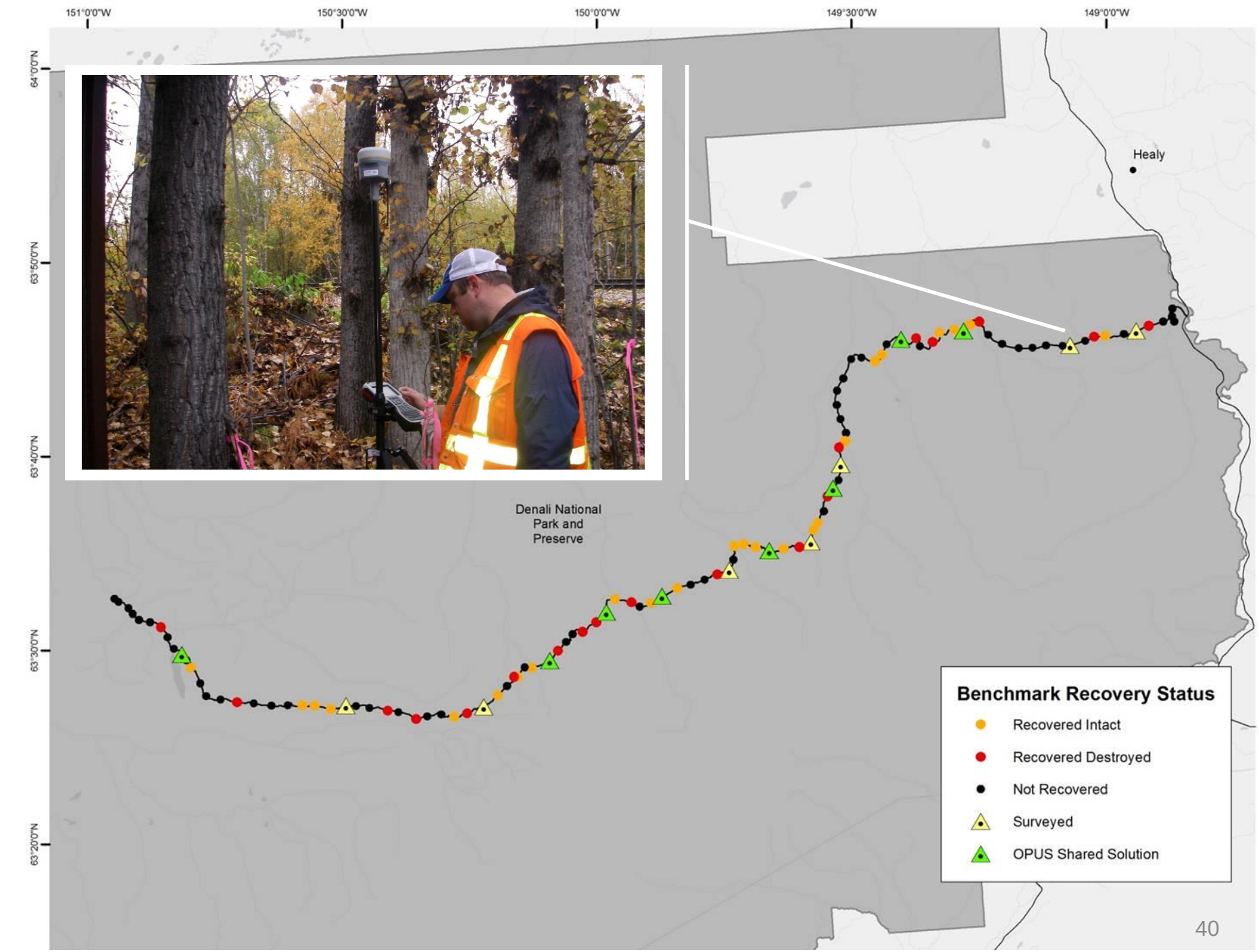
- Recovered Destroyed
- Not Recovered
- Surveyed
- OPUS Shared Solution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150°30'0"W
150°0'0"W
149°30'0"W
149°0'0"W
64°0'0"N
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151°0'0"W
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Denali National Park and Preserve

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63°40'0"N
63°30'0"N
63°20'0"N
Healy
Denali National
Park and
Preserve

Benchmark Recovery Status

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Denali National Park and Preserve

Healy

151°0'0"W
150°30'0"W
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149°30'0"W
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63°20'0"N

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Denali National Park and Preserve

Healy

151°0'0"W
150°30'0"W
150°0'0"W
149°30'0"W
149°0'0"W
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63°50'0"N
63°40'0"N
63°30'0"N
63°20'0"N

Benchmark Recovery Status

- Recovered Intact
- Recovered Destroyed
- Not Recovered
- Surveyed
- OPUS Shared Solution

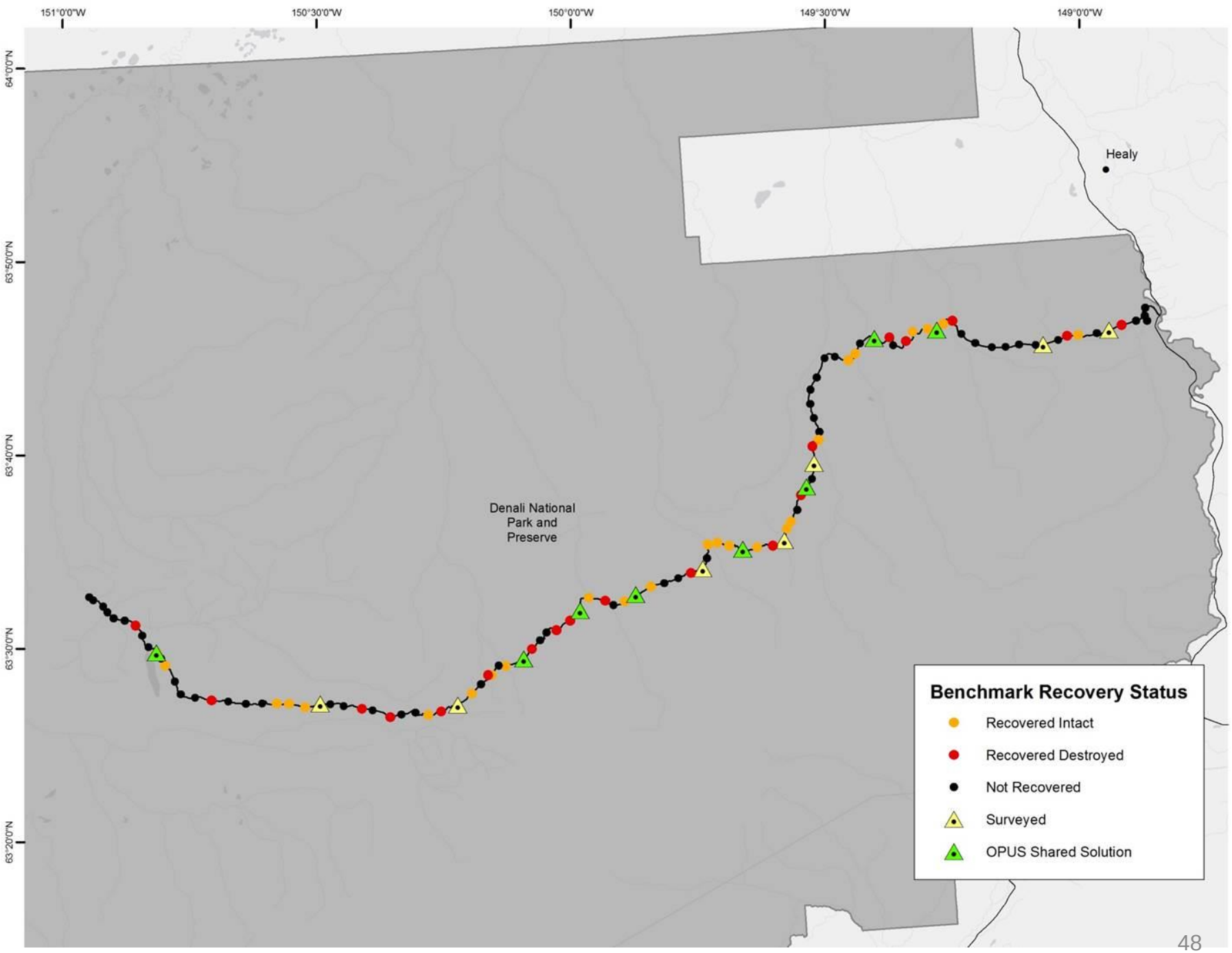
151°0'0"W
150°30'0"W
150°0'0"W
149°30'0"W
149°0'0"W
64°0'0"N
63°50'0"N
63°40'0"N
63°30'0"N
63°20'0"N
Healy
Denali National Park and Preserve
Benchmark Recovery Status
Recovered Intact
Recovered Destroyed
Not Recovered
Surveyed
OPUS Shared Solution

DENA

NPS

Alaska

NEXT LEVEL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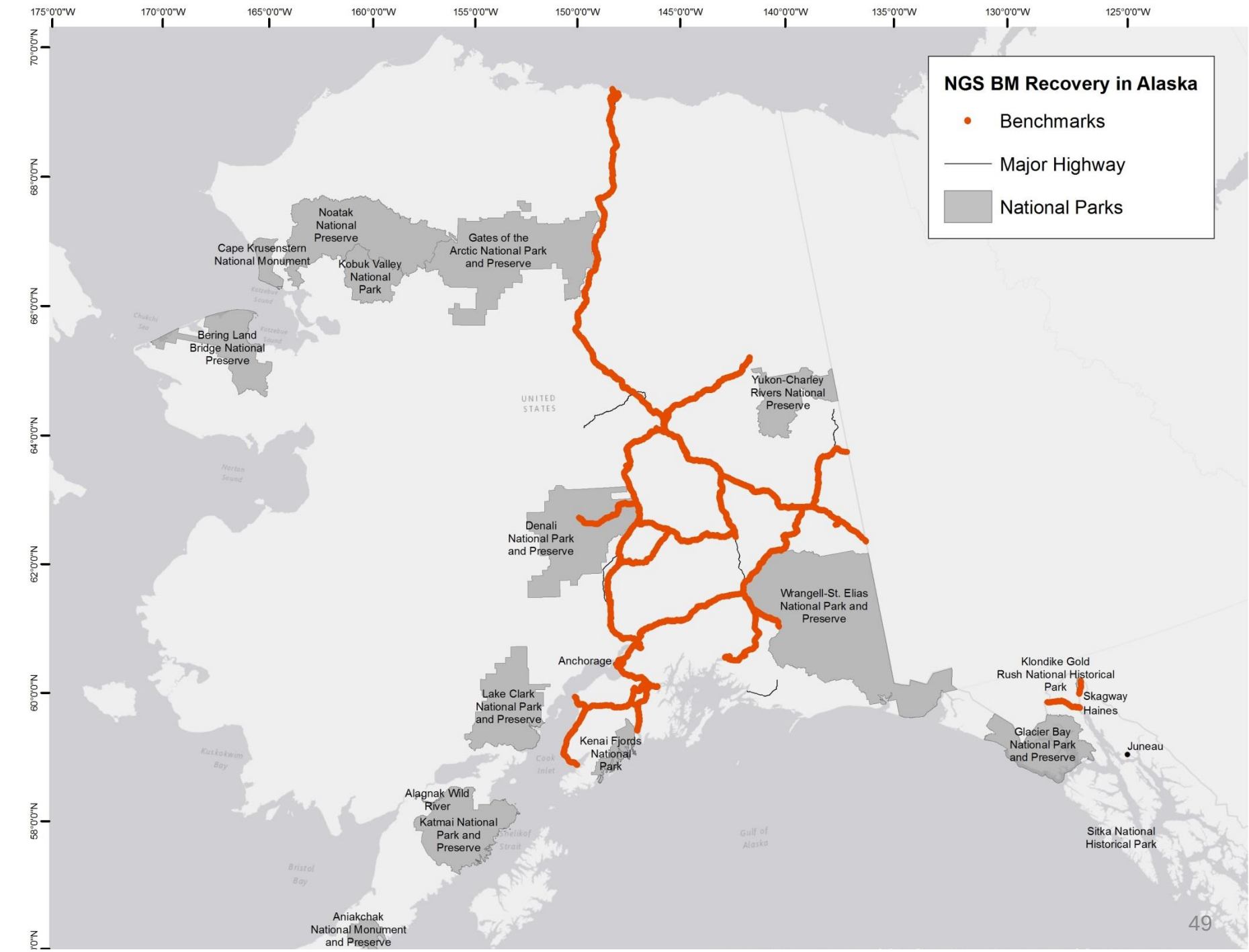
Surveyed
OPUS Shared Solution


NGS BM Recovery in Alaska
Benchmarks
Major Highway
National Parks
Noatak National Preserve
Cape Krusenstern National Monument
Kobuk Valley National Park
Gates of the Arctic National Park and Preserve
Bering Land Bridge National Preserve
Yukon-Charley Rivers National Preserve
Denali National Park and Preserve
Wrangell-St. Elias National Park and Preserve
Anchorage
Lake Clark National Park and Preserve
Kenai Fjords National Park
Klondike Gold Rush National Historical Park
Skagway
Haines
Glacier Bay National Park and Preserve
Juneau
Sitka National Historical Park
Alagnak Wild River
Katmai National Park and Preserve
Aniakchak National Monument and Preserve
UNITED STATES
175°0'0"W
170°0'0"W
165°0'0"W
160°0'0"W
155°0'0"W
150°0'0"W
145°0'0"W
140°0'0"W
135°0'0"W
130°0'0"W
125°0'0"W
70°0'0"N
68°0'0"N
66°0'0"N
64°0'0"N
62°0'0"N
60°0'0"N
58°0'0"N

STATION RECOVERY (1968)

RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1968 (BW)
THE STATION MARK HAS BEEN DISTURBED BY THE PARK RANGERS BECAUSE IT INTERFERED WITH THE BEAUTY OF THEIR SUNSETS.

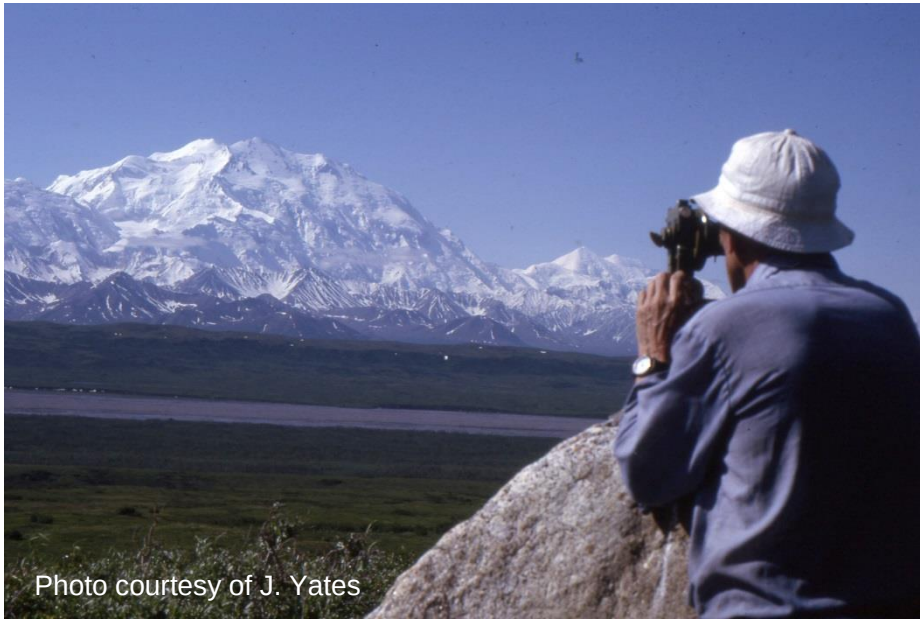


Photo courtesy of J. Yates

Mount McKinley National Park

Healy

Talkeetna

Year Established

- 1920-1929
- 1940-1941
- 1950-1959
- Railroad
- Major Highway (pre-1964)

Guidance


National Geodetic Survey
www.ngs.noaa.gov/GPSonBM/
GPS on Bench Marks
National Geodetic Survey
NGS Home
About NGS
Data & Imagery
Tools
Surveys
Science & Education
Search
September 16, 2016
What is GPS on Bench Marks?
Improve the National Spatial Reference System (NSRS):
Recover: Look up the description of an existing bench mark and visit the bench mark of your choice.
Observe: Record field notes, take digital photos, and collect GPS observations or coordinates for the bench mark you visit.
Report: Use online tools to send the information to NGS.
Where?
Currently there are over 400,000 bench marks across the Conterminous United States (CONUS), Alaska, Hawaii and all U.S. territories. Tidal marks and bench marks are used for determining heights. Use the maps to prioritize which bench marks to observe.
Who can participate?
Anyone with Global Positioning System (GPS) enabled phones, hand held devices or survey-grade GPS receivers can participate. Recommended procedures vary depending on the type of equipment used.
When should I start?
You can collect and share information any time. Join volunteer efforts across the United States in celebration of National Surveyors Week beginning March 20, 2016. Contact the local National Society of Professional Surveyors chapter or your NGS geodetic advisor to learn about projects being planned in your local area.
How?
For specific information on how to help please visit the Recover, Observe, and Report web
GPS on BM Links
Home
Recover
Observe
Report
Web Map
GPS on BM FAQ
GPS on BM One Pager
Webinar Information
2016 Video
2015 Video
Related Links
NGS Data Explorer
DSWorld
OPUS Upload
Mark Recovery Form
Photo Submission
GEOID12B
2014 Campaign
For geocachers:
Hunt for marks!
Bench Mark Hunting
Recover
Observe
Report
More information on Recover, Observe, Report please check out the videos of the 2015 and 2016 webinars we recorded for people to learn more. Click on the image to see this years webinar or the menu to the left for 2015 Video
GPS on BM Webinar Video and Information
The maps below show the distance to nearest bench mark used in GEOID12B as well as the estimated accuracy. The accuracy is highly correlated to the distance to nearest bench mark. You can help improve the next geoid by helping to fill these gaps and limit the distance between observed bench marks.
GEOID12B Distance to Nearest Bench Mark Map

References and Resources

- National Research Council (U.S.). Committee on the Alaska Earthquake. The Great Alaska Earthquake of 1964, Seismology and Geodesy. 1972. Washington, D.C. National Academy of Sciences
- NGS website
- U.S. Geological Survey Photo Library
- University of Alaska Photo library

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