



Climate Monitoring

National Park Service Southwest Alaska Network

Kenai Fjords National Park
Katmai National Park and Preserve
Lake Clark National Park and Preserve
Aniakchak National Preserve

24 9:22 PM

Sampling Design and Objectives

To deploy a network of remote automated weather stations in SWAN with the ability to:

- Fill in gaps of the existing network of weather stations.
- Capture average climate and climate variability across the SWAN region.
- Contribute to larger scale climate monitoring and modeling efforts.
- Contribute current weather observations to enhance day-to-day park operations.
- Maintain stations for the long-term (decades)

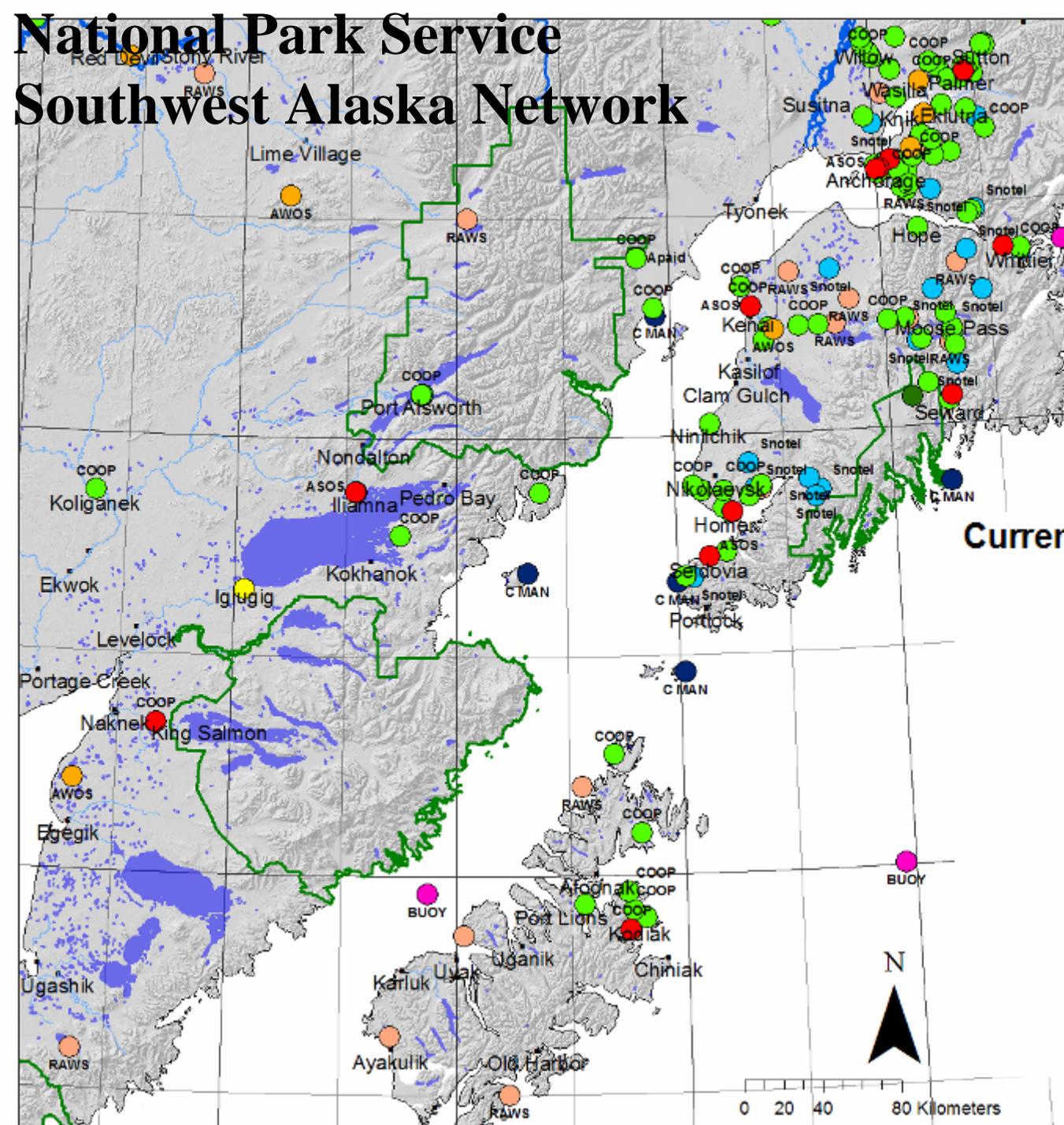
Hourly weather observations will include:

- Air temperature (current, min, max, average)
- Relative humidity (current, average)
- Wind speed and direction (current, average, 1-minute gust)
- Snow depth (current)
- Solar radiation (current)
- Precipitation (current)
- Soil Temperature (some locations)

- Observations available at:
<http://www.wrcc.dri.edu/NPS.html>
- Permanent archive:
 - Western Regional Climatic Center

- Reality:
 - Access Drives Long-term Maintenance Success
 - Fixed-wing (wheels or floats)
 - Boat
 - Helicopter only with Partnerships

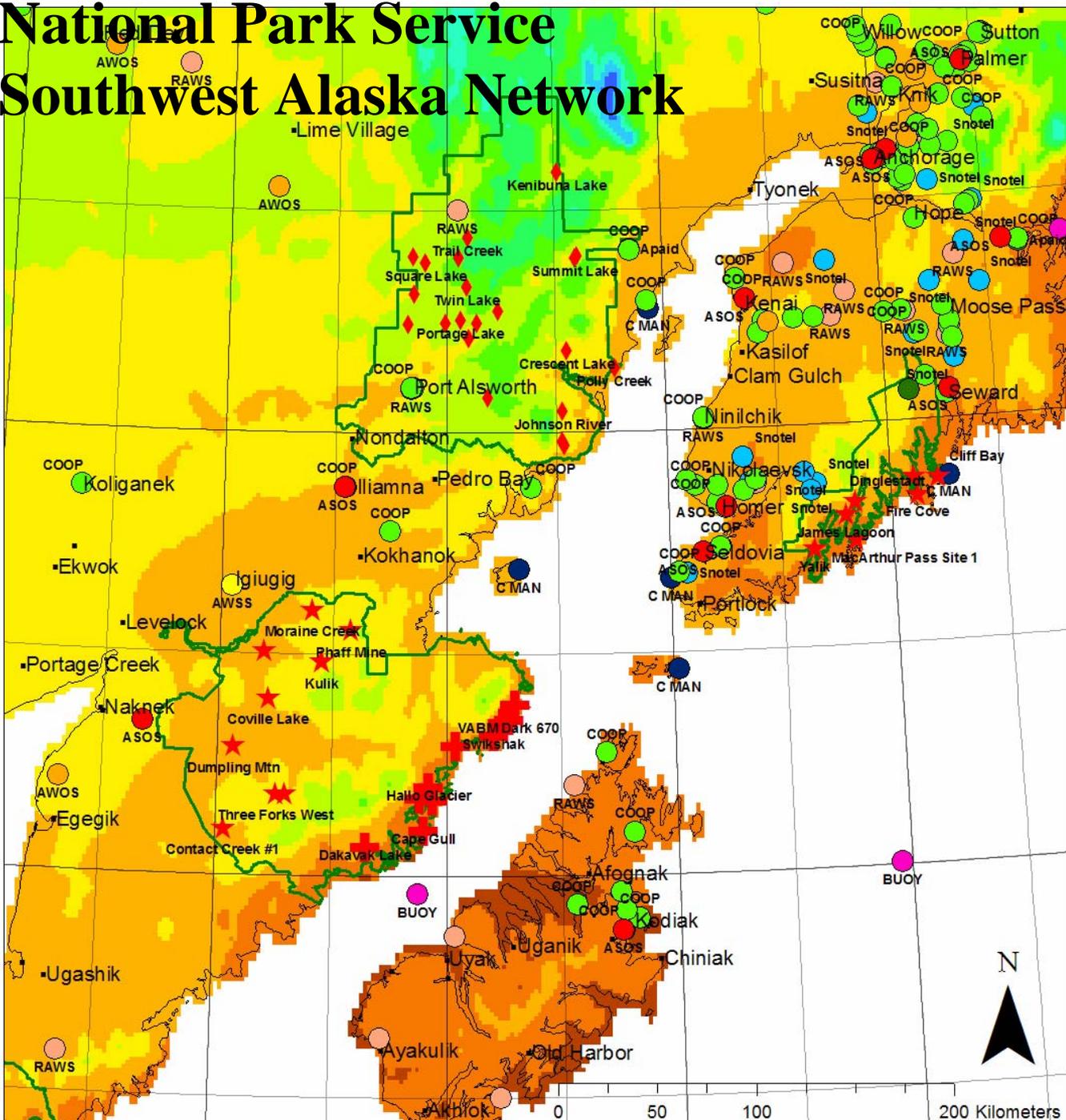
National Park Service Southwest Alaska Network



Current Weather Station Network

- ASOS
- AWSS
- AWOS
- Apaid
- COOP
- RAWS
- SnoTel
- NDBC_C-Man
- NDBC_Buoys
- Harding Icefield

National Park Service Southwest Alaska Network



Potential Weather Station Deployment Sites

- + Katmai NP&P - Aerial Inspections Completed 2006
- ★ Katmai NP&P - Ground Inspection Completed 2006
- Towns
- ▭ Park Outline- KEFJ

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- ASOS
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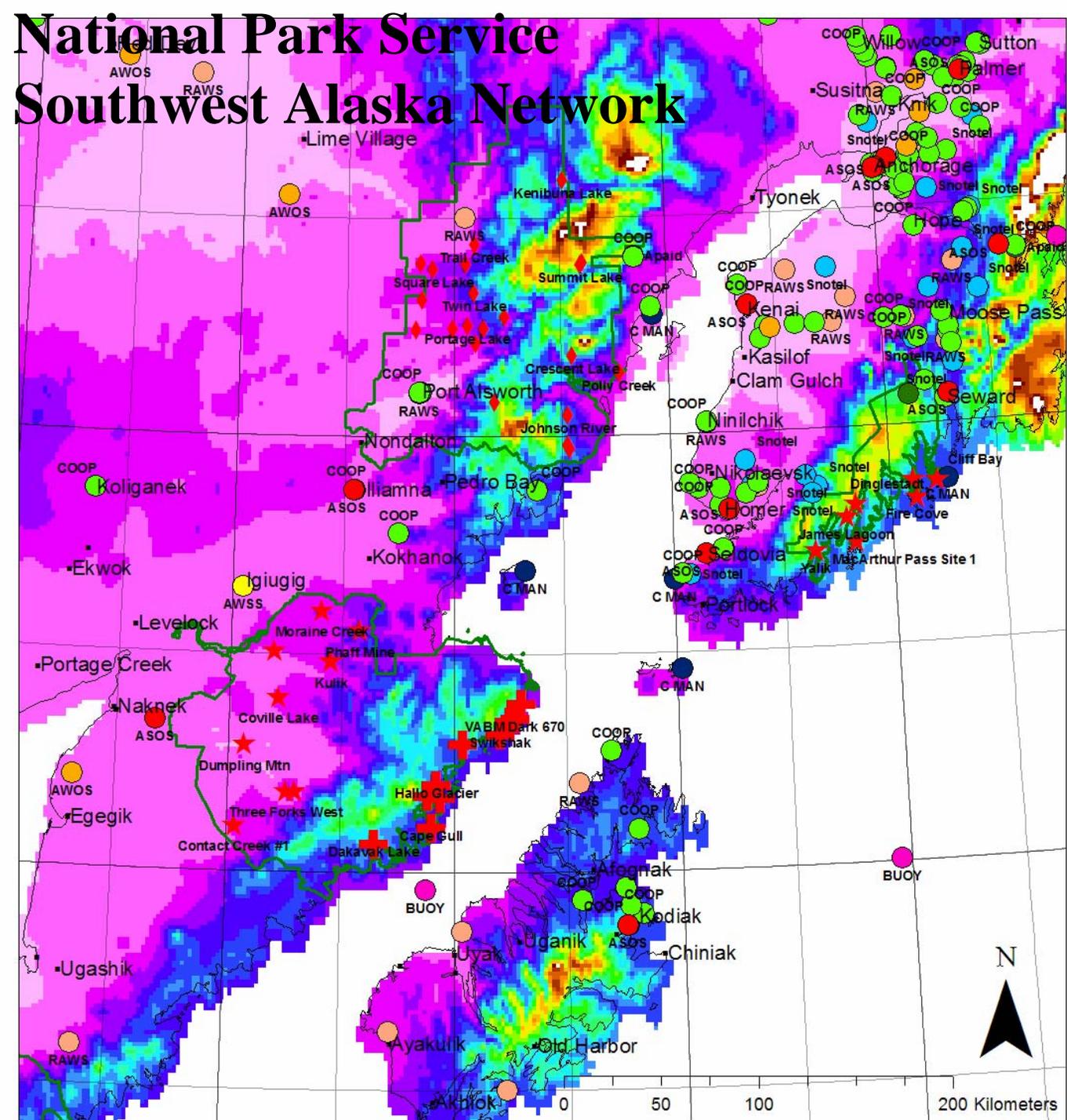
Mean Annual Temp - PRISM (Centigrade)

- 23 to -22
- 22 to -20
- 20 to -18
- 18 to -16
- 16 to -14
- 14 to -12
- 12 to -10
- 10 to -8
- 8 to -6
- 6 to -4
- 4 to -2
- 0 to 2
- 2 to 4
- 4 to 6
- 6 to 8



0 50 100 200 Kilometers

National Park Service Southwest Alaska Network



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Annual Precip (PRISM) millimeters

- 158 - 250
- 250 to 500
- 500 to 750
- 750 to 1,000
- 1,000 to 1,250
- 1,250 to 1,500
- 1,500 to 1,750
- 1,750 to 2,000
- 2,000 to 2,250
- 2,250 to 2,500
- 2,500 to 2,750
- 2,750 to 3,000
- 3,000 to 3,250
- 3,250 to 3,500
- 3,500 to 3,750
- 3,750 to 4,000
- 4,000 to 4,250
- 4,250 to 4,500
- 4,500 to 4,750
- 4,750 to 5,000



0 50 100 200 Kilometers

2006 Climate Station Site Selection Process

- KATM
 - 7 on-the-ground surveys completed
 - 10 fly-by reconnaissance completed
- KEFJ
 - 7 On-the-ground surveys completed

2006 Climate Station Site Selection Process

- Site ranking meeting/workshop
 - National Weather Service
 - Alaska Regional Office
 - River Forecast Center
 - University of Alaska
 - State Climatologist
 - Natural Resources Conservation Service
- Resulted in a priority ranking of climate station sites

Katmai National Park and Preserve



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BUOY

Karluk

Moraine Creek



Igloo
AWSS

CMAN

Moraine Creek

Phaff Mine

Nonvianuk Lake Site South

Kulik

Coville Lake

COOP
ASOS

Dumping Mtn

Fourpeaked Glacier
VA BM Dark 670

Three Forks West

Hollo Bay

Contact Creek #1

Hollo Glacier

Devil's Cove Lake

Dakavak Lake

Slope Gull

BUOY

0 10 20 40 Kilometers

Karluk

Moraine Creek looking southwest



19 1:13 PM

Moraine Creek looking north



Moraine Creek looking south



Phaff Mine



Kokhanok

Igiugig
AWSS

CMAN

Phaff Mine

Moraine Creek

Nonvianuk Lake Site South

Kulik

Coville Lake

COOP
ASOS

Dumping Mtn

Three Forks West

Contact Creek #1

Halo Bay

Fourpeaked Glacier

VABM Dark 670

Swikshak

Halo Glacier

Devil's Cove Lake

Dakavak Lake

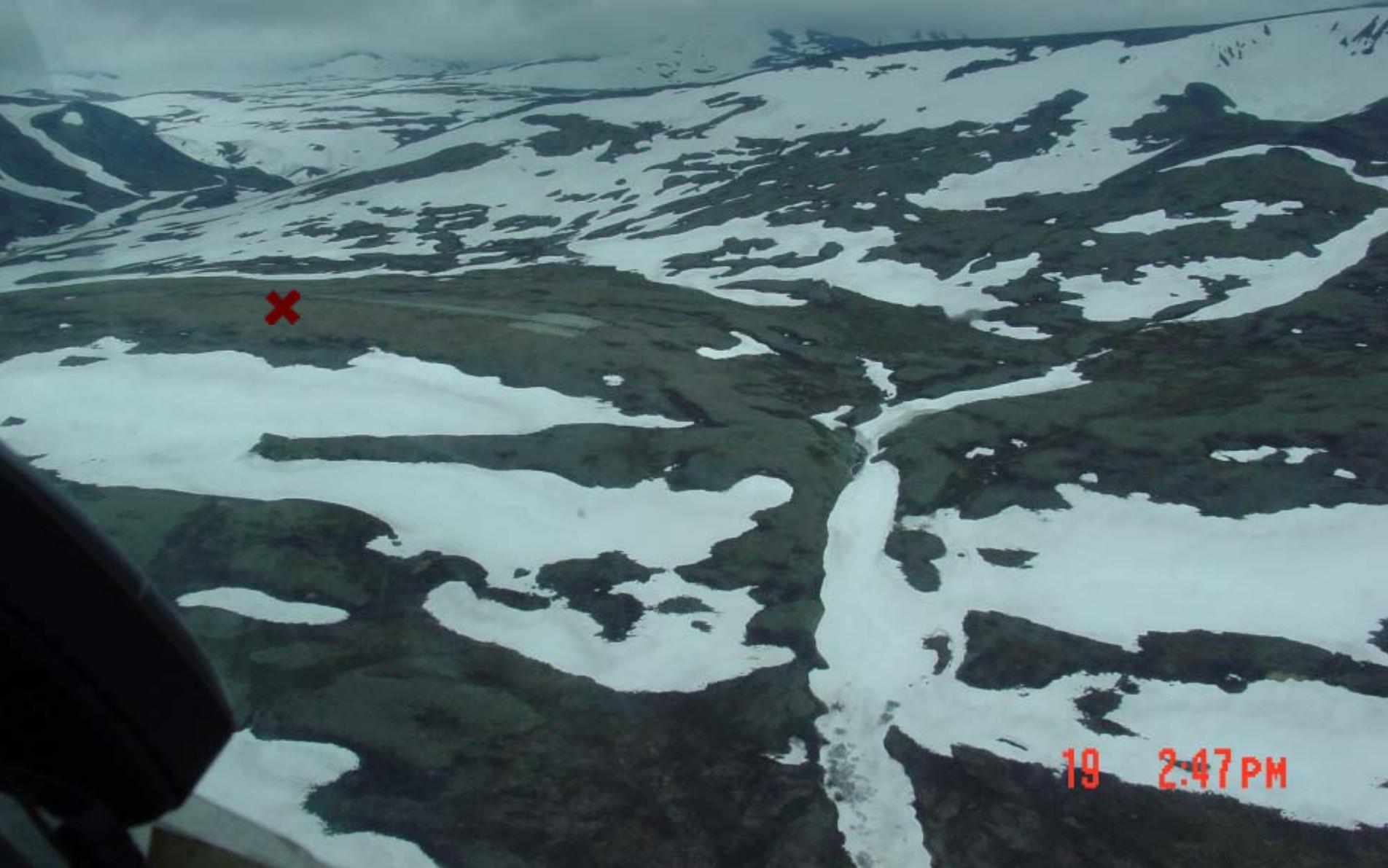
Spe Gull

BUOY

0 10 20 40 Kilometers

Karluk

Phaff Mine looking east



19 2:47 PM

Phaff looking north



Phaff looking south







Kulik looking southwest

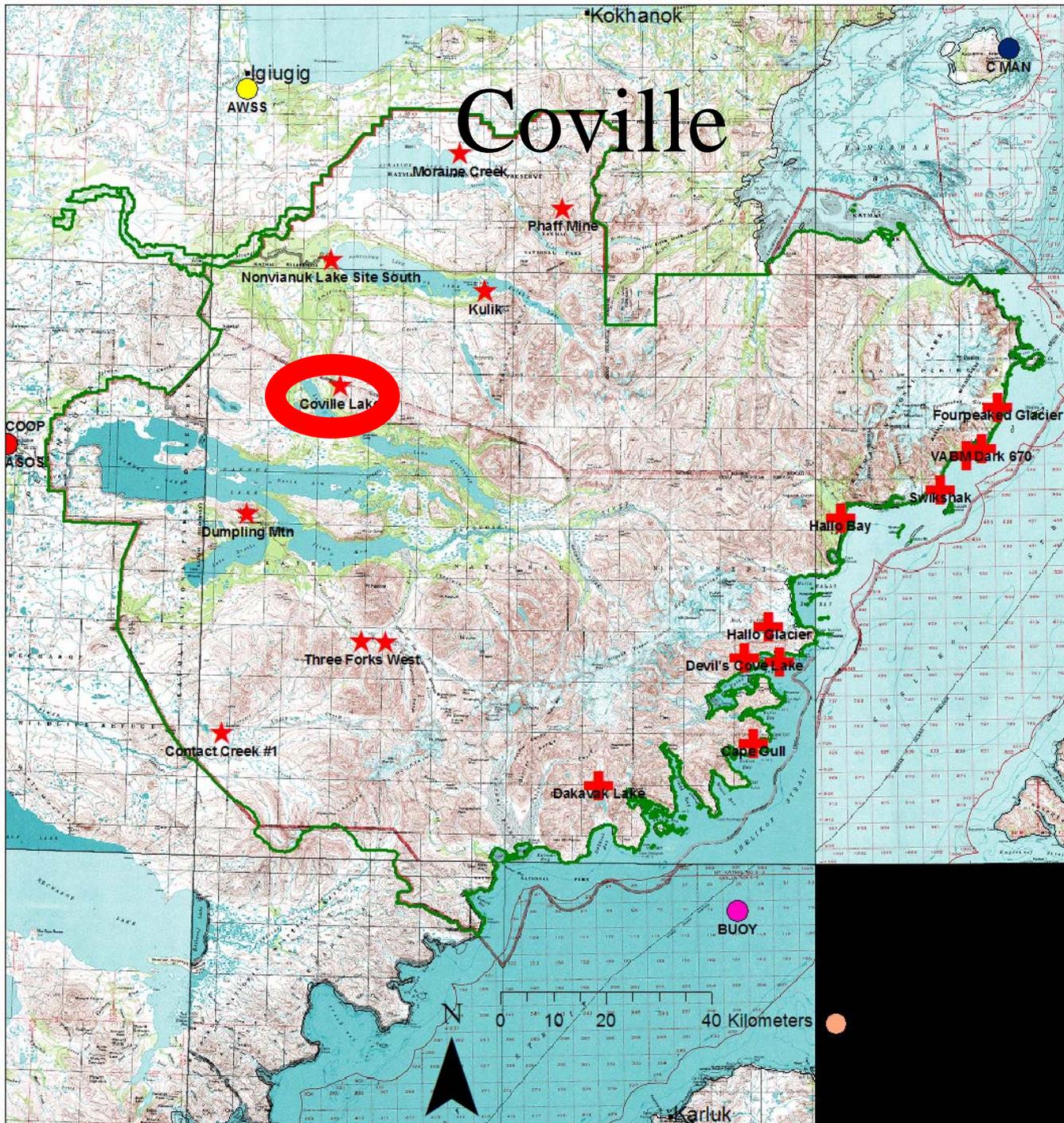
19 3:55 PM

Kulik looking north



Kulik looking south





Kokhanok

Igiugig
AWSS

Coville

CMAN

Moraine Creek

Phaff Mine

Nonvianuk Lake Site South

Kulik

Coville Lake

COOP
ASOS

Dumping Mtn

Three Forks West

Contact Creek #1

Dakavak Lake

Halo Bay

Swikshak

VABM Dark 670

Fourpeaked Glacier

Halo Glacier

Devil's Cove Lake

Cape Gull

BUOY

0 10 20 40 Kilometers

Karluk

Coville looking south



21 3:25 PM

Coville looking north



Coville looking south



21 2:49



Dumpling Mtn

Igiugig
AWSS

Kokhanok

CMAN

Moraine Creek

Phaff Mine

Nonvianuk Lake Site South

Kulik

Coville Lake

Fourpeaked Glacier

VABM Dark 670

COOP
ASOS

Dumpling Mtn

Halo Bay

Swikshak

Three Forks West

Halo Glacier

Devil's Cove Lake

Contact Creek #1

Cape Gull

Dakavak Lake

BUOY

0 10 20 40 Kilometers

Karluk

Dumpling Mtn looking northeast



19 12:24 PM

Dumpling Mtn looking north



Dumpling Mtn looking south



Three Forks



Three Forks looking northwest

Aerial snow marker ✕



19 12:07 PM

Three Forks looking north

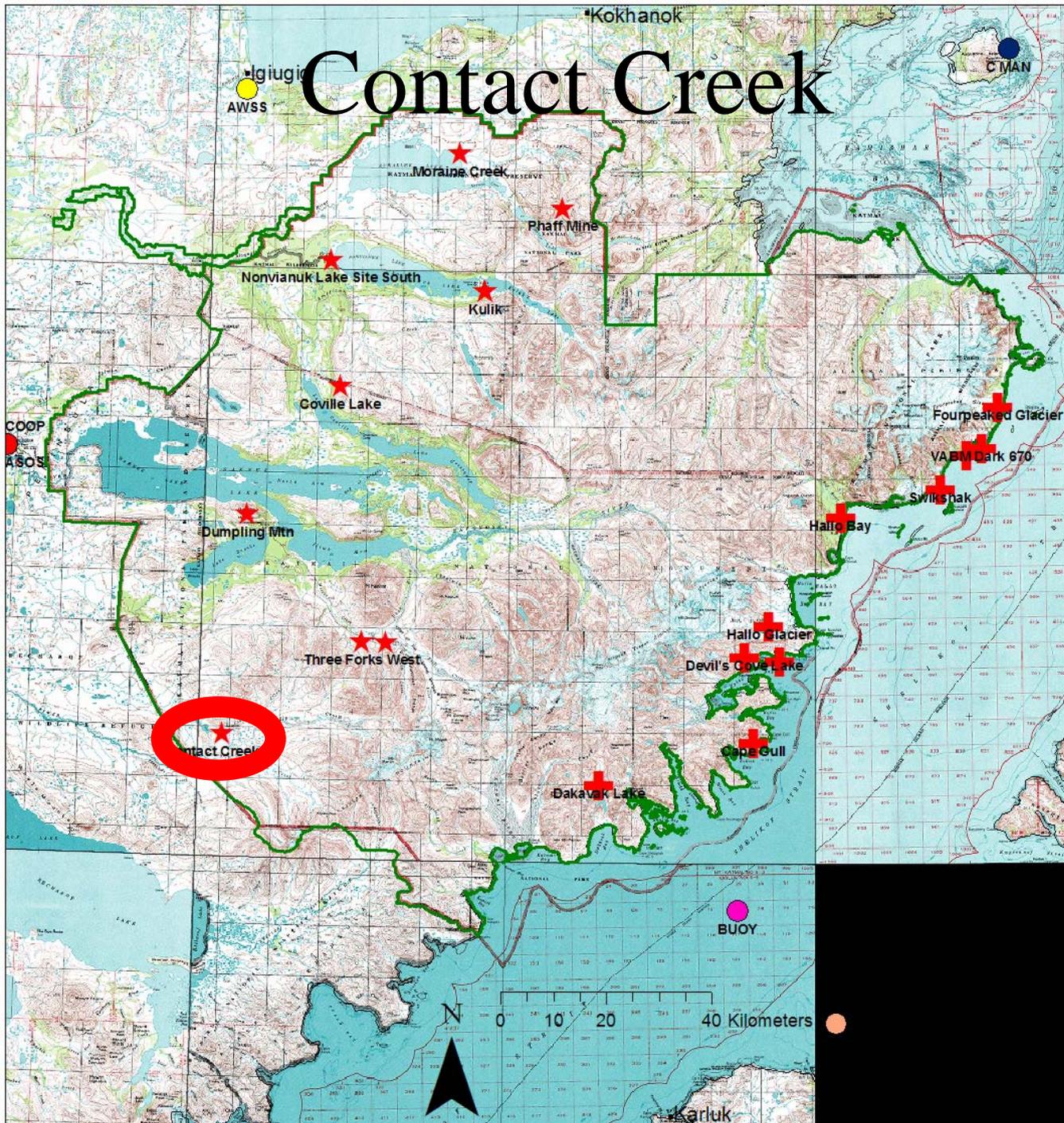


Three Forks looking south



22 2:01 PM

Contact Creek



Contact Creek looking southwest



19 10:24 AM

Contact Creek looking north



10 11:31 AM

10

Contact Creek looking south



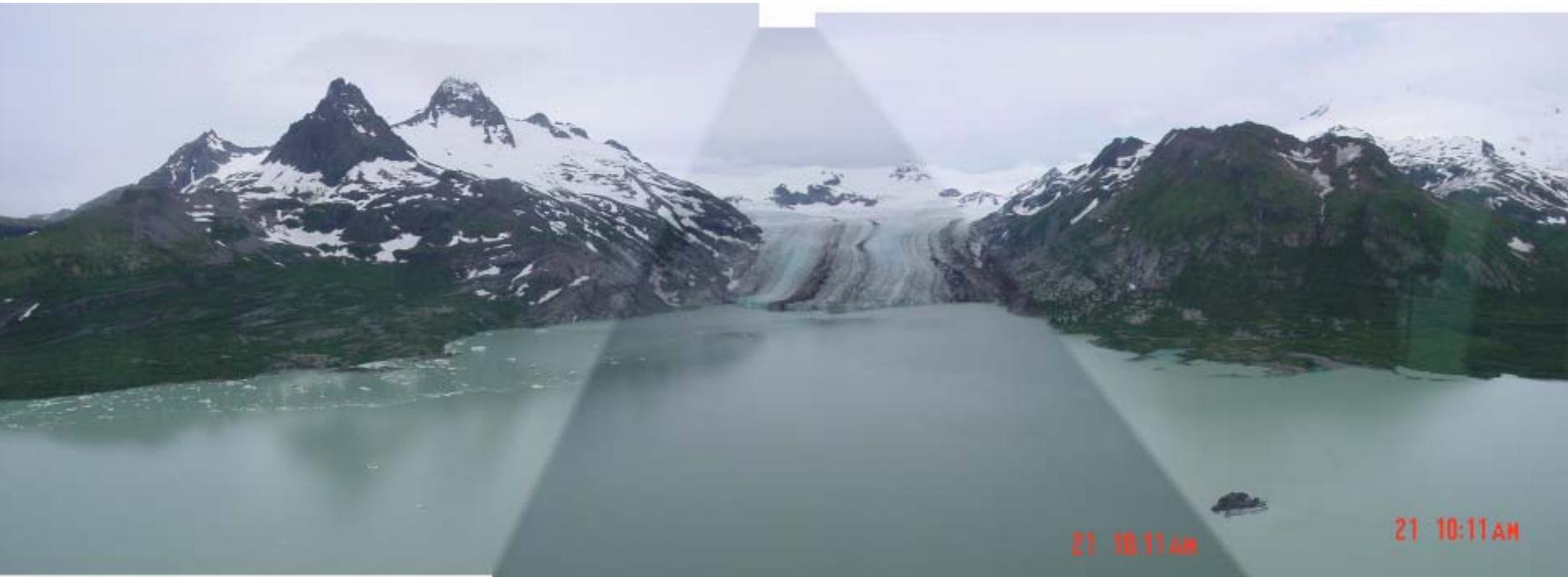
10 11:32 AM

10

Fourpeaked Glacier



Fourpeaked Glacier looking west

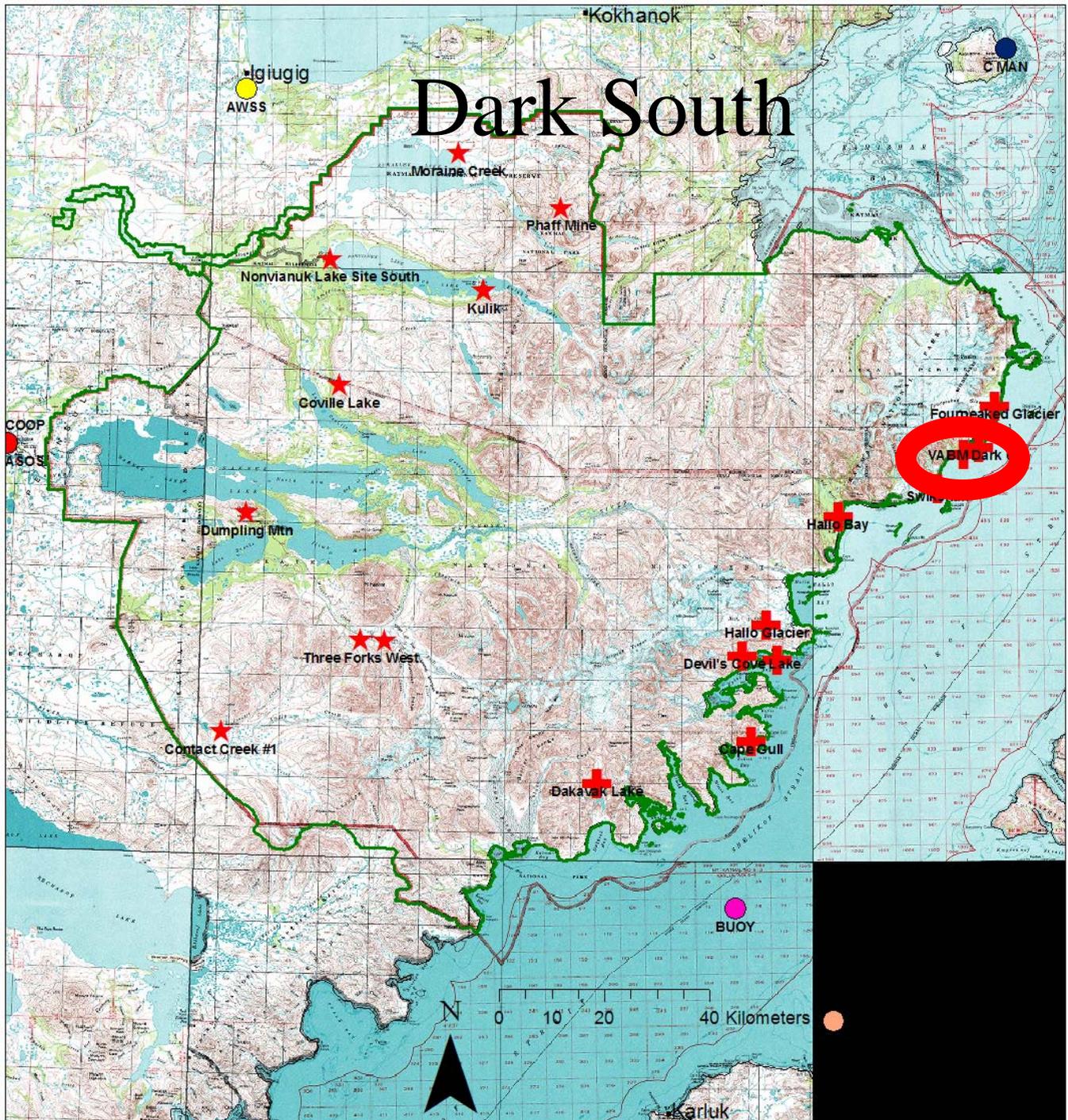


Dark
looking north



21 10:25 AM

Dark South



0 10 20 40 Kilometers



Karluk

Dark South looking northwest



21 10:26 AM

Swikshak



Swikshak looking northeast



Cape just north of Swikshak

21 10:29 AM

Hallo Bay Site



Hallo Bay Site looking northwest



21 10:36 AM

Hallo Bay Site looking southwest



21 9:54 AM

Hallo Bay Site looking southeast



21 9:56 AM

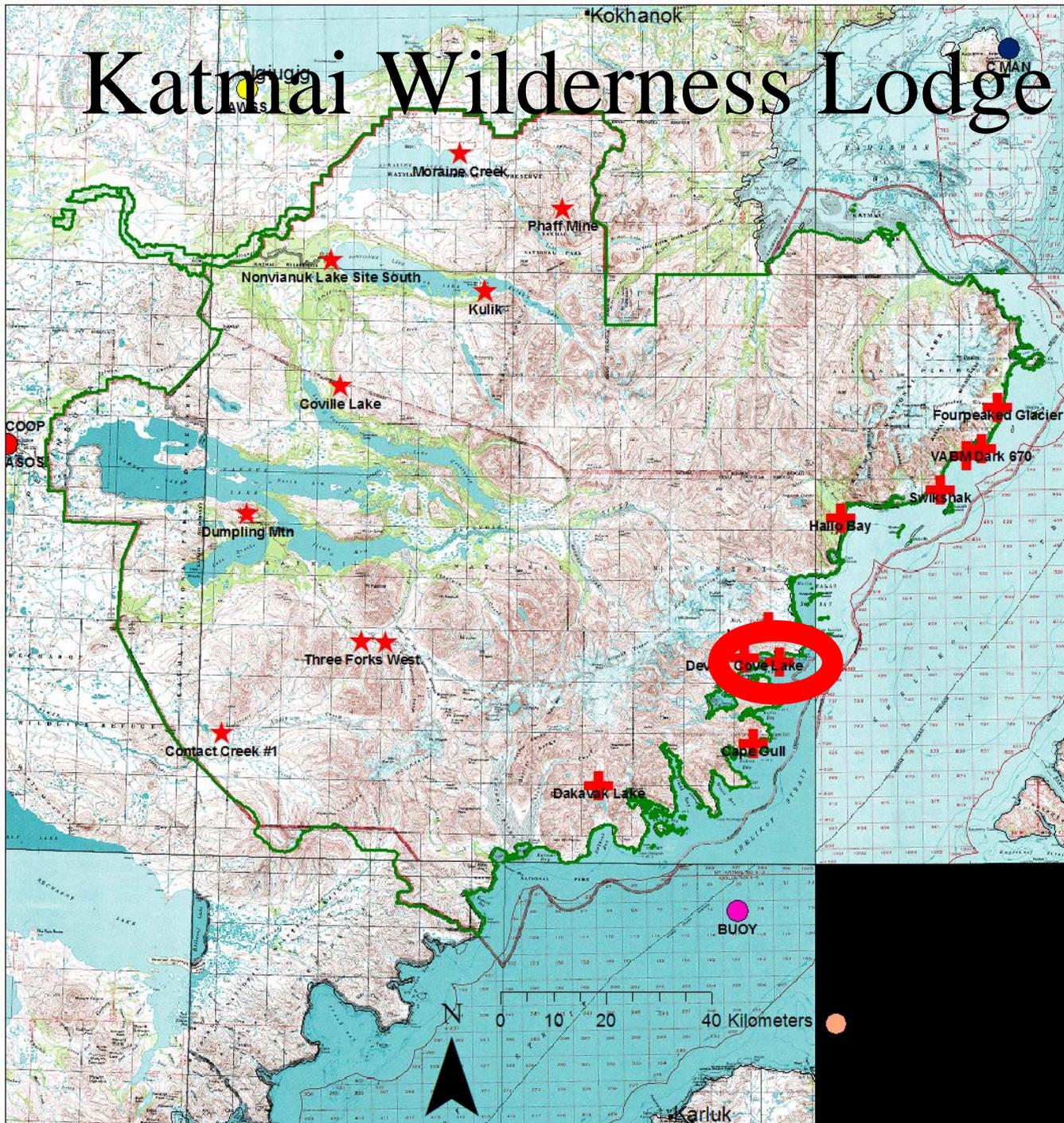


Hallo Glacier looking west



21 10:53 AM

Katmai Wilderness Lodge



Kokhanok

CMAN

Nonvianuk Lake Site South

Phaff Mine

Coville Lake

Fourpeaked Glacier

VABM Dark 670

Dumping Mtn

Halo Bay

Three Forks West

Devils Cove Lake

Contact Creek #1

Spe Gull

Dakavak Lake

BUOY

0 10 20 40 Kilometers

Karluk

Katmai Wilderness Lodge looking west

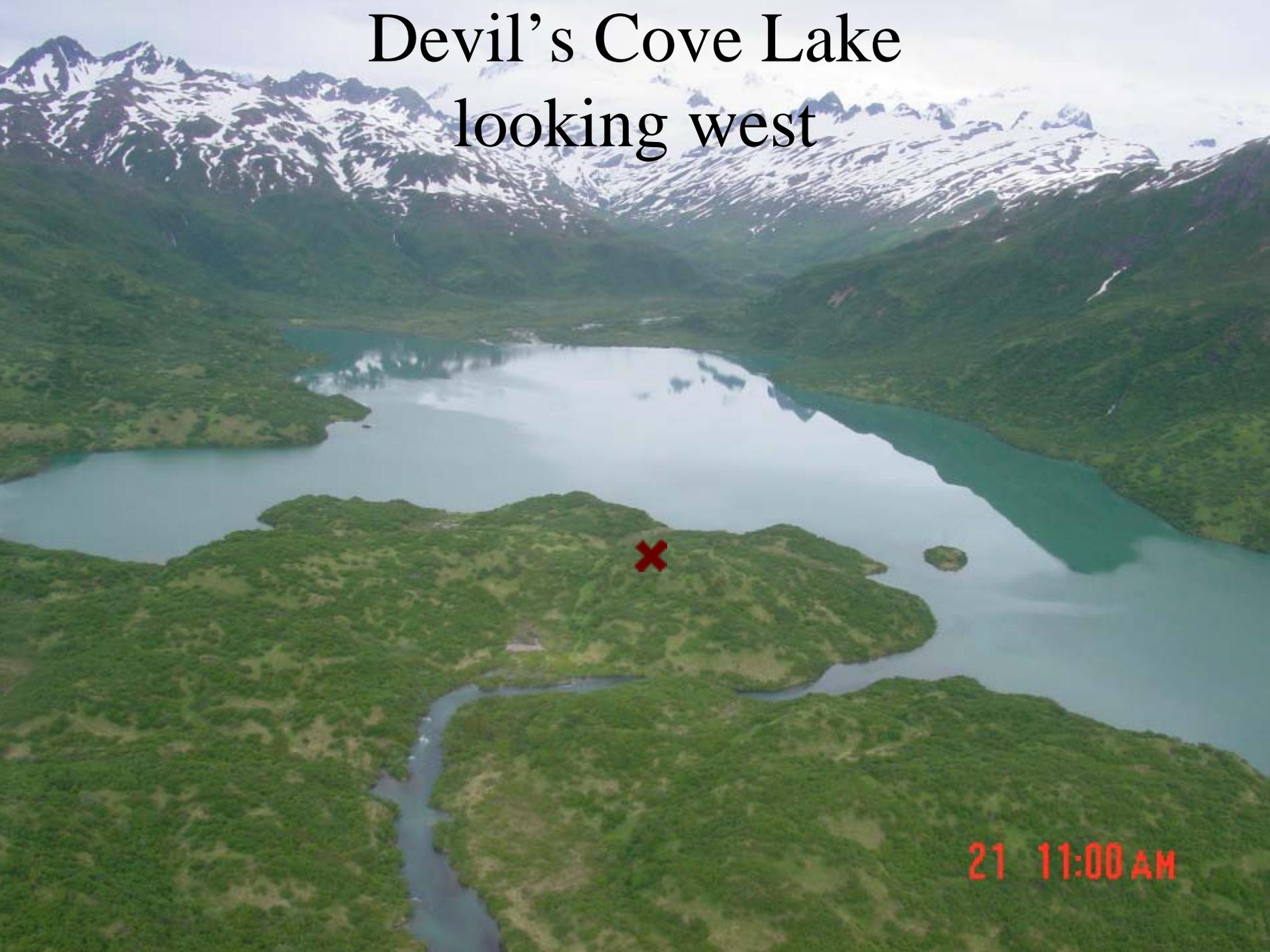


21 10:55 AM

Devil's Cove Lake



Devil's Cove Lake looking west



21 11:00 AM

Cape Gull



Kokhanok

CMAN

COOP
ASOS

Karluk



Cape Gull
looking north

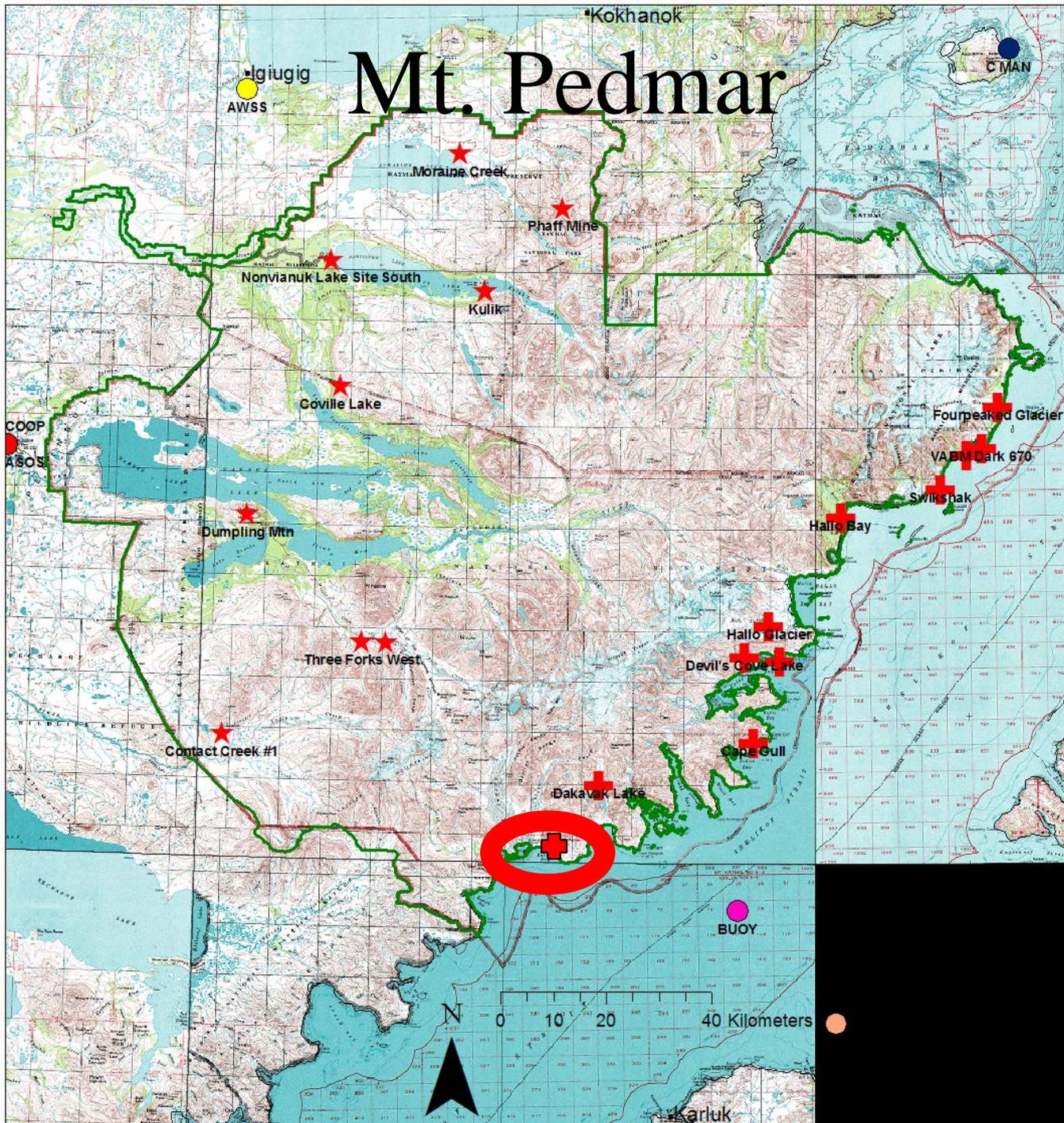
21 11:11 AM



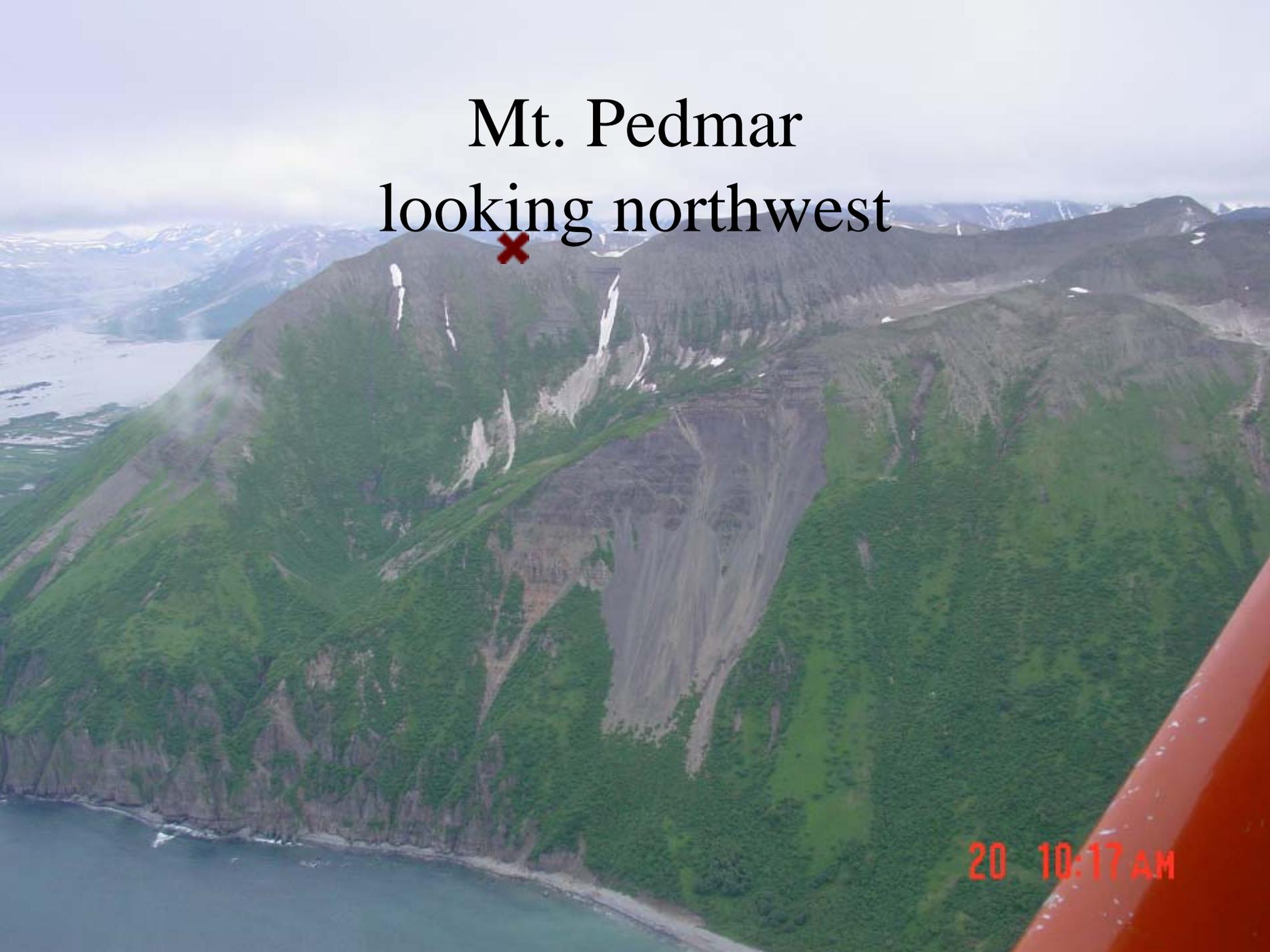


Dakavak Lake
looking north

20 9:46 AM

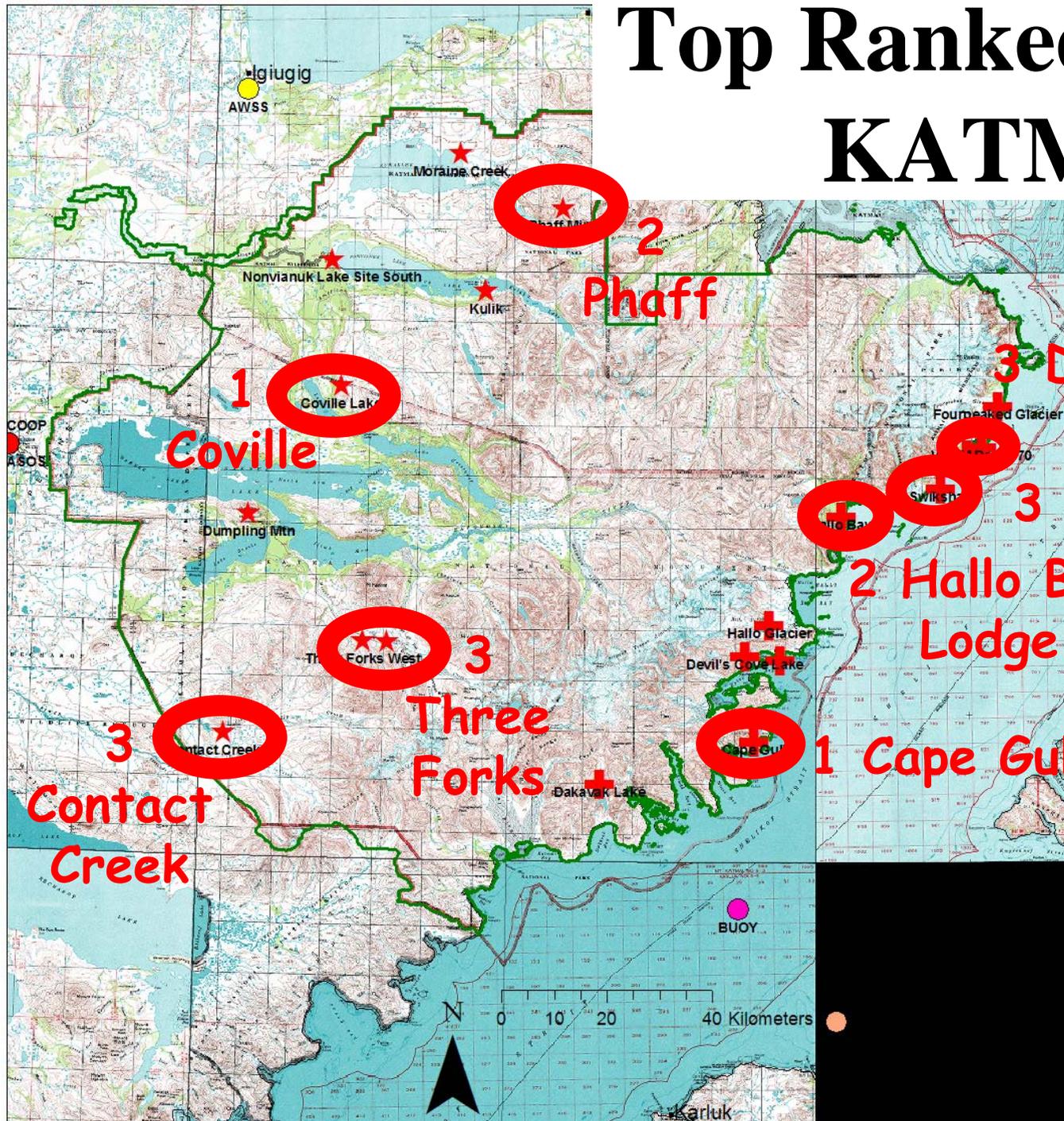


Mt. Pedmar
looking northwest
✘



20 10:17 AM

Top Ranked Sites KATM



2
Phaff

1
Coville

3 Dark South

3 Swwishak

2 Hallo Bay
Lodge

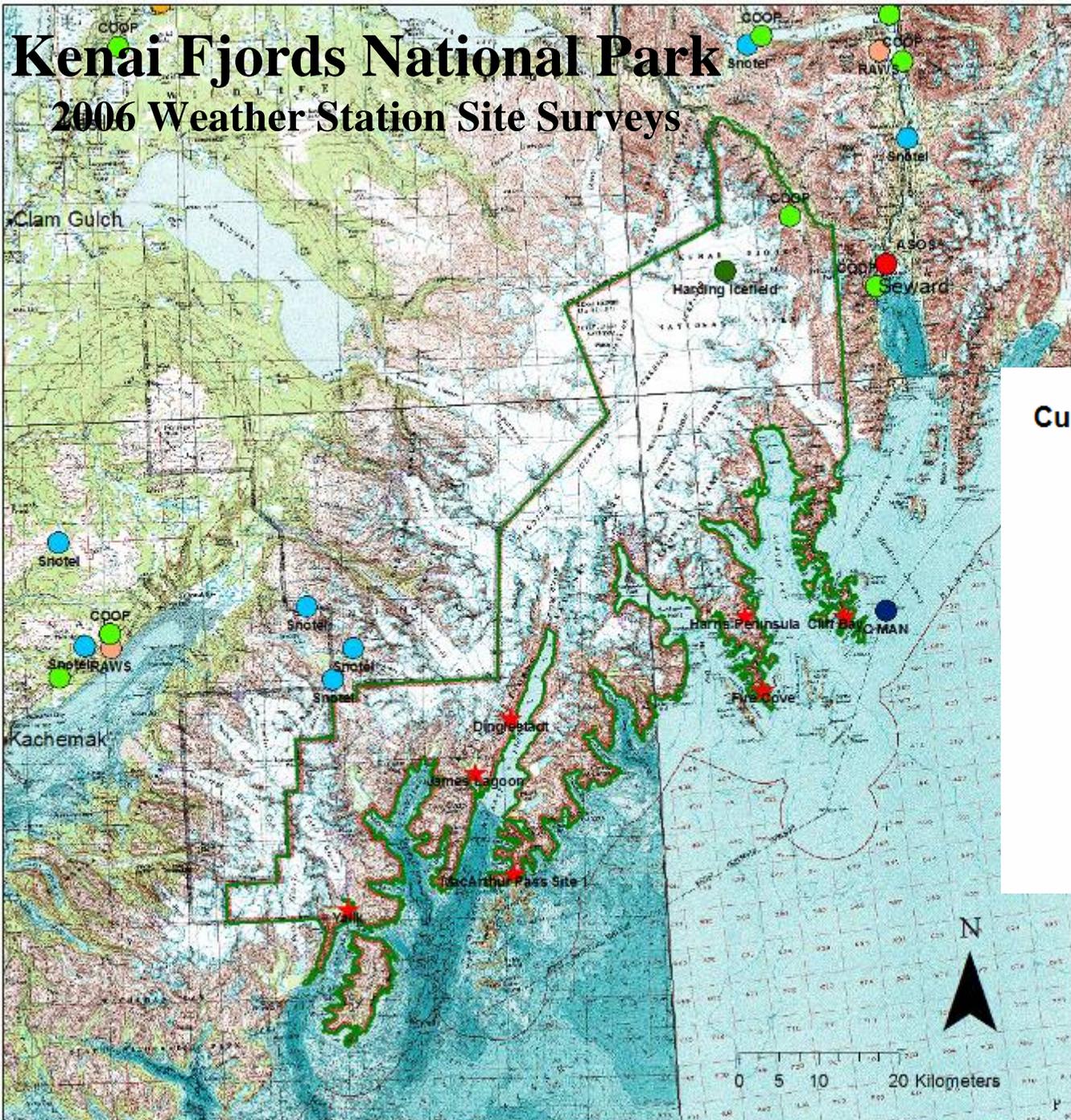
3
Three Forks

1 Cape Gull

3
Contact
Creek

Kenai Fjords National Park

2006 Weather Station Site Surveys



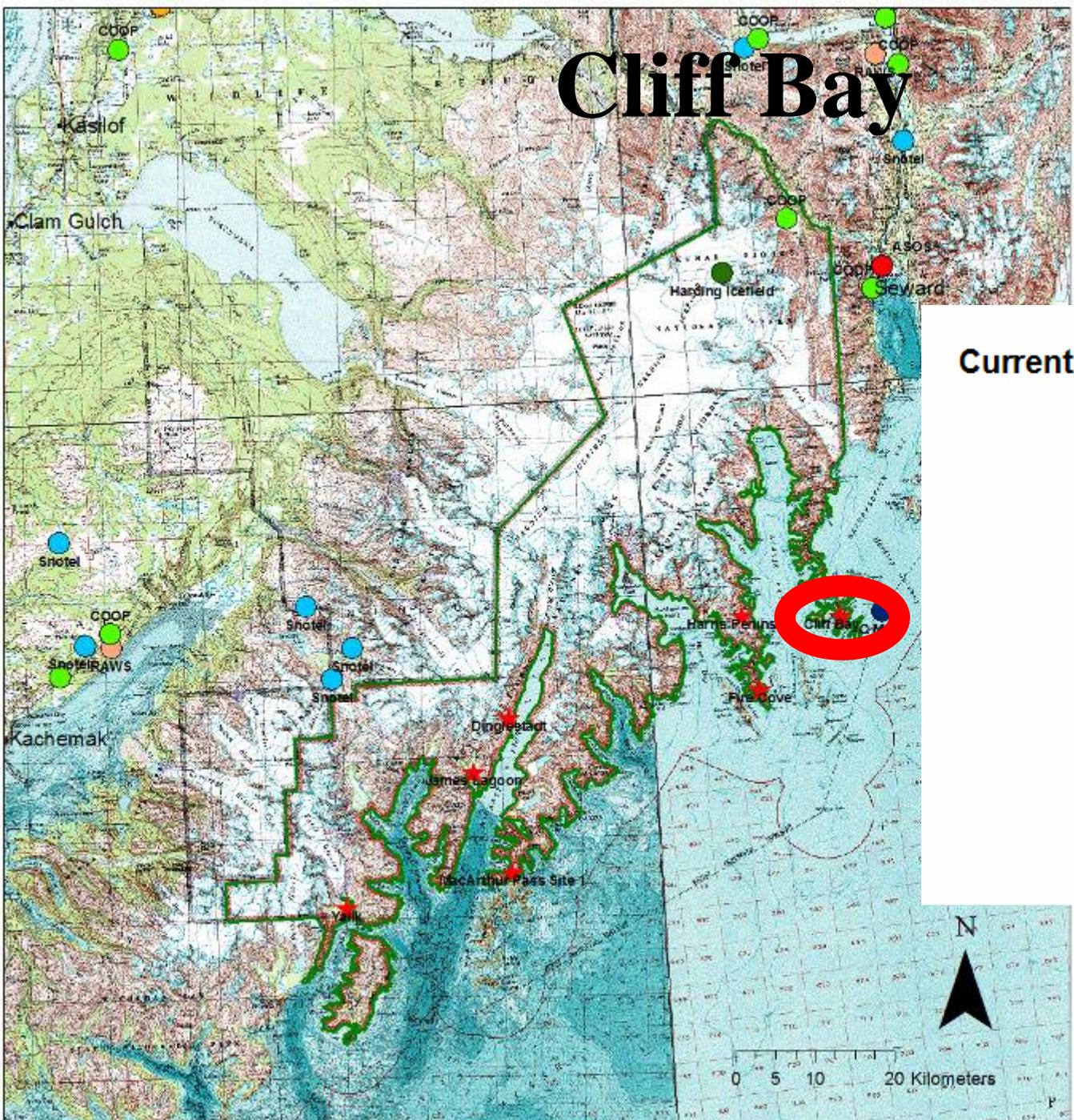
Potential Weather Station Deployment Sites

★ Kenai Fjords NP-
Ground Inspections
Completed 2006

Current Weather Station Network

- ASOS
- AWSS
- AWOS
- Apaid
- COOP
- RAWs
- SnoTel
- NDBC_C-Man
- NDBC_Buoys
- Harding Icefield

Cliff Bay



Current Weather Station Network

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- AWOS
- Apsid
- COOP
- RAWS
- SnoTel
- NDBC_C-Man
- NDBC_Buys
- Harding Icefield

Cliff Bay
looking northeast



19 4:42 PM

Cliff Bay
looking north



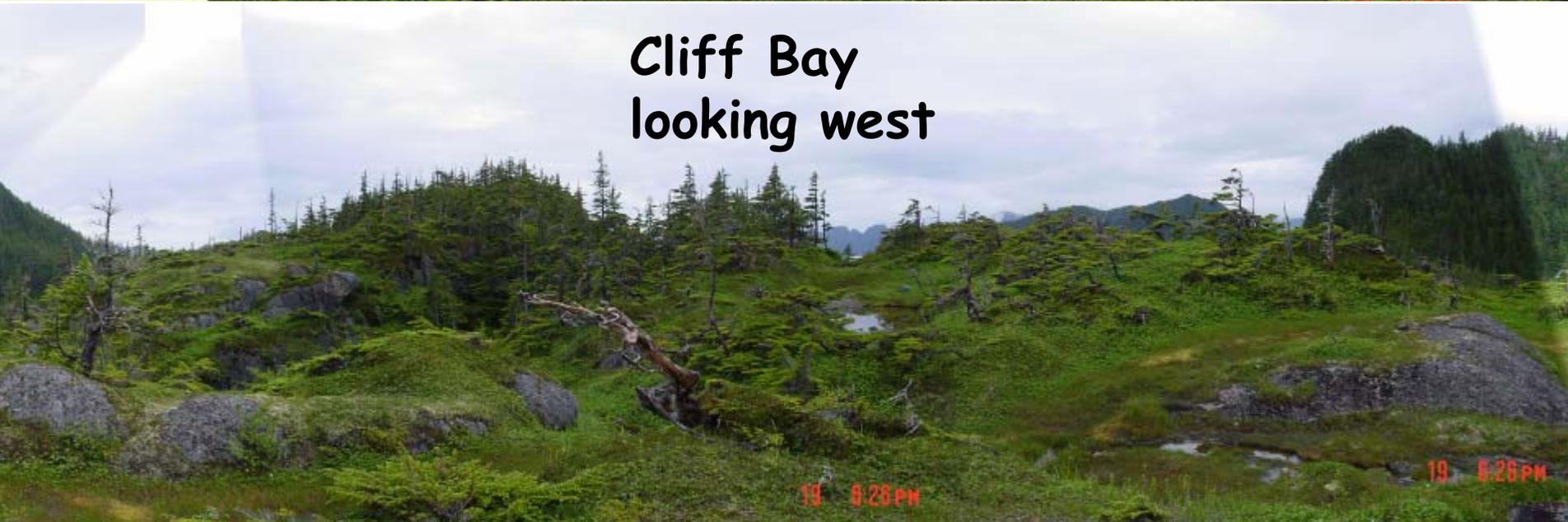
Cliff Bay
looking east



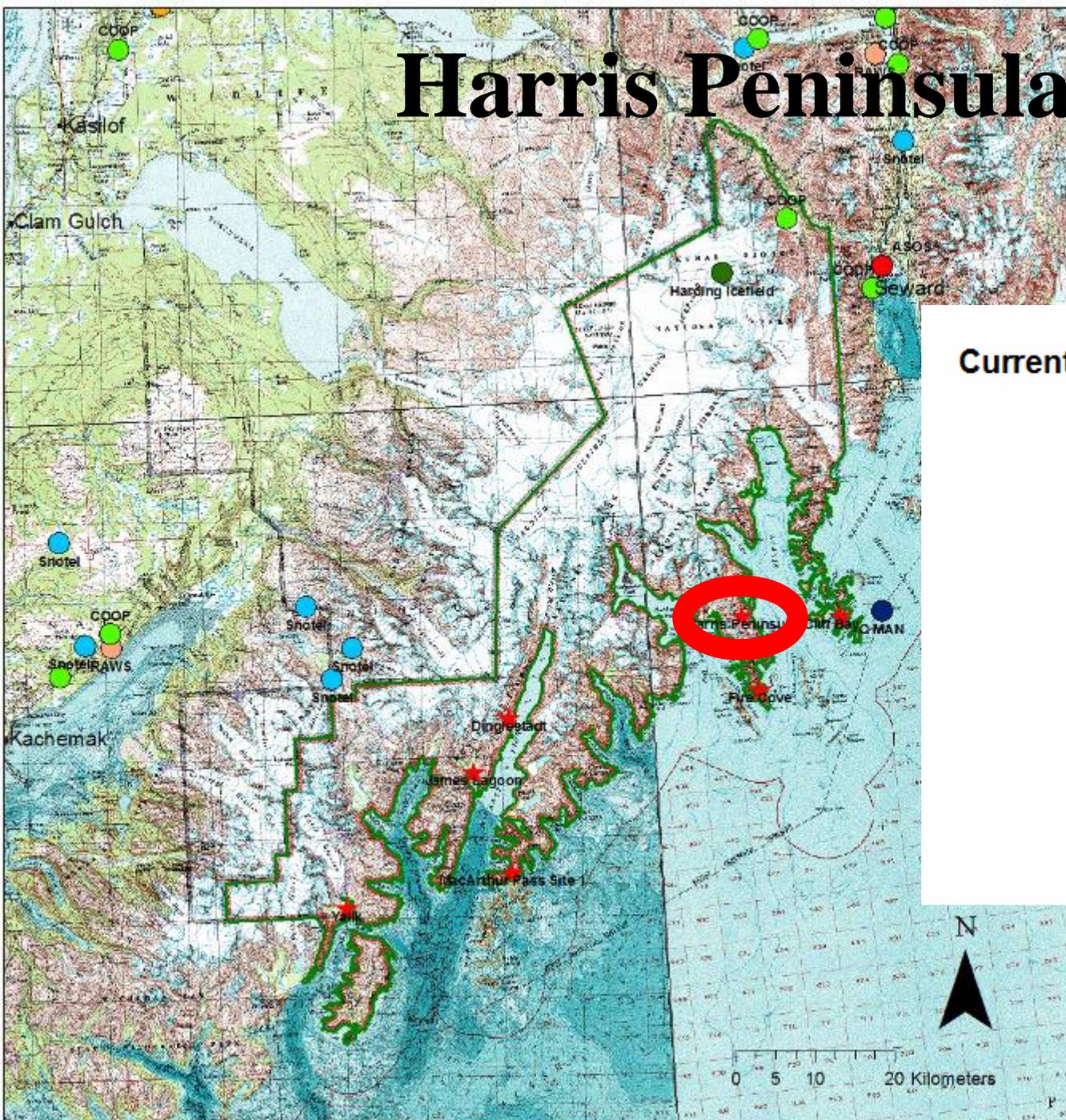
**Cliff Bay
looking south**



**Cliff Bay
looking west**



Harris Peninsula



Current Weather Station Network

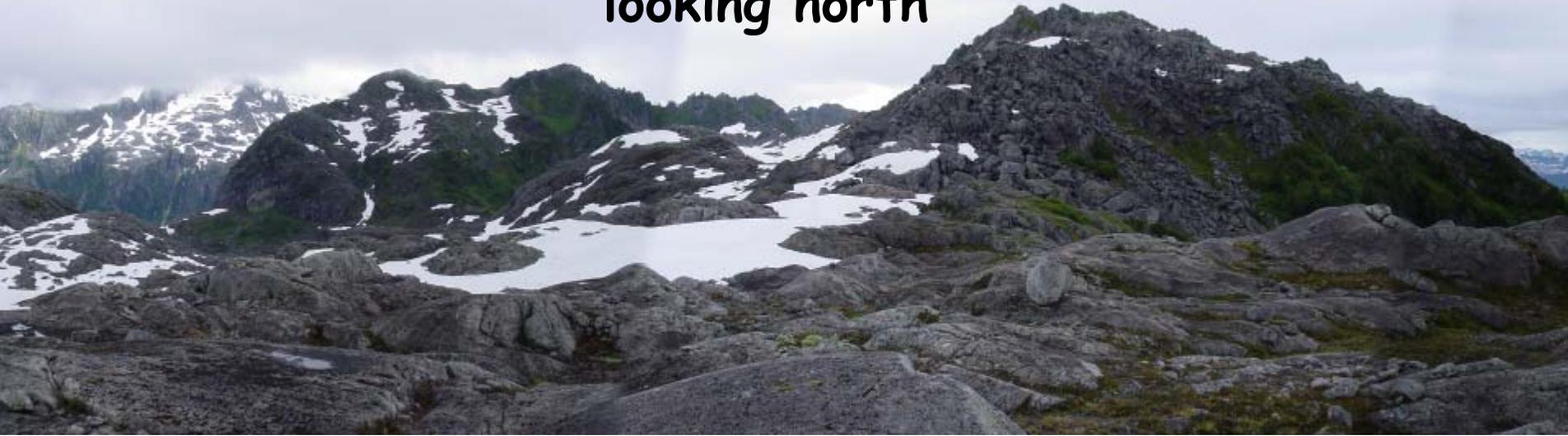
- ASOS
- AWSS
- AWOS
- Apsid
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- RAWS
- SnoTel
- NDBC_C-Man
- NDBC_Buys
- Harding Icefield

Harris Peninsula

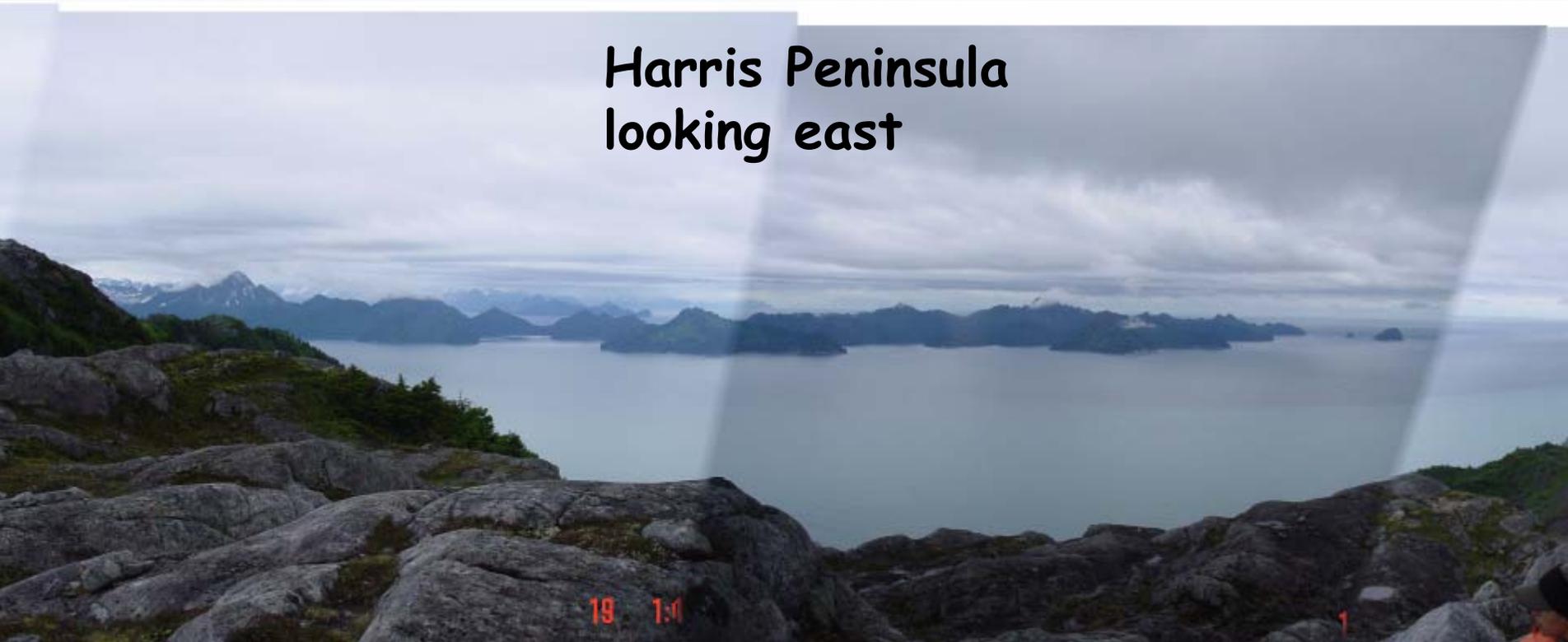


19 4:37 PM

Harris Peninsula
looking north



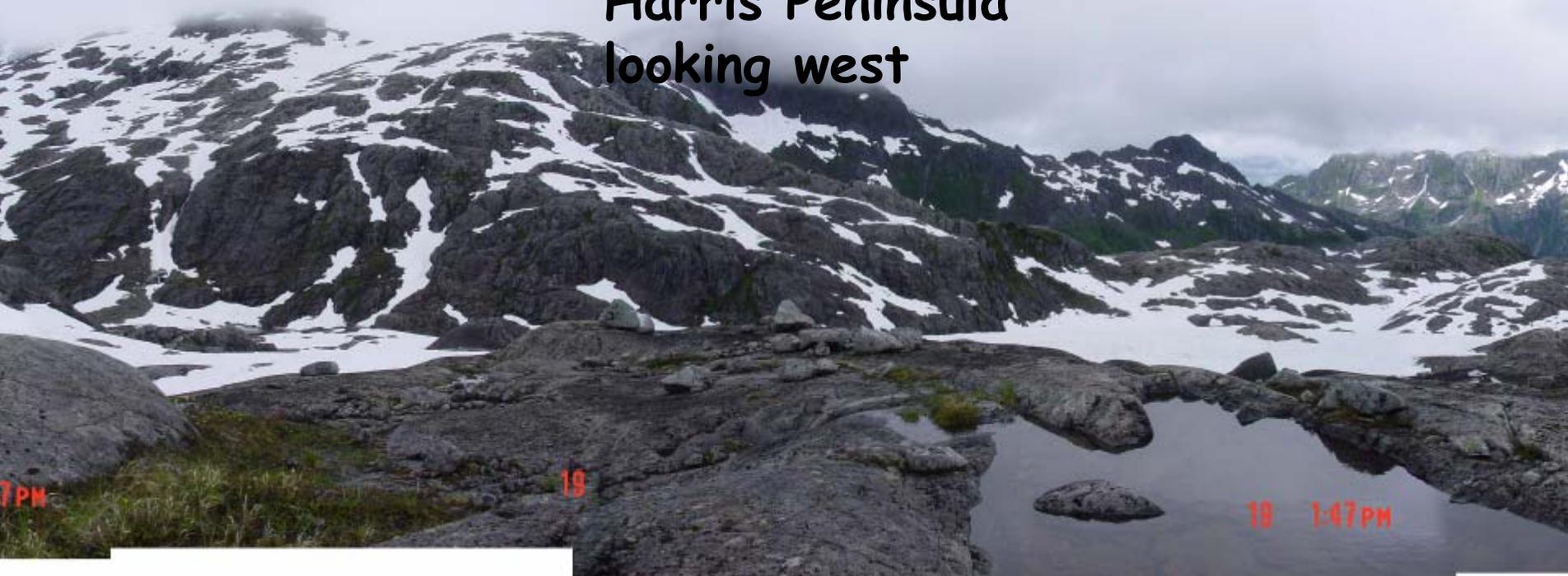
Harris Peninsula
looking east



Harris Peninsula
looking south



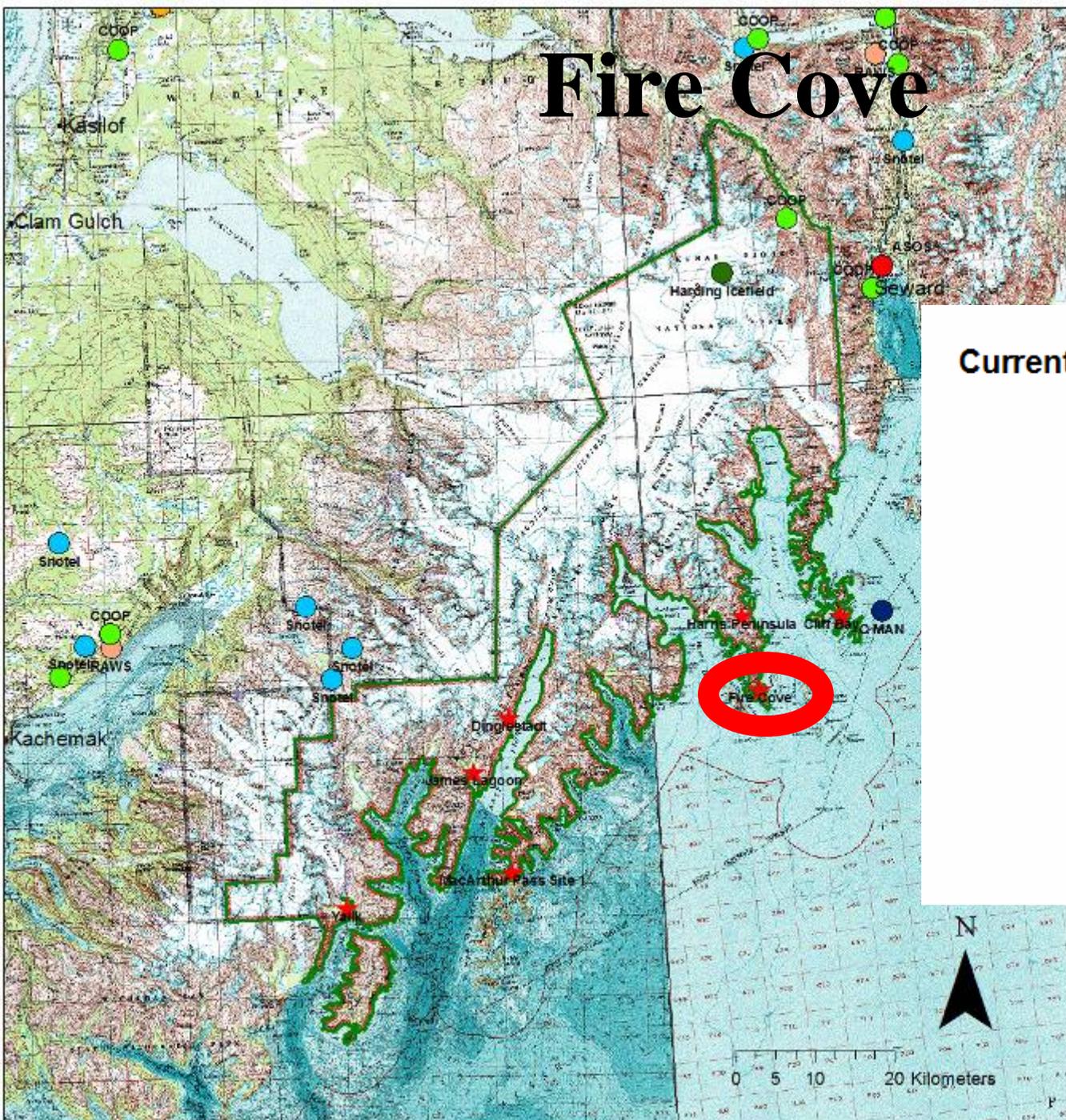
Harris Peninsula
looking west





19 1:42 PM

Fire Cove



Current Weather Station Network

-  ASOS
-  AWSS
-  AWOS
-  Apaid
-  COOP
-  RAWS
-  SnoTel
-  NDBC_C-Man
-  NDBC_Buys
-  Harding Icefield

Fire Cove looking northwest



18 2:47 PM

Fire Cove looking north



Fire Cove looking east



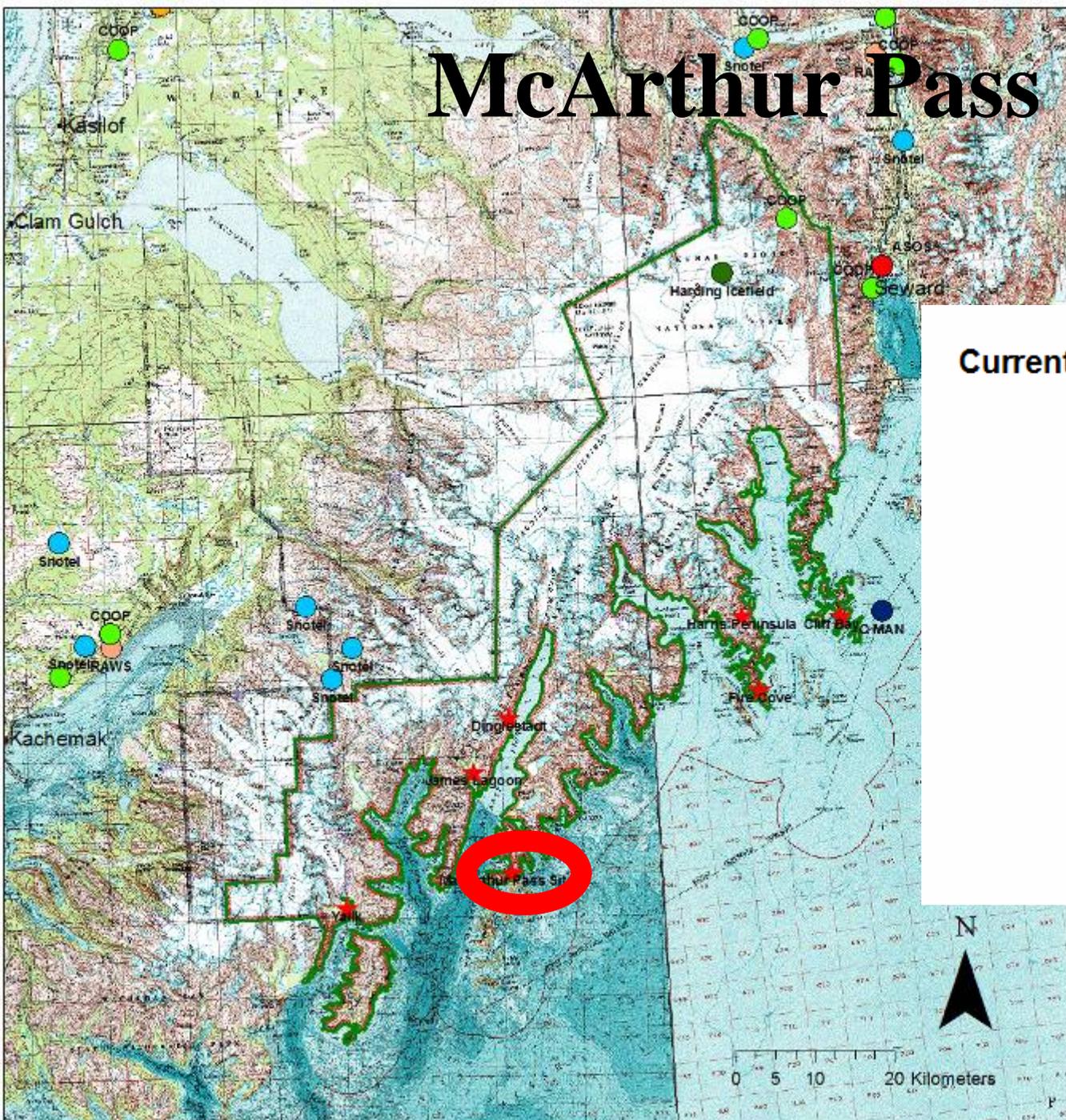
Fire Cove looking south



Fire Cove looking west



McArthur Pass



Current Weather Station Network

-  ASOS
-  AWSS
-  AWOS
-  Apaid
-  COOP
-  RAWS
-  SnoTel
-  NDBC_C-Man
-  NDBC_Buys
-  Harding Icefield



0 5 10 20 Kilometers

McArthur Pass looking north



McArthur Pass looking east



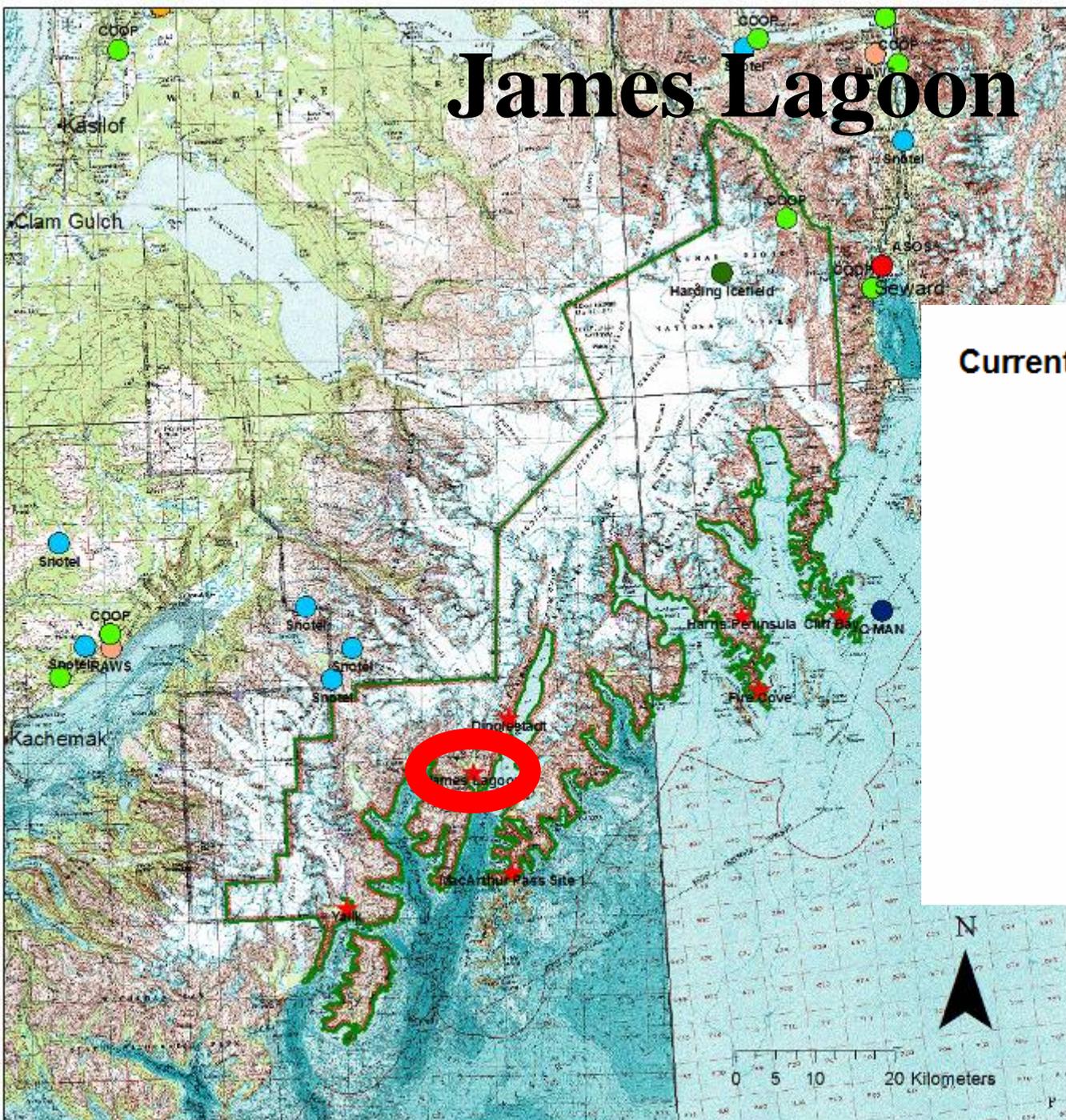
McArthur Pass looking south



McArthur Pass looking west



James Lagoon



Current Weather Station Network

-  ASOS
-  AWSS
-  AWOS
-  Apaid
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-  RAWS
-  SnoTel
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-  NDBC_Buys
-  Harding Icefield



**James Lagoon
Looking north**



**James Lagoon
Looking east**

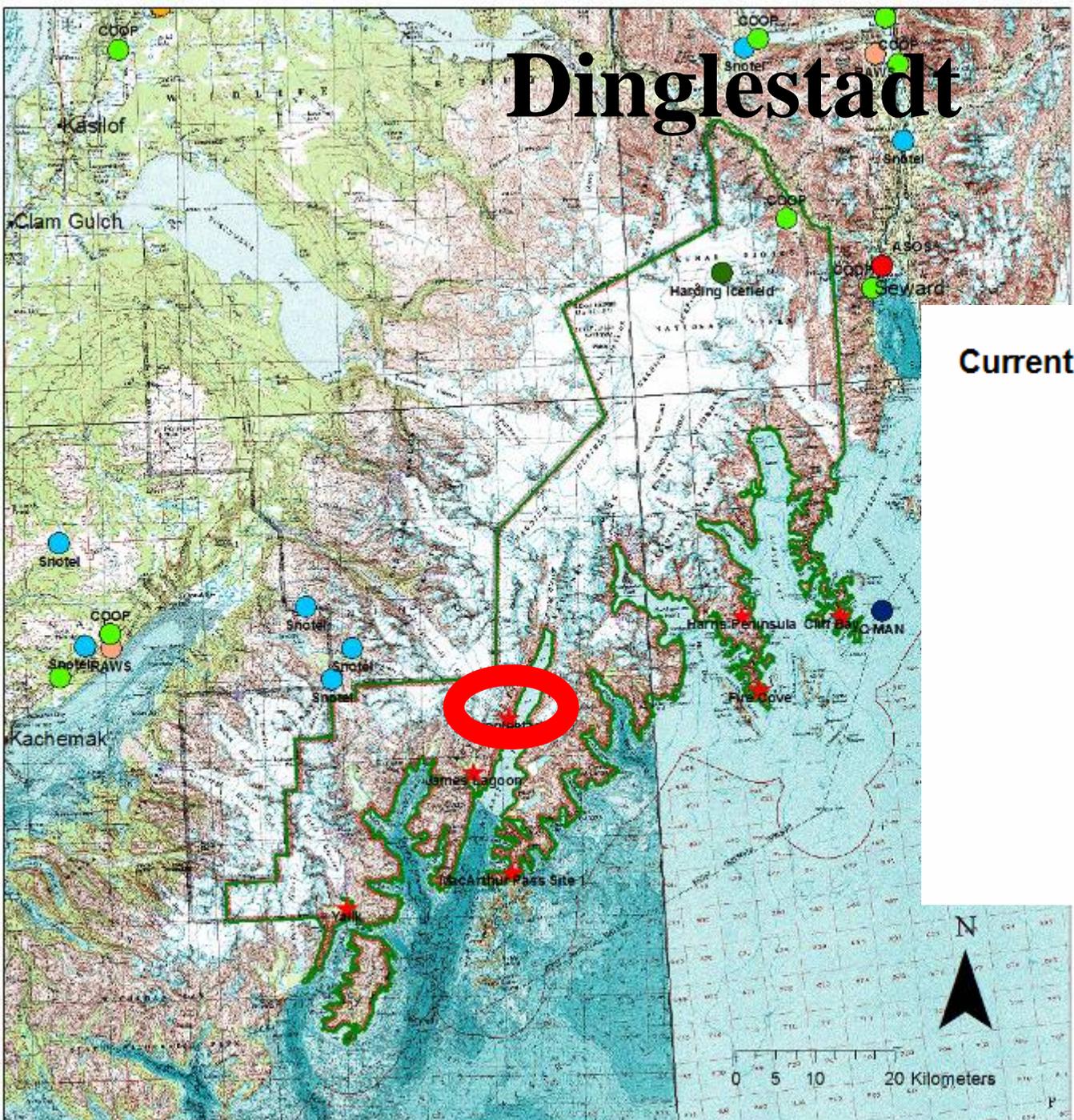


**James Lagoon
Looking north**



**James Lagoon
Looking east**

Dinglestadt



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- COOP
- RAWS
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- NDBC_Buys
- Harding Icefield

Dinglestadt looking west



17 4:17 PM

Dinglestadt looking north



17 3:10 PM

17 3:10 PM

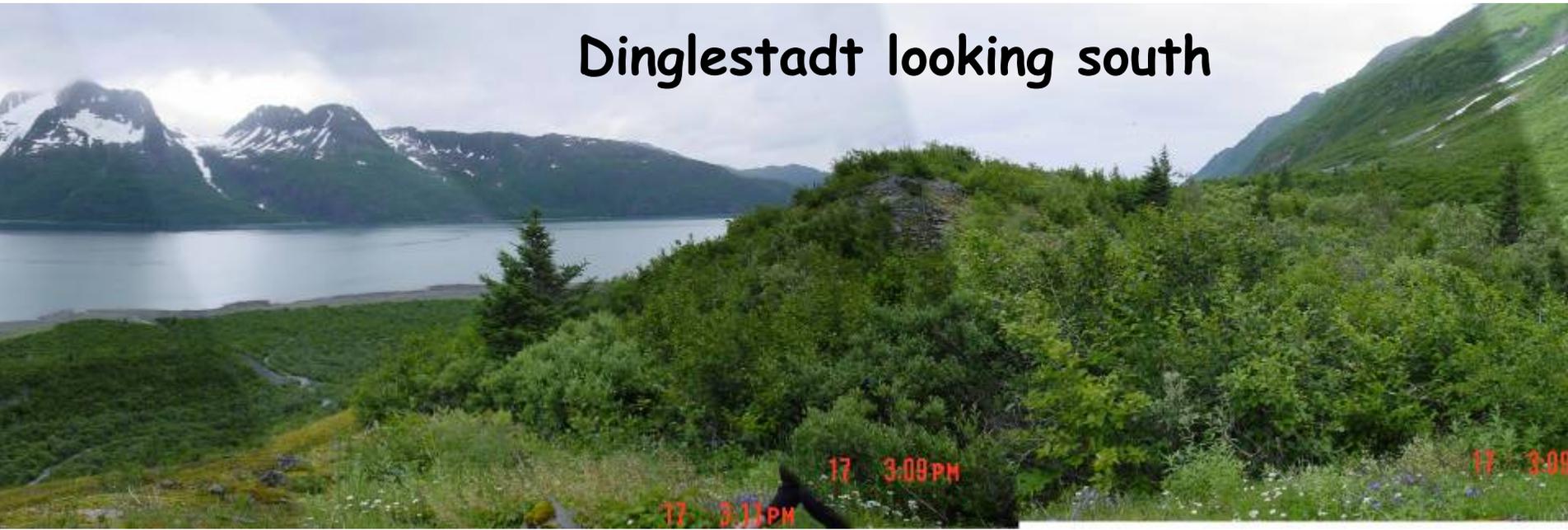
Dinglestadt looking east



17 3:10

17 3:11 PM

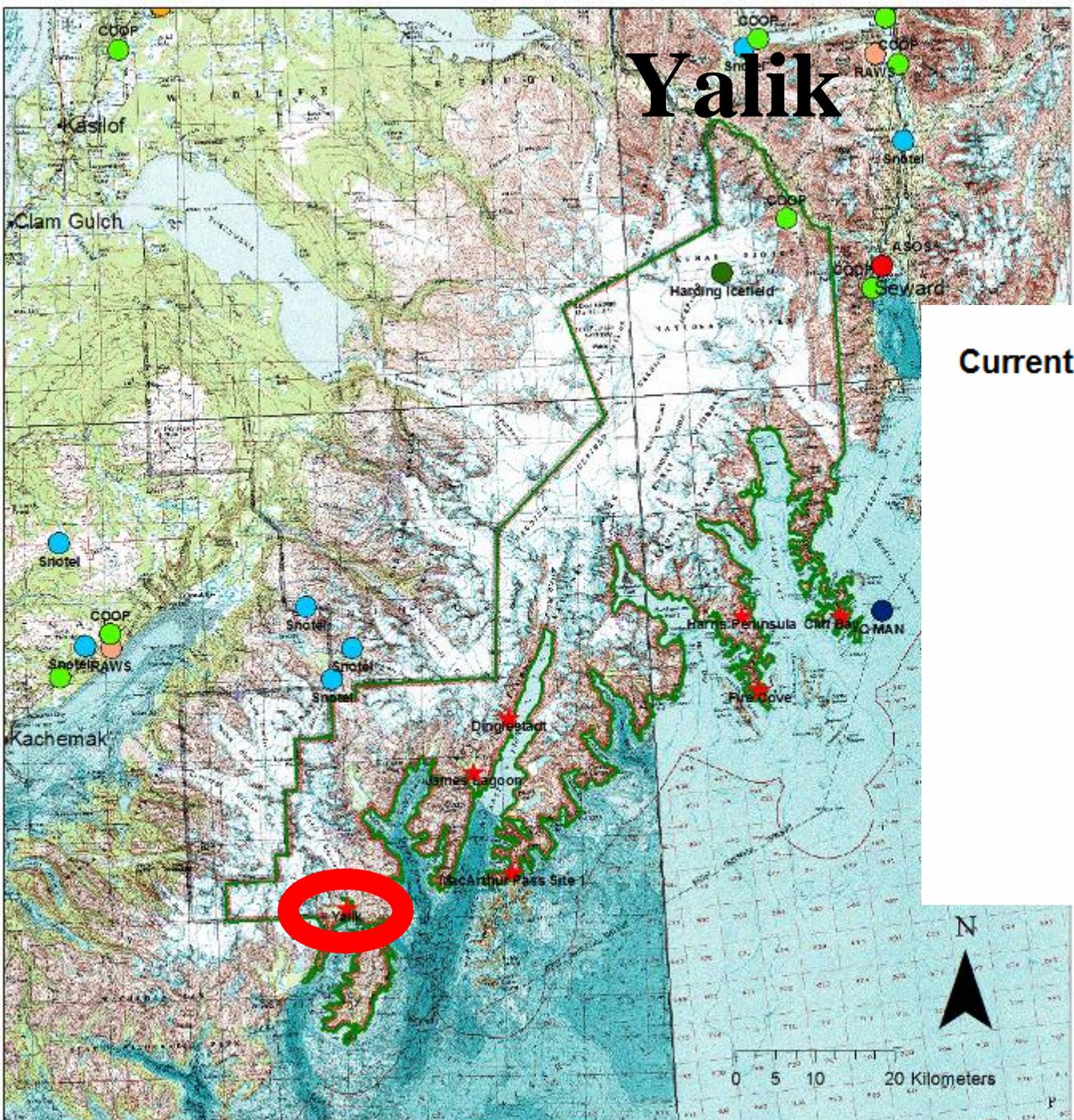
Dinglestadt looking south



Dinglestadt looking west



Yalik



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- RAWS
- SnoTel
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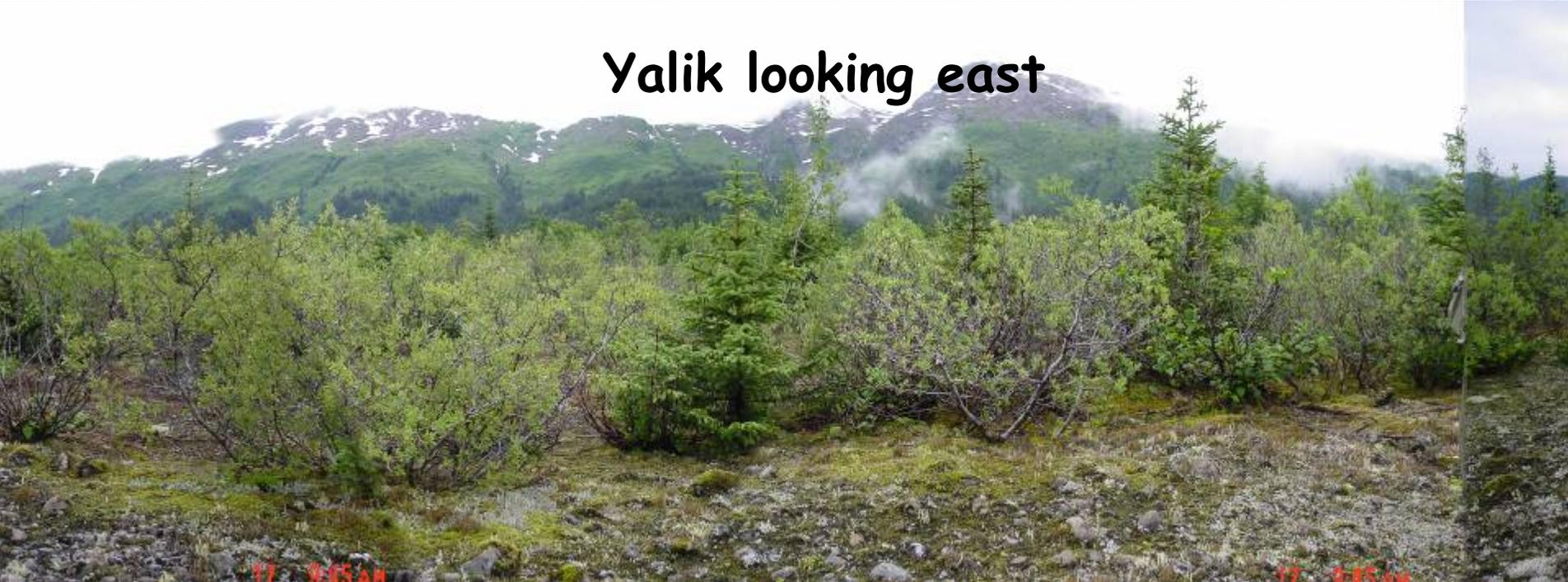


0 5 10 20 Kilometers

Yalik looking north



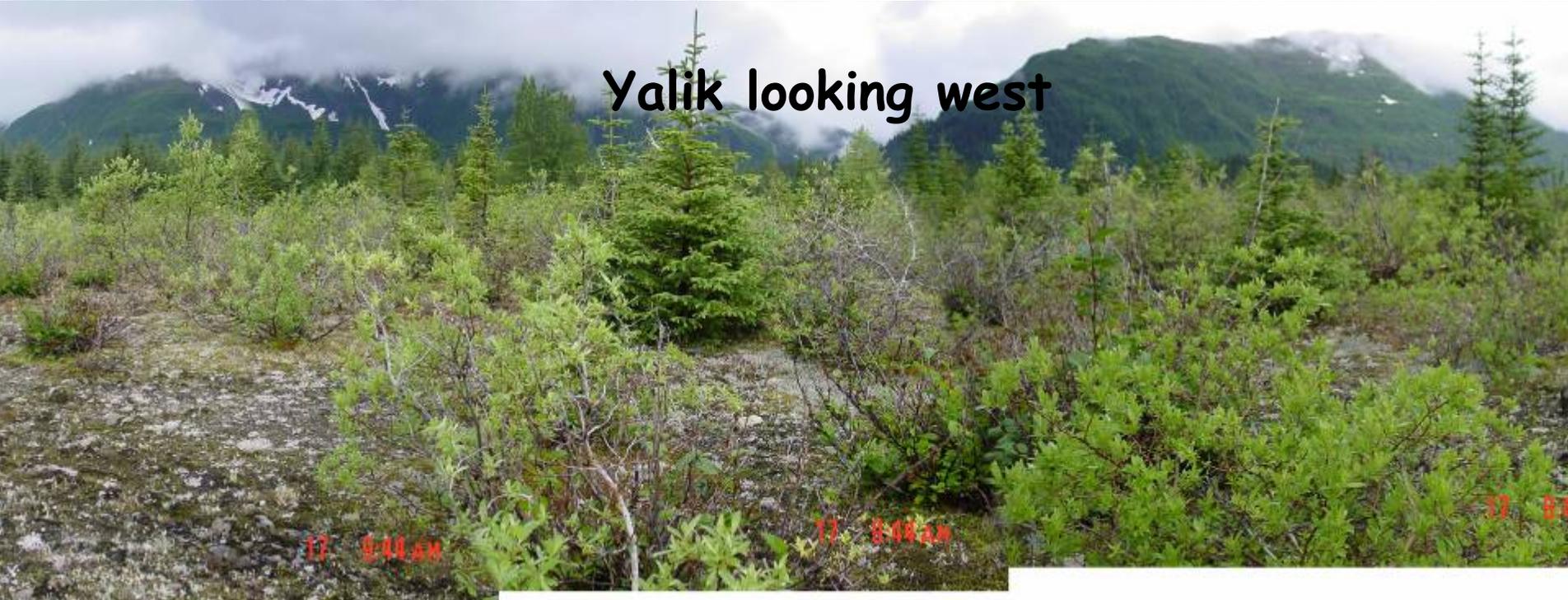
Yalik looking east



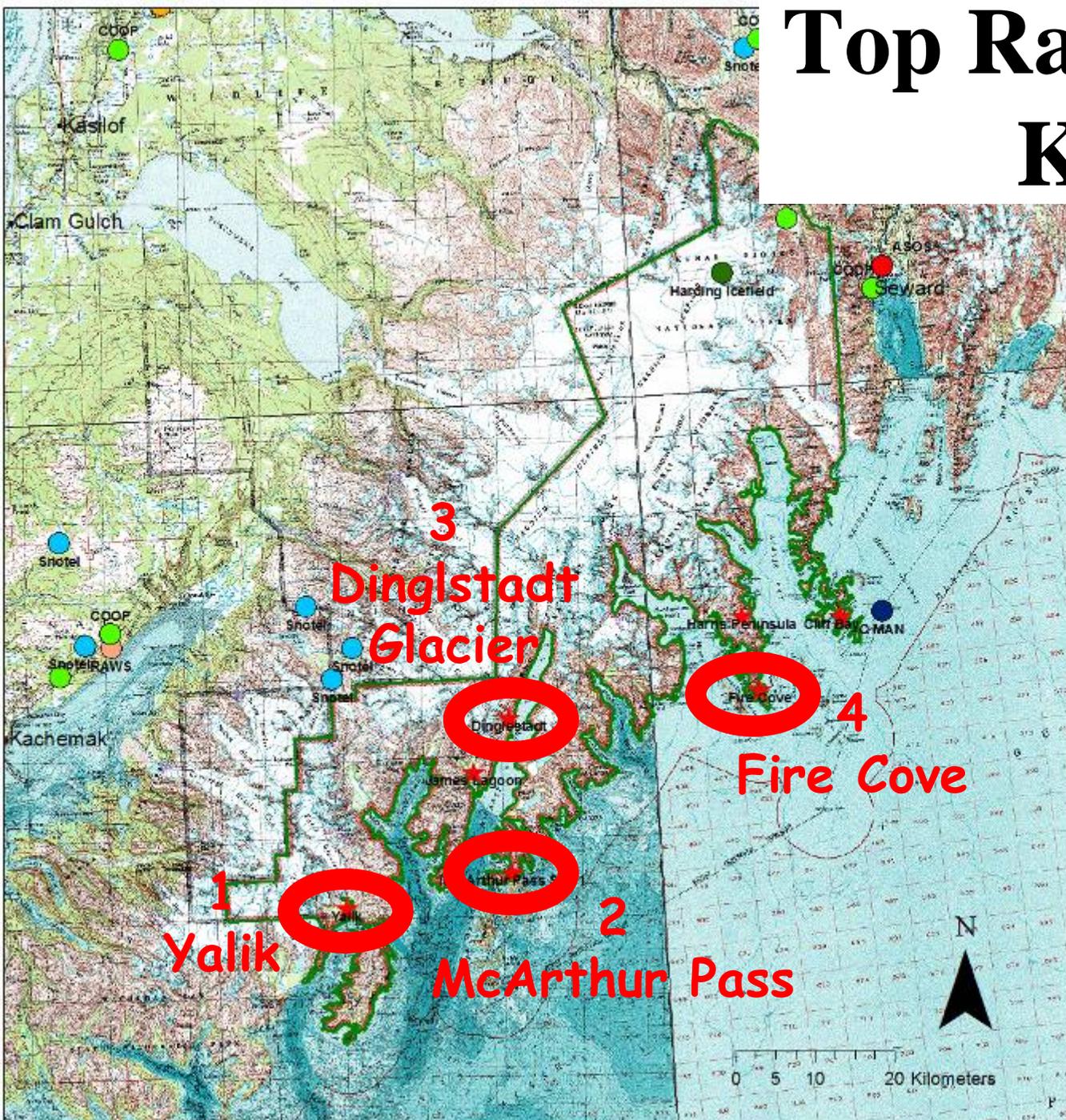
Yalik looking south



Yalik looking west



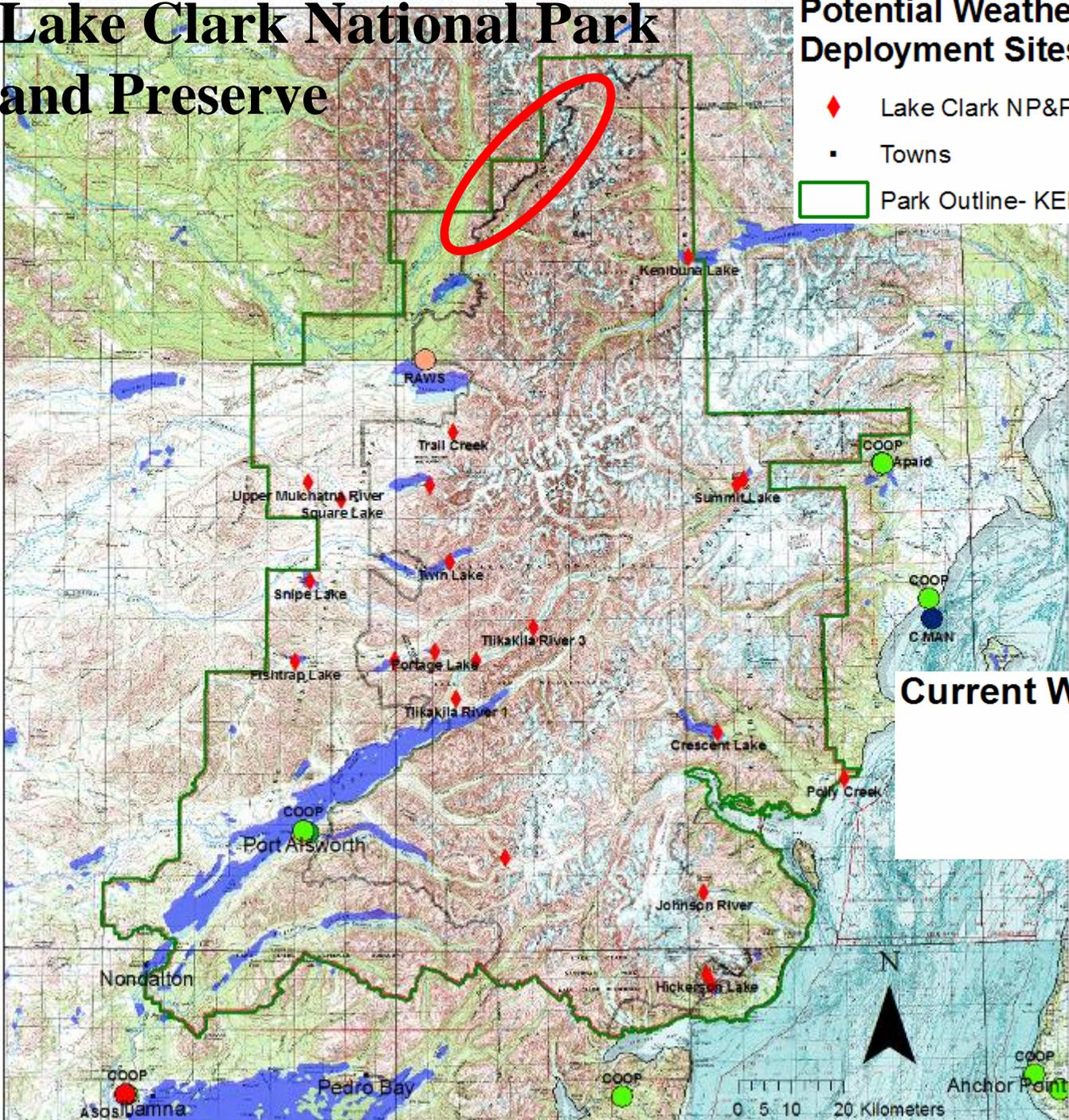
Top Ranked Sites KEFJ



Lake Clark National Park and Preserve

Potential Weather Station Deployment Sites

- ◆ Lake Clark NP&P - Potential Weather Station Locations
- Towns
- Park Outline- KEFJ



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0 5 10 20 Kilometers

Future Plans

- NEPA compliance on high ranked sites
 - Park Service preparation or contract
- Deploy climate stations in KEFJ and/KATM (testing phase)
- Complete site surveys
 - Coastal KATM
 - LACL
- Model protocol after CAKN