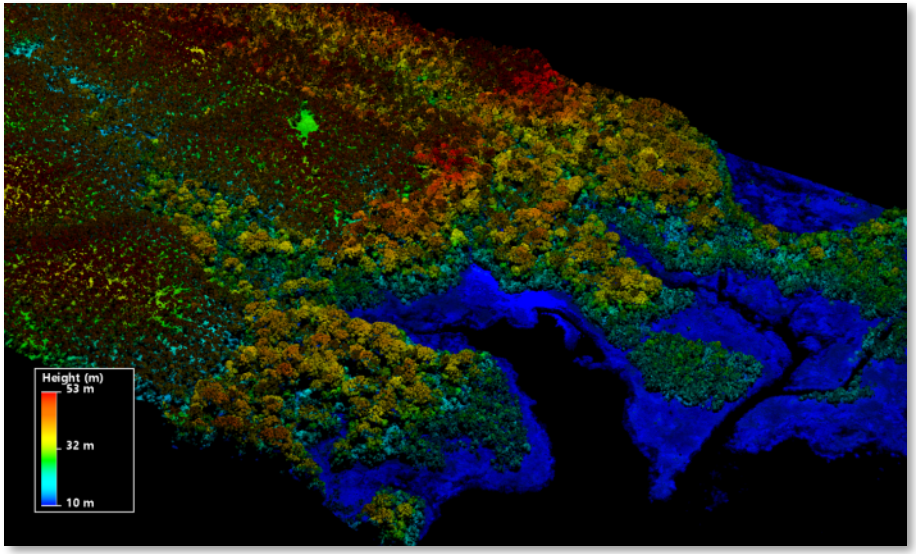
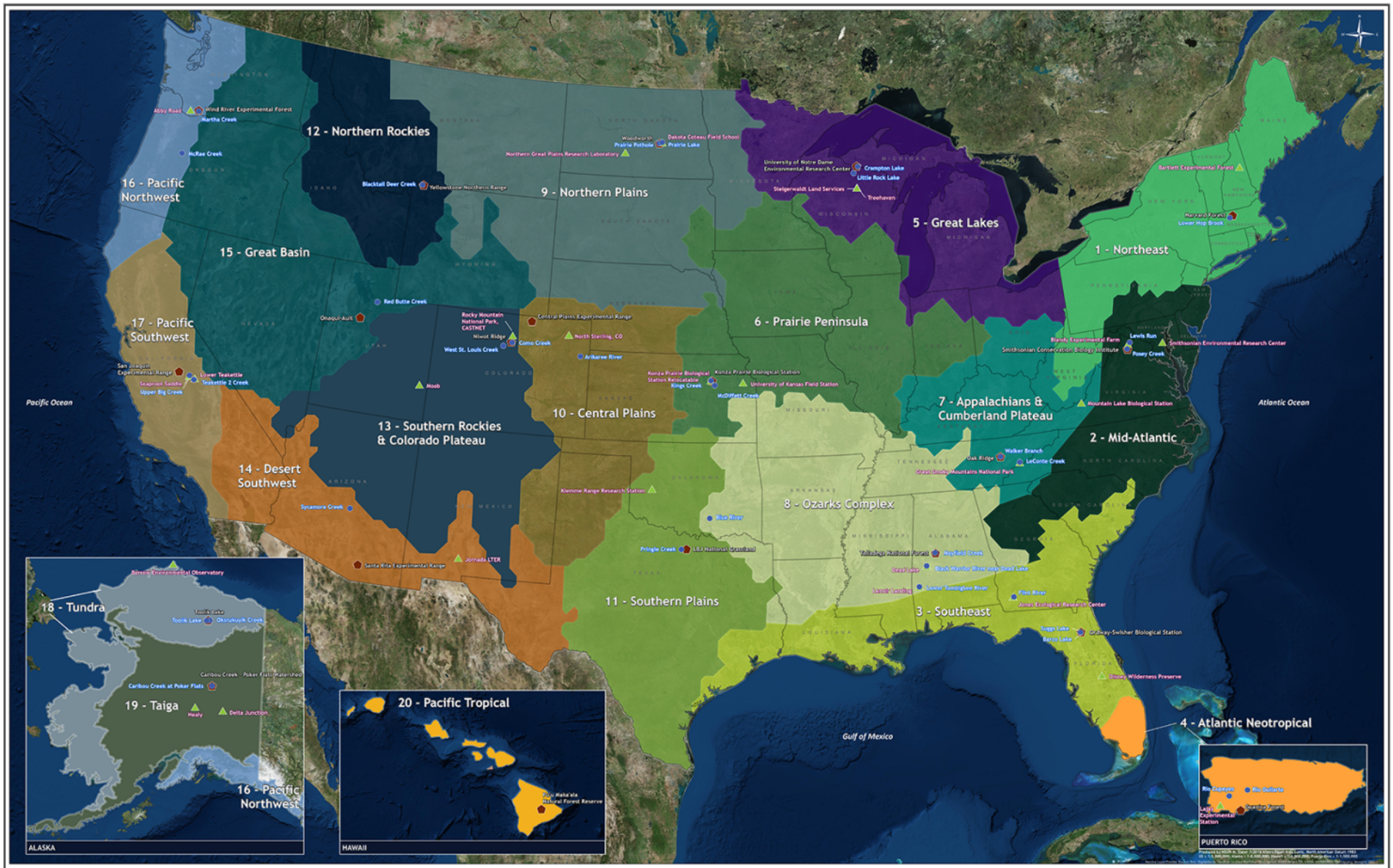
NATIONAL ECOLOGICAL OBSERVATORY NETWORK
2017 AIRBORNE FLIGHT CAMPAIGN
DOMAINS 18 TUNDRA & 19 TAIGA





FIELD SITES MAP

NEON Aquatic NEON Core NEON Relocatable

NEON is sponsored by the National Science Foundation and operated under cooperative agreement by Battelle

neon
National Ecological Observatory Network

Battelle
The Business of Innovation

NEON – by Subsystem

TIS - Terrestrial Instrumented System

AIS – Aquatic Instrumented System

TOS – Terrestrial Observation System

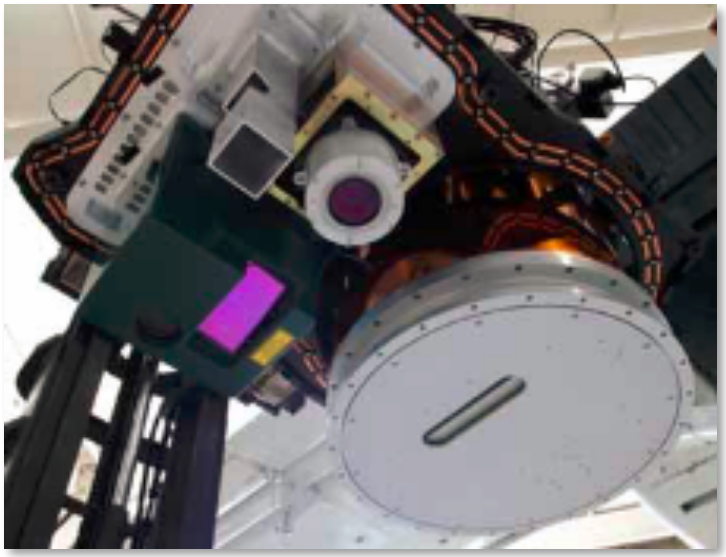
AOS – Aquatic Observation System

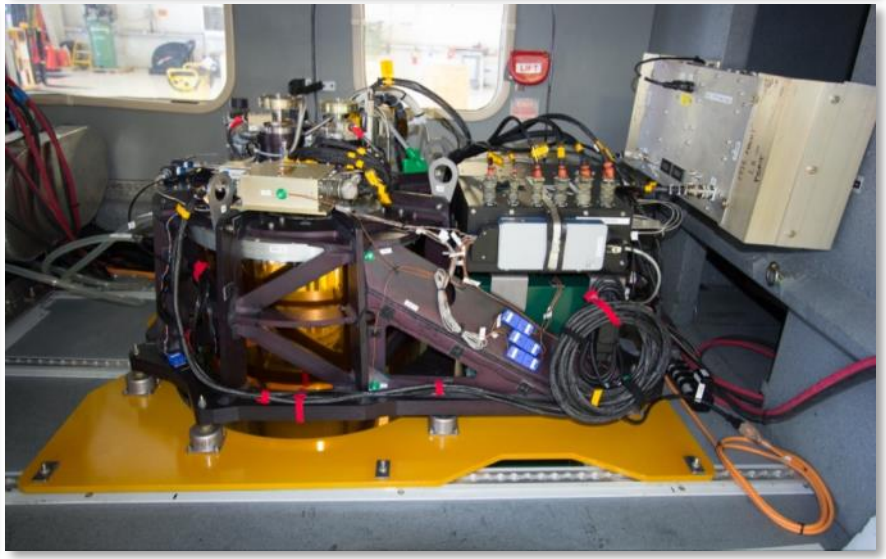
AOP – Airborne Observation Platform

Remote Sensing Payloads

2 NEON Science Payloads plus
1 Assignable Asset Payload

- VSWIR imaging spectrometer (AVIRISng)
- 1064 nm waveform lidar
- High resolution digital camera





Airborne RS Data Products - Current

Hyperspectral Data

Surface reflectance (recorded across 426 spectral bands, 380-2510nm)

Vegetation Indices (NDVI, EVI, ARVI, SAVI)

Xanthophyll

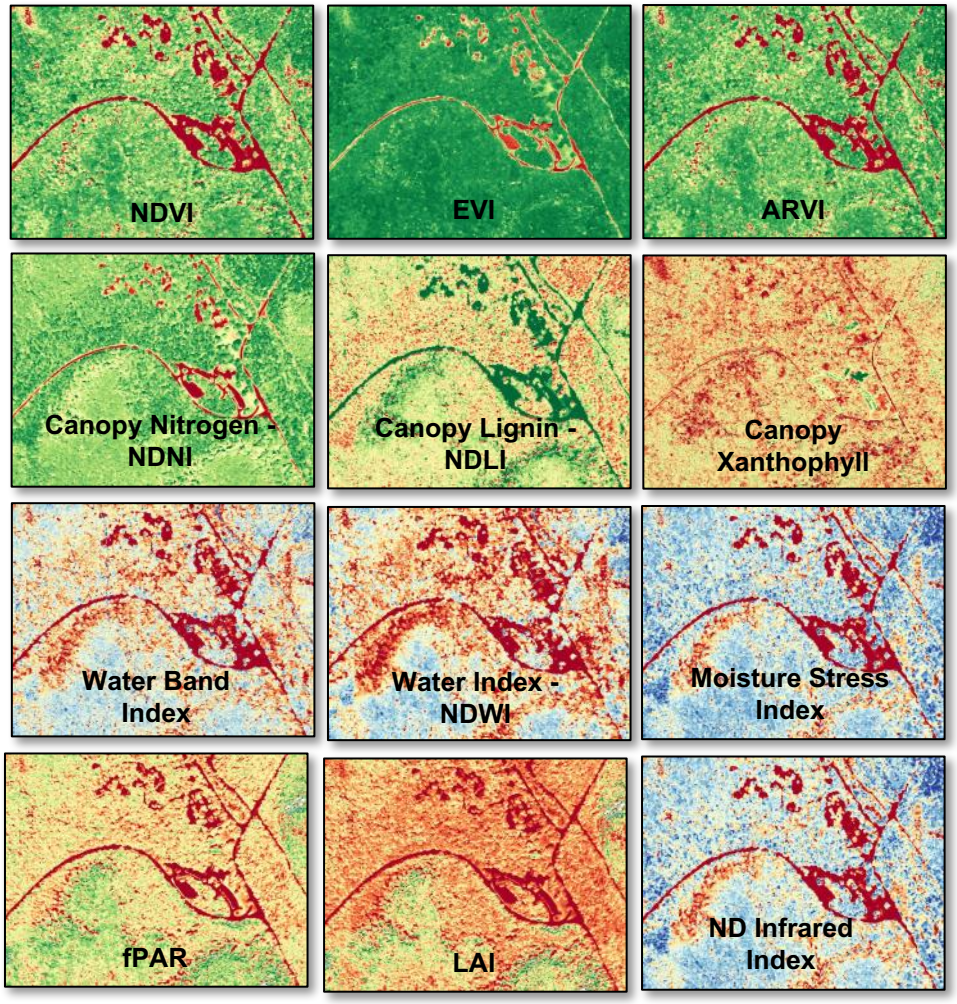
Lignin

fPAR

LAI

Water Indices (WBI, NDII, NDWI, MSI, NMDI)

Albedo



Airborne RS Data Products - Current

Lidar Data

DSM (Digital Surface Model; full mosaic)

DTM (Digital Terrain Model; full mosaic)

CHM (Canopy Height Model; full mosaic)

Slope and Aspect (full mosaics)

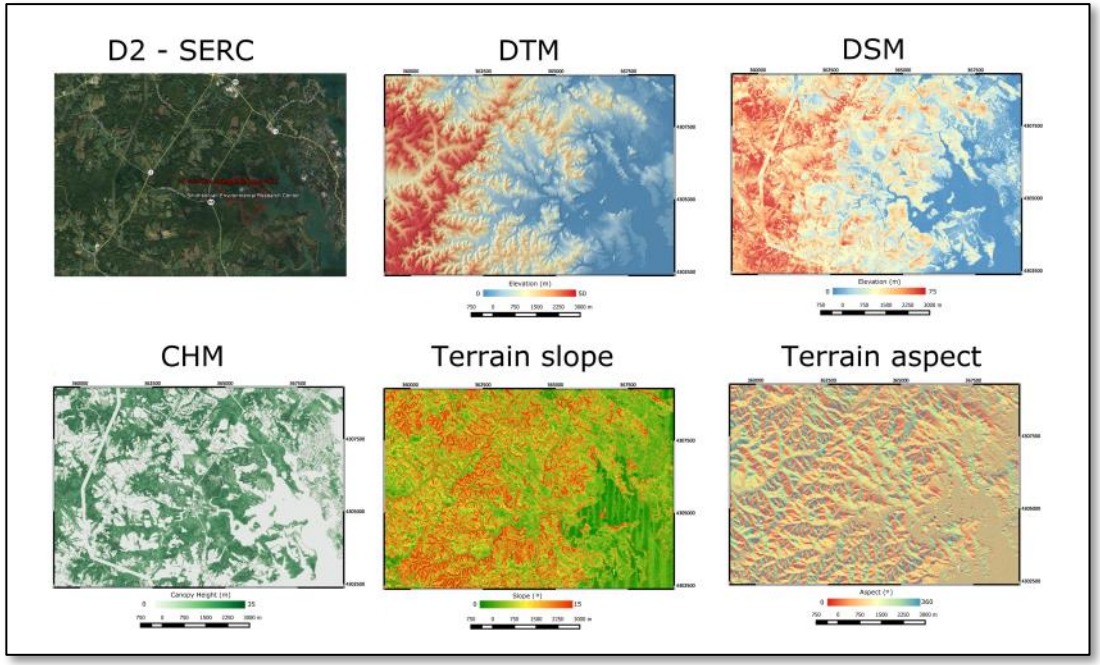
Classified point clouds (points classified as ground, building, vegetation, and unclassified; 1 km^2 tiles)

Unclassified point clouds (points by flight line)

Elevation uncertainty point cloud

KML (site and flight line boundaries)

Full waveform data



Camera Data

Orthorectified digital photographs

Camera mosaic

Flight Parameters

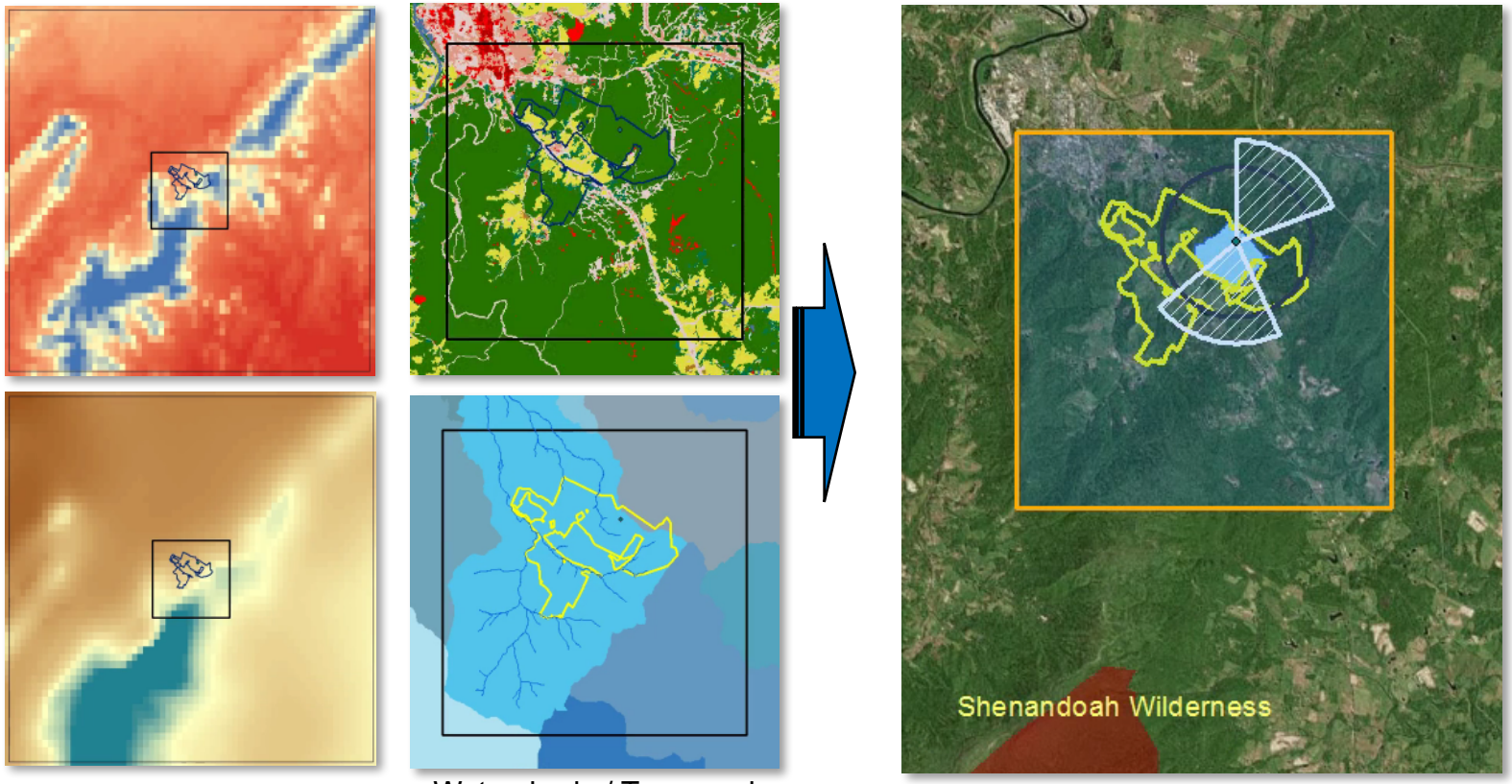
- Minimum sampling area 10km x 10km flight box
- Nominal flight altitude 1000m AGL, N/S flight line to minimize BRDF effects
- 1 m spectroscopy
- ~4 ppm lidar
- 10 cm photography
- GPS base station (or 1 sec CORS) within 20km of flight line
- Solar angles >40° (>35° in Alaska)
- Cloud cover <10%

Sampling of Ecologically Relevant Areas

Land Cover / 2000-2012 Forest Change

Average Annual Minimum Temperature (1981-2010)

Average Annual Precipitation (1981-2010)



Watersheds / Topography

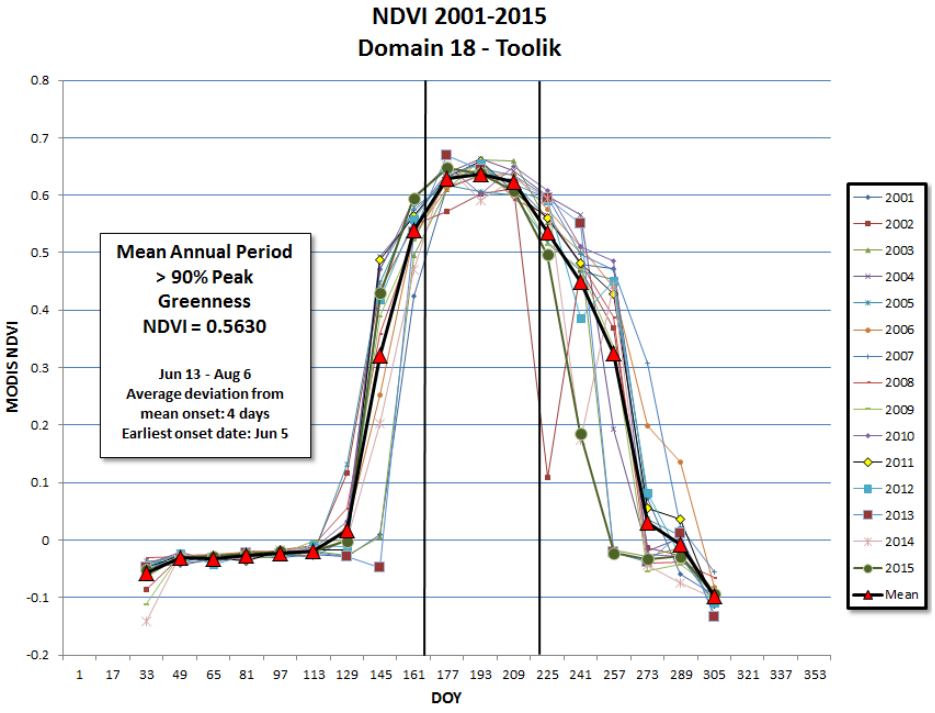
Minimum 10km x 10km Priority 1 flight boundaries and delineation of Priority 2 flight boundaries are designed capture:

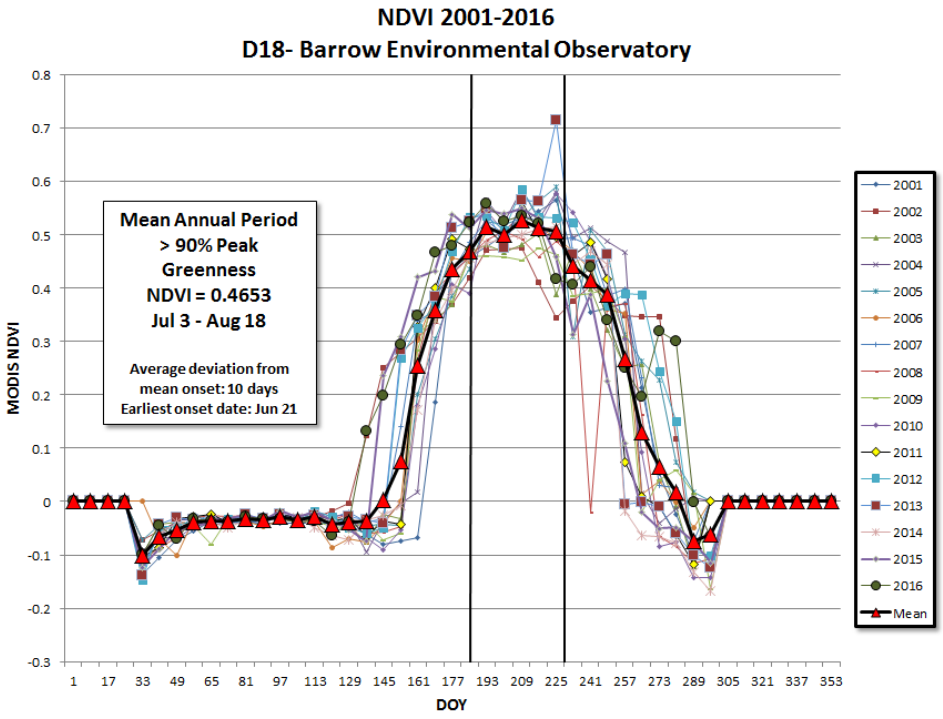
1) Landscape heterogeneity

2) Key ecological features/processes (e.g., climate patterns, hydrology) related to science themes

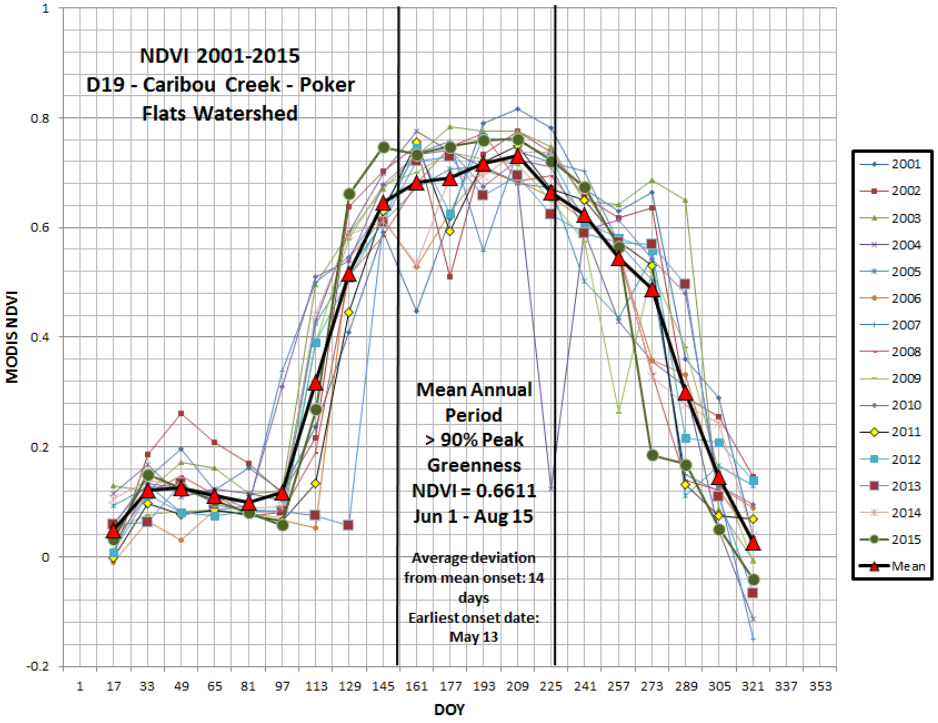
NEON Domain 18 & 19
Terrestrial and Aquatic Sites

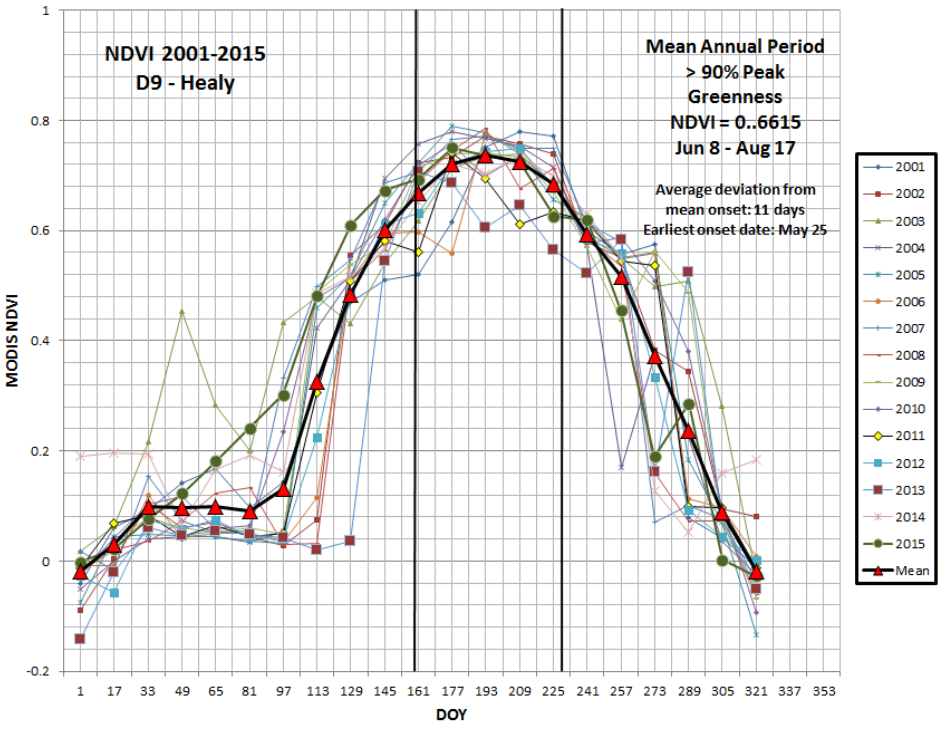
Phenological Constraints – Domain 18 (Tundra)



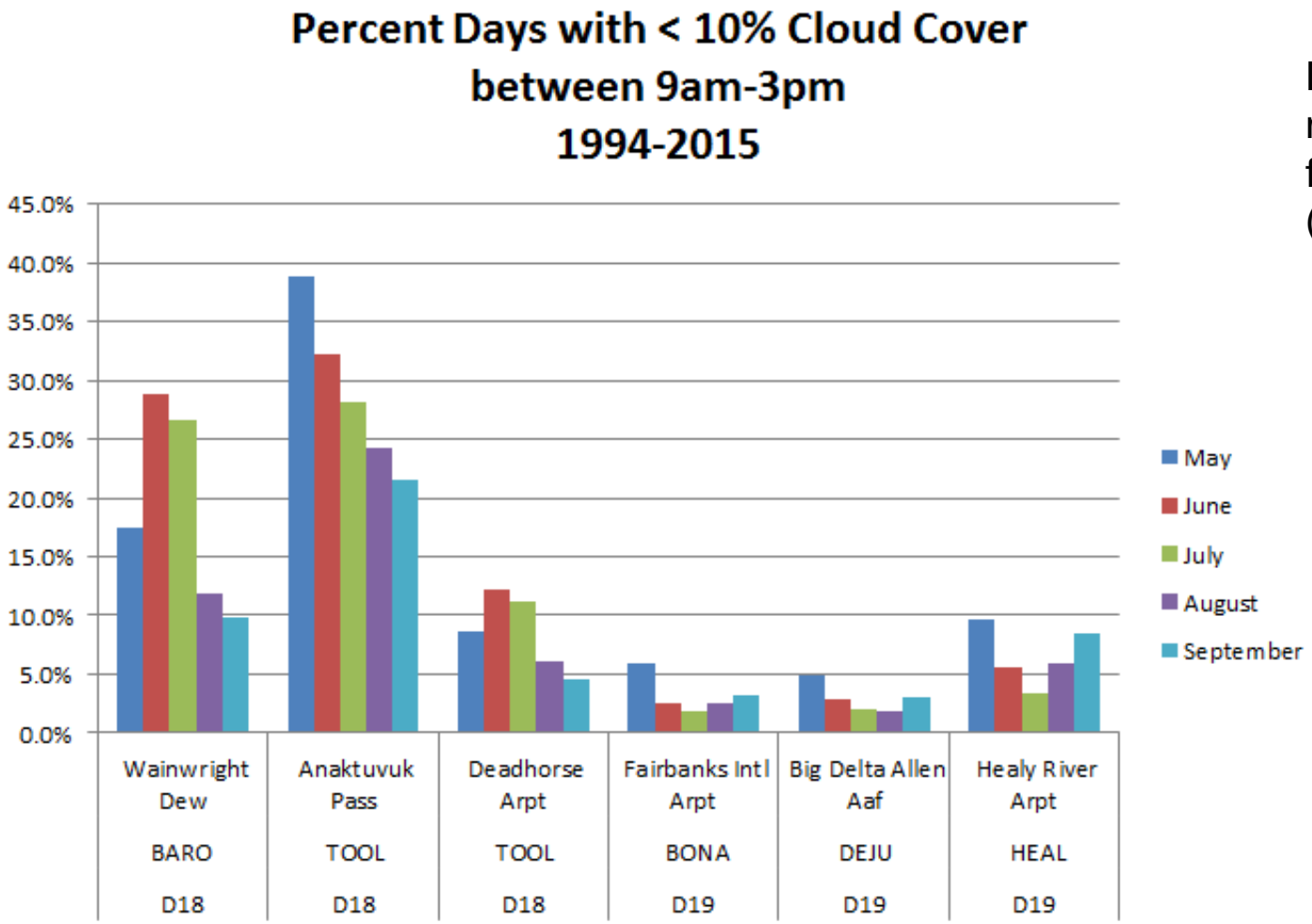


Phenological Constraints – Domain 10 (Taiga)





Cloud Cover Constraints



Derived from 20-year records of weather data from local airports (>175,000 obs.)

2017 Flight Campaign - Two Payloads

Payload	Domain	Core Site	FBO Name	Departure FBO	Destination FBO	FBO-FBO Transit Distance (nm)	FBO-FBO Transit Hrs @ 135 kts	Cooling Days	FBO-FBO Transit Days	Transit Days + cooling (rounded up)	Domain Latest Start Peak Greenness	Domain Earliest End Peak Greeness	Domain Flight Days	No Fly Days (flight days/8)	Days per Domain	Start Julian Day	End Julian Day	Domain Surveys Start Date	Domain Surveys End Date	Cummulative Flight Hours
1		BLDR	Boulder M	KGJT	KBDU	163	1.2	0	0.2	1	n/a	n/a	0	0	0	65	65	5-Mar	5-Mar	1.21
1		BLDR	Boulder M	KBDU	KFAT	710	5.26	0	0.9	1	n/a	n/a	24	0	24	66	89	6-Mar	29-Mar	65.47
1	17	SJER	Fresno	KFAT	KBDU	710	5.26	0	0.9	1	12-Feb	4-Apr	4	1	5	91	95	31-Mar	4-Apr	75.89
1		BLDR	Boulder M	KBDU	KSPS	486	3.60	0	0.6	1	n/a	n/a	14	0	14	97	110	6-Apr	19-Apr	79.49
1	11	CLBJ	Wichita F	KSPS	KBHM	587	4.35	0	0.7	1	21-Apr	2-May	10	2	12	112	123	21-Apr	2-May	105.48
1	8	TALL	Birmingha	KBHM	KTYS	192	1.42	0	0.2	1	29-Apr	11-Sep	15	2	17	125	141	4-May	20-May	131.82
1	7	ORNL	McGhee T	KTYS	KFOE	588	4.36	0	0.7	1	19-May	6-Sep	6	1	7	150	156	29-May	4-Jun	147.74
1	6	KONZ	Forbes Fie	KFOE	KBIS	520	3.85	0	0.6	1	22-May	4-Sep	8	1	9	158	166	6-Jun	14-Jun	163.75
1	9	WOOD	Bismark M	KBIS	KBZN	437	3.24	0	0.5	1	9-Jun	10-Aug	12	2	14	168	181	16-Jun	29-Jun	186.58
1	12	YELL	Gallatin F	KBZN	KHEF	1545	11.44	2	3.9	4	9-Jun	26-Jul	7	1	8	183	190	1-Jul	8-Jul	211.21
1	2	SCBI	Manassas	KHEF	KASH	366	2.71	0	0.5	1	25-May	9-Sep	19	3	22	195	216	13-Jul	3-Aug	245.86
1	1	HARV	Nashua	KASH	KRHI	792	5.87	0	1.0	1	27-May	15-Sep	11	2	13	225	237	12-Aug	24-Aug	270.30
1	5	UNDE	Rhineland	KRHI	KTVI	921	6.82	0	1.1	2	30-May	11-Sep	12	2	14	239	252	26-Aug	8-Sep	294.13
1	3a	JERC	Thomasvi	KTVI	KISM	202	1.50	0	0.2	1	21-Aug	28-Sep	5	1	6	255	260	11-Sep	16-Sep	281.66
1	3b	OSBS	Kissimme	KISM	KTYS	469	3.47	0	0.6	1	21-Aug	28-Sep	9	2	11	262	272	18-Sep	28-Sep	314.56
1	7	GRSM	McGhee T	KTYS	KBDU	1037	7.68	0	1.3	2	19-May	23-Sep	17	3	20	281	300	7-Oct	26-Oct	360.20
		BLDR	Boulder M	KBDU	KGJT	163	1.21	0	0.2	1	n/a	n/a	7	1	8	303	310	29-Oct	5-Nov	376.41
			Subtotal			**9888**	**73.24**	**2**	**14.3**	**22**			**180**	**24.00**	**204**	**240**				**376.41**
2		BLDR	Boulder M	KGJT	KBDU	163	1.21	0	0.2	1	n/a	n/a	0	0	0	124	124	3-May	3-May	1.21
2		BLDR	Boulder M	KBDU	KBDU	0	0.00	0	0.0	0	n/a	n/a	17	0	17	125	141	4-May	20-May	30.21
2	10	CPER	Boulder M	KBDU	KSLC	312	2.31	0	0.4	1	23-May	5-Jul	7	1	8	142	149	21-May	28-May	49.64
2	15	ONAQ	Salt Lake C	KSLC	KHIO	559	4.14	0	0.7	1	20-Apr	21-Jun	6	1	7	151	157	30-May	5-Jun	66.51
2	16	WREF	Hillsboro	KHIO	KFAT	546	4.04	0	0.7	1	7-Jun	17-Jul	11	2	13	159	171	7-Jun	19-Jun	86.00
2	17	SOAP	Fresno	KFAT	PASC	2209	16.36	2	4.7	5	22-Jun	10-Jul	8	1	9	180	188	28-Jun	6-Jul	116.69
2	18	TOOL	Deadhorse	PASC	PAFA	324	2.40	0	0.4	1	3-Jul	9-Aug	15	2	17	194	210	12-Jul	28-Jul	155.06
2	19	BONA	Fairbanks	PAFA	KELP	2500	18.52	2	5.1	6	9-Jun	16-Aug	15	2	17	212	228	30-Jul	15-Aug	197.77
2	14	SRER	El Paso In	KELP	KBDU	496	3.67	0	0.6	1	11-Aug	9-Sep	11	2	13	235	247	22-Aug	3-Sep	233.12
2	13	NIWO	Boulder M	KBDU	KBDU	0	0.00	0	0.0	0	1-Jul	1-Sep	15	2	17	256	272	12-Sep	28-Sep	246.79
2		BLDR	Boulder M	KBDU	KGJT	163	1.21	0	0.2	1	n/a	n/a	7	1	8	273	280	29-Sep	6-Oct	263.00
			Subtotal			**7272**	**53.87**	**4**	**13.0**	**18**			**112**	**14**	**126**	**153**				**263.00**
															Total days	**393**		**Total engine hrs**		**639.41**

Orange denotes domains where deployments have been truncated due to limited payload availability in 2017

Yellow denotes domains with sites flown outside of peak greenness due to limited payload availability in 2017

John Musinsky:
Includes 34 hrs training/ASO recertification and 25 hrs calibration flights (with RRV)

John Musinsky:
P1 install: 1 day
Cooling: 2 days
Shakeout flight: 1 day
Recert of ASOs: 2 days
Campaign calibration flights: 3 days
New ASO training: 9 days
Contingency: 6 days

John Musinsky:
Maximum 5 day maintenance break plus 2 day cooling (7 days total) - minimum is 3 days down time

John Musinsky:
Maximum 5 day maintenance break plus 2 day cooling (7 days total) - minimum is 3 days down time

John Musinsky:
Assumes MLBS flown from Domain 2 (KHEF)

John Musinsky:
Maximum 5 day maintenance break plus 2 day cooling (7 days total) - minimum is 3 days down time

John Musinsky:
Includes 15 hours for calibration flights

John Musinsky:
P2 install: 1 day
Cooling: 2 days
Shakeout flight: 1 day
Campaign calibration flights: 3 days
Additional ASO training: 4 days
Contingency: 6 days

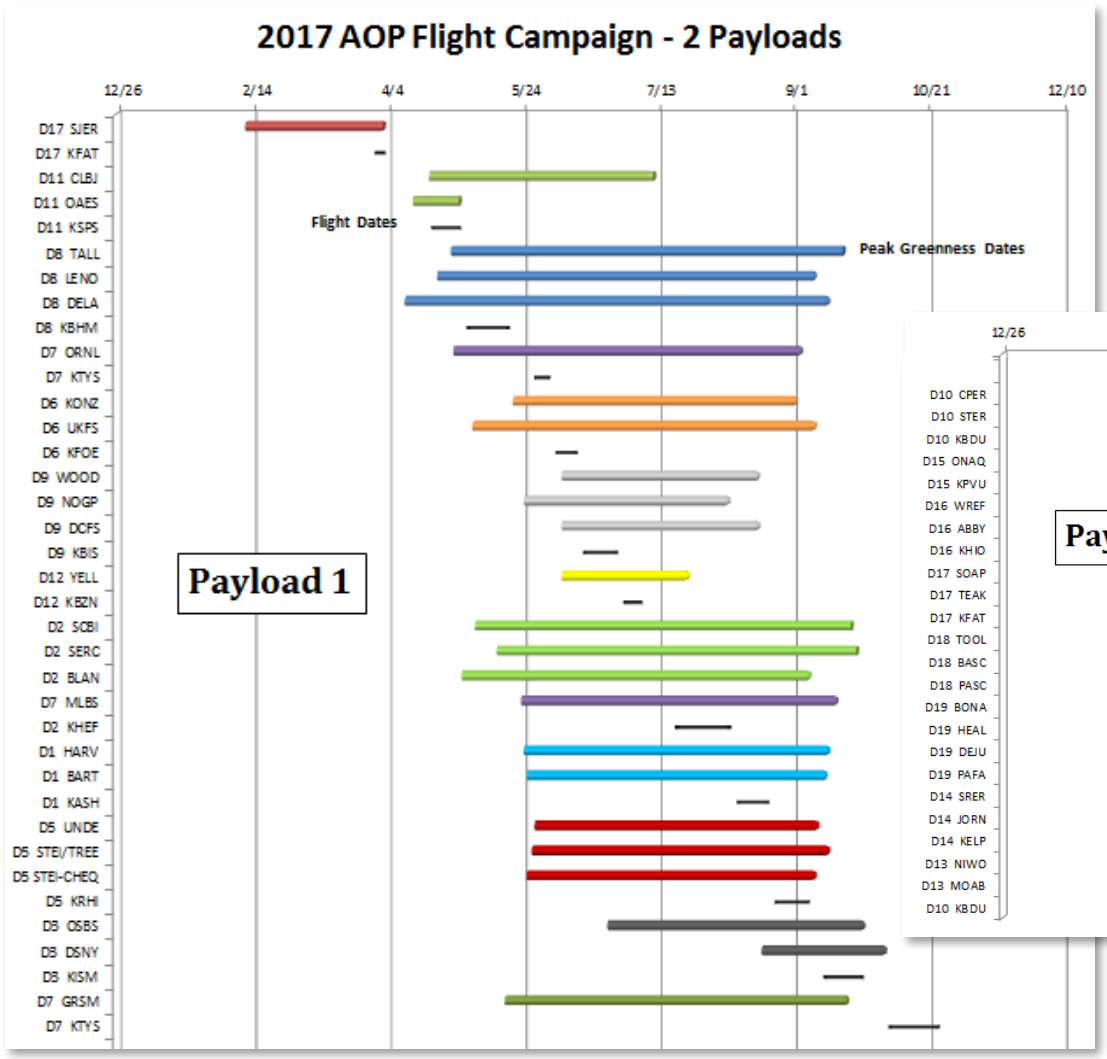
John Musinsky:
Includes 4 hours additional ASO training and 25 hrs for calibration flights (with RRV)

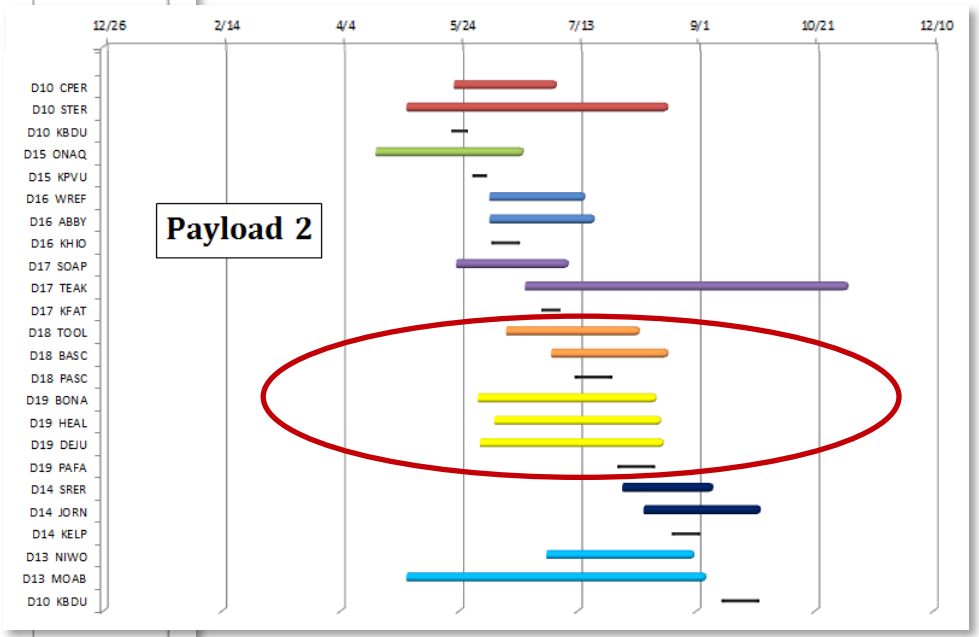
John Musinsky:
Maximum 5 day maintenance break plus 2 day cooling (7 days total) - minimum is 3 days down time

John Musinsky:
Maximum 5 day maintenance break plus 2 day cooling (7 days total) - minimum is 3 days down time

John Musinsky:
Includes 15 hours for calibration flights

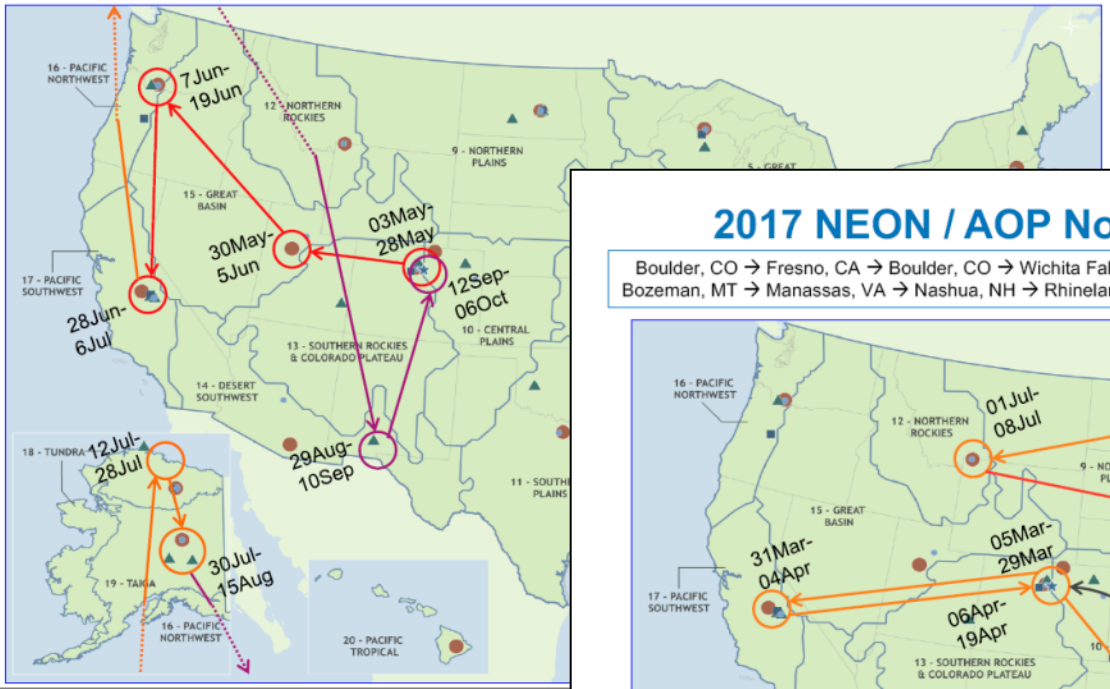
2017 Flight Campaign Schedule - Payloads 1 & 2





2017 NEON / AOP Notional Schedule – Payload 2

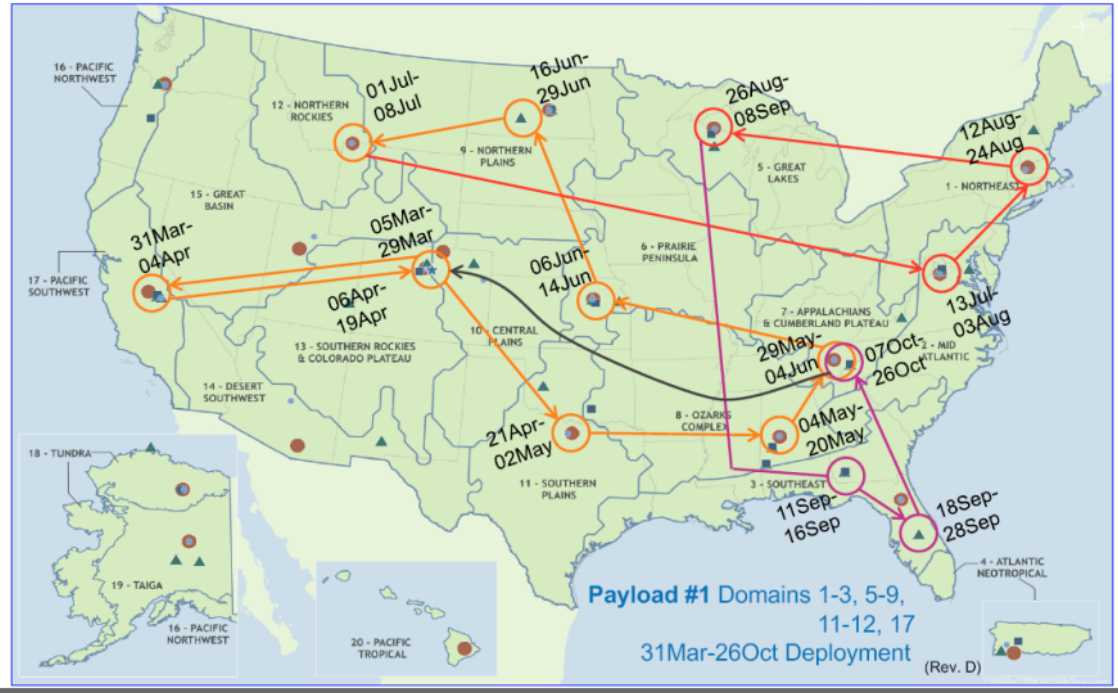
Payload #2: Boulder, CO → Salt Lake City, UT → Portland, OR → Fresno, CA → Deadhorse, AK → Fairbanks, AK → El Paso, TX → Boulder, CO



2 NEON AOP Flight Operations 2017 Ov

2017 NEON / AOP Notional Schedule – Payload 1

Boulder, CO → Fresno, CA → Boulder, CO → Wichita Falls, TX → Birmingham, AL → Knoxville, TN → Topeka, KS → Bismarck, ND → Bozeman, MT → Manassas, VA → Nashua, NH → Rhinelander, WI → Thomasville, GA → Kissimmee, FL → Knoxville, TN → Boulder, CO

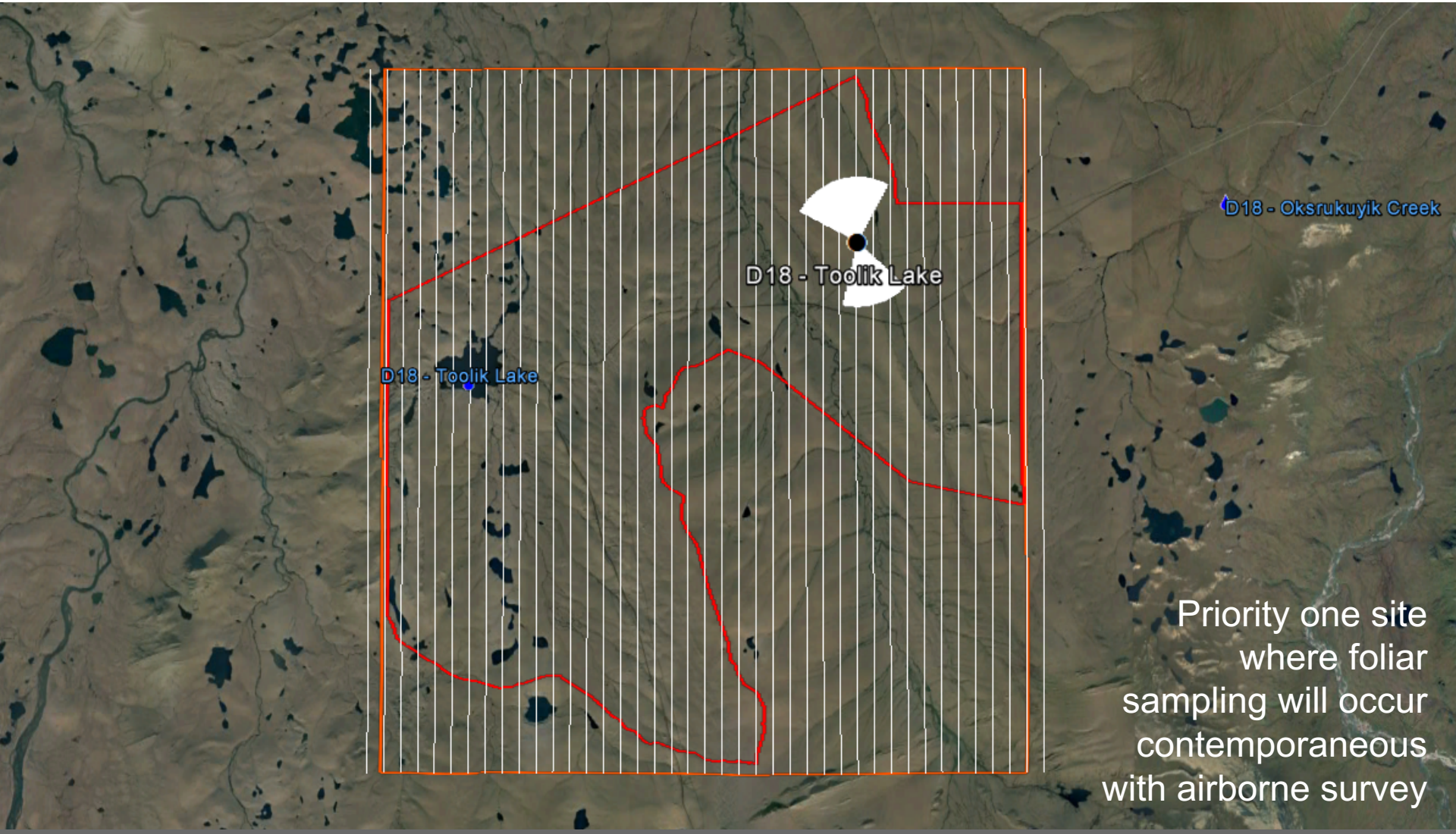


1 NEON AOP Flight Operations 2017 Overview

Colors used for visual clarity only

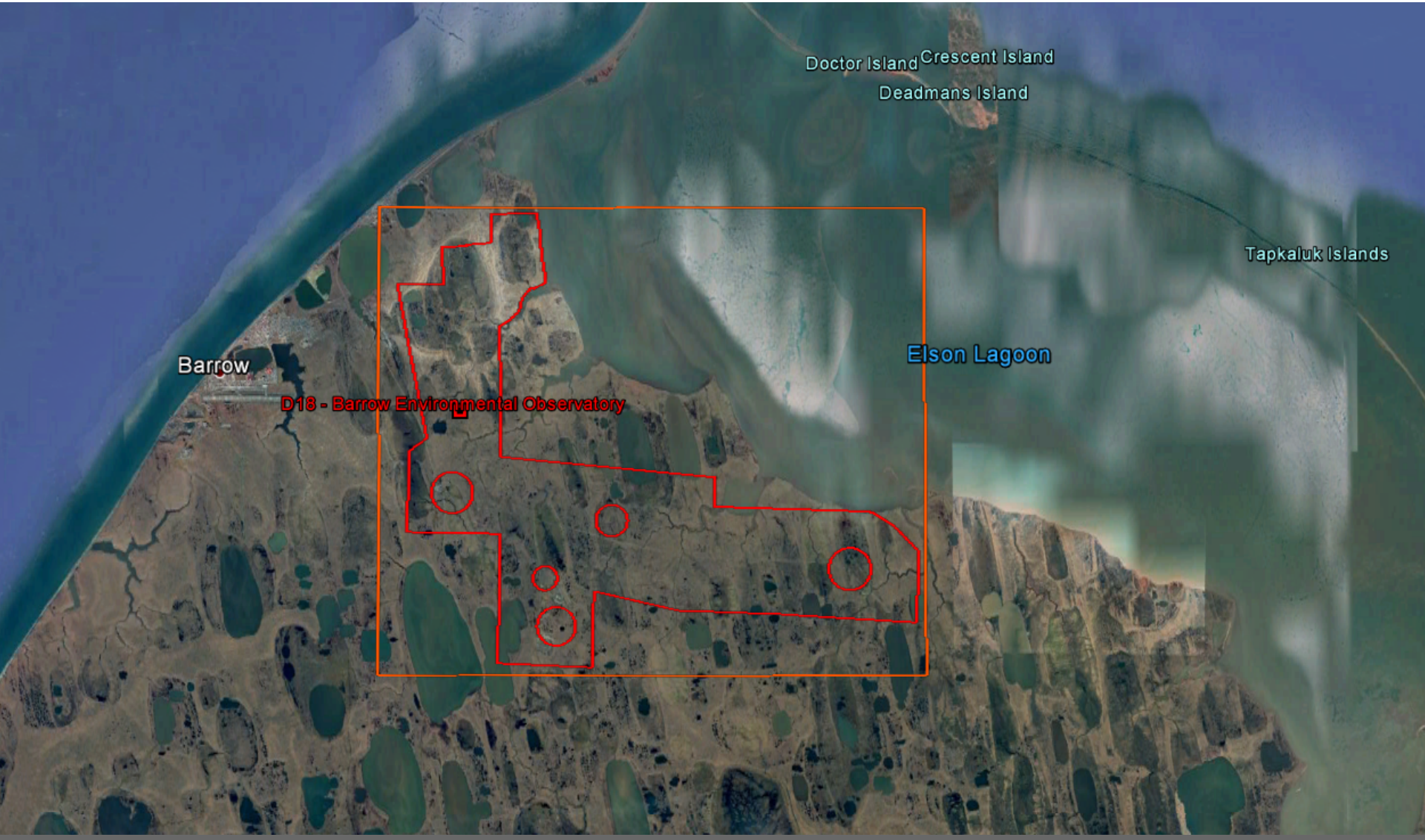
Battelle The Business of Innovation

D18 - Toolik

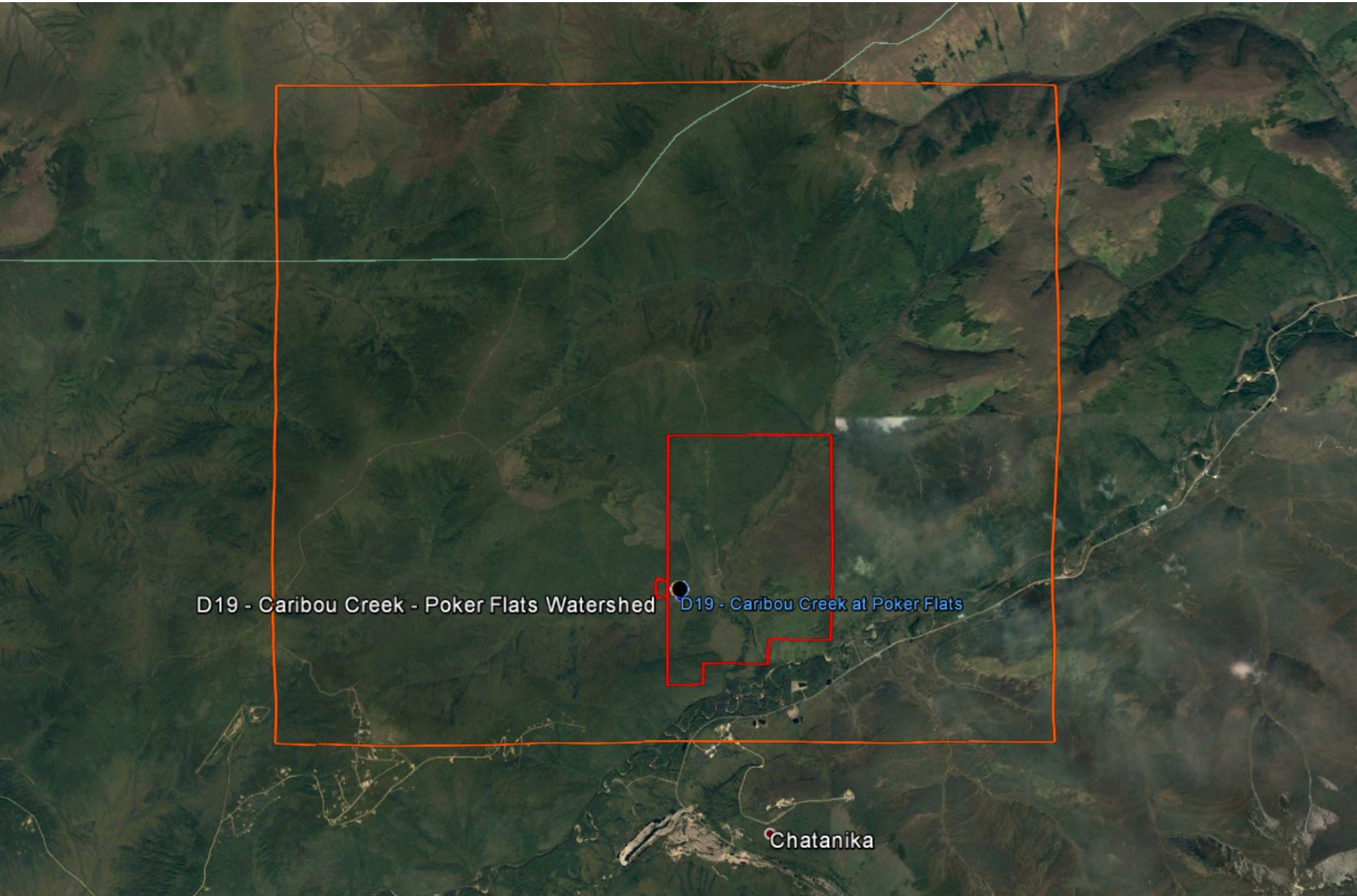


Priority one site where foliar sampling will occur contemporaneous with airborne survey

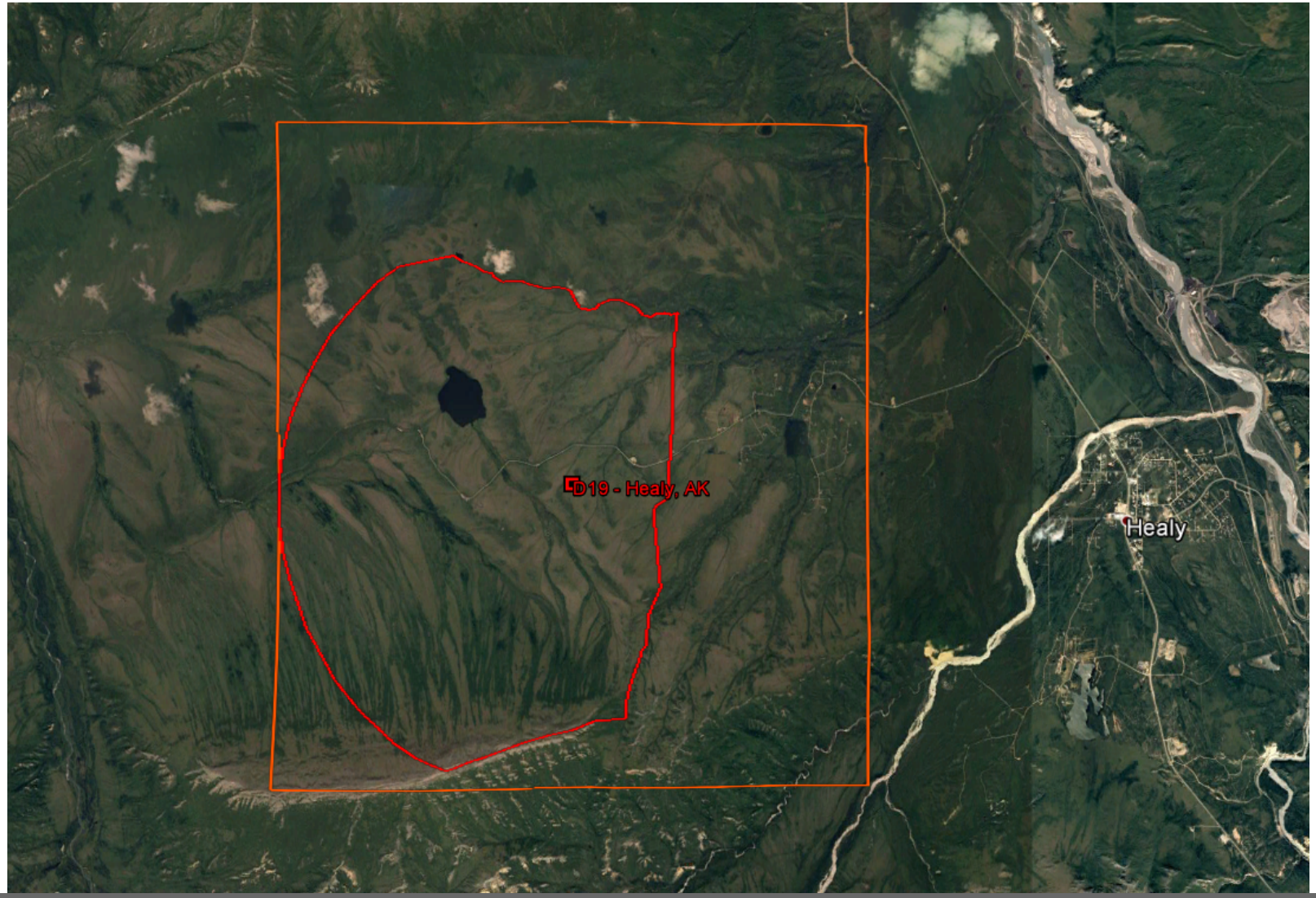
D18 - Barrow


Doctor Island
Crescent Island
Deadmans Island
Tapkaluk Islands
Elson Lagoon
Barrow
D18 - Barrow Environmental Observatory

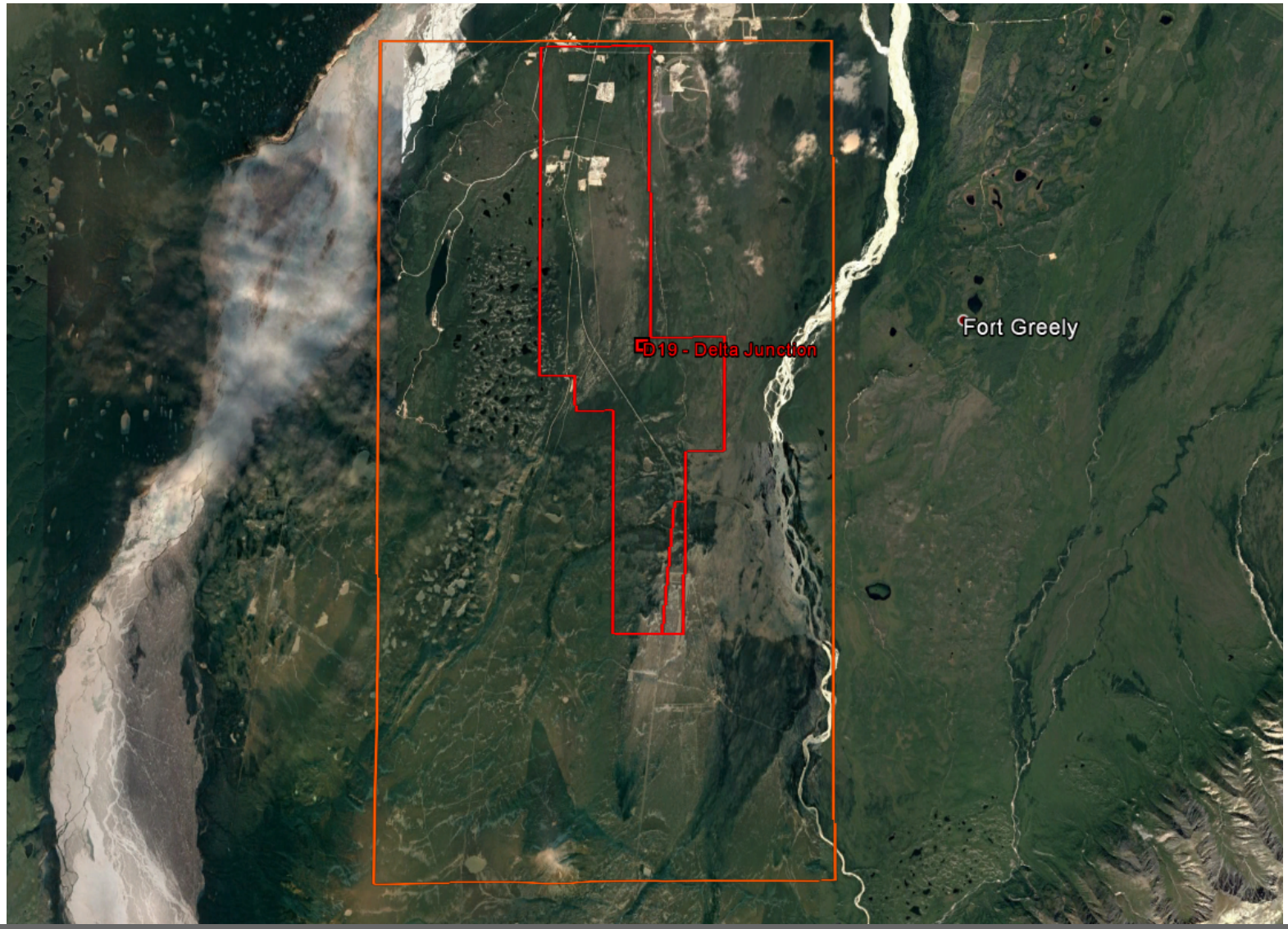
D18 – Caribou Creek – Poker Flats

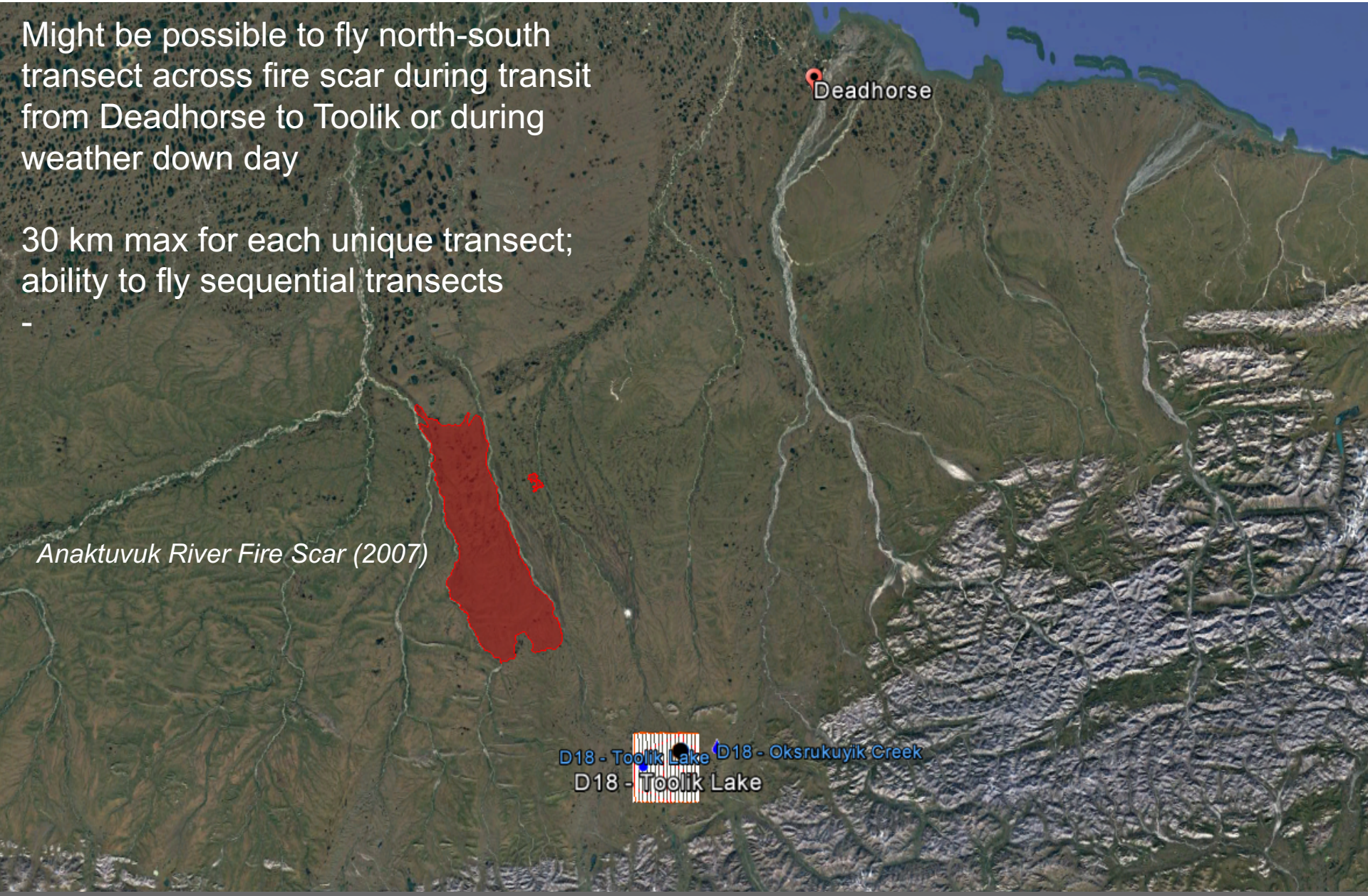


D19 - Healy



D19 – Delta Junction




Might be possible to fly north-south transect across fire scar during transit from Deadhorse to Toolik or during weather down day
30 km max for each unique transect; ability to fly sequential transects
-
Deadhorse
Anaktuvuk River Fire Scar (2007)
D18 - Toolik Lake
D18 - Oksrukuyik Creek
D18 - Toolik Lake