



Supplement of

A new habitat map of the Lena Delta in Arctic Siberia based on field and remote sensing datasets

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Table S1: Vegetation plots in the central Lena Delta, mainly on Kurungnakh and Samoylov islands (Dateset 1, 2: Shevtsova et al. 2025a, Shevtsova et al. 2025b).

Vegetation Plot Code	Latitude	Longitude	Date	Landscape	Habitat
LD18-VP01	N 72.2920	E 126.1606	01.08.2018	Yedoma upland, wet sedge and moss-dominated tundra	Polygonal tundra complex
LD18-VP02	N 72.2911	E 126.1651	01.08.2018	Yedoma upland, wet sedge and moss-dominated tundra	Polygonal tundra complex
LD18-VP03	N 72.2839	E 126.1955	02.08.2018	tundra slope	Dry tundra communities
LD18-VP04	N 72.28179	E 126.1942	02.08.2018	terrace with shrub communities (> 30 cm height)	Dry shrub communities
LD18-VP05	N 72.3229	E 126.2553	03.08.2018	young drained lake basin, baydzherakhs and wet basin floor	Dry grass to wet sedge communities
LD18-VP06	N 72.3228	E 126.2583	03.08.2018	young drained lake basin, Baydzherakhs and wet basin floor	Dry grass to wet sedge communities
LD18-VP07	N 72.3243	E 126.2633	04.08.2018	Yedoma upland, wet sedge and moss-dominated tundra	Polygonal tundra complex
LD18-VP08	N 72.3265	E 126.2638	04.08.2018	Yedoma upland, wet sedge and moss-dominated tundra	Polygonal tundra complex
LD18-VP09	N 72.3057	E 126.2506	07.08.2018	alas floor, tussock	Dry tundra communities
LD18-VP10	N 72.3042	E 126.2511	07.08.2018	alas floor, tussock	Dry tundra communities
LD18-VP11	N 72.3330	E 126.281536	08.08.2018	thermo-erosional valley	Dry grass to wet sedge communities
LD18-VP13	N 72.3679	E 126.2573	10.08.2018	tussock on slope	Dry tundra communities
LD18-VP14	N 72.3657	E 126.2731	10.08.2018	Yedoma upland, wet sedge and moss-dominated tundra	Polygonal tundra complex
LD18-VP15	N 72.3794	E 126.3892	11.08.2018	polygonal tundra, Holocene terrace	Polygonal tundra complex
LD18-VP16	N 72.3728	E 126.4702	14.08.2018	floodplain, dry ridge with shrub communities	Dry shrub communities
LD18-VP17	N 72.3873	E 126.4791	15.08.2018	floodplain, <i>Salix</i> , Alder	Moist <i>Equisetum</i> and shrubs

Vegetation Plot Code	Latitude	Longitude	Date	Landscape	Habitat
LD18-VP18	N 72.3669	E 126.2550	16.08.2018	heterogenous plot (not used for training)	
LD18-VP19-	N 72.3623	E 126.2666	16.08.2018	heterogenous plot (not used for training)	Dry grass to wet sedge communities
LD18-VP20	N 72.3244	E 126.2731	18.08.2016	thermo-erosional valley slope	Dry grass to wet sedge communities
LD18-VP21	N 72.3750	E 126.4987	19.08.2018	polygonal tundra, Holocene terrace	Polygonal tundra complex
LD18-VP22	N 72.3269	E 126.0479	22.08.2018	degraded Yedoma on slope	Polygonal tundra complex (transition to tussock)
LD18-VP23	N 72.3260	E 126.0544	22.08.2018	degraded Yedoma on slope	Polygonal tundra complex (transition to tussock)
LD18-VP24	N 72.3292	E 126.0439	22.08.2018	steep valley slope with high shrub communities (>100 cm) heterogenous plot (not used for training)	Dry shrub communities
LD18-VP25	N 72.3283	E 126.0397	22.08.2018	terrace with shrub communities (>50 cm) heterogenous plot (not used for training)	Dry shrub communities
LD18-VP26	N 72.3767	E 126.5038	24.08.2018	polygonal tundra, Holocene terrace	Polygonal tundra complex
LD18-VP27	N 72.3443	E 126.1907	25.08.2018	Yedoma upland, wet sedge and moss-dominated tundra	Polygonal tundra complex

Table S2: Cross Reference table for 2018 expedition plots for vegetation and field spectrometry in the central Lena Delta.

Landscape	Vegetation Plot [date of survey]	Spectrometry Plot [date of survey]
Polygonal tundra complex	VP01 [01.08.2018]	SP008 [09.08.2018]
Polygonal tundra complex	VP02 [01.08.2018]	SP009 [09.08.2018]
Polygonal tundra complex	VP07 [04.08.2018]	SP007 [08.08.2018]
Polygonal tundra complex	VP08 [04.08.2018]	SP026 [28.08.2018]
Polygonal tundra complex	VP14 [10.08.2018]	SP013 [10.08.2018]
Dry tundra communities	VP03 [02.08.2018]	SP010 [09.08.2018] SP024 [27.08.2018]
Dry tussock tundra	VP13 [10.08.2018]	SP015 [10.08.2018]
Dry tussock tundra	VP09	SP003 [07.08.2018]
Dry tussock tundra	VP10	SP004 [07.08.2018]
Dry grass to wet sedge communities in young drained lake basin, baydzherakhs, wet basin floor	VP05 [03.08.2018]	SP005 [08.08.2018] SP027 [28.08.2018]
Dry grass to wet sedge communities in young drained lake basin, rim with shrub communities (>50 cm height)	VP06 [03.08.2018]	SP006 [08.08.2019]
Terrace with dry shrub communities (>30 cm height)	VP04 [02.08.2018]	SP011 [09.08.2018] SP022 [27.08.2018]
Dry grass to wet sedge communities on disturbed slope	VP19 [16.08.2018]	SP014 [10.08.2018]
Floodplain, dry ridge with dry shrub communities	VP16 [14.08.2018]	SP019 [26.08.2018]
Floodplain, moist <i>Equisetum</i> and shrubs	VP17 [15.08.2018]	SP018 [26.08.2018]
Floodplain, low shrub communities	NaN	SP002 [06.08.2018]
Floodplain, sand	NaN	SP001 [06.08.2018]

Table S3: Dataset description

Dataset	Description	Unit	Source	Date/Time	Sensor	Method	Acquisition	Comment
1. Foliage projective cover, 26 vegetation plots	Foliage projective cover major vascular plant taxa and ground layer of moss and lichen	%	LD18 field work	July-August 2018	Human eye, RGB and NIR cameras	i) Visual estimation foliage projective cover in 2 x 2 m subplots ii) added plant composition description in 50 cm rings iii) upscaled by visual estimation from field photography of the plot	Vegetation plot: 30x30m, 3 subplots 2x2m	The survey was conducted by one person, I.Shevtsova with support of the regional vegetation specialist N.Lachinsky, Geobotanical Siberian Garden.
2. Above ground plant biomass 25 plots (same as in Dataset 1, one plot not doable due to too high biomass and time constraints)	Above ground plant biomass dry mass per major taxa, as well per 'moss and lichen', 'litter' and the few remaining minor taxa ('other plants') and the total biomass	g/m2	LD18 field work	July-August 2018		Collecting in the field and weighting and drying at the Samoylov research station	Plot: 30x30m; sampling in subplots of 2x2m and 0.5x0.5m, mosses and lichens in 0.1x0.1m	The survey was conducted by one person, I.Shevtsova with support from the expedition team.
3. Hyperspectral surface reflectance from field measurements	surface reflectance spectra of different homogeneous land cover	% reflectance	Field work: Spectral Evolution SR-2500 field spectrometer (350-2500 nm)	August 2018			30x30m, about 100 individual point measurements / plot	The survey was conducted by two persons, A.Runge and M.Fuchs with support from the expedition team

			Zenith LiteTM Diffuse Reflectance Target (50% reflectivity)				Reference measurements before and after ground measurements	
4. Central Lena Delta land cover classification	S-2 based classification of the central Lena Delta 10 vegetation classes, 1 water and 1 sand/barren class	Nominal class 12 classes	i) Cloudfree S-2 surface reflectance with 20m bands upsampled to 10m ii) trained with published training datasets in Dataset 4 for random forest classification	6 August 2018			10m pixel res.	Expert knowledge: additional training data and ESUs contain LD18 field plots (Dataset 1) with class assignments from table 1 and additional ESUs set with expert knowledge
5. Lena Delta habitat classification	S-2 based habitat classification of the Lena Delta 11 vegetation classes, 1 water and 1 sand/barren class sand probability	Nominal class 13 classes	Trained with published Dataset 4 262 Sentinel-2 images 6026 Sentinel-2 images	1 June - 15 September 2018 1 April - 15 October 2015- 2021			10m pixel res.	Expert knowledge: additional ESUs for 1 habitat class missing in the central Lena Delta (earlier AWI expeditions, field reports Sandbar probability map
6. Lena Delta disturbance regimes	3 disturbance classes : low high very high	3 nominal classes	Derived from the habitat classes of the published Dataset 5				10m pixel res.	Expert knowledge: assigning a disturbance regime to the habitat classes (table 2)

Table S4: Habitat classes of the central delta and 2nd terrace.

Habitat class	Field photo
Moist <i>Equisetum</i> and shrubs on floodplain, Samoylov Island (photo AWI 2018)	 A field photograph showing a vast, flat floodplain covered in dense, tall grasses and shrubs. The vegetation is a mix of green and yellowish-brown, indicating some dryness. In the middle ground, a person is standing, pointing towards the horizon. The sky is clear and blue, and the horizon is flat and distant.

Dry shrub communities
on the lower terrace on Kurungnakh
Island, regularly flooded during spring
floods (photo AWI 2018)



Moist to wet sedge communities
in thermo-erosional valley on
Kurungnakh Island
(photo AWI 2018)



Wet sedge communities
on floodplain, Samoylov Island
(photo AWI 2019)

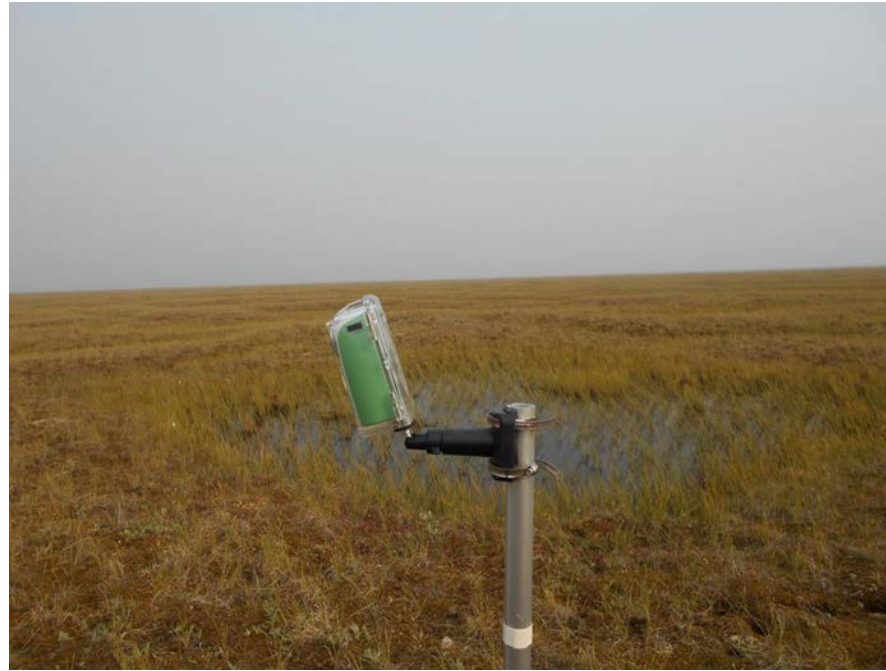


**Polygonal tundra up to 10% surface
water**
on Pleistocene Yedoma terrace,
Kurungnakh Island
(photo AWI 2018)



**Polygonal tundra up to 20% surface
water**

on Holocene fluvial terrace,
Island in the central delta
(photo AWI 2019)



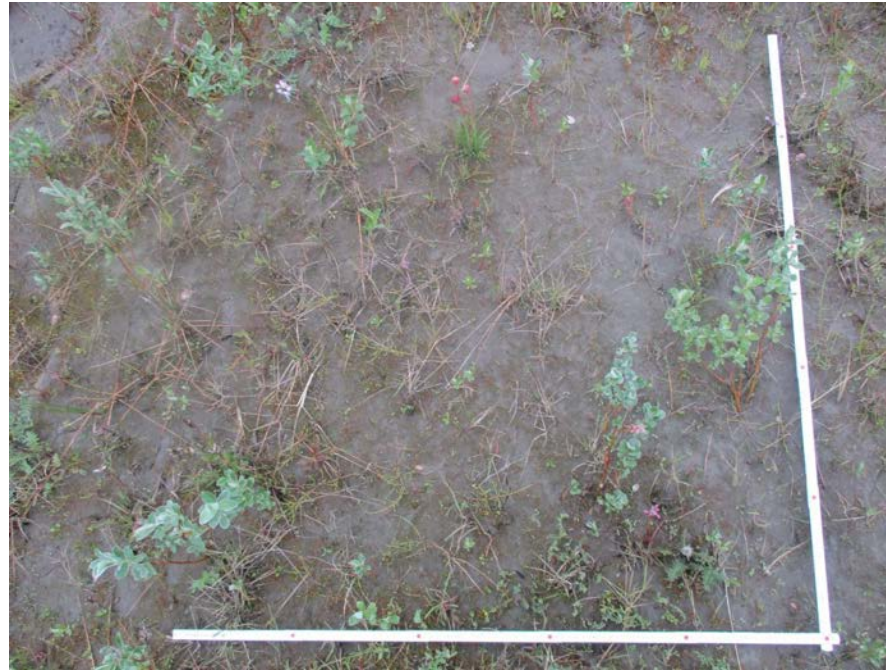
**Polygonal tundra up to 50% surface
water**
on Holocene fluvial terrace, Samoylov
Island
(photo AWI 2019)



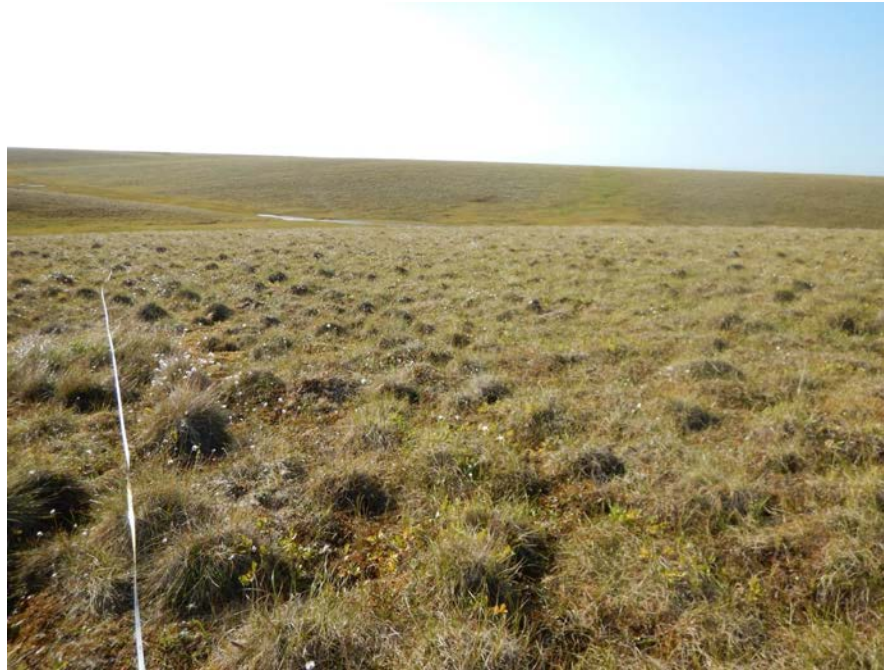
Dry grass to wet sedge communities
in a young drained lake basin on
Kurungnakh Island
(photo AWI 2018)



Sparsely vegetated areas
on floodplain, Samoylov Island
(photo AWI 2019)



Dry tundra tussock type
on drained slopes of Kurungnakh
Island
(photo AWI 2018)



Barren / sand
on floodplain, Samoylov Island
(photo AWI 2018)



Dwarf shrub - herb communities
on the 2nd delta terrace (sandy
Pleistocene fluvial and eolic complex)

in Schneider et al. 2009, Figure 2d,
dry moss-, sedge-, and dwarf shrub-
dominated tundra (class DMSD);
(photo AWI)

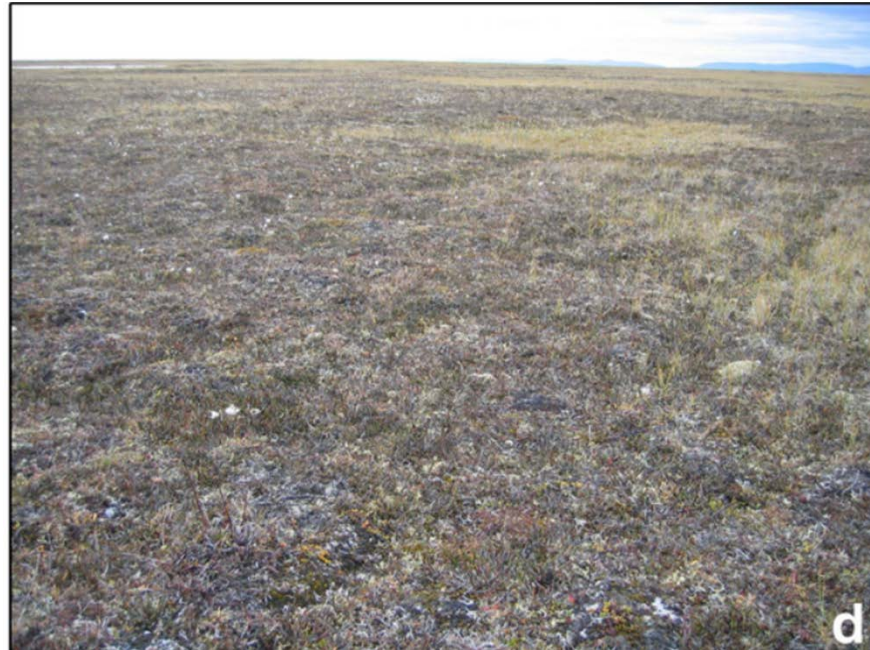
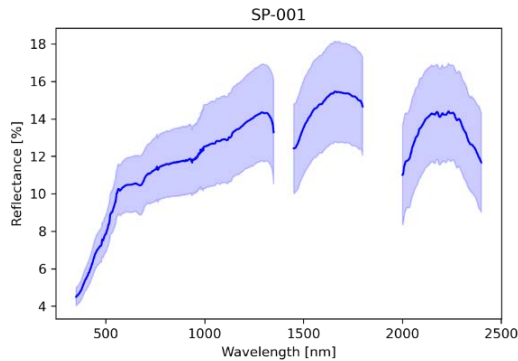


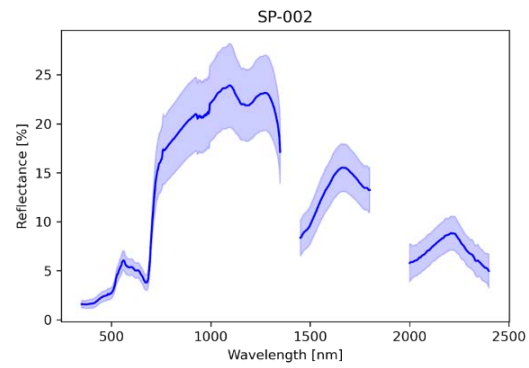
Table S5: LD18 spectrometry plots and their mean surface reflectance (Dataset 3, Runge et al. 2022). The mean surface reflectance is depicted in dark blue, the standard deviation in light blue, and n states the number of randomly scattered measurements within a spectrometry plot (900 m2).

LD18 Spectrometry plots	Surface reflectance spectrum	Field photo
SP-001 Floodplain, sand	$n = 194$  SP-001	

SP-002

Floodplain, low
shrubs

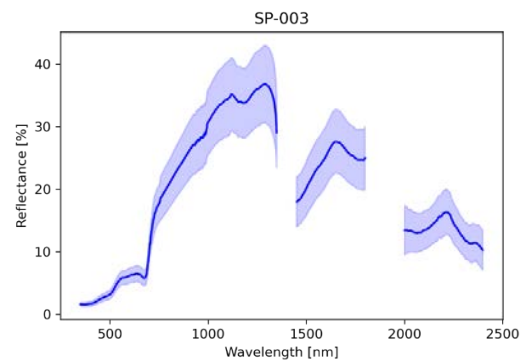
n = 206

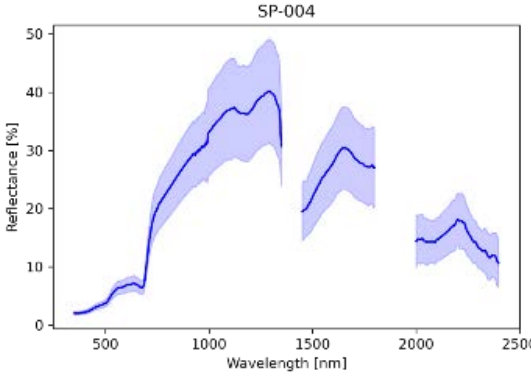
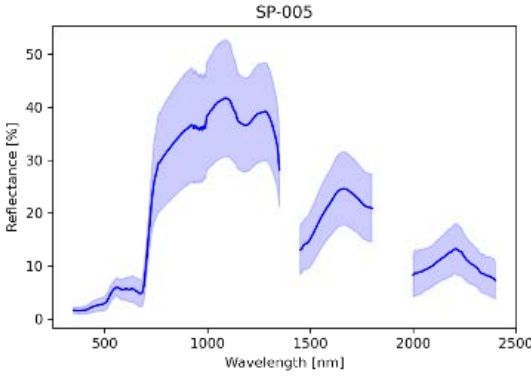


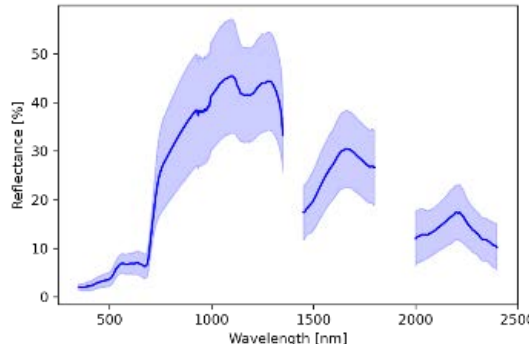
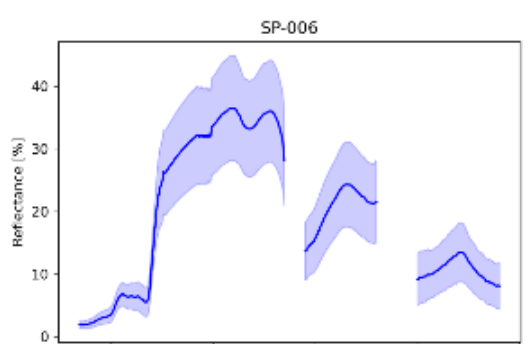
SP-003

Drained lake
basin floor,
tussock tundra

n = 89



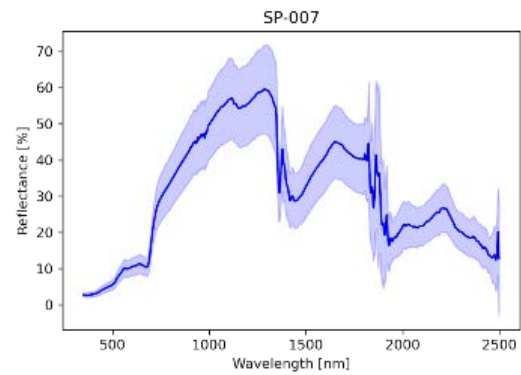
SP-004 Drained lake basin floor, tussock tundra	n =56  The plot for SP-004 shows reflectance (%) on the y-axis (0 to 50) against wavelength (nm) on the x-axis (500 to 2500). The curve starts at ~2% at 500 nm, rises to a broad peak of ~40% between 1000-1200 nm, drops to ~20% at 1500 nm, rises to a secondary peak of ~30% at 1700 nm, and ends at ~10% at 2500 nm. A light blue shaded area represents the standard deviation.	
SP-005 / SP-027 Young drained lake basin, Baydzherakhs and wet basin floor SP-005: 2018-08-08	n = 106  The plot for SP-005 shows reflectance (%) on the y-axis (0 to 50) against wavelength (nm) on the x-axis (500 to 2500). The curve follows a similar pattern to SP-004, with a primary peak of ~40% around 1100 nm, a dip to ~15% at 1500 nm, and a secondary peak of ~25% at 1700 nm. A light blue shaded area represents the standard deviation.	 A photograph showing a vast, flat landscape of a young drained lake basin. The ground is covered with a mix of green and brown vegetation, likely tussock tundra, under a clear blue sky.

SP-027: 2018-08-28	n = 126 SP-027  Reflectance [%] Wavelength [nm]	
SP-006 Young drained lake, rim with shrub communities (> 50 cm height)	n = 106 SP-006  Reflectance [%] Wavelength [nm]	

SP-007

Yedoma upland,
wet sedge and
moss-dominated
tundra

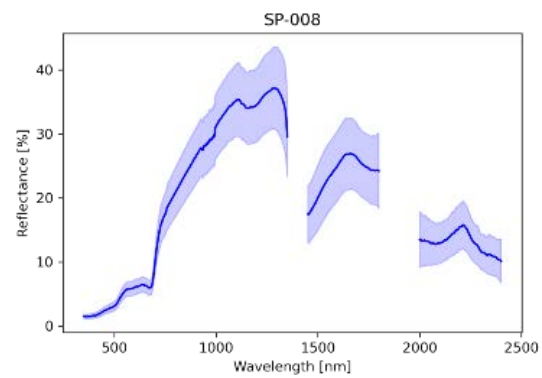
n = 106



SP-008

Yedoma upland,
wet sedge and
moss-dominated
tundra

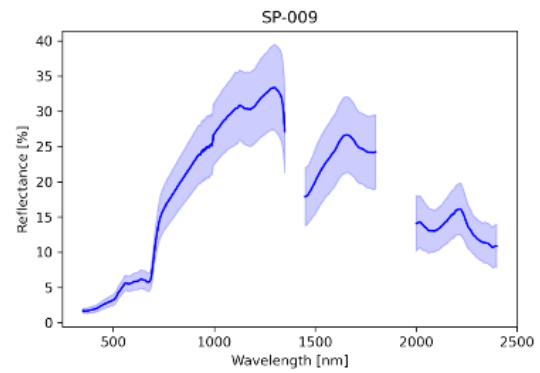
n = 107



SP-009

Yedoma upland,
wet sedge and
moss-dominated
tundra

n = 109

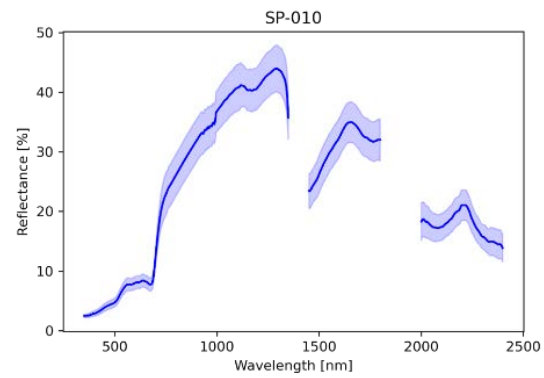


SP-010 / SP-024

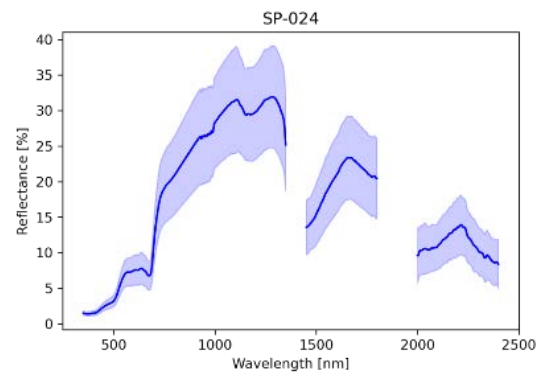
Dry tundra on
drained slope,
south-facing

SP-010: 2018-08-
09

n = 111



n = 108



SP-024: 2018-08-
27

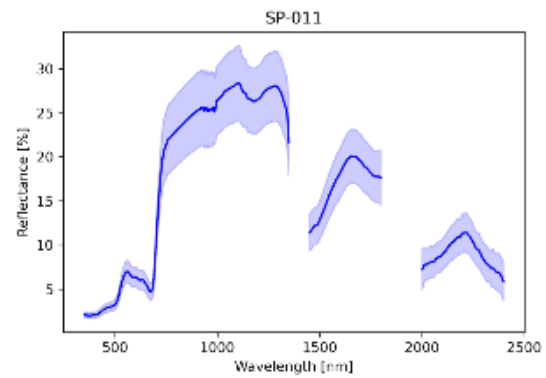


SP-011 / SP-022

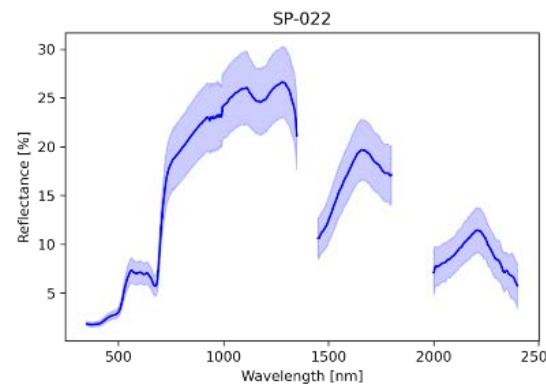
Terrace with
shrub
communities
(> 30 cm height)

SP-011: 2018-08-
09

n = 108



n = 110

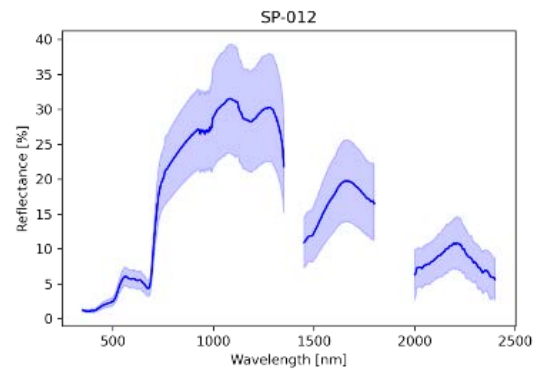


SP-022: 2018-08-
27

SP-012

Terrace, wetland
(sedges ~ 20 cm)

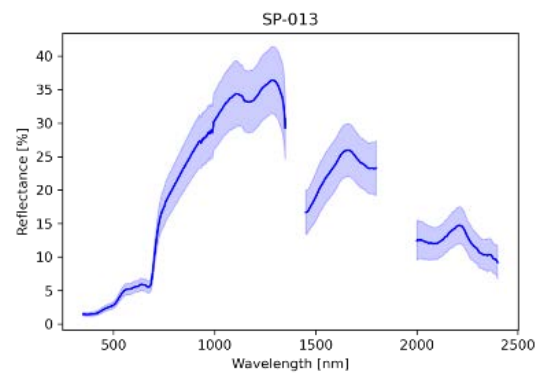
n = 73



SP-013

Yedoma upland,
wet sedge and
moss-dominated
tundra

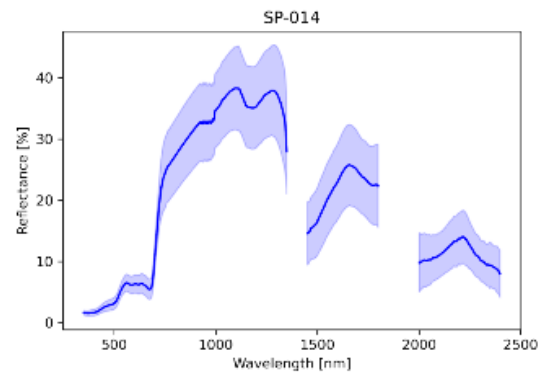
n = 106



SP-014

Disturbed slope,
grasses and
shrubs

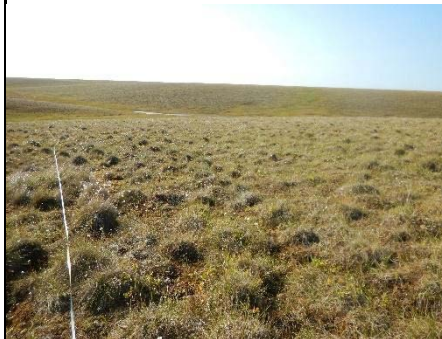
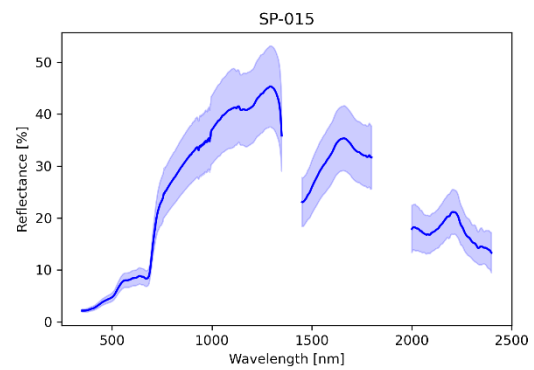
n = 120



SP-015

Tussock tundra
on drained slope,
southwest-facing

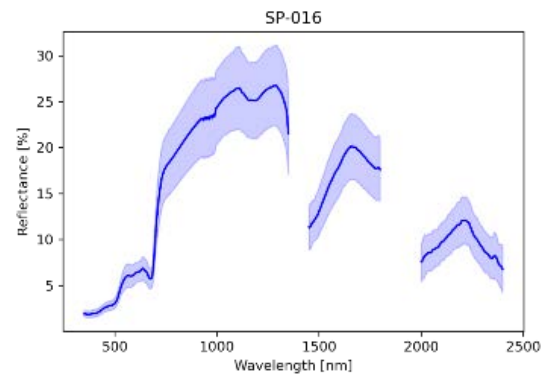
n = 106



SP-016

Floodplain, *Salix*
and mosses

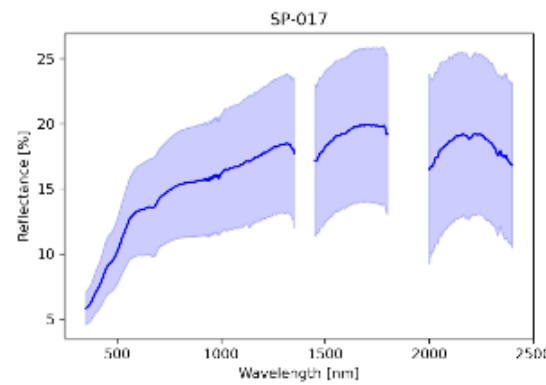
n = 116



SP-017

Floodplain, sand

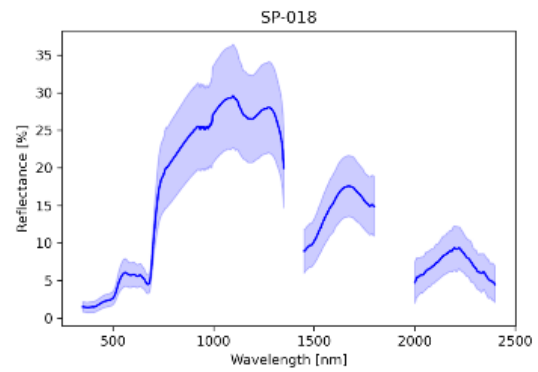
n = 50



SP-018

Floodplain,
moist, *Salix*,
Alder

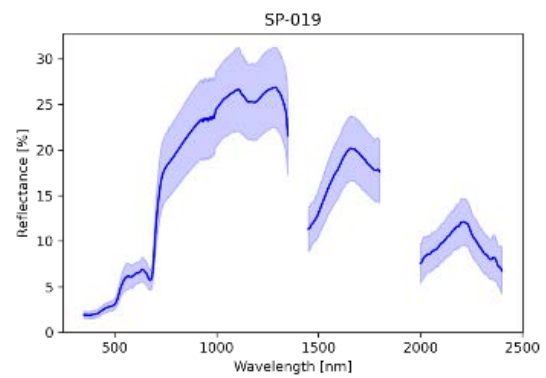
n = 106



SP-019

Floodplain, dry
elevated ridge
with shrub
communities

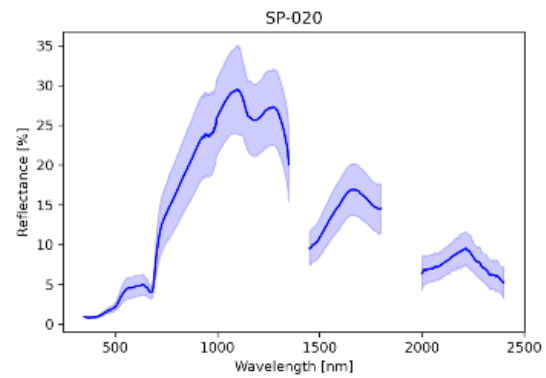
n = 106



SP-020

Drained lake
basin floor,
mosses, wetland

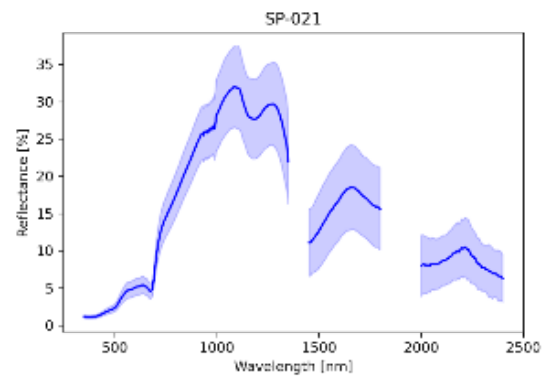
n = 106



SP-021

Drained lake
basin floor,
polygonal tundra
complex

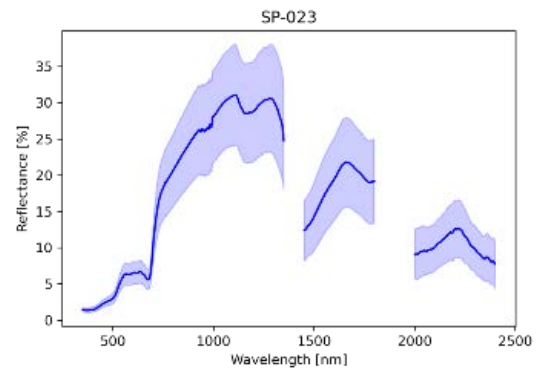
n = 113



SP-023

wet depression

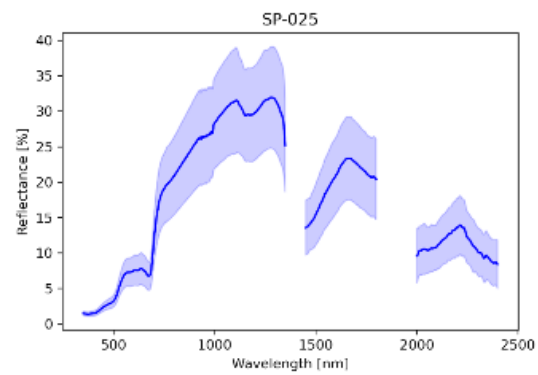
n = 118



SP-025

terrace, wetland

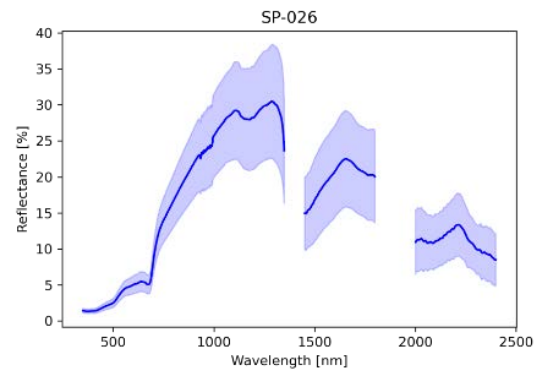
n = 106



SP-026

Yedoma upland,
wet sedge and
moss-dominated
tundra

n = 108



SP-028

Floodplain, sand

n = 109

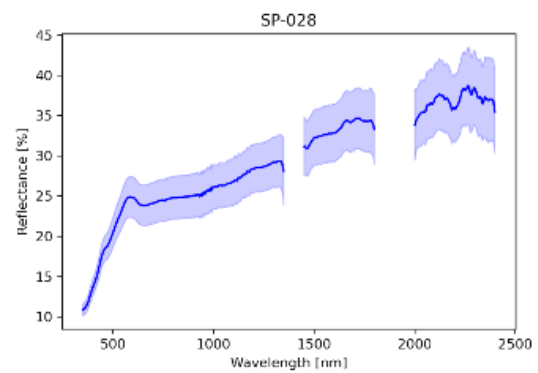


Table S6: Accuracy and precision results of the cross validation.

Class	Name	Accuracy	Precision	Correlation	Error rate	Samples
0	<i>Moist Equisetum and Shrubs on Floodplain</i>	0.999	0.987	0.990	0.001	4313
1	<i>Dry Low Shrub Community</i>	0.998	0.952	0.975	0.002	4314
2	<i>Moist to Wet Sedge Complex</i>	0.997	0.976	0.983	0.004	4315
3	<i>Wet Sedge Complex</i>	0.951	0.959	0.959	0.009	4316
4	<i>PC_50%: Wet Polygon Complex</i>	0.988	0.950	0.941	0.012	4317
5	<i>PC_20%: Moist Polygon Complex</i>	0.986	0.938	0.934	0.014	4318
6	<i>Dry Grass to Wet Sedge Complex</i>	0.981	0.949	0.949	0.010	4319
7	<i>'Sparsely Vegetated Areas'</i>	1.000	0.997	0.997	0.001	4320
8	<i>Dry Tundra Communities</i>	0.979	0.966	0.966	0.007	4321
9	<i>PC_10%: Dry Polygon Complex</i>	0.996	0.984	0.981	0.004	4322

Table S7: Cross match of the vegetation/habitat classes from the three different Lena Delta classification products discussed in the main text (Schneider et al. 2009, Bartsch et al. 2019, Lisovski et al. 2022).

Product name		Lena Delta habitat map	ESA GlobPermafrost Land Cover (selected regions)
sensor	Landsat 7 (30 m)	Sentinel-2 (10 m res.)	Sentinel-1, Sentinel-2 (20 m)
time	Summer 2000/2001	Peak summer 2018	2015 -2018
low disturbance regime land cover classes	Wet sedge and moss dominated tundra WT	Polygonal tundra complex up to 50 % water PC 50	Disturbed, including forest fire scars, seasonally inundated areas and landslide scars
	Moist grass and moss-dominated tundra MT	Polygonal tundra complex up to 20 % water PC 20	Sparse vegetation (without shrubs), mostly sandy soil; flood plains, recent landslides, also within fire scars
		Polygonal tundra complex up to 10 % water PC 10	Graminoid, prostrate dwarf shrub, patterned ground, partially bare Dry cryptogamic-crust
	Dry moss- sedge and dwarf shrub dominated tundra DMSD	Dwarf shrub - herb communities DSHH	Dry cryptogamic-crust
	Dry tussock tundra DT	Dry (tussock) tundra DT	Dry to moist prostrate to erect dwarf shrub tundra 'grassland' Moist to wet graminoid prostrate to erect dwarf shrub tundra 'grassland' Graminoid, prostrate dwarf shrub, patterned ground, partially bare 'grassland'

high disturbance regime land cover classes	Moist to dry dwarf shrub dominated tundra MDD	Dry low shrub communities DLSH	Wet to waterlogged graminoid prostrate to low shrub tundra
		Moist Equisetum and shrub communities I MESH	Floodplain, mostly fluvial
		Moist to wet sedge complex MWS	
		Wet sedge complex WS	Wet to waterlogged graminoid prostrate to low shrub tundra
	Dry grass-dominated tundra DG	Dry grass- to wet sedge complexes with low shrub communities D	Moist to wet graminoid prostrate to erect dwarf shrub tundra
very high disturbance	Mainly non-vegetated areas (NV)	Sparsely vegetated	Disturbed, including forest fire scars, seasonally inundated areas and landslide scars
		Barren, sand	





Figure S1: Spectral Evolution SR-2500 field-spectrometer measurement set-up in the Lena Delta, August 2018 (photos: M. Fuchs).

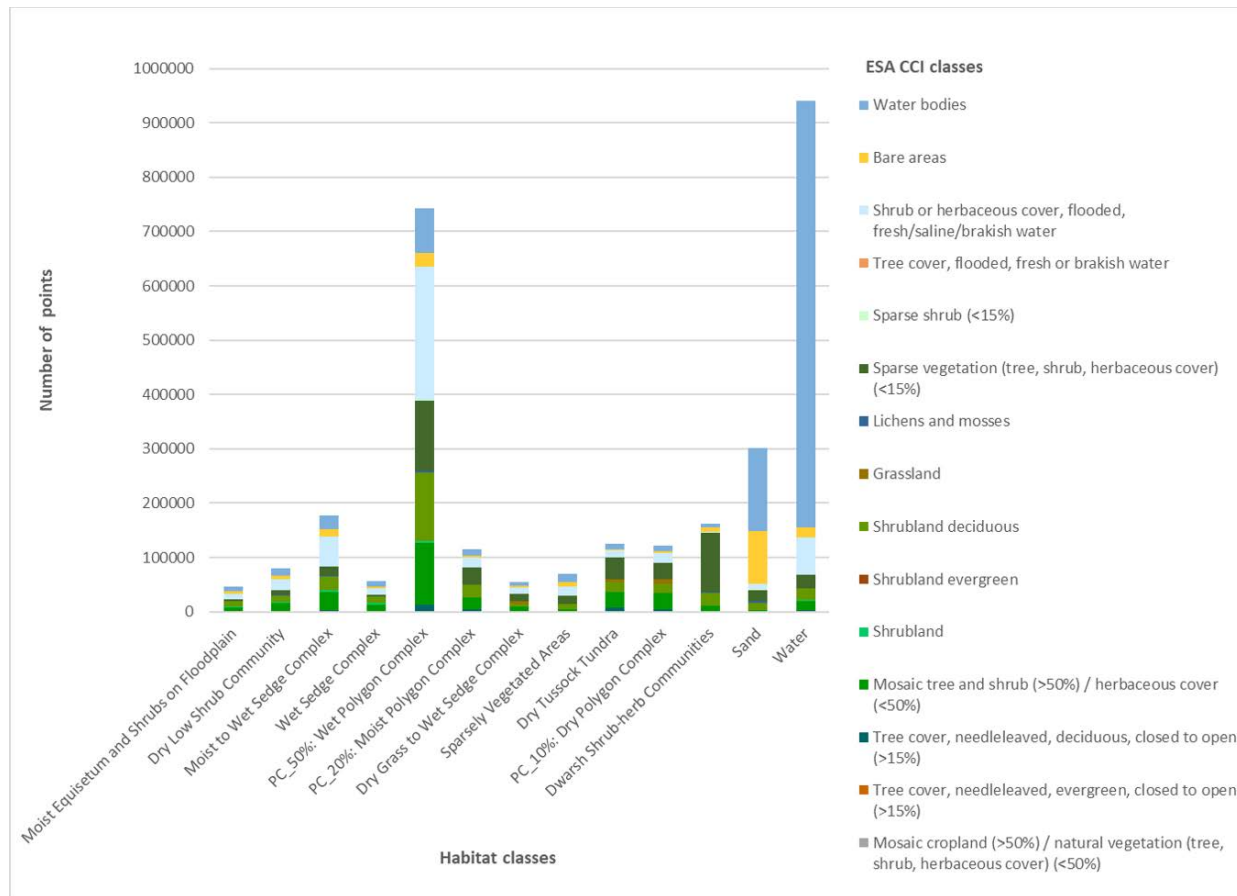


Figure S2: Comparison between the habitat classification (Dataset 5) and ESA CCI Landcover classes based on 3 million sampled points, regularly distributed in the Lena Delta.

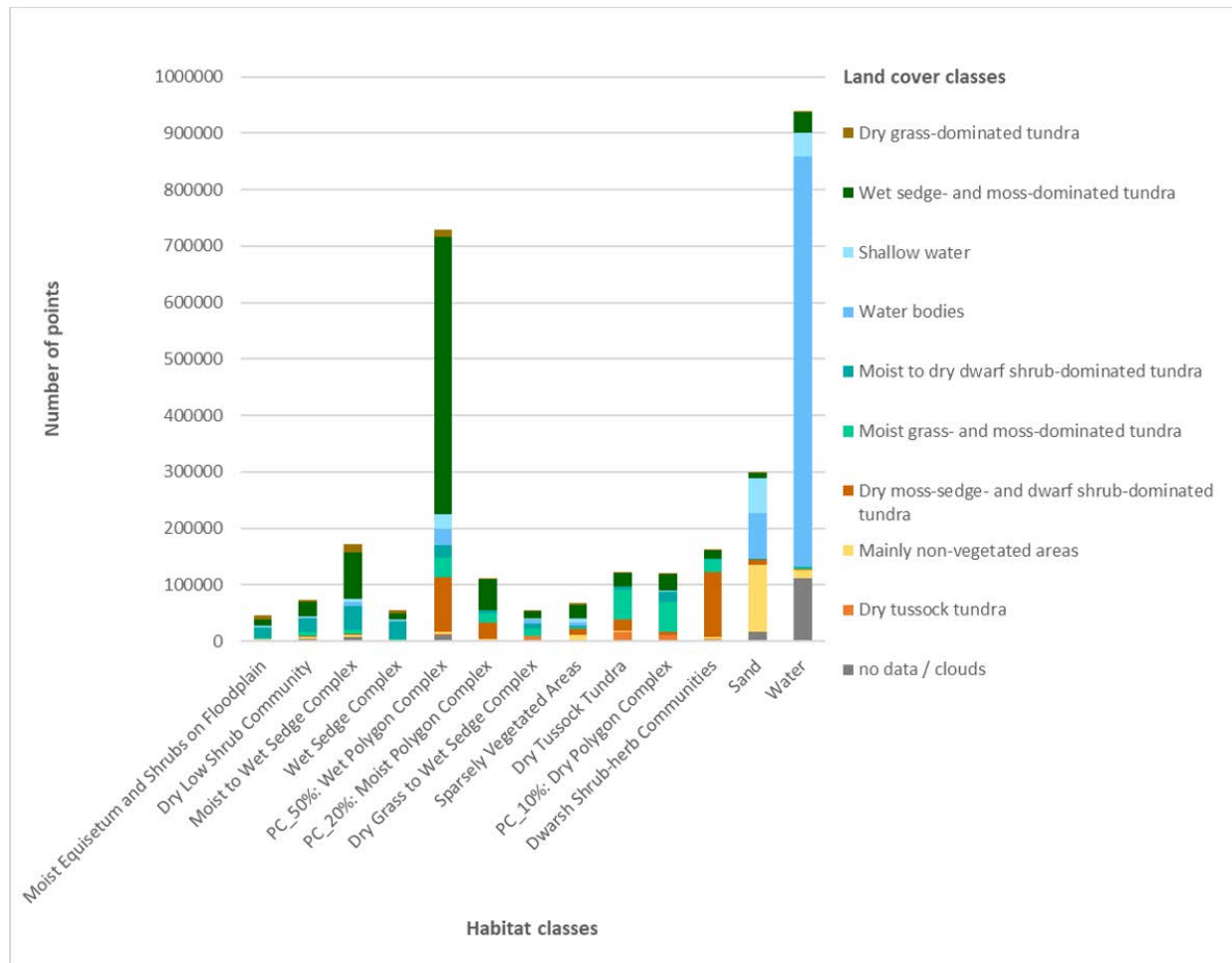


Figure S3: Comparison between the habitat classification (Dataset 5) and the land cover classification from Schneider et al. (2009) based on 3 million sampled points, regularly distributed in the Lena Delta.

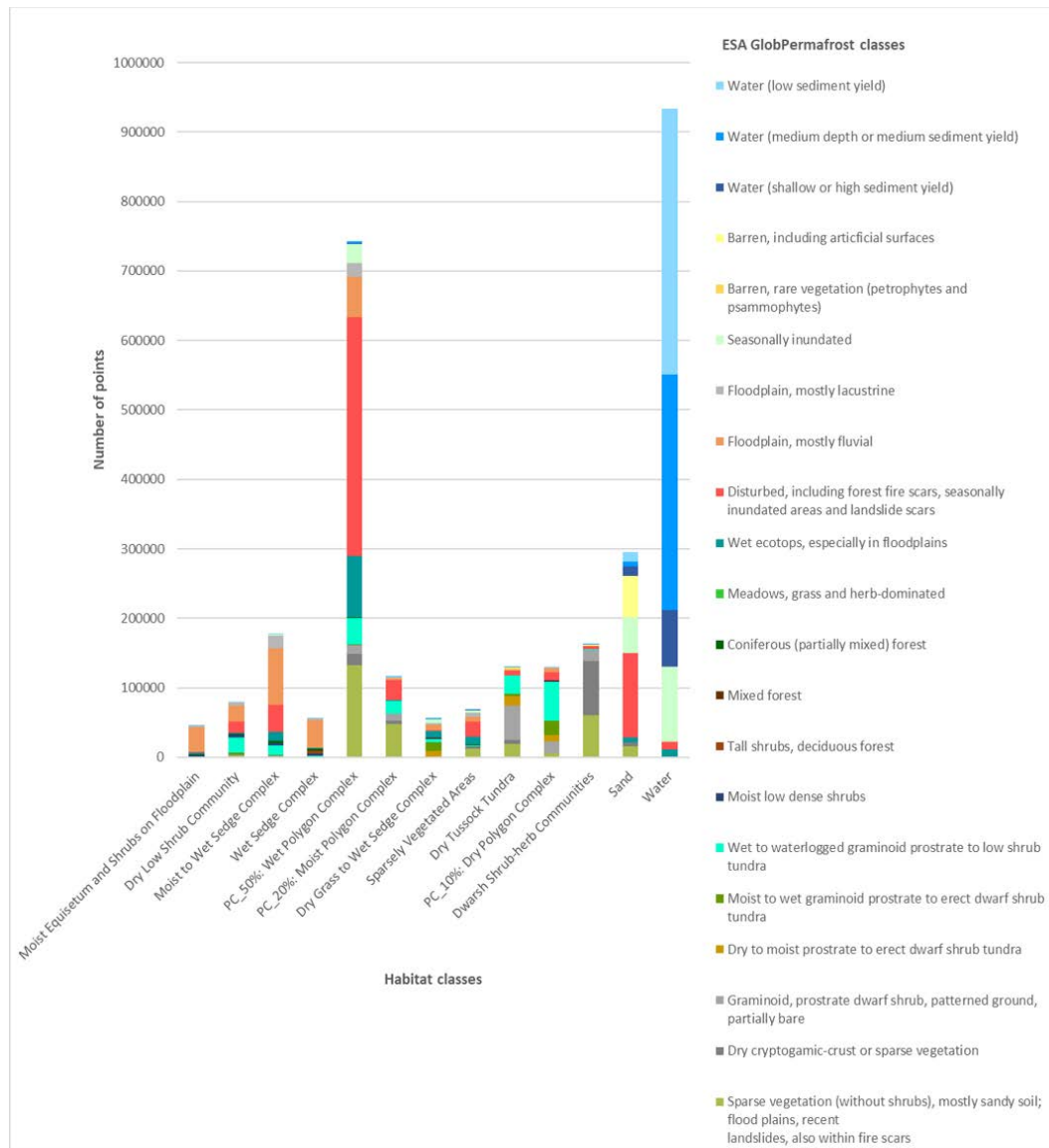


Figure S4: Comparison between the habitat classification (Dataset 5) and the land cover classification from ESA GlobPermafrost (Bartsch et al. 2019) based on 3 million sampled points, regularly distributed in the Lena Delta.

Data

Download dataset as tab-delimited text — use the following character encoding:

All files referred to in data matrix can be downloaded in one go as [ZIP](#) or [TAR](#). **Be careful: This download can be very large!** To protect our systems from misuse, we require to sign up for an user account before downloading.

1 	2  	3 	4 
Binary	Binary (Size) [Bytes]	Binary (Hash)	Content
LenaDelta_LandCoverHabitatClasses_Description.csv	2.3 kBytes	c0ab3f25a1add5281fc231ae3bf22c51	Description of Land Cover and Habitat Classes
LenaDelta_LandCoverHabitatClasses.tif	142.6 MBytes	4467483569c686f52d16a009511c20ec	Product raster file (geotif) with Land Cover Habitat Classes for the entire Lena Delta
LenaDelta_LandCoverHabitatClasses_ROI.zip	14.7 kBytes	df66b7ea08921ae7af23c86877da256f	The spatial region of interest as ESRI shapefile
LenaDelta_LandCoverHabitatClasses_TrainingDataset.csv	111.9 kBytes	b929c3e21f19f452d65da38ad28cb030	Training data set for Land Cover Habitat Classification (Longitude, Latitude, Class)
LenaDelta_SandProbability.tif	1.6 GBytes	e8d0e3f6614cd92920926dc4fbc16676	Product raster file (geotif) with Sand probability for the entire Lena Delta

Figure S5a. Example of data download for the Lena Delta habitat map (Lisovski et al, 2022, <https://doi.org/10.1594/PANGAEA.946407>).

Data

Download dataset as tab-delimited text — use the following character encoding:

All files referred to in data matrix can be downloaded in one go as [ZIP](#) or [TAR](#). **Be careful: This download can be very large!** To protect our systems from misuse, we require to sign up for an user account before downloading.

1 	2 
Binary	Content
S2A_20180806_LenaDelta_RF_landcover.tif 	the Land cover classification in geotiff format with assigned land cover classes CRS: EPSG:32652 - WGS 84 / UTM zone 52N, 2201 rows, 2930 columns, 10 m resolution; the Land Cover class band contains 12 classes
Lena_Delta_land_cover_training_classes.zip	10 training classes representing different vegetation composition (ESRI polygon shape files), covering Lena Delta 2018 expedition (LD18) vegetation plots and extended with expert knowledge from the field (file names are indicative)

Figure S5b. Example of data download for the central Lena Delta land cover map (Landgraf et al, 2025b, <https://doi.org/10.1594/PANGAEA.945056>)

Independent data for evaluation of classification

Table S8: Siewert et al. 2016 sampling locations with habitat class description and agreement with central Lena Delta habitat classification (100% overall and for all classes).

Plot Name (Siewert et al. 2016)	Landform (Siewert et al. 2016)	Habitat class (Landgraf et al.)	Longitude	Latitude	Match with central Lena Delta Habitat classification
KU-T1-01	Degraded Ice Complex	Polygonal tundra 10 % water	126.2110	72.2929	too heterogenous
KU-T1-02	Degraded Ice Complex	Polygonal tundra 10 % water	126.2128	72.2922	TRUE for shrubs
KU-T1-05	Degraded Ice Complex	Dry low shrubs	126.2176	72.2899	too heterogenous
KU-T1-06	Non-degraded Ice Complex	Polygonal tundra 20 % water	126.2187	72.2891	TRUE for polygonal tundra
KU-T1-07	Non-degraded Ice Complex	Polygonal tundra 50 % water	126.2201	72.2883	TRUE for polygonal tundra
KU-T1-08	Non-degraded Ice Complex	Polygonal tundra 50 % water	126.2212	72.2875	TRUE for polygonal tundra
KU-T1-09	Non-degraded Ice Complex	Polygonal tundra 10 % water	126.2226	72.2867	TRUE for polygonal tundra
KU-T1-10	Degraded Ice Complex	Dry grass to wet sedge complex	126.2238	72.2858	TRUE for wetland
KU-T2-01	Non-degraded Ice Complex	Dry tundra communities	126.1936	72.2903	TRUE for dry tundra
KU-T2-02	Non-degraded Ice Complex	Dry tundra communities	126.1922	72.2895	TRUE for dry tundra
KU-T2-03	Degraded Ice Complex	Dry tundra communities	126.1908	72.2887	TRUE for dry tundra
KU-T2-04	Degraded Ice Complex	Dry tundra communities	126.1893	72.2879	TRUE for dry tundra
KU-T2-05	Degraded Ice Complex	Polygonal tundra 10 % water	126.1880	72.2871	too heterogenous
KU-T2-06	Degraded Ice Complex	Dry tundra communities	126.1872	72.2863	TRUE for dry tundra
KU-T2-07	Degraded Ice Complex	Dry tundra communities	126.1853	72.2855	too heterogenous
KU-T2-08	Holocene Terrace	Polygonal tundra 50 % water	126.1840	72.2847	too heterogenous
KU-T2-09	Holocene Terrace	Polygonal tundra 50 % water	126.1826	72.2839	TRUE for polygonal tundra
KU-T2-10	Holocene Terrace	Polygonal tundra 50 % water	126.1811	72.2831	TRUE for polygonal tundra
KU-T3-01	Holocene Terrace	Sand	126.4430	72.3871	TRUE for sand
KU-T4-01	Non-degraded Ice Complex	Polygonal tundra 10 % water	126.1410	72.3539	TRUE for polygonal tundra
KU-T4-01b	Non-degraded Ice Complex	Polygonal tundra 10 % water	126.1409	72.3538	TRUE for polygonal tundra
KU-T4-02	Non-degraded Ice Complex	Polygonal tundra 20 % water	126.2496	72.3293	TRUE for polygonal tundra
LF-T1-01	Holocene Terrace	Polygonal tundra 20 % water	126.3902	72.3794	TRUE for polygonal tundra
LF-T1-02	Holocene Terrace	Polygonal tundra 50 % water	126.3940	72.3808	TRUE for polygonal tundra
LF-T1-03	Holocene Terrace	Polygonal tundra 50 % water	126.3977	72.3822	TRUE for polygonal tundra
LF-T1-04	Holocene Terrace	Polygonal tundra 50 % water	126.4015	72.3836	TRUE for polygonal tundra
LF-T1-05	Holocene Terrace	Polygonal tundra 20 % water	126.4054	72.3850	TRUE for polygonal tundra
LF-T1-06	Floodplain	Moist to wet sedge complex	126.4090	72.3864	TRUE for wetland
LF-T1-07	Floodplain	Moist to wet sedge complex	126.4126	72.3877	TRUE for wetland
LF-T1-08	Floodplain	Moist to wet sedge complex	126.4167	72.3890	TRUE for wetland
LF-T1-09	Floodplain	Moist to wet sedge complex	126.4212	72.3903	TRUE for wetland
LF-T1-09b	Floodplain	Moist equisetum and shrubs	126.4256	72.3888	too heterogenous
LF-T1-10	Floodplain	Moist to wet sedge complex	126.4255	72.3915	TRUE for wetland
LF-T2-01	Holocene Terrace	Polygonal tundra 50 % water	126.4071	72.3805	TRUE for polygonal tundra
LF-T2-01b	Holocene Terrace	Polygonal tundra 50 % water	126.4071	72.3805	TRUE for polygonal tundra
LF-T3-01	Alluvial Sediment	Sand	126.4431	72.3971	TRUE for sand
LF-T3-02	Alluvial Sediment	Sand	126.4416	72.3971	TRUE for sand

LF-T3-03	Alluvial Sediment	<i>Sparsely vegetated</i>	126.4401	72.3972	<i>too heterogenous</i>
LF-T3-04	Alluvial Sediment	<i>Sparsely vegetated</i>	126.4385	72.3973	<i>too heterogenous</i>
LF-T4-01	Alluvial Sediment	<i>Sand</i>	126.4626	72.4280	<i>TRUE for sand</i>
LF-T4-02	Alluvial Sediment	<i>Sparsely vegetated</i>	126.4628	72.4271	<i>too heterogenous</i>
LF-T4-03	Alluvial Sediment	<i>dry low shrubs</i>	126.4628	72.4263	<i>too heterogenous</i>
LF-T4-04	Floodplain	<i>Moist equisetum and shrubs</i>	126.4630	72.4253	<i>too heterogenous</i>
LF-T4-05	Floodplain	<i>Moist equisetum and shrubs</i>	126.4631	72.4245	<i>too heterogenous</i>
LF-T4-06	Floodplain	<i>Moist to wet sedge complex</i>	126.4633	72.4236	<i>too heterogenous</i>
LF-T4-07b	Floodplain	<i>Moist to wet sedge complex</i>	126.4629	72.4226	<i>too heterogenous</i>
LF-T4-07c	Floodplain	<i>Moist to wet sedge complex</i>	126.4643	72.4227	<i>too heterogenous</i>
LF-T4-08	Holocene Terrace	<i>Polygonal tundra 50 % water</i>	126.4643	72.4217	<i>TRUE for polygonal tundra</i>
LF-T4-09	Holocene Terrace	<i>Polygonal tundra 50 % water</i>	126.4638	72.4209	<i>TRUE for polygonal tundra</i>
LF-T4-10	Holocene Terrace	<i>Dry grass to wet sedge complex</i>	126.4632	72.4200	<i>too heterogenous</i>

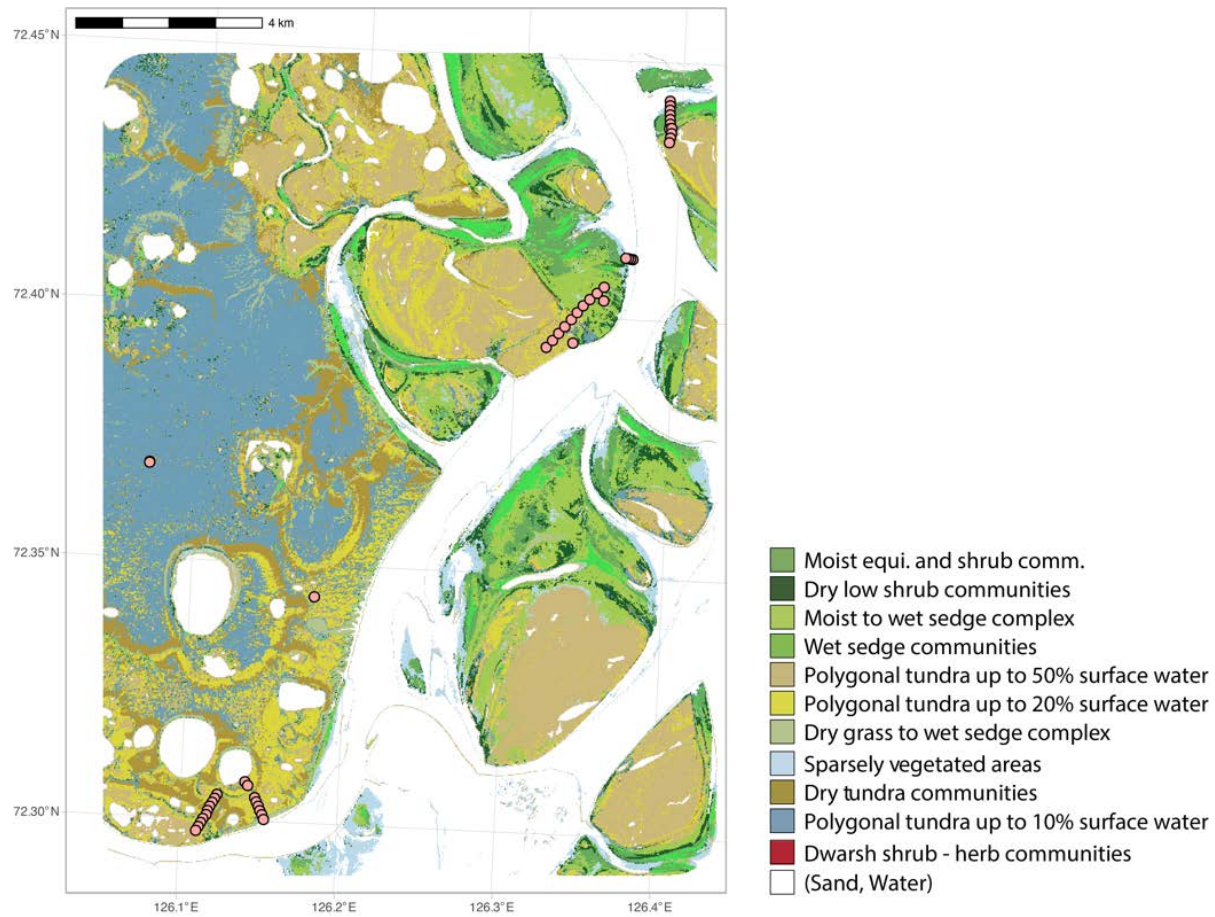


Figure S6: Subset of the central Lena Delta with the Siewert et al. 2016 sampling locations (circles), used for independent habitat classification evaluation.

Lena Delta Habitat Classification - visual/qualitative evaluation

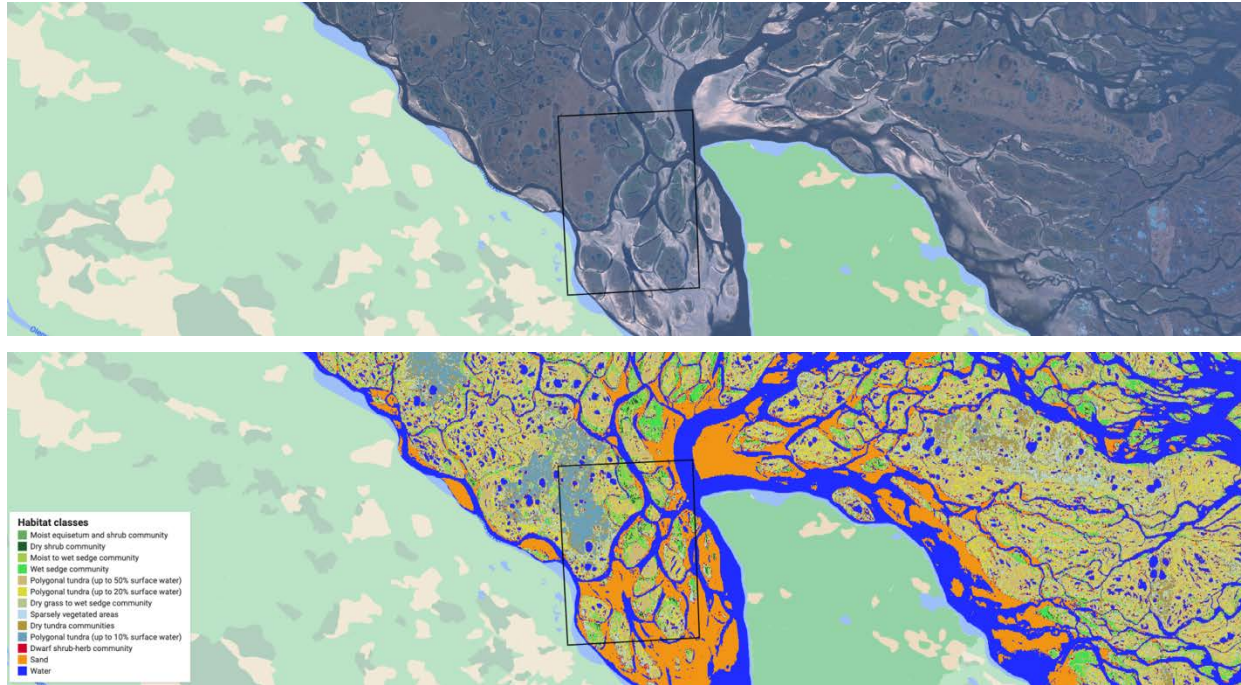


Figure S7. Sentinel-2 RGB composite (median of Sentinel-2 images from June to September 2018) and Lena Delta Habitat Classification (bottom) around the central Lena Delta training area (rectangle). The subregion highlights the representativeness of the central Lena Delta for the larger area in the south. The habitats are highly repetitive with clear geomorphological features (e.g. lakes, polygonal tundra on the terrace plateaus, low wet areas in valleys and on floodplains, etc.). Larger patches of polygonal tundra (north western part of the training area) are well classified also in areas further to the north west. Wet sedge communities on lowland areas are classified in river valleys and on the floodplains (clearly greener parts in the RGB picture on top). Sandy areas are also well classified throughout the shown subset.

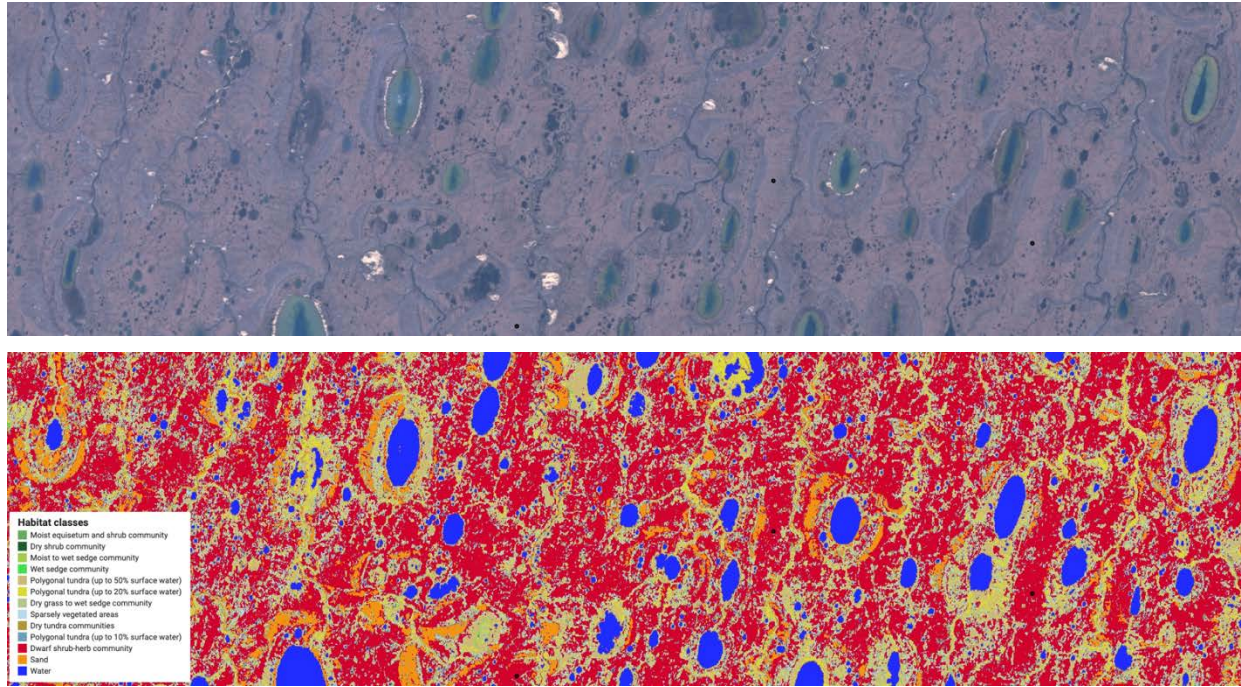


Figure S8. Sentinel-2 RGB composite (median of Sentinel-2 images from June to September 2018) and Lena Delta Habitat Classification (bottom) from the north west of the Lena Delta on the 2nd Lena Delta terrace. We defined the ESUs (training pixels) for the dwarf shrub-herb community (black points) based on expert knowledge from former AWI expeditions and expedition reports and highly dry patches in the S-2 SWIR bands. The two images highlight the abundance of this habitat class on the 2nd Lena Delta terrace. Dwarf shrub-herb communities cover the terrace plateau that is dissected by thermokarst basins and erosional valleys partly exhibiting open areas of sand (well classified). Towards the lower drainages and towards the lake, the surface gets wetter and the classification shows that basin floors are covered partly by polygonal tundra type habitats.

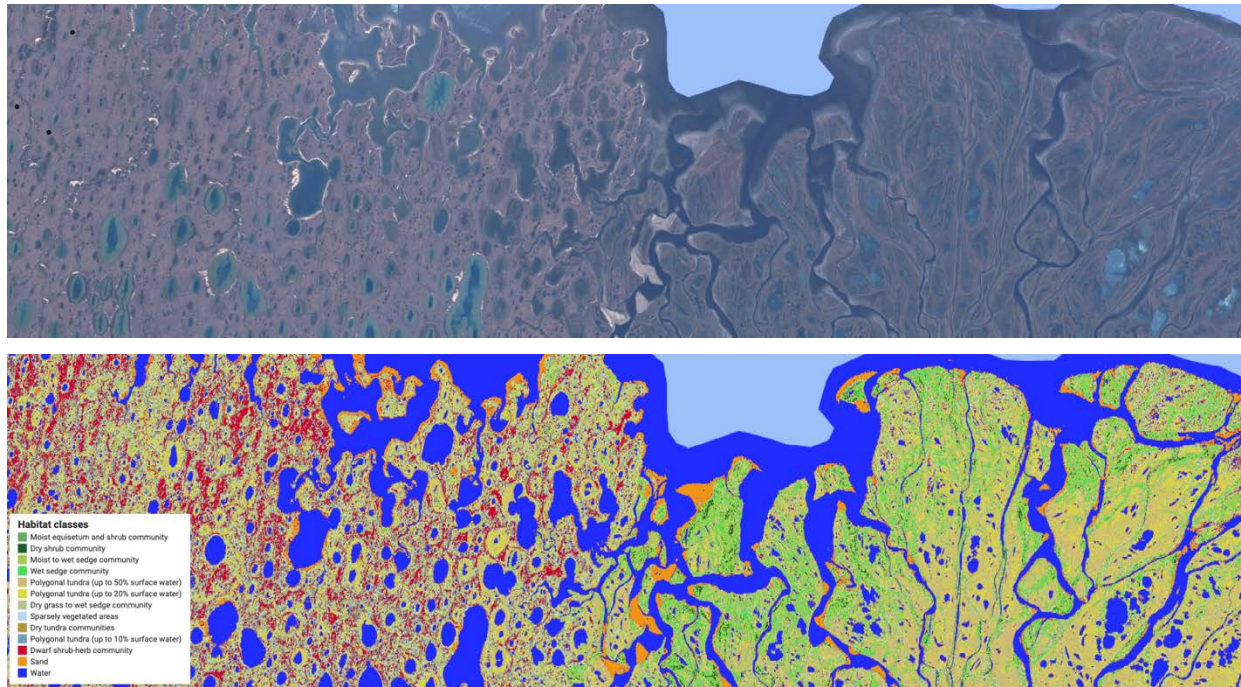


Figure S9. Sentinel-2 RGB composite (median of Sentinel-2 images from June to September 2018) and Lena Delta Habitat Classification (bottom) from the northern part of the Delta and the transition between the second (west) and the first (east) terrace. The first terrace, which comprises the Holocene fluvial terraces and the active floodplains, is the youngest and most active part of the delta. This main terrace predominantly consists of ice wedge-polygonal tundra and sandy and vegetated floodplains (well classified in bottom figure). The second main terrace, located in the northwestern part, contains mostly sandy, comparably well-drained soils with low ground-ice content and is dominated by the dwarf shrub-herb community (well classified in bottom image).

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