YUKON-CHARLEY RIVERS NATIONAL PRESERVE

White Sweet Clover Reconnaissance & Hand Pulling Trial

Summary Trip Report

July 20-28, 2021



Author: Danielle Knapp

August 2021

PURPOSE

The purpose of this work was to continue a preliminary survey for white sweet clover extent in Yukon-Charley Rivers National Preserve after its initial discovery during the summer of 2019 by a state biologist. In 2021, the field crew looked for white sweet clover between Circle and Slavens, then conducted a hand-pulling control trial near Rock of Ages.

PERSONNEL

Danielle Knapp: Project lead, identification of and navigation to sites with high risk for colonization, riverbank and gravel bar scouting, spatial data collection and processing, reporting, identification of hand-pulling trial sites

Jared Hughey: Piloting the river, riverbank and gravel bar scouting, data collection, hand-pulling white sweet clover, co-leading field trip

Chelonia Jones: Riverbank and gravel bar scouting, data collection, hand-pulling white sweet clover

Cassandra Brown: Riverbank and gravel bar scouting, data collection, hand-pulling white sweet clover

Don Corwin: Transport of white sweet clover after hand-pulling trial

Anna O'Brien: Invasive Species specialist, methods support

Amy Larsen: Support and oversight

ACCESS

A river boat was taken from the Fairbanks Administrative Center (FAC), launched from Circle, and driven up and down the river to Eagle and back over the course of eight days.

CAMPING AND LODGING

Gravel bars were primarily used for camping, barring stays at Slavens public use cabin two nights and the Bluff house in Eagle one night.

SAFETY CONSIDERATIONS

Having relatively recent tracks for navigation from a boat driver experienced with the river is important, as is being able to read the river. Boat driver fatigue, especially in poor weather conditions, was and should be managed by having multiple personnel capable of driving the boat, switching off duties. Life jackets should be worn at all times when on the boat, as any accident involving someone in the river can result in cold shock and disorientation, even if they are a capable swimmer. Emergency gear, water filters, extra oil and gas, and tools should be carried on the boat for on-the-fly maintenance and troubleshooting. The ATEC Hydro Lite at the FAC, loaded with four personnel and gear, made it from Circle to Eagle on 45 gallons of gas – but 10 extra gallons were carried in jerry cans (55 gallons total).

WEATHER PATTERNS

Weather was generally hot and sunny (70s), with the final day drizzling most of the day. Several pop-up high wind spells necessitated hasty securing of camp items during two of the nights.

PHENOLOGY

Mid-late July was an excellent time to search for white sweet clover, as it was in full bloom as were the wildflowers it was cohabiting with (goldenrod, grass of Parnassus, alpine sweet-vetch). In 2020, patches of white sweet clover were relatively easy to spot from the boat even without binoculars once our eyes were trained for it. However, many of the white sweet clover plants observed in 2021 may have been in an "off" year for blooming, as far fewer 2nd year tall, flowering plants were observed. In areas that were large blooming stands last year, we did find many small, young plants coming up. There was substantial ice damage to gravel bars in the spring of 2021, which may have scoured and set back older plants, as an additional explanation to our observations of fewer tall, blooming 2nd year plants.

ANIMAL OBSERVATIONS

Peregrine falcons were active on the bluffs, as were gulls. Many of the gravel bars we visited had extensive moose tracks, and we did see several adults with young. Kandik public use cabin had an active beaver lodge. One of the islands we visited also had relatively fresh, small bear tracks. We observed at least 7 black bears on the bluffs throughout the Preserve. Frogs were active at several sites and public use cabin lawns visited. Many pollinators were observed on wildflowers including white sweet clover.



Bumble bee visiting white sweet clover. Photo credit: S. Swanson

PROJECT SUMMARY AND OBSERVATIONS

In July 2021, aquatic ecologist Danielle Knapp, biological technician Jared Hughey, and Alaska Natives in Science and Engineering (ANSEP) Interns Cassandra Brown and Chloe Jones continued a survey of Yukon-Charley Rivers National Preserve for white sweet clover (*Melilotus albus*). A terrestrial invasive plant, it was discovered by a state biologist in the preserve in 2019 (65.14304, -141.67322°; Site # YUCH2020-016 in photos and map below). Prior to this discovery, white sweet clover had only been observed upstream of the preserve, on gravel bars between Dawson and Eagle. This year, the field crew met state biologists who grew up and currently work on the Yukon River in the Eagle area who remember seeing white sweet clover in Dawson 20 years ago. Locals have noticed that stands of white sweet clover have appeared in excavated and regularly plowed areas (S. Sagar, personal communication, July 2021). The tall, flowering plant is commonly found along Alaska's road system, river corridors, and publicly trafficked areas. It colonizes sunny, well drained areas where the soil has been disturbed. Roadways, boat launches, and riverbanks are ideal habitat for its establishment due to continuous disturbance to the soil via human activity and water movement. In Alaska, white sweet clover has been observed to colonize gravel bars in braided rivers and small areas of erosion along shorelines (Conn et al. 2008). The purpose of conducting this survey was to determine how prevalent the plant is within the preserve, and document the location and size of any found populations. This information can be used to develop a management plan and help park staff understand how it is transported, how aggressively the plant is spreading, and whether it is causing harm to the ecosystem.

In 2020, Knapp and biological technician Sarah Swanson documented populations of white sweet clover just upriver of the preserve at the boat ramp in Eagle (Figure 1), the boat launch at Eagle village (Figure 2), and along the road connecting the two communities.





(Left): Knapp with white sweet clover at the Eagle boat ramp, 2020. Photo credit: S. Swanson
(Right): Eagle village boat launch area with white sweet clover, 2020. Photo credit: D. Knapp

In 2021, the area by the main Eagle boat ramp had been cut by a private landowner, and ice action and/or the cyclical nature of white sweet clover's life cycle caused the crew to observe almost no flowering plants at the Eagle village boat launch area.





(Left): In 2021, the white sweet clover near the Eagle boat ramp had been cut by a private landowner. Photo credit: D. Knapp
(Right): Eagle village boat launch area, 2021. Photo credit: D. Knapp

However, the crew drove out the road to the new Eagle village, where flowering white sweet clover was observed.





(Left): White sweet clover on the road leading to the new Eagle village, 2021.
(Right): Open area with several white sweet clover plants intermixed with wildflowers near the Eagle Village boat ramp, 2021.

White sweet clover was also observed along the road between Tok and Eagle in 2020, which is likely a route of transit from the Alaska and Richardson Highways. Seeds from adult plants (Figure 3) may have spread via the movement of the river, wildlife, or preserve visitors launching from the Dawson or Eagle area.



Figure 3. White sweet clover going to seed. Photo credit: S. Swanson

In 2021, the field crew searched for, but did not find, white sweet clover around the Circle boat ramp and did not find the plant in Circle.





(Left) Vegetation absent of white sweet clover at the Circle boat ramp, 2021
(Right) The field crew searches for white sweet clover in Circle, 2021

The field crew used binoculars to search the river shorelines and gravel bars as the team boated between Circle and Slavens Roadhouse. At several gravel bars that appeared ideal for camping and at public use cabins, the crew performed ground searches for white sweet clover on foot. No white sweet clover was found between Circle and Slavens Roadhouse in 2021. Only one additional site with white sweet clover was found on an island near Eagle, across from Calico Bluff. The site is an ideal camp location, and bear tracks were also observed signifying wildlife travel to and from the island. This additional site brings the total known sites up to eight locations, as seven white sweet clover sites were identified within the preserve in 2020. However, the original discovery location documented in 2019, which was hand-pulled in 2020, did not appear to have white sweet clover on site this year.



(Left) Original discovery site, 2020 (Right) Original discovery site, 2021 after manual removal in 2020 and ice scouring in spring 2021.

This may be in part due to ice scouring on the island in the spring of 2021. The furthest downstream population of known white sweet clover remains at 55 river miles downstream from Eagle, on an island in the vicinity of Rock of Ages. This population was the target of a hand-pulling trial in 2021.

In both 2020 and 2021, the most common settings for white sweet clover colonization were open gravel bars and sunny shorelines; no colonizations were found at any of the public use cabins. White sweet clover was found co-habiting with other sun-loving wildflowers such as northern goldenrod (*Solidago multiradiata*), alpine sweet-vetch (*Hedysarum alpinum*), and grass of Parnassus (*Parnassia palustris*). It tended to persist in open areas, and substantially thinned and/or disappeared completely as the shoreline transitioned inland to alder and willow. No white sweet clover was found at the bases of bluffs, landslides and steep slopes commonly encountered along the Yukon River within the preserve. In 2021, we observed a decrease in the number of tall, flowering white sweet clover plants throughout the colonized areas. This may be due to “on” and “off” years in the white sweet clover life cycle (more first year plants one year, more tall flowering second year plants the next), and could also be impacted by the ice scouring in the spring of 2021. However, small first year plants were abundant in areas that did have tall, flowering plants in 2020.



A carpet of first year white sweet clover, 2021, in an area that had a large stand of tall, flowering plants in 2020 on an island near Rock of Ages.



A typical shoreline colonized by white sweet clover, 2020. Photo credit: D. Knapp



The same shoreline, 2021. Photo credit: D. Knapp

INFORMATION & LOCATION OF EXISTING WHITE SWEET CLOVER POPULATIONS

Site	Latitude	Longitude	Acres	% Cover	Removed?	Comments
YUCH2020-001	64.93449	-141.30662	0.25	15	No	Rocky shoreline with pioneer species
YUCH2020-002	65.055349	-141.36609	0.70	5	No	Wood Island-willows and mud; southern part of the island is frequently camped
YUCH2020-009	65.243514	-141.9045	0.86	5	No	Island with some flowers and willow/alder, mostly mud
YUCH2020-010	65.244849	-141.90349	0.83	40	No	Inside area of small island, large patch present
YUCH2020-011	65.245492	-141.90236	0.54	25	No	Other side of island (010), more rocky terrain
YUCH2020-013	65.244959	-141.90109	1.34	2	No	Upriver tip and river right side of island (010); sporadically in understory of willows
YUCH2020-016	65.143086	-141.67322	0.26	10	Yes	Site of original discovery
YUCH2020-017	65.107919	-141.52987	3.34	1	No	Heavily tented sand bar
YUCH2020-018	65.06722	-141.38355	0.09	2	No	Island below larger Wood Island patch, muddy bank with other flowers
YUCH2020-019	64.93361	-141.29942	0.01	20	No	Bar across from 40 mile river convergence
YUCH2021-007	64.9122	-141.1805	0.02	2	Partial	Sandy island across from Calico Bluff

HAND-PULLING CONTROL TRIAL & FEASIBILITY OF MANAGEMENT

In 2021, hand-pulling trials were conducted to help determine the feasibility of slowing the spread of white sweet clover, and resources required to do so. Two by two meter plots were set up in low (1-30% cover), medium (31-60% cover), and high (>60% cover) density stands of the invasive. General age structure of the plant within the plots was recorded, as well as the time it took to hand-pull the plot. Based on the field crew's experience, it became evident that hand-pulling first year white sweet clover (small plants, close to the ground) is not sustainable or efficient. However, if control measures are pursued, the pulling or weed whacking of the tall, 2nd year flowering plants could be a more viable option to help prevent seeding. Pulling larger, flowering plants took less time and removed the plants that would seed in the fall.

WHITE SWEET CLOVER HAND-PULL TRIAL TIMES AND VOLUMES

Density	Age structure	# of Plots	Average time to remove plants	% of 55 gallon garbage bag filled
Low	Mostly 1st year	1	44 min	10%
Low	Mostly 2nd year	4	24 min	15%
Medium	Mostly 1st year	2	1 hr 8 min	16%
Medium	Mostly 2nd year	2	35 min	15%
High	Mostly 1st year	3	2 hrs, 8 min	15%
High	Mostly 2nd year	1	36 min	67%





(Left) Hughey pulling a 2 meter x 2 meter plot containing a high density of 1st year plants
(Right) All white sweet clover plants pulled from the plot after 2 hours and 6 minutes



Brown pulling a high density plot of mixed 1st and 2nd year plants. It took 2 hours and 54 minutes to remove all white sweet clover from this 2 meter x 2 meter plot



Hughey and Jones with 13 2 meter x 2 meter plots' worth of white sweet clover, ready for disposal

NPS communicated with State of Alaska staff to ensure compliance with state regulations to conduct invasive species management work on gravel bars of the Yukon River within the Preserve. While in Eagle, the crew also received public help and input regarding white sweet clover from the Alaska Department of Fish & Game fisheries biologists that run the fish camp just upstream of the preserve. Fish biologist Mike McDougall and Sonja Sagar identified areas where they had seen white sweet clover within the preserve on a map, and expressed concern over the potential use of herbicides on the river's gravel bars due to sensitivities of the fry of recovering salmonid species.

MANAGEMENT RECCOMMENDATIONS

Continued monitoring of the identified sites and surrounding river banks and gravel bars is recommended to better understand spread and aggressiveness of white sweet clover in Yukon-Charley Rivers National Preserve. Based on 2021 findings and information from the AKR Invasive Species

Specialist Anna O'Brien, large flowering white sweet clover plants may have "on" years and "off" years. In "on" years (as in 2020), tall flowering plants are abundant and easy to spot from the river. In "off" years (as in 2021), white sweet clover was much more difficult to spot from the river because many of the infested areas were reduced to mostly first year, short non-flowering plants.

Most of the populations within the Preserve are well established and generally seem to be co-existing with native vegetation at the time of these surveys. Complete eradication efforts are unlikely to be successful due to large seed banks (Conn et al. 2008) and the difficulty of eliminating all young plants. Several management options are available to slow the spread, and could be considered by the Preserve:

1. **Develop invasive species management plan**. A management plan would provide guidance on best management practices and preferred eradication/control methods.
2. **Incentivize private land owner(s) to continue mowing the large white sweet clover patch at the main Eagle boat ramp.** This one activity is one of the most important options to slow the additional spread of seeds into the Preserve. Subsequent mowing of young plants at boat launches/road crossings can help prevent further seeding of the area (Nooker 2020).
3. **Work with Eagle and Eagle village to install boot brushes with informational signs at boat launches.** Boot brushes can help prevent seeds from getting on and off the boat at the launch.
4. **Canada populations.** During discussions with community members we learned that white sweet clover is also a problem in Dawson and may be coming downstream. We would recommend leadership investigate what the Canadian strategy is on managing WSC populations.
5. **Hand pulling 2nd year plants.** Field crews could spend time pulling large flowering plants on islands with known populations of white sweet clover. This would reduce the following year's seed bank and slow the spread. Hand pulling activities should be done in mid-July when flowering plants are easily spotted, but haven't started going to seed. Hand-pulling activities after seeds have turned red/brown should be avoided to prevent further accidental spread.
6. **Explore use of alternative control methods.** Flame weeding has not been trialed, but could be effective for destroying smaller, first-year plants. This method could be trialed in the springtime, or July while being conscientious of burn bans.
7. **Re-survey known populations**. Surveys would more easily be done during an "on" year, when the older plants are abundant and flowering. Re-estimating areal coverage of each population could help park staff to determine whether or not populations are remaining constant, growing, or shrinking. Repeat photos taken in the same location (coordinates above) from the same perspective can also help determine the river's influence on white sweet clover patches.
8. **Continue monitoring public use cabins**. No white sweet clover has been identified at any public use cabins within Yukon-Charley Rivers National Preserve at this time; however, its appearance at any of these sites could increase chances for further spread due to human traffic. Continued mowing/weed whacking at the public use cabins will help reduce spread of this and other terrestrial invasive plants.
9. **Herbicide treatment** of white sweet clover populations could be a viable option around boat launches and terrestrial areas away from the river, but should be treated as a last resort on gravel bars and islands within the river. Due to the dynamic nature of the Yukon and proximity to water, herbicides and byproducts will enter the river if applied on gravel bars. From an aquatic ecology perspective, there are concerns with commonly used herbicides regarding effects to non-target species, including reductions in native aquatic plants and unknowns

surrounding endocrine disruption in amphibians and fish, among other unknown effects (McDougall and Sagar 2021, Islam et al. 2018, WDNR 2012).

REFERENCES

J. S. Conn, K. L. Beattie, M. A. Shephard, M. L. Carlson, I. Lapina, M. Hebert, R. Gronquist, R. Densmore & M. Rasy (2008) Alaska Melilotus Invasions: Distribution, Origin, and Susceptibility of Plant Communities, Arctic, Antarctic, and Alpine Research, 40:2, 298-308, DOI: 10.1657/1523-0430(06-007)[CONN]2.0.CO;2

"Sturgeon v. Frost." Oyez, www.oyez.org/cases/2018/17-949. Accessed 1 Sep. 2021.

J. Nooker (2020), Personal Communication. Conservation Biologist and Research Scientist, Wisconsin Department of Natural Resources

M. McDougall and S. Sagar (2021), Personal communication.

F. Islam, J. Wang, M. A. Farooq, M. S.S. Khan, L. Xu, J. Zhu, M. Zhao, S. Muños, Q. X. Li, W. Zhou. 2018. Potential impact of the herbicide 2,4-dichlorophenoxyacetic acid on human and ecosystems. Environment International. Volume 111, Pages 332-351, ISSN 0160-4120, https://doi.org/10.1016/j.envint.2017.10.020

Wisconsin Department of Natural Resources. 2012. 2,4-D Chemical Fact Sheet. DNR PUB-WT-964. https://dnr.wi.gov/lakes/plants/factsheets/2,4-DFactSheet.pdf

DATA ACCESS

Geospatial data and photos accessible in the IRMA Data Portal, Code #2283865. Maps, photos, write-ups, and a geodatabase including points and areas of white sweet clover colonization are also available on the YUGA network drive K:\White Sweet Clover in YUCH

SITE PHOTOS



Property near Eagle Boat Ramp, Present, 2020



Property near Eagle Boat Ramp, Present, 2021



Eagle Village Boat launch, Present, 2020



Eagle Village Boat Launch, Present, 2021



Circle Boat Ramp, Absent, 2021



YUCH2020-001: Present, 2020



YUCH2020-001: Present, 2021



YUCH2020-002: Present, 2020



YUCH2020-002: Present, 2021



YUCH2020-003: Absent, Kandik public use cabin, 2020



YUCH2020-004: Absent, Biederman’s cabin, 2020



YUCH2020-005: Absent, Slavens Roadhouse, 2020



YUCH2020-006: Absent, 2020



YUCH2020-007: Absent, 2020



YUCH2020-008: Absent, Glenn Creek Cabin, 2020



YUCH2020-009: Present, 2020



YUCH2020-009: Present, 2021



YUCH2020-010: Present, 2020



YUCH2020-010: Present, 2021



YUCH2020-011: Present, 2020



YUCH2020-011: Present, 2021



YUCH2020-012: Present, 2020



YUCH2020-013: Present, 2020



YUCH2020-013: Present, 2021



YUCH2020-014: Absent, 2020



YUCH2020-015: Absent, Nation Bluff Cabin, 2020



YUCH2020-016: Present, original discovery site, 2020



YUCH2020-016: Absent, original discovery site, 2021. All plants found were removed by hand from this site in 2020, and river action scoured the area of the gravel bar that was populated by the plant in spring of 2021. A combination of these events likely led to the absence of white sweet clover observed in 2021.



YUCH2020-017: Present, 2020



YUCH2020-017: Present, 2021



YUCH2020-018: Present, 2020



YUCH2020-018: Present, 2021



YUCH2020-019: Present, 2020



YUCH2020-019: Present, 2021



YUCH2021-001, Absent



YUCH2021-003, Absent



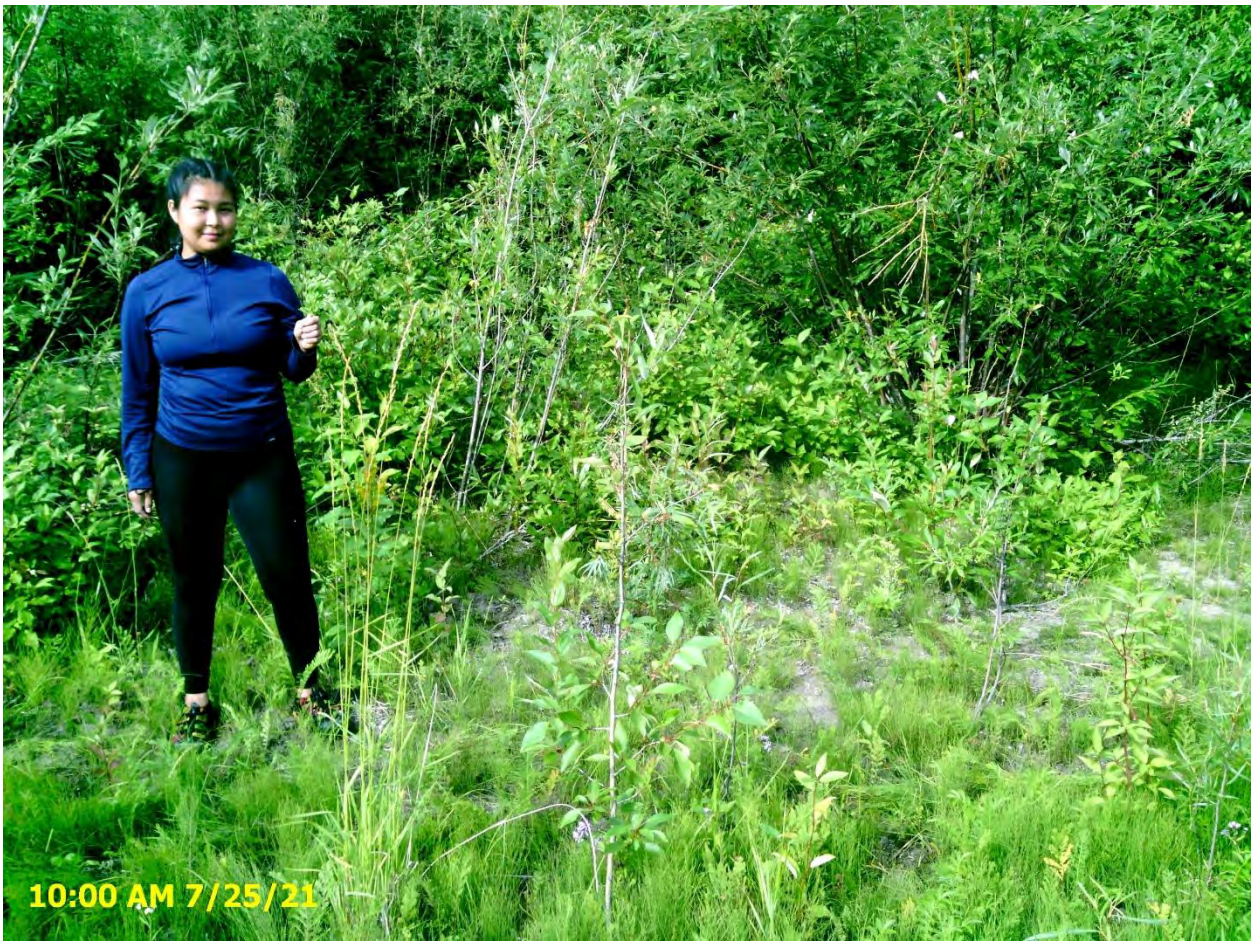
YUCH2021-004, Smith’s Cabin, Absent



YUCH2021-005, Absent



YUCH2021-006, Absent



YUCH2021-007, Present

HAND-PULL TRIAL

Hand-pull trial sites are labeled SITE NAME – DENSITY – REPLICATE. For example, YUCH2020-010-H-001 is the first replicate of a high density plot at YUCH2020-010. Low-Medium-High densities are recorded as L/M/H.



YUCH2020-010-H-001



YUCH2020-010-H-002



YUCH2020-010-H-003



YUCH2020-010-H-004



YUCH2020-010-L-001



YUCH2020-010-L-002



YUCH2020-010-L-003



YUCH2020-010-L-004



YUCH2020-010-L-005



YUCH2020-010-M-001



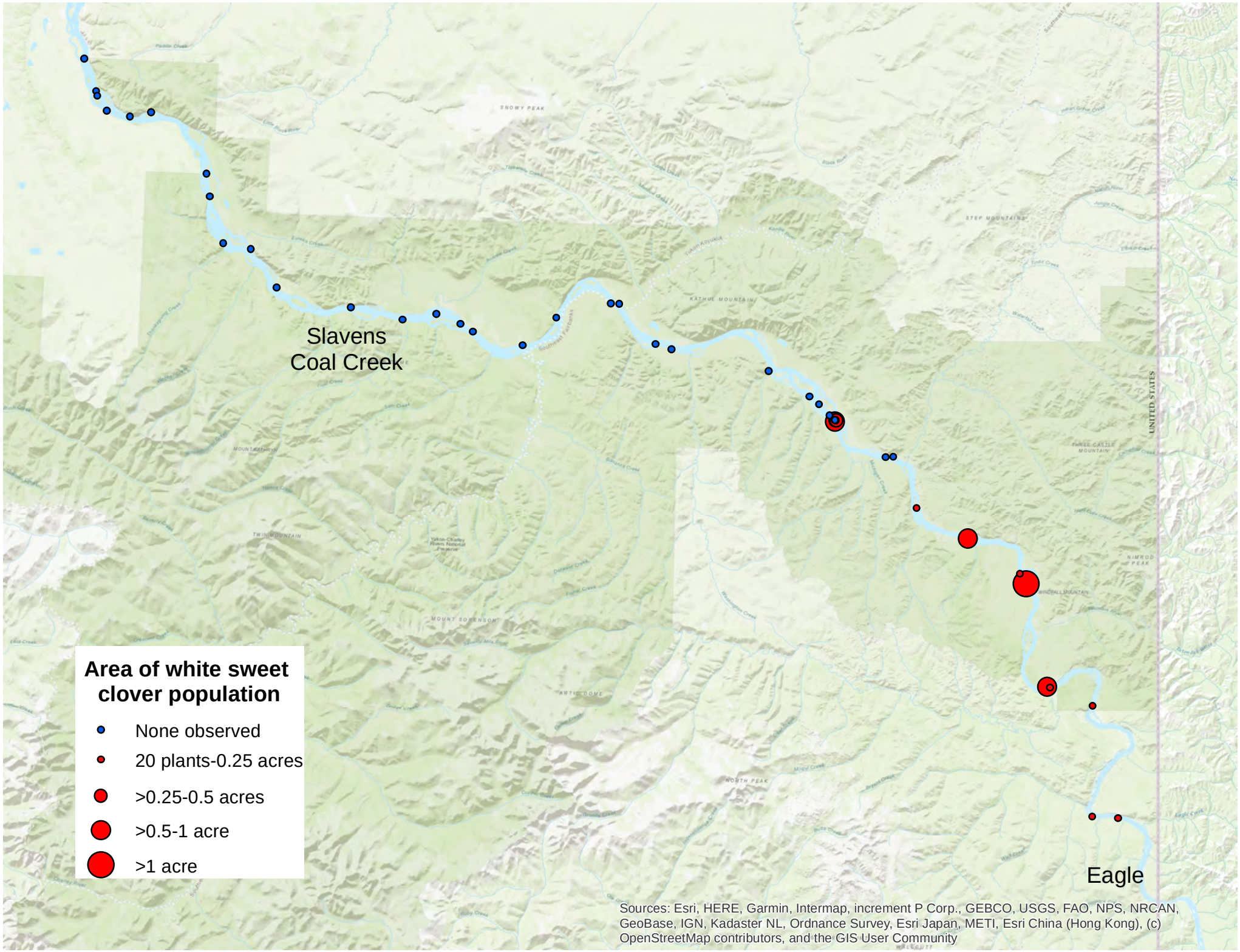
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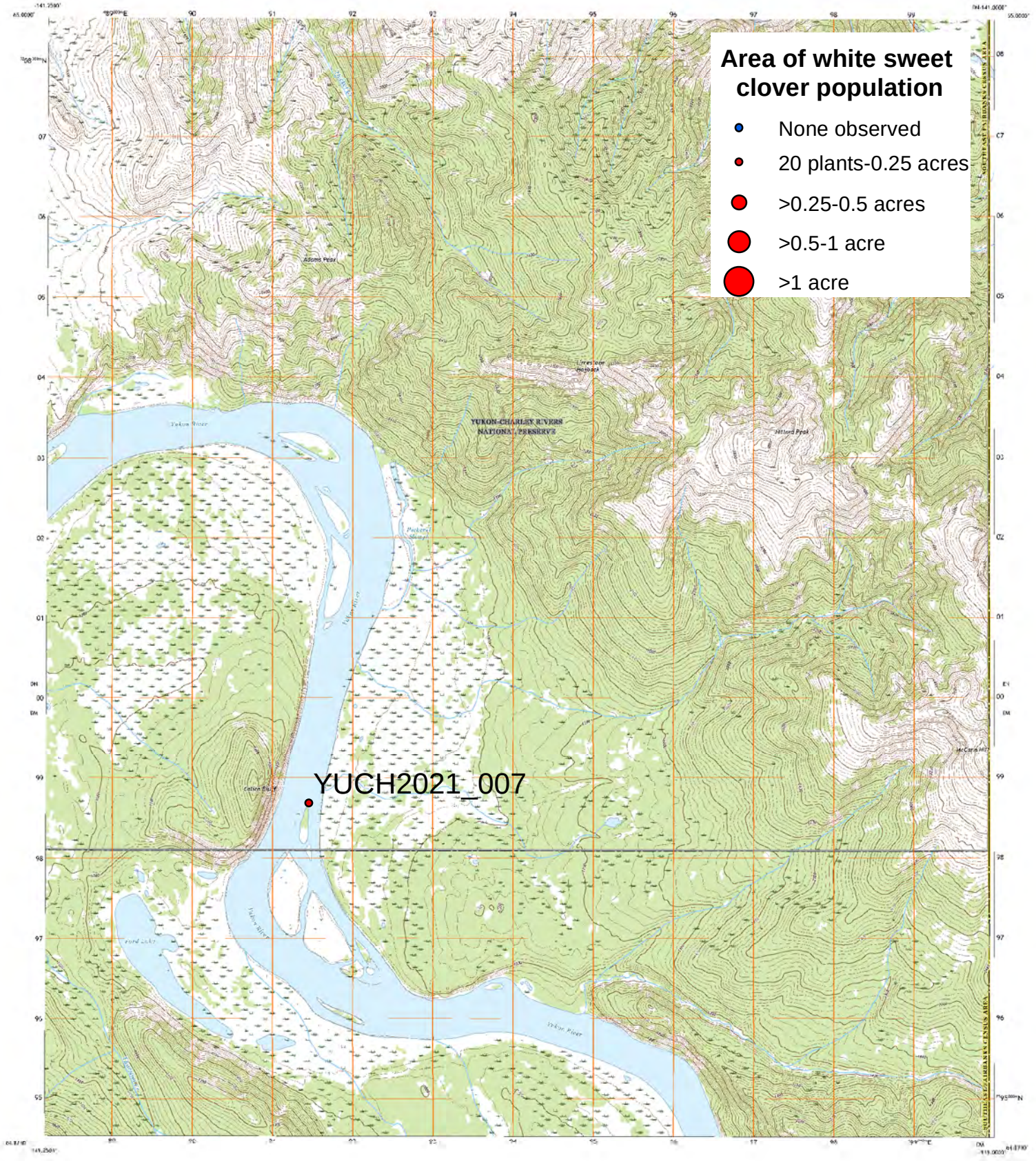


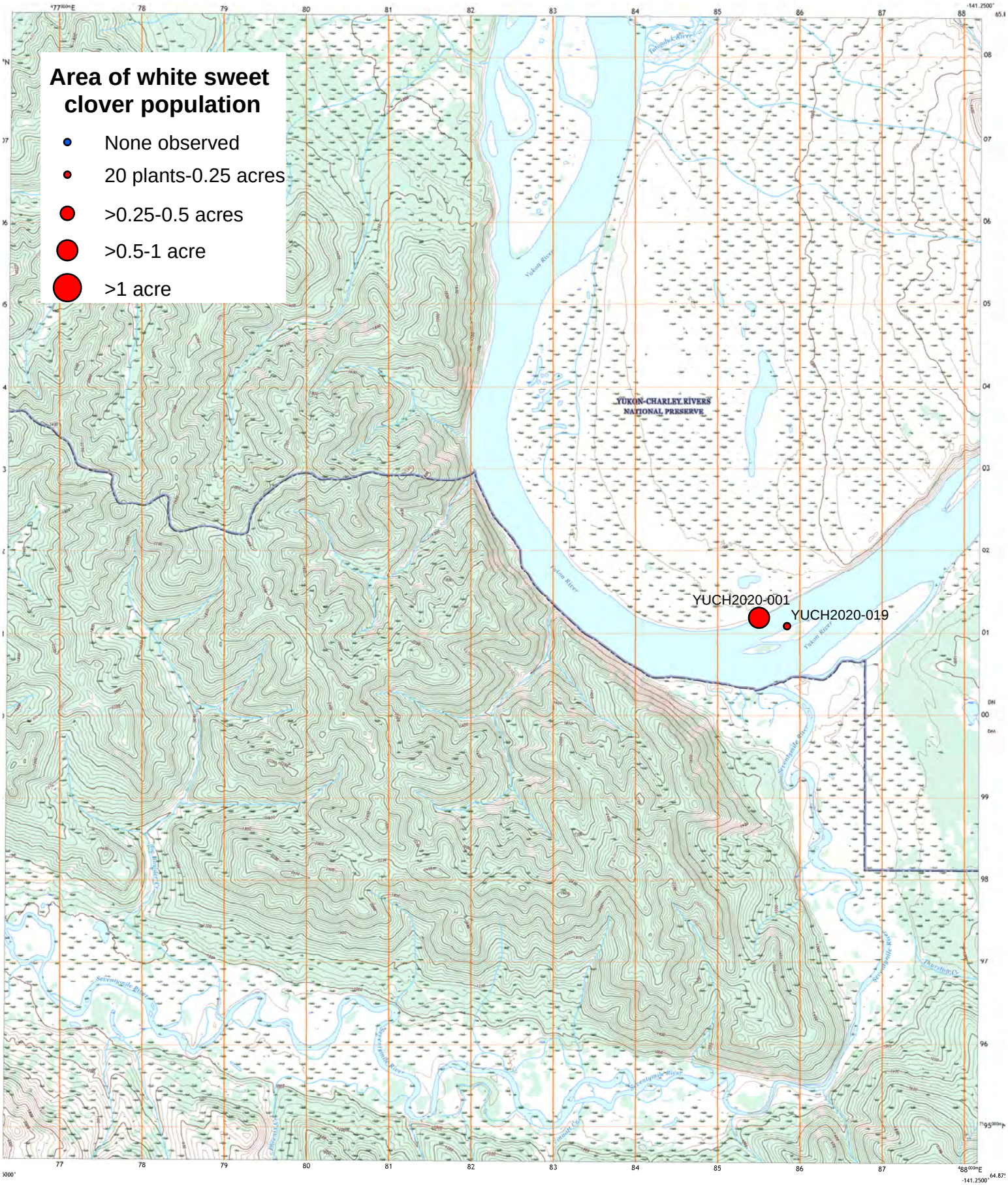
YUCH2020-010-M-003



YUCH2020-010-M-003


Slavens
Coal Creek
Eagle
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community


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>1 acre
YUCH2021_007
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
Yukon River
Adams Peak
Hitford Peak
Limestone Mountain
Packers Bluff
Coffee Bluff
McCarthy Hill
Pond Lake
SCALE 1:25 000
EAGLE D-1 NE, AK., YT
2018



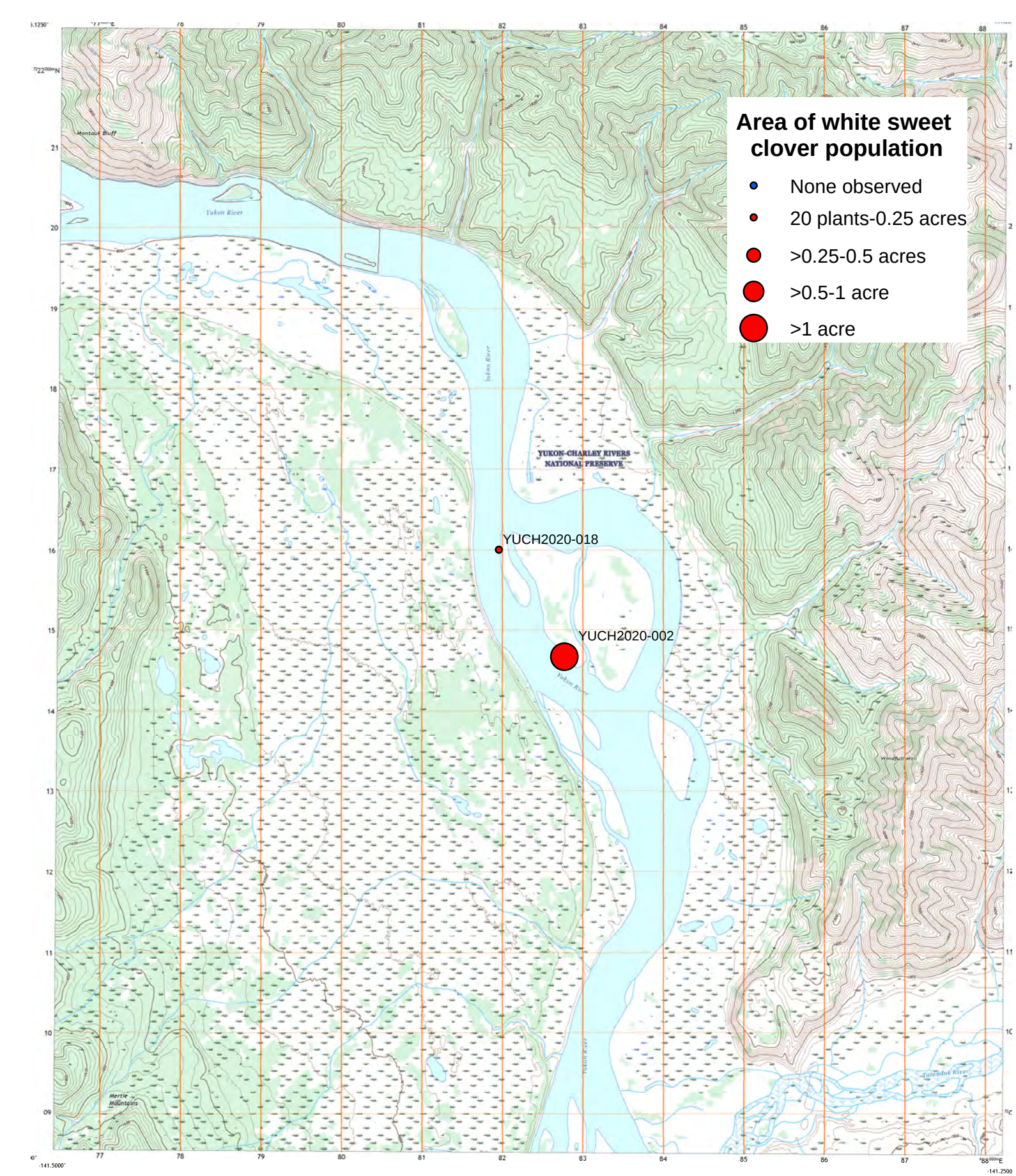
Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)

SCALE 1:25 000

UTM GRID AND 2017 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 40 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

ROAD CLASSIFICATION



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 7W
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.
Imagery ..... SPOT, September 2017
Roads ..... Alaska Dept. of Transportation, Not Available
Names ..... GNIS, 2000
Hydrography ..... National Hydrography Dataset, 2002 - 2018
Contours ..... National Elevation Dataset, 2018
Boundaries ..... Multiple sources, mostly 2018
Public Land Survey System ..... BLM, 2018
Wetlands ..... FWS National Wetlands Inventory 1982

UTM GRID AND 2017 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

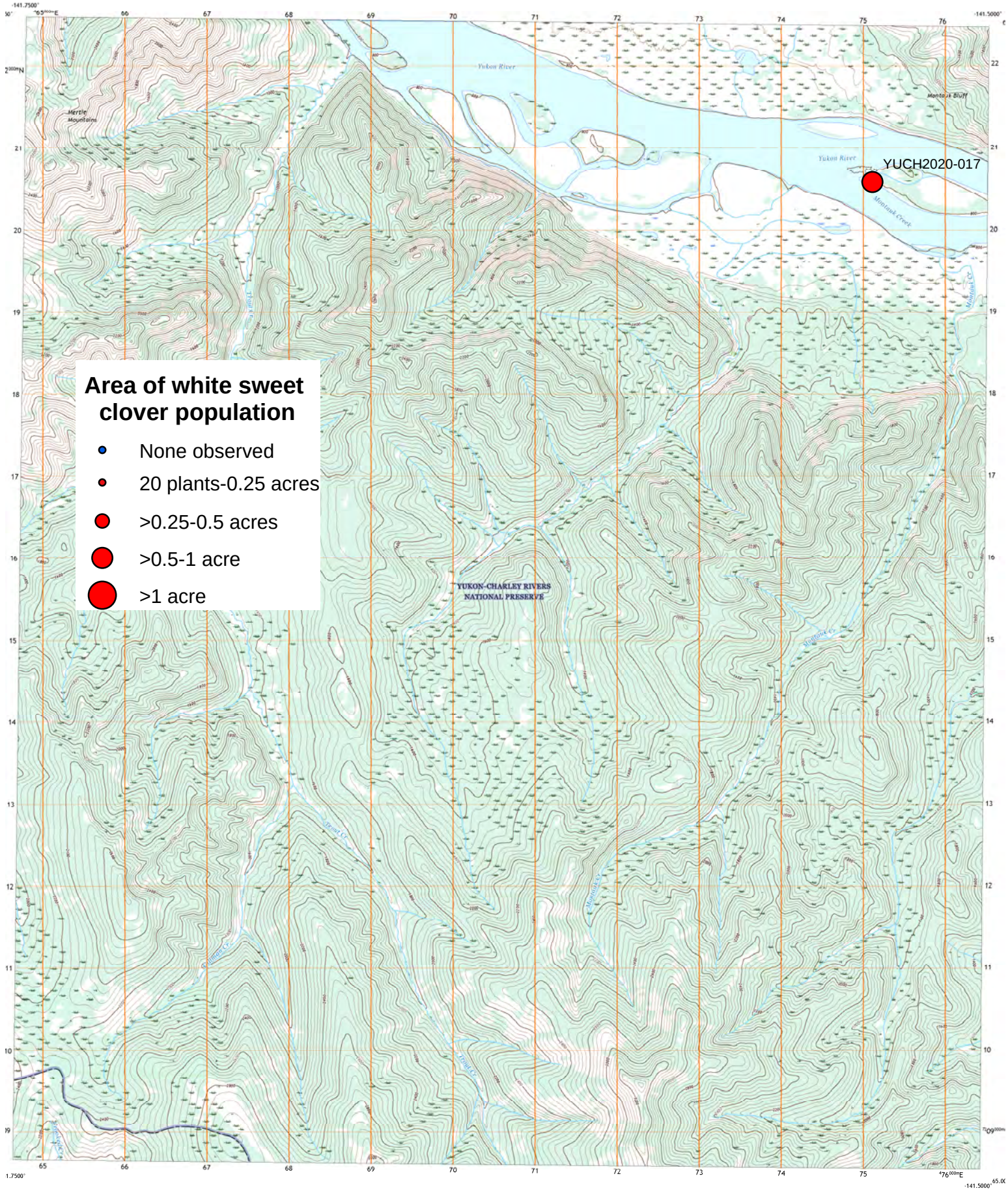
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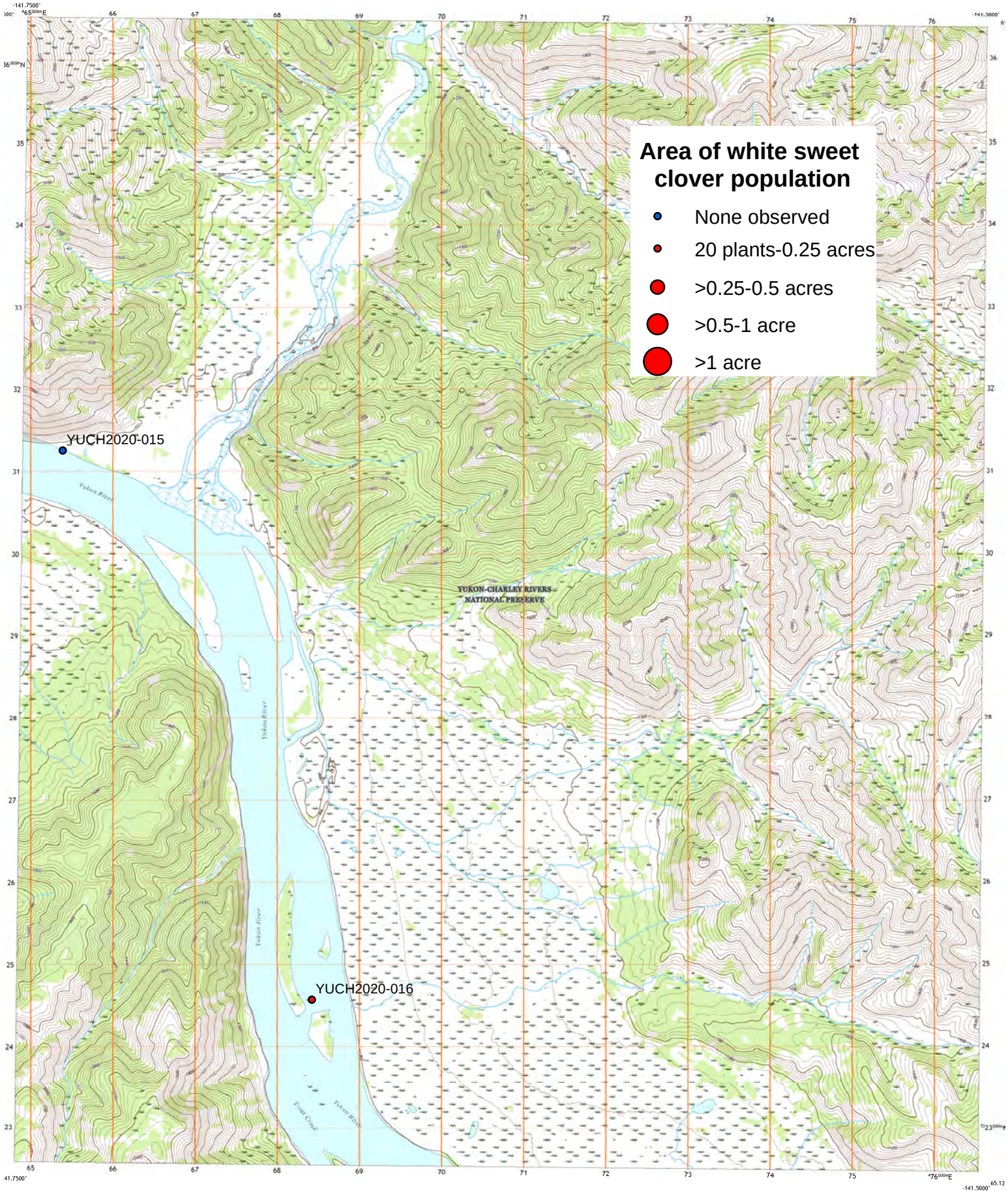
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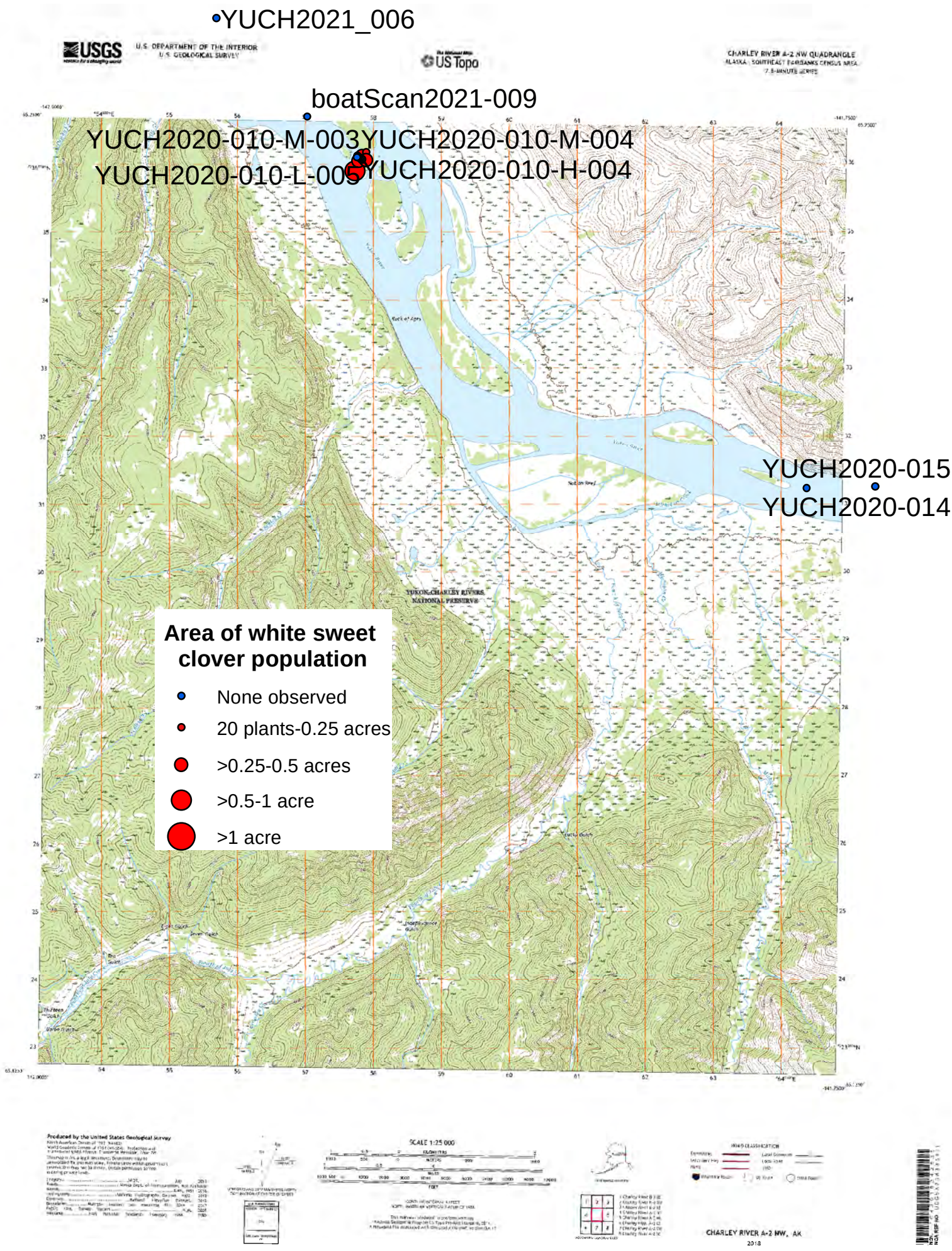
CONTOUR INTERVAL 40 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

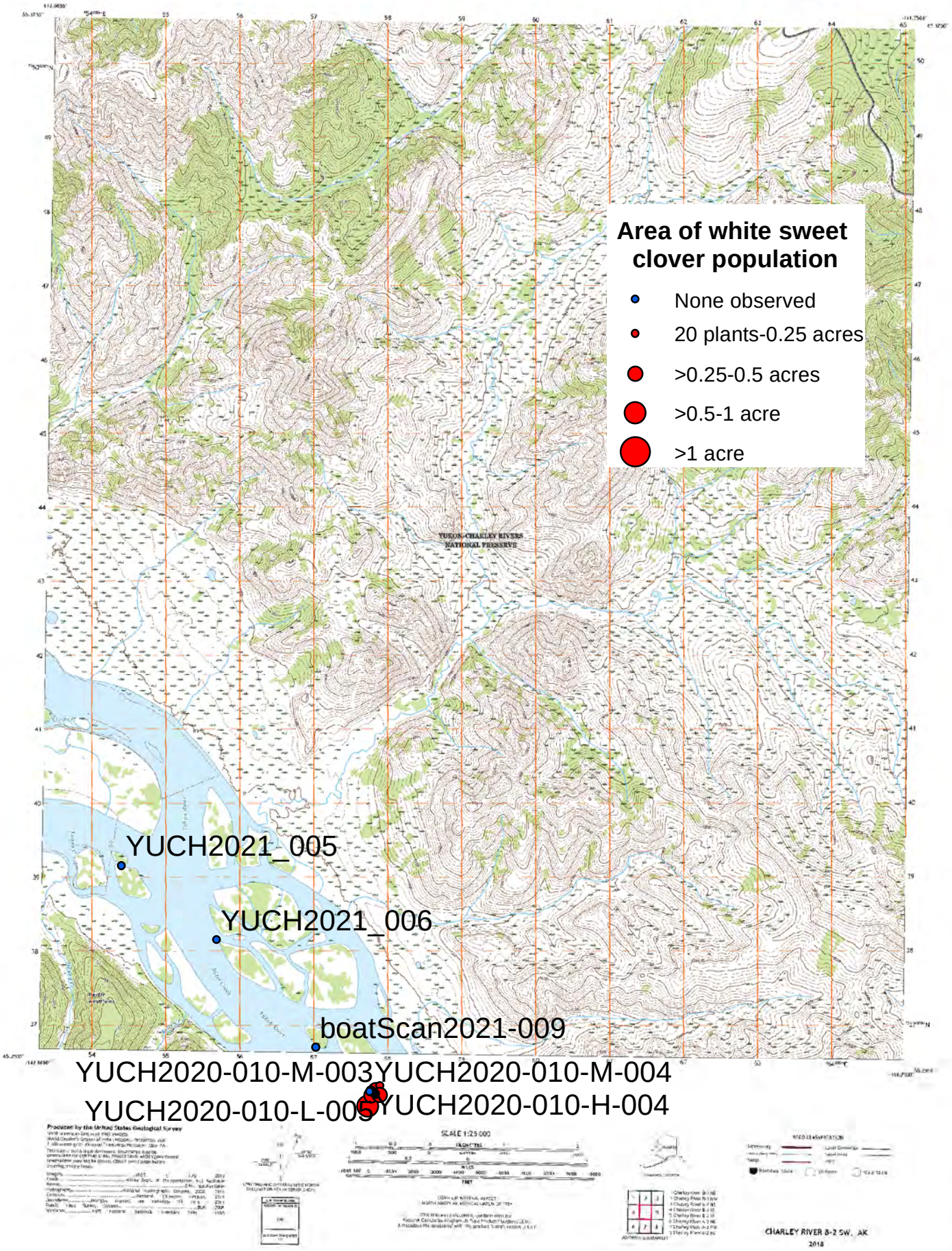
ROAD CLASSIFICATION

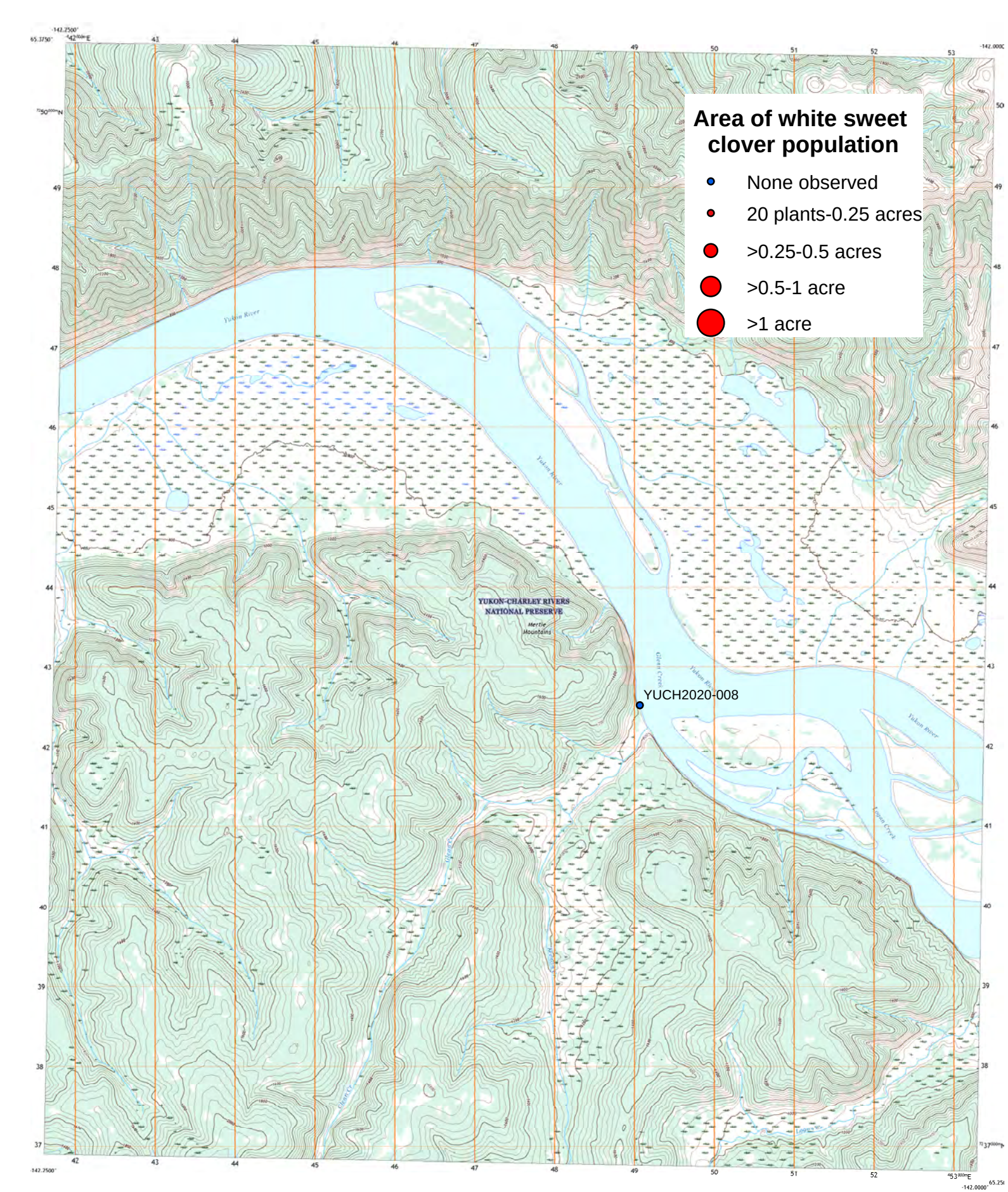
1 Charley River A-2 NE
2 Charley River A-1 NW
3 Charley River A-1 NE
4 Charley River A-2 SE
5 Charley River A-1 SE
6 Eagle D-2 NE

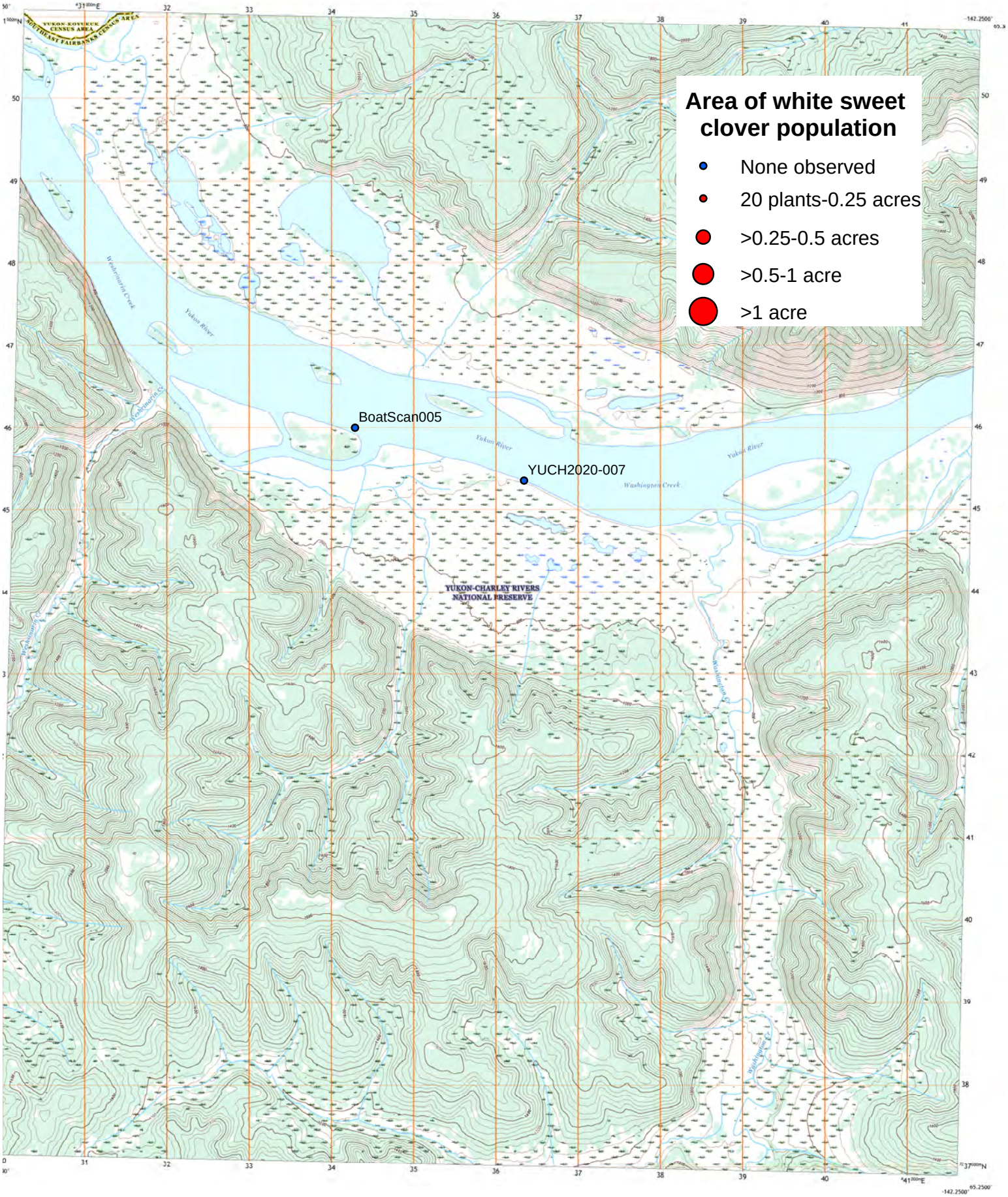

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YUCH2020-017
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
Yukon River
Mertie Mountains
Montauk Bluff
Montauk Creek
Trout Cr
Quitman Cr
Produced by the United States Geological Survey
SCALE 1:25 000
ROAD CLASSIFICATION


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YUCH2020-015
YUCH2020-016
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
Yukon River
Nation River
Trout Creek
Produced by the United States Geological Survey
SCALE 1:25 000
ROAD CLASSIFICATION


•YUCH2021_006
USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
US Topo
CHARLEY RIVER A-2 NW QUADRANGLE
ALASKA - SOUTHEAST FAIRBANKS CENSUS AREA
7.5-MINUTE SERIES
boatScan2021-009
YUCH2020-010-M-003
YUCH2020-010-M-004
YUCH2020-010-L-005
YUCH2020-010-H-004
YUCH2020-015
YUCH2020-014
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
Produced by the United States Geological Survey
SCALE 1:25 000
CHARLEY RIVER A-2 NW, AK
2018


USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
US Topo
CHARLEY RIVER B-2 SW QUADRANGLE
ALASKA - SOUTHEAST FAIRBANKS CENSUS AREA
7.5-MINUTE SERIES
YUKON-CHARLEY RIVERS
NATIONAL PRESERVE
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
YUCH2021_005
YUCH2021_006
boatScan2021-009
YUCH2020-010-M-003
YUCH2020-010-M-004
YUCH2020-010-L-005
YUCH2020-010-H-004
Produced by the United States Geological Survey
SCALE 1:25 000
CHARLEY RIVER B-2 SW, AK
2018


Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
YUCH2020-008
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
Mertie Mountains
Yukon River
Glenn Creek
Logan Creek
Clancy Creek
-142.2500°
-142.0000°
65.3750°
65.2500°



Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 7W

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery 2017
Roads ..... Alaska Dept. of Transportation, Not Available
Names ..... GNIS, 1981 - 2009
Hydrography ..... National Hydrography Dataset, 2002 - 2018
Contours ..... National Elevation Dataset, 2016
Boundaries ..... Multiple sources and dates, 1977 - 2017
Public Land Survey System ..... BLM, 2017
Wetlands ..... FWS, National Wetlands Inventory, 1984

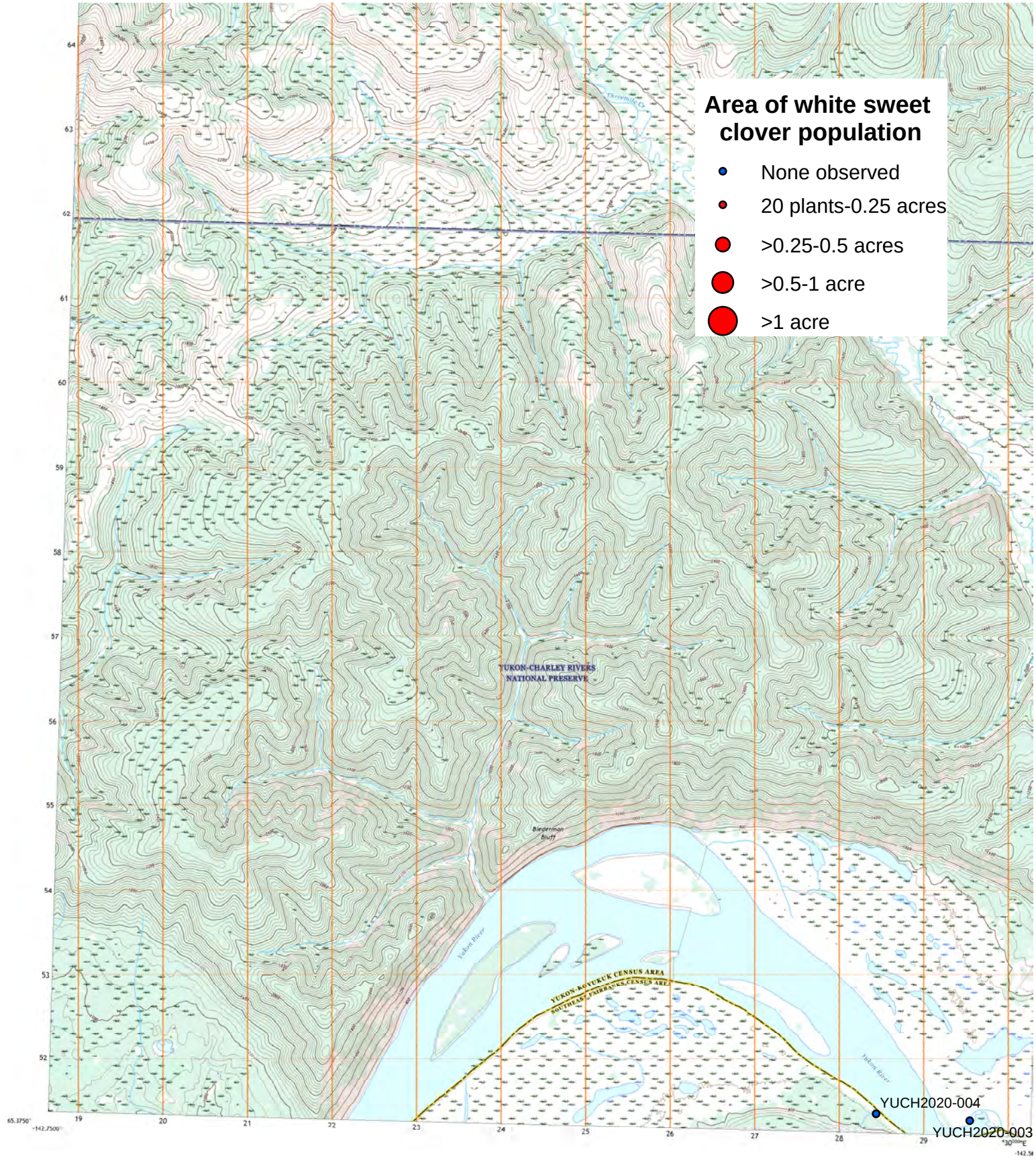
UTM GRID AND 2017 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

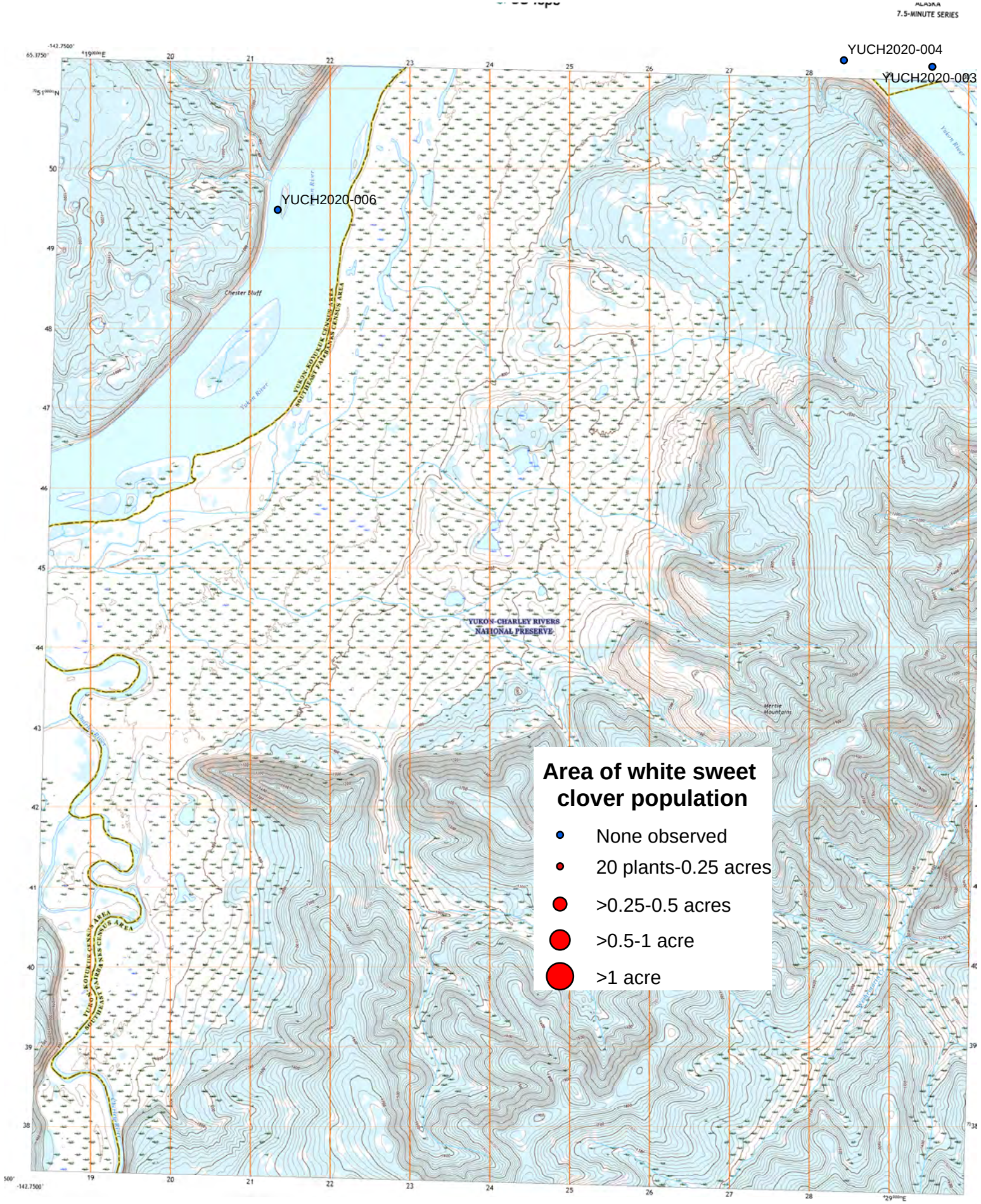
SCALE 1:25 000

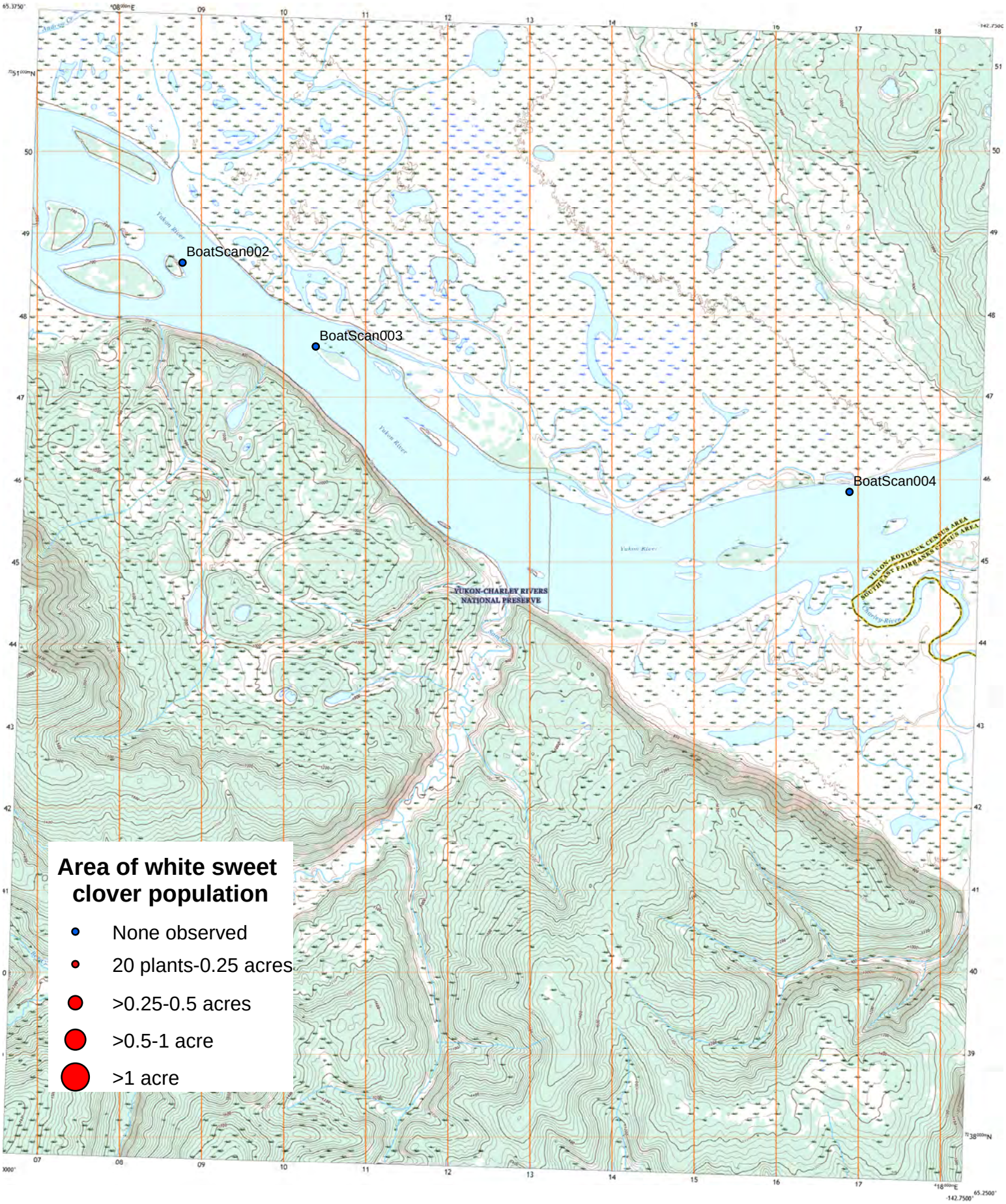
CONTOUR INTERVAL 40 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

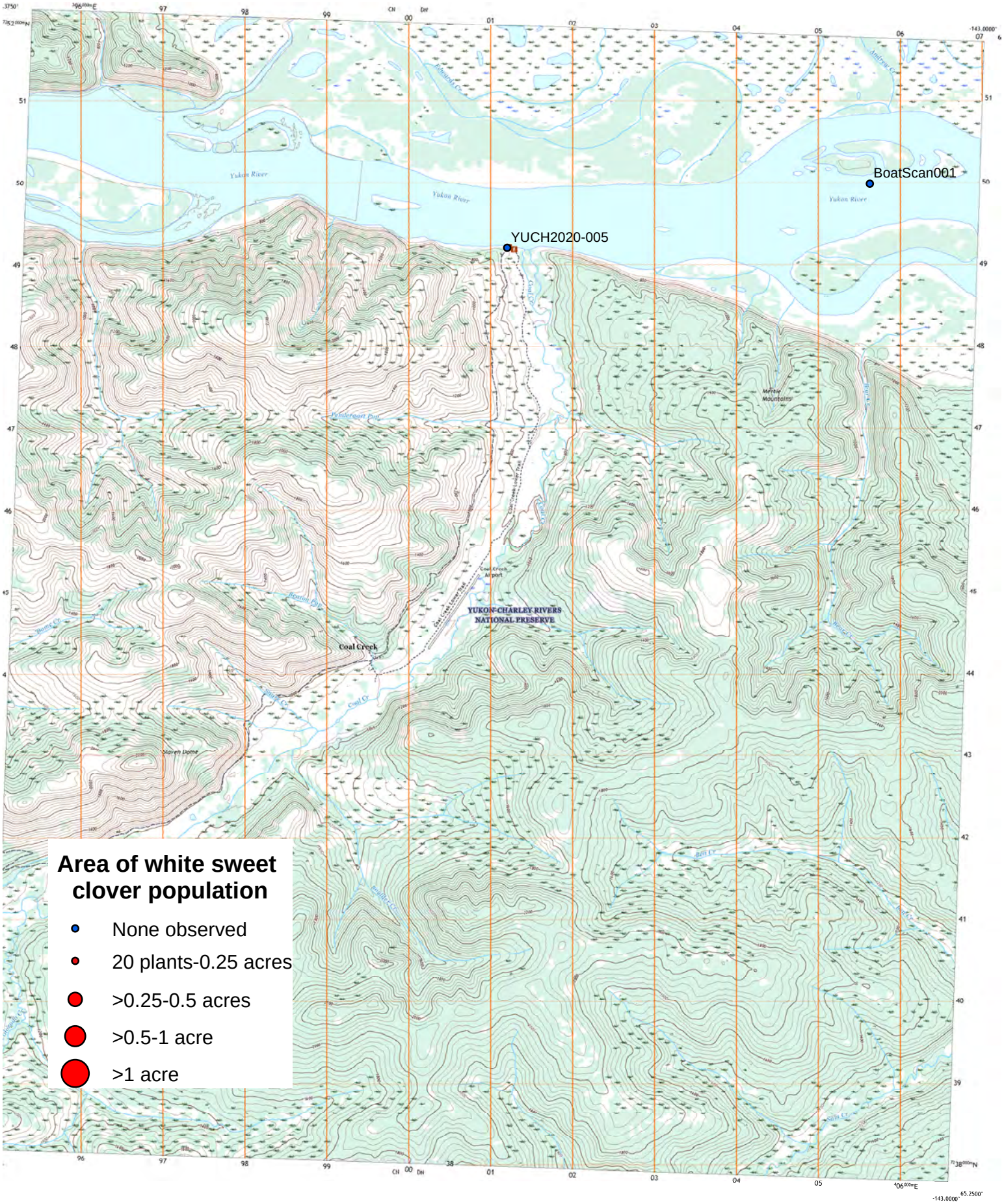
QUADRANGLE LOCATION

ROAD CLASSIFICATION

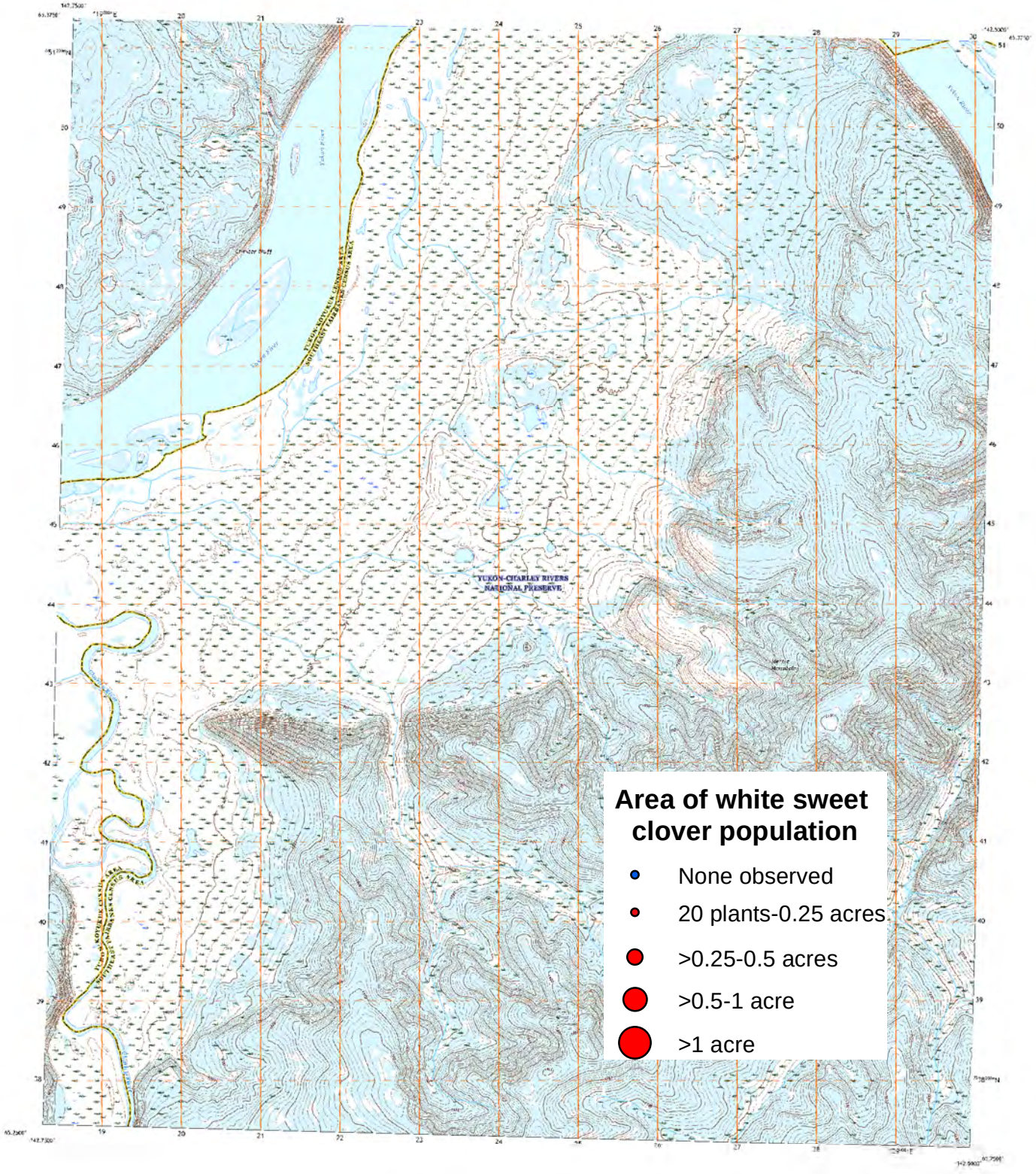

Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
Biederman Bluff
Yukon River
YUKON-KOYUKUK CENSUS AREA
SOUTHEAST FAIRBANKS CENSUS ARE
YUCH2020-004
YUCH2020-003
YUCH2020-006
Produced by the United States Geological Survey
SCALE 1:25 000
CHARLEY RIVER B-4 NE, AK
2018

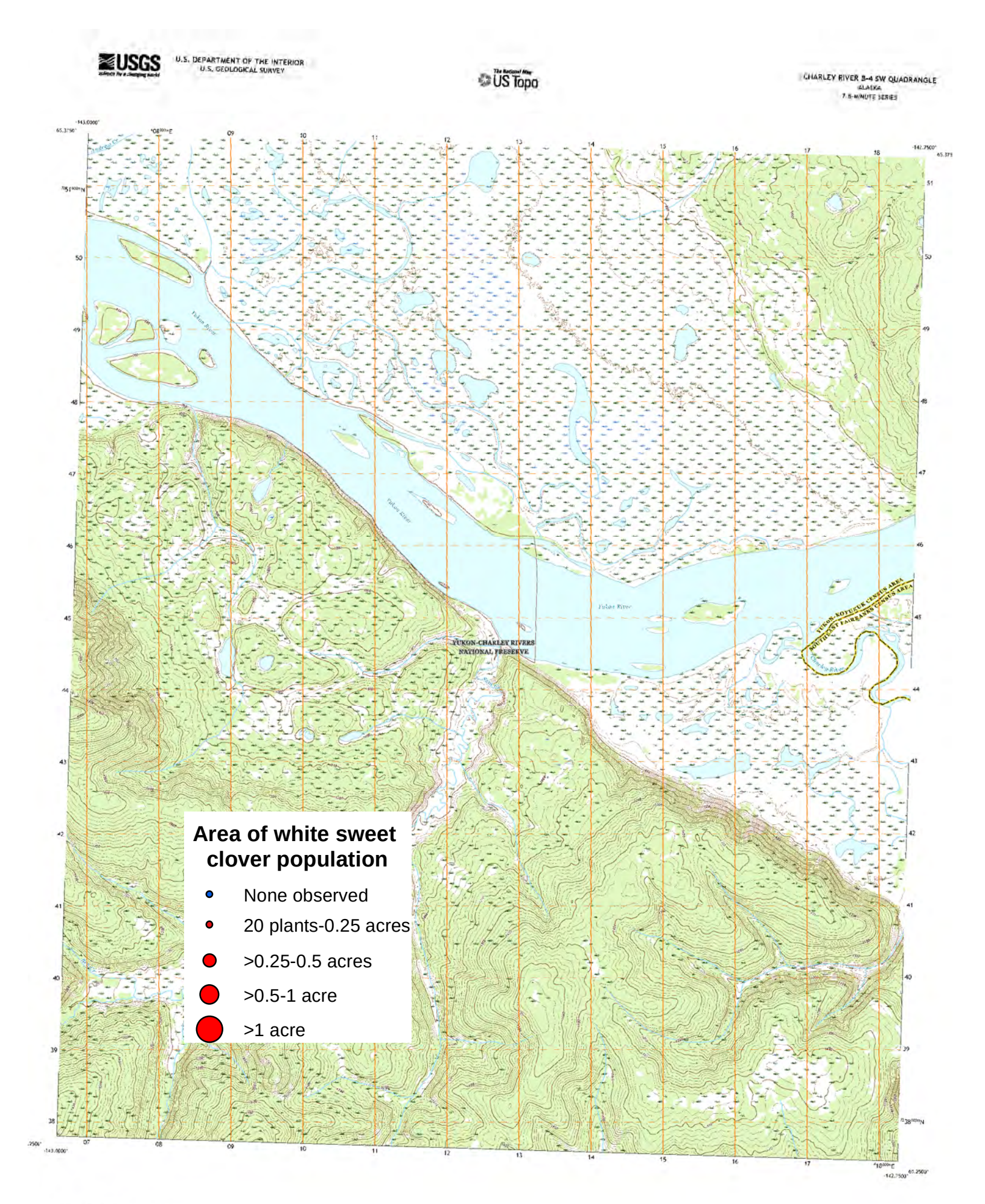

YUCH2020-004
YUCH2020-003
YUCH2020-006
Chester Bluff
YUKON-KOYUKUK CENSUS AREA
SOUTHEAST FAIRBANKS CENSUS AREA
YUKON-CHARLEY RIVERS
NATIONAL PRESERVE
Mertie Mountains
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre


BoatScan002
BoatScan003
BoatScan004
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
YUKON-KOYUKUK CENSUS AREA
SOUTHEAST FAIRBANKS CENSUS AREA
Yukon River
Charley River
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre



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SCALE 1:25 000
CONTOUR INTERVAL 40 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988
ROAD CLASSIFICATION


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U.S. GEOLOGICAL SURVEY
US Topo
CHARLEY RIVER B-4 SE QUADRANGLE
ALASKA
7.5-MINUTE SERIES
YUKON-CHARLEY RIVERS
NATIONAL PRESERVE
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
SCALE 1:25 000
CHARLEY RIVER B-4 SE, AK
2018


USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
US Topo
CHARLEY RIVER B-4 SW QUADRANGLE
ALASKA
7.5-MINUTE SERIES
Yukon River
YUKON-CHARLEY RIVERS
NATIONAL PRESERVE
YUKON-KOYUKUK CENSUS AREA
SOUTHEAST FAIRBANKS CENSUS AREA
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
SCALE 1:25 000
ROAD CLASSIFICATION

boatScan2021-007

USGS U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

US Topo

CHARLEY RIVER B-5 SW QUADRANGLE
ALASKA - YUKON-KOYUKUK CENSUS AREA
7.5-MINUTE SERIES

boatScan2021-008

YUKON-CHARLEY RIVERS
NATIONAL PRESERVE

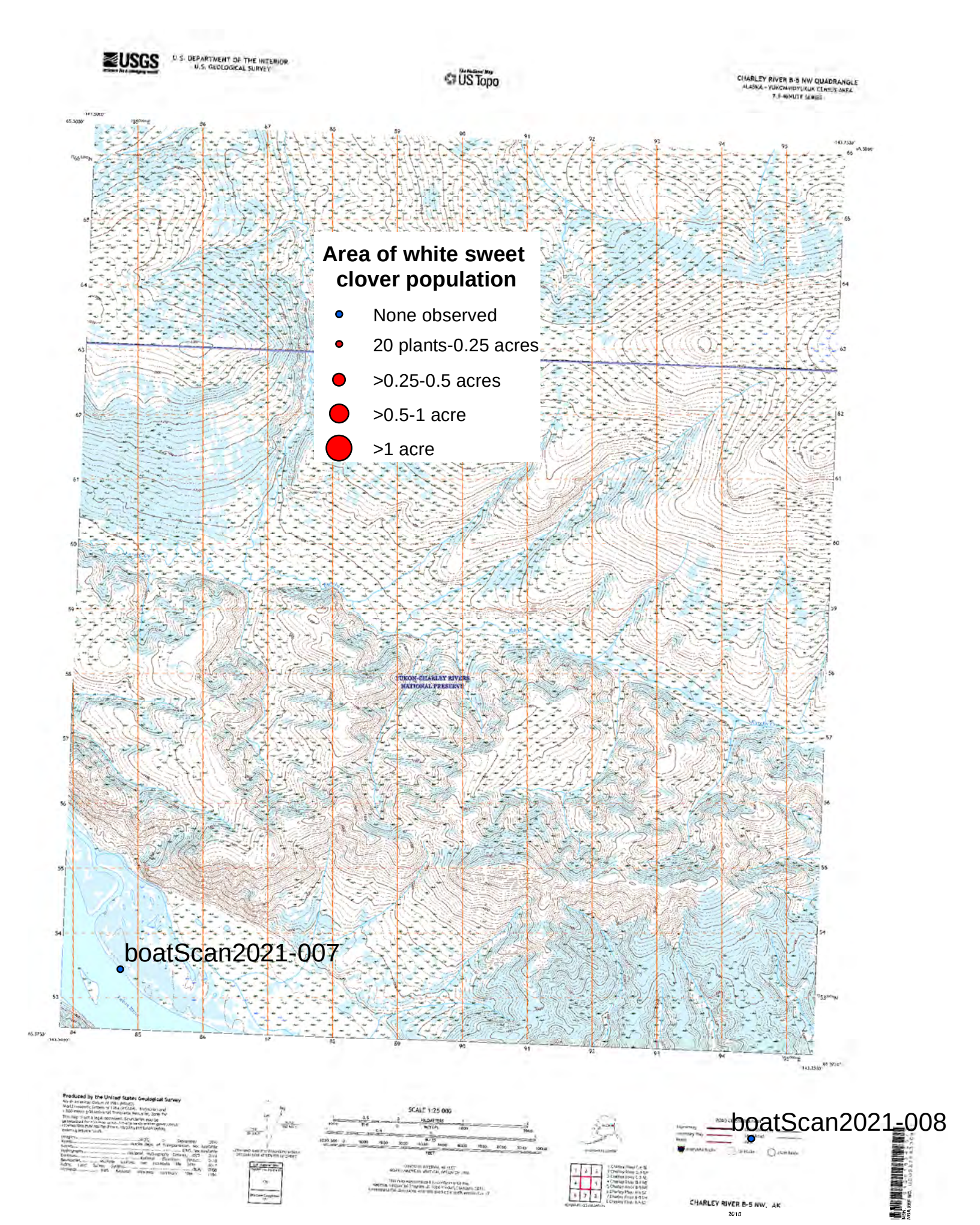
Area of white sweet clover population

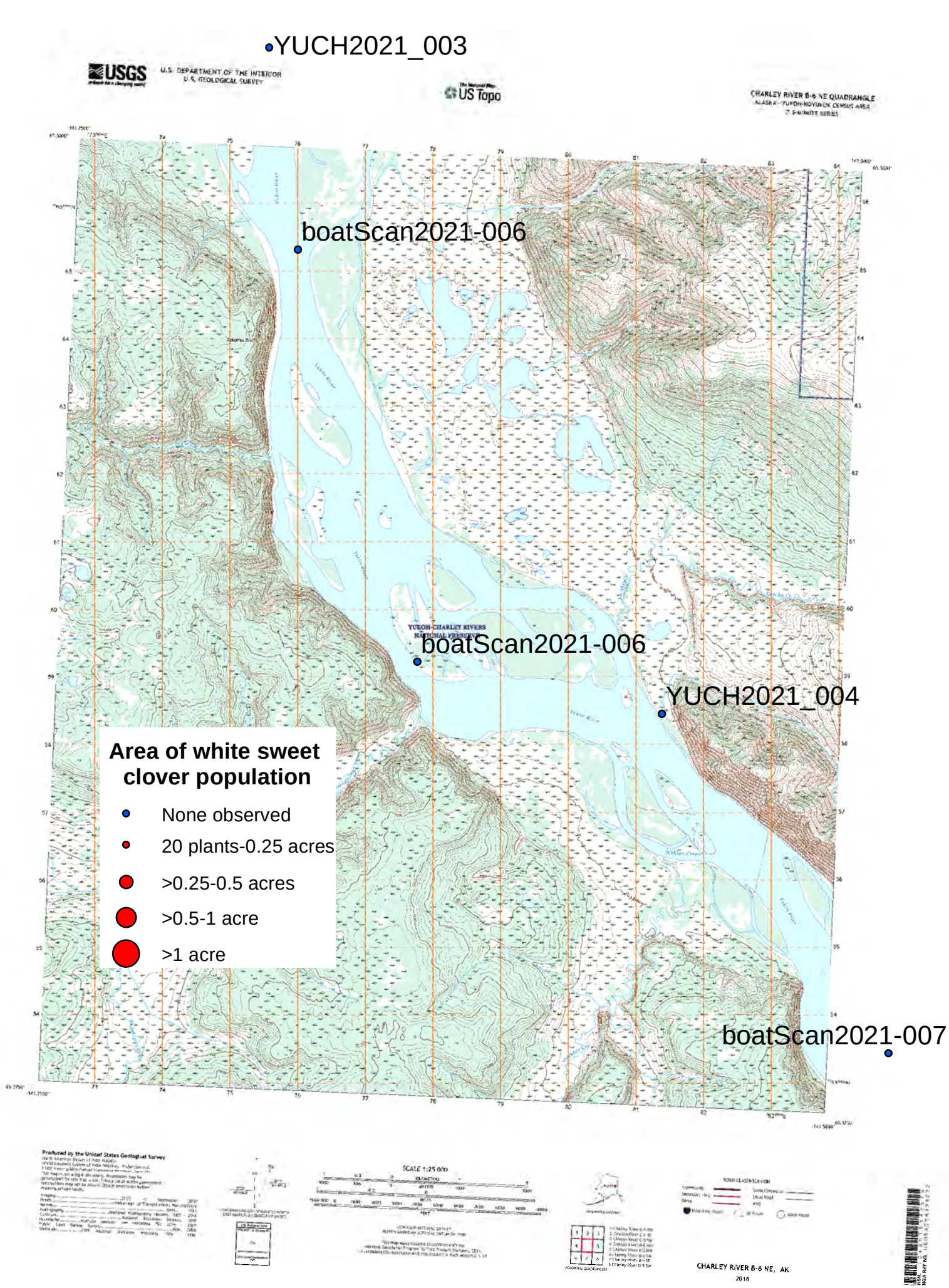
- None observed
- 20 plants-0.25 acres
- >0.25-0.5 acres
- >0.5-1 acre
- >1 acre

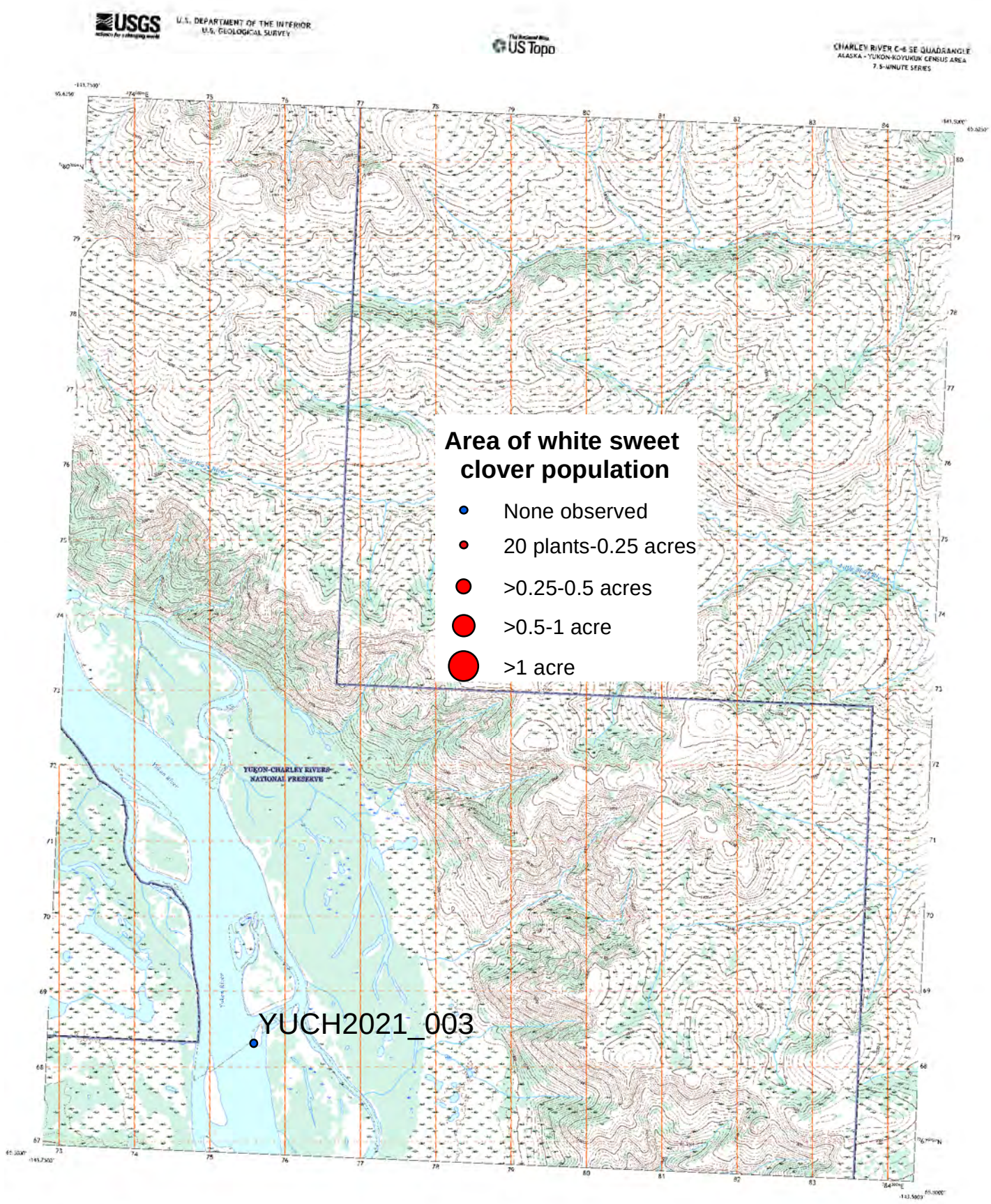
Produced by the United States Geological Survey

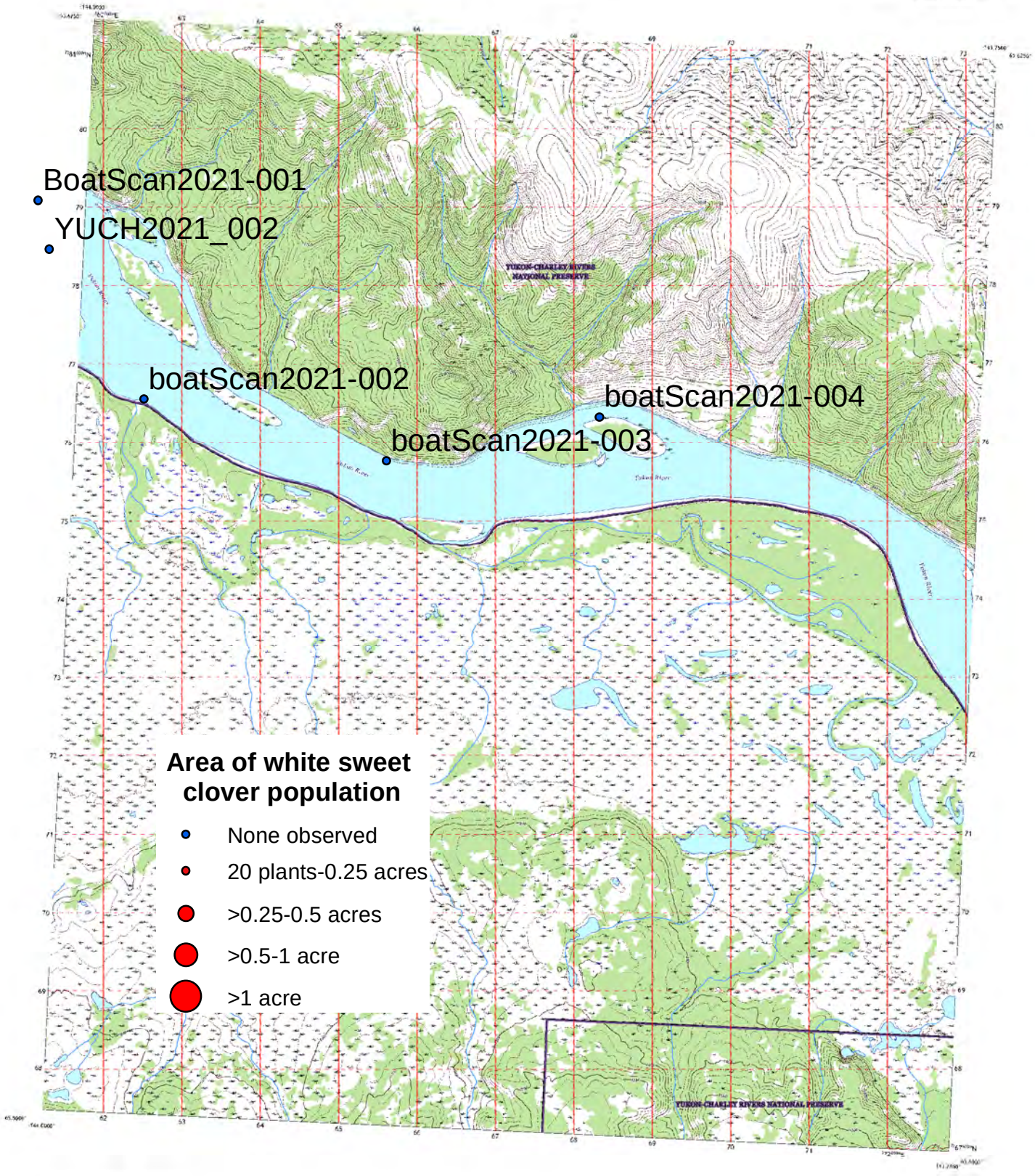
SCALE 1:25 000

CHARLEY RIVER B-5 SW, AK
2018


USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
US Topo
CHARLEY RIVER B-5 NW QUADRANGLE
ALASKA - YUKON-CHARLEY CENSUS AREA
7.5-MINUTE SERIES
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
boatScan2021-007
boatScan2021-008
Produced by the United States Geological Survey
SCALE 1:25 000
CHARLEY RIVER B-5 NW, AK
2018


YUCH2021_003
boatScan2021-006
boatScan2021-006
YUCH2021_004
boatScan2021-007
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
US Topo
CHARLEY RIVER B-6 NE QUADRANGLE
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
Produced by the United States Geological Survey
SCALE 1:25 000
CHARLEY RIVER B-6 NE, AK
2018


USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
US Topo
CHARLEY RIVER C-6 SE QUADRANGLE
ALASKA - YUKON-KOYUKUK CENSUS AREA
7.5-MINUTE SERIES
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
YUCH2021_003
boatScan2021_006
CHARLEY RIVER C-6 SE, AK
2016


USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
US Topo
CHARLEY RIVER C-6 SW QUADRANGLE
ALASKA - YUKON-KOYUKUK CENSUS AREA
7.5-MINUTE SERIES
BoatScan2021-001
YUCH2021_002
boatScan2021-002
boatScan2021-004
boatScan2021-003
YUKON-CHARLEY RIVERS NATIONAL PRESERVE
Area of white sweet clover population
None observed
20 plants-0.25 acres
>0.25-0.5 acres
>0.5-1 acre
>1 acre
SCALE 1:25 000
CHARLEY RIVER C-6 SW, AK
2016