

Everglades National Park – Taylor Slough Vegetation Transects

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Cover Photos by Jesse Hoffman: Top row left to right: *Rhynchospora microcarpa*, *Hymenocallis palmeri*, *Calopogon tuberosus*; Middle: *Asclepias lanceolata*; Bottom row left to right: *Panicum dichotomiflorum*, *Justicia angusta*, *Rhynchospora tracyi*

Background

In 1978, Everglades National Park (EVER) botanist Ingrid Olmstead installed three transects running across different sections of Taylor Slough in order to collect baseline data to assess the impact of the new pumping station (S-332, at the intersection of Taylor Slough and Canal L31W) on the vegetation of Taylor Slough. These transects (1-3) were 400 m to 900 m long. Ten plots designated "C" for areas dominated by *Cladium jamaicense* and ten plots designated "M" for areas dominated by *Muhlenbergia capilaris* were established along each transect. *Cladium* (longer hydroperiod) and *Muhlenbergia* (shorter hydroperiod) communities were thought to be the most likely to change as the hydrology of the area changed. (Olmstead et. al. 1980).

After Ingrid Olmstead initially sampled the plots in 1979, they remained unsampled until 1992, when EVER botanist Tom Armentano and Kurt von Kleist III (an FIU graduate student) sampled the plots along transect 2. In 1995, Sarah Riley and Germaine Ploos (both AmeriCorps) sampled the plots on transects 1 and 2. Many plots on these transects had become difficult to locate, due to broken poles, so the deteriorating poles on transects 1-3 were replaced with new galvanized electrical conduit poles in 1996. Hillary Cooley and Mike Rugge (also both AmeriCorps) sampled plots on transect 3 in early 1996. In the spring, Diane Riggs and Sam Simkin (AmeriCorps) recorded GPS points for the transect poles and plots along the portions of transects 1-3 with plots.

EVER botanist David Jones, along with EVER bio-technician Diane Riggs, and AmeriCorps volunteers Sarah Riley, and Lisu Derungs laid out transects 4 and 5 in the summer of 1996 to assess how the hydrological changes due to the operation of pumping station S-332D might influence the vegetation of northern Taylor Slough. When canal water levels are low, water from northern Taylor Slough flows into the L-31W canal along an elevational gradient. Pumping station S-332 then sporadically pumps this water from northern Taylor Slough back into southern Taylor Slough. Pumping station S-332D, along with other planned pumping stations to the north on the L-31W canal, are intended to maintain high enough water levels in the canal to allow water to flow from the canal into northern Taylor Slough. An increased water flow into northern Taylor Slough coupled with pumping station management practices which facilitate historical water level fluctuations based on rainfall may help restore sheet flow to the Taylor Slough ecosystem (Van Lent and Johnson 1993).

Transects 4 and 5 have twenty plots perpendicular to the transect and are 2,000 m long, with a tall PVC transect pole every 100 m. The plots lack the "C" or "M" designation found on the three original transects. All plots are perpendicular to the transect line and five meters away from the transect poles. Diane Riggs, and AmeriCorps volunteers Hillary Cooley and Mike Rugge sampled transects 4 and 5 in January and February of 1997.

In 2003, Craig Smith (EVER), Tom Armentano (EVER), and Hillary Cooley (Florida International University) re-sampled Olmstead's original transects (1-3). Transects 4 and 5 were not re-sampled at that time.

Introduction

In 2006, George Gann and Keith Bradley from the Institute for Regional Conservation (IRC) submitted a proposal to the U.S. Department of the Interior's Critical Ecosystems Study Initiative (CESI) to obtain funding to, in addition to other tasks, re-sample and perform maintenance on all existing Taylor Slough transects as well as install a sixth transect running through southern Taylor Slough. Following review, the Gann and Bradley proposal was approved and in August 2006, IRC and EVER signed cooperative agreement H5284-03-0044, Everglades National Park Vegetation Monitoring, with Craig Smith as co-principal investigator.

Equipment list for sampling

2 – 1 m² PVC quadrats divided into four equal sections with thin wire

1 – 6 m piece of rope (a cut piece of meter tape works well)

meter stick to measure water depth (or skip this and use the “meter tape rope”)

pole/wire flag/etc. to measure soil depth

data sheets

clipboard

pencils/permanent markers

plastic bags for collecting unknowns/vouchers

GPS Unit (set to UTM zone 17N, WGS84)

map of transect showing location of plots

map of how to get to the transect

list of plot pole GPS points

South Florida Water Management District (SFWMD) gate key (if sampling on transects 1, 4, or 5)

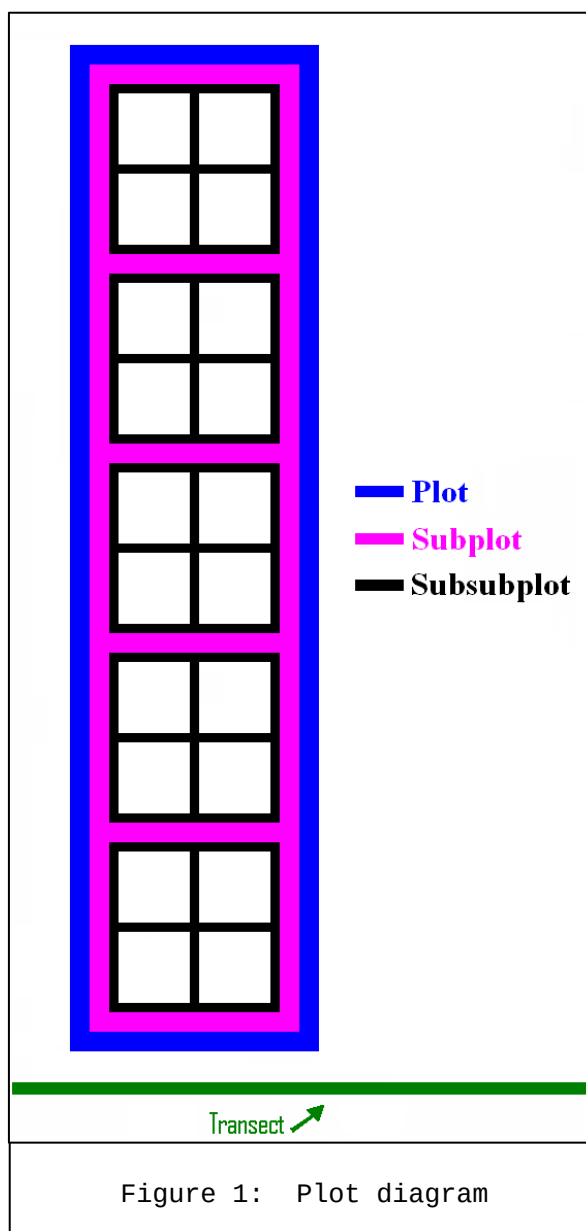
park radio

first aid kit

water, food, sun, insect protection

Sampling terminology (See Figure 1)

Plot: A series of five contiguous 1 m² subplots marked by ½” stainless steel poles at the end corners of the first and last subplots.



Subplot: One of the five 1 m² quadrats within a plot. The subplots are numbered 1-5 with 1 being the quadrat closest to the transect, and 5 being the quadrat furthest from the transect.

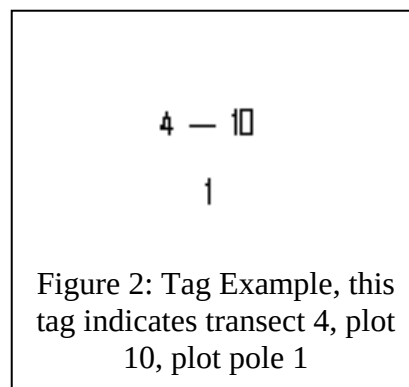
Subsubplot: One of the four 0.5 m² sections within a subplot delineated by wire that divides a 1 m² PVC frame into four equal parts. The subsubplots are identified by numbers 1-4 on the data sheet. When facing the subplot with one's back to the transect, subsubplot 1 is always in the lower left hand corner of the subplot. Subsubplots 2-4 are numbered sequentially counterclockwise from subsubplot 1.

Methodology

Part A – Transect maintenance and installation

In March – May 2007, Jesse Hoffman (IRC) re-sampled all plots on all transects. Because many plot poles were missing or difficult to locate due to corrosion, all poles were replaced with ½ inch stainless steel tubing. All four corners of each plot were marked with poles, three short (~30 cm protruding) and one tall (~1.2 m protruding) per plot. Also, the “C” or “M” designations on all plots were dropped and all transects were re-numbered sequentially from 1 to 20. Each plot pole was individually numbered on an aluminum tag affixed with stainless steel wire. Tag numbers are as follows:

the first number on the first line (before the dash) indicates the transect number, the number after the dash indicates the plot number, and the number on the second line indicates that specific pole number (to assist in orienting the plot if all poles are not immediately visible) (see figure 2). Plot poles are numbered the same way that the subsubplots are numbered (When facing the plot with one's back to the transect, plot pole 1 is in the lower left hand corner of the plot. Plot poles 2-4 are numbered sequentially counterclockwise from plot pole 1). Plot pole 2 is the tall pole. In addition, the location of every plot pole on transects 1-5 was recorded with a sub-meter accuracy Trimble ProXR GPS unit and the location of plot pole 2 was recorded with a Garmin GPSMap76 on transect 6. In both cases coordinates were recorded in UTM zone 17N, WGS84.



Transect 6 was installed and sampled in Southern Taylor Slough by IRC biologists Jesse Hoffman and Steve Woodmansee, and EVER botanist Jimi Sadle in April of 2007. The transect runs northwest – southeast and is composed of twenty plots, all running due south.

Part B – Setting up the plots (See Figure 3)

1. Plots were located by GPS coordinates.
2. A length of rope was run between poles 2 and 3 (the right hand side of the plot)
3. One of the PVC frames was placed so that plot poles 1 and 2 were inside of the frame in each corner, and so that the frame's edge lined up with the rope. The second PVC frame was placed with one of its sides overlapping the far side of the first frame, and so that its side also lined up with the rope. Subplots were always laid out beginning with subplot 1, not subplot 5. This was

important because often subplot 5 extended beyond plot poles 3 and 4 due to human error, and subplot 5 was sampled normally despite the fact that part of the PVC frame appeared to be outside of the plot.

4. When all 4 subsubplots within a quadrat had been sampled, that quadrat was leapfrogged over the next quadrat and so on until all 5 subplots were sampled.

It was discovered that when attempting to line up the PVC frames, the plot poles did not always (ever ?) form perfect 1x5m rectangles. When in doubt, plot pole 2 and the rope between plot poles 2 and 3 were used as the primary reference for setting up the plot.

Part C - An overview of sampling

In each subsubplot:

1. Total vegetation cover was estimated and recorded. Total cover was defined as the percent of the area covered by all live and dead vascular vegetation (not periphyton) as viewed from above. (See Part D)

2. A list of all plant species present and rooted within the plot were identified and recorded. Note that the plants recorded did not need to be rooted in the subsubplot being sampled, as long as they were rooted within the plot as a whole.

3. Percent cover was independently estimated for each species on the list. For *Cladium jamaicense*, *Muhlenbergia capillaris*, and *Eleocharis cellulosa*, the percent cover that was live, and the percent cover that was dead were estimated and recorded independently. For all other taxa, the percent live and the percent dead were added together and only one number was recorded. (See part D)

4. The soil depth in the center of each subsubplot was measured. Periphyton that may have been covering the soil was not counted in the soil depth measurement.

Once finished with the above tasks, a single water depth measurement was taken in the center of the subplot, where the wires intersected.

When sampling was completed, all data was entered into an existing database which was later converted into a Geodatabase.

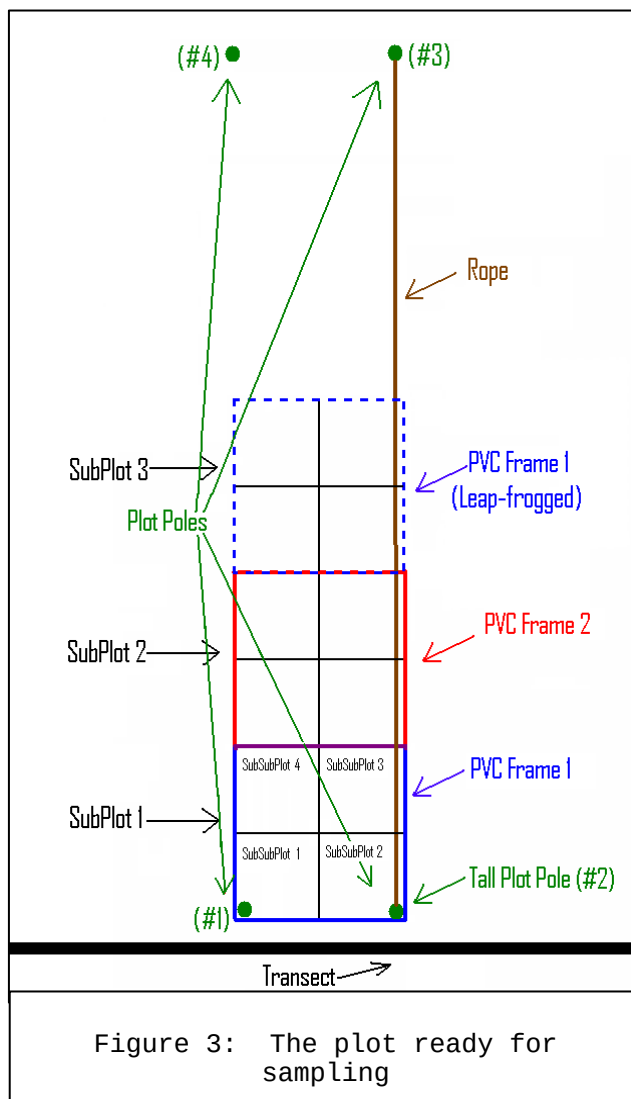


Figure 3: The plot ready for sampling

Part D – Rules and Notes on Estimating Percent Cover

1. Cover Classes were as follows:

trace = $\leq 3\%$, $< 10\%$, 10, 15, 20 ... in increments of 5% up to 100

2. Blades of graminoids were condensed into solid units of area.

3. When estimating percent cover, dried periphyton, which often coated plant stems and/or leaves, was mentally removed first.

To avoid sampling variations, sampling should always occur during the dry season, preferably during the months of March and April.

It was expected that estimates of percent cover for individual species would add to a number that was larger than the total cover percentage. This was because total cover does not account for the three-dimensionality of the vegetation.

Part E – Unknowns

If an unknown plant species was encountered, a specimen of the unknown was collected (outside of the plot if possible). A name, number, or letter for the unknown was recorded on the data sheet, and the specimen and a labeled tag were placed in a plastic bag. The specimen was pressed and then identified as soon as possible with its alias being replaced on the datasheet.

Directions to Transects (See maps also)

Transect 1: Leave the park on State Road 9336 going east. Shortly after exiting the park, you will see a canal (L31W). Turn left onto the gravel road just after driving over the canal. Use the South Florida Water Management District (SFWMD) gate key to open the first yellow gate and the gates that follow. Continue to drive down the gravel road, which will take you north along the canal, until you see a "Danger, No Swimming..." sign. Turn left onto the road that passes by this sign. You will encounter another yellow gate shortly after you pass the sign. Open the gate and continue driving down the gravel road, which briefly goes north and then turns to the west. Drive west until the road turns to the north. Park at the bend in the road (UTM 17N, NAD83: 541251 easting, 2811368 northing). Walk west-southwest ~550 m until you see transect poles.

Transect 2: From the intersection of the road to Royal Palm and the Main Park Road, turn right onto the Main Park Road, so you are going east. Depending on which part of transect you want to sample, you can park up to about 400 m east or west of the Taylor Slough sign. To park closest to the midpoint of the transect, park at UTM 17N, NAD83: 539477 easting, 2809589 northing. The transect line runs approximately 120° - 300° and is 250 m off of Main Park Road, on the northern side of the road.

Transect 3: From the intersection of the road to Royal Palm and the Main Park Road, turn right onto the Main Park Road, so you are going east. Shortly after you pass the entrance station, turn right onto the road to Pine Island. Take this road past the maintenance and residential areas. Bear right at the end and drive into the water treatment enclosure. Go through the locked gate at the far side of the water treatment center, the road will turn into a gravel road. Park on the side

of the road just before the well defined road ends and an overgrown trail/road turns to the left to form the old airstrip (UTM 17N, NAD83: 540798 easting, 2807046 northing). From this point, walk at about 157° (following the edge of the slough to the left) for approximately 1.2 km or until you encounter the transect.

Transect 4: Leave the park on State Road 9336 going east. Turn left onto SW 217th Ave. 3.5 km (2.2 miles) from the park entrance (the radio tower is on the right side of State Road 9336 where it intersects SW 217th Ave.). Head north on SW 217th Ave. until you go over a canal and see a yellow SFWMD gate on the left. If you get to the Homestead Airport, you've gone too far. Go through the yellow gate and follow the canal road west, briefly northwest, and then west again until it turns north. Just after the road turns north, there will be another gate, and a canal overpass on the left, go through the gate (west) heading toward the big building. When you get to the building, go north through another gate to pass over another canal, continue for a very short distance until you have to go over another canal and through another gate. Once through this gate follow the road east and then north for awhile until you get to an abandoned blocked off bridge on the right. At this bridge, go left (west), the road becomes unpaved. Continue west and bear slightly north toward the end of the road where it intersects with an old paved road. At this intersection, go left (south). The paved section then ends and you will go right (west) onto a gravel road. Continue to drive west on the gravel road until you reach a gate to Everglades National Park. Unlock the gate and drive down the degraded road (Context Road) for approximately 3.7 km (2.3 miles) to UTM 17N, NAD83: 538963 easting, 2820201 northing. Walk south about 200 meters from the road until you start seeing transect poles.

Transect 5: Leave the park on State Road 9336 going east. Shortly after exiting the park, you will see a canal (L31W). Turn left onto the gravel road just after driving over the canal. Use the South Florida Water Management District (SFWMD) gate key to open the first yellow gate and the gates that follow. Continue to drive down the gravel road, which will take you north along the canal, until you see a "Danger, No Swimming..." sign. Turn left onto the road that passes by this sign. You will encounter another yellow gate shortly after you pass the sign. Open the gate and continue driving down the gravel road, which briefly goes north and then turns to the west. Drive west until the road turns to the north, keep following the road north. Follow the road until you get to the fence by the pumping station. Open the fence and drive north onto the 2 track road for about 1.8 km (1.1 miles), until you see a hydrostation on the left, and a canal monitoring station on the right. Park on the side of the road here (UTM 17N, NAD83: 541209 easting, 2813490 northing). Walk west until you get to another hydrostation further out in the slough. From here, walk approximately west-northwest until you encounter the first transect poles.

Transect 6: From the Daniel Beard Research Center go east on Research Road until you get to the stop sign. Turn south onto the unpaved road and follow it until you get to a locked park service gate. Unlock this gate and follow the unpaved road (Old Ingraham Highway) south-southwest for about 4.3 km (2.7 miles) to UTM 17N, NAD83: 535623 easting, 2802342 northing. From here, walk southeast about 60 m until you encounter the first transect pole.

Literature Cited

Olmstead, I.C., Loope, L.L., and Rintz, R.E. 1980. A survey and baseline analysis of the vegetation of Taylor Slough, Everglades National Park. Report T-586, South Florida Natural Resource Center.

Van Lent, T. and R. Johnson. 1993. Towards the restoration of Taylor Slough. South Florida Natural Resource Center.

Figure 4: All Taylor Slough Transects

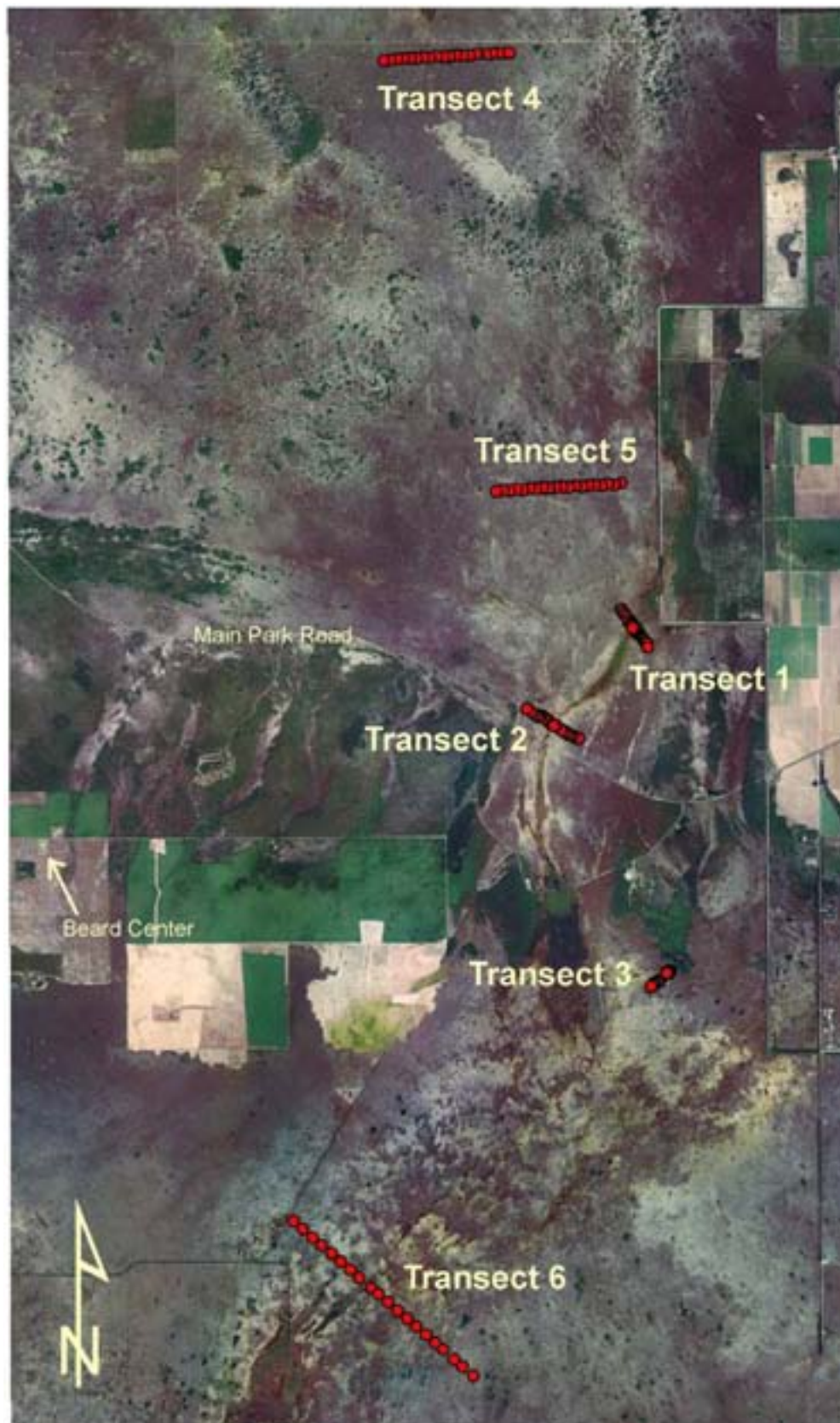


Figure 5: Transect 1 (UTM Zone 17N – WGS84)

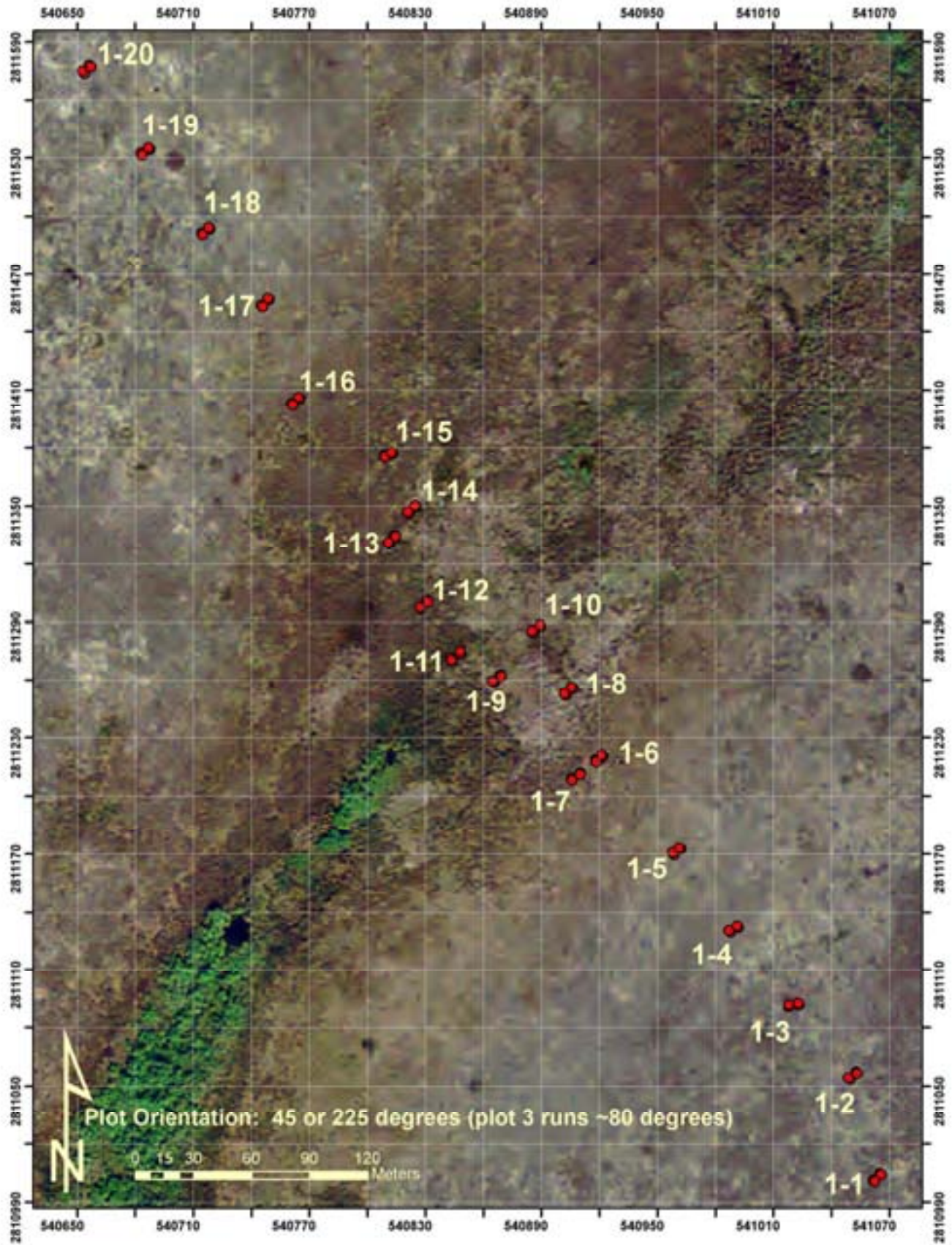


Figure 6: Transect 2 (UTM Zone 17N – WGS84)

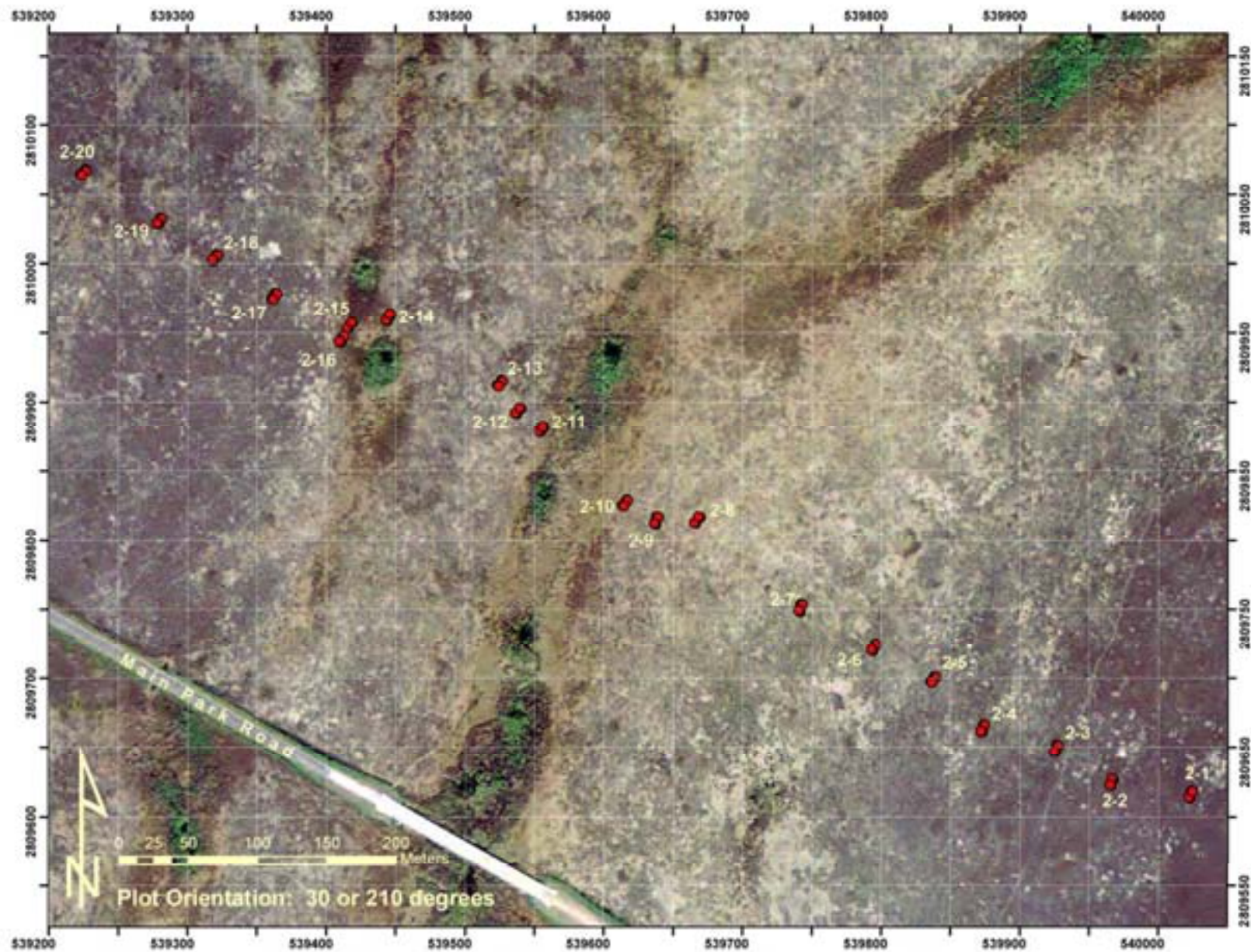


Figure 7: Transect 3 (UTM Zone 17N – WGS84)

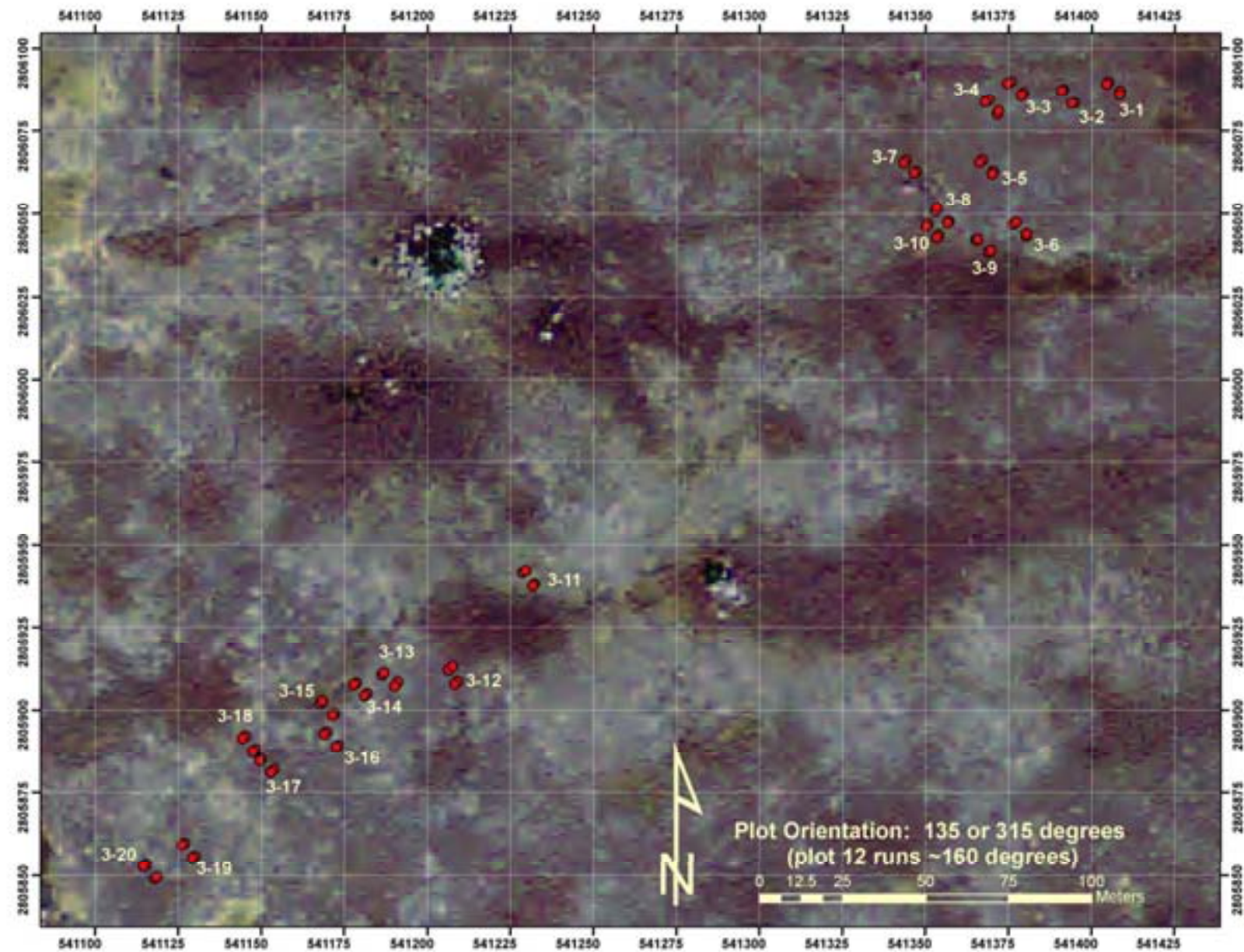


Figure 8: Transect 4 (UTM Zone 17N – WGS84)

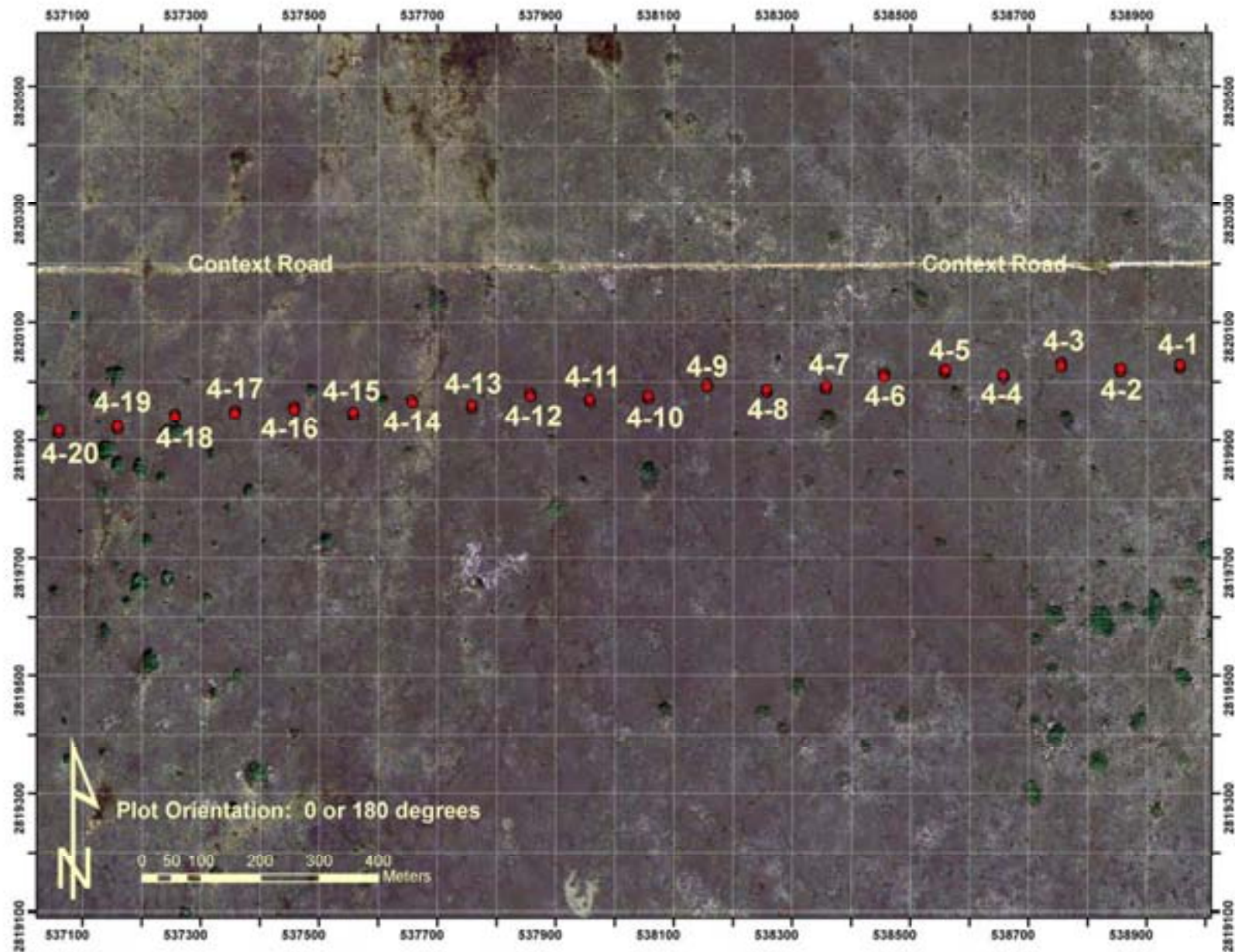


Figure 9: Transect 5 (UTM Zone 17N – WGS 84)

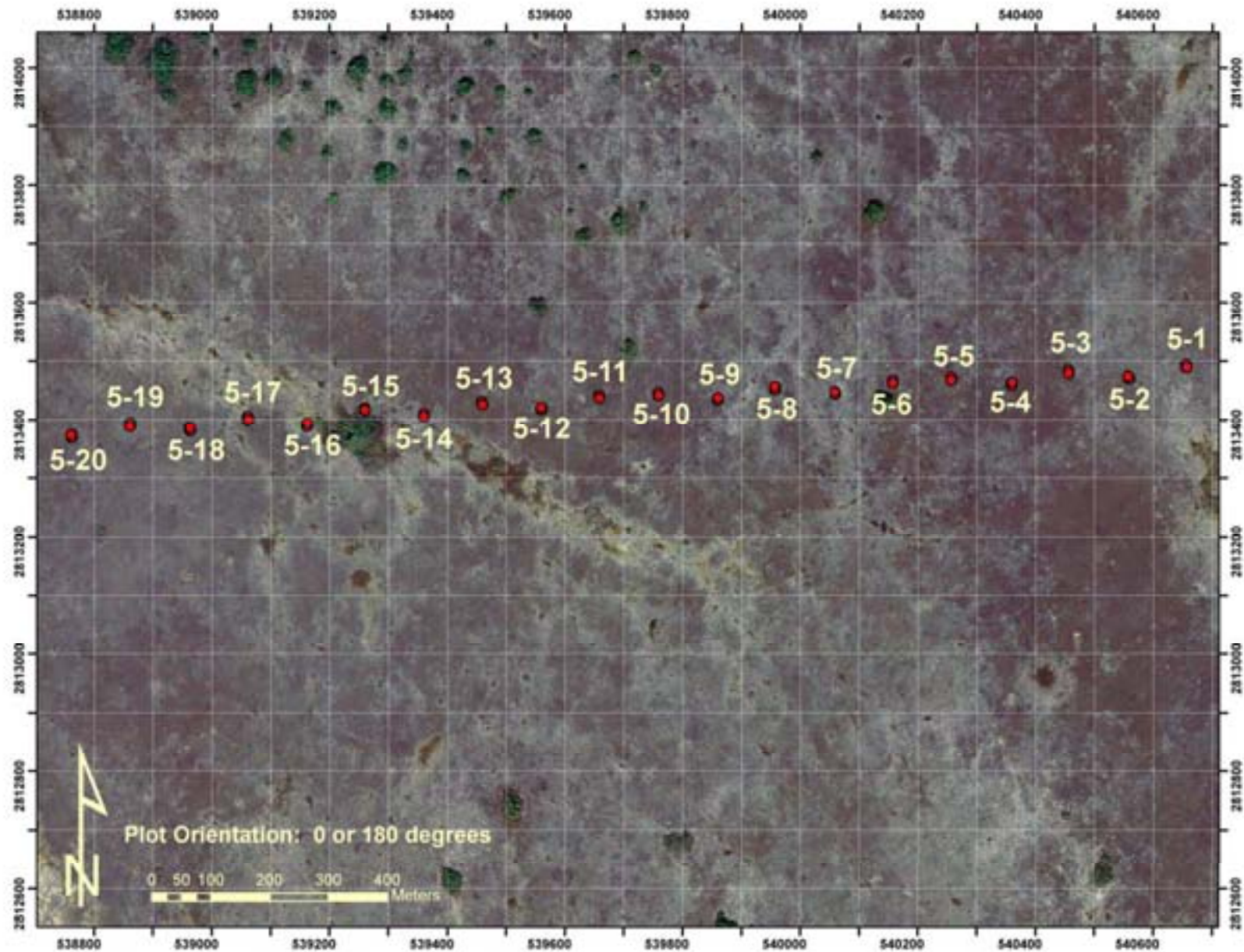


Figure 10: Transect 6 (UTM Zone 17N – WGS 84)

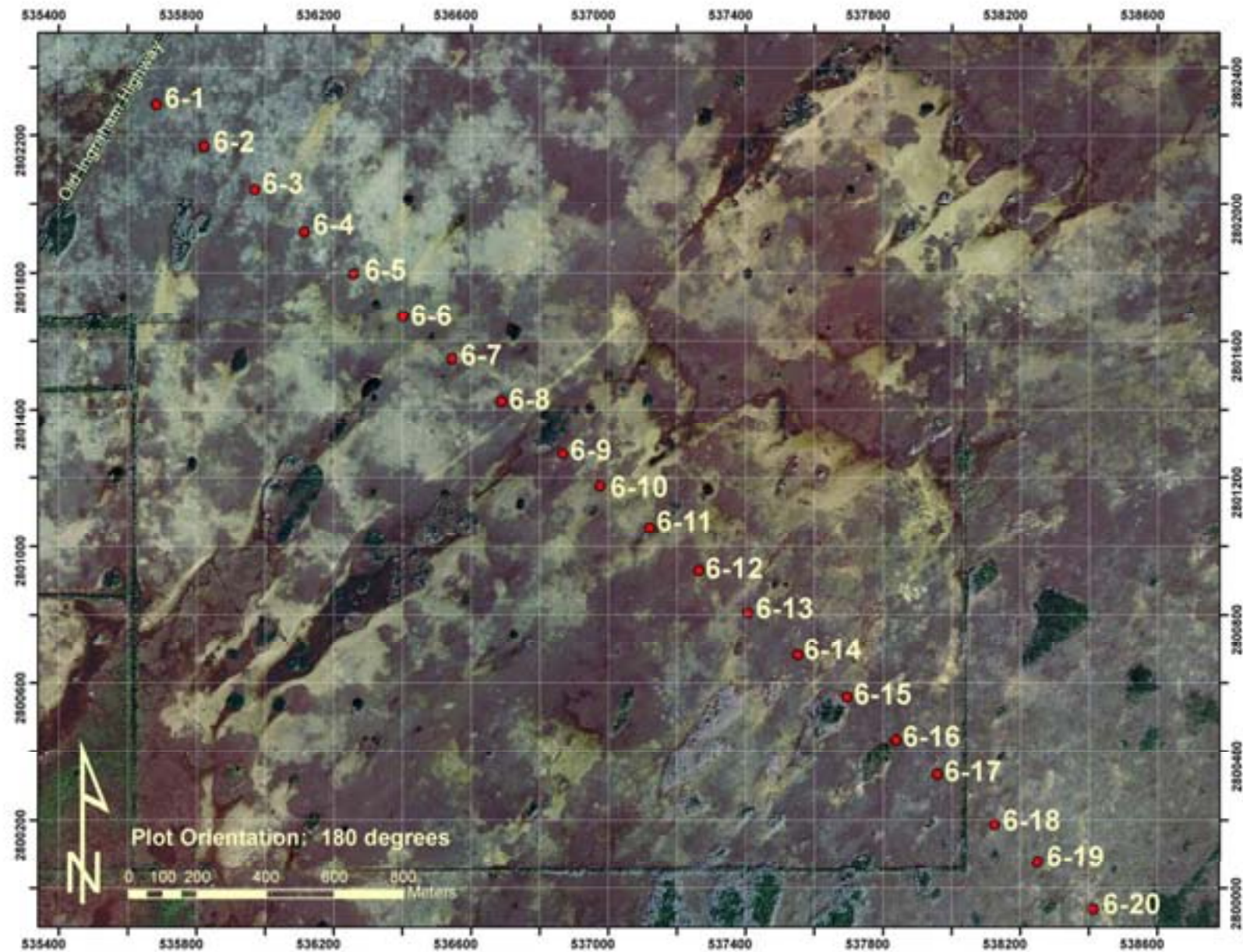


Figure 11: Directions to Transects 1 & 5 (UTM Zone 17N – WGS 84)

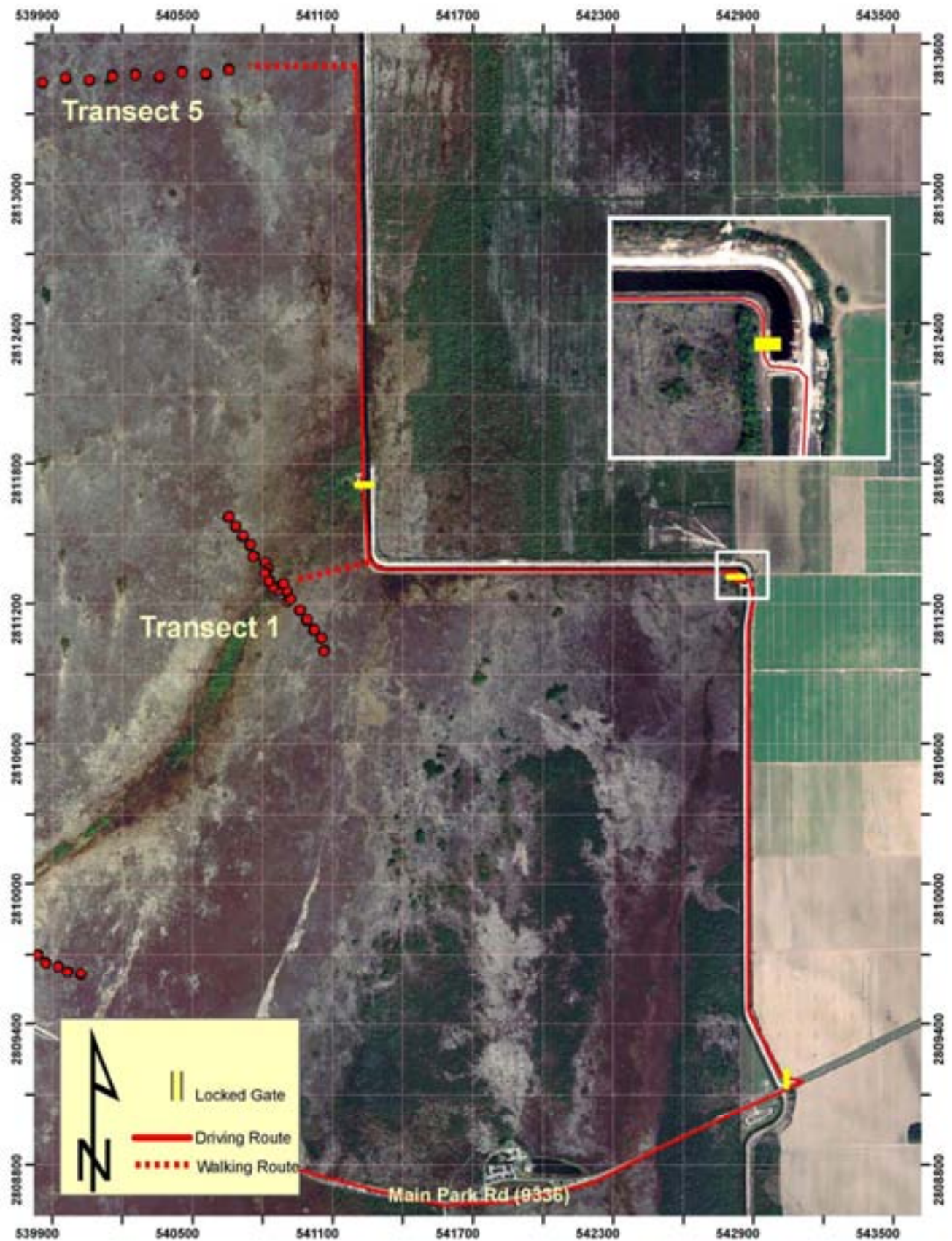


Figure 12: Directions to Transect 2 (UTM Zone 17N – WGS 84)

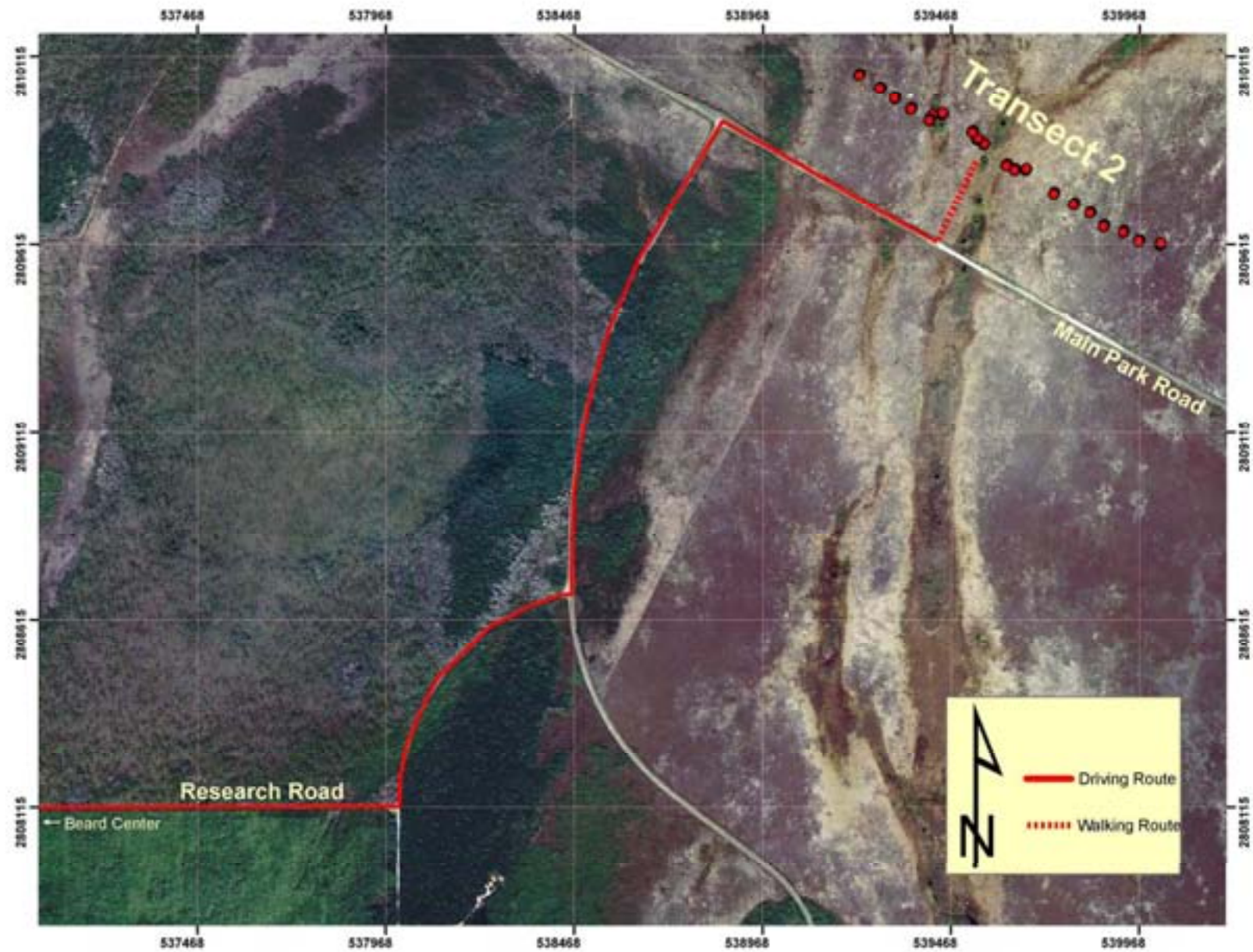


Figure 13: Directions to Transect 3 (UTM Zone 17N – WGS 84)

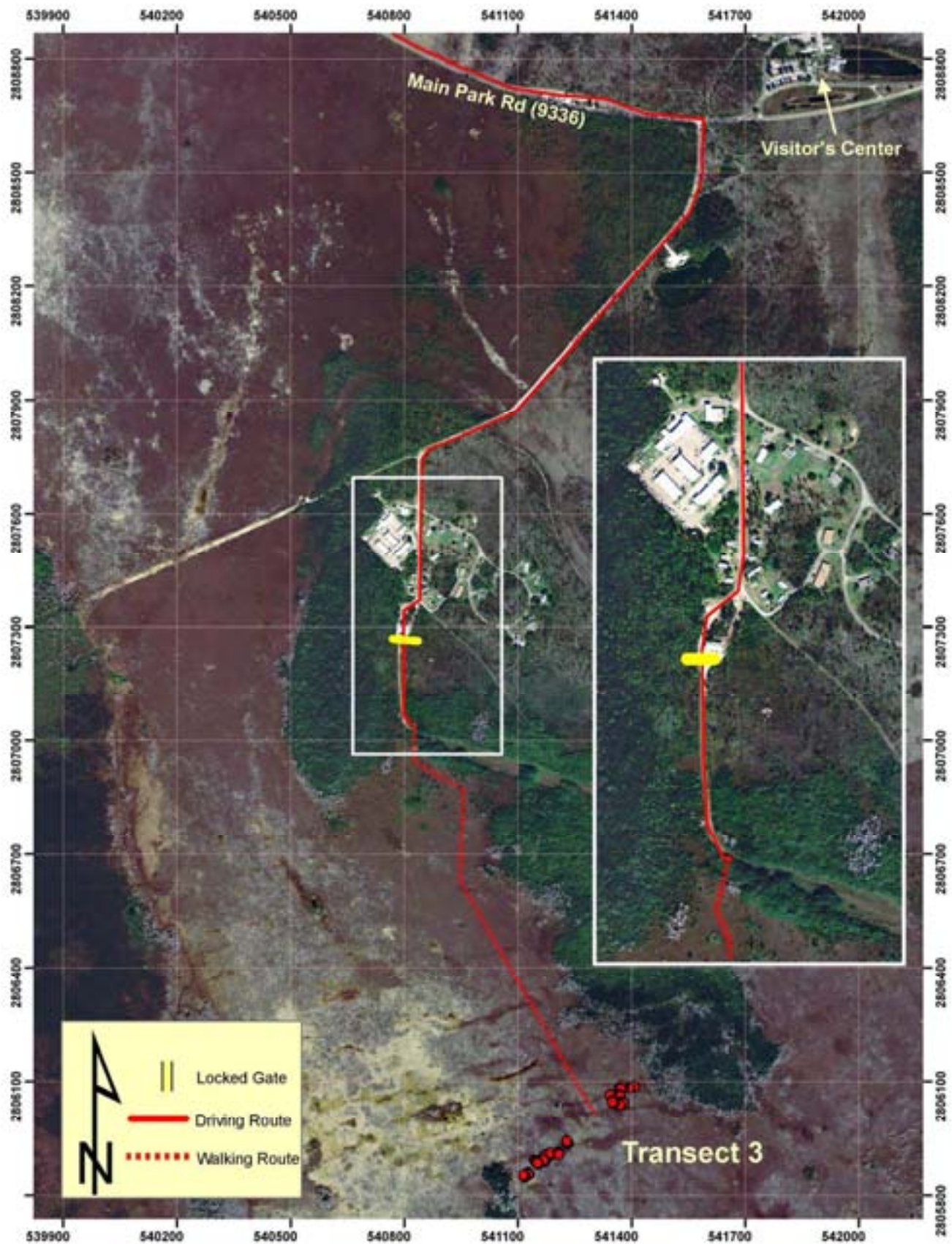


Figure 14: Directions to Transect 4 (UTM Zone 17N – WGS 84)

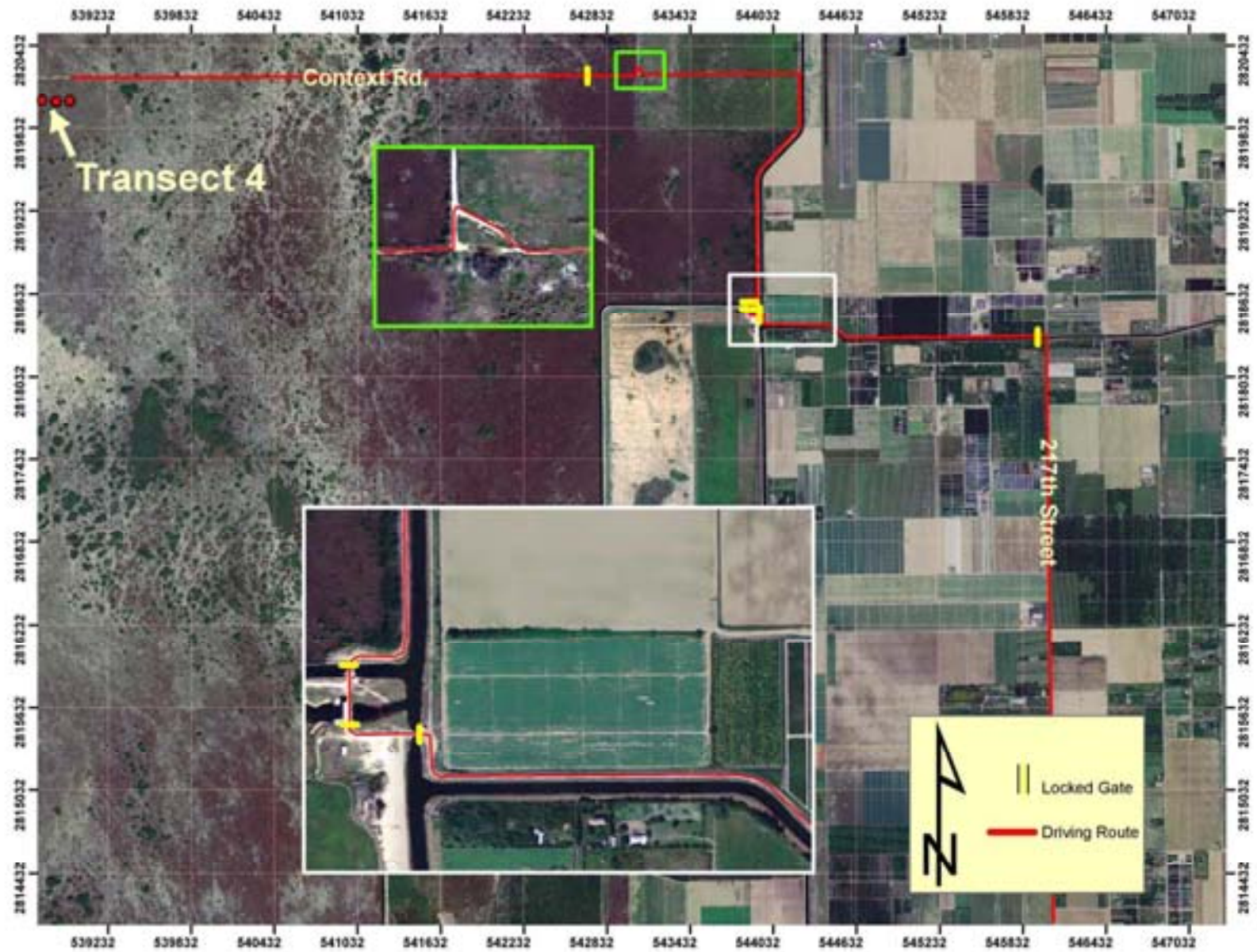


Figure 15: Directions to Transect 6 (UTM Zone 17N – WGS 84)

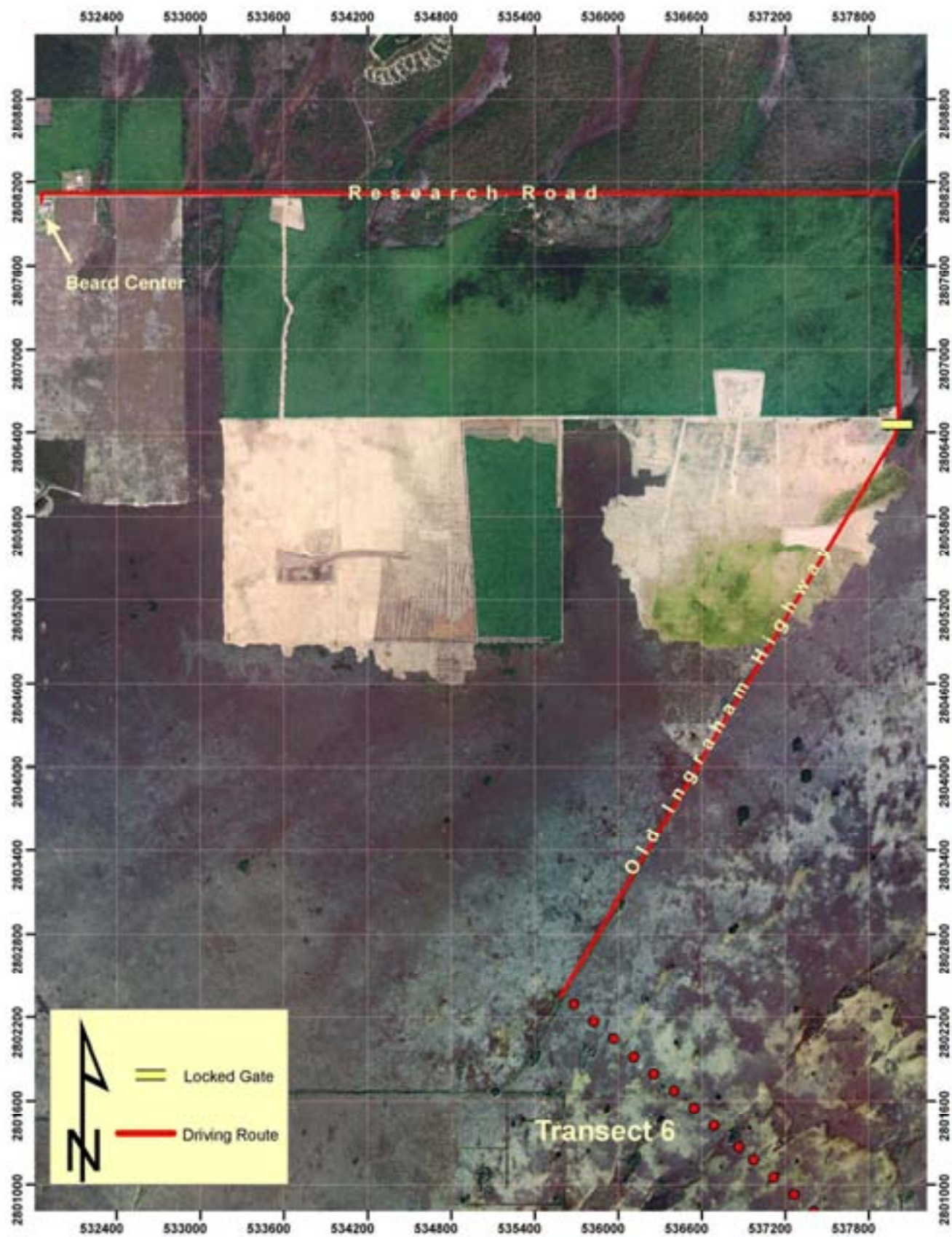


Table 1: Plot Pole GPS Points (UTM Zone 17N – WGS84)

Plot Pole	Northing	Easting		Plot Pole	Northing	Easting
1-1 1	2811004.1	541065.7		1-14 2	2811348.1	540821.7
1-1 2	2811004.7	541065.1		1-14 3	2811349.7	540825.5
1-1 3	2811001.2	541061.7		1-14 4	2811350.4	540824.7
1-1 4	2811000.6	541062.5		1-15 1	2811376.0	540808.9
1-2 1	2811054.3	541048.9		1-15 2	2811375.2	540809.2
1-2 2	2811053.4	541050.0		1-15 3	2811376.8	540813.2
1-2 3	2811056.4	541053.5		1-15 4	2811377.5	540812.5
1-2 4	2811057.2	541053.0		1-16 1	2811405.3	540765.3
1-3 1	2811091.6	541018.1		1-16 2	2811406.1	540764.6
1-3 2	2811090.6	541017.9		1-16 3	2811403.1	540760.8
1-3 3	2811091.4	541023.2		1-16 4	2811402.2	540761.4
1-3 4	2811092.5	541022.9		1-17 1	2811453.8	540745.2
1-4 1	2811130.4	540987.1		1-17 2	2811452.8	540746.0
1-4 2	2811129.7	540987.8		1-17 3	2811456.7	540749.3
1-4 3	2811132.1	540991.9		1-17 4	2811457.4	540748.6
1-4 4	2811132.8	540991.2		1-18 1	2811491.3	540714.4
1-5 1	2811170.6	540958.0		1-18 2	2811490.5	540714.9
1-5 2	2811169.5	540958.9		1-18 3	2811493.4	540718.8
1-5 3	2811172.2	540962.2		1-18 4	2811494.2	540718.1
1-5 4	2811173.0	540961.4		1-19 1	2811532.6	540683.1
1-6 1	2811218.4	540918.0		1-19 2	2811531.3	540683.7
1-6 2	2811217.6	540918.5		1-19 3	2811534.5	540687.7
1-6 3	2811220.1	540921.7		1-19 4	2811535.3	540687.0
1-6 4	2811220.8	540921.3		1-20 1	2811575.4	540652.7
1-7 1	2811211.2	540910.2		1-20 2	2811574.5	540653.4
1-7 2	2811212.0	540910.1		1-20 3	2811577.4	540657.0
1-7 3	2811209.0	540905.5		1-20 4	2811578.3	540656.1
1-7 4	2811208.4	540906.0		2-1 1	2809613.8	540021.5
1-8 1	2811252.8	540901.8		2-1 2	2809613.3	540022.5
1-8 2	2811252.1	540902.7		2-1 3	2809618.0	540024.4
1-8 3	2811255.5	540906.6		2-1 4	2809618.4	540023.7
1-8 4	2811256.0	540905.5		2-2 1	2809627.1	539966.5
1-9 1	2811261.8	540869.4		2-2 2	2809626.7	539967.5
1-9 2	2811262.6	540868.8		2-2 3	2809622.6	539964.9
1-9 3	2811260.2	540864.8		2-2 4	2809622.4	539965.9
1-9 4	2811259.3	540865.3		2-3 1	2809651.2	539927.6
1-10 1	2811285.5	540885.3		2-3 2	2809651.6	539926.3
1-10 2	2811284.8	540885.8		2-3 3	2809646.7	539924.9
1-10 3	2811287.7	540889.7		2-3 4	2809646.6	539925.6
1-10 4	2811288.5	540889.4		2-4 1	2809666.3	539874.8
1-11 1	2811273.9	540848.6		2-4 2	2809666.5	539873.8
1-11 2	2811274.7	540847.9		2-4 3	2809661.7	539871.9
1-11 3	2811271.7	540843.0		2-4 4	2809661.6	539872.7
1-11 4	2811270.4	540843.5		2-5 1	2809700.5	539839.4
1-12 1	2811300.1	540831.6		2-5 2	2809701.1	539838.4
1-12 2	2811301.7	540831.0		2-5 3	2809697.6	539835.6
1-12 3	2811297.3	540827.4		2-5 4	2809696.9	539836.3
1-12 4	2811296.4	540827.8		2-6 1	2809724.0	539796.4
1-13 1	2811334.3	540814.8		2-6 2	2809724.6	539795.8
1-13 2	2811334.8	540813.9		2-6 3	2809720.4	539793.1
1-13 3	2811331.2	540811.0		2-6 4	2809719.7	539794.1
1-13 4	2811330.5	540811.6		2-7 1	2809753.5	539743.1
1-14 1	2811348.9	540821.2		2-7 2	2809753.9	539742.0

2-7 3	2809749.1	539740.5		3-1 1	2806086.0	541408.4
2-7 4	2809748.5	539741.4		3-1 2	2806087.0	541408.5
2-8 1	2809812.3	539665.4		3-1 3	2806089.8	541405.2
2-8 2	2809811.9	539666.3		3-1 4	2806089.0	541404.5
2-8 3	2809816.1	539669.1		3-2 1	2806083.3	541394.0
2-8 4	2809816.6	539668.3		3-2 2	2806083.4	541394.9
2-9 1	2809816.4	539639.2		3-2 3	2806087.5	541391.5
2-9 2	2809816.6	539638.1		3-2 4	2806087.0	541390.9
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