Ozarks Environmental and Water Resources Institute (OEWRI)
Missouri State University (MSU)

Year 1 Data Report for**:**

Pre-Activity Assessment using the USFS Soil Disturbance Protocol, Mark Twain National Forest, SE Missouri.

DRAFT

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PURPOSE AND SCOPE

The United States Forest Service (USFS) has contracted the Ozarks Environmental and Water Resources Institute (OEWRI) to perform the USFS Forest Soil Disturbance Monitoring Protocol (FSDMP) within the Mark Twain National Forest (MTNF) in southern Missouri. The FSDMP is a national monitoring program designed to assess the extent of ground disturbance during timber harvest activity and to quantify changes to the landscape that may affect long-term sustainability of the site (Page-Dumroese et al. 2009[1]). This is the first time this type of monitoring has been performed within the MTNF and results of this study will be used to refine the FSDMP to adequately access the impact of timber harvest on variable Ozarks landscapes. The overall goal of this project is to use the FSDMP to monitor different areas within the MTNF and assess the effectiveness of the FSDMP as a monitoring tool. Specific objectives of this project are:

1. Implement FSDMP on MTNF lands based on forest management units selected by MTNF soils program manager.

2. Complete pre-activity data collection at six timber sale sites between 2017 and 2018.

3. Enter pre-activity data into provided database and provide a quality control review.

4. Provide a photo location representative for each transect line and spatial data associated with transects and points along transects.

5. Summarize findings, results, and analysis.

6. Provide a review of the protocol and recommendations or modifications (if any) to maximize effectiveness of the protocol for use in forest types and management systems in southern Missouri, following the first year of the agreement.

STUDY AREA

The MTNF consists of six ranger districts in southern Missouri (Figure 1). Three districts were chosen for this project: Doniphan/Eleven Point, Ava/Cassville/Willow Springs, and the Poplar Bluff Districts. Two sites were assessed within each district and range from 5.7-38.6 ha in size (Table 1). The Warthog and Monterey sites are located in the Doniphan/Eleven Point Ranger District in Carter and Oregon Counties. The Sterling Hollow and Fox Hollow sites are located in the Ava/Cassville/Willow Springs Ranger

District in Howell and Douglas Counties. Finally, the Swayback and Coyote sites are located in the Poplar Bluff Ranger District in Butler and Wayne Counties.

The MTNF is located in the southern Missouri Ozarks region that is characterized by a dissected plain grading from broad, gently rolling uplands to steep, highly dissected hillslopes when closer to major river valleys (USDA 2006). In general, the region is underlain by soluble Ordovician and Mississippian age cherty limestone and dolomite, with remnant Pennsylvanian age sandstone and shale along ridgetops (Adamski et al. 1995). The area is a karst landscape where sinkholes, losing streams, and springs are common. Upland soils are formed from cherty residuum and colluvium capped by a thin layer of loess, fragipans are common on the broad, flat divides (USDA 2006). The forest is dominated by Oak and Oak-mixed hardwood forest communities with smaller areas of native shortleaf pines (Nigh and Schroeder 2002).

METHODS

Geospatial Methods

USFS staff selected sites for the FSDMP and provided maps highlighting several payment units at each site (Appendix A). The maps were rectified in ArcGIS and each payment unit was digitized to create polygon areas of each unit. For each unit, a best-fit "zig-zag" transect including 68 total sampling points at equally-spaced intervals was created by visual judgement to cover all areas of the payment unit (see layout patterns of sampling points in Figures 2-7). The uniform use of 68 total sampling points at each site by MSU, regardless of differences in payment unit area, is based on criteria to collect the maximum number of points needed to quantify the maximum variability of soil variables within 20 percent confidence limits (Page-Dumroese et al. 2009[2]). These points were transferred to a Trimble 7x global positioning system (GPS) unit for navigation in the field (Photo 1). The Excel spreadsheet was prepared with the correct confidence intervals and other requirements and was accessed with an iPad.

Field Methods

Each zig-zag transect was sampled by starting at monitoring point #1 and performing FSDMP at every other pit (odd numbers). This scheme resulted in a minimum of 34 monitoring points being sampled across the entire unit. As data were entered into the FSDMP datasheet, the variability of the unit was quantified in the field by the FSDMP software. The FSDMP specifies the minimum number if points to be evaluated based on the chosen confidence interval. For this project 20 percent confidence interval was chosen. Therefore, if there was low variability in the data, a total of 30 locations would be enough to satisfy the minimum number of pits needed per the assessment within the

20 percent confidence limit. Alternatively, if the unit was highly variable, a total of 68 pits would be needed to evaluate the sampling error within 20 percent confidence limits. If this occurred, the evaluators would backtrack along the transect and fill in with more sampling pits at the even monitoring points to meet the 20% confidence limit requirement. For this project, a minimum of 34 points were evaluated, which exceeds the minimum required, to make sure the entire site was assessed.

At each pit location, a 6" ring has laid down at the predetermined location and a photo was taken to capture the condition of the forest floor to include the surrounding landscape (Photo 2). Forest floor depth was measured using a folding ruler and any notes of surrounding vegetation, surface rocks, or bare earth were also recorded (Photo 3). A pit was then dug to a depth of 6-12" (15-30 cm) (Photos 4 and 5). The exposed soil was then evaluated using the FSDMP protocol using visual indicators in the soil such as compaction and platy, massive, or puddled structure (Photo 6). Results of the assessment were entered into the Excel spreadsheet on site using an iPad (Appendix B, Photo 7). Finally, a photo of the pit was taken for later reference.

Data Storage and Visualization

All photos and datasheets were joined with each soil pit location and stored in an ArcGIS Geodatabase. These data can then be bought into ArcMap and the photo and the data collected at the individual pits can be observed by using the HTML Popup Tool to click on each point on the screen (Appendix C).

ASSESSMENT RESULTS

The six pre-activity sites were assessed between April 5th and September 27th, 2018. A description of each site and results of the assessment are given below.

Warthog

The Warthog site (22 ha) is located within the Doniphan/Eleven Point Ranger District in Carter County. It was assessed April 5, 2018 on a zig-zag transect with a length of 2,066 m and points spaced 62 m apart along the summit and steep side slope of a narrow ridge (Figure 2). The Coulstone gravelly sandy loam 3-8% slope is mapped on the ridgetop and Coulstone sandy loam 15-35% slopes is mapped on the side slope (USDA 2018a). Coulstone is formed from colluvium and sandstone residuum with 40-50% rock fragments in the upper 28 cm of the soil profile (USDA 2018b). There is also a small area of Midco very gravelly loam mapped at the base of the slope.

There were no disturbance indicators recorded at this site using the FSDMO protocol. The forest floor depth at this site ranged from 1.0-12 cm and averaged 4.9 cm (Table 2). The site was fairly rocky with almost a quarter of the sampling points having a rock identified on the surface (Photos 8 and 9). There was an old road along the top of the ridge, but our preselected site locations did not fall on the road. An intermittent stream was also noted during the assessment (Photo 10). Overall, the Warthog site was given a soil disturbance class of "0" for no impact observed using the FSDMP protocol.

Monterey

The Monterey site (28 ha) is located within the Doniphan/Eleven Point Ranger District in Oregon County. It was assessed May 11, 2018 on a zig-zag transect with length of 2,493 m and points spaced 74 m apart along the summit and shoulder of a broad upland landscape (Figure 3). The soils within along the summit were the Macedonia silt loam (3-8% slope) with smaller areas of Coulstone gravelly sandy loam (3-8% slopes) and Poynor very gravelly silt loam (1-8% slopes). The Macedonia soil series is formed from residuum of the underlying bedrock and capped by a thin layer of loess with 2-6% chert fragments in the upper 35 cm of the profile. Moving downslope the Clarksville very gravelly silt loam 8-15% is mapped on the side slope with 20-30% rock fragments in the upper 30 cm of the profile.

There was evidence of past disturbance at the Monterey site, but overall the site was classified as undisturbed. There were signs of recent prescribed fire in the area with charred pieces of woody debris present across the site. However, the forest floor depth still ranged from 1.0-8.0 cm and averaged 4.0 cm at this site (Table 2). The Monterey site also had the highest amount of live plants of all sites (35% of the sampling points). A sampling point did land on an ATV trail and one shallow rut point was recorded, however, there was no evidence of compaction or platy structure (Photo 11). Overall, the Monterey site was given a soil disturbance class of "0" for no impact observed using the FSDMP protocol.

Sterling Hollow

The Sterling Hollow site (7.9 ha) is located within the Ava/Cassville/Willow Springs Ranger District in Howell County. It was assessed July 31, 2018 on a zig-zag transect with length of 1,219 m and points spaced 36 m apart along the summit and side slope of a relatively narrow ridgetop (Figure 4). The soil series mapped along the ridgetop is the Tick very gravelly silt loam (3-5% slope). Moving downhill to the steep side slope, the soils are mapped as the Tick extremely gravelly silt loam (15-50% slope). The Tick soil series is formed in gravelly colluvium and the underlying mudstone with 15-35% chert fragments in the upper 25 cm. At the base of the slope there is a small area of Cedargap very gravelly silt loam (0-3% slope) mapped near the drainage way.

The Sterling Hollow site was also rocky with forest floor depths ranging from 0.05-6.0 cm with an average of 3.0 cm (Table 2). Around 20% of the sampling points had coarse and fine woody debris identified within the sampling ring, as there was evidence of storm damage that toppled several trees within the site. Additionally, around 6% of sampling points had at least some bare ground within the sampling ring. Overall the Sterling Hollow site was given a soil disturbance class of "0" for no impact observed using the FSDMP protocol.

Fox Hollow

The Fox Hollow site (38.6 ha) is located within the Ava/Cassville/Willow Springs Ranger District in Douglas County. It was assessed August 2, 2018 on a zig-zag transect with length of 3,276 m and points spaced 98 m apart along the summit and side slope of a relatively narrow ridgetop that including the base of the hillslope (Figure 5). The soil series mapped along the ridgetop is the Scholten-Tonti (3-8% slope), Scholten-Poynor (3-8% slope), and the Scholten-Poynor (8-15% slope). The Scholten and Tonti soil series have fragipans and all three series have between 15-40% rock fragments in the upper soil. Moving downhill to the steeper side slope the soils are mapped as the Poynor extremely gravelly silt loam (8-15% slope) and Coulstone-Bender complex (3-8% slope) toward the base of the hill. The Poynor soil series is formed in colluvium with 15-40% chert fragments in the upper portions of the profile.

The Fox Hollow site also had several trees laying on the ground either by snapping near the base or from tree throw. Forest floor depth ranged from 0.0-6.0 cm and averaged 3.0 cm (Table 2). Similar to Sterling Hollow, there was a relatively high number of sampling points (6%) with bare ground noted within the sampling ring compared to the other sites evaluated. Also, there was a number of trees that were laying on the ground from storm damage at this site, but the amount of coarse and fine woody debris observed was less than at Sterling Hollow (Photo 12 and 13). Overall, the Fox Hollow site was given a soil disturbance class of "0" for no impact observed using the FSDMP protocol.

Swayback

The Swayback site (5.8 ha) is located within the Poplar Bluff Ranger District in Douglas County. It was assessed September 26, 2018 on a zig-zag transect with length of 1,557 m and points spaced 47 m apart along the summit and shoulder of a ridge (Figure 6). The soil series mapped along the ridgetop is the Captina-Scholten complex (3-8% slope) and the Clarksville-Scholten complex (15-45% slope) mapped along the side slope. The Captina soil series has a fragipan and is typically free of rock fragments in the upper 30 cm of the profile.

The soils within the Swayback site were less rocky than the other sites that could make the unit more susceptible to disturbance impacts during timber harvest due to lower substrate support compared to rocky sites. Forest floor depth was 0.5-3.0 cm and averaged 2.0 cm (Table 2). This site had the lowest occurrences of live plants, woody debris, and bare soil among the six evaluated. While there were some pits that contained a few rocks within the upper profile, the majority of the pits evaluated at this site had a relatively thick layer of rock-free loess. This rock-free loess material may be more susceptible to compaction during timber harvest as compared to the rocky soils at the other sites. Overall, the Swayback site was given a soil disturbance class of "0" for no impact observed using the FSDMP protocol.

Wild Coyote

The Wild Coyote site (5.7 ha) is in the Poplar Bluff Ranger District in Wayne County. It was assessed September 27, 2018 on a zig-zag transect with length of 1,082 m and points spaced 32 m apart along a side slope below the summit of a ridge and includes a headwater drainage (Figure 7). The soil series mapped along the ridgetop is the Captina silt loam (3-8% slope) and the Yelton-Scholten (8-15% slope) was mapped further downhill along the side slope. The Yelton soil series has a fragipan and the upper soil is generally rock-free. At the base of the slope there is a small area of the Tilk-Secesh complex mapped which is formed in alluvium along floodplains, terraces, and alluvial fans.

Similar to the Swayback Site, the Wild Coyote site was less rocky than the other sites, which could make the unit more susceptible to disturbance impact during timber harvest. Forest floor depth was 0.5-3 cm and averaged 2.0 cm (Table 2). About 10% of the pits evaluated at this site had live plants and 6% had fine woody debris. There was no coarse woody, bare earth, or rock observed at the surface of any of the pit locations at this site. In addition, pits evaluated at this site had a relatively thick layer of rock-free loess in the upper part of the soil profile (Photos 14 and 15). As with the Swayback site, this material may be more susceptible to compaction during timber harvest as compared to the rocky soils at the other sites. Overall, the Wild Coyote site was given a soil disturbance class of "0" for no impact observed using the FSDMP protocol.

OBSERVATIONS AND RECOMMENDATIONS

Overall the FSDMP protocol was easy to understand and implement for the pre-activity portion of this project. Sampling bias and errors associated with in-the-field judgements during point selection were likely reduced by pre-determining sampling locations and

using objective GPS locations to locate sampling points. Additionally, using georeferenced photos at each sampling point to log the conditions at the time of the assessment is a good way to catalog temporal changes at each site. Furthermore, this allows other Forest Service personnel not present at the time of the assessment to visualize the site conditions. However, the applicability of the protocol cannot be fully evaluated until the post-activity assessment is completed.

Digging a 15-30 cm pit at each sampling point adds significantly more time to the overall assessment process. Perhaps it would be more efficient to only dig pits where there is an indicator of disturbance. Within the protocol the evaluator looks for indicators of disturbance such as skid trials, ruts, and other signs of activity. Therefore, an excavated pit may not be needed if the sample point does not show an indication of disturbance. Limiting pit sampling to disturbed points would allow more sites to be included in the program or more sampling points to be assessed at a site with improved confidence.

Another drawback is that sometimes the points do not land on a disturbance indicator, such as a road, which has been observed by the evaluator. Such conditions could necessitate additional pits to be evaluated that are effected by the disturbance. Therefore, if the predetermined points do not land on a disturbance indicator, additional pits should be added and the soil evaluated in these areas. Furthermore, it may also be beneficial to identify sensitive areas that are found within the unit, such as streams, and use photos to document any changes that may occur post-harvest. Possibly, adding a site mapping component to the assessment which locates pre-activity disturbance areas (i.e., roads) or excluded areas from sampling (i.e., streams) may help to focus sampling to better evaluate recent activity effects while maintaining sampling confidence requirements.

CONCLUSIONS

OEWRI implemented the USFS FSDMP at six pre-harvest activity payment units within the MTNF in southern Missouri. For this protocol, sampling locations were determined using a systematic, spatially-scaled, “zig-zag” transect method with a total of 68 equally spaced pit locations created in ArcGIS prior to going into the field. Transect length and the pit spacing were based on the size of the payment unit that ranged from 5.8-38.6 ha for the six sites evaluated for this study. These data were uploaded to a GPS that was used to navigate to the pit locations in the field. At each site the ground surface was evaluated prior to digging a 15-30 cm pit to assess the soil for signs of compaction. Ultimately, none of the sites evaluated using this protocol were considered impacted

prior to prior timber harvest or other disturbances. However, in some cases the predetermined sample pit locations did not land on disturbance indicators (like a road). Therefore, additional points may need to be collected in future assessments to more effectively evaluate observed disturbances that were under-sampled.. Finally, this report addresses the results and observations of the pre-activity portion of the protocol and cannot be fully evaluated until the post-activity assessment is completed.

REFERENCES

Adamski, J.C., J.C. Petersen, D.A. Freiwald, and J.V. Davis (1995) Environmental and Hydrologic Setting of the Ozark Plateaus Study Unit, Arkansas, Kansas, Missouri, and Oklhoma. U.S. Geological Survey Water Resources Investigations Report 94-4022.

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Page-Dumroese, D.S., A.M. Abbott, and T.M. Rice (2009[2]) Forest Soil Disturbance Monitoring Protocol Volume II: Supplementry Methods, Statistics, and Data Collecion. Forest Service, United States Department of Agriculture, Gen. Tech Report WO-82b.

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USDA (2018b) Official Soil Series Descriptions. National Resources Conservation Serive, U.S. Department of Agriculture. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/class/data/?cid=nrcs142p2_053587

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TABLES

Table 1. Summary of sites evaluated for this project

Site	MTNF District	County	Area (ha)	Date Assessed
Warthog	Doniphan/Eleven Point	Carter	22.3	April 5, 2018
Monterey	Doniphan/Eleven Point	Oregon	27.8	May 11, 2018
Sterling Hollow	Ava/Cassville/Willow Springs	Howell	7.9	July 31, 2018
Fox Hollow	Ava/Cassville/Willow Springs	Douglas	38.6	August 2, 2018
Swayback	Poplar Bluff	Butler	5.8	September 26, 2018
Wild Coyote	Poplar Bluff	Wayne	5.7	September 27, 2018

Table 2. Forest Floor Depth and Percentage of

Site	Forest Floor Depth (cm)			Present in Sample Point Observations (%)				
	Min	Avg.	Max	Live Plants	Coarse Woody Debris >7 cm Dia.	Fine Woody Debris >7 cm Dia.	Rock	Bare Soil
Warthog	1.0	4.9	12.0	8.8	8.8	14.7	23.5	2.9
Monterey	1.0	4.0	8.0	35.3	5.9	5.9	17.6	0.0
Sterling Hollow	0.05	3.0	6.0	8.8	20.6	20.6	2.9	5.9
Fox Hollow	0.0	3.0	6.0	5.9	11.8	5.9	0.0	5.9
Swayback	0.5	2.0	3.0	2.9	0.0	2.9	2.9	0.0
Wild Coyote	0.0	2.0	3.5	9.1	0.0	6.1	0.0	0.0

FIGURES

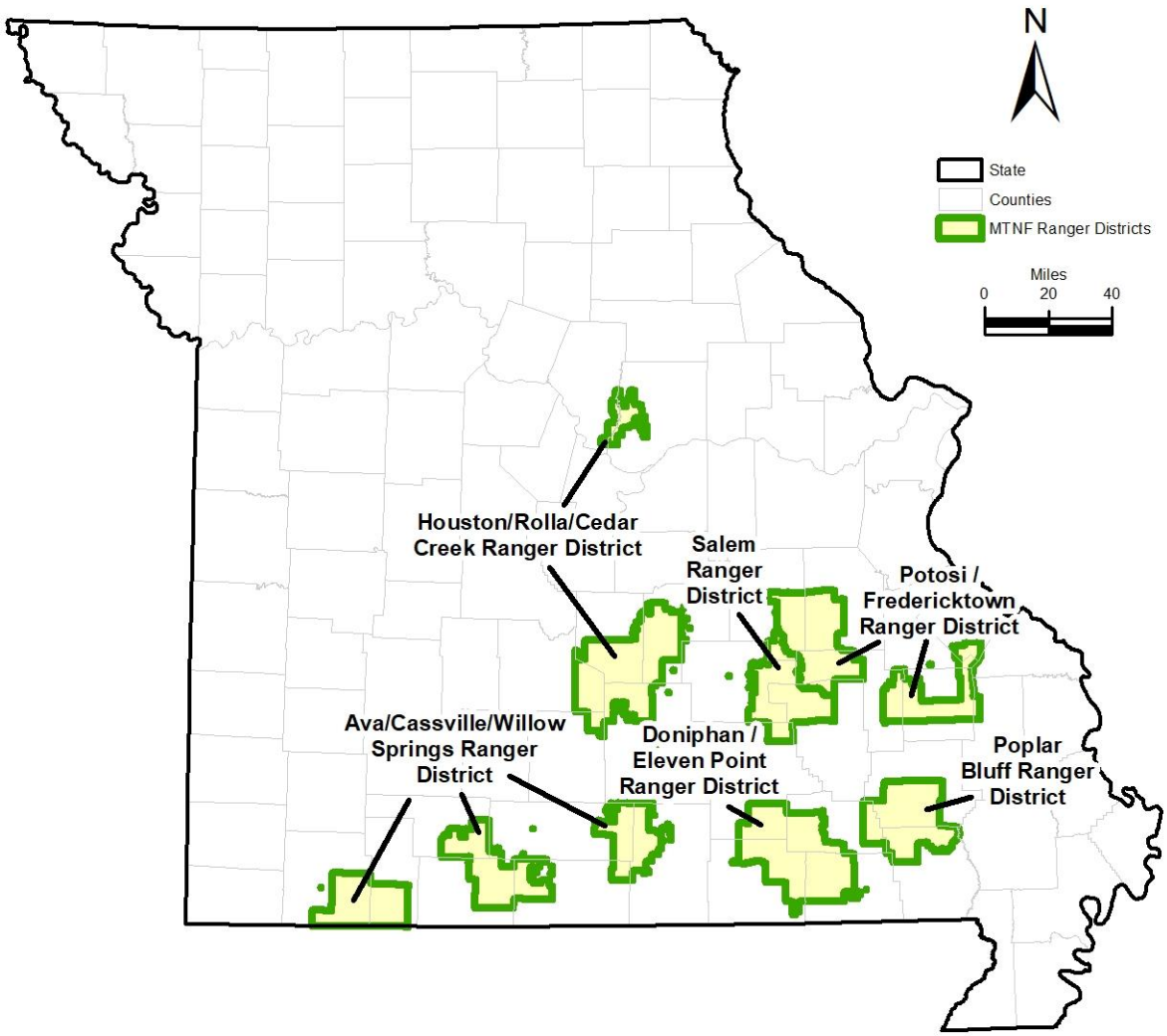

Figure 1. Mark Twain National Forest (MTNF) Ranger Districts in Southern Missouri.

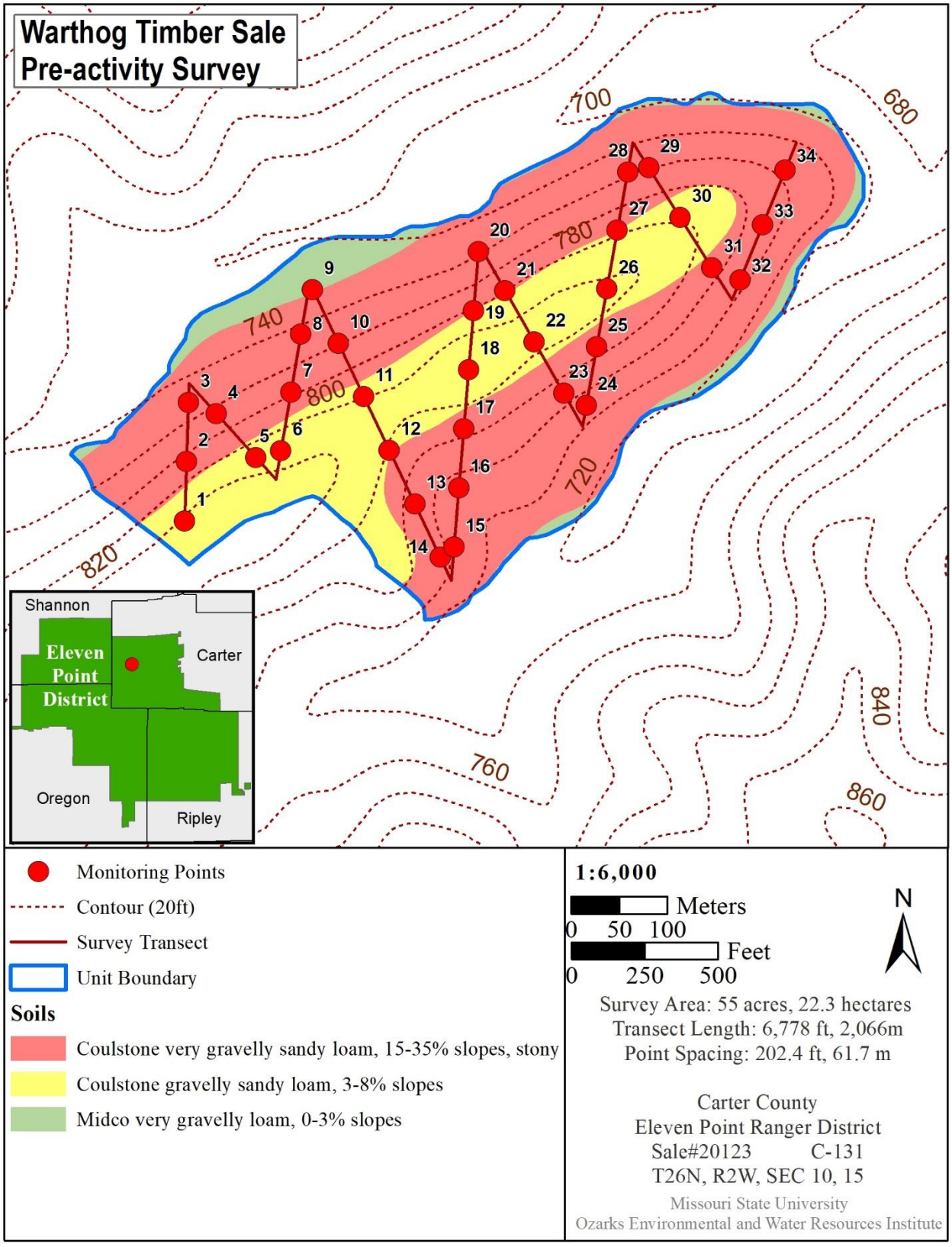

Figure 2. Warthog Site Map.

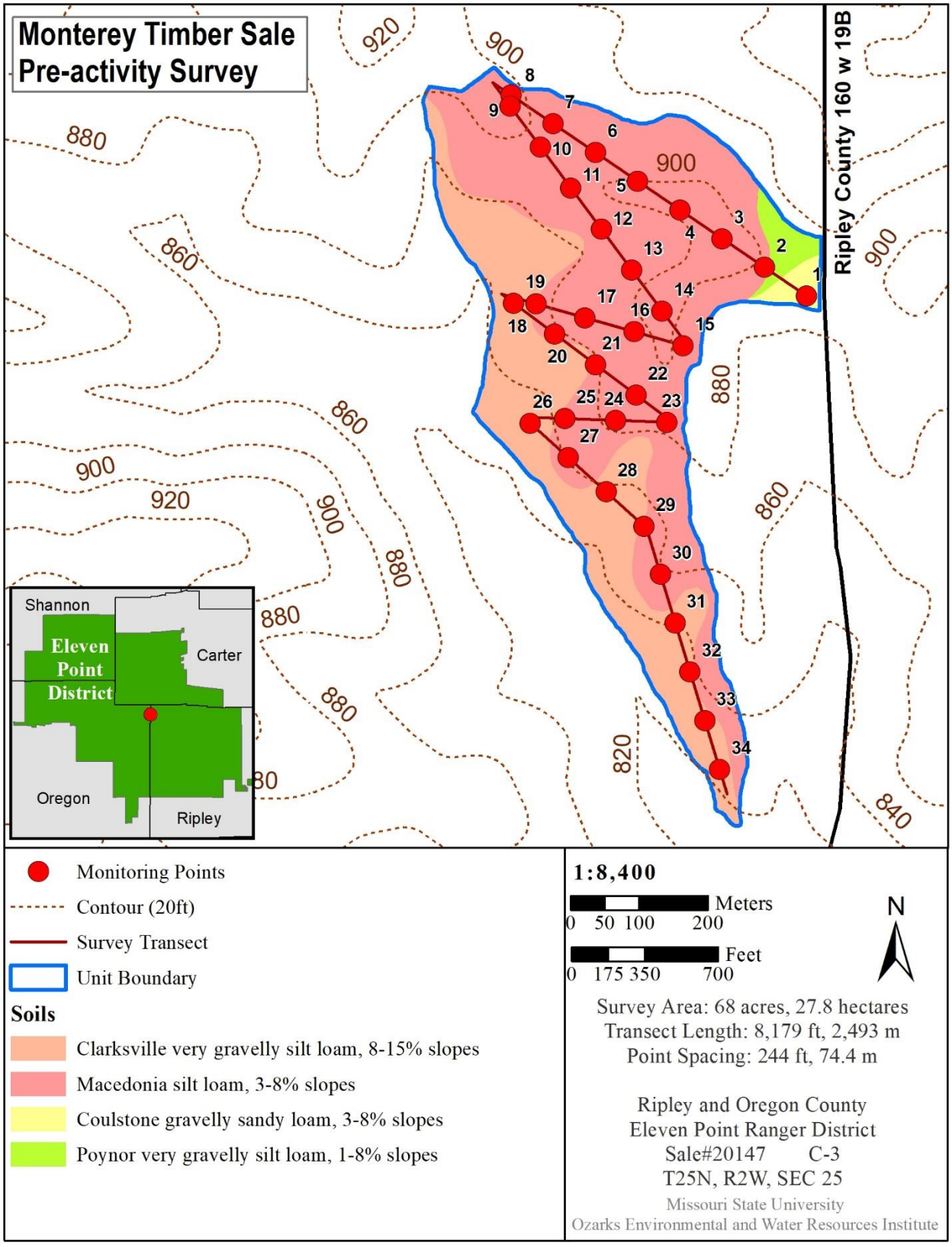

Figure 3. Monterey Site Map.

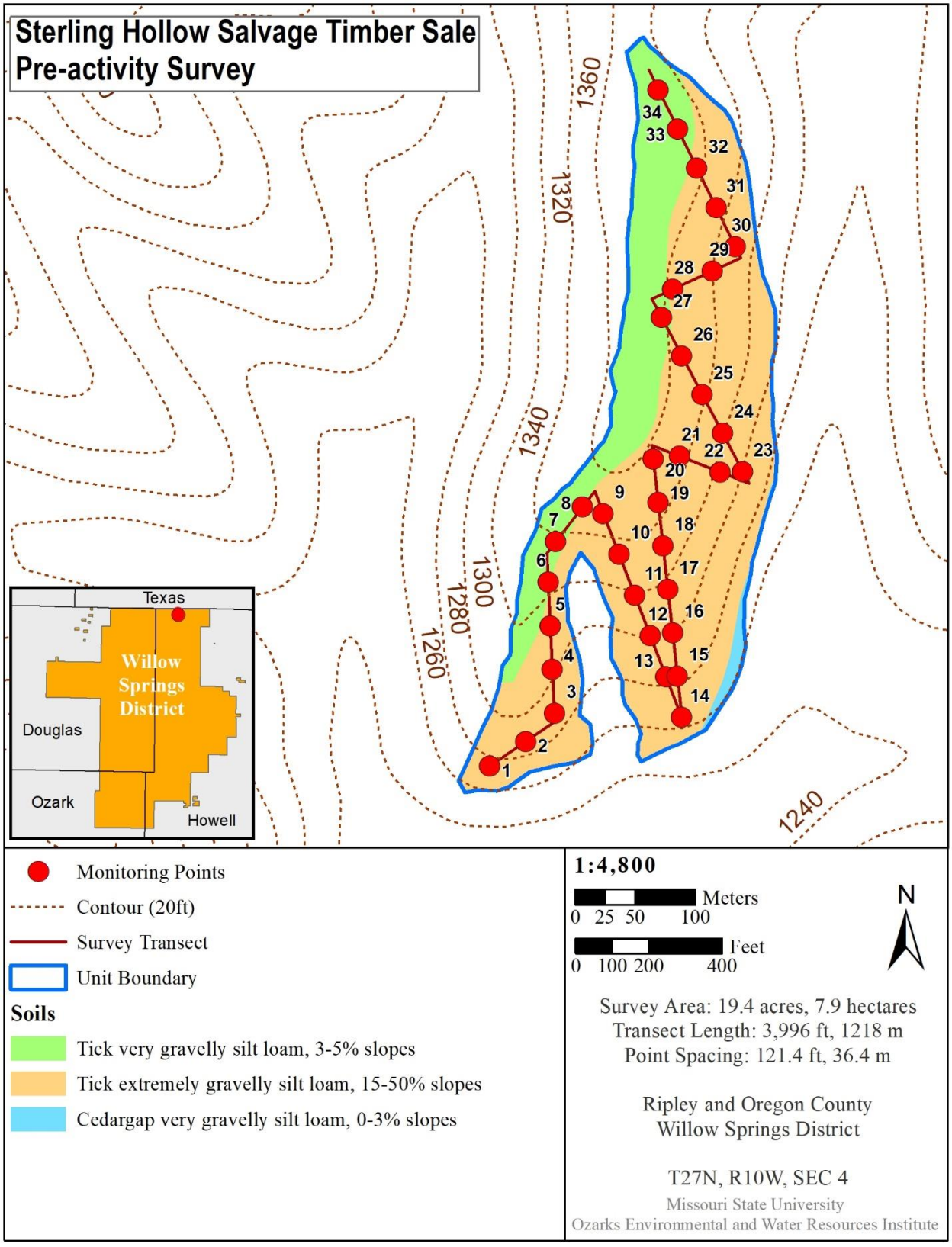

Figure 4. Sterling Hollow Site Map.

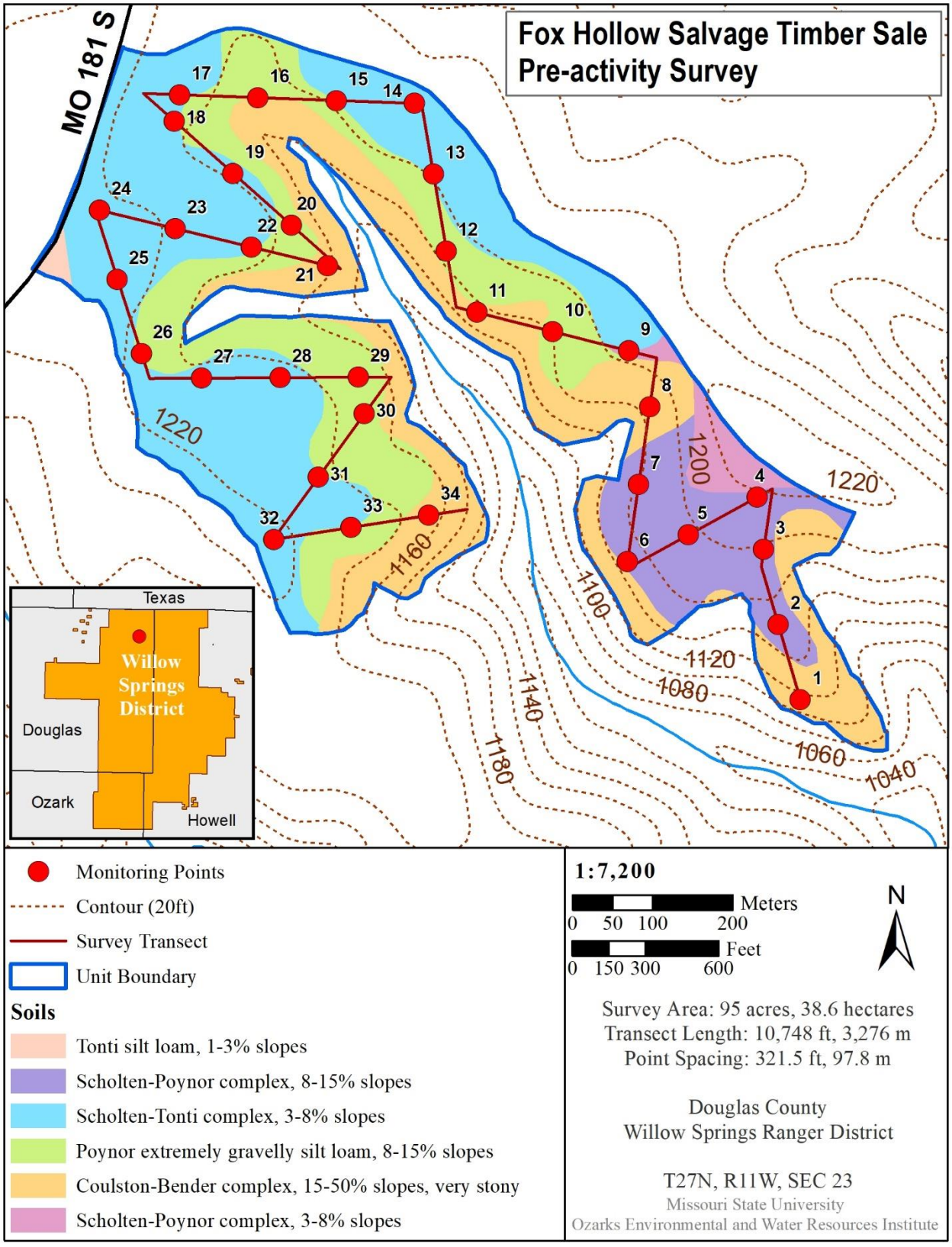

Figure 5. Fox Hollow Site Map.

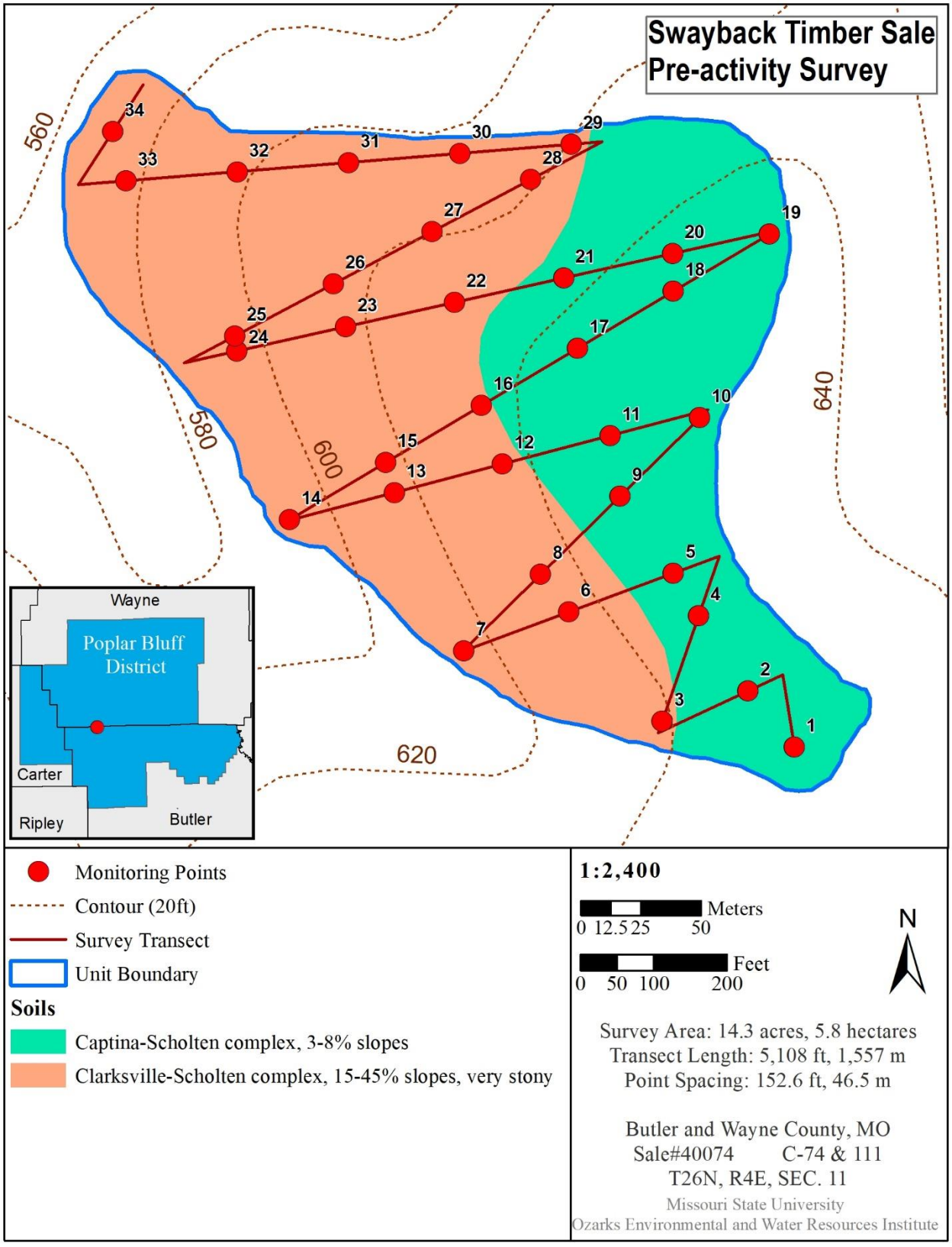

Figure 6. Swayback Site Map.

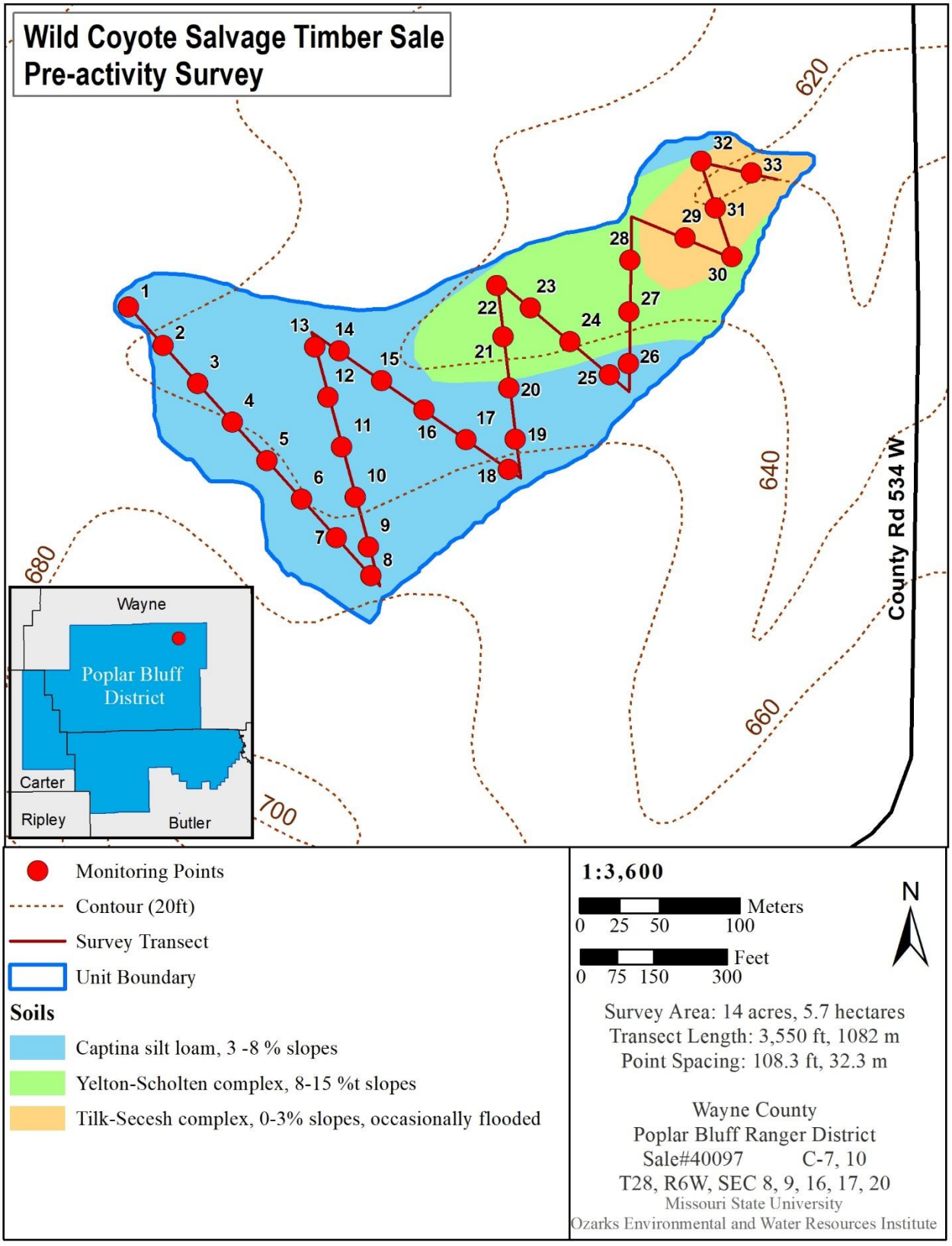

Figure 7. Wild Coyote Site Map.

PHOTOS

Photo 1. Using GPS navigation to locate pre-selected pit locations (Swayback: Sept. 26, 2018).

Photo 2. Pit location and ring where forest floor is evaluated prior to digging a pit (Monterey: May 11, 2018).

Photo 3. Measuring forest floor depth (Sterling Hollow: July 31, 2018).

Photo 4. Pits are dug to a depth of 15-30 cm (Warthog: April 5, 2018).

Photo 5. Measuring pit depth (Coyote: Sept. 27, 2018).

Photo 6. IPADs are used to enter data to FSDMP datasheet (Coyote: Sept. 27, 2018).

Photo 7. Using an example of platy structure to help field workers identify it in the field (Monterey: May 11, 2018).

Photo 8. Very rocky conditions were observed at some sites (Warthog: April 5, 2018).

Photo 9. Rocky colluvium material above loamy A horizon (Warthog: April 5, 2018).

Photo 10. Stream channels were located within some of the sites (Warthog April 5, 2018).

Photo 11. ATV trail located within the monitoring site (Monterey: May 11, 2018).

Photo 12. Wind damage was observed at some of the sites (Fox Hollow: August 2, 2018).

Photo 13. Tree throw was common at most sampling sites (Fox Hollow: August 2, 2018)

Photo 14. Loess parent material (Wild Coyote: Sept. 27, 2018) NOTE: Horizontal lines are not platy structure but are from scraping with a soil knife.

Photo 15. Weathered loess parent material (Wild Coyote: Sept. 27, 2018).

Photo 16. Deep, organic rich material (Monterey: May 11, 2018).

APPENDIX A - TIMBER SALE MAPS

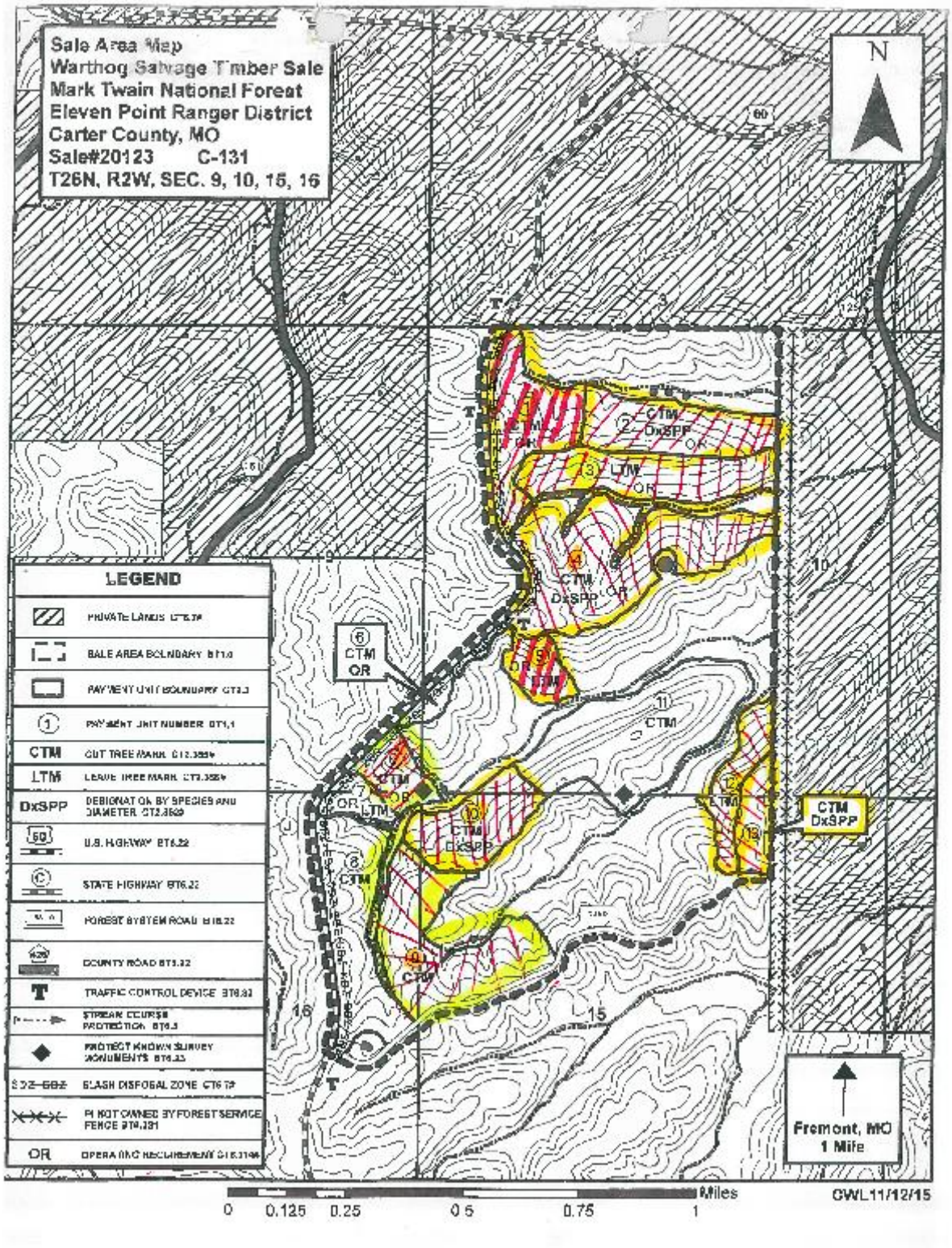

Figure 8. Warthog Timber Sale Map.

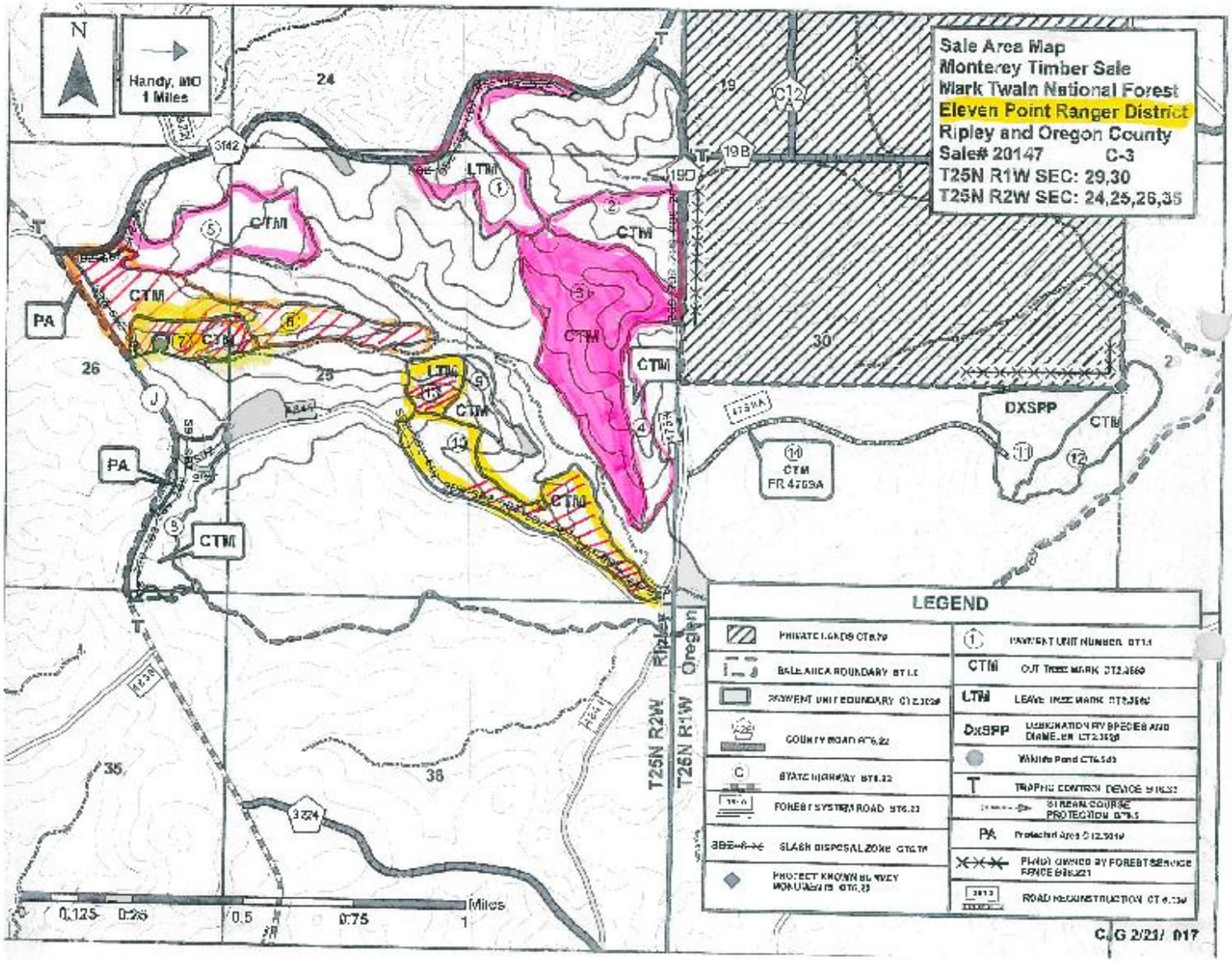

Figure 9. Monterey Timber Sale Map.

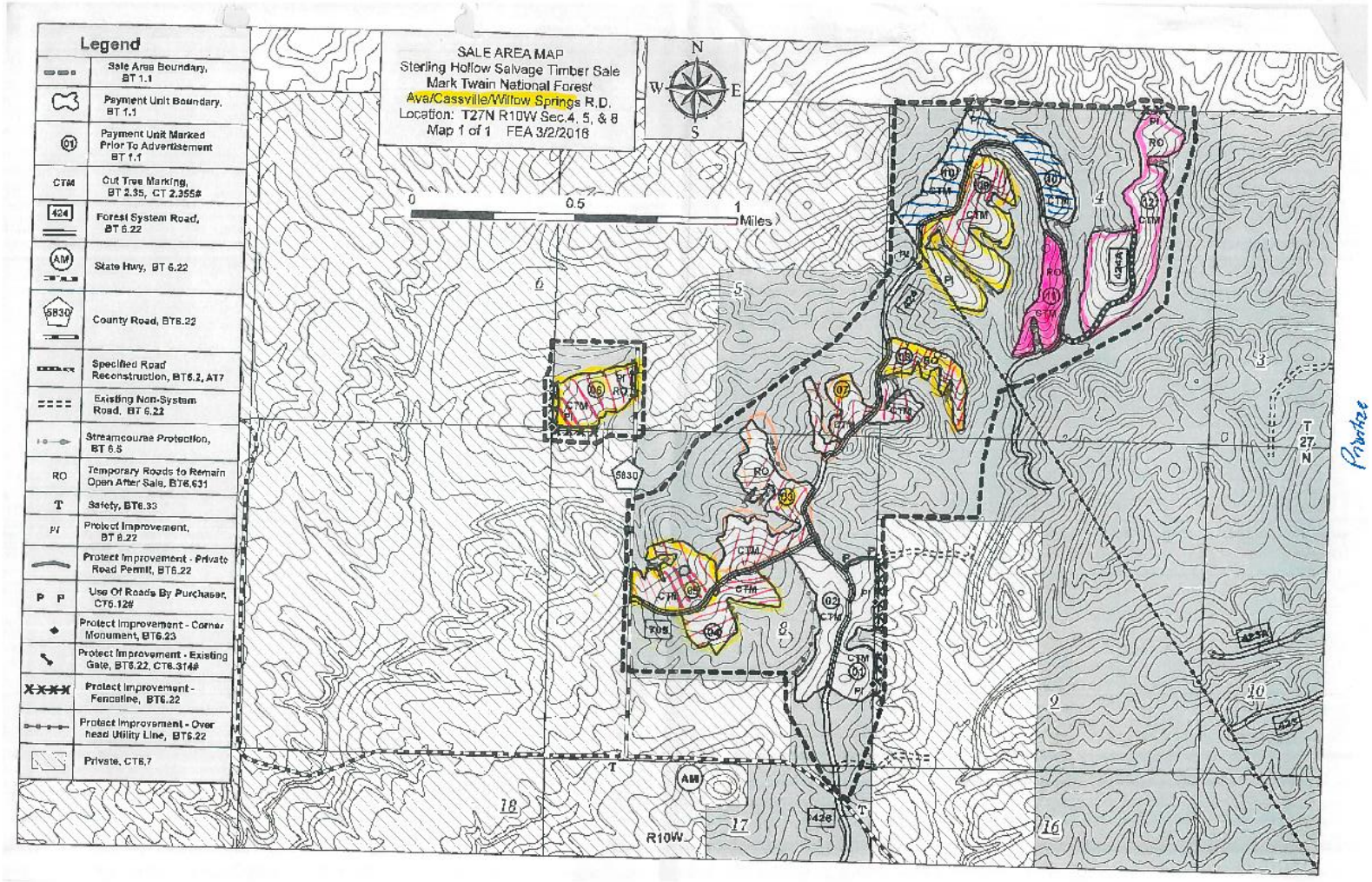

Figure 10. Sterling Hollow Timber Sale Map.

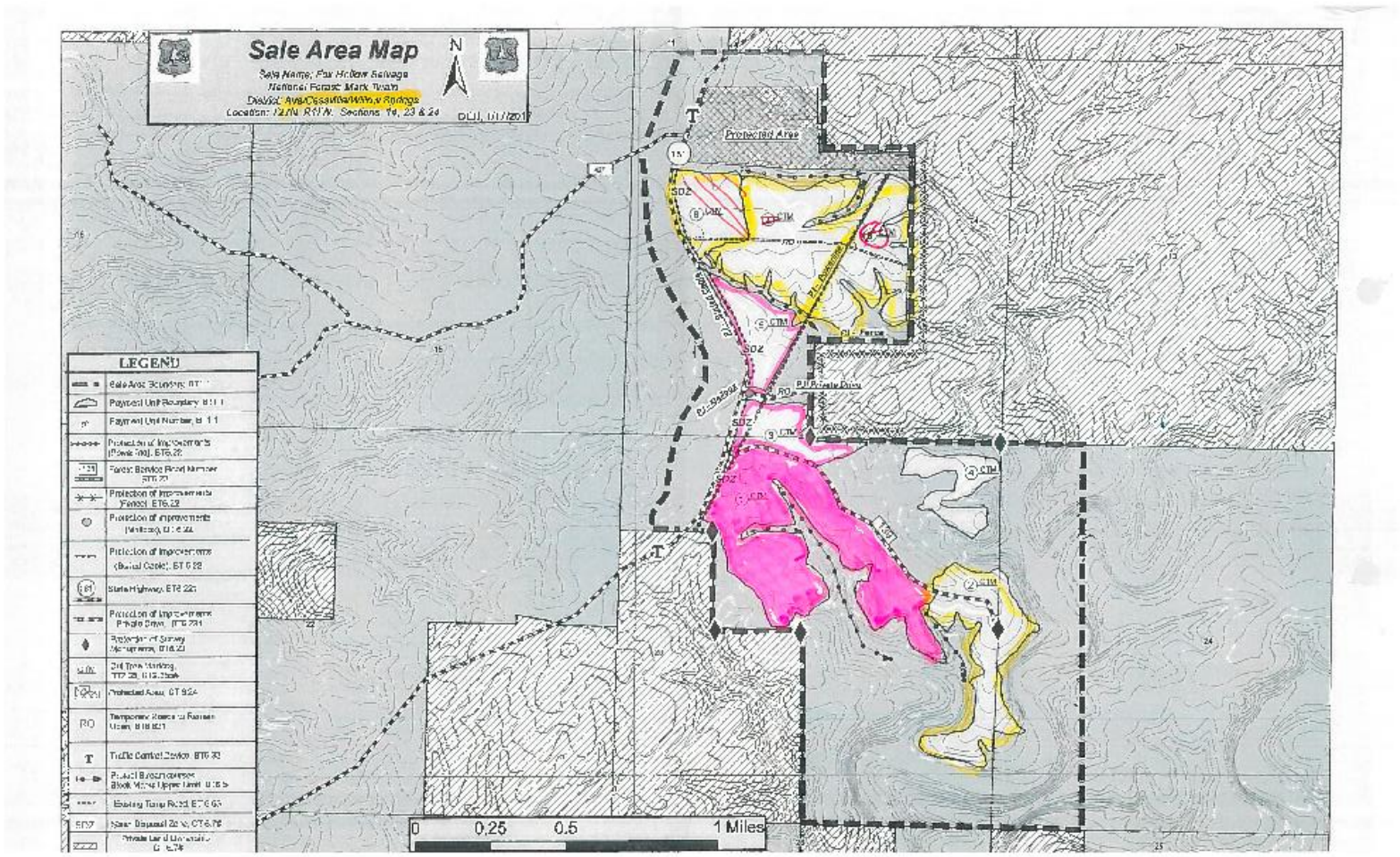

Figure 11. Fox Hollow Timber Sale Map.

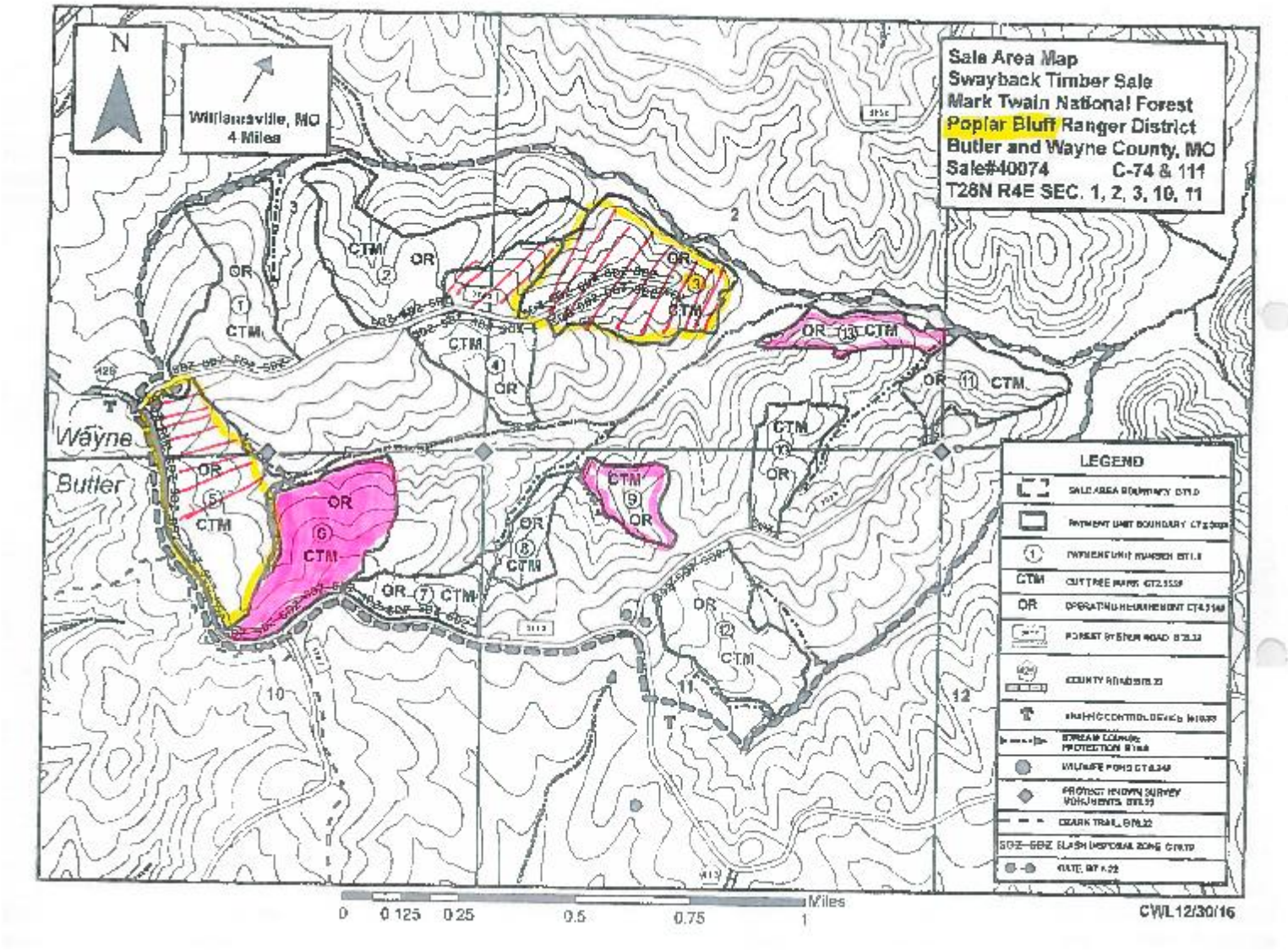

Figure 12. Swayback Timber Sale Map.

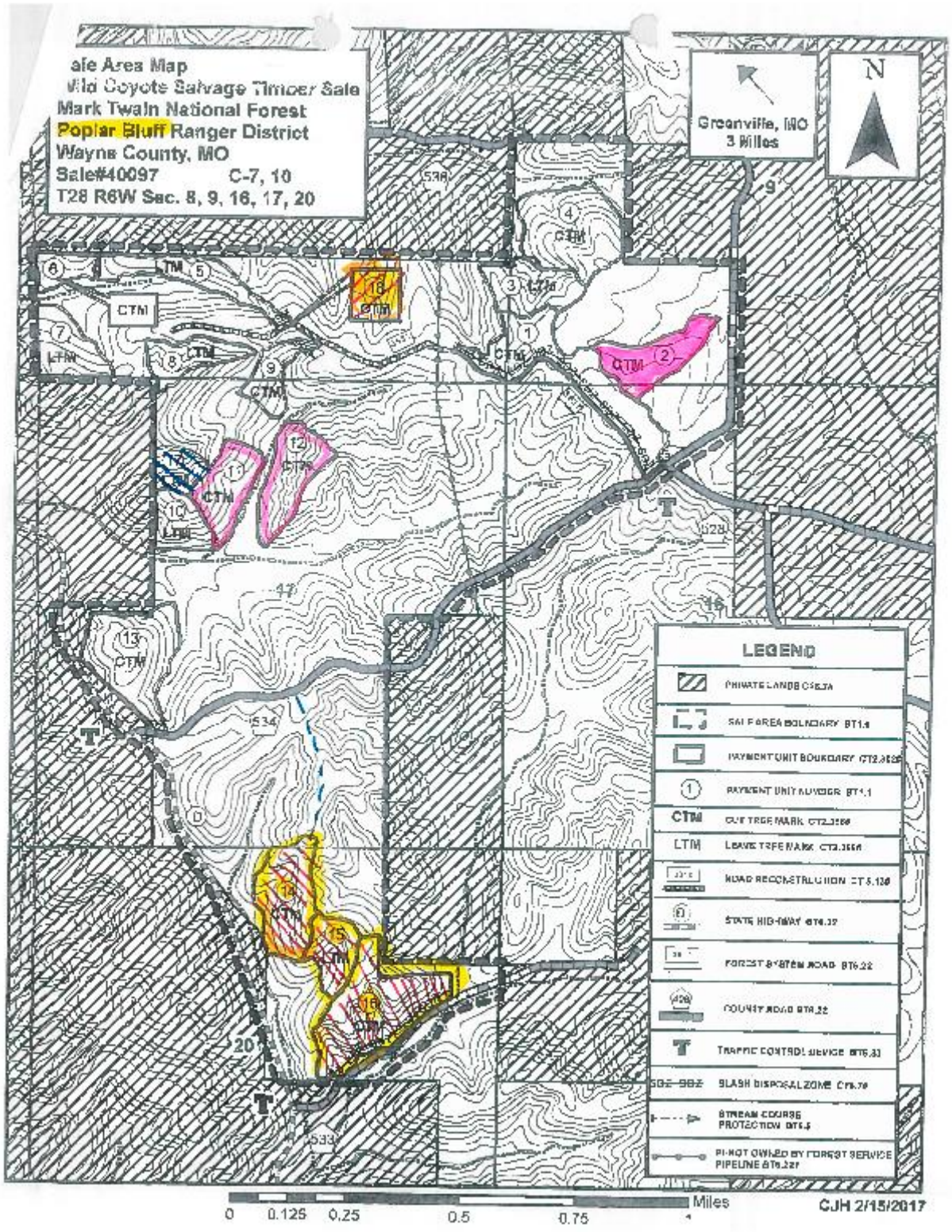

Figure 13. Coyote Timber Sale Map.

APPENDIX B – EXCEL DATASHEETS

Table 3. Warthog Data Entry Form

Project ID:							0	Unit ID:			0			Observer:			Hannah Adams							GPS (Starting Point)					Latitude:						Longitude:						Datum:				UTM East					UTM North						UTM Zone												
Date:	4/4/2018			Monitoring Type:				Pre-treatment											Point Spacing (m):						Confidence level? Enter 70, 75, 80, 85, 90, 95											90		Minimum Required Sample Size										30.00			Interval Width (enter 10 or 20)							20										
Direction:																																																																				
Sample point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
f. floor depth (cm):	2.5	10	4	4	7	4	5	5	5	1	4	5	3	4	5	3.5	2	12	6	6	3	7	1	6	7	7	5	7	6	3	4	6	7	1																																		
Forest floor Impacted?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Live Plant?	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Invasive Plant?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Fine Woody? <7 cm	1	0	0	0	1	0	0	1		1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Coarse Woody? >7cm	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0																																		
Bare Soil?	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Rock?	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	1	0	0	1	0	0	1																																		
0																																																																				
Topsoil displacement?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Erosion?, comment!		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Rutting? <5cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Rutting? 5-10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Rutting? >10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Burning light	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Burning moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Burning severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Compaction? 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Compaction? 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Compaction? >30cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Platy/Massive/Puddled structure 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Platy/Massive/Puddled structure 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Platy/Massive/Puddled structure >30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Mixed topsoil/subsoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
0																																																																				
N Needed (round UP)																																																																				
30.00																																																																				
Estimated Soil Disturbance Class	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Detrimental? Enter 1 if Yes, 0 if No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
Comments	Camera A 6752		6760					Live plant = grass			6781		Log - move 1 m east			Bank toe of stream																		Big rock in situ																																		

Table 4. Monterey Data Entry Form

Project ID:	0	Unit ID:	0	Observer:	0
GPS (Starting Point)		Latitude:		Longitude:	
Datum:		UTM East		UTM North	
UTM Zone					
Date:	5/11/2018	Monitoring Type:	Pre-treatment	Point Spacing (m):	
Confidence level? Enter 70, 75, 80, 85, 90, 95	90	Minimum Required Sample Size	52.67	Interval Width (enter 10 or 20)	20

Direction:																																		
Sample point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
f. floor depth (cm):	6	3	5	4	5	4	2.5	3	4	4	4	3	7	3	4	5	4	3	4	3	1	7	4	2	3	3	4	3	3	3	8	1	5	2
Forest floor Impacted?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Live Plant?	0	0	1	0	1	0	0	0	1	0	0	1	1	1	0	0	1	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1
Invasive Plant?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine Woody? <7 cm	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse Woody? >7cm	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bare Soil?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	1	1	0	0	0	0	0
0																																		
Topsoil displacement?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erosion?, comment!	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? <5cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? 5-10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? >10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning light	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0
Burning moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? >30cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure >30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed topsoil/subsoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0																																		
N Needed (round UP)																																		
52.67																																		
Estimated Soil Disturbance Class	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detrimental? Enter 1 if Yes, 0 if No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Comments	Camera D (forest floor) 6232camera a 6871	D6233(ff) A6872	D6234 A6872	D6235 A6874	D6237 A6875	D6238 A6876	D6239 A	D6248 A6878	D6241 A6879	D6242 A6880	D6243 A6881-3 compact natural?	D6244 A6884	D6245 A6885	Atv trail b/w 13 & 14 D6246 A6887	D6247 A6887	D6248 A6889-90	a6891 ATV D6249 a6892	D6250 A6893	D6251 A6894	D6252-3 A6895-6 half in rutt. Soil still good	D6254 A6897	D6255 A6898	D6256 A6899	D6257 A6900-1 old stump location (absent now)	A6902	D6259 A	D6260 A6904	D6261 A6905	D6262 A	A6907	A6907	A6909	D6266 A6910	D6267 A6911

Sample point	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68

Table 5. Sterling Hollow Data Entry Form

Project ID:	0	Unit ID:	0	Observer:	Hannah Adams	GPS (Starting Point)	Latitude:		Longitude:		Datum:		UTM East		UTM North		UTM Zone	
Date:	7/30/2018	Monitoring Type:	Pre-treatment	Point Spacing (m):		Confidence level? Enter 70, 75, 80, 85, 90, 95	90	Minimum Required Sample Size	30.00	Interval Width (enter 10 or 20)	20							

Direction:																	
Sample point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
f. floor depth (cm):	2.5	1.5	1	4	2	2.5	3.5	<1	1	<1	5	1	2	3.5	3	5	2
Forest floor Impacted?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Live Plant?	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Invasive Plant?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine Woody? <7 cm	0	0	1	0	1	0	1	0	0	0	1	0	0	0	0	0	0
Coarse Woody? >7cm	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
Bare Soil?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0																	
Topsoil displacement?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erosion?, comment!	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? <5cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? 5-10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? >10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning light	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? >30cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure >30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed topsoil/subsoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0																	
N Needed (round UP)																	
30.00																	
Estimated Soil Disturbance Class	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detrimental? Enter 1 if Yes, 0 if No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Comments	A6988	A6989	A6990	A6992	A6993 D7242	A6994	D7244 A6995			D7247 A6998	D7248 A6999	D7250 A7000	D7252 A7001	D7253 A7002	D7254 A7003	D7255 A7004	D7256 A 7005

Direction:																	
Sample point	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
f. floor depth (cm):	<1	3	3.5	3.5	6	4	5	2	2	3	<1	4	2	2	4	1	>1
Forest floor Impacted?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Live Plant?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Invasive Plant?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine Woody? <7 cm	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0
Coarse Woody? >7cm	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0
Bare Soil?	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Rock?	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0																	
Topsoil displacement?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erosion?, comment!	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? <5cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? 5-10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? >10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning light	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? >30cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure >30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed topsoil/subsoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0																	
N Needed (round UP)																	
30.00																	
Estimated Soil Disturbance Class	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detrimental? Enter 1 if Yes, 0 if No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Comments	Old rootwad fallen tree D7257	D7258/ A7007	D7259/ A7008	D7260/ A7009	D7261	D7263/ A7010	D7264/ A7012	D7265/ A7213	D7266/ A7014	D7267/ A7016	D7268	D7269/ A7018	D7270/ A7019	D7271 /7020	D7272/ A7021	D7273/ A7022	D7274

Sample point	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Sample point	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68

Table 6. Fox Hollow Data Entry Form

Project ID:	0	Unit ID:	0	Observer:	Hannah Adams	GPS (Starting Point)	Latitude:		Longitude:	Datum:	UTM East	UTM North	UTM Zone
Date:	8/2/2018	Monitoring Type:	Pre-treatment		Point Spacing (m):	Confidence level? Enter 70, 75, 80, 85, 90, 95			90	Minimum Required Sample Size	30.00	Interval Width (enter 10 or 20)	20
Direction:													

Sample point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
f. floor depth (cm):	3.5	3	0	1.5	4	4	3.5	2	1.5	2	2	<1	5	2	6	3	4	4	3.5	3	2.5	4	4	4.5	5	6	4	5	6	4	4	3	<1	5
Forest floor Impacted?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Live Plant?	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Invasive Plant?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine Woody? <7 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Coarse Woody? >7cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
Bare Soil?	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Rock?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0																																		
Topsoil displacement?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erosion?, comment!	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? <5cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? 5-10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? >10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning light	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? >30cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure >30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed topsoil/subsoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0																																		
N Needed (round UP)																																		
30.00																																		
Estimated Soil Disturbance Class	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detrimental? Enter 1 if Yes, 0 if No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Comments	D7275	A7276 D7276	A7277 D7277-78	A7278 D7279	A7279 D7280	A7280 D7281	A7281 D7282	A7282 D7283	A7283 D7284	A7285 D7285 rocky	A7286 D7286	A7287 D7287	A7288 D7288	A7289 D7289	A7290 D7290	A7291 D7291 one big rock	A7292 D7292	A7293 D7293	A7294 D7294	A7295 D7295	A7296 D7296		A7298 D7298	A7300 D7299 roots	A7301 D7300	A7302 D7301	A7303 A7302	A7305 D7304	A7306 D7305	A7305 D7304 2m to east of fallen tree	A7307 D7306	A7308 D7306	A7309 A7310	

Table 7. Swayback Data Entry Form

Project ID:	Swayback	Unit ID:	CTM 06	Observer:	HANNAH	GPS (Starting Point)	Latitude:		Longitude:		Datum:		UTM East		UTM North		UTM Zone	
Date:	9/26/2018	Monitoring Type:	Pre-treatment		Point Spacing (m):		Confidence level? Enter 70, 75, 80, 85, 90, 95			90	Minimum Required Sample Size		30.00		Interval Width (enter 10 or 20)	20		
Direction:																		

Sample point	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
f. floor depth (cm):	0.5	3	2	2	2	2.5	3	<1	1	<1	<1	3	3	3	<1	2	<1
Forest floor Impacted?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Live Plant?	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0
Invasive Plant?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine Woody? <7 cm	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse Woody? >7cm	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bare Soil?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0																	
Topsoil displacement?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erosion?, comment!	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? <5cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? 5-10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? >10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning light	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? >30cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure >30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed topsoil/subsoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0																	
N Needed (round UP)																	
30.00																	
Estimated Soil Disturbance Class	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detrimental? Enter 1 if Yes, 0 if No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Comments	Camera C7050 B6955			C7053 B6958		C7055		Eroded topsoil?	C7059 b6966	B6967 possible weak Platy		C7063 b6969		C7065 b6973		C7067 b6976	

Sample point	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
f. floor depth (cm):	3	1	2	2	3	5	2	3	3	2	<1	2	<1	2	2	2	2
Forest floor Impacted?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Live Plant?	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Invasive Plant?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine Woody? <7 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse Woody? >7cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bare Soil?	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Rock?	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Topsoil displacement?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erosion?, comment!	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? <5cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? 5-10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? >10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning light	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? >30cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure >30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed topsoil/subsoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estimated Soil Disturbance Class	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detrimental? Enter 1 if Yes, 0 if No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Comments	C7069 b6978			B6981 &6982	B6983	C7074 b6984& 6985 rockier	B6986	B6987	B6988	C7077 b6989		20c10s 70si			E horizon	B6995	

Sample point	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
Estimated Soil Disturbance Class	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table 8. Wild Coyote Data Entry Form

Project ID:	0	Unit ID:	0	Observer:	Hannah Adams
GPS (Starting Point)		Latitude:		Longitude:	
Datum:		UTM East		UTM North	
UTM Zone					
Date:		Monitoring Type:	Pre-treatment	Point Spacing (m):	
Confidence level? Enter 70, 75, 80, 85, 90, 95	90	Minimum Required Sample Size	30.00	Interval Width (enter 10 or 20)	20

Direction:	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	58	60	62	64	66
Sample point	1	2	**3**	4	5	**6**	7	8	**9**	10	11	**12**	13	14	**15**	16	17	**18**	19	20	**21**	22	23	**24**	25	26	**27**	28	29	**30**	31	32	**33**
f. floor depth (cm):	**2**	**2**	**<1**	**2**	**2**	**3**	**3**	**3**	**1**	**2**	**3**	**<1**	**0**	**3.5**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**<1**	**2**	**2**	**2**	**2**	**2**	**<1**	**2**	**<1**	**2**	**2**	**2**
Forest floor Impacted?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Live Plant?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	**1**		0	0	0	0	0	0	**1**	0	**1**	**1**
Invasive Plant?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine Woody? <7 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	**1**	0	0
Coarse Woody? >7cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bare Soil?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0																																	
Topsoil displacement?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erosion?, comment!	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? <5cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? 5-10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rutting? >10cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning light	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burning severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction? >30cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 0-10 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure 10-30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platy/Massive/Puddled structure >30 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed topsoil/subsoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0																																	
N Needed (round UP)																																	
30.00																																	
Estimated Soil Disturbance Class	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Detrimental? Enter 1 if Yes, 0 if No	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Comments	B6997 c7086		7088c	C7089	C7090		C7092 &93		C7095	C7096		C7098	In stream out of boundary	C7100		C7102		C7104				New point inside ctm c7108		C7110 &11			Skipp 56		C7116 &17				

Sample point	34	35	**36**	37	38	**39**	40	41	**42**	43	44	**45**	46	47	**48**	49	50	**51**	52	53	54	**55**	56	57	**58**	59	60	61	**62**	63	64	**65**	66	67	68
Estimated Soil Disturbance Class	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

APPENDIX C – ARCMAP GEODATABASE HTML POPUP TOOL

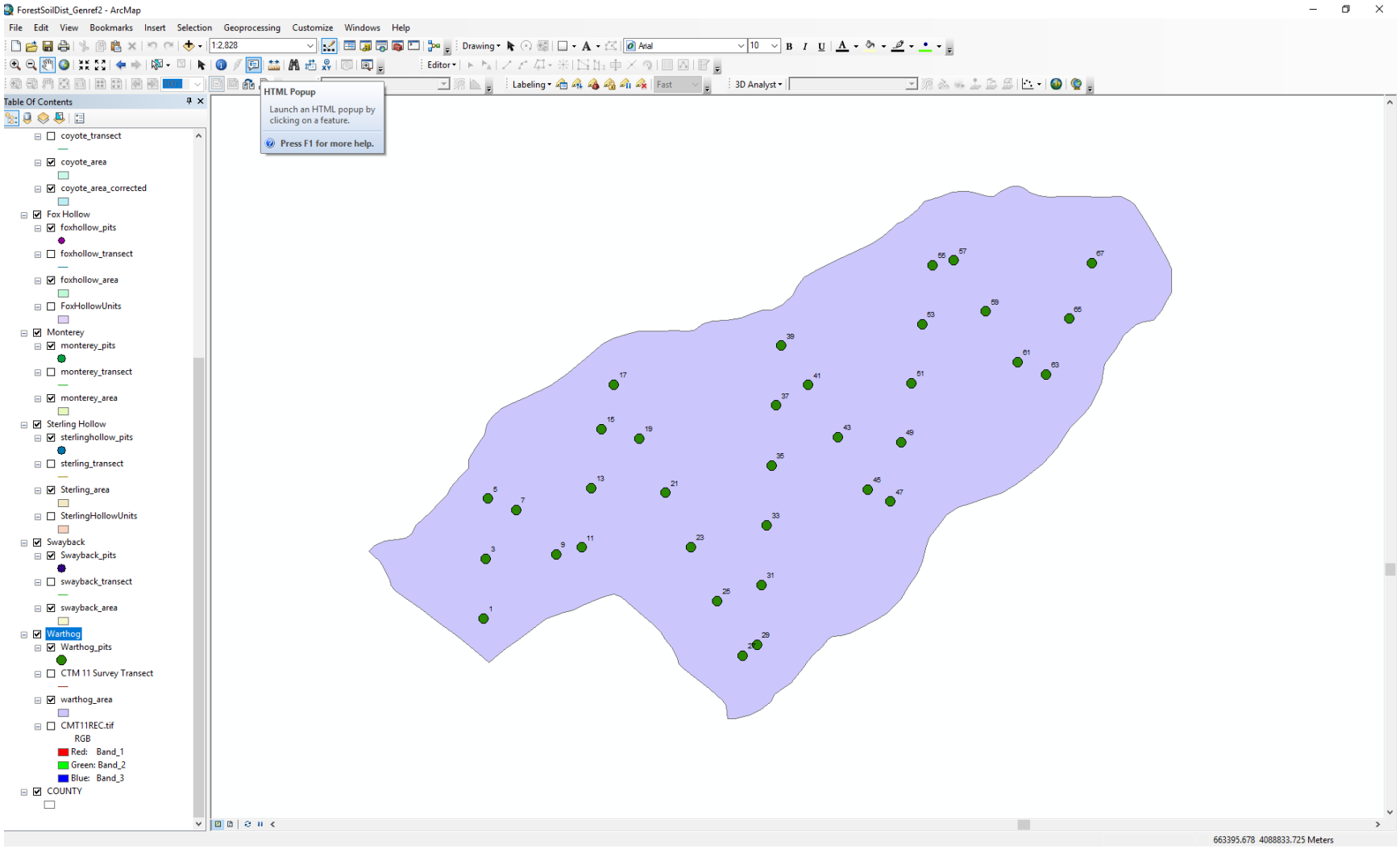

Figure 14. Select the HTML Popup Tool.

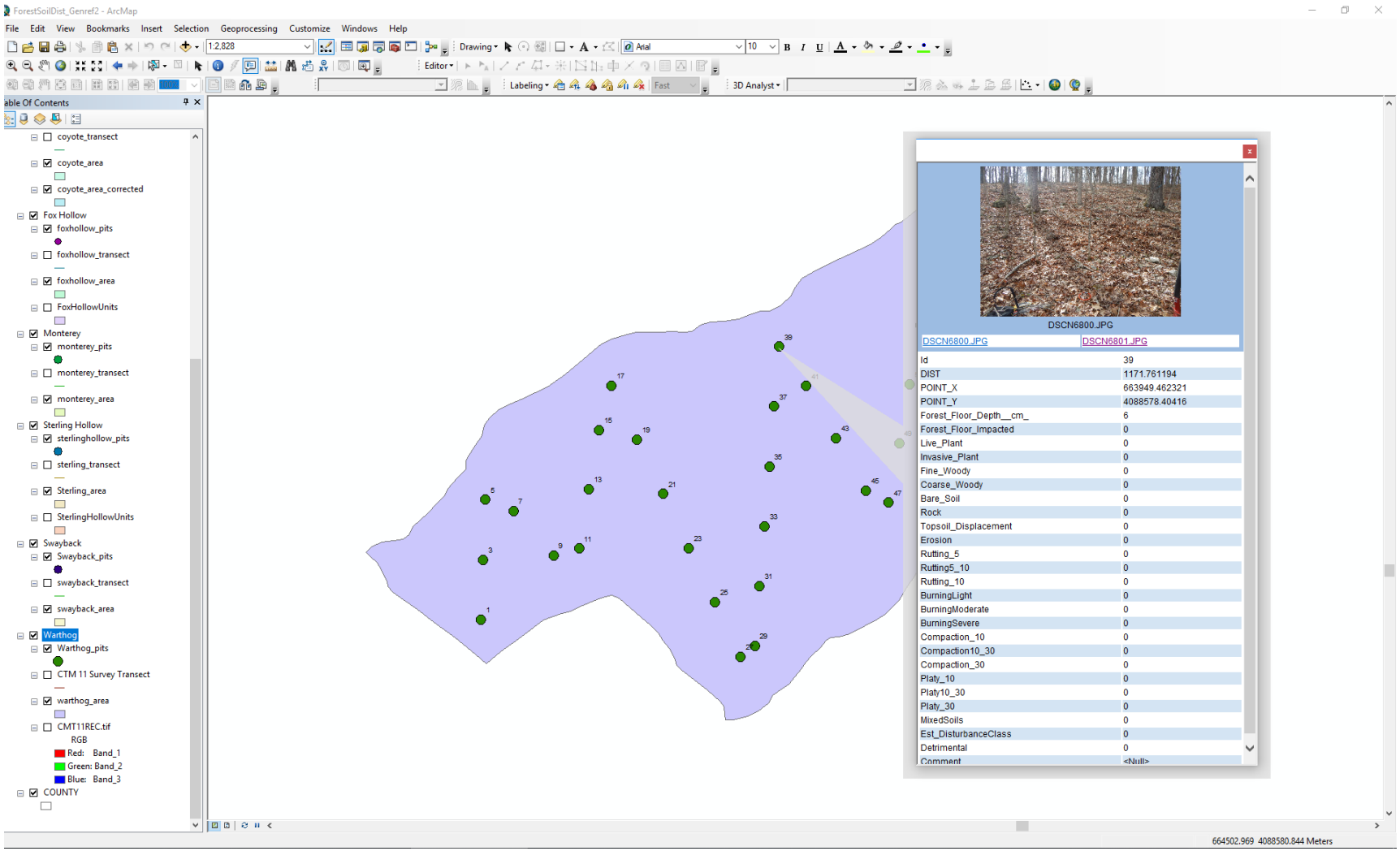

Figure 15. Click on the points using the HTML Popup Tool to see the photos and data collected at each pit.