Topeka Shiner Monitoring in Minnesota: Year Seven

submitted to:

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September 17, 2010

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ABSTRACT

This work represents the continuation of an ongoing project to monitor the presence/absence of Topeka shiners (*Notropis topeka*) within the federally designated critical habitat in Minnesota (Ceas & Anderson, 2004; Ceas & Monstad, 2005; Ceas & Monstad, 2006; Ceas & Plain, 2007; Ceas & Larson, 2008; Ceas & Larson, 2009). These data comprise the seventh year of this population-monitoring project, which is designed to provide the DNR with a tool for detecting changes in the overall presence/absence of Topeka shiners within Minnesota.

Following the protocol established in 2004, twenty 1-mile stream segments within the Rock and Big Sioux watersheds of southwestern Minnesota (Missouri River system) were selected randomly using an ArcView extension program. Based on known habitat preferences, aerial photos of the twenty stream segments were reviewed to identify the 10 most likely sampling sites within each stream segment. If off-channel habitats were present, then these were included as potential sample sites. A brief field reconnaissance of each stream segment allowed us to rank the ten sites within each segment according to which sites appeared most suitable for Topeka shiners, and sampling was conducted using small-mesh minnow seines.

Topeka shiners were found at twelve of the twenty 1-mile stream segments, and in 6 of these 12 stream segments Topeka shiners were found at the first site sampled. Off-channel habitats existed within only four of the 1-mile stream corridors. The shiners were generally found in well-developed in-channel pools or backwaters that appear to stay connected to the stream year-round; however, the two sites with the largest populations of shiners were both off-channel habitats.

Compared to the previous six years of sampling very few Topeka shiners were found in 2010. Only two stream segments contained Topeka shiners in relatively large numbers. In the remaining ten segments that contained Topekas only one or two individuals were generally found, even after extensive seining efforts once the first individual was captured. The segments that were sampled in 2010 typically had very limited amounts of suitable or ideal habitat, and even the pools/backwaters that were present did not contain the extensive shallow waters in which Topeka shiners seem to be most commonly found in Minnesota.

While the scope of this baseline project is limited and designed to conduct only straightforward presence/absence surveys for Topeka shiners in chosen stream segments, a few observations were noted. These observations lend continued support to the conclusions drawn from the 2004-09 surveys: (a) The stream segments that did not produce Topeka shiners tend to be continuously-flowing raceways/flowing waters; (b) The two 1-mile segments that contained "good" habitat also had large numbers of individuals; and (b) The GIS cover of critical habitat/stream channels needs to be updated using current aerial imagery to account for changes in stream position due to the shifting stream channels.

INTRODUCTION

(reproduced with some modifications from Ceas & Monstad, 2005)

As summarized by Ceas & Anderson (2004), recent studies have shown that the Topeka shiner (*Notropis topeka*) was once a common, wide-ranging species in the small prairie streams of portions of Minnesota, South Dakota, Nebraska, Kansas, Missouri, and Iowa. The species has experienced a widespread decline throughout its historic range, and was listed by the U.S. Fish and Wildlife Service (USFWS) as endangered, effective January 14, 1999.

Identification and life history characteristics of the Topeka shiner can be found in many recent reports (e.g., Tabor, 1998; Dahle, 2001; Berg et al., 2004) and will not be repeated here. As noted in Ceas & Anderson (2004), the habitat in which Topeka shiners are almost always found include (1) off-channel habitats (ponds and oxbows/meander cut-off channels) that occasionally get inundated by high water levels from associated streams, and (2) in-channel pools and backwaters that have little to no flow. This species does not normally live in riffles, raceways, or other constantly-flowing waters (Dahle, 2001; Ceas & Monstad, 2005). We would add that, during these seven years of sampling, the pool/backwater/off-channel habitats that contained the largest numbers of individuals tended to have extensive shallows (depths of less than 3 feet), and the bottom often slopes gently from a near-zero stream bank depth to the 3-foot depths (steep-sided pools, even if only 3 feet deep).

The consensus among Topeka shiner researchers is that the species is not nearly as abundant in Minnesota (or elsewhere) as it was prior to European settlement and the subsequent alteration of the prairie ecosystem. However, recent surveys of Minnesota waters have shown that the Topeka shiner is far more common in the state than was once thought (Hatch, 2001), and Tabor (2002) commented that, while much habitat in these Minnesota streams has been altered by channelization, erosion, and sedimentation, the current Minnesota habitat conditions provide most or all of the primary constituent elements consistent with designation as critical habitat. Topeka shiners appear to exist in disjunct populations that are subject to local extirpation, but recolonization events do seem to occur if a source population is near. Therefore, nearly all streams and associated off-channel pools within the Rock and Big Sioux watersheds of southwestern Minnesota are designated as critical habitat.

This work represents the seventh year of an ongoing population-monitoring project (Ceas & Anderson, 2004; Ceas & Monstad, 2005; Ceas & Monstad, 2006; Ceas & Plain, 2007; Ceas & Larson, 2008; Ceas & Larson, 2009) designed to provide the DNR with a tool for detecting changes in the overall presence/absence of Topeka shiners within the federally designated critical habitat in Minnesota. The goal was to randomly choose 20 one-mile stream segments, and then to sample the 10 "best" sites within each of these 20 stream segments to see if Topeka shiners could be found.

METHODS

Methods followed Ceas & Anderson (2004), and are reproduced with updated information below.

Selection of Stream Segments

Twenty random stream segments (Map 1, Appendix A) of designated Topeka shiner critical habitat within the Rock and Big Sioux watersheds of southwestern Minnesota were selected using an ArcView extension program written by Tim Loesch (Minnesota DNR). A brief description of this extension file follows (T. Loesch, pers. comm.):

> The extension randomly selects stream segments of user-specified size (one mile lengths in this case). Each line segment that represents a river or stream has a unique value assigned to it that represents the record number in the database for that stream segment. The program doesn't actually pick random points; instead it picks random record numbers that relate to stream segments. The program randomly selects segments by using a random number that is generated between 0 and the number of records in the database (e.g., if the random number is 2014 then the line segment that is record number 2014 in the database is chosen). If that segment is longer than the required length then the middle of the segment is selected and 1/2 of the segment distance is measured out from there and the line is clipped at those positions. If the line is not longer than the desired line length, then the lines that connect to the line are merged together. If that segment is long enough then it will select the center of the line and generate a line that is the correct length.

Landowner Contact

Permission from landowners was required to access the property containing the selected random stream segments. Landowner contact information was determined using county plat maps and/or contacting the County Auditor's Office. Diane Vejtruba and Margaret Edwards (MN DNR) contacted landowners by phone before the survey, explained the purpose and procedure of the survey, and requested permission to come onto their property. Segments 121 & 136 each contained small parcels where we did not receive permission to cross the land. At Segment 136 (Elk Creek) Topekas were found on the first seine haul in a stretch of stream for which we did have permission, so further sampling within the stream segment was not needed. Segment 121 was a portion of Flandreau Creek, which is a stream that contains very limited amounts of suitable habitat (pools, backwaters). The entire length of Segment 121 was devoid of suitable Topeka shiner habitat; therefore, we felt confident that Topekas would be not present in the extreme northern tip of Segment 121 where we did not have permission (and which did not appear to have suitable habitat).

Selection and Reconnaissance of Sampling Sites

Based on known habitat preferences, we reviewed aerial photos (U.S. Department of Agriculture, Farm Services Agency, Aerial Photography Field Office, Summer 2008, FSA NAIP 2008) of the 20 stream segments to identify the 10 most likely sampling sites within each stream segment. If off-channel habitats (OCH) were present then these were always included as potential sample sites. We then conducted a brief reconnaissance of each stream segment, and ranked the ten sites within each segment according to which sites appeared most suitable for Topeka shiners based on the species' habitat preferences. Reconnaissance of the streams and sampling for fishes occurred over three long field days on June 2-4, 2010. GPS coordinates were taken at each sampling site using a Garmin GPSmap 76.

Sampling for Fishes

Table 1 (Appendix B) lists the twenty stream segments, and provides locality information & basic habitat descriptions of all sampling sites. For each of the 20 stream segments, we began sampling at the site deemed most likely to contain Topeka shiners. Sampling techniques included standard seine hauls, set-kicks, and "working" undercut banks and vegetated shorelines while using a 15' x 5' eighth-inch mesh minnow seine or 30' x 5' quarter-inch bag seine. P. Ceas and Margaret Edwards (MN DNR) were assisted in the field by M. J. Stachowski, B. J. Giordano, and A. J. Besaw, three St. Olaf College summer research students. Water levels were typical to what was experienced during most days in the 2004-2007 and 2009 surveys (water levels in 2008 were high), and did not hinder our sampling efforts.

Given the differences in stream sizes and habitat heterogeneity, no attempt was made to standardize sampling effort or time between the sampling sites (quantitative sampling was not a goal of this project). At the sites where Topeka shiners were not found, sampling time varied from 5 minutes (e.g., a simple unobstructed 10-foot long pool) to 30 minutes. All available habitats within a given site were thoroughly sampled until either (1) Topeka shiners were found or (2) in the professional judgment of P. Ceas it was reasonably determined that there were no Topeka shiners present.

The purpose of this project is to determine the presence/absence, but not the quantity, of individuals at a given sampling site within a stream segment; however, natural curiosity compelled us to frequently continue sampling each site once Topeka shiners were found. During each year of sampling no attempt was made to quantify the numbers of individuals per unit area or catch per unit effort since such an effort was beyond the scope of this project, but we did assess qualitatively whether the species was "abundant," "common," or merely "present." The species was considered "abundant" if generally 10 or more individuals were collected per seine haul, and we often would catch upwards of 50 individuals in one seine haul (we would begin to notice a decrease in numbers captured after 3-6 seine hauls, depending on pool size); "common" if generally 4-8 individuals were collected per seine haul, with perhaps the initial seine haul capturing 10-15 individuals; and "present" if only 1-2 individuals were captured during the initial surveying of the site, with subsequent seining resulting in less than 5 additional individuals.

RESULTS

Topeka shiners were found at 12 of the twenty 1-mile stream segments (Map 2, Appendix A; Table 1, Appendix B; Appendix C); they were not found in the eight remaining segments (121, 122, 124, 128, 129, 131, 132, and 140). In six of the 12 stream segments that did contain Topeka shiners, we found the species in the first site sampled, and we captured Topeka shiners in the first seine haul at three of these six sites. These six segments & corresponding sites are 123-1, 134-1, 135-1, 136-1, 138-1, and 139-1. Topeka shiners were also found in Sites 125-6, 126-2, 127-3, 130-4, 133-3, and 137-2. Topeka shiners were always found in pool/backwater habitats within the 12 stream segments, though limited sampling occurred in raceways or other flowing waters.

Only four of the stream segments (Segments 121, 122, 127, and 135) contained off-channel habitats (OCH). Topeka shiners were not found in the OCH at Segments 121 and 122, but were found at 127 and 135. Segments 121 and 122 are on Flandreau Creek, which is a small headwater stream with constantly flowing waters and limited suitable habitat.

Very few Topeka shiners were found this year. Only two stream segments (127 and 135) contained Topeka shiners in high numbers. In the remaining ten segments only one or two individuals were generally found, even after extensive seining efforts once the first individual was captured.

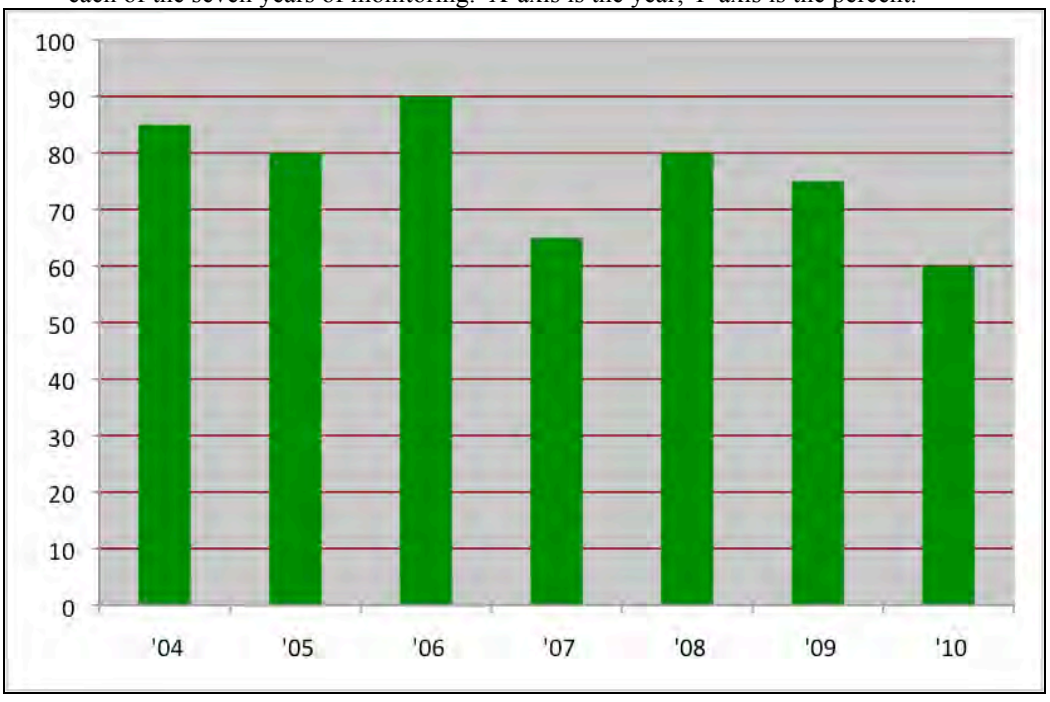
DISCUSSION

The scope of the seventh year of this study was to continue to conduct basic presence/absence surveys for Topeka shiners within 20 randomly chosen one-mile stream segments. Given the random selection of stream segments, the reaches of streams varied in size and diversity of habitat types. As with the 2004-09 surveys, no attempt was made to quantify habitat assessment or sampling effort & time between sites. Even so, we made observations that are consistent with our conclusions from the 2004-09 surveys.

(a) **Critical Habitat.** During the seven years of this study Topeka shiners have been found in 107 of the 140 stream segments sampled (Map 2, Appendix A). These 107 segments are spread throughout the range of the species in southwestern Minnesota, which reinforces the idea that all streams that are currently designated as critical habitat within Minnesota should remain as critical habitat.

(b) **Year-to-Year Comparisons 1: Percent of Streams with Shiners.** During each of the seven years of this study Topeka shiners have been found in a high percentage of stream segments sampled (Figure 1, below), including four years (2004, 2005, 2006, and 2008) when they were found in at least 16 of the 20 streams (≥80%). During the remaining three years (2007, 2009, 2010) shiners were still found in 12 – 15 (60-75%) of the twenty stream segments. Two years (2007 and 2010) fell below 70%. In 2007, four of the 20 segments were situated on Flandreau Creek, which is not known to harbor an abundance of suitable pool habitat (Ceas & Larson, 2007). In 2010, the eight stream segments where Topeka shiners were absent (two from Flandreau Creek) also lacked the typical pool habitat required by this species, and were instead essentially flowing waters.

Figure 1. Percent of stream segments in which Topeka shiners were found during each of the seven years of monitoring. X-axis is the year; Y-axis is the percent.



(c) **Year-to-Year Comparisons 2: Relative Abundance.** In contrast to the previous six years, very few Topeka shiners were found this year. For 2006 – 2009 the number of 1-mile stream segments in which the species was reported as common or abundant are as follows: 2006 (7 Stream Segments); 2007 (8); 2008 (11); 2009 (7) (relative abundance was not recorded for 2004 or 2005). Only two stream segments in 2010 (#'s 127 and 135) contained Topeka shiners in high numbers; in the remaining ten segments only one or two individuals were generally found, even after extensive seining efforts. In previous years many of these same streams (e.g., Kanaranzi Creek, Beaver Creek) have usually produced stream segments with an abundance of shiners; however, the segments that were sampled in 2010 typically had very limited amounts of suitable or ideal habitat, and even the pools/backwaters that were present did not contain extensive shallow waters.

(d) **Stream Segments without Shiners.** Segment 129 (Mound Creek in Blue Mounds State Park) included the upper reservoir, which is nearly silted in and can be difficult to sample as the seining crew sinks up to their thighs in muck, and the boulder-strewn flowing waters below the spillway. Topeka shiners have been collected from this segment in previous years by P. Ceas and others, but they were not found during the sampling on June 2, 2010.

Segments 121 and 122 are on Flandreau Creek. This year's field reconnaissance in the Flandreau Creek system continues to support previous years' findings that this small "upland" stream system consists mostly of continuously-flowing water, and simply does not provide much ideal pool habitat. Topeka shiners have been found in only 4 of the 15 one-mile stream segments sampled from 2004-2010. In the 2009 report we stated that Topeka shiners are probably "never common in this stream system" (Ceas & Larson, 2009). However, one of only two stream segments in 2010 that contained a large number of Topeka shiners (Site 127, Willow Creek) is a tributary of Flandreau Creek.

The five remaining stream segments that did not produce Topeka shiners (124, 128, 131, 132, and 140) were generally continuously-flowing waters. With the exception of Segment 124 (Chanarambie Creek), the other six segments were all small headwaters/ditches and once again were similar to other segments that failed to yield shiners during the 2004-09 surveys.

(e) **Off-Channel Habitats and Population Viability.** Some researchers have noted that off-channel habitats (OCH's) tend to have the largest populations of Topeka shiners, and that Topekas are often not found in adjacent stream channels (e.g., Dahle, 2001). As with the previous six years of study, very few OCH's were sampled in 2010. Ceas & Larson (2009) stated that Topeka shiners were captured regularly, and often in sizeable numbers, in the stream itself when "good" pool habitats existed, and that while OCH's are an important component of the shiner's critical habitat, streams with "intact" channel features (i.e., pool-riffle-run vs. a ditched continuous-flowing channel) can support viable populations of Topeka shiners. As mentioned previously, none of the 20 one-mile stream segments that were sampled in 2010 contained an abundance of intact channel features, and overall very few Topeka shiners were found in 2010. The only two sites that contained large numbers of Topeka shiners in 2010 (127, Willow Creek, and 135, Elk Creek) were both OCH.

(f) **Update GIS Maps.** The GIS cover of some of the critical habitat/stream channels needs to be updated using current aerial imagery.

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APPENDIX A – MAPS OF STREAM SEGMENTS

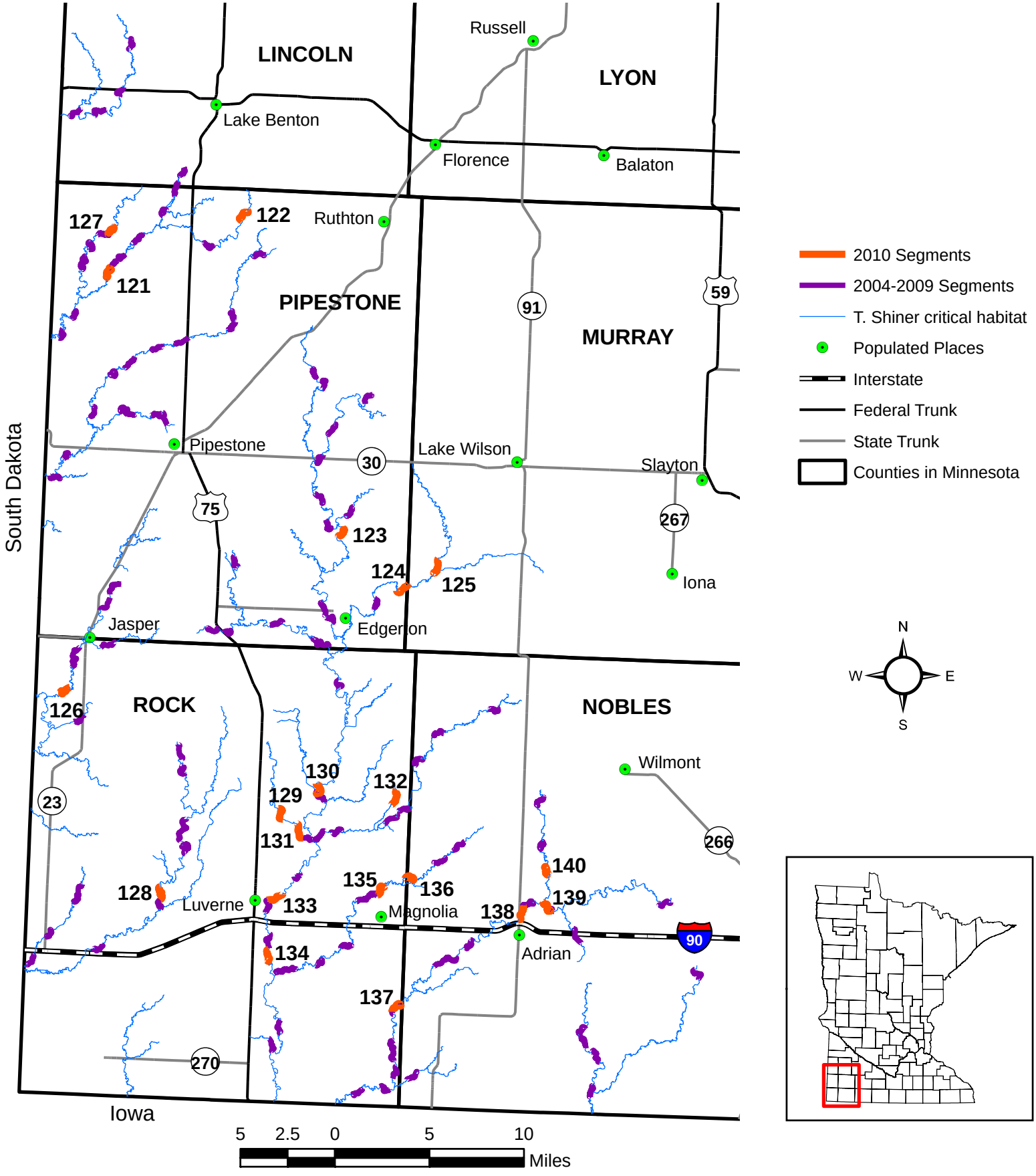
Map 1. Overview of all 140 1-mile stream segments sampled during the seven years of this study, 2004-2010. The map is a general map of the SW corner of Minnesota that highlights in blue all Minnesota streams that have been designated as Critical Habitat for the Topeka shiner. The localities for 2010 (121-140) correspond to Table 1 (Appendix B).

Map 2. Presence/absence of Topeka shiners, 2004-2010. The presence (green) or absence (red) of Topeka shiners in a particular 1-mile stream segment is indicated; the 2010 segments are highlighted by colored triangles.

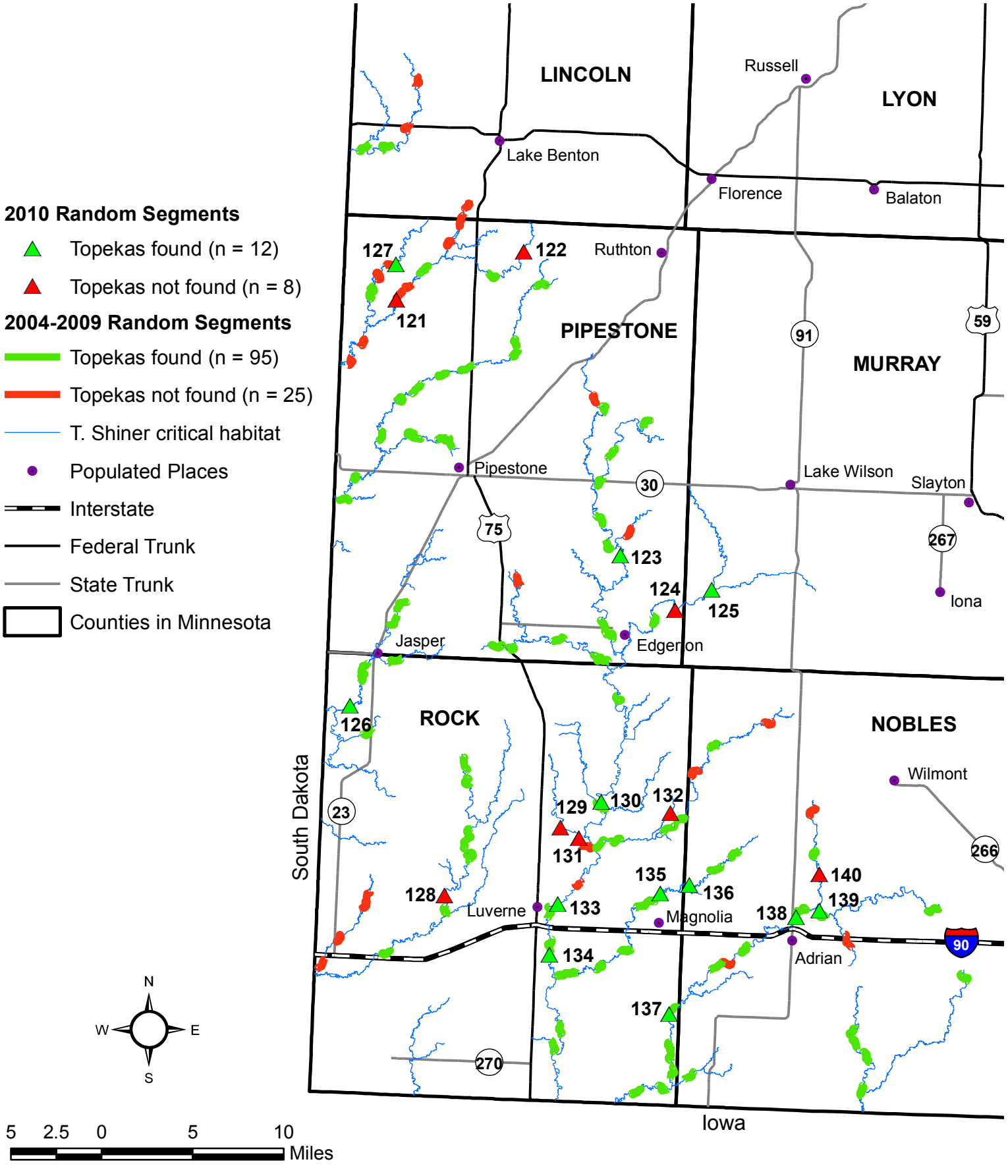
Maps 3-22. Aerial view of the twenty 1-mile stream segments that were sampled in 2010. For these 20 maps:

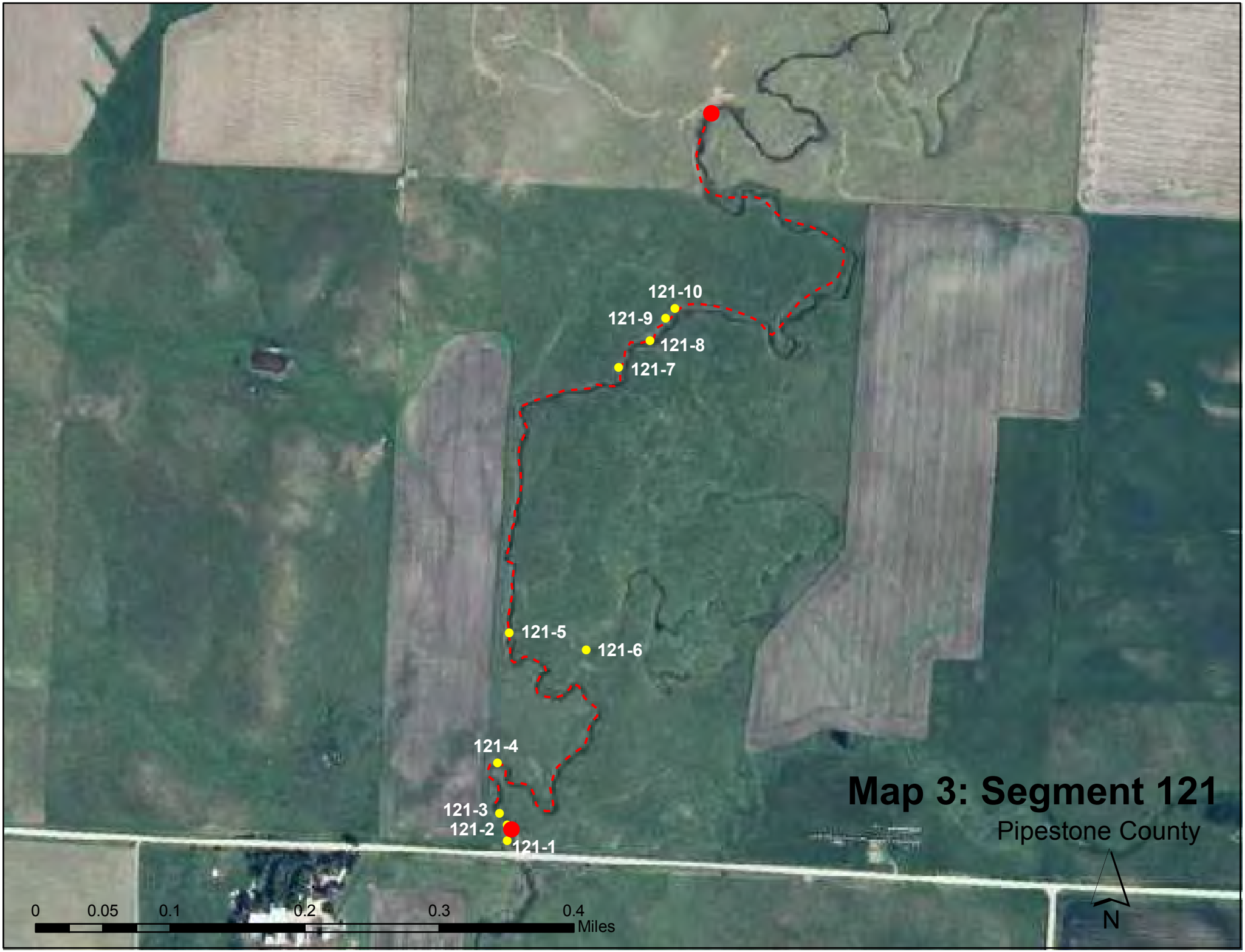
(1) the yellow dots (with white numbers) correspond to the site numbers given in Table 1, Appendix B.
(2) the red-dotted lines show the actual stream channel as currently defined in the federally designated critical habitat shapefile, and delineate each 1-mile stream segment.

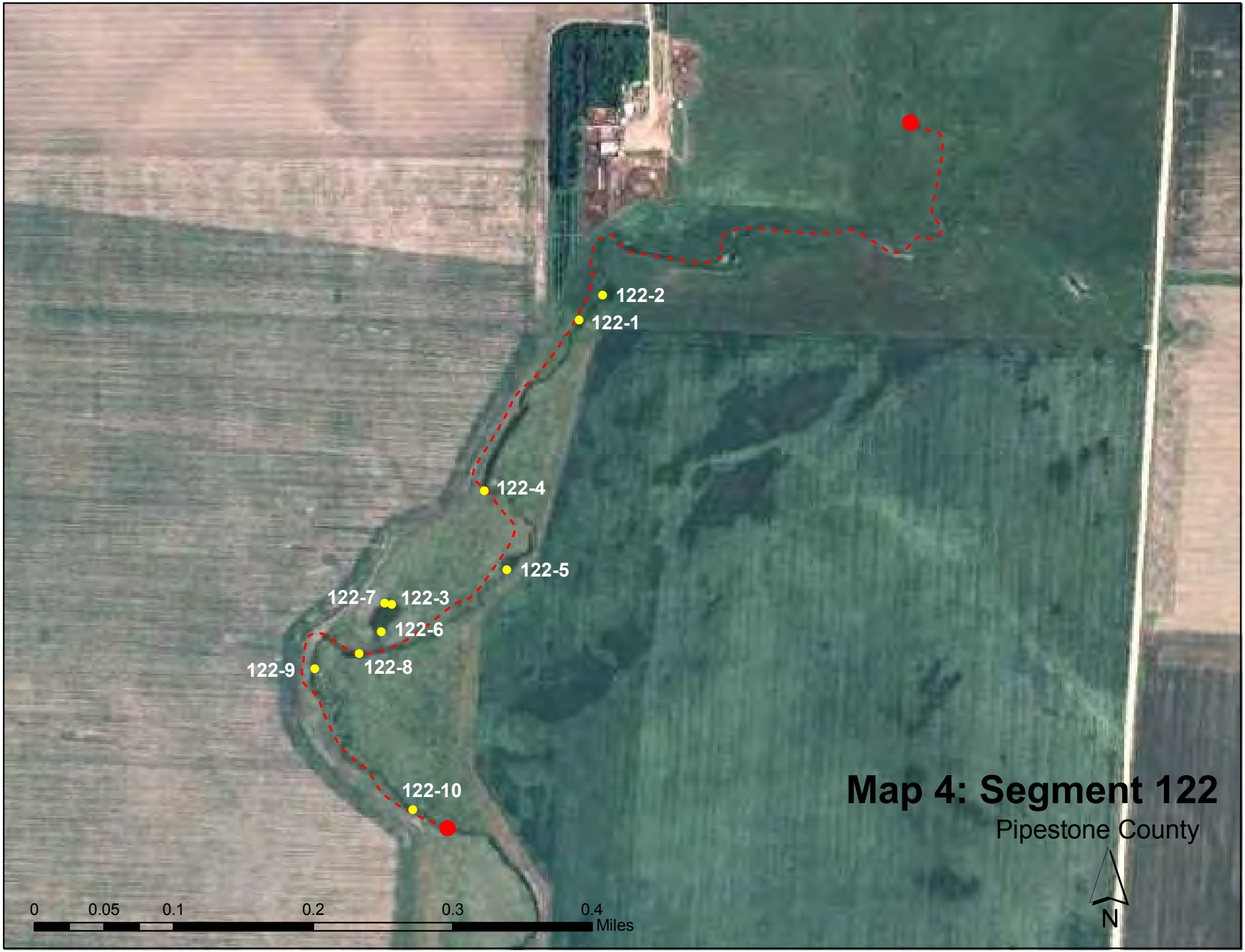
Map 1: Overview of Random Segments 2004-2010

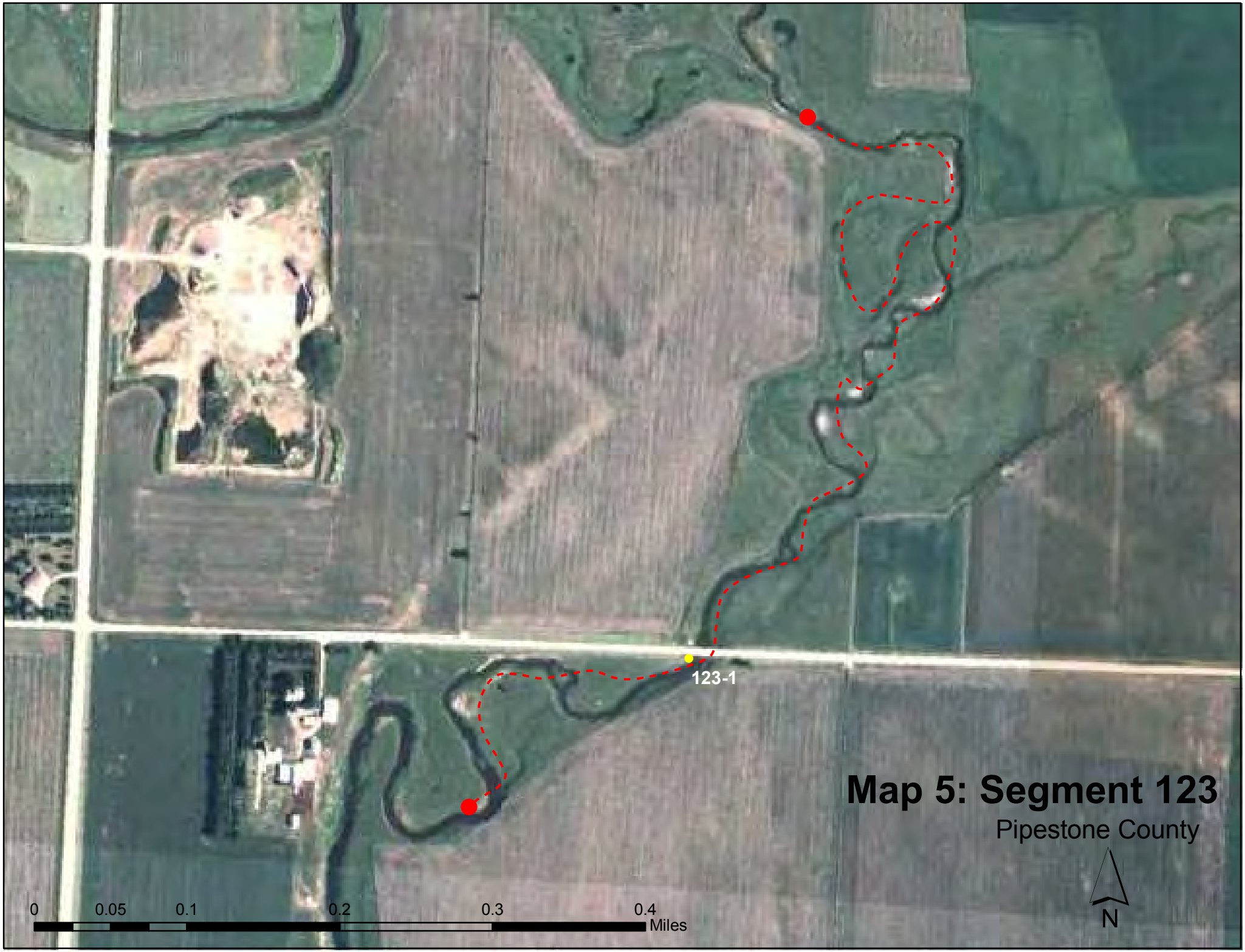


Map 2: Overview of segments where Topeka Shiners were found 2004-2010




121-10
121-9
121-8
121-7
121-5
121-6
121-4
121-3
121-2
121-1
Map 3: Segment 121
Pipestone County
0
0.05
0.1
0.2
0.3
0.4
Miles
N


122-2
122-1
122-4
122-5
122-7
122-3
122-6
122-8
122-9
122-10
Map 4: Segment 122
Pipestone County
0
0.05
0.1
0.2
0.3
0.4
Miles
N



Map 5: Segment 123

Pipestone County


124-1
124-3
124-4
124-2
124-6
124-7
124-8
124-10
124-9
Map 6: Segment 124
Pipestone & Murray counties
0
0.05
0.1
0.2
0.3
0.4
Miles
N

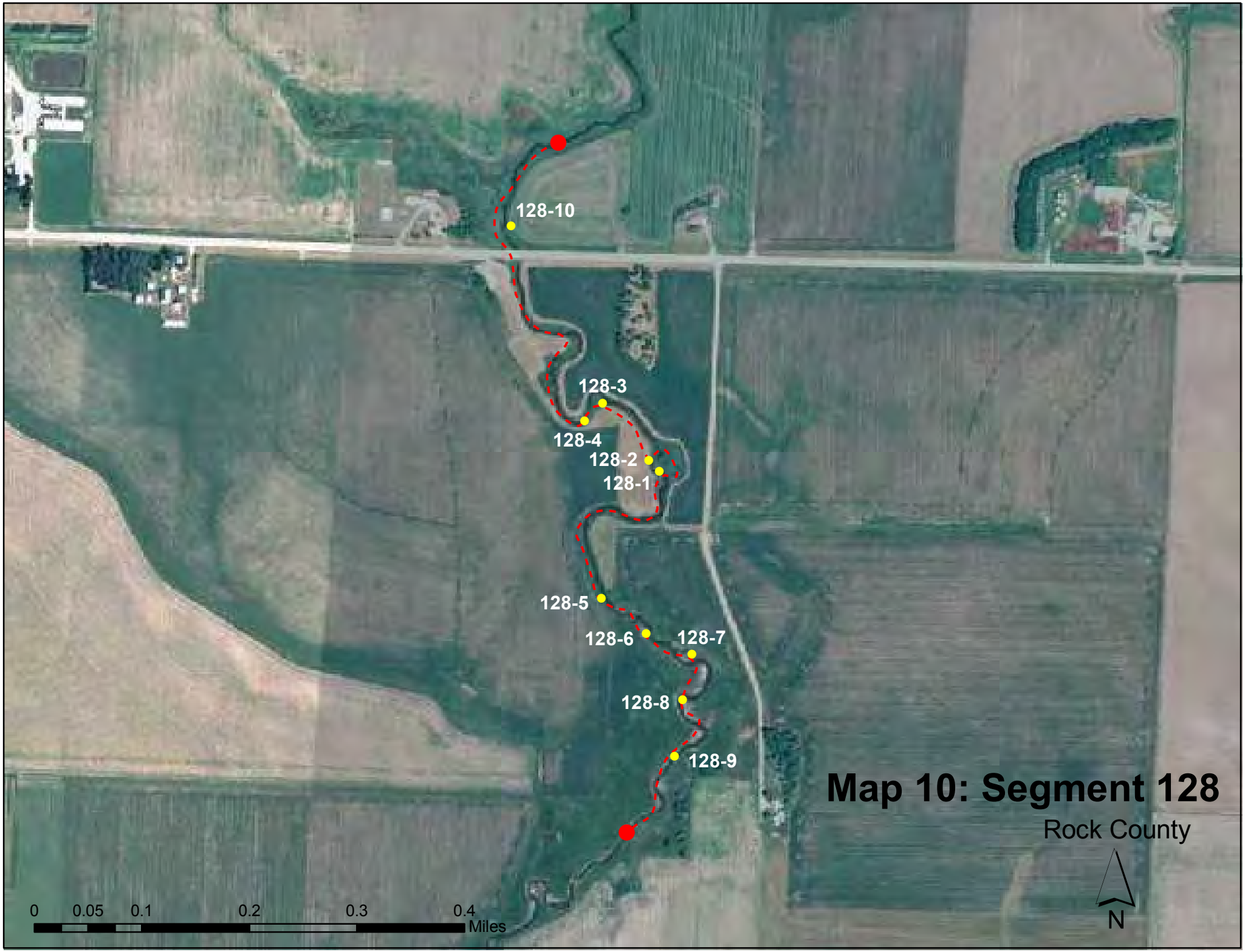

125-2
125-3
125-4
125-5
125-6
125-1
Map 7: Segment 125
Murray County
N
0 0.05 0.1 0.2 0.3 0.4
Miles

Map 8: Segment 126

Rock County

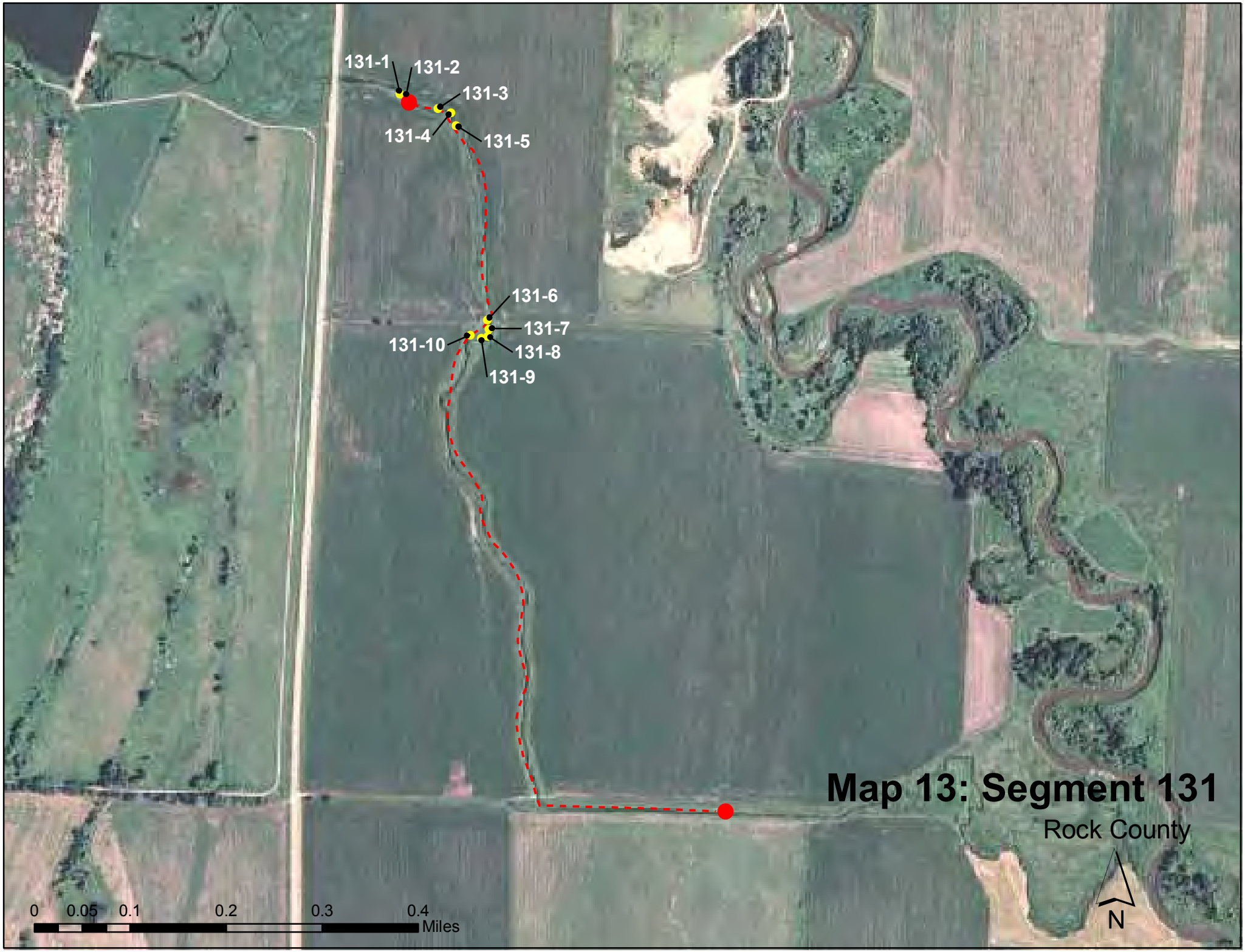
Map 9: Segment 127

Pipestone County


128-10
128-3
128-4
128-2
128-1
128-5
128-6
128-7
128-8
128-9
Map 10: Segment 128
Rock County
0 0.05 0.1 0.2 0.3 0.4
Miles
N


129-4
129-3
129-2
129-5
Blue Mounds State Park
129-1
129-6
129-7
129-8
129-10
129-9
Map 11: Segment 129
Rock County
0
0.05
0.1
0.2
0.3
0.4
Miles
N

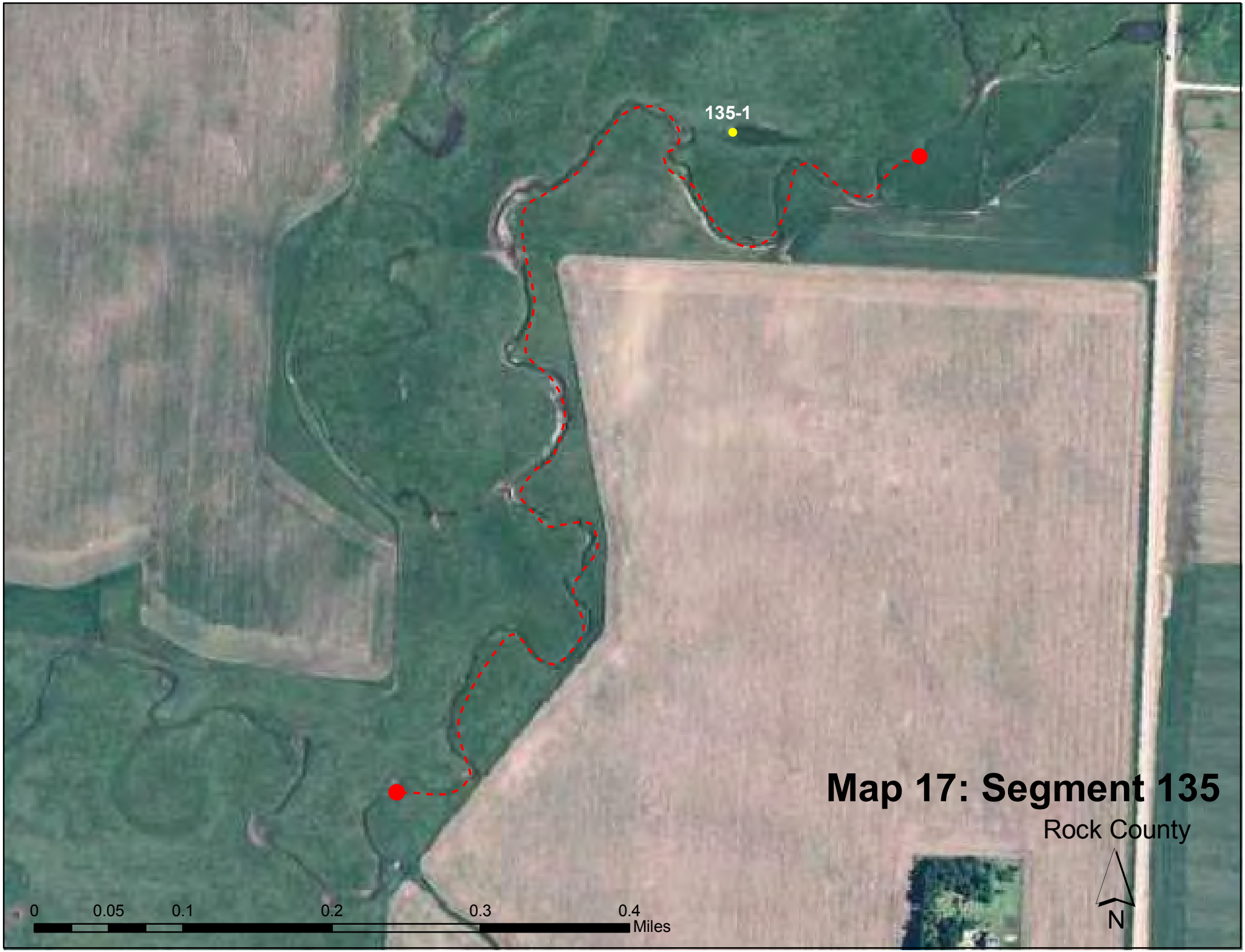

130-4
130-1
130-2
130-3
Map 12: Segment 130
Rock County
0
0.05
0.1
0.2
0.3
0.4
Miles
N

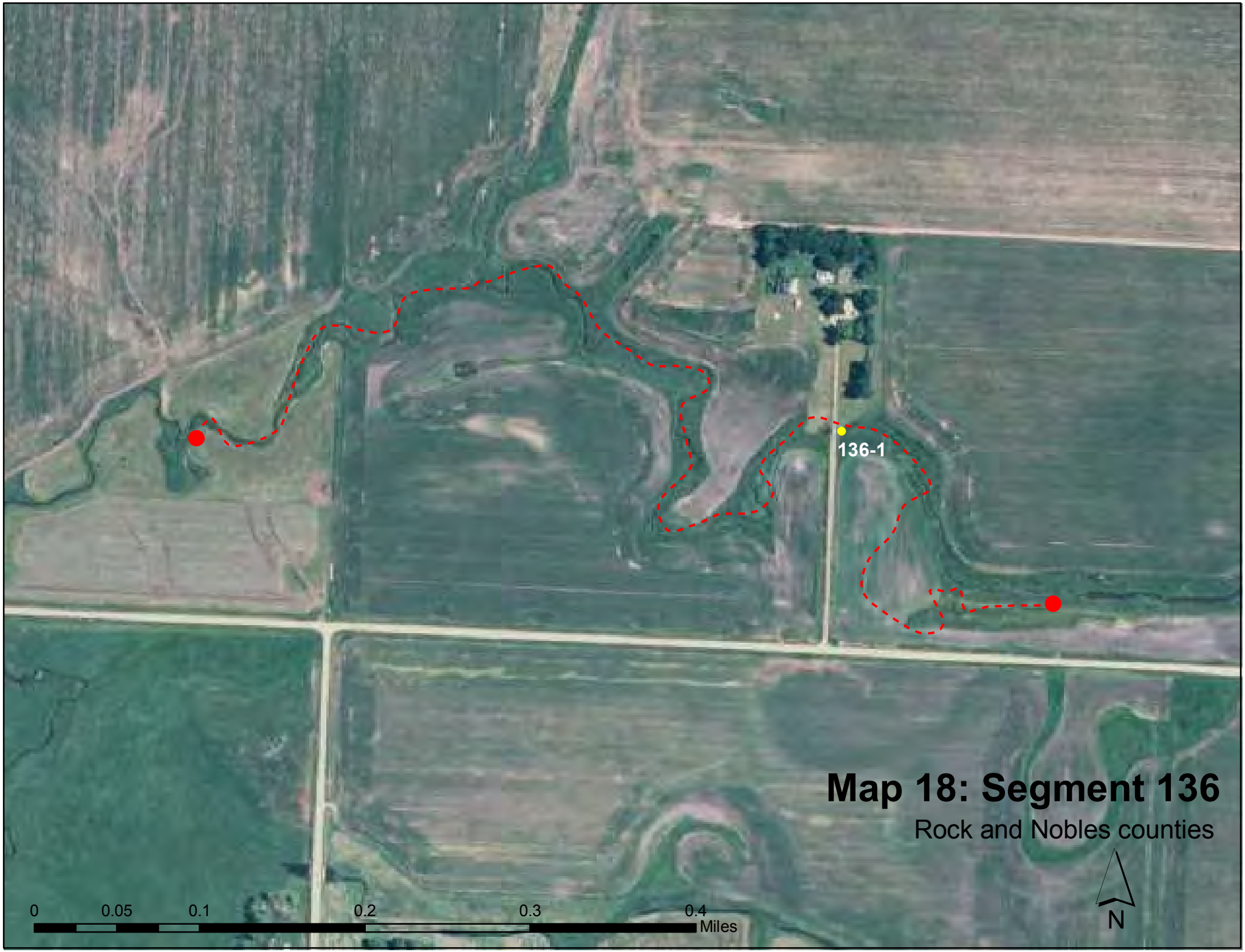

131-1
131-2
131-3
131-4
131-5
131-6
131-7
131-8
131-9
131-10
Map 13: Segment 131
Rock County
0 0.05 0.1 0.2 0.3 0.4
Miles
N

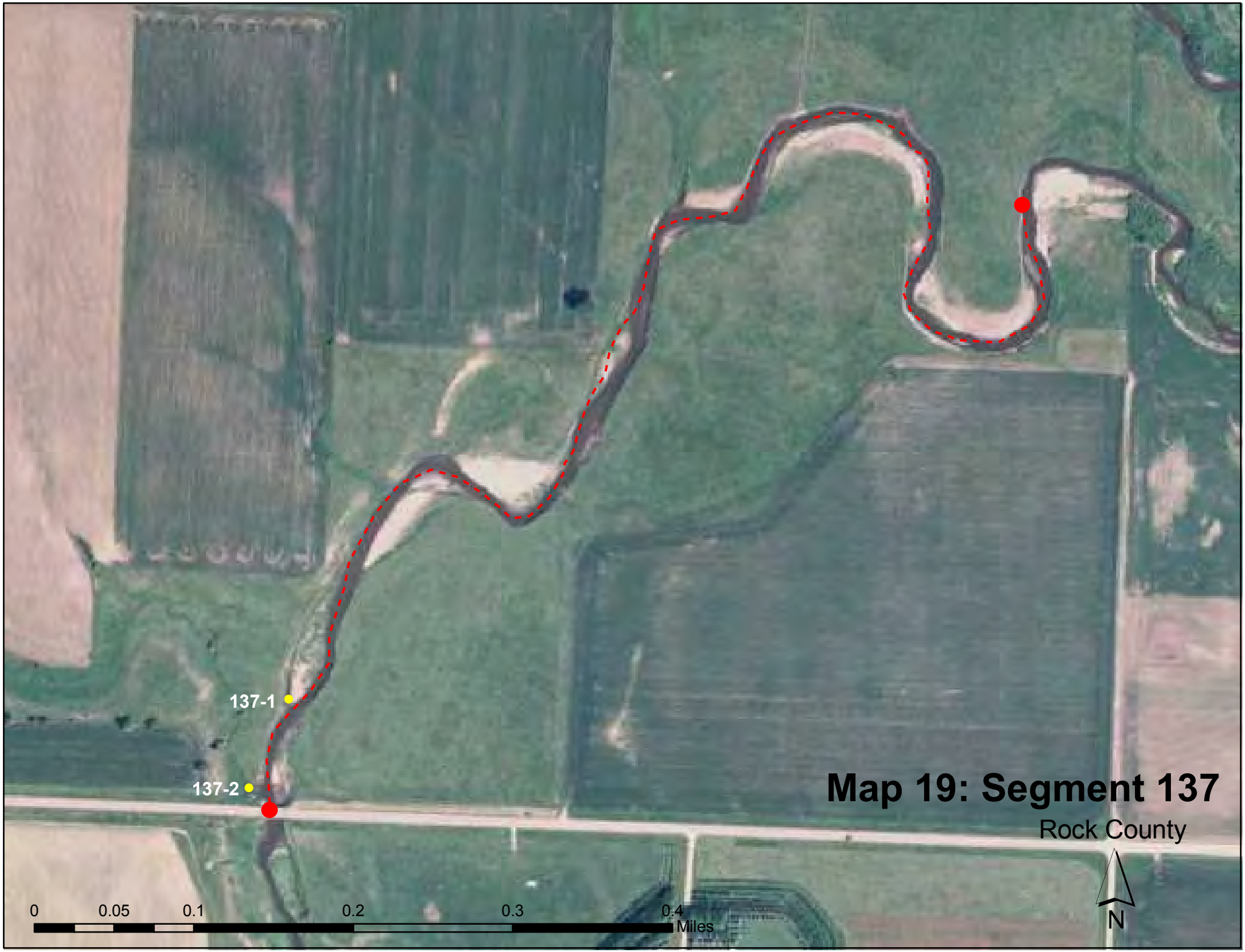

132-2
132-1
Map 14: Segment 132
Rock County
0 0.05 0.1 0.2 0.3 0.4
Miles
N

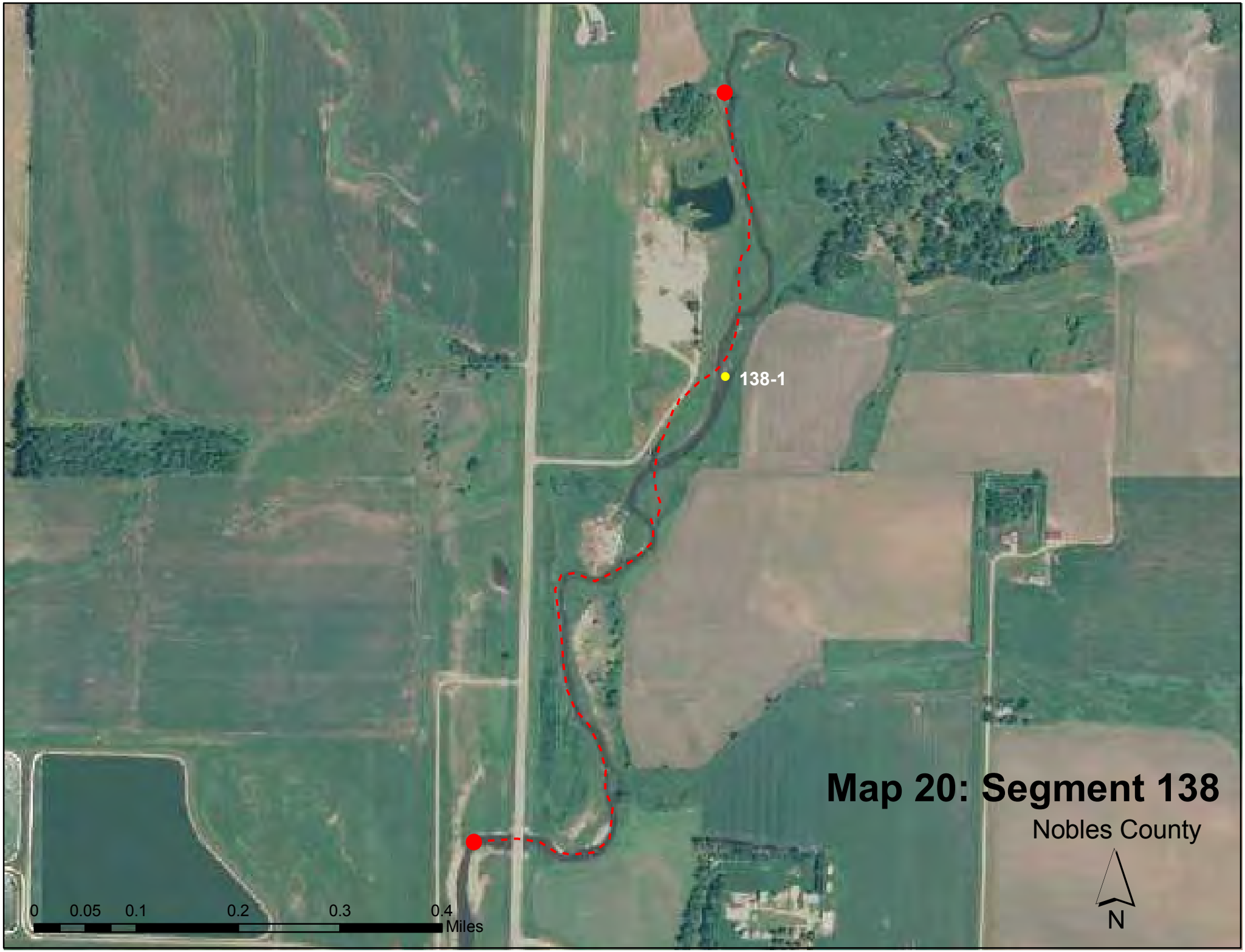

133-3
133-2
133-1
Map 15: Segment 133
Rock County
0 0.05 0.1 0.2 0.3 0.4
Miles
N


134-1
P.F. Mulder WMA
Map 16: Segment 134
Rock County
0 0.05 0.1 0.2 0.3 0.4
Miles
N


135-1
Map 17: Segment 135
Rock County
0
0.05
0.1
0.2
0.3
0.4
Miles
N


136-1
Map 18: Segment 136
Rock and Nobles counties
0
0.05
0.1
0.2
0.3
0.4
Miles
N

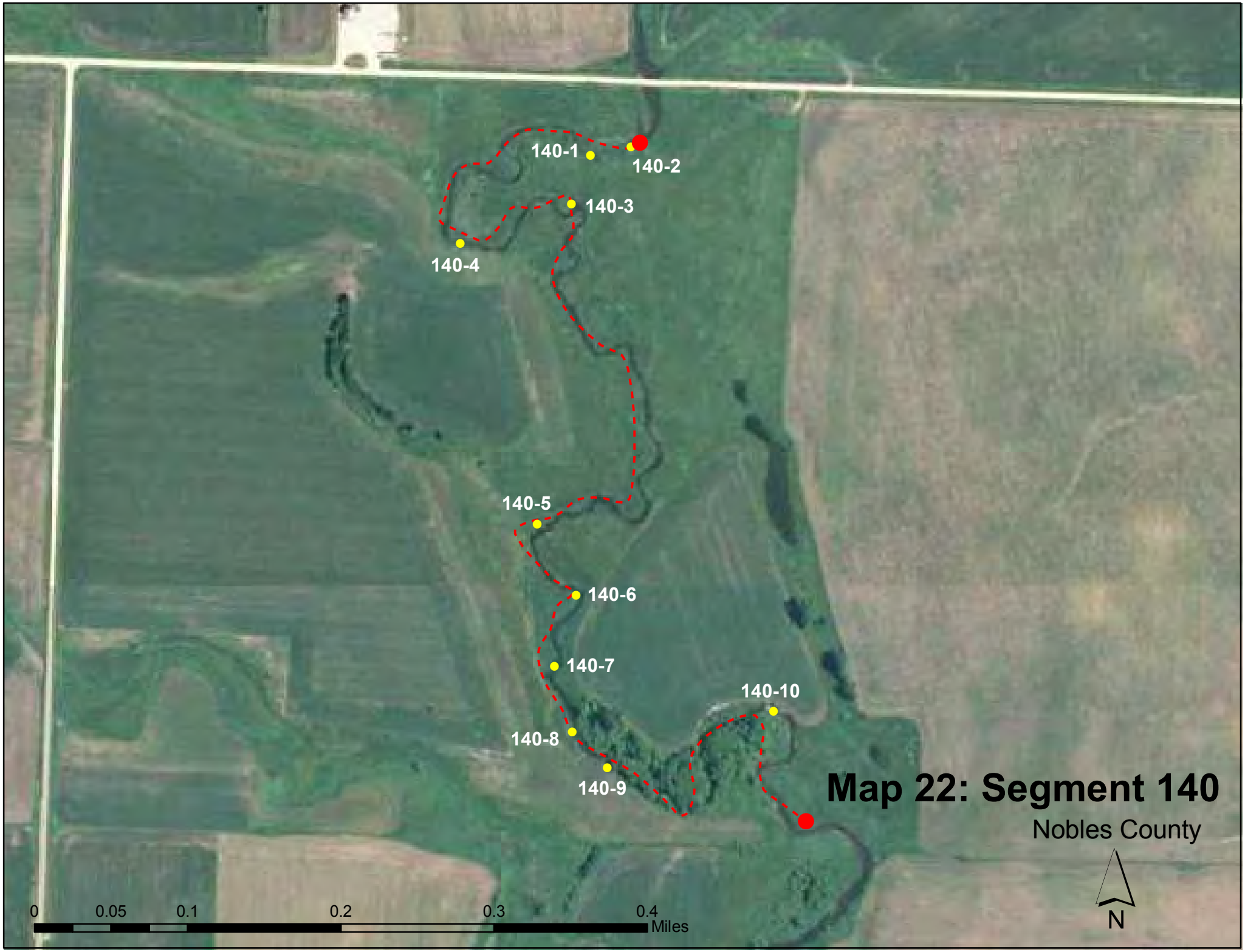

137-1
137-2
Map 19: Segment 137
Rock County
0
0.05
0.1
0.2
0.3
0.4
Miles
N



Map 20: Segment 138

Nobles County


139-1
Map 21: Segment 139
Nobles County
0
0.05
0.1
0.2
0.3
0.4
Miles
N


140-1
140-2
140-3
140-4
140-5
140-6
140-7
140-8
140-9
140-10
Map 22: Segment 140
Nobles County
0
0.05
0.1
0.2
0.3
0.4
Miles
N

APPENDIX B – TABLE 1. DESCRIPTIONS OF ALL 2010 STREAM SEGMENTS AND SITES, INCLUDING TOPEKA SHINER PRESENCE/ABSENCE

Table 1 lists the twenty stream segments sampled in 2010, indicates presence/absence of Topeka shiners, and provides locality information & basic habitat descriptions of all sampling sites.

Table 1. Locations of the twenty stream Segments (sites 121-140) sampled in 2010, corresponding sampling sites within each segment, and a brief habitat description for each site from which Topeka shiners were collected. Included are a "Common Location" descriptor (approximate mileage & direction to nearest town/highways), the Township/Range for the 20 Segments, and UTM coordinates for each sampling Site.

Segment	Stream Name & Common Location							UTM Coordinates (Zone 15)	
	County	T	R	Section(s)	Township Name	Site Number	Habitat Type	Northing	Easting
121	**Flandreau Creek** 4 mi N, 1.5 mi W Cazenovia								
	Pipestone	108	46	29	Altona	121-1	in-channel	44.12543	-96.39626
						121-2	in-channel	44.12560	-96.39627
						121-3	in-channel	44.12572	-96.39639
						121-4	in-channel	44.12626	-96.39645
						121-5	in-channel	44.12766	-96.39636
						121-6	off-channel	44.12751	-96.39520
						121-7	in-channel	44.13056	-96.39489
						121-8	in-channel	44.13086	-96.39444
						121-9	in-channel	44.13111	-96.39422
						121-10	in-channel	44.13122	-96.39409

Habitat Description: narrow (10-15') flowing headwater; no pools/backwaters present.
Topekas: no Topekas captured.
Substrate = sand/silt mixture.

(Table 1 continued on next page)

Table 1. Continued.

Segment	Stream Name & Common Location							UTM Coordinates (Zone 15)	
	County	T	R	Section(s)	Township Name	Site Number	Habitat Type	Northing	Easting
122	**Flandreau Creek** 7.5 mi W Ruthton								
	Pipestone	107	46	14	Fountain Prairie	122-1	in-channel	44.17870	-96.25367
						122-2	in-channel	44.17897	-96.25335
						122-3	off-channel	44.17568	-96.25621
						122-4	in-channel	44.17689	-96.25494
						122-5	in-channel	44.17608	-96.25457
						122-6	off-channel	44.17539	-96.25634
						122-7	off-channel	44.17569	-96.25631
						122-8	in-channel	44.17515	-96.25665
						122-9	in-channel	44.17498	-96.25728
						122-10	in-channel	44.17356	-96.25579
	Habitat Description: narrow (10-15') flowing headwater; no pools/backwaters present.								
	Topekas: no Topekas captured.								
	Substrate = sand/silt mixture.								
123	**Rock River** 4 mi N Edgerton; 1 mi N Hwy 2								
	Pipestone	105	44	4	Osborne	123-1	in-channel	43.93561	-96.13640
	Habitat Description: gently-flowing with occassional backwaters.								
	Topekas: one female captured on first seine haul; uncommon.								
	Substrate = firm silt/sand.								

Table 1. Continued.

Segment	Stream Name & Common Location							UTM Coordinates (Zone 15)	
	County	T	R	Section(s)	Township Name	Site Number	Habitat Type	Northing	Easting
124	**Chanarambie Creek** 3.5 mi NE Edgerton, 0.75 mi S Hwy 2								
	Pipestone	105	44	13	Osborne	124-1	in-channel	43.89953	-96.06391
						124-2	in-channel	43.89779	-96.06564
						124-3	in-channel	43.89811	-96.06653
						124-4	in-channel	43.89792	-96.06684
						124-5	in-channel	43.89761	43.89761
						124-6	in-channel	43.89681	-96.06803
						124-7	in-channel	43.89633	-96.06882
						124-8	in-channel	43.89589	-96.06945
						124-9	in-channel	43.89372	-96.07176
						124-10	in-channel	43.89391	-96.07429
	Habitat Description: continuously flowing water through entire stretch except for two backwaters.								
	Topekas: no Topekas captured.								
	Substrate = sand/silt mixture.								
125	**Chanarambie Creek** 4 mi SW Chandler @ CR 1								
	Murray	105	43	8, 18	Moulton	125-1	in-channel	43.91072	-96.03432
						125-2	in-channel	43.91112	-96.03319
						125-3	in-channel	43.91103	-96.03328
						125-4	in-channel	43.91104	-96.03341
						125-5	in-channel	43.91090	-96.03370
						125-6	in-channel	43.91080	-96.03465
	Habitat Description: narrow, constant flow meandering stream; one backwater.								
	Topekas: present; one female captured in the backwater.								
	Substrate = firm sand/silt.								

Table 1. Continued.

Segment	Stream Name & Common Location							UTM Coordinates (Zone 15)	
	County	T	R	Section(s)	Township Name	Site Number	Habitat Type	Northing	Easting
126	**Split Rock Creek** 3 mi S Rock/Pipestone county line; 1.25 mi E South Dakota state line.								
	Rock	104	47	13	Rose Dell	126-1	in-channel	43.80794	-96.42600
						126-2	in-channel	43.80793	-96.42628
	Habitat Description: 20-40' wide slow-flowing pool; Topekas found along margin/backwater.								
	Topekas: present; uncommon, only one individual captured.								
	Substrate = 2' muck throughout the slow-moving water and backwater; sand/gravel in thalweg.								
127	**Willow Creek** 2.5 mi E South Dakota state line; 2.5 mi S Lincoln Co. line								
	Pipestone	102	46	5	Altona	127-1	in-channel	44.15816	-96.39607
						127-2	in-channel	44.15821	-96.39595
						127-3	off-channel	44.15940	-96.39595
	Habitat Description: narrow flowing channel; one artificial backwater/cow pond that is connected to the channel.								
	Topekas: abundant in the backwater/cowpond.								
	Substrate = firm sand/silt.								
128	**Beaver Creek** 5 mi W Luverne @ Hwy 5								
	Rock	102	46	2, 11, 12	Beaver Creek	128-1	in-channel	43.65706	-96.31171
						128-2	in-channel	43.65720	-96.31191
						128-3	in-channel	43.65794	-96.31281
						128-4	in-channel	43.65770	-96.31313
						128-5	in-channel	43.65532	-96.31269
						128-6	in-channel	43.65487	-96.31183
						128-7	in-channel	43.65462	-96.31097
						128-8	in-channel	43.65400	-96.31111
						128-9	in-channel	43.65324	-96.31122
						128-10	in-channel	43.66028	-96.31463
	Habitat Description: 10' wide ditched stream with constant flow; no pools or backwaters.								
	Topekas: no Topekas captured.								
	Substrate = sand/gravel/muck mixture.								

Table 1. Continued.

Segment	Stream Name & Common Location							UTM Coordinates (Zone 15)	
	County	T	R	Section(s)	Township Name	Site Number	Habitat Type	Northing	Easting
129	**Mound Creek** Blue Mounds State Park; upper reservoir and immediately downstream								
	Rock	103	45	13, 24	Mound	129-1	in-channel	43.71881	-96.18974
						129-2	in-channel	43.72213	-96.18909
						129-3	in-channel	43.72296	-96.18951
						129-4	in-channel	43.72308	-96.18921
						129-5	in-channel	43.72182	-96.18906
						129-6	in-channel	43.71806	-96.19027
						129-7	in-channel	43.71800	-96.19029
						129-8	in-channel	43.71769	-96.19033
						129-9	in-channel	43.71764	-96.19041
						129-10	in-channel	43.71772	-96.19059
	Habitat Description: reservoir/pool upstream of dam; flowing water downstream of dam.								
	Topekas: no Topekas captured.								
	Substrate = upper reservoir silted to within 1-2' of water surface; below reservoir flowing water and large boulders.								
130	**Rock River** 4 mi W Kenneth; 3 mi SE Hardwick								
	Rock	103	44	7, 8	Vienna	130-1	in-channel	43.73886	-96.14752
						130-2	in-channel	43.73876	-96.14736
						130-3	in-channel	43.73843	-96.14740
						130-4	in-channel	43.73982	-96.14715
	Habitat Description: 3-4' wide backwater that certainly has flow during elevated water levels.								
	Topekas: present; uncommon, only two individuals captured.								
	Substrate = main channel of Rock River with firm sand/silt mixture; backwater with 2-6" silt over sand.								

Table 1. Continued.

Segment	Stream Name & Common Location	County	T	R	Section(s)	Township Name	Site Number	Habitat Type	UTM Coordinates (Zone 15) Northing	Easting
131	**Mound Creek** E edge of Blue Mounds State Park, downstream of Hwy 8	Rock	103	44	12, 19	Vienna	131-1	in-channel	43.71384	-96.17152
							131-2	in-channel	43.71379	-96.17140
							131-3	in-channel	43.71364	-96.17072
							131-4	in-channel	43.71359	-96.17045
							131-5	in-channel	43.71340	-96.17033
							131-6	in-channel	43.71048	-96.16952
	Habitat Description: channelized ditch; a few marginal backwaters but otherwise continuous flow.						131-7	in-channel	43.71035	-96.16948
							131-8	in-channel	43.71024	-96.16950
	Topekas: no Topekas captured.						131-9	in-channel	43.71021	-96.16964
	Substrate = firm sand/silt; gravel.						131-10	in-channel	43.71025	-96.16987
132	**Unnamed trib, Champepadan Creek** 1.5 mi S Kenneth along Hwy 3	Rock	103	44	12	Vienna	132-1	in-channel	43.707152	-96.288184
							132-2	in-channel	43.73233	-96.07080
	Habitat Description: a long narow (ca. 10') ditch with excessive amounts of duckweed and filamentous algae at 131-2 to downstream terminus; upstream of 132-2 the remainder of the stream segment is a grass-lined swale that lacks open water.									
	Topekas: no Topekas captured.									
	Substrate = firm sand/silt.									
133	**Rock River** Luverne, upstream of City Park ball fields	Rock	102	45	11	Luverne	133-1	in-channel	43.65526	-96.19140
							133-2	in-channel	43.65677	-96.19023
							133-3	in-channel	43.65687	-96.19030
	Habitat Description: Beaver dam upstream has created extensive pool habitat; downstream is deeply downcut through the thick soils; 5-10' width.									
	Topekas: present; uncommon.									
	Substrate = firm sand/silt in backwater; sand/gravel in main channel.									

Table 1. Continued.

Segment	Stream Name & Common Location							UTM Coordinates (Zone 15)	
	County	T	R	Section(s)	Township Name	Site Number	Habitat Type	Northing	Easting
134	**Rock River** 3 mi S Luverne @ Hwy 16								
	Rock	102	45	26	Luverne	134-1	in-channel	43.61644	-96.19731
	Habitat Description: Braided channel, perhaps more backwater habitat during summer low-flow; new bridge & riprap but late-season seeding of stream banks has allowed considerable siltation.								
	Topekas: present; uncommon, only one individual captured among 100's of fishes.								
	Substrate = sand/fine gravel.								
135	**Elk Creek** 1.5 mi N Magnolia, off Hwy 3								
	Rock	102	44	2	Magnolia	135-1	off-channel	43.602626	-96.173458
	Habitat Description: wide 30-40' shallow pool.								
	Topekas: abundant; captured in first seine haul; many gravid females.								
	Substrate = firm sand/gravel/silt.								
136	**Elk Creek** 2.5 mi NE Magnolia								
	Rock	103	44	36	Vienna	136-1	in-channel	43.542610	-96.061000
	Habitat Description: headwater swale without much water in the channel; 2-4' deep pool surrounding the bridge/driveway.								
	Topekas: present; only one individual captured.								
	Substrate = silt and muck.								
137	**Kanaranzi Creek** 1.5 mi E Kanaranzi @ CR 15								
	Rock	101	44	1	Kanaranzi	137-1	in-channel	43.57391	-96.06381
						137-2	in-channel	43.57309	-96.06426
	Habitat Description: shallow 30-40' meandering channel with very limited pool/backwater habitat.								
	Topekas: present; only one individual captured.								
	Substrate = 1-2' muck over sand.								

Table 1. Concluded.

Segment	Stream Name & Common Location							UTM Coordinates (Zone 15)	
	County	T	R	Section(s)	Township Name	Site Number	Habitat Type	Northing	Easting
138	**Kanaranzi Creek** 1 mi N Adrian, off Hwy 91 (parked on gravel pit road); also TS 7, 35, 117)								
	Nobles	102	42	7	Olney	138-1	in-channel	43.65376	-95.92938
	Habitat Description: The backwater now has silted in considerably; only a few inches of water are in the upper reaches.								
	Topekas: present; only 1 captured.								
	Substrate = sand/gravel in main channel.								
139	**E Branch Kanaranzi Creek** 2 mi NE Adrian; also TS 8, 98 are in this same 1-mile segment								
	Nobles	102	42	8, 12	Olney	139-1	in-channel	43.65931	-95.90453
	Habitat Description: sampled backwater at the bridge (did not find Topeka shiners in this backwater in 2004, 2008)								
	Topekas: present; caught on 1st haul; uncommon.								
	Substrate = deep muck.								
140	**Kanaranzi Creek** 4 mi NNE Adrian								
	Nobles	103	42	32	Larkin	140-1	in-channel	43.68828	-95.90586
						140-2	in-channel	43.68808	-95.90592
						140-3	in-channel	43.68752	-95.90667
						140-4	in-channel	43.68711	-95.90810
						140-5	in-channel	43.68449	-95.90697
						140-6	in-channel	43.68383	-95.90643
						140-7	in-channel	43.68315	-95.90668
						140-8	in-channel	43.68254	-95.90642
						140-9	in-channel	43.68221	-95.90595
						140-10	in-channel	43.68280	-95.90381
	Habitat Description: ditched, flowing water.								
	Topekas: no Topekas captured in designated sampling segment; Topekas were caught in 1st haul in backwater immediately upstream of segment.								
	Substrate = firm sand/muck; gravel.								

APPENDIX C –PHOTOGRAPHS OF HABITATS & FISHES

Stream photographs for Segments 121, 122, 124, 128, 129, 131, 132, and 140 (no Topeka shiners captured) are photographs of representative stream habitat for the 1-mile stream segments. Stream photographs for the remaining segments are of the actual stream sites where Topeka shiners were collected. The yellow outlined areas on these photographs represent the exact location where the shiners were first captured. Voucher photographs of Topeka shiners from the actual site of capture are included. Photos by P. Ceas with assistance from M. Edwards.

Site 121-1 - no Topeka shiners

Site 122-2 - no Topeka shiners

Site 123-1 In this and all following sites that contained Topeka shiners, the area of first capture is outlined in yellow.

Site 124-10 - no Topeka shiners

Site 125-6

Site 126-2

Site 127-3

Site 128-10 – no Topeka shiners

Site 129-10 – no Topeka shiners

Site 130 – 4

Site 131-10 – no Topeka shiners

Site 132– no Topeka shiners; ditch, swale

Site 133-1

Site 134-1

Site 135-1

Site 136-1

Site 137-2 – no fish photo

Site 138-1

Site 139-1 (TS-8; 98 were within same 1-mile stream segment but different site)

Site 140-10 – no Topeka shiners