

Topeka Shiner Monitoring in Minnesota: Year Six

submitted to:

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ABSTRACT

This work represents the continuation of an ongoing project (Ceas & Anderson, 2004; Ceas & Monstad, 2005; Ceas & Monstad, 2006; Ceas & Plain, 2007; Ceas & Larson, 2008) to monitor the presence/absence of Topeka shiners (*Notropis topeka*) within the federally designated critical habitat in Minnesota. These data comprise the sixth 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 fifteen of the twenty 1-mile stream segments, and in 10 of these 15 stream segments Topeka shiners were found at the first site sampled. Off-channel habitats existed within only three of the 1-mile stream corridors, and the shiners were generally found in well-developed in-channel pools or backwaters that appear to stay connected to the stream year-round.

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 further support to the conclusions drawn from the 2004-08 surveys: (a) The stream segments that did not produce Topeka shiners tend to be continuously-flowing raceways/flowing waters; (b) A few of the 1-mile segments had good numbers of individuals and what appeared to be an abundance of suitable habitat; and (3) 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).

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 sixth year of an ongoing population-monitoring project (Ceas & Anderson, 2004; Ceas & Monstad, 2005; Ceas & Monstad, 2006; Ceas & Plain, 2007; Ceas & Larson, 2008) 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 (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. For three segments (104, 113, and 119), we did not receive permission to sample within the designated 1-mile stream segment. Stream Segments 104 & 113 began just upstream (and downstream, respectively) from road crossings. Since these road access points contained the same type of habitat as what was within the designated 1-mile segments we sampled near the bridges at these access points. For Segment 119, we entered from the first bridge access upstream of the stream segment. At all three localities Topeka shiners were found on the first seine haul; therefore, further sampling within each stream segment was not conducted.

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 8-10, 2009. 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 was assisted in the field by K. A. Chezick and S. M. Helgeson, two St. Olaf College summer research students.

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. Some additional exploratory sampling took place at a few sites that appeared to contain relatively large numbers of shiners and/or “good” habitat.

Water levels during June 8 & 9 were similar to what was experienced during most days in the 2004-2007 surveys (water levels in 2008 were high), but the streams rose substantially over night on June 9 due to a heavy rain. However, we were still very successful in finding Topeka shiners on June 10 (stream Segments 113 – 120).

RESULTS

Topeka shiners were found at 15 of the twenty 1-mile stream segments (Map 2, Appendix A; Table 1, Appendix B; Appendix C); they were not found in the five remaining segments (103, 106, 110, 114, and 118). In 10 of the 15 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 9 of these 10 segments. These 10 segments & corresponding sites are 101-1, 104-1, 105-1, 109-1, 112-1, 113-1, 115-1, 117-1, 119-1, and 120-1. Topeka shiners were also found in Sites 102-2 (first seine haul), 107-4, 108-4, 111-2, and 116-4. Topeka shiners were always found in pool/backwater habitats within the 15 stream segments, though limited sampling occurred in raceways or other flowing waters.

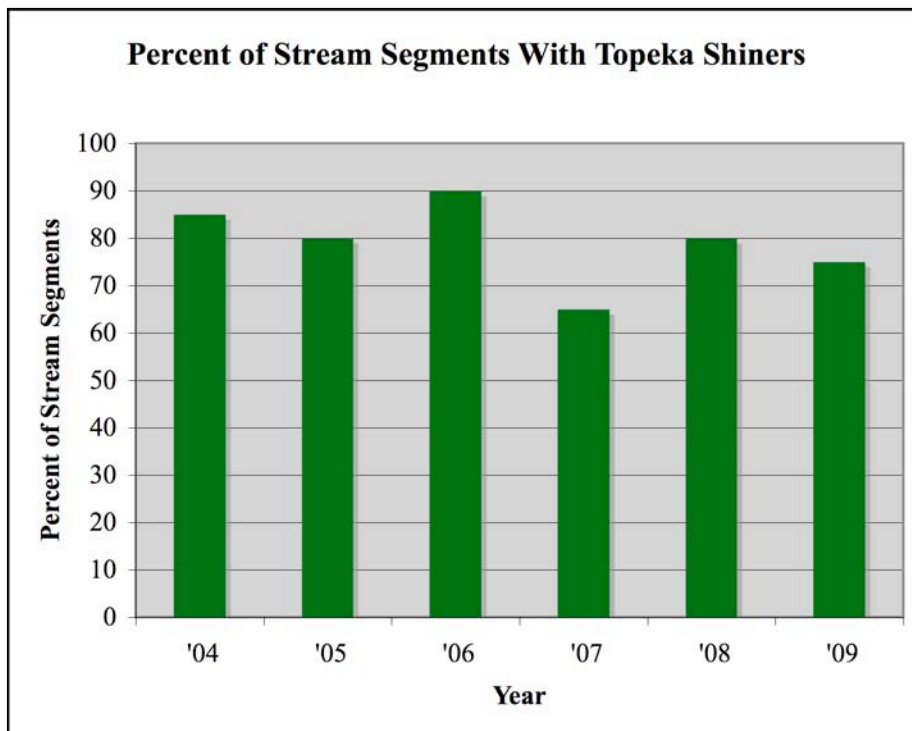
Only three of the stream segments (Segments 105, 117, and 120) contained off-channel habitats (OCH); however, no OCH’s were sampled since Topeka shiners were found at in-stream pools in all three stream segments on the 1st seine haul.

DISCUSSION

The scope of the sixth 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 2004-08 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 2004-08 surveys.

- (a) **Critical Habitat.** During the six years of this study Topeka shiners have been found in 95 of the 120 stream segments sampled (Map 2, Appendix A). These 95 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.** During the six years of this study, Topeka shiners have been found in a high percentage of stream segments sampled, and this percentage has been relatively consistent across survey years (Figure 1, below). In only two years (2007, 2009) were shiners found in fewer than 80% of the twenty stream segments. In 2007, four of the 20 segments were situated on Flandreau Creek, which is not known to harbor extensive numbers of shiners or an abundance of suitable pool habitat (Ceas & Larson, 2008); in 2009, the five stream segments where Topeka shiners were absent lacked the typical pool habitat required by this species.

Figure 1. Percent of stream segments in which Topeka shiners were found during each of the six years of monitoring.



- (c) **Stream Segments without Shiners.** The 2009 stream segments that did not produce Topeka shiners (103, 106, 110, 114, 118) were generally continuously-flowing waters. With the exception of Segment 114 (Champepadan Creek), the four remaining segments were all small headwaters/ditches and similar to other segments that failed to yield shiners during the 2004-08 surveys.

Segment 103 was located on Willow Creek, which is a tributary of Flandreau Creek. Field observations from every year show that the Flandreau Creek system is an “upland” stream that consists mostly of continuously-flowing water, and simply does not provide ideal pool habitat. Topeka shiners have been found in only 3 of the 12 one-mile stream segments sampled from 2004-2009 and are likely never common in this stream system.

Segment 106 (unnamed trib., Rock River, Burke WMA) was a very narrow (2-3') reach of stream (see Figures in Appendix C) with flowing water throughout except for one pool; this pool contained an abundance of Plains topminnows (*Fundulus sciadicus*).

Segment 110 (Springwater Creek) was also a very narrow (2-3') reach of stream that was spring-fed. There was one suitable pool, which contained an abundance of plains topminnows (*Fundulus sciadicus*), but no shiners were found (see Figures in Appendix C).

Segment 118 (unnamed trib., East Branch Kanaranzi Creek) was a narrow stream that contained flowing pools at the bridge crossings and was completely ditched throughout the remainder of the stream segment. Therefore, this sampling location only offered continuously-flowing water instead of the calm pools that are required by Topeka shiners.

Segment 114 (Champepadan Creek), although not a small headwater like the other four stream segments, flowed through a region where the stream was considerably down-cut. This resulted in a segment with continuously-flowing water and a lack of well-developed pool habitats (which is very similar to the situation for Segment 92 on the Rock River in 2008).

- (d) **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 five years of study, very few OCH's were sampled in 2009. However, Topeka shiners were captured regularly, and often in sizeable numbers, in the stream itself when “good” pool habitats existed. Therefore, 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.
- (e) **Update GIS Maps.** The GIS cover of some of the critical habitat/stream channels needs to be updated using current aerial imagery.

LITERATURE CITED

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- Tabor, V. M. 2002. Endangered and Threatened Wildlife and Plants; Designation of critical habitat for the Topeka shiner. *Federal Register*. 67:54261-54306

APPENDIX A – MAPS OF STREAM SEGMENTS

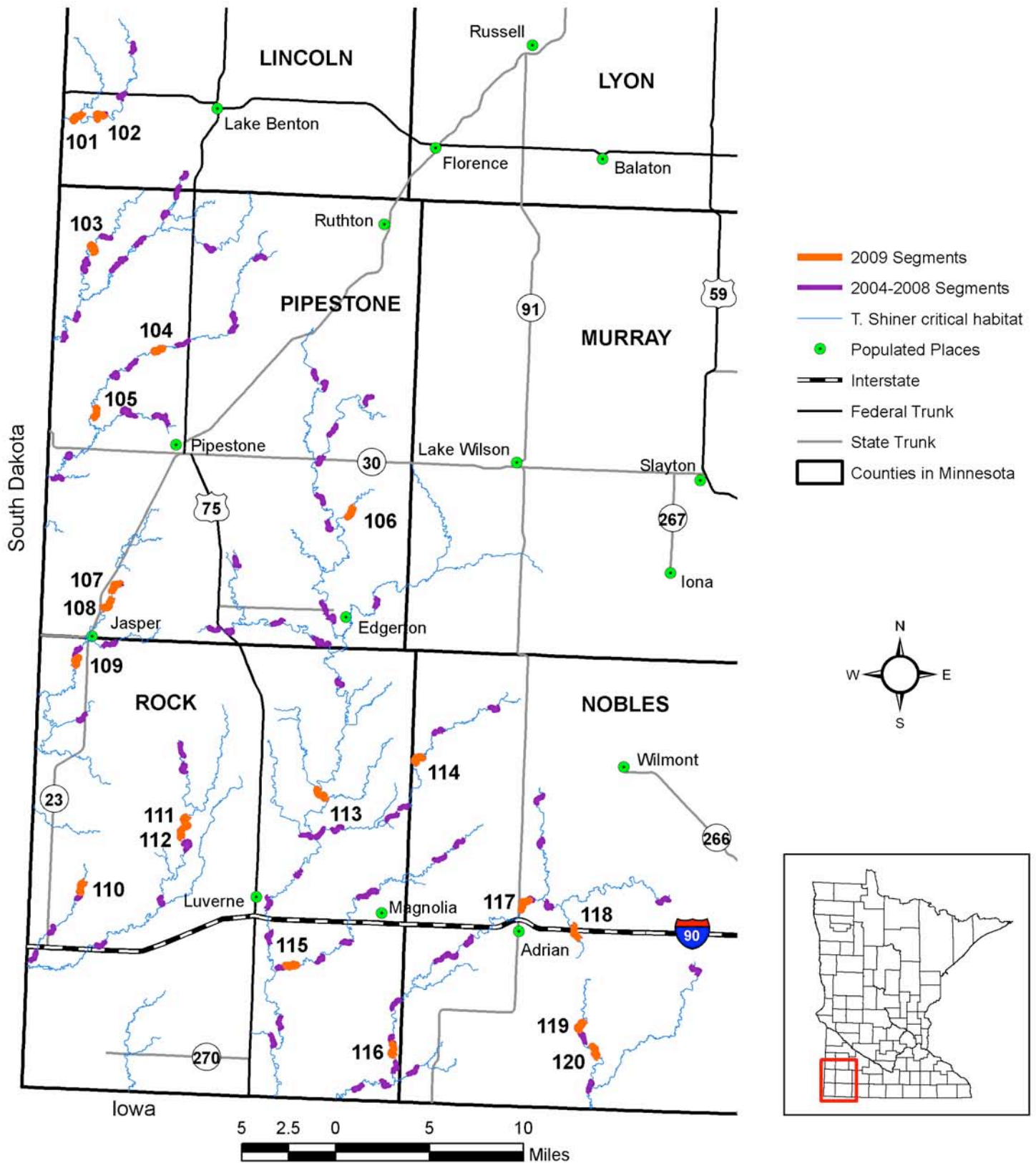
Map 1. Overview of all 120 1-mile stream segments sampled during the six years of this study, 2004-2009. The map is a general map of the SW corner of Minnesota that highlights in blue all Minnesota streams that have been designated as Critical Habitat for the Topeka shiner. The localities for 2009 (101-120) correspond to Table 1 (Appendix B).

Map 2. Presence/absence of Topeka shiners, 2004-2009. The presence (green) or absence (red) of Topeka shiners in a particular 1-mile stream segment is indicated; the 2009 segments are highlighted by colored triangles.

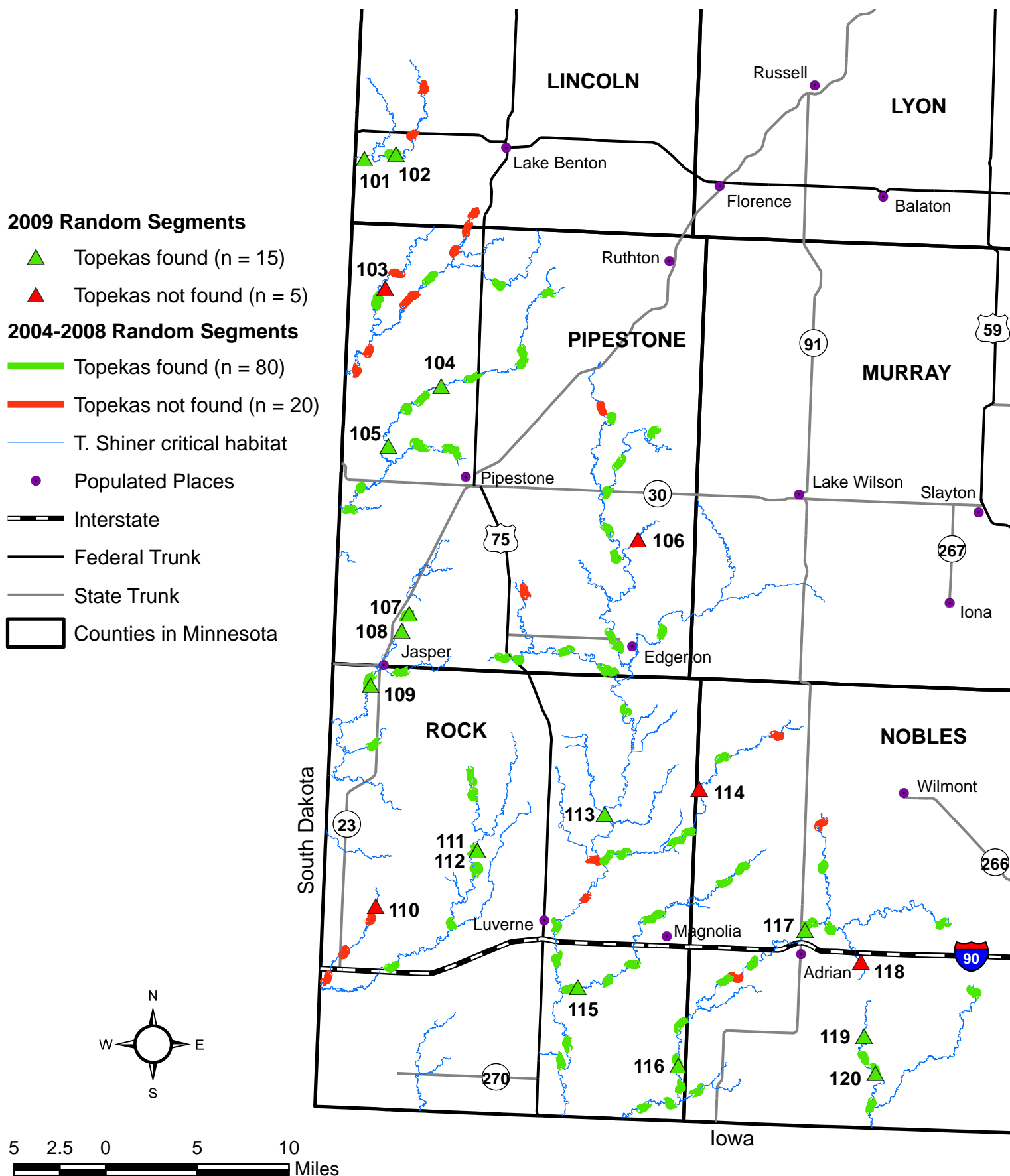
Maps 3-22. Aerial view of the twenty 1-mile stream segments that were sampled in 2009. For these 20 maps:

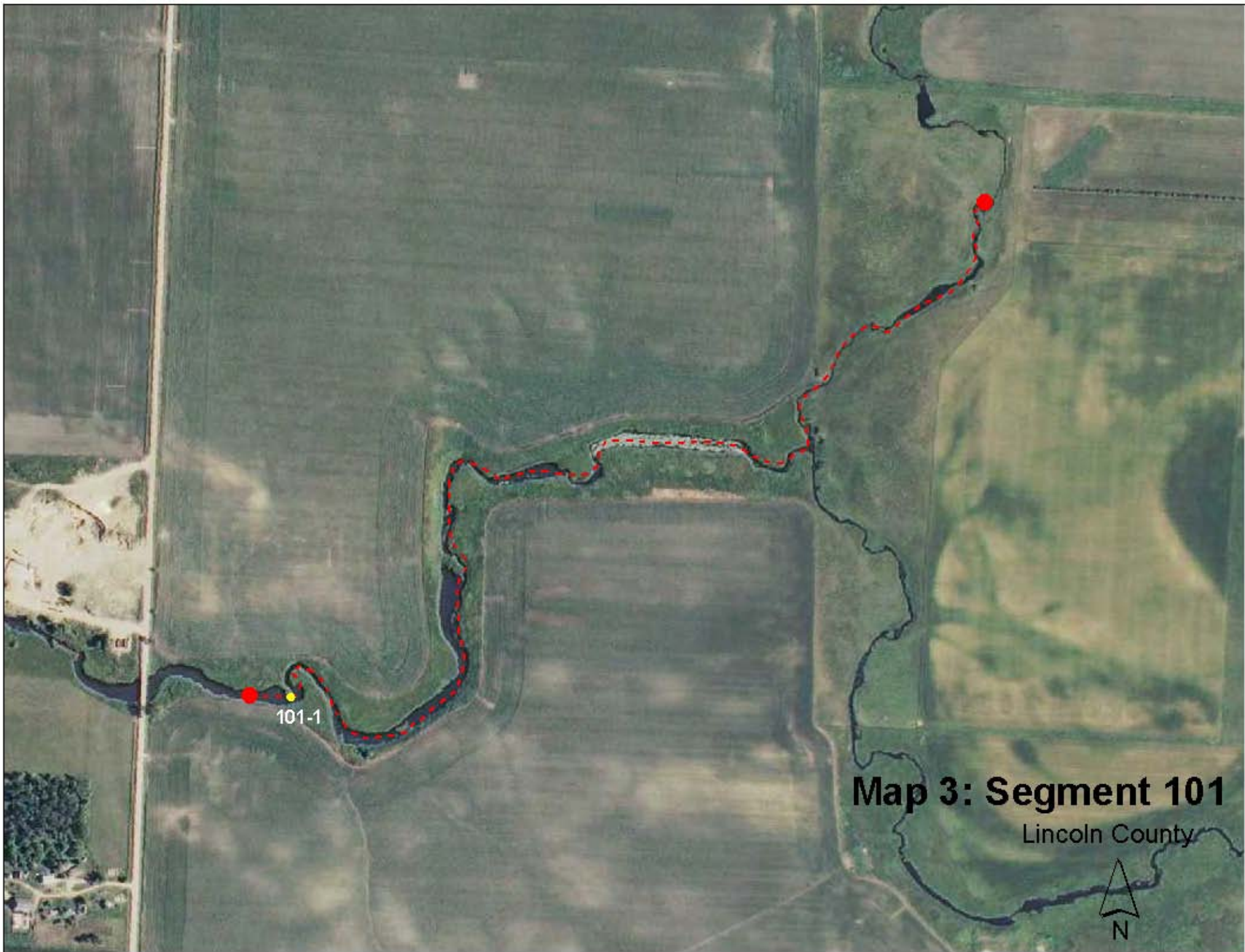
- (1) the yellow dots (with white numbers) correspond to the site numbers given in Table 1, Appendix B.
- (2) the red-dotted lines show the actual stream channel as currently defined in the federally designated critical habitat shapefile, and delineate each 1-mile stream segment.

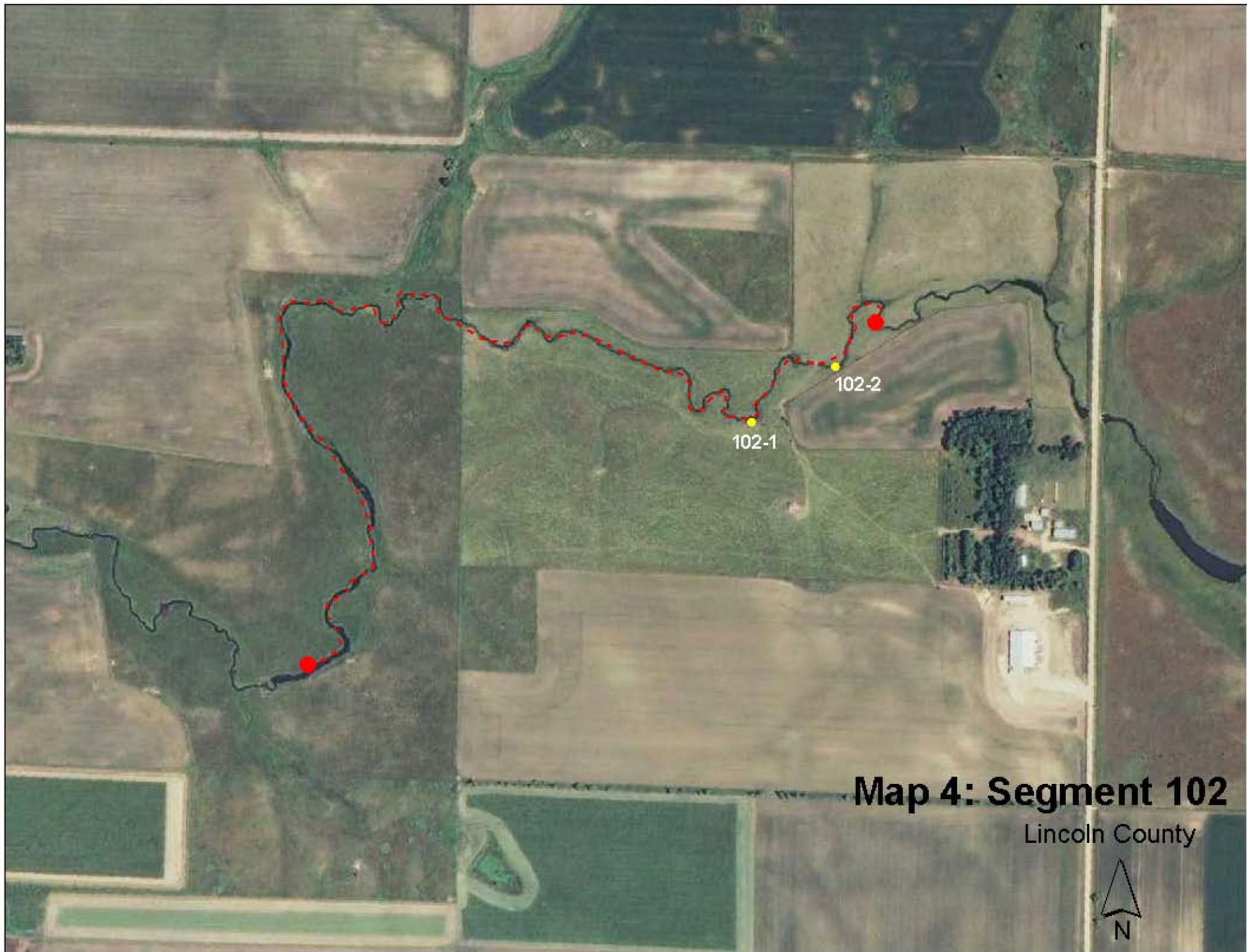
Map 1: Overview of Random Segments 2004-2009



Map 2: Overview of segments where Topeka Shiners were found 2004-2009



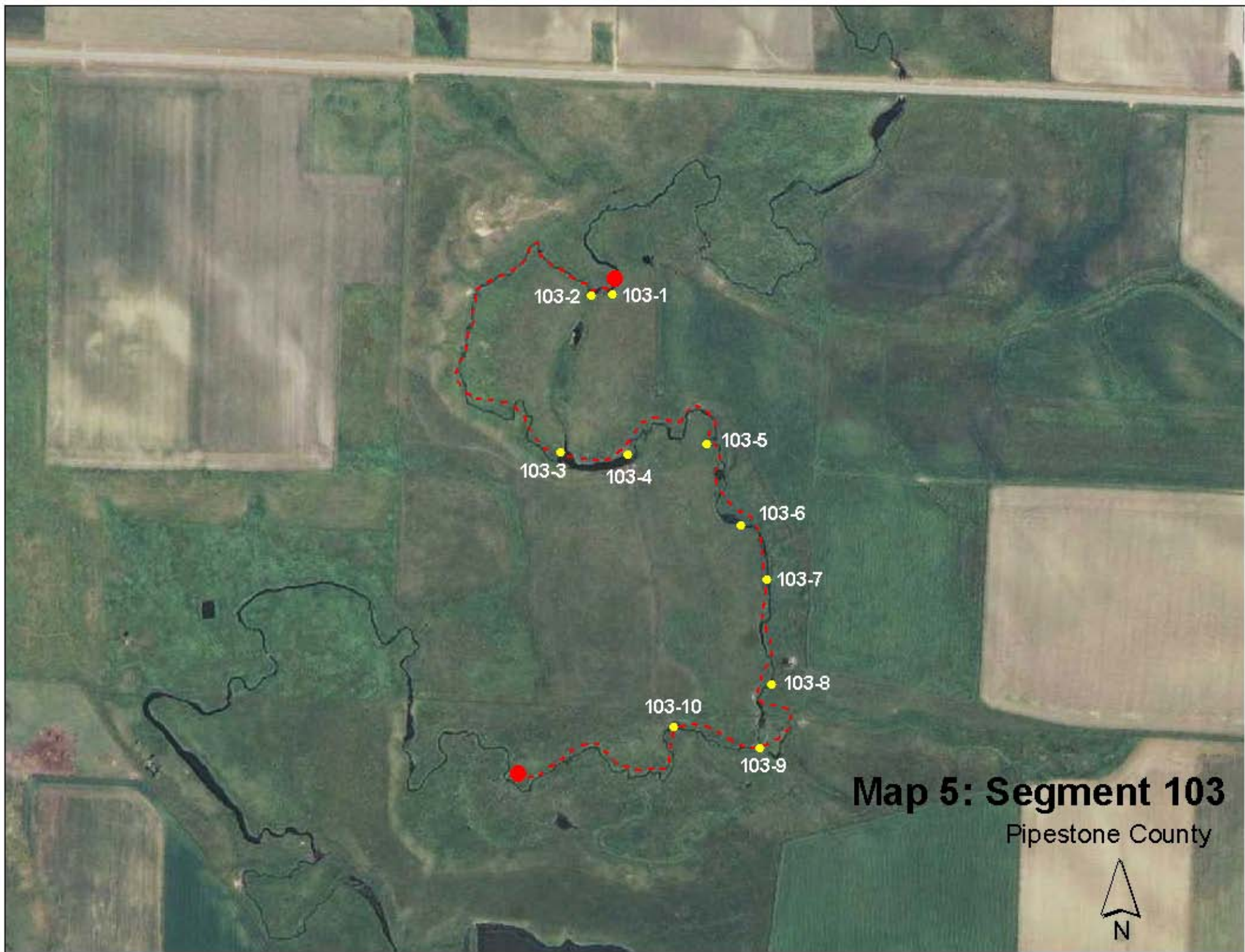




Map 4: Segment 102

Lincoln County





Map 5: Segment 103

Pipestone County



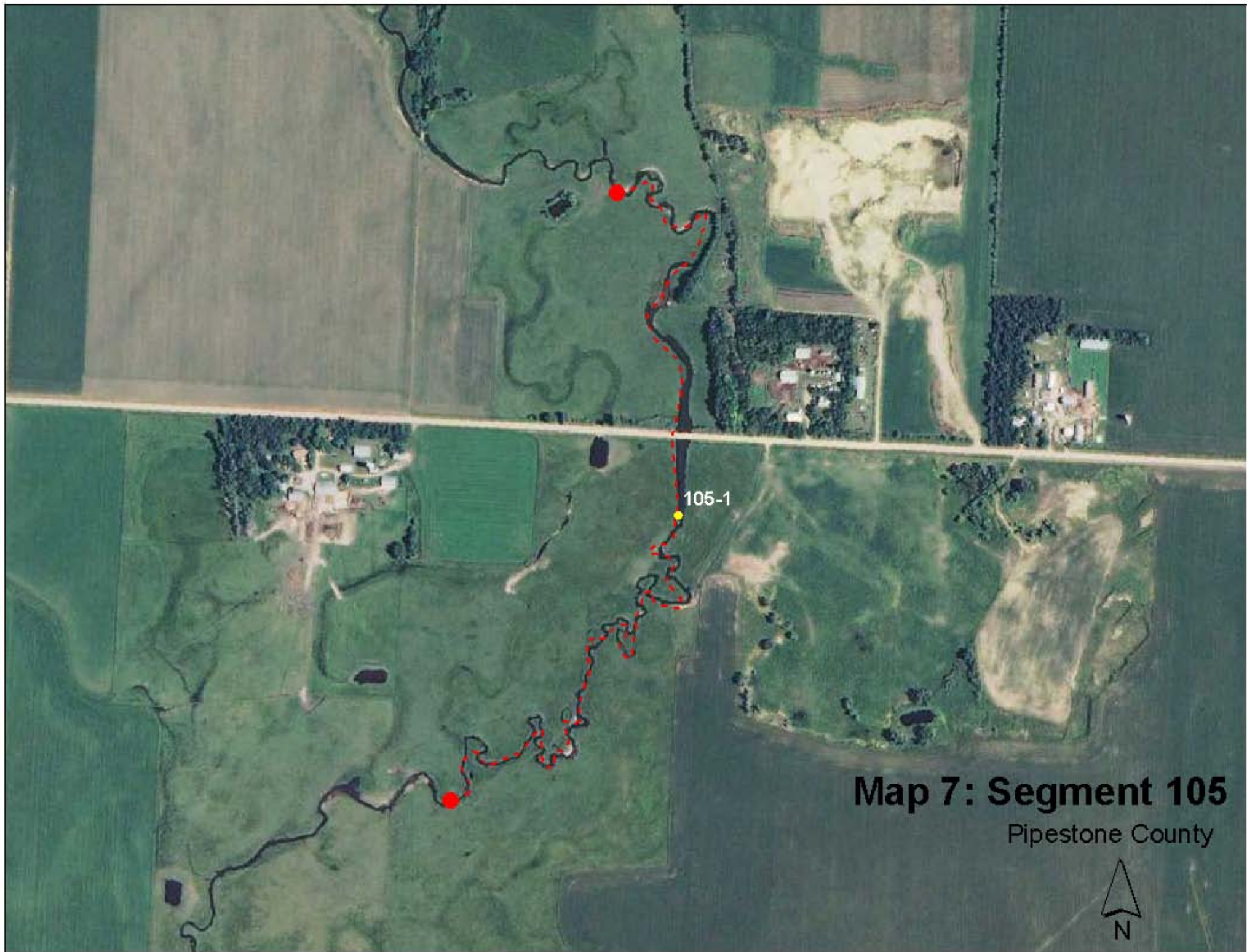


104-1

Map 6: Segment 104

Pipestone County

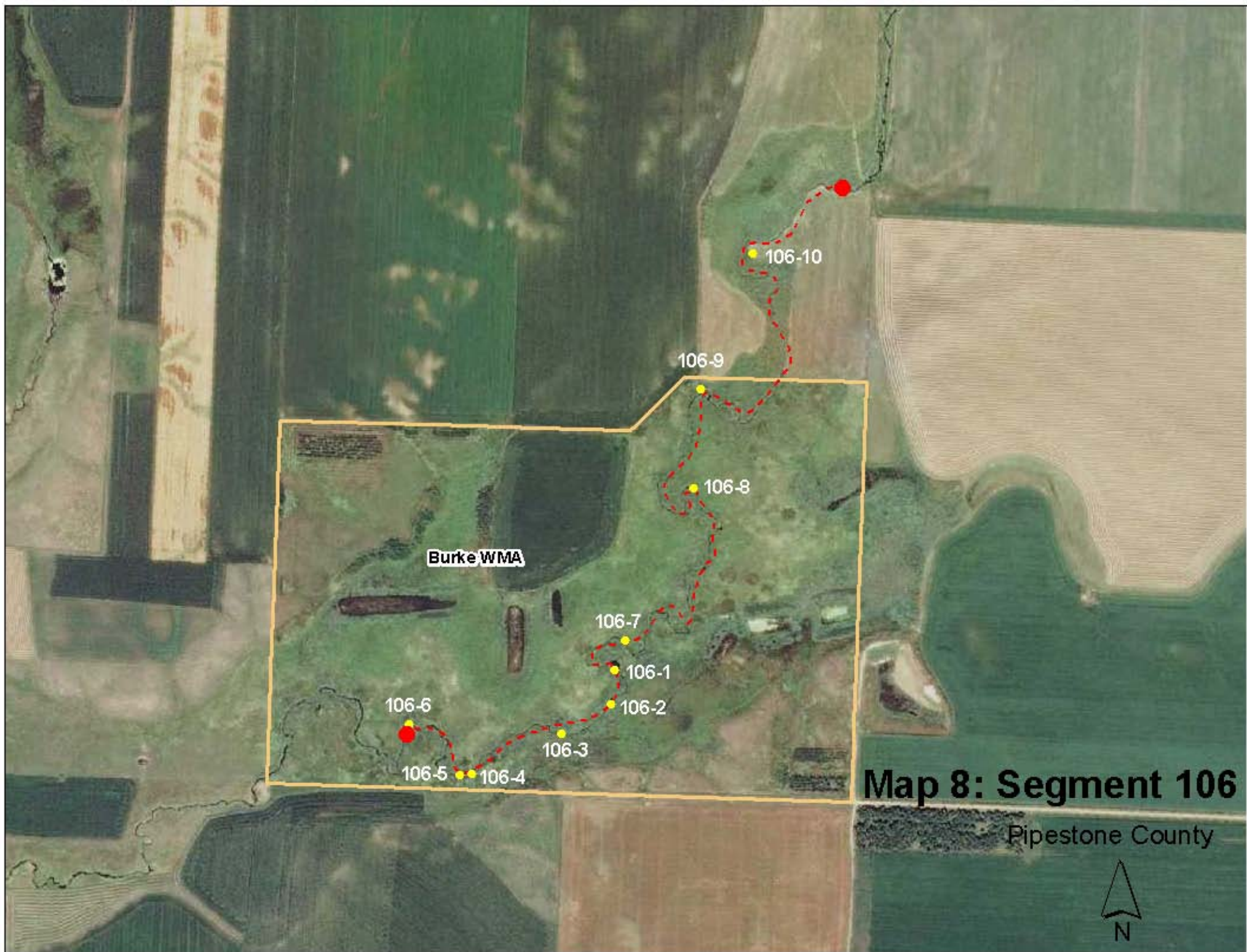


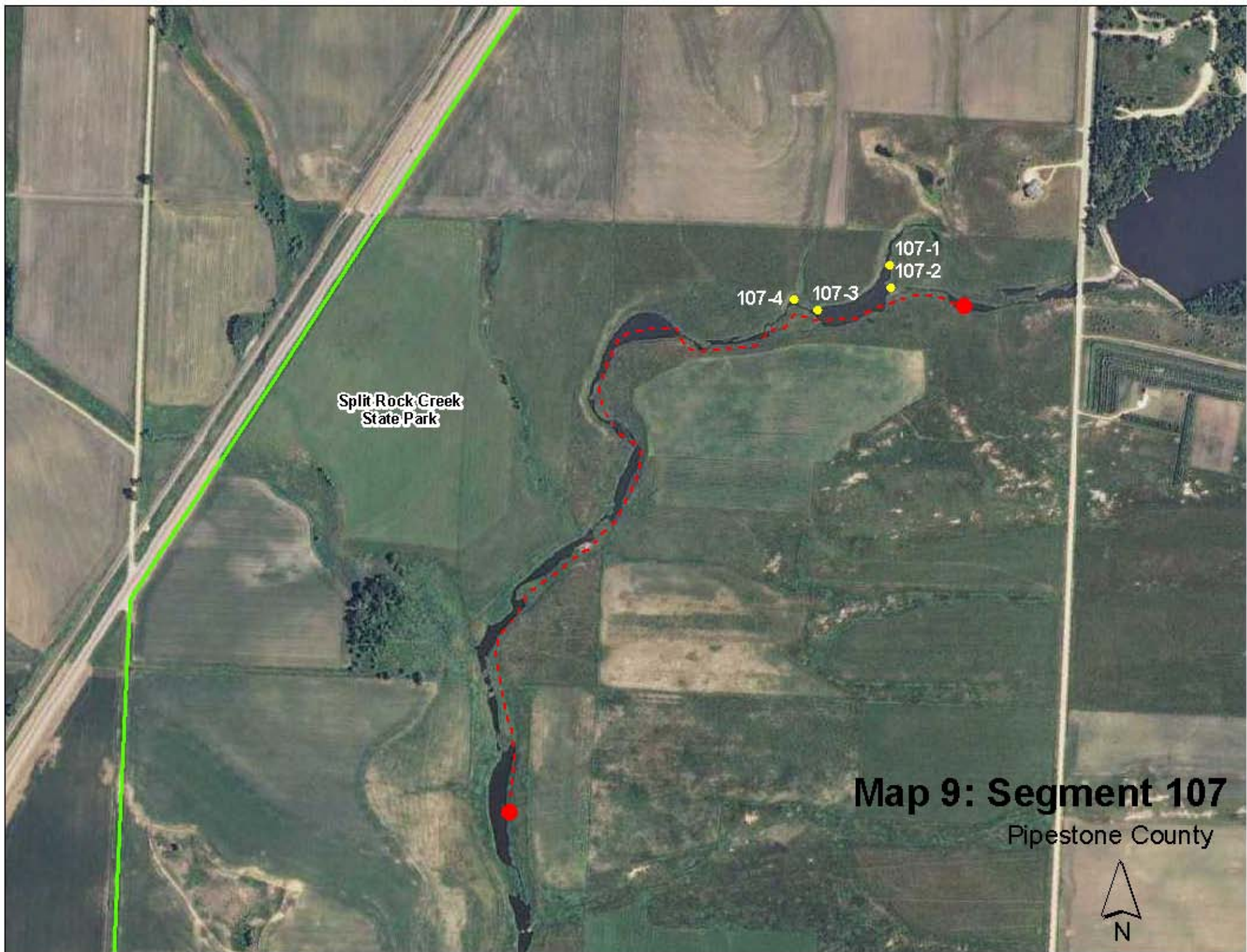


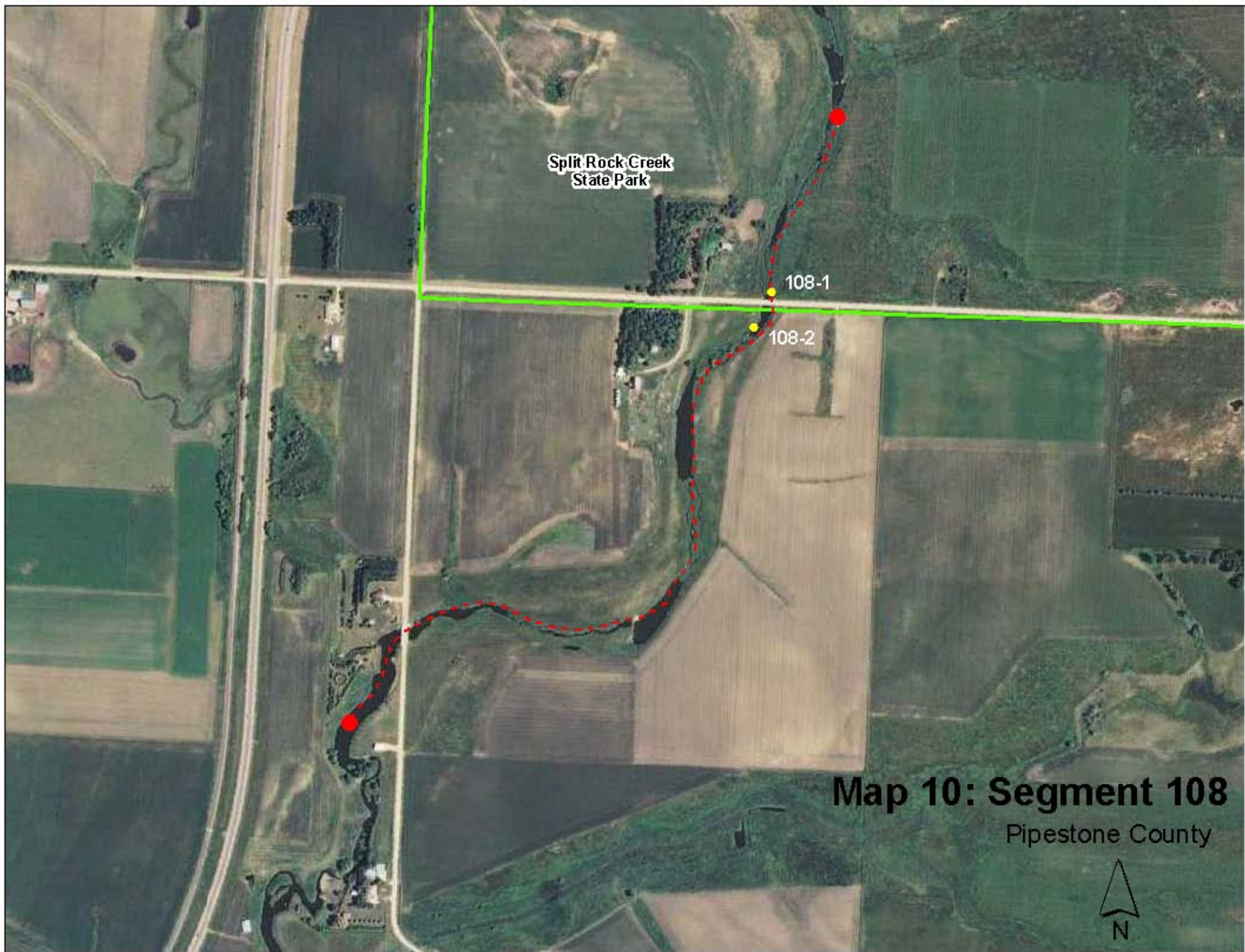
Map 7: Segment 105

Pipestone County









Split Rock Creek
State Park

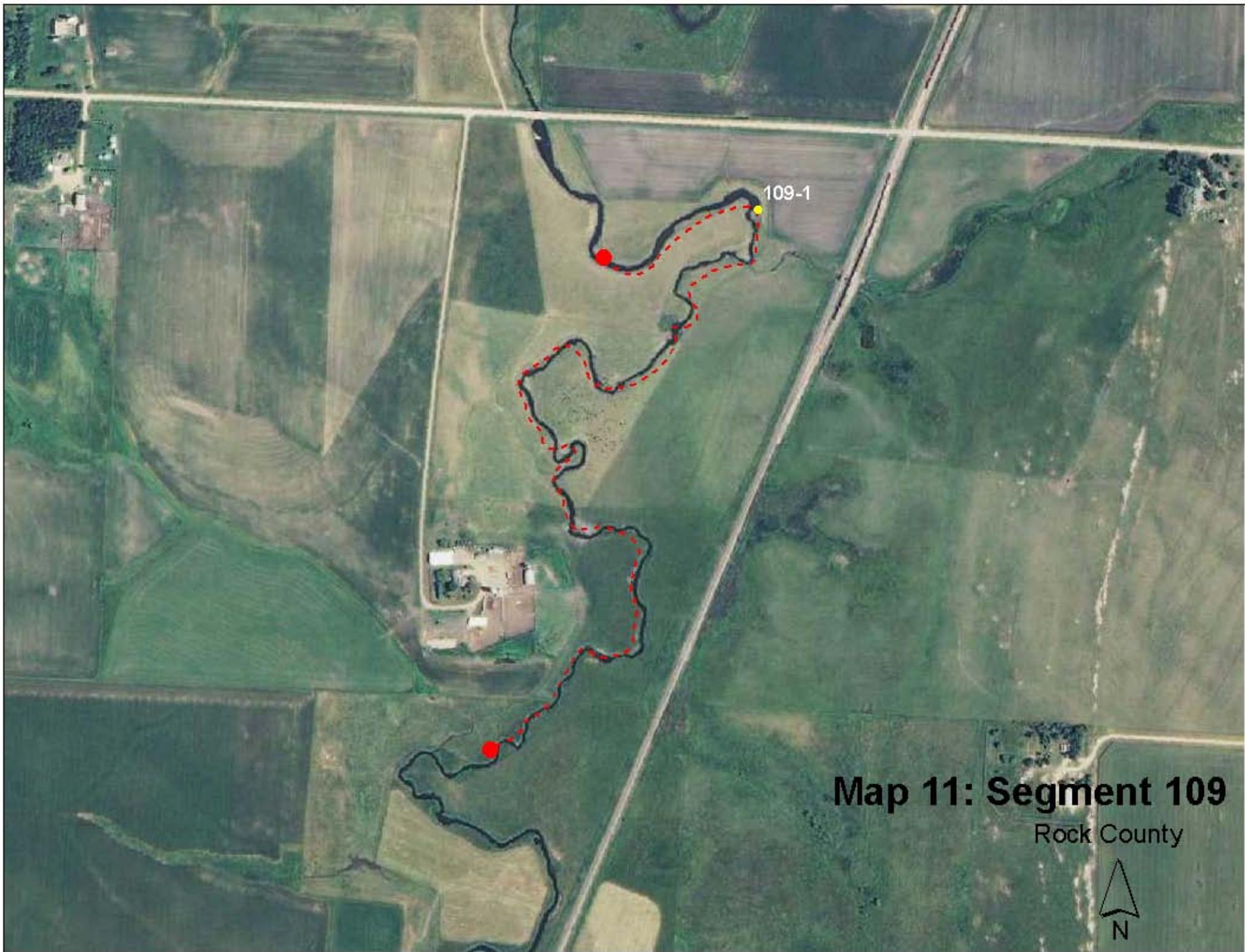
108-1

108-2

Map 10: Segment 108

Pipestone County





Map 11: Segment 109

Rock County

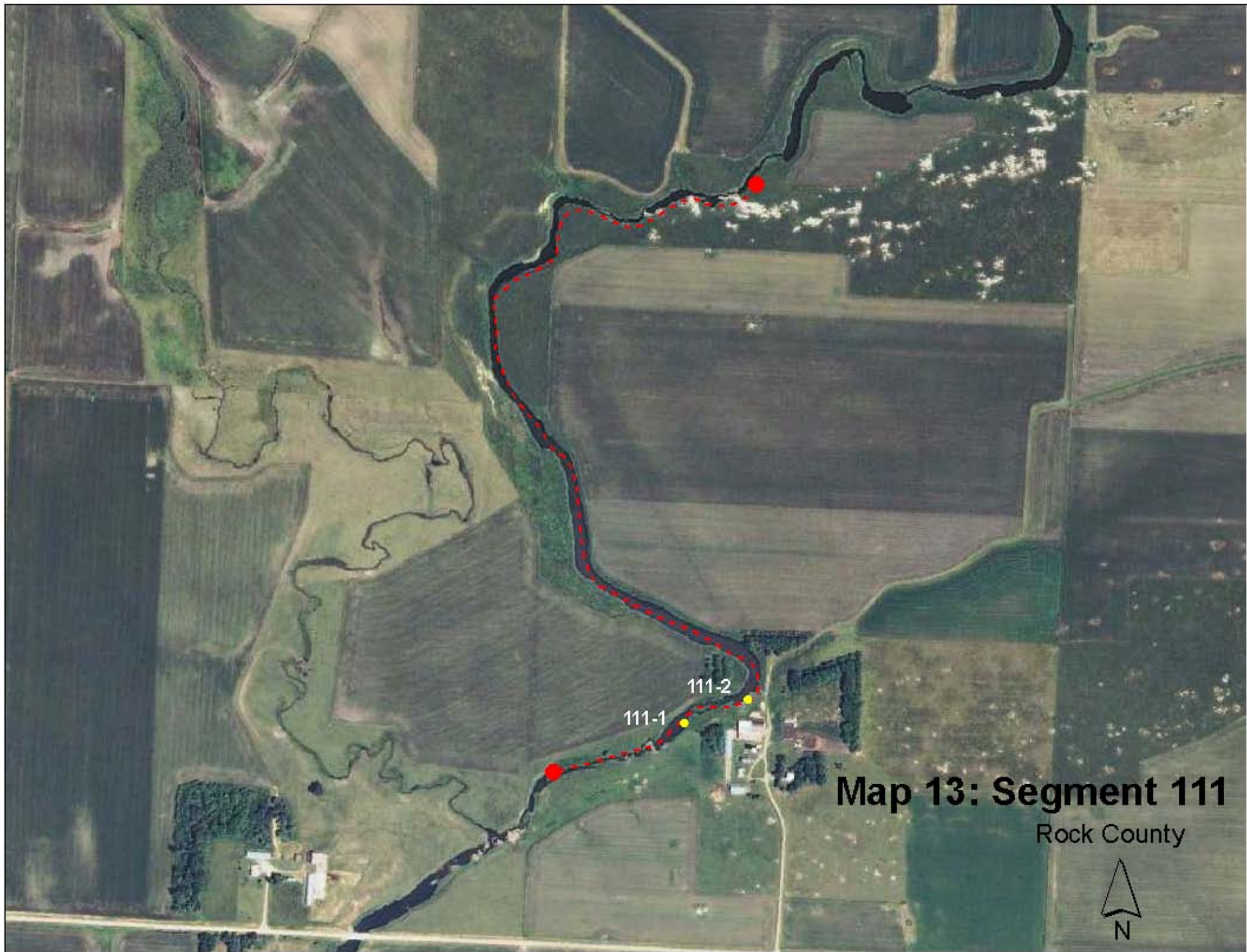




Map 12: Segment 110

Rock County





Map 13: Segment 111

Rock County

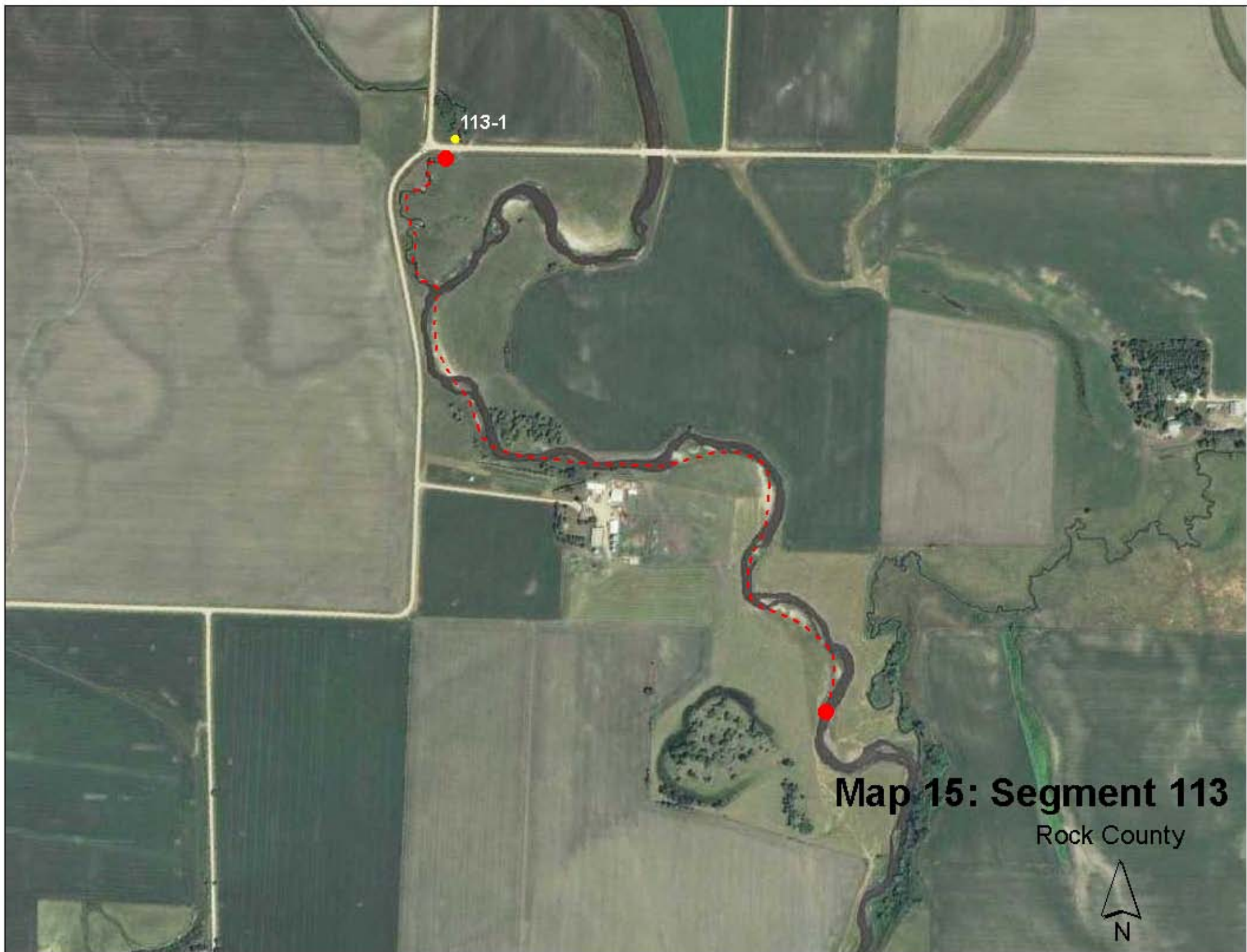


112-1

Map 14: Segment 112

Rock County

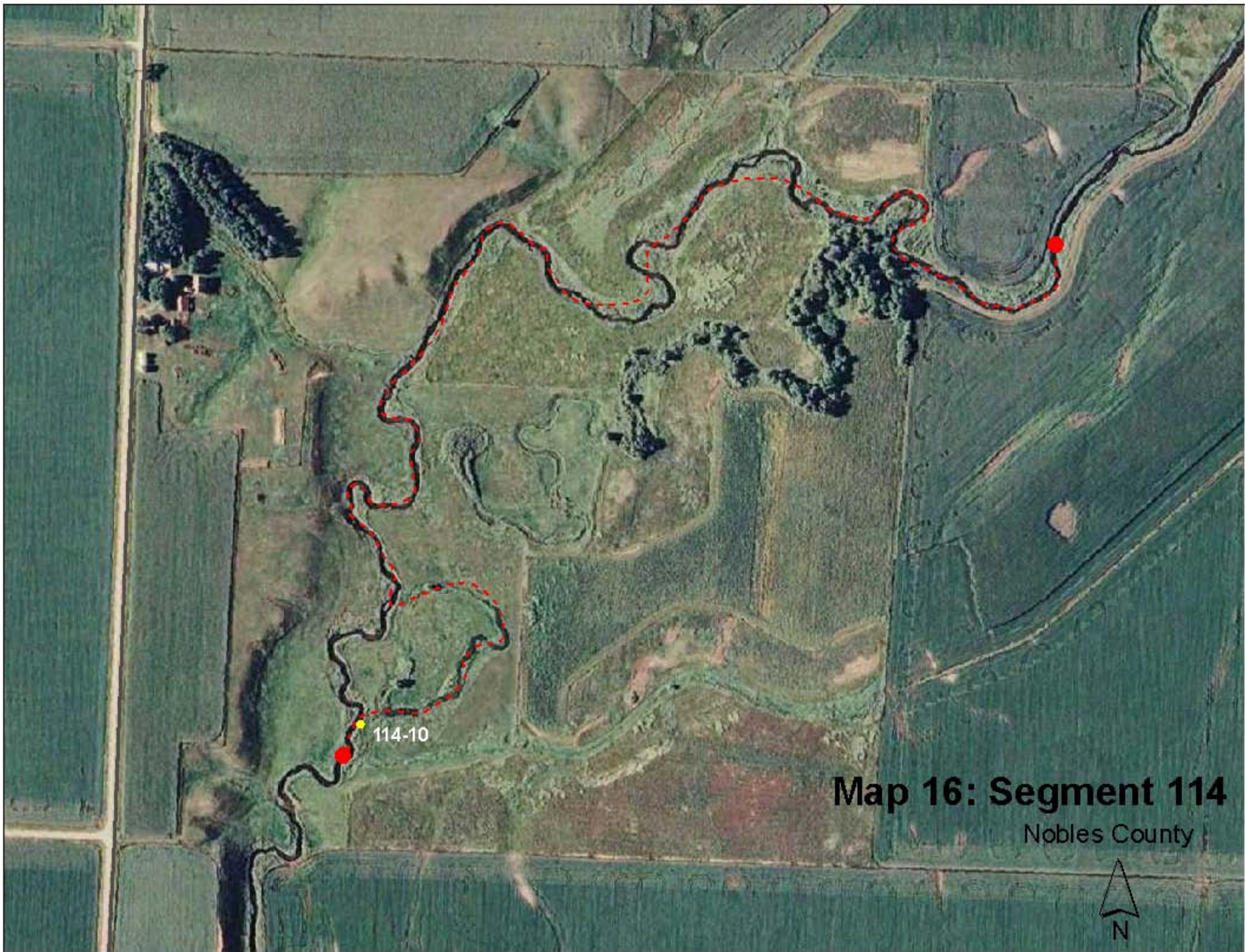




Map 15: Segment 113

Rock County

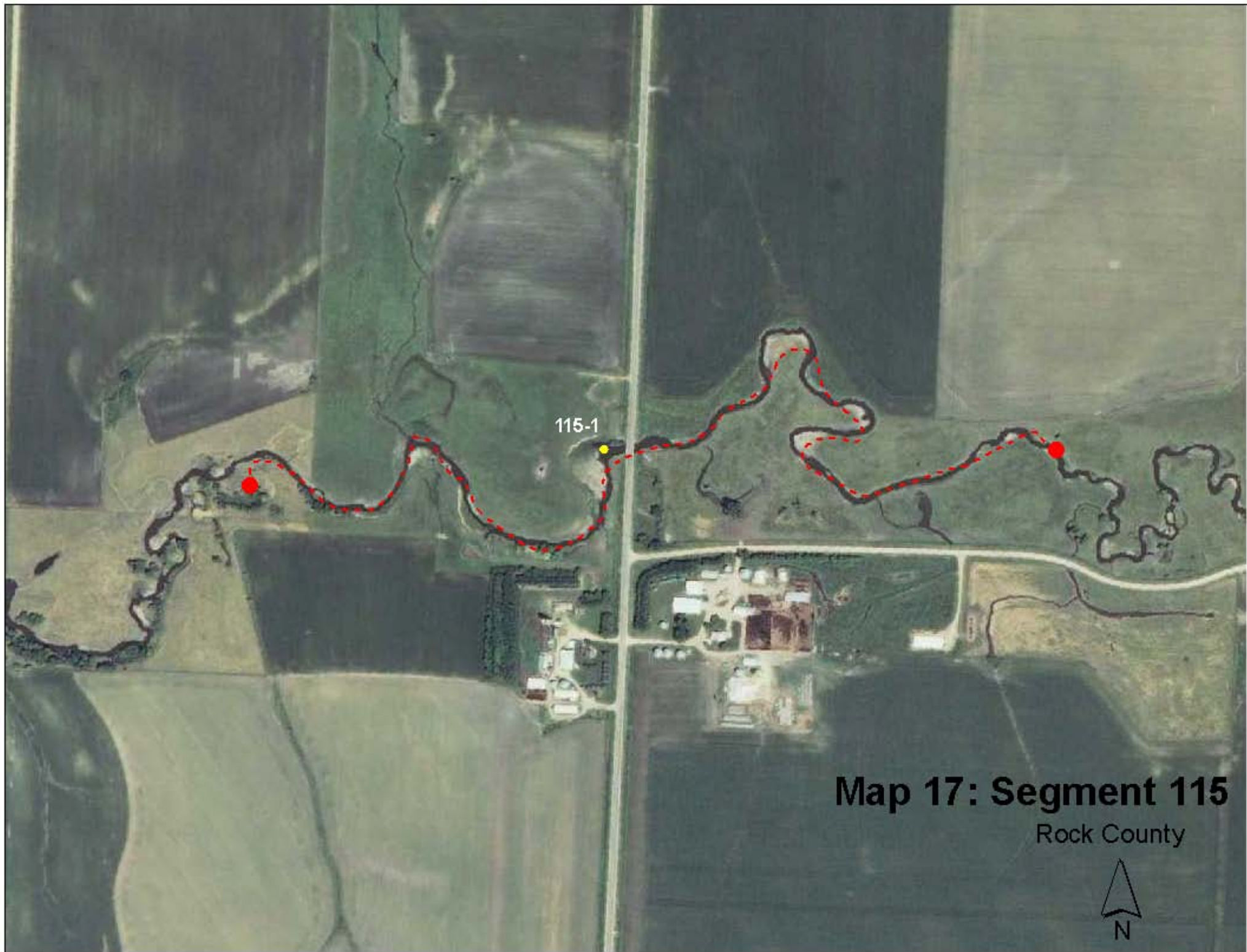




Map 16: Segment 114

Nobles County





Map 17: Segment 115

Rock County

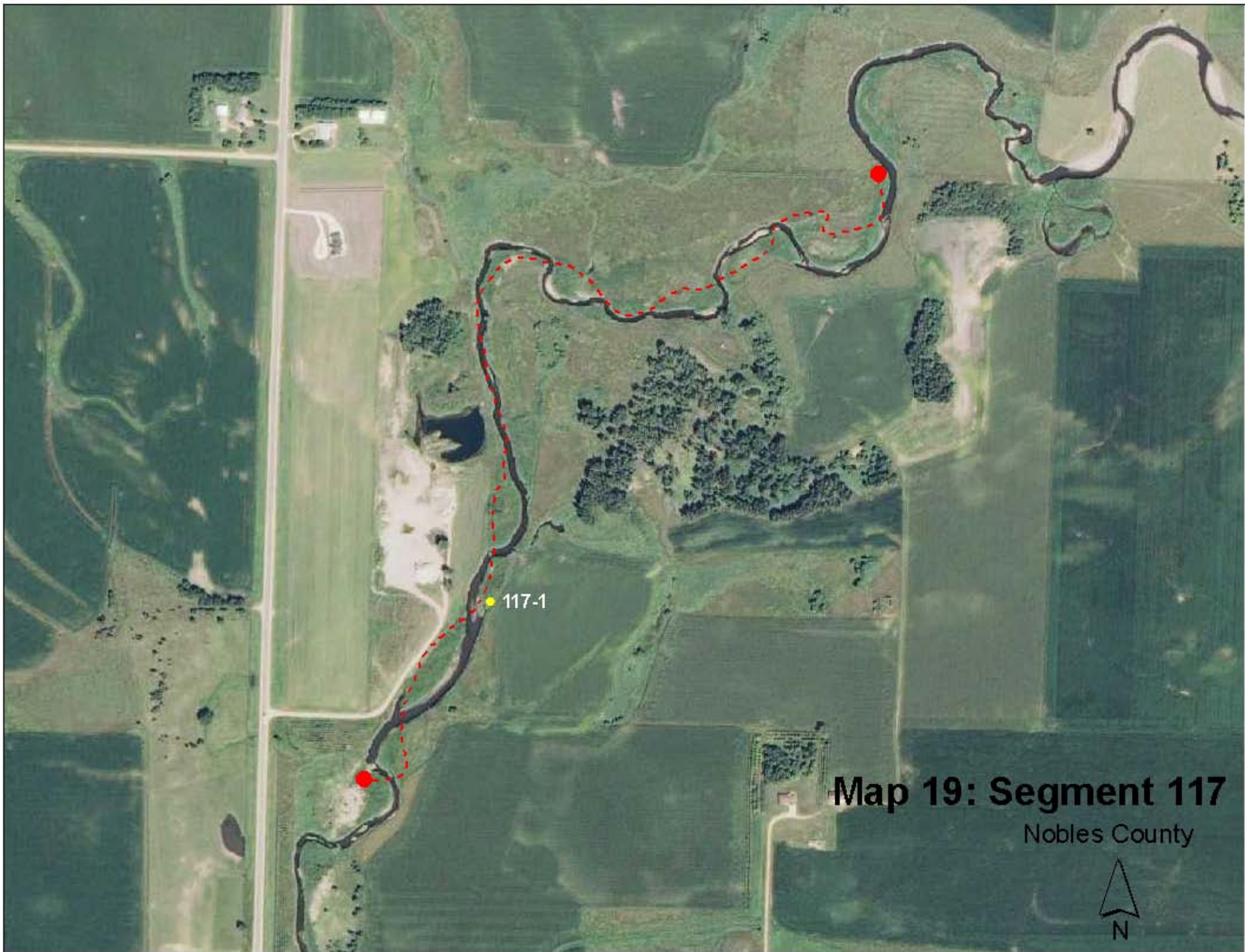




Map 18: Segment 116

Rock County

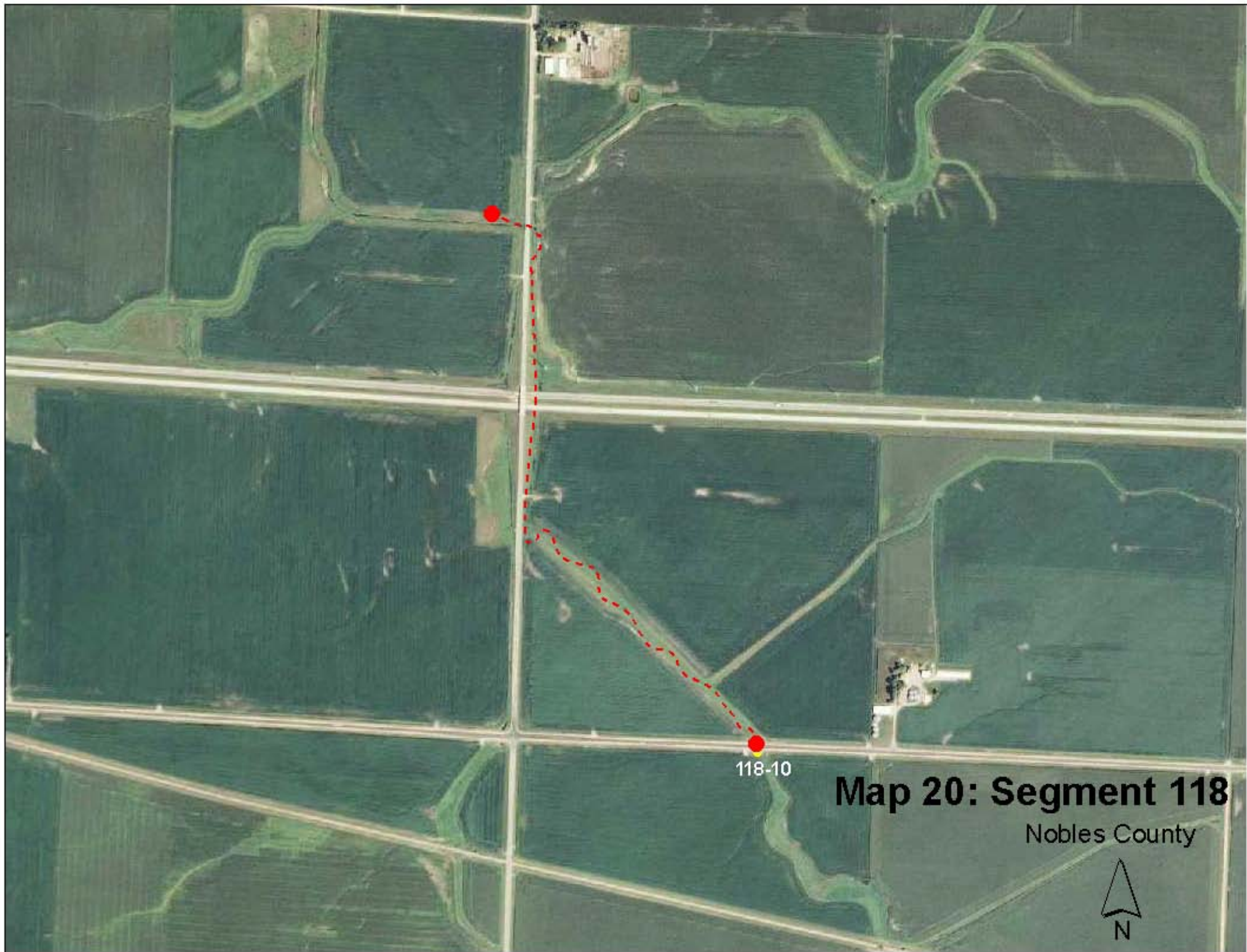




Map 19: Segment 117

Nobles County



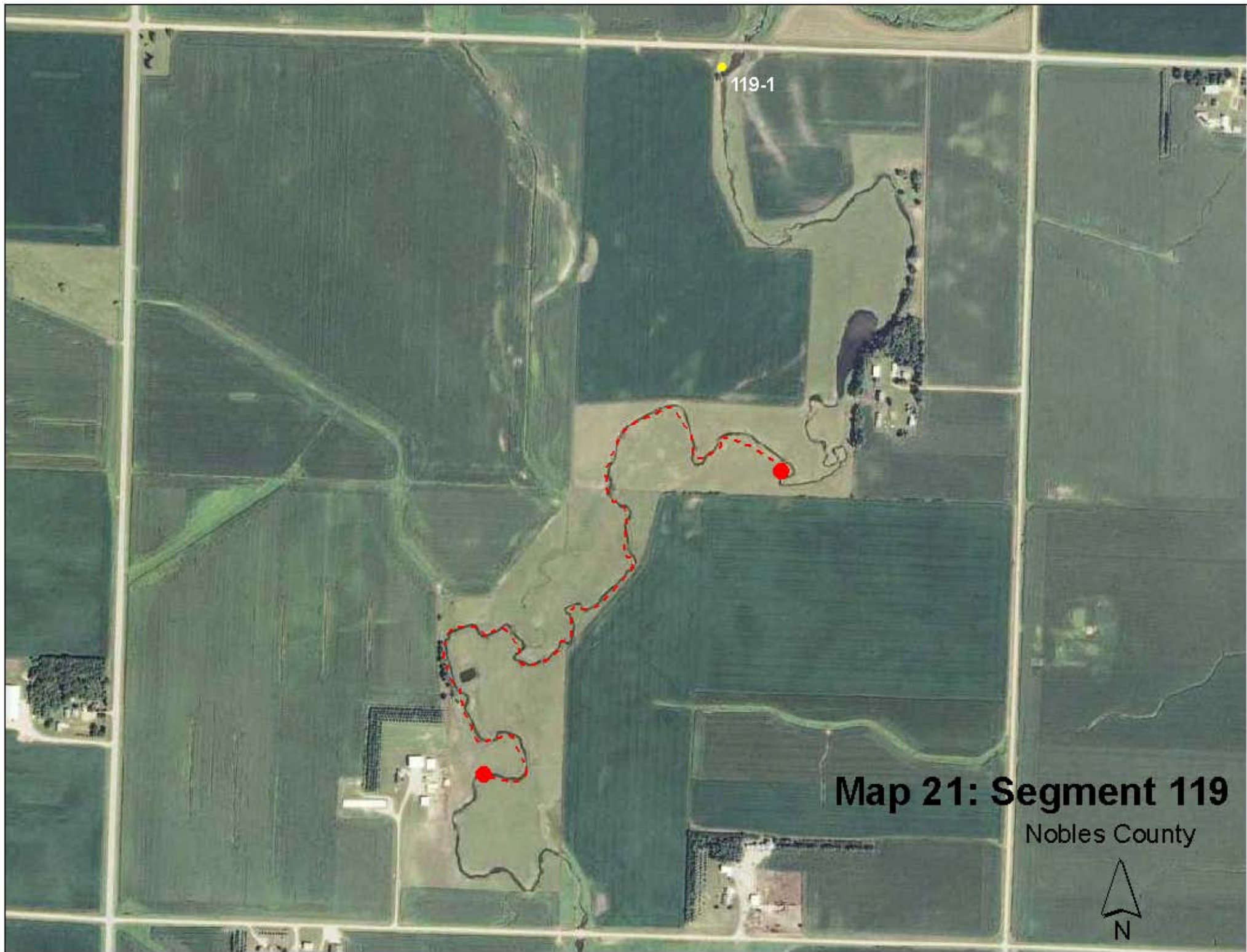


118-10

Map 20: Segment 118

Nobles County



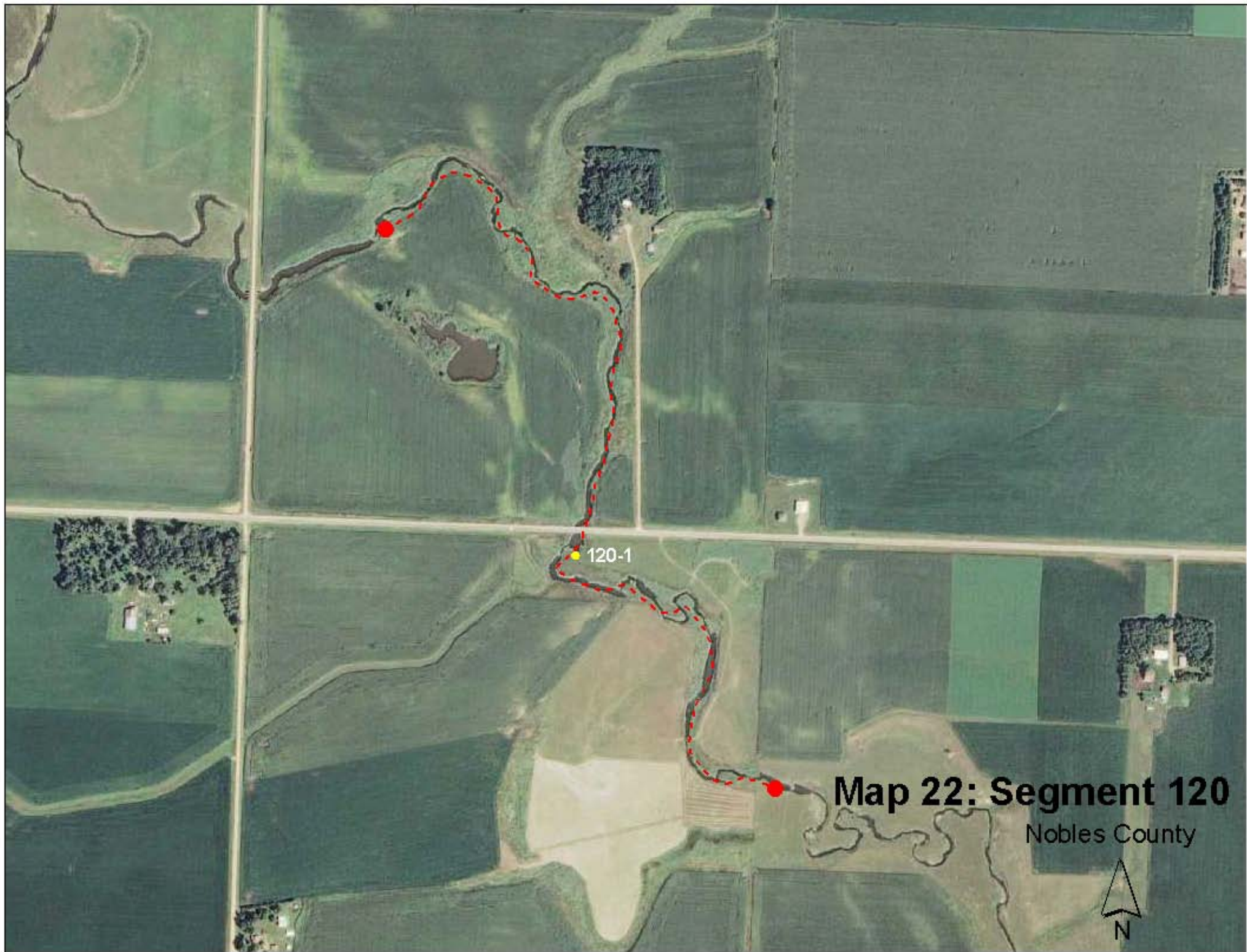


119-1

Map 21: Segment 119

Nobles County





Map 22: Segment 120

Nobles County



APPENDIX B – TABLE 1. DESCRIPTIONS OF ALL 2009 STREAM SEGMENTS AND SITES, INCLUDING TOPEKA SHINER PRESENCE/ABSENCE

Table 1 lists the twenty stream segments sampled in 2009, indicates presence/absence of Topeka shiners, and provides locality information & basic habitat descriptions of all sampling sites.

Table 1. Locations of the 2009 twenty stream Segments (sites 101-120) and corresponding sampling sites within each segment, along with 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
<u>101</u>	<u>Medary Creek</u> 7.5 mi W Lake Benton, 1 mi S U.S. 14								
	Lincoln	109	46	18	Verdi	101-1	in-channel	44.247850	-96.442180
	Habitat Description: small meandering stream; extensive pool habitat compared to upstream segments from previous years.								
	Topekas: present; caught on 1st haul; extremely abundant.								
	Substrate = firm silt/sand.								
<u>102</u>	<u>Medary Creek</u> 6 mi W Lake Benton, 1 mi S U.S. 14								
	Lincoln	109	46	17	Verdi	102-1	in-channel	44.251992	-96.409221
						102-2	in-channel	44.252660	-96.407933
	Habitat Description: meandering headwater (5-10' width) with a few pools widened to 20' but nearly constant flow throughout.								
	Topekas: present; caught on 1st haul of 2nd site.								
	Substrate = firm silt/sand.								
<u>103</u>	<u>Willow Creek</u> 6 mi NNW Cazenovia								
	Pipestone	108	46	19	Altona	103-1	in-channel	44.151908	-96.415050
						103-2	in-channel	44.151881	-96.415377
						103-3	in-channel	44.150090	-96.415757
						103-4	in-channel	44.150097	-96.414689
						103-5	in-channel	44.150245	-96.413451
						103-6	in-channel	44.149344	-96.412862
						103-7	in-channel	44.148732	-96.412412
						103-8	in-channel	44.147542	-96.412279
						103-9	in-channel	44.146809	-96.412421
						103-10	in-channel	44.147018	-96.413791
	Habitat Description: 2-3' wide except at cattle crossings; excessive algal/nutrient loading.								
	Topekas: absent.								
	Substrate = muck.								

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
<u>104</u>	<u>North Branch Pipestone Creek</u> <u>1.5 mi NE Cazenovia @ CR 76</u>								
	Pipestone	107	46	14	Troy	104-1	in-channel	44.071150	-96.348196
	Meandering stream (5-15' widths); large shallow pool downstream of bridge, upstream of riffle.								
	Topekas: present; caught on 1st haul; common.								
	Substrate = firm sand/silt.								
<u>105</u>	<u>North Branch Pipestone Creek</u> <u>3 mi SW Cazenovia @ CR 71</u>								
	Pipestone	106	46	5	Troy	105-1	in-channel	44.022478	-96.403263
	Habitat Description: 30' wide pool at bridge that narrows into a 10' stream upstream and downstream.								
	Topekas: present; caught on 1st haul.								
	Substrate = firm sand/silt.								
<u>106</u>	<u>Unnamed trib, Rock River</u> <u>3.5 mi E Hatfield @ Burke WMA</u>								
	Pipestone	106	44	28	Burke	106-1	in-channel	43.951732	-96.128472
						106-2	in-channel	43.951299	-96.128514
						106-3	in-channel	43.950920	-96.129343
						106-4	in-channel	43.950379	-96.130866
						106-5	in-channel	43.950359	-96.131059
						106-6	in-channel	43.950956	-96.131978
						106-7	in-channel	43.952096	-96.128310
						106-8	in-channel	43.954019	-96.127238
						106-9	in-channel	43.955260	-96.127174
						106-10	in-channel	43.956969	-96.126362
	Habitat Description: 2-3' wide springfed headwater; flowing water throughout, not good Topeka habitat.								
	Topekas: absent.								
	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
<u>107</u>	<u>Split Rock Creek</u> 1 mi S Ihlen @ CR 20 (Split Rock Creek State Park; also TS 86 in part)								
	Pipestone	105	46	21	Eden	107-1	in-channel	43.892188	-96.371310
						107-2	in-channel	43.891826	-96.371278
						107-3	in-channel	43.891445	-96.372824
						107-4	in-channel	43.891581	-96.373329
	Habitat Description: Almost no flow, stream is a series of pools with just a trickle of water connecting. Water was a distinctive green color, massive algal growth (pig manure spill occurred upstream of the state park on May 6).								
	Topekas: present, but very uncommon (found hundreds in 2008).								
	Substrate = boulders/slab rock/gravel; sand/silt substrate.								
<u>108</u>	<u>Split Rock Creek</u> 2 mi NNE Jasper @ CR 51								
	Pipestone	105	46	28	Eden	108-1	in-channel	43.878304	-96.379794
						108-2	in-channel	43.877741	-96.380152
	Habitat Description: 10' wide stream with a few 30-40' wide pools; excessive algal growth.								
	Topekas: present; caught in main pool downstream of bridge.								
	Substrate = firm sand/silt with scattered boulders.								
<u>109</u>	<u>Split Rock Creek</u> 1 mi SW Jasper; 11 mi NW Hardwick								
	Rock	104	47	12	Rose Dell	109-1	in-channel	43.833606	-96.411701
	Habitat Description: 10-15' stream width; 30-40' wide pools; significant improvement in water quality vs seg. 107 & 108.								
	Topekas: present; captured on 1st seine haul; common.								
	Substrate = firm sand/silt.								
<u>110</u>	<u>Springwater Creek</u> 3.5 mi N Beaver Creek, 0.5 mi W CR 14								
	Rock	102	46	7	Beaver Creek	110-10	in-channel	43.659940	-96.396192
	Habitat Description: 2-3' wide channel; downcut; constant flow; no Topeka habitat.								
	Walked entire stream segment, but took GPS coordinates at only 1 site.								
	Topekas: absent.								
	Substrate = 6-12 ' silt over 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
<u>111</u>	<u>Beaver Creek</u> 5 mi NW Luverne @ CR 8 (N of CR 8); Topeka Shiner Site 75 (in part)								
	Rock	103	45	19	Mound	111-1	in-channel	43.706798	-96.289333
						111-2	in-channel	43.707152	-96.288184
	Habitat Description: shallow stream with widened pools; a small but very muddy feedlot sits on the east bank.								
	Topekas: present; caught on 1st haul of 2nd site.								
	Substrate = firm sand/silt; bedrock/slabrock. Muck/algae downstream of feedlot (heavy erosion).								
<u>112</u>	<u>Beaver Creek</u> 5 mi NW Luverne @ CR 8; Topeka Shiner Site 75 (in part)								
	Rock	103	46	24	Mound	112-1	in-channel	43.707152	-96.288184
	Habitat Description: shallow stream with widened pools.								
	Topekas: present; caught on 1st haul; abundant.								
	Substrate = firm sand/silt; bedrock/slabrock.								
<u>113</u>	<u>Unnamed trib., Rock River</u> 3 mi SE Hardwick								
	Rock	103	44	8	Vienna	113-1	in-channel	43.739705	-96.151530
	Habitat Description: Beaver dam upstream has created extensive pool habitat; downstream is deeply downcut through the thick soils; 5-10' width.								
	Topekas: present; caught on 1st haul; abundant.								
	Substrate = firm sand/silt above dam; sand/mud downstream								
<u>114</u>	<u>Champepadan Creek</u> 5 mi W Lismore								
	Nobles	104	43	31	Leota	114-10	in-channel	43.762182	-96.049513
	Habitat Description: 10-30' wide; meandering, deeply downcut, constant flow, no pools.								
	Walked entire stream segment, but took GPS coordinates at only 1 site.								
	Topekas: absent.								
	Substrate = Sand/fine gravel.								

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
<u>115</u>	<u>Elk Creek</u>	<u>4 mi NW Kanaranzi</u>			<u>Magnolia</u>				
	Rock	102	45	25		115-1	off-channel	43.602626	-96.173458
	Habitat Description: meandering relatively shallow 30-40' channel; water level was up from rains, but backwaters still present.								
	Topekas: present; caught on 1st haul; common.								
	Substrate = firm sand/gravel/silt.								
<u>116</u>	<u>Kanaranzi Creek</u>	<u>2.5 mi SSE Kanaranzi @ Hwy 1 (also Topeka Shiner Segment 80)</u>							
	Rock	101	44	24	Kanaranzi	116-1	in-channel	43.542610	-96.061000
						116-2	in-channel	43.542865	-96.061330
						116-3	in-channel	43.543789	-96.061583
						116-4	in-channel	43.543973	-96.061369
	Habitat Description: sampled near bridge & old RR piers; meandering stream; nearly all flowing water, even in the "pool" habitat.								
	Topekas: present; only one individual captured.								
	Substrate = looser sand/silt mix.								
<u>117</u>	<u>Kanaranzi Creek</u>	<u>2 mi N Adrian, E of Hwy 91</u>							
	Nobles	102	42	7	Olney	117-1	in-channel	43.654033	-95.929176
	Habitat Description: high water from heavy rains, difficult to assess this segment; a few long backwaters present.								
	Topekas: present; only one individual captured.								
	Substrate = sand/silt mix.								
<u>118</u>	<u>Unnamed trib., East Branch Kanaranzi Creek</u>	<u>3 mi E Adrian @ Hwy 35</u>							
	Nobles	102	42	15, 16	Olney	118-10	in-channel	43.630575	-95.867182
	Habitat Description: ditched channel with constantly-flowing water and pools at the bridge. Walked entire stream segment, but only took GPS coordinates at 1 site.								
	Topekas: absent.								
	Substrate = sand/gravel.								

Table 1. Concluded.

<u>Segment</u>	<u>Stream Name & Common Location</u>					<u>UTM Coordinates (Zone 15)</u>			
	County	T	R	Section(s)	Township Name	Site Number	Habitat Type	Northing	Easting
<u>119</u>	<u>West Branch Little Rock River</u> 4 mi NW Ransom @ CR 56								
	Nobles	101	42	10	Little Rock	119-1	in-channel	43.572320	-95.860984
	Habitat Description: 30-40' channel; constant flow but a few backwaters.								
	Topekas: present; caught on 1st haul.								
	Substrate = firm sand/gravel/muck.								
<u>120</u>	<u>West Branch Little Rock River</u> 2.75 mi W Ransom @ Hwy 1								
	Nobles	101	42	23	Little Rock	120-1	in-channel	43.543234	-95.847515
	Habitat Description: 5-15' channel width, 20-40' wide pools; extensive pool habitat present.								
	Topekas: present; caught on 1st haul; common.								
	Substrate = firm sand/muck.								

APPENDIX C –PHOTOGRAPHS OF HABITATS & FISHES

Stream photographs for Segments 103, 106, 110, and 118 (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 K. Chezik.

Site 101-1

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



Site 102-2



Site 103-10 - no Topeka shiners



Site 104-1



Site 105-1



Site 106-10 – no Topeka shiners



Site 107-4



Site 108-4



Site 109-1



Site 110 – 10 – no Topeka shiners



Site 111-1



Site 112-2



Site 113-1



Site 114-10 – no Topeka shiners



Site 115-1



Site 116-4 (also TS 80)



Site 117-1



Site 118-10 – No Topeka shiners



Site 119-1



Site 120-1 (also TS-100)

