# Topeka Shiner Monitoring in Minnesota:

# Year Five

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) to monitor the presence/absence of Topeka shiners (*Notropis topeka*) within the federally designated critical habitat in Minnesota. These data comprise the fifth 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 a 10' x 5' eighth-inch mesh minnow seine.

Topeka shiners were found at sixteen of the twenty 1-mile stream segments, and in fourteen of these sixteen stream segments Topeka shiners were found at the first site sampled. Off-channel habitats existed within only two of the 1-mile stream corridors (Topekas were found at both), 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 2004-07 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 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 fifth year of an ongoing population-monitoring project (Ceas & Anderson, 2004; Ceas & Monstad, 2005; Ceas & Monstad, 2006; Ceas & Plain, 2007) designed to provide the DNR with a tool for detecting changes in the overall presence/absence of Topeka shiners (*Notropis topeka*) 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. K. A. Larson contacted landowners by phone before the survey, explained the purpose and procedure of the survey, and requested permission to come onto their property. If permission was not granted or landowners were not available (we also stopped by their houses if they live on site), the portion of the stream segment outside of the property in question was surveyed. In the latter cases (which were few), Topeka shiners were found in the sampling sites outside of the property; therefore, further sampling within the stream segment was not required.

**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 2003, FSA NAIP 2003) 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 during May 28-30 and June 25-26. 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. We were assisted in the field by K. A. Chezik and N. B. Schlichter, two St. Olaf College summer research students who were studying under P. Ceas.

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 May and June were generally higher than what was experienced during the 2004-2007 surveys due to heavy rains. However, we were still very successful in finding Topeka shiners.

## RESULTS

Topeka shiners were found at 16 of the twenty 1-mile stream segments (Map 2, Appendix A; Table 1, Appendix B; Appendix C); they were not found in the four remaining segments (82, 89, 90, and 92). In 14 of the 16 stream segments that did contain Topeka shiners, we found the species in the first site sampled (e.g., Site 83-1). These 14 segments & corresponding sites are 83-1, 84-1, 85-1, 86-1, 87-1, 88-1, 91-1, 93-1, 94-1, 95-1, 97-1, 98-2, 99-1, and 100-1 (for "fun" we tried Site 98-1 even though we knew that the water was too deep). We captured Topeka shiners in the first seine haul at all 14 of these segments. Topeka shiners were also found in Sites 81-8 (first seine haul; this was the only pool present) and 96-4 (first seine haul). Topeka shiners were always found in pool/backwater habitats within the 14 stream segments, though limited sampling occurred in raceways or other flowing waters.

With the exception of Segment 92 (Rock River) the three remaining segments in which Topeka shiners were not found (82, 89, 90) were all small headwaters and similar to other segments that failed to yield shiners during the 2004-07 surveys. In general these small headwaters tended to be channelized or field-tiled, resulting in segments with relatively continuously flowing waters and an absence of typical pool habitat associated with Topeka shiners. Segment 92 on the Rock River, although not a headwater, flowed through a region where the river was considerably down-cut, resulting in a segment with continuously-flowing water and a lack of well-developed pool habitats.

Only two of the stream segments (Segments 81 and 95) contained off-channel habitats (OCH), and the OCH in both stream segments produced Topeka shiners. Segment 81 (Flandreau Creek) was a narrow relatively high-gradient headwater that lacked appropriate habitat except for one farm pond that is seasonally inundated; the shiners were found in this pond. Segment 95 (Champepadan Creek) was a "typical" meandering creek with many backwaters and an abundance of Topeka habitat.

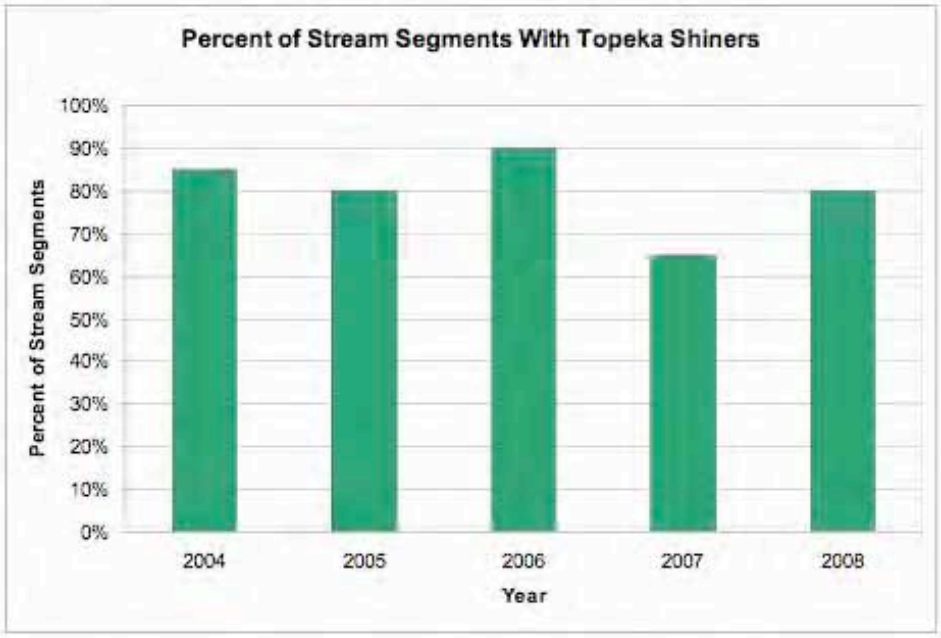
## DISCUSSION

The scope of the fifth year of this study was to continue to conduct straightforward presence/absence surveys for Topeka shiners in a randomly chosen group of 20 one-mile stream segments. Given the random selection of stream segments, the streams varied in size and diversity of habitat types. Therefore, no attempt was made to quantify habitat assessment or sampling effort & time between sites. Even so, we continued to make observations that are consistent with our conclusions from the 2004-07 surveys.

(a) **Critical Habitat.** During the five years of this study Topeka shiners have been found in 80 of the 100 stream segments sampled (Map 2, Appendix A). These 80 segments are spread throughout the range of the species in 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 five years of this study the number (or percent) of segments where Topeka shiners were found was relatively consistent (Figure 1, below), and a high percentage of stream segments contained Topeka shiners. In only one year (2007) were shiners found in fewer than 80% of the twenty stream segments, and during that year 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 (see below).

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



(c) **Stream Segments without Shiners.** The 2008 stream segments that did not produce Topeka shiners (82, 89, 90, and 92) were generally continuously-flowing raceways/flowing waters, or were severely degraded.

Segment 82 is a segment of Flandreau Creek. This year's field reconnaissance in the Flandreau Creek system (Segments 81, 82) continues to support previous years' findings that this small "upland" stream consists mostly of continuously-flowing water, and simply does not provide ideal pool habitat. Topeka shiners have been found in only 3 of the 10 one-mile stream segments sampled from 2004-2008, and are likely never common in this stream system.

Segments 89 & 90 (Springwater Creek) have been severely degraded by channelization and complete stream bank destruction by cattle (see Figures in Appendix C).

Segment 92 (Rock River) is a continuously-flowing stretch of river and does not appear to harbor suitable spawning habitat for Topeka shiners. Topekas shiners are known to live in the Rock River upstream and downstream of this segment (see Map 2: Segment 92 is the first red locality NW of Luverne), and it is probable that Topeka shiners move through this stream segment on a "regular" basis.

(d) **Off-Channel Habitats.** Some researchers have noted that off-channel habitats (OCH) tend to have the largest populations of Topeka shiners, and that Topekas are often not found in adjacent stream channels. During the five years of this study very few OCH were sampled, but Topeka shiners were captured regularly, and often in sizeable numbers, in the stream itself when "good" pool habitats existed.

(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

Berg, J. A., T. A. Petersen, Y. Anderson, and R. Baker. 2004. Hydrogeology of the Rock River watershed, Minnesota and associated off-channel habitats of the Topeka shiner. Minnesota Department of Natural Resources Report. 13 pp.

Ceas, P. A., and Y. C. Anderson. 2004. Results of a pilot monitoring project for Topeka shiners in southwestern Minnesota. Minnesota Department of Natural Resources Report. 56 pp.

Ceas, P. A., and Y. A. Monstad. 2005. Results of a pilot monitoring project for Topeka shiners in southwestern Minnesota: Year two. Minnesota Department of Natural Resources Report. 59 pp.

Ceas, P. A., and Y. A. Monstad. 2006. Topeka shiner monitoring in Minnesota: Year three. Minnesota Department of Natural Resources Report. 57 pp.

Ceas, P. A., and A. M. Plain. 2007. Topeka shiner monitoring in Minnesota: Year four. Minnesota Department of Natural Resources Report. 49 pp.

Dahle, S. P. 2001. Studies of Topeka shiner (*Notropis Topeka*) life history and distribution in Minnesota. M.S. Thesis, University of Minnesota, St. Paul. iv + 69 pp.

Hatch, J. T. 2001. What we know about Minnesota's first endangered fish species: the Topeka shiner. Journal of the Minnesota Academy of Science. 65:39-46.

Tabor, V. M. 1998. Final rule to list the Topeka shiner as endangered. Federal Register. 63:69008-69021.

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

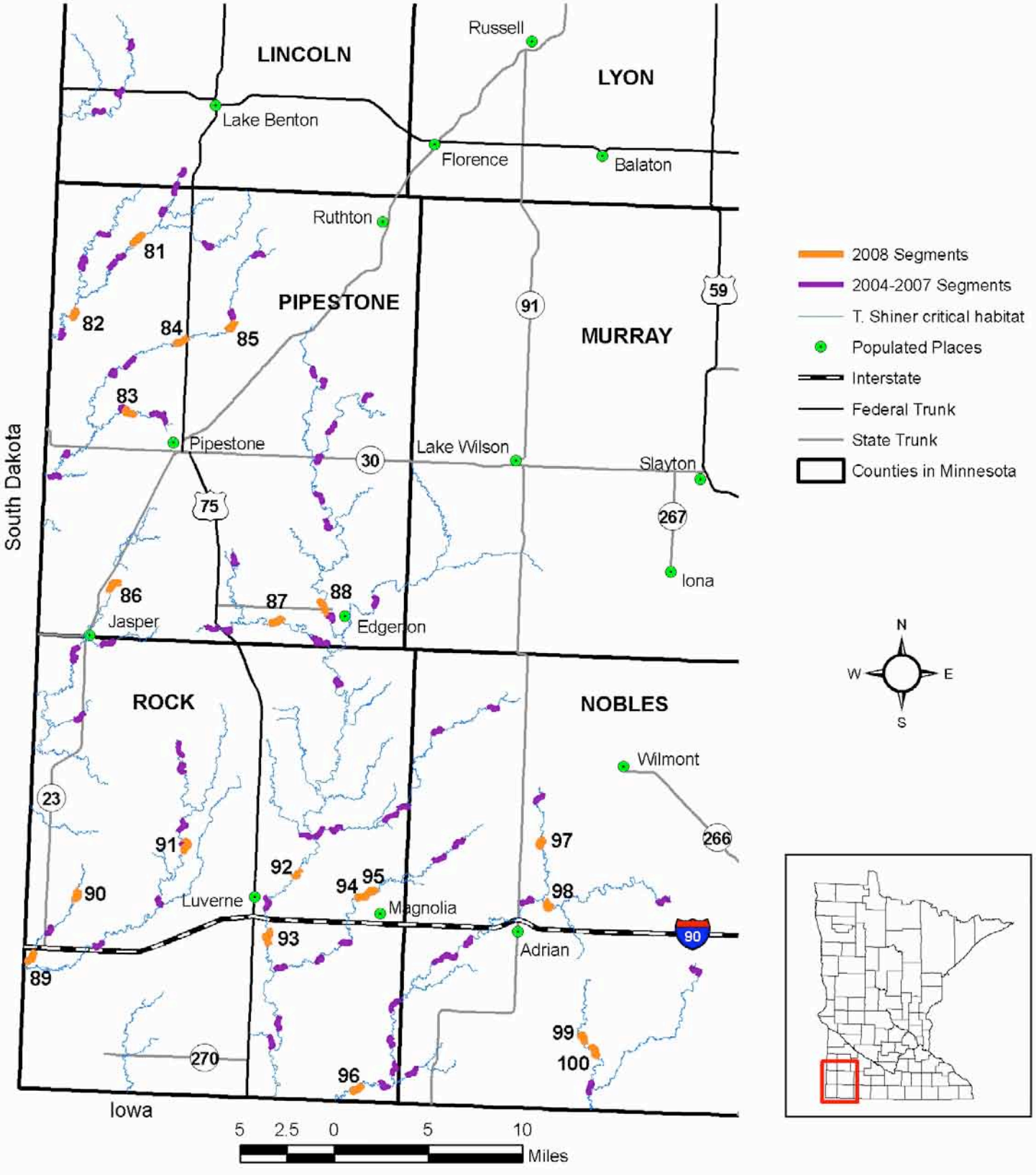
Map 1. Overview of all 100 1-mile stream segments, 2004-2008. The map is a general map of the SW corner of Minnesota that highlights in blue all Minnesota streams that have been designated as Critical Habitat for the Topeka shiner. The map contains all collecting localities during the five years of this study (2004-2008). The localities for 2008 (81-100) correspond to Table 1 (Appendix B).

Map 2. Presence/absence of Topeka shiners, 2004-2008. The presence (green) or absence (red) of Topeka shiners in a particular 1-mile stream segment is indicated; the 2008 segments are highlighted by colored triangles.

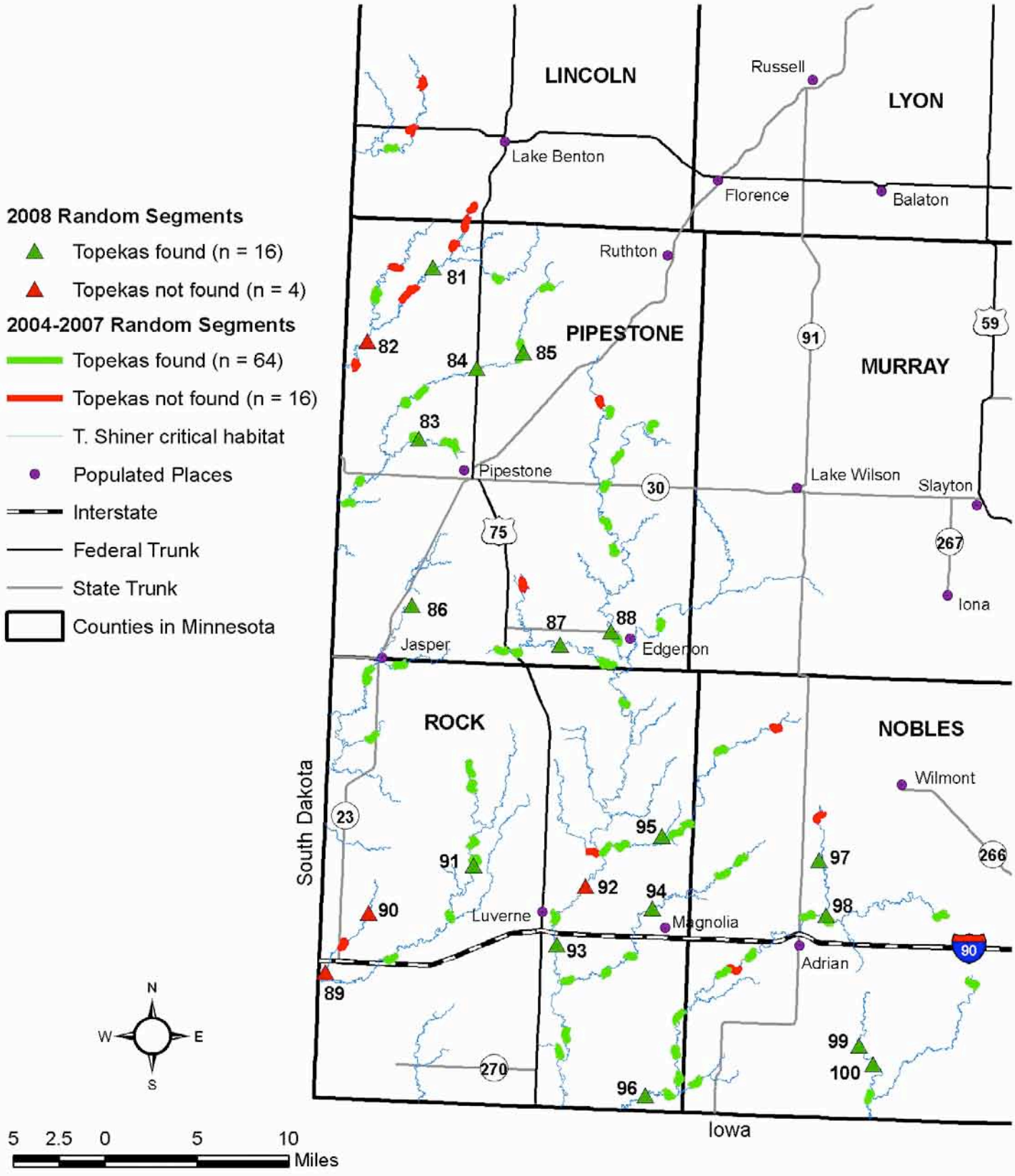
Maps 3-22. Aerial view of the twenty 1-mile stream segments that were sampled in 2008. For these 20 maps:

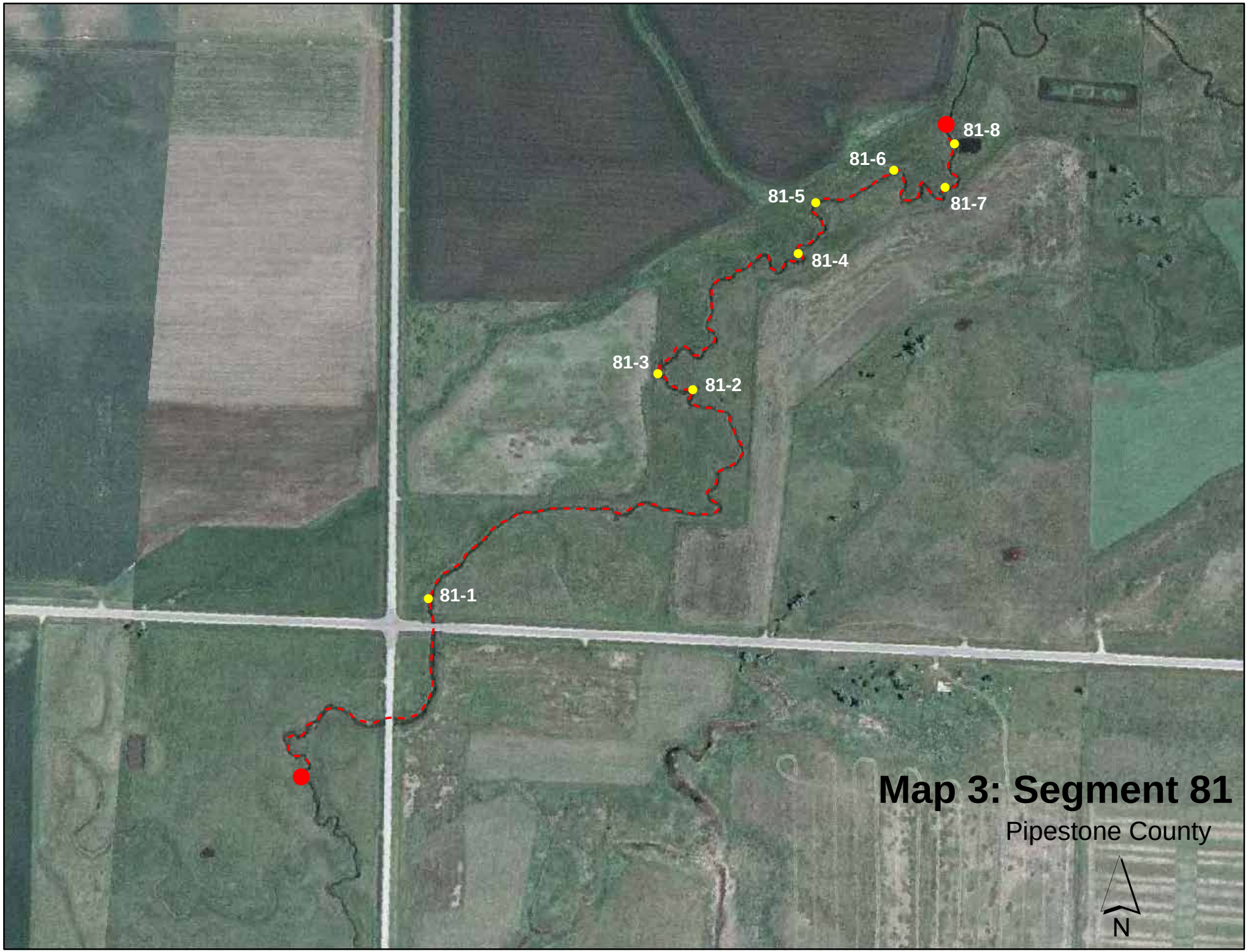
(1) the yellow dots (with white numbers) correspond to the Sites given in Table 1, Appendix B.
(2) the red-dotted lines show the actual stream channel as currently defined in the federally designated critical habitat shapefile, and delineate each 1-mile stream segment.

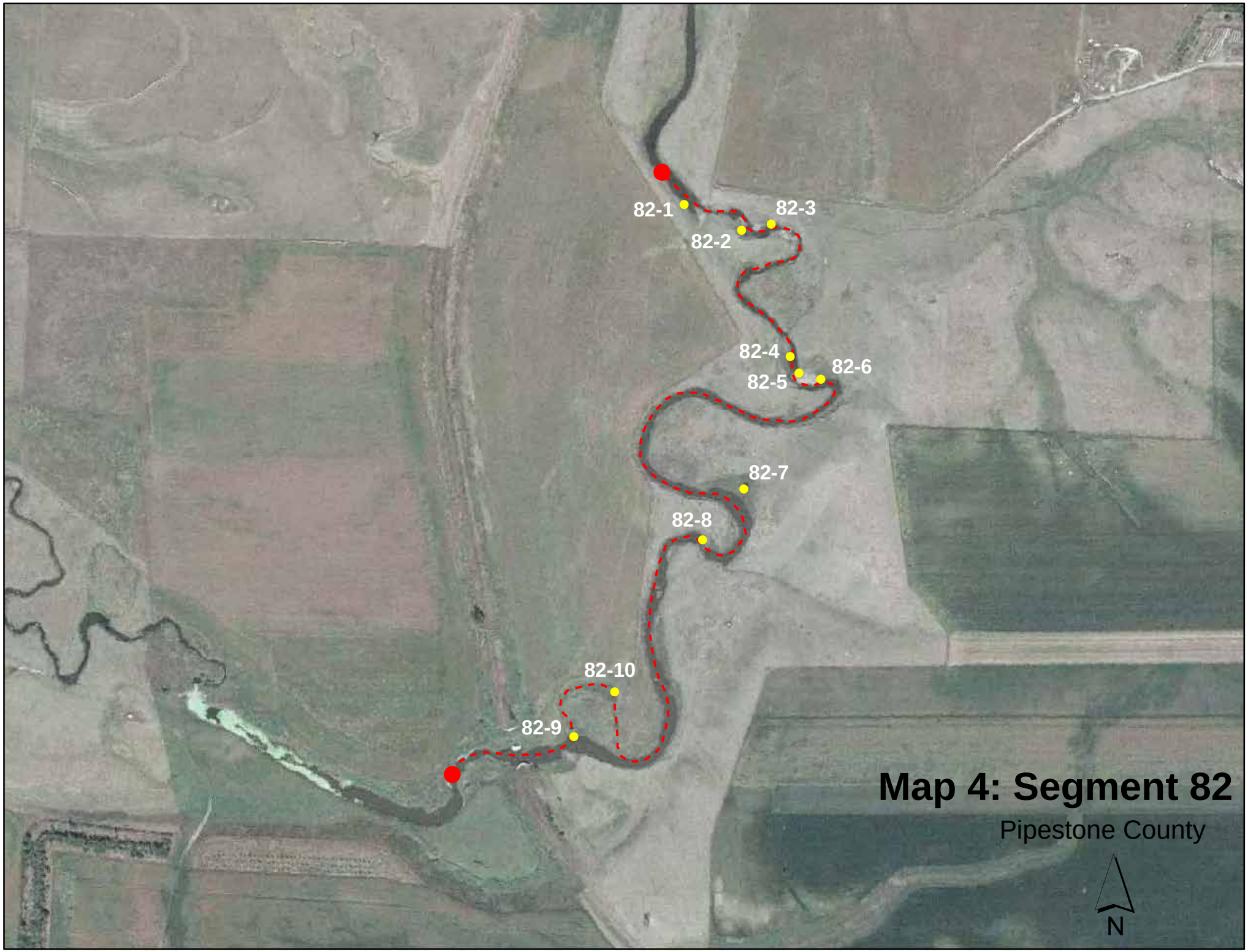
# Map 1: Overview of Random Segments 2004-2008



# Map 2: Overview of segments where Topeka Shiners were found 2004-2008

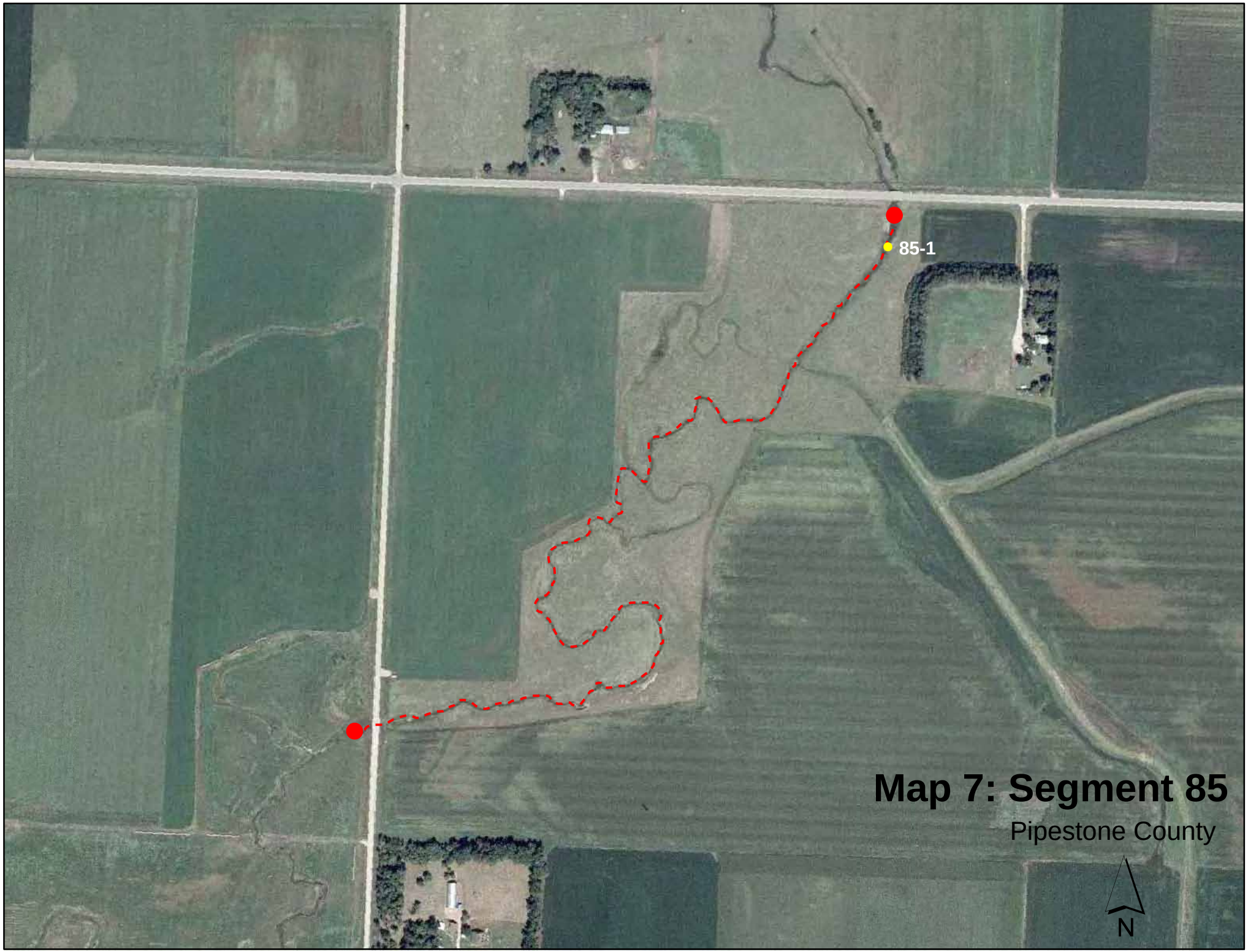


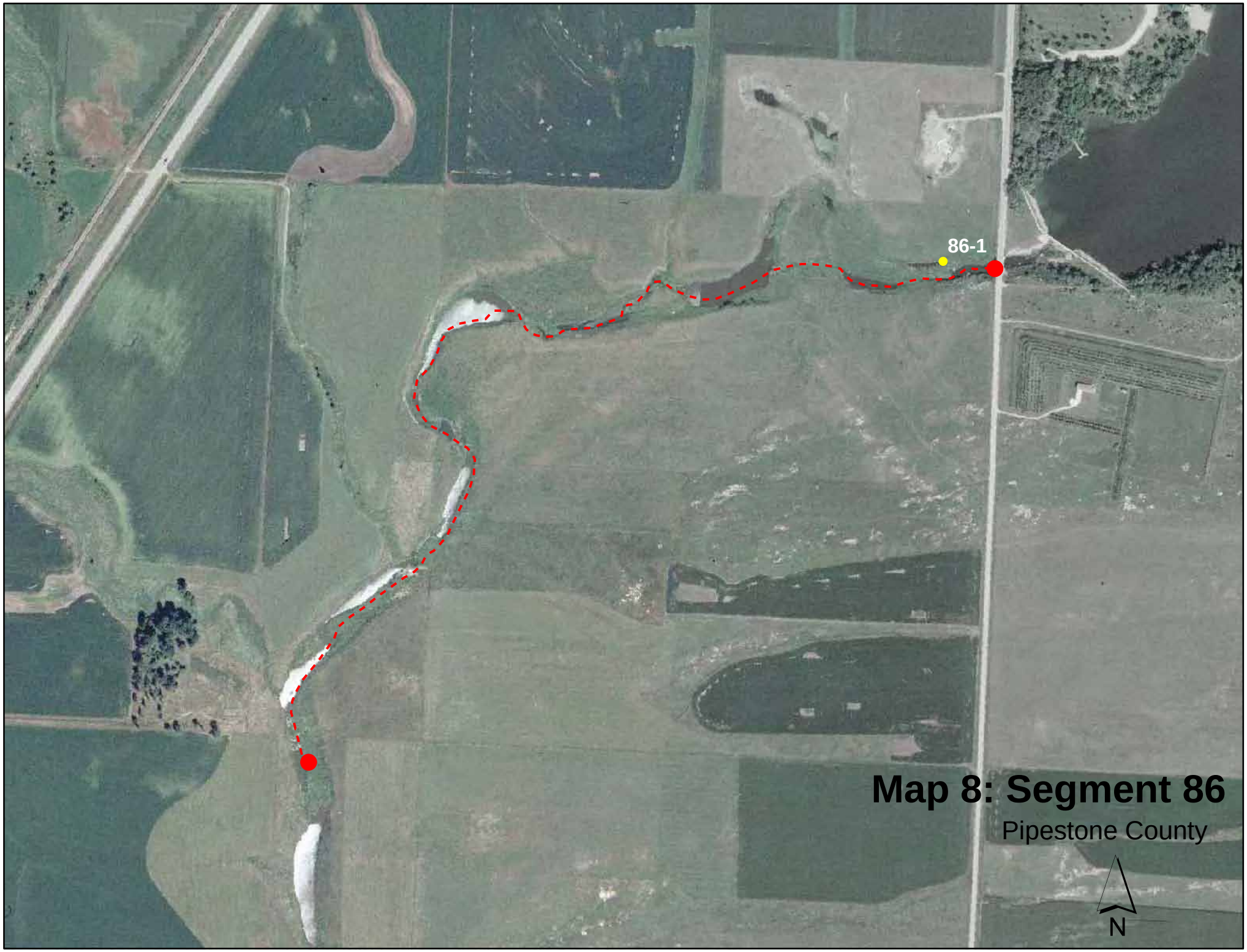

81-8
81-6
81-5
81-7
81-4
81-3
81-2
81-1
Map 3: Segment 81
Pipestone County
N

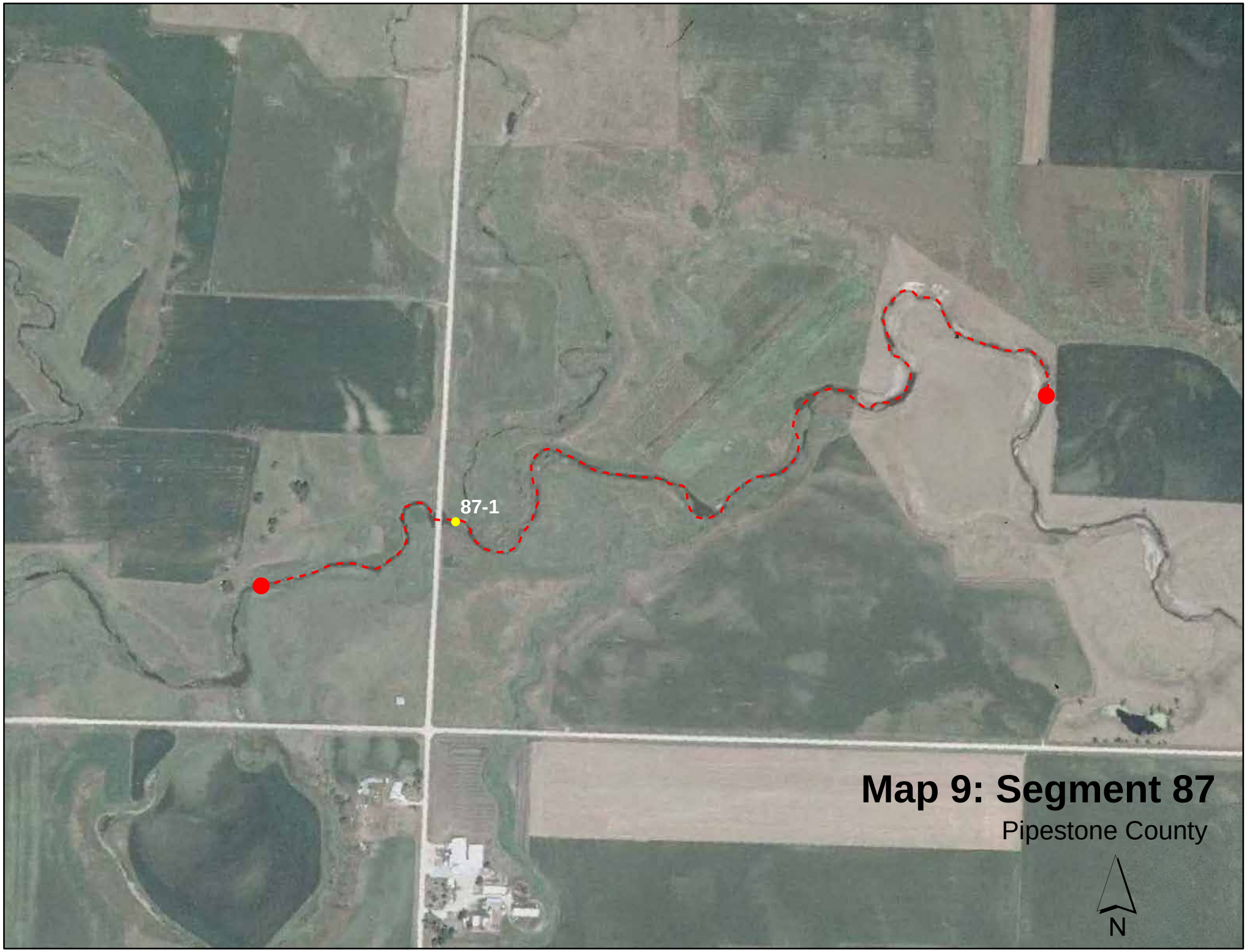

82-1
82-2
82-3
82-4
82-5
82-6
82-7
82-8
82-9
82-10
Map 4: Segment 82
Pipestone County
N


83-1
Map 5: Segment 83
Pipestone County
N

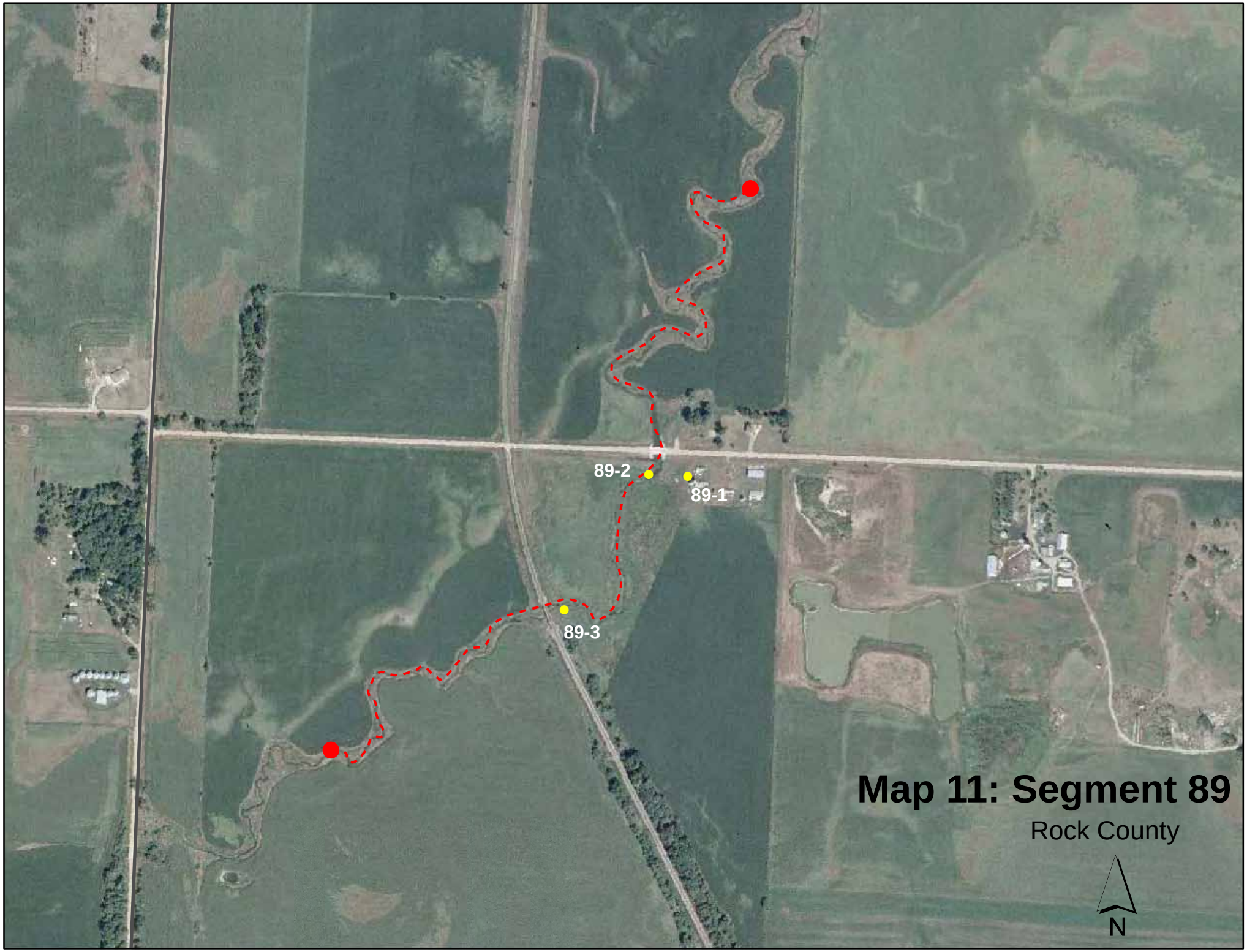

84-1
Map 6: Segment 84
Pipestone County
N


85-1
Map 7: Segment 85
Pipestone County
N

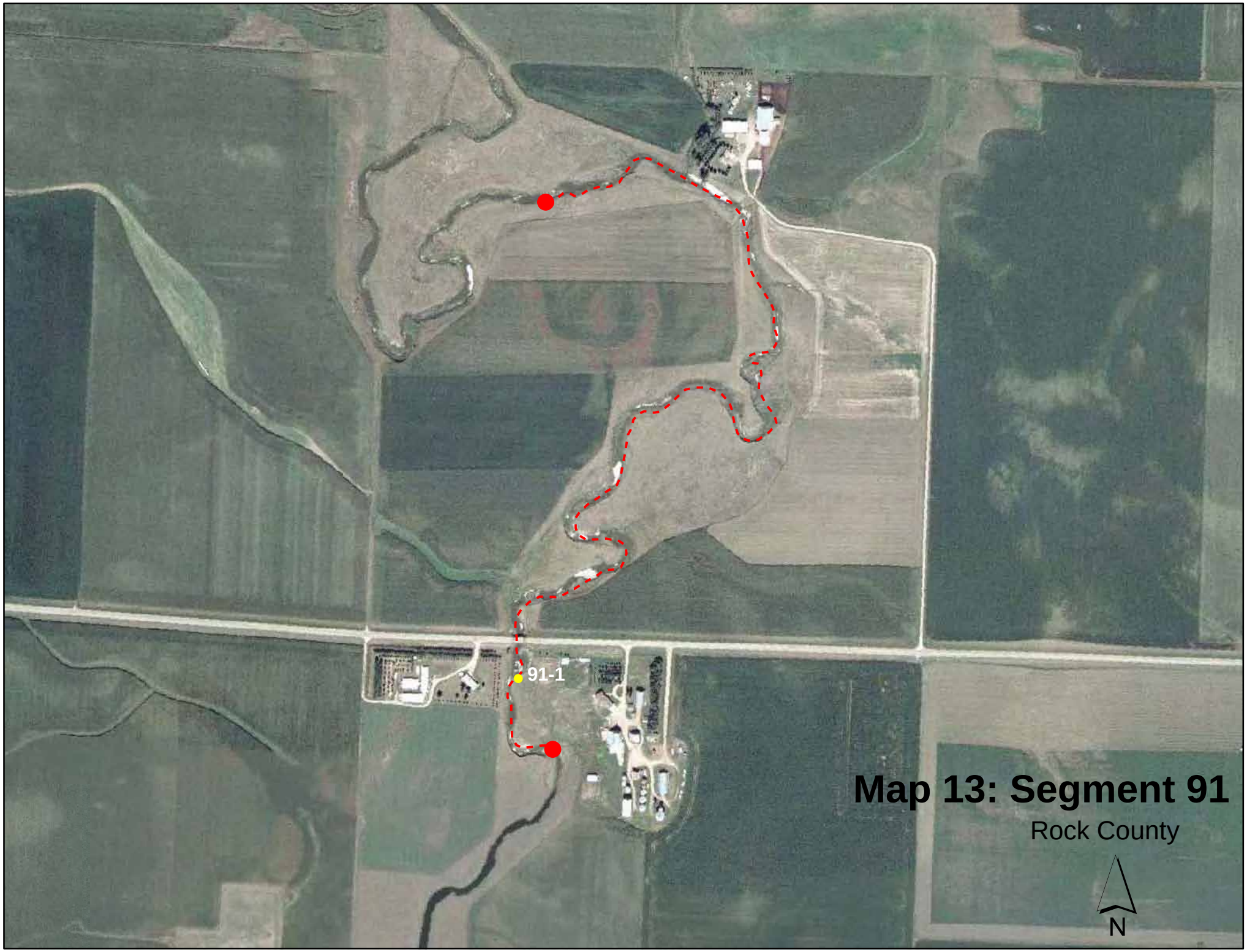

86-1
Map 8: Segment 86
Pipestone County
N


87-1
Map 9: Segment 87
Pipestone County
N

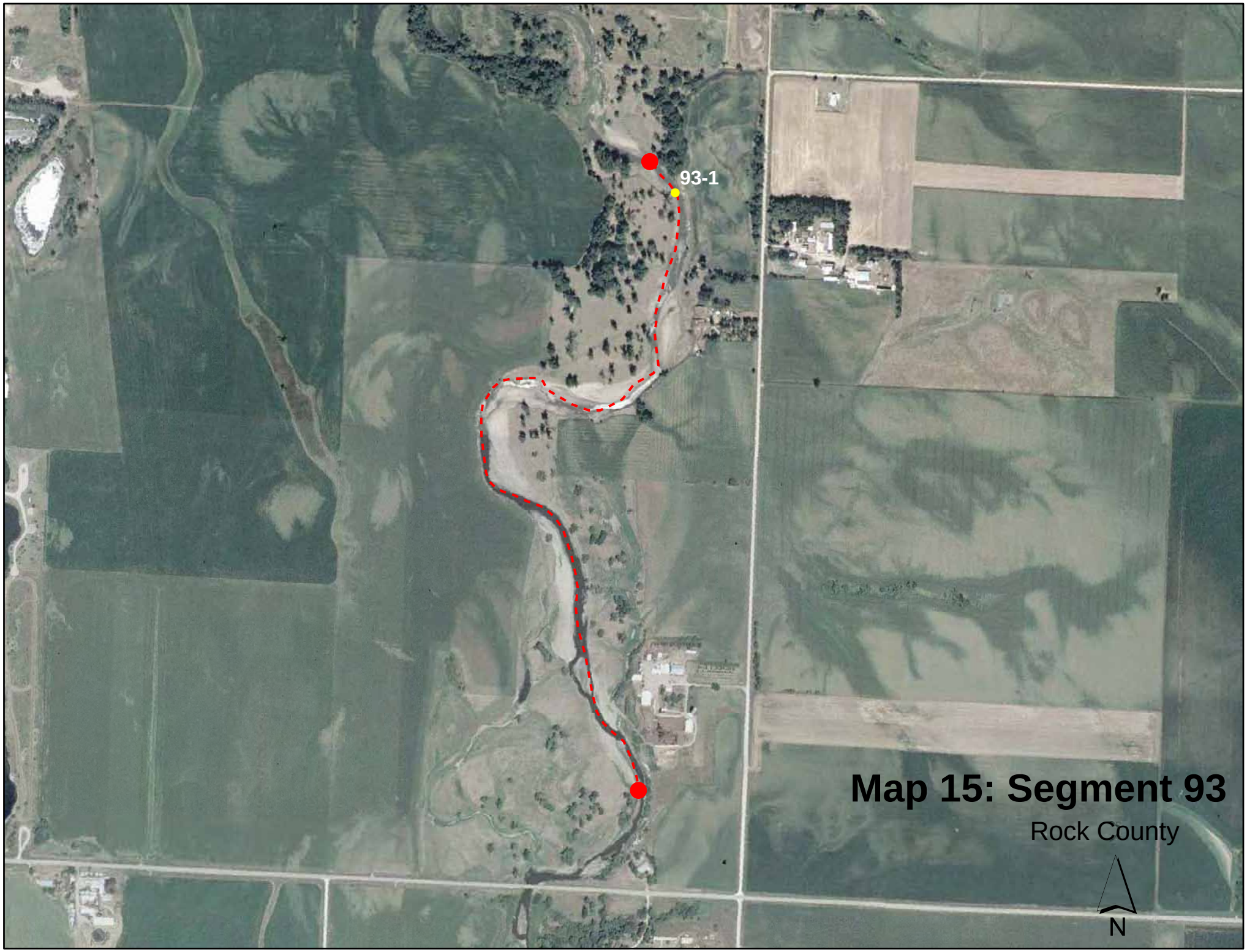

88-1
Map 10: Segment 88
Pipestone County
N

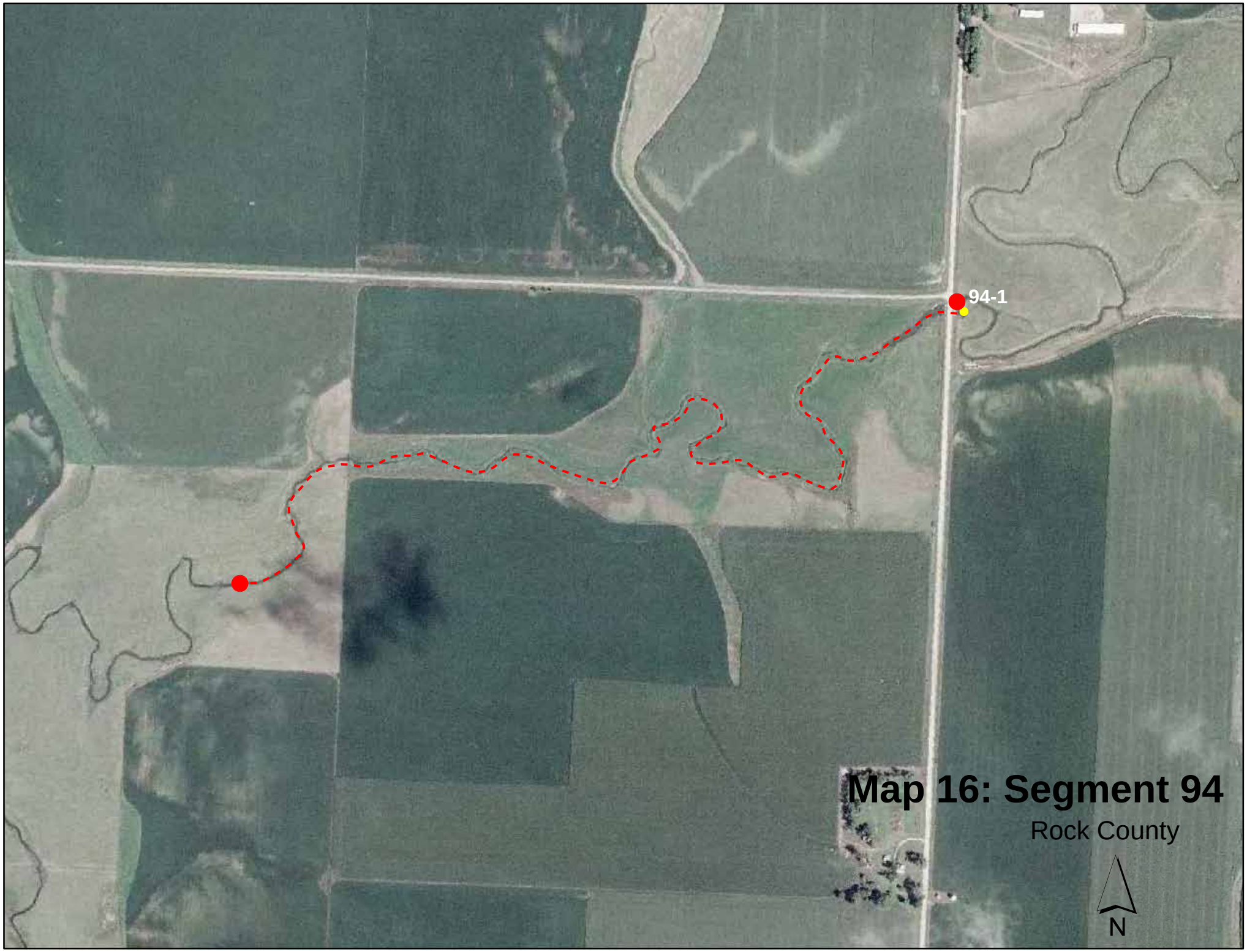

89-2
89-1
89-3
Map 11: Segment 89
Rock County
N

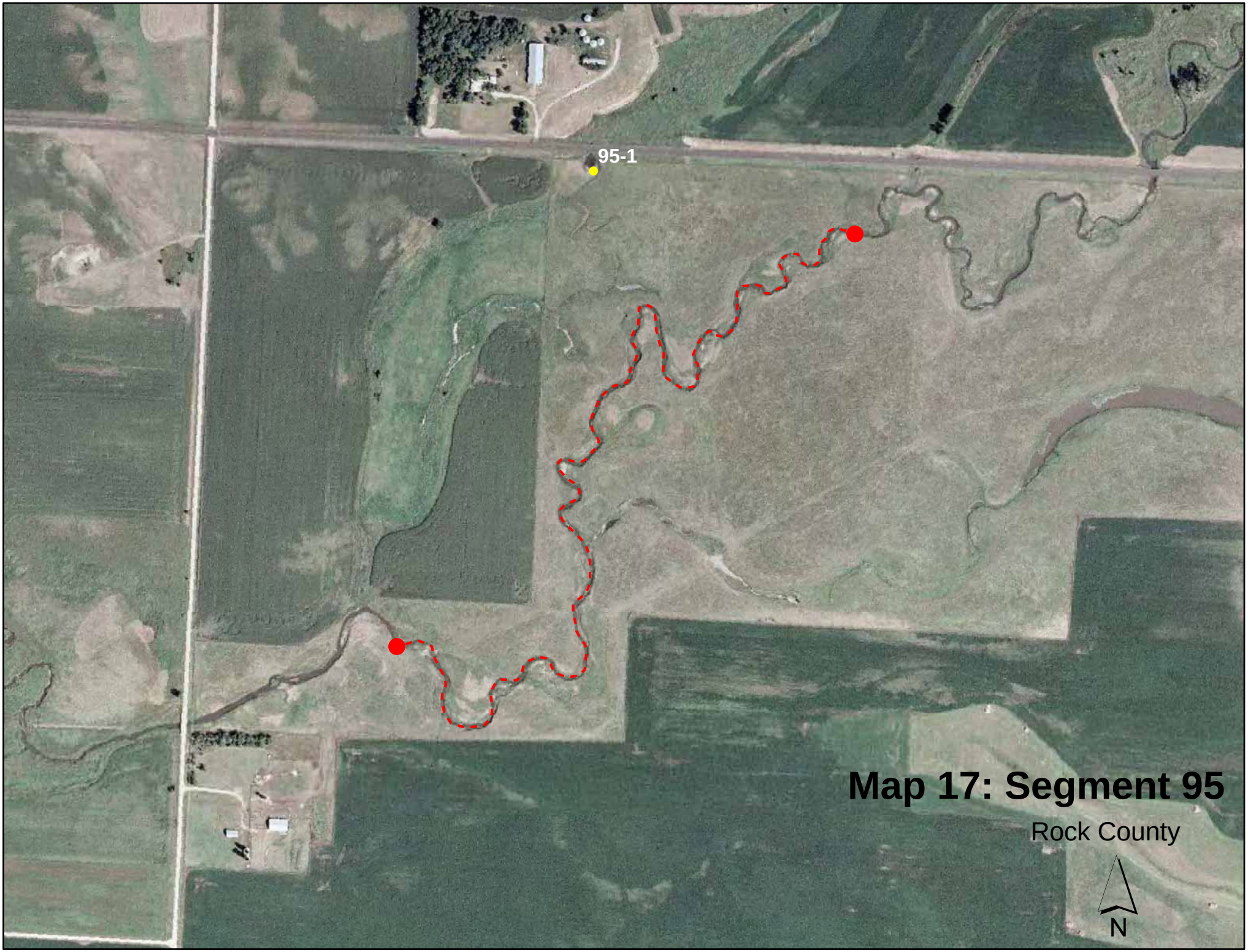

90-1
Map 12: Segment 90
Rock County
N

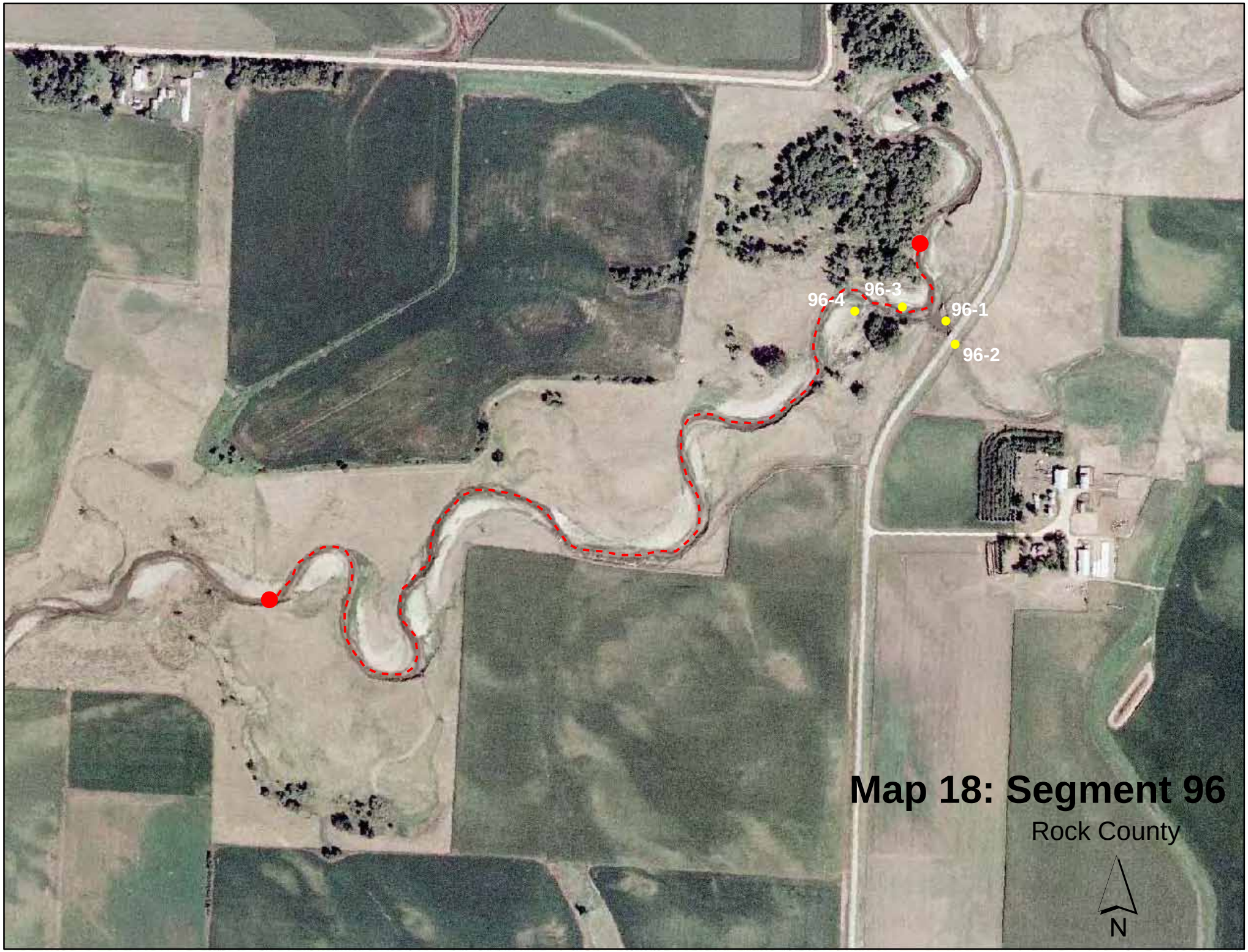

91-1
Map 13: Segment 91
Rock County
N

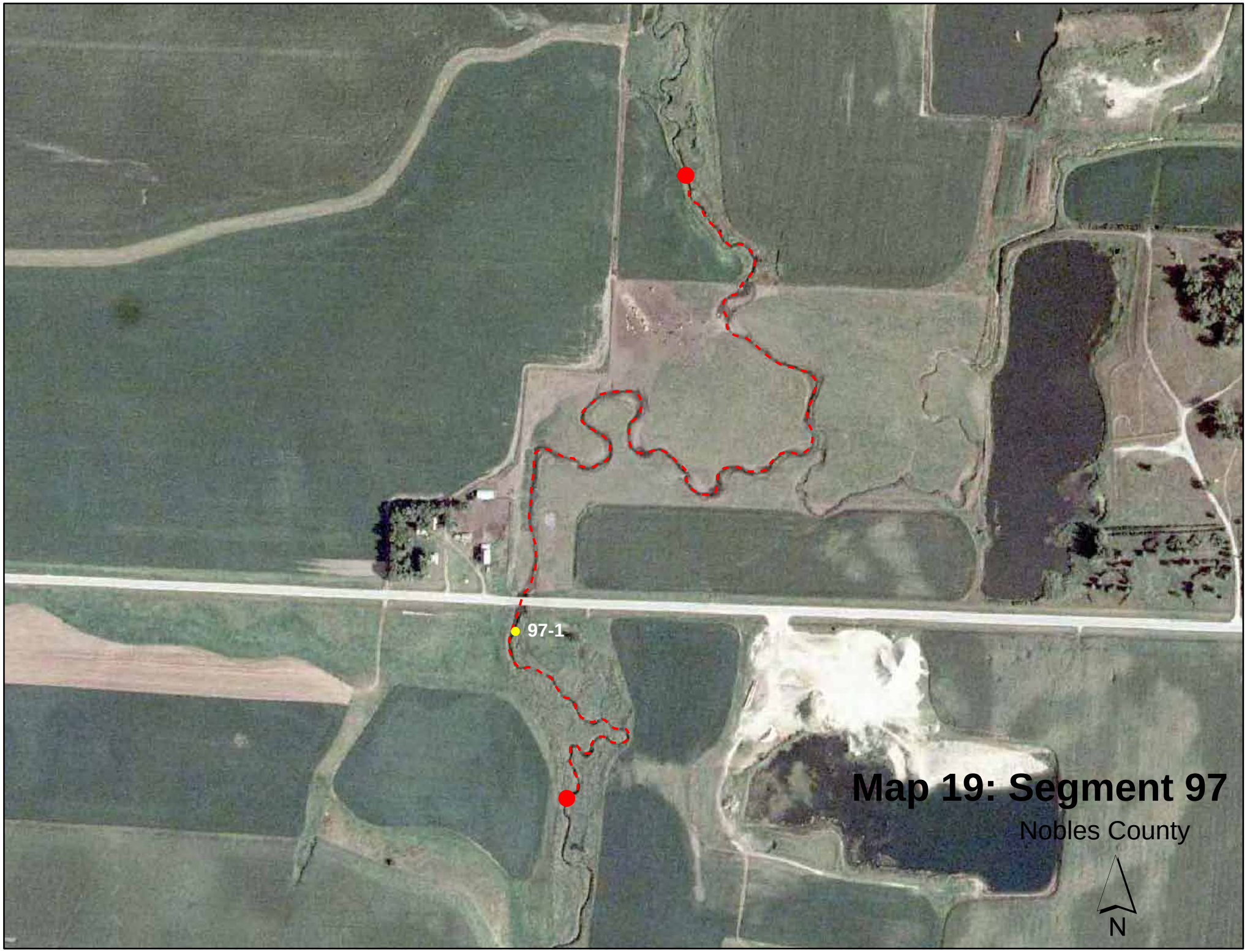

92-5
92-4
92-3
92-2
92-1
Map 14: Segment 92
Rock County
N

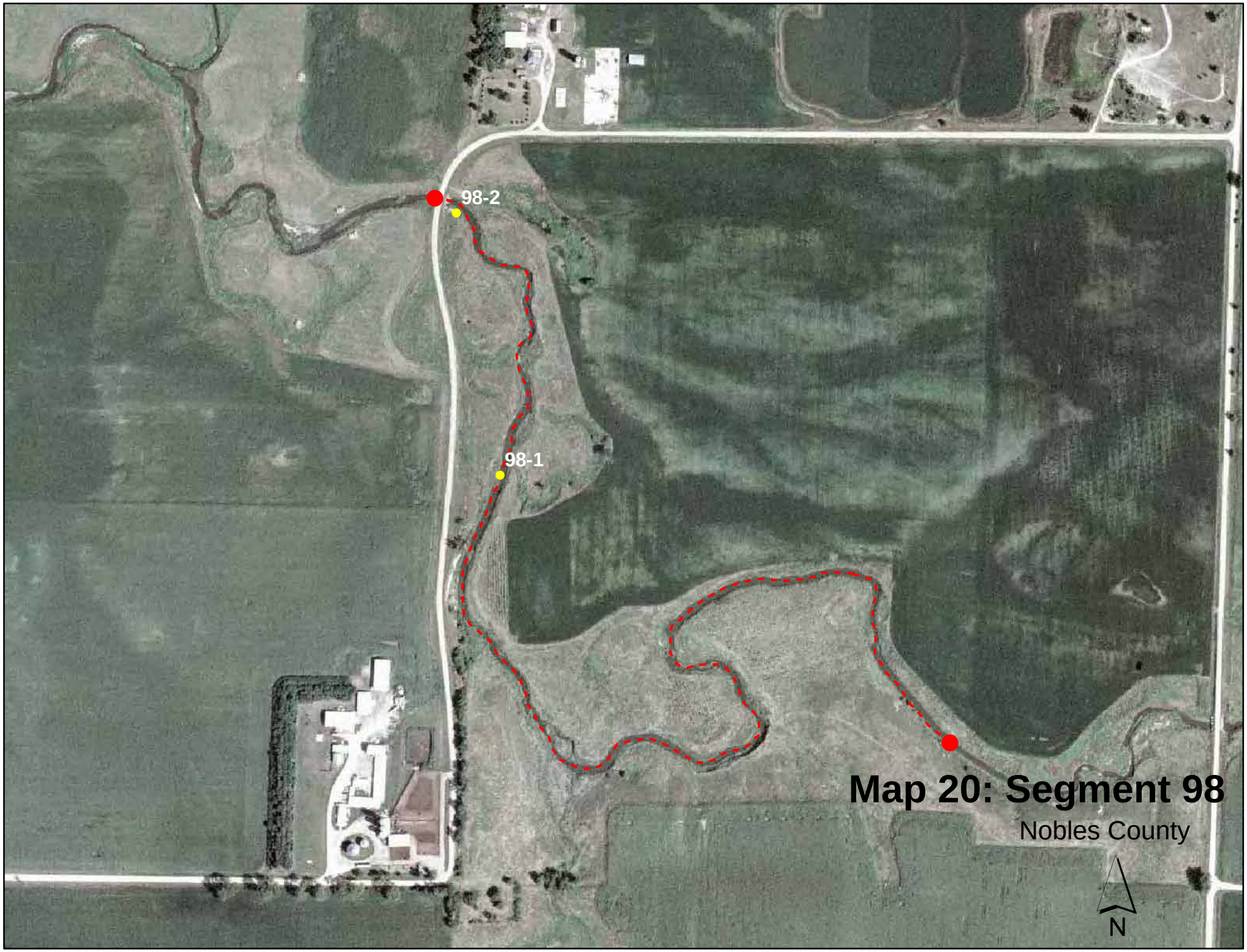

93-1
Map 15: Segment 93
Rock County
N

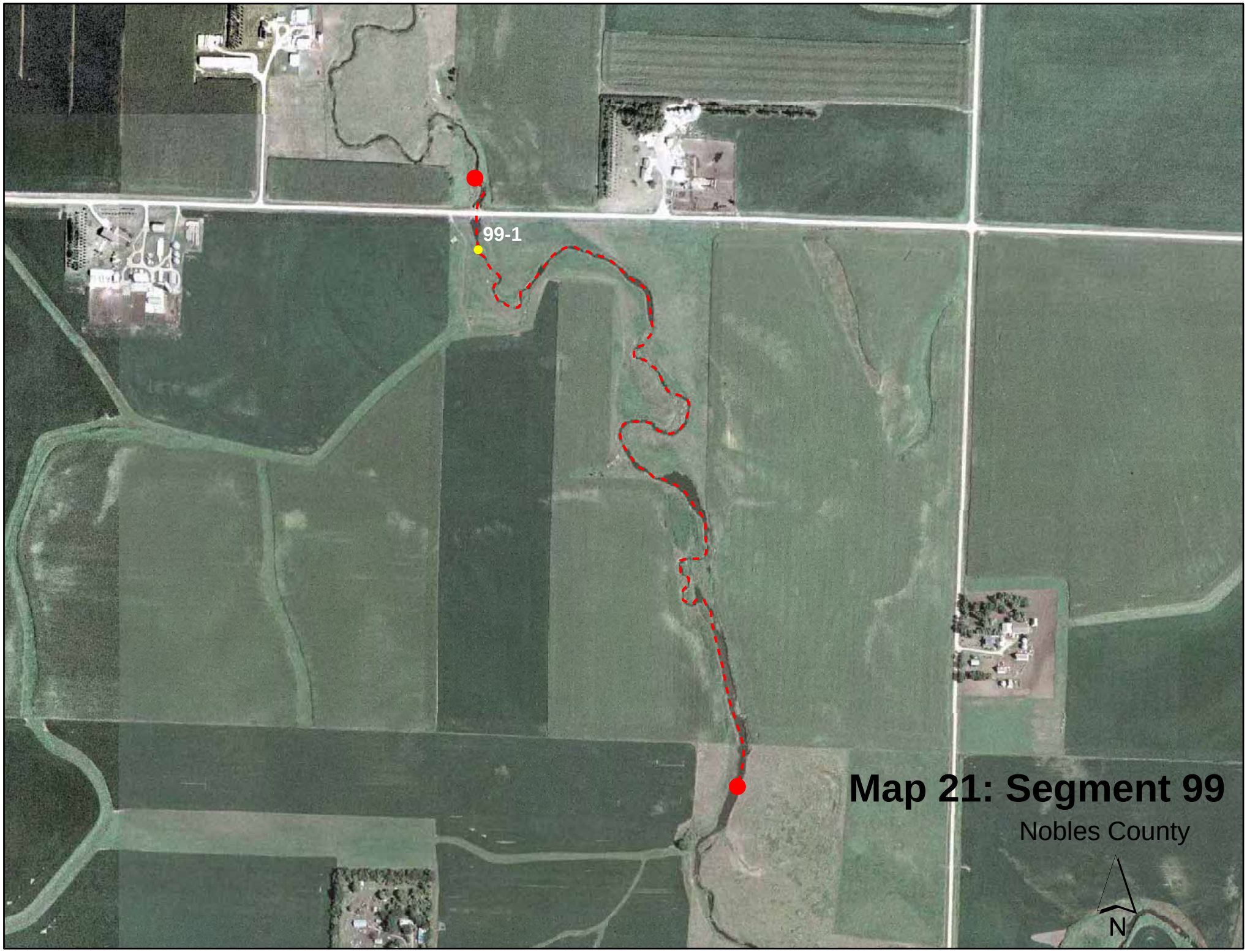

94-1
Map 16: Segment 94
Rock County
N

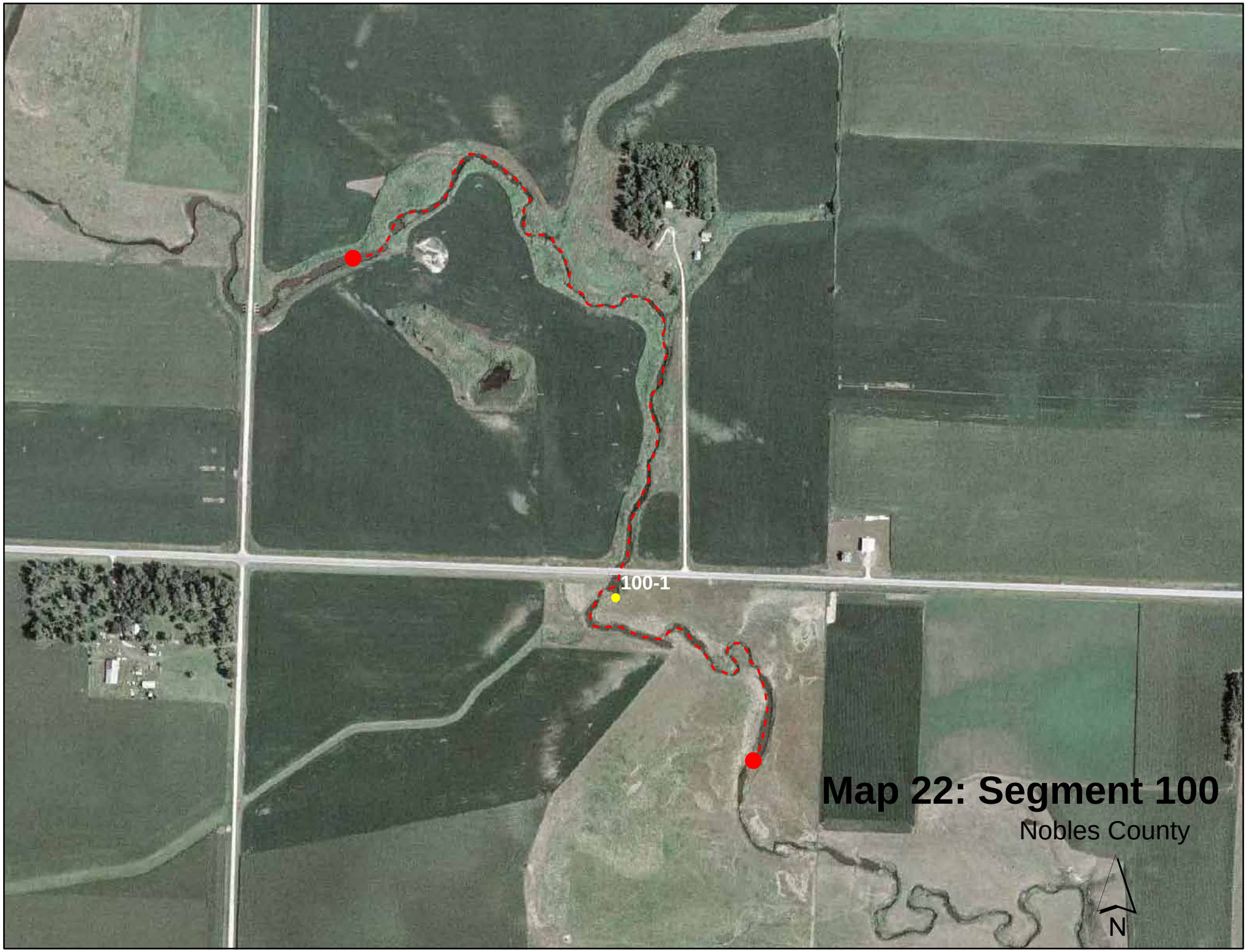

95-1
Map 17: Segment 95
Rock County
N


96-4
96-3
96-1
96-2
Map 18: Segment 96
Rock County
N


97-1
Map 19: Segment 97
Nobles County
N


98-2
98-1
Map 20: Segment 98
Nobles County
N


99-1
Map 21: Segment 99
Nobles County
N


100-1
Map 22: Segment 100
Nobles County
N

## APPENDIX B – TABLE 1. DESCRIPTIONS OF ALL 2008 STREAM SEGMENTS AND SITES, INCLUDING TOPEKA SHINER PRESENCE/ABSENCE

Table 1 lists the twenty stream segments sampled in 2008, indicates presence/absence of Topeka shiners, and provides locality information & basic habitat descriptions of all sampling sites.

**Table 1.** Locations of the 2008 twenty stream segments (81-100) and corresponding sampling sites within each segment, along with a brief habitat description for sites 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. For stream segments 81, 96, and 98, Topeka shiners were found at the highest site numbers (e.g., 81-8) Topeka shiners were not found in segments 82, 89, 90, and 92 (*italics*); they were found in all remaining segments (underlined).

| Segment | Stream Name & Common Location | | | | | | | UTM Coordinates (Zone 15) | |
|---|---|---|---|---|---|---|---|---|---|
| | County | T | R | Section(s) | Township Name | Site Number | Habitat Type | Northing | Easting |
| **81** | **Flandreau Creek** 3 mi S Lincoln Co. line, 3 mi W U.S. 75 | | | | | | | | |
| | Pipestone | 108N | 46W | 15 | Altoona | 81-1 | in-channel | 4894554 | 230704 |
| | | | | | | 81-2 | in-channel | 4894799 | 231018 |
| | | | | | | 81-3 | in-channel | 4894814 | 230965 |
| | | | | | | 81-4 | in-channel | 4894954 | 231135 |
| | | | | | | 81-5 | in-channel | 4895013 | 231155 |
| | | | | | | 81-6 | in-channel | 4895051 | 231246 |
| | | | | | | 81-7 | in-channel | 4895034 | 231305 |
| | | | | | | 81-8 | off-channel | 4895082 | 231318 |
| | Narrow headwater (ave width 5 ft); high gradient; no in-channel pools/backwaters. | | | | | | | | |
| | One farm pond is connected to stream; Topeka shiner found at entrance of pond, not common. | | | | | | | | |
| | Substrate = sand-mud mixture; firm. | | | | | | | | |
| ***82*** | **Flandreau Creek** 12 mi W Holland @ end of CR 50 | | | | | | | | |
| | Pipestone | 107N | 47W | 1, 12 | Troy | 82-1 | in-channel | 4888611 | 225521 |
| | | 108N | 46W | 6, 7 | | 82-2 | in-channel | 4888596 | 225599 |
| | | | | | | 82-3 | in-channel | 4888602 | 225639 |
| | | | | | | 82-4 | in-channel | 4888453 | 225658 |
| | | | | | | 82-5 | in-channel | 4888432 | 225674 |
| | | | | | | 82-6 | in-channel | 4888429 | 225692 |
| | Generally a high-gradient stream. | | | | | 82-7 | in-channel | 4888314 | 225607 |
| | Steep-sided channels; some larger backwaters but | | | | | 82-8 | in-channel | 4888245 | 225564 |
| | *no Topeka shiners found.* | | | | | 82-9 | in-channel | 4888027 | 225417 |
| | Substrate = very loose & deep (> 2') muck | | | | | 82-10 | in-channel | 4888075 | 225470 |

**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 |
| **83** | **South Branch Pipestone Creek** 3 mi S Cazenovia [NOTE: This site is also Site 16-1 (2004) & Site 67-1 (2007)] | | | | | | | | |
| | Pipestone | 107N | 46W | 33 | Troy | 83-1 | in-channel | 4879997 | 230062 |
| | Meandering headwater with numerous backwaters. | | | | | | | | |
| | Topekas caught in first seine haul; common. | | | | | | | | |
| | Substrate = heavily silted (a much heavier silt load than in 2004) | | | | | | | | |
| **84** | **North Branch Pipestone Creek** 5.5 mi N Pipestone @ U.S. 75 | | | | | | | | |
| | Pipestone | 107N | 46W | 13 | Troy | 84-1 | in-channel | 4886234 | 235142 |
| | Typical low-gradient creek that is common to the extreme SW corner of MN. | | | | | | | | |
| | Sampled ditch inlet & backwater on south bank. Topekas caught in first seine haul; common. | | | | | | | | |
| | Substrate = sand/silt. | | | | | | | | |
| **85** | **North Branch Pipestone Creek** 3.5 mi W Holland, between CR 8 & CR 69 [NOTE: This site is also Site 15-1 (2004)] | | | | | | | | |
| | Pipestone | 107N | 45W | 9 | Grange | 85-1 | in-channel | 4887587 | 239259 |
| | Small headwater with a few wide & shallow pools. | | | | | | | | |
| | Topekas caught in first seine haul in shallow pool upstream of the raceway (downstream from bridge); common. | | | | | | | | |
| | Substrate = sand/silt mixture. | | | | | | | | |
| **86** | **Split Rock Creek** Split Rock Creek State Park, downstream of Hwy 20 | | | | | | | | |
| | Pipestone | 105N | 46W | 21 | Eden | 86-1 | in-channel | 4865386 | 229460 |
| | Shallow, wide (60-100') stream fragmented into almost-isolated pools. | | | | | | | | |
| | Topekas caught in 1st haul; extremely abundant (probably 100's in just the one pool). Orangespotted sunfish also abundant. | | | | | | | | |
| | Substrate = loose sand/silt. | | | | | | | | |
| **87** | **Poplar Creek** 4 mi WSW Edgerton @ 130th Ave; 1 mi S Hwy 268 | | | | | | | | |
| | Pipestone | 105N | 45W | 26 | Elmer | 87-1 | in-channel | 4861980 | 242492 |
| | Meandering, deeply incised headwater with few backwaters/pools. | | | | | | | | |
| | Topekas caught in first seine haul; common. | | | | | | | | |
| | Substrate = sand/gravel/silt 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 |
| **88** | **Pipestone Creek** 0.5 mi W Edgerton @ CR 268 | | | | | | | | |
| | Pipestone | 105N | 45W | 20 | Osborne | 88-1 | in-channel | 4863123 | 246939 |
| | Meandering, sluggish creek. Limited backwaters in this segment of the stream. | | | | | | | | |
| | Topekas caught from connected backwater in first seine haul; common. | | | | | | | | |
| | Substrate = sand/silt mixture. | | | | | | | | |
| ***89*** | **Springwater Creek** 1 mi NW Manley, 0.5 mi E South Dakota state line | | | | | | | | |
| | Rock | 102N | 47W | 35 | Beaver Creek | 89-1 | in-channel | 4833399 | 222034 |
| | | | | | | 89-2 | in-channel | 4833401 | 221979 |
| | | | | | | 89-3 | in-channel | 4833209 | 221859 |
| | Small, downcut muddy headwater ditch with constant flow; no pools or signs of Topeka shiner habitat. | | | | | | | | |
| | Reconnoitered entire segment; took GPS coordinates at three sites. *No Topeka shiners.* | | | | | | | | |
| | Substrate = mud. | | | | | | | | |
| ***90*** | **Springwater Creek** 3 mi N Beaver Creek, 0.5 mi W CR 14 | | | | | | | | |
| | Rock | 102N | 46W | 7 | Beaver Creek | 90-1 | in-channel | 4838355 | 225666 |
| | Headwater stream that suffers from massive erosion from cattle; almost entire stretch of stream is constantly flowing. | | | | | | | | |
| | Reconnoitered entire segment; took GPS coordinates at one site. *No Topeka shiners.* | | | | | | | | |
| | Substrate = heavy siltation over the sand/gravel substrate. | | | | | | | | |
| **91** | **Beaver Creek** 5 mi NW Luverne @ CR 8 [NOTE: Immediately downstream of Site 3-1 (2004)] | | | | | | | | |
| | Rock | 103N | 45W | 31 | Mound | 91-1 | in-channel | 4842546 | 234891 |
| | Meandering headwater with many backwaters. | | | | | | | | |
| | Topekas caught on 1st seine haul; abundant. | | | | | | | | |
| | Substrate = sand/gravel, some 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 |
| *92* | **Rock River** 2.5 mi NE Luverne @ CR 9 | | | | | | | | |
| | Rock | 103N | 44W | 31 | Vienna | 92-1 | in-channel | 4840359 | 244328 |
| | | | | | | 92-2 | in-channel | 4840368 | 244519 |
| | | | | | | 92-3 | in-channel | 4840625 | 244752 |
| | | | | | | 92-4 | in-channel | 4840698 | 244720 |
| | | | | | | 92-5 | in-channel | 4840739 | 244707 |
| | Steep banks; continuous flow; no backwater or pool habitats. | | | | | | | | |
| | Reconnoitered entire stream segment; took GPS readings at five sites. *Topekas not present.* | | | | | | | | |
| | Substrate = sand/silt. | | | | | | | | |
| **93** | **Rock River** 3 mi S Luverne, ca. 0.75 mi N CR 16 | | | | | | | | |
| | Rock | 102N | 45W | 23 | Luverne | 93-1 | in-channel | 4835569 | 242208 |
| | Shallow, wide channel. Water was up about 2', so many backwaters will not be connected during low-flow conditions. | | | | | | | | |
| | Topekas caught on 1st seine haul; not common. | | | | | | | | |
| | Substrate = sand & gravel; silt in backwaters. | | | | | | | | |
| **94** | **Elk Creek** 1 mi NW Magnolia @ Hwy 3 | | | | | | | | |
| | Rock | 102N | 44W | 10, 11 | Magnolia | 94-1 | in-channel | 4838742 | 250605 |
| | Small (15' width) stream; backwaters present near bridge. | | | | | | | | |
| | Topekas caught on 1st seine haul; abundant. | | | | | | | | |
| | Substrate = sand/gravel with silt in pools. | | | | | | | | |
| **95** | **Champepadan Creek** 2.5 mi S Kenneth @ CR 8 | | | | | | | | |
| | Rock | 103N | 44W | 23 | Vienna | 95-1 | off-channel | 4845131 | 251388 |
| | Small meandering creek; sampled off-channel pool west of bridge; | | | | | | | | |
| | Topekas caught on 1st seine haul over green sunfish nests; very abundant. The cleared silt made it very easy to spot sunfish nests and to locate aggregates of spawning Topeka shiners. | | | | | | | | |
| | Substrate = relatively firm sand-silt-gravel combination. | | | | | | | | |

**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 |
| 96 | **Rock River** 4.5 mi SSW Kanaranzi, downstream of Hwy 3 | | | | | | | | |
| | Rock | 101N | 44W | 34, 35 | Kanaranzi | 96-1 | in-channel | 4822316 | 250074 |
| | | | | | | 96-2 | in-channel | 4822273 | 250085 |
| | | | | | | 96-3 | in-channel | 4822334 | 250019 |
| | | | | | | 96-4 | in-channel | 4822329 | 249960 |
| | Meandering, numerous backwaters (but high water had backwaters interconnected and with obvious flow). | | | | | | | | |
| | Topekas caught in the "best-developed" backwater, given the higher water levels; not common. | | | | | | | | |
| | Substrate = shifting sand; sand/gravel riffles; silted backwaters. | | | | | | | | |
| 97 | **Kanaranzi Creek** 5 mi N Adrian @ CR 14 | | | | | | | | |
| | Nobles | 103N | 42W | 30 | Larkin | 97-1 | in-channel | 4843003 | 265195 |
| | Stream typically 15-20' wide during normal water levels; backwaters scattered about this segment. | | | | | | | | |
| | Topekas found on 1st seine haul; common. | | | | | | | | |
| | Substrate = sand/silt, pockets of gravel. | | | | | | | | |
| 98 | **East Branch Kanaranzi Creek** 2 mi NE Adrian @ Dolan Ave [NOTE: This site is a backwater that is adjacent to Site 8-1 (2004)] | | | | | | | | |
| | Nobles | 102N | 42W | 8 | Olney | 98-1 | in-channel | 4837849 | 265848 |
| | | | | | | 98-2 | in-channel | 4838130 | 265802 |
| | Stream is approx. 30' wide and generally has continuous flow; a few scattered backwaters. | | | | | | | | |
| | Topekas found on 1st seine haul of second site; abundant (Site 98-1, which is also Site 8-1 from 2004, was too deep to work this year due to the rains). | | | | | | | | |
| | Substrate = firm sand and sand-gravel in main channel; silt-bottomed pools. | | | | | | | | |
| 99 | **West Branch Little Rock River** 4 mi WNW Ransom | | | | | | | | |
| | Nobles | 101N | 42W | 15 | Little Rock | 99-1 | in-channel | 4826728 | 268724 |
| | Small headwater; much potentially good habitat downstream. | | | | | | | | |
| | Topekas found on 1st seine haul; found near bridge where "good" habitat did not exist. | | | | | | | | |
| | Substrate = sand/gravel/mud mixture. | | | | | | | | |

**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 |
| 100 | **West Branch Little Rock River** 3 mi WNW Ransom @ CR 6; 7.5 mi SE Adrian | | | | | | | | |
| | Nobles | 101N | 42W | 23 | Little Rock | 100-1 | in-channel | 4825086 | 269956 |
| | Small headwater with many pools/backwaters. | | | | | | | | |
| | Topekas found on 1st seine haul; not common. | | | | | | | | |
| | Substrate = sand/mud. | | | | | | | | |

# APPENDIX C –PHOTOGRAPHS OF HABITATS & FISHES

Stream photographs for Segments 82, 89, 90, and 92 (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. Larson.

## Site 81-8

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

## Site 82 - no Topeka shiners

**Site 83-1** (same location as 16-1 [2004] and 67-1 [2007])

**Site 84-1**

**Site 85-1** (same location as 15-1 [2004])

**Site 86-1**

**Site 87-1**

(Topeka shiner, top; fathead minnow, center; common shiner, bottom)

**Site 88-1**

**Site 89-1**- no Topeka shiners

**Site 90** - no Topeka shiners

**Site 91-1**

**Site 92-1-** no Topeka shiners

## Site 93-1

## Site 94-1

## Site 95-1

## Site 96-1

## Site 97-1

## Site 98-1

**Site 99-1**

**Site 100-1**