

Topeka Shiner Monitoring in Minnesota: Year Four

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) to monitor the presence/absence of Topeka shiners within the federally designated critical habitat in Minnesota. These data comprise the fourth 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 and used again in '05 and '06, 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 thirteen of the twenty 1-mile stream segments, and in nine of these thirteen stream segments Topeka shiners were found at the first site sampled. Off-channel habitats existed within only one 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.

The scope of this baseline project was limited and designed to conduct only straightforward presence/absence surveys for Topeka shiners in chosen stream segments. Even so, a few of observations were noted. These observations are essentially the same as witnessed during the 2004-06 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 may warrant a closer look for future habitat enhancement/landowner involvement projects; 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 ever-changing stream channels.

INTRODUCTION

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

This work represents the fourth year of a long-term surveying project (Ceas & Anderson, 2004; Ceas & Monstad, 2005; Ceas & Monstad 2006) to monitor the presence/absence of Topeka shiners within the federally proposed critical habitat in Minnesota. 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.

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 [this state] than was once thought” (Hatch, 2001). As stated in Tabor (2002), while much habitat in these Minnesota streams has been altered by channelization, erosion, and sedimentation, “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 listed as critical habitat.

These data will comprise the fourth year of an ongoing population-monitoring project designed to provide the DNR with a tool for detecting changes in the overall presence/absence of Topeka shiners within Minnesota.

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).

METHODS

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

Selection of Stream Segments

Twenty random stream segments (Appendix A) 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 plat maps and/or contacting the County Auditor's Office. A. M. Plain 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; so 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. Reconnaissance of the streams and sampling for fishes occurred during May 20-24. 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 10’ x 5’ eighth-inch mesh minnow seine.

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.

RESULTS

Topeka shiners were found at thirteen of the twenty 1-mile stream segments (Table 1, Appendix B; Appendices A & C); they were not found in 7 of the 20 Segments (61-64, 71, 77, and 79). In 9 of the 13 stream segments that did contain Topeka shiners, we found the species in the first site sampled (e.g., Site 65-1). These 9 segments & corresponding sites are 65-1, 67-1, 68-1, 69-1, 70-1, 72-1, 73-1, 74-1, and 75-1. We captured Topeka shiners in the first seine haul in 8 of these 9 segments, and in the 2nd haul at Site 68-1. Topeka shiners were also found in Sites 66-3 (first haul), 76-3 (first haul), 78-2 (second haul), and 80-2 (first haul). Topeka shiners were always found in pool habitats within the 13 stream segments.

With the exception of Segment 79 (Kananranzi Creek) the six remaining segments in which Topeka shiners were not found (61-64, 71, and 77) were all small headwaters, and were similar to other segments that failed to yield shiners during the 2004-06 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 79 on Kananranzi Creek, although not a headwater, flowed through a region where the creek exhibited a noticeable drop in elevation, resulting in a segment with continuously-flowing water and a lack of well-developed pool habitats.

Only one of the stream segments (Segment 64) contained off-channel habitats (OCH), but this small upland stream segment did not produce Topeka shiners.

DISCUSSION

The scope of the fourth 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 choosing of stream segments, the streams varied in size and variety of habitats. 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 of the results from the 2004-06 surveys.

- (a) The stream segments that did not produce Topeka shiners (61-64, 77, and 79) were generally continuously flowing raceways/flowing waters. Segment 71 was a grass-lined buffer strip that probably never harbors fishes. Given the species' preference for pools and slow-moving waters, we were not surprised that Topeka shiners were not found at these seven segments. Furthermore, four years of field reconnaissance in the Flandreau Creek system (Segments 61-64) has led us to conclude that this small "upland" stream simply does not provide ideal pool habitat (even most of the "pools" have observable flow), and Topeka shiners are likely never very abundant in this stream system.
- (b) A few of the 1-mile segments had large numbers of individuals (including breeding individuals) and what appeared to be an abundance of suitable habitat. These sites, along with the sites mentioned in Ceas & Anderson (2004) and Ceas & Monstad (2005; 2006), warrant a closer look for future habitat enhancement/landowner involvement projects. These segments include numbers 67, 73, and 75.
- (c) Other researchers have noted that OCH tend to have the largest populations of Topeka shiners, and that Topekas are often not found in adjacent stream channels. During the four 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.
- (d) During the four years of this study Topeka shiners were found in 64 of the 80 stream segments sampled, which are spread throughout the range of the species in Minnesota. These results would tend to reinforce the idea that all streams that are currently designated as critical habitat within Minnesota must remain as critical habitat.
- (e) As one can see from the orange-dashed lines representing the "federally-proposed designated critical habitat for the Topeka Shiner" on the aerial photographs (Appendix A) of the stream segments sampled in this study, 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. 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

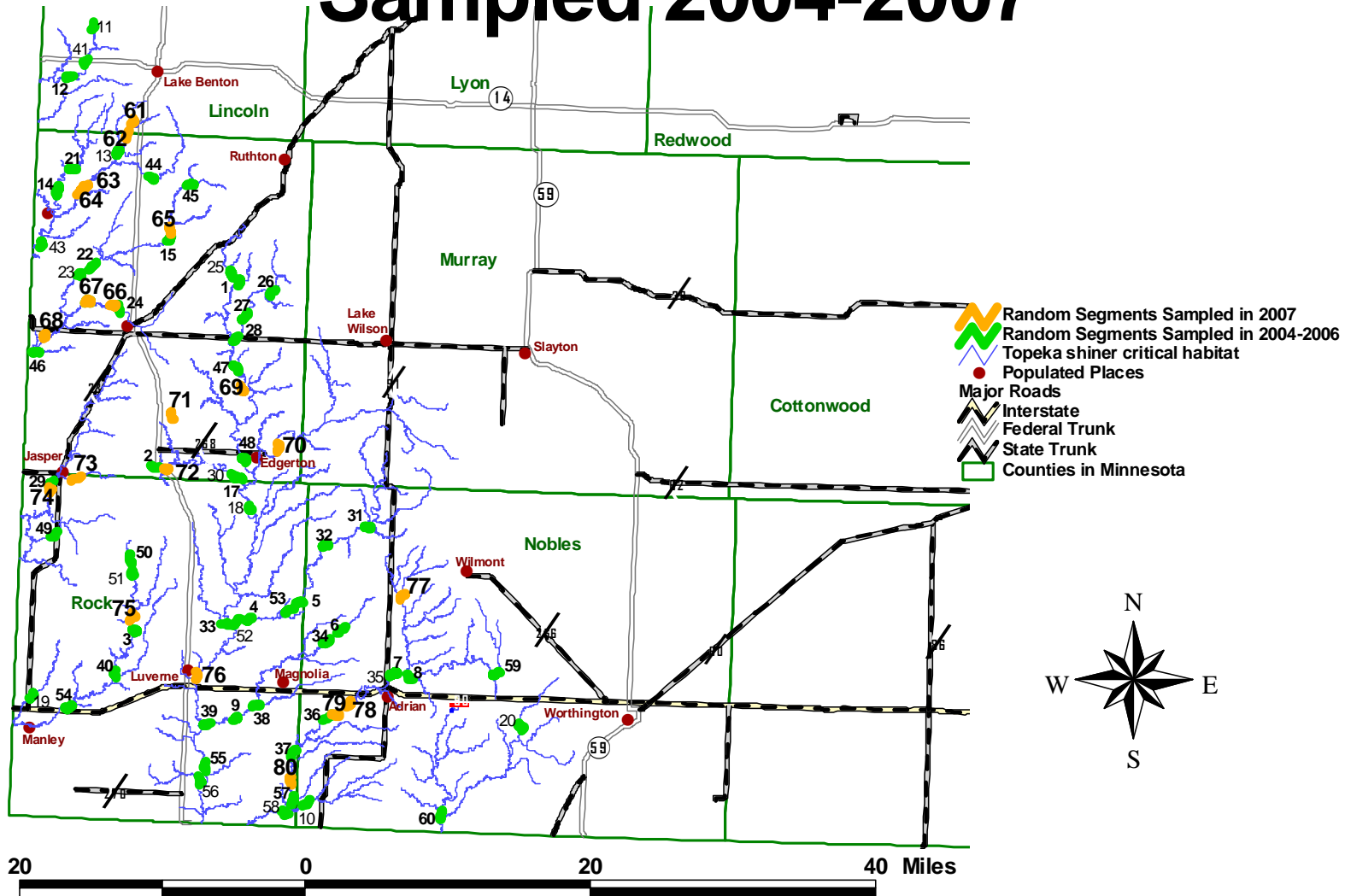
Map 1. Locations of all eighty 1-mile stream segments. The map is a general map of the SW corner of Minnesota that highlights in blue all Minnesota streams that have been designated as Critical Habitat for the Topeka shiner. The map contains all collecting localities during the four years of this study (2004-2007)

Map 2. Presence/absence of Topeka shiners, 2004-2007. The presence (green) or absence (red) of Topeka shiners in a particular 1-mile stream segment is indicated, with special attention given to the 2007 sampling locations.

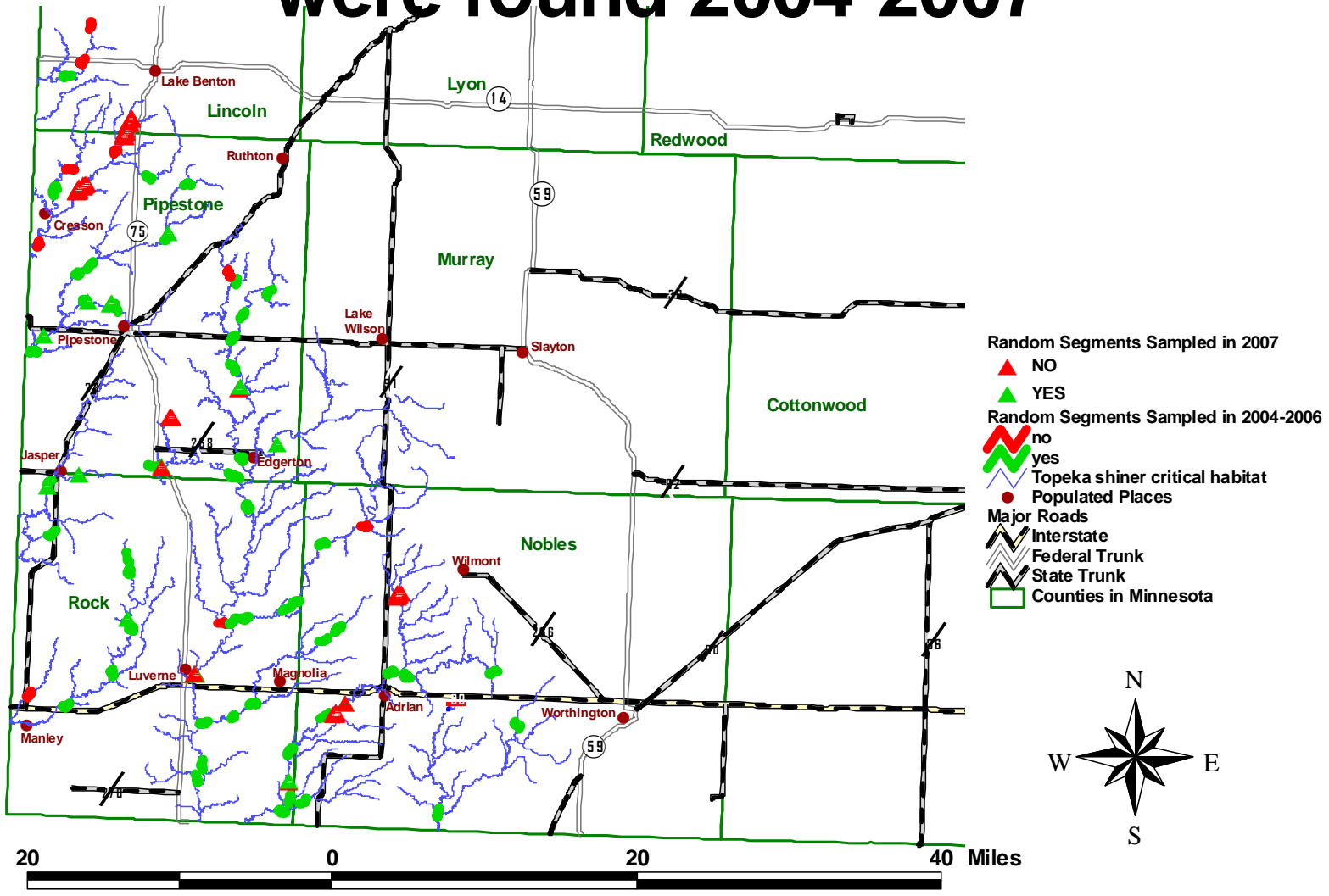
Maps 3-22. Aerial view of the twenty 1-mile stream segments that were sampled in 2007. For these 20 maps:

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

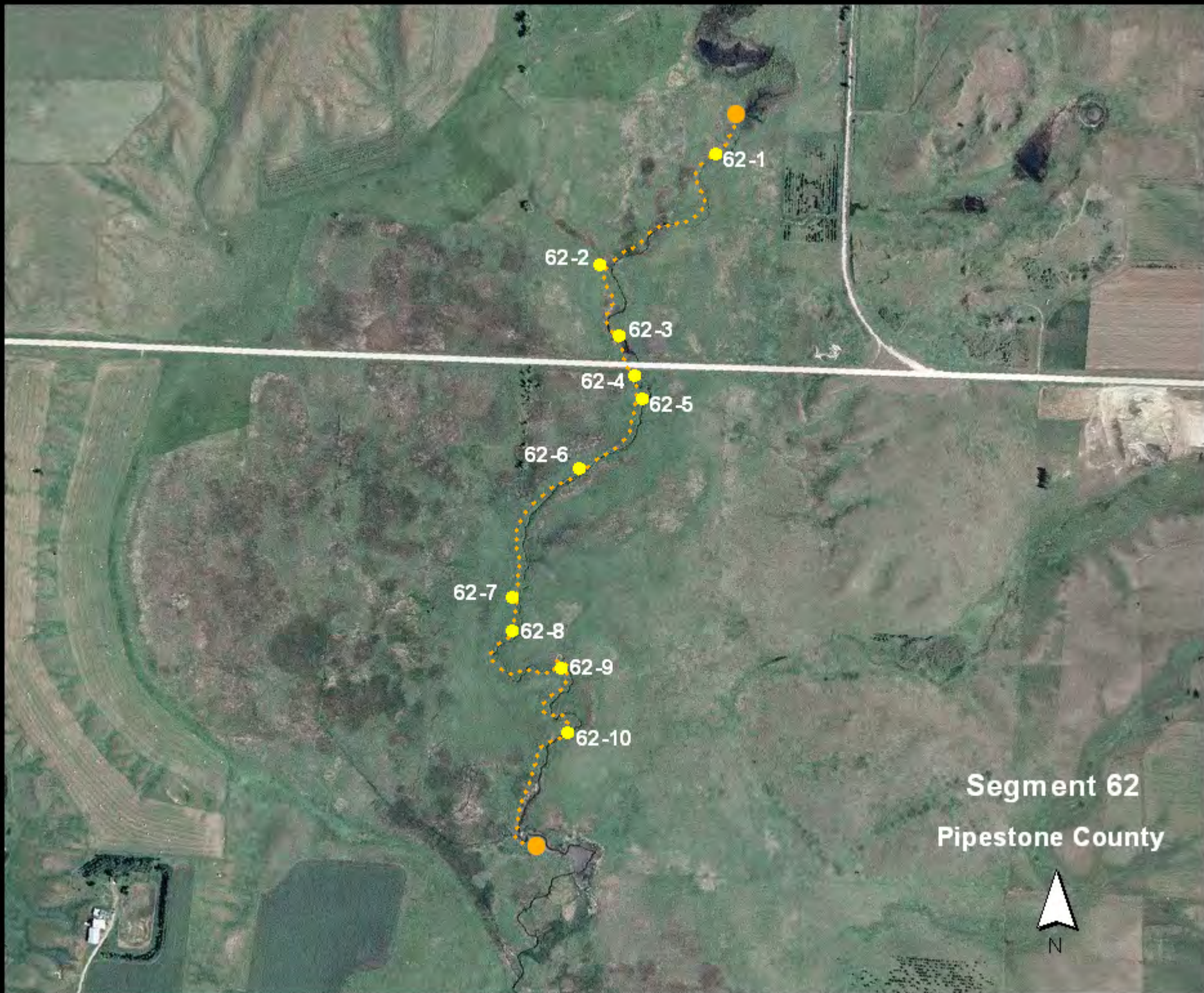
Overview of Random Segments Sampled 2004-2007



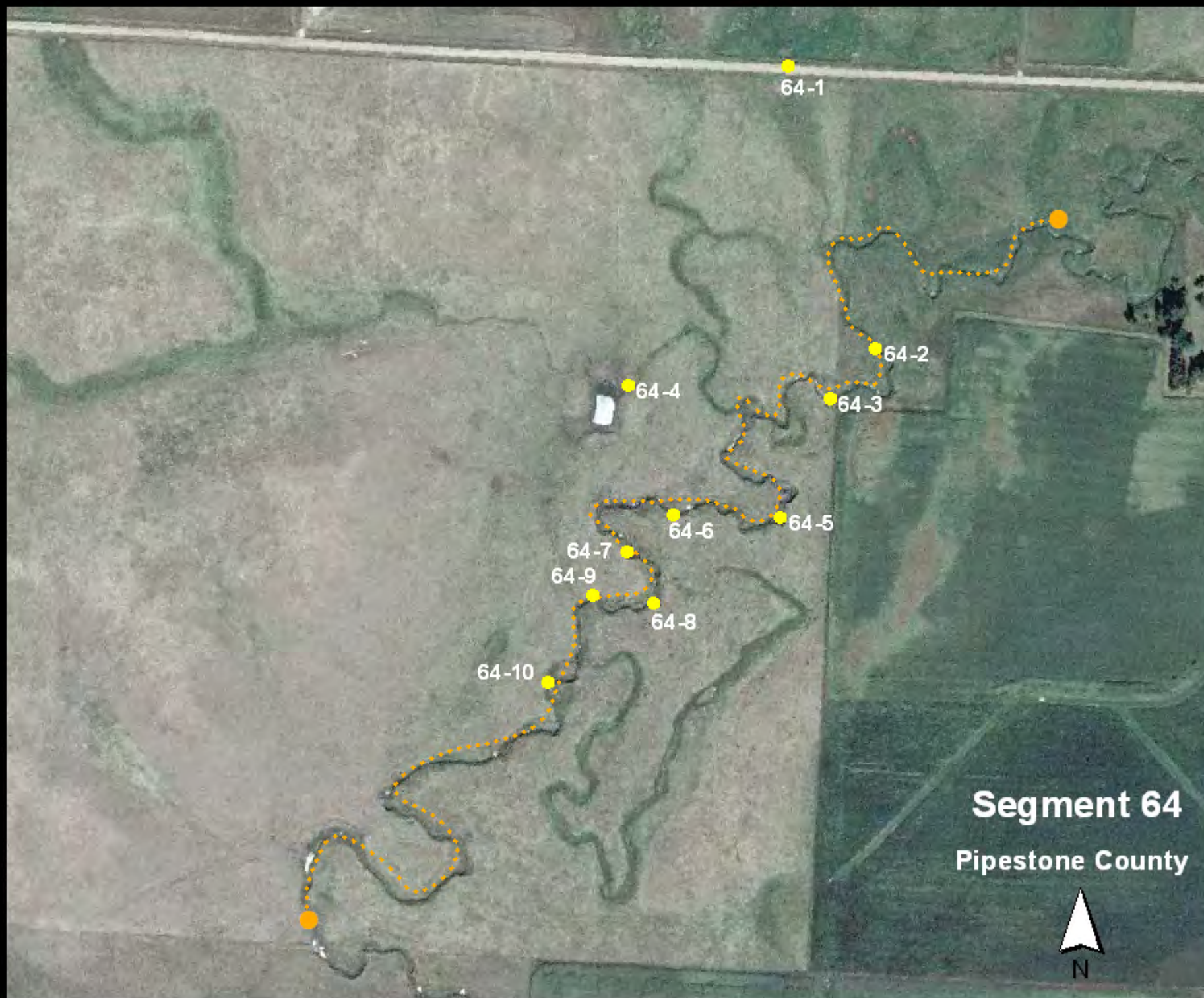
Overview of Segments where Topekas were found 2004-2007









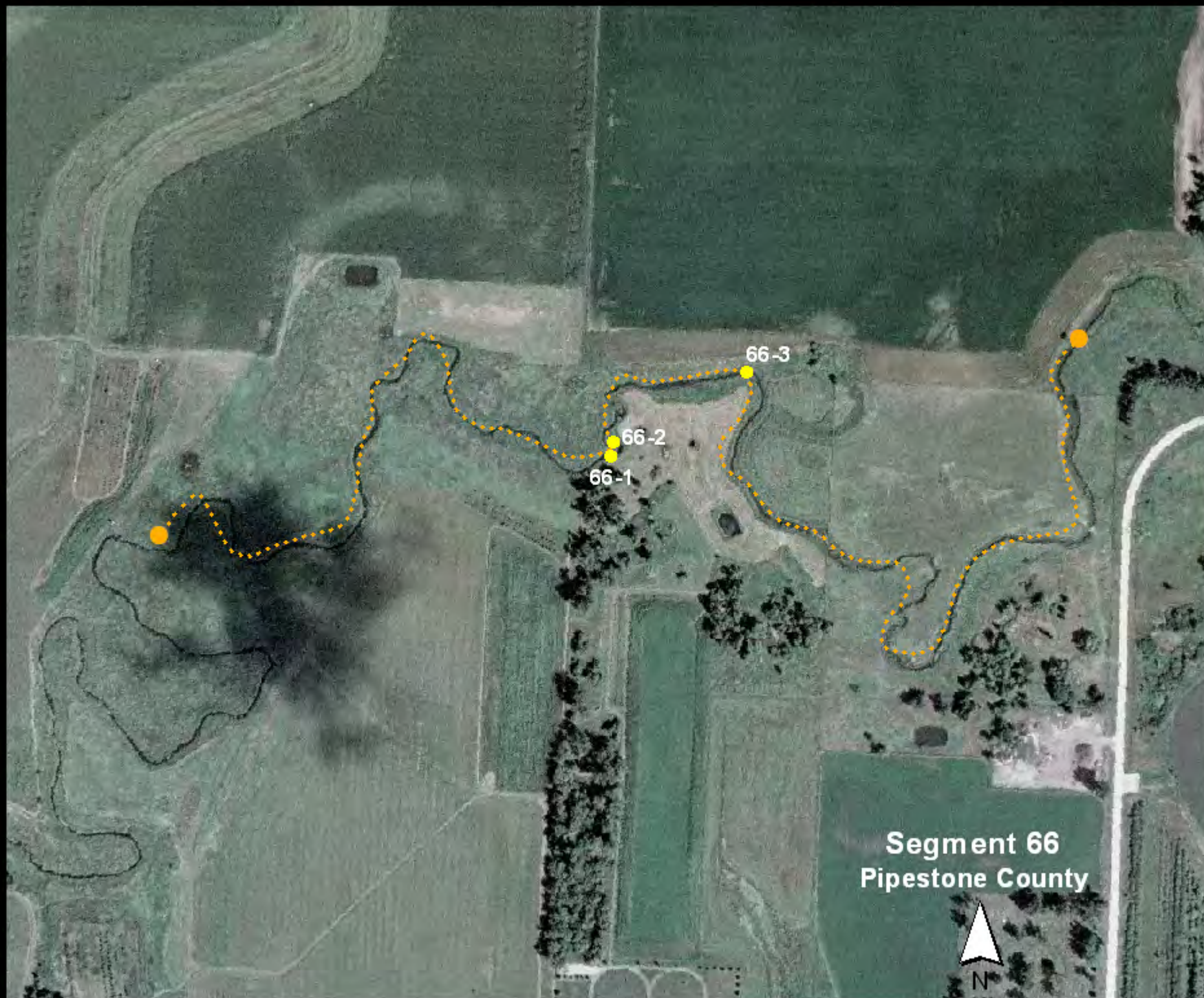




65-1

Segment 65
Pipestone County





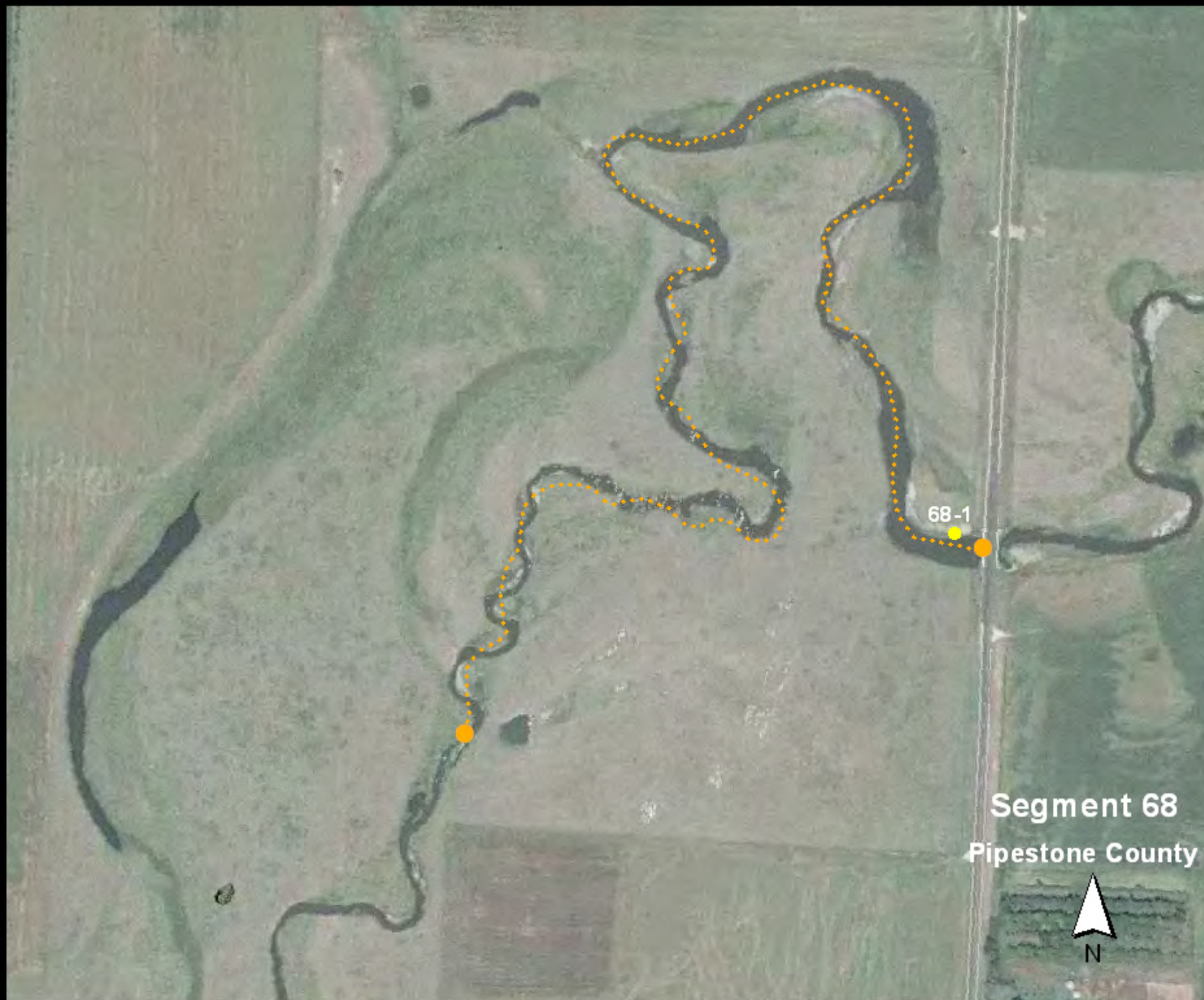
Segment 66
Pipestone County





Segment 67
Pipestone County





68-1

Segment 68
Pipestone County





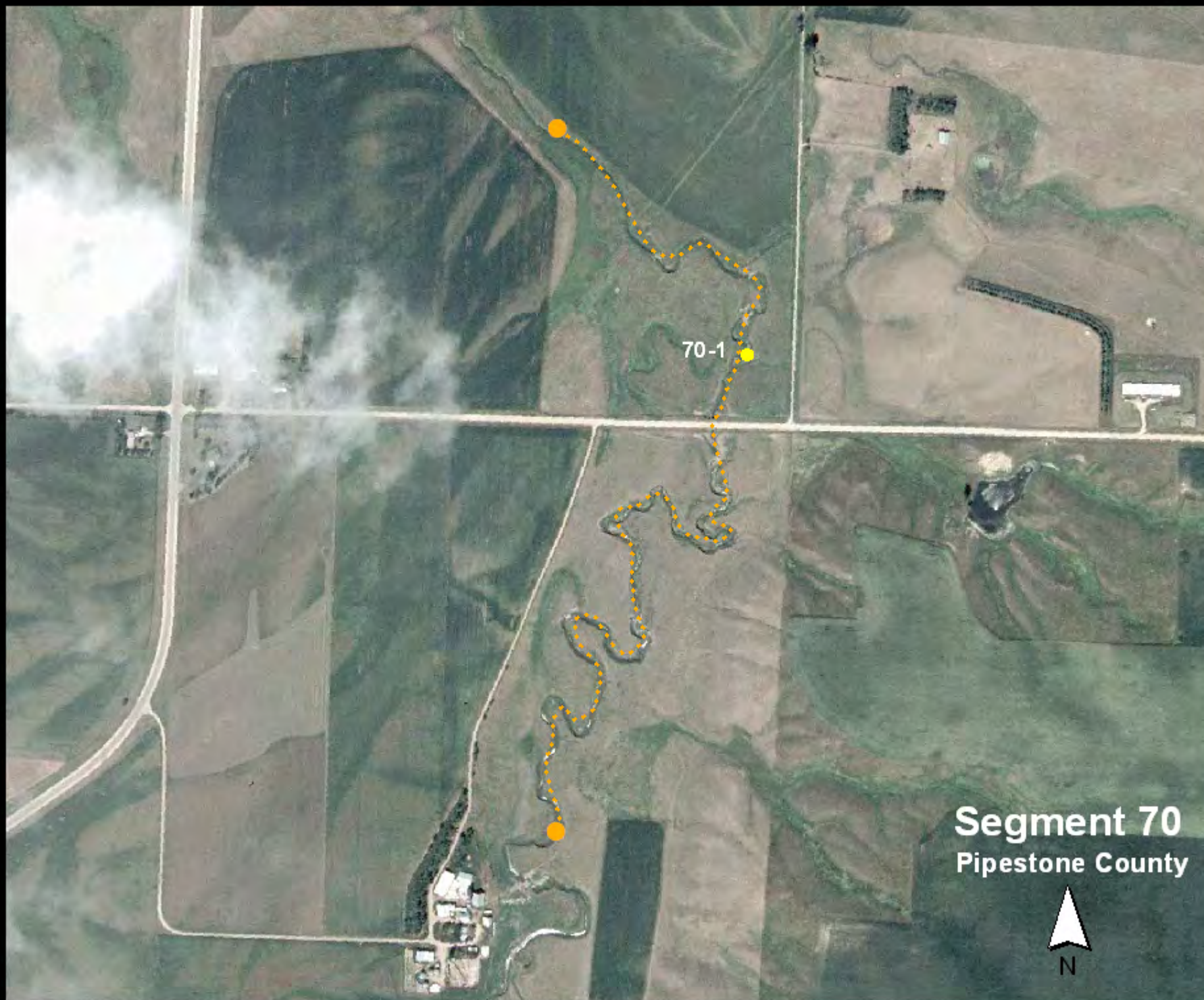
69-1

69-2

69-3

Segment 69
Pipestone County





70-1

Segment 70
Pipestone County





Segment 71
Pipestone County





72-1

72-2

Segment 72
Pipestone County





73-1

Segment 73
Rock County



74-1

Segment 74
Rock County





Segment 75
Rock County





Segment 76
Rock County







Segment 78
Nobles County





Segment 79
Nobles County





Segment 80
Rock County



APPENDIX B – DESCRIPTIONS OF STREAM SEGMENTS AND SITES

Table 1 lists the twenty stream segments, and provides locality information & basic habitat descriptions of all sampling sites.

Table 1. Locations of the 2007 twenty stream Segments (sites 61-80 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. For stream segments 66, 76, and 78 the Site Number that is the highest (e.g., 66-3) is where the Topeka shiners were found. Topeka shiners were not found in Segments 61, 62, 63, 64, 71, 77, and 79.

<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>61</u>	<u>Flandreau Creek</u>	<u>1.5 mi NE Verdi</u>							
	Lincoln	109	45	30	Lake Benton	61-1	in-channel	4900784.9428	234877.1437
	Lincoln	109	45	30	Lake Benton	61-2	in-channel	4900778.6666	234903.1449
	Lincoln	109	45	31	Lake Benton	61-3	in-channel	4900753.5621	234889.6960
	Lincoln	109	45	31	Lake Benton	61-4	in-channel	4900719.4915	234904.0415
	Lincoln	109	45	31	Lake Benton	61-5	in-channel	4900668.3858	234880.7301
	Lincoln	109	45	31	Lake Benton	61-6	in-channel	4900232.6418	234722.0332
	Lincoln	109	45	31	Lake Benton	61-7	in-channel	4900263.1259	234658.3751
	Lincoln	109	46	36	Verdi	61-8	in-channel	4900168.9837	234595.6136
	Lincoln	109	46	36	Verdi	61-9	in-channel	4900155.5348	234575.8886
	Lincoln	109	46	36	Verdi	61-10	in-channel	4900111.6018	234522.0930

Narrow headwater (ave width 5 ft); with cattails throughout except for a few short stretches of open water.

Massive amounts of siltation, even though the stream generally has a constant flow of water; no pools.

Substrate = 24-30" of 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>62</u>	<u>Flandreau Creek</u>	<u>1.5 mi SE Verdi @ Lincoln/Pipestone county line (CR 117)</u>							
	Lincoln	109	46	36	Verdi	62-1	in-channel	4899503.6072	234371.7097
	Lincoln	109	46	36	Verdi	62-2	in-channel	4899331.3859	234190.6566
	Lincoln	109	46	36	Verdi	62-3	in-channel	4899220.9876	234221.5681
	Pipestone	108	46	1	Fountain Prairie	62-4	in-channel	4899157.6926	234245.1197
	Pipestone	108	46	1	Fountain Prairie	62-5	in-channel	4899120.8932	234256.8955
	Pipestone	108	46	1	Fountain Prairie	62-6	in-channel	4899013.4389	234158.2731
	Pipestone	108	46	1	Fountain Prairie	62-7	in-channel	4898811.7781	234053.7627
	Pipestone	108	46	1	Fountain Prairie	62-8	in-channel	4898758.7869	234053.7627
	Pipestone	108	46	1	Fountain Prairie	62-9	in-channel	4898701.3798	234130.3055
	Pipestone	108	46	1	Fountain Prairie	62-10	in-channel	4898599.8134	234140.6094
	Bottomland WMA; poorly positioned road culvert has resulted in development of fish barrier to upstream movement. Except for a widening at the bridge, this is a narrow (< 5') channel of flowing water without any pool habitat. Substrate = very loose & deep (> 3') muck.								
<u>63</u>	<u>Flandreau Creek</u>	<u>4 mi W US 75 & 4 mi S Lincoln Co. line; upstream of CR 74 bridge</u>							
	Pipestone	108	46	21	Altona	63-1	in-channel	4892996.5886	229424.7924
	Pipestone	108	46	21	Altona	63-2	in-channel	4892995.8081	229425.1833
	Pipestone	108	46	21	Altona	63-3	in-channel	4893067.7722	229498.4883
	Pipestone	108	46	21	Altona	63-4	in-channel	4893188.3122	229497.3446
	Pipestone	108	46	21	Altona	63-5	in-channel	4893138.0864	229561.6099
	Pipestone	108	46	21	Altona	63-6	in-channel	4893220.4178	229617.5880
	Pipestone	108	46	21	Altona	63-7	in-channel	4893206.2707	229687.4006
	Pipestone	108	46	21	Altona	63-8	in-channel	4893275.3094	229733.2547
	Pipestone	108	46	21	Altona	63-9	in-channel	4893298.5407	229772.7241
	Pipestone	108	46	21	Altona	63-10	in-channel	4893383.4149	229841.2871
	Narrow (5-10'), downcut channel. Constant flow, no pools or backwater habitat. Substrate = 12-18" of silt covering the original gravel/sar								

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>64</u>	<u>Flandreau Creek</u> 4 mi W US 75 & 4 mi S Lincoln Co. line; downstream of CR 74 bridge								
	Pipestone	108	46	29	Altona	64-1	off-channel	4892975.4801	228933.4764
	Pipestone	108	46	28	Altona	64-2	in-channel	4892723.0145	229011.4387
	Pipestone	108	46	29	Altona	64-3	in-channel	4892677.6519	228970.9494
	Pipestone	108	46	29	Altona	64-4	off-channel	4892689.8131	228790.4981
	Pipestone	108	46	29	Altona	64-5	in-channel	4892571.0304	228926.9728
	Pipestone	108	46	29	Altona	64-6	in-channel	4892574.0070	228830.8149
	Pipestone	108	46	29	Altona	64-7	in-channel	4892541.2217	228789.7606
	Pipestone	108	46	29	Altona	64-8	in-channel	4892494.9196	228812.7691
	Pipestone	108	46	29	Altona	64-9	in-channel	4892501.3858	228758.4370
	Pipestone	108	46	29	Altona	64-10	in-channel	4892423.5846	228719.1719
	Narrow (5-10'), downcut channel.								
	Constant flow, no pools or backwater habitat.								
	Substrate = 12-18" of silt covering the original gravel/sand bottom.								
<u>65</u>	<u>North Br Pipestone Creek</u> 3.5 mi W Holland @ Hwy 8, upstream of birdge								
	Pipestone	107	45	4	Grange	65-1	in-channel	4887812.0062	239097.4290
	Meandering headwater with wide & shallow pools at cattle crossings.								
	Topekas caught in first seine haul in shallow pool upstream of the riffle.								
	Substrate = sand/fine gravel.								
<u>66</u>	<u>North Br Pipestone Creek</u> 2 mi NW Pipestone, north of the cemetary								
	Pipestone	106	46	2	Sweet	66-1	in-channel	4879777.9927	232520.3591
	Pipestone	106	46	2	Sweet	66-2	in-channel	4879790.4500	232522.8505
	Pipestone	106	46	2	Sweet	66-3	in-channel	4879853.5667	232643.2706
	This segment of headwater stream is pooled-up from some unknown downstream obstruction (beaver dam?).								
	Topekas caught in first seine haul of site 3; present along pooled margins of channel.								
	Substrate = loose 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>67</u>	<u>Pipestone Creek</u>	3 mi S Cazenovia [NOTE: This site is also Site 16 from the 2004 surveys]							
	Pipestone	107	46	33	Troy	67-1	in-channel	4880007.0644	230065.2863
	Meandering headwater with numerous backwaters.								
	Topekas caught in first seine haul; abundant.								
	Substrate = heavily silted (a much heavier silt load than in 2004)								
<u>68</u>	<u>Pipestone Creek</u>	6 mi WSW Pipestone @ CR 13							
	Pipestone	106	47	13	Lone Rock	68-1	in-channel	4876179.1705	225049.3060
	Many potentially good backwaters in this segment of the stream								
	Topekas caught in second seine haul.								
	Substrate = sand/silt mixture.								
<u>69</u>	<u>Rock River</u>	3 mi SE Hatsfield, 1.5 mi S CR 65							
	Pipestone	106	44	32	Burke	69-1	in-channel	4870366.4318	247141.4532
	Meandering stream with a few backwaters, but Topekas found in the main channel with slight flow.								
	Topekas common; caught in first seine haul.								
	Substrate = sand/gravel mixture; some silt in pools.								
<u>70</u>	<u>Chanarambie Creek</u>	2 mi NE Edgerton							
	Pipestone	105	44	23	Obsorne	70-1	in-channel	4863855.9009	251377.3896
	Headwater stream that shows some excessive erosion from cattle; almost entire stretch of stream is constantly flowing.								
	Topekas found in the only pooled segment of stream, second haul.								
	Substrate = gravel & sand with 2-3" silt in the pool.								

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>71</u>	trib., Poplar Creek <u>1 mi NNW Trosky, 0.25 mi N Hwy 2</u>								
	Pipestone	105	45	10	Elmer	71-1	in-channel	4866904.8238	239463.5739
	Pipestone	105	45	9	Elmer	71-2	in-channel	4866946.6976	239378.5573
	Pipestone	105	45	9	Elmer	71-3	in-channel	4866946.6976	239323.9945
	Pipestone	105	45	9	Elmer	71-4	in-channel	4866926.3952	239184.4151
	Pipestone	105	45	9	Elmer	71-5	in-channel	Coordinates for sites 5 - 10 not taken	
	Pipestone	105	45	9	Elmer	71-6	in-channel		
	Pipestone	105	45	9	Elmer	71-7	in-channel		
	Pipestone	105	45	9	Elmer	71-8	in-channel		
	Pipestone	105	45	9	Elmer	71-9	in-channel		
	Pipestone	105	45	9	Elmer	71-10	in-channel		
	Intermittent headwater; is essentially a grass-lined drainage strip.								
<u>72</u>	Poplar Creek <u>2.5 mi S Trosky @ US 75</u>								
	Pipestone	105	45	33	Elmer	72-1	in-channel	4861316.4108	238275.5214
	Very small headwater, yet one enlarged pool by hwy & old RR bridge.								
	Topekas caught on third seine haul, common in the pool.								
	Substrate = sand/gravel mixture.								
<u>73</u>	Trib., Split Rock Creek <u>1 mi SE Jasper</u>								
	Rock	104	46	5	Rose Dell	73-1	in-channel	4860420.1400	228930.6770
	Small headwater with widened shallows created at cattle crossing.								
	Topekas caught on first seine haul; abundant.								
	Substrate = sand & gravel.								
<u>74</u>	Split Rock Creek <u>1.5 mi SSW Jasper, 1 mi S Hwy 269</u>								
	Rock	104	47	12	Highland	74-1	in-channel	4859152.8425	225390.2830
	Wide (50-60') channel with a well-developed backwater downstream of bridge. Topekas caught on first seine haul; common.								
	Substrate = shifting sand.								

Segment Stream Name & Common Location

UTM Coordinates (Zone 15)

Fast-flowing headwater; no pool habitats present.

No Topekas.

Substrate = deep silt 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
<u>78</u>	<u>Kanaranzi Creek</u> 3 mi W Adrian; enter property @ 15501 250th St								
	Nobles	102	43	22	Westside	78-1	in-channel	4834601.9406	259085.9247
	Nobles	102	43	22	Westside	78-2	in-channel	4834600.0099	259060.8259
	Wide, numerous shallows and backwaters.								
	Topekas caught on second haul of site 2; common.								
	Substrate = sand/gravel in main channels with lightly silted pools.								
<u>79</u>	<u>Kanaranzi Creek</u> 4mi SW Adrian								
	Nobles	102	43	21	Westside	79-1	in-channel	4833630.6157	258072.4411
	Nobles	102	43	28	Westside	79-2	in-channel	4833558.0395	258066.9290
	Nobles	102	43	28	Westside	79-3	in-channel	4833476.2765	258094.4896
	Nobles	102	43	28	Westside	79-4	in-channel	4833371.5463	258054.0674
	Nobles	102	43	28	Westside	79-5	in-channel	4833377.0584	258032.0189
	Nobles	102	43	28	Westside	79-6	in-channel	4833321.9372	257949.3372
	Nobles	102	43	28	Westside	79-7	in-channel	4833349.4978	257933.7195
	Nobles	102	43	28	Westside	79-8	in-channel	4833336.6362	257810.6156
	Nobles	102	43	28	Westside	79-9	in-channel	4833310.9130	257799.5913
	Nobles	102	43	28	Westside	79-10	in-channel	4833343.9857	257718.7470
	Medium-size creek; braided channel; constantly-flowing water								
	Substrate = sand/gravel								
<u>80</u>	<u>Kanaranzi Creek</u> 7.5 mi E Ash Creek @ Hwy 1								
	Rock	101	44	24	Kanaranzi	80-1	in-channel	4825722.9854	252663.0787
	Rock	101	44	13	Kanaranzi	80-2	in-channel	4825784.5310	252667.0926
	Site 79 flowed through relativey high-gradient topography, whereas this segment is much more low-gradient and slower flow.								
	Topekas found on second haul; common.								
	Substrate = sand/silt mixture.								

APPENDIX C –PHOTOGRAPHS OF HABITATS & FISHES

Stream photographs for Segments 61-64, 71, 77, and 79 (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. Due to a lapse by the photographer (P. Ceas), there is no photograph of a Topeka shiner from Segment 73. Voucher photographs of Topeka shiners from the remaining 12 stream segments are included. Photos by P. Ceas with assistance from A. Plain.

Site 61 - no Topeka shiners



Site 62 - no Topeka shiners



Site 63 - no Topeka shiners



Site 64 - no Topeka shiners



Site 65-1

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



Site 66-3



Site 67-1



Site 68-1



Site 69-1



Site 70-1 (fish photo is out of focus)



Site71 No Topekas



Site 72-1



Site 73-1 No photo of Topeka shiner



Site 74-1



Site 75-1



Site 76-3 Topeka Shiner (top) & sand shiner (bottom)



Site 77 No Topekas



Site 78-2



Site 79 No Topekas



Site 80-2

