



**ILLINOIS NATURAL
HISTORY SURVEY**
PRAIRIE RESEARCH INSTITUTE

**Monitoring and Assessment of Aquatic Life in the Kaskaskia River for
Evaluating IDNR Private Lands Programs: Annual Report 2016**

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Annual Summary Report

Project Title:

Monitoring and Assessment of Aquatic Life in the Kaskaskia River
for Evaluating IDNR Private Lands Programs

Project Number:

RC13CREP01

Contractor information:

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Annual Reporting Period:

1 July 2015—30 June 2016

Annual Project Report Due Date:

13 December 2016

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Goals/ Objectives:

(1) Develop and initiate monitoring program that provides a basin-wide assessment of status and trends for aquatic life in wadeable streams of the Kaskaskia River; (2) track the status of selected populations of sensitive species in focal reaches of the Kaskaskia River associated with enhanced DO regulations, BSS designation, and presence of SGNC; (3) evaluate the influence of conservation easements and associated practices on biological communities within the Kaskaskia River Basin.

Project Title: Monitoring and Assessment of Aquatic Life in the Kaskaskia River for evaluating IDNR Private Lands Programs.

Summary of Work Completed During Reporting Period (7/1/2015 – 6/30/2016):

Work during this period continued monitoring efforts to characterize fish assemblages, benthic macroinvertebrate assemblages, physical habitat and water quality in streams within the Kaskaskia basin. During summer of 2015, 48 locations were surveyed (a survey event includes physiochemical and biological evaluations), bringing the total locations over three survey seasons to 139 (Table 1, Figure 1). Several of these locations have been surveyed in multiple years to evaluate interannual variation of stream characteristics or to compliment concurrent studies, and therefore the total number of monitoring events (i.e., efforts to characterize the physiochemical and biological attributes of a stream) is 179. Progress was made in assembling and evaluating relevant information from outside sources (e.g., Illinois Department of Natural Resources [IDNR], Illinois Environmental Protection Agency [IEPA]) during the reporting period.

Three types of survey locations, corresponding to monitoring objectives, were visited during the reporting period (Figure 2). Water quality, habitat, benthic macroinvertebrates and fish were evaluated at 27 randomly selected survey locations for characterization of streams in the basin. An additional twelve locations with biological significance were surveyed (no electrofishing occurred), as they were in 2013 and 2014. The four ISWS in the Kaskaskia basin were also surveyed, as they were in 2014. Seventeen additional locations were surveyed in support of graduate student research.

Continuous temperature recorders were placed at 44 survey locations. These records were combined with those from previous years (81 total records) to characterize thermal regime within the basin (Figure 3). Mean daily summer temperature in evaluated streams ranged from 18.9°C to 27.2°C with a mean of 23.5°C. Temperature records were used to construct models for estimation of mean temperature, maximum temperature and temperature variability throughout the basin. These models may be valuable in identifying interactions between temperature and environmental characteristics and spatial patterns in assemblage composition.

Water quality parameters (dissolved oxygen, specific conductance, turbidity, pH, nitrate nitrogen, total reactive phosphorus, ammonia nitrogen and temperature) were measured during summer base flow conditions at 39 survey locations, bringing the total number of water quality measurement events to 210 for the three-year monitoring effort.

Physical habitat evaluations, using the Qualitative Habitat Evaluation Index (QHEI, OEPA 2006) and the Illinois Habitat Index (IHI, Sass et al. 2011), were completed at 47 locations during the reporting period. A total of 171 habitat evaluations have been completed during the monitoring effort.

Thirty-two summer benthic macroinvertebrate surveys were completed during the reporting period, bringing the three-year total to 151. All macroinvertebrate samples were prepped for processing and shipped to EcoAnalysts, Inc. (Moscow, ID) for identification and enumeration. Samples collected in 2013 and 2014 have been completed and those data have been received.

Electrofishing surveys occurred at 32 locations during the reporting period, and the total number of completed surveys is now 123.

More than 3250 water quality, habitat, fish and mussel survey records from external sources were compiled to improve spatiotemporal coverage of information regarding stream characteristics in the basin. These records will be evaluated separately from our monitoring data as several parameters differ from those we used. But, when appropriate, our monitoring data and those from external sources will be combined for additional evaluations. Evaluation of monitoring results and of external data is ongoing.

Potential survey locations for the 2016 field season were selected and scouted in spring 2016 (Figure 4). Temperature recorders were placed at selected locations.

Work conducted during this reporting period was performed primarily by one FTE research scientist aided by the Principle Investigators, two graduate students and three hourly workers. A total of 14 hourly workers (mainly undergraduate students) have assisted staff during the three years of study.

Objective 1: Basin-wide status and trends.

To evaluate contemporary physiochemical and biological status of streams in the Kaskaskia River basin and to provide a baseline for comparison to future conditions, stream segments were randomly selected using a stratified (size and CRP density categories) procedure. During the 2015 field season, 27 basin-wide status assessment locations were surveyed (Figures 1 and 2).

During the three-year monitoring effort, 92 locations were surveyed for characterization of the Kaskaskia River basin. Spatial distribution (HUC8 stratum) was roughly equal with 25 to 22 surveys in each subbasin. Survey efforts occurred more frequently at small (size class 1) streams with low CRP density (CRP classes 1-3) due to the limited availability and accessibility of large streams with high CRP density. Fish were collected at most (84) locations and those without fish had either spring or summer (or both) macroinvertebrate collections to fulfill the biological component for a survey event. Fall water quality measures were taken at 33 basin-wide survey locations and at 84 locations during base flow surveys. Habitat was evaluated during each survey where fish or summer macroinvertebrates were collected, but not in every occasion when spring macroinvertebrates were the only biota collected.

Objective 2: Status of streams with sensitive species (focal stream monitoring).

Focal stream survey locations (n=15, Figures 1 and 2) were established in stream segments where Biologically Significant Streams (BSS; Bol et al. 2007) and Enhanced Dissolved Oxygen streams (IDNR/IEPA 2006) overlapped. These locations were selected to evaluate impacts of private land programs in areas of conservation concern. During this reporting period efforts focused on surveying focal locations for a third summer year.

Twelve of the fifteen sensitive species locations were surveyed in each study year, and one trio was surveyed in both 2013 and 2014. Spring EPT were collected at each location in 2014 and 2015. Fall

water quality measurements were taken at all locations in 2013 and at nine locations in 2014. Summer macroinvertebrates were collected at each location during each survey event.

Objective 3: Influence of private land conservation efforts (fixed site monitoring):

ISWS selected four locations for their monitoring that we use as fixed sites (Figures 1 and 2) to evaluate physiochemical and biological characteristics while ISWS concurrently evaluates discharge, sediment loading and nutrient loading.

Fixed locations were surveyed in 2014 and 2015 following their establishment by the ISWS. Water quality measurements were taken in three of the four locations in fall 2014. Spring EPT were collected at one location in 2014 and two locations in 2015. Macroinvertebrates were collected during each survey event, but fish could only be collected at three of the four locations.

Reporting:

Two presentations at scientific conferences (Drake et al. 2015, Metzke and Hinz, Jr. 2016) were given during the reporting period. Presentations described relationships between fish assemblages and watershed characteristics. The final project report is in preparation.

Literature Cited:

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- Illinois Department of Natural Resources and Illinois Environmental Protection Agency. 2006. Recommended Revisions to the Illinois General Use Water-Quality Standard for Dissolved Oxygen. Illinois Department of Natural Resources and Illinois Environmental Protection Agency, Springfield, IL.
- Metzke, B.A. and L.C. Hinz, Jr. 2016. Evaluating the Relationship Between Incentive Based Conservation Land Programs and Fish Assemblages. Illinois Chapter of the American Fisheries Society Meeting, Springfield, IL.
- Ohio Environmental Protection Agency. 2006. Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI). Ohio EPA Technical Bulletin EAS/2006-06-1. State of Ohio Environmental Protection Agency, Division of Surface Water, June 2006.
- Sass, L., L.C. Hinz, Jr., J. Epifanio and A.M. Holtrop. 2010. Developing a multi-metric index for wadeable streams in Illinois. Final Report to the Illinois Department of Natural Resources. Illinois Natural History Survey Technical Report 2010/21.

Table 1. Frequency of survey events (data collection) and number of locations (unique stream segments) for physiochemical and biotic characterization of streams in the Kaskaskia River basin between 2013 and 2015.

<u>Evaluated Characteristic</u>	Survey Purpose				<u>Total Events</u>	<u>Total Locations</u>
	<u>Basin-Wide Status</u>	<u>Focal</u>	<u>ISWS</u>	<u>Student Research/ Special Questions</u>		
Fish Assemblage	83	0	6	34	123	113
Benthic Macroinvertebrate Assemblage	78	42	8	23	151	126
Spring EPT Macroinvertebrate Assemblage	68	30	3	0	101	86
Water Quality	117	66	11	16	210	126
Temperature Regime	47	18	2	0	67	60
Habitat	87	42	8	34	171	159
Total Locations:	92	12	4	31		

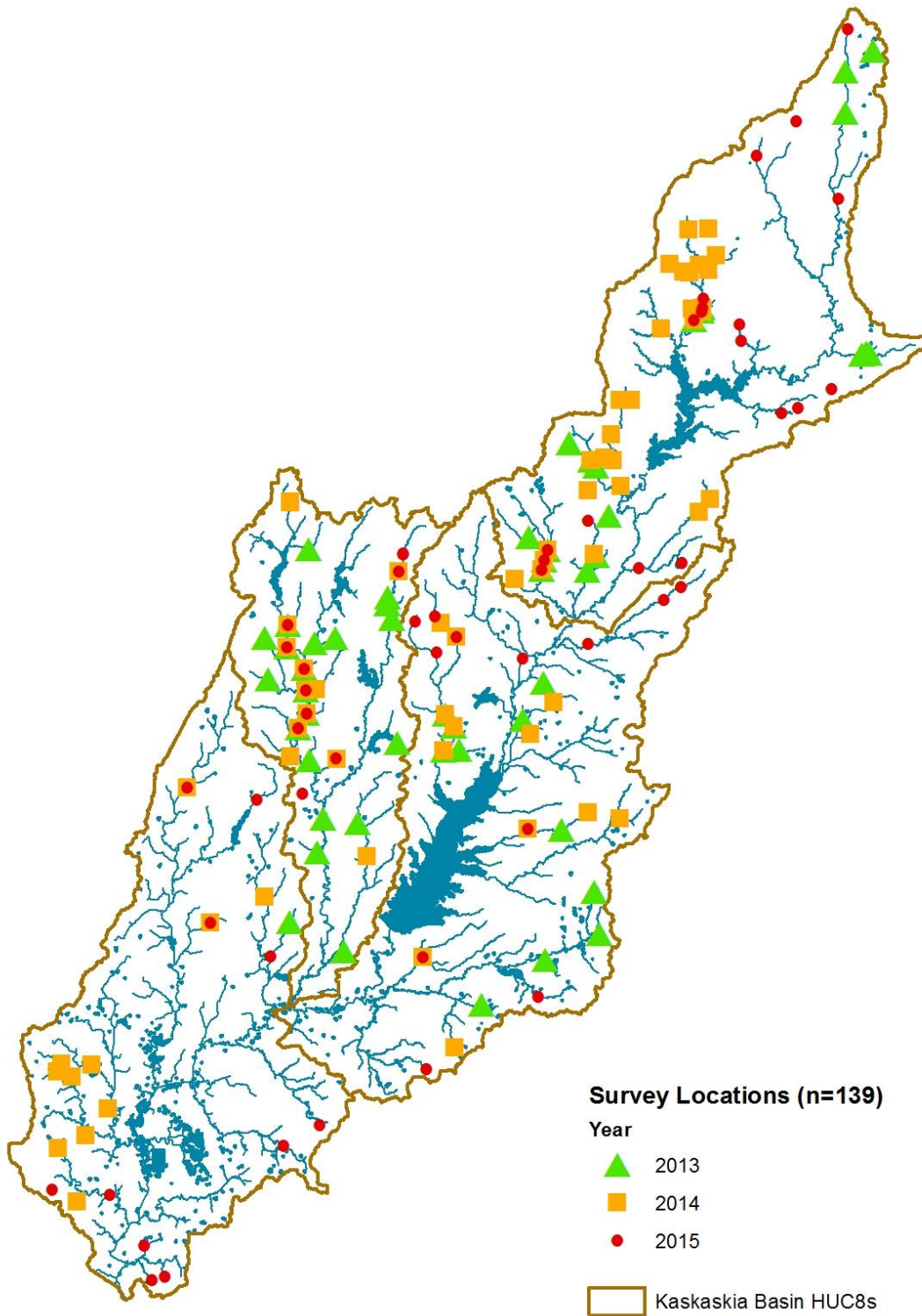


Figure 1. Location and survey year for all data collection events between 2013 and 2015.

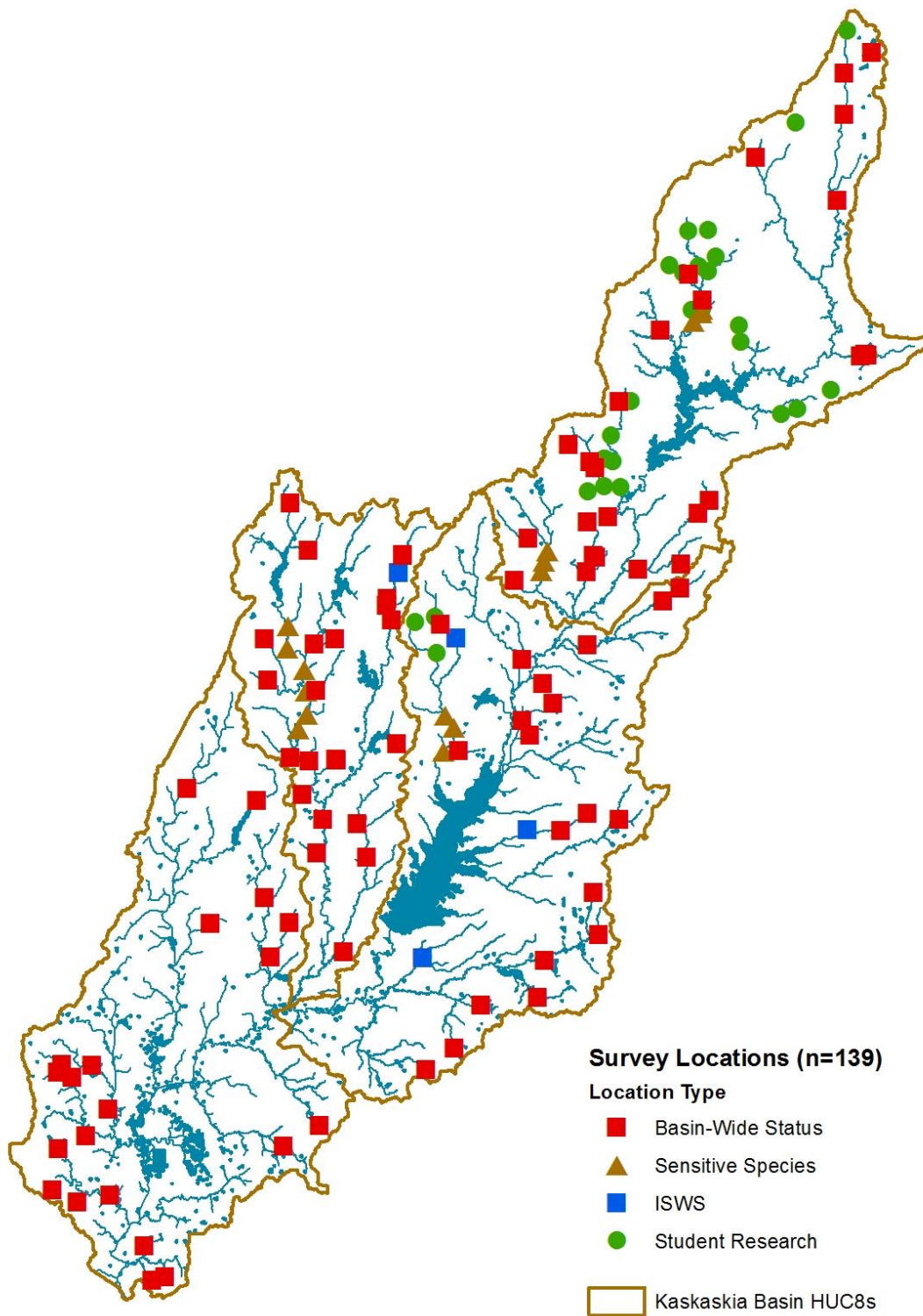


Figure 2. Location and purpose for all data collection events between 2013 and 2015.

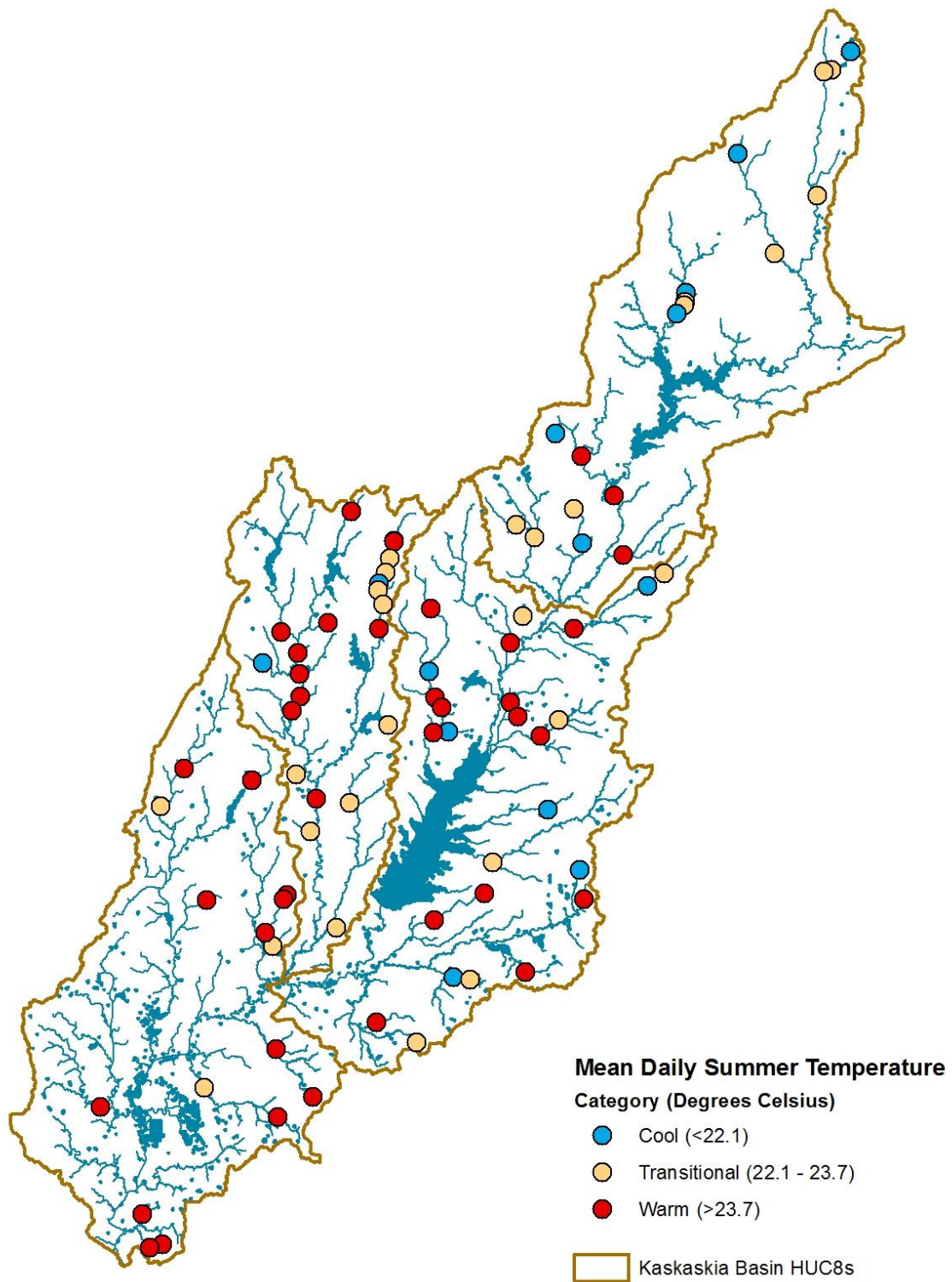


Figure 3. Location and mean daily summer temperature for all valid temperature data (n=81) recorded between 2013 and 2015.

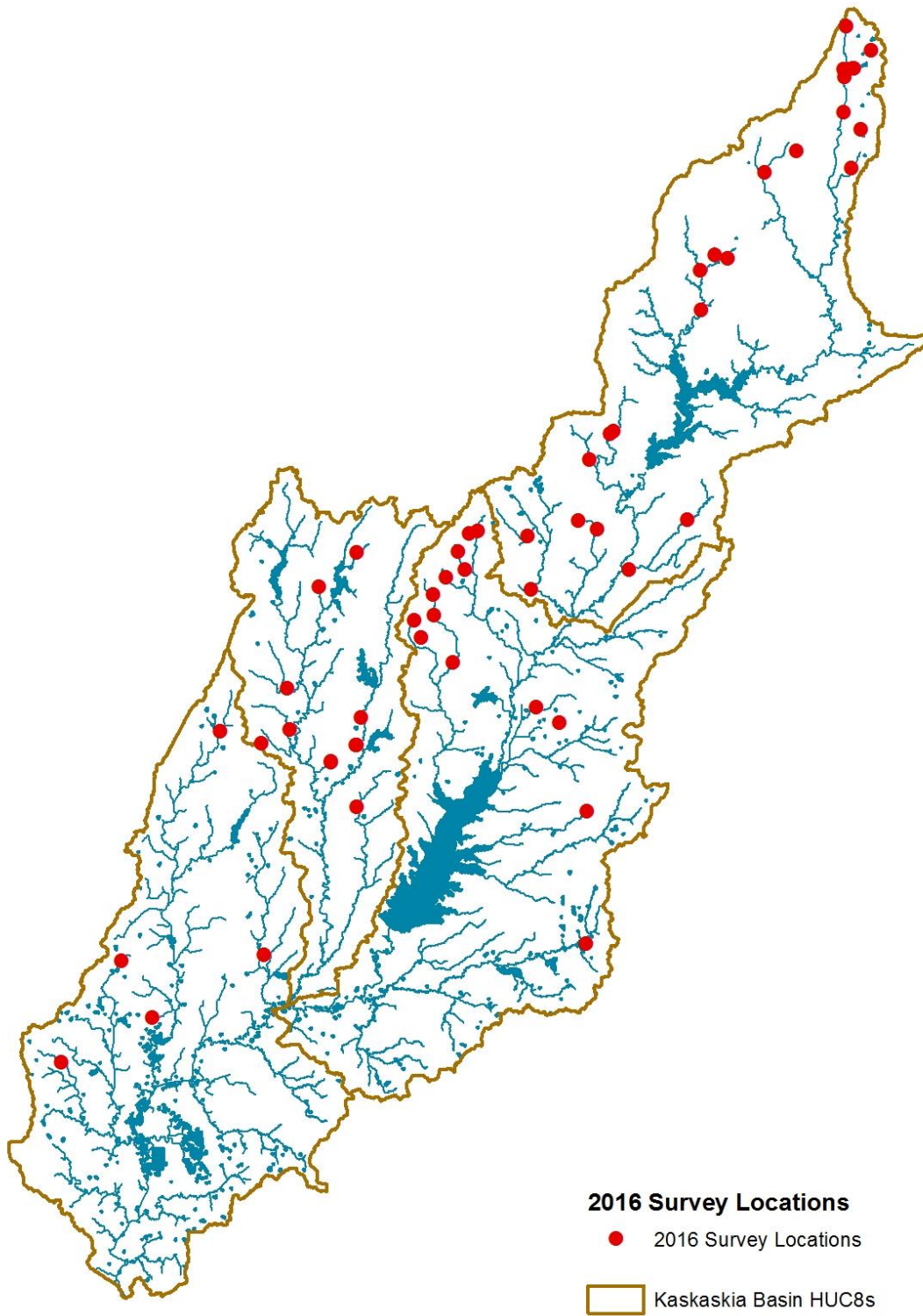


Figure 4. Survey locations for the 2016 field season monitoring effort.