East Branch Creek Watershed

Ottawa and Kent Counties, MI

Field Surveys
performed by DEQ staff
October, November and
December 2003

SUMMARY OF EAST BRANCH CREEK WATERSHED ASSESSMENT
KENT AND OTTAWA COUNTIES, MICHIGAN

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INTRODUCTION

The East Branch Creek watershed is located to the southwest of Grand Rapids at the Ottawa and Kent County border just north of the Allegan County border. It originates in the agricultural fields of southwest Kent County and southeast Ottawa County to the southeast of Hudsonville. It flows north to Jenison where it converges with Rush Creek before Rush Creek joins the Grand River. The majority of the watershed drains a predominantly agricultural area with low to heavy density residential use. The only urban area is located along the lower reaches of East Branch Creek near Jenison and Grandville. Department of Environmental Quality (DEQ) field staff surveyed road/stream crossings within the watershed to quickly assess the health of the watershed. The survey combined both qualitative and quantitative assessment of East Branch Creek and its tributaries and provided a basis upon which to identify any potential sources of non point source pollution negatively affecting the watershed. In total, twenty-four road/stream crossing locations were surveyed during the assessment of the East Branch Creek Watershed. Refer to Attachment A, Road Stream Crossings Inventory, for a summary of the survey locations conducted between October 31 and December 5, 2003, as well as survey location maps. Site identification codes were developed using four letter identifiers for the subwatershed followed by the two digit site location number. Sites were numbered successively from the headwaters to the mouth.

METHODS

The DEQ's stream crossing watershed survey procedure was developed as a quick screening tool to assess general water quality and possible pollutant sources, causes and problems within the watershed. The survey procedure provides standardized visual assessments that can be conducted by DEQ staff or trained volunteers. Only observations that can be made from the road stream crossings are recorded; recording "educated guesses" or suspicions is prohibited. Because this assessment is based on visual observations, designed to be conducted quickly and by many different types of people and knowledge backgrounds, the survey results are only qualitative in nature.

A minimum of 30% of the road stream crossings within a watershed are to be surveyed with attention given to balanced geographical coverage and assessment across major land use changes and possible pollutant sources. Surveys are always conducted in one general direction (either upstream to downstream OR downstream to upstream), and the attempt is made to keep the surveyors and weather conditions consistent to limit bias and subjectivity between surveyors and field days. This survey was conducted from the upstream to downstream in three field days by two DEQ field staff. The right and left bank designations were always assigned based on looking downstream at each road stream crossing location.

At each survey location the following stream conditions are visually assessed:

- Weather and any rain event conditions
- Culvert/bridge conditions
- Channel conditions (width, depth, high water mark, riffles, pools, natural, maintained, recovering)
- Stream appearance (color, turbidity, algae, aquatic plants, trash, oil sheen, bacteria, foam)
- Substrate composition (boulder, gravel, silt, sand, unknown)
- In-stream Cover (undercut banks, overhanging vegetation, woody debris, pools, boulders, plants)
- Stream corridor (riparian vegetation type and width, bank erosion, canopy cover, adjacent land use)
- Potential Pollutant Sources (source and pathway identification)

At each survey location the following stream conditions are directly measured:

- Water temperature
- Dissolved oxygen content
- pH
- flow velocity
- latitude and longitude coordinates (GPS)

In addition each site was photo-documented with a digital picture taken in the downstream direction, upstream direction and of the road crossing itself. Refer to the DEQ's *Stream Crossing Watershed Survey Procedure* for further information and a complete description of the above conditions. Please note that because the meter used to measure dissolved oxygen, pH and temperature was not working properly, dissolved oxygen levels and pH were not recorded. Temperature measurements were collected using a standard thermometer which was lowered into the water on a string. Care should be taken when interpreting temperature results since this method is not as reliable or as consistent as using a standard water quality meter.

OBSERVATIONS

Water Temperature and pH

Survey locations were assessed in the order of upstream sites (in the headwaters) to downstream sites (towards the mouth). Twenty-two locations, including eight along the main stem of East Branch Creek, were measured for temperature. Overall the average temperature was 45.5° F, with a range between 36°and 57° F.

Normal stream temperatures capable of supporting a coldwater fishery with few diseases are below 57°F. Walleye, northern pike and some trout are adapted to temperatures between 57° to 68°F while temperatures over 68°F are suitable for fish communities characterized by bass, crappie, bluegill, carp and sucker with occurrence of fish disease high. While temperatures recorded here seem low it is important to note that this survey was not conducted during the hottest summer months when temperature becomes a limiting factor to some species. Temperatures will appear cool because the survey was conducted during the fall. Maximum air temperatures during the three field days of this survey ranged from 42°F (on December 5) to 68°F (on October 31). Refer to Figure 1 in

Attachment B, which depicts the temperature at all locations surveyed and to Figure 2, for only those temperatures the mainstream locations.

Substrate

Substrate was observed and quantified for both the upstream and downstream stretch at each survey location. In all, 48 substrate observations were recorded. Substrate type is important when considering habitat suitability for desired species within the system (i.e. trout and other fish species). Cobble and gravel substrates with a low degree of embeddedness are the most suitable for reproduction in many fish species and is important for macroinvertebrates as well. Evidence of silt and sand dominated substrate could indicate problems within the watershed such as erosion and sedimentation. Among the survey locations within the East Branch Creek Watershed approximately 15 were dominated (80 to 100% covered) by sand and 5 were dominated silt, detritus or muck. 8 of the sites were unable to be categorized due to turbidity. The remaining sites had substrate with varying amounts of silt, sand and gravel. Refer to Figures 3 through 5 for substrate data for each of the subwatersheds separately. Refer to Figure 6, in Attachment B, for a graph depicting the substrate composition for those survey locations located along the main channel of East Branch Creek.

In-Stream Cover

The presence of in-stream cover was assessed at each location for both the upstream and downstream stretches. In-stream cover, such as overhanging vegetation, undercut banks, deep pools, boulders, plant cover and large woody debris provide habitat for macroinvertebrates and aquatic organisms such as amphibians and fish. Of the 48 observations made, 75% of the sites had overhanging vegetation and 31% of the sites had woody debris. Undercut banks and boulders were each found in approximately 15% and 2% of the sites, respectively. Refer to Table 1, in Attachment B for a summary of the in-stream cover observations made at each survey location.

Physical Appearance

The physical appearance of the stream at each survey location was assessed based on the presence or absence of aquatic plants, floating algae, filamentous algae, bacterial slimes, turbidity, oil sheen, foam and/or trash. In all, 24 sites were assessed for physical appearance; observations were recorded and rated as either present or abundant. No oil or bacteria sheens or filamentous algae were observed at any of the sites. In general floating algae and aquatic plants were the least common. Approximately 29% of the sites exhibited turbidity, 18% exhibited foam and 15% exhibited trash. Refer to Table 2, in Attachment B for a summary of the physical appearance observations made for each survey location.

Stream Corridor

The riparian vegetation was assessed at each survey location for both the right and left banks of the upstream and downstream stretches. The presence of riparian vegetation reduces the amount of surface water runoff to streams, provides a filter strip for nutrients within runoff waters, provides overhanging vegetation for stream habitat, provides a source of woody debris, stabilizes stream banks against erosion and determines the availability of sufficient stream canopy cover for temperature regulation. Twenty four survey locations were assessed, resulting in 96 observations of riparian vegetation width recorded. Most of the observations fell into two of the four width categories: 53% had less than 10 feet and 32% had between 10 and 30 feet. Only 6% and 8% of the sites had either 30 to 100 feet or over 100 feet of riparian vegetation. Although most sites had little riparian vegetation most common type of vegetation was trees (48%) followed by grasses (35%) and shrubs (16%). Trees benefit the stream by being able to provide more shade than either grasses or shrubs.

The streamside land cover, estimated bank erosion and percent stream canopy were evaluated at each of the 24 survey locations for both the upstream and downstream stretches. In all, 48 observations were made for each of the above listed characteristics. Although most sites had little riparian vegetation most common type of vegetation was trees (48%) followed by grasses (35%) and shrubs (16%). Trees benefit the stream by being able to provide more shade than either grasses or shrubs. In general, vegetation such as grasses and shrubs and residential and agricultural land uses, are associated with narrow riparian widths. More extensive riparian vegetation is usually associated with forests and old fields. Overall erosion of the banks was not a major problem in the East Branch Creek Watershed with approximately 92% of the sites described as having none or low bank erosion. Refer to Table 3, in Attachment B for the distribution of riparian width and vegetation observations made for both the right and left bank at each survey location.

Stream canopy cover is important for providing shade and maintaining cool temperatures within the stream. Cooler temperatures also help keep dissolved oxygen levels from depleting, an important habitat requirement for many fish species and other aquatic organisms. Of the 24 sites assessed, 33% had less than 25% cover, 25% had between 25 and 50% cover and 40% had over 50% cover.

Adjacent Land Uses

Adjacent land uses were recorded at each survey location for both the upstream and downstream stretches as well as both the right and left banks. Because the entire section of stream that can be seen from the road crossing is evaluated, multiple land uses can be recorded for each site. Land uses within the watershed play an important role in nutrient input, erosion, and in-stream conditions that affect water quality, quantity and habitat. Refer to Attachment B, Table 4 and Figure 7 for a summary of all the adjacent land uses recorded within the watershed. The most common adjacent land uses were maintained lawn, forest and shrub/old field followed by a lesser number of observations for pasture, cropland, impervious surfaces, and disturbed ground.

Potential pathways of non-point source pollution

During the completion of the road stream crossing surveys, field staff also evaluated the *potential* for non point source pollution. This assessment focuses on the severity of *potential* pollutant *inputs*, not pollutant *impacts*. As part of this evaluation process field staff look for 1.) a possible pollutant source, 2.) a potential pathway to the waterbody and 3.) potential severity of the input. Because each potential source was given a ranking of slight, moderate and high for severity, the values recorded were weighted before they were summed for each category (Refer to Figure 8, Attachment B). Observations recorded as slight were considered to be the basis for comparison, therefore observations recorded as moderate were multiplied by 1.5 and observations recorded as high were multiplied by 2. Potential non point source pollution from transportation and urban residential runoff were the most serious while crop and grazing related sources, golf courses and hydrology were also considered potential sources of NPS pollution. Refer to Table 5 in Attachment B for a summary of the non point source pollution observations identified for each survey location.

RESULTS

Western Upper Subwatershed (Westernmost Tributary of East Branch Creek)

The western upper portion of the East Branch Creek watershed originates in the agricultural fields south of Riley Street and north of Byron Road in southeast Ottawa County. It converges with East Branch Creek just north of Jackson Street. Five survey locations were evaluated on this unnamed tributary and are denoted by WUEB prefixes. The land use in this area is dominated by agriculture use and low density residential. Refer to Attachment C for site photos and to Attachment D for site survey forms. The following conditions and comments were recorded on the survey forms:

WUEB-01: Riley Street east of 24th Avenue

Water temperature was ~57°F. Silt, detritus and muck dominated the upstream substrate, while sand and silt were present downstream. Only overhanging vegetation was available for in-stream cover. No aquatic plants, floating algae, filamentous algae, turbidity, bacterial sheen/slime, oil sheen, foam or trash was observed. Little riparian vegetation (less than 10 feet) was observed which consisted of grasses. Adjacent land uses consist of maintained lawn both upstream and downstream. Potential non point source pollution (NPS) was categorized as high for urban residential runoff and slight for transportation. Comments were*: Needs more riparian buffer.*

WUEB-02: Greenley west of 16th

Water temperature was ~57°F. Silt, detritus and muck appeared to dominate the substrate with lesser amounts of sand and gravel also present. Overhanging vegetation and some woody debris was available for in-stream cover. No aquatic plants, floating algae, filamentous algae, turbidity, bacterial sheen/slime, oil sheen, foam or trash was observed. Abundant

riparian vegetation (more than 100 ft) was observed on the upstream side which consisted of shrubs and small trees. Riparian vegetation was varied on the downstream side and ranged from less than 10 feet (ft) on the left bank to between 30 and 100 ft on the right bank. Vegetation consisted of grasses. Adjacent land uses included shrub/old field (downstream), forest (upstream), and maintained lawn (both upstream and downstream). Potential NPS was categorized as moderate for urban residential runoff, and slight for transportation. Comments were*: Overall looks good although landowner mows right up to the edge on the downstream side.*

WUEB-03: Quincy east of 16th Avenue

Water temperature was ~46°F. Sand appeared to dominate the substrate with lesser amounts of silt also present. Overhanging vegetation and some woody debris was available for in-stream cover. Some turbidity and trash (only upstream) were observed. A moderate amount of riparian vegetation (10 to 30 on the left bank and 30-100 ft on the right bank) was observed which consisted of shrubs and trees. Adjacent land uses included shrub/old field (upstream), forest (downstream) and maintained lawn (both upstream and downstream). Potential NPS was categorized as slight for transportation, urban residential runoff and streambank erosion. Comments were*: No specific comments were recorded for this site.*

WUEB-04: Greenley east of 16th Avenue

Water temperature was ~56°F. Due to level of turbidity, water depth and overhanging vegetation, substrate observations were prohibited. In addition to the overhanging vegetation, some woody debris was also available for in-stream cover. Aquatic plants were observed both upstream and downstream while floating algae and turbidity were observed only upstream. Moderate to abundant riparian vegetation (from 30 ft to more than 100 ft) was observed downstream while little riparian vegetation (less than 10 ft) was observed upstream. Vegetation consisted of shrubs and trees. Adjacent land uses included forest (both upstream and downstream) and maintained lawn (upstream). Potential NPS was categorized as slight for transportation, urban residential runoff and upstream impoundment. Comments were*: Impoundment has been installed near culvert forcing water to pool on upstream side.*

WUEB-05: Ransom east of 8th Avenue

Water temperature was not collected at this site. Although substrate observations were prohibited on the downstream side, a mix of sand, silt, and gravel made up the substrate on the upstream side. Only overhanging vegetation was available for in-stream cover. Some turbidity and foam was observed both upstream and downstream. In general, little riparian vegetation (less than 10 ft) was observed both upstream and downstream, which

consisted of shrubs and trees. Adjacent land uses included shrub/old field, impervious surfaces and disturbed ground upstream, as well as pasture and maintained lawn downstream. Potential NPS was categorized as slight for grazing related activities, transportation, urban residential runoff, channelization and road/bridge construction. Comments were*: Area undergoing bridge construction for new highway, streambanks just upstream from road are completely concrete riprap.*

The majority of the impacts to the stream in this area seem to result from little riparian vegetation, road stream crossings, adjoining maintained lawns and new highway construction. In a few areas possible nutrient runoff from adjoining crops and cattle impacts from pasture could also potentially impact the stream. The impoundment at Greenley (WUEB-04) has the potential to block fish passage and also allow water to be heated during the summer months.

Central Upper Subwatershed (Central tributary of East Branch Creek)

The central unnamed tributary to East Branch straddles the Ottawa/Kent County border and originates in the area north of Perry Street and east of 16th Avenue. It drains heavily agricultural areas with low to moderate density residential use. Ten survey locations were completed along this tributary and are denoted by CUEB prefixes. The following conditions and comments were recorded on the survey forms:

CUEB-01: 8th south of Byron Road

Water temperature was ~44°F. Both silt and sand substrate were found both upstream and downstream with lesser amounts of gravel also present downstream. Only overhanging vegetation was available for in-stream cover. Some aquatic plants and turbidity were observed upstream. Little riparian vegetation (less than 10 ft) was observed which consisted of grasses. Adjacent land uses included pasture (upstream) and impervious surfaces and maintained lawns (downstream). Potential NPS was categorized as moderate for grazing related activities and slight for transportation, urban residential runoff, streambank erosion and riparian vegetation removal. Comments were*: Stream impacted by grazing cattle with unrestricted access.*

CUEB-02: 84th east of Kenowa

Water temperature was ~44°F. Sand appeared to dominate both the upstream and downstream substrates with lesser amounts of silt and gravel also present. Only overhanging vegetation was available for in-stream cover. A small amount of trash was observed downstream. Riparian vegetation ranged from less than 10 ft to between 10 and 30 ft and consisted of shrubs and grasses. Adjacent land uses included impervious surfaces (downstream) and cropland (upstream and downstream). Potential NPS was categorized as moderate for crop related activities, and slight for transportation. Comments were*: Some gully erosion from road crossing evident although it is still vegetated.*

CUEB-03: Wilson north of 84th

Water temperature was ~46°F. Substrate was varied and consisted of silt, sand and gravel both upstream and downstream. Overhanging vegetation and some woody debris was available for in-stream cover. A small amount of foam was observed downstream. In general little riparian vegetation (less than 10 ft) was observed both upstream and downstream which consisted of shrubs and small trees. Adjacent land uses included shrub/old field, pasture, cropland, and impervious surfaces on the downstream side as well as maintained lawn both upstream and downstream. Potential NPS was categorized as slight for crop related activities, transportation and urban residential runoff. Comments were *No specific comments were recorded for this site.*

CUEB-04: Wilson north of 92nd

Water temperature was ~44°F. The upstream portion f the stream at this site was visible however the downstream side appeared to be piped underground and all that was visible was manhole cover. Although substrate observations were prohibited on the downstream side, silt, detritus and muck accounted for 100% of the substrate upstream. Overhanging vegetation and some woody debris was available for in-stream cover. No aquatic plants, floating algae, filamentous algae, turbidity, bacterial sheen/slime, oil sheen, foam or trash were observed. In general little riparian vegetation (less than 10 ft) was observed both upstream and downstream, which consisted of grasses and a few small trees. Adjacent land uses included pasture (downstream) and shrub/old field (both upstream and downstream). Potential NPS was categorized as slight for grazing related activities, transportation and urban residential runoff. Comments were*: Although nearby cows are fenced out there is little buffer, the culvert is very old and cracked and the downstream side is diverted into a drain.*

CUEB-05: 84th east of Wilson

Water temperature was ~46°F and silt, detritus and muck accounted for 100% of the substrate both upstream and downstream. Only overhanging vegetation was available for in-stream cover. Aquatic plants, turbidity and trash were observed. Little riparian vegetation (less than 10 ft) was observed upstream, which consisted of grasses. A moderate amount of riparian vegetation (10 to 30 ft) was observed downstream, which consisted of grasses as well. Adjacent land uses included cropland both upstream and downstream. Potential NPS was categorized as slight to high for crop related activities, moderate for channelization, and slight for transportation. Comments were*: Stream looks pretty heavily impacted by amount of sediment coming off upstream crops (which are currently bare soil).*

CUEB-06: Wilson south of 76th

Water temperature was ~47°F. Substrate was divided almost evenly between sand and gravel both upstream and downstream. Overhanging vegetation and some woody debris was available for in-stream cover. No aquatic plants, floating algae, filamentous algae, turbidity, bacterial sheen/slime, oil sheen, foam or trash were observed. Little riparian vegetation (less than 10 ft) was observed downstream while a moderate amount of riparian vegetation (10 to 30 ft) was observed upstream. Vegetation consisted of shrubs and trees. Adjacent land uses included shrub/old field and pasture upstream as well as maintained lawn both upstream and downstream. Potential NPS was categorized as slight to moderate for transportation, and slight for grazing related activities and urban residential runoff. Comments were*: Some gully erosion from road crossing although not severe.*

CUEB-07: 76th east of Kenowa

Water temperature was ~45°F. Substrate was divided almost evenly between sand and gravel both upstream and downstream. Overhanging vegetation and some woody debris was available for in-stream cover. A small amount of aquatic plants were observed upstream, while an abundant amount of trash was observed downstream. A moderate amount of riparian vegetation (10 to 30 ft upstream and 30-100 ft downstream) was observed which consisted of trees. Adjacent land uses included cropland (upstream) and forest (both upstream and downstream). Potential NPS was categorized as slight to moderate for transportation, and slight for hydrology and crop related activites. Comments were*: Lots of road runoff, especially on downstream side creating pool on the side of the culvert.*

CUEB-08: Quincy west of Kenowa

Water temperature was inadvertently not collected at this site. Sand appeared to dominate the substrate both upstream and downstream, however, lesser amounts of silt and gravel were also present. Only overhanging vegetation was available for in-stream cover. Some foam was observed upstream. In general, little riparian vegetation (less than 10 ft) was observed both upstream and downstream which consisted of grasses and a few trees. Adjacent land uses included shrub/old field (downstream), cropland (upstream), and maintained lawn (both upstream and downstream). Potential NPS was categorized as slight to high for urban residential runoff and slight for crop related activities, transportation and streambank erosion. Comments were*: Some evidence of bank erosion.*

CUEB-09: Ransom west of Kenowa

Water temperature was ~46°F. Sand appeared to dominate the substrate both upstream and downstream, however, lesser amounts of silt and gravel were also present. Only overhanging vegetation was available for in-stream cover. Some foam was observed upstream and downstream. In general, little riparian vegetation (less than 10 ft) was observed both upstream and downstream which consisted of grasses and a few trees. Adjacent land uses included shrub/old field, impervious surfaces and disturbed ground on the upstream side, as well as pasture and maintained lawn on the downstream side. Potential NPS was categorized as moderate for grazing related activities and slight for transportation and urban residential runoff. Comments were*: Site of engineered sand trap, adjacent pasture is fenced out.*

CUEB-10: Jackson east of 4th

Water temperature was ~36°F. Sand appeared to dominate the substrate both upstream and downstream, however, lesser amounts of silt and gravel were also present. Overhanging vegetation, undercut banks and woody debris were available for in-stream cover. Foam and trash were observed downstream. A moderate amount of riparian vegetation (10 to 30 ft) was observed both upstream and downstream, which consisted of mainly trees. Adjacent land uses included forest (upstream), shrub/old field (downstream) and maintained lawn (both upstream and downstream). Potential NPS was categorized as slight for transportation and urban residential runoff. Comments were*: No specific comments were recorded for this site.*

The majority of the impacts to the stream in this area seem to result from inadequate riparian buffers at some sites, grazing related activities and subsequent streambank erosion, nutrient and sediment runoff from cropland, and transportation non point source pollution. Many of the residential landowners near the road stream crossings surveyed appeared to have almost no buffer between their lawns and the stream. In addition, since a majority of the survey locations were not listed as having problems with erosion but a high amount of sand and silt dominated substrate was observed, runoff from agricultural fields and possibly gravel/sand roads could be contributing to the sediment load within the stream.

Eastern Upper Subwatershed (East Branch Creek headwaters)

The eastern upper subwatershed refers to the headwaters of the actual main channel of East Branch Creek (which originates near Byron Center) extending until the mouth of the two other major tributaries near Jackson Street. It drains heavily agricultural areas with low to moderate density residential us. Six survey locations were completed along this portion of East Branch Creek and are denoted by EUEB prefixes. The following conditions and comments were recorded on the survey forms:

EUEB-01: 76th east of Byron Center

Water temperature was ~50°F. Due to level of turbidity and water depth substrate observations were prohibited upstream however sand and gravel were observed upstream. Only overhanging vegetation was available for in-stream cover. Some foam was observed downstream. In general little riparian vegetation (less than 10 ft) was observed both upstream and downstream, which consisted of grasses and shrubs. Adjacent land uses included shrub/old field (upstream) and maintained lawn (both upstream and downstream). Potential NPS was categorized as slight to moderate for urban residential runoff and slight for transportation. Comments were*: Needs more riparian buffer between stream and highly fertilized lawns.*

EUEB-02: 76th west of Byron Center

Water temperature was ~48°F. Due to level of turbidity substrate observations were prohibited. Overhanging vegetation and some woody debris was available for in-stream cover. Abundant turbidity was observed both upstream and downstream. Little riparian vegetation (less than 10 ft) was observed which consisted of grasses. Adjacent land uses included impervious surfaces (downstream) and maintained lawn (both upstream and downstream). Potential NPS was categorized as high for golf courses, slight to moderate for urban residential runoff and slight for transportation. Comments were*: Stream flows through golf course, barely any buffer.*

EUEB-03: 72nd west of Byron Center

Water temperature was ~48°F. Substrate was varied and consisted of mostly silt and sand with lesser amounts of gravel also present. Overhanging vegetation, undercut banks and woody debris were available for in-stream cover. Some turbidity and trash were observed both upstream and downstream. Little riparian vegetation (less than 10 ft) was observed both upstream and downstream, which consisted of grasses and scattered trees. Adjacent land uses included pasture (upstream) and maintained lawn (both upstream and downstream). Potential NPS was categorized as slight to moderate for urban residential runoff and slight for transportation. Comments were*: No specific comments were recorded for this site.*

EUEB-04: 64th east of Ivanrest

Water temperature was ~48°F. Substrate was varied and consisted of mostly silt and sand with lesser amounts of gravel also present. Overhanging vegetation, undercut banks and woody debris were available for in-stream cover. Only turbidity was observed upstream. Little riparian vegetation (less than 10 ft) was observed on the left banks, while a moderate amount of riparian vegetation (10 to 100 ft) was observed on the right bank. Vegetation consisted of grasses and trees. Adjacent land uses included shrub/old field (downstream) and maintained lawn (both upstream and downstream).

Potential NPS was categorized as slight to moderate for urban residential runoff and slight for transportation and hydrology. Comments were*: Looks like there could be a slight hydrology issue due to large deposits of sand on the inside of bends.*

EUEB-05: Wilson north of 64th

Water temperature was ~40°F. Sand appeared to dominate the substrate with a lesser amount of silt also present. Overhanging vegetation and some woody debris was available for in-stream cover. No aquatic plants, floating algae, filamentous algae, turbidity, bacterial sheen/slime, oil sheen, foam or trash was observed. Abundant riparian vegetation (more than 100 ft) was observed both upstream and downstream, which consisted of grasses and trees. Adjacent land uses included shrub/old field (upstream) and forest (downstream). Potential NPS was categorized as slight for transportation and hydrology. Comments were*: Poor alignment of culvert is causing some erosion problems.*

EUEB-06: Jackson west of Kenowa

Water temperature was ~36°F. Substrate was varied and consisted of mostly silt and sand with lesser amounts of gravel also present. Overhanging vegetation, undercut banks and woody debris were available for in-stream cover. Only turbidity was observed upstream. In general a moderate amount of riparian vegetation (10 to 30 ft) was observed upstream while very little riparian vegetation existed downstream. Vegetation consisted of grasses and trees. Adjacent land uses included forest and maintained lawn both upstream and downstream. Potential NPS was categorized as slight to moderate for urban residential runoff and slight for transportation. Comments were*: Very little riparian buffer on downstream side.*

Although grazing and crop related activities are less of a concern in the Eastern Upper sub watershed, maintained lawns and impacts from urban residential runoff and golf courses remains important. A large amount of sand and silt dominated substrate as well as large amounts of sand noticeably deposited in stream bends indicates a potential hydrology problem whereby be storm flows are excessive and can significantly move sand within the stream and redeposit it downstream.

Lower Subwatershed (East Branch Creek until it converges with Rush Creek)

The lower East branch Creek subwatershed includes only the main channel of east Branch creek as it flows north to its convergence with Rush Creek north of Port Sheldon. The majority of the land use in this area is low to heavy density residential and commercial use. Three survey locations were completed along this reach and are denoted by the LEB prefix. The following conditions and comments were recorded on the survey forms:

LEB-01: Barry west of Kenowa

Water temperature was ~36°F. Sand appeared to dominate the substrate with lesser amounts of silt and gravel also present. Overhanging vegetation and undercut banks were available for in-stream cover. No aquatic plants, floating algae, filamentous algae, turbidity, bacterial sheen/slime, oil sheen, foam or trash was observed. In general a moderate amount of riparian vegetation (10 to 30 ft) was observed both upstream and downstream which consisted of shrubs and trees. Adjacent land uses included shrub/old field (upstream), impervious surfaces (downstream), and forest and maintained lawn (both upstream and downstream). Potential NPS was categorized as slight to moderate for urban residential runoff and slight for transportation. Comments were*: No specific comments were recorded for this site.*

LEB-02: 44th west of Kenowa

Water temperature was ~36°F. Silt and sand dominated the substrate with small amount of gravel also present. Only overhanging vegetation was available for in-stream cover. No aquatic plants, floating algae, filamentous algae, turbidity, bacterial sheen/slime, oil sheen, foam or trash was observed. In general a moderate amount of riparian vegetation (10 to 30 ft) was observed both upstream and downstream which consisted of shrubs and trees. Adjacent land uses included shrub/old field and maintained lawn both upstream and downstream. Potential NPS was categorized as slight to moderate for urban residential runoff and slight for transportation. Comments were*: No specific comments were recorded for this site.*

LEB-03: Port Sheldon

Water temperature was ~44°F. Due to level of turbulence on the upstream side, substrate observations were prohibited. However, silt and sand appeared to dominate the downstream substrate with lesser amounts of gravel also present. Overhanging vegetation, boulders and woody debris were available for in-stream cover. No aquatic plants, floating algae, filamentous algae, turbidity, bacterial sheen/slime, oil sheen, foam or trash was observed. In general little riparian vegetation (less than 10 ft) was observed both upstream and downstream which consisted of grasses and trees. Adjacent land uses included forest (downstream) and maintained lawn (both upstream and downstream). Potential NPS was categorized as moderate for hydrology and slight for transportation and urban residential runoff. Comments were*:*

Talked to adjacent landowner who informed us about frequent flooding during increased stormflow.

The lower portion of East Branch Creek is impacted by little riparian vegetation in some areas and impact from increased flows from increasingly urbanized areas within the watershed. One adjoining landowner that was interviewed along the lower East Branch indicated a problem with flooding that has increasingly gotten worse over the years. These concerns were corroborated by the watershed survey which indicated turbid conditions, evidence of streambank erosion and substrate dominated by silt and sand.

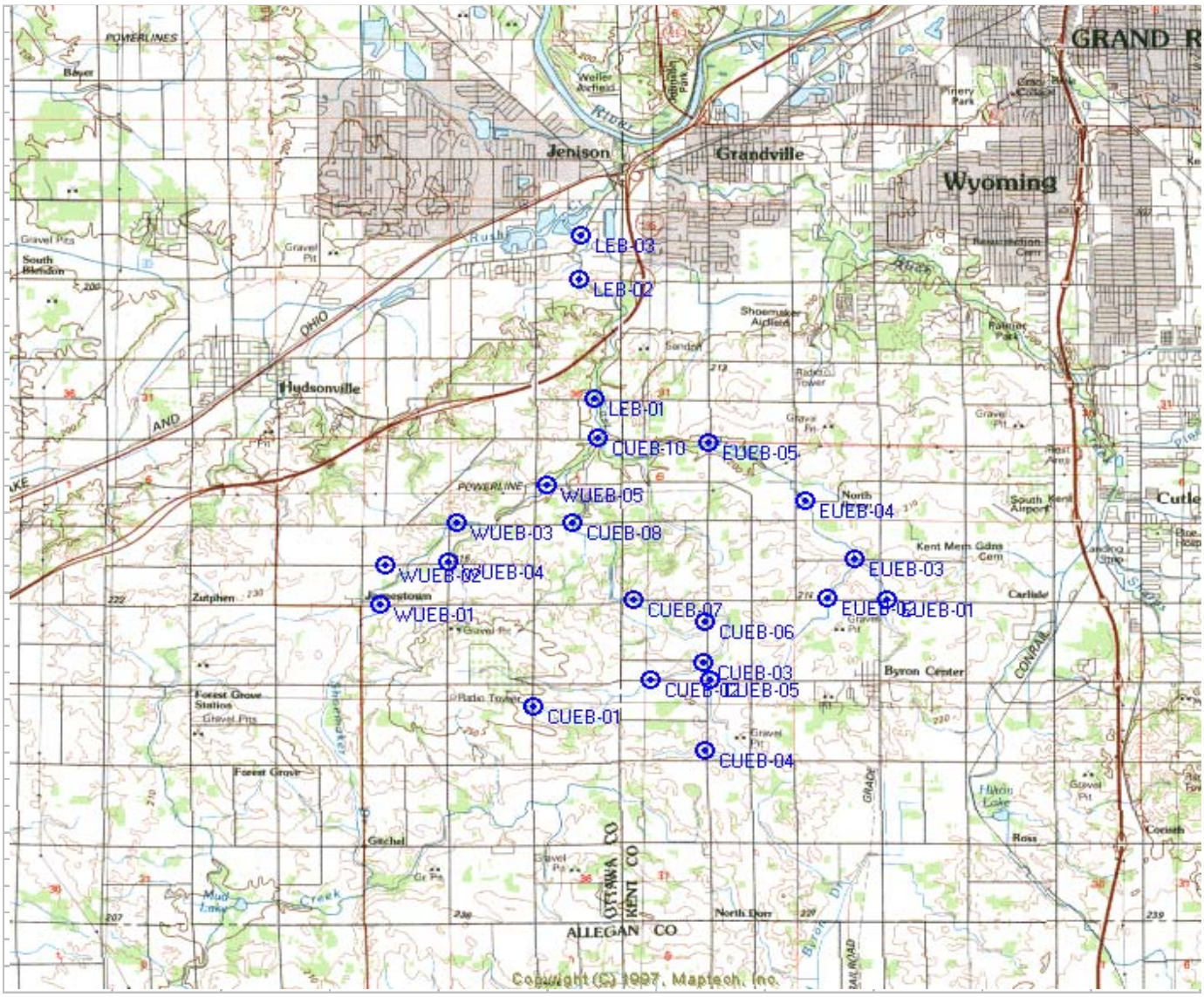
Attachment A

Road Stream Crossing Inventory and Site Maps

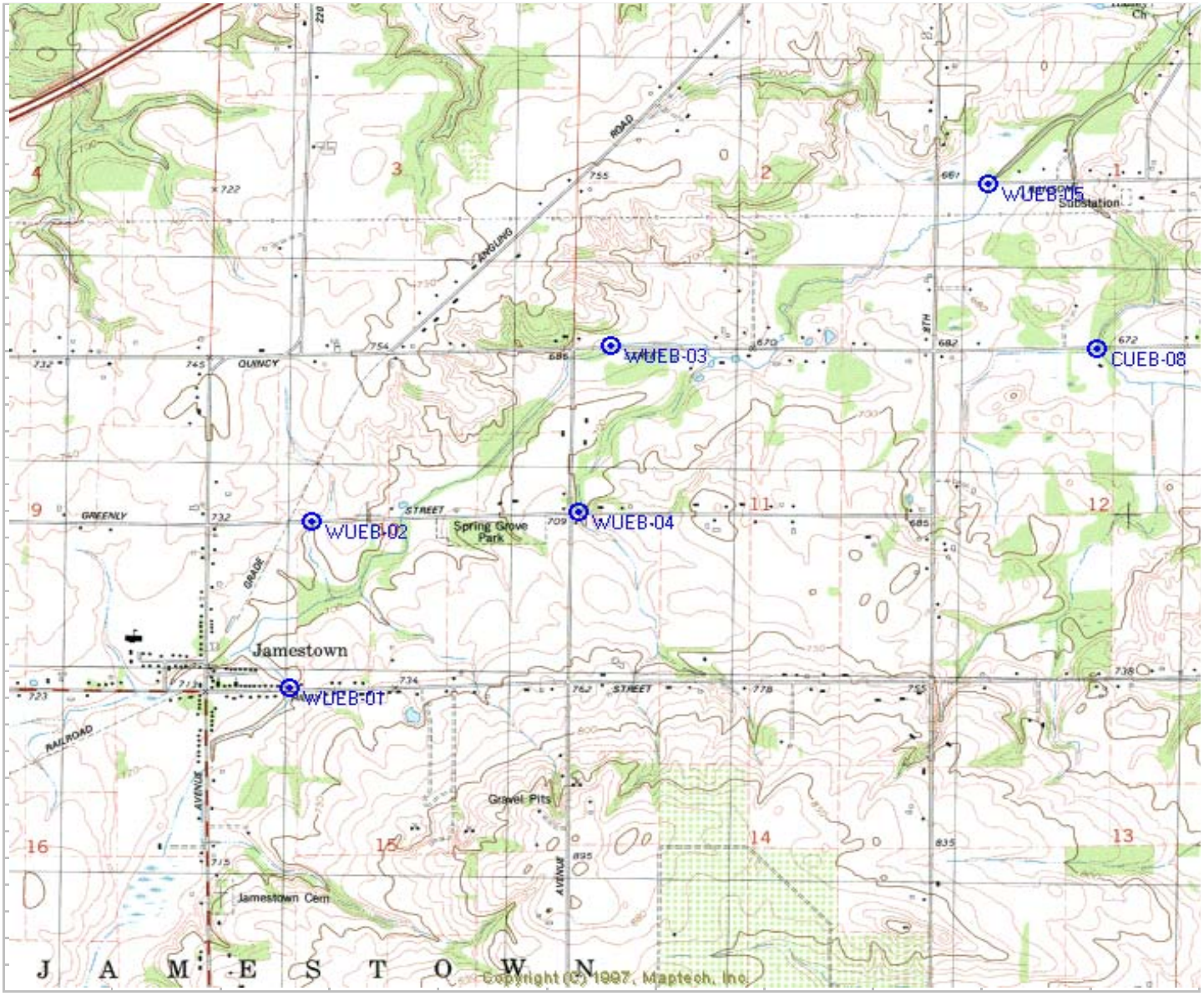
Road Stream Crossing Inventory for East Branch Creek 2003

Count	Site ID	Sub-Watershed Name	Location	Township/County	Stream Name	Inventory Date
1	WUEB-01	Western Upper East Branch	Riley Street east of 24th Avenue	Jamestown/Ottawa	Unnamed Tributary to East Branch	10/31/2003
2	WUEB-02	Western Upper East Branch	Greenley west of 16th Avenue	Jamestown/Ottawa	Unnamed Tributary to East Branch	10/31/2003
3	WUEB-03	Western Upper East Branch	Quincy east of 16th Avenue	Jamestown/Ottawa	Unnamed Tributary to East Branch	11/21/2003
4	WUEB-04	Western Upper East Branch	Greenley east of 16th Avenue	Jamestown/Ottawa	Unnamed Tributary to East Branch	10/31/2003
5	WUEB-05	Western Upper East Branch	Ransom east of 8th Avenue	Jamestown/Ottawa	Unnamed Tributary to East Branch	11/21/2003
6	CUEB-01	Central Upper East Branch	8th south of Byron Road	Jamestown/Ottawa	Unnamed Tributary to East Branch	11/21/2003
7	CUEB-02	Central Upper East Branch	84th east of Kenowa	Byron/Kent	Unnamed Tributary to East Branch	11/21/2003
8	CUEB-03	Central Upper East Branch	Wilson north of 84th	Byron/Kent	Unnamed Tributary to East Branch	11/21/2003
9	CUEB-04	Central Upper East Branch	Wilson north of 92nd	Byron/Kent	Unnamed Tributary to East Branch	11/21/2003
10	CUEB-05	Central Upper East Branch	84th east of Wilson	Byron/Kent	Unnamed Tributary to East Branch	11/21/2003
11	CUEB-06	Central Upper East Branch	Wilson south of 76th	Byron/Kent	Unnamed Tributary to East Branch	11/21/2003
12	CUEB-07	Central Upper East Branch	76th east of Kenowa	Byron/Kent	Unnamed Tributary to East Branch	11/21/2003
13	CUEB-08	Central Upper East Branch	Quincy west of Kenowa	Jamestown/Ottawa	Unnamed Tributary to East Branch	11/21/2003
14	CUEB-09	Central Upper East Branch	Ransom west of Kenowa	Jamestown/Ottawa	Unnamed Tributary to East Branch	11/21/2003
15	CUEB-10	Central Upper East Branch	Jackson east of 4th	Jamestown/Ottawa	Unnamed Tributary to East Branch	12/5/2003
16	EUEB-01	Eastern Upper East Branch	76th east of Byron Center	Byron/Kent	East Branch (Dorr & Byron Drain)	11/21/2003
17	EUEB-02	Eastern Upper East Branch	76th west of Byron Center	Byron/Kent	East Branch (Dorr & Byron Drain)	11/21/2003
18	EUEB-03	Eastern Upper East Branch	72nd west of Byron Center	Byron/Kent	East Branch (Dorr & Byron Drain)	11/21/2003
19	EUEB-04	Eastern Upper East Branch	64th east of Ivanrest	Byron/Kent	East Branch (Dorr & Byron Drain)	11/21/2003
20	EUEB-05	Eastern Upper East Branch	Wilson north of 64th	Wyoming/Kent	East Branch (Dorr & Byron Drain)	12/5/2003
21	EUEB-06	Eastern Upper East Branch	Jackson west of Kenowa	Jamestown/Ottawa	East Branch (Dorr & Byron Drain)	12/5/2003
22	LEB-01	Lower East Branch	Barry west of Kenowa	Georgetown/Ottawa	East Branch	12/5/2003
23	LEB-02	Lower East Branch	44th west of Kenowa	Georgetown/Ottawa	East Branch	12/5/2003
24	LEB-03	Lower East Branch	Port Sheldon	Georgetown/Ottawa	East Branch	12/5/2003

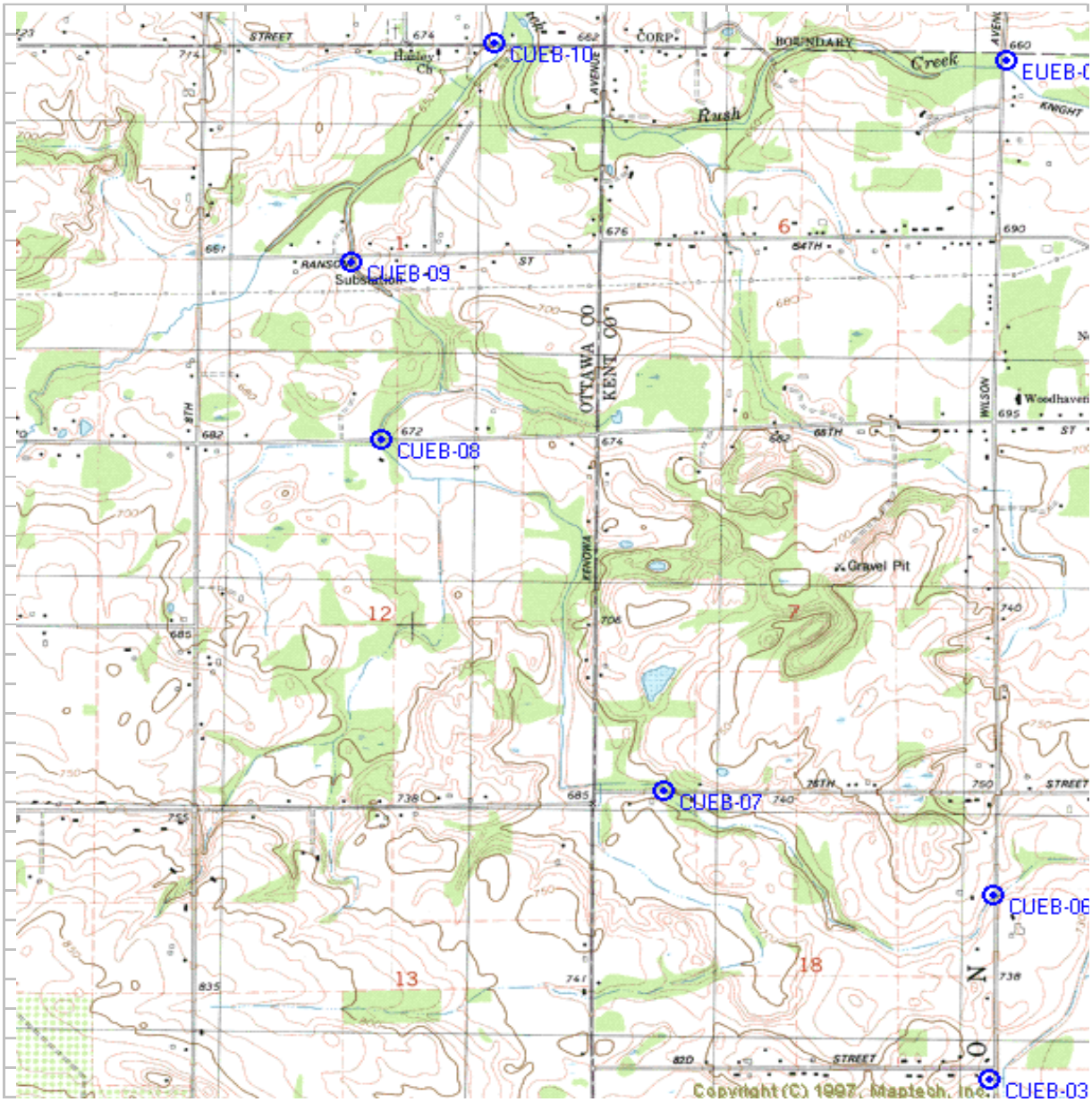
Road Stream Crossing Location Maps
Map 1: All East Branch Creek Stations



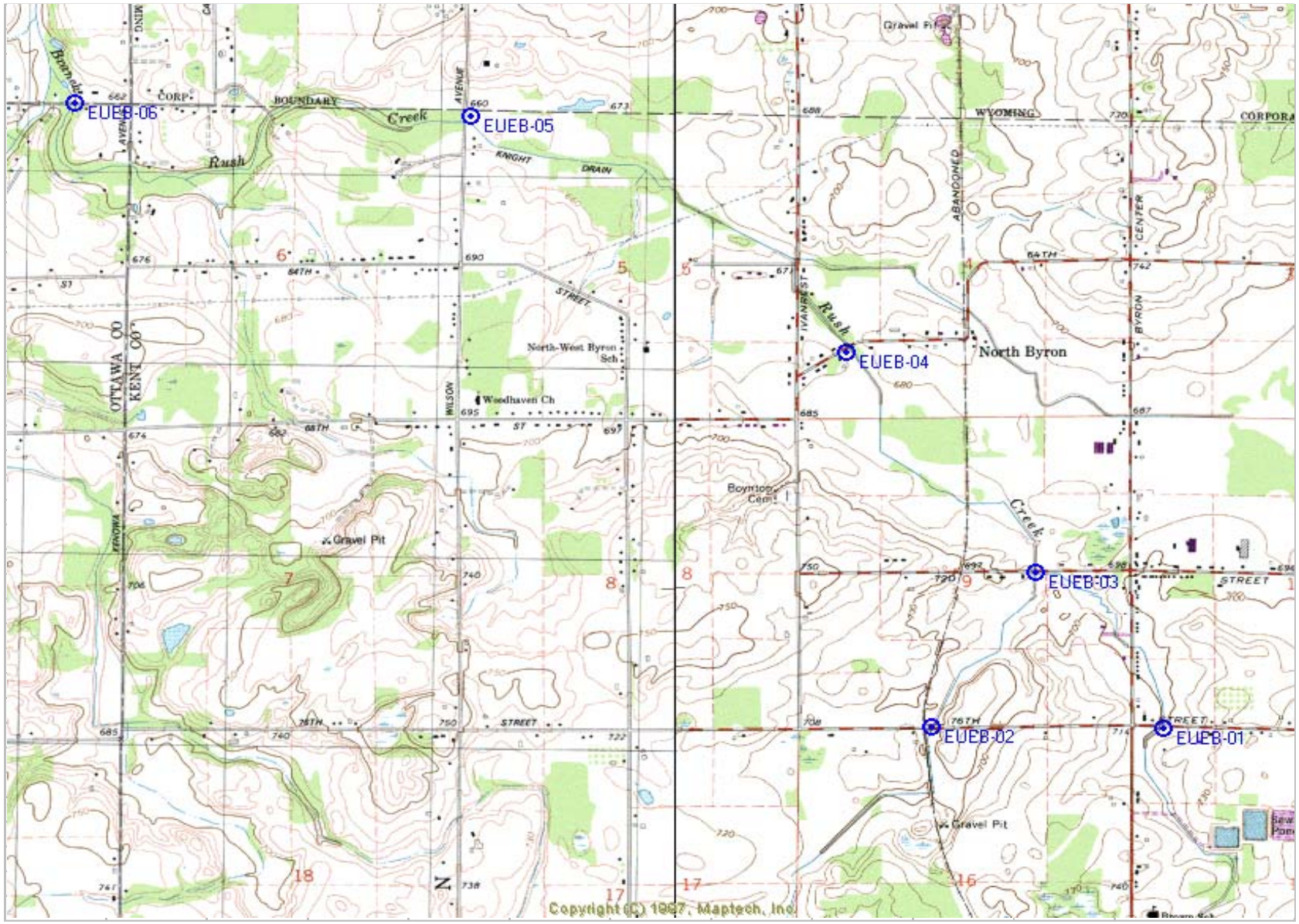
Map 2: Western Upper East Branch (WUEB) Stations



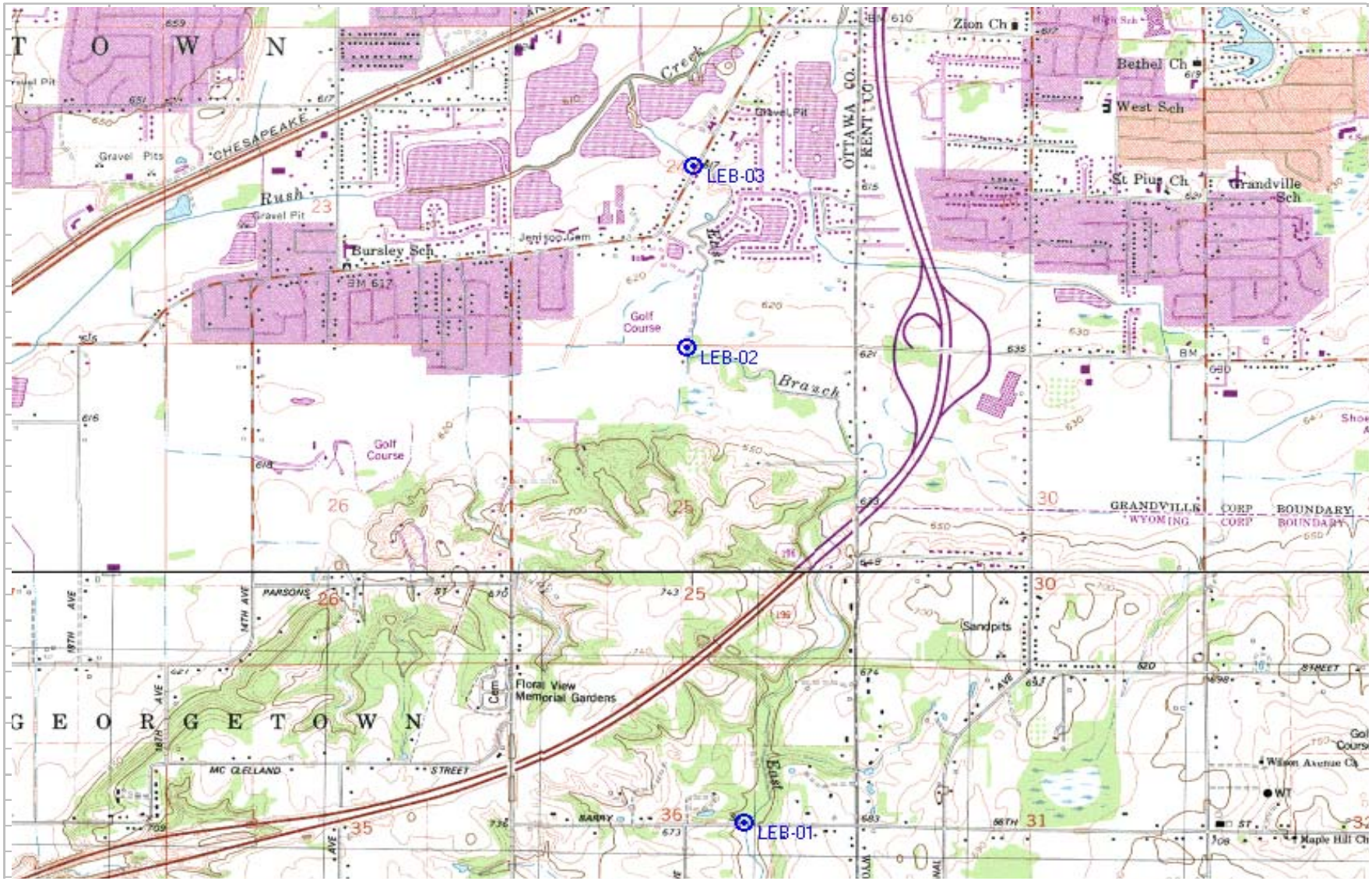
Map 3: Central Upper East Branch (CUEB) Stations



Map 4: Eastern Upper East Branch (EUEB) Stations



Map 5: Lower East Branch Creek (LEB) Stations



Attachment B

Figures and Tables

Figure 1. Temperature and pH summary for the East Branch Creek Watershed

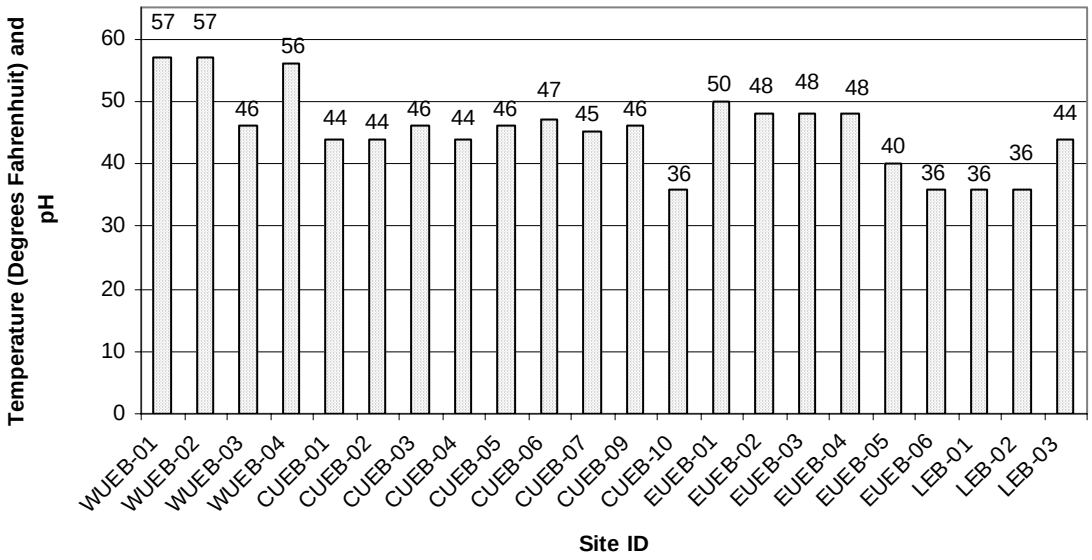


Figure 2. Temperature and pH summary for the mainstem sample locations from the headwaters to the mouth of East Branch Creek

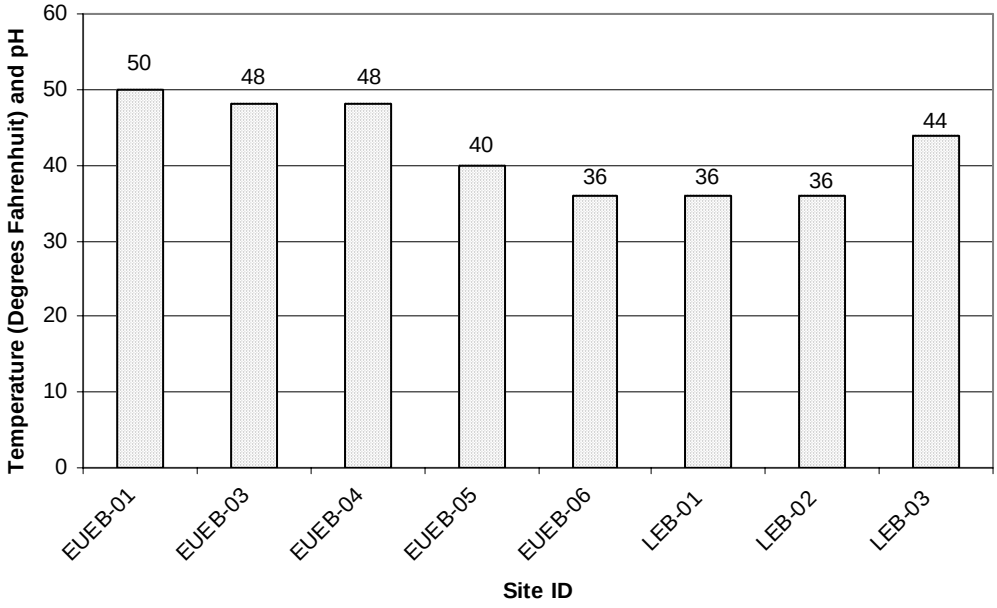


Figure 3. Percent substrate observations for each sample location in the Western Upper Subwatershed

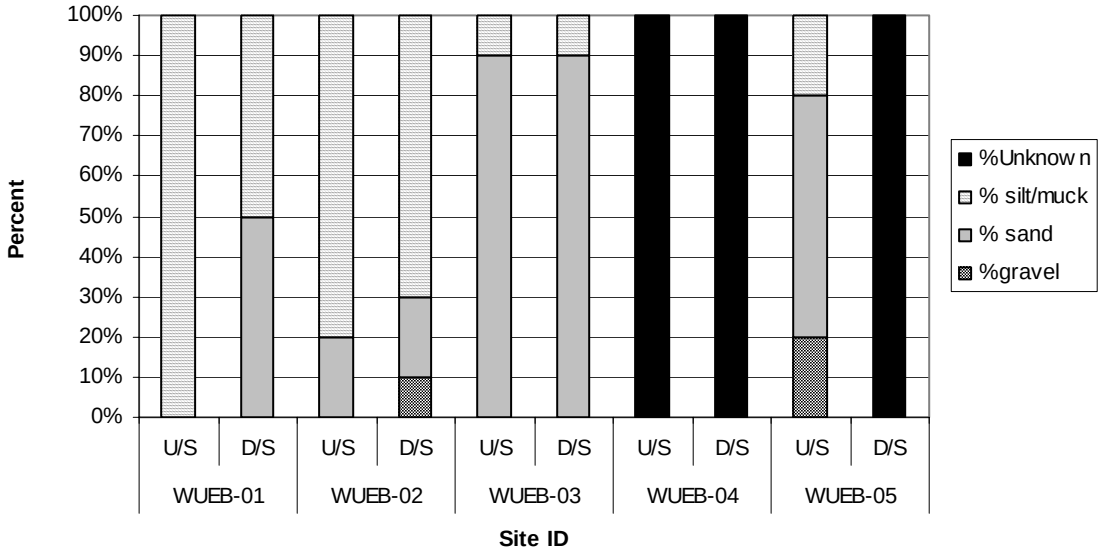


Figure 4. Percent substrate observations for each sample location in the Central Upper Subwatershed

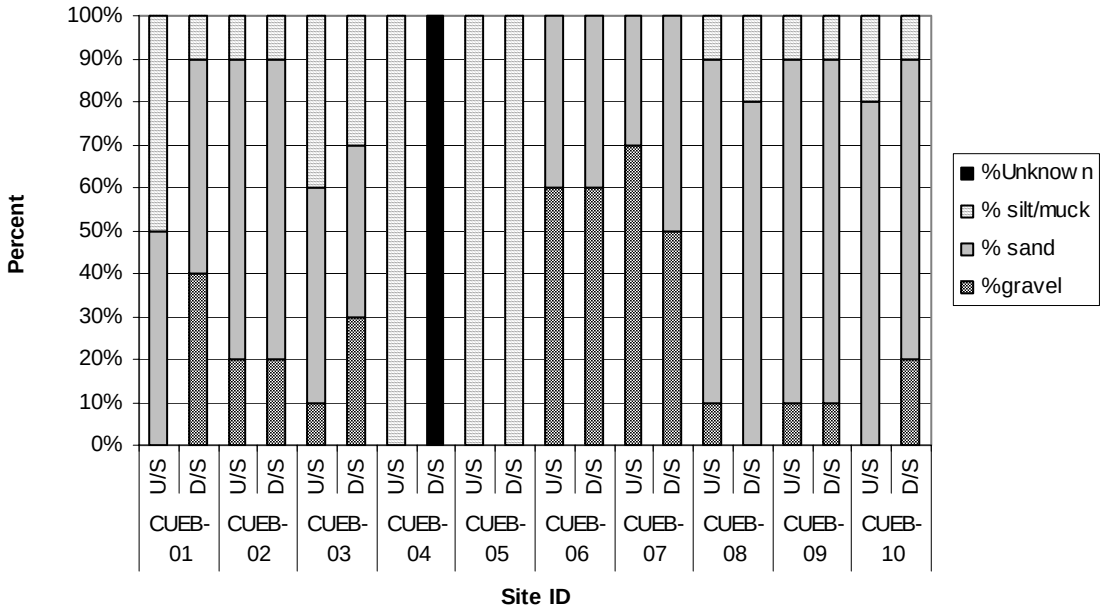


Figure 5. Percent substrate observations for each sample location in the Eastern Upper and Lower subwatersheds

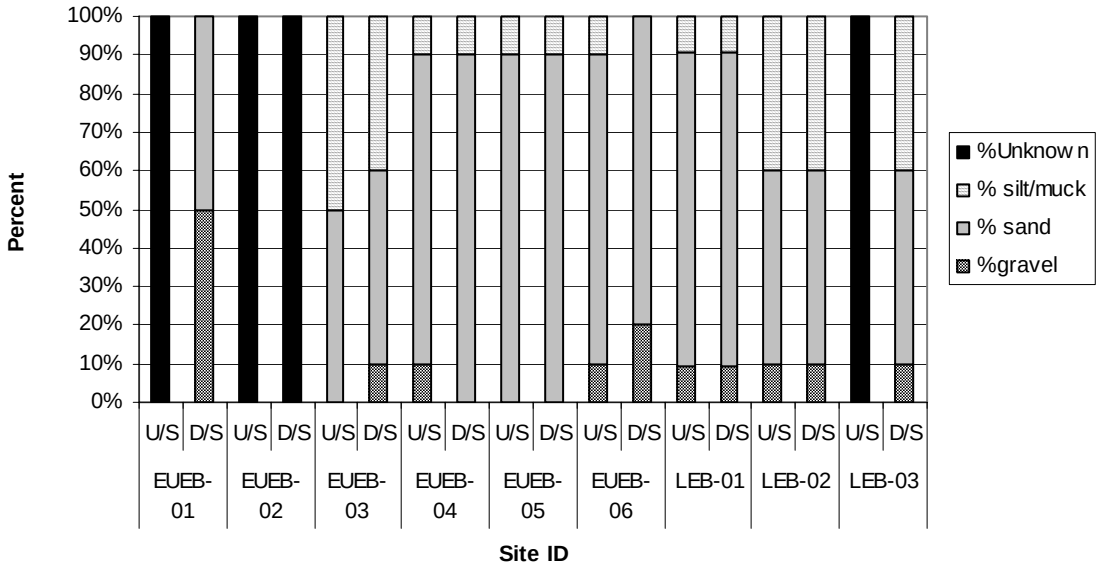


Figure 6. Percent substrate observation for the mainstem sample locations from the headwaters to the mouth of East Branch Creek

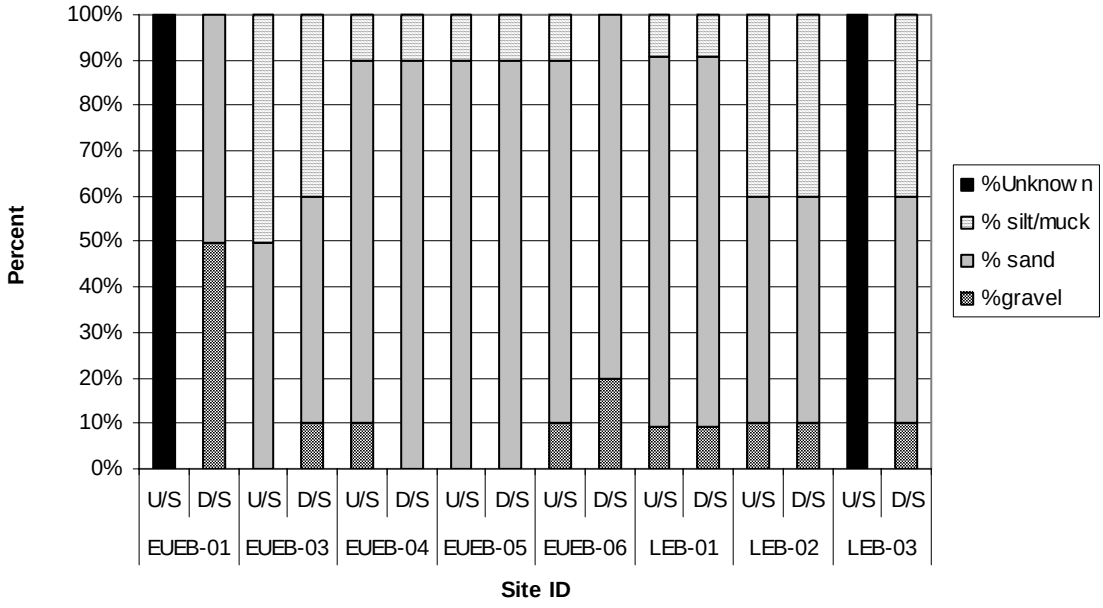


Figure 7. Summary of adjacent land uses

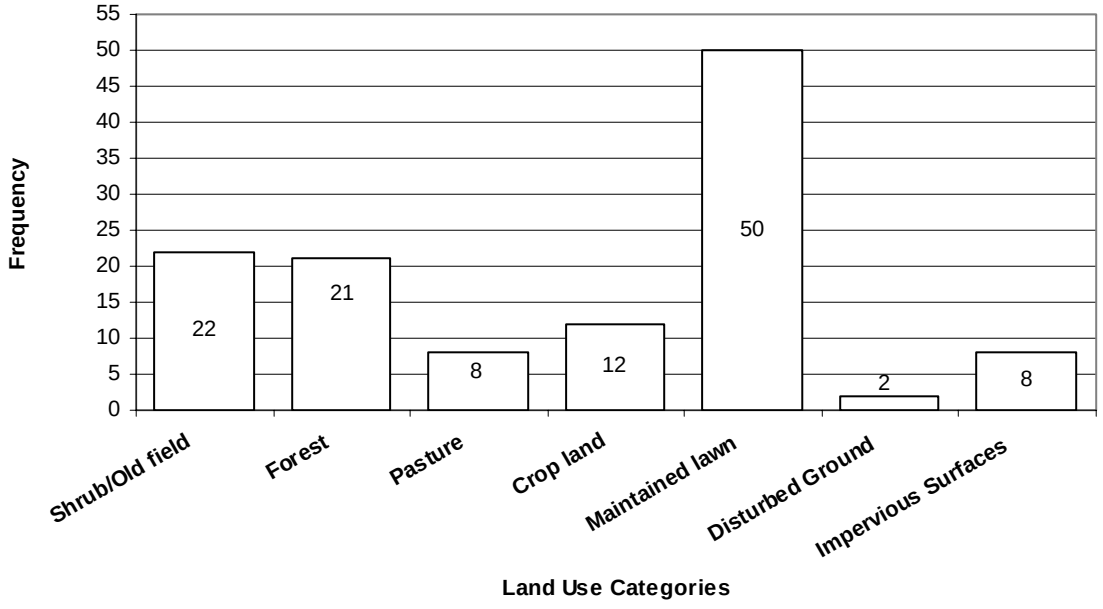


Figure 8. Weighted values for possible sources of non point source pollution (cumulative score for all locations)

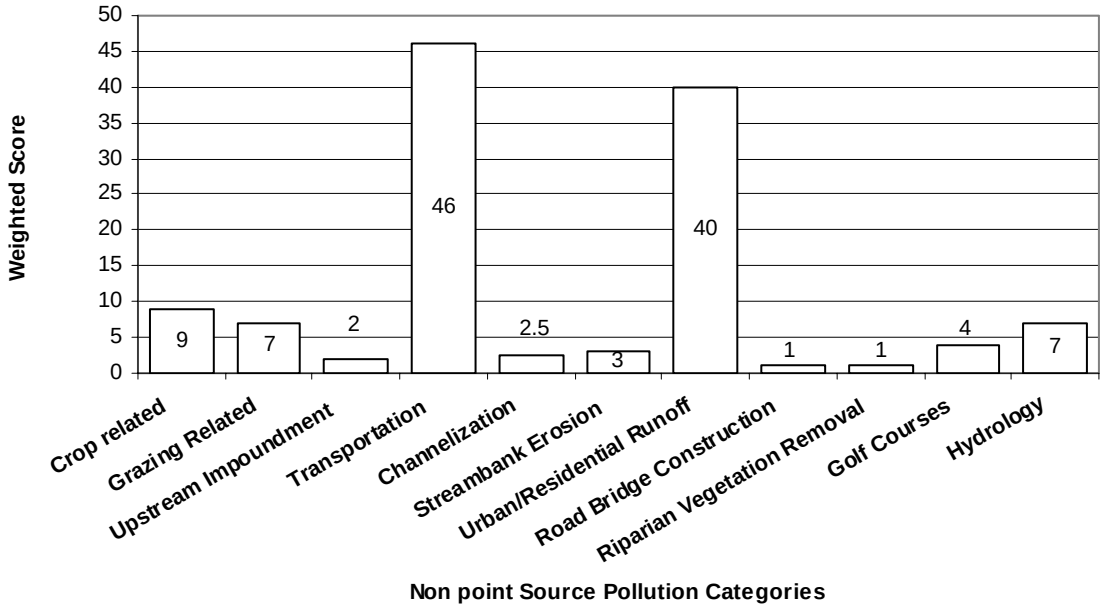


Table 1. Summary of Observations made for in-stream habitat and cover

SITE ID		Undercut Banks	Overhanging Vegetation	Deep Pools	Boulders	Aquatic Plant Cover	Logs/Woody Debris
WUEB-01	U/S		X				
	D/S		X				
WUEB-02	U/S		X				X
	D/S		X				
WUEB-03	U/S		X				
	D/S		X				X
WUEB-04	U/S						
	D/S		X				X
WUEB-05	U/S		X				
	D/S		X				
CUEB-01	U/S						
	D/S		X				
CUEB-02	U/S		X				
	D/S						
CUEB-03	U/S		X				X
	D/S						
CUEB-04	U/S		X				X
	D/S						
CUEB-05	U/S		X				
	D/S		X				
CUEB-06	U/S		X				
	D/S		X				X
CUEB-07	U/S		X				X
	D/S		X				
CUEB-08	U/S						
	D/S		X				
CUEB-09	U/S						
	D/S		X				
CUEB-10	U/S		X				X
	D/S	X	X				X
EUEB-01	U/S						
	D/S		X				
EUEB-02	U/S						
	D/S		X				X
EUEB-03	U/S	X	X				X
	D/S						
EUEB-04	U/S	X	X				
	D/S	X	X				X

Table 1. continued

SITE ID		Undercut Banks	Overhanging Vegetation	Deep Pools	Boulders	Aquatic Plant Cover	Logs/Woody Debris
EUEB-05	U/S		X				
	D/S		X				X
EUEB-06	U/S		X				X
	D/S	X					
LEB-01	U/S	X	X				
	D/S	X	X				
LEB-02	U/S		X				
	D/S		X				
LEB-03	U/S						X
	D/S		X		X		

U/S= upstream direction
D/S= downstream direction

X denotes presence but does not indicate abundance

Table 2. Summary of Observations made for in-stream physical appearance

SITE ID		Aquatic Plants	Floating Algae	Filamentous Algae	Turbidity	Bacterial Sheen	Foam	Trash
WUEB-01	U/S							
	D/S							
WUEB-02	U/S							
	D/S							
WUEB-03	U/S				P			P
	D/S				P			
WUEB-04	U/S	P	P		P			
	D/S	P						
WUEB-05	U/S				P		P	
	D/S				P		P	
CUEB-01	U/S	P			P			
	D/S							
CUEB-02	U/S							
	D/S							P
CUEB-03	U/S							
	D/S						P	
CUEB-04	U/S							
	D/S							
CUEB-05	U/S	P			P			P
	D/S	P			P			
CUEB-06	U/S							
	D/S							
CUEB-07	U/S	P						
	D/S							A
CUEB-08	U/S						P	
	D/S							
CUEB-09	U/S						P	
	D/S						P	
CUEB-10	U/S							
	D/S						P	P
EUEB-01	U/S							
	D/S						P	
EUEB-02	U/S				A			
	D/S				A			
EUEB-03	U/S				P			P
	D/S				P			P
EUEB-04	U/S				P			
	D/S							

Table 2. continued

SITE ID		Aquatic Plants	Floating Algae	Filamentous Algae	Turbidity	Bacterial Sheen	Foam	Trash
EUEB-05	U/S							
	D/S							
EUEB-06	U/S				P			
	D/S							
LEB-01	U/S							
	D/S							
LEB-02	U/S							
	D/S							
LEB-03	U/S							
	D/S							

U/S= upstream direction
D/S= downstream direction

A denotes abundance
P denoted
presence

Table 3. Summary of observations made for riparian vegetation width (in feet) and type

SITE ID		Left Bank				Right bank				Streamside land cover
		< 10	10-30	30-100	>100	< 10	10-30	30-100	>100	
WUEB-01	U/S	X				X				grasses
	D/S	X				X				grasses
WUEB-02	U/S				X				X	trees
	D/S	X						X		grasses
WUEB-03	U/S		X					X		shrubs
	D/S		X						X	trees
WUEB-04	U/S	X				X				trees
	D/S			X					X	trees
WUEB-05	U/S	X				X				shrubs
	D/S		X			X				trees
CUEB-01	U/S	X				X				grasses
	D/S	X				X				grasses
CUEB-02	U/S		X			X				grasses
	D/S	X					X			grasses
CUEB-03	U/S	X				X				trees
	D/S		X			X				trees
CUEB-04	U/S		X			X				grasses
	D/S	X				X				grasses
CUEB-05	U/S	X				X				grasses
	D/S		X				X			grasses
CUEB-06	U/S		X				X			shrubs
	D/S	X				X				trees
CUEB-07	U/S		X				X			trees
	D/S			X				X		trees
CUEB-08	U/S	X				X				grasses
	D/S	X					X			trees
CUEB-09	U/S	X				X				grasses
	D/S	X					X			trees
CUEB-10	U/S		X				X			trees
	D/S		X				X			trees
EUEB-01	U/S		X			X				shrubs
	D/S	X				X				grasses
EUEB-02	U/S	X				X				grasses
	D/S	X				X				shrubs
EUEB-03	U/S	X				X				trees
	D/S	X				X				grasses

Table 3. continued

SITE ID		Left Bank				Right bank				Streamside land cover
		< 10	10-30	30-100	>100	< 10	10-30	30-100	>100	
EUEB-04	U/S	X					X			trees
	D/S	X						X		trees
EUEB-05	U/S				X				X	grasses
	D/S				X				X	trees
EUEB-06	U/S		X				X			trees
	D/S		X			X				trees
LEB-01	U/S		X				X			shrubs
	D/S		X			X				trees
LEB-02	U/S		X				X			trees
	D/S		X			X				shrubs
LEB-03	U/S	X				X				trees
	D/S		X			X				shrubs

U/S= upstream direction
D/S= downstream direction

Table 4. Summary of adjacent land uses

Site ID		Shrub/Old field	Forest	Pasture	Crop land	Maintained lawn	Disturbed Ground	Impervious Surfaces
WUEB-01	U/S					B		
	D/S					B		
WUEB-02	U/S		B			L		
	D/S	R				L		
WUEB-03	U/S	B				R		
	D/S		B			L		
WUEB-04	U/S		R			L		
	D/S		B					
WUEB-05	U/S	L					R	B
	D/S			L		B		
CUEB-01	U/S			B				
	D/S					L		R
CUEB-02	U/S				B			
	D/S				B			R
CUEB-03	U/S					B		
	D/S	L			R	R		L
CUEB-04	U/S	L						
	D/S	B		R				
CUEB-05	U/S				B			
	D/S				B			
CUEB-06	U/S	R		L		R		
	D/S					B		
CUEB-07	U/S		B		L			
	D/S		B					
CUEB-08	U/S				B	B		
	D/S	B				B		
CUEB-09	U/S	R					L	L
	D/S			B		R		
CUEB-10	U/S		B			B		
	D/S	L				R		
EUEB-01	U/S	L				B		
	D/S					B		
EUEB-02	U/S					B		
	D/S					B		R

Table 4. continued

Site ID		Shrub/Old Field	Forest	Pasture	Crop land	Maintained Lawn	Disturbed Ground	Impervious Surfaces
EUEB-03	U/S			R		L		
	D/S					B		
EUEB-04	U/S					B		
	D/S	R				L		
EUEB-05	U/S	B						
	D/S		B					
EUEB-06	U/S		B			R		
	D/S		L			R		
LEB-01	U/S	L	R			B		
	D/S		L			R		L
LEB-02	U/S	B				R		
	D/S	B				R		
LEB-03	U/S					B		
	D/S		L			R		

U/S= upstream direction
D/S= downstream direction

R denotes the land use was located on the right bank
L denoted the land use was located on the left bank
B denoted the land use was located on both banks

Note: Right and left bank designations are always assigned looking downstream for each survey location.

Table 5. Summary of potential sources of non-point source pollution identified for each location

Site ID		Crop related	Grazing Related	Upstream Impoundment	Transportation	Channelization	Streambank Erosion	Urban/Residential Runoff	Road Bridge Construction	Riparian Vegetation Removal	Golf Courses	Hydrology
WUEB-01	U/S				S			H				
	D/S				S			H				
WUEB-02	U/S				S							
	D/S				S			M				
WUEB-03	U/S				S			S				
	D/S				S		S	S				
WUEB-04	U/S			S	S							
	D/S			S	S			S				
WUEB-05	U/S				S	S			S			
	D/S		S					S				
CUEB-01	U/S		M		S		S			S		
	D/S				S			S				
CUEB-02	U/S	M			S							
	D/S	M			S							
CUEB-03	U/S				S			S				
	D/S	S			S			S				
CUEB-04	U/S		S		S			S				
	D/S		S		S							
CUEB-05	U/S	H			S	M						
	D/S	S			S							
CUEB-06	U/S		S		M							
	D/S				S			S				
CUEB-07	U/S	S			S							
	D/S				M							S
CUEB-08	U/S	S			S			H				
	D/S				S		S	S				
CUEB-09	U/S				S							
	D/S		M		S			S				
CUEB-10	U/S				S			S				
	D/S				S			S				
EUEB-01	U/S				S			M				
	D/S				S			S				
EUEB-02	U/S							M			H	
	D/S				S			S			H	

Table 5. continued

Site ID		Crop related	Grazing Related	Upstream Impoundment	Transportation	Channelization	Streambank Erosion	Urban Residential Runoff	Road Bridge Construction	Riparian Vegetation Removal	Golf Courses	Hydrology
EUEB-03	U/S				S			S				
	D/S				S			M				
EUEB-04	U/S				S			M				S
	D/S				S			S				S
EUEB-05	U/S				S							
	D/S				S							S
EUEB-06	U/S				S			S				
	D/S				S			M				
LEB-01	U/S				S			S				
	D/S				S			M				
LEB-02	U/S				S			S				
	D/S				S			M				
LEB-03	U/S				S			S				M
	D/S				S			S				M

U/S= upstream direction
D/S= downstream
direction

S denotes the potential source was slight
M denotes the potential source was moderate
H denotes potential source was heavy

Note: Observations made in these categories indicate a potential for pollution from the source to occur not a confirmed source of pollution

Attachment C

Site Photographs
(refer to attached powerpoint file)