

SUMMARY OF BELLAMY CREEK WATERSHED ASSESSMENT IONIA, MICHIGAN

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INTRODUCTION

The Bellamy Creek watershed is located in the northwest quarter of Ionia County. DESCRIPTION: It originates south of Belding in a primarily agricultural area and flows southeast towards the Ionia and then joins the Grand River southwest of the city. The majority of the watershed drains a predominantly agricultural area with low density residential use and dispersed forests. Michigan Department of Environmental Quality (MDEQ) 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 Bellamy 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, 23 road/stream crossing locations were surveyed during the assessment of the Bellamy Creek Watershed. Refer to Attachment A, Road Stream Crossings Inventory for a summary of the survey locations conducted during September and October of 2004, 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 mouth to the headwaters.

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. This survey was conducted from the upstream to downstream direction and was completed in one day by two DEQ field staff. The right and left bank designations are 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 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. Refer to the DEQ's *Stream Crossing Watershed Survey Procedure* for further information and a complete description of the above conditions.

OBSERVATIONS

Water Temperature, pH, and Dissolved Oxygen

Survey locations were assessed in the order of upstream sites (in the headwaters) to downstream sites (towards the mouth). 23 locations, including eight along the main stem of Bellamy Creek, were measured for temperature, DO, and pH. pH values ranged from 6.97 to 8.22, which were not outside of the normal range for streams within Michigan. Overall the average temperature was 52.7°F, with most stations at either 53 or 54° 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 characteristic of 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. The average dissolved oxygen content is 6.19 ppm; it varies from 11.92 ppm at station BELM-21 to a measurement of 0.04 ppm at BELM-02 where there is very low flow. The dissolved oxygen requirement for native bass and crappie growth and well-being is 5 ppm and for trout it is at least 6 ppm. Given the relatively high average oxygen content, at most locations, Bellamy Creek is a comfortable

environment for aquatic life. Refer to Figure 1, which depicts the temperature, pH, and DO levels at main stem locations.

Substrate

Substrate was observed and quantified for both the upstream and downstream stretch at each survey location. In all, 46 substrate observations were recorded at 23 locations. Substrate type is important when considering habitat suitability for desired species within the system (i.e. trout and other fish species). Cobble and gravel substrate with a low degree of embeddedness are the most suitable for reproduction in many fish species and is important for macro invertebrates 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 Bellamy Creek Watershed, approximately 16% were dominated (50 to 100% covered) by sand, 30% were dominated silt, detritus or muck, and 13% were dominated by gravel. 53% of the sites were unable to be categorized due to turbidity or other factors (note: some sites had equal amounts of sand and silt). Refer to Figure 2 for a graph depicting the substrate composition for those survey locations located along the main channel of Bellamy 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 macro invertebrates and aquatic organisms such as amphibians and fish. Of the 46 observations made, 98% of the sites had overhanging vegetation and 52% of the sites had woody debris. Undercut banks, deep pools, boulders, and aquatic plant cover were each found in approximately 7%, 17%, 24, and 22% of the remaining sites respectively. Refer to Table 1 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, 46 sites were assessed for physical appearance; observations were recorded and rated as either present or abundant. No oil sheens were observed at any of the sites. There were a few instances each of foam, bacterial sheens, turbidity, trash, and floating algae, but they were all quite uncommon. Approximately 13% of the sites exhibited filamentous algae, and 39% of the sites had some aquatic plants (including duckweed). Refer to Table 2 for a summary of the physical appearance observations made for each survey location.

Stream Corridor

The width of riparian vegetation was assessed at each survey location for the 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. 23 survey locations were assessed, resulting in 92 observations of riparian vegetation width recorded. The observations fell almost evenly into all four width categories: 29% had less than 10 feet, 22% had between 10 and 30 feet, 15% had between 30 and 100 feet, and 34% had over 100 feet of riparian vegetation. The streamside land cover, estimated bank erosion and percent stream canopy were evaluated at each of the 23 survey locations for both the upstream and downstream stretches. In all, 46 observations were made for each of the above listed characteristics. Of the survey locations, 26% were recorded as having streamside land cover predominantly shrubs, 46% predominantly grasses, and 28% were dominated by trees. 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 a slight to moderate problem in the Bellamy Creek Watershed with approximately 11% of the sites described as having moderate bank erosion. Refer to Table 3 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 helps keep dissolved oxygen levels from depleting, an important habitat requirement for many fish species and other aquatic organisms. Of the 46 sites assessed, 52% had less than 25% cover, 33% had between 25 and 50% cover and 15% 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 3 for a summary of all the adjacent land uses recorded within the watershed. The most common adjacent land uses were shrub/old field, crop land, and forest followed by a lesser number of observations for pasture, impervious surfaces, maintained lawns, disturbed ground and wetlands.

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 4). 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, crop related sources and urban residential runoff were the most serious while streambank erosion, riparian vegetation, and grazing related sources were also considered common sources of NPS pollution. Refer to Table 5 for a summary of the non point source pollution observations identified for each survey location.

RESULTS

Bellamy Creek originates in the agricultural fields northwest of Ionia. Stations in along Bellamy Creek are denoted by BELM prefixes. The land use in this area is dominated by agriculture use with low density residential use and dispersed forest. 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:

BELM-01: Seely west of Chickering

Water temperature, pH, DO and substrate observations were prohibited. 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 were observed. Little to moderate riparian vegetation width was available. Grasses made up the land cover. Adjacent land uses included shrub/old field and cropland. Potential non point source pollution (NPS) was categorized as slight for transportation and moderate for crops and bank erosion. Comments were: *Low flow agricultural ditch; downstream has some stream bank erosion issues; not enough water to use meters.*

BELM-02: Jacoby west of Chickering

Water temperature was 53° F, pH was 6.97, and the DO was recorded as 0.04 ppm. Substrate observations were prohibited. Overhanging vegetation were 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 width was available. Grasses made up the land cover. Adjacent land uses included cropland and maintained lawn. Potential non point source pollution (NPS) was categorized as slight for urban/residential runoff and moderate for crops. Comments were: *Low flow ; agricultural ditch; quite large*

BELM-03: Johnson north of Woolridge

Water temperature was 55° F, pH was 7.31, and the DO was recorded as 2 ppm. Substrate observations were prohibited. Overhanging vegetation were available for in-stream cover. Some aquatic plants were observed. Moderate riparian vegetation width was available. Grasses made up the land cover. Adjacent land uses included shrub/old field and cropland. Potential non point source pollution (NPS) was categorized as slight for transportation, bank erosion, and crops upstream and moderate for crops downstream. Comments were: *Culvert downstream appears to be partially collapsed; some erosion has occurred as a result of the culverts failure*

BELM-04: Hawley north of Ellison

Water temperature was 54° F, pH was 7.21, and the DO was recorded as 0.07 ppm. Substrate observations were prohibited. Overhanging vegetation was available for in-stream cover. Some aquatic plants were observed. Little riparian vegetation width was available. Grasses made up the land cover. Adjacent land uses included pasture, cropland, and maintained lawn. Potential non point source pollution (NPS) was categorized as slight for transportation and grazing and moderate for crops. Comments were: *Low flow; agricultural ditch*

BELM-05: Johnson north of Bradford

Water temperature was 54° F, pH was 7.55, and the DO was recorded as 4.49 ppm. Substrate observations were prohibited. Overhanging vegetation and woody debris were available for in-stream cover. Abundant aquatic plants were observed. Moderate to abundant riparian vegetation width was available. Grasses made up the land cover. Adjacent land uses included shrub/old field, forest, cropland, and maintained lawn. Potential non point source pollution (NPS) was categorized as slight for urban/residential runoff. Comments were: *Low flow; abundance of duckweed downstream*

BELM-06: Ellison west of Johnson

Water temperature was 53° F, pH was 7.63, and the DO was recorded as 4.68 ppm. Silt, detritus, and muck appeared to dominate the substrate with lesser amounts of gravel also present. Overhanging vegetation, boulders, and aquatic plants were available for in-stream cover. Some filamentous algae were observed. Moderate to abundant riparian vegetation width was available. Grasses made up the land cover. Adjacent land uses included shrub/ old field and cropland. Potential non point source pollution (NPS) was categorized as slight for transportation and crops. Comments were: *Stream is starting to get away from agricultural ditch features*

BELM-07: Johnson south of Ellison

Water temperature was 54° F, pH was 7.78, and the DO was recorded as 9.02 ppm. Substrate observations were prohibited. Overhanging vegetation was available for in-stream cover. Abundant filamentous algae and some turbidity were observed. Variable riparian vegetation width was available. Grasses and shrubs made up the land cover. Adjacent land uses included shrub/ old field, pasture, and cropland. Potential non point source pollution (NPS) was categorized as slight for transportation and crops and moderate for grazing. Comments were: *Animals upstream have unrestricted access to stream; although erosion problems are very minor*

BELM-08: Hawley south of Scott

Water temperature was 52° F, pH was 7.48, and the DO was recorded as 1.98 ppm. Substrate observations were prohibited. Overhanging vegetation 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 were observed. Variable riparian vegetation width was available. Grasses made up the land cover. Adjacent land uses included shrub/old field, forest, and cropland. Potential non point source pollution (NPS) was categorized as slight for transportation and moderate for crops. Comments were: *Low flow agricultural ditch; stream has appearance of a recovering channel upstream*

BELM-09: Johnson north of McKendry

Water temperature was 53° F, pH was 7.37, and the DO was recorded as 0.05 ppm. Substrate observations were prohibited. Overhanging vegetation and

aquatic plants were available for in-stream cover. Abundant aquatic plants were observed. Little to moderate riparian vegetation width was available. Grasses made up the land cover. Adjacent land uses included cropland. Potential non point source pollution (NPS) was categorized as slight for transportation and moderate for crops. Comments were: *Low flow; abundance of duckweed*

BELM-10: Ellison west of Graff

Water temperature was 56° F, pH was 7.78, and the DO was recorded as 6.5 ppm. Substrate observations were prohibited. Overhanging vegetation and aquatic plants were available for in-stream cover. Abundant aquatic plants were observed. Variable riparian vegetation width was available. Shrubs made up the land cover. Adjacent land uses included shrub/old field, forest, cropland, and maintained lawn. Potential non point source pollution (NPS) was categorized as slight for crops, transportation, and urban/residential runoff. Comments were: *Low flow; high vegetative cover; abundance of duckweed downstream; perched culvert on both sides?*

BELM-11: Dildine west of Graff

Water temperature was 54° F, pH was 7.89, and the DO was recorded as 7.24 ppm. Silt, detritus, and muck appeared to dominate the substrate with lesser amounts of gravel and sand also present. Overhanging vegetation, deep pools, boulders, and woody debris were available for in-stream cover. Some floating and filamentous algae were observed. Abundant riparian vegetation width was available. Shrubs and trees made up the land cover. Adjacent land uses included shrub/old field, forest, and pasture. Potential non point source pollution (NPS) was categorized as slight for transportation and grazing. Comments were: *Stream appears to be stagnant or has very low flow despite having a fair amount of water in it*

BELM-12: Hoyt south of Heald

Water temperature was 57° F, pH was 7.54, and the DO was recorded as 2.05 ppm. Silt, detritus, and muck appeared to dominate the substrate. Overhanging vegetation and woody debris were available for in-stream cover. Some aquatic plants were observed. Moderate riparian vegetation width was available. Trees made up the land cover. Adjacent land uses included shrub/old field, forest, cropland, and pasture. Potential non point source pollution (NPS) was categorized as slight for crops and grazing. Comments were: *Low flow*

BELM-13: Cowan east of Bellamy Rd.

Water temperature was 56° F, pH was 7.54, and the DO was recorded as 0.38 ppm. Silt, detritus, and muck appeared to dominate the substrate. Overhanging vegetation, aquatic plants, and woody debris were available for in-stream cover. Abundant aquatic plants and some filamentous algae were observed. Moderate to abundant riparian vegetation width was available. Shrubs and trees made up the land cover. Adjacent land uses included shrub/old field and cropland. Potential non point source pollution (NPS) was categorized as slight for transportation and crops downstream and moderate for crops upstream. Comments were: *Low flow; culvert is an old railroad tanker car on upstream side; abundance of duckweed*

BELM-14: Haynor south of Cowan

Water temperature was 50° F, pH was 7.33, and the DO was recorded as 6.56 ppm. Sand and silt appeared to dominate the. Overhanging vegetation, aquatic plants, and woody debris were available for in-stream cover. Some aquatic plants were observed. Moderate riparian vegetation width was available. Shrubs made up the land cover. Adjacent land uses included shrub/old field, pasture, cropland, maintained lawn, and impervious surfaces. Potential non point source pollution (NPS) was categorized as slight for crops, grazing, transportation, riparian vegetation removal, and urban/residential runoff. Comments were: *No specific comments were recorded for this site.*

BELM-15: Bellamy north of Dildine

Water temperature was 49° F, pH was 8.01, and the DO was recorded as 10.57 ppm. Sand and silt appeared to dominate the substrate. Overhanging vegetation and woody debris were available for in-stream cover. Some aquatic plants and abundant bacterial slime were observed. Little to moderate riparian vegetation width was available. Grasses and shrubs made up the land cover. Adjacent land uses included shrub/old field and pasture. Potential non point source pollution (NPS) was categorized as slight for transportation and downstream grazing, moderate for stream bank erosion, and high for upstream grazing and riparian vegetation removal. Comments were: *Cattle grazing from farm in southeast corner of crossing (1668 Bellamy Road) have significantly terraced bank. Cattle have unrestricted access to the stream. Bridge is old and unable to view due to crossing configuration and vegetation*

BELM-16: Dildine west of Bellamy Rd.

Water temperature was 48° F, pH was 7.84, and the DO was recorded as 10.66 ppm. Silt, detritus, and muck appeared to dominate the substrate with lesser amounts of sand also present. Overhanging vegetation, aquatic plants, and woody debris were available for in-stream cover. Some aquatic plants, bacterial slime, and trash were observed. Variable riparian vegetation width was available. Shrubs made up the land cover. Adjacent land uses included shrub/old field, forest, maintained lawn, and wetlands. Potential non point source pollution (NPS) was categorized as slight for transportation and upstream riparian vegetation removal and urban/residential runoff and moderate for downstream riparian vegetation removal and urban/residential runoff. Comments were: *Culverts are old rail tanker type. One culver (east) completely out of alignment*

BELM-17: Bellamy north of Lyle

Water temperature was 50° F, pH was 8.13, and the DO was recorded as 10.08 ppm. Silt, detritus, and muck appeared to dominate the substrate with lesser amounts of sand also present. Overhanging vegetation, deep pools, boulders, and woody debris were available for in-stream cover. Some aquatic plants were observed. Moderate to abundant riparian vegetation width was available. Trees made up the land cover. Adjacent land uses included shrub/old field, forest, and pasture. Potential non point source pollution (NPS) was categorized as slight for transportation and upstream bank erosion and moderate for bank erosion downstream. Comments were: *Erosion notable on high bank of downstream side.*

BELM-18: Lyle east of Strong

Water temperature was 50° F, pH was 8.16, and the DO was recorded as 10.02 ppm. Sand appeared to dominate the substrate with lesser amounts of boulders, gravel, and silt also present. Overhanging vegetation, deep pools, boulders, and woody debris were available for in-stream cover. Some bacterial slime, foam, and trash were observed. Variable riparian vegetation width was available. Trees made up the land cover. Adjacent land uses included shrub/old field, forest, and maintained lawn. Potential non point source pollution (NPS) was categorized as slight for transportation and bank erosion and moderate for urban/residential runoff and hydrology. Comments were: *Bridge is old and single lane. Downstream side: pond is present on west side and appears to be fed from a spring on the east side that is piped (see d/s photo) across creek.*

BELM-19: Lincoln east of Strong

Water temperature was 51° F, pH was 8.02, and the DO was recorded as 7.88 ppm. Sand and silt appeared to dominate the substrate with lesser amounts of gravel also present. Overhanging vegetation, undercut banks, deep pools, boulders, and woody debris were available for in-stream cover. Some foam was observed. Moderate to abundant riparian vegetation width was available. Shrubs and trees made up the land cover. Adjacent land uses included shrub/old field, forest, and maintained lawn. Potential non point source pollution (NPS) was categorized as slight for transportation, bank erosion, riparian vegetation removal, and urban/residential runoff. Comments were: *No specific comments were recorded for this site.*

BELM-20: Strong north of Lincoln

Water temperature was 51° F, pH was 8.16, and the DO was recorded as 9.95 ppm. Sand appeared to dominate the substrate with lesser amounts of gravel and silt also present. Overhanging vegetation, aquatic plants, and woody debris were available for in-stream cover. Some aquatic plants were observed. Little riparian vegetation width was available. Grasses made up the land cover. Adjacent land uses included shrub/old field, pasture, maintained lawn, and disturbed ground. Potential non point source pollution (NPS) was categorized as slight for transportation, riparian vegetation removal, and urban/residential runoff and high for grazing. Comments were: *Resident on downstream indicates stream backed up at his drive culvert (downstream of road-stream crossing) and flooded his basement. Upstream, horse pasture open to drainage way (see photo).*

BELM-21: M-21 east of Bellamy Rd.

Water temperature was 53° F, pH was 8.22, and the DO was recorded as 11.92 ppm. Gravel appeared to dominate the substrate with lesser amounts of sand and silt 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 were observed. Variable riparian vegetation width was available. Trees made up the land cover. Adjacent land uses included shrub/old field, forest, and maintained lawn. Potential non point source pollution (NPS) was categorized as slight for transportation, riparian vegetation removal, and urban/residential runoff. Comments were: *No specific comments were recorded for this site.*

BELM-22: M-21 east of Bellamy Rd.

Water temperature was 54° F, pH was 8.07, and the DO was recorded as 9.88 ppm. Sand and silt appeared to dominate the substrate with lesser amounts of gravel also present. Overhanging vegetation, boulders, aquatic plants, and woody debris were available for in-stream cover. Abundant aquatic plants and some trash were observed. Variable riparian vegetation width was available. Grasses and shrubs made up the land cover. Adjacent land uses included shrub/old field, maintained lawn, impervious surface, and wetland. Potential non point source pollution (NPS) was categorized as slight for transportation, bank erosion and hydrology and moderate for riparian vegetation removal and urban/residential runoff. Comments were: *Park like setting result of residence on upstream side.*

BELM-23: Main east of Bellamy Rd.

Water temperature was 53° F, pH was 8.10, and the DO was recorded as 10.14 ppm. Sand and gravel appeared to dominate the substrate with lesser amounts of silt, detritus, and muck 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 were observed. Moderate to abundant riparian vegetation width was available. Trees made up the land cover. Adjacent land uses included shrub/old field, forest, maintained lawn, and impervious surface. Potential non point source pollution (NPS) was categorized as slight for transportation. Comments were: *Upstream channel is "braided" western culvert is poorly aligned.*

The majority of the impacts to the stream in this area seem to result from transportation erosion or erosion due to the road stream crossing (sand/gravel roads, road washout). Crop related sources and urban/residential runoff also account for some pollution in this tributary to the Grand River.

