SUMMARY OF MESSER BROOK WATERSHED ASSESSMENT
IONIA AND BARRY, MICHIGAN

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INTRODUCTION

The Messer Brook watershed is located in the southwestern Ionia County and northeastern Barry County. It originates in the agricultural fields and residential area northwest of Lake Odessa and the area along M-50 and flows southwest to its convergence with the Coldwater River east of Freeport. The majority of the watershed drains a predominantly agricultural area with low density residential uses, although residential runoff was a potential non-point source in some areas. 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 Messer Brook 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, six road/stream crossing locations were surveyed during the assessment of the Messer Brook Watershed. Refer to Attachment A, Road Stream Crossings Inventory for a summary of the survey locations conducted during September 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 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. 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, Dissolved Oxygen, and pH

Survey locations were assessed in the order of upstream sites (in the headwaters) to downstream sites (towards the mouth). Six locations, including two along the main stem of Messer Brook, were measured for temperature and pH. pH values ranged from 7.44 to 7.99, which were not outside of the normal range for streams within Michigan. Overall the average temperature was 59.9°F, with most stations at either 60 or 61° 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 early fall. The average dissolved oxygen content was 4.7 ppm; it varies from 7.83 ppm at station MESS-06 to a measurement of 0.5 ppm in a stagnant part of the stream. The dissolved oxygen requirement for native bass and crappie growth and well-being was 5 ppm and for trout it was at least 6 ppm. Given the low dissolved oxygen content and low flow, it seems that Messer Brook was not a comfortable

environment for abundant aquatic life. Refer to Figure 1 in Attachment B, which depicts the temperature, pH, and dissolved oxygen levels at all locations surveyed.

Substrate

Substrate was observed and quantified for both the upstream and downstream stretch at each survey location. In all, 12 substrate observations were recorded at six 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 substrates with a low degree of embeddedness are the most suitable for reproduction in many fish species and are 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 Messer Brook Watershed approximately 33% were dominated by silt, detritus or muck (50 to 100% covered), and 17% were dominated by gravel. 20% of the sites were unable to be categorized due to turbidity. No sites observed appeared to be dominated by sand or boulders; however, 33% of the sites had some amount of sand present, and 33% of the sites had boulders. Refer to Figure 2 for substrate data for the Messer Brook sub-watershed.

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 12 observations made, 100% had overhanging vegetation and 33% had boulders. Woody debris, deep pools, and aquatic plant cover were each found in approximately 8%, 17% and 25% of the observations 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, 12 observations at 6 sites were assessed for physical appearance; observations were recorded and rated as either present or abundant. No oil sheens, foam, or trash were observed at any of the sites. Approximately 42% of the observations exhibited aquatic plants (including duckweed) while 25% exhibited floating algae, 8% exhibited filamentous algae and 58% exhibited turbidity. Refer to Table 2, in Attachment B 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. Six survey locations were assessed, resulting in 24 observations of riparian vegetation width recorded. The observations fell most commonly into two width categories: 67% had between 10 and 30 feet; 17% had between 30 and 100 feet of riparian vegetation. The riparian width class of less than 10 feet and over 100 feet were the least common and were observed at only 8% of the sites each.

The streamside land cover, estimated bank erosion, and percent stream canopy were evaluated at each of the six survey locations for both the upstream and downstream stretches. In all, 12 observations were made for each of the above listed characteristics. Of the survey observations, 25% were recorded as having streamside land cover predominantly shrubs, 67% predominantly grasses, and one site was listed as 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 not a major problem in the Messer Brook Creek Watershed with none of the sites described as having any 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 banks 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 6 sites assessed, 50% had less than 25% cover, 42% had between 25 and 50% cover and 8% 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. The most common adjacent land uses were crop land, maintained lawn, and shrub/old field followed by a lesser number of observations for pasture, impervious surfaces, forest, and disturbed ground. There were no observations for wetlands. Refer to Attachment B, Table 4 and Figure 3 for a summary of all the adjacent land uses recorded within the watershed.

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 looks 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 5, 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 crop related sources, transportation, and urban residential runoff were the most serious while grazing related sources was also considered a possible source 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

Messer Brook and Tributaries

Messer Brook originates in the agricultural fields and residential area northwest of Lake Odessa and the area along M-50. Six survey locations were evaluated on Messer Brook and its tributaries. Stations in the Messer Brook subwatershed are denoted by MESS prefixes. The land use in this area was dominated by agriculture use, low density residential, and forests. 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:

MESS-01: M-50 east of Bliss

Water temperature was ~61°F, pH was measured at 7.64, and the DO was only 2.00 ppm. Although substrate observations could not be made on the downstream side, the upstream side appeared to be dominated by silt, detritus and muck. Some overhanging vegetation and aquatic plant cover was available for in-stream cover. Some aquatic plants and turbidity was observed. A moderate amount of riparian vegetation (10-30 ft) was observed which consisted of grasses on both the upstream and downstream sides. Adjacent land uses included shrub/old field, cropland, and maintained lawn. Potential non point source pollution (NPS) was categorized as moderate for crop/grazing related activities and urban residential runoff and slight for transportation. Comments were*: Low flow, and there is an abundance of duckweed.*

MESS-02: M-50 east of Jackson

Water temperature was ~59°F, pH was 7.71, and the DO was measured at 4.48 ppm. Due to a high level of turbidity and water depth substrate observations were prohibited. Some overhanging vegetation and aquatic plant cover was available for in-stream cover. There were abundant aquatic plants, but no floating algae, filamentous algae, turbidity, bacterial sheen/slime, oil sheen, foam or trash were observed. A moderate amount of riparian vegetation (10-30 feet) was observed which consisted of grasses on both the upstream and downstream sides. Adjacent land uses included pasture, cropland, maintained lawn, and disturbed ground. Potential non point source pollution (NPS) was categorized as slight for crop/grazing, transportation, and urban residential runoff. Comments were*: Extremely low flow. There is an abundance of duckweed downstream. The stream is an agricultural ditch.*

MESS-03: Jackson south of Musgrove Hwy

Water temperature was ~61°F, pH was 7.98, and the DO was measured at 7.14 ppm. Silt, detritus and muck dominate the substrate with lesser amounts of sand also present. Only overhanging vegetation was available for in-stream cover. Some aquatic plants and filamentous algae were observed. A moderate amount of riparian vegetation (10 to 30 feet) was observed which consisted of shrubs on the upstream side and grasses on the downstream side. Adjacent land uses included shrub/old field, cropland, and maintained lawn. Potential non point source pollution (NPS) was categorized as moderate for crop related activities. Comments were*: low flow.*

MESS-04: M-50 west of Jackson

Water temperature was ~60°F, pH was 7.44, and the DO was measured at only 0.05 ppm due to its stagnant nature. Due to level of turbidity and water depth substrate observations were prohibited downstream, and silt, detritus and muck appeared to dominate the substrate upstream. Only overhanging vegetation was available for in-stream cover. Some turbidity was observed upstream while abundant turbidity was observed downstream. A moderate amount of riparian vegetation (10 to 30 feet) was observed which consisted of grasses on both the upstream and downstream sides. Adjacent land uses included cropland and pasture. Potential non point source pollution (NPS) was categorized as moderate for crop related activities and slight for grazing related activities. Comments were*: some turbidity and low flow.*

MESS-05: Darby north of Vedder

Water temperature was ~60°F, pH was 7.93, and the DO was measured at 6.53 ppm. Gravel appeared to dominate the substrate with lesser amounts of silt, detritus, muck, and boulders also present. Some overhanging vegetation, boulders and deep pools were available for in-stream cover. Some filamentous algae and turbidity were observed. Abundant riparian vegetation (more than 100 feet) was observed upstream with a moderate amount (30-100 feet) downstream; both consisted of shrubs. Adjacent land uses included shrub/old field, forest, maintained lawn, and impervious surfaces. Potential non point source pollution (NPS) was categorized as slight for transportation and urban/residential runoff related sources. Comments were*: high algae content on rocks/cobbles.*

Mess-06: Osborne Rd. north of Brown Rd.

Water temperature was ~58°F, pH was 7.99, and the DO was measured at 7.83 ppm. Silt, detritus, muck, sand, and gravel appeared to dominate the substrate with lesser amounts of sand and gravel also present. Some overhanging vegetation, woody debris, boulders and deep pools were available for in-stream cover. Some turbidity was observed. Moderate to abundant riparian vegetation (30-more than 100 ft) was observed downstream which consisted of shrubs and trees. Little riparian vegetation (less than 10 feet) was observed upstream which consisted of grasses. Adjacent land uses included shrub/old field, impervious surfaces, forest, and maintained lawn. Potential non point source pollution (NPS) was categorized as moderate for urban residential runoff and slight for transportation. Comments were*: High silt content on substrate and structure appears to be a box culvert that has a round culvert installed in it.*

The majority of the impacts to the stream in this area seem to result from urban/ residential runoff and transportation non point source pollution. Also, in a few areas inadequate riparian buffer and possible nutrient runoff from adjoining crops, pasture could also potentially impact the stream. Transportation erosion or erosion due to the road stream crossing (sand/gravel roads, road washout) was also possible at one road/ stream crossing site.