

**EAST INTERLAKE CONSERVATION DISTRICT:
WATERSHED 05SD RIPARIAN ASSESSMENT SURVEY – WITH
EMPHASIS ON THIRD ORDER DRAINS and HIGHER – 2008 and 2009**

A Report Prepared
for



by

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EXECUTIVE SUMMARY AND WATERSHED OVERVIEW

The East Interlake Conservation District (EICD) invited North/South Consultants Inc. to conduct the *Watershed 05SD – Riparian Assessment Survey*. The primary objective of this survey was to provide the EICD board with a comprehensive overview of riparian and land use conditions affecting Watershed 05SD. Secondary objectives included the identification of barriers to fish passage and migration; to determine the utilization of recreationally important fish species in the watershed; and to provide a list of potential fisheries-based projects for future works within Watershed 05SD.

The study area within Watershed 05SD (third order drains and higher) includes the riparian areas along: Blind Creek; Bottle Creek; Broad Valley Drain; Dumoulin Drain; mainstem Fisher River; east Fisher River; west Fisher River; Kilkenny Drain; Leroy Drain; Meridian Drain; Plishka Drain; Rus Drain; and the Sunny Valley Drain (approximately 256 linear km).

A search for existing information on watershed 05SD was conducted through: internet and library sources; conversations with provincial employees; and discussions with local land owners and community members. Information, as related to report deliverables, was limited and non-conclusive. Data exist for two water survey of Canada gauging stations on the east and mainstem Fisher rivers and Manitoba Water Stewardship – Water Quality Branch has compiled some water quality information.

Although limited, fisheries information pertaining to watershed 05SD was available through a Manitoba Water Stewardship – Fisheries Branch FIHCS search, existing files, and a study conducted by MacDonell (1995). The FIHCS search shows at least 14 fish species occurring throughout watershed 05SD, none of which are listed under COSEWIC. Eleven species are reported from the mainstem Fisher River, seven in the Broad Valley Drain, five in east Fisher River, and five in the Kilkenny Drain. The white sucker was the most commonly occurring species in watershed 05SD, being reported in 62% of the watercourses in the study area (i.e., eight out of 13). Northern pike (54%), central mudminnow (38%), and brook stickleback (31%) were the next most common species. Walleye were only reported in the mainstem Fisher River by MacDonell (1995) and field investigations conducted by North/South Consultants Inc. during spring, 2009. Discussions with local residents and

Manitoba Conservation staff suggest that although walleye migrate along the mainstem Fisher River they do not likely travel south of Hwy. 325.

High flows in 2008 and the magnitude of the spring 2009 flood caused a number of breaches and complete washouts of several fords, road crossings, and temporary barriers. This ultimately allowed for the migration/passage of larger bodied spring spawners into habitat otherwise unavailable (e.g., headwater areas, smaller drains). Fish habitat along the mainstem Fisher River and the east and west Fisher rivers is primarily Class 1 (i.e., has a high capability for the production of fish) and/or important habitat. Although capable of providing suitable spawning conditions (e.g., Broad Valley Drain) the majority of the smaller drains and tributaries in the study area are considered marginal fish habitat. Although likely present, no critical fish habitat (e.g., specific spawning sites) were identified during the study.

Approximately 184 km (71.8%) of watershed 05SD was classified according to land use/cover and aquatic habitat quality. With some minor exceptions (i.e., cropland, 5.7%; transportation, 1.5%; and other urban or built-up land, 0.4%) all nine land use/cover classifications employed in this report were equally represented throughout the watershed. The total combined land use/cover classifications included: meadow/floodplain (20.7%); hayland (16.9%); residential/commercial (16.9%); pasture/grazing (16.3%); mixed forest land (10.9%); and other agricultural land (10.5%).

Nearly half of watershed 05SD classified according to aquatic habitat quality was rated as either Class A (37.6%: minimally impacted) or B (11.9%: marginally impacted) habitat. These classifications are relatively high for a watershed which drains through an agricultural area with a number of communities and is likely the result of high incidences of meadow/floodplain, well treed and grassed residential areas, mixed forest land, and the natural sinuosity existing along many of the watercourses (i.e., lack of channelization). The remaining half of the watershed classified by aquatic habitat quality was determined to be highly (Class C: 36.0%) and severely impacted (Class D: 14.4%).

Largely identified along the east Fisher River (n = 66), west Fisher River (n = 38), and the mainstem Fisher River (n = 27), a total of 151 potential rehabilitation sites were designated throughout watershed 05SD. These rehabilitation sites were primarily related to barriers (n = 65; 43.0%), pasture (n = 49; 32.5%) and, to a lesser extent, residential (n = 18; 11.9%) issues. With the possible exception of barriers located in the headwaters, none of the barriers identified were complete blockages to fish migration. Rather, they were either temporary (e.g., beaver dams) or associated with some form of transportation

(e.g., a low level ford composed of gravel and culvert). Most of the potential barriers identified were designated as Priority 3 ($n = 45$ or 69% of all barriers identified). Conversely, the majority of pasturing issues identified were designated as Priority 1 sites (i.e., $n = 32$ or 65% of all pasture identified). The pasturing sites were typically extensive (i.e., long ranging) and extremely impacting (e.g., large numbers of cattle directly in-stream) to the aquatic and terrestrial habitat.

Although more recent water quality data are being collected (2006 to 2008), existing water quality information for watershed 05SD is primarily dated to a study which determined the runoff effect of hog manure from fields (Green 1996). This study suggested the east Fisher River was a significant contributor to phosphorus levels in the mainstem Fisher River. This was determined because samples from the upstream east Fisher River sites were higher than the west Fisher River and from samples downstream of the target areas (i.e., channels which received target field runoff) (Green 1996). The test sites established by Green (1996) fall within a reach of the east Fisher River identified as pasture/grazing and as Class D aquatic habitat quality (i.e., specifically between Wpts. # 13 and 17).

Watershed management plans should focus on the reduction of grazing areas in the watercourses and the restoration of riparian areas (e.g., bank stabilization, re-vegetation, off-site watering, exclusion fencing, etc). These efforts could improve the quality of water (e.g., by reducing levels of phosphorus) with a goal towards better aquatic habitat throughout this watershed and (ultimately) Lake Winnipeg. Although present, most of the barriers identified could be considered temporary or, at the least, impediments to upstream migration. However, the continued practice and/or repair of fords or low level crossings throughout this watershed should be reviewed. The improper design and implementation of crossings can have deleterious effects on the aquatic habitat.

ACKNOWLEDGMENTS

Manitoba Water Stewardship Fisheries Branch (Winnipeg) is thanked for conducting a search of the Fisheries Inventory and Habitat Classification System and providing existing information on Watershed 05SD.

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1.0 INTRODUCTION

The use of water in Manitoba for such practices as agriculture, urban expansion and development, and recreation has severely taxed this valuable commodity. Recent policy developments (The Manitoba Water Strategy, 2003; *Water Protection Act*, proclaimed in 2006) focus on a number of water protection strategies, with a focus on watershed planning and a reduction in nutrient loading to Lake Winnipeg.

With funding obtained by the Manitoba Fisheries Enhancement Initiative fund and the federal Stewardship in Action fund, the East Interlake Conservation District (EICD) retained North/South Consultants Inc. to conduct the Watershed 05SD -Riparian Assessment Survey. The primary objective of this survey was to provide the EICD board with a comprehensive overview of riparian and land use conditions affecting 3rd order drains (and higher) within this watershed. The study area includes the riparian areas along: Blind Creek; Bottle Creek; Broad Valley Drain; Dumoulin Drain; mainstem Fisher River; east Fisher River; west Fisher River; Kilkenny Drain; Leroy Drain; Meridian Drain; Plishka Drain; Rus Drain; and the Sunny Valley Drain (Figure 1).

Specific objectives of the assessment included:

- To identify and assess the quality of riparian and aquatic ecosystem habitat;
- To identify barriers to fish passage and migration;
- To identify the extent to which recreationally important fish species utilize the watershed; and
- To provide a list of potential fisheries-based projects for future works within Watershed 05SD.

This report provides baseline aquatic habitat and riparian conditions pertaining to the watershed. It can act as a resource tool for continued watershed management and water quality improvements.

2.0 METHODS

2.1 REVIEW OF EXISTING INFORMATION

2.1.1 Digital Topographic Data (DTD)

Both the Manitoba Land Initiative (MLI 2008) and Natural Resources Canada (NRC 2008) data bases were queried for existing digital topographic data. This information was used to develop base maps for field surveys, determine lengths of watercourses, and as an additional tool towards classifications.

2.1.2 Physical and Hydrological Information

The Environment Canada (2008 and 2009) data base was reviewed for historical hydrological data throughout Watershed 05SD.

Using a USGS digital elevation model (DEM), elevation profiles were generated for the Broad Valley Drain, mainstem Fisher River, east and west Fisher rivers. The profiles were produced by intersecting points along polylines with 90 m Shuttle Radar Topography Mission (SRTM) USGS DEM, using Spatial Analyst extension in ESRI ArcGIS® v.9. Due to the coarse resolution of the DEM (i.e., each pixel is 90 m x 90 m), spikes in the elevation profiles may be exaggerated.

2.1.3 Water Quality

The Water Quality Management Section - Manitoba Water Stewardship (WQMS-MWS 2009) was queried for water quality records relating to Watershed 05SD. Library and internet searches were also conducted for existing documentation.

2.1.4 Fish Species Utilization

Existing information on fish utilization in Watershed 05SD was documented by querying the Manitoba Water Stewardship - Fisheries Branch (MWSFB) office in Winnipeg. The MWSFB Fisheries Inventory Habitat Classification System (FIHCS) was also searched by provincial staff. Where possible, interviews were conducted with local landowners and

tenants who live within the watershed, and members of the Department of Fisheries and Oceans.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) website was searched for fish species listed as: endangered; threatened; or of special concern.

2.2 FIELD SURVEYS

2.2.1 Physical and Hydrological Information

To provide a general understanding of stream morphology and substrates in the various branches of the watershed, a number of sampling locations were selected during groundtruthing investigations. Site selection depended on road access, stream accessibility (i.e., depths and velocity), groundtruthing locations, and/or if fisheries investigations were to be conducted.

Substrate types (i.e., composition) were assessed based on a modified Wentworth classification, as outlined in Bain and Stevenson (1999). Substrate compaction was based on three general criteria (i.e., soft, medium, or hard) and determined by inserting a survey rod into the bottom of the stream bed (where possible). Stream velocities were measured with a Swiffer-Model 2100® velocity meter. Velocities measured in culverts were typically taken near the bottom. Discharges were calculated using the ‘mean section method’ outlined in Terzi (1981).

2.2.2 Water Quality

In conjunction with groundtruthing and fish utilization surveys, basic water quality parameters were measured *in situ* (i.e., in the field) with a Horiba W22 water quality meter. The parameters measured included: dissolved oxygen; conductivity (measured as specific conductance); temperature; pH; and turbidity. In some locations, water temperature was measured with a hand-held alcohol-filled pocket thermometer. Water quality parameters were measured at or just below the water surface.

2.2.3 Fish Species Utilization

2.2.3.1 Summer and Fall 2008

Fish use within Watershed 05SD was assessed during the late summer (August 22) and fall (October 27) of 2008. Methods included back-pack electrofishing (Smith-Root Model LR-24), dip netting, seine nets, and visual surveys. Effort was comparable at each site and was conducted to determine presence/absence and possible extent of spawning migration through capture of young-of-the-year fish species.

Sampling was conducted at sites throughout the watershed where access and/or water were available. All fish collected were identified to species and released. A number of the small-bodied fish were preserved in the field (10% formaldehyde solution) for subsequent identification. Any commercially or recreationally important species captured (i.e., northern pike, walleye, white sucker, yellow perch) were measured for fork length (± 1 mm).

2.2.3.2 Spring 2009

The primary objectives of the spring fishing program were to determine: the degree to which recreationally and commercially important species utilize the watershed; the presence/absence of fish species; and the level of potential spring spawning.

It was determined, by consultation with the EICD and regional resource officers, that spring fishing efforts be focused on the following watercourses: mainstem Fisher River, east Fisher River; west Fisher River; and the Broad Valley Drain. In the field, fishing locations were based on suitable flow conditions (e.g., minimal spring velocity), depths (<1.5 m), and site accessibility. Efforts were based on water temperatures within the range of 4.0°C to 10.0°C .

Oriented to capture fish moving upstream, hoop nets (1.2 m in diameter, constructed of 6.45 cm^2 nylon mesh, and 10.0 m long wings) were deployed between April 21 to 24 and April 28 to 30. All fish captured were identified to species and released. A sub-sample of fish (approximately 25/species/day) were also measured for fork length (± 1 mm) and weight (± 25 g), classified by sex and state of maturity, and released. The duration of each set was approximately 20 to 24 hours.

Minnow traps (baited with bread crumbs) were placed in proximity to hoop nets to capture forage fish. Where possible, visual inspections for fish presence were conducted along stream reaches (typically at road crossings or constricted areas). When observed, dip nets were used to capture fish at constrictions. These were identified to species, enumerated and released. Conversations with local residents (e.g., while they were dip netting or at stream side) were also conducted to gain information on fish presence, potential abundance, and extent of migration.

2.2.4 Groundtruthing

Areas of Watershed 05SD were groundtruthed for the identification of potential rehabilitation sites and collection of ground-based photographs. This was accomplished by driving along lengths of drain and/or creek (where possible) and observing existing conditions. All sites visited were geolocated with the use of a hand held Global Positioning System (GPS). Although useful to confirm aerial classifications, ground-based reconnaissance can be limited by landowner approval, presence of roads, or the ability of the vehicle being used. For the purpose of groundtruthing, the riparian area was defined as the area of land starting at the channel bank, extending perpendicular by at least one full channel width. Also, bank sides (i.e., left or right) were delineated while looking upstream.

2.2.5 High Resolution Aerial Imagery (HRAI)

On November 3, 2008 (09:30 to 14:00 hrs.), HRAI was collected with the use of a Bell206L-1 Long Ranger helicopter chartered out of Taiga Air Services, Winnipeg. Imagery was collected through Taiga's GAIM (geo-referenced aerial imagery and mapping) system, which is comprised of a high resolution near-nadir still image camera and a forward looking broadcast quality video camera. Average flight speed was 76 kph with a low of 35 kph on very tight corners and a high of 136 kph. Average altitude was 443 meters above sea level (MASL) with a low of 405 MASL and a high of 515 MASL.

In consultation with the EICD manager, the flight path was developed to gather information from areas that could not be readily accessed by vehicle or where natural stream sinuosity appeared to occur on map (Figure 1).

2.3 CLASSIFICATIONS

Information collected on Watershed 05SD (via groundtruthing, HRAI, and a review of existing DTD) was reviewed for basic land use/cover (Section 2.3.1), areas of detriment to aquatic habitat (Section 2.3.2), and potential barriers to fish migration (Section 2.3.2.4). The end results were to classify riparian areas within the watershed according to aquatic habitat quality and to develop a prioritized list of potential fisheries-based projects for future works (Sections 2.3.2.5 and 2.3.4).

Where noted, reaches were bound by obvious changes in classification attributes and extended at least two active channel widths on each side. The active channel width is the

stream width at 'bank full' discharge or the flow rate that controls the shape and size of the active channel (USDA 1998).

The following sections outline the rationale behind the land use/cover classifications, the rating system incorporated for aquatic habitat quality and the prioritization methodology employed for each potential rehabilitation site.

2.3.1 Land Use/Cover and General Classifications

Within the boundaries of classification systems, the definitions of land use and/or land cover are often interchangeable. However, within this document the accepted definition of land use refers to the direct use of land by humans (e.g., agricultural practices, homesteads, industry) (Clawson and Stewart, 1965 in: Anderson et al. 1976). Although land cover can also refer to human practices (e.g., cropland), within the scope of this document land cover refers to more 'natural' cover types (i.e., mixed forest land, meadow/floodplain).

Land use/cover within Watershed 05SD was reviewed for nine general categories as outlined below. The categories were developed by North/South Consultants Inc. based on the predominant land use practices found in the region and by implementing classifications described in Anderson et al. (1976) and Dieck and Robinson (2004). The categories focused on reaches of the watercourses and the predominant land use adjacent to them. Although the reaches classified could incorporate more than one land use/land cover type, classification of each reach was based on the most intensive use within the area.

Residential/Commercial: Anderson et al. (1976) define residential as an area with multiple units (e.g., houses) or houses on lots of more than one acre. Generally, residential strips have uniform size and spacing of structures, linear driveways, and lawn areas. Examples of residential areas are towns or the recently developed 'suburbs' of these small towns.



The commercial classification outlines areas used for the sale or production of goods and services, and may include: warehouses; waste disposal areas; strip developments; junkyards;

etc. Areas under this classification can also be ‘developed’ for multi-use and could include: parks; marinas; boat launches; or rip/rapped shorelines (Dieck and Robinson 2004).

Transportation: A classification applies where a major transportation route (e.g., provincial highway) or roadway crosses or influences other land uses and/or dominates the landscape (Dieck and Robinson 2004). These routes are typically bounded by grasses and shrubs, and usually associated with some form of drainage.



Other Agricultural Land: This category is applied when separate land uses cannot be mapped individually and typically involves agricultural practices. This classification may include: farmsteads; holding areas for livestock (i.e., corrals); or structures associated with agricultural practices (e.g., barns, storage silos, etc.). Practices under this category are typically on a small scale.



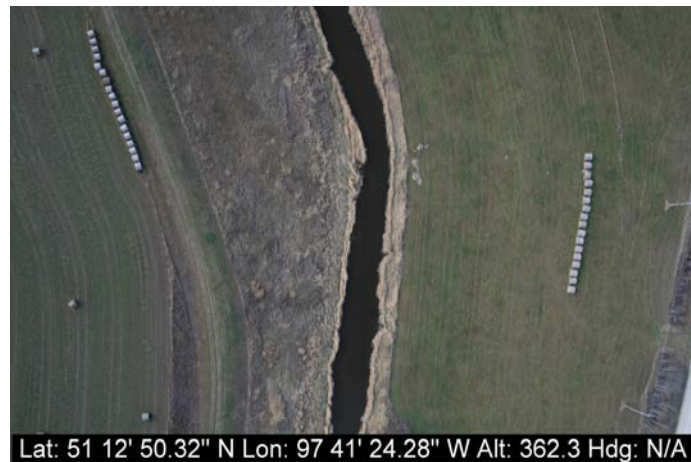
Other Urban or Built-up Land: Land use within this category is defined as golf courses, parks, cemeteries, and undeveloped land within an urban setting (Anderson et al. 1976).



Crop Land (top right and left): This category may be defined as land used for the production of food (e.g., wheat crop, legumes, etc.). These areas are generally characterized by coarser textures, linear crop/cultivation features, and yellow to gold colour tones. Land under cultivation or without vegetative cover (e.g., tilled) also falls under this category.



Hayland: This category is defined as land used for the production of forage crops for livestock (e.g., alfalfa, timothy, etc.). Hayland crops are often characterized by hay bales spotting the landscape adjacent to watercourses.



Lat: 51 12' 50.32" N Lon: 97 41' 24.28" W Alt: 362.3 Hdg: N/A

Pasture/Grazing: Areas of land used for livestock 'feeding' were classified as pasture/grazing. This land use is generally characterized by a smooth texture resulting from grazed herbaceous cover. Pasture/grazing is often associated with heavily defined linear tracks and, where applicable, fence lines. Pastures in forested areas were identified by a decreased density of trees within the forest stand.



Lat: 51 7' 12.89" N Lon: 97 34' 1.03" W Alt: 451.6 Hdg: N/A

Mixed Forest Land: This classification includes forested areas where evergreens and deciduous trees are growing, yet neither predominate (Anderson et al. 1976).



Meadow/Floodplain: This classification defines the area within the floodplain width of a watercourse or where a waterbody has fluctuating water levels. These could be areas that are temporarily flooded (water only present during early part of growing season) (e.g., headwaters of a river) or an area where the soil is saturated with water during the



growing season (e.g., confluence of Fisher River and Lake Winnipeg) (Dieck and Robinson 2004). Vegetation under this classification varies, but could be dominated by grasses, sedges, and (to a lesser extent) woody vegetation (e.g., *Salix* sp.). This classification is also comparable to conditions which may be found in non-forested wetland or a riverine wetland; where wetland herbaceous vegetation dominants (e.g., *Juncus*, *Typha*, *Carex*, etc.) (Anderson et al. 1976).

Residential/commercial, transportation, other agricultural land, other urban or built-up land, cropland, hayland, and pasture/grazing, were considered to be anthropogenic in origin. Mixed forest land and meadow/floodplain are assumed to be in natural states or areas not necessarily altered by anthropogenic means.

2.3.2 Aquatic Habitat Quality and Qualitative Ratings

Streams were classified based on a visual qualitative assessment of conditions in and adjacent to the watercourse. Stream condition assessments were based on the United States Department of Agriculture Stream Visual Assessment Protocol (USDA 1998).

The classification system was based on identifying potential impacts to aquatic habitat as either a 'Positive' or 'Negative' attribute to stream processes. The four criteria selected for the evaluation of impacts were: channel morphology (hydrologic alterations and channelization); bank stability; riparian zone function; and barriers to fish migration. These criteria were chosen based on their relative importance to stream health as described within the USDA Stream Visual Assessment Protocol (1998), and the ability to interpret these criteria using both the HRAI and the information gathered on the ground.

The following sections describe the stream conditions assessed in determining aquatic habitat quality, as well as the classification methods used.

2.3.2.1 Channel Morphology

Bank full flows and flooding are important in maintaining both the shape of a channel and its function (USDA 1998). High flows can redistribute larger sediments and debris to form pool/riffle habitats and increase the habitat diversity of a watershed. Altered channel morphology can limit the scouring effect of high flows, allowing siltation of important spawning areas and habitat zones (USDA 1998; Bain and Stevenson 1999).

Channel morphology was rated based on the following criteria (USDA 1998):

Negative condition(s):

- Dykes or other man-made structures were present that prevented natural flooding of the adjacent floodplain;
- Channel was altered, braided, or contained man-made structures restricting floodplain width. Channel may be incised; or
- Evidence of past channel alteration, but with significant recovery of channel and banks.

Positive condition(s):

- Channel appears to be ‘natural’ with no structures or dykes. No dams, water withdrawal, dykes or other structures limit stream access to the floodplain.

2.3.2.2 Bank Stability

Stream banks are important transition zones between aquatic and terrestrial systems (Bain and Stevenson 1999). Eroding banks can reduce instream fish cover, reduce water transparency, smother fish eggs and benthic invertebrates with silt, and infill shallow water habitats (Bain and Stevenson 1999). Although some bank erosion is normal in a healthy watershed system, excessive erosion can occur when riparian areas are degraded, hydrology is altered, or when sediment load is increased (USDA 1998).

Assessments of bank stability were based on the potential for detachment of soil from the upper and lower stream banks and the subsequent deposition to the stream channel. Where bank stability was difficult to assess visually using HRAI, ratings were primarily based on the application of groundtruthing data and an overall visual assessment of the stream reach being classified.

Bank stability was rated on the following criteria (USDA 1998):

Negative condition(s):

- Bank(s) unstable and typically high. There may be overhanging vegetation at top of a bare bank, trees falling into stream, or a number of slope failures apparent;
- Bank(s) moderately unstable and typically high. Some trees may be falling into the stream and there may be some slope failures apparent; or
- Bank(s) moderately stable and low. A lower amount of eroding surface on outside bends is protected by roots that extend to the base-flow elevation.

Positive condition(s):

- Bank(s) are stable and low. A large amount of eroding surface area on outside bends is protected by roots that extend to the base-flow elevation.

2.3.2.3 Riparian Zone Function

Riparian zone is defined as an area adjacent to a body of water or as the transition zone between aquatic and upland areas; it can also be referred to as riparian buffer zone, buffer strip, or vegetation retention zone (Kipp and Callaway 2003; Williams et al. 1997; Bain and

Stevenson 1999). The health of the riparian zone is fundamental to the well-being of an entire stream ecosystem (USDA 1998). A healthy riparian zone can: buffer the introduction of pollutants and/or organic matter to a stream; regulate instream algal production via shading; decrease erosion by stabilizing stream banks and dissipating energy during flood events; provide a source of cover, food, and microclimate control for fish and invertebrates; and act as a travel corridor for terrestrial animals/birds (Williams et al. 1997; USDA 1998; Bain and Stevenson 1999; Koning 1999).

From an agricultural standpoint, riparian vegetative cover helps regulate soil climate, stimulate soil activity (via biomass production), and acts as a buffer between water courses and fertilizer and pesticide applications (Donat 1995). It has been found that dew formation and soil moisture increase in the vicinity of a well-established riparian zone (Donat 1995). The quality of the riparian zone increases as both the width and complexity of woody vegetation within it increases (USDA 1998).

Riparian zone function was rated based on the following criteria (USDA 1998):

Negative condition(s):

- Natural vegetation/regeneration of vegetation is lacking and the ‘filtering’ function of the riparian zone is severely or moderately compromised.

Positive condition(s):

- Natural vegetation extends at least two active channel widths on each side and the ‘filtering’ function of the riparian zone does not appear to be compromised.

2.3.2.4 Barriers to Fish Migration

Barriers to fish movement can be defined as any structure or habitat conditions that create a potential obstacle to fish movements under certain hydrologic conditions (Bain and Stevenson 1999). These barriers can be anthropogenic in origin (e.g., concrete structure, earthen dam, dike, perched culvert) or natural (e.g., beaver dam, debris dam, rapids). Besides limiting/stopping the movement of fishes, barriers can affect the health of a stream via disruption of stream flow, sediment transport, and thermal regimes (Bain and Stevenson 1999). Barriers were classified as follows:

- 1) Beaver dams;
- 2) Debris – accumulations of natural or man-made debris; and
- 3) Anthropogenic – fords or culverts.

Fords are typically defined as low-water stream crossings with bank access allowing either temporary or permanent passage to vehicles and livestock (Fisheries and Oceans - Manitoba Natural Resources 1996; Armantrout 1998). Within this document, ford composition may include naturally occurring materials (e.g., stream bed), transported aggregate (e.g., gravel, boulder, cobble), or a low level composition of cement and culvert. Although allowing some fish passage via culvert placement, the gravel/cement and culvert ford is considered a potential barrier. Upstream fish passage at these sites may be hindered in the spring during low water events. Downstream (larval, juvenile, or adult) migrations may also be hindered during similar hydrologic conditions. The culverts may also act as velocity barriers or become plugged with debris. In some cases the ford may also washout if not properly installed resulting in the transport of aggregate and other debris through the watercourse.

Culverts, within roads, are also listed as potential barriers if: they act as velocity barriers; become plugged with debris; or appear to be perched.

Each barrier was assessed as to the severity of blockage including the potential to limit fish access to important areas for feeding, reproduction, and/or rearing.

2.3.2.5 Qualitative Ratings

To assist in the identification of sites for rehabilitation, a qualitative rating of aquatic habitat quality was assigned to areas of streams based on an overall visual assessment of the four basic stream processes described above (Section 2.3.2). The rating system incorporated four classes as outlined below:

- Class A: Stream reaches within this category were minimally impacted and tended to have natural channel morphology. The riparian vegetation, which was typically present on both stream banks, provided a high level of buffering capacity, fish habitat, and bank stability.
- Class B: Stream reaches in this category were moderately impacted, and typically had a more natural channel morphology and hydrologic regime than Class C reaches. Bank stability in this class tended to be moderate. Commonly, a margin of natural vegetation may have remained, increasing bank stability and buffering capacity. Some stream reaches in this category had more 'natural' conditions on one bank and a greater amount of impact on the opposite bank.
- Class C: Stream reaches within this category were highly impacted and generally had altered hydraulic regimes (e.g., channelization, barriers). Bank stability in this class tended

to be moderate. Reaches with marginal riparian vegetation may have had a moderate filtering capacity.

- Class D: Stream reaches within this category were severely impacted and generally characterized by altered channels and a heavily altered hydrologic regime. There was a lack of vegetative regeneration within the riparian zone, and because of this the filtering function of the riparian zone may have been severely compromised. The bank was generally unstable within this class.

Typically, drains are constructed to either remove excess water from fields or to supply irrigation water to areas which require water (Evanitski, no date; AAFC-PFRA 2004). Although drains can offer certain agricultural advantages (e.g., earlier planting times) there are environmental concerns associated with them. An accelerated removal of water from fields can place rivers into a flood or near flood stage, increasing the risk of water erosion and bank failure (AAFC-PFRA 2004). Man-made drains are often also associated with marginal riparian zones, which are unable to act as effective buffers resulting in increased introduction of substances deleterious to the aquatic habitat (AAFC-PFRA 2004).

By definition, drains typically exhibit one or all of the negative conditions associated with degraded aquatic habitat discussed within this document. Therefore, when a watercourse was labelled as ‘drain’ during the initial land use/cover classification it automatically received a Class C rating. However, segments of the drain may also receive a Class D rating if multiple negative conditions are observed (e.g., linear design, barrier present, slumping bank(s), denuded/removed riparian, agricultural inputs, etc).

2.3.3 Fish Habitat Classification

Upon reviewing existing information, and completing: ground truthing investigations and surveys; land use/cover classifications; and defining stream reaches according to aquatic habitat quality; watercourses within the study area were assessed for their ability to support a fish community. Within this document and for the purpose of developing fisheries-based rehabilitation plans, ‘fish community’ is defined as habitat utilization by commercially or recreational important species. These typically larger bodied fish could be species such as northern pike, walleye, sucker *sp.*, channel catfish, freshwater drum, lake whitefish, etc. Although smaller bodied/forage fish species (e.g., brook stickleback, central mudminnow, common shiner, etc.) are not included in this definition, they are still taken into consideration and recognised as an important part of the aquatic ecosystem. Based on a subjective assessment, outlined in Newbury and Gaboury (1993), four standardized classes were utilized:

- Class 1: Water bodies having a high capability for production of fish;
- Class 2: Water bodies having slight limitations to production of fish;
- Class 3: Water bodies having moderate limitations to production of fish; and
- Class 4: Water bodies having severe limitations to production of fish.

In addition to the classes defined above the following three definitions were also considered in assessment of fish habitat within the study area (DFO 1998):

- Critical Habitat: Habitat requiring a high level of protection due to its importance in sustaining subsistence, commercial, or recreational fisheries, rareness, high productive capacity, or sensitivity of certain life stages of fish species being supported;
- Important Habitat: Habitat requiring a moderate level of protection, including areas utilized for fish feeding, growth, and migration. These areas are not considered critical, contain a large amount of comparable habitat, and may include areas previously disrupted by human activity; and
- Marginal Habitat: Habitat requiring minimal protection. These areas would have a low productive capacity and marginally contribute to fish production. However, these areas would also have a reasonable potential for enhancement or restoration.

2.3.4 Potential Rehabilitation Sites

A compilation of potential rehabilitation sites was developed following completion of groundtruthing, a review of the aerial footage, and an application of the qualitative rating systems discussed above. Once reviewed, sites were prioritized using a scale from 1 to 3. Sites given a priority of 1 were often ‘large’ in scale, exhibiting multiple environmental issues (e.g., water quality degradation, shoreline erosion, denuded riparian, etc.) that may warrant more immediate attention (i.e., rehabilitation efforts). These sites typically had many direct negative impacts on the health of the watershed. Conversely, sites labelled as priority 3 were often ‘smaller’ in scale, typically exhibiting only one environmental concern. Sites identified as priority 3 were also areas in which: long-term planning could be required; a return to the site’s ‘full’ potential could not occur within a reasonable time frame; the site may not currently be a detriment to habitat quality, but may become one in the future (USDA 2004).

3.0 RESULTS AND DISCUSSION

For ease of reference, results for watercourses are provided in alphabetical order.

The majority of existing information on Watershed 05SD was collected through discussions with Manitoba Water Stewardship and, to a lesser extent, conversations with local landowners.

Distances provided in this document (i.e., length of watercourse, length of reaches defined by land use/cover, and length of reaches defined by aquatic habitat quality) may vary slightly from one identifier to another. This variation stems from the inability to view all portions of a watercourse either from the ground or air and from inferences developed while completing classifications for certain reaches of stream. Therefore, distances provided should be taken as best approximations.

Waypoint descriptions, stream properties measured (i.e., discharges, depths, substrate composition), *in situ* water quality parameters (measured by North/South Consultants Inc.), and biological information recorded during fisheries investigations are provided in Appendix 1 (Tables A1-1 to A1-5). Ground and aerial based classifications are provided in Appendix 2 (Tables A2-1 to A2-13). A complete listing of all potential rehabilitation sites (including site descriptions) are provided in Appendix 3 (Table A3-1). A summary of detriments to riparian areas and/or aquatic ecosystem health, as well as potential mitigative measures are provided in Appendix 4 (Table A4-1).

The study area is presented in Figure 1. Elevation profiles for Broad Valley Drain, mainstem Fisher River, east Fisher River, and west Fisher River are presented in Figures 2 to 5. Land use/cover classifications and groundtruthing sites (i.e., waypoints) are provided in Figures 6 to 9. Aquatic habitat classifications and potential rehabilitation sites are provided in Figures 10 to 13.

Length of watercourse (NRC 2008), percentage of the watercourse classified, and the primary classification source(s) used are provided in Table 1. A summary of existing fisheries information is provided in Table 2 and site-specific results of the 2008-09 fisheries investigations conducted by North/South Consultants Inc. are provided in Table 3. Land use/cover and aquatic habitat classifications determined for each watercourse are provided in Tables 4 and 5. A summary of potential rehabilitation sites (as determined by primary environmental issue) is provided in Table 6.

3.1 BLIND CREEK

Blind Creek flows in a south easterly direction for approximately 8 km before entering the west Fisher River (south of Fisherton) (Table 1, Figure 1, Photo 1).

3.1.1 Review of Existing Information

No hydrometric data were found on the Water Survey of Canada website pertaining to Blind Creek (ECWSC 2008). In addition, the WQMS-MWS (2009) did not have any records of water quality sampling on this watercourse. Manitoba Water Stewardship – Fisheries Branch records indicate fishing surveys were conducted on Blind Creek (by Department of Fisheries and Oceans) in 2004 with no species being captured (MWSFB 2009).

3.1.2 Field Surveys – 2008 and 2009

Ground investigations along Blind Creek were conducted on August 5, 2008 (Appendix 2 Table A2-1). These investigations were restricted to land use/cover classification and collection of photographs.

Blind Creek was not identified as a watercourse for either summer/fall or spring fisheries investigations.

3.1.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

Approximately three km of Blind Creek was classified according to land use/cover, the majority of which was pasture/grazing (62.5%) (Table 4, Figure 9). This was followed by cropland (21.9%), hayland (9.4%), and meadow/floodplain (6.3%).

Approximately 63% of the three km of Blind Creek rated for aquatic habitat quality was Class D (Table 5, Figure 13). This was followed by Class C (31.3%) and B (6.3%) ratings. One potential rehabilitation site (# 141) was identified on Blind Creek (Table 6, Figure 13). This priority 1 site showed signs of pasturing with direct cattle access to the watercourse (Appendix 3 Table A3-1).

Considering its location in the watershed (i.e., upper reaches), likely ephemeral nature, and existing land use/cover, Blind Creek should be considered a Class 4 stream (i.e., having severe limitations to the production of fish) and/or as consisting of marginal fish habitat

(Photo 1). However, as a tributary to the west Fisher River (and subsequently Lake Winnipeg) rehabilitation efforts here should not be overlooked, especially if the rehabilitation projects could reduce the effects of nutrient loading.



Photo 1. Looking upstream on Blind Creek, Wpt. # 25, August 5, 2008.

3.2 BOTTLE CREEK

Bottle Creek flows in a north west direction for approximately 14 km before entering the east Fisher River, east of Hodgson (Table 1, Figure 1) (Photo 2).

3.2.1 Review of Existing Information

No hydrometric data were found regarding Bottle Creek (ECWSC 2008). Summarized in Green (1996), water quality samples were collected from four sites along Bottle Creek to determine the impacts of winter application of hog manure on test fields. Although still relatively low, sulphate levels showed a significant increase downstream of target field runoff on the Fisher River. Green (1996) suggested these increases did not come from the targeted fields, rather from areas on the Bottle (Drain) Creek.

Manitoba Water Stewardship – Fisheries Branch records indicate fishing surveys were conducted on Bottle Creek (by Department of Fisheries and Oceans) in 2004 with no species being captured (MWSFB 2009).

3.2.2 Field Surveys – 2008 and 2009

Ground surveys were conducted on Bottle Creek on August 5, 2008. This work comprised the collection of ground based photographs and land use/cover classifications (Photo 2) (Appendix 2 Table A2-2).

Bottle Creek was not identified for summer/fall 2008 or spring 2009 fisheries investigations.

3.2.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

Ground classifications for Bottle Creek are provided in Appendix 2 (Table A2-2). The first 1.7 km of Bottle Creek (upstream from its confluence with the east Fisher River) was classified according to land use/cover (Table 4, Figure 8). Primarily based on aerial images, 88.2% of Bottle Creek was comprised of hayland and rated as Class C (i.e., highly impacted) aquatic habitat (Tables 4 and 5, Figures 8 and 12). The remaining 11.8% of the land use/cover was other agricultural land rated as Class D (i.e., severely impacted).



Photo 2. Looking downstream on Bottle Creek, Wpt. # 15, August 5, 2008.

One potential rehabilitation site (# 151; Priority 3) was identified on Bottle Creek (Table 6, Figure 12). This site, located in the Class D aquatic habitat may have some moderate issues related to lack of riparian (potential fenced grazing) and a culvert which may be causing/accelerating bank erosion (Appendix 3 Table A3-1).

Bottle Creek has been identified as a water body having moderate limitations to the production of fish (i.e., Class 3) and one that contains marginal habitat.

3.3 BROAD VALLEY DRAIN

The Broad Valley Drain flows north for approximately 20 km before emptying into the east Fisher River (north east of Fisher Branch and Hwy. 17) (Table 1, Figure 1). With an approximate elevation of 260 meters above sea level (MASL) near its headwaters, the Broad Valley Drain drops 14 m at the east Fisher River (Figure 2).

3.3.1 Review of Existing Information

No hydrometric data were located pertaining to the Broad Valley Drain (ECWSC 2008).

Likely collected in relation to a discharge event from the Fisher Branch lagoon, water quality samples (one upstream and one downstream of the lagoon) were collected from the Broad Valley Drain on May 25, 1995 (WQMS-MWS 2009). With the exception of fecal coliform, all other parameters measured (i.e., soluble ammonia, soluble nitrate/nitrite, TKN, total phosphorus, and total dissolved phosphorus) were comparable between upstream and downstream sites.

Fish utilization surveys were conducted on the Broad Valley Drain (by Department of Fisheries and Oceans) in July, 2002 (MWSFB 2009). Four species were captured including brook stickleback, central mudminnow, johnny darter, and white sucker (Table 2). The one white sucker captured was 308 mm long and may either be a resident of the Broad Valley Drain or a fish that migrated up from the east Fisher River during spring. However, this fish was likely not sexually mature during the spring spawn.

A review of the Canadian Environmental Assessment Archives (File # 05-01-16743) showed a screening request was required for the Broad Valley Drain on December 29, 2005 (www.ceaa.gc.ca/052/details-eng.cfm?pid=16743, Accessed September 15, 2008). In 2007, the proposed works (i.e., mowing and removing brush from 1 mile of drain and realigning

drains in the upper reaches of the Broad Valley Drain) was determined 'not likely to cause significant adverse environmental effects'. These projects were to be completed over the next six years.

3.3.2 Field Surveys – 2008 and 2009

The Broad Valley Drain was visited during the summer and fall of 2008 (August 5, 6, 22, and October 27) as well as the spring of 2009. On August 22, the discharge at Wpt. 2 was determined to be 0.203 m³/sec (Figure 9, Appendix 1 Table A1-2) (Photo 3).



Photo 3. Looking downstream on the Broad Valley Drain from Wpt. # 2, August 22, 2008.

On August 22, a total of 10 fathead minnow were dip netted under the bridge at Wpt. 2 (Table 3) (Photo 3). One each of central mudminnow, johnny darter, and slimy sculpin were also captured at this location on October 27, 2008. All of these species are common to this watershed and not listed under COSEWIC.

A hoop net set at Wpt. 2 (for a total of five nights) captured 12 northern pike and six white sucker in water temperatures ranging from 4 to 9°C (Table 3, Figure 9, Appendix 1 Tables A1-3 and A1-5). These fish were adults (northern pike mean length = 414 mm, white sucker

mean length = 403 mm) either preparing to spawn or in spawning condition (e.g., ripe female northern pike and ripe male white sucker).

With water levels experienced during the spring of 2009 (Section 3.5.2) it is reasonable to conclude that these fish successfully migrated upstream from the mainstem Fisher River and (probably) Fisher Bay. It may also be a reasonable assumption that the remaining smaller drains and watercourses in the study area also provide some spawning habitat for these two spring migrating species (i.e., northern pike and white sucker). However, this may not always be the case in low flow years when these habitats are not readily accessible.

3.3.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

Ground based classifications for Broad Valley Drain are provided in Appendix 2 (Table A2-3). Comprised mostly of hayland (27.0%) and other agricultural land (24.6%), the 12 km of the Broad Valley Drain classified by land use/cover also exhibited a high percentage of mixed forest land (24.6%) (Table 4, Figure 9) (Photo 4). Additional classifications included: cropland (15.6%); pasture/grazing (4.1%); and meadow/floodplain (4.1%).



Photo 4. Looking downstream along the Broad Valley Drain, Wpt. # 51, August 6, 2008.

Although some areas of the Broad Valley Drain have been channelized and exhibit land use classifications often associated with poorer aquatic habitat quality, nearly 50.0% of the area reviewed was determined to either Class B (27.0%) or A (15.6%) habitat (Table 5, Figure 13). This is likely attributable to the relatively 'natural areas' that remain (i.e., mixed forest land and meadow/floodplain). However, the majority of this watercourse was still rated as Class C (57.4%) or highly impacted.

A total of 10 potential rehabilitation sites (nine priority 3 and one priority 2) were identified along the Broad Valley Drain (Table 6, Figure 13). Five of these sites included potential barriers, three were related to pasture/grazing, while the remaining two identified off site retention ponds/dugouts (Appendix 3 Table A3-1). The pasture/grazing sites may be fenced but could also allow limited access to the watercourse. At the discretion of EICD, additional investigations may be warranted at these sites.

Although the Broad Valley Drain contains areas of natural habitat its importance for fish production can be limited by seasonal flows, its location in the upper headwaters of the Fisher River, and a natural barrier near its confluence with the east Fisher River. This watercourse has been identified as Class 3 (i.e., moderate limitations to fish production) and a river containing marginal fish habitat.

3.4 DUMOULIN DRAIN

The Dumoulin Drain flows in a north-north west direction for approximately 17 km before emptying into the east Fisher River (Table 1, Figure 1).

3.4.1 Review of Existing Information

Neither hydrometric data or water quality information were located pertaining to the Dumoulin Drain (ECWSC 2008, WQMS-MWS 2009). In July, 2002, the Department of Fisheries and Oceans conducted fisheries investigations on the Dumoulin Drain and captured brook stickleback, northern pike, and white sucker (Table 2) (MWSFB 2009). The one northern pike captured was 401 mm in length, likely sexually mature, and may have migrated into the Dumoulin Drain from the east Fisher River for spawning purposes. The four white sucker captured ranged in length from 189 to 301 mm. These fish are likely not sexually mature and could be residents from previous spawning activities in the area.

3.4.2 Field Surveys – 2008 and 2009

Ground investigations were conducted along the Dumoulin Drain on August 5 and 6, 2008, to gather photographs and confirm land use/cover classifications (Appendix 2 Table A2-4) (Photo 5). The Dumoulin Drain was not identified for summer/fall 2008 or spring 2009 fish utilization surveys.

3.4.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

The seven km of Dumoulin Drain classified for land use/cover were determined to consist of cropland (78.6%) and pasture/grazing (21.4%) (Table 4, Figure 9) (Photo 5). The majority of this watercourse was classified as Class C aquatic habitat (78.6%) followed by Class D (21.4%) habitat located at the pasture/grazing area (Table 5, Figure 13).



Photo 5. Looking upstream along the Dumoulin Drain, Wpt. # 9, August 5, 2008.

One potential rehabilitation site (# 148) consists of a gravel and culvert ford apparently used for machinery moving between fields (Table 6, Figure 13, Appendix 3 Table A3-1). Although water flow is apparent, the relatively close proximity of this ford to the east Fisher River deserves notice. Although pasture/grazing was identified along this watercourse (via

DTD – Manitoba Land Initiative 1996) no rehabilitation sites were identified which may warrant additional ground investigations along this area.

3.5 MAINSTEM FISHER RIVER

The east and west branches of the Fisher River meet downstream of the community of Peguis to form the headwaters of the Fisher River, an elevation of approximately 227 MASL (Figures 1 and 3) (Photo 6). The mainstem Fisher River then flows north east for approximately 40 km emptying into Fisher Bay (an elevation of 217 MASL), located on Lake Winnipeg (Table 1). Fisher Bay forms the extreme southern tip of Lake Winnipeg's north basin.



Photo 6. Confluence of the east and west Fisher rivers forming the mainstem Fisher River, November 3, 2008.

3.5.1 Review of Existing Information

Environment Canada – Water Survey of Canada has a metering station (#05SD003) located near Dallas which has been measuring flow from 1961 to 2008 (ECWSC 2008). For the period of record (i.e., 48 years) mean monthly discharge shows a peak in April ($10.7 \text{ m}^3/\text{sec}$) which recedes throughout the summer months (July = $0.741 \text{ m}^3/\text{sec}$). A slight increase in discharge can occur in August ($1.00 \text{ m}^3/\text{sec}$) which also tapers off during the fall. Extreme monthly mean discharges occur in April ($46.8 \text{ m}^3/\text{sec}$ in 1976), May ($28.1 \text{ m}^3/\text{sec}$ in 1974), and June ($18.9 \text{ m}^3/\text{sec}$ in 1963). In 2008, the monthly mean discharges for March, April, and May were 0.325, 12.5 and $2.90 \text{ m}^3/\text{sec}$, respectively (ECWSC 2009).

Water quality records exist for the mainstem Fisher River from 1994 and 1996, as well as 2006 to 2008 (WQMS-MWS 2009). Green (1996) documented and summarized the samples collected in 1996 as part of a manure application study. At this time, it was suggested the Fisher River was able to ‘dilute and assimilate’ most runoff from the study area, however, a significant increase in phosphorus levels was recorded and attributed to runoff from the study area as well as areas upstream on the east Fisher River (Green 1996). Samples from 2006 to 2008 were collected systematically, likely in conjunction with a long-term sampling program. Data were provided to the EICD for inclusion in their water quality data base.

As one of the larger tributaries entering Lake Winnipeg (at Fisher Bay) over 60 native freshwater species could find suitable habitat along the Fisher River (Stewart and Watkinson 2004). Manitoba Water Stewardship-Fisheries Branch (FIHCS search 2009) identified a total of 17 species throughout the Fisher River watershed (Table 2, Appendix 1 Table A1-4). Specific to the mainstem Fisher River, investigations conducted by the Department of Fisheries and Oceans in July 2002 and 2004 captured six species, including brook stickleback, Iowa darter, johnny darter, northern pike, rock bass, and white sucker (MWSFB 2009). Two of three white sucker and two of four northern pike captured were young-of-the-year with average lengths of 77 mm and 106 mm, respectively. None of the species identified along the mainstem Fisher River are listed under COSEWIC.

In 1995, North/South Consultants Inc. conducted an assessment of fish utilization on an artificial spawning riffle located under a newly constructed bridge on the Fisher River (MacDonell 1995). This study found that six species of fish (white sucker, walleye, northern pike, longnose sucker, yellow perch, and brown bullhead) utilized the Fisher River (at this location) during the spring of 1995 (Table 2, Figure 6; Wpt. # 54). However, catches at this time primarily consisted of white sucker and walleye. Egg collections along the riffle also suggested that walleye and white sucker spawned in the immediate vicinity.

Fish Futures surveyed four specific reaches along the mainstem Fisher River (Fish Futures 1994). Measurements on physical attributes (and cross sectional surveys) included channel widths and depths, air and water temperature, and substrate classifications. Notes (i.e., UTM's, sketches, and photographs) were also taken in each reach where riffles/rapids, stream crossings (i.e., fords), erosion scours, pipelines (i.e., inputs), barriers, clean out areas, or 'other' occurred. This document could provide baseline information should rehabilitation plans be conducted along these reaches.

Around 2003, the 'Peguis Riparian Improvement Project' was being initiated to address environmental impacts caused by First Nations cattle operations throughout the community of Peguis (Peguis Development Corporation 2004). Three priorities/phases of this program were to deal with: I) water; II) the development of sustainable agricultural practices; and III) development and implementation of long-term practices related to water and community development. Phase I of this project identified four livestock operations adjacent to a major tributary along the community of Peguis. Assessments (i.e., soil, water, and manure tests) were conducted to determine the degree of environmental impact from each site and to assist in the development of environmental action plans. The extent to which Phases II and III were carried out is uncertain.

3.5.2 Field Surveys – 2008 and 2009

No discharge measurements were taken on the mainstem Fisher River in 2008 due to high water events throughout the open-water season (i.e., 12.5 m³/sec in April ECWSC 2009) (Photos 7 and 8). Manitoba Water Stewardship's Hydrologic Forecast Centre had issued high water advisories (July 11), flood watches (August 21), and flood warnings (August 22) throughout the fall (<http://news.gov.mb.ca/news/index.html?archive>). Most of these bulletins suggested the Fisher River should remain within its banks but heavy rains resulted in saturated soils and the potential for significant overland flooding. The rain events of the fall also resulted in controlled discharges of lagoons at the Marble Ridge and Broad Valley Hutterite colonies (September 11). Manitoba Water Stewardship had collected water samples for analysis, notified downstream residents, and issued a boil water advisory for residents whose wells may be in close proximity to the Fisher River.



Photo 7. Looking upstream on the mainstem Fisher River, Wpt. # 31, August 6, 2008.

Summer and fall (2008) fish utilization surveys were not conducted along the mainstem Fisher River due to the high water events of the open water season. The high flows reduced accessibility along stream banks and resulted in scour holes at most of the gravel fords identified for investigation (Photo 8). Water levels in spring, 2009, continued to be high and prompted massive flood control measures and evacuations along the Fisher River. Property damage resulted (100+ homes destroyed by floodwater) as well as a number of washouts throughout the watershed (www.cbc.ca/canada/manitoba/story/2009/04/19/mb-floodstatus.html), accessed May 8, 2009).

Hoop nets set for a total of four nights from April 22 to 24 and April 28 to 29 (in water temperatures ranging between 4.5 to 9.0 °C) captured a total of 26 fish (Table 3, Figure 6, Appendix 1 Table A1-5). These were primarily northern pike (n = 12), white sucker (n = 10), and walleye (n = 4). Five of the northern pike captured were males, three of which were preparing to spawn in the current year. Although sex and maturity were not determined, two large northern pike (average length = 746 mm) were likely females that had not yet reached spawning condition. All of the white suckers captured were relatively large (average length 524 mm) and likely adults migrating upstream to spawn. All of the walleye captured were males preparing to spawn in the current year.



Photo 8. Washed out ford on the mainstem Fisher River at Wpt. # 40, August 6, 2008.

3.5.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

Ground investigations along the mainstem Fisher River were completed on August 6 and 22 (Figures 6 and 7, Appendix 1 and 2 Tables A1-1 and A2-5). Via HRAI, the entire length (41.4 km) of the mainstem Fisher River was reviewed for land use/cover (Table 1). Starting at the confluence of the east and west branches of the Fisher River, the flight path progressed downstream towards Fisher Bay (Figure 1). The primary land use/cover along the mainstem Fisher River was determined to be residential/commercial (60.4%), followed by mixed forest land (16.7%) and meadow/floodplain (13.5%) (Table 4, Figures 6 and 7). Less than 10% of the remaining land use/cover was comprised of pasture/grazing (4.1%), other agricultural land (3.4%), and other urban or built-up land (1.9%).

Likely due to the existing land use/cover which is in a relatively 'natural' state (i.e., well treed/grassed residential yards, mixed forest land, and meadow/floodplain) nearly three quarters of the mainstem Fisher River was determined to Class A (58.5%) and B (16.4%) aquatic habitat (Table 5, Figures 10 and 11). The remaining aquatic habitat was comprised of Class C (22.2%) and D (2.9%) areas.

Twenty-seven potential rehabilitation sites were identified along the mainstem Fisher River (Table 6, Figures 10 and 11, Appendix 3 Table A3-1). The majority of these sites were Priority 3 (n = 17), followed by Priority 1 (n = 7), and 2 (n = 3). Issues were primarily identified within residential areas (n = 11), along pastures (n = 8), or at crossings identified as barriers (n = 3 ford crossings, one beaver dam) (Table 6). With the high spring flows three of the ford crossings identified along the mainstem Fisher River had been washed out (Photo 8). By August 22, the fords at Wpt. # 39 and 40 were repaired (Photo 9); however, by November 3 the ford at rehabilitation site 95 was still in need of repair (Photo 10).



Photo 9. Aerial view of repaired ford at Wpt. # 40, mainstem Fisher River, November 3, 2008.

The mainstem Fisher River provides enough natural habitat, sinuosity, instream variability and flow to be considered Class 1 fish habitat (i.e., water body having a high capability for production of fish). In addition, the majority of the mainstem Fisher River should be considered important habitat (i.e., requiring a moderate level of protection) with areas of, likely, critical habitat. However, critical areas are not identified within this document as none were identified through existing information and/or fisheries investigations conducted by North/South Consultants Inc.



Photo 10. Rehabilitation site 95 on the mainstem Fisher River, November 3, 2008.

3.6 EAST FISHER RIVER

With a gross drainage area of 393 km², the east Fisher River flows north (through the community of Fisher Branch) for approximately 50 km before meeting the west Fisher River downstream of the community of Peguis (Table 1, Figure 1) (ECWSC 2008). With an average elevation of 238 MASL (at its headwaters), the east Fisher River drops approximately 31 m when it meets the west Fisher River (Figure 4).

3.6.1 Review of Existing Information

Environment Canada - Water Survey of Canada has one discontinued station (# 05SD004) on the east Fisher River located near Hodgson which monitored flows from 1961 to 1997 (ECWSC 2008). Mean monthly discharge for the 37-year period shows flows starting in March (0.371 m³/sec), peaking in April (4.15 m³/sec), and receding from May (1.14 m³/sec) until October (0.266 m³/sec). The extreme monthly mean discharge during the period of record occurred in April 1976, with a record discharge of 17.9 m³/sec.

Sporadic water quality records exist for the east Fisher River from 1994 and 1995 (WQMS-MWS 2009). However, sample stations were established on this watercourse in 1996 as part

of a study conducted by Green (1996). This study suggested the east Fisher River was a significant contributor to phosphorus levels in the mainstem Fisher River. This was determined because samples from the upstream east Fisher River sites were higher than the west Fisher River and from samples downstream of the target areas (i.e., channels which received target field runoff) (Green 1996).

The Land Resource Unit (1999) compiled information on the soils and terrain within the Rural Municipality of Fisher. As the east Fisher River flows through the majority of this municipality this document could be a valuable resource tool for watershed planning by the EICD.

No specific fisheries records were located for east Fisher River following an FIHCS search or conversations with regional fisheries biologists (MWSFB 2008). However, it is possible that some or all of the 17 species identified throughout the watershed could inhabit portions of the east Fisher River (Appendix 1 Table A1-4).

3.6.2 Field Surveys – 2008 and 2009

Results of field surveys conducted by North/South Consultants Inc. along the east Fisher River are provided in Appendix 1 and 2.

On August 22, 2008, a discharge of $0.100 \text{ m}^3/\text{sec}$ was recorded by North/South Consultants Inc. at Wpt. # 47 (east of Fisher Branch) (Figure 9, Appendix 1 Table A1-2). Approximately 13 km downstream (at Wpt. # 12) a discharge of $0.437 \text{ m}^3/\text{sec}$ was recorded. Although these flows are within the range of mean monthly discharges previously recorded on the east Fisher River, higher spring flows were likely experienced (ECWSC 2008). On August 6, two gravel fords were flooded over (Wpt. # 8) and/or washed out (Wpt. # 10) (Figure 9) (Photo 10). The high water event during the spring of 2009 also washed out a number of the crossings along the east Fisher River.

On August 22, 2008, three white sucker were captured under a bridge at Wpt. # 12 (Tables 2 and 3, Figure 8, Appendix 1 Table A1-5). With a mean length of 183 mm, these fish were either young-of-the-year ($n = 1$) or juvenile residents ($n = 2$). On October 27, 2008, four fish (two northern pike, one central mudminnow, and one rock bass) were captured at Wpt. # 13 (Figure 8, Appendix 1 Table A1-5). With a mean length of 190 mm, the northern pike represent the young-of-the-year class. Data suggest that northern pike and white sucker may migrate upstream along the east Fisher River from the mainstem Fisher River at least to Wpt. # 12 (a distance of approximately 17 km) for the purpose of spawning. There may also be

resident populations of northern pike and white sucker over wintering along reaches of the east Fisher River.

A hoop net set for one night (April 23, 2009) at Wpt. # 13 captured one ripe female northern pike and one adult white sucker (Table 3, Figure 8, Appendix 1 Table A1-5). A second hoop net was set at Wpt. # 17 for two nights (average water temperature 8.0 °C) (April 28 and 29) and captured 68 white suckers. These white suckers averaged 502 mm in length and were all adults either preparing to spawn in the current year (three ripe females and five males) or had already spawned (two spent males). White suckers were also observed being dip netted at the crossing beside Wpt. # 17, suggesting they were traveling in fairly large numbers.



Photo 11. Washed out ford on the east Fisher River at Wpt. # 10, August 5, 2008.

3.6.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

Ground classifications for the east Fisher River are provided in Appendix 2 (Table A2-6). Nearly 78% of the east Fisher River was classified according to land use/cover (Table 1, Figures 1, 8, and 9). Meadow/floodplain (29.6%) and pasture/grazing (27.3%) were the dominant land use/cover classifications identified (Table 4, Figures 8 and 9). With the exception of residential/commercial (13.8%), the remaining classifications were almost evenly distributed between mixed forest land (8.1%), other agricultural land (7.8%), hayland

(7.3%), and transportation (6.2%). Reaches of meadow/floodplain were distributed throughout the course of the east Fisher River. Conversely, nearly all of the pasture/grazing identified on the east Fisher River was located along a stretch of river between the Dumoulin and Meridian drains (Figures 8 and 9).

The aquatic habitat quality along the east Fisher River was primarily rated as Class A (37.1%) and D (31.7%), followed by Class C (22.3%), and B (8.8%) (Table 5, Figures 12 and 13). Class A habitat was primarily located in the headwaters of this watercourse (in areas with natural sinuosity or along transportation routes (closer to the confluence with the west Fisher River). Long tracts of Class D habitat were often associated with agricultural practices such as pasture/grazing and were typically extensive.

With issues notably related to barriers and pasturing, a total of 66 potential rehabilitation sites were identified along the east Fisher River (Table 6, Figures 12 and 13, Appendix 3). Nearly half of the sites identified were either Priority 3 (n = 32) or 1 (n = 30) sites, followed by Priority 2 (n = 4) (Table 6). Nineteen of the Priority 1 sites were related to pasturing compared to 10 (Priority 1) barrier sites. Where identified, pasturing and related issues along the east Fisher River were often extensive and extremely impacting (Photo 12). Large numbers of cattle were often observed directly instream, banks showed excessive erosion, and riparian zones were habitually non-existent (Photo 13). A large number of the fords identified were 'bed-grade' used to allow cattle access into and through streams (Photo 14). Or, in other cases, allowed the passage of machinery from one side of the river to the other.

From its confluence with the west Fisher River upstream to Fisher Branch, the east Fisher River could provide Class 1 and/or important fish habitat for larger bodied species such as northern pike and white sucker. However, land use practices along this watercourse have likely marginalized long tracts of fish habitat, specifically between Wpt. # 10 and 17 (Figure 8) (Photos 12, 13, and 14).



Photo 12. Aerial image of extensive cattle grazing along the east Fisher River (Wpt. # 13, Rehabilitation site 50), November 3, 2008.



Photo 13. Cattle grazing along the east Fisher River at Wpt. #13 (Rehabilitation # 50), August 5, 2008.



Photo 14. A 'bed-grade' ford cattle crossing along the east Fisher River (Rehabilitation # 47), 2008. Note – cattle on both sides and in river.

3.7 WEST FISHER RIVER

At an elevation of approximately 259 MASL, the headwaters of the west Fisher River are formed by Blind Creek and the Kilkenny Drain (Figures 1 and 5). Flowing northeast for approximately 50 km, the west Fisher River meets the east Fisher River (south of the community of Peguis) to form the mainstem of the Fisher River (Table 1, Figure 1). Along this course the west Fisher River drops approximately 32 m, to an elevation of 227 MASL.

3.7.1 Review of Existing Information

Environment Canada - Water Survey of Canada does not have a metering station on the west Fisher River (ECWSC 2008). Water quality samples were collected from the west Fisher River in as part of a manure application study being conducted by Green (1996) (WQMS-MWS 2009).

The Land Resource Unit (1999) compiled information on the soils and terrain within the Rural Municipality of Fisher. Much of the west Fisher River flows through this municipality which makes this document a valuable resource tool for watershed planning by the EICD.

No specific fisheries records were located for west Fisher River following an FIHCS search or conversations with regional fisheries biologists (MWSFB 2008). However, it is possible that some or all of the 17 species identified throughout the watershed could inhabit portions of the west Fisher River (Appendix 1 Table A1-4).

3.7.2 Field Surveys – 2008 and 2009

A discharge of 1.780 m³/sec was recorded by North/South Consultants Inc. at Wpt. 44 (north of Hodgson) (Figure 8, Appendix 1 Table A1-2) (Photo 15). Also recorded at this site was a turbidity reading of 210 NTU (Appendix 1 Table A1-3). This relatively high reading is likely a result of the constricted flow through the culvert and the unconsolidated gravel based shoreline/road which is prone to erosion.

No fisheries investigations were conducted along the west Fisher River during the summer/fall, 2008. However, 18 white sucker were dip netted within 10 minutes at the washed out road crossing at Wpt. # 44 (Table 3, Figure 8, Appendix 1 Table A1-5). Although not in spawning condition (average water temperature 6.0 °C), these fish were adults attempting to migrate further upstream. Their upstream migration was likely impaired by excessive velocities recorded at the washout (1.60 m/s) and at the downstream end of the culvert (3.07 m/s) which was still in place (Photo 16).

3.7.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

The entirety of the west Fisher River was classified according to land use/cover (Table 4, Figures 8 and 9). The lack of channelization and, subsequent natural sinuosity of the west Fisher River, helps maintain relatively high percentages of meadow/floodplain (35.7%) and mixed forest land (11.2%). The remaining land use/cover along this watercourse was pasture/grazing (15.9%), other agricultural land (6.0%), residential/commercial (1.8%), and transportation (0.8%) (Table 3, Figures 8 and 9).

The natural land cover of the west Fisher River contributes to the high percentage of Class A (49.1%) and B (15.5%) aquatic habitat (Table 5, Figures 12 and 13). The remaining habitat was determined to be Class C (26.6%) and, to a lesser extent, Class D (8.7%).



Photo 15. Looking downstream along the west Fisher River, Wpt. # 44, August 22, 2008.



Photo 16. Washout at Wpt. # 44, April 23, 2009.

A total of 38 potential rehabilitation sites were identified along the west Fisher River (Table 6, Figures 12 and 13 Appendix 3 Table A3-1). The majority of these were identified as Priority 3 sites (n = 26), followed by Priority 1 (n = 10) and 2 (n = 2). Composed of nine beaver dams, nine bed grade fords, and one debris barrier, a total of 19 Priority 3 sites were identified as temporary/potential barriers. The remaining Priority 3 sites were related to road way crossings (n = 3), residential sites (n = 2), grazing (n = 1), and one off-site retention pond. Nine of the Priority 1 sites were livestock-based (i.e., six grazing areas and three instream fords for cattle crossing) while the remaining Priority 1 site identified an area of shoreline erosion. Both of the Priority 2 sites were related to shoreline erosion either expedited by a road crossing or denuded river banks.

None of the barriers identified on the west Fisher River are assumed to block the migration of fish entirely. Specifically, all of the fords are considered 'bed grade' and should pass both water and fish throughout the course of the season. However, in years of lower flows this may not always be the case. The beaver dams are also only considered temporary barriers as they are part of the natural stream process.

The size, natural sinuosity, stream morphology, and current land use of the west Fisher River were all determining factors when identifying this watercourse as Class 1 (i.e., water body having a high capability for the production of fish) and/or important fish habitat.

3.8 KILKENNY DRAIN

The Kilkenny Drain runs in a south to north direction for approximately 11 km before discharging into the headwaters of the west Fisher River (adjacent to the mouth of Blind Creek) (Table 1, Figure 1) (Photo 17).



Photo. 17. Looking upstream along the Kilkenny Drain, Wpt. # 27, 2008.

3.8.1 Review of Existing Information

Neither hydrometric data nor existing water quality information were found relating to the Kilkenny Drain (ECWSC 2008; WQMS-MWS 2009). Two species of fish (brook stickleback and central mudminnow) were reported being captured on the Kilkenny Drain (MWSFB 2009) (Table 2).

A Manitoba Government news release (dated September 19, 2006) outlined a series of provincial drainage projects (Canadian Environmental Assessment Archives. 2008). Scheduled for completion within five to six years, projects along the Kilkenny Drain were to include land acquisition for water retention and the reconstruction of existing drains.

3.8.2 Field Surveys – 2008 and 2009

Field surveys were conducted along the Kilkenny Drain on August 5, 2008. Investigations were conducted, primarily, for the collection of photographs and land use/cover classifications (Appendix 2 Table A2-8). The Kilkenny Drain was not identified for summer/fall (2008) fish utilization surveys. However, one hoop net set at Wpt. # 27 (for a total of four nights) captured one female white sucker (479 mm) preparing to spawn in the current year (Table 3, Figure 9, Appendix 1 Table A1-5). Although data are limited, they do

suggest adult large bodied species could migrate well into this watershed. At this site, several thousand brook stickleback were observed and dip netted at a culvert.

3.8.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

The approximate 11 km of Kilkenny Drain classified according to land use/cover were determined to be: other agricultural land (58.2%); meadow/floodplain (19.1%); pasture/grazing (13.6%); and hayland (9.1%) (Table 4, Figure 9). Aquatic habitat classifications along this drain were comprised of Class C (64.5%), Class A (21.8%), and Class D (13.6%) (Table 5, Figure 13). Primarily, the Class C habitat was the channelized portion of this drain where other agricultural land predominated. The Class D habitat was specifically located with the pasture/grazing land use.

Two potential rehabilitation sites (# 139 and 140) were identified on the Kilkenny Drain (Table 5, Figure 13, Appendix 3 Table A3-1). Both Priority 1, these sites identified issues related to extensive grazing and direct livestock access to the watercourse.

The location of this drain in the upper headwaters of this watershed likely limits its potential for the production of fish. However, these limitations are moderate (i.e., Class 3), being offset by the relative size; fairly unobstructed channel; and natural habitat along this drain. Despite the natural habitat of this watercourse it should also be considered as marginal fish habitat.

3.9 LEROY DRAIN

The Leroy Drain primarily flows in a south easterly direction for seven km before discharging into the west Fisher River (north east of Fisherton) (Table 1, Figure 1) (Photo 18).



Photo 18. Looking downstream along the Leroy Drain, Wpt. # 22, August 5, 2008.

3.9.1 Review of Existing Information

Neither hydrometric data nor existing water quality information were found relating to the Leroy Drain (ECWSC 2008; WQMS-MWS 2009). No specific fisheries records were located for the Leroy Drain following an FIHCS search or conversations with regional fisheries biologists (MWSFB 2009).

3.9.2 Field Surveys – 2008 and 2009

With the exception of digital photography, no stream properties (i.e., discharges, depths, substrate composition) or summer/fall fish utilization surveys were conducted on Leroy Drain Creek in 2008. In addition, Leroy Drain was not identified for spring fisheries investigations in 2009.

3.9.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

Pasture/grazing (38.7%), mixed forest land (32.3%), and hayland (29.0%) comprised the three km of the Leroy Drain classified according to land use/cover (Table 4, Figure 8). Due

to existing land use and channelization, the majority of the Leroy Drain was classified as Class D (37.5%) and C (28.1%) aquatic habitat (Table 5, Figure 12). However, just over one km of habitat (upstream from its mouth) along this drain was determined to be Class A (28.1%) and B (6.3%).

No potential rehabilitation sites were identified along the Leroy Drain (Table 6, Figure 12). Under the right water levels, it is suspected that the first one km of this drain (at west Fisher River) could provide marginal fish habitat as a Class 3 waterbody (i.e., moderate limitations to the production of fish).

3.10 MERIDIAN DRAIN

The Meridian Drain flows in a north westerly direction for approximately 15 km before emptying onto the east Fisher River, south east of Hodgson (Table 1, Figure 1) (Photo 19).



Photo 19. Looking downstream along the Meridian Drain, Wpt. # 16, August 5, 2008.

3.10.1 Review of Existing Information

Hydrometric data were not available for the Meridian Drain (ECWSC 2008). However, water quality samples were collected on this drain in a study conducted by Green (1996) to determine the impacts of hog manure (WQMS-MWS 2009).

Fisheries investigations conducted by the Department of Fisheries and Oceans (July 2004) captured three young-of-the-year white sucker (32 mm mean length) (MWSFB 2009). Data suggest that white sucker migrated into the Meridian Drain (from the east Fisher River) and were able to find suitable spawning habitat in the spring of 2004.

3.10.2 Field Surveys – 2008 and 2009

On August 5, ground investigations (land use classifications and collection of photographs) were conducted at three sites along the Meridian Drain. However, this watercourse was not identified for either summer/fall (2008) or spring fisheries investigations (2009).

3.10.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

Ground classifications for Meridian Drain are provided in Appendix 2 (Table A2-10). The first two km of this drain (from east Fisher River) were classified according to land use/cover and aquatic habitat quality. One reach of pasture/grazing (77.8%) was determined to be Class D habitat while an area of mixed forest land (22.2%) was classified as Class A habitat (Tables 4 and 5, Figures 8 and 12).

One potential rehabilitation site (# 62) was identified on the Meridian Drain (Table 6, Figure 12, Appendix 3 Table A3-1). This Priority 2 site identified a pasturing area with some bank erosion and, likely, direct access to the watercourse. However, additional groundtruthing would be warranted at this site at the discretion of the EICD. The two km of the Meridian Drain reviewed could offer some fish habitat, but it should be considered as Class 3 (i.e., having moderate limitations to the production of fish) and/or marginal.

3.11 PLISHKA DRAIN

The Plishka Drain flows south-eastward for approximately 10 km before emptying into the east Fisher River, south west of the town of Fisher Branch (Table 1, Figure 1) (Photo 20).



Photo 20. Looking upstream along the Plishka Drain, Wpt. # 49, August 6, 2008.

3.11.1 Review of Existing Information

No existing information regarding hydrometric data or water quality records were found relating to Plishka Drain (ECWSC 2008, WQMS-MWS 2009).

The Department of Fisheries and Oceans conducted fisheries investigations on the Plishka Drain in July, 2002 (MWSFB 2009). Records indicate that four young-of-the-year white sucker (ranging in length from 90 to 100 mm) were captured suggesting successful spawning in this drain in 2002.

3.11.2 Field Surveys – 2008 and 2009

Two sites were visited on the Plishka Drain on August 6, 2008. However, no hydrometric surveys or fisheries investigations were conducted due to minimal flow conditions at this time. The Plishka Drain was not identified for either summer/fall (2008) or spring (2009) fisheries investigations.

3.11.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

Ground classifications for the Plishka Drain are provided in Appendix 2 (Table A2-11).

Approximately six km of the Plishka Drain was classified according to land use/cover (Table 4, Figure 9). Other agricultural land (42.1%) and cropland (36.8%) comprised the majority of the land use followed by hayland (12.3%) and pasture/grazing (8.8%). The Plishka Drain was rated as Class C (91.2%) and, to a lesser extent, Class D (8.8%) aquatic habitat (Table 5, Figure 13).

No potential rehabilitation sites were identified along the Plishka Drain (Table 6, Figure 13). Forming the headwaters of the east Fisher River and likely maintaining minimal or intermittent flows, the Plishka Drain is considered a Class 4 watercourse (i.e., having severe limitations to the production of fish) being comprised of marginal habitat.

3.12 RUS DRAIN

The Rus Drain primarily flows west for five km before discharging into the east Fisher River, north of the town of Fisher Branch (Table 1, Figure 1) (Photo 21).



Photo 21. Looking upstream along the Rus Drain, Wpt. # 45, August 6, 2008.

3.12.1 Review of Existing Information

No existing records regarding hydrometric data were found relating to Rus Drain (ECWSC 2008). On May 25, 1995, the Rus Drain was sampled (at PTH #17) for ammonia soluble, fecal coliforms, soluble nitrate and nitrite, total and dissolved phosphorus, and TKN (WQMS-MWS 2009). These data were provided to EICD for inclusion in their water quality database.

In July 2002, the Department of Fisheries and Oceans conducted fisheries investigations on the Rus Drain capturing two northern pike (195 and 200 mm) (MWSFB 2009). Perhaps not young-of-the-year or sexually mature, these two fish are likely residents of the east Fisher River and migrated into the Rus Drain for feeding purposes.

3.12.2 Field Surveys – 2008 and 2009

Two sites were visited on the Rus Drain on August 6, 2008. However, no hydrometric surveys or fisheries investigations were conducted due to minimal flow conditions during this period. The Rus Drain was not identified for either summer/fall (2008) or spring (2009) fisheries investigations.

3.12.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

Ground classifications for the Rus Drain are provided in Appendix 2 (Table A2-12).

The one km of the Rus Drain classified for land use/cover was determined to be hayland, consistent with Class C (100.0%) aquatic habitat (Tables 4 and 5, Figures 9 and 13). Although not indicated on the figures, groundtruthing identified the area upstream of Wpt. 45 as pasture/grazing (Photo 20). This fenced area, identified as rehabilitation site #142, showed direct access by livestock into the watercourse and a denuded riparian zone defining it as a Priority 1. The second rehabilitation site (#150, Priority 3) identified on the Rus Drain was a ford located near the east Fisher River (Figure 13, Appendix 3 Table A3-1)

The Rus Drain should be considered a Class 4 waterbody (i.e., having severe limitations to the production of fish) with marginal fish habitat.

3.13 SUNNY VALLEY DRAIN

The Sunny Valley Drain flows in a south easterly direction for approximately seven km before emptying into the Fisher River, north of Dallas (Table 1, Figure 1) (Photo 22).



Photo 22. Looking downstream along the Sunny Valley Drain, Wpt. # 33, August 6, 2008.

3.13.1 Review of Existing Information

In 2005, an environmental assessment was required by the Department of Fisheries and Oceans for proposed works along the Sunny Valley Drain (Canadian Environmental Assessment Archives, 05-01-16742). The project involved the mowing and removal of brush from approximately 11 km of this drain starting at 14-28-1 W1M and extending upstream to 10-29-1 W1M. In March 2007, this project was allowed to proceed in that it was not likely to cause ‘significant adverse environmental effects’.

Neither hydrometric data nor existing water quality information were found relating to the Sunny Valley Drain (ECWSC 2008, WQMS-MWS 2009).

In July 2004, two species of fish (one central mudminnow and one northern pike) were captured on the Sunny Valley Drain (Table 2, Figure 1) (MWSFB 2009). The northern pike was 66 mm in length representing a young-of-the-year fish.

3.13.2 Field Surveys – 2007 and 2008

Ground investigations were conducted along the Sunny Valley Drain on August 6 and 22, 2008 (Appendix 2 Table A2-13). This work included the compilation of digital photographs, land use/cover classifications, and basic water quality readings.

The Sunny Valley Drain was not identified for spring fisheries investigations in 2009.

3.13.3 Land Use/Cover, Aquatic Habitat and Rehabilitation Sites

Just over seven km of the Sunny Valley Drain was classified according to land use/cover (Table 4, Figure 6). The four classifications identified were hayland (71.2%), pasture/grazing (17.8%), meadow/floodplain (6.8%), and cropland (4.1%). The majority of the Sunny Valley Drain has been channelized and, subsequently, was rated as Class C (82.2%) aquatic habitat quality (Table 5, Figure 10). The remainder of this drain was comprised of Class A (6.8%), D (6.8%), and B (4.1%) aquatic habitat.

One potential rehabilitation site (# 143, Wpt. 34) was identified on the Sunny Valley Drain (Table 6, Figure 10, Appendix 3 Table A3-1) (Photo 22). This site identified a pasturing/grazing area with direct access by livestock into the watercourse, no buffer areas, and the possibility of manure piles in close proximity to the drain. The level of grazing and potential for nutrient loading into the Fisher River (and subsequently Lake Winnipeg) warrants the labelling of this site as a Priority 1.

Discussions with local landowners suggest the presence of beaver dams downstream of Wpt. 35 (Figure 6). Although not directly observed, these dams are likely located in the section of drain classified as meadow/floodplain (i.e., closer to the confluence with the Fisher River). Depending on their size and flow conditions, these dams could hinder upstream fish passage but should be considered as temporary barriers.

Despite the presence of beaver dams near the mouth of this drain the first one km (i.e., upstream to Wpt. 35) could be considered Class 2 (i.e., slight limitations to production of fish) and/or important fish habitat (i.e., requiring a moderate level of protection). This relatively large tributary to the Fisher River is also in close proximity to Lake Winnipeg.

The natural habitat found at the mouth of the Sunny Valley Drain could attract several species of migrating fish for feeding, growth, and/or reproduction. However, upstream of Wpt. 35 (due to channelization and current land use) the habitat becomes marginal and more comparable to Class 4 habitat (i.e., severe limitations to the production of fish).



Photo 22. Cattle grazing in and along the Sunny Valley Drain, Rehabilitation Site 143 (Wpt. #34), August 6, 2008.

4.0

REFERENCES

- Agriculture and Agri-Food Canada – Prairie Farm Rehabilitation Administration, Prairies East Region (AAFC-PFRA). 2004. Summary of resources and land use issues related to riparian areas in the Icelandic River watershed study area. Agriculture and Agri-Food Canada – Prairie Farm Rehabilitation Administration, Winnipeg.
- Anderson, J.R., E.E. Hardy, J.T. Roach, and R.E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. Geological Survey Professional Paper: 964.
- Armantrout, N. B., compiler. 1998. Glossary of aquatic habitat inventory terminology. American Fisheries Society, Bethesda, Maryland.
- Bain, M.B. and N.J. Stevenson, editors. 1999. Aquatic habitat assessment: Common methods. American Fisheries Society, Bethesda, Maryland.
- Canadian Environmental Assessment Archives. 2008. (<http://www.ceaa.gc.ca/052/index-eng.cfm>)
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2008. www.cosewic.gc.ca/. Accessed February, 2008.
- Department of Fisheries and Oceans (DFO). 1998. Habitat conservation and protection guidelines. Developed from the *Policy for the management of fish habitat* (1986). Communications Directorate, Fisheries and Oceans Canada, Ottawa, Ontario. Second edition.
- Dieck, J. J. and L. R. Robinson. 2004. Techniques and Methods Book 2, Collection of Environmental Data, Section A, Biological Science, Chapter 1. General classification handbook for floodplain vegetation in large river systems: U.S. Geological Survey, Techniques and Methods 2 A-1, 52 p.
- Donat, M. 1995. Bioengineering techniques for stream bank restoration: A review of central European practices. Ministry of Environment, Lands, and Parks and Ministry of Forests, British Columbia. Watershed Restoration Project Report No. 2.
- Environment Canada, Water Survey of Canada (ECWSC). 2008 and 2009. www.msc.ec.gc.ca/wsc. Accessed February 18, 2008.
- Evanitski, C. no date. The drain primer: A guide to maintaining and conserving agricultural drains and fish habitat. Produced by Drainage Superintendents Association of Ontario and Ontario Federation of Agriculture in association with Fisheries and Oceans Canada.
- Fish Futures. 1994. Fisher River area surveys including East Fisher River, Fisher River, Kirkness Creek, Goldeye Creek, and Jean Mason's Creek. Fish Futures On-the-water Interpretive Centre. Lockport, Manitoba, General Delivery.
- Fisheries and Oceans – Manitoba Natural Resources. 1996. Manitoba stream crossing guidelines for the protection of fish and fish habitat.

- Green, D. J. 1996. Surface water quality impacts following winter applications of hog manure in the Interlake Region, Manitoba, Canada, 1996. Water Quality Management Section. Manitoba Environment. Report No. 96-14.
- Kipp, S., and C. Callaway. 2003. On the living edge: Your handbook for waterfront living. Saskatchewan/Manitoba Edition. www.livingbywater.ca
- Koning, C.W. 1999. Riparian assessment and prescription procedures. Ministry of Environment, Lands, and Parks, Watershed Restoration Program. University of British Columbia. Watershed Restoration Technical Circular No. 6.
- Land Resource Unit. 1999. Soils and terrain. An introduction to the land resource. Rural Municipality of Fisher. Information bulletin 99-18, Brandon Research Center, Research Branch, Agriculture and Agri-Food Canada.
- MacDonell, D. S. 1995. Assessment offish utilization of an artificial spawning riffle near bridge site no. 4500 on the Fisher River, Manitoba. A report prepared for Manitoba Highways and Transportation by North/South Consultants Inc.
- Manitoba Land Initiative (MLI). 2008. <http://www.mli2.gov.mb.ca>. Accessed April 2008.
- Manitoba Water Stewardship - Fisheries Branch (MWSFB). 2009. Office located in Winnipeg Manitoba. Fisheries Inventory Habitat Classification System (FIHCS), files and library search.
- Natural Resources Canada (NRC). National Topographic Service Base. 2008. <http://www.geogratis.gc.ca>. Accessed April 2008.
- Newbury, R. W. and M. N. Gaboury. 1993. Stream analysis and fish habitat design. A field manual. Newbury Hydraulics Ltd. and The Manitoba Habitat Heritage Corporation. Co-published by Manitoba Natural Resources.
- Peguis Development Corporation. 2004. Mid term report – Peguis riparian improvement project. Submitted to: Sustainable Development Innovations Fund. Manitoba Conservation, Pollution Prevention Branch, Winnipeg Manitoba.
- Stewart, K. W. and D. A. Watkinson. The freshwater fishes of Manitoba. University of Manitoba Press.
- Terzi, R. A. 1981. Hydrometric field manual – measurement of streamflow. Inland Waters Directorate Water Resources Branch. Ottawa, Canada.
- United States Department of Agriculture (USDA). 1998. Stream visual assessment protocol. National Water and Climate Center technical note: 99-1.
- United States Department of Agriculture (USDA). 2004. Riparian assessment using the NRCS riparian assessment method. United States Department of Agriculture and Natural Resources Conservation Service (NRCS).
- Water Quality Management Section - Manitoba Water Stewardship (WQMS-MWS). 2009. 123 Main Street, Suite 160. Winnipeg, Manitoba. R3C 1A5.
- Williams, J.E., C.A. Wood, and M.P. Dombeck, editors. 1997. Watershed restoration: Principles and practices. American Fisheries Society, Bethesda, Maryland.

TABLES AND FIGURES

Table 1. Length of watercourse (determined by the National Topographic Service Base), length and percent of each watercourse classified, and availability of provincial water quality data for Watershed 05SD, 2008.

| WATERCOURSE | Length (km) ¹ | Length Classified (km) | % Classified | Classification Source ² | | | WQMS Data ⁶ |
|---------------------------|--------------------------|------------------------|--------------|------------------------------------|-------------------|-------------------|------------------------|
| | | | | DTD ³ | HRAI ⁴ | GRND ⁵ | |
| Blind Creek | 7.8 | 3.2 | 40.9 | 1 | 3 | 2 | |
| Bottle Creek | 14.0 | 1.7 | 12.1 | 1 | 2 | 3 | Yes |
| Broad Valley Drain | 19.8 | 12.2 | 61.7 | 2 | 1 | 3 | Yes |
| Dumoulin Drain | 16.7 | 7.0 | 42.0 | 1 | 3 | 2 | |
| mainstem Fisher River | 41.4 | 41.4 | 100.0 | 3 | 1 | 2 | Yes |
| east Fisher River | 49.5 | 38.5 | 77.8 | 3 | 1 | 2 | Yes |
| west Fisher River | 50.2 | 50.2 | 100.0 | 3 | 1 | 2 | Yes |
| Kilkenny Drain | 11.0 | 11.0 | 100.0 | 3 | 1 | 2 | |
| Leroy Drain | 7.3 | 3.1 | 42.5 | 1 | 3 | 2 | |
| Meridian Drain | 15.0 | 1.8 | 12.0 | 2 | 3 | 1 | Yes |
| Plishka Drain | 9.9 | 5.7 | 57.3 | 1 | 3 | 2 | |
| Rus Drain | 4.9 | 1.0 | 20.4 | 2 | 3 | 1 | Yes |
| Sunny Valley School Drain | 9.0 | 7.3 | 81.1 | 3 | 2 | 1 | |
| TOTAL | 256.5 | 184.1 | 71.8 | | | | |

¹ Source: Department of Natural Resources, Government of Canada (NRC 2008); 1:50,000 National Topographic Service Base

² Primary (1), Secondary (2), or Tertiary (3) source of information

³ DTD = Digital Topographic Data (Source: Manitoba Land Initiative, 1996 imagery)

⁴ HRAI = High Resolution Aerial Imagery

⁵ GRND = Groundtruthing

⁶ WQMS = Water Quality Management Section (2009)

Table 2. Site specific capture information for fish species throughout watershed 05SD. (Note – Only watercourses with capture information are identified. Data compiled from MWSFB files (2009), MacDonell (1995), and field work conducted by North/South Consultants Inc. (2008 and 2009).

| COMMON NAME | ABBREVIATION | Broad Valley Drain | Dumoulin Drain | mainstem Fisher River | east Fisher River | west Fisher River | Kilkenny Drain | Meridian Drain | Plishka Drain | Rus Drain | Sunny Valley School Drain |
|--------------------------|--------------|--------------------|----------------|-----------------------|-------------------|-------------------|----------------|----------------|---------------|-----------|---------------------------|
| Brook stickleback | BRST | 1 | 1 | 1, 3 | | | 1 | | | | |
| Brown bullhead | BRBL | | | 2, 3 | | | | | | | |
| Central mudminnow | CNMN | 1, 3 | | 3 | 3 | | 1 | | | | 1 |
| Fathead minnow | FHMN | 3 | | | | | 3 | | | | |
| Iowa darter | IWDR | | | 1 | | | | | | | |
| Johnny darter | JHDR | 1, 3 | | 1 | 3 | | | | | | |
| Longnose sucker | LNSC | | | 2 | | | | | | | |
| Northern redbelly dace | NRDC | | | | | | 3 | | | | |
| Northern pike | NRPK | 3 | 1 | 1, 2 | 3 | 3 | | | | 1 | 1 |
| Rock bass | RCBS | | | 1 | 3 | | | | | | |
| Slimy sculpin | SLSC | 3 | | | | | | | | | |
| Walleye | WALL | | | 2, 3 | | | | | | | |
| White sucker | WHSC | 1, 3 | 1 | 1, 2, 3 | 3 | 3 | 3 | 1 | 1 | | |
| Yellow perch | YLPR | | | 2 | | | | | | | |
| # OF SPECIES/WATERCOURSE | | 7 | 3 | 11 | 5 | 2 | 5 | 1 | 1 | 1 | 2 |

1 = Manitoba Water Stewardship - Fisheries Branch files (2009)

2 = MacDonell (1995)

3 = North/South Consultants Inc., field studies 2008 and 2009

Table 3. A summary of fish species captured (by Wpt. #) during summer and fall 2008 and spring 2009 fish utilization surveys conducted by North/South Consultants Inc. Species codes provided in Appendix 1, Table A1.4.

| WATERCOURSE | Wpt. # | SEASON | SPECIES | | | | | | | | | | | TOTALS |
|-----------------------|--------|-------------|---------|------|------|------|------|------|------|------|------|------|------|--------|
| | | | BRBL | BRST | CNMD | FHMN | JHDR | NRDC | NRPK | RCBS | SLSC | WALL | WHSC | |
| Broad Valley Drain | 2 | Summer - 08 | - | - | - | 10 | - | - | - | - | - | - | - | 10 |
| Broad Valley Drain | 2 | Fall - 08 | - | - | 1 | - | 1 | - | - | - | 1 | - | - | 3 |
| Broad Valley Drain | 2 | Spring - 09 | - | - | 2 | - | - | - | 12 | - | - | - | 6 | 20 |
| mainstem Fisher River | 54 | Summer - 08 | - | - | - | - | - | - | - | - | - | - | - | - |
| mainstem Fisher River | 54 | Fall - 08 | - | - | - | - | - | - | - | - | - | - | - | - |
| mainstem Fisher River | 54 | Spring - 09 | 2 | 2 | - | - | - | - | 12 | - | - | 4 | 10 | 30 |
| east Fisher River | 12 | Summer - 08 | - | - | - | - | - | - | - | - | - | - | 3 | 3 |
| east Fisher River | 12 | Fall - 08 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| east Fisher River | 12 | Spring - 09 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| east Fisher River | 13 | Summer - 08 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| east Fisher River | 13 | Fall - 08 | - | - | 1 | - | - | - | 2 | 1 | - | - | - | 4 |
| east Fisher River | 13 | Spring - 09 | - | - | - | - | - | - | 1 | - | - | - | 1 | 2 |
| east Fisher River | 17 | Summer - 08 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| east Fisher River | 17 | Fall - 08 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| east Fisher River | 17 | Spring - 09 | - | - | 1 | - | 1 | - | - | - | - | - | 68 | 70 |
| west Fisher River | 44 | Summer - 08 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| west Fisher River | 44 | Fall - 08 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| west Fisher River | 44 | Spring - 09 | - | - | - | - | - | - | - | - | - | - | 18 | 18 |

Table3. Continued.

| WATERCOURSE | Wpt. # | SEASON | SPECIES | | | | | | | | | | | TOTALS |
|-------------------|--------|--------------|----------|----------|----------|-----------|----------|----------|-----------|----------|----------|----------|------------|------------|
| | | | BRBL | BRST | CNMD | FHMN | JHDR | NRDC | NRPK | RCBS | SLSC | WALL | WHSC | |
| west Fisher River | 56 | Summer - 08 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| west Fisher River | 56 | Fall - 08 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| west Fisher River | 56 | Spring - 09 | - | - | - | - | - | - | 2 | - | - | - | 1 | 3 |
| Kilkenny Drain | 27 | Summer - 08 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| Kilkenny Drain | 27 | Fall - 08 | - | - | - | - | - | - | - | - | - | - | - | 0 |
| Kilkenny Drain | 27 | Spring - 09* | - | - | - | 1 | - | 1 | - | - | - | - | 1 | 3 |
| TOTALS | | | 2 | 2 | 5 | 11 | 2 | 1 | 29 | 1 | 1 | 4 | 108 | 166 |

* 1000+ brook stickleback were dip netted at the culvert but not included in total count

Table 4. Total number of reaches (by land use/cover), length of watercourse classified, and percentage of reach by land use/cover in Watershed O5SD, 2008

| LAND USE/LAND COVER | # OF REACHES | TOTAL LENGTH OF REACHES (km) | % OF REACHES (km) |
|--|--------------|------------------------------|-------------------|
| <i>Blind Creek</i> | | | |
| Hayland | 1 | 0.3 | 9.4 |
| Residential/Commercial | 0 | 0.0 | 0.0 |
| Pasture/Grazing | 1 | 2.0 | 62.5 |
| Cropland | 1 | 0.7 | 21.9 |
| Other Agricultural Land | 0 | 0.0 | 0.0 |
| Mixed Forest Land | 0 | 0.0 | 0.0 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 1 | 0.2 | 6.3 |
| <i>Total along Blind Creek</i> | 4 | 3.2 | 100.0 |
| <i>Bottle Creek</i> | | | |
| Hayland | 1 | 1.5 | 88.2 |
| Residential/Commercial | 0 | 0.0 | 0.0 |
| Pasture/Grazing | 0 | 0.0 | 0.0 |
| Cropland | 0 | 0.0 | 0.0 |
| Other Agricultural Land | 1 | 0.2 | 11.8 |
| Mixed Forest Land | 0 | 0.0 | 0.0 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 0 | 0.0 | 0.0 |
| <i>Total along Bottle Creek</i> | 2 | 1.7 | 100.0 |
| <i>Broad Valley Drain</i> | | | |
| Hayland | 2 | 3.3 | 27.0 |
| Residential/Commercial | 0 | 0.0 | 0.0 |
| Pasture/Grazing | 1 | 0.5 | 4.1 |
| Cropland | 1 | 1.9 | 15.6 |
| Other Agricultural Land | 4 | 3.0 | 24.6 |
| Mixed Forest Land | 5 | 3.0 | 24.6 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 1 | 0.5 | 4.1 |
| <i>Total along Broad Valley Drain</i> | 14 | 12.2 | 100.0 |

Table 4. Continued.

| LAND USE/LAND COVER | # OF REACHES | TOTAL LENGTH OF REACHES (km) | % OF REACHES (km) |
|---|--------------|------------------------------|-------------------|
| <i>Dumoulin Drain</i> | | | |
| Hayland | 0 | 0.0 | 0.0 |
| Residential/Commercial | 0 | 0.0 | 0.0 |
| Pasture/Grazing | 1 | 1.5 | 21.4 |
| Cropland | 2 | 5.5 | 78.6 |
| Other Agricultural Land | 0 | 0.0 | 0.0 |
| Mixed Forest Land | 0 | 0.0 | 0.0 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 0 | 0.0 | 0.0 |
| <i>Total along Dumoulin Drain</i> | 3 | 7.0 | 100.0 |
| <i>mainstem Fisher River</i> | | | |
| Hayland | 0 | 0.0 | 0.0 |
| Residential/Commercial | 6 | 25.0 | 60.4 |
| Pasture/Grazing | 1 | 1.7 | 4.1 |
| Cropland | 0 | 0.0 | 0.0 |
| Other Agricultural Land | 3 | 1.4 | 3.4 |
| Mixed Forest Land | 5 | 6.9 | 16.7 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 1 | 0.8 | 1.9 |
| Meadow/Floodplain | 2 | 5.6 | 13.5 |
| <i>Total along mainstem Fisher River</i> | 18 | 41.4 | 100.0 |
| <i>east Fisher River</i> | | | |
| Hayland | 2 | 2.8 | 7.3 |
| Residential/Commercial | 3 | 5.3 | 13.8 |
| Pasture/Grazing | 2 | 10.5 | 27.3 |
| Cropland | 0 | 0.0 | 0.0 |
| Other Agricultural Land | 5 | 3.0 | 7.8 |
| Mixed Forest Land | 4 | 3.1 | 8.1 |
| Transportation | 1 | 2.4 | 6.2 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 7 | 11.4 | 29.6 |
| <i>Total along east Fisher River</i> | 24 | 38.5 | 100.0 |

Table 4. Continued.

| LAND USE/LAND COVER | # OF REACHES | TOTAL LENGTH OF REACHES (km) | % OF REACHES (km) |
|---|--------------|------------------------------|-------------------|
| <i>west Fisher River</i> | | | |
| Hayland | 11 | 14.4 | 28.7 |
| Residential/Commercial | 1 | 0.9 | 1.8 |
| Pasture/Grazing | 7 | 8.0 | 15.9 |
| Cropland | 0 | 0.0 | 0.0 |
| Other Agricultural Land | 3 | 3.0 | 6.0 |
| Mixed Forest Land | 8 | 5.6 | 11.2 |
| Transportation | 1 | 0.4 | 0.8 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 8 | 17.9 | 35.7 |
| <i>Total along west Fisher River</i> | 39 | 50.2 | 100.0 |
| <i>Kilkenny Drain</i> | | | |
| Hayland | 1 | 1.0 | 9.1 |
| Residential/Commercial | 0 | 0.0 | 0.0 |
| Pasture/Grazing | 1 | 1.5 | 13.6 |
| Cropland | 0 | 0.0 | 0.0 |
| Other Agricultural Land | 1 | 6.4 | 58.2 |
| Mixed Forest Land | 0 | 0.0 | 0.0 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 2 | 2.1 | 19.1 |
| <i>Total along Kilkenny Drain</i> | 5 | 11.0 | 100.0 |
| <i>Leroy Drain</i> | | | |
| Hayland | 1 | 0.9 | 29.0 |
| Residential/Commercial | 0 | 0.0 | 0.0 |
| Pasture/Grazing | 1 | 1.2 | 38.7 |
| Cropland | 0 | 0.0 | 0.0 |
| Other Agricultural Land | 0 | 0.0 | 0.0 |
| Mixed Forest Land | 1 | 1.0 | 32.3 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 0 | 0.0 | 0.0 |
| <i>Total along Leroy Drain</i> | 3.0 | 3.1 | 100.0 |

Table 4. Continued.

| LAND USE/LAND COVER | # OF REACHES | TOTAL LENGTH OF REACHES (km) | % OF REACHES (km) |
|--|--------------|------------------------------|-------------------|
| <i>Meridian Drain</i> | | | |
| Hayland | 0 | 0.0 | 0.0 |
| Residential/Commercial | 0 | 0.0 | 0.0 |
| Pasture/Grazing | 1 | 1.4 | 77.8 |
| Cropland | 0 | 0.0 | 0.0 |
| Other Agricultural Land | 0 | 0.0 | 0.0 |
| Mixed Forest Land | 1 | 0.4 | 22.2 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 0 | 0.0 | 0.0 |
| <i>Total along Meridian Drain</i> | 2 | 1.8 | 100.0 |
| <i>Plishka Drain</i> | | | |
| Hayland | 1 | 0.7 | 12.3 |
| Residential/Commercial | 0 | 0.0 | 0.0 |
| Pasture/Grazing | 1 | 0.5 | 8.8 |
| Cropland | 2 | 2.1 | 36.8 |
| Other Agricultural Land | 1 | 2.4 | 42.1 |
| Mixed Forest Land | 0 | 0.0 | 0.0 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 0 | 0.0 | 0.0 |
| <i>Total along Plishka Drain</i> | 5.0 | 5.7 | 100.0 |
| <i>Rus Drain</i> | | | |
| Hayland | 1 | 1.0 | 100.0 |
| Residential/Commercial | 0 | 0.0 | 0.0 |
| Pasture/Grazing | 0 | 0.0 | 0.0 |
| Cropland | 0 | 0.0 | 0.0 |
| Other Agricultural Land | 0 | 0.0 | 0.0 |
| Mixed Forest Land | 0 | 0.0 | 0.0 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 0 | 0.0 | 0.0 |
| <i>Total along Rus Drain</i> | 1 | 1.0 | 100.0 |

Table 4. Continued.

| LAND USE/LAND COVER | # OF REACHES | TOTAL LENGTH OF REACHES (km) | % OF REACHES (km) |
|--|--------------|------------------------------|-------------------|
| <i>Sunny Valley Drain</i> | | | |
| Hayland | 1 | 5.2 | 71.2 |
| Residential/Commercial | 0 | 0.0 | 0.0 |
| Pasture/Grazing | 1 | 1.3 | 17.8 |
| Cropland | 1 | 0.3 | 4.1 |
| Other Agricultural Land | 0 | 0.0 | 0.0 |
| Mixed Forest Land | 0 | 0.0 | 0.0 |
| Transportation | 0 | 0.0 | 0.0 |
| Other Urban or Built-up Land | 0 | 0.0 | 0.0 |
| Meadow/Floodplain | 1 | 0.5 | 6.8 |
| <i>Total along Sunny Valley Drain</i> | 4 | 7.3 | 100.0 |
| <i>Combined</i> | | | |
| Hayland | 22 | 31.1 | 16.9 |
| Residential/Commercial | 10 | 31.2 | 16.9 |
| Pasture/Grazing | 18 | 30.1 | 16.3 |
| Cropland | 7 | 10.5 | 5.7 |
| Other Agricultural Land | 18 | 19.4 | 10.5 |
| Mixed Forest Land | 24 | 20.0 | 10.9 |
| Transportation | 2 | 2.8 | 1.5 |
| Other Urban or Built-up Land | 1 | 0.8 | 0.4 |
| Meadow/Floodplain | 22 | 38.2 | 20.7 |
| <i>Total combined</i> | 124 | 184.1 | 100.0 |

Table 5. Total number of reaches (by habitat quality rating), length of watercourse classified, and percentage of reach by rating in Watershed O5SD, 2008.

| AQUATIC HABITAT CLASSIFICATION | # OF REACHES | TOTAL LENGTH OF REACHES (km) | % OF REACHES (km) |
|---|-----------------|---------------------------------|----------------------|
| <i>Blind Creek</i> | | | |
| Class 'A' | 0 | 0.0 | 0.0 |
| Class 'B' | 1 | 0.2 | 6.3 |
| Class 'C' | 2 | 1.0 | 31.3 |
| Class 'D' | 1 | 2.0 | 62.5 |
| <i>Total along Blind Creek</i> | 4 | 3.2 | 100.0 |
| <i>Bottle Creek</i> | | | |
| Class 'A' | 0 | 0.0 | 0.0 |
| Class 'B' | 0 | 0.0 | 0.0 |
| Class 'C' | 1 | 1.5 | 88.2 |
| Class 'D' | 1 | 0.2 | 11.8 |
| <i>Total along Bottle Creek</i> | 2 | 1.7 | 100.0 |
| <i>Broad Valley Drain</i> | | | |
| Class 'A' | 1 | 1.9 | 15.6 |
| Class 'B' | 3 | 3.3 | 27.0 |
| Class 'C' | 2 | 7.0 | 57.4 |
| Class 'D' | 0 | 0.0 | 0.0 |
| <i>Total along Broad Valley Drain</i> | | 12.2 | 100.0 |
| <i>Dumoulin Drain</i> | | | |
| Class 'A' | 0 | 0.0 | 0.0 |
| Class 'B' | 0 | 0.0 | 0.0 |
| Class 'C' | 2 | 5.5 | 78.6 |
| Class 'D' | 1 | 1.5 | 21.4 |
| <i>Total along Dumoulin Drain</i> | 3 | 7.0 | 100.0 |
| <i>mainstem Fisher River</i> | | | |
| Class 'A' | 11 | 24.2 | 58.5 |
| Class 'B' | 6 | 6.8 | 16.4 |
| Class 'C' | 7 | 9.2 | 22.2 |
| Class 'D' | 3 | 1.2 | 2.9 |
| <i>Total along mainstem Fisher River</i> | 27 | 41.4 | 100.0 |

Table 5. Continued.

| AQUATIC HABITAT CLASSIFICATION | # OF REACHES | TOTAL LENGTH OF REACHES (km) | % OF REACHES (km) |
|---|-----------------|---------------------------------|----------------------|
| <u>east Fisher River</u> | | | |
| Class 'A' | 5 | 14.3 | 37.1 |
| Class 'B' | 4 | 3.4 | 8.8 |
| Class 'C' | 4 | 8.6 | 22.3 |
| Class 'D' | 4 | 12.2 | 31.7 |
| <i>Total along east Fisher River</i> | 17 | 38.5 | 100.0 |
| <u>west Fisher River</u> | | | |
| Class 'A' | 10 | 24.7 | 49.1 |
| Class 'B' | 8 | 7.8 | 15.5 |
| Class 'C' | 8 | 13.4 | 26.6 |
| Class 'D' | 5 | 4.4 | 8.7 |
| <i>Total along west Fisher River</i> | 31 | 50.3 | 100.0 |
| <u>Kilkenny Drain</u> | | | |
| Class 'A' | 2 | 2.4 | 21.8 |
| Class 'B' | 0 | 0.0 | 0.0 |
| Class 'C' | 1 | 7.1 | 64.5 |
| Class 'D' | 1 | 1.5 | 13.6 |
| <i>Total along Kilkenny Drain</i> | 4 | 11.0 | 100.0 |
| <u>Leroy Drain</u> | | | |
| Class 'A' | 1 | 0.9 | 28.1 |
| Class 'B' | 1 | 0.2 | 6.3 |
| Class 'C' | 1 | 0.9 | 28.1 |
| Class 'D' | 1 | 1.2 | 37.5 |
| <i>Total along Leroy Drain</i> | 4 | 3.2 | 100.0 |
| <u>Meridian Drain</u> | | | |
| Class 'A' | 1 | 0.4 | 22.2 |
| Class 'B' | 0 | 0.0 | 0.0 |
| Class 'C' | 0 | 0.0 | 0.0 |
| Class 'D' | 1 | 1.4 | 77.8 |
| <i>Total along Meridian Drain</i> | 2 | 1.8 | 100.0 |

Table 5. Continued.

| AQUATIC HABITAT CLASSIFICATION | # OF REACHES | TOTAL LENGTH OF REACHES (km) | % OF REACHES (km) |
|--|-----------------|---------------------------------|----------------------|
| <i>Plishka Drain</i> | | | |
| Class 'A' | 0 | 0.0 | 0.0 |
| Class 'B' | 0 | 0.0 | 0.0 |
| Class 'C' | 1 | 5.2 | 91.2 |
| Class 'D' | 1 | 0.5 | 8.8 |
| <i>Total along Plishka Drain</i> | 2 | 5.7 | 100.0 |
| <i>Rus Drain</i> | | | |
| Class 'A' | 0 | 0.0 | 0.0 |
| Class 'B' | 0 | 0.0 | 0.0 |
| Class 'C' | 1 | 1.0 | 100.0 |
| Class 'D' | 0 | 0.0 | 0.0 |
| <i>Total along Rus Drain</i> | 1 | 1.0 | 100.0 |
| <i>Sunny Valley Drain</i> | | | |
| Class 'A' | 1 | 0.5 | 6.8 |
| Class 'B' | 1 | 0.3 | 4.1 |
| Class 'C' | 2 | 6.0 | 82.2 |
| Class 'D' | 1 | 0.5 | 6.8 |
| <i>Total along Sunny Valley Drain</i> | 5 | 7.3 | 100.0 |
| <i>Combined</i> | | | |
| Class 'A' | 32 | 69.3 | 37.6 |
| Class 'B' | 24 | 22.0 | 11.9 |
| Class 'C' | 32 | 66.4 | 36.0 |
| Class 'D' | 20 | 26.6 | 14.4 |
| <i>Total combined</i> | 108 | 184.3 | 100.0 |

Table 6. A summary of potential rehabilitation sites (presented by primary issue and priority) identified throughout Watershed O5SD, 2008.

| SITE <i>Priority</i> | Barrier | Cropping | Input | Primary Issue* | | | Pasture | Residential | Total |
|------------------------------|---------|----------|-------|---------------------------------|----------------|----|---------|-------------|-------|
| | | | | Modified and/or Constriction | Off Channel | | | | |
| Blind Creek | | | | | | | | | |
| <i>Priority 1</i> | - | - | - | - | - | 1 | - | 1 | |
| <i>Priority 2</i> | - | - | - | - | - | - | - | 0 | |
| <i>Priority 3</i> | - | - | - | - | - | - | - | 0 | |
| Bottle Creek | | | | | | | | | |
| <i>Priority 1</i> | - | - | - | - | - | - | - | 0 | |
| <i>Priority 2</i> | - | - | - | - | - | - | - | 0 | |
| <i>Priority 3</i> | - | - | - | 1 | - | - | - | 1 | |
| Broad Valley Drain | | | | | | | | | |
| <i>Priority 1</i> | - | - | - | - | - | - | - | 0 | |
| <i>Priority 2</i> | 1 | - | - | - | - | - | - | 1 | |
| <i>Priority 3</i> | 4 | - | - | - | 2 | 3 | - | 9 | |
| Dumoulin Drain | | | | | | | | | |
| <i>Priority 1</i> | - | - | - | - | - | - | - | 0 | |
| <i>Priority 2</i> | - | - | - | - | - | - | - | 0 | |
| <i>Priority 3</i> | 1 | - | - | - | - | - | - | 1 | |
| mainstem Fisher River | | | | | | | | | |
| <i>Priority 1</i> | 2 | - | - | - | - | 3 | 2 | 7 | |
| <i>Priority 2</i> | 1 | - | - | - | - | 2 | - | 3 | |
| <i>Priority 3</i> | 1 | 1 | 1 | 1 | 1 | 3 | 9 | 17 | |
| east Fisher River | | | | | | | | | |
| <i>Priority 1</i> | 10 | - | 1 | - | - | 19 | - | 30 | |
| <i>Priority 2</i> | 2 | - | - | - | - | 2 | - | 4 | |
| <i>Priority 3</i> | 18 | 1 | - | 1 | 2 | 4 | 6 | 32 | |
| west Fisher River | | | | | | | | | |
| <i>Priority 1</i> | 3 | - | - | 1 | - | 6 | - | 10 | |
| <i>Priority 2</i> | - | - | - | 2 | - | - | - | 2 | |
| <i>Priority 3</i> | 19 | - | - | 3 | 1 | 2 | 1 | 26 | |
| Kilkenny Drain | | | | | | | | | |
| <i>Priority 1</i> | 1 | - | - | - | - | 1 | - | 2 | |
| <i>Priority 2</i> | - | - | - | - | - | - | - | 0 | |
| <i>Priority 3</i> | - | - | - | - | - | - | - | 0 | |
| Leroy Drain | | | | | | | | | |
| <i>Priority 1</i> | - | - | - | - | - | - | - | 0 | |
| <i>Priority 2</i> | - | - | - | - | - | - | - | 0 | |
| <i>Priority 3</i> | 1 | - | - | - | - | - | - | 1 | |
| Meridian Drain | | | | | | | | | |
| <i>Priority 1</i> | - | - | - | - | - | - | - | 0 | |
| <i>Priority 2</i> | - | - | - | - | - | 1 | - | 1 | |
| <i>Priority 3</i> | - | - | - | - | - | - | - | 0 | |

Table 6. Continued.

| SITE <i>Priority</i> | Primary Issue* | | | | | | | Total |
|----------------------------------|----------------|----------|-------|---------------------------------|----------------|---------|-------------|-------|
| | Barrier | Cropping | Input | Modified and/or Constriction | Off Channel | Pasture | Residential | |
| <u>Plishka Drain</u> | | | | | | | | |
| Priority 1 | - | - | - | - | - | - | - | 0 |
| Priority 2 | - | - | - | - | - | - | - | 0 |
| Priority 3 | - | - | - | - | - | - | - | 0 |
| <u>Rus Drain</u> | | | | | | | | |
| Priority 1 | - | - | - | - | - | 1 | - | 1 |
| Priority 2 | - | - | - | - | - | - | - | 0 |
| Priority 3 | 1 | - | - | - | - | - | - | 1 |
| <u>Sunny Valley Drain</u> | | | | | | | | |
| Priority 1 | - | - | - | - | - | 1 | - | 1 |
| Priority 2 | - | - | - | - | - | - | - | 0 |
| Priority 3 | - | - | - | - | - | - | - | 0 |
| TOTAL | 65 | 2 | 2 | 9 | 6 | 49 | 18 | 151 |
| RELATIVE ABUNDANCE (%) | 43.0 | 1.3 | 1.3 | 6.0 | 4.0 | 32.5 | 11.9 | 100.0 |

***Primary Issue**

A rehabilitation site often has more than one environmental issue associated with it. Therefore, to assist in watershed management planning and prioritization of rehabilitation plans by the EICD, the 151 potential sites identified in this study were sorted according to a 'primary issue'. The following definitions/descriptions apply (Also refer to Appendix 3 and 4):

- Barrier – Associated with barriers to fish migration (described in Section 2.3.2.4)
- Cropping - Banks are typically devoid of riparian vegetation consisting either of hayfield or cropland directly adjacent to waters edge.
- Input – Refers to a direct source input to the watercourse (e.g., culvert discharge, drain confluence).
- Modified and/or constriction – A modification to the stream channel by channelization or addition of aggregate (for example) or constriction in stream flow (e.g., small diameter culvert), fence line (e.g., catching debris), or debris dams.
- Off channel – Typically refers to land use practices or conditions outside of the immediate river channel but that could still impact aquatic habitat quality (e.g., settling ponds, dugouts, etc).
- Pasture – Pasture/grazing land use/cover defined in Section 2.3.1.
- Residential – The residential land use/cover defined in Section 2.3.1

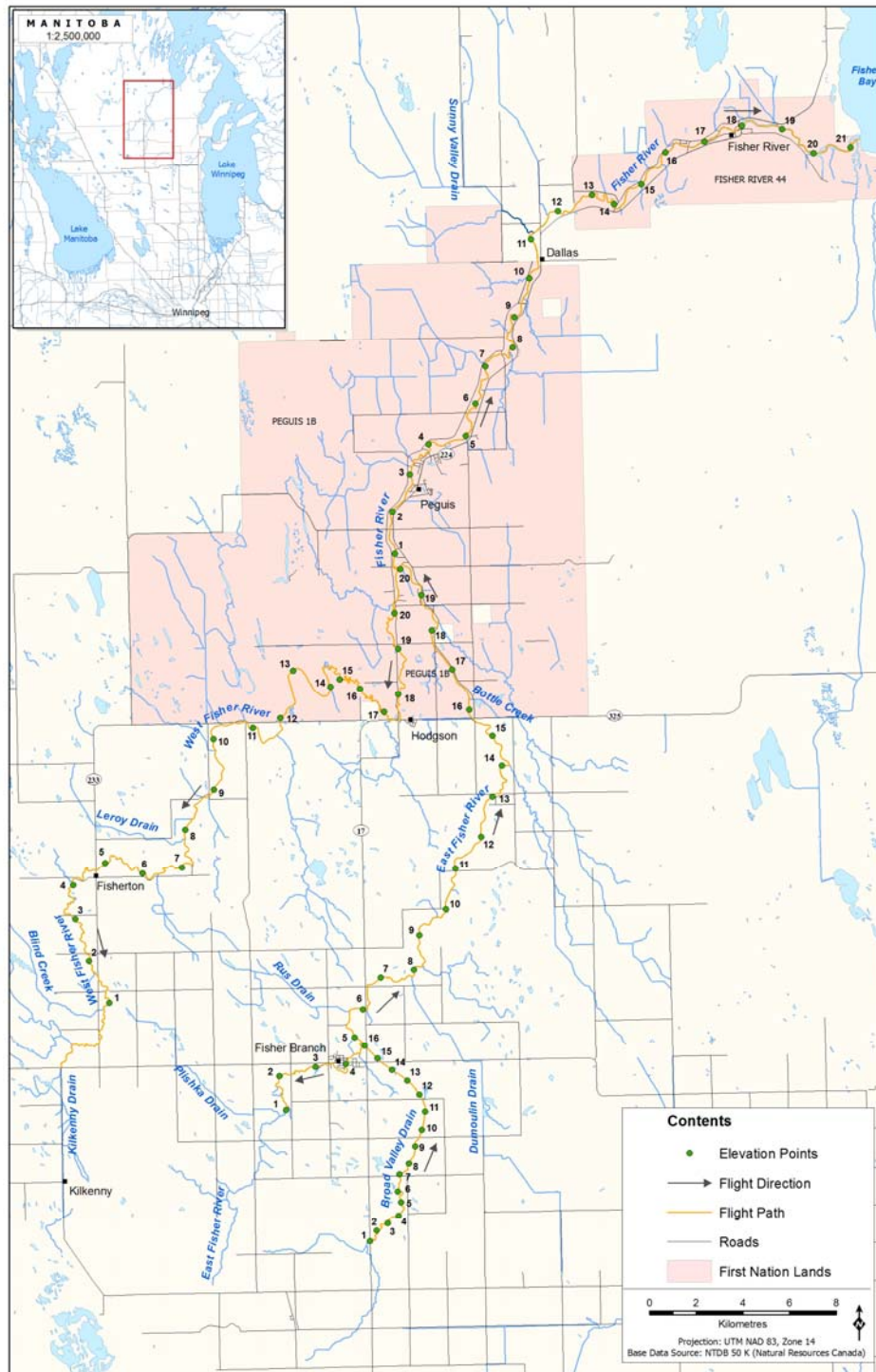


Figure 1. Watershed 05SD study area, points used for longitudinal elevations profiles, and flight path/direction flown for collection of high resolution aerial imagery, 2008.

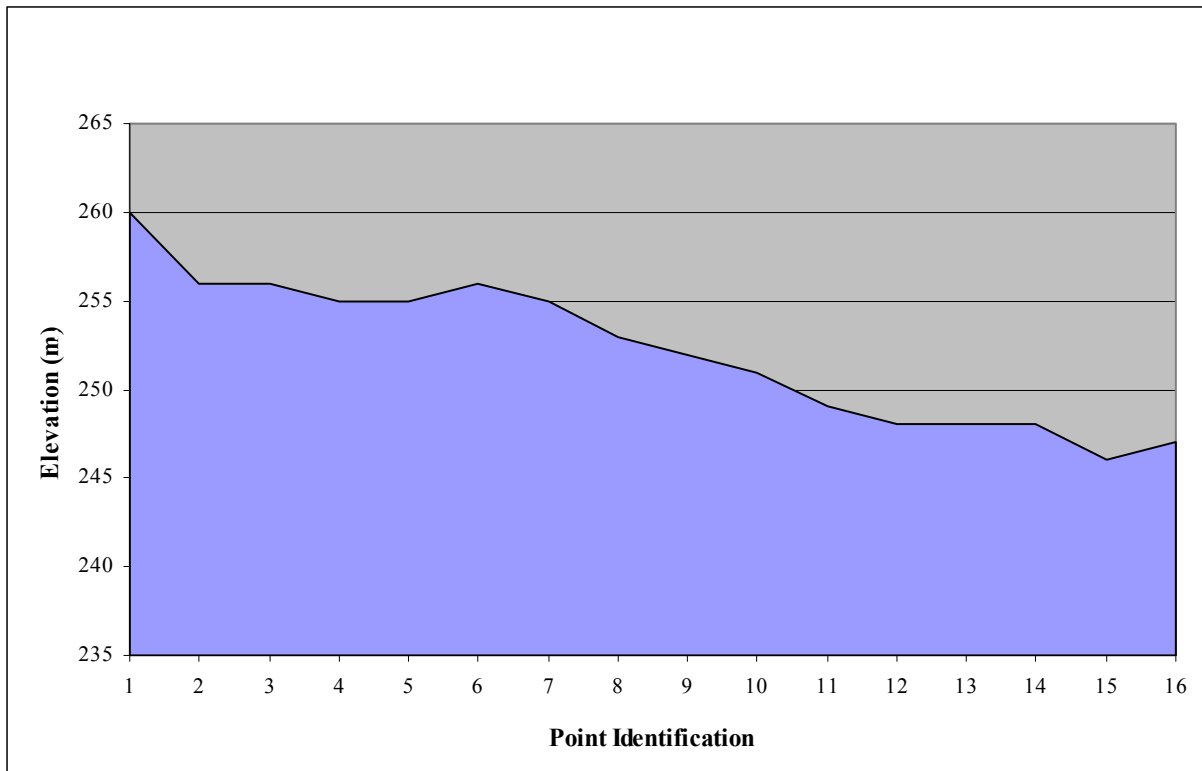


Figure 2. Longitudinal elevation profile (m) along the Broad Valley Drain.

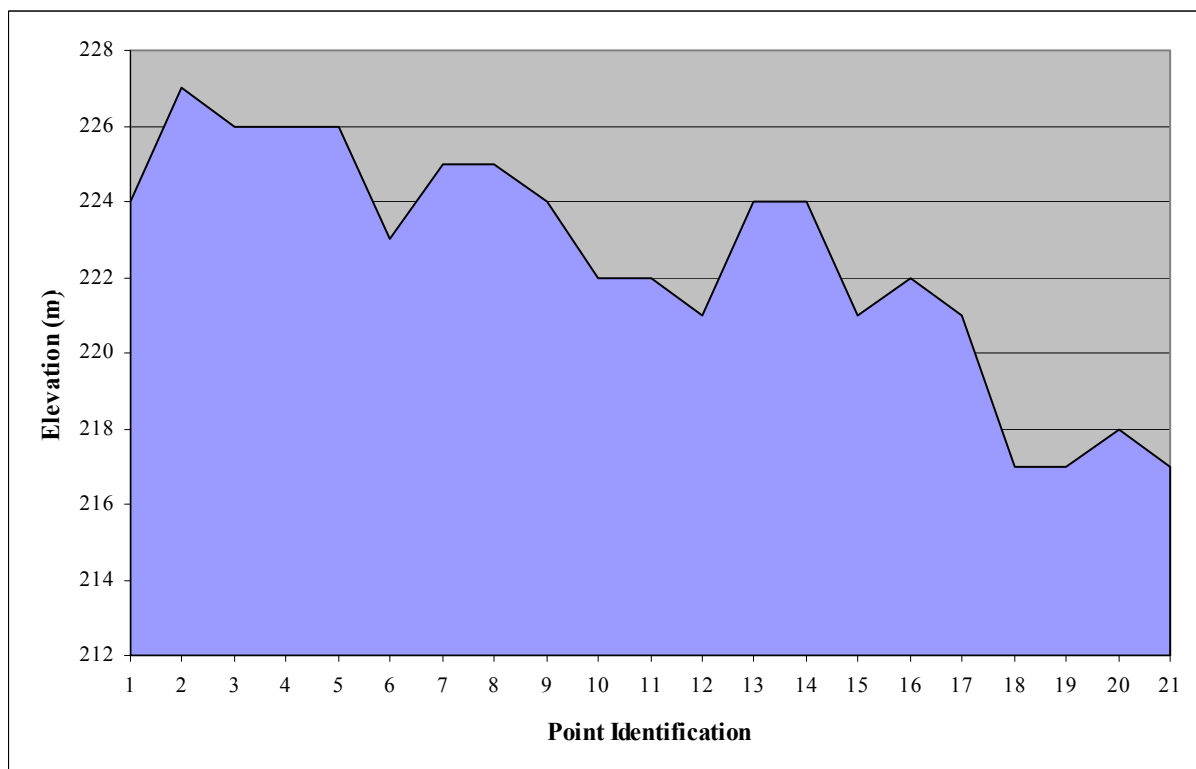


Figure 3. Longitudinal elevation profile (m) along the mainstem Fisher River.

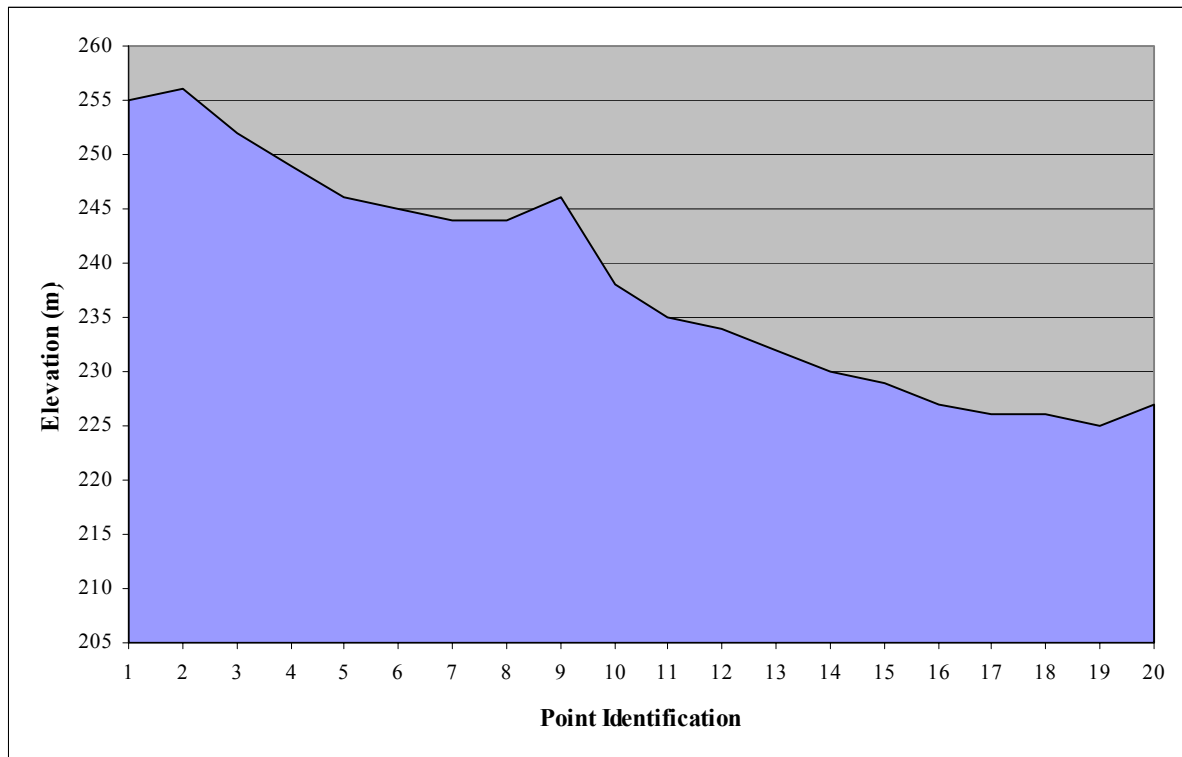


Figure 4. Longitudinal elevation profile (m) along the east Fisher River.

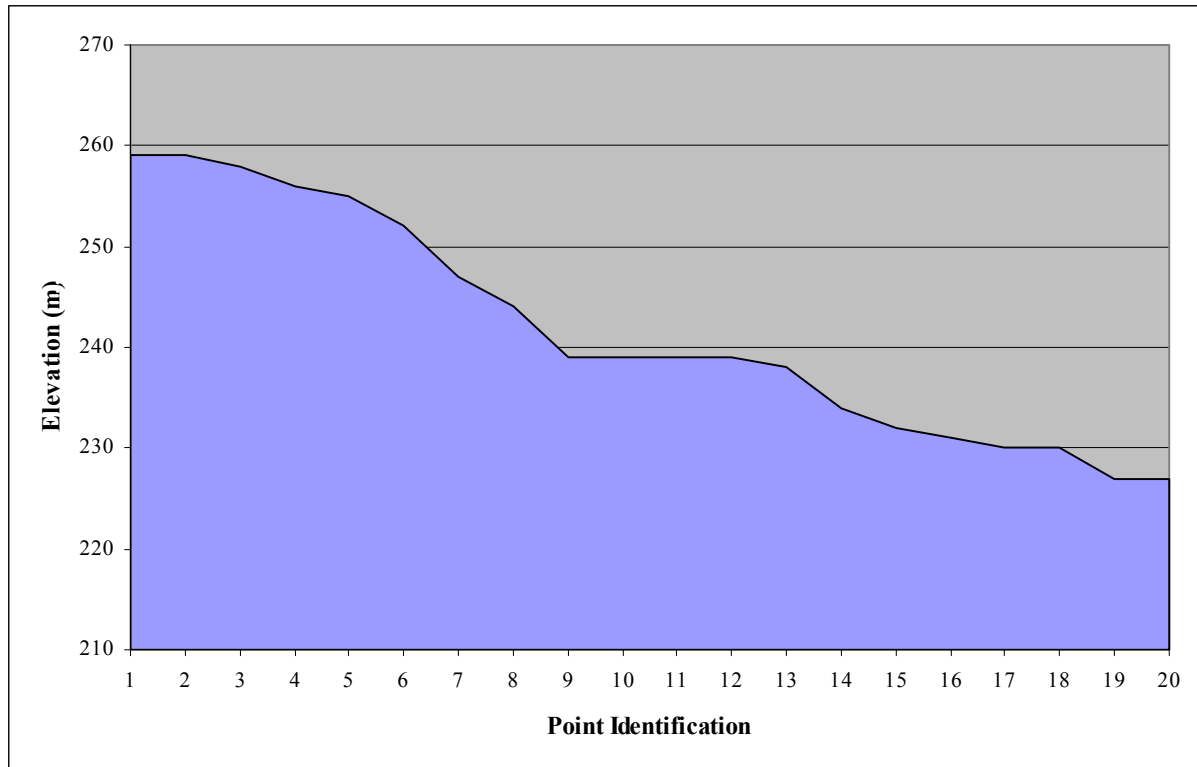


Figure 5. Longitudinal elevation profile (m) along the west Fisher River.

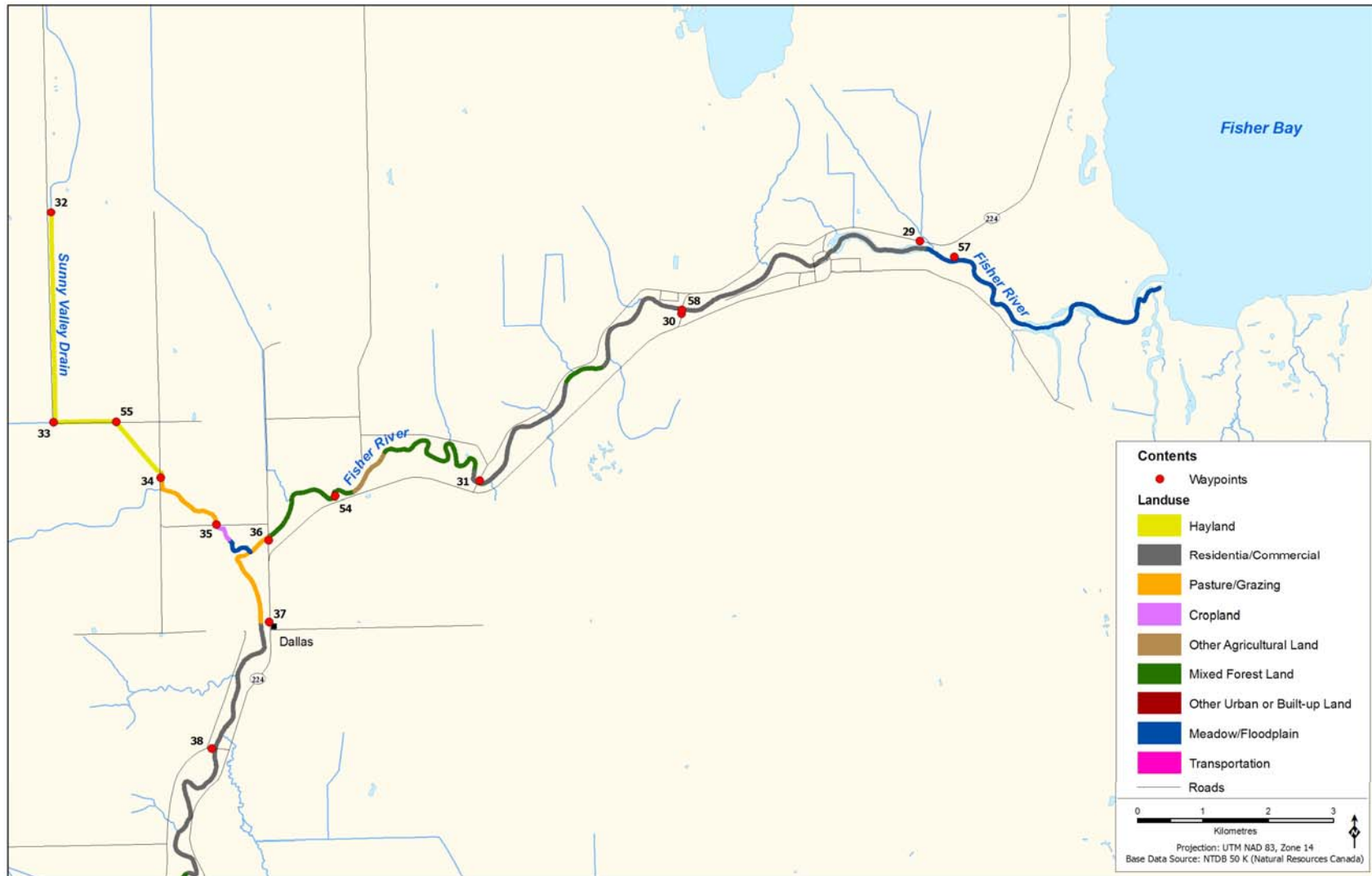


Figure 6. Sites groundtruthed (by Wpt. #) and land use/cover classified along Sunny Valley Drain and the mainstem Fisher River (Dallas and Fisher Bay regions), 2008.

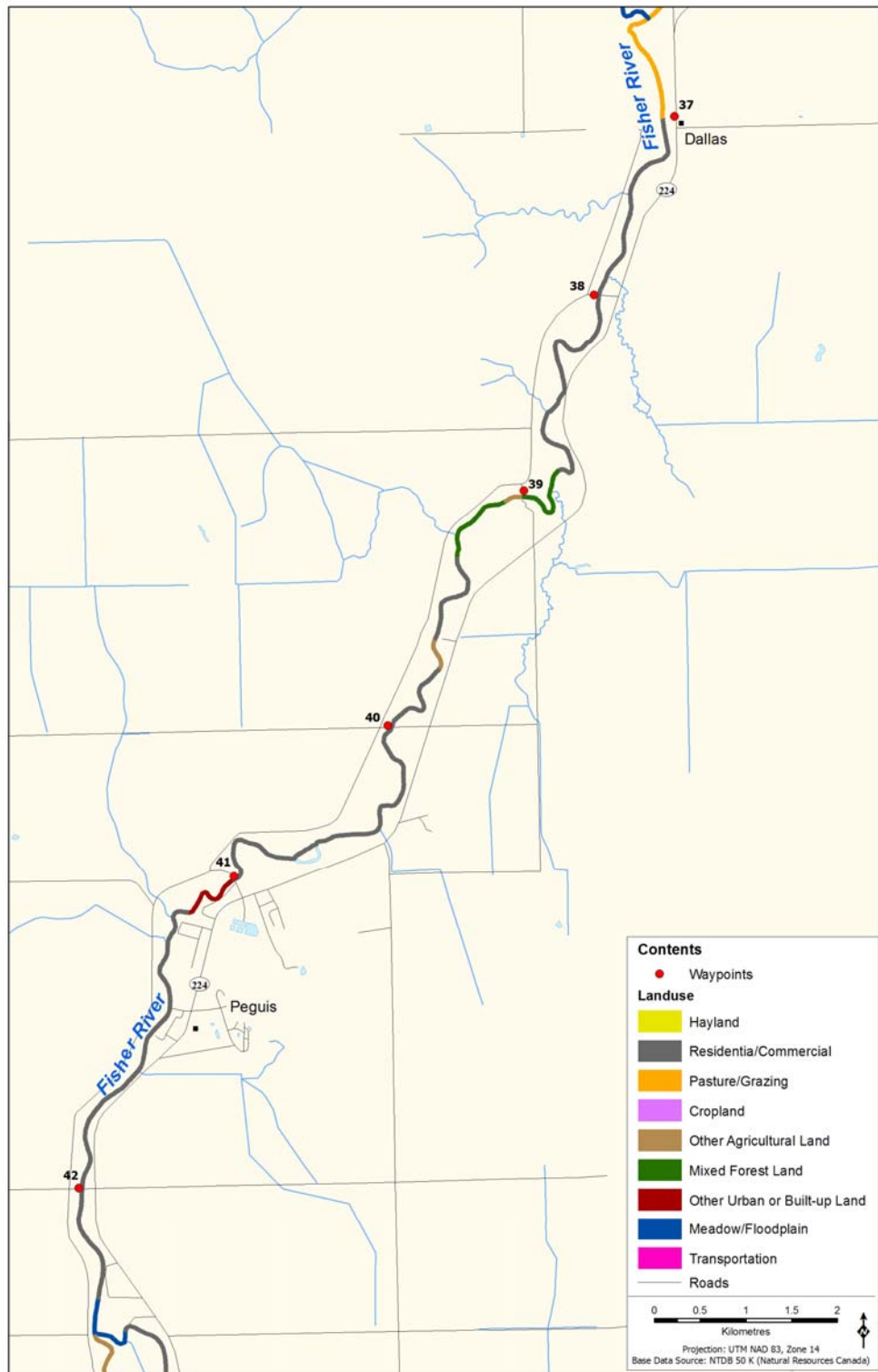


Figure 7. Sites groundtruthed (by Wpt. #) and land use/cover classified along the mainstem Fisher River (Peguis and Dallas regions), 2008.

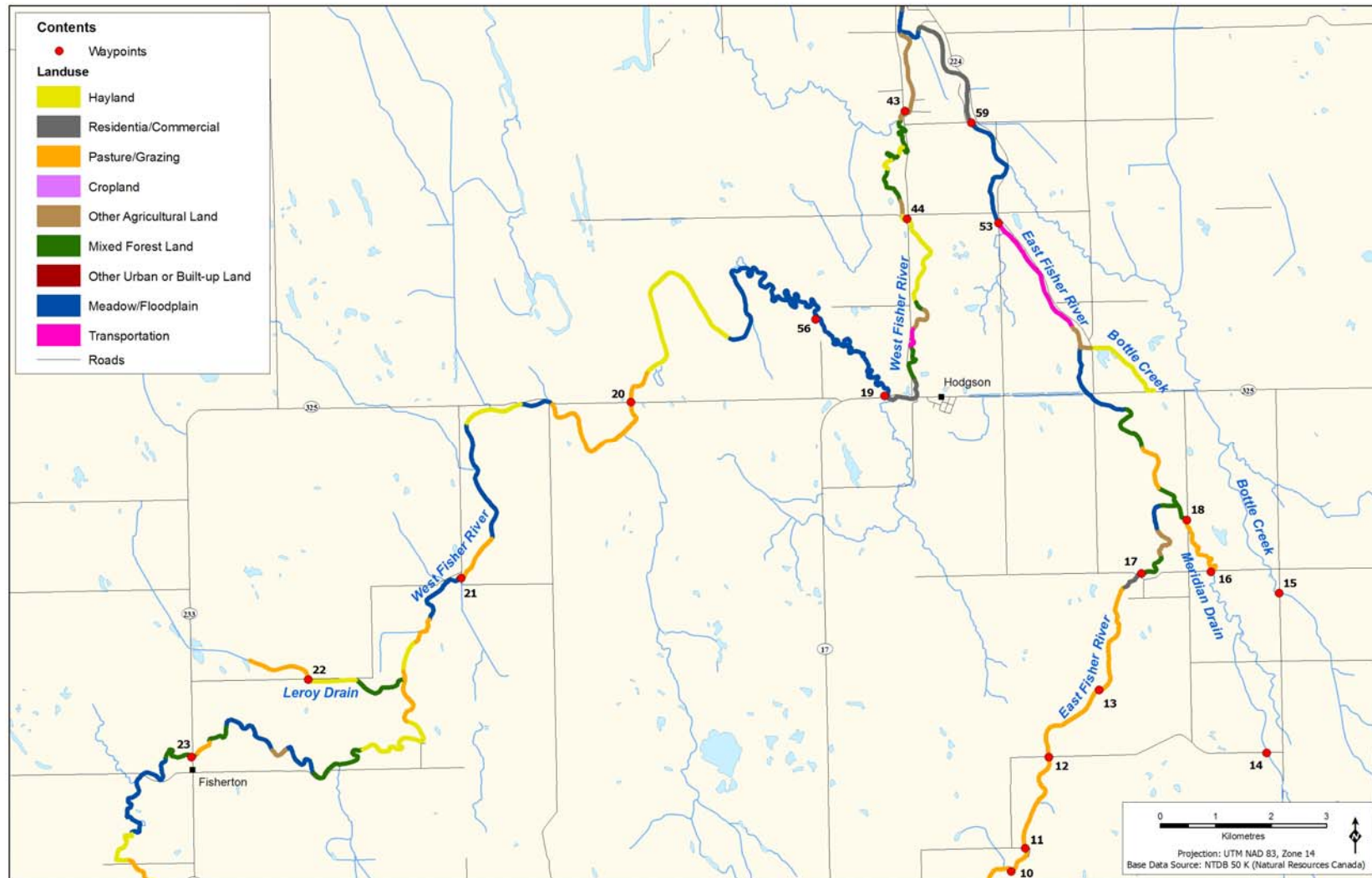


Figure 8. Sites groundtruthed (by Wpt. #) and land use/cover classified throughout the south-central portion of the study area (Fisherton and Hodgson regions), 2008.

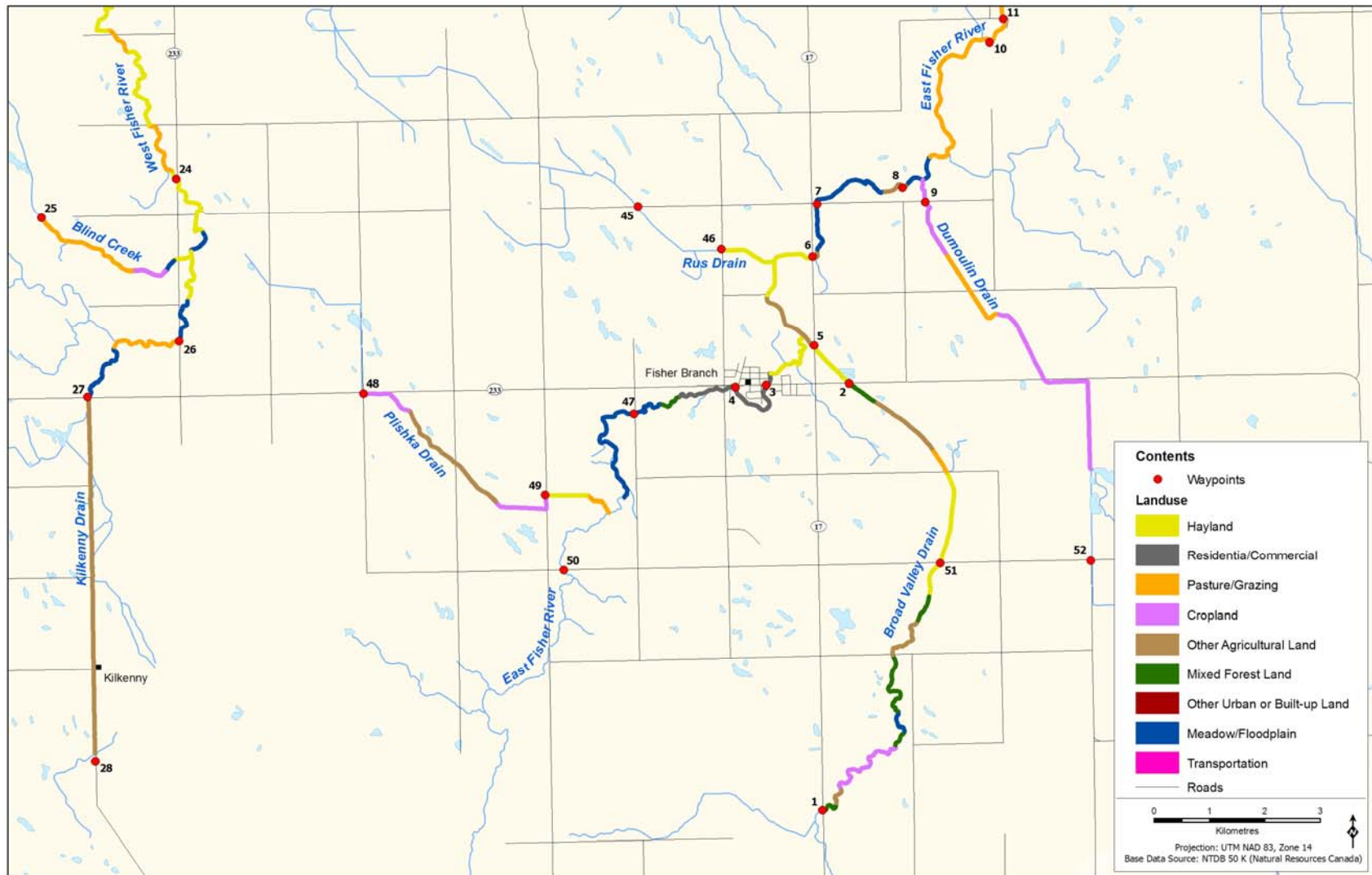


Figure 9. Sites groundtruthed (by Wpt. #) and land use/cover classified throughout the southern portion of the study area (Fisher Branch region), 2008.

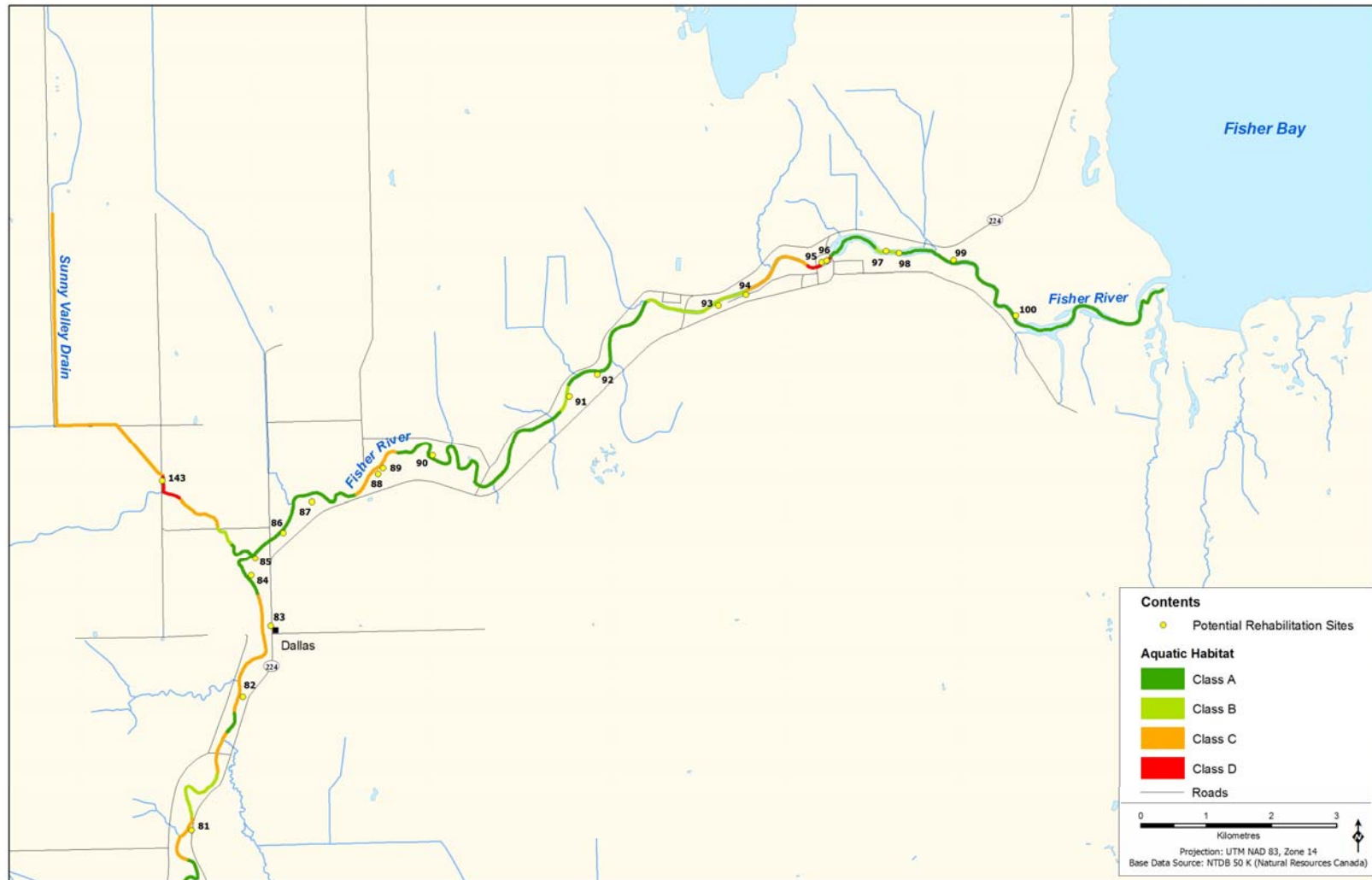


Figure 10. Aquatic habitat quality ratings and potential rehabilitation sites identified along Sunny Valley Drain and the mainstem Fisher River (Dallas and Fisher Bay regions), 2008.

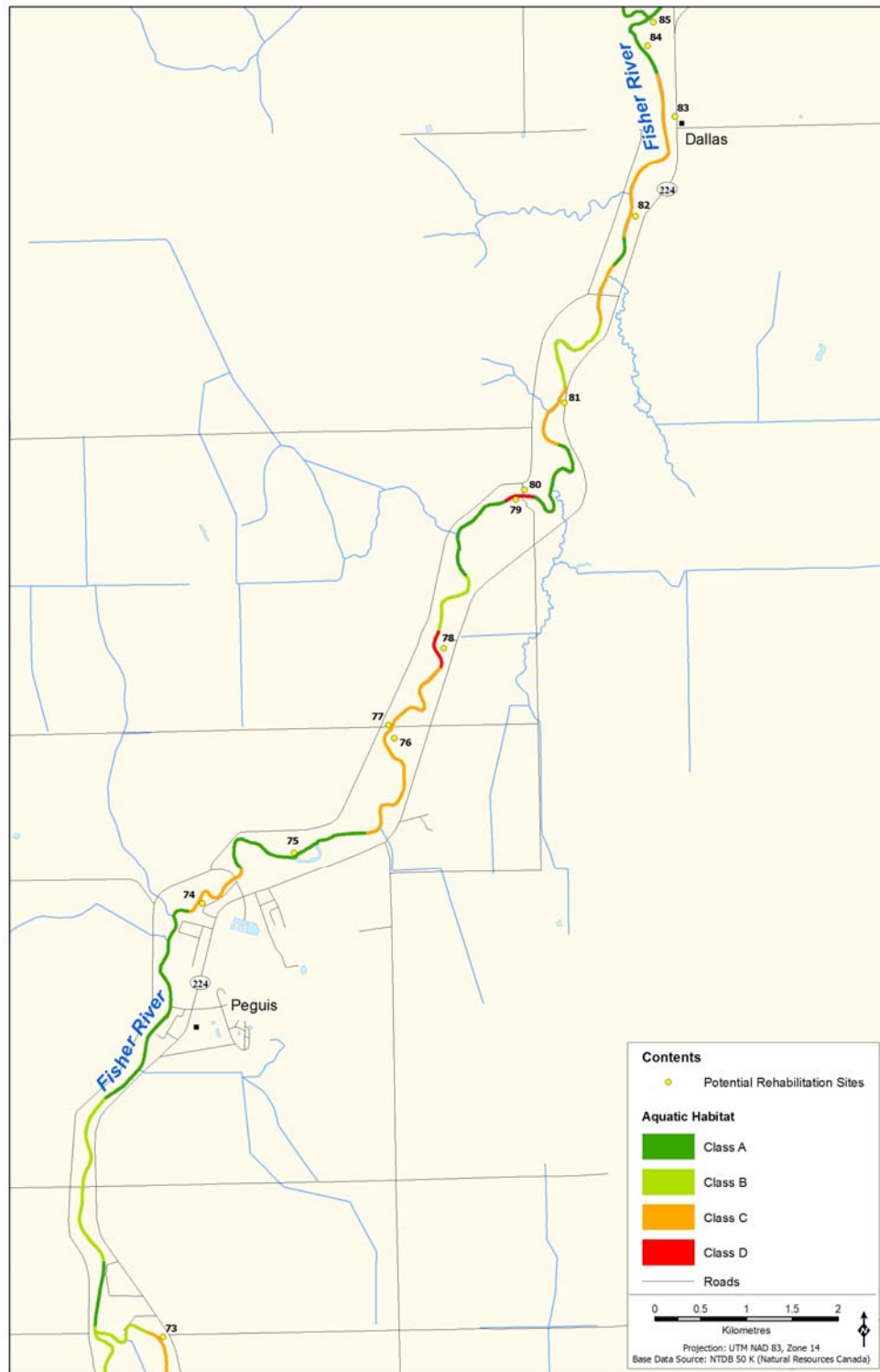


Figure 11. Aquatic habitat quality ratings and potential rehabilitation sites identified along the mainstem Fisher River (Peguis and Dallas region), 2008.

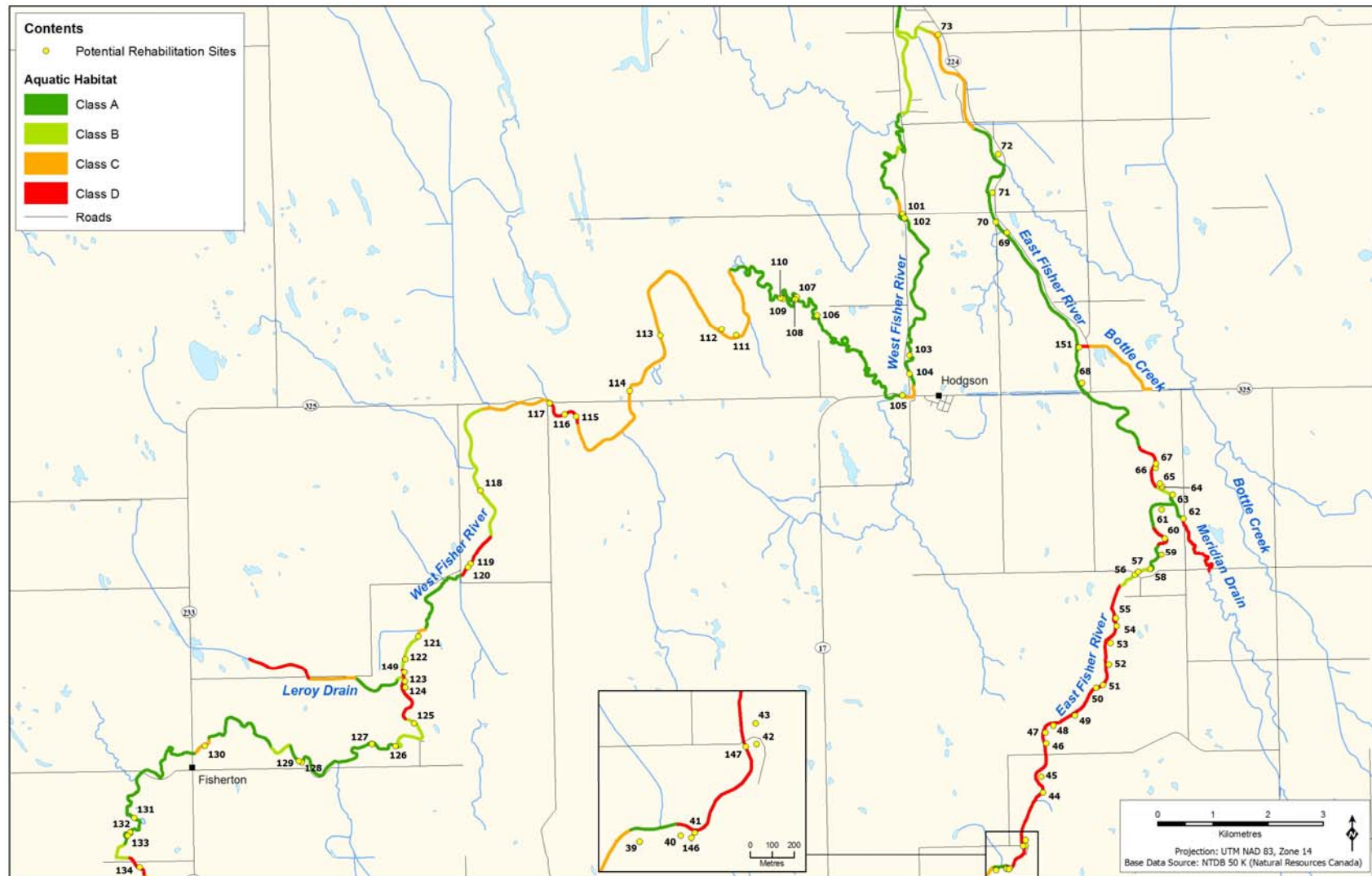


Figure 12. Aquatic habitat quality ratings and potential rehabilitation sites identified throughout the south-central portion of the study area (Fisherton and Hodgson regions), 2008.

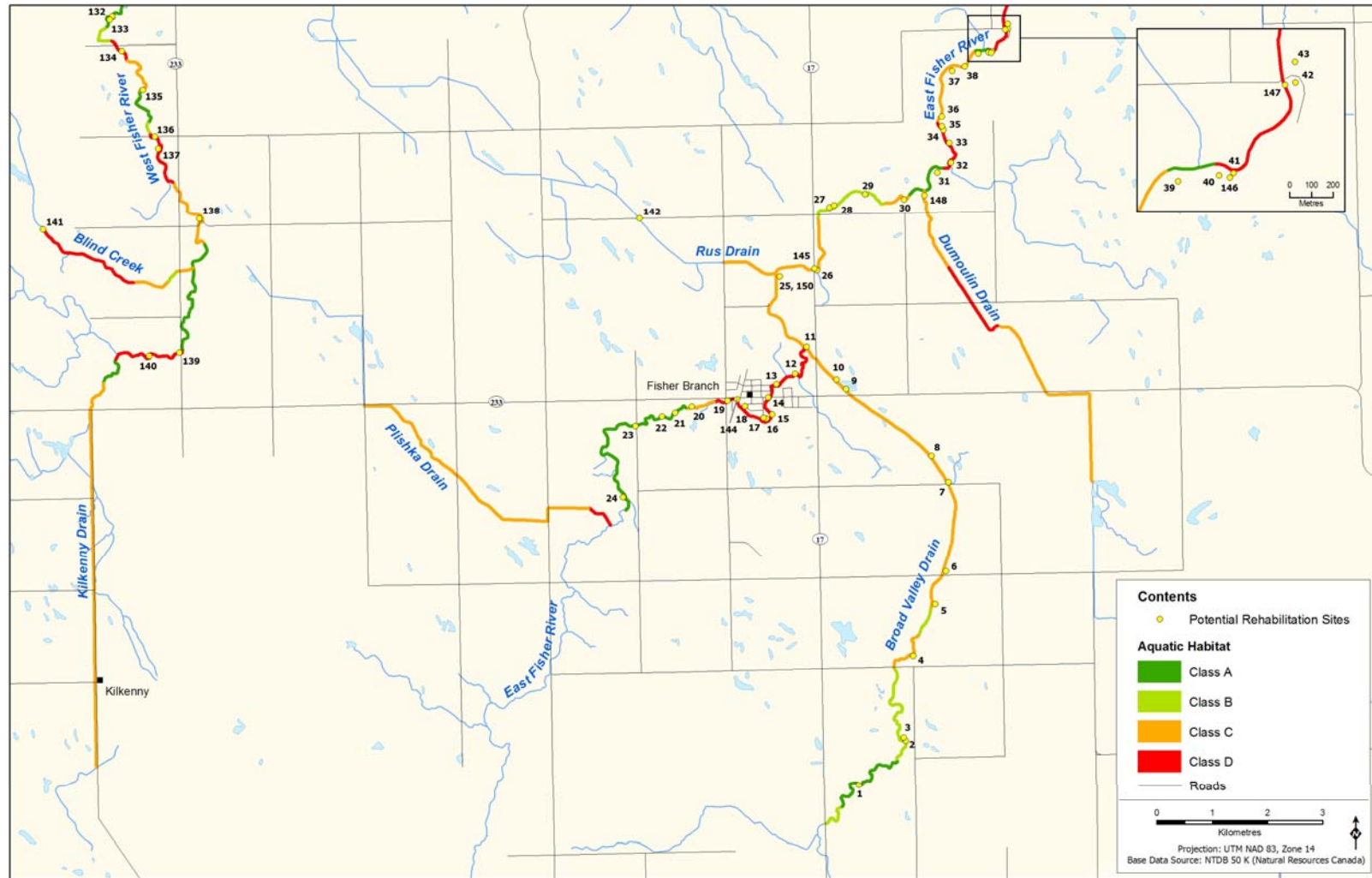


Figure 13. Aquatic habitat quality ratings and potential rehabilitation sites identified throughout the southern portion of the study area (Fisher Branch region), 2008.

APPENDICES

APPENDIX 1.
SITE DESCRIPTIONS AND WORK CONDUCTED BY NORTH/SOUTH
CONSULTANTS INC. 2008 AND 2009

Table A1-1. Reference list of sites visited (by Wpt. #), site description, and work conducted by North/South Consultants Inc. throughout watershed 05SD, 2008 and 2009.

| Wpt. # | Watercourse | Date(s) Visited | | | | UTM (14U) | | Work Conducted | | | | | | | | | |
|--------|--------------------|-----------------|-----------|-----------|-----------|-----------|----------|----------------|------|--------|---|------|----|---|------|---|----------|
| | | 1st | 2nd | 3rd | 4th | easting | northing | WQ | Hoop | Photos | Q | Vel. | DN | E | Phy. | V | Seine MT |
| 1 | Broad Valley Drain | 5-Aug-08 | | | | 598005 | 5652226 | | | Y | | | | | | | |
| 2 | Broad Valley Drain | 5-Aug-08 | 22-Aug-08 | 27-Oct-08 | 21-Apr-09 | 598484 | 5659951 | Y | Y | Y | Y | | Y | Y | | | Y Y |
| 3 | east Fisher River | 5-Aug-08 | | | | 596987 | 5659922 | | | Y | | | | | | | |
| 4 | east Fisher River | 5-Aug-08 | | | | 596425 | 5659886 | | | Y | | | | | | | |
| 5 | Broad Valley Drain | 5-Aug-08 | | | | 597850 | 5660641 | | | Y | | | | | | | |
| 6 | east Fisher River | 5-Aug-08 | | | | 597827 | 5662248 | | | Y | | | | | | | |
| 7 | east Fisher River | 5-Aug-08 | | | | 597905 | 5663212 | | | Y | | | | | | | |
| 8 | east Fisher River | 5-Aug-08 | 22-Aug-08 | | | 599449 | 5663506 | | | Y | | | | | | | |
| 9 | Dumoulin Drain | 5-Aug-08 | 22-Aug-08 | | | 599860 | 5663248 | | | Y | | | | | | | |
| 10 | east Fisher River | 5-Aug-08 | 22-Aug-08 | | | 601028 | 5666143 | | | Y | | | | | | | |
| 11 | east Fisher River | 5-Aug-08 | | | | 601277 | 5666559 | | | Y | | | | | | | |
| 12 | east Fisher River | 5-Aug-08 | 22-Aug-08 | | | 601695 | 5668204 | | | Y | Y | | | | | | |
| 13 | east Fisher River | 5-Aug-08 | 27-Oct-08 | 22-Apr-09 | | 602599 | 5669409 | Y | Y | Y | | | | Y | | | |
| 14 | Meridian Drain | 5-Aug-08 | | | | 605623 | 5668279 | | | Y | | | | | | | |
| 15 | Bottle Creek | 5-Aug-08 | | | | 605845 | 5671156 | | | Y | | | | | | | |
| 16 | Meridian Drain | 5-Aug-08 | | | | 604616 | 5671538 | | | Y | | | | | | | |
| 17 | east Fisher River | 5-Aug-08 | 21-Apr-09 | | | 603364 | 5671509 | | Y | Y | | | | | | | Y |
| 18 | Meridian Drain | 5-Aug-08 | | | | 604181 | 5672489 | | | Y | | | | | | | |
| 19 | west Fisher River | 5-Aug-08 | | | | 598732 | 5674731 | | | Y | | | | | | | |
| 20 | west Fisher River | 5-Aug-08 | | | | 594152 | 5674614 | | | Y | | | | | | | |
| 21 | west Fisher River | 5-Aug-08 | 21-Apr-09 | | | 591093 | 5671427 | | | Y | | | | | | | |
| 22 | Leroy Drain | 5-Aug-08 | | | | 588337 | 5669595 | | | Y | | | | | | | |
| 23 | west Fisher River | 5-Aug-08 | | | | 586230 | 5668207 | | | Y | | | | | | | |
| 24 | west Fisher River | 5-Aug-08 | | | | 586309 | 5663667 | | | Y | | | | | | | |
| 25 | Blind Creek | 5-Aug-08 | | | | 583876 | 5662953 | | | Y | | | | | | | |
| 26 | Kilkenny Drain | 5-Aug-08 | | | | 586360 | 5660718 | | | Y | | | | | | | |
| 27 | Kilkenny Drain | 5-Aug-08 | 22-Apr-09 | | | 584708 | 5659717 | | Y | Y | | Y | Y | | | | |
| 28 | Kilkenny Drain | 5-Aug-08 | | | | 584850 | 5653111 | | | Y | | | | | | | |

Table A1-1. Continued.

| Wpt. # | Watercourse | Date(s) Visited | | | | UTM (14U) | | Work Conducted | | | | | | | | | |
|--------|-----------------------|-----------------|-----------|-----------|-----|-----------|----------|----------------|------|--------|---|------|----|---|------|---|----------|
| | | 1st | 2nd | 3rd | 4th | easting | northing | WQ | Hoop | Photos | Q | Vel. | DN | E | Phy. | V | Seine MT |
| 29 | mainstem Fisher River | 6-Aug-08 | | | | 615311 | 5700442 | | | Y | | | | | | | |
| 30 | mainstem Fisher River | 6-Aug-08 | | | | 611651 | 5699340 | | | Y | | | | | | | |
| 31 | mainstem Fisher River | 6-Aug-08 | | | | 608556 | 5696767 | | | Y | | | | | | | |
| 32 | Sunny Valley Drain | 6-Aug-08 | | | | 601983 | 5700890 | | | Y | | | | | | | |
| 33 | Sunny Valley Drain | 6-Aug-08 | | | | 602022 | 5697666 | | | Y | | | | | | | |
| 34 | Sunny Valley Drain | 6-Aug-08 | | | | 603665 | 5696814 | | | Y | | | | | | | |
| 35 | Sunny Valley Drain | 6-Aug-08 | 22-Aug-08 | | | 604519 | 5696096 | Y | | Y | | | | | | | |
| 36 | mainstem Fisher River | 6-Aug-08 | 22-Aug-08 | | | 605320 | 5695856 | Y | | Y | | | | | | | |
| 37 | mainstem Fisher River | 6-Aug-08 | | | | 605326 | 5694604 | | | Y | | | | | | | |
| 38 | mainstem Fisher River | 6-Aug-08 | | | | 604449 | 5692656 | | | Y | | | | | | | |
| 39 | mainstem Fisher River | 6-Aug-08 | 29-Apr-09 | | | 603684 | 5690519 | | | Y | | | Y | | | Y | |
| 40 | mainstem Fisher River | 6-Aug-08 | 22-Aug-08 | 29-Apr-09 | | 602200 | 5687943 | | | Y | | | | | | Y | |
| 41 | mainstem Fisher River | 6-Aug-08 | | | | 600521 | 5686293 | | | Y | | | | | | | |
| 42 | mainstem Fisher River | 6-Aug-08 | | | | 598829 | 5682897 | | | Y | | | | | | | |
| 43 | west Fisher River | 6-Aug-08 | | | | 599097 | 5679857 | | | Y | | | | | | | |
| 44 | west Fisher River | 6-Aug-08 | 22-Aug-08 | 21-Apr-09 | | 599132 | 5677917 | Y | | Y | Y | | Y | | | | |
| 45 | Rus Drain | 6-Aug-08 | | | | 594665 | 5663161 | | | Y | | | | | | | |
| 46 | Rus Drain | 6-Aug-08 | | | | 596175 | 5662383 | | | Y | | | | | | | |
| 47 | east Fisher River | 6-Aug-08 | 22-Aug-08 | | | 594592 | 5659409 | Y | | Y | Y | | | | | | |
| 48 | Plishka Drain | 6-Aug-08 | | | | 589703 | 5659775 | | | Y | | | | | | | |
| 49 | Plishka Drain | 6-Aug-08 | | | | 592984 | 5657934 | | | Y | | | | | | | |
| 50 | east Fisher River | 6-Aug-08 | | | | 593327 | 5656568 | | | Y | | | | | | | |
| 51 | Broad Valley Drain | 6-Aug-08 | | | | 600133 | 5656699 | | | Y | | | | | | | |
| 52 | Dumoulin Drain | 6-Aug-08 | | | | 602857 | 5656743 | | | Y | | | | | | | |
| 53 | east Fisher River | 22-Aug-08 | 21-Apr-09 | 22-Apr-09 | | 600788 | 5677844 | Y | | Y | | Y | | | | Y | |
| 54 | mainstem Fisher River | 22-Apr-09 | | | | 606343 | 5696535 | | Y | Y | | | | Y | | | Y |
| 55 | Sunny Valley Drain | 22-Apr-09 | | | | 602985 | 5697671 | | | | | Y | | | | Y | |
| 56 | west Fisher River | 29-Apr-09 | | | | 597484 | 5676105 | | Y | Y | | | | | | | |
| 57 | mainstem Fisher River | 23-Apr-09 | | | | 615835 | 5700198 | | | Y | | | | | | | |

Table A1-1. Continued.

| Wpt. # | Watercourse | Date(s) Visited | | | | UTM (14U) | | Work Conducted | | | | | | | | | |
|--------|-----------------------|-----------------|-----|-----|-----|-----------|----------|----------------|------|--------|---|------|----|---|------|---|----------|
| | | 1st | 2nd | 3rd | 4th | easting | northing | WQ | Hoop | Photos | Q | Vel. | DN | E | Phy. | V | Seine MT |
| 58 | mainstem Fisher River | 23-Apr-09 | | | | 611661 | 5699395 | | | Y | | | | | | | |
| 59 | east Fisher River | 23-Apr-09 | | | | 600296 | 5679646 | | | Y | | | | | | | |

Description of Work

Conducted:

WQ = in situ = water quality parameters measured in the field

Hoop = hoop nets set for adult migrating fish

Photos = digital 'still' photos

Q = Stream discharge; hydrologic measurement

Vel. = velocities (m³/sec) taken near bottom of culverts or stream edges

DN = Fine mesh dip net

E = backpack electrofishing unit used to capture small bodied fish

Phy. = physical parameters recorded (e.g., substrate compaction, composition)

V = Visual observation for fish species

Seine = beach seine

MT = minnow trap baited for forage and juvenile fish species

Table A1-2. Physical information (substrate composition/compaction, water depths, velocities, discharges) collected by North/South Consultants Inc. throughout watershed 05SD, 2008 and 2009. Definitions provided at end of Table A1-2.

| DATE | LOCATION | STUDY SITE | SIDE | DISTANCE (m) | WIDTH (m) | DEPTH (m) | SUBSTRATE | | AREA | VELOCITY (m/sec) | DISCHARGE (m³/sec) | Comments | |
|-----------|--------------------|------------|------|--------------|-----------|-----------|------------|----------------|------|------------------|--------------------|----------|---|
| | | | | | | | Compaction | Composition | | | | | |
| 22-Aug-08 | Broad Valley Drain | 2 | RB | 0.0 | 0.25 | 0.00 | Hard | Cobble/boulder | 0.00 | 0.00 | 0.000 | | |
| 22-Aug-08 | Broad Valley Drain | 2 | | 0.5 | 0.5 | 0.28 | Hard | Cobble/boulder | 0.14 | 0.18 | 0.025 | | |
| 22-Aug-08 | Broad Valley Drain | 2 | | 1.0 | 0.5 | 0.32 | Hard | Cobble/boulder | 0.16 | 0.14 | 0.022 | | |
| 22-Aug-08 | Broad Valley Drain | 2 | | 1.5 | 0.5 | 0.35 | Hard | Gravel | 0.18 | 0.17 | 0.030 | | |
| 22-Aug-08 | Broad Valley Drain | 2 | | 2.0 | 0.5 | 0.40 | Hard | Gravel | 0.20 | 0.13 | 0.026 | | |
| 22-Aug-08 | Broad Valley Drain | 2 | | 2.5 | 0.5 | 0.37 | Hard | Gravel | 0.19 | 0.17 | 0.031 | | |
| 22-Aug-08 | Broad Valley Drain | 2 | | 3.0 | 0.5 | 0.38 | Hard | Gravel | 0.19 | 0.15 | 0.028 | | |
| 22-Aug-08 | Broad Valley Drain | 2 | | 3.5 | 0.5 | 0.35 | Hard | Gravel | 0.18 | 0.15 | 0.026 | | |
| 22-Aug-08 | Broad Valley Drain | 2 | | 4.0 | 0.5 | 0.35 | Hard | Gravel | 0.18 | 0.02 | 0.004 | | |
| 22-Aug-08 | Broad Valley Drain | 2 | | 4.5 | 0.5 | 0.22 | Hard | Cobble/boulder | 0.11 | 0.07 | 0.008 | | |
| 22-Aug-08 | Broad Valley Drain | 2 | LB | 5.0 | 0.25 | 0.15 | Hard | Cobble/boulder | 0.04 | 0.06 | 0.002 | | |
| | | | | | | | | | | | | 0.203 | Q |
| 22-Aug-08 | east Fisher River | 47 | LB | 0.00 | 0.13 | 0.00 | Medium | Silt/gravel | 0.00 | 0.00 | 0.000 | | |
| 22-Aug-08 | east Fisher River | 47 | | 0.25 | 0.25 | 0.00 | Medium | Silt/gravel | 0.00 | 0.00 | 0.000 | | |
| 22-Aug-08 | east Fisher River | 47 | | 0.50 | 0.25 | 0.45 | Medium | Silt/gravel | 0.11 | 0.01 | 0.001 | | |
| 22-Aug-08 | east Fisher River | 47 | | 0.75 | 0.25 | 0.55 | Medium | Silt/gravel | 0.14 | 0.11 | 0.015 | | |
| 22-Aug-08 | east Fisher River | 47 | | 1.00 | 0.25 | 0.65 | Medium | Silt/gravel | 0.16 | 0.09 | 0.015 | | |
| 22-Aug-08 | east Fisher River | 47 | | 1.25 | 0.25 | 0.70 | Medium | Silt/gravel | 0.18 | 0.08 | 0.014 | | |
| 22-Aug-08 | east Fisher River | 47 | | 1.50 | 0.25 | 0.65 | Medium | Silt/gravel | 0.16 | 0.05 | 0.008 | | |
| 22-Aug-08 | east Fisher River | 47 | | 1.75 | 0.25 | 0.62 | Medium | Silt/gravel | 0.16 | 0.09 | 0.014 | | |
| 22-Aug-08 | east Fisher River | 47 | | 2.00 | 0.25 | 0.50 | Medium | Silt/gravel | 0.13 | 0.11 | 0.014 | | |
| 22-Aug-08 | east Fisher River | 47 | | 2.25 | 0.25 | 0.55 | Medium | Silt/gravel | 0.14 | 0.06 | 0.008 | | |
| 22-Aug-08 | east Fisher River | 47 | | 2.50 | 0.25 | 0.50 | Medium | Silt/gravel | 0.13 | 0.01 | 0.001 | | |
| 22-Aug-08 | east Fisher River | 47 | | 2.75 | 0.25 | 0.20 | Medium | Silt/gravel | 0.05 | 0.20 | 0.010 | | |
| 22-Aug-08 | east Fisher River | 47 | RB | 3.00 | 0.13 | 0.00 | Medium | Silt/gravel | 0.00 | 0.00 | 0.000 | | |
| | | | | | | | | | | | | 0.100 | Q |

Table A1-2. Continued.

| DATE | LOCATION | STUDY SITE | SIDE | DISTANCE (m) | WIDTH (m) | DEPTH (m) | SUBSTRATE | | AREA | VELOCITY (m/sec) | DISCHARGE (m³/sec) | Comments |
|-----------|-------------------|------------|------|--------------|-----------|-----------|------------|---------------|------|------------------|--------------------|----------|
| | | | | | | | Compaction | Composition | | | | |
| 22-Aug-08 | east Fisher River | 12 | LB | 0.00 | 0.50 | 0.00 | | Grasses | 0.00 | 0.00 | 0.000 | |
| 22-Aug-08 | east Fisher River | 12 | | 1.00 | 1.00 | 0.80 | Hard | Silt/mud | 0.80 | 0.09 | 0.072 | |
| 22-Aug-08 | east Fisher River | 12 | | 2.00 | 1.00 | 0.80 | Hard | Gravel/cobble | 0.80 | 0.13 | 0.104 | |
| 22-Aug-08 | east Fisher River | 12 | | 3.00 | 1.00 | 0.70 | Soft | Silt/mud | 0.70 | 0.11 | 0.077 | |
| 22-Aug-08 | east Fisher River | 12 | | 4.00 | 1.00 | 0.75 | Medium | Gravel/mud | 0.75 | 0.10 | 0.075 | |
| 22-Aug-08 | east Fisher River | 12 | | 5.00 | 1.00 | 0.80 | Medium | Gravel/mud | 0.80 | 0.09 | 0.072 | |
| 22-Aug-08 | east Fisher River | 12 | | 6.00 | 1.00 | 0.75 | Medium | Gravel/mud | 0.75 | 0.03 | 0.023 | |
| 22-Aug-08 | east Fisher River | 12 | | 7.00 | 1.00 | 0.70 | Medium | Silt/mud | 0.70 | 0.02 | 0.014 | |
| 22-Aug-08 | east Fisher River | 12 | RB | 8.00 | 1.00 | n/a | | Grasses | - | - | - | |
| 22-Aug-08 | east Fisher River | 12 | | 8.50 | - | n/a | | Grasses | - | - | - | |
| | | | | | | | | | | | 0.437 | Q |
| 22-Aug-08 | west Fisher River | 44 | LB | 0.00 | 0.25 | 0 | Hard | Cobble/gravel | 0.00 | 0.00 | 0.000 | |
| 22-Aug-08 | west Fisher River | 44 | | 0.50 | 0.50 | 0.35 | Hard | Cobble/gravel | 0.18 | 0.74 | 0.130 | |
| 22-Aug-08 | west Fisher River | 44 | | 1.00 | 0.50 | 0.32 | Hard | Cobble/gravel | 0.16 | 0.73 | 0.117 | |
| 22-Aug-08 | west Fisher River | 44 | | 1.50 | 0.50 | 0.35 | Hard | Cobble/gravel | 0.18 | 1.12 | 0.196 | |
| 22-Aug-08 | west Fisher River | 44 | | 2.00 | 0.50 | 0.32 | Hard | Cobble/gravel | 0.16 | 0.99 | 0.158 | |
| 22-Aug-08 | west Fisher River | 44 | | 2.50 | 0.50 | 0.32 | Hard | Cobble/gravel | 0.16 | 0.97 | 0.155 | |
| 22-Aug-08 | west Fisher River | 44 | | 3.00 | 0.50 | 0.31 | Hard | Cobble/gravel | 0.16 | 0.74 | 0.115 | |
| 22-Aug-08 | west Fisher River | 44 | | 3.50 | 0.50 | 0.32 | Hard | Cobble/gravel | 0.16 | 0.89 | 0.142 | |
| 22-Aug-08 | west Fisher River | 44 | | 4.00 | 0.50 | 0.25 | Hard | Cobble/gravel | 0.13 | 0.87 | 0.109 | |
| 22-Aug-08 | west Fisher River | 44 | | 4.50 | 0.50 | 0.25 | Hard | Cobble/gravel | 0.13 | 0.81 | 0.101 | |
| 22-Aug-08 | west Fisher River | 44 | | 5.00 | 0.50 | 0.22 | Hard | Cobble/gravel | 0.11 | 0.86 | 0.095 | |
| 22-Aug-08 | west Fisher River | 44 | | 5.50 | 0.50 | 0.22 | Hard | Cobble/gravel | 0.11 | 0.97 | 0.107 | |
| 22-Aug-08 | west Fisher River | 44 | | 6.00 | 0.50 | 0.20 | Hard | Cobble/gravel | 0.10 | 0.88 | 0.088 | |
| 22-Aug-08 | west Fisher River | 44 | | 6.50 | 0.50 | 0.22 | Hard | Cobble/gravel | 0.11 | 0.82 | 0.090 | |
| 22-Aug-08 | west Fisher River | 44 | | 7.00 | 0.50 | 0.18 | Hard | Cobble/gravel | 0.09 | 0.85 | 0.077 | |
| 22-Aug-08 | west Fisher River | 44 | | 7.50 | 0.50 | 0.18 | Hard | Cobble/gravel | 0.09 | 0.84 | 0.076 | |
| 22-Aug-08 | west Fisher River | 44 | | 8.00 | 0.50 | 0.10 | Hard | Cobble/gravel | 0.05 | 0.50 | 0.025 | |
| 22-Aug-08 | west Fisher River | 44 | | 8.50 | 0.50 | 0.00 | Hard | Cobble/gravel | 0.00 | 0.00 | 0.000 | |
| 22-Aug-08 | west Fisher River | 44 | RB | 8.80 | - | 0 | Hard | Cobble/gravel | - | - | - | |
| | | | | | | | | | | | 1.780 | Q |

Table A1-2. Continued.

| DATE | LOCATION | STUDY SITE | SIDE | DISTANCE (m) | WIDTH (m) | DEPTH (m) | SUBSTRATE | | AREA | VELOCITY (m/sec) | DISCHARGE (m ³ /sec) | Comments |
|-----------|-----------------------|------------|------|--------------|-----------|-----------|------------|-------------|------|------------------|---------------------------------|------------|
| | | | | | | | Compaction | Composition | | | | |
| 22-Apr-09 | Broad Valley Drain | 2 | RB | at hoop | | 1.2 | Soft | silt/clay | | 0.79 | | |
| 22-Apr-09 | Kilkenny Drain | 27 | | | 4.0 | | | | | 1.02 | | |
| 22-Apr-09 | Sunny Valley Drain | 55 | | | | | | | | 0.67 | | |
| 23-Apr-09 | mainstem Fisher River | 54 | RB | at hoop | | | | | | 0.60 | | |
| 23-Apr-09 | east Fisher River | 53 | | | | | | | | 2.07 | | at culvert |
| 23-Apr-09 | west Fisher River | 44 | | | | | | | | 3.07 | | at culvert |
| 23-Apr-09 | west Fisher River | 44 | | | | | | | | 1.60 | | at washout |
| 23-Apr-09 | east Fisher River | 17 | | | | | | | | 1.50 | | |
| 23-Apr-09 | east Fisher River | 13 | | | | | | | | 0.64 | | at hoop |
| 23-Apr-09 | Kilkenny Drain | 27 | | | | | | | | 0.62 | | at hoop |
| 29-Apr-09 | mainstem Fisher River | 54 | RB | at hoop | | | | | | 0.74 | | |
| 29-Apr-09 | east Fisher River | 17 | | at hoop | | 0.99 | | | | 0.71 | | |
| 29-Apr-09 | west Fisher River | 44 | | | | | | | | 1.50 | | at washout |
| 29-Apr-09 | Broad Valley Drain | 2 | RB | 0.00 | 0.15 | 0.00 | | | - | - | - | |
| 29-Apr-09 | Broad Valley Drain | 2 | | 0.30 | 0.30 | 0.82 | | | 0.25 | 0.41 | 0.101 | |
| 29-Apr-09 | Broad Valley Drain | 2 | | 0.60 | 0.30 | 0.80 | | | 0.24 | 0.38 | 0.091 | |
| 29-Apr-09 | Broad Valley Drain | 2 | | 0.90 | 0.30 | 0.92 | | | 0.28 | 0.34 | 0.094 | |
| 29-Apr-09 | Broad Valley Drain | 2 | | 1.20 | 0.30 | 0.95 | | | 0.29 | 0.36 | 0.103 | |
| 29-Apr-09 | Broad Valley Drain | 2 | | 1.50 | 0.30 | 0.87 | | | 0.26 | 0.39 | 0.102 | |

Table A1-2. Continued.

| DATE | LOCATION | STUDY SITE | SIDE | DISTANCE (m) | WIDTH (m) | DEPTH (m) | SUBSTRATE | | AREA | VELOCITY (m/sec) | DISCHARGE (m ³ /sec) | Comments |
|-----------|--------------------|---------------|------|-----------------|--------------|--------------|------------|-------------|------|---------------------|------------------------------------|----------|
| | | | | | | | Compaction | Composition | | | | |
| 29-Apr-09 | Broad Valley Drain | 2 | | 1.80 | 0.30 | 0.82 | | | 0.25 | 0.30 | 0.074 | |
| 29-Apr-09 | Broad Valley Drain | 2 | | 2.10 | 0.30 | 0.80 | | | 0.24 | 0.21 | 0.050 | |
| 29-Apr-09 | Broad Valley Drain | 2 | | 2.40 | 0.30 | 0.72 | | | 0.22 | 0.09 | 0.019 | |
| 29-Apr-09 | Broad Valley Drain | 2 | | 2.70 | 0.30 | 0.62 | | | 0.19 | 0.08 | 0.015 | |
| 29-Apr-09 | Broad Valley Drain | 2 | | 3.00 | 0.30 | 0.55 | | | 0.17 | 0.00 | 0.000 | |
| 29-Apr-09 | Broad Valley Drain | 2 | LB | 3.20 | 0.10 | 0.00 | | | - | - | - | |
| | | | | | | | | | | | 0.649 | Q |

Side = Left (LB) or Right (RB) bank

Distance = Distance (m) from either the left or right bank

Width = Distance between two vertical points of measurement

Area = Width x Depth

Table A1-3. Water quality parameters collected *in situ* (i.e., in the field) by North/South Consultants Inc. throughout watershed # 05SD, 2008 and 2009.

| DATE | LOCATION | Wpt. | Time | Dissolved Oxygen ¹ | Temperature (°C) | Temperature (°C) | pH ² | Turbidity ³ | Conductivity ³ |
|-----------|-----------------------|------|-------|-------------------------------|------------------|------------------|-----------------|------------------------|---------------------------|
| | | | | Horiba | Horiba | Hand held | Horiba | (NTU) | (uS/cm) |
| 22-Aug-08 | Broad Valley Drain | 2 | 9:40 | 3.41 | 18.6 | | 7.55 | 3 | 0.736 |
| 21-Apr-09 | Broad Valley Drain | 2 | 16:00 | | | 7.0 | | | |
| 22-Apr-09 | Broad Valley Drain | 2 | 9:00 | 3.73 | 5.8 | 6.0 | 7.90 | 174 | 0.520 |
| 23-Apr-09 | Broad Valley Drain | 2 | 14:37 | | | 6.0 | | | |
| 24-Apr-09 | Broad Valley Drain | 2 | 10:19 | | | 4.0 | | | |
| 28-Apr-09 | Broad Valley Drain | 2 | 15:15 | | | 8.0 | | | |
| 29-Apr-09 | Broad Valley Drain | 2 | 17:15 | | | 9.0 | | | |
| 30-Apr-09 | Broad Valley Drain | 2 | 12:05 | | | 9.0 | | | |
| 22-Aug-08 | east Fisher River | 47 | 10:45 | 4.40 | 14.7 | | 7.49 | 6 | 0.754 |
| 22-Aug-08 | east Fisher River | 53 | 13:30 | 4.40 | 21.3 | | 7.67 | 30 | 0.740 |
| 21-Apr-09 | east Fisher River | 53 | 16:30 | | | 8.0 | | | |
| 21-Apr-09 | east Fisher River | 17 | 18:00 | | | 9.0 | | | |
| 22-Apr-09 | east Fisher River | 13 | 15:10 | | | 6.0 | | | |
| 23-Apr-09 | east Fisher River | 13 | 12:30 | 8.47 | 7.9 | - | 7.95 | 77.7 | 0.430 |
| 24-Apr-09 | east Fisher River | 13 | 9:55 | | | 4.0 | | | |
| 28-Apr-09 | east Fisher River | 17 | 17:00 | | | 9.0 | | | |
| 29-Apr-09 | east Fisher River | 17 | 12:30 | | | 8.0 | | | |
| 30-Apr-09 | east Fisher River | 17 | 9:58 | | | 8.0 | | | |
| 22-Aug-08 | Fisher River | 36 | 13:45 | 5.25 | 22.1 | | 7.65 | 31 | 0.600 |
| 22-Apr-09 | Kilkenny Drain | 27 | 14:10 | | | 5.0 | | | |
| 23-Apr-09 | Kilkenny Drain | 27 | 14:00 | 9.41 | 6.8 | - | 8.04 | 97.7 | 0.340 |
| 24-Apr-09 | Kilkenny Drain | 27 | 10:50 | | | 2.0 | | | |
| 28-Apr-09 | Kilkenny Drain | 27 | 15:45 | | | 9.0 | | | |
| 29-Apr-09 | Kilkenny Drain | 27 | 15:15 | | | 9.0 | | | |
| 30-Apr-09 | Kilkenny Drain | 27 | 12:40 | | | 8.5 | | | |
| 22-Apr-09 | mainstem Fisher River | 54 | 11:00 | | | 5.0 | | | |
| 22-Apr-09 | mainstem Fisher River | 54 | 10:00 | 8.58 | 7.3 | - | 7.83 | 110 | 0.360 |

Table A1-3. Continued.

| DATE | LOCATION | Wpt. | Time | Dissolved Oxygen ¹ | Temperature (°C) | Temperature (°C) | pH ² | Turbidity ³ | Conductivity ³ |
|-----------|-----------------------|------|-------|-------------------------------|------------------|------------------|-----------------|------------------------|---------------------------|
| | | | | Horiba | Horiba | Hand held | Horiba | (NTU) | (uS/cm) |
| 24-Apr-09 | mainstem Fisher River | 54 | 9:15 | | | 4.5 | | | |
| 28-Apr-09 | mainstem Fisher River | 54 | 18:04 | | | 9.0 | | | |
| 29-Apr-09 | mainstem Fisher River | 54 | 10:03 | | | 9.0 | | | |
| 30-Apr-09 | mainstem Fisher River | 54 | 9:30 | | | 8.0 | | | |
| 22-Aug-08 | Sunny Valley Drain | 35 | 14:00 | 3.10 | 21.3 | | 7.30 | 2 | 0.434 |
| 22-Aug-08 | west Fisher River | 44 | 15:00 | 6.62 | 21.6 | | 7.79 | 210 | 0.560 |
| 21-Apr-09 | west Fisher River | 44 | 17:00 | | | 7.0 | | | |
| 23-Apr-09 | west Fisher River | 44 | 12:00 | | | 5.0 | | | |
| 29-Apr-09 | west Fisher River | 56 | 14:20 | | | 8.5 | | | |
| 30-Apr-09 | west Fisher River | 56 | 11:40 | | | 8.0 | | | |

¹MWQ objective instantaneous minimum of 5 mg/L for the protection of cool water (>5°C) aquatic life.

²MWQ guidelines for: Recreation (5.0-9.0); Protection of Freshwater Aquatic Life (6.5-9.0); and Drinking Water Aesthetic Objectives (6.5-8.5).

³ Collected with Horiba meter

Table A1-4. Fish species (common name and abbreviation used), COSEWIC listing, and sex/maturity code outlined in Table A1-5.

| FAMILY | COMMON NAME | ABBREVIATION | GENUS | SPECIES | COSEWIC Listing ¹ |
|----------------------|------------------------|--------------|--------------------|-------------------|------------------------------|
| Gasterosteidae | Brook stickleback | BRST | <i>Culaea</i> | <i>inconstans</i> | Not Listed |
| Ictaluridae | Brown bullhead | BRBL | <i>Ameiurus</i> | <i>nebulosus</i> | Not Listed |
| Umbridae | Central mudminnow | CNMD | <i>Umbra</i> | <i>limi</i> | Not Listed |
| Cyprinidae | Fathead minnow | FTMN | <i>Pimephales</i> | <i>promelas</i> | Not Listed |
| Percidae | Iowa darter | IWDR | <i>Etheostoma</i> | <i>exile</i> | Not Listed |
| Percidae | Johnny darter | JHDR | <i>Etheostoma</i> | <i>nigrum</i> | Not Listed |
| Catostomidae | Longnose sucker | LNSC | <i>Catostomus</i> | <i>catostomus</i> | Not Listed |
| Esocidae | Northern pike | NRPK | <i>Esox</i> | <i>lucius</i> | Not Listed |
| Cyprinidae | Northern redbelly dace | NRDC | <i>Phoxinus</i> | <i>eos</i> | Not Listed |
| Centrarchidae | Rock bass | RCBS | <i>Ambloplites</i> | <i>rupestris</i> | Not Listed |
| Cottidae | Slimy sculpin | SLSC | <i>Cottus</i> | <i>cognatus</i> | Not Listed |
| Percidae | Walleye | WALL | <i>Sander</i> | <i>vitreus</i> | Not Listed |
| Catostomidae | White sucker | WHSC | <i>Catostomus</i> | <i>commersoni</i> | Not Listed |
| Percidae | Yellow perch | YLPR | <i>Perca</i> | <i>flavescens</i> | Not Listed |
| TOTAL SPECIES | | 14 | | | |

¹ COSEWIC - Committee on the Status of Endangered Wildlife in Canada

Sex and Maturity Codes Used:

F = Female

F2 = Female preparing to spawn in the current year

F3 = A female, ripe and ready to spawn in the current year

F4 = A female that has spawned in the current year (spent)

M = Male

M7 = Male preparing to spawn in the current year

M8 = A male, ripe and ready to spawn in the current year

M9 = A male that has spawned in the current year (spent)

Table A1-5. Biological information collected from fish captured during summer/fall (2008) and spring (2009) fish utilization surveys by North/South Consultants Inc. throughout watershed 05SD. Fish species codes and sex/maturity ID are described in Table A1-4.

| Waterbody | Wpt. # | Season | Total Count | Fish Species | Check Date (y/m/d) | Check Time (h:m) | Fork Length (mm) | Weight (g) | Sex ID | Maturity ID | Comments (e.g., gear) |
|-----------------------|--------|-------------|-------------|--------------|-----------------------|------------------|---------------------|---------------|--------|-------------|---|
| Kilkenny Drain | 28 | Summer | | | 5-Aug-08 | 16:00 | | | | | visual of forage fish at culvert |
| Broad Valley Drain | 2 | Late summer | 10 | FHMN | 22-Aug-08 | 9:40 | | | | | Dip net |
| east Fisher River | 12 | Late summer | 1 | WHSC | 22-Aug-08 | 12:00 | 250 | | | | Seine haul |
| east Fisher River | 12 | Late summer | 1 | WHSC | 22-Aug-08 | 12:00 | 200 | | | | Seine haul |
| east Fisher River | 12 | Late summer | 1 | WHSC | 22-Aug-08 | 12:00 | 100 | | | | Seine haul |
| east Fisher River | 13 | Fall | 1 | NRPK | 27-Oct-08 | 10:40 | 182 | | | | Electrofishing |
| east Fisher River | 13 | Fall | 1 | NRPK | 27-Oct-08 | 10:40 | 197 | | | | Electrofishing |
| east Fisher River | 13 | Fall | 1 | CNMD | 27-Oct-08 | 10:40 | 101 | | | | Electrofishing |
| east Fisher River | 13 | Fall | 1 | RCBS | 27-Oct-08 | 10:40 | 31 | | | | Electrofishing |
| Broad Valley Drain | 2 | Fall | 1 | CNMD | 27-Oct-08 | 11:30 | | | | | Electrofishing |
| Broad Valley Drain | 2 | Fall | 1 | JHDR | 27-Oct-08 | 11:30 | | | | | Electrofishing |
| Broad Valley Drain | 2 | Fall | 1 | SLSC | 27-Oct-08 | 11:30 | | | | | Electrofishing |
| Broad Valley Drain | 2 | Spring - 09 | | | 21-Apr-09 | | | | | | Hoop net in at 16:00 hrs; BVD-HN1 |
| west Fisher River | 44 | Spring - 09 | 6 | WHSC | 21-Apr-09 | 17:00 | | | | | Dip net at washout in 10 min. |
| Broad Valley Drain | 2 | Spring - 09 | 1 | WHSC | 22-Apr-09 | 9:00 | 404 | 900 | M | 7 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 22-Apr-09 | 9:00 | 397 | 400 | F | 2 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 22-Apr-09 | 9:00 | 382 | 150 | | | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 22-Apr-09 | 9:00 | 655 | 2300 | F | 3 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 22-Apr-09 | 9:00 | 333 | 375 | M | 7 | BVD-HN1 |
| mainstem Fisher River | 54 | Spring - 09 | 0 | | 22-Apr-09 | | | | | | Electrofishing: no catch |
| Kilkenny Drain | 27 | Spring - 09 | 0 | | 22-Apr-09 | | | | | | KD-HN1 (E584815 N5659940) in |
| east Fisher River | 13 | Spring - 09 | 0 | | 22-Apr-09 | 15:28 | | | | | Hoop net in (E602689 N5669490) eFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 0 | | 22-Apr-09 | 16:20 | | | | | Hoop net in; mFR-HN 1 |
| Sunny Valley Drain | - | Spring - 09 | 0 | | 22-Apr-09 | 17:02 | | | | | Visuals along drain, no fish |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 10:05 | 542 | 2700 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 10:05 | 766 | 4000 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 10:05 | 526 | 2600 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 10:05 | 526 | 2100 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 10:05 | 525 | 2500 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 10:05 | 547 | 2600 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WALL | 23-Apr-09 | 10:05 | 491 | 1600 | M | 7 | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WALL | 23-Apr-09 | 10:05 | 425 | 950 | M | 7 | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WALL | 23-Apr-09 | 10:05 | 476 | 1400 | M | 7 | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 10:05 | 491 | 1500 | M | 7 | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | BRBL | 23-Apr-09 | 10:05 | 172 | 100 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 10:05 | 726 | 3200 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 10:05 | 350 | 350 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 10:05 | 525 | 2750 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 10:05 | 530 | 2800 | F | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WALL | 23-Apr-09 | 10:05 | 398 | 800 | M | 7 | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 10:05 | 520 | 2300 | | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 10:05 | 495 | 1900 | M | 9 | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 10:05 | 286 | 150 | | | mFR-HN 1 |

Table A1-5. Continued.

| Waterbody | Wpt. # | Season | Total Count | Fish Species | Check Date (y/m/d) | Check Time (h:m) | Fork Length (mm) | Weight (g) | Sex ID | Maturity ID | Comments (e.g., gear) |
|-----------------------|--------|-------------|-------------|--------------|-----------------------|------------------|---------------------|---------------|--------|-------------|---|
| mainstem Fisher River | 54 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 10:05 | 507 | 2200 | F | | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 10:05 | 302 | 250 | M | 7 | mFR-HN 1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 10:05 | 261 | 250 | M | 7 | mFR-HN 1 |
| west Fisher River | 44 | Spring - 09 | 12 | WHSC | 23-Apr-09 | 12:00 | | | | | Dip net in 5 min.; no spawn; holding at culvert |
| east Fisher River | 17 | Spring - 09 | 0 | | 23-Apr-09 | | | | | | Visual, no fish |
| east Fisher River | 13 | Spring - 09 | 1 | WHSC | 23-Apr-09 | 12:30 | 534 | 2300 | | | eFR-HN 1 |
| east Fisher River | 13 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 12:30 | 595 | 1850 | F | 3 | eFR-HN 1 |
| Kilkenny Drain | 27 | Spring - 09 | 0 | | 23-Apr-09 | 14:00 | | | | | KD-HN1 (E584815 N5659940) |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 14:37 | 268 | 100 | | | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 14:37 | 374 | 450 | M | 8 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 14:37 | 340 | 300 | M | 8 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 14:37 | 346 | 400 | F | 3 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 23-Apr-09 | 14:37 | 481 | 125 | F | 3 | BVD-HN1 |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 24-Apr-09 | 9:15 | 268 | 75 | M | | mFR-HN 1 pulled |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 24-Apr-09 | 9:15 | 285 | 150 | M | | mFR-HN 1 pulled |
| east Fisher River | 13 | Spring - 09 | 0 | | 24-Apr-09 | 9:55 | | | | | eFR-HN 1 pulled |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 24-Apr-09 | 10:19 | 527 | 2500 | | | BVD-HN1 pulled |
| Broad Valley Drain | 2 | Spring - 09 | 1 | WHSC | 24-Apr-09 | 10:19 | 262 | 75 | | | BVD-HN1 pulled |
| Kilkenny Drain | 27 | Spring - 09 | 0 | | 24-Apr-09 | 10:50 | | | | | KD-HN1pulled |
| Broad Valley Drain | 2 | Spring - 09 | | | 28-Apr-09 | 15:15 | | | | | BVD-HN1 in |
| Broad Valley Drain | 2 | Spring - 09 | | | 28-Apr-09 | 15:15 | | | | | Minnow trap in |
| Kilkenny Drain | 27 | Spring - 09 | | | 28-Apr-09 | 15:45 | | | | | KD-HN1 hoop in |
| east Fisher River | 17 | Spring - 09 | | | 28-Apr-09 | 17:00 | | | | | eFR-HN 2 in (E603378 N5671578) |
| east Fisher River | 17 | Spring - 09 | | | 28-Apr-09 | 17:00 | | | | | Minnow trap in |
| mainstem Fisher River | 54 | Spring - 09 | | | 28-Apr-09 | 18:04 | | | | | mFR-HN 1 in |
| mainstem Fisher River | 54 | Spring - 09 | | | 28-Apr-09 | 18:04 | | | | | Minnow trap in |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 29-Apr-09 | 10:03 | | | | | mFR-HN 1; net cut |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 29-Apr-09 | 10:03 | | | | | mFR-HN 1; net cut |
| mainstem Fisher River | 54 | Spring - 09 | 1 | NRPK | 29-Apr-09 | 10:03 | | | | | mFR-HN 1; net cut |
| mainstem Fisher River | 54 | Spring - 09 | 1 | BRBL | 29-Apr-09 | 10:03 | | | | | Minnow trap |
| mainstem Fisher River | 39 | Spring - 09 | 0 | | 29-Apr-09 | 11:30 | | | | | Dip net and visual |
| east Fisher River | 53 | Spring - 09 | 2 | WHSC | 29-Apr-09 | 12:15 | | | | | Visual of white sucker remains |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 516 | 2200 | F | | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 489 | 1700 | M | 8 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 572 | 2650 | F | 4 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 522 | 2600 | F | 3 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 510 | 2300 | F | 4 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 527 | 2400 | F | 4 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 468 | 1700 | M | 8 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 497 | 1750 | M | 9 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 482 | 1600 | M | 9 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 534 | 2800 | F | 2 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 542 | 2500 | F | 2 | eFR-HN 2 |

Table A1-5. Continued.

| Waterbody | Wpt. # | Season | Total Count | Fish Species | Check Date (y/m/d) | Check Time (h:m) | Fork Length (mm) | Weight (g) | Sex ID | Maturity ID | Comments (e.g., gear) |
|-----------------------|--------|-------------|-------------|--------------|-----------------------|------------------|---------------------|---------------|--------|-------------|---|
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 476 | 1600 | M | 8 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 430 | 1200 | M | 8 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 12:30 | 497 | 1900 | M | 8 | eFR-HN 2 |
| east Fisher River | 17 | Spring - 09 | 1 | JHDR | 29-Apr-09 | 12:30 | | | | | Minnow trap |
| east Fisher River | 17 | Spring - 09 | 1 | CNMD | 29-Apr-09 | 12:30 | | | | | Minnow trap |
| west Fisher River | 56 | Spring - 09 | | | 29-Apr-09 | 14:20 | | | | | wFR-HN 1 in E597484 N5676105 |
| Kilkenny Drain | 27 | Spring - 09 | 0 | | 29-Apr-09 | 15:15 | | | | | KD-HN1 hoop no catch; large rodent hole |
| Kilkenny Drain | 27 | Spring - 09 | 1 | NRDC | 29-Apr-09 | 15:15 | | | | | Dip net |
| Kilkenny Drain | 27 | Spring - 09 | 1 | FHMN | 29-Apr-09 | 15:15 | | | | | Dip net; 1000+ stickleback at culvert as well |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 29-Apr-09 | 17:15 | 528 | 1325 | F | 3 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | NRPK | 29-Apr-09 | 17:15 | 332 | 350 | M | 8 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 17:15 | 271 | 300 | M | 8 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 17:15 | 493 | 2000 | F | 4 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | 1 | WHSC | 29-Apr-09 | 17:15 | 454 | 1550 | M | 8 | BVD-HN1 |
| Broad Valley Drain | 2 | Spring - 09 | | | 29-Apr-09 | 17:15 | | | | | Minnow trap with invertebrates, no fish |
| mainstem Fisher River | 54 | Spring - 09 | 0 | | 30-Apr-09 | 9:30 | | | | | mFR-HN 1 pulled |
| mainstem Fisher River | 54 | Spring - 09 | 2 | BRST | 30-Apr-09 | 9:30 | | | | | Minnow trap pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 502 | 1750 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 522 | 2000 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 484 | 2000 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 424 | 1125 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 513 | 2050 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 483 | 1700 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 556 | 2700 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 520 | 2300 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 468 | 1700 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 499 | 2100 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 510 | 2100 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 475 | 1650 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 520 | 2300 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 488 | 1750 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 475 | 1600 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 522 | 2200 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 473 | 1650 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 532 | 2200 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 475 | 1700 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 518 | 2300 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 475 | 1500 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 470 | 1750 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 524 | 1950 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 551 | 1900 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 504 | 2000 | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 9:58 | 519 | 2150 | | | eFR-HN 2 pulled |

Table A1-5. Continued.

| Waterbody | Wpt. # | Season | Total Count | Fish Species | Check Date (y/m/d) | Check Time (h:m) | Fork Length (mm) | Weight (g) | Sex ID | Maturity ID | Comments (e.g., gear) |
|--------------------|--------|-------------|-------------|--------------|-----------------------|------------------|---------------------|---------------|--------|-------------|--------------------------------------|
| east Fisher River | 17 | Spring - 09 | 28 | WHSC | 30-Apr-09 | 9:58 | | | | | eFR-HN 2 pulled |
| east Fisher River | 17 | Spring - 09 | | | 30-Apr-09 | 9:58 | | | | | Minnow trap pulled; crayfish |
| west Fisher River | 56 | Spring - 09 | 1 | NRPK | 30-Apr-09 | 11:40 | 470 | 700 | | | wFR-HN 1 pulled |
| west Fisher River | 56 | Spring - 09 | 1 | NRPK | 30-Apr-09 | 11:40 | 432 | 550 | M | 9 | wFR-HN 1 pulled |
| west Fisher River | 56 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 11:40 | 492 | 1750 | F | 4 | wFR-HN 1 pulled |
| Broad Valley Drain | 2 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 12:05 | 532 | 2350 | F | 2 | BVD-HN1 pulled |
| Broad Valley Drain | 2 | Spring - 09 | 2 | CNMD | 30-Apr-09 | 12:05 | | | | | Minnow trap: plus some invertebrates |
| Kilkenny Drain | 27 | Spring - 09 | 1 | WHSC | 30-Apr-09 | 12:40 | 479 | 1725 | F | 2 | KD-HN1 pulled |

APPENDIX 2.

GROUND CLASSIFICATIONS FOR WATERCOURSES THROUGHOUT WATERSHED 05SD

Table A2-1. Ground based observations, by waypoint (Wpt. #) and date, along Blind Creek, 2008.

| Wpt. # | Rehab # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|---------|----------|-------------|------------------|-----------|----------|-----------|------|-------|-------|----------|--|
| | | | | | easting | northing | | | | | | |
| 25 | 141 | 5-Aug-08 | Blind Creek | middle reaches | 583876 | 5662953 | u/s | LB | Yes | Creek | 1 | Grassed pasture with dugout; access likely |
| 25 | 141 | 5-Aug-08 | Blind Creek | middle reaches | 583876 | 5662953 | u/s | RB | Yes | Creek | 1 | Grassed pasture with dugout; access likely |
| 25 | 141 | 5-Aug-08 | Blind Creek | middle reaches | 583876 | 5662953 | d/s | LB | Yes | Creek | 1 | Grassed pasture; access likely |
| 25 | 141 | 5-Aug-08 | Blind Creek | middle reaches | 583876 | 5662953 | d/s | RB | Yes | Creek | 1 | Grassed pasture; access likely |

Table A2-2. Ground based observations, by waypoint (Wpt. #) and date, along Bottle Creek, 2008.

| Wpt. # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|----------|--------------|------------------|-----------|----------|-----------|------|-------|---------|----------|-------------------------------------|
| | | | | easting | northing | | | | | | |
| 15 | 5-Aug-08 | Bottle Creek | middle reaches | 605845 | 5671156 | u/s | LB | No | Channel | - | Grassed drain extending to crop |
| 15 | 5-Aug-08 | Bottle Creek | middle reaches | 605845 | 5671156 | u/s | RB | No | Channel | - | Grassed drain extending to crop |
| 15 | 5-Aug-08 | Bottle Creek | middle reaches | 605845 | 5671156 | d/s | LB | No | Channel | - | Grassed drain extending to hayfield |
| 15 | 5-Aug-08 | Bottle Creek | middle reaches | 605845 | 5671156 | d/s | RB | No | Channel | - | Grassed drain extending to hayfield |

Table A2-3. Ground based observations, by waypoint (Wpt. #) and date, along the Broad Valley Drain, 2008.

| Wpt. # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|----------|--------------------|---------------------------------|-----------|----------|-----------|------|-------|---------|----------|--|
| | | | | easting | northing | | | | | | |
| 1 | 5-Aug-08 | Broad Valley Drain | upper reaches | 598005 | 5652226 | u/s | LB | Yes | Natural | - | Natural; good riparian |
| 1 | 5-Aug-08 | Broad Valley Drain | upper reaches | 598005 | 5652226 | u/s | RB | Yes | Natural | - | Natural, but farm with yard in area |
| 1 | 5-Aug-08 | Broad Valley Drain | upper reaches | 598005 | 5652226 | d/s | LB | Yes | Natural | - | Natural; good riparian |
| 1 | 5-Aug-08 | Broad Valley Drain | upper reaches | 598005 | 5652226 | d/s | RB | Yes | Natural | - | Natural; good riparian |
| 2 | 5-Aug-08 | Broad Valley Drain | east of Fisher Branch; Hwy. 233 | 598484 | 5659951 | u/s | LB | Yes | Drain | - | Channel but good riparian |
| 2 | 5-Aug-08 | Broad Valley Drain | east of Fisher Branch; Hwy. 233 | 598484 | 5659951 | u/s | RB | Yes | Drain | - | Channel but good riparian |
| 2 | 5-Aug-08 | Broad Valley Drain | east of Fisher Branch; Hwy. 233 | 598484 | 5659951 | d/s | LB | Yes | Drain | - | Natural; good riparian |
| 2 | 5-Aug-08 | Broad Valley Drain | east of Fisher Branch; Hwy. 233 | 598484 | 5659951 | d/s | RB | Yes | Drain | - | Natural; good riparian |
| 5 | 5-Aug-08 | Broad Valley Drain | at Hwy. 17 | 597850 | 5660641 | u/s | LB | Yes | Drain | - | Grassed riparian with hayfields beyond |
| 5 | 5-Aug-08 | Broad Valley Drain | at Hwy. 17 | 597850 | 5660641 | u/s | RB | Yes | Drain | - | Grassed riparian with hayfields beyond |
| 5 | 5-Aug-08 | Broad Valley Drain | at Hwy. 17 | 597850 | 5660641 | d/s | LB | Yes | Natural | - | Grassed and wooded riparian |
| 5 | 5-Aug-08 | Broad Valley Drain | at Hwy. 17 | 597850 | 5660641 | d/s | RB | Yes | Natural | - | Grassed and wooded riparian |
| 51 | 6-Aug-08 | Broad Valley Drain | middle reaches | 600133 | 5656699 | u/s | LB | Yes | Natural | - | Grassed and wooded with hayfields beyond |
| 51 | 6-Aug-08 | Broad Valley Drain | middle reaches | 600133 | 5656699 | u/s | RB | Yes | Natural | - | Grassed and wooded with hayfields beyond |
| 51 | 6-Aug-08 | Broad Valley Drain | middle reaches | 600133 | 5656699 | d/s | LB | Yes | Natural | - | Grassed and wooded with hayfields beyond |
| 51 | 6-Aug-08 | Broad Valley Drain | middle reaches | 600133 | 5656699 | d/s | RB | Yes | Natural | - | Grassed and wooded with hayfields beyond |

Table A2-4. Ground based observations, by waypoint (Wpt. #) and date, along the Dumoulin Drain, 2008.

| Wpt. # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|----------|----------------|----------------------|-----------|----------|-----------|------|-------|---------|----------|--|
| | | | | easting | northing | | | | | | |
| 9 | 5-Aug-08 | Dumoulin Drain | at Laval School Road | 599860 | 5663248 | u/s | LB | Yes | Channel | - | Grassed drain; crop beyond |
| 9 | 5-Aug-08 | Dumoulin Drain | at Laval School Road | 599860 | 5663248 | u/s | RB | Yes | Channel | - | Grassed drain; crop beyond |
| 9 | 5-Aug-08 | Dumoulin Drain | at Laval School Road | 599860 | 5663248 | d/s | LB | Yes | Channel | - | Grassed drain; crop beyond |
| 9 | 5-Aug-08 | Dumoulin Drain | at Laval School Road | 599860 | 5663248 | d/s | RB | Yes | Channel | - | Grassed drain; crop beyond |
| 52 | 6-Aug-08 | Dumoulin Drain | middle reaches | 602857 | 5656743 | u/s | LB | No | Ditch | - | Grassed and wooded riparian into old pasture gone to hay |
| 52 | 6-Aug-08 | Dumoulin Drain | middle reaches | 602857 | 5656743 | u/s | RB | No | Ditch | - | Grassed and wooded up into roadway |
| 52 | 6-Aug-08 | Dumoulin Drain | middle reaches | 602857 | 5656743 | d/s | LB | No | Ditch | - | Grassed and wooded |
| 52 | 6-Aug-08 | Dumoulin Drain | middle reaches | 602857 | 5656743 | d/s | RB | No | Ditch | - | Grassed and wooded |

Table A2-5. Ground based observations, by waypoint (Wpt. #) and date, along the mainstem Fisher River, 2008.

| Wpt. # | Rehab # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|---------|----------|-----------------------|--------------------------|-----------|----------|-----------|------|-------|-------|----------|--|
| | | | | | easting | northing | | | | | | |
| 29 | - | 6-Aug-08 | mainstem Fisher River | off Hwy. 224 near mouth | 615311 | 5700442 | u/s | LB | Yes | River | - | Grassed and wooded banks to residential |
| 29 | - | 6-Aug-08 | mainstem Fisher River | off Hwy. 224 near mouth | 615311 | 5700442 | u/s | RB | Yes | River | - | Grassed and wooded banks to Hwy. 224 |
| 29 | - | 6-Aug-08 | mainstem Fisher River | off Hwy. 224 near mouth | 615311 | 5700442 | d/s | LB | Yes | River | - | Grassed and wooded banks to residential |
| 29 | - | 6-Aug-08 | mainstem Fisher River | off Hwy. 224 near mouth | 615311 | 5700442 | d/s | RB | Yes | River | - | Grassed and wooded banks to Hwy. 224 |
| 30 | - | 6-Aug-08 | mainstem Fisher River | on bridge along Hwy. 224 | 611651 | 5699340 | u/s | LB | Yes | River | - | Grassed and wooded banks to residential |
| 30 | - | 6-Aug-08 | mainstem Fisher River | on bridge along Hwy. 224 | 611651 | 5699340 | u/s | RB | Yes | River | - | Grassed banks to residential |
| 30 | - | 6-Aug-08 | mainstem Fisher River | on bridge along Hwy. 224 | 611651 | 5699340 | d/s | LB | Yes | River | - | Grassed and wooded banks to residential |
| 30 | - | 6-Aug-08 | mainstem Fisher River | on bridge along Hwy. 224 | 611651 | 5699340 | d/s | RB | Yes | River | - | Grassed and wooded banks to residential |
| 31 | - | 6-Aug-08 | mainstem Fisher River | bridge on gravel road | 608556 | 5696767 | u/s | LB | Yes | River | - | Grassed and wooded banks to residential |
| 31 | - | 6-Aug-08 | mainstem Fisher River | bridge on gravel road | 608556 | 5696767 | u/s | RB | Yes | River | - | Wooded banks to residential |
| 31 | - | 6-Aug-08 | mainstem Fisher River | bridge on gravel road | 608556 | 5696767 | d/s | LB | Yes | River | - | Grassed and wooded banks to residential |
| 31 | - | 6-Aug-08 | mainstem Fisher River | bridge on gravel road | 608556 | 5696767 | d/s | RB | Yes | River | - | Wooded banks to residential |
| 37 | 83 | 6-Aug-08 | mainstem Fisher River | at Dallas | 605320 | 5695856 | n/a | n/a | Yes | River | 1 | Homestead with pasturing; access likely |
| 38 | - | 6-Aug-08 | mainstem Fisher River | south of Dallas | 604449 | 5692656 | u/s | LB | Yes | River | - | Wooded banks into residential |
| 38 | - | 6-Aug-08 | mainstem Fisher River | south of Dallas | 604449 | 5692656 | u/s | RB | Yes | River | - | Wooded banks into residential |
| 38 | - | 6-Aug-08 | mainstem Fisher River | south of Dallas | 604449 | 5692656 | d/s | LB | Yes | River | - | Wooded banks into residential |
| 38 | - | 6-Aug-08 | mainstem Fisher River | south of Dallas | 604449 | 5692656 | d/s | RB | Yes | River | - | Wooded and grassed banks into residential |
| 39 | 80 | 6-Aug-08 | mainstem Fisher River | on gravel ford | 603684 | 5690519 | u/s | LB | Yes | River | 1 | Wooded but washed out ford; residential beyond |
| 39 | 80 | 6-Aug-08 | mainstem Fisher River | on gravel ford | 603684 | 5690519 | u/s | RB | Yes | River | 1 | Wooded but washed out ford; residential beyond |
| 39 | 80 | 6-Aug-08 | mainstem Fisher River | on gravel ford | 603684 | 5690519 | d/s | LB | Yes | River | 1 | Wooded but washed out ford; residential beyond |
| 39 | 80 | 6-Aug-08 | mainstem Fisher River | on gravel ford | 603684 | 5690519 | d/s | RB | Yes | River | 1 | Wooded but washed out ford; residential beyond |
| 40 | 77 | 6-Aug-08 | mainstem Fisher River | on gravel ford | 602200 | 5687943 | u/s | LB | Yes | River | 1 | Wooded but washed out ford; residential beyond |
| 40 | 77 | 6-Aug-08 | mainstem Fisher River | on gravel ford | 602200 | 5687943 | u/s | RB | Yes | River | 1 | Wooded but washed out ford; residential beyond |
| 40 | 77 | 6-Aug-08 | mainstem Fisher River | on gravel ford | 602200 | 5687943 | d/s | LB | Yes | River | 1 | Wooded but washed out ford; residential beyond |
| 40 | 77 | 6-Aug-08 | mainstem Fisher River | on gravel ford | 602200 | 5687943 | d/s | RB | Yes | River | 1 | Wooded but washed out ford; residential beyond |
| 41 | - | 6-Aug-08 | mainstem Fisher River | near Peguis | 600521 | 5686293 | u/s | LB | Yes | River | - | Wooded banks into residential |
| 41 | - | 6-Aug-08 | mainstem Fisher River | near Peguis | 600521 | 5686293 | u/s | RB | Yes | River | - | Wooded banks into residential |
| 41 | - | 6-Aug-08 | mainstem Fisher River | near Peguis | 600521 | 5686293 | d/s | LB | Yes | River | - | Wooded banks into residential |
| 41 | - | 6-Aug-08 | mainstem Fisher River | near Peguis | 600521 | 5686293 | d/s | RB | Yes | River | - | Wooded banks into residential |
| 42 | - | 6-Aug-08 | mainstem Fisher River | near Peguis | 598829 | 5682897 | u/s | LB | Yes | River | - | Grassed riparian into residential |
| 42 | - | 6-Aug-08 | mainstem Fisher River | near Peguis | 598829 | 5682897 | u/s | RB | Yes | River | - | Grassed and wooded into residential |
| 42 | - | 6-Aug-08 | mainstem Fisher River | near Peguis | 598829 | 5682897 | d/s | LB | Yes | River | - | Grassed and wooded into residential |
| 42 | - | 6-Aug-08 | mainstem Fisher River | near Peguis | 598829 | 5682897 | d/s | RB | Yes | River | - | Grassed riparian into residential |

Table A2-6. Ground based observations, by waypoint (Wpt. #) and date, along the east Fisher River, 2008.

| Wpt. # | Rehab # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|---------|----------|-------------------|-----------------------------------|-----------|----------|-----------|------|-------|---------|----------|--|
| | | | | | easting | northing | | | | | | |
| 3 | 14 | 5-Aug-08 | east Fisher River | at Fisher Branch | 596987 | 5659922 | u/s | LB | Yes | River | 1 | Road but grassed; old walking bridge; debris; potential barrier Trees, grasses, old walking bridge; debris; potential barrier Good riparian Good riparian |
| 3 | 14 | 5-Aug-08 | east Fisher River | at Fisher Branch | 596987 | 5659922 | u/s | RB | Yes | River | 1 | |
| 3 | - | 5-Aug-08 | east Fisher River | at Fisher Branch | 596987 | 5659922 | d/s | LB | Yes | River | - | |
| 3 | - | 5-Aug-08 | east Fisher River | at Fisher Branch | 596987 | 5659922 | d/s | RB | Yes | River | - | |
| 4 | 144 | 5-Aug-08 | east Fisher River | Fisher Branch Motel | 596425 | 5659886 | u/s | LB | Yes | River | 3 | Home with grass trimmed to edge |
| 4 | 144 | 5-Aug-08 | east Fisher River | Fisher Branch Motel | 596425 | 5659886 | u/s | RB | Yes | River | 3 | Sheet metal bank and Hwy.; mowed to edge |
| 4 | - | 5-Aug-08 | east Fisher River | Fisher Branch Motel | 596425 | 5659886 | d/s | LB | Yes | River | - | Grassed riparian; hay field beyond |
| 4 | - | 5-Aug-08 | east Fisher River | Fisher Branch Motel | 596425 | 5659886 | d/s | RB | Yes | River | - | Grassed riparian |
| 6 | - | 5-Aug-08 | east Fisher River | at Hwy. 17 | 597827 | 5662248 | u/s | LB | Yes | Channel | - | Grassed dyke with hayfield beyond |
| 6 | - | 5-Aug-08 | east Fisher River | at Hwy. 17 | 597827 | 5662248 | u/s | RB | Yes | Channel | - | Grassed dyke with hayfield beyond |
| 6 | 145 | 5-Aug-08 | east Fisher River | at Hwy. 17 | 597827 | 5662248 | d/s | LB | Yes | River | 3 | Homestead with trimmed lawn to edge |
| 6 | - | 5-Aug-08 | east Fisher River | at Hwy. 17 | 597827 | 5662248 | d/s | RB | Yes | River | - | Grassed and wooded riparian |
| 7 | - | 5-Aug-08 | east Fisher River | Laval School Rd. east off Hwy. 17 | 597905 | 5663212 | u/s | LB | Yes | Channel | - | Channelized; grassed with hayfield beyond |
| 7 | - | 5-Aug-08 | east Fisher River | Laval School Rd. east off Hwy. 17 | 597905 | 5663212 | u/s | RB | Yes | Channel | - | Channelized; grassed with hayfield beyond |
| 7 | - | 5-Aug-08 | east Fisher River | Laval School Rd. east off Hwy. 17 | 597905 | 5663212 | d/s | LB | Yes | River | - | Natural with grassed/wooded riparian |
| 7 | - | 5-Aug-08 | east Fisher River | Laval School Rd. east off Hwy. 17 | 597905 | 5663212 | d/s | RB | Yes | River | - | Natural with grassed/wooded riparian |
| 8 | 30 | 5-Aug-08 | east Fisher River | at ford crossing (off Laval S. R) | 599449 | 5663506 | u/s | LB | Yes | River | 3 | Grassed area |
| 8 | 30 | 5-Aug-08 | east Fisher River | at ford crossing (off Laval S. R) | 599449 | 5663506 | u/s | RB | Yes | River | 3 | Grassed and wooded riparian |
| 8 | 30 | 5-Aug-08 | east Fisher River | at ford crossing (off Laval S. R) | 599449 | 5663506 | d/s | LB | Yes | River | 3 | Grassed and wooded with farmyard |
| 8 | 30 | 5-Aug-08 | east Fisher River | at ford crossing (off Laval S. R) | 599449 | 5663506 | d/s | RB | Yes | River | 3 | Grassed and wooded riparian |
| 10 | 40 | 5-Aug-08 | east Fisher River | ford on Malanchak Rd. | 601028 | 5666143 | u/s | LB | Yes | River | 3 | Wooded riparian; but old fence in river |
| 10 | 40 | 5-Aug-08 | east Fisher River | ford on Malanchak Rd. | 601028 | 5666143 | u/s | RB | Yes | River | 3 | Wooded riparian; but old fence in river |
| 10 | 146 | 5-Aug-08 | east Fisher River | ford on Malanchak Rd. | 601028 | 5666143 | d/s | LB | Yes | River | 2 | Wooded but pasture and access (fence in river) |
| 10 | 146 | 5-Aug-08 | east Fisher River | ford on Malanchak Rd. | 601028 | 5666143 | d/s | RB | Yes | River | 2 | Wooded but likely access (fence in river) |
| 11 | 42 | 5-Aug-08 | east Fisher River | ford east of Malanchak Rd. | 601277 | 5666559 | u/s | LB | Yes | River | 2 | Culvert velocity; wooded pasture with access (see photo) |
| 11 | 42 | 5-Aug-08 | east Fisher River | ford east of Malanchak Rd. | 601277 | 5666559 | u/s | RB | Yes | River | 2 | Culvert velocity; wooded pasture with access (see photo) |
| 11 | 147 | 5-Aug-08 | east Fisher River | ford east of Malanchak Rd. | 601277 | 5666559 | d/s | LB | Yes | River | 1 | Wooded pasture with access |
| 11 | 147 | 5-Aug-08 | east Fisher River | ford east of Malanchak Rd. | 601277 | 5666559 | d/s | RB | Yes | River | 1 | Wooded pasture with access |
| 12 | - | 5-Aug-08 | east Fisher River | 2.5 miles east of Hwy. 17 | 601695 | 5668204 | u/s | LB | Yes | River | - | Grassed and wooded riparian with hayfields beyond |
| 12 | - | 5-Aug-08 | east Fisher River | 2.5 miles east of Hwy. 17 | 601695 | 5668204 | u/s | RB | Yes | River | - | Grassed and wooded riparian with hayfields beyond |
| 12 | - | 5-Aug-08 | east Fisher River | 2.5 miles east of Hwy. 17 | 601695 | 5668204 | d/s | LB | Yes | River | - | Grassed and wooded riparian with hayfields beyond |
| 12 | - | 5-Aug-08 | east Fisher River | 2.5 miles east of Hwy. 17 | 601695 | 5668204 | d/s | RB | Yes | River | - | Grassed and gradual banks but hayfield is close |
| 13 | - | 5-Aug-08 | east Fisher River | 2.5 miles east of Hwy. 17 | 602599 | 5669409 | u/s | LB | Yes | Channel | - | Grassed dyke into (likely) hay |
| 13 | - | 5-Aug-08 | east Fisher River | 2.5 miles east of Hwy. 17 | 602599 | 5669409 | u/s | RB | Yes | Channel | - | Grassed dyke into pasture with fence (access unlikely) |
| 13 | 50 | 5-Aug-08 | east Fisher River | 2.5 miles east of Hwy. 17 | 602599 | 5669409 | d/s | LB | Yes | Channel | 1 | Definite pasture with access (multiple head) |
| 13 | 50 | 5-Aug-08 | east Fisher River | 2.5 miles east of Hwy. 17 | 602599 | 5669409 | d/s | RB | Yes | Channel | 1 | Definite pasture with access (multiple head) |

Table A2-6. Continued.

| Wpt. # | Rehab # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|---------|-----------|-------------------|----------------------------------|-----------|----------|-----------|------|-------|-------|----------|---|
| | | | | | easting | northing | | | | | | |
| 17 | - | 5-Aug-08 | east Fisher River | 3.5 miles east of Hwy. 17 (ford) | 603364 | 5671509 | u/s | LB | Yes | River | - | Grassed bank but extends to colony and lawns (?); side discharge |
| 17 | - | 5-Aug-08 | east Fisher River | 3.5 miles east of Hwy. 17 (ford) | 603364 | 5671509 | u/s | RB | Yes | River | - | Grassed and wooded |
| 17 | 57 | 5-Aug-08 | east Fisher River | 3.5 miles east of Hwy. 17 (ford) | 603364 | 5671509 | d/s | LB | Yes | River | 1 | Grassed but pasture and access (see photo); still relatively unimpacted |
| 17 | 57 | 5-Aug-08 | east Fisher River | 3.5 miles east of Hwy. 17 (ford) | 603364 | 5671509 | d/s | RB | Yes | River | 1 | Grassed but pasture and access (see photo); still relatively unimpacted |
| 47 | 23 | 6-Aug-08 | east Fisher River | 1 mile south of Fisher Branch | 594592 | 5659409 | u/s | LB | Yes | River | 3 | Grassed and wooded riparian, but small beaver dam in river |
| 47 | 23 | 6-Aug-08 | east Fisher River | 1 mile south of Fisher Branch | 594592 | 5659409 | u/s | RB | Yes | River | 3 | Grassed and wooded riparian, but small beaver dam in river |
| 47 | - | 6-Aug-08 | east Fisher River | 1 mile south of Fisher Branch | 594592 | 5659409 | d/s | LB | Yes | River | - | Grassed and wooded riparian |
| 47 | - | 6-Aug-08 | east Fisher River | 1 mile south of Fisher Branch | 594592 | 5659409 | d/s | RB | Yes | River | - | Grassed and wooded riparian |
| 50 | - | 6-Aug-08 | east Fisher River | headwaters | 593327 | 5656568 | u/s | n/a | Yes | Field | - | No channel definition; cropland |
| 50 | - | 6-Aug-08 | east Fisher River | headwaters | 593327 | 5656568 | u/s | n/a | Yes | Field | - | No channel definition; cropland |
| 50 | - | 6-Aug-08 | east Fisher River | headwaters | 593327 | 5656568 | d/s | LB | No | Field | - | No channel definition; cropland |
| 50 | - | 6-Aug-08 | east Fisher River | headwaters | 593327 | 5656568 | d/s | RB | No | Field | - | No channel definition; cropland |
| 53 | 70 | 22-Aug-08 | east Fisher River | 2 miles north of Hodgson | 600788 | 5677844 | u/s | LB | Yes | River | 1 | Grassed and wooded riparian; but previously washed out ford |
| 53 | 70 | 22-Aug-08 | east Fisher River | 2 miles north of Hodgson | 600788 | 5677844 | u/s | RB | Yes | River | 1 | Grassed and wooded riparian; but previously washed out ford |
| 53 | 70 | 22-Aug-08 | east Fisher River | 2 miles north of Hodgson | 600788 | 5677844 | d/s | LB | Yes | River | 1 | Grassed with gravel towards Hwy.; gravel ford |
| 53 | 70 | 22-Aug-08 | east Fisher River | 2 miles north of Hodgson | 600788 | 5677844 | d/s | RB | Yes | River | 1 | Grassed with gravel into residential; gravel ford |

Table A2-7. Ground based observations, by waypoint (Wpt. #) and date, along the west Fisher River, 2008.

| Wpt. # | Rehab # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|---------|----------|-------------------|----------------------------|-----------|----------|-----------|------|-------|---------|----------|---|
| | | | | | eastings | northing | | | | | | |
| 19 | - | 5-Aug-08 | west Fisher River | west of Hodgson | 598732 | 5674731 | u/s | LB | Yes | River | - | Grassed and wooded riparian extending (well) into hayfields |
| 19 | - | 5-Aug-08 | west Fisher River | west of Hodgson | 598732 | 5674731 | u/s | RB | Yes | River | - | Grassed and wooded riparian extending (well) into hayfields |
| 19 | - | 5-Aug-08 | west Fisher River | west of Hodgson | 598732 | 5674731 | d/s | LB | Yes | River | - | Grassed and wooded extending to a cemetary |
| 19 | - | 5-Aug-08 | west Fisher River | west of Hodgson | 598732 | 5674731 | d/s | RB | Yes | River | - | Grassed and wooded |
| 20 | - | 5-Aug-08 | west Fisher River | at Hwy. 325 | 594152 | 5674614 | u/s | LB | Yes | Channel | - | Grassed gentle dyke into hayfield |
| 20 | - | 5-Aug-08 | west Fisher River | at Hwy. 325 | 594152 | 5674614 | u/s | RB | Yes | Channel | - | Grassed gentle dyke into hayfield |
| 20 | - | 5-Aug-08 | west Fisher River | at Hwy. 325 | 594152 | 5674614 | d/s | LB | Yes | River | - | |
| 20 | - | 5-Aug-08 | west Fisher River | at Hwy. 325 | 594152 | 5674614 | d/s | RB | Yes | River | - | |
| 23 | - | 5-Aug-08 | west Fisher River | just north of Fisherton | 586230 | 5668207 | u/s | LB | Yes | River | - | Grassed and wooded |
| 23 | - | 5-Aug-08 | west Fisher River | just north of Fisherton | 586230 | 5668207 | u/s | RB | Yes | River | - | Grassed and wooded |
| 23 | - | 5-Aug-08 | west Fisher River | just north of Fisherton | 586230 | 5668207 | d/s | LB | Yes | River | - | Grassed and wooded |
| 23 | - | 5-Aug-08 | west Fisher River | just north of Fisherton | 586230 | 5668207 | d/s | RB | Yes | River | - | Grassed towards farmhouse and horse pasture (fenced) |
| 24 | - | 5-Aug-08 | west Fisher River | north of Blind Creek | 586309 | 5663667 | u/s | LB | Yes | Channel | - | Grassed on gentle dykes extending to crop |
| 24 | - | 5-Aug-08 | west Fisher River | north of Blind Creek | 586309 | 5663667 | u/s | RB | Yes | Channel | - | Grassed on gentle dykes extending to crop |
| 24 | - | 5-Aug-08 | west Fisher River | north of Blind Creek | 586309 | 5663667 | d/s | LB | Yes | Channel | - | Grassed and some wooded |
| 24 | - | 5-Aug-08 | west Fisher River | north of Blind Creek | 586309 | 5663667 | d/s | RB | Yes | Channel | - | Grassed and wooded into homestead |
| 43 | - | 6-Aug-08 | west Fisher River | near fork with east Fisher | 599097 | 5679857 | u/s | LB | Yes | River | - | Mostly wooded |
| 43 | - | 6-Aug-08 | west Fisher River | near fork with east Fisher | 599097 | 5679857 | u/s | RB | Yes | River | - | Grassed and wooded riparian with hayfields (?) beyond |
| 43 | - | 6-Aug-08 | west Fisher River | near fork with east Fisher | 599097 | 5679857 | d/s | LB | Yes | River | - | Mostly wooded |
| 43 | - | 6-Aug-08 | west Fisher River | near fork with east Fisher | 599097 | 5679857 | d/s | RB | Yes | River | - | Mostly wooded |
| 44 | 101 | 6-Aug-08 | west Fisher River | 2 miles north of Hodgson | 599132 | 5677917 | u/s | LB | Yes | River | 1 | Mostly wooded riparian; culvert/road could washout |
| 44 | 101 | 6-Aug-08 | west Fisher River | 2 miles north of Hodgson | 599132 | 5677917 | u/s | RB | Yes | River | 1 | Mostly wooded riparian; culvert/road could washout |
| 44 | 102 | 6-Aug-08 | west Fisher River | 2 miles north of Hodgson | 599132 | 5677917 | d/s | LB | Yes | River | 2 | Wood with gravel for road |
| 44 | 102 | 6-Aug-08 | west Fisher River | 2 miles north of Hodgson | 599132 | 5677917 | d/s | RB | Yes | River | 2 | Grass and field beyond; eroding banks by crop |

Table A2-8. Ground based observations, by waypoint (Wpt. #) and date, along the Kilkenny Drain, 2008.

| Wpt. # | Rehab # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|---------|----------|----------------|------------------|-----------|----------|-----------|------|-------|-------|----------|--------------------------------|
| | | | | | easting | northing | | | | | | |
| 26 | - | 5-Aug-08 | Kilkenny Drain | Hwy. 233 | 586360 | 5660718 | u/s | LB | Yes | River | - | Grassed river into old pasture |
| 26 | - | 5-Aug-08 | Kilkenny Drain | Hwy. 233 | 586360 | 5660718 | u/s | RB | Yes | River | - | Grassed river into old pasture |
| 26 | - | 5-Aug-08 | Kilkenny Drain | Hwy. 233 | 586360 | 5660718 | d/s | LB | Yes | River | - | Mostly wooded |
| 26 | - | 5-Aug-08 | Kilkenny Drain | Hwy. 233 | 586360 | 5660718 | d/s | RB | Yes | River | - | Grassed river onto hayfield |
| 27 | - | 5-Aug-08 | Kilkenny Drain | at Hwy. 233 | 584708 | 5659717 | u/s | LB | Yes | Drain | - | Grassed onto gravel road |
| 27 | - | 5-Aug-08 | Kilkenny Drain | at Hwy. 233 | 584708 | 5659717 | u/s | RB | Yes | Drain | - | Grassed into wooded area |
| 27 | - | 5-Aug-08 | Kilkenny Drain | at Hwy. 233 | 584708 | 5659717 | d/s | LB | Yes | Drain | - | Grassed and wooded |
| 27 | - | 5-Aug-08 | Kilkenny Drain | at Hwy. 233 | 584708 | 5659717 | d/s | RB | Yes | Drain | - | Grassed and wooded |
| 28 | - | 5-Aug-08 | Kilkenny Drain | headwaters | 584850 | 5653111 | u/s | LB | Yes | Drain | - | Grassed onto gravel road |
| 28 | - | 5-Aug-08 | Kilkenny Drain | headwaters | 584850 | 5653111 | u/s | RB | Yes | Drain | - | Grassed into wooded area |
| 28 | - | 5-Aug-08 | Kilkenny Drain | headwaters | 584850 | 5653111 | d/s | LB | Yes | Drain | - | Grassed onto gravel road |
| 28 | - | 5-Aug-08 | Kilkenny Drain | headwaters | 584850 | 5653111 | d/s | RB | Yes | Drain | - | Grassed into cropland |

Table A2-9. Ground based observations, by waypoint (Wpt. #) and date, along the Leroy Drain, 2008.

| Wpt. # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|----------|-------------|------------------|-----------|----------|-----------|------|-------|-------|----------|---|
| | | | | easting | northing | | | | | | |
| 22 | 5-Aug-08 | Leroy Drain | middle reaches | 588337 | 5669595 | u/s | LB | No | Drain | - | Grassed drain and banks beside fenced pasture |
| 22 | 5-Aug-08 | Leroy Drain | middle reaches | 588337 | 5669595 | u/s | RB | No | Drain | - | Grassed drain and banks into pasture (?) |
| 22 | 5-Aug-08 | Leroy Drain | middle reaches | 588337 | 5669595 | d/s | LB | No | Drain | - | Grassed drain into cropland |
| 22 | 5-Aug-08 | Leroy Drain | middle reaches | 588337 | 5669595 | d/s | RB | No | Drain | - | Grassed drain onto road |

Table A2-10. Ground based observations, by waypoint (Wpt. #) and date, along the Meridian Drain, 2008.

| Wpt. # | Rehab # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|---------|----------|----------------|------------------------|-----------|----------|-----------|------|-------|---------|----------|---|
| | | | | | easting | northing | | | | | | |
| 14 | - | 5-Aug-08 | Meridian Drain | middle reaches | 605623 | 5668279 | u/s | LB | Yes | Channel | - | Grassed drain extending to crop |
| 14 | - | 5-Aug-08 | Meridian Drain | middle reaches | 605623 | 5668279 | u/s | RB | Yes | Channel | - | |
| 14 | - | 5-Aug-08 | Meridian Drain | middle reaches | 605623 | 5668279 | d/s | LB | Yes | Channel | - | |
| 14 | - | 5-Aug-08 | Meridian Drain | middle reaches | 605623 | 5668279 | d/s | RB | Yes | Channel | - | |
| 16 | - | 5-Aug-08 | Meridian Drain | near east Fisher River | 604616 | 5671538 | u/s | LB | Yes | Natural | - | Mostly grassed into wooded area |
| 16 | - | 5-Aug-08 | Meridian Drain | near east Fisher River | 604616 | 5671538 | u/s | RB | Yes | Natural | - | |
| 16 | - | 5-Aug-08 | Meridian Drain | near east Fisher River | 604616 | 5671538 | d/s | LB | Yes | Natural | - | |
| 16 | - | 5-Aug-08 | Meridian Drain | near east Fisher River | 604616 | 5671538 | d/s | RB | Yes | Natural | - | |
| 18 | 62 | 5-Aug-08 | Meridian Drain | near east Fisher River | 604181 | 5672489 | u/s | LB | No | Natural | 2 | Wooded and grassed but extends to pasture |
| 18 | - | 5-Aug-08 | Meridian Drain | near east Fisher River | 604181 | 5672489 | u/s | RB | No | Natural | - | Grassed and wooded; road |
| 18 | - | 5-Aug-08 | Meridian Drain | near east Fisher River | 604181 | 5672489 | d/s | LB | No | Natural | - | Grassed and wooded |
| 18 | - | 5-Aug-08 | Meridian Drain | near east Fisher River | 604181 | 5672489 | d/s | RB | No | Natural | - | Grassed and wooded |

Table A2-11. Ground based observations, by waypoint (Wpt. #) and date, along the Plishka Drain, 2008.

| Wpt. # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|----------|---------------|----------------------------------|-----------|----------|-----------|------|-------|-------|----------|--------------------------------------|
| | | | | easting | northing | | | | | | |
| 48 | 6-Aug-08 | Plishka Drain | headwaters | 589703 | 5659775 | u/s | LB | No | Drain | - | Grassed drain onto gravel road |
| 48 | 6-Aug-08 | Plishka Drain | headwaters | 589703 | 5659775 | u/s | RB | No | Drain | - | Grassed drain into crops |
| 48 | 6-Aug-08 | Plishka Drain | headwaters | 589703 | 5659775 | d/s | LB | No | Drain | - | Grassed drain onto gravel road |
| 48 | 6-Aug-08 | Plishka Drain | headwaters | 589703 | 5659775 | d/s | RB | No | Drain | - | Grassed drain into crops |
| 49 | 6-Aug-08 | Plishka Drain | near confluence with east Fisher | 592984 | 5657934 | u/s | LB | Yes | Drain | - | Grassed drain extending to crops |
| 49 | 6-Aug-08 | Plishka Drain | near confluence with east Fisher | 592984 | 5657934 | u/s | RB | Yes | Drain | - | Grassed drain extending to crops |
| 49 | 6-Aug-08 | Plishka Drain | near confluence with east Fisher | 592984 | 5657934 | d/s | LB | Yes | Drain | - | Grassed drain extending to hayfields |
| 49 | 6-Aug-08 | Plishka Drain | near confluence with east Fisher | 592984 | 5657934 | d/s | RB | Yes | Drain | - | Grassed drain extending to hayfields |

Table A2-12. Ground based observations, by waypoint (Wpt. #) and date, along the Rus Drain, 2008.

| Wpt. # | Rehab # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|---------|----------|-------------|------------------|-----------|----------|-----------|------|-------|-------|----------|---|
| | | | | | eastings | northing | | | | | | |
| 45 | 142 | 6-Aug-08 | Rus Drain | middle reaches | 594665 | 5663161 | u/s | LB | Yes | Drain | 1 | Fenced pasture; old tracks evident (see photo) Grassed into hay Grassed into crop |
| 45 | 142 | 6-Aug-08 | Rus Drain | middle reaches | 594665 | 5663161 | u/s | RB | Yes | Drain | 1 | |
| 45 | - | 6-Aug-08 | Rus Drain | middle reaches | 594665 | 5663161 | d/s | LB | Yes | Drain | - | |
| 45 | - | 6-Aug-08 | Rus Drain | middle reaches | 594665 | 5663161 | d/s | RB | Yes | Drain | - | |
| 46 | - | 6-Aug-08 | Rus Drain | closer to mouth | 596175 | 5662383 | u/s | LB | No | Drain | - | Grassed dyke /drain bordered by hay |
| 46 | - | 6-Aug-08 | Rus Drain | closer to mouth | 596175 | 5662383 | u/s | RB | No | Drain | - | Grassed dyke /drain bordered by hay |
| 46 | - | 6-Aug-08 | Rus Drain | closer to mouth | 596175 | 5662383 | d/s | LB | No | Drain | - | Grassed dyke /drain bordered by hay |
| 46 | - | 6-Aug-08 | Rus Drain | closer to mouth | 596175 | 5662383 | d/s | RB | No | Drain | - | Grassed dyke /drain bordered by hay |

Table A2-13. Ground based observations, by waypoint (Wpt. #) and date, along the Sunny Valley Drain, 2008.

| Wpt. # | Rehab # | Date | Watercourse | Site Description | UTM (14U) | | Direction | Bank | Water | Use | Priority | Comments |
|--------|---------|----------|--------------------|------------------|-----------|----------|-----------|------|--------|-------|----------|--|
| | | | | | eastings | northing | | | | | | |
| 32 | - | 6-Aug-08 | Sunny Valley Drain | headwaters | 601983 | 5700890 | u/s | LB | No | Drain | - | Grassed drain extending to road Grassed drain into some woods and then hayfield Grassed drain extending to road Grassed drain extending to hayfield |
| 32 | - | 6-Aug-08 | Sunny Valley Drain | headwaters | 601983 | 5700890 | u/s | RB | No | Drain | - | |
| 32 | - | 6-Aug-08 | Sunny Valley Drain | headwaters | 601983 | 5700890 | d/s | LB | Pooled | Drain | - | |
| 32 | - | 6-Aug-08 | Sunny Valley Drain | headwaters | 601983 | 5700890 | d/s | RB | Pooled | Drain | - | |
| 33 | - | 6-Aug-08 | Sunny Valley Drain | middle reaches | 602022 | 5697666 | u/s | LB | No | Drain | - | Grassed drain extending to road |
| 33 | - | 6-Aug-08 | Sunny Valley Drain | middle reaches | 602022 | 5697666 | u/s | RB | No | Drain | - | Grassed drain extending to hayfield |
| 33 | - | 6-Aug-08 | Sunny Valley Drain | middle reaches | 602022 | 5697666 | d/s | LB | Yes | Drain | - | Grassed drain extending to road |
| 33 | - | 6-Aug-08 | Sunny Valley Drain | middle reaches | 602022 | 5697666 | d/s | RB | Yes | Drain | - | Grassed drain extending to hayfield |
| 34 | 143 | 6-Aug-08 | Sunny Valley Drain | towards mouth | 603665 | 5696814 | u/s | LB | Yes | Creek | 1 | Pasturing and direct cattle access |
| 34 | 143 | 6-Aug-08 | Sunny Valley Drain | towards mouth | 603665 | 5696814 | u/s | RB | Yes | Creek | 1 | Pasturing and direct cattle access |
| 34 | 143 | 6-Aug-08 | Sunny Valley Drain | towards mouth | 603665 | 5696814 | d/s | LB | Yes | Creek | 1 | Pasturing and direct cattle access |
| 34 | 143 | 6-Aug-08 | Sunny Valley Drain | towards mouth | 603665 | 5696814 | d/s | RB | Yes | Creek | 1 | Pasturing and direct cattle access |
| 35 | - | 6-Aug-08 | Sunny Valley Drain | towards mouth | 604519 | 5696096 | u/s | LB | Yes | Creek | - | Grassed bank to fenced pasture (no access?) |
| 35 | - | 6-Aug-08 | Sunny Valley Drain | towards mouth | 604519 | 5696096 | u/s | RB | Yes | Creek | - | Grassed bank to fenced pasture (no access?) |
| 35 | - | 6-Aug-08 | Sunny Valley Drain | towards mouth | 604519 | 5696096 | d/s | LB | Yes | Creek | - | Grassed banks into hayfield |
| 35 | - | 6-Aug-08 | Sunny Valley Drain | towards mouth | 604519 | 5696096 | d/s | RB | Yes | Creek | - | Grassed banks and wooded |

APPENDIX 3.

INDEX OF POTENTIAL REHABILITATION SITES AND ISSUES IDENTIFIED THROUGHOUT WATERSHED 05SD

Table A3-1. Index of potential rehabilitation sites identified throughout watershed 05SD, 2008. Data referenced by HRAI #, potential rehabilitation #, Wpt. #, priority, and primary issue.

| HRAI # | Rehab # | Wpt. # | Watercourse | Site Description | Direction | Bank | Water | Use | Priority | Composition | Primary Issue | Comments |
|--------|---------|--------|--------------------|---------------------|-----------|------|-------|----------------|----------|---------------------------|-----------------------|--|
| 61 | 1 | - | Broad Valley Drain | Beaver dam | | | Yes | Natural | 3 | Wood | Barrier | Appears to be an active beaver dam with impounded water |
| 80 | 2 | - | Broad Valley Drain | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Bed grade ford with obvious use; slight riffle on d/s end; potential sediment and erosion |
| 81 | 3 | - | Broad Valley Drain | Dug out (retention) | | | Yes | Not determined | 3 | Dug out (retention) | Off channel | Off RB; dugout with unknown purpose; no pasturing evident; potential for runoff into drain; irrigation? |
| 107 | 4 | - | Broad Valley Drain | Pasturing | | | Yes | Grazing | 3 | Fenced pasture | Pasture | Obvious pasture with fence leading to drain; trees still with leaf; possible access |
| 121 | 5 | - | Broad Valley Drain | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Potential bed grade ford crossing; likely not used this (high water) year but old tracks evident |
| 129 | 6 | - | Broad Valley Drain | Grazing | | RB | Yes | Grazing | 3 | Fenced pasture | Pasture | Might be pasturing beyond drain; likely fenced with limited (nil) access |
| 148 | 7 | - | Broad Valley Drain | Grazing | | LB | Yes | Grazing | 3 | Fenced pasture | Pasture | Might be pasturing beyond drain; likely fenced with limited (nil) access |
| 154 | 8 | - | Broad Valley Drain | Ford | | | Yes | Machinery | 2 | Bed grade | Barrier | Active ford; flow over and sedimentation |
| 177 | 9 | - | Broad Valley Drain | Retention ponds | | LB | Yes | Not determined | 3 | 2 ponds | Off channel | Two retention ponds which likely discharge into drain; source/use not investigated |
| 180 | 10 | - | Broad Valley Drain | Barrier | | | Yes | Natural | 3 | Debris | Barrier | Likely a natural woody debris barrier instream; slightly constricts flow and may impede fish passage at lower flows. |
| 189 | 11 | - | east Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Active ford; flow over and sedimentation; riffle on d/s side (also on image 358) |
| 209 | 12 | - | east Fisher River | Barrier | | | Yes | Man-made | 3 | Woody and mud | Barrier | Deposition likely human induced; unlikely spot for natural deposition; banks stable; ford in creation? |
| 215 | 13 | - | east Fisher River | Ford | | | Yes | Machinery | 3 | Culvert and gravel | Barrier | Single culvert with gravel; active ford; banks apparently stable |
| 221 | 14 | 3 | east Fisher River | Walking bridge | u/s | Both | Yes | Man-made | 1 | Steel and cement | Barrier | Old walking bridge; debris covered during ground inspection; potential as barrier to fish migration |
| 226 | 15 | - | east Fisher River | Residential | | Both | Yes | Man-made | 3 | De-nuded | Residential | Lawns manicured to wetted width; no buffer zone |
| 231 | 16 | - | east Fisher River | Residential | | RB | Yes | Man-made | 3 | De-nuded | Residential | Lawns manicured to wetted width; no buffer zone (continuation of image 226) |
| 232 | 17 | - | east Fisher River | Hayland | | LB | Yes | Hayland | 3 | De-nuded | Cropping | Minimal buffer zone; area denuded for hayland (likely); cropped close to banks; slope low therefore minimal erosion |
| 239 | 18 | - | east Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Active ford through channel bed; shallow area; was it built up dumping fill?; grass covered banks; required? Bridge near |
| 245 | 19 | - | east Fisher River | Residential | | Both | Yes | Residential | 3 | De-nuded | Residential | Manicured lawns and residential; no buffer |
| 256 | 20 | - | east Fisher River | Homestead | | RB | Yes | Homestead | 3 | Thinned | Residential | Areas of cleared buffer zone up to rivers edge |
| 261 | 21 | - | east Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Bed grade ford through thick riparian; active between cropland; slight impoundment on u/s side; gravel riffle |
| 265 | 22 | - | east Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Bed grade ford through thick riparian; potentially active between homesteads; obscured by trees |
| 274 | 23 | 47 | east Fisher River | Barrier | | | Yes | Natural | 3 | Vegetation and mud | Barrier | Possibly a natural area with mud and plant matter accumulating or old beaver dam site; potential barrier to fish passage |
| 300 | 24 | - | east Fisher River | Dug out (retention) | | RB | Yes | Man-made | 3 | 1 pond | Off channel | Unknown use; livestock not evident; irrigation?; with dugout area fenced? |
| 377 | 25 | - | east Fisher River | Drain confluence | | RB | Yes | Man-made | 3 | Drain | Off channel | Drain has ford just u/s of confluence; darker stained water entering east Fisher River |
| 387 | 26 | - | east Fisher River | Livestock holding | | LB | Yes | Man-made | 2 | Overwintering | Pasture | Holding area is well beyond LB and fenced; no direct access; however 1 culvert may drain nutrients into river during high runoff |
| 406 | 27 | - | east Fisher River | Input | | RB | Yes | Man-made | 1 | Input | Input | Obvious input from bank (water coloration); unknown origin; possible culvert; GROUNDTRUTH |
| 407 | 28 | - | east Fisher River | Ford | | | Yes | Old | 3 | Bed grade | Barrier | Old ford; may be active; riffle banks grassed and relatively stable |
| 414 | 29 | - | east Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Tracks evident between hayland but likely only during lower water levels |
| 422 | 30 | 8 | east Fisher River | Ford (Road) | | | Yes | Transportation | 3 | Multi. Culvert and gravel | Barrier | Multiple culverts and low bed gravel; can washout and/or over; repairs cause aggregate load, eroding banks |
| 434 | 31 | - | east Fisher River | Grazing | | RB | Yes | Grazing | 3 | Fenced pasture | Pasture | Possible fenced pasture beyond banks; access unlikely |
| 439 | 32 | - | east Fisher River | Grazing | | Both | Yes | Grazing | 1 | Obvious pasture | Pasture | Cattle in area with direct access to river (2 points); nil buffer and eroding banks (can likely graze area in image 434) |
| 444 | 33 | - | east Fisher River | Grazing | | Both | Yes | Grazing | 1 | Obvious pasture | Pasture | Continuation of grazing from image 439 (Rehab #32); multiple head |
| 447 | 34 | - | east Fisher River | Grazing | | Both | Yes | Grazing | 1 | Obvious pasture | Pasture | Continuation of grazing from images 439 and 444 (Rehab #32 and 33); multiple head |
| 448 | 35 | - | east Fisher River | Fence line | | | Yes | Fencing | 3 | Wire and post | Modified/Constriction | Fence line across river acting as debris catch; may continually catch debris and cause future problems |
| 450 | 36 | - | east Fisher River | Grazing | | Both | Yes | Pasture | 1 | Pasture | Pasture | Pasture (at this time) but not as extensively used; access likely; denuded and eroded areas (see image 457 for crossing points) |
| 460 | 37 | - | east Fisher River | Grazing | | Both | Yes | Pasture | 1 | Pasture | Pasture | Pasture with obvious access and eroding banks |
| 463 | 38 | - | east Fisher River | Grazing | | Both | Yes | Pasture | 1 | Pasture | Pasture | Pasture with obvious access and eroding banks; a continuation of image 460 (Rehab # 37) |
| 468 | 39 | - | east Fisher River | Holding | | RB | Yes | Holding | 3 | Feeding area | Pasture | Although beyond banks it concentrates feeding activity and is likely not entirely fenced |
| 471 | 40 | 10 | east Fisher River | Ford (Road) | | | Yes | Transportation | 3 | Multi. Culvert and gravel | Barrier | Multiple culverts and low bed gravel; can washout and/or over; repairs cause aggregate load, eroding banks |
| 472 | 41 | - | east Fisher River | Grazing | | Both | Yes | Pasture | 1 | Pasture | Pasture | Extensive pasture with obvious access points and eroding banks with no buffer (also see image 474 and continues to 478) |

Table A3-1. Continued.

| HRAI # | Rehab # | Wpt. # | Watercourse | Site Description | Direction | Bank | Water | Use | Priority | Composition | Primary Issue | Comments |
|--------|---------|--------|-----------------------|------------------|-----------|------|-------|-------------------|----------|----------------------|-----------------------|---|
| 479 | 42 | 11 | east Fisher River | Ford (Road) | | | Yes | Land owner | 2 | Culvert and gravel | Barrier | Double culvert with potential to washout and or become velocity/debris barrier |
| 480 | 43 | - | east Fisher River | Grazing | | Both | Yes | Livestock | 1 | Pasture | Pasture | Extensive grazing with obvious cattle access; eroding banks with no buffer (may continue at least to image 489) |
| 492 | 44 | - | east Fisher River | Operation | | Both | Yes | Holding | 1 | Small operation | Pasture | Extensive holding and feeding area for livestock; obvious access to river; eroding banks; runoff from paddock (Images 492 to 500) |
| 497 | 45 | - | east Fisher River | Ford | | | Yes | Livestock | 1 | Bed grade | Barrier | Coincides with operation along river (Rehab # 44); obvious use and stream degradation |
| 507 | 46 | - | east Fisher River | Grazing | | Both | Yes | Livestock | 1 | Obvious pasture | Pasture | Obvious extensive pasturing (likely starts at image 503 and extends to 525); many cattle crossings and access points thru river |
| 509 | 47 | - | east Fisher River | Ford | | Both | Yes | Livestock | 1 | Bed grade | Barrier | Obvious cattle ford (see cow in river) with eroding banks and zero buffer (continuation with Rehab #46) |
| 513 | 48 | - | east Fisher River | Ford | | Both | Yes | Livestock | 1 | Bed grade | Barrier | Obvious cattle ford (see cow in river) with eroding banks and zero buffer; continued grazing; fence line in river |
| 518 | 49 | - | east Fisher River | Ford | | Both | Yes | Livestock | 1 | Bed grade | Barrier | Obvious cattle ford (see cows in river) with eroding banks and zero buffer; continued grazing |
| 526 | 50 | 13 | east Fisher River | Grazing | | Both | Yes | Livestock | 1 | Pasture | Pasture | Extensive grazing with obvious cattle access; eroding banks with no buffer (likely continues to image 532 and fence line in river) |
| 527 | 51 | - | east Fisher River | Ford | | Both | Yes | Livestock | 1 | Bed grade | Barrier | Obvious use coinciding with grazing Rehab #51 |
| 533 | 52 | - | east Fisher River | Grazing | | Both | Yes | Livestock | 1 | Pasture | Pasture | Extensive grazing with obvious cattle access; eroding banks with no buffer (likely continues to image 543 and fence line in river) |
| 538 | 53 | - | east Fisher River | Ford | | Both | Yes | Livestock | 1 | Livestock | Barrier | Obvious use coinciding with grazing Rehab #52 |
| 542 | 54 | - | east Fisher River | Ford | | Both | Yes | Livestock | 1 | Livestock | Barrier | Obvious use coinciding with grazing Rehab #52 |
| 544 | 55 | - | east Fisher River | Grazing | | Both | Yes | Livestock | 1 | Pasture | Pasture | Extensive grazing with obvious cattle access; eroding banks with no buffer (likely continues to image 550 and fence line |
| 554 | 56 | - | east Fisher River | Ford (Road) | | | Yes | Transportation | 3 | Culvert and gravel | Barrier | Prone to washouts (see Wpt. 17) |
| 555 | 57 | 17 | east Fisher River | Grazing | | Both | Yes | Livestock | 1 | Pasture | Pasture | Cattle in river; not evident with aerial but cattle likely just gained access; buffer still in tact likely not for long if cattle remain |
| 558 | 58 | - | east Fisher River | Riffle | | | Yes | Natural | 3 | Vegetation and silt | Barrier | May act as debris barrier or cattle crossing if allowed; may also prevent fish passage at low water levels or (conversely) provide habitat |
| 563 | 59 | - | east Fisher River | Ford(s) | | | Yes | Livestock | 2 | 2 Bed grade | Barrier | Active either for livestock and (perhaps) machine; likely continued grazing from Rehab #57 |
| 568 | 60 | - | east Fisher River | Operation | | LB | Yes | Holding | 1 | Paddocks and feeding | Pasture | Smaller operation; multiple paddocks and holding areas; river buffered but runoff may occur; site warrants investigation with proximity to river |
| 576 | 61 | - | east Fisher River | Beaver dam | | Both | Yes | Natural | 3 | Woody debris | Barrier | Temporary dam; likely active; impounding water and (likely) preventing fish passage beyond this point |
| 579 | 62 | 18 | Meridian Drain | Grazing | | Both | Yes | Livestock | 2 | Pasture | Pasture | Erosion, possible cattle access to drain; Groundtruth this site |
| 583 | 63 | - | east Fisher River | Homestead | | LB | Yes | Livestock | 1 | Holding and grazing | Pasture | Area has fenced area (over wintering of cattle?); potential for nutrient runoff and grazing into river; trails may exist along river bank (image 585) |
| 587 | 64 | - | east Fisher River | Grazing | | LB | Yes | Livestock | 1 | Pasture | Pasture | Continuation of Rehab #63; grazing more obvious along LB and crossing by ford to RB pasture |
| 588 | 65 | - | east Fisher River | Ford | | Both | Yes | Livestock | 1 | Bed grade | Barrier | Continuation of Rehab #63 and 64; grazing obvious on RB; cattle crossing and bank erosion |
| 592 | 66 | - | east Fisher River | Operation | | Both | Yes | Livestock | 1 | Multiple | Pasture | Grazing; holding areas; retention ponds for runoff; river access; ford (continues to image 600) |
| 593 | 67 | - | east Fisher River | Ford | | Both | Yes | Livestock/Machine | 1 | Bed grade | Barrier | Active ford for livestock and machinery; silt/sediment deposition obvious on d/s side (continuation of Rehab #66) |
| 629 | 68 | - | east Fisher River | Grazing | | LB | Yes | Livestock | 3 | Irregular | Pasture | Possibly an old grazed area (suggested by patterns and textures) |
| 663 | 69 | - | east Fisher River | Grazing | | RB | Yes | Livestock | 3 | Pasture | Pasture | Patterns suggest grazed areas into river and through riparian area (not extensive) |
| 666 | 70 | 53 | east Fisher River | Ford (Road) | | | Yes | Transportation | 3 | Culvert and gravel | Barrier | Prone to washouts; washed out in 2008; image shows extent of sediment transport |
| 671 | 71 | - | east Fisher River | Barrier | | Both | Yes | Natural | 3 | Woody debris | Barrier | Natural choke point for debris and deposition; may be temporary barrier to migration at lower water levels; may also offer riffle habitat |
| 682 | 72 | - | east Fisher River | Beaver dam | | Both | Yes | Natural | 3 | Woody | Barrier | Does not appear active but remains in watercourse; may act as temporary barrier or accumulate additional debris |
| 714 | 73 | - | east Fisher River | Ford (Road) | | | Yes | Transportation | 3 | Culvert and gravel | Barrier | Likely prone to washouts, accumulation of debris, and/or velocity barriers for fish migration |
| 790 | 74 | - | mainstem Fisher River | Recreational | | LB | Yes | Ball Diamonds | 3 | Manicured lawns | Residential | Area used for recreation; manicured lawns to immediate river bank |
| 810 | 75 | - | mainstem Fisher River | Channelized | | LB | Yes | Flows | 3 | Channel | Modified/Constriction | Channelized portion of river; old meander accumulates debris; not a true rehabilitation site but for reference |
| 841 | 76 | - | mainstem Fisher River | Residential | | RB | Yes | Homestead | 3 | Burning | Residential | Apparent fire to remove shoreline vegetation; although not directly on shore this also occurred further u/s at a # of locations |
| 842 | 77 | 40 | mainstem Fisher River | Ford (Road) | | | Yes | Transportation | 1 | Culvert and gravel | Barrier | Prone to washouts; gravel/sediment deposition evident |
| 858 | 78 | - | mainstem Fisher River | Homestead | | LB | Yes | Livestock | 2 | Holding and grazing | Pasture | Potential grazing in buffer zone; holding/feeding areas close to river; access to river banks; small operation where fencing could work |
| 883 | 79 | - | mainstem Fisher River | Operation | | LB | Yes | Livestock | 1 | Holding and grazing | Pasture | Potential grazing and access to river; no buffer; nutrient runoff (?) (see algal growth in river) |

Table A3-1. Continued.

| HRAI # | Rehab # | Wpt. # | Watercourse | Site Description | Direction | Bank | Water | Use | Priority | Composition | Primary Issue | Comments |
|--------|---------|--------|-----------------------|------------------|-----------|------|-------|----------------|----------|---------------------|-----------------------|---|
| 885 | 80 | 39 | mainstem Fisher River | Ford (Road) | | | Yes | Transportation | 1 | Culvert and gravel | Barrier | Prone to washouts; sediment/gravel deposition evident |
| 908 | 81 | - | mainstem Fisher River | Grazing | | RB | Yes | Livestock | 1 | Pasture | Pasture | Textures and color suggests current grazing; access to river and no buffer |
| 938 | 82 | - | mainstem Fisher River | Residential | | LB | Yes | Refuse | 1 | Dumping | Residential | Likely a personal dumping ground for refuse. High water events can put refuse into river and cause contamination or create navigation hazards |
| 953 | 83 | 37 | mainstem Fisher River | Grazing | | LB | Yes | Livestock | 1 | Pasture | Pasture | Pasture area for cattle (up to image 956); area appears to be fenced (except 1 pasture) excluding access to river |
| 962 | 84 | - | mainstem Fisher River | Beaver dam(s) | | Both | Yes | Natural | 3 | Woody and veg. | Barrier | Apparently active beaver dams (3 areas) in shallow portion of river with islands; temporary (images 962 and 963) |
| 966 | 85 | - | mainstem Fisher River | Confluence | | RB | Yes | Natural | 3 | Confluence | Input | Confluence with Sunny Valley Drain; Distinct plume (dark); Known cattle pasture u/s (see Wpts. 34 and 35) |
| 972 | 86 | - | mainstem Fisher River | Grazing | | LB | Yes | Livestock | 3 | Pasture(?) | Pasture | Patterns, color, and texture suggests grazing; not confirmed; may warrant groundtruthing; access to river would be possible |
| 979 | 87 | - | mainstem Fisher River | Grazing | | RB | Yes | Livestock | 3 | Pasture(?) | Pasture | Patterns, color, and texture suggests grazing; not confirmed; may warrant groundtruthing; access to river would be possible |
| 992 | 88 | - | mainstem Fisher River | Operation | | LB | Yes | Livestock | 2 | Holding and feeding | Pasture | Although small, operation is in proximity to river (runoff?); area appears fenced but access may be possible |
| 993 | 89 | - | mainstem Fisher River | Residential | | Both | Yes | Residential | 3 | Lawns and refuse | Residential | Manicured lawns and residential; reduction to buffer; there also appears to be refuse depot on RB |
| 1004 | 90 | - | mainstem Fisher River | Residential | | LB | Yes | Residential | 3 | Lawns | Residential | Manicured lawn in proximity to river; reduced buffer |
| 1053 | 91 | - | mainstem Fisher River | Hayfield | | LB | Yes | Agricultural | 3 | Hayfield | Cropping | Likely a hayfield in close proximity to river; nutrient runoff or cropping close to river may result in runoff; future pasturing may also occur |
| 1059 | 92 | - | mainstem Fisher River | Grazing | | LB | Yes | Livestock | 3 | Pasture | Pasture | Patterns, color, and texture suggests grazing; not confirmed; may warrant groundtruthing; access to river would be possible |
| 1083 | 93 | - | mainstem Fisher River | Industrial | | LB | Yes | Machinery | 3 | Machinery | Off channel | Larger vehicles and earth movers; close proximity to river; watch for fuel spills, refuse, etc. |
| 1087 | 94 | - | mainstem Fisher River | Residential | | RB | Yes | Residential | 3 | Lawn | Residential | Manicured lawn next to river; no buffer; potential erosion and runoff |
| 1102 | 95 | - | mainstem Fisher River | Ford (Road) | | Both | Yes | Transportation | 2 | Gravel and culvert | Barrier | Ford is washed out; old culverts still in river (also see image 1106) and shore; sediment deposition evident; all terrain tracks in river |
| 1103 | 96 | - | mainstem Fisher River | Recreational | | RB | Yes | Park(?) | 1 | Lawns | Residential | Area devoid of buffer; all terrain tracks in river; some bank stabilization; d/s of ford washout |
| 1115 | 97 | - | mainstem Fisher River | Boat launch | | LB | Yes | Boating | 3 | Bed grade | Residential | Boat launch carved into bank and dredged; may result in erosion; no buffer |
| 1117 | 98 | - | mainstem Fisher River | Boat launch | | RB | Yes | Boating | 3 | Bed grade | Residential | Boat launch carved into bank and dredged; may result in erosion; no buffer; also a harbor d/s of launch |
| 1126 | 99 | - | mainstem Fisher River | Boat launch | | RB | Yes | Boating | 3 | Concrete | Residential | Boat launch at river; no buffer; old cribs in river |
| 1140 | 100 | - | mainstem Fisher River | Boat launch | | LB | Yes | Boating | 3 | Concrete | Residential | Boat launch at river; gravel pad with concrete; docks in place; no buffer |
| 153 | 101 | 44 | west Fisher River | Erosion | | Both | Yes | Unknown | 2 | River bend | Modified/Constriction | Erosion occurring at this point in river; although natural process may be expedited by non-buffered shorelines (primarily RB) and crossing |
| 154 | 102 | 44 | west Fisher River | Road | | Both | Yes | Transportation | 1 | Culvert and gravel | Modified/Constriction | Large single culvert with constricted flow; may expedite d/s erosion; sedimentation evident d/s |
| 194 | 103 | - | west Fisher River | Beaver dam(s) | | Both | Yes | Natural | 3 | Woody and silt | Barrier | Active beaver activity (with lodge); also natural bend for deposition of silts and woody debris |
| 198 | 104 | - | west Fisher River | Retention pond | | LB | Yes | Unknown | 3 | Fenced | Off channel | Fenced pond well beyond river; likely discharges to river at some point |
| 208 | 105 | - | west Fisher River | Homestead | | LB | Yes | Residential | 3 | Buildings | Pasture | Old pasture area (fence and grazing); not currently active; river likely floods; old manure piles; potential nutrients |
| 294 | 106 | - | west Fisher River | Ford | | Both | Yes | Machinery | 3 | Bed grade | Barrier | Ford crossing in channel; two wheeled tracks evident; LB more eroded than RB; all terrain vehicles?; trail leads to road in image 295 |
| 310 | 107 | - | west Fisher River | Homestead | | LB | Yes | Residential | 3 | Erosion | Residential | LB eroding at home; appears to be some stabilization efforts (better view on image 312) |
| 312 | 108 | - | west Fisher River | Beaver dam | | | Yes | Natural | 3 | Woody | Barrier | Active beaver in area |
| 327 | 109 | - | west Fisher River | Beaver dam | | | Yes | Natural | 3 | Woody | Barrier | Beaver dam but is breached |
| 328 | 110 | - | west Fisher River | Beaver dam | | | Yes | Natural | 3 | Woody | Barrier | Old beaver dam but is breached; sediments still not grown over on u/s side |

Table A3-1. Continued.

| HRAI # | Rehab # | Wpt. # | Watercourse | Site Description | Direction | Bank | Water | Use | Priority | Composition | Primary Issue | Comments |
|--------|---------|--------|--------------------|--------------------|-----------|------|-------|---------------------|----------|---------------------------|-----------------------|--|
| 404 | 111 | - | west Fisher River | Barrier | | | Yes | Man-made | 3 | Debris | Barrier | Might be old crossing with culverts in river and concrete; debris is building in area; flow through is evident at this water level |
| 407 | 112 | - | west Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Ford in channel likely active but not at this water level |
| 441 | 113 | - | west Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Ford in channel likely active but not at this water level; hay fields/lanes on each side |
| 460 | 114 | - | west Fisher River | Old crossing | | | Yes | Not currently | 3 | Culvert debris | Modified/Constriction | Large old culvert in center channel; likely left over from removed crossing at this spot or washed from u/s at bridge (image 462) |
| 491 | 115 | - | west Fisher River | Operation | | RB | Yes | Holding and grazing | 1 | Livestock | Pasture | Area rather large; holding and feeding facilities; fenced areas for grazing; access to river likely (ford); no buffers (Images 489 to 502) |
| 496 | 116 | - | west Fisher River | Ford | | | Yes | Livestock | 3 | Bed grade | Barrier | Not currently active at this water level; could be used for livestock or machinery |
| 503 | 117 | - | west Fisher River | Old crossing | | | Yes | None | 3 | Rehabilitation | Modified/Constriction | Not a true rehabilitation site; already rehabilitated; monitor for erosion and/or positive effects (e.g., regrowth of vegetation) |
| 550 | 118 | - | west Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Ford currently used between hayfields; gravel added to shorelines and (likely) in bed |
| 571 | 119 | - | west Fisher River | Operation | | Both | Yes | Livestock | 1 | Mutli use | Pasture | Larger operation with extensive grazing areas, holding area, and access to river (although fenced in areas); nutrient runoff potential (images 562 to 574) (Wpt. 21) |
| 572 | 120 | - | west Fisher River | Ford | | | Yes | Livestock | 1 | Bed grade | Barrier | Ford used for livestock crossing (active) and possible machinery (part of Rehabilitation #119) |
| 612 | 121 | - | west Fisher River | Grazing | | LB | Yes | Livestock | 3 | Pasture | Pasture | Patterns and texture suggests grazing area; area appears to be fenced with no access |
| 618 | 122 | - | west Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Active ford in river between hayfields |
| 623 | 123 | - | west Fisher River | Grazing | | LB | Yes | Livestock | 1 | Pasture | Pasture | Extensive grazing area with access through river slightly limited by fencing (not entire) (Images 623 to 632); grazing on both sides but staggers |
| 624 | 124 | - | west Fisher River | Ford | | | Yes | Livestock | 1 | Bed grade | Barrier | Ford used for livestock crossing (active) (part of Rehabilitation #123) |
| 635 | 125 | - | west Fisher River | Beaver dam | | | Yes | Natural | 3 | Woody | Barrier | Might be active, but not impounding large volumes of water |
| 650 | 126 | - | west Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Active ford in river between hayfields |
| 659 | 127 | - | west Fisher River | Beaver dam | | | Yes | Natural | 3 | Woody | Barrier | Breached and likely inactive |
| 693 | 128 | - | west Fisher River | Beaver dam(s) | | | Yes | Natural | 3 | Woody | Barrier | Beavers active in area; natural curves and shallow areas; water impounded here |
| 694 | 129 | - | west Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Active ford in river |
| 741 | 130 | - | west Fisher River | Grazing | | RB | Yes | Livestock | 1 | Pasture | Pasture | Grazing in area (which may be extensive) with access to river; outbuildings in area buffer impacted |
| 791 | 131 | - | west Fisher River | Beaver activity | | RB | Yes | Natural | 3 | Woody | Barrier | Large beaver lodge in river (and/or food cache) |
| 801 | 132 | - | west Fisher River | Beaver dam | | | Yes | Natural | 3 | Woody | Barrier | Active |
| 802 | 133 | - | west Fisher River | Road | | | Yes | Transportation | 3 | Gravel and stone | Modified/Constriction | Composed of gravel, stone, and culvert; water flow is apparent but slightly impounded (d/s velocity); could wash out |
| 815 | 134 | - | west Fisher River | Grazing | | LB | Yes | Livestock | 1 | Pasture | Pasture | Relatively large area with definite cattle access; shoreline eroded and no buffer (up to image 819) |
| 829 | 135 | - | west Fisher River | Ford | | | Yes | Machinery | 3 | Bed grade | Barrier | Likely used for machinery (and possible livestock); likely not active at this water level |
| 844 | 136 | - | west Fisher River | Grazing | | Both | Yes | Livestock | 1 | Pasture | Pasture | Extensive along both sides; livestock fenced into river on both sides; no buffer (Images 844 to 856) |
| 848 | 137 | - | west Fisher River | Ford | | | Yes | Livestock | 1 | Bed grade | Barrier | Cattle access from both sides (part of Rehab #136) |
| 865 | 138 | - | west Fisher River | Road | | | Yes | Transportation | 2 | Gravel and culvert | Modified/Constriction | 4 culverts; slight impoundment; possible erosion on d/s side due to velocities; potential washouts or overflow |
| 911 | 139 | - | Kilkenny Drain | Grazing | | LB | Yes | Livestock | 1 | Pasture | Pasture | Extensive section of grazing (textures and patterns); primarily LB but switches to both at ford, etc; access evident u/s (images 911 to 937); no buffer |
| 924 | 140 | - | Kilkenny Drain | Ford | | | Yes | Livestock | 1 | Bed grade | Barrier | Active ford; old culvert in place from previous washout; on bend with velocities (part of Rehab # 139) |
| - | 141 | 25 | Blind Creek | Grazing | | Both | Yes | Livestock | 1 | Pasture | Pasture | Grassed pasture with dugout; access likely |
| - | 142 | 45 | Rus Drain | Grazing | u/s | Both | Yes | Livestock | 1 | Pasture | Pasture | Fenced with grazing; tracks on shore |
| - | 143 | 34 | Sunny Valley Drain | Grazing | Both | Both | Yes | Livestock | 1 | Pasture | Pasture | Pasturing with direct cattle access; manure piles?; nutrient loading |
| - | 144 | 4 | east Fisher River | Residential | u/s | LB | Yes | Residential | 3 | Manicured lawn | Residential | Home with grass trimmed to edge |
| - | 145 | 6 | east Fisher River | Residential | d/s | LB | Yes | Residential | 3 | Manicured lawn | Residential | Home with grass trimmed to edge |
| - | 146 | 10 | east Fisher River | Grazing | Both | Both | Yes | Livestock | 2 | Pasture | Pasture | Fenced areas for pasture but likely access |
| - | 147 | 11 | east Fisher River | Grazing | Both | Both | Yes | Livestock | 1 | Pasture | Pasture | Fenced areas for pasture but likely access |
| 426 | 148 | - | Dumoulin Drain | Ford | | Both | Yes | Machinery | 3 | Gravel and culvert | Barrier | Appears to allow water |
| 621 | 149 | - | Leroy Drain | Ford | | Both | Yes | Unknown | 3 | Likely gravel and culvert | Barrier | Water flow through appears slightly impounded |
| 377 | 150 | - | Rus Drain | Ford | | Both | Yes | Machinery | 3 | Bed grade | Barrier | Water flow through; near confluence with east Fisher River |
| 636 | 151 | - | Bottle Creek | Other agricultural | Both | Both | Yes | Other agricultural | 3 | Channel; pasture | Modified/Constriction | Channelized and denuded area; unknown agricultural use; requires groundtruthing; culvert may be eroding banks |

APPENDIX 4.

**A SUMMARY OF DETRIMENTS TO RIPARIAN AND/OR AQUATIC
ECOSYSTEM HEALTH, NEGATIVE IMPACTS, AND POTENTIAL
MITIGATIVE MEASURES. REFERENCE SECTION PROVIDED AT END
OF APPENDIX.**

PRESENCE OF LIVESTOCK IN THE RIPARIAN ZONE:

Negatives^{1, 3, 8}:

- Not only is it a detriment to aquatic health the well being of livestock is also threatened via direct access to water bodies (e.g., foot rot and/or mastitis, water becomes contaminated with livestock waste providing a transfer medium for other diseases; cattle drink less water if dirty resulting on lower beef production);
- Livestock trample shorelines and destroy aquatic vegetation (erosion and sedimentation are increased);
- Stream flow is more variable which increases bank instability.

Potential Mitigative Measures¹:

- Completely restrict access by fencing;
- Provide off site watering systems;
- If access is required limit it with on-site fencing or install erosion ramps (e.g., cattle crossings);
- If possible, initiate a rotational grazing system;
- A 'best possible scenario' would involve complete livestock exclusion with a (fenced) 9 to 10 m buffer strip along the waters edge.

Potential Benefits (gains) of Mitigative Measures¹:

- Reduced risk of infection and disease (e.g., less bacteria);
- Cleaner water via reduced sedimentation;
- Less nutrient loading and potential algal growth;
- Protected and potentially improved habitat for fish and other aquatic organisms.

Note⁶ – The real issues of livestock within a riparian area are not the animals themselves but rather the poor management issues associated with this practice (i.e., overgrazing, continuous grazing, poor water access and crossings, pasture overstocking, and proximity of feedlots to stream sides).

REMOVAL OF RIPARIAN VEGETATION (LACK OF BUFFER STRIPS):

The removal of riparian vegetation can be a result of overgrazing by livestock, deforestation to allow for agricultural practices, or as a result of urban expansion.

Negatives²:

- Fields cropped too close to watercourses may not be able to slow runoff, resulting in erosion and bank failure;
- Without buffer strips or riparian areas detriments to aquatic health (e.g., sediments, fertilizers, pesticides, pathogens) are not filtered/stopped before they enter the stream;
- Increased levels of nitrogen and phosphorus entering streams (if not trapped by riparian vegetation) can result in toxic conditions (e.g., algal blooms);
- Ground water may also be affected by the leaching of nitrates.

Potential Mitigative Measures^{2, 4, 5}:

- Re-establish buffer strips and riparian vegetation where it is needed;
- If buffer strips have been reduced as a result of livestock, include exclusion fencing;
- Buffer strips can be allowed to regenerate naturally or can be assisted with bio-engineering practices (e.g., plantings of willow, grasses or other naturally occurring hardy species);
- The recommended width of a buffer strip is at least 10 m; however 30 m is more ideal.

Potential Benefits (gains) of Mitigative Measures^{2, 5}:

- Dense buffer strips slow the rates of spring runoff and flood water. The result is a reduction in soil erosion and potential groundwater recharge (e.g., vegetated banks can withstand up to three times the flow of an un-vegetated bank);
- Vegetation traps sediments and organic matter, thus enriching soils;
- Less leaching of nitrates and phosphates into the water system occurs;
- There is a direct improvement to water quality and (often) clarity;
- Diverse plant communities in riparian and or buffer strip areas can reduce weed invasion;
- Water temperatures can be kept cooler as a result of overhanging vegetation. The result is an increase in oxygen for aquatic organisms and a reduction in the effects of pollution (which are magnified by warmer water).

URABAN ENCROACHMENT AND RECREATIONAL OVERUSE/ABUSE:

Human-induced (i.e., anthropogenic) disturbances related to land use can have the greatest impact on water bodies and can include crop and livestock production (discussed above), urban practices (e.g., waste matter, construction activities, concrete drains and roads, channelization), industry (e.g., mining, forestry, assembly and production), and recreational use/abuse (e.g., parks, golf courses, marinas)⁶.

Negatives^{6, 7, 8}:

- Recreational development can reduce species diversity, result in compaction of soils, and disrupt wildlife.
- Manicured lawns in areas such as parks, golf courses, and/or private properties are often directly to the edge of water bodies. This can result in: a reduction in species diversity; the direct input of deleterious substances (e.g., fertilizers, lawn trimmings, brush); or bank failure.
- Marinas can result in oil/gas spills or leaks, direct nutrient loading via improperly functioning privies or improperly disposed waste material, bank failure due to excessive/un-checked vessel activity; or the introduction of invasive species (e.g., zebra mussels).
- Urbanization can: increase runoff that is potentially polluted (e.g., drains and ditches or paved roadways); result in the clearing of riparian areas; and increase the number of stream crossings in an area.

Potential Mitigative Measures^{6, 7, 8}:

- Avoid riparian areas and increase buffer widths along water bodies;
- Plan for a reduction in impervious cover (e.g., roofs, roads, parking lots, etc);
- Limit the disturbance and, subsequent, erosion of soils;
- Treat storm water runoff;
- Initiate buffer widths in urban areas, especially along water courses;
- Reduce or ban the use of lawn fertilizers and chemicals used in the home;
- Enforce regulations to prevent the illegal dumping of material into watercourses;
- Educate the public on how they can make a difference.

Potential Benefits (gains) of Mitigative Measures:

- Increased riparian areas which serve a filtering function and act towards erosion control;
- Improved riparian areas are aesthetically pleasing;
- Treating storm water runoff can improve water quality;
- A reduction of lawn fertilizers and chemicals should reduce the amount of phosphates and nitrates entering a water body, thus improving water quality.

IMPROPERLY DESIGNED STREAM PASSAGE:

Improperly designed stream passage can take a number of forms, including: improperly sized culverts; the use of fords; bridges, or lack of complete structure.

Negatives⁹:

- Improperly designed stream crossings can cause washouts and increase erosion within a stream channel.
- Stream crossings can act as barriers to fish migration. For example, culverts may be perched, act as velocity barriers, or become clogged with debris;
- If not properly maintained, crossings can become blocked by debris (e.g., logs, silt, gravel, etc). These blockages can result in washouts or act as barriers to fish migration;
- Through construction activities sediments entering the stream may increase. These sediment loads could destroy or alter fish habitat and reduce water quality;
- Construction activities can also result in altered or destroyed riparian areas.

Potential Mitigative Measures⁹:

- All road crossings should be designed properly and maintained;
- New road crossings should follow all applicable construction guidelines and guidelines for the protection of fish and aquatic habitat;
- Crossings determined to be detrimental to aquatic health should be replaced.

Potential Benefits (gains) of Mitigative Measures:

- Properly designed and maintained crossings should allow for the passage of fish;
- Properly designed and maintained crossings should not increase sedimentation or result in erosion;
- Properly designed crossings are cost effective if they do not result in washouts and subsequent repairs.

References:

1. www.agr.gc.ca/pfra/land/gft14.htm (accessed August 16, 2005)
2. www.agr.gc.ca/pfra/land/stream/streamf1.htm (accessed August 16, 2005)
3. www.agr.gc.ca/pfra/land/stream/streamf3.htm (accessed August 16, 2005)
4. www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/factsheets (accessed August 16, 2005)
5. www.agr.gc.ca/pfra/land/shorelds.htm (accessed August 19, 2005)
6. McIver, Serena. 2004. Using off-stream water sources as a beneficial management practice in riparian areas- a literature review. Agriculture and Agri-Food Canada Prairie Farm Rehabilitation Administration.
7. Fischenich, J. C. and H. Allen. 1999. Stream Management. Prepared for US Army Corps of Engineers, Ft. Worth District under Water Operations and Technical Support Program. Working document, June 1999.
8. Bentrup, G. and J. C. Hoag. 1998. The practical streambank bioengineering guide: users guide for natural streambank stabilization techniques in the arid and semi-arid great basin and international west. USDA Natural Resources Conservation Service, Plant Materials Center. Aberdeen, Idaho.
9. Fisheries and Oceans and Manitoba Natural Resources. 1996. Manitoba stream crossing guidelines for the protection of fish and fish habitat.