INTRODUCTION

This report has been made possible through collaboration between various stakeholders within the Lower Maitland River Valley. It is a collection of previous studies conducted on the Lower Maitland Valley by various private consultants, government and non-government agencies and universities. The report is structured in a way that summarizes the lengthy technical reports to include key findings, information gaps, unique/unusual features and comments from local individuals. A bibliography and reference list contains the information to most of the material available for the Lower Maitland River. The original technical documents will be available for further viewing at the Maitland Valley Conservation Authority office.

It is important to note that the intention of this document is to raise awareness of the Lower Maitland River Valley Project and provide information to all users and landowners in hope of raising knowledge and appreciation of the natural features of the valley and encouraging participation in this initiative. This document is not a finished product. It is assumed that it will be updated as information and reports arise in the near and distant future.

WHAT IS THE LOWER MAITLAND STEWARDSHIP GROUP?

The Lower Maitland Stewardship Group began in 1998 with informal meetings between interested community members to discuss issues and concerns relating to the Maitland Valley and surrounding area. It has evolved into an informal community-based organization with diverse representation.

Initial meetings were held to find out if there was interest in this project within the community, as well as to explore the possibility of cooperation. A technical "resource group" was also formed consisting of: the Maitland Valley Conservation Authority (MVCA), Ministry of Natural Resources, Huron Stewardship Council, University of Guelph, Nature Conservancy of Canada and the Huron County Planning and Development Department. During 1999 the resource group led several studies in the valley. These centred on the water resources and fish of the Maitland River, the Maitland Valley and adjacent natural areas and the users of the area.

In December 1999, a public meeting was held at the Huron County Museum in Goderich to inform landowners what had been done to date, discuss common interests and concerns and talk about future actions and directions for managing the river. Following this, a subsequent public meeting was held to provide community members the opportunity to develop a strategy to undertake the future actions.

As a result of these public meetings and numerous discussions among interested groups, a core of individuals representing landowners, stakeholders, government agencies

and non-government organizations has progressed into a group which actively promotes the maintenance and enhancement of the natural ecosystem features of the Lower Maitland River Valley. The aims and purposes of the group are given below.

MISSION STATEMENT

"To maintain and enhance the natural ecosystem of the Lower Maitland River Valley."

VALUES (Key Principles)

1. We envision a community that enables owners to manage their land for the mutual benefit of themselves and the community.
2. We believe that most landowners holding valley lands do so because they appreciate the beauty and natural features of the valley and the adjoining landscape.
3. We believe that many non-landowners have an interest in preserving and enhancing the valley's natural vitality.
4. We believe that landowners and non-landowners coming together as a community will assure the integrity of the valley for both their interests.

GOALS

1. To advocate responsible stewardship of resources by landowners and valley users through:
    - encouraging a sense of community and cooperation among landowners and valley users through providing a forum for them to interact, share ideas and develop an understanding of each other's viewpoints;
    - provision of information on natural features, their presence, status and management options, and;
    - provision of educational opportunities to learn about and develop an appreciation for the valley resources;

2. To encourage and direct research on natural features of the valley.
3. To profile existing protection measures, i.e. legislation, and encouraging their appropriate enforcement.
4. To investigate other opportunities for protection, including recommendations to regulators, special designations, learning about approaches taken in other areas, etc.
5. To foster sustainable use of the valley and its resources.

WORK PLAN FOR 2000:

1. Continue to establish and enhance awareness of the group and valley resources
   through:
   - Community awareness events.
   - Development and distribution of an information package highlighting information currently available on valley resources.
2. Continue with resource data collection (science)
3. Continue with the formative process of the group and further define its structure and function.

To date, the Maitland Stewardship Group has planned several community events and activities throughout the year 2000 and in the near future.

HISTORY OF THE MAITLAND VALLEY

PRECONTACT SETTLEMENT

The Precontact Period is the name archaeologists give to the times of early aboriginal settlement in Ontario. It incorporates the Paleo-Indian, Archaic, and Woodland time periods and covers a span of some 10,500 years. The Precontact Period is generally considered to end with the arrival of Europeans to Ontario, sometime in the late 1500s or early 1600s.

So far, there have been no significant Paleo-Indian or Archaic occupations documented for the Lower Maitland River Valley. However, several features of the landscape (proximity to water, including ancient glacial lake shores) and an isolated find of a single archaic projectile point suggest that they did exist in the area.

Archaeological sites show that Woodland Period peoples exploited the Lower Maitland River Valley to a considerable degree. Woodland sites provide evidence of an early agricultural lifestyle, including substantial villages, clay pottery vessels, and the remains of corn. Several sites have been located along the highly elevated river terraces surrounding the Lower Maitland River, including those in the vicinity of the Maitland Falls and Holmesville community. Many of these sites likely reflect small seasonal camps used during fishing and hunting expeditions, but may also be associated with larger village communities that are located nearby.

The lands within the Goderich Harbor and along the Lower Maitland River were described by a Recollet missionary in 1626 AD as very abundant in wildlife, with “an incredible number of deer, moose, panthers, bears, wildcats, squirrels...[and] all types of

birds." The vegetation in the area consisted of sugar maple, beech, elm and basswood and hemlock, interspersed with cherry, butternut, and various species of oak and birch. The soil in the Goderich area was described as particularly fertile. All of these features suggest that the Lower Maitland River would have been extremely attractive to aboriginal settlement.

Several specific areas are noted below for their high probability for yielding prehistoric cultural materials.

Lake Warren Beach Strandlines

Lake Warren was a glacial lake whose ancient shorelines are still visible today running parallel to the Lake Huron shoreline and extending from Wyoming in the south to Elmwood in the north. At least three separate old Lake Warren shorelines intersect the Lower Maitland River just beyond the southern limits of Goderich. Old glacial lake shorelines were extremely attractive places for early aboriginal settlements in Ontario and, in fact, many of the earliest sites identified in the province have been located on these features. The well-drained soils, high elevation, and plentiful natural food sources associated with these ancient shorelines would have been extremely desirable for long and short-term settlement. To date, only limited surveys have been completed in this area. A few isolated finds of Woodland period projectile points and associated artifacts suggests the area was in use in the past and there is still significant potential for finding similar and earlier materials in the vicinity.

Goderich Harbour

Early European visitors to the Goderich area described it as having an abundance of fish, migratory birds and wild rice. Because of this, and since Goderich Harbour was an outlet to Lake Huron, it would have been visited frequently by Native hunting and fishing parties from very early to more recent times. We have no knowledge of any prehistoric aboriginal sites presently located in the Goderich Harbour. Part of the problem is that land modifications, building construction and disturbances have made locating such sites extremely difficult and many may have not survived into the present. Open areas, parklands, and recreation locales may provide the only undisturbed deposits of cultural materials related to the prehistoric period near the Harbour. A discovery of some stone tool manufacturing debris in a nearby golf course suggests that some intact deposits may remain.

Maitland Falls (Falls Reserve)

The most archaeologically productive area located so far in the Lower Maitland River Valley is that associated with Maitland Falls, in the present day Falls Reserve Conservation Authority lands. While this area was also attractive to early Native settlement for many reasons, the carrying out of formal archaeological surveys in this area might well explain our better knowledge of site distributions here.

Maitland Falls would have been a good place for obtaining spawning fish, such as sucker and pickerel. Unusual land formations, such as waterfalls, rock outcrops and mounds, were often important locations to aboriginal peoples who saw them as special or spiritual places. It is therefore very likely that the Maitland Falls are would have attracted a great deal of Native settlement.

The area surrounding Maitland Falls shows evidence of use for short-term stopovers and campsites, perhaps associated with seasonal subsistence activities like fishing or as smaller activity areas relating to large village occupations located in the vicinity. Several small sites in the vicinity have produced Woodland period artifacts, including stone projectile points, drills, wood working tools and pottery vessels. Continued use of these areas throughout the Woodland period from approximately 500 through 1200 AD suggests they may have been suitable for agriculture and a high potential for village settlements exists.

Holmesville Vicinity & Similar Areas

Areas where smaller creeks and tributaries join with the Maitland River also show high potential for prehistoric sites. For example, Woodland period sites have also been located in the vicinity of the Bridgewater Creek. There are several similar locations along the north and south banks of the Lower Maitland and these would be considered to have high archaeological potential.

HISTORIC SETTLEMENT

Because access to fresh water, transportation routes, good agricultural soils and abundant natural resources were also important determinants of early pioneer settlements, these criteria can still be employed to determine the potential of locating archaeological resources dating to the historic period of 1828-1829. Given this, the areas surrounding the Lower Maitland River seem to have a generally high potential for locating historic sites. Before the construction of major land routes in the area, early pioneer settlements were still restricted to areas that had easy access to water. Early histories of Huron County suggest the existence of early log cabin homesteads in the area of Goderich and along the banks of the Maitland River. Early historic industries known in the area, like logging, milling and mining, would have depended on the reliable and plentiful water source the Maitland River provided, for both processing and power.

With the construction of the Huron Road in the early 1830s, settlers moved out of the river and Harbour areas and constructed farmsteads along the roadways. Early concession roads like the Lake Concession (now Hwy 21) and the Maitland Concession B (now Hwy 8) were the locations of some of the first permanent homesteads. The earliest settlers to the Goderich Area were thought to have settled along the Maitland Concession between AD 1828-1829. At major sets of crossroads some of the earliest hamlets (e.g. Holmesville, Benmiller, and Bridgendplace) grew, incorporating blacksmith shops,

taverns, schools and churches. The early farmsteads, industries and unmarked pioneer cemeteries can be considered valuable and sensitive historical and archaeological resources that can contribute to our knowledge of early settlement of this part of Huron County.

Following is a summary of potential historical resources for the Goderich Harbour and the north and south side of the Lower Maitland River Valley.

Goderich Harbour

Although there is some historical mention of the first true European settlement in the Goderich Harbour consisting of a late 18th century trading post, we do know with certainty that the first substantial settlement in Goderich was orchestrated by the Canada Company in the early 1800s. In 1826, the Canada Company office was erected on the south side of the Harbour prominence. From here, the business of leasing Company land in the Huron Tract was carried out. Buildings associated with the Canada Company office included a mill, draw bridge extending across the Maitland River, perhaps even a pre-1830 schoolhouse. The north side of the Harbour was home to early settlement by Canada Company employees and other dignitaries of the time. Schools, churches, and stores were constructed in these locales to service the needs of the local populations.

Historic Features on the North Side of the Lower Maitland River

Several locales along the north shore of the Lower Maitland River have potentially significant historical resources. These will be described in order from west to east.

The community of Bridgendplace, (the modern day community of Dunlop) was an early centre of activity, located on the Old Lake Road Concession (Hwy 21). The historic community of Maitlandville, later called Garbraid and now known as Saltford, housed the estate of the Dunlop family; at its peak it contained two hotels, a large tannery, a blacksmith shop, a shoe shop, two brick yards, two lime kilns, a cigar factory and a school. Explorations for oil in Maitlandville during 1866 discovered deeply buried salt deposits and quickly initiated the establishment of salt mining operations in the area. A salt mining industry was established along the north shore of the Maitland River at the mouth of the Goderich Harbour. Two historic cemeteries and associated buildings located just south of Saltford, near the southward bend in the river, may also be associated with early settlements in and around Maitlandville (Garbraid).

Adjacent to what were then the Falls Reserve lands, likely now the Conservation Area property, is a historic homestead once owned by T. Sowerby with a house located along the river's edge.

The community of Benmiller was also significant, from a historical perspective, as one of the first developed centers in the area. The earliest settler of Benmiller established

a log shanty sometime during 1828 or 1829 and replaced it in subsequent years with a log cabin and finally in 1836 with a stone house which, apparently, still stands. Benmiller eventually incorporated a tavern, church and several other establishments.

In general, the lands on both sides of the Maitland River attracted early pioneer settlement particularly because they were considered prime agricultural land. Settlement quickly grew along established concession roads. Several homesteads are known to have existed along the portion of the Maitland Concession that runs north from Holmesville (now Cty Rd. 31) at the southern terminus of this study area.

Historic Resources on South Side of the Lower Maitland River

Salt mining industries were also established in the areas south of the Lower Maitland River by the late 1800s. The International Salt Company established itself along the shore of Lake Huron near the outer limits of present day Goderich. Another smaller salt works is identified at the intersection of the Grand Trunk Railway and the Maitland Concession B (Hwy 8). Other early industries along the south side of the Maitland River include a brewery, flour and woolen mills, located near present day Cemetery Creek. This area also contained a cemetery.

The historic community of Holmesville was first settled in 1832 and became a focus of settlement in the area. It once contained a tavern, mail service, two or three blacksmith shops, store and, later on, a cheese factory.

OWNERSHIP

The ownership of the bed of the Maitland River, and its islands, is determined by the property description in the original crown patents, and whether the river is navigable. Where the river forms the boundary between townships (i.e. that section below Auburn where it is the boundary between Goderich, Colborne and Hullett Townships), the bed and islands were never initially granted from the Crown to the Canada Company. A subsequent patent was issued to the Canada Company for any part of the bed that was not navigable. However, the Canada Company never transferred any rights to the bed that they might have had, prior to the company being dissolved. Consequently, the bed and all islands are crown land, and have never been privately owned.

Where the river flows through a township (i.e. above Auburn), ownership, as identified in the deed, varies from property to property. Regardless, the portion of the river from Wingham to Auburn is considered navigable, and as such, is crown land. Islands, however, may be privately owned, if so identified on the deed.

In simple terms, the Province of Ontario claims ownership of the bed and islands of the Maitland River from Auburn to Lake Huron, and to the bed from Wingham to Auburn.

PHYSICAL SETTING OF THE LOWER MAITLAND RIVER

LAND SYSTEMS

The Lower Maitland Valley falls within the Huron Slope section of the Great Lakes - St, Lawrence Forest Region of Rowe (1972). The landscape through which the valley flows is characterized by a gently rolling to rolling terrain of ice laid materials that typically cover the bedrock deeply. Dominant landforms include spillways, till plains and till and kame moraines. A narrow band along the eastern shore of Lake Huron from the base of the Bruce Peninsula south to Grand Bend includes a progression of wave cut terraces with gravel bars, beach ridges sand dunes and shore cliffs.

Bedrock Geology:

Overlapping layers of Paleozoic sedimentary rocks (formed between 570 to 240 million years ago) about 1000 m thick underlie all of southern and southwestern Ontario. These in turn lie on much older (approximately 600 million years ago) Precambrian igneous and metamorphic rocks formed within the earth's crust. The Paleozoic rocks form overlapping layers of limestone, dolostone, shale and sandstone that dip gently to the south and west and decrease in age towards the southwest. The most prominent geological feature of southern Ontario is the Niagara escarpment, formed of resistant rocks of the Ordovician and Silurian ages (Hewitt and Freeman, 1972).

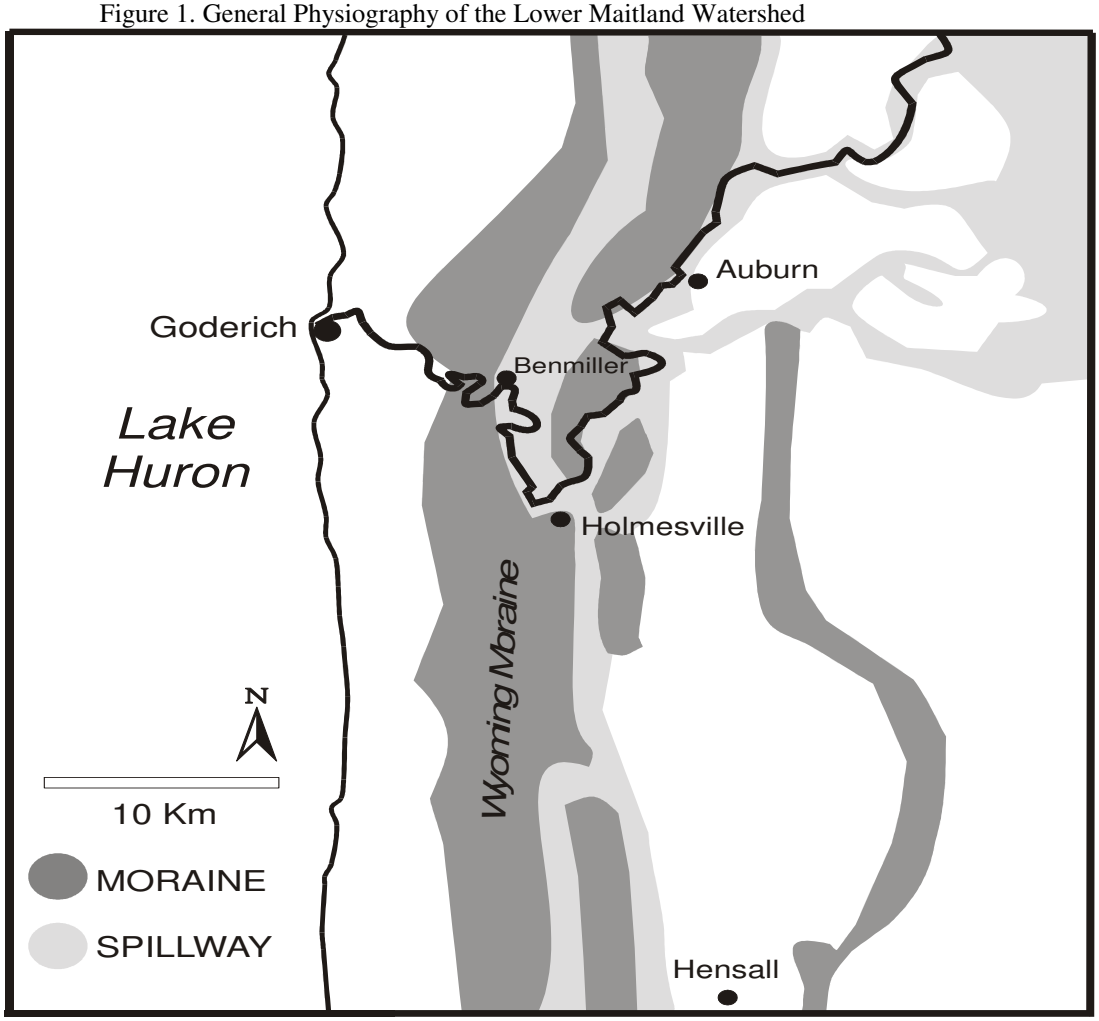
The Lower Maitland Valley lies on Devonian rocks some 400 million years old that lie in a broad belt extending across southwestern Ontario from central Lake Erie to Lake Huron (Uyeno *et al.*, 1982). These rocks also underlie part of the Windsor-Essex area and form the bedrock of Pelee Island. The reference for this formation, and one of the thickest sections is at St. Marys, Ontario, where the rocks are quarried for the manufacture of lime and portland cement. The rocks outcrop along the Maitland River valley, where the river has worn down through the overlying glacial deposits to expose the bedrock in the riverbed and low cliffs along the river. The limestone contains common fossils including corals, brachiopods, bryozoans and crinoids. The upper beds show vertical cracks and jointing, which may have resulted from post-glacial rebound (Jin, 1998). The texture and fossils in the rocks suggest the limestones originated as lime muds with brief conditions of active bottom currents (Cordiner, 1979).

The contact between two important layers of limetone called the Dundee Formation and the Detroit River Formation is exposed in the Maitland River just upstream from Goderich. This site was proposed as an Earth Science Area of Natural and Scientific Interest (ANSI) in 1979 (Cordiner, 1979), but was rejected because of the relatively poor condition of the exposure.

Surficial Geology and Physiography:

Eighteen thousand years ago most of Southern Ontario was covered with a massive ice sheet. During the retreat of the Wisconsin Icesheet, the wasting glacier broke into several lobes. The Huron Lobe filled the basin of Lake Huron and had most influence on the surficial geology of the Maitland River and surrounding areas. About thirteen thousand years ago Lake Whittlesey covered the entire Lake Erie basin as well much of southwestern Ontario. About this time the melting edge of the Huron Lobe built the Wyoming Moraine, a ridge of land which runs parallel to the shore of Lake Huron but several kilometers inland from the current shoreline. Melt water running off the icesheet formed a well-developed spillway along the front of the moraine (Figure 1). The spillway entered Lake Whittlesey at the location of Hensell. The Maitland River runs in this ancient spillway, and from Auburn to Benmiller, a straight distance of some 15 km, it meanders south along the spillway almost as far as Homesville before finding a break in an outlying section of the Wyoming Moraine and travelling north again (a distance of about 54 km). At Benmiller, the river breaks through the main moraine in a deeply incised valley that has cut through to the underlying bedrock. The river then continues in a meandering valley to its mouth at Goderich. The process of rapid down cutting during the period when the Lake Huron shore was rebounding after the ice was removed, has left a series of terraces, slopes and meander scars in the sides of the valley.

Figure 1. General Physiography of the Lower Maitland Watershed



As the river passes through the Wyoming Moraine west of Benmiller, there are steep valley slopes and bottomland terraces. Tributary ravines are spectacularly narrow and steep-sided; a result of rapid down cutting by streams as they reach the level of the main river. At the outside of bends, the river is actively undercutting the valley walls. Here the valley slopes are steep and often actively eroding. At the base of the slopes, ice scouring keeps the exposed limestone bedrock relatively free of soil and vegetation. At the inside of river meanders, deposits of gravel and cobbles form bars and swales. There is often a substantial bottomland between the river and the valley wall, and often fine examples of meander scars well above the present level of the river.

Soils and Moisture Regime:

According to the Huron County Soil Survey (Hofman, et al., 1952) the soils of the upland and valley slopes of the Lower Maitland Valley are generally heavy textured tills with good drainage, slightly stoney and neutral to slightly alkaline. They are Grey-Brown Podsolic soils with a well-developed profile. The soils of the flood plain and terraces of the river valley comprise well sorted gravely outwash material of the spillway. The drainage is good and the reaction is neutral to slightly acid. Low-lying land along the river has recent alluvial deposits with an immature profile. The bars in the river are composed mainly of cobbles and coarse gravel. Where the underlying bedrock is exposed there are cliffs and flat limestone pavements with no soil accumulation except in cracks.

Channel Morphology

The major factor shaping a stream channel is a certain volume of flow, which has sufficient energy to reshape and adjust the channel. Flood flows every 1.5 - 2 years are the major flows that adjust channels, sort the bottom of rivers, move materials to deepen pools and reshape riffles. This flow is called the "bankfull" flow. The term "dynamic equilibrium" is used to explain that even though the actual location of pools and riffles, bends and straight portions may change and adjust after every bankfull flow, the overall shape and form of a stream appears to be the same over many years. In this way, a stream channel moves within its valley adjusting for minor variances in flows and sediments. This is a major natural tendency of a healthy river that maintains the appropriate shape and form of channel most efficient at storing both water and sediment at all flows.

An important determinant of channel quality is the river's ability to contain low flow water into a channel that provides good depths for all sizes of fish during the times of little water. The shape of the low flow channel is actually controlled by the high flow stage that adjusts the channel's cross-section, riffles and pools (Figure 2). The quality of the high flow or "bankfull" channel is controlled to a certain degree by the riparian zone and the less frequent flows that move into it. The quality of the riparian zone and floodplain is controlled by the large flows that occur perhaps only once every 100 years.

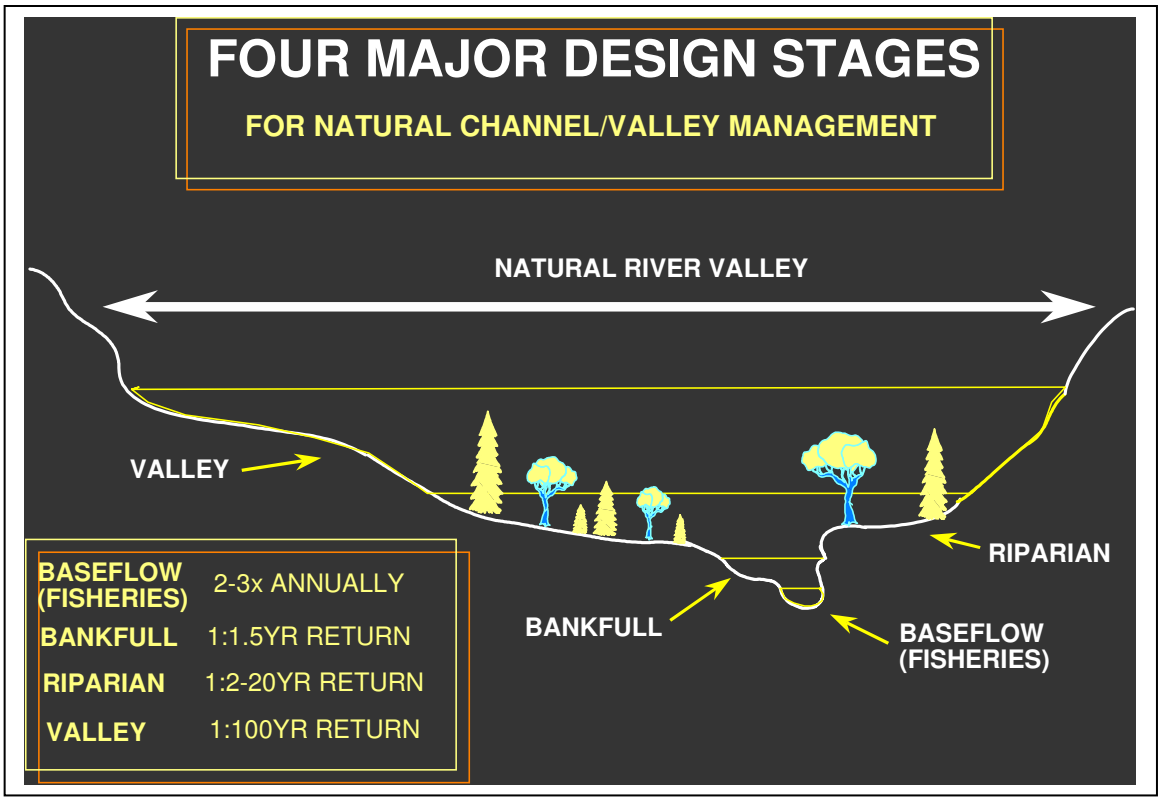
The channel morphology of the Lower Maitland River is highly diverse and quite unusually so compared with many other large rivers in southern Ontario. The channel

forms from Wingham downstream to Goderich fall into two broad categories of stream forms, moderately meandering floodplain channels (Wingham to Benmiller) and moderately meandering channels controlled by bedrock cliffs (Benmiller to Highway 21).

The mainstem of the Maitland is relatively stable because of three major characteristics:

- Healthy, undamaged riparian and floodplain vegetation composed of deeply rooted grasses, forbes, reeds, shrubs and trees;
- The high flow patterns of the watershed (as mentioned above), and;
- The local geology of gravels, cobbles and bedrock.

Figure 2: Stages of a river that control its quality



Even though the channel shows a greater level of stability than most other large rivers in southern Ontario, it nevertheless demonstrates the results of historical landuse changes. Detailed geomorphic field studies (Parish and Mariette, 2000) were undertaken at three sites along the Lower Maitland River: Donnybrook, Shelter Valley and Pipers Dam (Figure 3). Site selection was based on local environment (i.e. geology) and Ministry of Natural Resources field work (fisheries, pool survey) that had been previously undertaken. The upper study reach around the hamlet of Donnybrook is the most stable section of the three studied. However, even in this reach, the substrate of the river suggests that high loads of fine sands from farm fields and upstream sites move through

the river during flood flows. This fine sand may have moderate effects on the animals and plants in this reach of river.

The Shelter Valley study reach is dominated by a series of islands and gravel bars in the middle of the channel. These characteristics indicate that more sediment moves into this reach than is moved out of the reach. This situation is likely caused by two factors:

- Historical landuse activities that discharged huge quantities of fine sands and gravels down the river, into a reach that does not have the shape to move it out efficiently;
- Higher sediment loads because the river cuts through the old Huron beach formation near Holmesville and therefore acquires more fine sediment than it has the flow volumes (during floods) to carry downstream out of the reach.

The results are that in this reach habitat is not as diverse as it is upstream of Holmesville. Although there is one very deep pool the vast majority of pools and riffles have very little high quality cover for larger fish. On the positive side, this reach does provide reasonably good habitat for juvenile fish and good habitat for some amphibians.

The study reach at Piper's Dam, determined that the deepest pools in the Maitland watershed are associated with the bedrock gorge that runs from Benmiller to Highway 21. Although general channel structure is not as diverse as the reach upstream of Holmesville, the pools are substantially deeper (i.e. maximums depths of 5-7m deep compared to 1.5m deep).

In conclusion, the diversity of the channel forms in the Lower Maitland provides generally moderate to high quality habitat for many species of aquatic plants, fish, amphibians and reptiles. This diversity is the result of a number of factors including:

- the valley form that constrain the morphology of the river somewhat causing more diverse shallow and deep sections than would normally be found in a typical river in southern Ontario;
- The relatively undisturbed, high quality natural riparian zone and floodplain found in the valley bottom;
- The moderate nature of the high flow patterns (once every 100 years);
- The groundwater coming into the system from the moraines flanking the mainstem of the river;
- The glacial geology of cobbles, boulders and bedrock ledges found in the valley bottom

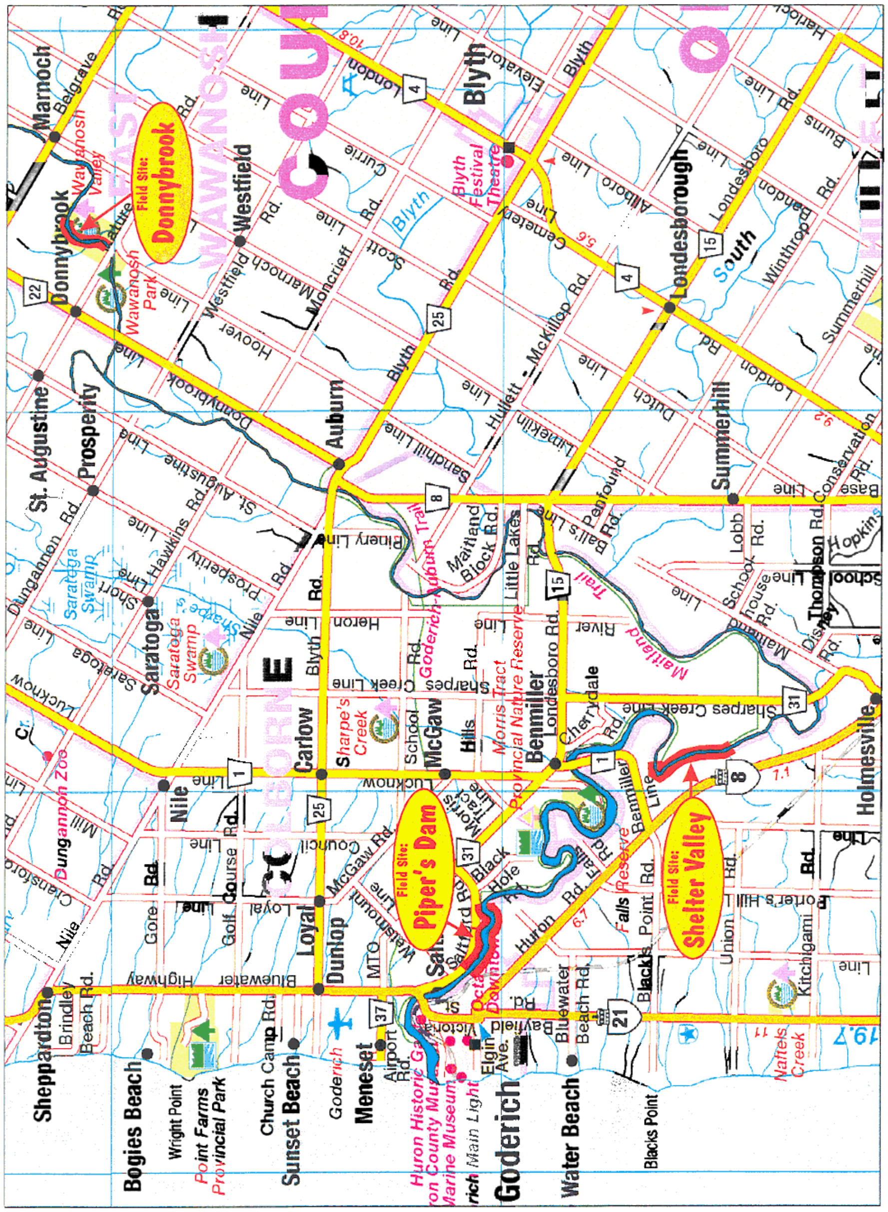


Figure 3. Map of the Maitland River Field Site Locations

The result of all these characteristics is a river system from Wingham to Goderich and especially from Holmesville to Goderich that provides enormous opportunities for animal and plants to thrive, thereby creating one of the healthiest valley and river habitat systems in southern Ontario. Perhaps one of the limitations of the river is its' over-wide cross-section which creates a poor (wide and extremely shallow) channel cross-section during periods of drought.

WATER SYSTEM

Water Quantity:

Flow patterns in the Lower Maitland are affected by the geology, topography and weather patterns that occur in the upper portions of the watershed. Precipitation can reach a river channel by several pathways: overland run-off, interflow through the shallow soils during and shortly after a storm event; and groundwater discharges.

In the Maitland River, like many agricultural watersheds in southern Ontario, another major pathway (perhaps the dominant now) is tile drainage. Tiled fields are very efficient at capturing surface water and shallow recharging groundwater. Therefore, many rural watersheds have the same "improved" drainage as urban centers with their storm sewers! This "improved" drainage can equate in high flow patterns that are "flashy", showing a quick response to a rainfall event with a just as quick a drop in flow after the event. Low flow patterns in these types of systems can also be modified.

The high and low flow patterns in the Lower Maitland are influenced by the watershed geology of the upper river and its' tributaries.

Low Flow Patterns

Low flow is defined as the flow that is typical in the river after several weeks of no precipitation. When a stream is at low flow, the vast majority of water flowing down the channel is groundwater discharge either from deep aquifers or from surrounding shallow water tables. Therefore the character of the water tables determines the volume of the typical low flow.

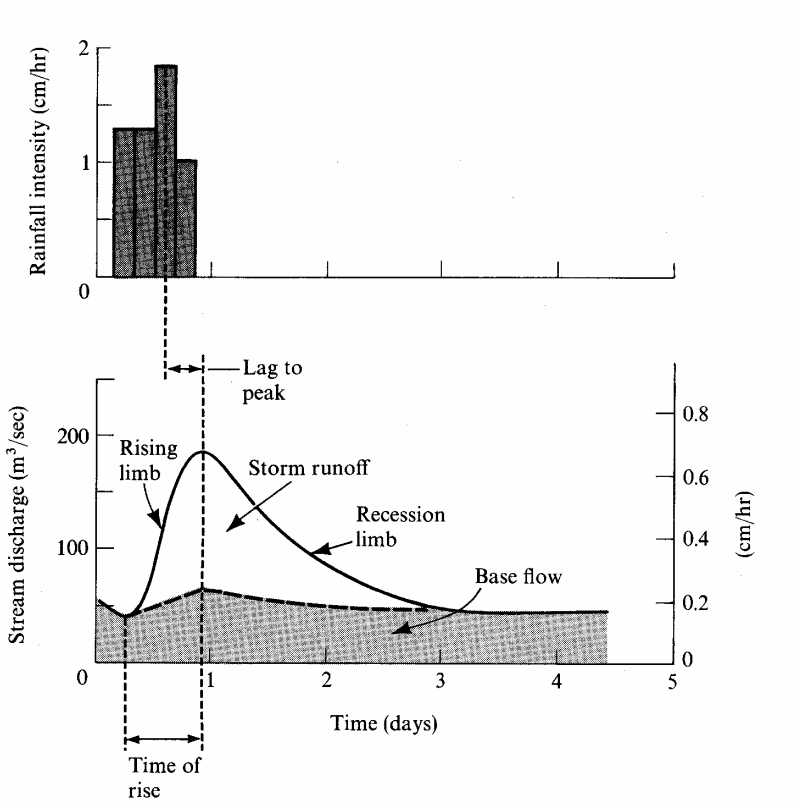
The mainstem of the Maitland River cuts through relatively deep and large deposits of gravel and sand. These deposits encourage more water to soak into the ground than runs off, thereby creating excellent storage of groundwater that can slowly discharge into the river during periods of low flow. In a normal year, the Lower Maitland River has a relatively large and very stable low flow discharge. This type of low flow volume provides ample living space for aquatic creatures (for the purpose of this study, the term aquatic creature will include all creatures such as fish, amphibians, reptiles, insects, mammals, etc.) and therefore more productivity than rivers with less and more variable low flows (e.g. Bayfield River).

Under long periods of drought (i.e. 1997-1999), the shallow watertables above the Lower Maitland drain down without their normal recharge events (i.e. lack of deep and abundant snow pack) and the river suffers with extreme low flows. The consequences for the river are less productivity, high water temperatures and severe stress on the creatures that live there.

High Flow Patterns

High flow patterns occur at snowmelt or after storm events. The high flow patterns of the Lower Maitland are very unusual when compared to those found in rivers throughout southern Ontario. The river exhibits a modestly fast response to major precipitation or snowmelt, similar to other rural rivers in southern Ontario but it stays high longer than most rivers. River levels are recorded on a hydrograph (Figure 4). The Lower Maitland is described as having a short, rapid rising limb with an extremely long descending limb to the hydrograph. This type of hydrograph indicates that the Maitland River stores significant amounts of precipitation in the headwaters upstream of Wingham and this water flushes slowly out of the shallow water table for a period of weeks after the major storm event.

Figure 4. Sample Hydrograph



Hydrograph of streamflow in response to a rainstorm from a 100-square-kilometer basin. Methods of separating storm runoff and baseflow are described in Chapter 10.

This kind of high flow pattern is usually found only in heavily forested watersheds that have not been disturbed or modified by humans. In the Maitland Watershed where only about 18% of forest remains it is the geology of the upper mainstem of the river that creates this unusual characteristic.

This flow pattern is not shared in other sub-watersheds of the Maitland such as the Middle Maitland that flows out of dense clays and tills. This sub-basin is extremely flashy, meaning that the South Maitland responds very fast to precipitation and after the event, the tributary flows drop very quickly. The sharp inputs of the South Maitland are masked by the time they get to the lower river by the large volumes of water that come down the river from the mainstem upstream of Wingham.

The high flow pattern experienced by the Maitland River is much more benign to the aquatic animals than more flashy systems in other parts of southern Ontario. Aquatic animals in southern Ontario have evolved and adapted to modestly sharp rise in flood flows and long, slow drops in high water typical of forested landscapes that once dominated the area. Therefore, the high flow environment in the Lower Maitland is ideally suited to many of the aquatic species found in this section of the river, unlike the high flow regimes of many other rivers.

Implications of Water Quantity to River Health

In general, neither low and high flow patterns limit migration and allow free movements of aquatic and terrestrial animals. The slow response of high flow characteristics allows creatures to find refuges from the flow and still not be stranded as water levels drop. Higher and longer sustained moderate flows allow more creatures to survive longer in the river and therefore make it more productive for many species at all of the stages of their life cycles. Typical low flow volumes in the Lower Maitland provide extensive habitats for all creatures. Unfortunately these systems can demonstrate major catastrophes when exposed to long periods of drought because of the very characteristics that make the system so healthy during normal precipitation years.

Water Quality

The issue of water quality is currently being debated throughout Huron and Bruce Counties. Although much of the attention has focused on bacterial contamination, particularly *Escherichia coli (E. coli)* levels, research shows that there is no single cause of water pollution. Instead, poor water quality is an extremely complex problem that stems from multiple sources.

The Maitland Valley Conservation Authority (MVCA) in conjunction with the Ontario Ministry of Environment and Energy has been monitoring the quality of water in area streams and rivers for over 30 years. These monitoring studies have been conducted with federal, provincial and municipal funding. Study results have identified a variety of

pollution sources including; runoff from manure storages and manure handling techniques, sub-standard septic systems, milkhouse waste water, sewage treatment plants, urban runoff (fertilizers, storm water, etc.) livestock access to water courses and agriculture fertilizers. The relative contribution of these sources is not yet known although their impact does fluctuate during the year and varies between sub-basins in the Maitland and Nine Mile watersheds.

Several local agencies working on water quality issues have noted that none of these sources of contamination inherently cause pollution. The critical factors in water pollution are the management practices being used by rural and urban residents. In essence, environmental management practices determine pollution conditions. The ability of the environment to handle nutrients has declined since the components of watershed ecosystems that bind or use nutrients and prevent their becoming pollutants have also been reduced. For example, the existence of tile drains leading straight to water courses, the removal of stream bank vegetation and the reduction in forest cover all limit the ability of the ecosystem to absorb nutrients. A number of water quality trends have been observed:

1. Nitrate levels in major watercourses in the Maitland watershed have been steadily increasing since the early 1970's. Readings now exceed acceptable levels in most area rivers and streams. Concentrations as low as 3mg/L have been found to be toxic to fish and amphibian eggs. High nitrate levels in water can cause methemoglobinemia or blue baby syndrome, a condition especially found in infants under six months. Nitrate is absorbed in the blood, and hemoglobin (the oxygen carrying component of blood) is converted to methemoglobin. Methemoglobin does not carry oxygen efficiently. This results in reduced oxygen supply to vital tissues such as the brain. Methemoglobin in infant blood cannot change back to hemoglobin, which normally occurs in adults. Severe methemoglobinemia can result in brain damage and death. The major contributors of nitrates include, sub-standard septic systems, agricultural fertilizers, urban run-off and sewage treatment facilities.

2. Increases in bacteria counts appear to be event oriented. This means that rather than an increasing or decreasing trend over time, bacteria levels exhibit sharp increases followed by equally sharp declines. These spikes may relate to rainfall or snowmelt, washing manure or sewage into watercourses as well as manure and sewage spills.

3. Phosphate readings are above desirable levels in the Lower Maitland but have remained consistent since 1965. Excessive phosphate content in the water induces giant algae blooms and unusual plant growth that would not occur naturally. This may create aesthetically undesirable conditions. It could also affect the recreational uses of the area. But, more importantly, plants use oxygen dissolved in water and excessive growth of plants may deprive fish and other aquatic organisms of the oxygen they need. Algae blooms may also block light

from underwater plants. When plants and animals die, the process of decay use more oxygen and release more nutrients for algae growth and the process accelerates. Eventually, eutrophication can occur that makes the water practically useless for any other species to live there.

4. Several other indicators of water quality have improved across the Maitland watershed particularly since 1987. Water temperatures have been declining and dissolved oxygen levels have been increasing. Cooler water contains more oxygen and oxygen is critical for the survival of stream organisms. Water sampling has also shown that biological oxygen demand (BOD) readings are declining. BOD relates to organic loadings found in watercourses. This improvement can be traced to improved sewage treatment facilities, reductions of manure entering streams and improvements in food processing practices. (Steele, Rick, 1999. Unpublished historic water quality data, MVCA)

There are numerous government and farming agencies working on water quality issues. There is a recognized need for co-operation amongst these groups and discussions are underway concerning the sharing of information on water pollution issues.

Throughout the years, many successful water quality services have been eliminated, including the highly successful Clean Up Rural Beaches (CURB) program. The only remaining local programs are the Environmental Farm Plan program, the Best Management Practices guidelines issued by Agriculture Canada and OMAFRA, and the Water Quality Assessment Service offered by the MVCA.

The MVCA, in the year 2000 is nearing completion of an initiative known as the Ecosystem Health Project (EHP). This project has focused on identifying characteristics of sub-basins in the Maitland and Nine Mile watersheds. Various components of sub-basins such as surface watercourses, forest cover, and the amount of artificial drainage were measured. This information was then used to identify those sub-basins most at risk for pollution and other problems. With regards to water quality, the EHP assessed stream health based on sampling for stream organisms rather than chemical testing. The sampling of stream invertebrates enables a more comprehensive assessment of aquatic health to be made compared to chemical testing that only provides information on water conditions at the moment the sample was taken.

Results from the EHP will assist landowners in understanding the environmental conditions of a specific sub-basin. In addition, the report will help landowners to develop realistic expectations for their property.

One intriguing result from the EHP has been the recognition that some streams are starved for energy. The removal of trees and shrubs from stream banks means that leaves and debris, critical as a food source for stream organisms, are not entering the stream system. Even with water quality improvements the health of some streams will remain impaired unless trees and shrubs are planted along their banks.

With approximately 80% of the land base in Huron County being used for agriculture, it is not surprising that much of the blame for water quality problems has fallen on the farming community. Local agencies concerned about water quality are stressing to the public that water pollution stems from a variety of sources and all these sources must be dealt with in order to restore the health of area streams and rivers. It has been suggested that a co-operative approach involving both rural and urban interests will be necessary to successfully implement solutions. Identifying such solutions must begin with an assessment of management practices at the individual and community levels.

Fish Habitat Characteristics

Fish, like any other animals, require habitat that supports them throughout their life cycle from egg to adult, and over the entire year from spring through summer, fall and especially winter. Each stage of the animal's life requires the appropriate habitat. This makes the determination of habitat quality sometimes quite complex. The typical life stages of a fish are shown in Table 1 using for example the Smallmouth Bass. Habitat can be broken down into several essential components:

- Water quantity
- Water quality
- Space
- Shelter
- Food

Water quantity was discussed under section 3.2.1. The Lower Maitland is fortunate that it has extensive groundwater discharges into the river between Wingham and Goderich. This maintains relatively good low flow levels in normal years.

Water quality (section 3.2.2) in the Lower Maitland is relatively good for a large agricultural watershed. This is in part due to the large amount of groundwater that enters the system and sustains low flows between Wingham and Goderich. Without the diluting characteristics of the groundwater, the Lower Maitland would exhibit the same extensive algae growths that plague its tributary, the South Maitland. Increases in nutrient loadings could create new problems on the river and the community should be conscious of the importance of improving water quality in the headwaters and tributaries of the Maitland River.

The three dimensional *space* that fish occupy is defined by its diversity, stability, and shape. Diversity can be referred to as complexity whereby there are a wide array of depths, water velocities and bottom substrates. Stability refers to the term "steady-state equilibrium" which means that the river shape and structure is in balance with its high flow pattern and the sediments it is used to carrying during high flows. A stable river does not have excessive erosion of its bed and/or banks, nor does it radically shift and change position in its valley, but rather slowly adjusts its position, often over many years

or decades. Shape refers to the channels structure and the spacing, length, width and depth of riffles and pools.

Shelter is a combination of space with special features that create breaks in the flow of water, protects the animal from extreme conditions (e.g. over-summer and over-winter habitats) or hides an animal from view. The shape of the banks, streamside vegetation, or objects in the stream may provide shelter.

Of course all animals require *food* in order to live and grow. Food for fish can include algae or diatoms on rocks, aquatic insects and crustaceans, plants or other animals including other fish, snakes, amphibians, etc.

The Lower Maitland is a complex portion of river in which there is a good combination of water quantity, quality, space, shelter and food. The channel complexity is quite high so the "space" component of the river is relatively good with stable riffles and pools in good sequences although many of the pools are not very deep. Shelter is very abundant because of the large numbers of boulders, ledges and back bays. Food is very abundant because of the coarse substrate, stable form and abundant nutrients coming into the river from agricultural sources.

In conclusion, habitat in the Lower Maitland River is relatively good to excellent for fish species. Spawning sites are abundant. The margins of the river with its shallow, scalloped edges and large cobbles make it ideal habitat for fry and juveniles. The complexity of the channel creates a wide variety of habitats for larger fish.

Unknown at this time however, is the location and numbers of over-wintering habitat in the Maitland. Fish populations in rivers are often limited by the quality of over-wintering pools. The location of these pools and the supply of these pools need to be investigated.

Table 1: Life stage/state characterization for smallmouth bass (*Micropterus dolomieui*) in relation to dynamic processes, physical characteristics and required habitat attributes and their interactions.

Life stage/state	Requirements/Characterization (Dynamic Processes)	Physical Characteristics (Static Condition)	Physical Habitat Attributes
Reproduction - habitat	- depositional zones and of erosional zones velocity = < 15 cm/sec depth = > 30 cm - adult male guards eggs and fry for approx. 1 month - margins need water coverage of approx. 30 cm for period of incubation and yolk sac absorption (approx. 2 wks.) before water levels drop.	- Variable locations, although usually found in units having gravel/cobble bed channels with modest incidence of boulders - Substrate composition variable (fine sand – cobble) - indented shoreline margins with coarse woody debris preferred - also occur along margins of bedrock channels	- Usually reproduce in 3-7th Order streams. - Occasionally in lower order streams if pool depths are sufficient - margins of pools, usually on upper or lower margin of point bars - can also be found at lower portion of riffle zones - occasionally on outside bend of shallow, poorly defined pools in bedrock controlled systems
Reproduction - flows	- sufficient volume and duration to wet channel margins for 3 weeks to one month in late May to mid-June - dampened spring hydrograph	- river systems with large drainage area upstream - watersheds within large moraines systems	- Lower order streams are most typical because they exhibit a dampened hydrograph with a long duration
Nursery	- depositional zones and margins of erosional zones - Same locations as spawning - nursery period of approx. 2-3 weeks in water depths from 15-40 cm ideally with some woody debris along margins as well or large boulders - warm temperatures required for optimum growth	- gravel/cobble boulder areas (with boulders) adjacent to depositional zones	- as above
Juvenile/late young of the year (YOY)	- erosional/depositional areas - modest flows adjacent to the main channel - velocity gradients	- substrate from cobble to boulder - Good bottom roughness - woody debris preferred	- edges of pools, bottom of pools in transition to riffles - edges of riffles in mid to lower third of riffle areas
Overwintering - juvenile/adult	- depositional zones - Deep pool areas, near over-summering locations (for YOY) - warm summer conditions for YOY to maximize fitness	- boulder material in channel	- good pool complexity, with boulders and woody debris; - Deep well defined pools with good complexity comprised of boulders and/or woody material
Adult - Shelter	- lateral velocity gradients	- gravel/cobble, ideally with small to moderate % boulders - depth and structural complexity including pools, runs and ledge rock areas - coarse woody debris a modifier	- Deep and extensive pools and bouldery runs with good structure and roughness in 4-7th Order streams - With extensive woody debris and deep pools, fish will be found in 3rd order streams
Feeding - environment - food habitats	- erosional and depositional features - locations having variable food items - crayfish, macroinvertebrates, amphibians and small fish all important	- substrate of cobbles and boulders ideal for most of the food items - shallow flats and runs adjacent to pools very important	- runs with coarse substrates with boulders - flats with coarse textured substrates - head and tail of pool areas for macroinvertebrates - well sorted pools ideal for minnows
Migration - reproduction and environmental	- main channel edge spawners although some movement will occur from lake to river or larger river to large tributary - movements between pools can occur under lower flows in large rivers, some constraint on movement in smaller streams during low flow periods		- easy access to larger tributaries from river system or lake

ANIMALS

FISH

Information on the fish community in the Maitland River has been collected by organized surveys in 1973, 1991 and 1999. Additional information has come from angler surveys, and sporadic fish sampling surveys.

A total of 35 species of fish have been sampled in the river below Wingham, 30 of which are river residents or migratory spawners (Table 2). In addition, five lake species have been sampled in the mouth of the river. The number and diversity of species sampled during the three organized surveys did not change over the 25-year interval from 1973-99.

The river can be classified as a warm-water fish community, with localized zones of cold-water habitat where groundwater seepages or coldwater streams empty into the river. The river hosts runs of migratory Trout and Salmon, which spawn both in the main river and in tributary streams as far as 75 miles up river. Also, fish from Lake Huron move into the mouth of the river, (below the railway bridge) to feed, or, in some cases, to spawn. The assembly of warmwater species is typical of most rivers in southwestern Ontario, however, one species, the Black Redhorse (sucker) is a nationally threatened species.

Most angling activity in the Maitland River is directed at one of three species: the river resident Smallmouth Bass, the migratory fall-spawning Chinook Salmon, and the migratory spring/fall running Rainbow (or Steelhead) Trout. Northern Pike have been sampled in the river, but are so rarely encountered, that they are not specifically targeted by anglers.

Smallmouth Bass are found throughout the Maitland River system. Specimens sampled in the river in 1999, were aged and found to take 15-18 years to reach trophy size (>18”). Although deep pools could not be sampled with the equipment used, fewer large fish than expected were found, leading to some concern about the possibility of habitat limitations or overharvesting. The river produces large numbers of young of the year (YOY, under 1 year of age) but survival to 2 years of age is relatively low. Overwintering survival may be affected by the number, size and habitat quality of pools, or coldwater stream mouth refuges.

Rainbow Trout spend their adult life in Lake Huron, migrating into river systems annually to spawn. The adults return to the lake shortly after spawning while the juveniles reside in the streams for 1-3 years, before “smolting” to the lake. During their stream life, the juveniles require cold water, which is found either in a handful of coldwater streams, or in cold zones of the main Maitland River. Trout populations are at

reasonably stable levels, with some expected annual fluctuation in spawner abundance. Rainbow Trout runs have increased in size in the past 10-20 years as a result of a very active habitat improvement program, the installation of fish passes and improved operation of several dams, improved compliance with harvest regulations and active stocking programs. Production of rainbow trout during the drought years of 1998 and 1999 probably declined and may result in a moderate reduction in the size of the runs in the next 3-5 years.

Chinook Salmon make one spawning run at about age 4-6, and then die. The eggs hatch through the winter, and the juveniles leave the river, in early-May to mature in the lake. Consequently, juvenile Chinook are not in the river system when it experiences warm summer temperatures. Adults spawn throughout the river and its tributaries. One of their main habitat limitations is a shortage of water in the river in the early fall, which prevents them from migrating. It is common for the rock ledges at Falls Reserve to restrict migration in years when the river experiences low water in September and October. The Chinook population has been reasonably stable for the past decade, and runs of 5-10,000 fish are common.

In 1999, two projects were undertaken to assess fish habitat in the river below Wingham. The first project was an assessment of the entire river valley to establish a benchmark on those features that have an impact on the river and its floodplain. The valley below Wingham was assessed for its land uses, ecological habitat types and development activities. Features like pools, islands and instream habitat structures were enumerated and measured. All of this information was mapped on air photo mosaics. It was found that 82% of the valley from Goderich to Holmesville was in natural vegetation, but only 47% was naturally vegetated from Holmesville to Wingham. Gaps of up to 2.8 km in the vegetated corridor were identified. This was the first collection of data at this type of a scale, and further analysis will occur to compare results with other large rivers in southwestern Ontario.

The second project in 1999, collected detailed habitat information on pools at the 5 sites where fish sampling had been conducted. Generally, the number, size and structural complexity of the pools was very impressive, despite the drought conditions experienced that year. Pool depths of up to 3.5 m. were sampled, and its known that other pools, most notably the black hole, may reach depths of 10 m. This type of pool formation in a boulder/cobble or bedrock substrate is extremely limited in southwestern Ontario.

Table 2. Fish species Sampled or Angled in the Maitland River below Wingham

Species	1973	1991	1999	Angler or spot surveys	River mouth surveys
Rainbow trout		X		X	
Brown trout		X		X	
Chinook salmon				X	

Coho Salmon				X	
Pink salmon				X	
Smallmouth bass	X	X	X	X	
Largemouth bass		X			
Rock bass	X	X	X		
Bluegill	X				
Pumpkinseed		X	X		
Northern pike	X				
White sucker	X	X	X		
Redhorse sucker	X		X		
Stonecat		X	X		
N. hog sucker	X	X	X		
Rainbow darter	X	X	X		
Blackside darter		X	X		
Fantail darter		X			
Carp	X		X		
Common shiner	X	X	X		
Rosyface shiner	X				
River chub	X	X	X		
Bluntnose minnow	X		X		
Pearl dace	X				
Creek chub	X		X		
Hornyhead chub			X		
Emerald shiner		X			
Longnose dace			X		
Brook lamprey		X			
Sea Lamprey				X	
Walleye					X
Yellow perch					X
Gizzard shad					X
Smelt					X
Channel catfish					X

BIRDS

The Morris Tract Life Science Inventory (Boles *et* al., 1999) reported more than 70 species of birds using the area during the breeding season in 1995.

Some or the larger forested areas in the valley provide habitat for bird species that prefer relatively undisturbed, mature deciduous forests and interior habitat. Screech Owl, Red-bellied Woodpecker, Pileated Woodpecker, White-breasted Nuthatch, Wood Thrush, Ovenbird and Scarlet Tanager are all in this group. These "interior" species generally require large tracts of forest and breed a long distance from the forest edge.

The proximity of the valley to the Lake Huron shoreline attracts a diverse assembly of birds during their annual spring and fall migration. Both Osprey and Bald eagles use the river for migration, (and occasionally for winter feeding in the case of eagles), but no nesting has ever been documented. Turkey Vultures nest in the area, and

upwards of one thousand birds may congregate in the valley, especially upriver of Holmesville, during fall migration in September and October.

Wetlands, that are adjacent to the river or its forested corridor, are generally in low abundance, and this restricts the number of aquatic bird species that might be expected. Canada Geese, Common Mergansers, Bufflehead, and Mallards make extensive use of the river at certain times of the year. Great Blue Herons and Green-backed Herons use the river for feeding during the breeding season and during migration. There is one Great Blue Heron nesting colony in the corridor, near Auburn.

MAMMALS:

The more common forest mammal species are generally abundant in the valley (e.g. deer, raccoons, and coyotes). There are two deer-yards along the river, both of which are upstream of Auburn. Fur-bearing animals, especially beaver, muskrat and mink are common.

RETILES AND AMPHIBIANS:

A provincially coordinated survey of reptiles and amphibians, in the mid-1980's, resulted in the reporting of 19 species in the lower part of the valley (below Holmesville). The species list included 6 snakes, 3 turtles, 1 toad, 6 frogs and 3 salamanders. A pond in the Fall Reserve Conservation Area is one of the richest sites for breeding amphibians in southern Ontario.

SPECIES AT RISK:

The Ministry of Natural Resources, through its Natural Heritage Information Centre, maintains a database on records of species at risk from a great variety of surveys and reporting methods. The database contains records of 1 fish, 1 bird, and 2 reptile species that are considered at risk and that have been identified in the Lower Maitland River valley.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has designated 1 of these species, the Henslow's Sparrow, as being endangered. The record is based on a 1943 occurrence, and the species may no longer be found in the valley.

Louisiana Waterthrush, which nests in the valley, is considered Vulnerable by the Committee on the Status on Wildlife in Canada (COSEWIC).

The two listed reptile species are Wood Turtle and Queen Snake. Two known nesting areas for Wood Turtles have been recorded on the Maitland River and its tributaries. In recent years there has been a sharp decline in the number of these rare turtles, and they have not been seen at one site in the last year or two.

The optimum habitat for Queen Snake is small to medium, permanent, relatively shallow streams with slight to moderate current, often with rocky banks and bottoms, usually in woodland surroundings. The habitat must be open enough for an abundance of sunshine for at least a few hours each clear day. The Lower Maitland River contains suitable habitat of this kind and is a stronghold for the species in Ontario.

There has never been a full survey undertaken on the valley for the specific purpose of locating and identifying rare species. It is quite possible that additional species, especially plants, will be identified in the future.

VEGETATION AND FLORA

VEGETATION AND HABITAT TYPES:

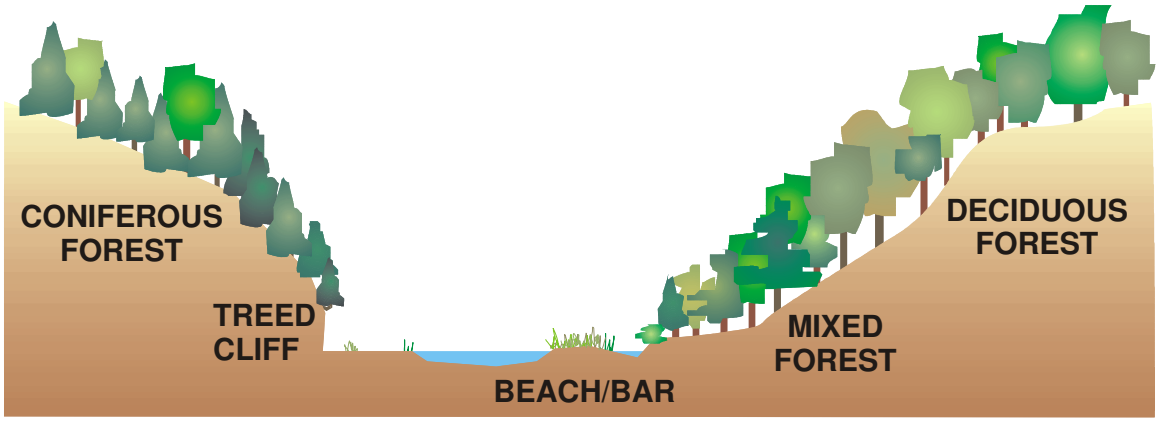
Natural vegetation patterns in the region of the Lower Maitland Valley are dominated by Deciduous Forests of Sugar Maple and American Beech. Trees such as Basswood, White Ash, Red Ash, Yellow Birch, Red Maple, Large Tooth Aspen, Black Cherry and a number of oak species are usually associated with the mixture. Eastern Hemlock and Eastern White Pine also frequently occur mixed with the hardwood types. Hemlock is most often associated with cooler sites on north facing slopes, or in shaded ravines. Bottomlands and wetter areas often contain Blue Beech, Silver Maple, elm species and Black Ash. Eastern White Cedar typically occupies wet depressions, where it may be associated with Tamarack. It is also found in old fields, and on steep slopes along the river and shoreline.

Almost all of the forests in the Lower Maitland Valley, except perhaps the steepest slopes and cliffs have been heavily logged in the past, and some areas have been cleared. Most of the logging and clearing has taken place in the last 150-200 years since European settlement. Many such forests have recovered to a condition that approaches their pre-settlement state, although repeated logging at most sites mean that the trees are much younger, and the forest are less biologically diverse, than they once were. On other land, where disturbances have been more intense, the vegetation has been substantially altered from its pre-settlement condition. Such sites include “Cultural Communities”, those planted or actively managed by humans to keep them in a certain condition, or communities on which management operations have recently ceased. They occur in several places along the valley. Cultural communities include plantations, old fields, hawthorn thickets, pasture, arable land, lawns and so on. Cultural communities usually have much lower biodiversity than natural communities, and are far less valuable ecologically. Never-the-less many, particularly those that are naturally regenerating, play a role in maintaining overall species and habitat diversity. Some cultural communities form a barrier to movement of wildlife, which may be unable to cross an inhospitable terrain.

At any one location, the vegetation depends on the location, soils aspect and land use history (Figure 5). Most of the gentle valley slopes and terraces in the Lower Maitland Valley are covered with Deciduous Forest on deep soils. One of the characteristics of such forest is a rich spring ground flora that blooms in April to May before the leaves open and the canopy closes. Typical species include Trout Lily, Red and White Trillium and Bloodroot. Some of these species such as the Trilliums retain these leaves all summer, while others such as Trout Lily die down and disappear soon after they flower. Seeps and wet places on these slopes organic soils where Skunk Cabbage and Bulblet Fen grow. The ravines and lower slopes with cool seeps may include hemlock.

Figure 5.

PROFILE OF THE LOWER MAITLAND VALLEY SHOWING DISTRIBUTION OF THE MAJOR VEGETATION TYPES



On the steeper, less stable slopes, or in places that have been cleared and re-grown, or where the soil is poorer and thinner, the vegetation changes to Mixed Forest or Coniferous Forest dominated by Eastern White Cedar. Often the canopy is completely closed, shutting out the light to the understory. Occasional deciduous trees of White Birch, Yellow Birch, Basswood or Red Ash may overtop the cedar canopy. The ground layer vegetation is confined to small openings where sunlight penetrates. A characteristic plant of such openings is sedge whose fine, bright green leaves can form a lawn-like carpet where few other plants grow.

On actively eroding slopes, the soil is very thin. If the slope is on bedrock above a cliff, there may be a loose talus of rock and stones. Here the cedars are smaller and more

open. The openings often provide habitat for weedy species that can thrive in unstable conditions. These include native species such as Red Osier Dogwood and Tall Goldenrod as well as introduced aliens such as Coltsfoot, whose yellow flowers, similar to dandelions, are one of the earliest plants to flower in spring. Also found on the steep, unstable slopes are species that do well in the calcium-rich bedrock and parent materials. These include Grass-of-Parnassus and Golden Ragwort.

Where the valley sides are exposed limestone cliffs, the Eastern White Cedar trees cling tenuously to the rock face, and hold on by inserting their roots deep into cracks in the bedrock. As the top of the cliff crumbles trees may slip and hang precariously while they put out new roots. Over the decades, trees take on fantastic and distorted forms. Some of these trees have avoided fire and land clearing and are more than three hundred years old. The Eastern White Cedar Cliff Communities are probably the only old growth forest that remains in the Lower Maitland Valley. The base of the cliffs is regularly ice-scoured, so trees don't grow below a certain height above the river. The cliffs here are bare except for small herbaceous plants such as Harebell and Wild Columbine that grow in cracks in the rocks. One species, Hyssop-leaved Fleabane, is a northern species that occurs along the cliffs of the northern shore of Lake Superior, and up into the arctic. This plant may have survived on the ice scoured rocks of the Maitland Valley for thousands of years, since the retreat of the last glaciation.

Where the banks of the Maitland River have sufficient soil, the vegetation is very different. Tangled shrubs dominate the banks below the forest of the bottomland terraces, and plants grow abundantly in the plentiful light. Species such as Ninebark, Willow and Riverbank Grape abound. Occasional trees of Basswood, Manitoba Maple or Hybrid Willow lean over the bank.

The river flood plain is divided into two main habitat types. Dense, lush meadows of Reed Canary Grass and Canada Blue-joint dominate the low cobble and gravel bars that form at the insides of bends in the river. Reed Canary Grass is a European import, and an aggressive invader. In all but a few places it has replaced the native prairie species such as Cord Grass, Indian Grass and Turkey Grass that were probably once more common. The dense growth of Reed Canary Grass almost conceals the diversity of other species such as Touch-me-not, Boneset and Spotted Joe-Pye-Weed that grow in these meadows. In the late summer Tall Sunflowers and Oxeye make a bright yellow display along the river.

In other places, level beds of exposed limestone form the river shore. High water levels can periodically flood this habitat, but in summer the rock shelves can be hot and dry. Plants survive in cracks where silt and organic debris may get trapped. Perhaps the most characteristic species of the limestone flats is Tufted Hair Grass. Less exposed areas, where flooding is less frequent, and some soil may begin to accumulate support more prairie species such Little Bluestem and Prairie Loosestrife. The habitats associated with these exposed limestone shorelines are poorly represented in southern Ontario, and are considered rare.

FLORAL AFFINITIES AND PLANT DISTRIBUTIONS:

Most of the plant species occurring in the Lower Maitland Valley are typical of the Great Lakes-St. Lawrence forest, however a number of species show affinity with southern and western floras.

The northern boundary of the region known as the Carolinian Zone in Canada lies just south of the Maitland River. This northern boundary represents an average position of the northern limits of several Carolinian plant species. A few Carolinian plants have ranges that extend northwards and include the Maitland River Valley, and a number of species found in the valley are either considered to be Carolinian, or are southern species near the northern limit of their range. A list of some of these plants with southern affinity them listed in Table 3.

Table 3. Vascular plant species in the Lower Maitland Valley that have southern affinities.

Scientific Name	Common Name
Arisaema dracontium	Green Dragon
Carpinus caroliniana	Blue Beech
Carya cordiformi	Bitternut Hickory
Celtis occidentalis	Hackberns
Dryopteris goldiana	Goldie's Fern
Eupatorium purpureum	Sweet Joe-Pye Weed
Hybanthus concolor	Green Violet
Hydrastis Canadensis	Goldenseal
Jeffersonia dipylla	Twinleaf
Lindera benzoin	Spicebush
Meminspermum canadense	Moonseed
Platanus occidentalis	Sycamore
Vitis aestivalis	Summer Grape

Some prairie species found along the river have the centres of their range to the west of Ontario. These include Big Bluestem, Little Bluestem and Indian Grass. Two species, Indian Plantain and Ohio Goldenrod, have ranges confined to the Great Lakes Basin.

The lower Maitland Valley also contains arctic plant species, which are most likely remnant populations surviving on the ice-scoured riverbanks since the last ice retreat. The next nearest populations are on the northern shores of Lake Superior. These species include Hyssop-leaved Fleabane and a grass, Mat Muhley. Plants of cold limestone seeps along the shore cliffs are associated with fen floras, but in the lower Maitland River they grow only metres away from rare prairie species and unusual hybrids. It is partly this diversity of juxtaposed habitats that make the Lower Maitland Valley such a unique place.

SPECIES AT RISK

Several species of vascular plant found in the Lower Maitland Valley are considered provincially rare or have very specific habitat requirements. A list of rare and conservative plant species is presented in Table 4.

Table 4: Provincially Rare Vascular Plants of the Lower Maitland Valley.

Scientific Name:	Common Name
Arisaema dracontium	Green Dragon
Cacalia plantaginea	Indian-plantain
Carex formosa	Sedge
Carex tetanica	Sedge
Cohloselinum chinense	Hemlock Parsley
Eupatorium purpureum	Sweet Joe-Pye-Weed
Hydrastis Canadensis	Golden Seal
Lithospermum latifolium	(American) Gromwell
Monarda didyma	Oswego Tea
Muhlenbergia tenuiflora var. *tenuifolia*	Muhly
Onosmodium molle var. *hispidissimum*	False Gromwell
Panicum clandestinum	Hidden Panic Grass
Valeriana edulris spp. ciliata	Hairy Valerian
Zizia aptera	Prairie Golden Alexanders

USERS, USES AND REGULATIONS

USER SURVEY RESULTS

From June through October 1999, four different user surveys were initiated in the Lower Maitland Valley (Plummer, Ryan. 2000. Unpublished User Survey Results. University of Guelph). The purpose of the surveys was to estimate use and determine characteristics of different user groups. The first survey involved observing vehicles and users at access points. The second survey involved presenting a questionnaire to individuals at each of the access points. Individuals from a variety of community groups conducted the third questionnaire, which focused on trail users. The final survey was focused on visitors at the Falls Reserve Conservation Area.

Data were submitted, entered into a database and analyzed. Findings of the research indicate that there is considerable use within the Maitland River corridor for angling, hiking and camping. The vehicle/user counts provided an overall idea of the amount of use. Based on the assumption that the information, systematically collected,

was representative, the amount of users at access points may be 4136 people over the five month period from June to October 1999. Respondents suggested that they visit the Maitland River because of the numbers of fish and the scenic landscape. Although many people use the river corridor, respondents did not suggest that other groups interfered with their experience to a great extent. Gaining information on interactions that occur among humans and between humans and wildlife contributes to understanding the social carrying capacity.

Information gathered specifically on angling and trail recreation provided additional details. Of those individuals that were surveyed, approximately 5% used the access for hiking and 95% were anglers. Based on information collected at access points, an inference may be drawn about the total number of anglers. If the respondents were representative of anglers, the Lower Maitland River may receive 2470 hours of angling pressure during the five month period, (this is an estimate since we do not know the angling pressure from private access sites) with a catch rate of 0.77 or 1.25 hours of angling effort per fish. Big fish, however, were relatively scarce. In terms of trail use, most respondents stated that they used the Maitland Trail and suggested that a guide/map would be useful. Respondents indicated that the least adequate services/attractions in the area were a lack of outdoor equipment suppliers and guiding.

The difference between these groups illustrates the importance of the developing user profiles. The anglers tend to be males that travel further to get to the Maitland and stay longer. The trail users tend to have a high proportion of women who use the Maitland River more often, but travel a shorter distance and stay for a shorter period. Combining such user characteristics may be important when considering other information relating to tourism, how respondents receive information and suggestions for amenity improvements. The general socio-economic information may also help to ensure responsiveness to users from different groups and agencies. Most respondents in all the surveys received information via word of mouth regarding tourism and recreation opportunities.

In summary, the information collected provides an overview of the intensity and characteristics of recreational users in the Maitland River Valley. Continuing to collect systematic information throughout the entire system may give a more accurate appraisal of use. Although the information collected provided many insights, gathering additional information may be beneficial. Three particular aspects require further attention. First, analysis of the surveys suggest that there may be discrepancies in the amount of total use in the Maitland River Corridor. It may not be possible to get an accurate picture of use through focusing on access points alone. To get a more accurate picture of all uses a systematic user surveys would be required. Second, it may be beneficial to build upon the user profiles developed in this report. For example, the information on angling activities provided some indication of the fishery and angling pressure. It may be useful to explore things such as angler attitudes towards management practices. Finally, the user surveys analyzed in this report predominately captured use among hikers, anglers and Conservation Area visitors. They also focused on activities that take place between June

and October. Personal observation suggests that other activities occur along the Maitland River Corridor. Attempting to capture information regarding these other uses may be useful. Respondents undertaking outdoor recreation the Maitland River Valley along with their comments indicate a high level of admiration for the beauty and natural features of the area.

USES

A short list of all the known recreational uses of the Maitland Valley are found in this section. This list was derived from the Lower Maitland Stewardship Group.

-hiking	-canoeing	-bird watching
-fishing	-kayaking	-snow mobiling
-hunting	-horse riding	-camping
-trapping	-mountain biking	

This is an incomplete list of activities. Other activities may occur in the valley which we are not aware of their existence.

REGULATIONS

Overview

The Lower Maitland River encompasses an area from the mouth of the river at Lake Huron to Forester's Bridge. This area falls under three municipal jurisdictions: Goderich Township, Colborne Township, and the Town of Goderich. Each of these municipalities has its own land use policy plans and respective zoning by-laws. Collectively these municipalities form part of Huron County that have regard to The County of Huron Official Plan (1999). Since Huron County is located in the Province of Ontario, the province has its own land use planning legislation stated under the Ontario Planning Act and the Provincial Policy Statement that all municipalities must have regard to.

The local policy plans (the Township of Goderich Secondary Plan 1977, the Township of Colborne Secondary Plan 1978, and the Town of Goderich Official Plan 1981) generally call for the protection of natural areas including the Maitland River Valley and the adjacent forested lands. The policies allow for non-intensive outdoor recreation uses, forestry, and limited development of existing lots. The creation of new lots is not permitted for new development within the Natural Environment designation. There are, however, areas within and adjacent to the valley which contain existing development and the plans may recognize these areas and allow for limited additional development.

Local policy plans are implemented by zoning by-laws passed by the respective municipalities. The zoning by-laws generally prohibit new development in Natural

Environment areas, but do recognize existing development such as cottages, trailer parks, urban uses, golf courses, etc.

Non-conforming Uses

One of the limitations of planning is that municipal planning documents cannot require pre-existing land uses to cease, unless the uses were not legal when they were established or have voluntarily ceased on their own. Uses of land that existed when a zoning by-law was passed are said to have legal non-conforming rights as protected by Section 34(9) of the Ontario Planning Act. The legal protection provided to existing uses by the Planning Act makes it difficult for municipalities to regulate certain existing uses, even if those uses are considered not compatible with the surrounding area. The expansion of existing buildings and structures is regulated, and the establishment of new buildings is regulated, but uses of land that do not involve buildings enjoy certain protection from zoning by-laws under the Planning Act.

Provincial Policy Statement

The Province of Ontario issued the Provincial Policy Statement (PPS) in 1996 under the authority of the Planning Act. The Natural Heritage section of the PPS intends to protect natural heritage features. Development is not permitted in wetlands and in habitats of endangered and threatened species. Development may be permitted in woodlands, valleylands, wildlife habitat and areas of natural and scientific interest if it is demonstrated that there will be no negative impact on the natural features or the ecological functions for which the area is identified. As more information is gathered about the significance of remaining natural areas and systems, greater onus is placed on municipalities or development interests to conduct environmental impact studies when proposals are being considered.

Huron County Official Plan

Huron County Council adopted a new Official Plan in 1998 that was approved by the Ministry of Municipal Affairs and Housing in 1999. The preparation of the plan followed a community-based process that involved some 1500 participants from across the County. The plan is an easy to read document using the direction and language of the community.

The Natural Environment section of the County Official Plan sets out the values and directions expressed by the community, and identifies policies and actions. The community values a healthy environment including the quality of the water and air, and recognizes that its quality of life is dependent on a healthy ecosystem. The plan directs that an ecosystem approach to planning be followed (meaning that planning decisions should take into account their effect on natural processes, cumulative effects, human health, etc.). The plan also directs that actions and decisions should involve the

community and be pro-active, and that the environment should be protected and enhanced while pursuing economic opportunity.

The policies and actions of the natural environment section of the plan include:

- protecting and restoring the integrity and function of the ecosystem;
- developing watershed management plans; reporting on the state of environment;
- protecting provincially significant natural areas and encouraging the protection of locally significant natural areas;
- promoting agricultural practices which sustain the land base and environment health; and
- respecting natural hazards.

Local Zoning By-laws

Each local municipality has its own zoning by-law passed under the Planning Act. Zoning by-laws regulate the use of land and the establishment, location and size of buildings and structures. Zoning by-laws must conform to Secondary and Official Plans and must have regard for the Provincial Policy Statement.

Most of the Maitland River valley and contiguous forested areas are zoned as Natural Environment (NE1) in local By-laws. Typical permitted uses in the NE1 zone are forestry, passive recreation (e.g., trails), private recreational uses (e.g., tennis court, swimming pool), and public parks. Permanent buildings are generally not allowed, except that existing lots may be eligible for a rezoning to permit a dwelling in non-sensitive areas.

Exceptions to the NE1 zone include areas in the Town of Goderich zoned to recognize long standing uses such the salt brine wells and settling ponds, golf course, marina, harbour and rock salt mine. In Colborne Township, exceptions to the NE1 zone include a marina, the settlements of Saltford and Benmiller, and pockets of cottages in a few locations. In Goderich Township, exceptions to the NE1 zone include pockets of recreational development, a gravel pit, and development at Benmiller.

Other Municipal Regulations

The Huron County Tree Cutting By-law regulates the clearing of forested areas and the cutting for commercial purposes of trees that have not attained a minimum size. Nutrient Management By-laws require livestock operations to demonstrate through a nutrient management plan that an adequate land base and cropping practices are used to apply manure in an accepted manner.

Other Regulations

The Fisheries Act is federal legislation that controls activities that may affect fish habitat, or cause the addition of deleterious substances into the aquatic environment. It is an offence to harmfully alter, disrupt or destroy fish habitat unless authorized by the Federal Minister of Fisheries and Oceans. Creating or enhancing fish habitat nearby must compensate any authorizations.

The Lakes and Rivers Improvement Act is administered by MNR, and deals with the construction, repair and use of dams, or other alterations to watercourses. Permits may be required for works on watercourses including channelizations, dredgings, and the construction of dams, bridges, crossings and docks.

The Public Lands Act is administered by MNR, and provides for the management of crown lands, the granting of water powers and the administration and control of the construction and maintenance of dams. The beds of larger rivers are usually crown land.

The Fish and Wildlife Conservation Act is administered by MNR, and provides for the administration of hunting, trapping, fishing, protection of property, and keeping wildlife in captivity.

The Ontario Water Resources Act is the provincial government's main legislative tool for the control of water pollution and the management of water resources. The act is the primary statute governing the construction, operation and maintance of sewage treatment and disposal.

The Environmental Protection Act contains a general prohibition against the discharge into the natural environment of contaminants that may adversely affect plants, animal life and human health. While the OWRA covers pollution of surface waters, the EPA deals with subsurface pollution.

The Environmental Assessment Act provides a process through which significant impacts on the environment may be prevented before a project is implemented. A full EA is required to undergo a hearing by an environment assessment panel. The panel may deny approval or impose terms and conditions on the issue at hand.

UNIQUE FEATURES OF THE MAITLAND RIVER

-the size, complexity and depth of pools in the river
-rare species – large number for a small area (good taxonomic diversity)
-wildlife concentration areas (heronry/deer yards)
-an expansive, largely forested, undeveloped river valley which is still in a pristine condition
-highly prized rainbow trout, chinook salmon and smallmouth bass fishery
-attracts users from throughout southwestern Ont and adjoining US states

PROBLEMS AND ISSUES

-encroaching development
-intensive recreational use
-poor water quality and quantity issues from remainder of watershed
-potential overharvesting of smallmouth bass
-specialized management requirements of species at risk
-breaks in the forested corridor

SUMMARY

The Lower Maitland Valley is an extremely rich natural resource area, with unique recreational value in southwestern Ontario. This report has brought to your attention many aspects of this beautiful area. This is not a finished report! If you have additional information to share with the Lower Maitland Stewardship Group, please pass this on so we can include it in this report. This area requires an ongoing effort and co-operation between landowners, governing agencies and users to ensure the resources of the valley are sustained for the use and enjoyment of future generations.

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