

SNYDER'S FLATS CONSERVATION AREA



MANAGEMENT PLAN

2016-2026



Grand River
Conservation Authority

Snyder's Flats Conservation Area

2016-2026

Management Plan

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1.0 INTRODUCTION

1.1 Location

Snyder's Flats is situated within the Bloomingdale Oxbow bend of the Grand River in Woolwich Township and immediately east of the City of Waterloo (Map 1). The property is legally described as the Western part of the Oxbow or Bend Lot, Township of Woolwich, Regional Municipality of Waterloo. The property consists of 96.5 hectares (238.5 acres).

Snyder's Flats Road runs west from Bloomingdale and leads to the Snyder's Flats property. The Bloomingdale Community Centre and agricultural land owned by Preston Sand & Gravel are along this road before reaching the Snyder's Flats property. In addition, there is a former Mennonite Church to the north of the road. Of note in the church cemetery are numerous tombstones naming Snyders, Schneiders, and Sniders which dot the cemetery with regularity.

Snyder's Flats is directly across the Grand River from the urban centres of Kitchener and Waterloo which have a combined population of 368,500 (Regional Municipality of Waterloo, 2015). The eastern expansion of these centres has, to date, been encumbered by the expense of crossing the Grand River with services and transport. No major urbanization has occurred to the immediate east of the Grand River in the years since major settlement has taken place. Communities of note, in close proximity to the Snyder's Flats property, on the east side of the Grand River would be Elmira, St. Jacobs, Conestogo, Breslau and Bridgeport.

1.2 History of the Snyder's Flats Property

Historical information was provided in an interview with Florence and Raymond Snyder, the family from whom the property was originally purchased by the Grand River Conservation Authority (GRCA).

The Snyder family lineage in the Bloomingdale Oxbow lots was first established by Jacob Snyder in 1807. Jacob Snyder was an emigrant from Pennsylvania. The land was further carried on through the generations from Jacob to Christian to Benjamin to Fernando and finally to Raymond. Douglas and Richard were Raymond and Florence's sons who later moved to other parts of the Township of Woolwich.

In his first year on the property, Jacob built a modest log house amidst the still existing mature trees on the high ground on the northwestern fringes of the floodplain. Eventually, Jacob and his descendants cleared the land and established a mixed farm. Soon after, the log house was replaced by a 2-storey brick farmhouse and a large barn was built. By

the turn of the century, a full set of outbuildings had been constructed: drive shed, milk house, chicken house, pigpen and a smokehouse.

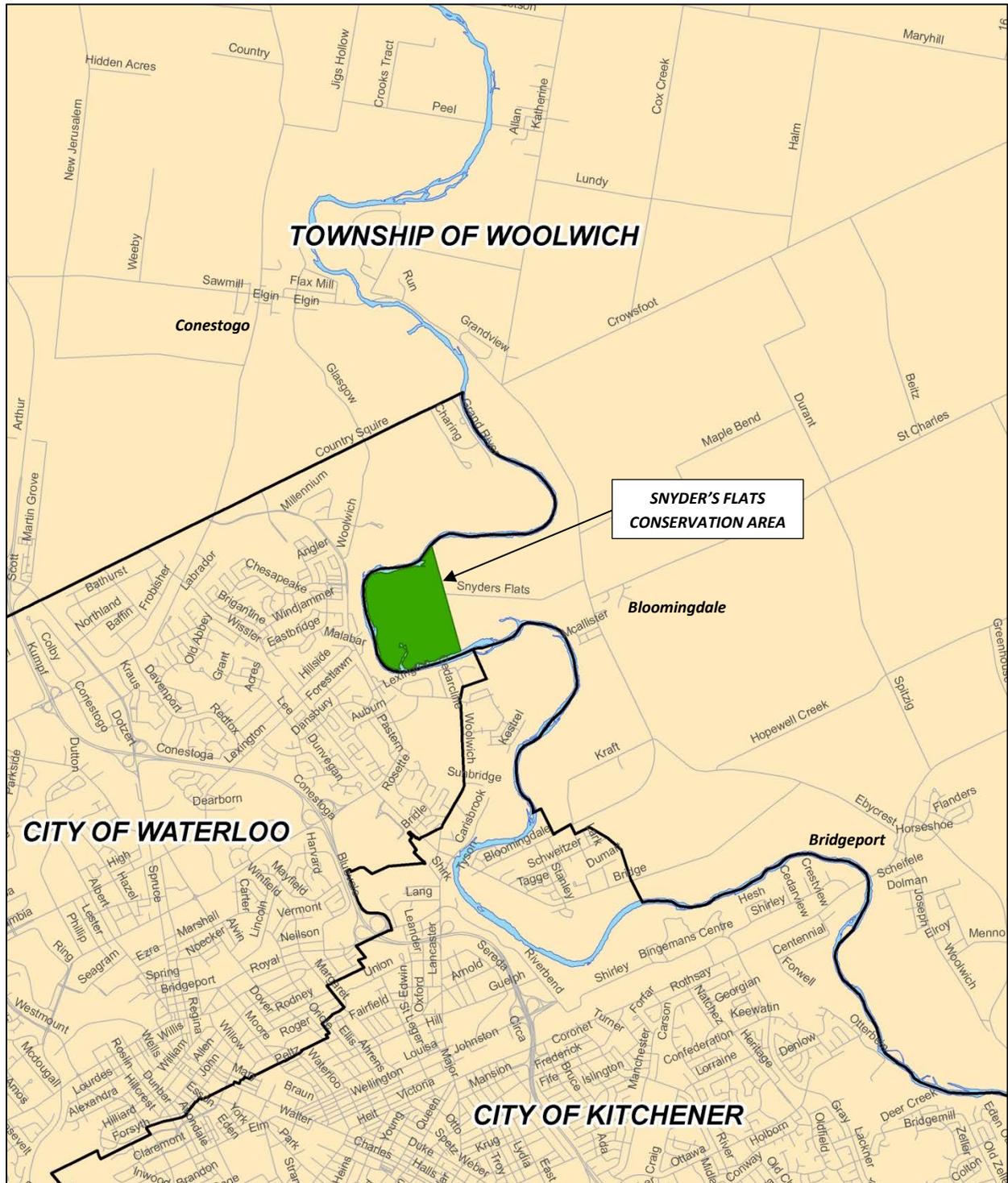
Land use on the farm was distinctly divided by the floodplain. Upland areas were used for row crops, while the flood prone areas were reserved solely for pasturing sheep and cows. The floodplain flats were also a popular picnic spot; first, for the local Mennonites after church services, and later by residents of Kitchener and Waterloo. The floodplain flats were locally known as the "picnic flats".

Eventually, Raymond and Florence Snyder constructed three small cottages and rented them out. As the area became more and more popular for day use recreation, the Snyder's built several outhouses on the picnic flats and charged 25 cents per car to cover expenses.

1.3 Land Acquisition

The Grand River Conservation Authority acquired the Snyder Flats property from Raymond Snyder in 1969 for \$200,000 under the K-W Valley Lands Acquisition Program. In 1973 the GRCA acquired the closed portion of Snyder Flats Road from the Township of Woolwich. At that same time the GRCA transferred to the Township of Woolwich a small parcel of land to permit the construction of a turning circle at the end of the road.

MAP 1 LOCATION OF SNYDER'S FLATS CONSERVATION AREA



2.0 MANAGEMENT PLAN PROCESS

2.1 Developing a Management Plan

A Management Plan describes an overall development concept including present uses and future land development plans for a property. All Management Plans are related to an authority's watershed plan or conservation land management plan, while also contributing to subsequent stages site development and operational planning guidelines for the area of land in question.

Different levels of detail will be required for different types of properties. Management Plans can be prepared on a site-specific basis, or alternatively, one plan can be prepared for an entire class of properties. Furthermore, site specific plans can be comprehensive or focused. A comprehensive Management Plan is a strategic document that identifies the overall objectives for a property, with respect to social, economic, natural heritage and environmental attributes. A focused Management Plan would be less comprehensive. It would not consider a large number of alternative uses, and would not require significant public input.

There are a number of key components included in most Management Plans. They include a general introduction and history of the property, followed by a detailed ABC inventory (Abiotic, Biotic, and Culture), some information about past, present and potential future uses, and then proposed plans that are followed by a suggested implementation process. An approach to developing a Management Plan is outlined below. Depending on the size and nature of the property this process may take several years.

Steps involved in developing a Management Plan are outlined below.

1. Determine the class of plan applicable to the subject property.
2. Gather existing relevant data, management records, Management plans, relevant sections from thematic and/or subwatershed plans, reports, and policies.
3. Identify information gaps that need to be addressed for the appropriate class of plan.
4. Develop and implement a work plan to address information gaps.
5. Develop and implement a strategy for staff and community involvement in the planning process appropriate to the subject Management Plan.
6. Establish the goals and objectives for the management of the subject property.
7. Describe the property's physical, natural, and cultural heritage attributes and context, its history and past management, and its current use.
8. Identify management opportunities and constraints presented by the subject property's physical, social, environmental and cultural attributes.
9. Identify and reconcile potential or current conflicts related to goals/objectives, constraints/opportunities, current or potential use.
10. Create, and show in map form, zones of land use; develop and apply generic and/or specific land use policies to the various zones.
11. Identify threats to the long-term sustainability and ecological health of the property, and recommend mitigating strategies.
12. Recommend policies, strategies, and actions that protect the sustainability and ecological integrity of the property and optimize benefits to the watershed and its community.
13. Compile all of this information according to the appropriate template into an informative and readable Management Plan.

14. Ensure that the plan is compatible with adopted plans or strategies of the Grand River Conservation Authority; the expectations of staff, the board, and the community; and, relevant municipal, provincial, national, and international strategies.
15. Present the Management Plan to the board of the Grand River Conservation Authority for approval.

Historically, most Management Plans provided a twenty year horizon for management activities and development, as well as to set the context for routine property operations. Generally, a Management Plan's time frame is dependent upon its recommendations. A plan usually will take five, ten or twenty years to implement all recommendations.

Key to developing any Management Plan is the involvement of multiple internal professionals, as well as private and public stakeholders. In general, society has a growing demand for outdoor recreation, and therefore, is visiting and using parks more often than in the past. Also, in general, society has a higher expectation of being involved in community matters. There is much knowledge in the community to be brought to the planning process. Therefore, it is vitally important to have their input into the Management Plan process. Also, GRCA staff with backgrounds in planning, forestry, parks management, business, and ecology, provide input to the Management Plan process.

2.2 Snyder's Flats Management Plan

Since 1987 the focus of the rehabilitation efforts at Snyder's Flats has been primarily on the creation of aquatic habitat within the traditional floodplain of the Grand River. A secondary focus has been on the restoration of the former gravel pit to provide terrestrial habitat benefits. On June 14, 1991, the Executive Committee of the Grand River Conservation Authority accepted the following recommendation from the Land Use Advisory Board:

"THAT this board recommend to the Executive Committee that a general concept be developed for the Snyder Flats Conservation Area which would support a passive area suitable for the development of healthy aquatic and terrestrial systems; and that demonstration techniques be developed to determine the suitability of this type of use for other areas of the watershed".

This recommendation has formed the guiding principle for the ongoing development of the Snyder's Flats property.

Since the goals and objectives for the property have been succinctly outlined, and a substantial amount of work has been completed towards meeting these goals and objectives, it has been determined that a focused Management Plan process will be followed in the preparation of the Snyder's Flats Management Plan. This means that relatively few management options would be considered through the process and the public consultation process would be of limited extent. The Snyder's Flats management plan will have a 10 year planning horizon as this is consistent with the time period required to implement the rehabilitation objectives for the property.

3.0 PUBLIC POLICY

This section presents a brief summary of the legislation which may impact on management decision for conservation authority properties. While not all will be directly applicable to the Snyder's Flats property, it is necessary to keep these legislative requirements in mind through the management plan process.

3.1 Federal Legislation

3.1.1 Fisheries Act

In Ontario, the federal government, through the Department of Fisheries and Oceans Canada (DFO), is responsible for the management and protection of fish habitat as outlined in Section 35 of the federal Fisheries Act. Under this section of the Fisheries Act, only the Minister of Fisheries and Oceans may authorize an undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery. In Ontario, DFO, the Ontario Ministry of Natural Resources and Forestry, Conservation Authorities, and Parks Canada all play a role in the management of fish habitat.

3.1.2 Species at Risk Act

The *Species at Risk Act (SARA)* was proclaimed in June 2003, and is one part of a three-part Government of Canada strategy for the protection of wildlife species at risk. This three-part strategy also includes commitments under the *Accord for the Protection of Species at Risk* and activities under the *Habitat Stewardship Program for Species at Risk*. In addition, it complements existing laws and agreements to provide for the legal protection of wildlife species and conservation of biological diversity. The *Act* applies wildlife species and their critical habitat on all federal lands in Canada. On private lands, the *Act* applies to birds and aquatic species.

The purposes of the *Act* are to prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species, and encourage the management of other species to prevent them from becoming at risk. Two of the key ways that it accomplishes this is through the establishment of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as an independent body of experts responsible for assessing and identifying species at risk; and by establishing regulations to protect listed threatened and endangered species and their critical habitat.

3.2 Provincial Legislation

3.2.1 Conservation Authorities Act

The Grand River Conservation Authority derives its mandate from the *Conservation Authorities Act* (1946). The objectives and powers of conservation authorities to become involved in water management and natural resource conservation is derived from Section 20 (1) of the Act:

"The objects of an authority are to establish and undertake, in the area over which it has jurisdiction, a program designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals".

Specifically Section 21(1) of the Act outlines the powers of the conservation authorities which includes the power:

- To study the watershed and develop programs for the conservation, restoration, development and management of the watershed natural resources;

- To acquire and dispose of land subject to the approval of the Minister (of Natural Resources);
- To lease land for a term of 5 years or less;
- To enter into agreements with owners of adjacent land;
- To erect works and structure and create reservoirs;
- To use the lands owned or controlled by the Authority for any purpose it considers proper so long as it is consistent with the objects of the Authority; and
- To establish parks or other recreational uses on land owned or controlled by the Authority and to erect buildings and facilities in support of the recreational uses.

3.2.2 Planning Act

The *Planning Act* is the enabling legislation for land use planning in Ontario. As such it:

- Makes provision for a provincial policy-led land use planning system;
- Promotes sustainable economic development in a healthy natural environment;
- Integrates matters of provincial interest into provincial and municipal planning decisions by requiring all decision-makers to be consistent with the Provincial Policy Statement;
- Provides for planning processes that are fair by making them open, accessible, timely and efficient;
- Encourages co-operation and coordination among various interests; and,
- Recognizes the decision-making authority and accountability of municipal councils in planning;
- Provincial ministries, municipal councils, planners and other stakeholders use the Act when:
 - Preparing official plans and planning policies that will guide future development considering provincial interests, such as protecting and managing natural resources;
 - Regulating and controlling land uses through zoning by-laws and minor variances; and,
 - Dividing land into separate lots for sale or development through a plan of subdivision or a land severance.

The *Planning Act* requires that all decisions affecting land use planning matters “shall be consistent with” the *Provincial Policy Statement (PPS)*. The focus of the PPS is on the achievement of policy outcomes rather than a prescriptive process. As a result decision makers must demonstrate that their decisions are achieving the outcomes anticipated by the PPS in building strong, healthy communities, supporting a strong economy and protecting the environment and resources.

Section 2.0 (Wise Use and Management of Resources) and Section 3.1 (Natural Hazard) of the PPS is of primary importance to the GRCA Land Management Plan and to the subsequent Area Management Plans that will be developed.

The 2014 Provincial Policy Statement provides the provincial policy structure for the management of all land in Ontario, these include but not limited to:

- Strengthening linkages between land use planning and healthy, active communities
- Recognizing the importance of parks and recreation, green spaces trails and trail linkages;
- Encouraging green infrastructure and strengthening stormwater management requirements;
- Recognizing the importance of biodiversity;
- Requiring the identification of natural heritage systems in southern Ontario;
- Refining the area of protection for significant woodlands and valleylands in southern Ontario;
- Clarifying provisions for aggregate extraction within and adjacent to certain natural heritage features;

- Encouraging comprehensive rehabilitation planning after aggregate extraction;
- Promoting the conservation of cultural heritage and archaeological resources.

3.2.3 Endangered Species Act

The Province of Ontario has direct responsibility for many species that are listed under the *Endangered Species Act*. Ontario Parks, a branch of Ontario's Ministry of Natural Resources and Forestry (MNRF), provides protection for provincially listed endangered and threatened species through the *Endangered Species Act* (2007). In addition, policy applicable to the *Planning Act* requires municipalities to protect the habitat of endangered and threatened species. Special Concern species also receive consideration under the Significant Wildlife Habitat section of the *PPS*.

The MNRF oversees the implementation of Ontario's *Endangered Species Act (ESA)*, which was originally created in 1971 and more recently superseded by a new ESA in 2007. The purpose of the current *ESA* is to:

- identify species at risk based on the best available scientific information, including information obtained from community knowledge and aboriginal traditional knowledge;
- protect species that are at risk and their habitats, and to promote the recovery of species that are at risk; and
- promote stewardship activities to assist in the protection and recovery of species that are at risk.

Once species are classified "at risk", they are added to the Species at Risk in Ontario (SARO) list in one of four categories. Endangered, threatened and extirpated species on this list automatically receive legal protection.

3.2.4 Aggregate Resources Act

The *Aggregate Resources Act*, governing approval of pits and quarries and administered by the MNRF, recognizes the potential impact quarrying activities may have on cultural features such as archaeological resources. Furthermore, the development of a pit or quarry will often require an official plan amendment or zoning by-law amendment, and thus would require involvement by the municipality at either the upper or lower tier level. The process for addressing archaeological concerns is similar to that outlined for *Planning Act* related projects. A background study, field survey and detailed archaeological investigations are all identified as required Technical Reports under Part 2.2 of the Provincial Standards for Bill 53 under the *Aggregate Resources Act*.

3.3 Grand River Conservation Authority

3.3.1 Conservation Authorities Act - Section 28: Development, Interference and Alteration to Waterways Regulation (Regulation 150/06 as amended)

The GRCA administers the Development, Interference and Alteration to Waterways Regulation (Ontario Regulation 150/06 as amended) under Section 28 of the Conservation Authorities Act. This Regulation allows the conservation authority the ability to regulate development and activities within or adjacent to river and stream valleys, inland lakes including reservoirs, hazardous lands, wetlands and Great Lakes (Lake Erie) and inland lake shorelines. The regulation also allows the GRCA to regulate interference with watercourses and wetlands. The intent of the regulation is to protect public health and safety and prevent loss of life and property damage. If it can be demonstrated to the satisfaction of the GRCA that the proposed activity, development or interference will not adversely affect these areas, the GRCA may grant permission for proposed work or activities. The majority of the property contains features which

would be regulated under Ontario Regulation 150/06 due to the floodplain, wetland and associated slopes on the property.

3.3.2 Conservation Authorities Act – Section 29

Section 29 of the Conservation Authorities Act states:

An authority may make regulations applicable to the lands owned by the authority,

- (a) regulating and governing the use by the public of the lands and the works, vehicles, boats, services and things of the authority;
- (b) providing for the protection and preservation from damage of the property of the authority;
- (c) prescribing fees for the occupation and use of lands and works, vehicles, boats, recreational facilities and services;
- (d) prescribing permits designating privileges in connection with use of the lands or any part thereof and prescribing fees for permits;
- (e) regulating and governing vehicular and pedestrian traffic and prohibiting the use of any class of vehicle or classes of vehicles;
- (f) prohibiting or regulating and governing the erection, posting up or other display of notices, signs, sign board and other advertising devices;
- (g) prescribing terms and conditions under which horses, dogs and other animals may be allowed on the lands or any part thereof;
- (h) subject to the Forest Fires Prevention Act and the regulations made thereunder, prohibiting or regulating and governing the use, setting and extinguishment of fires. R.S.O. 1990, c.C.27, s.29(1); 1998, c.18, Sched. I, s. 13(1).

3.3.3 Conservation Areas – Grand River (Regulation 106)

Regulation 106 gives the Grand River Conservation Authority specific powers to regulate activities on the lands owned by the authority. The Regulation prohibits some activities such as begging; defacing or damaging property; removing, damaging or destroying plants; removing or destroying soil or rocks; and abusive, insulting or threatening behavior or excessive noise. Other activities are prohibited unless a permit has been issued by the authority. Section 4(2) of the Regulation states:

“No person shall, in the conservation area, except under a permit issued by the Authority,

- (a) kill, trap, pursue or disturb a wild bird, reptile or animal;
- (b) possess or ignite fireworks;
- (c) camp;
- (d) make an excavation;
- (e) possess, shoot, discharge or use a spring gun, air gun, firearm, slingshot or any archery equipment;
- (f) erect, paint or affix a sign or notice;
- (g) engage in fund raising;
- (h) advertise or carry on a business or enterprise;
- (i) conduct a public performance of any kind, or bring equipment for public entertainment into the conservation area;
- (j) conduct a public meeting or do anything that is likely to cause persons to congregate; or
- (k) remain in the conservation area after the posted times. R.R.O. 1990, Reg. 106, s. 4(2).

Regulation 106 also restricts littering, the use of campsites, where and when a person can swim, the use of boats and fires. Under the regulation permits are required for visitors to use day-use areas, for

bringing animals into the conservation area and for the control of those animals, and for the operation of motor vehicles within the conservation area.

3.4 Municipal Policy

3.4.1 Regional Official Policies Plan - Region of Waterloo

Within a regional municipal context Snyder's Flats is located with the upper tier municipal boundaries of the Region of Waterloo. As a requirement under the *Planning Act* the Region's Official Plan must be consistent with the Province's Provincial Policy Statement. The Region of Waterloo's Official Plan (ROW OP) is comprised of eight sections which provide guidance on land use planning within the Region. These are:

- Shaping Waterloo Region's Urban Communities
- Livability in Waterloo Region
- Supporting Waterloo Region's Business Community
- Addressing Waterloo Region's Infrastructure Needs
- Supporting the Countryside
- The Greenlands Network
- Source Water Protection and;
- Managing Aggregate Resources

Snyder's Flats is located in the Region of Waterloo's Rural Area designation and has identified resources for both Aggregates and Greenlands Network.

Designation within the Greenlands Network is primarily associated with the proximity to the Grand River and contains mapped portions of both Significant Valleys and Core Environmental Features. The Greenlands policies are generally intended for areas with natural environment features to be used for passive or limited activities and encourage conservation, restoration or enhancement of ecological functions and linkages.

Aggregate policies within the ROW OP are intended to limit activities on aggregate resource areas to protect the resource for future use and maintain aggregate sources for local market use while still protecting hydrologic resources and water tables.

The Region's Countryside mapping also has the area designated as rural areas special policy area. This allows for some limited opportunity for recreational and tourism uses.

3.4.2 Official Plan and Zoning Bylaw - Township of Woolwich

The Township of Woolwich Official Plan provides guidance on a local municipal. Themes within the Township's Official Plan are as follows:

- Population Policy
- Rural Land Use Policy
- Settlement Patterns
- Economic Policy
- Housing Policy
- Open Space Policy
- Aggregate Resources Policy
- Heritage Policy

- Environmental Stewardship
- Health and Social Services Policy
- Transportation Policy
- Utilities
- Finance Policy
- Community Improvement Policy
- Implementation Policy

Under the Township Official Plan, the policies that apply to the property are: the Aggregate Resources Policy, Rural Land Use Policy and the Environmental Stewardship Policies. The Aggregate Resources and Environmental Stewardship Policies would apply to the majority of the site as both aggregate resources and natural environment (floodplain) exists on the site.

Under the Rural Land Use policy the areas outside the settlement areas are designated as Rural Land Use and the primary emphasis is on Agricultural use and supporting agricultural operations. There are limited options for intensification within the Rural Land Use and intensification or further development would be directed to the settlement areas.

The Township of Woolwich Zoning Bylaw reflects the land uses set out in the Township's Official Plan and provides detailed land use provisions at a site specific level. The property is identified as Extractive ("E") within the zoning by-law which limits uses to extraction of the mineral resource as per the Aggregate Resources Act approval and agriculture activities within those areas not under extraction. Buildings would be limited to support either extraction or agricultural use.

4.0 NATURAL ENVIRONMENT

4.1 Physical Conditions

4.1.1 Climate

The Region of Waterloo, like other portions of southern Ontario, is characterized by a humid continental climate with large seasonal differences of warm and humid summers to cold or very cold winters. Summer days typically reach highs in the mid-20s (degrees Celsius) but may also include several days where temperatures exceed 30°C. During the winter, daytime highs are normally a few degrees below 0°C, but can also be much warmer (above 10 degrees) or colder (the record for the Region is -32 degrees). Waterloo has approximately 140 frost-free days per year.

In an average year, the annual precipitation in the Region of Waterloo is 917mm (Environment Canada, 2015). The area typically receives more precipitation in the spring and summer months than in the fall and winter. Snowfall accounts for approximately 17% of the annual precipitation.

Wind patterns across the Region generally originate from the northwest and southwest. However, conditions observed at Snyder's Flats during the spring and summer months note winds blowing from the south and southwest. An elevated riverbank on the west side of the Grand River may shield lower portions of the property from west and northwest winds.

4.1.2 Surficial Geology and Topography

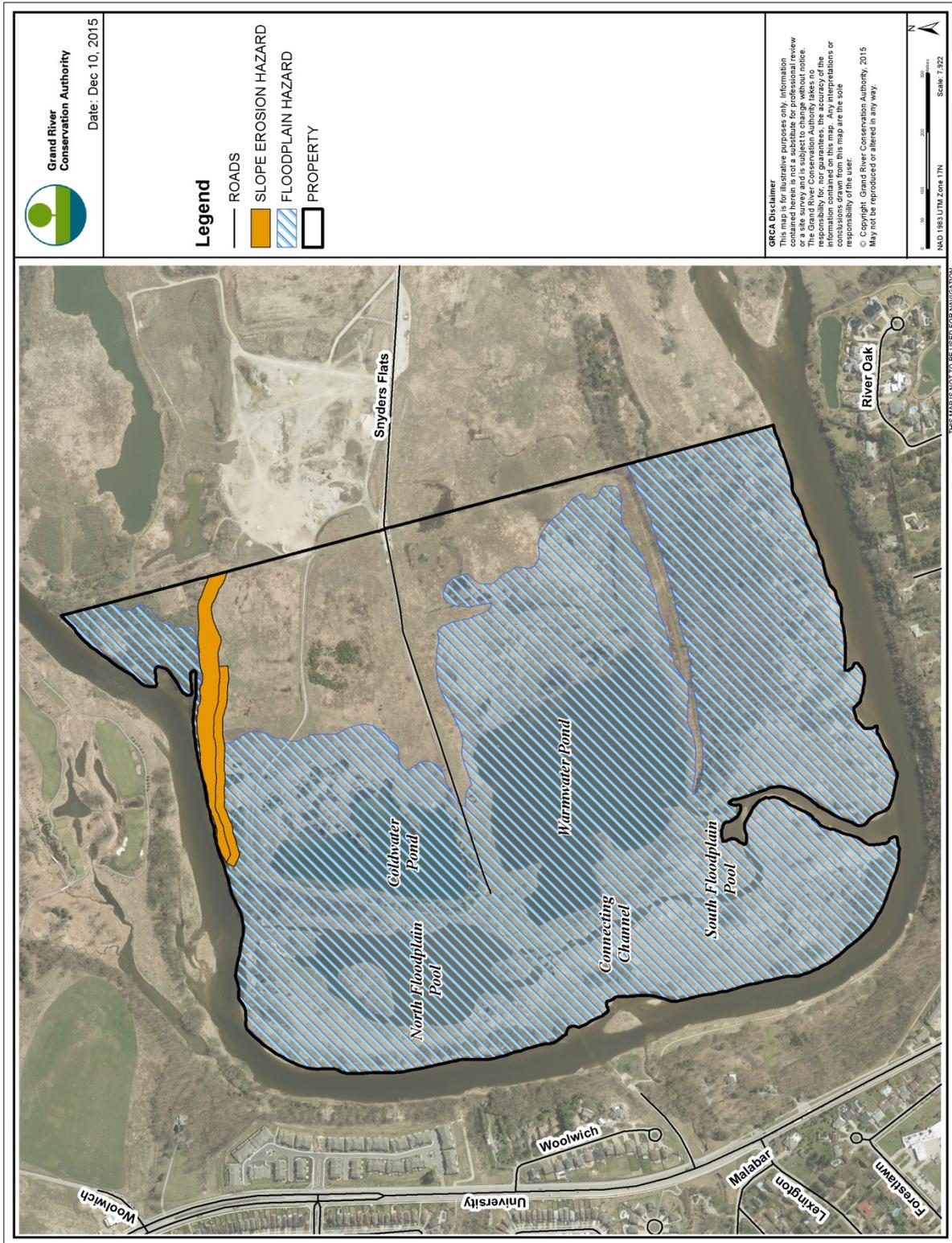
Located within the middle portion of the Grand River Watershed, Snyder's Flats straddles the boundary of two major physiographic regions – the Guelph Drumlin Field and the Oxford Till Plain (GRCA, 2008). Surficial geology provides a foundation for the variations in soils, vegetation and water movement through the landscape. Generally, the Snyder's Flats property is quite flat, with few abrupt topographical features – one being a steep embankment along the northern river escarpment where slopes exceed 20% (Map 2). Another landscape feature is the edge of the floodplain terrace which rings the western and southern portions of the site. The slopes at this interface, between upland terrace and floodplain flats, are between 10% and 15%.

The present-day landforms within the Region of Waterloo are largely the result of glacial activity that took place in the late Wisconsinan substage of the Pleistocene Epoch. This was a period of repeated advancements and melting of continental ice sheets, the last of which is estimated to have melted approximately 23,000 to 10,000 years ago.

As the glacial ice melted, major river valleys were developed and outwash sands and gravels were deposited at the edge of the ice margins. The present course of the Grand River more or less follows this ancient spillway and Snyder's Flats is within the original valley of the meltwaters. The deposits of sand and gravel on the property are outwash deposits described as a glaciofluvial outwash plain. Underlying the sand and gravel unit is very compact grey and sandy silt till identified as the Catfish Creek Till.

Adjacent to the river, (i.e. within about 200 metres) approximately one metre of alluvium, consisting of brown silty sand with trace amounts of gravel, comprises the upper geologic unit. A thin (10 to 20 centimetres) veneer of topsoil is present at a short distance from the river. Beneath the topsoil, a poorly sorted sand and gravel, containing few fines and having a thickness ranging from 1.5 to 10 metres, has been noted on site.

MAP 2 FLOODPLAIN AND STEEP SLOPES



Bedrock in this area originated during the Silurian Era (400 to 425 million years ago) and consists of dolomite, sandstone and limestone. Known as the Salina Formation, the bedrock has been deeply buried by subsequent glacial deposits and only becomes exposed near Paris, in Brant County. This Salina Formation consists of brown dolomite and limestone, grey dolomitic shales, and anhydrite. With the shrinking of the seas which covered much of the area at the time, salt and gypsum were also deposited.

4.1.3 Groundwater Hydrology

The regional geologic characteristics influence the hydrogeology of the Snyder's Flats site. The sand and gravel outwash deposits comprise the water table aquifer, and groundwater movement through this aquifer is controlled by the underlying silt till sloping downward towards the west. The aquifer is continuous across the site but has an average saturated thickness of less than two metres. The aquifer at Snyder Flats is relatively thin (1 to 2.5 metres) and thins towards the east as a result of the till unit rising in elevation to the east of the site.

There is a very limited amount of water flowing across the Snyder's Flats property. Through the upland portions of the property groundwater flow is generally towards the west, but at the edges of the upland areas, flow radiates outwards towards the north and south banks of the river. In the uplands the gradient is approximately 0.014 m/m and decreases moving across the property from east to west.

In the floodplain, groundwater flow is influenced by the change in river water levels but generally flows towards the southwest. In the floodplains the horizontal gradient (water table slope) is relatively low (0.0012 m/m) resulting in groundwater velocities on the order of 1 metre/year.

Because the site is bounded on three sides by the Grand River, the main recharge area is the eastern portion of the property and the adjacent lands. However there is not a significant contribution of groundwater cross flow across the property. In the upland areas groundwater flow across the property is estimated at 5 litres/minute and in the floodplain areas river water can be considered a minor recharge source which contributing to the flow across the floodplain area on the order of 0.35 litres/minute.

4.1.4 River & Floodplain

Located west of Bloomingdale, Snyder's Flats is bounded on three sides by the Grand River. The site is situated on the inside bend of the Bloomingdale Oxbow and the river flows around the property in a north to south direction. Historically the Grand River was likely located further east on the property and as the river shifted towards its current position, it sculptured the valley leaving remnant channels and depressions which can be found in the floodplain today. A large portion of the Snyder's Flats property resides within the regulatory floodplain however approximately 20 hectares is outside the floodline (Map 2).

Flows through this portion of the Grand River are regulated upstream by the Conestogo and Shand Dams. Prior to construction of the dams, the high flows of the spring freshet would inundate the floodplain for up to three weeks with a gradual decline in water levels throughout the third week. This allowed the river 20-25 days of connection with the adjacent floodplain and its oxbow ponds and pools. Today the regulation of flows, by upstream dams, has influenced the riverine conditions and the river responds in a different manner. Instead of a sustained period of flow in the spring, the rivers rise and quickly recede resulting in floodplains that are inundated for 10 days or less.

4.2 Aquatic System

Interaction between a river and its floodplain are important for the productivity and biodiversity of the river valley it occupies. Historically the spring freshet would inundate the flood plain for up to 3-weeks allowing various species of fish to spawn in the pools. As the flow slowly receded, fish fry would follow the water back into the river. With the regulation of flows by dams and clearing of river valley for agriculture and urban development, many traditional floodplain habitat areas have been lost. As a result certain species of fish that utilize the floodplain for spawning are often unable to complete all or part of their reproductive cycle.

The Snyder's Flats project is an attempt to recreate some of those lost features. Through the Snyder's Flats rehabilitation plan, gravel extraction was permitted with the vision of modeling an innovative approach that would lead to the creation of productive aquatic and terrestrial habitat. The floodplain rehabilitation of the site included the construction of five main aquatic zones: the floodplain channel, the north floodplain pool, the south floodplain pool & wetland complex, the cool water habitat and the warm water habitat.

4.2.1 Grand River

The Grand River flows around the outside edge of the Snyder's Flats property for a stretch of 3-kilometres. Between Snyder's Flats and Kiwanis Park the channel tends to be deeper than upstream reaches at approximately 1.2 metres. The channel substrate is a mix of rubble and gravel but with considerable amounts of organics deposited in the deeper pockets. This reach may be better described as a sequence of shallow runs or deep flats as there is less distinction between the pools and riffles in terms of aquatic habitat.

A comparison of almost 50 years of fisheries data shows an expansion in the number of fish species present in the river in the vicinity of Snyder's Flats. Game fishes such as Smallmouth Bass, Largemouth Bass, Northern Pike, Rock Bass, Yellow Perch and Pumpkinseed were not documented during the 1966 biological assessments. The presence of these species upstream of Kitchener since the late 1970's has been documented and is primarily due to improvements in water quality and augmentation of base flows. Two at risk fish species (Silver Shiner and Black Redhorse) and several at risk mussel species (Rainbow Mussel and Wavy-rayed Mussel) are also documented in this reach of the Grand River.

Along the northern riverbank edge of the property, an inlet control structure allows direct flow from the Grand River into the connecting channel during the rising river levels of the spring freshet. This design allows for flooding of the northern floodplain pool and water elevation levels are controlled by a weir installed at the lower end of the pool. The southern floodplain pool is also linked to the floodplain channel and is only flooded by flows from the Grand River during the springtime.

4.2.2 Floodplain Channel

The floodplain channel runs through the complex from the north floodplain pool, past the south floodplain pool and back into the Grand River. It is a 530-meter connecting channel which ensures constant water flow into the floodplain pools through a culvert system and boulder channel. This channel aids in reducing flow velocity, especially during periods of flooding. The main purpose of the floodplain channel is to regulate flooding, while allowing for a constant supply of water during less turbulent times. The boulders and riffles in the channel also serve to churn up the water, thus allowing for oxygen mixing which allows for sustainable aquatic life.

4.2.3 Floodplain Pools

The North and South floodplain pools have been designed to help replace some of the extensive wetlands the Grand River watershed has lost from settlement over the years. Snyder's Flats was originally comprised of its own natural floodplain pools and channels and the re-created ones were designed to replace these and bring fish and waterfowl back to the property. This is achieved through the reshaping of the shoreline to ensure a constant flow of water through the pools, maintain shallow warm water areas, and encourage vegetation suitable for native wildlife species. These floodplain pools will provide ideal habitat for various species including: fishes, amphibians invertebrates, and plants.

The North Floodplain pool is a shallow pool covering 3.8 hectares. Along with its 0.6 hectare island, this pool provides 1,620 metres of shoreline. Seasonal flooding from the Grand River has introduced many species of fish, including Largemouth Bass, Smallmouth Bass, Black Crappie, Northern Pike, Yellow Perch, Pumpkinseed, suckers and many species of minnows. Monitoring has found "young of the year" Northern Pike, Largemouth Bass, and minnow species using the site as nursery habitat.

The South Floodplain pool and adjacent wetland complex is a shallow depression in the floodplain. The area is covered with water during the spring runoff period. It remains damp throughout the summer, and provides habitat for wetland plants and animals.

4.2.4 Warmwater Pond

This 9.6 hectare pond has 1,640 meters of shoreline. Pond depths range from 7 meters along the west and south edges, to 0.6 meters along most of the east side. Although there is no direct flow from the river, the pond has been designed to allow flooding during the spring and fall, through the backup of water from river flows in the connecting channel and south floodplain pool. Spring flood waters attract fish from the river into the pond, where they can spawn and spend the summer rearing their young. In addition to the increased habitat within the Snyder's Flats property, this pond will contribute to the fishery in the Grand River, as fish return to the river when water levels rise again in the fall.



Warmwater Pond

Species such as Largemouth Bass, Smallmouth Bass, Northern Pike, Pumpkinseed and minnows have been recorded in the warmwater pond during fisheries inventories.

4.2.5 Coolwater Pond

Isolated from the other aquatic features, the coolwater pond covers 3.6 hectares and includes 1,120 metres of shoreline. Depth ranges from 6 meters in the southwest corner to 0.6 meters along the eastern edge. The original intent of the coolwater pond was to create a habitat for rearing coolwater fish species that could be released into the Grand River. However, the pond does not receive sufficient groundwater inputs and, therefore, the habitat favours warmwater species.

Several additional demonstration techniques were incorporated into the design to aid the natural cooling effects of the pond. The banks of the pond are steep on the south and west sides and these banks have been planted with trees which provide shading from the hot midday and afternoon sun. The eastern side of the pond is shallow to encourage light penetration which promotes plant growth and a greater variation of shoreline habitats. To break up wind gusts that would cause thermal mixing of the pond, vegetated finger projections were constructed during extraction activities.

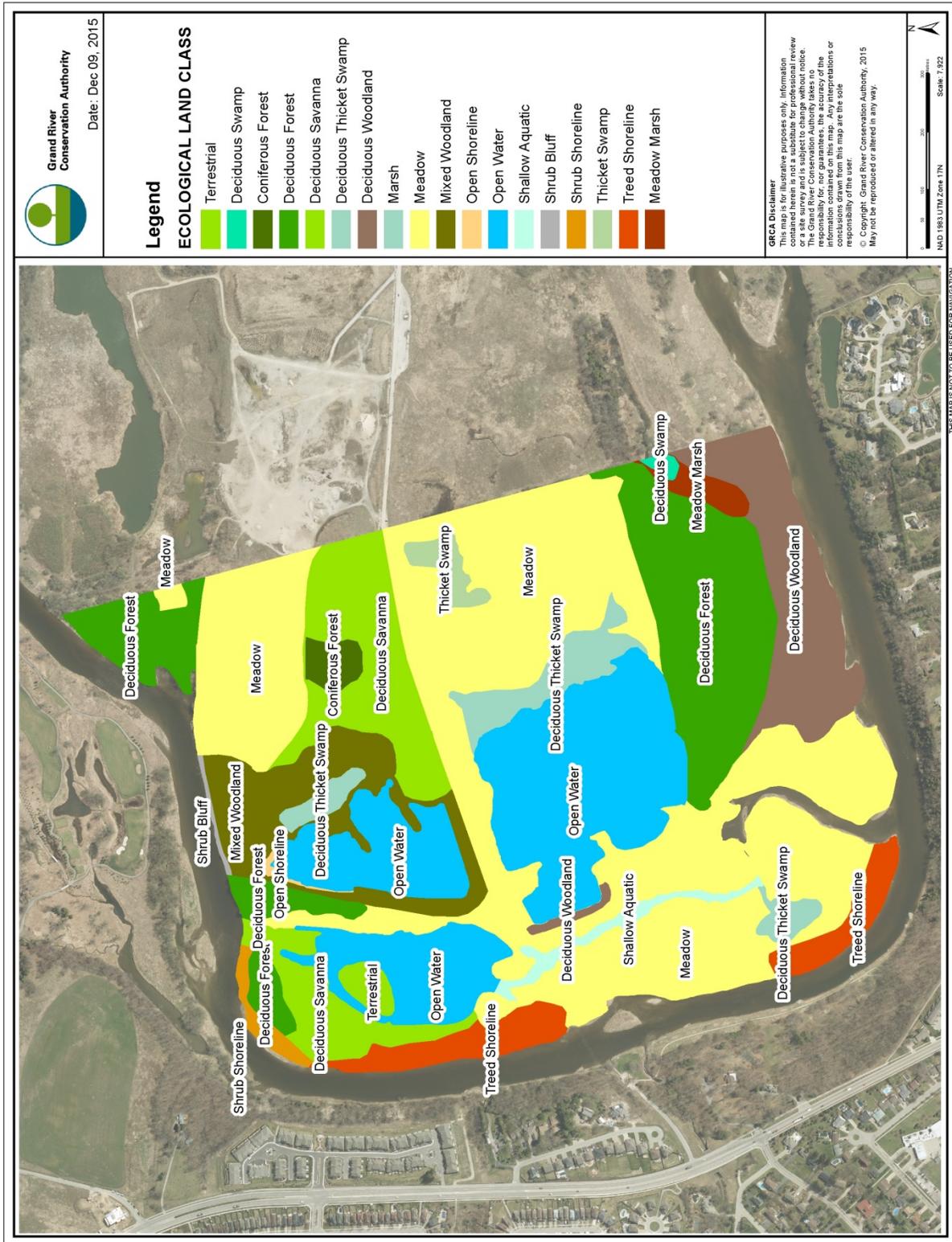
4.3 Terrestrial and Wetland System

From farmland to aggregate pit to valuable wildlife habitats, the Snyder's Flats property has evolved into a diverse ecological landscape. In order to better understand the various ecological communities establishing at the site, the Ecological Land Classification (ELC) System for Southern Ontario (Lee et al., 1998, 2008) was applied. The ELC protocol provides a standardized and consistent method for the identification, classification, and mapping of vegetation communities. The ELC inventory and resultant mapping prepared for Snyder's Flats will inform future land management decisions, including ecological restoration and enhancement efforts, and the protection of sensitive or significant habitat on the property.

Between the fall of 2014 and summer of 2015, vegetation inventories were conducted on the Snyder's Flats property in accordance with the ELC protocol (Lee et al., 1998, 2008). The inventory identified 15 distinct terrestrial ecological communities including dry and wet meadows, thickets, swamp, and forest. Although none are considered regionally or provincially rare, Snyder's Flats provides a variety of habitat types, which in turn support an array of flora and fauna.

Brief descriptions of the major vegetation community classes found on the property are provided in the following section and 18 broad ecosites have been illustrated on Map 3. These broad ecosites have been further subdivided into distinct vegetation community types which are listed in Table 4-1 (Appendix 1).

MAP 3 VEGETATION COMMUNITIES (ECOLOGICAL LAND CLASSIFICATIONS)



4.3.1 Swamp

Swamp communities can be dominated by hydrophytic shrub or tree species (> 25% cover) and are characterized by variable flooding regimes. Both thicket and deciduous swamp communities are present at Snyder's flats. These communities are found in areas of lower topography and/or adjacent to ponds. They are dominated by hydrophytic trees and/or shrubs such as white cedar, pussy willow and red-osier dogwood, which provide valuable habitat for wildlife at Snyder's Flats.

4.3.2 Meadow Marsh

Meadow marsh communities are typically dominated by plant species less tolerant of prolonged flooding. Meadow marsh communities at Snyder's Flats are situated in transition zones between upland and lowland areas, and usually flooded during the spring but wet to dry during the summer months. Two of the larger meadow marsh communities on this site are dominated by common cattail and reed-canary grass.

4.3.3 Meadow

Meadow communities at Snyder's Flats are highly variable in form and function. They range from moist to dry and some are dominated by forbs while others are dominated by grasses or a mixture of the two. All meadow communities have patchy tree or shrub cover and all have a high number of exotic species. Some of these meadows have been planted with trees and/or shrub to advance natural succession.

4.3.4 Savanna

Savannas are communities in which tree cover is greater than twenty-five percent and less than thirty-five percent. These communities typically require some level of disturbance to prevent natural succession, which can lead to the exclusion of desirable species and the development of a forest canopy. Savanna communities at Snyder's Flat are variable in their species composition but all are located on fresh to moist soils. Savanna communities located in the central part of the property are expected to develop into forest communities through natural succession, whereas the savanna community located on the channel connection island is likely to remain as savanna habitat as a result of periodic flooding.

4.3.5 Woodland

Woodlands are semi-treed communities that are typically dominated by more invasive herbaceous shrubs and tree species than natives and have lower than a sixty percent tree cover. Both deciduous and mixed deciduous coniferous woodland can be found at Snyder's Flats. The large, southern woodland contains black maple and hackberry. Located entirely within the floodplain, the woodland is affected by a dynamic system of periodic flooding. The groundcover community has been affected by the colonization of invasive species. Other woodlands on the property are dominated by invasive Manitoba maple. The northerly woodland comprises a mix of deciduous and coniferous species such as white pine, white birch, and white ash, and represents one of the original forest restoration areas on the property.

4.3.6 Forests

There are several areas of deciduous forest communities in Snyder's Flats with the largest; a black maple floodplain forest, located on the eastern edge of the property. This area of forest was never cleared for farmland and offers a chance for trail users to view impressively large black maples as well as butternut (Endangered) and hackberry (Regional Rare) trees. The other deciduous forests are lowland Manitoba maple or oak dominated. A small pocket of coniferous forest is present at Snyder's flats and is the result of the early 1990's restoration work. The forest is white cedar dominated and often used by deer for shelter.

4.3.7 Bluff and Shoreline Communities

A relatively small shrub bluff community is present at Snyder's Flats on the northwest edge of the property. Created and limited by erosion activities from the Grand River and soil composition. Both tree and shrub dominated shorelines are present at Snyder's Flats and is the dominate community interacting with the Grand River along the floodplain channel island. These communities have a high number of invasive species and show evidence of ice sheeting damage and debris build up during spring river melts.

4.4 Monitoring and Inventories

4.4.1 Summary of 2014-2015 Monitoring and Inventory Activities

Biological inventories were completed between the fall of 2014 and into the summer of 2015. Almost 15 years has passed since formal monitoring activities were undertaken on the Snyder's Flats property. Full inventory results are provided in Appendix 1.

Vegetation Surveys

A detailed vegetation inventory has never been completed for the Snyder's Flats property and a complete vegetation survey was not feasible during the update of this management plan. Plant species were observed and recorded in accordance with the ELC protocol and anecdotally during other related field survey work. Plant species observed on the property are listed in Table 4-2 (Appendix 1). The checklist of plants is not considered to be a complete inventory of all vegetation species on the property, but rather provides a representation of dominant species found within the major vegetation communities found throughout the property.

Breeding Bird Surveys

A total of 2 breeding bird surveys were conducted in 2015 in accordance with Ontario Breeding Bird Atlas protocols. The surveys were conducted between sunrise and 10 am. The 2015 surveys covered habitats previously surveyed in 2000 by Dance Environmental (Dance, 2000). In addition to the data generated through these formal surveys, records generated by recreational birders were also compiled and integrated with GRCA records.

To date, 150 bird species have been observed at Snyder's Flats (see Table 4-3, Appendix 1). As many as 82 bird species have been observed during the breeding season and 56 species were determined to be breeding in 2015 alone. The property hosts 64 species that are considered to be significant in the Region of Waterloo and 9 provincially or federally listed species at risk, including Eastern Meadowlark, which breeds regularly on the property. The diversity of bird species observed on the property throughout the year can be attributed to the property's diverse mix of aquatic and terrestrial habitats.

Fisheries Surveys

In partnership with the Ontario Ministry of Natural Resources and Forestry, electrofishing surveys were conducted in the floodplain channel and ponds in June 2015. Shallow areas within the northern floodplain pool, warmwater pond, and coolwater pond were surveyed using seine nets and minnow traps. A total of 33 species were confirmed during the sampling events. Complete results are listed in Table 4-4 of Appendix 1.

A creel survey was posted on the Grand River Fish Plan and the Grand River Conservation Authority Facebook pages on May 26th 2015. Recreational anglers confirmed that several fish species are being

caught within the aquatic features on the property including Black Crappie, Yellow Perch, Largemouth Bass, bullhead catfish, Common Carp and Northern Pike.

Amphibian Surveys

Breeding amphibians were surveyed in accordance with the Marsh Monitoring Program, which is administered throughout the Great Lakes Region by Bird Studies Canada in cooperation with Environment Canada and the U.S. Environmental Protection Agency. A total of 3 surveys were completed at least 15 days apart during appropriate weather conditions in the spring. Four species were confirmed during the surveys and are listed in Table 4-5. All were confirmed by vocal identification and with the exception of spring peeper, all were visually identified as well. Frogs are using the pond for breeding.

Incidental Wildlife Observations

Turtles, snakes, mammals, and butterflies observed on an incidental basis were also recorded. Species observed on or within the vicinity the property by GRCA staff and others are listed in Table 4-5 and Table 4-6. Snapping turtle, a species of special concern in Ontario, was the only provincially significant species observed. Snapping and midland painted turtles are confirmed to be nesting along the sandy shorelines.

4.4.2 Summary of Monitoring and Inventory Activities prior to 2015

A comprehensive hydrogeology and natural heritage features report was completed in 1988 prior to the floodplain restoration works. In 1991, rehabilitation of the site began in stages with the majority of the works completed in 1995 upon the completion of gravel extraction. Monitoring by the GRCA was conducted between 1991 and 1996 to assess the establishment of the newly created aquatic habitats.

In 2000, a follow up study was completed by Dance Environmental Inc. This study consisted of a breeding bird survey, a wildlife habitat assessment as well as management recommendations. No other inventory or monitoring work has been completed on site since 2000 with the exception of tree survival assessments completed yearly since 2009. All known previous monitoring data has been included within the Appendix 1 tables.

1966	The “Biological Survey of the Grand River and its Tributaries” identifies 8 species of fish in the Grand River in the vicinity of Snyder’s Flats.
1988	A complete fauna survey was last completed throughout 15 visits between May and September of 1988. Seventy species of terrestrial wildlife were observed: 3 amphibians, 6 reptiles, 47 birds and 14 mammals and 8 fish species.
1991	Fish inventory completed for the connecting channel, northern floodplain pool, coolwater and warmwater ponds. A total of 17 fish species were identified. Note the connecting channel and northern floodplain pool were not connected to the Grand River at this time.
1993	A biological diversity study was conducted focusing on fish, snakes, turtles and amphibian species. The connecting channel, northern floodplain pool, coolwater and warmwater ponds were sampled and a total of 19 fish species were inventoried.
1994	Fish and aquatic plant survey was completed for the connecting channel, northern and southern floodplain pool, and coolwater pond. A total of 18 species were identified.
1995	Snyder Flats Watershed Assessment Report by Blair Hamilton of GRCA Aquatic Resources inventoried a total of 14 fish species throughout the connecting channel, northern floodplain pool, and cool and warmwater ponds.
1996	A total of 18 species are reported through fisheries inventories in the connecting

channel, northern floodplain pool, coolwater and warmwater ponds. Overall, between 1991 and 1996 a total of 26 different fish species are documented - eight of these species are game fish.

2000 A natural heritage report was completed by Dance Environmental Inc. This study consisted of a breeding bird survey, a wildlife habitat assessment and management recommendations.

2009-2014 More than 45,500 native trees and shrubs have been planted since 2009 as part of the Kitchener-Conestogo Rotary Forest at Snyder's Flats. Survival census of trees and shrubs takes place in Year 1, Year 2 and Year 5 following establishment.

4.5 Provincially Significant Species

The following sections provide a summary of provincially significant species that have been observed at Snyder's Flats. The list of species includes species that are ranked by the Natural Heritage Information Centre as being rare in Ontario (S1-S3) and provincially and/or federally listed species at risk. A full listing of provincially significant species is found in Table 4-7 of Appendix 1.

4.5.1 Flora

Butternut (*Juglans cinerea*) and the Slender Bush-clover (*Lespedeza virginica*) are ranked as critically imperilled (S1) in Ontario, and both are listed as endangered at the provincial and federal level. Butternut is a tree species recorded throughout the lowland forested area and slender bush-clover is a dry meadow / grassland species. Canada Lily (*Lilium canadense*), an attractive lily, was found within edge habitats at Snyder's Flat is also ranked as critically imperilled (S1) in Ontario. Wingstem (*Verbesina alternifolia*), a larger perennial herbaceous flowering plant, is ranked as vulnerable (S3) in Ontario. This species was found in wet meadow areas on the property.

Three species identified on the property are considered to be rare (significant) in the Region of Waterloo: White Water Lily (*Nymphaea alba*), Virginia Mountain Mint (*Pycnanthemum virginianum*), and the Hackberry (*Celtis occidentalis*).

4.5.2 Fauna

Fish surveys, previous to 2015, revealed the presence of Silver Shiner (*Notropis photogenis*) and Black Redhorse (*Moxostoma duquesnei*) in the main channel of the Grand River. In 2015, electrofishing surveys confirmed that silver shiner is also present within the connecting channel at Snyder's Flats. This species is listed as threatened in Ontario, and is considered a species of special concern in Canada. Silver shiners prefer moderate to large size streams with swift currents that are free of weeds and have clean gravel or boulder bottoms. They live in schools and feed on crustaceans and adult flies that fall in the water or fly just above the surface. In June or July, they spawn by scattering their eggs over gravel riffles. Black redhorse is also listed as threatened in Ontario. The species prefers pools and riffle areas of medium-sized rivers and streams that are usually less than two metres deep. These rivers usually have few aquatic plants, a moderate to fast current, and a sandy or gravel bottom. In the spring, it migrates to breeding habitat where eggs are laid on gravel in fast water. The winter is spent in deeper pools. Adults feed on crustaceans and aquatic insects, while the young fish feed on plankton.

Out of 150 bird species observed Snyder's Flats, 9 are listed as provincial and/or federal species at risk. Provincially listed species at risk include bald eagle (*Haliaeetus leucocephalus*), bank swallow (*Riparia riparia*), barn swallow (*Hirundo rustica*), bobolink (*Dolichonyx oryzivorus*), chimney swift (*Chaetura pelagica*), eastern meadowlark (*Sturnella magna*), and hooded warbler (*Wilsonia citrina*). Chimney swift

and hooded warbler are also listed as federally threatened. Two species, red-shouldered hawk (*Buteo lineatus*) and rusty blackbird (*Euphagus carolinus*), are listed as species of special concern at the federal level and are not considered to be at risk in Ontario.

4.6 Invasive Species

With the exception of the pond works and tree planting efforts, the majority of the property was restored through natural regeneration. Given that the area has been highly disturbed and is located near an urban area, it is not surprising that thirty of the ninety-six species currently identified on the property are listed as exotic to Ontario. Only 8 species are considered to be harmful to native vegetation communities, and only 4 of these are considered highly aggressive and are expected to have significant impacts on native communities. These 4 species include Himalayan balsam (*Impatiens glandulifera*), common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Rhamnus frangula*) and common European reed (*Phragmites australis* subsp. *australis*). Recent management efforts have been implemented in order to help reduce the size of existing *Phragmites* populations on the property and to limit its spread within the local landscape and region.

5.0 OPERATIONS AND MANAGEMENT

5.1 Site Management

5.1.1 Restoration / Enhancement Activities

The Conestogo and Shand dams regulate upstream flows and have influenced the riverine conditions in this reach of the Grand River. The spring freshet no longer follows a historical pattern of flooding where there would normally be up to two weeks of high flows followed by another week of gradual decline in water levels. This allowed 20-25 days where the river was hydraulically connected to the adjacent floodplain and its oxbow ponds and pools.

Today most freshets are controlled to the point where the duration of flooding within the floodplain has been reduced to 10 days or less. As a result, certain fish species that utilize the floodplain for spawning are often unable to complete all or part of their reproductive cycle due to limited access to suitable flooded vegetation or adhesive eggs, which are still incubating, being left high and dry by declining water levels.

In spite of these variable conditions, floodplain pools provide considerable benefit to the aquatic system. There is a certain level of production and biomass of juvenile fish which may be recruited back to the river. By means of a summer storm event or in the case of a catastrophic event such as a riverine fish kill, the pools can act as 'fish havens'. There is also a conversion of energy from the terrestrial ecosystem back to the aquatic system through the annual flood event.

The loss of wetlands and sensitive areas resulting from various land use practices (farming, clearing the land, drainage, urban expansion, etc.) within the Grand River watershed has been significant. The loss of these areas has led to a decrease in ecological diversity. Over the years, development along the Grand River and its tributaries has disrupted natural river wetlands which are a vital component of the ecosystem.

Historically, the floodplains provided a "natural" area for many species through the provision of floodplain pools and wetland habitats. These natural areas provided refuge for fish, mammals and waterfowl during times of spring freshets and winter snow melts. At other times of the year, these same areas provided resting areas for waterfowl migration and food sources for predator species.

In 1979 the GRCA entered into an agreement with a local aggregate producer to extract gravel from the Snyder's Flats property. The aggregate extraction continued for the next eight years with two major conditions being applied to the continued extraction:

- (i) That 5 acre strips be worked and rehabilitated at one time;
- (ii) That a setback limit of 50' from the normal riverbank be observed.

During this time the rehabilitated land was being put back into agriculture and the floodplain lands remained as regenerating river flats. In 1987, excellent gravel resources were uncovered which extended well below the water table. This prompted the development of the Snyder's Flats Rehabilitation Plan and, subsequently, to the creation of the various aquatic components of the plan.

The Snyder's Flats Rehabilitation Project provided a unique opportunity to return some of the wetland to this portion of the river valley simply by designing for nature in the extraction and rehabilitation of an active gravel pit. The post-extraction rehabilitation project that has occurred on the Snyder's Flats property has created floodplain pools and wetland areas on a stretch of the Grand River that is was not previously very productive. The creation of nursery areas provided refuge and spawning areas for many warm water species of fish and waterfowl. This nursery area provides angling opportunities in an urban area where angling demand is increasing.

The property currently provides a "natural" environment for passive recreational uses such as hiking, biking and dog-walking. The close proximity of this property to the urbanized areas of Waterloo Region makes the area particularly attractive for these uses. The innovative rehabilitation of a former aggregate extraction operation presents numerous opportunities for public education and scientific research opportunities.

The following is a summary of the work carried out on the site from 1989 to 2015:

- 1989** • Coolwater pond under construction.
- 1990** • In April 1990, 7575 White Cedar were planted around the coolwater ponds.
- 1991** • An inlet control structure was installed, directing flow from the Grand River through the north flood plain pool. A weir was installed at the lower end of the pool to control the water elevation.
- The floodplain channel was built, with a straight configuration and a consistent grade throughout. This allowed the natural evolution of the channel to be observed, as riffles and pools formed, and a meander pattern developed.
- The south flood plain pool, which is only flooded during the spring freshet, was linked to the floodplain channel to minimize the chance for stranding fish when the spring flows recede.
- A number of innovative soil bioengineering structures were installed including live crib walls, live fascines, and brush layers. These structures provided an opportunity to examine the suitability of using plant material to stabilize highly erodible sites.

- 1992**
 - Extraction of the warm water habitat pond continued.
 - Spring flows washed out the barrier berm, allowing flows from the river to inundate the warm water pond. Numerous species of fish were introduced, and remained in the pond when the flows receded.
 - The spring inundation provided sufficient information to determine that the warm water habitat could function as a backwater area that will flood in the spring and fall. Isolated from the Grand River during normal flow periods, the pond provides a sheltered area for spawning and rearing fry throughout the summer. When the river rises in the fall and the following spring, fish will have an opportunity to re-enter the river.
- 1993**
 - Extraction below the water table in the warm water habitat pond was completed in the fall.
 - No major capital works were installed this year, although a trial soil bioengineering project was carried out.
 - The suitability of synthetic erosion control blankets for establishing quick cover in erosion prone areas was tested. It was determined that the mulch blankets provide excellent erosion protection, and assist with establishing dense grass cover.
- 1994**
 - In the spring ice jamming at Kaufmann's Flats caused flow in the Grand River to back up and inundate the cool water habitat which may have introduced fish to this isolated pond.
 - The warm water habitat was left isolated from the rest of the complex to allow for the establishment of aquatic vegetation before the introduction of large numbers of fish.
- 1995**
 - In the spring the area around the warm water habitat was frost seeded with a mixture of legumes and grasses. Frost seeding appears to be well suited for establishing cover on the well-drained soil on the Snyder Flats property.
 - A link was made between the floodplain channel and the warm water habitat in the fall which allowed the area to flood with the spring freshet and fish could migrate from the river to the pond. It is expected that fish will enter the pond to spawn and rear their young for the summer, and re-enter the river in the fall or the following spring.
 - The soil bioengineering installations proved to be quite successful. In the spring of 1995 beavers ate most of the live plant material and built a lodge against one of the live crib walls. Since the willow, dogwood, and poplar plants respond well to trimming, the plants have regrown with renewed vigor.
- 2009**
 - GRCA launched the Kitchener Conestogo Rotary Forest at Snyder's Flats with the erection of a new kiosk and the first phase of tree planting (16,000 trees).
- 2010**
 - Prescribed burn and seeding of tall grass prairie; design and construction of trails; installation of second kiosk and benches; 20,000 trees planted by volunteers
- 2011**
 - Trail upgrades continued; interpretive signage installed; 7,100 trees planted, 2,500 tree replanted, and 5,000 trees tended
- 2012-15**
 - Invasive plant control; trail maintenance; adaptive infill tree planting; tree maintenance and tending.

5.1.2 Partnerships

Site rehabilitation has involved the efforts of numerous partners. The following organizations have participated in the rehabilitation of the Snyder's Flats property by providing funding for restoration activities or providing volunteers for trail development, tree planting or invasive species control:

- Kitchener-Conestoga Rotary Club – The proceeds from the annual “Dream Home Lottery” were awarded to the GRCA in 2008 for the purpose of establishing forest and grassland habitats, and trails at Snyder’s Flats. The objectives of the “Rotary Forest” were to enhance habitat, improve public access, and enrich the user experience. The donation of approximately \$182,000 provided the funding necessary to advance the terrestrial rehabilitation of the site.
- Good Foundation – In 2008 the Good Foundation donated \$25,000 toward the “Rotary Forest” project.
- Trees Ontario
- Waterloo Catholic District School Board
- Waterloo Region District School Board
- Royal Bank of Canada
- Township of Woolwich Environmental Enhancement Committee
- Region of Waterloo – Environmental Champions Club
- C.R.E.W. Geocaching Group
- First Mennonite Church

5.1.3 Existing Property Use

Nature Appreciation

The trail system at Snyder’s Flats provides the opportunity for hiking through upland hardwood forest, areas of old field regeneration, floodplain meadows, riverine and pond shorelines and established grasslands. The diversity of habitats attracts a wide variety of bird and animal species which, in turn, attracts visitors who wish to view these species. The picturesque and changing views, combined with the close proximity to a major urban area, attracts a large number of people to the property throughout the year. While there are no statistics to indicate the number of visitors to this area on an annual basis it is not uncommon to find 30 to 40 vehicles parked at the entrance at any given time.

Fishing

The created ponds on the property contain a diverse variety of fish species including small and largemouth bass, yellow perch, pumpkinseed, black crappie, northern pike and common carp. Fishing is permitted on the property provided the anglers follow provincial fishing regulations regarding recreational fishing licenses, open seasons and catch limits. No boats are permitted on the ponds.

Swimming

Swimming in the ponds is a popular activity at Snyder’s Flats although it is a prohibited activity. The GRCA does not have the facilities or staff resources in place to allow swimming in the ponds to occur safely. As a result the area is posted as “No swimming”. In addition, swimming in the ponds is contrary to the habitat enhancement objectives. The most productive environment in a water body is the near shore area where sunlight can penetrate to a sufficient depth to encourage the growth of aquatic vegetation. Uncontrolled entry of humans and animals into the ponds results in the degradation of the shoreline and the destruction of vegetation.

Dog Walking

By far the most popular activity at Snyder's Flats is dog walking. Walking with a dog on a leash of no more than 2.0 metres (6 feet) is a permitted activity. However, a large proportion of dog owners allow their animals to run "at large" while on the property. Anecdotal evidence from public comments suggests that off leash dogs are discouraging some members of the public from enjoying the conservation area. In addition, there are specific safety and environmental concerns related to off leash dogs which include:

- Potential harm to conservation area visitors (dog bites or being knocked down);
- Potential harm to other dogs;
- Environmental harm (destruction of habitat, disruption of nesting, harm to wildlife)
- Potential for conflicts between conservation area visitors;
- Potential harm to the dog resulting from vehicular accidents or attacks by wildlife; and
- Potential for the spread of diseases from uncollected dog waste.

A literature review was conducted to gain a greater understanding of the potential impacts of dogs on wildlife communities. This topic has received increased attention in recent years and there have been several studies which are relevant to Snyder's Flats. A study conducted by Banks and Bryant (2007, p.613) reported a 35% decline in diversity of bird species in areas where dog walking occurs, and for those species that were present, there was a 41% decline in abundance. The presence of pedestrians alone has been shown to have an impact on wildlife but the impact increases when dogs are added and where the activity occurs away from formal trail systems (Sine, 1999, p. 8.11; Miller et al, 2001, p. 130; and Lenth et al, 2008, p. 225). The literature encourages resource managers to consider the impact of dogs on wildlife when making management decision on environmentally sensitive lands.

5.2 Operational Considerations

5.2.1 Management and Operations

Staffing

Snyder's Flats Conservation Area operates as a passive recreational area with no on-site staff. Laurel Creek Conservation Area personnel are responsible for maintenance and enforcement for this area. Laurel Creek has two full-time staff members who are responsible for the day-to-day operation of the Laurel Creek Conservation Area, approximately 1,800 acres of property, two large flood control dams and several other small dam structures. Limited staff resources result in infrequent staff visits to Snyder's Flats with most visits related to routine maintenance or in response to public complaints.

Budget

Snyder's Flats is a non-revenue generating property which means that no entry fees are charged for the use of the property. Operating funds are derived primarily from revenues generated through the property rental program and through contributions from the Grand River Conservation Foundation (GRCF). The Snyder's Flats property is not supported by the municipal levy or by government grants. The annual operating budget for Snyder's Flats in 2014 and 2015 was \$6,600 although typical expenditures

are in the range of \$3,000 per year. In prior years, the GRCF provided up to \$20,000 annually for rehabilitation projects.

5.2.2 Facilities and Infrastructure

The facilities and infrastructure present on the Snyder's Flats property are shown on Map 4. At the end of Snyder's Flats Road a small parking area has been constructed which can accommodate approximately 24 vehicles. During busy periods, visitors also park along the township road. There is a locked gate at the entrance which allows maintenance vehicles to enter the property.

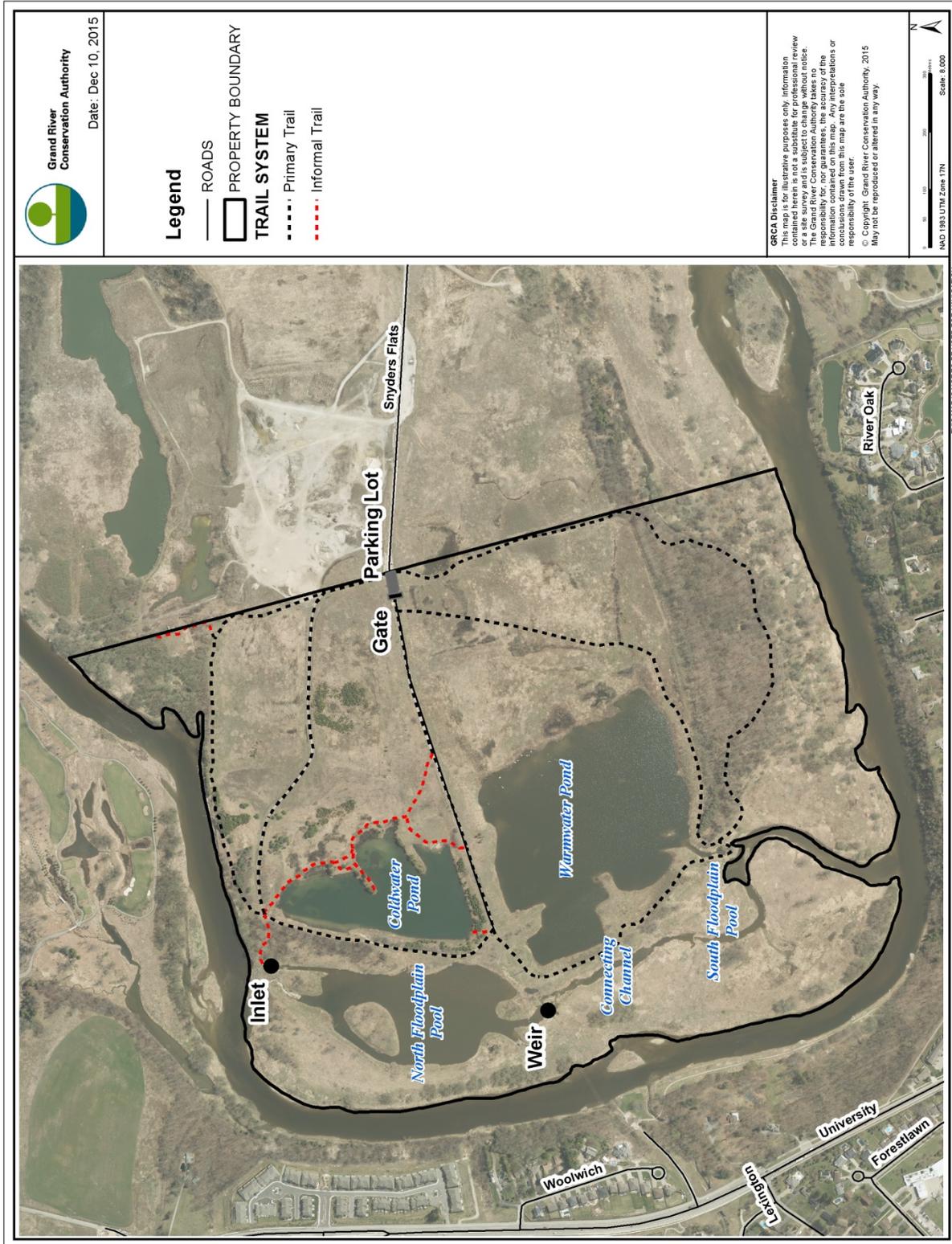
The primary trail system follows the former road allowance that runs east-west through the middle of the property with loops around both the cool water and warm water ponds. In addition to the main trails there are several smaller footpaths that traverse the woodlot in the south portion of the property, follow a section of the Grand River and access other areas around the ponds. The primary trail system consists of a combination of stone dust trails and smaller earthen trails totaling approximately 5.5 kilometres in length.

These trails are currently in good condition but will require periodic inspections and maintenance. An annual inspection should be completed to ensure that acceptable trail standards are being maintained. Over time a number of informal footpaths have developed as the public create their own routes through the property. Some of the more frequently used informal trails are shown on Map 4 but there are more on the property that have not been mapped. Informal trails may increase human intrusion into a natural area and can disrupt wildlife behaviour. Visitors to the area should be encouraged to stay on the primary trails to lessen these impacts. Informal trails should be assessed and closed wherever possible.

As part of the original rehabilitation plan an intake structure was constructed at the inlet to the floodplain channel to direct water from the Grand River through the floodplain channel and floodplain ponds during high flows. Erosion of the river bank is occurring immediately downstream of the inlet. Re-grading will be required as a high priority over the next few years to prevent a more direct connection to the Grand River.

There are no other structures on the property other than kiosks, signs and benches. In addition, there are no services such as drinking water, washrooms or electricity provided to the public. Ontario Hydro has an easement over the former road allowance and maintains a pole line in this location.

MAP 4 FACILITIES AND INFRASTRUCTURE



6.0 COMMUNITY ENGAGEMENT

6.1 Community Engagement Process

A public open house was held on November 9, 2015 at the Bloomingdale Community Centre to provide the public with an opportunity to review the information collected through the management plan process and to discuss with GRCA personnel the proposed recommendations for the site. The open house was advertised through the local media and notice of the meeting was posted on the GRCA website. Information regarding the open house was also sent directly to a number of organizations who have had past involvement in the restoration activities at Snyder's Flats.

Approximately 100 people attended the open house. The presentation consisted of a series of display boards that explained the management plan process, the results of the biological inventory work and the recommendations for future management of the property. The public were encouraged to submit their comments and suggestions through the use of comment forms provided at the meeting.

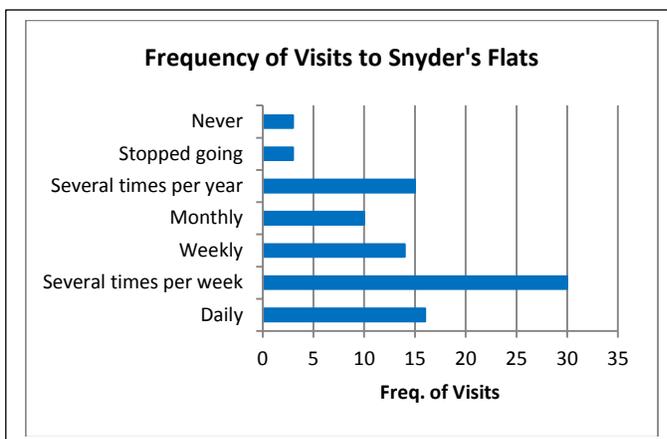
Alternatively, the materials presented at the meeting were posted to the GRCA website along with an online survey that the public could use to submit their comments.

Based on postal code information collected at the meeting attendees at the open house were from Kitchener (37%), Woolwich Township (29%), Waterloo (28%) and various areas within Wellington County (6%). Postal code information was also collected from the on-line survey. Together this information suggests that the majority of visitors to Snyder's Flats drive an average of 15 minutes to reach the site. Some visitors however noted in their comments that they travel up to 30 minutes.

6.2 Public Comments

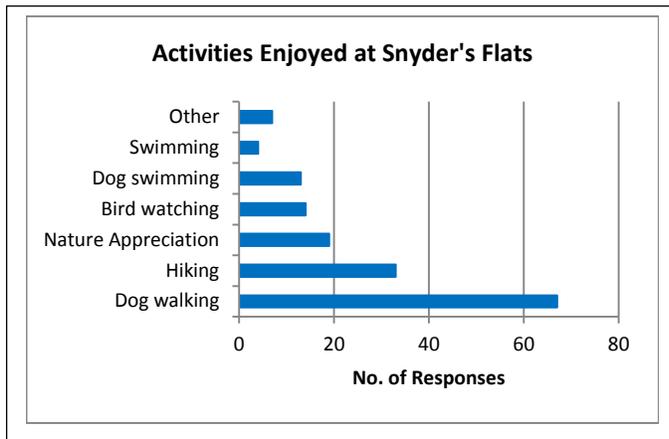
Comment sheets were submitted at the open house meeting as well as through email and via the online survey. The comments from the various submissions were grouped according to similar responses. The responses are shown below.

Question 1: How often do you visit Snyder's Flats?



There were 91 responses to this question with the majority of the respondents (66%) visiting Snyder's Flats on a weekly or more frequently. These respondents were primarily people who were using the area for dog walking.

Question 2: What activities do you enjoy when visiting Snyder's Flats Conservation Area?

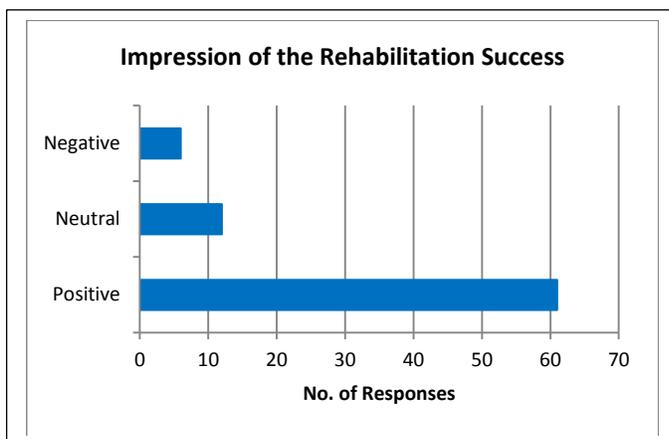


Respondents were asked about the types of activities that they engage in while visiting the Snyder's Flats area. The responses were tallied based on the number of times a particular activity was mentioned. The most frequently mentioned activity was dog walking which was mentioned in 90% of the responses. In addition, off-leash dog walking was specifically mentioned in over 50% of those responses. Respondents closely associated dog walking with hiking and nature appreciation and often viewed these as concurrent activities.

Hiking, including trail running, was mentioned in 45% of the responses. Nature appreciation and birdwatching are closely linked and together were mentioned in 45% of the responses. The number of responses that specifically indicate bird watching as an activity (19%) is quite high in comparison to findings from other surveys suggesting that the area has great appeal to the local birding community. Dog swimming (18% of responses) and swimming (5% of responses) are both prohibited activities but popular amongst the users. Finally, other activities listed included picnicking, geocaching and photography.

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Question 3: What are your impressions regarding the success of the rehabilitation of the area to date?



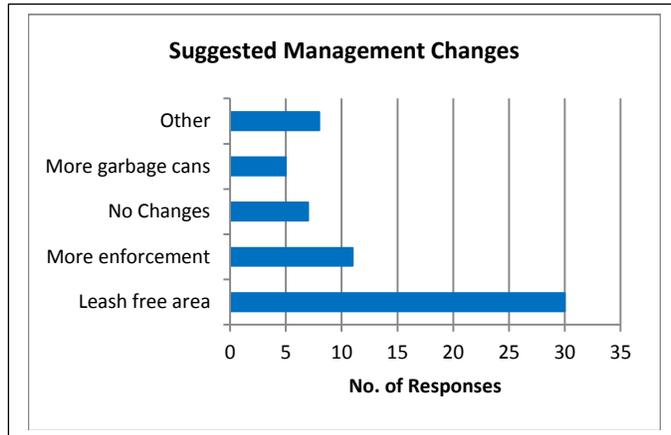
Responses to this question were assessed as to whether the comments were positive towards the success of the rehabilitation efforts, whether they were neutral or whether they were negative.

Overall the comments regarding the rehabilitation efforts were positive (77%). The positive comments were related to the beauty of the area, the success of rehabilitating a former gravel pit, the mix of

habitats on the property (wooded areas, meadows, ponds, etc) and the addition of the trails and interpretive signage. Approximately 15% of the comments were neutral citing some success but some failures as well and 8% of the respondents had a negative impression of the rehabilitation to date. The negative comments were related to the high mortality rate in the tree planting areas, and the damage

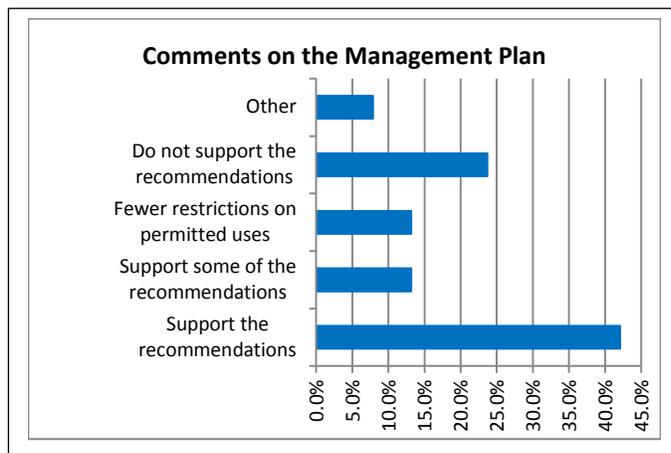
being done by beavers. Several comments also noted that the installation of trails, parking and signage have attracted too many people to the area which has led to increased use and, in some cases, misuse.

Question 4: Do you have suggestions for changes that should be made in the management of the property?



Respondents were asked if there were any changes that they would suggest in how the property is managed. Approximately half of the respondents who answered this question wanted to see either the entire property, or some portion of the property, designated as an off-leash dog area. This is not surprising considering the majority of the respondents are dog walkers and this is the predominant activity occurring on the property. Nearly 20% of the respondents indicated that there should be more enforcement of the

regulations. While most of these comments were specifically focused on off-leash dogs there were also calls for increased enforcement of alcohol consumption, campfires, camping and swimming. A number of respondents suggested that there be no changes to the current management of the area. Several respondents wanted to see more garbage containers located throughout the area. Other suggestions included more benches, improved parking, disc golf, a fee for entry to help with maintenance costs and more signage explaining the conservation and rehabilitation efforts.



Attendees at the open house were also asked to comment on the proposed Snyder’s Flats Management Plan. The responses were grouped according to the respondent’s level of support for the draft recommendations. There were also a number of comments which did not address the management plan as a whole but were more concerned with the range of uses permitted on the property.

Of the forty four (44) responses received for this question, 42% of the respondents indicated their support for the management plan recommendations. Another 13% of the respondents agreed with some of the recommendations (usually those related to future restoration). 37% of the respondents wanted to see fewer restrictions placed on the permitted uses or did not agree with the recommendations. The majority of these specifically wanted off leash dogs to be permitted. Other

comments included the desire for more trails, benches and bridges and that no user fees be implemented.

Respondents were also given the opportunity to provide any other comments that they would like to share. In general there were two opposing themes represented in the final comments – a plea to allow dogs to be off-leash on the property and a desire to keep dogs on leash. The majority of the final comments stated the case for an off-leash area. It was clear that Snyder’s Flats currently fills a much desired need for a large, naturalized area where off leash dogs and their owners can enjoy the outdoors together.

7.0 MANAGEMENT PLAN

7.1 Goals

On June 14, 1991, the Executive Committee of the Grand River Conservation Authority accepted the following recommendation from the Land Use Advisory Board:

“THAT this board recommend to the Executive Committee that a general concept be developed for the Snyder Flats Conservation Area which would support a passive area suitable for the development of healthy aquatic and terrestrial systems; and that demonstration techniques be developed to determine the suitability of this type of use for other areas of the watershed”.

This recommendation has formed the guiding principle for the ongoing development of the Snyder’s Flats property since that time. The goal for the Snyder’s Flats Management Plan was to build on this guiding principle and to reaffirm the purpose for the Snyder’s Flats property. The following goals have been established for the Snyder’s Flats Management Plan:

- To maintain and enhance the biological productivity and diversity of vegetation, fish and wildlife through continued restoration activities;
- To promote Snyder’s Flats as an example of habitat restoration techniques through an innovative approach to gravel extraction;
- To provide educational and research opportunities; and
- To accommodate compatible outdoor recreational uses that will not impair habitat values.

7.2 Zoning

Management zones are used to describe a geographic area with common characteristics, management challenges and/or priorities. Zoning provides a standardized approach to support activities and actions on conservation lands. Each zone has an underlying set of management priorities and permitted uses to guide future planning decisions within the zone. The zones provide a quick visual reference to the management objectives for the area and inform the public, agencies, educators and others regarding the function of the zone.

The GRCA has developed a set of management zones which will be implemented through management plans on GRCA owned lands throughout the watershed. Management zones were applied to the Snyder’s Flats property according to the management goals for the property and the findings of the biophysical inventory work. The management zones for Snyder’s Flats are shown on Map 5 and are described below.

Natural Environment (Zone 2a)

These areas are predominant zones on GRCA lands and represent the watershed’s natural landscape. They exhibit a wide variety of flora, fauna and ecosystem types. Low to medium intensity uses will be permitted which may include:

- Public access with minimal intrusion or built facilities.
- Educational activities.
- Management actions that may be required to sustain the natural feature.

- Research to improve scientific understanding; and
- Outdoor recreational activities such as hiking, nature appreciation, cross-county skiing, fishing, photography, cycling.

Natural Environment (Zone 2b) - Sensitive Habitat/Species Management Area

Within this zone there may be species or habitat that warrants protection but the area may be small in extent, located near disturbed or intensively used areas, or be of lesser significance than the natural features of landforms found in the Nature Preservation zone. Designation of the Sensitive Habitat / Species Management Area zone provides a means to protect features without completely restricting other uses. Low intensity uses will be permitted which may include:

- Limited public access based on the sensitivity of the habitat and/or species.
- Educational activities.
- Management actions to maintain or enhance the habitat or species; and
- Research to improve scientific understanding.

Natural Environment (Zone 2d) - Restoration Management Area

Within this zone there may be areas where ecological health and biodiversity could be enhanced through active restoration activities or by allowing natural regeneration to occur. This zone designates areas where active restoration has taken place or is contemplated in the future. These areas will be allowed to transition to Nature Preservation or Natural Environment zones in the future. Low to medium intensity uses will be permitted which may include:

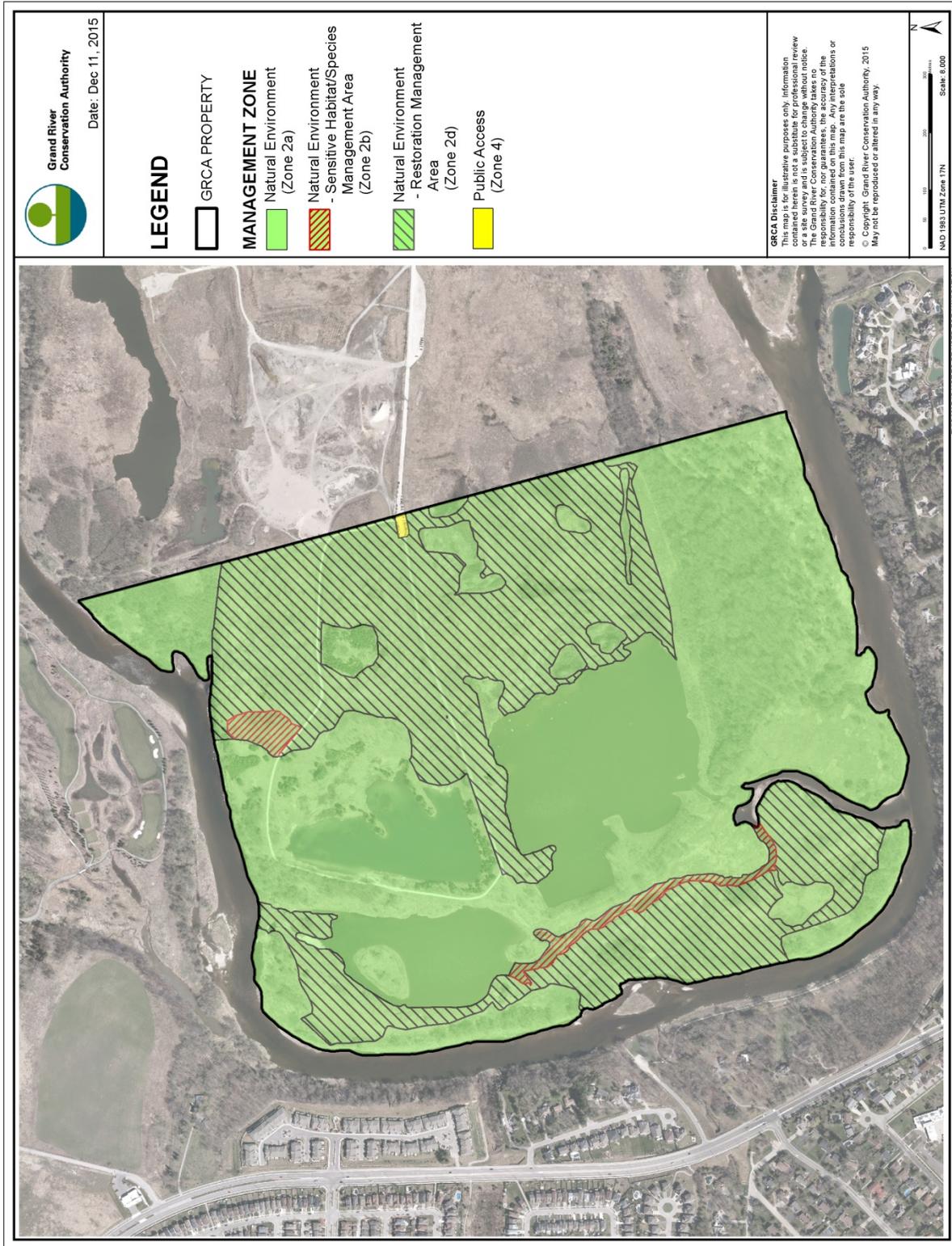
- Limited public access dependent on the sensitivity of the restoration work being undertaken.
- Management actions that may be required to restore or enhance the natural feature.
- Educational activities.
- Research to improve scientific understanding; and
- Outdoor recreational activities with minimal intrusion or built facilities e.g. nature trails.

Public Access (Zone 4)

This zone provides or is capable of providing public access to adjacent zones in a manner compatible with the management objectives for the property. Low to medium intensity uses will be permitted which may include:

- Management and development of modest facilities and infrastructure to support permitted uses in adjacent zones e.g. roads, parking areas, boat launches, educational kiosks, trails.

MAP 5 SNYDER'S FLATS MANAGEMENT ZONES



7.3 Management Options

The Snyder's Flats Management Plan is a focused, site specific plan that, due to the past use of the property and the long standing restoration objectives, does not consider a large number of alternative uses or management options. The options considered were related to two issues – the status of the restoration efforts to date and whether to permit an expanded range of uses on the property (specifically off leash dogs and/or swimming).

Option One: Status Quo

The entire Snyder's Flats property has focused on terrestrial restoration over the past 8 years. The "Status Quo" option would be to simply allow the property to naturalize on its own. This option would also assume that no changes would be made to the operational management of the area in terms of maintenance and current levels of regulation enforcement.

This option would allow existing habitats to evolve slowly as the site naturalizes but would not maximize the ecological potential of the site. The property would remain a fair example of habitat restoration within former gravel pits with obvious areas where the restoration has not been as successful. Education and research opportunities would also be fair. Without changes to the operational service levels the existing uses of the property would continue to limit the habitat potential. This option however would have minimal impact on GRCA staffing or financial resources.

Option Two: Enhanced Restoration

Past restoration efforts would be evaluated to determine whether the existing approach to habitat creation would continue or whether alternative restoration techniques would be explored which might be more successful. This option would also assume the status quo for operational service levels including maintenance frequency (waste removal, sign repairs, trail inspections and repairs) and enforcement of regulation compliance.

Option Two provides the opportunity to enhance the restoration of the area and to explore alternative habitat creation that might be more successful on this site. For example, the success of past tree planting initiatives has been variable with some areas showing good tree survival while in other areas tree mortality has been very high. Tree mortality is likely linked to the lack of topsoil across much of the former gravel pit resulting in nutrient deficiency and droughty conditions. Switching the rehabilitation efforts toward a larger component of grassland or meadow plantings would be more compatible with the existing soil conditions and would provide more habitat for some existing species at risk found on the property (e.g. Eastern Meadowlark).

By enhancing habitat creation, the property also becomes a better demonstration site for rehabilitation efforts and a better setting for education and research. However, without changes to the operational service levels the existing uses of the property would continue to limit the habitat potential. Implementation costs would be slightly higher due to the cost of rehabilitation projects. These projects

are typically funded through donations and volunteer efforts which would minimize the impact on GRCA operational budgets.

Option Three: Expanded Range of Permitted Uses

Comments received from the public through the management plan process expressed a desire for fewer restrictions on the activities that are permitted on this property. Specifically, there were requests to consider allowing off leash dogs on all or a portion of the property and requests to allow both human and dog swimming in the ponds.

By removing the prohibition against off leash dogs, Option Three would formally sanction the use of all or part of the Snyder's Flats property as an off leash dog area. Comments received through the management plan process clearly show that there is a high demand for off leash facilities in the Kitchener-Waterloo area. As a result, it would be expected that significantly higher visitation levels would be experienced if off leash dogs were permitted.

Similarly, removing the prohibition against swimming in the ponds would be expected to result in increased degradation to the aquatic environment. It would also place a higher duty of care on the GRCA to provide water safety. This would typically include the requirement to provide signage, lifesaving equipment, access to a telephone or directions to the nearest public telephone and a higher level of supervision of the area.

The result of removing the prohibition on either off leash dogs or allowing swimming in the ponds would be to negatively impact biodiversity and reduce habitat value. This would lessen the value of the property as a habitat restoration demonstration site and as an education/research opportunity. Increased use of the property would require the GRCA to respond with higher levels of maintenance (e.g. signage, waste removal, trail maintenance) and enforcement resulting in higher operational costs.

Option Four: Enhanced Restoration and Increased Operational Service Levels

This option would combine continued restoration efforts on the site with a higher operational service level with respect to maintenance and enforcement. Increased enforcement and maintenance would assist with the restoration efforts by controlling damaging activities that occur at the Snyder's Flats property (off leash dogs, swimming, campfires, and after-hour usage). It is also important to encourage the public to stay on the primary trail system and to discourage informal trails wherever possible.

Enhancing the restoration of the area would have a positive impact on biological productivity and diversity and would improve the role of the area as a demonstration site for effective rehabilitation of former gravel pits. At the same time, the value of the site for educational and research purposes would be increased. Increased GRCA presence at the site for maintenance and enforcement of regulations would allow low impact recreational use of the property to continue without impairing the habitat values. Increased operational service levels would result in modest operational cost increases which

could be met through established budget allocations. Staffing resources to achieve an increased presence at Snyder’s Flats would continue to be a challenge.

7.4 Preferred Option

The four options identified were assessed according to the management goals for the property. The potential impacts of the option on GRCA staffing and resources were also taken into consideration. Each option was assigned a ranking based on how well the option would meet these evaluation criteria. The chart below summarizes the results of the assessment. Option Four: Enhanced Restoration & Increased Operational Service Levels was identified as the preferred option. The preferred option presents the best alternative for meeting both the environmental management goals of the plan and continued public use of the property.

<p style="text-align: center;">Evaluation Criteria</p> <p>○ Least compatible with goals</p> <p>◐ Fair compatibility with goals</p> <p>◑ Moderate compatibility with goals</p> <p>● Most compatible with goals</p>	Option One: Do Nothing	Option Two: Enhanced Restoration	Option Three: Expand Range of Permitted Uses	Option Four: Enhanced Restoration & Increased Service Levels
To maintain and enhance the biological productivity and diversity of vegetation, fish and wildlife through continued restoration activities	◐	◑	○	●
To promote Snyder’s Flats as an example of a habitat restoration techniques through an innovative approach to gravel extraction	◐	◑	○	●
To provide educational and research opportunities	◐	◑	○	●
To accommodate compatible outdoor recreational uses that will not impair habitat values	◐	◑	○	●
Minimize impact on GRCA staffing and resources	●	◑	◐	○

8.0 RECOMMENDATIONS

Enhancing habitats and ecological functions on the property continues to fulfil the goals of enhancing biological diversity and of developing and managing a demonstration site for habitat restoration techniques. This area reconnects the river to its adjacent floodplain and supports important wildlife resources.

RECOMMENDATION #1 – THAT restoration and conservation of the natural environment at Snyder’s Flats continues to be a priority when evaluating management decisions for the property.

RECOMMENDATION #2 - THAT partnerships with the community continue to be fostered to implement on-going restoration and enhancement activities.

RECOMMENDATION #3 - THAT research collaborations with the community be developed to continue monitoring the progress of the restoration efforts and to support the continuing use of the Snyder’s Flats property as a demonstration site.

RECOMMENDATION #4 - THAT invasive species will continue to be monitored and controlled at Snyder’s Flats so as not to impact important habitats.

Activities permitted on this property should be supportive of the overall habitat enhancement objectives of the management plan. The enforcement of GRCA regulations is an important component in meeting the management objectives for the property and in ensuring that all members of the public have an equal opportunity to enjoy the benefits of the property. Permitting a broader range of permitted uses, including off leash dogs, was found to be incompatible with the management objectives for the property.

RECOMMENDATION #5 - THAT the permitted uses on the Snyder’s Flats property be in conformity with the management zones as identified in the Snyder’s Flats Management Plan and that no additional uses be considered beyond resource management, education, research or low intensity recreational uses.

RECOMMENDATION #6 – THAT existing erosion in the vicinity of the floodplain channel intake structure be monitored and maintenance of the structure be completed as funding is available.

RECOMMENDATION #7 – THAT the day to day operational responsibility for Snyder’s Flats be reviewed to determine options for improving the GRCA’s ability to maintain and monitor activities at Snyder’s Flats.

RECOMMENDATION #8 - THAT informal trails be closed and the creation of new informal trails be discouraged through the installation of barriers and signage, active removal and public education.

Informing the public by means of improved signage and literature of the negative impacts that result from unpermitted uses will help in protecting the natural environment. The literature could be used as a public education tool when enforcing regulations on any GRCA property.

RECOMMENDATION #9 - THAT a public education brochure be created to explain why certain types of activities are prohibited on conservation authority land.

9.0 IMPLEMENTATION

The recommendations identified thought the management plan will be implemented throughout the life of the plan. The implementation phasing shown below outlines when various tasks will be completed but is not intended to be an exhaustive list. Other initiatives that would assist with meeting the management objectives of the plan may be identified during the life of the plan and could be implemented according to the availability of resources. It is assumed that initiatives undertaken under the preferred option will place increased demand on both staff and financial resources. A costing analysis has not been provided for these increased demands as it is assumed that any additional costs will be modest and met through a combination of existing budget allocations or through additional resources provided through donations, funding applications or other external sources.

Task	Description	Timing
1	Re-engage past partners and encourage new partnerships with community groups to assist with rehabilitation projects.	Short Term (2016)
2	Conduct an operational review of the maintenance and enforcement requirements necessary to support the environmental and outdoor recreation objectives of the plan.	Short Term (2016)
3	Produce educational brochures and signage for informing the public about the ecological objectives specific to Snyder's Flats and about prohibited activities in general.	Short Term (2016)
4	Continued rehabilitation and enhancement of wooded and meadow areas.	Medium Term (2017-2021)
5	Maintenance of tall grass prairie habitat through second controlled burn if necessary.	Medium Term (2017-2021)
6	Implement a regular schedule of monitoring and control of invasive species on the property.	Medium Term (2017-2021)
7	Implement a regular schedule of inspection and maintenance for the water control structures and/or the floodplain channel.	Medium Term (2017-2021)
8	Highlight the educational and research potential of Snyder's Flats with local universities, colleges and school boards and provide update information to the aggregate producers industry.	Long Term (2017-2026)

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11.0 APPENDIX 1: MONITORING AND INVENTORY RESULTS TABLES

Table 4-1. Ecological Land Classification Communities Documented at Snyder's Flats Conservation Area

ELC Code	ELC Description	Area of ELC Community within Snyder's Flats Conservation Area (ha)
AQ	Aquatic System	4.5
BLSC2	Calcareous Coarse Mineral Shrub Bluff Ecosite	0.3
FOCM4-1	Fresh - Moist White Cedar Coniferous Forest Type	1
FODM4-5	Dry - Fresh Manitoba Maple Deciduous Forest Type	1.7
FODM7-3	Fresh - Moist Willow Lowland Deciduous Forest Type	1.4
FODM7-5	Fresh - Moist Black Maple Lowland Deciduous Forest Type	7.8
FODM7-7	Fresh - Moist Manitoba Maple Lowland Deciduous Forest Type	1.4
FODM7-9	Fresh - Moist Exotic Lowland Deciduous Forest Type	0.4
FODR2-1	Dry Fresh Oak - Hardwood Non-Calcareous Shallow Deciduous Forest Type	0.7
MAMM1-3	Reed-canary Grass Graminoid Mineral Meadow Marsh Type	0.6
MASM1-1	Cattail Mineral Shallow Marsh Type	0.1
MEFM1	Dry - Fresh Forb Meadow Ecosite	0.3
MEFM4	Fresh - Moist Forb Meadow Ecosite	0.2
MEGM4	Fresh - Moist Graminoid Meadow Ecosite	9
MEMM4	Fresh - Moist Mixed Meadow Ecosite	21.7
OA	Open Water	10.3
OAO	Open Aquatic	4
SAM	Mixed Shallow Aquatic	1
SHO	Open Shoreline	0.5
SHSM1-3	Willow Mineral Shrub Shoreline Type	0.6
SHTM1	Mineral Treed Shoreline Ecosite	3.5
SVDM4	Fresh - Moist Deciduous Savanna Ecosite	8.8
SWDM3	Maple Mineral Deciduous Swamp Ecosite	0.3
SWTM3	Willow Mineral Deciduous Thicket Swamp Ecosite	2.7
SWTM3-6	Mixed Willow Mineral Deciduous Thicket Swamp Type	0.8
WODM4	Dry - Fresh Deciduous Woodland Ecosite	0.6
WODM5	Fresh - Moist Deciduous Woodland Ecosite	6.8
WOMM4	Fresh - Moist Mixed Woodland Ecosite	5.5

Table 4-2 Plants Observed at Snyder's Flats Conservation Area

Common Names	Scientific Name	S RANK	ESA	SARA	Regionally Rare in Region of Waterloo
Plants					
Yarrow	<i>Achillea millefolium</i>	NS			
Annual ragweed	<i>Ambrosia artemisiifolia</i>	S5			
Aster	<i>Aster spp</i>	N/A			
Black-eyed susan	<i>Rudbeckia hirta</i>	S5			
Bloodroot	<i>Sanguinaria canadensis</i>	S5			
Blue Vervain	<i>Verbena hastata</i>	S5			
Boneset	<i>Eupatorium perfoliatum</i>	S5			
Broadleaf arrowhead	<i>Sagittaria latifolia</i>	S5			
Broadleaf cattail	<i>Typha latifolia</i>	S5			
Broadleaf Water-plantain	<i>Alisma subcordatum</i>	S4			
Broad-leaved pondweed	<i>Potamogeton natans</i>	S5			
Canada blue joint	<i>Calamagrostis canadensis</i>	S5			
Canada lily	<i>Lilium canadense</i>	S1			
Canada wood nettle	<i>Laportea canadensis</i>	S5			
canker-root	<i>Kickxia elatine</i>	NS			
Chara	<i>Chara spp.</i>	N/A			
Common milkweed	<i>Asclepias syriaca</i>	S5			
Common plantain	<i>Plantago major</i>	S5			
Common Sneezeweed	<i>Helenium autumnale</i>	S5			
Coon's-tail	<i>Ceratophyllum demersum</i>	S5			
Cubmoss species	<i>Lycopodium sp.</i>	N/A			
Foxglove beardtongue	<i>penstemon digitalis</i>	S4			
goldenrod spp	<i>Solidago spp</i>	N/A			
Grass-leaved Goldenrod	<i>Euthamia graminifolia</i>	S5			

Jack-in-the-pulpit	<i>Arisaema triphyllum</i>	S5			
Lesser duckweed	<i>Lemna minor</i>	S5			
Mayapple	<i>Podophyllum peltatum</i>	S5			
Nodding bur marigold	<i>Bidens cernua</i>	S5			
Ox Eye Sunflower	<i>Heliopsis helianthoides</i>	S5			
Sago pondweed	<i>Stuckenia pectinata</i>	S5			
Self-heal	<i>Prunella vilgaris</i>	S5			
Showy ticktrefoil	<i>Desmodium canadense</i>	S4			
Slender bushclover	<i>Lespedeza virginica</i>	S1	END	END	
Softstem bulrush	<i>Schoenoplectus tabernaemontani</i>	S5			
Spike rush species		N/A			
Spotted joe-pye weed	<i>Eupatorium maculatum</i>	S5			
Swamp Milkweed	<i>Asclepias incarnate</i>	NS			
Tape grass	<i>Valisneria americana</i>	S5			
Virginia mountainmint	<i>Pycnanthemum virginianum</i>	S4			YES
Virginia Wild Rye	<i>Elymus virginicus</i>	S5			
Water plantain	<i>Alisma sp.</i>	N/A			
Waternymph species	<i>Najas sp</i>	N/A			
White Heath Aster	<i>Symphotrichum ericoides</i>	S5			
White trillium	<i>Trillium grandiflorum</i>	S5			
Fragrant white water lily	<i>Nymphaea odorata</i>	S5			YES
Whorl-leaf watermilfoil	<i>Myriophyllum verticillatum</i>	S5			
Wild bergamot	<i>Mondarda fistulosa</i>	S5			
Wild mint	<i>Mentha arvensis</i>	S5			
Wingstem	<i>Verbesina alternifolia</i>	S3			
Invasive Plants					
Velvetleaf	<i>Abutilon theophrasti</i>	No Status			
Garlic mustard	<i>Alliaria petiolata</i>	No Status			
Chicory	<i>Cichorium intybus</i>	No Status			
Field bindweed	<i>Convolvulus arvensis</i>	No Status			

Queen Ann's Lace	<i>Daucus carota</i>	No Status			
Hairy willow herb	<i>Epilobium hirsutum</i>	No Status			
Common St Johnswort	<i>Hypericum perforatum</i>	No Status			
Himalayan balsam	<i>Impatiens glandulifera</i>	No Status			
Butter-and-eggs	<i>Linaria vulgaris</i>	No Status			
Bird's-foot trefoil	<i>Lotus corniculatus</i>	No Status			
Purple loostrife	<i>Lythrum salicaria</i>	No Status			
True forget-me-not	<i>Myosotis scorpioides</i>	No Status			
Timothy grass	<i>Phleum pratense</i>	No Status			
European common reed	<i>Phragmites australis</i>	No Status			
Lady's thumb	<i>Polygonum persicaria</i>	No Status			
Curly pondweed	<i>Potamogeton crispus</i>	No Status			
Curled dock	<i>Rumex crispus</i>	No Status			
Climbing nightshade	<i>Solanum dulcamara</i>	No Status			
Common tansy	<i>Tanacetum vulgare</i>	No Status			
Dandelion	<i>Taraxacum officinale</i>	No Status			
Red Clover	<i>Trifolium pratense</i>	No Status			
Narrowleaf cattail	<i>Typha angustifolia</i>	No Status			
Common mullein	<i>Verbascum thapsus</i>	No Status			
Trees and Shrubs					
Basswood	<i>Tilia americana</i>	S5			
Beech	<i>Fagus grandifolia</i>	S4			
Black Maple	<i>Acer nigrum</i>	S4			
Black Walnut	<i>Juglans nigra</i>	S4			YES
Bur Oak	<i>Quercus macrocarpa</i>	S5			
Butternut	<i>Juglans cinerea</i>	S3	END	END	
Eastern Cottonwood	<i>Populus deltoides</i>	S5			
Green Ash	<i>Fraxinus pennsylvanica</i>	S4			
Hackberry	<i>Celtis occidentalis</i>	S4			YES
Hawthorn	<i>Crataegus spp</i>	N/A	N/A	N/A	N/A

Ironwood	<i>Ostrya virginiana</i>	S5			
Manitoba maple	<i>Acer negundo</i>	S5			
Red Oak	<i>Quercus rubra</i>	S5			
Silver Maple	<i>Acer Saccharinum</i>	S5			
Sugar Maple	<i>Acer saccharum</i>	S5			
White ash	<i>Fraxinus americana</i>	S4			
White Cedar	<i>Thuja occidentalis</i>	S5			
White Elm	<i>Ulmus americana</i>	S5			
White Pine	<i>Pinus strobus</i>	S5			
Willow Species	<i>Salix spp</i>	N/A			
Invasive Trees and Shrubs					
Norway maple	<i>Acer platanoides</i>	No Status			
Scotch Pine	<i>Pinus sylvestris</i>	No Status			
English Oak	<i>Quercus robur</i>	No Status			
Common buckthorn	<i>Rhamnus cathartica</i>	No Status			
Glossy buckthorn	<i>Rhamnus sp.</i>	No Status			
Siberian elm	<i>Ulmus pumila</i>	No Status			
Russian Olive	<i>Elaeagnus angustifolia</i>	No Status			
Black locust	<i>Robinia pseudoacacia</i>	No Status			

Table 4-3. Birds Observed at Snyder's Flats Conservation Area

Common Name	Scientific name	S RANK	SARA	ESA	Significant in Region of Waterloo	Years Observed	Data Sources
Alder Flycatcher	<i>Empidonax alnorum</i>	S5B			Y	2015	GRCA 2015
American Bittern	<i>Botaurus lentiginosus</i>	S4B				2001-2005	Cadman et al. 2007
American Black Duck	<i>Anas rubripes</i>	S5B			Y	2014	Ebird 2015
American Coot	<i>Fulica americana</i>	S4B			Y	2013	Ebird 2015
American Crow	<i>Corvus brachyrhynchos</i>	S5B				2014-2015	GRCA 2015
American Goldfinch	<i>Carduelis tristis</i>	S5B				2014-2015	GRCA 2015
American Kestrel	<i>Falco sparverius</i>	S5B				2014	GRCA 2014, Ebird 2015
American Pipit	<i>Anthus rubescens</i>	S4B				2012	Ebird 2015
American Redstart	<i>Setophaga ruticilla</i>	S5B			Y	2000, 2015	GRCA 2015
American Robin	<i>Turdus migratorius</i>	S5B				2000, 2014-2015	GRCA 2015
American Tree Sparrow	<i>Spizella arborea</i>	S5B				2012	Ebird 2015
American Woodcock	<i>Scolopax minor</i>	S5B				2015	Ebird 2015
Bald Eagle	<i>Haliaeetus leucocephalus</i>	S4B,S2N		SC	Y	2012-2015	GRCA 2014, Ebird 2015
Baltimore Oriole	<i>Icterus galbula</i>	S5B				1993, 2000, 2015	Dance 2000, GRCA 2015
Bank Swallow	<i>Riparia riparia</i>	S5B		THR		2005, 2010-2012, 2015	Ebird 2015
Barn Swallow	<i>Hirundo rustica</i>	S5B		THR		2010-2012, 2014-2015	Ebird 2015, GRCA 2015
Belted Kingfisher	<i>Ceryle alcyon</i>	S5B				1993, 2014-2015	GRCA 2015
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	S5B			Y	2015	Ebird 2015
Blackpoll Warbler	<i>Dendroica striata</i>	S4B				2012	Ebird 2015
Black-capped Chickadee	<i>Parus atricapillus</i>	S5B				2014-2015	GRCA 2015
Black-throated Green Warbler	<i>Dendroica virens</i>	S5B			Y	2014	Ebird 2015
Blue Jay	<i>Cyanocitta cristata</i>	S5B				2014-2015	GRCA 2015
Blue-winged Teal	<i>Anas discors</i>	S5B				2014	Ebird 2015

Blue-winged Warbler	<i>Vermivora pinus</i>	S4B			Y	2015	Ebird 2015
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	S5B			Y	2000	Dance 2000
Bobolink	<i>Dolichonyx oryzivorus</i>	S4B		THR		2000, 2010, 2014-2015	Dance 2000, Ebird 2015, GRCA 2015
Brown Creeper	<i>Certhia americana</i>	S5B			Y	2000, 2013	Dance 2000, Ebird 2015
Brown Thrasher	<i>Toxostoma rufum</i>	S5B			Y	2000, 2010, 2012, 2014-2015	Dance 2000, Ebird 2015, GRCA 2015
Brown-headed Cowbird	<i>Molothrus ater</i>	S5B				2000, 2015	Dance 2000, GRCA 2015
Bufflehead	<i>Bucephala albeola</i>	S3B				2015	Ebird 2015
Canada Goose	<i>Branta canadensis</i>	S5B				1993, 2014-2015	GRCA 2015
Canvasback	<i>Aythya valisineria</i>	S1B,S2N				?	Dance 2000
Carolina Wren	<i>Thryothorus ludovicianus</i>	S3S4			Y	2015	Cadman et al. 2007
Caspian Tern	<i>Sterna caspia</i>	S3B			Y	2000, 2015	GRCA 2015
Cedar Waxwing	<i>Bombycilla cedrorum</i>	S5B				2000, 2015	Dance 2000, GRCA 2015
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	S5B			Y	2015	Ebird 2015
Chimney Swift	<i>Chaetura pelagica</i>	S4B	THR	THR		2000, 2003, 2010, 2015	Dance 2000, Ebird 2015
Chipping Sparrow	<i>Spizella passerina</i>	S5B				2014-2015	GRCA 2014, Ebird 2015
Clay-colored Sparrow	<i>Spizella pallida</i>	S4B			Y	2015	Ebird 2015
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	S5B			Y	2000, 2012	Dance 2000, Ebird 2015
Common Gallinule	<i>Gallinula chloropus</i>	S5B				2001-2005	Cadman et al. 2007
Common Goldeneye	<i>Bucephala clangula</i>	S5B				2013	Ebird 2015
Common Grackle	<i>Quiscalus quiscula</i>	S5B				2000, 2014-2015	Dance 2000, GRCA 2015
Common Loon	<i>Gavia immer</i>	S4B			Y	2000, 2012	Dance 2000, Ebird 2015
Common Merganser	<i>Mergus merganser</i>	S5B,S5N			Y	1993, 2014	Dance 2000, Ebird 2015
Common Redpoll	<i>Carduelis flammaea</i>	S4B				2013	Ebird 2015

Common Yellowthroat	<i>Geothlypis trichas</i>	S5B				2000, 2015	GRCA 2015
Cooper's Hawk	<i>Accipiter cooperii</i>	S4B			Y	2013	Ebird 2015
Dark-eyed Junco	<i>Junco hyemalis</i>	S5B				2013	Ebird 2015
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	S5B				2014-2015	2, GRCA 2015
Downy Woodpecker	<i>Picoides pubescens</i>	S5B				2014-2015	GRCA 2015, Ebird 2015
Eastern Bluebird	<i>Sialia sialis</i>	S4S5B			Y	1993, 2014	GRCA 2014, Ebird 2015
Eastern Kingbird	<i>Tyrannus tyrannus</i>	S5B				2015	GRCA 2015
Eastern Meadowlark	<i>Sturnella magna</i>	S5B		THR		2000, 2002, 2005, 2009, 2010, 2012-2015	Dance 2000, Ebird 2015, GRCA 2015, NHIC 2015
Eastern Phoebe	<i>Sayornis phoebe</i>	S5B				2000, 2015	Dance 2000, Ebird 2015
Eastern Screech-Owl	<i>Otus asio</i>	S4B				2001-2005	Cadman et al. 2007
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	S5B			Y	2015	Ebird 2015
Eastern Wood-Pewee	<i>Contopus virens</i>	S5B				2015	GRCA 2015
European Starling	<i>Sturnus vulgaris</i>	S5B				2000, 2015	Dance 2000, GRCA 2015
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	S5B				2014	GRCA 2014
Field Sparrow	<i>Spizella pusilla</i>	S5B				2012, 2015	Ebird 2015
Gadwall	<i>Anas strepera</i>	S4B			Y	2012	Ebird 2015
Golden-crowned Kinglet	<i>Regulus satrapa</i>	S5B			Y	2012, 2014	GRCA 2014, Ebird 2015
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	S5B			Y	2012	Ebird 2015
Gray Catbird	<i>Dumetella carolinensis</i>	S5B				2000, 2015	Dance 2000, GRCA 2015
Great Blue Heron	<i>Ardea herodias</i>	S5B			Y	1993, 1999, 2014-2015	GRCA 2015
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	S5B				2015	GRCA 2015
Great Egret	<i>Casmerodius albus</i>	S2B				2015	Ebird 2015
Great Horned Owl	<i>Bubo virginianus</i>	S4B				?	2

Greater Scaup	<i>Aythya marila</i>	S4B				2014	Ebird 2015
Green Heron	<i>Butorides virescens</i>	S4B			Y	1999, 2014-2015	Dance 2000, GRCA 2014, Ebird 2015
Green-winged Teal	<i>Anas crecca</i>	S5B			Y	2014	Ebird 2015
Hairy Woodpecker	<i>Picoides villosus</i>	S5B				2014-2015	GRCA 2015
Herring Gull	<i>Larus argentatus</i>	S5B,S4N				2014-2015	GRCA 2015
Hooded Merganser	<i>Lophodytes cucullatus</i>	S5BS5N			Y	2015	Dance 2000, Ebird 2015
Hooded Warbler	<i>Wilsonia citrina</i>	S3B	THR	SC	Y	2012	Ebird 2015
Horned Lark	<i>Eremophila alpestris</i>	S5B				2000, 2015	Dance 2000, GRCA 2015
House Finch	<i>Carpodacus mexicanus</i>	S5B				2000, 2015	Dance 2000, Ebird 2015
House Sparrow	<i>Passer domesticus</i>	S5B				2015	Ebird 2015
House Wren	<i>Troglodytes aedon</i>	S5B				2000, 2015	GRCA 2015
Indigo Bunting	<i>Passerina cyanea</i>	S5B				2000, 2015	Dance 2000, GRCA 2015
Killdeer	<i>Charadrius vociferus</i>	S5B				1993, 2014-2015	GRCA 2015
Least Flycatcher	<i>Empidonax minimus</i>	S5B			Y	2000, 2015	GRCA 2015
Least Sandpiper	<i>Calidris minutilla</i>	S4B				2015	Ebird 2015
Lesser Scaup	<i>Aythya affinis</i>	S4B				2015	Ebird 2015
Lesser Yellowlegs	<i>Tringa flavipes</i>	S4B				2015	Ebird 2015
Long-eared Owl	<i>Asio otus</i>	S4B				2001-2005	Cadman et al. 2007
Mallard	<i>Anas platyrhynchos</i>	S5B				1993, 2014-2015	GRCA 2015
Magnolia Warbler	<i>Dendroica magnolia</i>	S5B			Y	2015	Ebird 2015
Marsh Wren	<i>Cistothorus palustris</i>	S5B			Y	2000	Dance 2000
Merlin	<i>Falco columbarius</i>	S5B				2015	Ebird 2015
Mourning Dove	<i>Zenaida macroura</i>	S4B				2015	GRCA 2015
Mourning Warbler	<i>Oporornis philadelphia</i>	S5B			Y	2000, 2015	GRCA 2015
Nashville Warbler	<i>Vermivora ruficapilla</i>	S5B			Y	2012	Ebird 2015
Northern Cardinal	<i>Cardinalis cardinalis</i>	S5B				2000, 2014-2015	Dance 2000, GRCA 2015

Northern Flicker	<i>Colaptes auratus</i>	S5B				2014-2015	GRCA 2015
Northern Harrier	<i>Circus cyaneus</i>	S4B			Y	2012, 2014	Ebird 2015
Northern Mockingbird	<i>Mimus polyglottos</i>	S4B			Y	2015	Ebird 2015
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	S5B				2015	Ebird 2015
Northern Shoveler	<i>Anas clypeata</i>	S4B			Y	2014	Ebird 2015
Northern Shrike	<i>Lanius excubitor</i>	S2S3B				2013	Ebird 2015
Northern Waterthrush	<i>Seiurus noveboracensis</i>	S5B			Y	2001-2005	Cadman et al. 2007
Orange-crowned Warbler	<i>Vermivora celata</i>	S4B?				2012	Ebird 2015
Orchard Oriole	<i>Icterus spurius</i>	SZB			Y	2015	GRCA 2015
Osprey	<i>Pandion haliaetus</i>	S5B			Y	1993, 2014-2015	2, GRCA 2015
Ovenbird	<i>Seiurus aurocapillus</i>	S5B			Y	2015	GRCA 2015
Palm Warbler	<i>Dendroica palmarum</i>	S?				2015	Ebird 2015
Pied-billed Grebe	<i>Podilymbus podiceps</i>	S4B			Y	2014	Ebird 2015
Pileated Woodpecker	<i>Dryocopus pileatus</i>	S5B				2001-2005	Cadman et al. 2007
Pine Grosbeak	<i>Pinicola enucleator</i>	S3S4B				2012	Ebird 2015
Pine Siskin	<i>Carduelis pinus</i>	S4B			Y	2012	Ebird 2015
Pine Warbler	<i>Dendroica pinus</i>	S5B			Y	2015	Ebird 2015
Purple Finch	<i>Carpodacus purpureus</i>	S4B			Y	2012	Ebird 2015
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	S4B			Y	2014-2015	GRCA 2015
Red-breasted Nuthatch	<i>Sitta canadensis</i>	S5B			Y	2012	Ebird 2015
Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B				2000, 2015	GRCA 2015
Red-shouldered Hawk	<i>Buteo lineatus</i>	S4B	SC		Y	2015	Ebird 2015
Red-tailed Hawk	<i>Buteo jamaicensis</i>	S5B				2014-2015	GRCA 2015
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	S5B				2000, 2014-2015	Dance 2000, GRCA 2015
Ring-billed Gull	<i>Larus delawarensis</i>	S5B				1999, 2014-2015	Dance 2000, GRCA 2015
Ring-necked Duck	<i>Aythya collaris</i>	S5B			Y	2015	Ebird 2015
Ring-necked Pheasant	<i>Phasianus colchicus</i>	S5B				2001-2005	Cadman et al. 2007
Rock Pigeon	<i>Columba livia</i>	S5B				2015	Ebird 2015

Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	S5B				2000, 2015	Dance 2000, GRCA 2015
Ruby-crowned Kinglet	<i>Regulus calendula</i>	S5B			Y	2015	Ebird 2015
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	S5B				2015	GRCA 2015
Ruddy Duck	<i>Oxyura jamaicensis</i>	S5B				2012	Ebird 2015
Ruffed Grouse	<i>Bonasa umbellus</i>	S5B				2001-2005	Cadman et al. 2007
Rusty Blackbird	<i>Euphagus carolinus</i>	S5B	SC			2014	Ebird 2015
Savannah Sparrow	<i>Passerculus sandwichensis</i>	S5B				2003, 2009-2012, 2014-2015	Ebird 2015, GRCA 2015
Scarlet Tanager	<i>Piranga olivacea</i>	S5B			Y	2015	Ebird 2015
Semipalmated Plover	<i>Charadrius semipalmatus</i>	S4B				2015	Ebird 2015
Sharp-shinned Hawk	<i>Accipiter striatus</i>	S5B			Y	2015	Ebird 2015
Snow Bunting	<i>Plectrophenax nivalis</i>	SZB?				2012	Ebird 2015
Song Sparrow	<i>Melospiza melodia</i>	S5B				2000, 2014-2015	Dance 2000, GRCA 2015
Sora	<i>Porzana carolina</i>	S5B			Y	2001-2005	Cadman et al. 2007
Spotted Sandpiper	<i>Actitis macularia</i>	S5B				2015	GRCA 2015
Swainson's Thrush	<i>Catharus ustulatus</i>	S5B			Y	2012	Ebird 2015
Swamp Sparrow	<i>Melospiza georgiana</i>	S5B				2015	Ebird 2015
Tennessee Warbler	<i>Vermivora peregrina</i>	S5B				2015	Ebird 2015
Tree Swallow	<i>Tachycineta bicolor</i>	S5B				2015	GRCA 2015
Tundra Swan	<i>Cygnus columbianus</i>	S3B				2012	Ebird 2015
Turkey Vulture	<i>Cathartes aura</i>	S5B			Y	2000, 2015	2, GRCA 2015
Veery	<i>Catharus fuscescens</i>	S5B			Y	2001-2005	Cadman et al. 2007
Vesper Sparrow	<i>Pooecetes gramineus</i>	S4B			Y	2001-2005, 2010	Cadman et al. 2007, Ebird 2015
Virginia Rail	<i>Rallus limicola</i>	S4B				2001-2005	Cadman et al. 2007
Warbling Vireo	<i>Vireo gilvus</i>	S5B				2000, 2015	GRCA 2015
White-breasted Nuthatch	<i>Sitta carolinensis</i>	S5B				2015	GRCA 2015
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	S4B				2015	Ebird 2015
White-throated Sparrow	<i>Zonotrichia albicollis</i>	S5B			Y	2014	Ebird 2015

White-winged Crossbill	<i>Loxia leucoptera</i>	S5B				2012	Ebird 2015
White-winged Scoter	<i>Melanitta fusca</i>	S4BS4N				2013	Ebird 2015
Wild Turkey	<i>Meleagris gallopavo</i>	S5B				2015	Ebird 2015
Willow Flycatcher	<i>Empidonax traillii</i>	S5B				2010, 2012, 2014-2015	Ebird 2015, GRCA 2015
Wilson's Snipe	<i>Gallinago gallinago</i>	S5B			Y	2000, 2015	Dance 2000, Ebird 2015
Wilson's Warbler	<i>Wilsonia pusilla</i>	S5B				2012	Ebird 2015
Winter Wren	<i>Troglodytes troglodytes</i>	S5B			Y	2012	Ebird 2015
Wood Duck	<i>Aix sponsa</i>	S5B			Y	2014	Ebird 2015
Wood Thrush	<i>Hylocichla mustelina</i>	S5B				2012	Ebird 2015
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	S4B			Y	2012	Ebird 2015
Yellow Warbler	<i>Dendroica petechia</i>	S5B				2000, 2015	GRCA 2015
Yellow-rumped Warbler	<i>Dendroica coronata</i>	S5B			Y	2015	Ebird 2015
Yellow-throated Vireo	<i>Vireo flavifrons</i>	S4B			Y	2015	Ebird 2015

Table 4-5. Herpetofauna Observed at Snyder's Flats Conservation Area

Common Names	Scientific Name	S RANK	SARA	ESA
Amphibians				
American Toad	<i>Anaxyrus americanus</i>	S4		
Green Frog	<i>Rana clamitans</i>	S4		
Northern Leopard frog	<i>Lithobates pipiens</i>	S4		
Spring Peeper	<i>Pseudacris crucifer</i>	S4		
Reptiles				
Dekay's Brownsnake	<i>Storeria dekayi</i>	S4		
Eastern Garter snake	<i>Thamnophis sirtalis sirtalis</i>	S4		
Eastern Ribbonsnake	<i>Thamnophis sauritus sauritus</i>	S3	SC	SC
Midland Painted Turtle	<i>Chrysemys picta</i>	S4		
Snapping Turtle	<i>Chelydra serpentina</i>	S3	SC	SC

Table 4-6. Mammals Observed at Snyder's Flats Conservation Area

Common Names	Scientific Name	S RANK	SARA	ESA
Beaver	<i>Castor canadensis</i>	S5		
Coyote	<i>Canis latrans</i>	S5		
Deer mouse	<i>Peromyscus species</i>	S5		
Eastern Chipmunk	<i>Tamias striatus</i>	S5		
Eastern Cottontail	<i>Sylvilagus floridanus</i>	S5		
Eastern Grey Squirrel	<i>Sciurus carolinensis</i>	S5		
Ermine	<i>Mustela erminea</i>	S5		
European Hare	<i>Lepus europaeus</i>	E		
Meadow Vole	<i>Microtus pennsylvanicus</i>	S5		
Mink	<i>Neovison vison</i>	S4		
Muskrat	<i>Ondatra zibethicus</i>	S5		
Raccoon	<i>Procyon lotor</i>	S5		
Striped skunk	<i>Mephitis mephitis</i>	S5		
White-tailed Deer	<i>Odocoileus virginianus</i>	S5		
Woodchuck (Groundhog)	<i>Marmota monax</i>	S5		

Table 4-7. Provincially Significant Species Observed at Snyder's Flats Conservation Area

Common Name	Scientific name	S RANK	SARA	ESA	Data Sources
Plants & Trees					
Canada lily	<i>Lilium canadense</i>	S1			GRCA 2015
Slender bushclover	<i>Lespedeza virginica</i>	S1	END	END	GRCA 2015
Butternut	<i>Juglans cinerea</i>	S3	END	END	GRCA 2015
Birds					
Bald Eagle	<i>Haliaeetus leucocephalus</i>	S4B,SZN		SC	GRCA 2015, Ebird 2015
Bank Swallow	<i>Riparia riparia</i>	S5B,SZN		THR	Ebird 2015
Barn Swallow	<i>Hirundo rustica</i>	S5B,SZN		THR	Ebird 2015, GRCA 2015
Bobolink	<i>Dolichonyx oryzivorus</i>	S4B,SZN		THR	Dance 2000, Ebird 2015, GRCA 2015
Chimney Swift	<i>Chaetura pelagica</i>	S4B,SZN	THR	THR	Dance 2000, Ebird 2015
Eastern Meadowlark	<i>Sturnella magna</i>	S5B,SZN		THR	Dance 2000, Ebird 2015, GRCA 2015, NHIC 2015
Hooded Warbler	<i>Wilsonia citrina</i>	S3B,SZN	THR	SC	Ebird 2015
Red-shouldered Hawk	<i>Buteo lineatus</i>	S4B,SZN	SC		Ebird 2015
Rusty Blackbird	<i>Euphagus carolinus</i>	S5B,SZN	SC		Ebird 2015
Fish					
Black Redhorse	<i>Moxostoma duquesnei</i>	S2	THR	THR	NHIC 1980
Silver shiner	<i>Notropis photogenis</i>	S2	THR	SC	NHIC 1981, GRCA 2015
Reptiles					
Eastern Ribbonsnake	<i>Thamnophis sauritus sauritus</i>	S3	SC	SC	NHIC 1977
Snapping Turtle	<i>Chelydra serpentina</i>	S3	SC	SC	GRCA 2015
Mussels					
Rainbow Mussel	<i>Villosa iris</i>	S2S3	THR	THR	DFO 2015
Wavy-rayed Lampmussel	<i>Lampsilis fasciola</i>	S1	SC	THR	DFO 2015