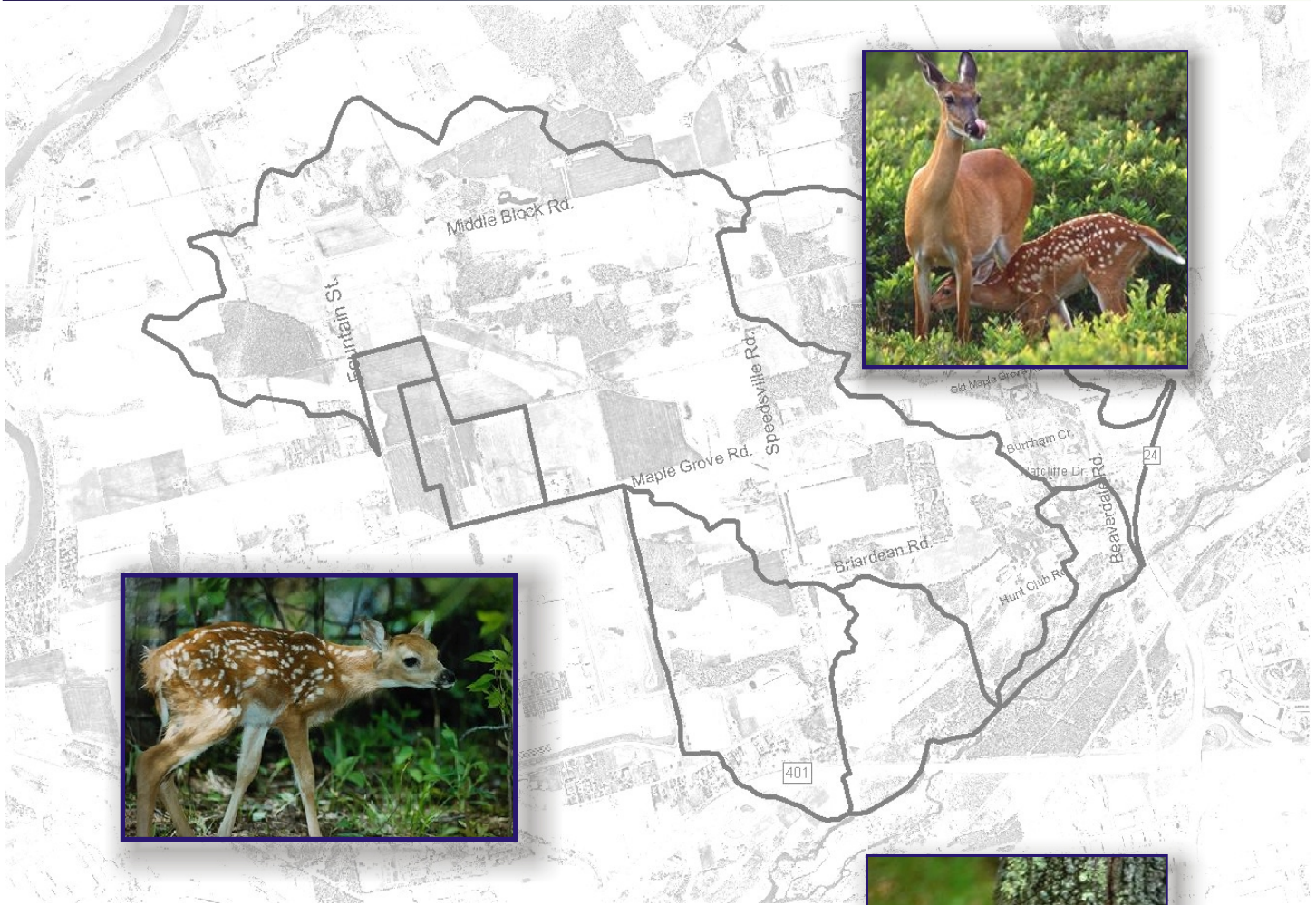


Hespeler West Subwatersheds Study



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WHITE-TAILED DEER (ODOCOILEUS VIRGINIANUS)



The White-tailed Deer (*Odocoileus virginianus*) is the only member of the deer family encountered in southern Ontario. It prefers open forest environments interspersed with meadows, woodland clearings or farmland. Although it is a common inhabitant of the Hespeler West Subwatersheds area, its presence is most often revealed by discovering the characteristic tracks made by the cloven hoofs: two crescent - shaped halves with a pronounced ridge running down the centre.

White-tailed deer forage most often in the dim light of sunrise and sunset but are active throughout the day or night. In winter, deer tend to seek out low-lying areas with dense cover, such as those found along the Speed River. Here in these traditional “yards” as many as 50 individuals can gather.



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EXECUTIVE SUMMARY

1.0 Introduction

A study for the Hespeler West area comprised of the subwatersheds of East, Middle and West Creeks has been prepared under the direction of the City of Cambridge. It was prepared by an interdisciplinary team of consultants led by Planning & Engineering Initiatives Ltd. of Kitchener with extensive input from a Steering Committee.

Development pressure in this area of the City of Cambridge required the preparation of a subwatershed plan in order to comply with provincial, regional and municipal planning documents and to ensure that any future urban development would proceed in an environmentally sustainable manner. A subwatershed plan is both a technical document and one that sets in place the framework necessary for effective management of water resources and the related environment. The subwatersheds of East, Middle and West Creeks are subwatersheds of the Speed River watershed that forms a part of the larger Grand River watershed that flows into Lake Erie.

The plan has been prepared for the entire area being comprised of the three individual creeks and their corresponding subwatersheds including the mix of existing land uses from agriculture and residential development to commercial, industrial and open space. Two small areas that drain directly to the Speed River are also included in the study area. The Hespeler West Subwatersheds are shown on [Figure A 1.1.1](#).

The plan is a component of the integrated planning process because of the interrelationship of water resources, environmental conservation and urbanization within the subwatershed. This integration into the planning process in turn means that the subwatershed plan has become part of the overall decision-making process that directs land use in the broadest sense in the City of Cambridge.

2.0 Background

Watershed plans take a broad ecosystem approach, but are focused on water, water related natural features, terrestrial resources, fisheries, water dependencies and open space systems. Watershed plans are closely linked to land use planning at a Regional level. Land use activities in the broadest sense ultimately govern the health of the natural systems.

A watershed plan is a fundamental background and supporting document to subsequent Community Plans, and ultimately the construction of stormwater management facilities and other water management structures that are subject to the Class Environmental Assessment (EA) process. Therefore, creation of the subwatershed plan was carried out in the spirit of the EA process and in particular, incorporated a similar process of public consultation.

A strength of the process was the public involvement component that involved numerous public meetings and workshops, on-site tours, elementary school sessions and presentations to the Cambridge Environment Advisory Committee, local and regional governments. The project was also detailed and updated on a web site available from the GRCA and PEIL web sites.

3.0 Goal of the Subwatershed Plan

The overall goal of the Hespeler West Subwatersheds Study is to protect, maintain and enhance the ecological processes and functions and significant natural features of the subwatersheds in a way that is environmentally sound and socially and economically sustainable. This requires a balancing of considerations of the natural environment with those of the human economy that often place considerable stress on the natural systems.

The subwatershed plan through public consultation, agency comments and the study team investigations, defines issues and objectives for resource management and provides an appropriate set of management strategies to achieve these objectives. The policies, guidelines and regulations of both Federal, Provincial and local governments govern baseline or minimum requirements for the protection of watershed resources and these have been used as the starting point in defining goals and





objectives. These were refined according to the specific conditions and issues for Hespeler West subwatersheds. A summary of the various objectives and issues is shown in Table ES-1 and demonstrates that they have been addressed.

4.0 Results of the Technical Studies

The results of the Technical Studies are summarized in the following sections regarding hydrogeology, hydrology, floodplains, fluvial geomorphology, water quality, fish habitat, agriculture and terrestrial resources under the headings of existing conditions and future management considerations.

Hydrogeology

Existing Conditions

The Hespeler West subwatersheds consist of a high percentage of sands and gravels, which are highly permeable. Rainfall on these areas contribute to recharge of the overburden and bedrock aquifers and base flow of the East, Middle and West Creeks and related wetland areas. Groundwater therefore plays an important role in sustaining the health of the surfacewater environment within the Hespeler West study area as well as providing the drinking water supply.

Future Management Considerations

Hydrogeological issues are summarized as:

- Geotechnically problematic soils occur in several areas such as the organic sediments consisting of muck, marl, and peat in low-lying areas. These highly compressible soils are unsuitable to support roads, homes, or other structures.
- High groundwater levels occur in low-lying areas and in much of the land to the west of Regional Road #24. These conditions require drainage around homes and increase the potential for buried utilities to intercept and divert groundwater and thus alter the natural hydrogeological regime.
- The Guelph Formation is a high quality aquifer and the study area has the potential to support additional privately serviced development should planning considerations favour this type of servicing. The mantle of permeable sandy soils that occurs over the majority of the subwatersheds provides a favourable environment for individual or small communal sewage disposal systems (again assuming that planning considerations make this mode of servicing desirable).
- Any increased runoff due to development will need to be infiltrated near to its point of generation in order to minimize the loss of groundwater recharge.
- Development in the subwatershed might cause water quality changes related to the increased use of de-icing salts, vehicle exhaust residue, leaks, and spills; and the reduced use of nitrates and other fertilizers.
- Grading and the construction of buried utilities have the potential to alter the groundwater levels and flow patterns within the subwatershed by intercepting or diverting existing groundwater flow and discharge patterns.
- At-source infiltration should be maximized wherever feasible as this is the most desirable form of stormwater management from a hydrogeological perspective.
- Recharge within the north and northeast portions of the study area may contribute baseflow to the adjacent Chilligo Creek and its Tributaries. Chilligo Creek supports a valuable coldwater fishery and infiltration within the north and northeast portions of the study area should be managed with the assumption that the recharge contributes to Chilligo Creek.
- Infiltration of salt-laden stormwaters should be avoided in areas where wetland vegetation communities are particularly sensitive to salt impacts.
- Water quality should be maintained or improved although the temperature of groundwater discharge is less critical in areas bordering the three creeks than would be the case for development bordering coldwater streams.
- All monitoring wells constructed as part of the hydrogeological study should be decommissioned by a licensed well contractor. Region WRP staff should be consulted prior to the decommissioning in case any should be retained for long term monitoring.



Hydrology

Existing Conditions

The Hespeler West Subwatersheds area drains 990 hectares of land entirely within the City of Cambridge, where 94 hectares drains directly to the Speed River. Each of the three creeks has different attributes regarding hydrology. West Creek (151 ha) has been altered the most by industrial development. It is the shortest creek of the three in length. East Creek is slightly longer and larger in drainage area (160 ha) and less impacted by adjacent development. Middle Creek is the longest creek and largest by area (585 ha). Both Middle and East Creek retain the headwater wetlands that are critical components to the overall system. Various ponds exist throughout the subwatersheds (see [Figure A 1.1.2](#) in the study) and specific sections of Middle Creek have been channelized. Significant development has occurred in the lower and middle portions of the subwatersheds including large industrial development surrounding Maple Grove Road. Runoff from some of these developments have been re-routed out of the subwatershed area, some discharge through storm sewer pipe to the creeks.

Future Management Considerations

The major considerations in establishing hydrologic management targets are related to ensuring that peak flows are not increased and to ensure that development does not cause flooding in downstream areas. In addition, careful consideration should be given to the discharge of runoff from development to ensure that the fluvial and aquatic characteristics of the creeks are not further impacted. Considerations include maintaining the hydrograph, maintaining infiltration rates to groundwater recharge both within the subwatersheds and potentially within adjacent Chilligo Creek Subwatershed, and maintaining the flow attenuation function of the wetlands.

Floodplain

Existing Conditions

Floodplain hydraulics were assessed and elevations were calculated for each of the three creeks from the headwater areas to the Speed River floodplain. Constrictions in the watercourse channels primarily due to culverts and road crossings were assessed and considered. Floodplain mapping for East, Middle and West Creeks was prepared as part of this study.

Future Management Considerations

The major considerations are to maintain floodlines through stormwater management strategies to ensure that post-development peak flows do not exceed pre-development levels, accept the Regional Storm flood as the Regulatory floodline, and update floodline models if channel alterations occur.

Fluvial Geomorphology

Existing Conditions

In order to properly assess the stream courses, it is essential that each creek be dealt with individually, rather than collectively. This arises from the fact that stresses operating on either East, Middle or West Creeks may not be operating on the others, and also from the fact that resilience to stresses will be different for each different watercourse. Clearly, Middle Creek is undergoing the majority of stresses at present with extensive development in the upper areas of the watershed. East and West Creeks, being smaller and less developed, are in a different phase of stability and should not be considered with Middle Creek.

Future Management Considerations

The data presented above indicates that the Hespeler West subwatersheds, (East, Middle and West Creeks) are in a state of flux with respect to fluvial functioning and are in no means stable and resilient to long-term changes in land use activities.



- East Creek displays classic symptoms of being a flashy system, with areas of high to moderate instability downstream of Maple Grove Road. A lack of riparian buffer in the lower reaches coupled with the impacts of transportation infrastructure leave a creek with little fluvial stability. Upstream, the creek appears to be relatively stable and should be protected from future development in the basin.
- Middle Creek is in a high state of flux. Middle Creek is in poor shape with some exceptions. Unless mitigation measures are undertaken to rehabilitate the creek, it will continue to degrade to the point where the existing stable, properly functioning reaches will be virtually useless. It may be difficult to rehabilitate the entire creek, but measures must be taken to prevent further damage.
- West Creek will continue to adjust to having its contributing area decreased significantly. The reaches below the Toyota plant will continue to decrease capacity over time, effectively maintaining a period of high instability for many years to come.

Overall, these creeks are on the edge. The degree of existing alteration coupled with the increased development in the area is at risk of putting these three creeks into a rapid state of decline if no management strategies are put in place in the near future. Once these creeks start to degrade further they will be at the point of no return, and they would require significant capital outlay to return to even the existing condition found at this time. It is recommended that these creeks receive immediate attention if they are at all going to retain, and possibly regain, some of their natural form and functions.

Surfacewater Quality

Existing Conditions

Based on stream temperature results, cool water stream conditions occur in the West Hespeler Subwatersheds system. However these creeks are described as generally intermittent flow with short sections of perennial flow in the mid to lower reaches. The primary problem regarding the water quality concerns is the lack of information. Monitoring from the results of this study was the only source of data and conclusions are therefore, difficult to make.

Future Management Considerations

Using the information compiled in this study, preliminary objectives for water quality are based on the Ministry of Natural Resources' criteria for both cool and warmwater streams in Southern Ontario. Objectives for water quality parameters such as water temperature, dissolved oxygen, phosphorus, sediment and bacteria are provided for specific watercourse locations. Additionally, the Stormwater Management Practices Planning and Design Manual will be implemented for any proposed new development to address water quality concerns and attempt to maintain or improve existing conditions.

Fish Habitat and Community

Existing Conditions

All three creeks begin as low gradient watercourses in their headwaters, which have fine-textured substrates, have been ditched (the uppermost reaches of West Creek have been eliminated) and quite likely experience only intermittent flow. Each creek also has a steeper middle section that probably reflects underlying bedrock topography. East and West Creek have only short low-to moderate-gradient reaches between their steeper section and the Speed River, but Middle Creek flows a considerable distance downstream of the topographic break before entering the Speed. This section of Middle Creek, however, goes dry as the water from the stream apparently is recharged.

Creek chub, brook stickleback and common shiner species have been found to inhabit the systems primarily in their lower sections.

Future Management Considerations

There are three key habitat factors that effect fish productive capacity in the subwatersheds, specifically base flow, migration barriers and the existing on-line ponds. Preservation of the upper watershed wetlands and implementation of stormwater





management practices will ensure base flow is maintained or improved. Improvements to creek channels will maintain and potentially improve fish habitat.

Agricultural and Rural Resources

Existing Conditions

Most of the agricultural land within the subwatershed has been rated for soil capability between Classes 1 and 3 with some classified in capability classes 4, 5 and 6. Only half of the land within the study area is in agricultural production with common field crops such as corn, wheat and soybeans predominating. Two other land uses are significant within the subwatersheds and they are the Guelph Agricultural Research Station (East Creek subwatershed) and sod farms (Middle and West Creek subwatersheds).

Future Management Considerations

The management of the subwatershed will be influenced by the relative weight given to agriculture within the planning process in the short run as well as in the long-term. Agricultural uses are predominant in the north portion of the subwatersheds and have the potential to significantly affect water quality and quantity. Two categories of considerations exist related to: preservation of agricultural land with emphasis on specialty crop areas and lands with higher common field crop capability; and recommendations related to best management practices.

Terrestrial Resources

Existing Conditions

The Hespeler West Subwatersheds Study has documented core habitat areas and corridors that provide habitat for plant and wildlife species, including species considered rare on a local, regional, provincial and national basis. Creek corridors have been retained to some degree with encroachment of development from adjacent residential and commercial and industrial uses. The upper subwatershed contains upland forest as well as wetlands, with no presently designated Environmentally Sensitive Policy Area by the Region. The Speed River Wetland is considered Provincially Significant along the Speed River corridor near the lower portion of the study area. The Subwatersheds Study determined that the Maple Grove Wetland Complex, formerly shown as locally significant is Provincially Significant based on current inventory information. That evaluation has been confirmed by the Ministry of Natural Resources. The “newly” evaluated West Creek Wetland Complex was determined to be locally significant.

Forest cover within the subwatersheds is approximately 18% while wetlands cover 18% of the landscape. Nine habitat blocks were identified that provide potential “forest interior” habitat. Development covers approximately 22.5% of the study area. Twenty four regionally significant plant species and one provincially significant plant species are associated with the upland forest and wetland habitats in the subwatersheds. Significant wildlife issues include the presence of numerous bird, several mammal, and one amphibian species that are considered rare in the Region. The subwatersheds support significant numbers of White-tailed Deer, which are known to overwinter along the Speed River. Habitats supporting significant wildlife include upland forest, wetlands, and successional meadows. Nine habitat blocks were identified that provide potential ‘forest interior’ habitat for breeding migratory birds; “area-sensitive” forest species were detected in all of these areas.

The three creek corridors provide relatively continuous natural habitat connection between the regionally significant Speed River corridor, and the upper subwatershed wetlands as well as adjoining subwatersheds. Middle Creek may provide a regional corridor function between the Grand River corridor (to the north) and the Speed River corridor (to the south). Although locally constrained by existing residential, agricultural and highway land uses, the variety of upland forest, wetland and successional communities present sustain quality species, and active wildlife movements. The quality, attributes and functions of these habitats are supported in part by the linked cover of the wetland and upland habitats, their relationship to local groundwater and surfacewater regimes, but also by the agricultural matrix which greatly facilitates species movements.



Future Management Considerations

The wetlands within the Maple Grove Wetland Complex are Provincially Significant and those of the newly evaluated West Creek Wetland Complex require protection from development based on Provincial, Regional and City policies. The recommended Greenspace Management Strategy will retain and protect the wetlands and corridor functions within a Natural Heritage System enhanced to offset the impacts of future urbanization. The Subwatershed Study provides a Comprehensive Environmental Impact Study that defines limits to future development, refines the feature boundaries, and recommends the treatment of adjacent lands. Enhancement and buffer areas are identified to ensure the protection of these areas and their functions. Stewardship Areas including existing developed lands are also highlighted.

Specific issues to be considered include the impacts of urban encroachment and proximity on habitats and species, the maintenance of significant corridor functions between the Speed River corridor and the upper subwatersheds, maintenance of the hydrogeologic regime, and the potential impacts of urban stormwater runoff on wetland integrity.

5.0 Conclusion of the Technical Studies

The results of each of the technical studies were assessed in comparison to the goals and objectives of the subwatershed plan. A series of options were evaluated to determine the best management strategy and course of action. Watershed management strategies were then produced that incorporate the optimal approach to achieving the goals and objectives of the subwatershed plan.

Based on the results of the technical analyses, the Hespeler West Subwatersheds will be capable of accommodating future urban growth by maintaining or enhancing the current subwatershed conditions through consideration and implementation of the following watershed management strategies.

6.0 Watershed Management Strategies

The Watershed Management Strategy is described under the topics of:

- Greenspace Management Strategy ([Figure C 3.3.1](#) and **Map 3**) includes management needs related to terrestrial resource protection and land use management.
- Aquatic Rehabilitation Strategy ([Figure C 3.1.3](#)) describes the rehabilitation and enhancement recommendations for aquatic features and riparian corridors.
- Conceptual Trail Strategy ([Figure C 3.4.1](#)) outlines the concept requirements for future trail corridors.
- Water Management Strategy – includes quantity and quality control for surface and groundwater as well as servicing requirements.
- Adaptive Management / Monitoring Strategy.

6.1 Greenspace Management Strategy

It is recommended that the Greenspace Management Strategy (outlined in Section C 3.3) be adopted and implemented. The plan will aid in the protection, enhancement, and use of ecological features and functions for the subwatershed. The plan will be implemented through the Community Plan process and subsequent Official Plan, Zoning By-law, Draft Plan of Subdivision, Scoped and Full Site EIS Studies and other studies related to detailed design and development.

Provincial, Regional and Local Policy Areas

It is recommended that the boundaries of the natural heritage and natural hazard features that are addressed in land use policy (Provincial, Regional and Local Policy) be refined or added to existing Regional and City Official Plan and Zoning By-laws to reflect the boundaries of the features. These areas include the Regulatory Floodline (not previously mapped), Provincially Significant Wetlands, Locally Significant Wetlands and any candidate Environmentally Sensitive Policy Areas.



Environmental Constraints Areas

The environmental basis or rationale for the existing natural heritage policies described above is reflected by the Environmental Constraints ([Figure B 8.3.3](#)) and shown as either a High or Medium Constraint. These constraints are an amalgamation of the environmental constraints related to steep slopes, vegetation communities and wildlife inventories completed as part of this study. This hierarchy of constraint is related to the characteristics of the area: High Constraint being those areas that form Core features of the Greenspace Management Strategy (flood lines, wetlands) and Medium Constraint being terrestrial features often found adjacent to identified high constraint areas and are imperfectly drained areas, moderate slopes, or areas of natural vegetation that provide linkage functions (such as hedgerows). Although not as sensitive to development impacts as high constraint lands, these features and the functions they provide help to reinforce and enhance the functions of the more sensitive features.

Where possible, Medium Constraint areas will be integrated as part of the Greenspace Management Strategy, as natural features, or will be subject to supporting Complementary Land Uses (as outlined in Section C 3.3.2), or as Enhancement Areas. Complementary uses such as school playgrounds, stormwater management facilities and other open spaces should be considered in these areas. A list of complementary uses should be prepared as part of the Community Plan and updated as additional information on this alternative management technique becomes available. The Zoning By-Law should be amended to recognize the land use restrictions on these lands to direct land use planning in these areas of the subwatershed.

In the case of hedgerows rated as Medium Constraint, integration may be difficult due to grading or other considerations unless the particular features are taken into account in the layout of land uses. Compensation for hedgerow loss or fragmentation should take the form of replacement plantings in strategic areas in order to maintain and enhance existing functions.

These constraints are an amalgamation of the environmental constraints related to vegetation communities and wildlife inventories completed as part of this study. Watercourse systems and related fish habitat constraints are contained within, or absorbed by the terrestrial constraint areas. Steep slope constraints are also contained within these designations. Groundwater constraints do exist within these features and buffers however, outside these areas it is not considered a limiting factor to development provided that the Stormwater Management Strategy recommendations are implemented.

Development applications subject to approval under the Planning Act must be located outside these constraint areas. A line identifying the development limit is therefore shown as the outside extent of these constraints. The area within these constraints and the appropriate buffer surrounding them is typically shown as Open Space or Parkland in land use planning documents.

Enhancement and Stewardship Areas

The Greenspace Management Strategy also includes enhanced corridor areas which increase the overall width of the Greenspace Management corridor to a total width of between 250 to 300 m along Middle Creek and a minimum of 50 m along East and West Creeks. Subject to confirmation during the Community Plan process, the enhancement areas may be included in future Open Space, or in Parkland designations. These areas may presently include agricultural fields and cultural landscape features such as hedgerows. Agricultural fields currently provide for extensive movement of mammals, amphibians and reptilian species, which will not occur under urban conditions. Confirmation of these specific areas as naturalized buffers and / or subject to complementary land uses described above, is recommended by the Greenspace Management Strategy through the Community Plan process.

Stewardship Areas in the vicinity of existing residential developments and close to core features and watercourses identify high priority areas where focused landowner contact and stewardship programs would be beneficial. These programs are voluntary. The intent is to promote education on sustainable practices including rehabilitation of degraded areas, naturalization close to sensitive features, planting of native species and ecosystem monitoring.

Buffer Requirements

Buffers are intended to protect habitats and key functions including: sensitive vegetative species and habitat, wildlife species and habitat for nesting or foraging, shallow groundwater movement, surfacewater quality, and local topography. Sections C 3.3



discussed buffer requirements in the subwatershed, and recommended a preferred option which includes a 15 metre stream buffer in conjunction with enhancement of habitat in key areas of the subwatershed, as follows:

- 30 metre buffer from natural features.
- 50 metre enhanced corridor (total width) surrounding East and West Creeks.
- Buffers could potentially be reduced (minimum 15 metre recommended) adjacent to upland habitat provided that it can be justified through a Scoped EIS.
- A 200 -300 metre wide enhanced corridor (total width) surrounding Middle Creek, containing natural features, buffers, the watercourse channel and ponds, and enhancement areas which would substantially maintain existing wildlife movements, reconnect fragmented sections, and eventually reinforce core habitats to offset the encroachment effects of urban proximity.

It is recommended that these buffers and enhancement areas be implemented to ensure that the key natural areas of the subwatersheds are maintained and enhanced. Grading within buffers will not be allowed except for what may be required by permitted stormwater management facilities, a Community Trail or for Complementary Land Uses approved under the Community Plan. Buffers should be designated as open space and be publicly owned in order to preserve their integrity and function. The ultimate ownership and zoning of buffers and enhancement areas should be determined at the Community Plan level.

Environmental Impact Studies (EISs)

This subwatershed study has been conducted to the level of a Comprehensive Environmental Impact Study which defines limits of future development and recommends management strategies. Scoped or Full Site Environmental Impact Studies should be carried out wherever encroachment or interference with functions are proposed that run counter to the recommendations of the Subwatersheds Study. EIS studies will be completed by the development proponent, to the satisfaction of the City of Cambridge and those public agencies having jurisdiction. EIS requirements are outlined in Section D 2.5 of the document. In general, the more extensive the encroachment/interference, the more detailed the required studies to identify and address impacts.

Relationship with the Adjacent Subwatersheds.

The subwatershed lies adjacent to other lands that share natural heritage features and functions. Areas such as the Speed River corridor to the south and the upland connections to the adjacent subwatersheds (eg. Chilligo Creek,) should be recognized and enhanced where possible. For example, Enhancement Areas identified in Section C 3.3.2 specifically deal with that area to the northeast through corridor enhancement techniques and stewardship opportunities.

6.2 Aquatic Rehabilitation Strategy

It is recommended that remediation of riparian corridors associated with East, Middle, West Creeks and associated ponds be carried out prior to, or as development proceeds. The remediation strategy includes some channel rehabilitation and buffer plantings as outlined in Section C 3.1. Any future plans to upgrade roads / culvert crossing and culverts by the appropriate agencies should consider the viability of enlarging the culvert size. This would improve the corridor function and improve the potential for the movement of wildlife through the culvert.

6.3 Conceptual Trail Strategy

It is necessary that a well-defined Community Trail system be established by implementation of a comprehensive Trail Strategy through the Community Plan process. The conceptual trail framework developed as part of this study focuses on the environmental implications **ONLY** and does not address issues such as trail safety, trail standards and liability. The trail system will encourage recreational use of least environmentally sensitive or most resilient natural areas. It will also provide a degree of pedestrian and wildlife safety in a natural setting and provide opportunities for the appreciation of nature. It will provide connections to existing and future communities and to serve as links in the trail network spanning Cambridge.

The specific components are described in Section C 3.4 with conclusions listed in Section C 3.4.8 to be considered and implemented.





6.4 Stormwater Management Strategy

The intent of the Stormwater Management strategy is to maintain existing peak flows, maintain the existing infiltration rates, and to reduce the post-development volume of runoff in order to protect local and downstream features. Where a single stormwater management facility serves more than one landowner, an appropriate cost sharing agreement should be implemented through the appropriate means (i.e., Draft Plan conditions, Community Plan, agreement, etc.). General stormwater management criteria include the following:

- Maintain or enhance infiltration using at-source controls for rooftop runoff and pre-treatment facilities and infiltration trenches for road runoff.
- Protect water quality by implementing a range of Stormwater Management Practices.
- Provide stormwater quantity control.
- Provide erosion control measures for slopes and stream channels.
- Avoid or minimize water quality and quantity impacts to the Provincially Significant Wetlands (Maple Creek Wetland Complex and Speed River Wetland Complex) and Locally Significant Wetland (West Creek Wetland Complex).

6.5 Adaptive Management / Monitoring Strategy

This strategy recommends that public agencies and public stewardship programs undertake the Systems and Post-Development Monitoring and that the During Construction Program be undertaken by the developer. The During Development Program includes three phases: 1) pre-development; 2) during construction; and 3) guarantee period. The proponent is responsible for monitoring surfacewater, groundwater, and terrestrial features that could potentially be impacted by construction.

7.0 Management Strategy Implementation

Amendments to Existing Planning Documents

A number of amendments are recommended as a direct result of this subwatershed plan. They pertain to the identification of a) the regulatory flood line associated with East, Middle and West Creeks, b) the Maple Grove Wetland Complex as a Provincially Significant Wetland; c) the locally significant West Creek Wetland Complex and d) changes to the current boundaries of Locally Significant Natural Areas and recommended buffers (when confirmed by Community Planning process). These changes need to be reflected in both the Regional Official Plan Policies and the City of Cambridge Official Plan.

Community Plan

There are a number of components of the above strategies including the Greenspace Management Strategy, Scoped and Full Site EIS requirements, Recreational Trail Components, and Stormwater Management Plan that will be implemented at the time of Community Plan creation. These recommendations will be implemented through the policies of the completed Community Plan, existing Zoning By-laws, Draft Plans of Subdivision, Severances, Site Plans, and all other development applications subject to approval under the Planning Act.

Best Management Practices (Stewardship / Education Programs)

It is recommended that best management practices (including a public education program and stewardship program) be implemented by the City of Cambridge, Regional Municipality of Waterloo, other public agencies and the development proponents at the time of development.

This would include:

- Agricultural lands and the protection and management of surface water quality and quantity.
- Residential lands and the protection of riparian corridors related to lawn management, domestic pets, and related issues.
- Industrial lands ensuring programs such as ISO 14001 are being implemented.





Similar information could be used to provide information for local schools, neighbourhood associations and groups, real estate, and development industries and other relevant groups. The developer would use this information and distribute it to builders, real estate firms and potential homebuyers (e.g., included in the offer to purchase and other correspondence). Educational signs would be provided as part of the construction work for the development.

8.0 Summary

Based on the results of the technical analyses and management strategies, the Hespeler West subwatersheds will be capable of accommodating future urban growth by maintaining or enhancing the current subwatershed conditions through consideration and implementation of the Subwatersheds Management Strategy. This strategy is composed of the Greenspace Management Strategy, Aquatic Rehabilitation Strategy, Community Trail Strategy, Water Management Strategy, Adaptive Management / Monitoring Strategy and Interim Land Use Management Strategy.

Table ES - 1 outlines the issues identified in the outset of the study and discussed in previous sections of the Subwatershed Plan. It also provides the tools that implement the watershed management strategies by identifying key recommendations to address these issues. **Table ES - 2** outlines the study recommendations, responsibilities and timing for the implementing organizations and groups. A Quick Summary of Development Targets / EIS Requirements forms the final page of this Executive Summary.



Table ES – 1 Subwatershed Objectives, Issues and Actions

| Objectives | Issues | Tools / Requirements | Key Recommendations |
|--|---------------------|--|--|
| 1. AQUATIC | | | |
| 1.1 To identify, protect, maintain and enhance aquatic resources. | A, B, C, E, F, G, I | Delineate and protect green space system functions and features. | Adoption and implementation of the Aquatic Rehabilitation Strategy. |
| 1.2 To prepare a strategy for the aquatic component of the Hespeler West creeks. | | Rehabilitate East, Middle and West Creeks and associated ponds. | |
| 1.3 To determine the impact of bridges, dams and ponds on fish habitat. | | Maintain/improve riparian conditions along selected stream reaches. | |
| 1.4 To determine the status, potential, and management objectives for Hespeler West Creeks in accordance with the Grand River Fish Habitat Management Plan. | | | |
| 2. TERRESTRIAL | | | |
| 2.1 To identify, protect, maintain and enhance terrestrial resources. | A, E, F, H, I, J | Delineate and protect green space system functions and features. | Adoption and implementation of the Greenspace Management Strategy. |
| 2.2 Identify, protect and manage Environmental Preservation Areas, Environmentally Sensitive Policy Areas and Regionally Significant Natural Corridors. | A, B, C, F, H, I | Delineate and protect environmentally significant areas. | |
| 2.3 To confirm the wetland boundaries and the status of the wetland complex. | | Direct scoped EIS reports to guide adjacent development. | |
| 2.4 To prepare a strategy for the terrestrial component of each creek system. | | | |
| 2.5 To assess and provide recommendations for future management of the agricultural lands within the subwatershed. | | | |
| 2.6 To determine a preferred Natural Habitat Network and the elements of a Natural Habitat Network/ Greenspace Management Plan as per the Regional Official Plan Policies. | | | |
| 2.7 To determine appropriate woodlot and vegetation management strategies. | | | |
| 3. NATURAL HAZARDS | | | |
| 3.1 To minimize the risk to life and property due to flooding and erosion. | A, B, E | Implement appropriate BMP's that maintain / reduce runoff peaks and volumes. Delineate regulatory flood lines. Require levels of development and runoff peak and volume control that maintain existing flood lines. Manage floodplain as integrated whole within greenspace system. | Adoption and implementation of the Natural Heritage Strategy and the Stormwater Management Strategy. |



Table ES – 1 Subwatershed Objectives, Issues and Actions

| Objectives | Issues | Tools / Requirements | Key Recommendations |
|---|---------------|--|--|
| 4. SURFACEWATER RESOURCES | | | |
| 4.1 To preserve natural hydrological systems. | A, B, E, F, G | Delineate and protect greenspace system functions and features, Rehabilitate Hespeler West creeks and associated ponds, Maintain /improve riparian conditions along selected stream reaches, Delineate and protect environmentally significant areas. | Adoption and implementation of the Natural Heritage Strategy and the Stormwater Management Strategy |
| 4.2 To protect and manage surfacewater quality and quantity in order to ensure the future ability of Regional water-taking requirements and maintain the assimilative capacity of downstream wastewater treatment plants. | D | | |
| 5. GROUNDWATER RESOURCES | | | |
| 5.1 To preserve natural hydrogeologic systems | D, F, H, J | Implement appropriate water quality control BMPs and promote infiltration and/or sedimentation control and maintain / reduce runoff peaks and volumes, Limit impervious cover, Promote water conservation, Protect greenspace system functions and features. | Adoption and implementation of the Natural Heritage Strategy and the Water Management Strategy. |
| 5.2 To protect and manage the quantity and quality of groundwater resources | | | |
| 5.3 To determine implications on water quality and quantity from infiltrated stormwater runoff from development | | | |
| 6.0 THE RURAL and URBAN ENVIRONMENT | | | |
| 6.1 To develop an ecosystem-based approach to land use planning and resource management in the subwatershed. | ALL | Identify process related to implementing management options through land use planning and stewardship approaches, *Identify monitoring requirements related to the management options. | Adoption and implementation of the Subwatershed Management Strategy composed of the following components: The Greenspace Management Strategy; The Aquatic Rehabilitation Strategy; The Water Management Strategy, Community Trail Strategy; and The Adaptive Management - Monitoring Strategy. |
| 6.2 To produce an implementation and monitoring plan to guide future development in the subwatershed. | ALL | | |
| 6.3 To determine and address the implications on development opportunities on the provision of infrastructure. | D, E | | |



Table ES – 1 Subwatershed Objectives, Issues and Actions

| Objectives | Issues | Tools / Requirements | Key Recommendations |
|---|--------|----------------------|---------------------|
| 6.4 To determine the current state of repair of bridges, dams and ponds and to develop long-term remediation recommendations which would address public safety, maintenance and operation, public use and aesthetics. | | | |
| 6.5 To determine ownership and management strategies of the Greenspace Management Strategy. | | | |
| 6.6 To determine the appropriate buffers from development. | | | |
| 6.7 To determine the location and status of any existing agricultural or municipal drains. | | | |
| 6.9 To determine a potential trail system with potential linkages (within and beyond the subwatershed) and interconnection of natural areas. | | | |

Delineate and protect greenspace system functions and features.
Delineate and protect environmentally significant areas.

Issues List for Table

- A. Hespeler West Subwatersheds Greenspace Management Strategy– status and future plans – ownership, management;
- B. Bridges, Dam and Ponds – impact on fisheries, current state of repair, recommendations;-Fisheries – status, potential, management objectives (per Grand River Fisheries Management Plan);
- C. Wellhead protection area – implications for stormwater infiltration;
- D. Maple Grove Wetland and West Creek Wetland Complex – confirmation of wetland boundaries, buffers from development;
- E. Location and status of municipal drains;
- F. ROPP Elements of the Natural Habitat Network);
- G. Woodlot protection and vegetation management;
- H. Potential trail linkages (within the subwatershed and beyond) and interconnection of natural areas;
- I. Agricultural land classification and consideration





Table ES – 2 Study Recommendations, Responsibilities and Timing

| Management Recommendation | Purpose (why) | Responsibility (who) | Timing (when) | Other Considerations (how) |
|---|---|---|--|---|
| Greenspace Management Strategy | To preserve and protect the core and linkage components of the Hespeler West Subwatersheds natural heritage system. | City, GRCA, Landowners and Community. | Develop and adopt policies through Community Plan process: Implement at Community Plan and draft plan stage to complement existing regulatory framework. | Designate greenspace in OP and land use zoning by-law; Public education. |
| <ul style="list-style-type: none"> Protect flood line, fill line (steep slopes). Protect PSW. | Protect life & property; water quality buffer for all 3 creeks; preserve hydrologic function. | City, GRCA, Landowners and Community. | Develop & adopt floodline policies immediately; implement at Community Plan stage. | Implement Flood & Fill regulations SWM design EIS for adjacent development SWM, trail and interface between wetland and development. |
| <ul style="list-style-type: none"> Protect Environmental Policy Areas. | Protect significant habitat and core areas of natural heritage system. | Region, City, GRCA, Landowners and Community. | Develop & adopt policies immediately; implement at Community Plan stage | Designate greenspace EIS for adjacent developments. |
| <ul style="list-style-type: none"> Require EIS for development in buffer areas as stipulated. | Protect and enhance function of NHS, develop amenity benefit for human residents. | City to review and adopt; Developer EIS. | Community Plan stage; Prior to development. | Refer to specific considerations and features as stated in EIS summary table (trails, SWM, etc.) |
| <ul style="list-style-type: none"> Incorporate Enhancement Areas. | To protect and maintain the existing corridor function of the stream / wetland corridor. | City to review and adopt. | Community Plan stage; Prior to development. | Complementary land uses need further definition at Community Plan. |
| <ul style="list-style-type: none"> Apply buffer criteria. | To protect and preserve core features and functions of the NHS. | City to review and adopt criteria. | Community Plan stage; Prior to development | Designate as Open space; Consider |
| <ul style="list-style-type: none"> Best Management Practices. | To enhance the feature and functions of the NHS. | GRCA, Landowners and Community. | Immediately upon study adoption. | Removal of fencelines & garbage, reduce grass cutting. |
| Aquatic Rehabilitation Strategy | To enhance and rehabilitate the Hespeler West Subwatershed natural heritage system. | City, GRCA, Landowners and Community. | Community Plan stage. | Possible CFIP financial assistance. |



Table ES – 2 Study Recommendations, Responsibilities and Timing

| Management Recommendation | Purpose (why) | Responsibility (who) | Timing (when) | Other Considerations (how) |
|---|--|--|--|---|
| <ul style="list-style-type: none"> Rehabilitate creek portion as per strategy. | To rehabilitate the creek system to a condition closer to the natural state. | City, GRCA, Landowners and Community. | Community Plan stage. | GRCA approvals, Creek bank naturalization. |
| <ul style="list-style-type: none"> Remove barriers within creek near bottom end. | Provide fish migration upstream from Speed River. | City, GRCA, Landowners and Community. | Community Plan stage. | Possible CFIP financial assistance. |
| Community Trail Strategy | To provide access and recreation areas for community residents to low impact recreation through the least sensitive natural areas. | City, GRCA, Landowners and Community. | Community Plan stage. | Use trail corridors as starting point, apply City policies and standards. |
| <ul style="list-style-type: none"> Main routes are established with respect to environmental considerations. | To provide a cursory trail layout to work from at more detailed stage. | Routes subject to confirmation by City / public; City to incorporate into overall City trail system. | Community Plan stage. | Ownership: combination of dedication during development, donation and purchase of high priority routes where necessary. |
| Water Management Strategy | To maximize infiltration, protect quality of sfc and gr water, and minimize impact of post development conditions downstream. | City, GRCA, Landowners and Community. | Community Plan stage and at draft plan of subdivision. | Infiltration and recharge criteria. |
| <ul style="list-style-type: none"> Quality standards | To maintain existing quality due to issues related to fisheries, PSW and Speed River corridor. | City, GRCA, and developers. | SWM facilities and draft plan considerations. | In conformance with Level 1 MOE standards. |
| <ul style="list-style-type: none"> Quantity control <ul style="list-style-type: none"> - lot level; - conveyance control; - end of pipe control. | To duplicate runoff / maintain flood lines, protect the creek, protect supply to ground water. | City, GRCA, and developers. | Details to be confirmed at Community Plan stage. | Post development flow conditions match pre development. |
| <ul style="list-style-type: none"> Infiltration. | Maintain baseflow to all 3 creeks and wetlands | City and GRCA. | Details to be confirmed at Community Plan. | Highest rates near northeast sector of study area. |



Table ES – 2 Study Recommendations, Responsibilities and Timing

| Management Recommendation | Purpose (why) | Responsibility (who) | Timing (when) | Other Considerations (how) |
|--|---|---|--|--|
| Adaptive Management Strategy (Monitoring) | To provide direction to be able to respond to changes that may occur in the subwatershed. | City, GRCA, Landowners and Community. | Community Plan stage. | Relies on staff expertise and time commitment; volunteer assistance is possible. |
| <ul style="list-style-type: none"> System Monitoring. | To provide ongoing analysis of the subwatershed ecosystem. | City, GRCA, local citizens groups, MNR. | Ongoing. | Update ELC criteria where necessary. |
| <ul style="list-style-type: none"> During development: <ul style="list-style-type: none"> - pre development; - during construction; - guarantee period. | To provide monitoring during development construction. | Developer / City & GRCA. | <ul style="list-style-type: none"> -Draft plan of development - Detailed design submission - End of guarantee period. | Pre development = Minimum of 2 seasons of monitoring prior to construction. |
| <ul style="list-style-type: none"> Post development monitoring. | To track changes and adapt strategies to management criteria. | City, GRCA, local citizens groups, MNR. | - End of guarantee period, ongoing. | Will rely on adaptive management criteria to adjust as necessary. |
| Interim Land Use Management Strategy | To provide land use policy direction immediately following the adoption of the study. | Region & City. | Immediate. | Community plan process will not capture all areas where policy changes are needed. |
| <ul style="list-style-type: none"> Identify floodplain, PSW and ESPA. | To protect environmental features & functions. | Region & City. | Immediate. | ROPP & OP amendments. |
| <ul style="list-style-type: none"> Encourage BMPs for areas prior to Community Plan stage. | To assist in rehabilitating the NHS and encourage stewardship goals. | City, GRCA, local citizens groups, landowners. | Immediate. | I.e., Remove fences, collect garbage, reduce grass cutting. |
| Public Education | To encourage stewardship consistent with study goals. | Region, City, GRCA, local citizens groups, MNR. | Immediate. | Assist in dissemination of study info, data, results. |

Quick Summary: Development Targets / EIS Requirements

The following is a brief summary of the requirements for development that have been recommended by the Hespeler West Subwatersheds Study. Please refer to the text of the parent document for a full description of the recommendations and findings.





Water Management Issues

- Water quantity must match post development flows with pre development flows.
- Water quality must be addressed to Level One standards (MOE 1994) due to the temperature characteristics of the creek systems, the PSW and status of the downstream watercourse (Speed River).
- Surfacewater infiltration be maintained or enhanced using at-source controls for rooftop runoff and pre-treatment facilities and infiltration trenches for road.

Greenspace Management Issues

- Buffers form a key management strategy in protecting the core natural areas and corridors that link them.
- Buffers 15 metres from East, Middle, and West Creek watercourses.
- Buffers are 30 metres from natural features with the opportunity to reduce a buffer adjacent to upland habitat provided it is justified through an EIS process to a minimum of a 15 metre buffer.
- An Enhancement Area surrounding Middle Creek is recommended to achieve a total corridor width of 200 to 300 metres using the identified core areas, buffers and complementary land uses to achieve the required corridor for ecosystem function given the expansion of future development adjacent.
- An Enhancement Area surrounding East and West Creeks is recommended to achieve a total corridor width a minimum of 50 metres.
- This study forms a Comprehensive Environmental Impact Study regarding defined limits of future development and recommended management strategies in the context of the PSW.
- Scoped or Full Site Environmental Impact Studies will be required wherever encroachment or interference with functions are proposed that run counter to the recommendations of the Subwatershed Study.
- Full site EIS information is provided through the Subwatershed Study for a period of 5 years after approval by the City - these criteria should be reviewed to ensure continued applicability after that time.
- Development is not permitted to encroach into core natural areas such as floodplains, PSWs, on steep slopes and in ESPA / LSNA designations.

Community Trail Management Issues

- A cursory trail route has been provided to address environmental issues **ONLY** with suitable minimum setbacks from core environmental features (15 metres).
- Trail construction parameters have been suggested such as total trail width, surface treatment, lighting, and signage near environmental features.
- Any subsequent variation from these recommendations within the Greenspace Management Strategy and environmental feature buffers require further EIS supporting documentation.

Adaptive Management – Monitoring Issues

- Monitoring is separated into those responsibilities of public agencies / public stewardship and the development community.
- Public agencies / public stewardship approaches undertake the Systems and Post development Monitoring.
- The development community undertake the during development program which is divided into three phases of responsibility: 1) pre-development, 2) during construction, and 3) the guarantee period.



Quick Facts: Hespeler West Subwatersheds

- Total drainage area of subwatersheds including Speed River catchments = 990 ha
- Percent of subwatershed covered by 'wooded cover' = 17.75% (includes forests, woodlands, swamps and plantations)
- Percent of subwatershed covered by wetland = 18.15% (includes swamps and open aquatic features)
- Percent of subwatershed covered by development = 22.5%
- Percent of subwatershed covered by agricultural lands = 38.20%
- Percent of subwatershed covered by vegetation (natural, cultural and agricultural) = 74.6%
- Number of Provincially Significant Wetland (PSW) complexes = 2
- Number of Locally Significant Wetland (LSW) complexes = 1
- Number of Environmentally Sensitive Policy Areas (ESPA) polygon units found in the Hespeler West subwatersheds = 0 (However, certain areas of the subwatersheds meet ESPA criteria)
- Number of habitat blocks that contain forest interior wildlife species = 9
- Provincially or nationally 'vulnerable' (special concern), 'threatened' or 'endangered' species = none found
- Vascular plant species = 437
- Provincially Significant vascular plant species = 1
- Regionally Significant vascular plant species = 24
- Wildlife species = 144
- Provincially Significant wildlife species = none found
- Regionally Significant wildlife species = 35
- Birds = 91 (81 observed during the breeding season)
- Mammals = 17
- Amphibian and Reptiles (Herpetofauna) = 13
- Butterflies = 12
- Damselflies and Dragonflies = 11