

Lower Englishman River Watershed Wetlands Study

Environmental report with maps, site descriptions and conservation assessment for wetlands located in selected portions of the Lower Englishman River Watershed

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Research and Report by Christopher M. Stephens Consulting

For Mid Vancouver Island Habitat Enhancement Society
& GW Solutions Inc.

Christopher M. Stephens Consulting, MSc., CLGA. Parksville, BC. 250-228-3470

Email cmstephens@shaw.ca Website - www.cmswritingconsulting.com

Facebook – Christopher M. Stephens Consulting & Writing

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Summary

This report provides an assessment of key wetlands in the Lower Englishman River Watershed. All wetlands mapped fall within the Coastal Douglas-fir moist, maritime, biogeoclimatic zone; an ecosystem region where the characteristic forest and wetland habitat is considered to fall within the “globally at risk” category. All of the work took place in the Lower Englishman River Watershed, primarily within the city limits of Parksville. All sites were located at elevations ranging from 4 m to 50 m above sea level.

The work completed includes the identification of wetlands within the Lower Englishman River Watershed, the measurement of the perimeter and area, notes on the ecological conditions, and soil types, identification of conservation concerns and future research priorities.

Fieldwork was completed by:

- Faye Smith, MVIHES Project Coordinator
- Christopher Stephens, MSc., CLGA, Wetlands Research Consultant, Christopher M. Stephens Consulting
- Nicole Ure, Resource Management Officer Technology Diploma Program, Vancouver Island University, Volunteer Field Assistant
- Travis Arnold, BSc. Biology, Biologist in Training
- Shelly Goertzen, MVIHES Volunteer
- Additional one time volunteers from community including MVIHES and Arrowsmith Naturalists participated
- Some adjacent landowners were present and provided historical information that guided mapping

Dates of Research: October 10, 11, 17, 25, 31 and November 7, 2015.

Conditions: Beaufort Scale 2, mix of light overcast with minimal to interludes of moderate rain at approximately 60°F, clear at 60°F, clear at 50°F and rainy at 50°F.

The locations of each study areas are provided in Figure 1 and a summary of the wetland geographical setting is provided in Table 1.

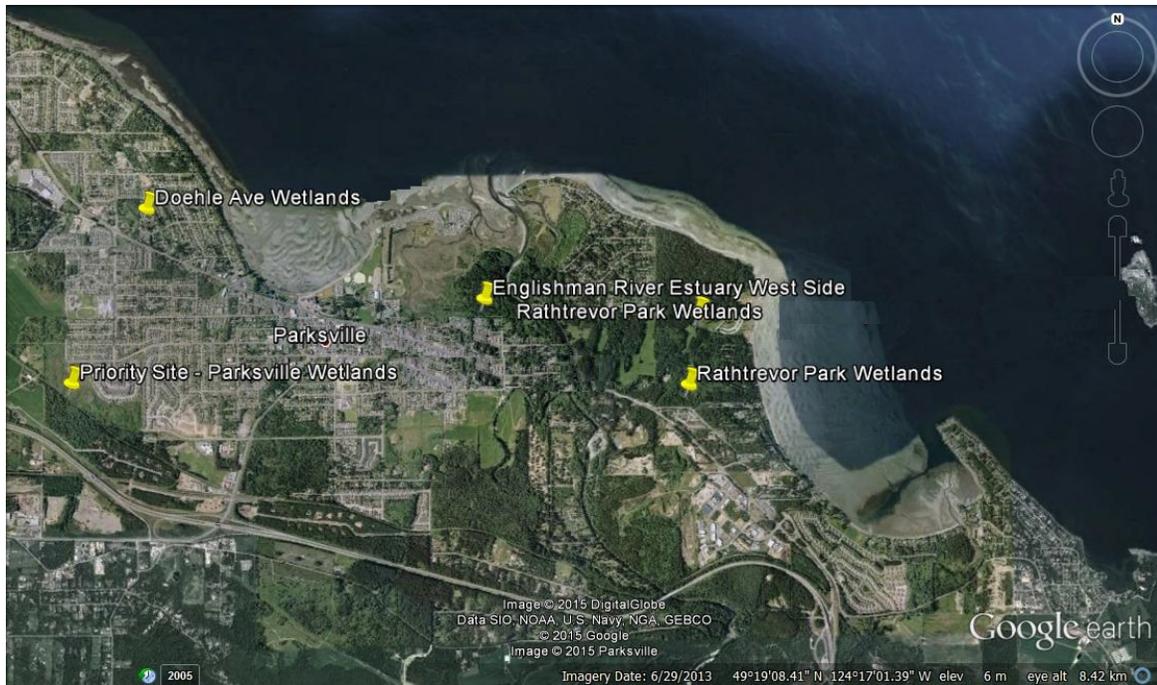


Figure 1: Englishman River Watershed Wetlands Study Area Map. The four wetland areas of research interest are pinpointed from left to right. © (Google Earth, 2015)

Table 1: Wetland study area specifications – Ecology, elevation, coordinates, perimeter and area.

Name	Ecosystem	Elevation (m-asl)	Coordinates (10 UTM)	Perimeter (m)	Area (ha)
Parksville Wetlands	Marsh/Stream Headwaters	50	0402397m E, 5463494m N	1,321	2.83
Ermineskin Nature Park Swamp	Forested Swamp with Deciduous and Conifer	51	0402431m E, 5463222m N	775	1.93
Doehle Avenue Wetland	Willow Swamp with Bulrush	37	0402947.61m E, 5464921.74m N	459	0.79
Secondary Wetland at Doehle	Forested Swampy Pool	37.2	0402845.00m E, 5464974.00m N	84	0.049
Rath Trevor Wetland Northwest	Open Marsh, Conifer Narrow Forested Wetland	8	0407611.16m E, 5463972.35m N	1,627	2.14
Rath Trevor Wetland Southeast	Mixed Deciduous and Conifer Wetland	8	0407696.69m E, 5463449.66m N	1,045	4.61
Mills Street Marsh	Bulrush marsh beside estuary	6	0405498.80m E, 5463958.86m N	159	0.13

Name	Ecosystem	Elevation (m-asl)	Coordinates (10 UTM)	Perimeter (m)	Area (ha)
Dugout Pond	Steep sided pond surrounded by shrubs with sedge at west end	2	0405562.00m E, 5464040.00m N	190	0.09
Englishman River Estuary Wetland Forest	Primarily coniferous wetland forest characterized by pools of water filled with slough sedge. Shrubby west end.	4	0405693.00m E, 5464010.00 m N	630	0.61

Background

At the request of Mid Vancouver Island Habitat Enhancement Society (MVIHES) and GW Solutions Inc. (GWS), Christopher M. Stephens Consulting, with the involvement of community volunteers, was retained to identify and map selected wetlands in the Lower Englishman River Watershed. GPS mapping was used to determine the wetland center-point coordinates, boundary position, wetland perimeter and the area of each wetland. Preliminary ecological assessment of each wetland was completed during fieldwork including notation of vegetation types, relevant environmental conditions and consideration of context within the larger watershed and potential pollution and conservation management factors.

Over a period of four weeks, from early October to early November, four wetlands sites were assessed in the Lower Englishman River Watershed. Seven distinguishable wetland habitats were identified as components of the four initial sites. In addition, a dugout pond and a secondary wetland beside the Doehle Avenue Willow Swamp were assessed bring the total of water habitats in the report to nine.

The research consisted of GPS mapping of wetland locations, perimeters, photographs and baseline review of site conditions. The key deliverables in this report consist of:

- (1) Creation of area maps
- (2) Preliminary notation of ecological conditions of significance and watershed values.
- (3) Photographs of representative sites to showcase wetland conditions, type and vegetation present

Methodology

Wetlands were surveyed on foot and categorized by soil, vegetation and water conditions to identify ecological boundaries. Boundaries were marked by GPS waypoints and uploaded to Google Earth to identify boundaries and facilitate the creation of maps (Figures 2 to 5).

Wetlands were mapped to the extent that they were passible, with nine percent of the exact boundaries being reached on foot. Challenging terrain was accessed from two directions to ensure accurate mapping through marking of GPS waypoints along the true perimeter of the wetlands. The homeowner on Mills Street, by the Englishman River Estuary, was consulted during mapping and access to their yard, which contains an ecologically significant cattail marsh, was granted.

Expertise was applied in wetland ecosystem research and ecological boundary delineation using vegetation types, along with biodiversity survey methodologies, risk assessment and ecosystem mapping.



Figure 2: GPS Mapping of the Parkville Wetlands – Christopher Stephens, MSc., wetlands research consultant with MVIHES Volunteers. MVIHES Photo (2015)



Figure 3: Nicole Ure taking GPS and vegetation description notes at the Doehle Avenue Wetland. Duckweed and bulrush vegetation adjoins willow.



Figure 4: Christopher Stephens inspecting Slough Sedge beside the trail in the forested wetland section of the Englishman River Estuary



Figure 5: Christopher Stephens with Nicole Ure taking notes on water levels, soil and vegetation at the northwest Wetland at Rath Trevor Park.

Site Descriptions

The Parksville Wetlands & Ermineskin Nature Park

Figure 6 shows the location of both the Parksville Wetland and Ermineskin Nature Park. Table 2 summarizes the geographic setting of the wetlands.



Figure 2: Google Earth Map of the Parksville Wetlands Study Area © (Google Earth, 2015)

Table 2: Geographic setting of Parksville Wetlands and Ermineskin Nature Park.

Name	Ecosystem	Elevation (m-asl)	Coordinates (10 UTM)	Perimeter (m)	Area (ha)
Parksville Wetlands	Marsh/Stream Headwaters	50	0402397m E, 5463494m N	1,321	2.83
Ermineskin Nature Park	Forested Swamp with Deciduous and Conifer	51	0402431m E, 5463222m N	775	1.93
Total Area					4.76

Parksville Wetlands

The Parksville Wetlands is located at the southwest edge of the City of Parksville (Figure 6). The Parksville Wetlands (Figure 7) forms the headwaters of Carey Creek, is positioned above Aquifer 216 which is the City of Parksville's water supply. For further details about the water supply see Appendix 1.



Figure 3: Parksville Wetlands main pool with the Ermineskin Nature Park in the background.

Vegetation, Ecology & Biodiversity

The Parksville Wetlands environment is a highly aesthetic natural environment with the open pools characterized by rushes, sedge patches and extensive hardhack, giving way to small, at times stunted red alder copses interspersed with willow species on the margins. Scattered trembling aspen saplings, spruce trees and wild roses, together with thicker hardhack areas characterize the transition to upland zones present in this area. The wetland flows into Carey Creek from the northeast towards Parksville Bay. An additional transitional area covering 0.5 ha beyond the wetland is subject to spillover and has been colonized by some wetland vegetation. A wet meadow environment covers 0.2 ha that is subject to some invasive species, primarily canary grass. The main wetlands are almost entirely free of invasive species (approximately 98% of vegetation) due to frequent full immersion of up to 0.5 m of water in the deeper sections.

The soil type in a wetland is a good indicator for a variety of parameters including: biological activity types, water quality according to acidity parameters, organic content and species usability, vegetation recruitment potential, seasonal boundaries, flood mitigation values and

groundwater recharge potential. The soil present had significant sand with some clay, and moderate organic content.

As a seasonal wetland, the Parksville Wetlands present shallow water and seasonally exposed mud that allows many species to forage. Invertebrates, such as fairy shrimp, have been documented in the area utilizing the muddy conditions.

The Parksville Wetland contains habitat for a unique set of species, including migratory songbirds, deer, voles, shrews, raptors, and amphibians, that define the property as a valuable habitat. A distinct wetland bird community, not common in the lowlands of Parksville, is present and includes the following species: Virginia Rail, Wilson's Snipe, Short-eared Owl, Northern Harrier, Song Sparrow, Red-winged Blackbird, Yellow Warbler, Common Yellowthroat, Willow Flycatcher and Black-headed Grosbeak. A total of 87 bird species have been documented on the property, with a noteworthy percentage of these species being neotropical migrants. Amphibians present include the Long-toed Salamander, Pacific Treefrog, and potentially, Rough-skinned Newt.

Healthy wetlands, with contiguous uplands and transition zones, are capable of providing significant watershed values in the form of water collection and filtration, groundwater recharge, flood mitigation and a slow release of water during dryer seasons. The diversity of vegetation in the wetland and species present indicate high ecological values. Soil types present warrant further testing following this initial mapping work. Water quality is excellent with clear water and invertebrates present that act as indicators for high water quality due to their environmental sensitivity.

Ermineskin Nature Park Wetland

The Ermineskin Nature Park wetland is best identified as a swamp, with significant ecological values such as habitat provision, water retention, filtration and groundwater recharge. It is located on top of Aquifer 216 and is likely hydraulically connected to the Parksville Wetland (although separated by the rail line). The surrounding forest (Figure 8 & 9) provides an important ecological buffer.



Figure 4: Romney Creek riparian zone section in the Ermineskin Nature Park defined by a Big-leaf Maple Canopy, Snowberry understory, moderate shade and abundant birdlife.



Figure 5: Western red cedar/red alder forest represents a significant portion of the transitional vegetation of surrounding the swamp habitat making up the Ermineskin Nature Park wetland, acting as an ecological buffer.

Vegetation, Ecology & Biodiversity

Vegetation consists of mixed wetland species and associated deciduous tree species of lesser height. Predominate species were slough sedge and skunk cabbage amongst pools of clear water. A light canopy cover is provided by Pacific dogwood, willow species, bitter cherry, cascara, Indian plum, and red alder.

Extensive shrubbery consists of salmonberry, scattered hardhack and wild rose. The

surrounding buffer and transitional vegetation consists of western red cedar, a conifer associated with damper soil conditions compared to Douglas-fir. This intact transitional vegetation surrounding the wetland maintains the hydrological and ecological conditions that support a resilient wetland ecosystem with quality wildlife habitat and watershed values.

The soil type is high organic, with a likelihood of moderate acidity in places where cedar and extensive black mud formation exists. Water is perfectly clear and amphibian and bird activity is present, although species are more closely associated with forests compared to the marsh species at the open “Parksville Wetlands” on the Ermineskin property.

Dohele Avenue Wetland – A Louisiana Type Willow Swamp

The locations of the Dohele Avenue Wetlands and its associated secondary wetland are shown in Figure 10. The geographic settings are summarized in Table 3.

Table 3: Geographic setting of Dohele Avenue wetlands

Name	Ecosystem	Elevation (m-asl)	Coordinates (10 UTM)	Perimeter (m)	Area (ha)
Dohele Avenue Wetlands	Willow Swamp with Bulrush	37	0402947.61m E, 5464921.74m N	459	0.79
Secondary Wetland	Forested Swampy Pool	37.2	0402845.00m E, 5464974.00m N	84	0.049
Total Area					0.839



Figure 6: The 0.79 ha Doehle Avenue Wetland by the Parksville RCMP Station, with thick organic mud, willow swamp and bulrush habitat to the East with adjoining 0.049 ha pocket swamp to the northwest.

The Doehle Avenue Wetland is a rare willow swamp ecosystem reminiscent of Louisiana wetland environments, with widely spaced willows and swampy soils. The main wetland area covers 0.56 ha, the remaining 0.23 ha is occupied by the transitional zone (the area between open water and the edge of the wetland) that ranges in width from three to fourteen meters.

Vegetation, Ecology & Biodiversity

The tall, well established willows are interspersed with bare, rich mud that frequently contains up to 0.4 m of water. The prolific duckweed and cattail areas cover two patches totalling around 300 m²,

complemented by stands of black cottonwood and scattered trembling aspen (Figure 11).

The southern portion of the wetland borders meadow grass with the transition area approximately three meters wide with a sharp distinction between the willow swamp and grass. On the north and northeast sides of the wetland, there is a well-defined, but slightly more gradual transition to upland habitat with a rise of up to 1.5 m a matrix of western red cedar, coastal Douglas-fir and red alder forest with Oregon grape, salal and ocean spray understory. This forest forms an important buffer area and upland habitat adjacent to the wetland for a more resilient and complete lowland ecosystem. Mallard and hooded merganser are often seen in the swamp during the wet season, while migratory and resident songbirds associated with swamps and wet forest including common yellowthroat, Wilson's warbler, Pacific slope flycatcher and black-headed grosbeak are seen in season.



Figure 7: Open water and bulrush transition to dominant willow swamp matrix in the Doehle Avenue Wetland. This wetland provides locally scarce bulrush and swamp habitat.

Detached Secondary Wetland at Doehle Avenue

The secondary wetland at Doehle Avenue, located 21 m northwest of the main wetland, located in the upper left hand corner of Figure 10.

This very small secondary wetland has been detached by a bridge of dry land that consists of patches of wild rose and coastal Douglas-fir vegetation. Several hardhack plants near the edges of the wetland give way to open mud and slough sedge. The more open southeast side of the wetland is encircled by Pacific crabapple, wild rose, shore pine, willow species and non-native hawthorn. At the margins there are some invasive species including spurge laurel, grasses and Himalayan blackberry. The northwest side consists of coastal Douglas-fir and shore pine.

Rathrevor Provincial Park Wetlands

Rathrevor Provincial Park contains two significant wetlands located approximately one kilometer from the Englishman River (Figure 12). The southeast Wetland is comprised of shrubby marshland habitat and swamp conditions, whereas the Northwest Wetland consists of open rush and sedge that transitions into a dry forest. Both wetlands contained sharp transition zones rich in biodiversity, including a forested bluff that gives way to swamp forest and a marsh, or open rush and hardhack habitat transitioning into Douglas fir forest adjacent to sedge pools. The geographic setting is summarized in Table 4.

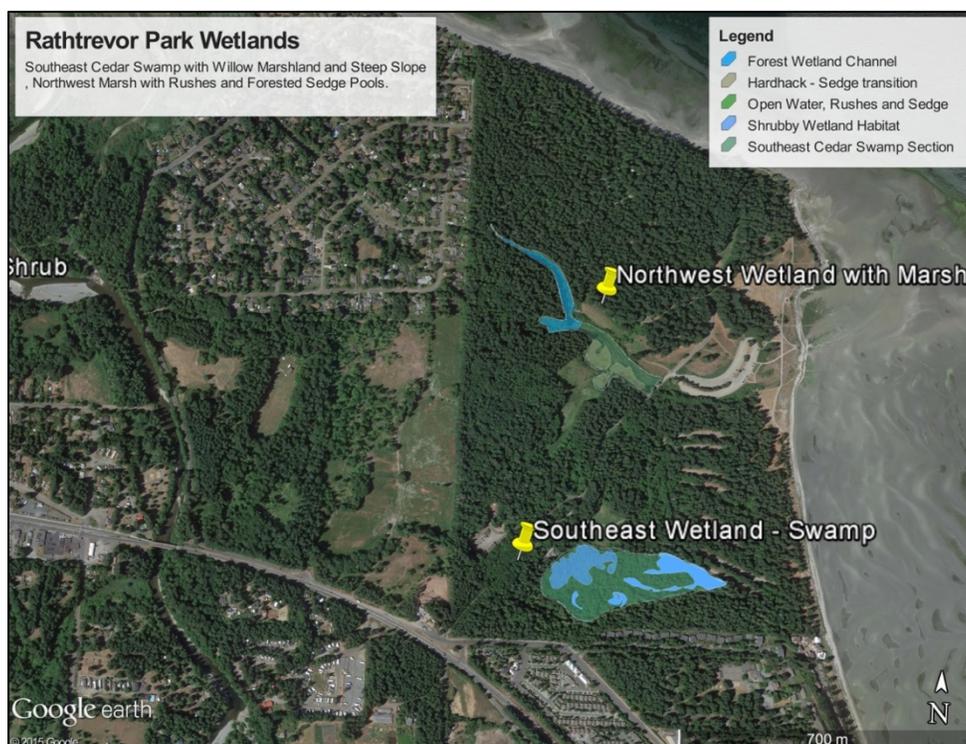


Figure 8: The two freshwater wetlands at Rathtrevor Park make up 6.75 ha of the total park area, forming a significant percentage of the non-marine section of the park.

Table 4: Geographic setting of Rathtrevor wetlands

Name	Ecosystem	Elevation (m-asl)	Coordinates (10 UTM)	Perimeter (m)	Area (ha)
Rathtrevor Wetland Northwest	Open Marsh, Conifer Narrow Forested Wetland	8	0407611.16m E, 5463972.35m N	1,627	2.14
Rathtrevor Wetland Southeast	Mixed Deciduous and Conifer Wetland	8	0407696.69m E, 5463449.66m N.	1,045	4.61
Total Area					6.75

Southeast Wetland

The Southeast Wetland is situated between the southeast boundary of the park and campsites to the north (Figure 13). The wetland is 63% cedar/alder swamp (2.89 ha), with a sharp bluff transition from upland to wetland on the south side, followed by more gradual transitions from cedar swamp to open willow wetland and shrub patches throughout the predominate swamp matrix. The remaining 37% (1.72 ha) of the marshland is characterized by willow, hardhack, sedge pools, rushes and open water.



Figure 9: The Southeast wetland at Rathtreavor defined by swamp conditions and open marshy habitat bordered by wetland forest, steep slopes and shrubs.

Vegetation, Ecology & Biodiversity

The southern side of the wetland transitions from dry land at the bottom of the steep slope into a swamp habitat that is clearly defined.

High organic soil, soft, deep mud (0.25 m) and standing pools of water support a diverse range of vegetation types associated with swamp conditions and provide habitat for numerous birds and amphibians. A very moderate amount of clay is present in the soil, however, it is dominated by organics.

The wetland transitions from pooling water located below western red cedar stands interspersed with skunk cabbage and slough sedge at the southeast edge into marshy habitats characterized by extensive willow, dogwood and Indian plum that makes up 0.67 ha marshy area. This marshy area is subsequently interrupted by patches of swamp habitat defined by western red cedar, thicker patches of willow species and dogwood. Amongst the swamp matrix towards the northeast, a marshland and shrubby wetland zone is characterized by hardhack, wild rose, slough sedge pools, isolated aspen and cottonwood trees and salmonberry patches (Figure 14).



Figure 10: Southeast wetland at Rathrevor characterized by slough sedge dominated marsh/swamp transition areas, mixed shrub cover and red alder patches in between the central marsh habitat and surrounding western red cedar swamp matrix.

Northwest Rathrevor Wetland

The wetland consists of a well-defined mix of open marsh and forested wetland habitat with deep water sections, shallow pools and very slow drainage. The Northwest Rathrevor Wetland is identified by an arm that extends to the northeast (Figure 15).

Vegetation, Ecology & Biodiversity

The main portion of the northwest wetland is located east of a footbridge, with open marsh conditions and high levels of organic

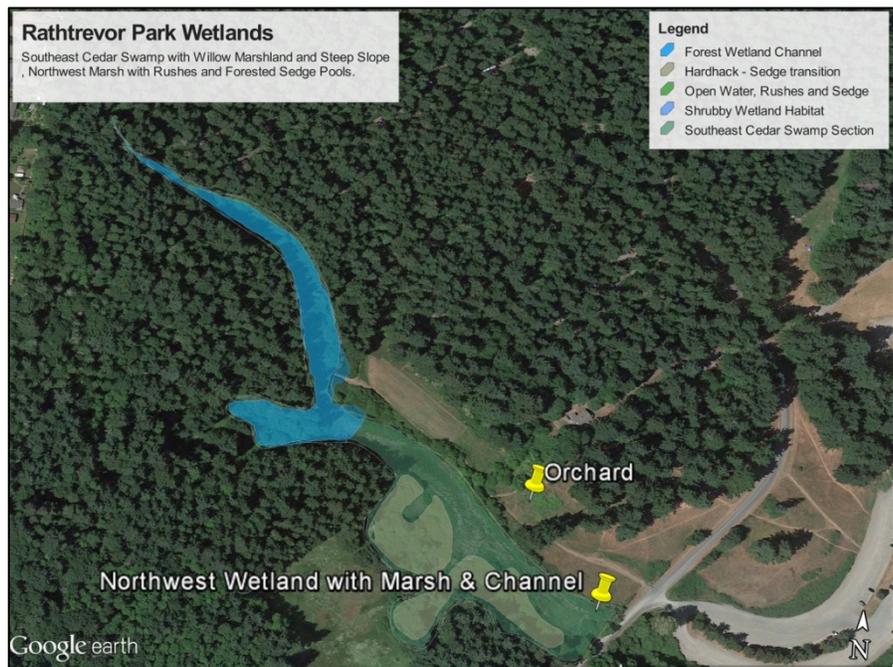


Figure 11: The northwest wetland at Rathrevor characterized by open, shallow water pools dominated by rushes and a forest wetland arm with sedge and salmonberry covered channels.

content formed by nutrient rich soil and sedges as shown in Figure 16. This main section covers 1.38 ha, forming approximately 65% of the wetland. It is composed of approximately 40% rush, 10% slough sedge, 30% hardhack transition zone and 20% Pacific crabapple, willow species, Pacific dogwood and grand fir. The northern portion of the main wetland is characterized by a sharp, approximately one meter drop from grassy meadows into high organic content with a significant sandy component and a degree of clay. The upper layer of organic mud in this soil type can be separated by hand from a roughly 50/50 sand/clay mix.



Figure 12: Northwest wetland at Rath Trevor with rush tussock section (left) and nearby wet meadow zones (right), bounded by Hardhack and Pacific Crabapple to the east, and Douglas-fir and western red cedar/grand fir wetland forest to the west.

To the west of the footbridge, the wetland narrows sharply, and forms a long, thin tapered arm approximately 26 m across at the midpoint covering an area of approximately 0.76 ha. This wetland extension accounts for the remaining 30% of the wetland and is characterized by slough sedge, hardhack, salmonberry and skunk cabbage, with overshadowing mature Douglas-firs, scattered grand fir and bigleaf maple. The effect is a more swamp-like condition with a moister, cooler environment with less herbaceous vegetation and marginal vegetation present. The soil has more clay and organic content and slightly less sandy compared to the main pool with rushes. The lack of rushes is a significant differentiating factor between the two sections.

The open water conditions attract waterfowl that feed in the nutrient rich mud, while the abundance of native berries and native fruit trees attract migratory songbirds feeding on the fruit. The willows provide habitat for caterpillars, upon which many insectivorous migrants such as warblers feed. Due to the relative proximity of this habitat to the Englishman River, groundwater recharge, filtration and retention levels are of interest and should warrant further investigation. The origin of the clay component of wetland substrates in the area may be of additional interest. Trails surround the northwest wetland, but a fairly sensitive design limit impacts to the transitional vegetation zones and habitats present.

Englishman River Estuary Wetlands

The Englishman River Estuary has three wetlands. The geographic settings are described in Table 5 below.

Table 5: Geographic setting of wetlands in the Englishman River estuary

Name	Ecosystem	Elevation (m-asl)	Coordinates (10 UTM)	Perimeter (m)	Area (ha)
Mills Street Marsh	Bulrush marsh beside estuary	6	0405498.80m E, 5463958.86m N	159	0.13
Dugout Pond	Steep sided pond surrounded by shrubs with sedge at west end	2	0405562.00m E, 5464040.00m N	190	0.09
Englishman River Estuary Wetland Forest	Primarily coniferous wetland forest characterized by pools of water filled with slough sedge. Shrubby west end.	4	0405693.00m E, 5464010.00 m N	630	0.61
Total Area					0.83

The Englishman River Estuary is a significant conservation area bordering the centre North section of Parksville, interfacing between residential neighbourhoods to the south and oceanfront to the North (Figure 17). While the primary conservation values present on most of the estuary consist of riparian habitat, upland forest, moist coastal forest, grassland, saltmarshes, shrubby heathland, wooded islands, estuarine habitat and grasslands, there are three wetland environments present.



Figure 13: The Englishman River Estuary showing the Mills Street Marsh, Dugout Pond and Wetland Forest in context. The wetlands and associated rivulets are concentrated at the inland mid portion of the estuary bordering forest, grassland and urban zones.

Mills Street Marsh

The locally rare cattail marsh environment is located on private property next to the estuary, with a wide variety of wetland specialist species (Figure 18). The property owners have expressed support for the protection of the wetland and are interested in conservation and management options. This wetland will be described as the Mills Street Marsh for the purposes of this report.



Figure 14: The Mills Street Marsh is characterized by bulrush beds and willow and hardhack borders. The marsh is located between saltmarsh a residential environments. Himalayan Blackberry grows on the residential property bordering the south side of t marsh.

The open portion of this wetland forms 0.09 ha, consisting of approximately 90% cattails and 10% hardhack and open water/organic rich mud. The transitional zone habitat characterized by pools of water with willow, hardhack and Indian plum makes up the remaining portion of the wetland area (0.04 ha). The wetland borders moist western red cedar and maple stands with willow and dogwood patches forming the surrounding habitat.

Vegetation, Ecology & Biodiversity

The wetland provides a valuable source of aquatic habitat for marsh dependant species throughout the year and exhibits significant biodiversity and ecological value. A biodiversity hotspot, this small wetland supports marsh dependant Virginia Rail, the locally uncommon Marsh Wren, Common Yellowthroat, Yellow Warbler, Cooper’s Hawk, Black-headed Grosbeak, Red-winged Blackbird, Mallard, Purple Finch and Song Sparrow. Amphibians and reptile species are expected onsite. The wetland provides a water source and helps to maintain fruiting plants in drought conditions as a food source for wildlife species including migratory and resident birds.

Photographs of significant historic flooding during combined high tide and heavy rainfall conditions showed large quantities of water exchanged from the wetland into the estuary as shown in Figure 19. This wetland provides flood mitigation and water retention values.



Figure 15: Historic flooding with mixing of Mills Street Marsh and brackish water from the Englishman River estuary saltmarsh section. (Photo provided by owner of the Mill Street Marsh property for reference use.)

Dugout Pond at Mills Street

Located 60 meters north of the Mills Street Marsh a manmade pond occupying 0.09 ha (Figure 20). The pond consists of 0.06 ha of open water habitat with steep sides and water depths estimated to be less than one meter. The remaining 0.03 ha of habitat is comprised of a one meter drop off with a sharp transition from open water to bordering terrestrial habitat along the eastern side of the pond and up to a 0.2 m drop transitioning from grassland and some saltmarsh environments along the western edge of the pond.



Figure 16: The dugout pond near Mills Street exhibits deep water, brackish conditions and a sharp transitions from aquatic habitat to terrestrial habitat. Marginal zones and shallow water are limited with only a small rush bed at the west end.

Vegetation, Ecology & Biodiversity

The pond has gained some important created habitat values for a wide range of estuarine and upland birds, reptiles and mammals including wood ducks known to nest nearby in trees, otherwise uncommon along the Parksville Waterfront. However, this habitat is a prime example of why natural wetlands are innately superior to manmade wetlands for provision of habitat values and watershed functionality.

The deep water limits access to the bottom of the pond and wading in many areas compared to a natural wetland, while the sharp transition from dry land to deep water limits marginal zone habitats for many wetland species, and a lack of transitional vegetation limits water filtration and retention values. Additionally, the water body alternates between higher and lower salinity brackish conditions as opposed to purely salt or fresh water, which further limits its suitability for a range of wetland and marine species. Stranding of a marine animal in the pond is a possibility in the case of combined flooding and high tide.

Wetland Forest at Mills Street & Shelly Road

The 21.44 ha coastal plain forest on the Shelly Road and Mills Street side of the Englishman River Estuary contains wetland forest and shrubby wetland habitat consisting of a 0.61 ha wetland forest. Standing water occupies extensive patches of habitat during the wet seasons, with predominant vegetation consisting of slough sedge in these pools, as shown in Figure 21.



Figure 17: Englishman River Estuary Wetland Forest is characterized by extensive sedge beds with standing shallow water, bordering salmonberry and a forest canopy with a cover of around 65 %, with interspersed western red cedar and red alder with scattered grand fir.

Vegetation, Ecology & Biodiversity

The slough sedge filled seasonal pools are bordered by salmonberry shrubs and mixed lowland forest consisting primarily of western red cedar, red alder and grand fir. The wetland forest substrate consists of high organic content muddy soil with moderate clay and sand present. The slough sedge dominated pools make up the floor and lower vegetation levels of the wetland forest in lieu of the ferns defining the floor of the surrounding dryer forest.

Adjacent to the wetland forest at the northwest perimeter of the wetland, a wet meadow and sedge transition area surrounded by shrubs makes up 0.07 ha (10 UTM 405644.35 m E, 5464008.97 m N). At the southwest perimeter of the wetland a shrubby wetland environment with extensive willow, hardhack and native fruit and berry trees including Pacific crabapple cover 0.05 ha (10UTM 405642.51 m E, 5463981.26 m N).

The wetland forms five distinct habitats: wetland forest, sedge pool, shrubby wetland and wet meadows and a clear transition into dry forest. This wetland habitat collects surface water and limits runoff into the Englishman River Estuary, filters water, and retains water for gradual release in the dryer seasons, while mitigating flooding in wet seasons.

Education and Outreach

As public awareness and community involvement are key aspects of the project, two hours of public education and media publication was pursued. With volunteer engagement activities and the involvement of community members mapping the wetlands and assisting in the creation of this report, led to two media articles being published through RB Web News and the Mount Arrowsmith Biosphere Region Blog, as well as presentations to a VIU Geography undergraduate class and to the Arrowsmith Watershed Coalition Society.

Future Research Recommendations and Conclusion

This report identifies the baseline information about the location, physical characteristics, area extent and perimeter of key wetlands in the Lower Englishman River Watershed Study Area. Further research should be completed to assess the interactions between the surface and groundwater components of the identified wetlands within the Lower Englishman River Watershed.

Priority research for the wetlands upon allocation of funding may consist of the following:

1: Surface and Groundwater Relationship Research with Data Loggers – High Priority

Assessment of the relationship between the wetlands and the groundwater resources, including the characteristics of local aquifers. This will be accomplished in part through the installation of data loggers to monitor the fluctuation in groundwater dynamics at priority wetland sites – likely one of the Rath Trevor Provincial Park Wetlands and the Parksville Wetlands.

2: Soil Sampling and Surface Water Study – Intermediate Priority

Soil samples can be taken at all or some of the wetlands, according to research priority, to determine the composition of the soil. Determining percentages of clay, mineral content, washed up soil and organic mud will shed light on the permeability of the wetlands; consequently, this will help to determine the groundwater recharge potential and watershed value of these wetlands.

3: Pollution and conservation concerns – Intermediate Priority

Physical site assessment to further determine sources and patterns of pollution and adjacent environmental impacts, as well as threats from development and human impacts would be warranted, particularly around the Englishman River Estuary Wetlands. Site descriptions and mapping of pollution sources, together with possible testing of soil for specific organic and inorganic contaminants may be indicated.

4: Biodiversity Assessment – High Priority

Wetlands are among the most important wildlife habitats in British Columbia and worldwide. As well, wetlands are among the most sensitive and threatened habitats. Inventories to more

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precisely determine native plant occurrences, wildlife occurrence and use, particularly with regard to wetland birds and amphibians would provide valuable further insight into the ecological values and sensitivities of these wetlands and are highly recommended. Description of sensitive species occurrence, potential impacts and management of water levels, vegetation conditions and disturbance would support maintenance and enhancement of the ecological values of these wetlands.

Given the interest that the City of Parksville has in the protection of wetlands, the City should also be notified that additional information on the Parksville Wetlands has been collected. This report documents wetland existence, location, size and conservation values; therefore, it has the potential to serve as a valuable resource for wetland conservation planning in the community, stewardship and possibly park planning, acquisitions and protected areas management.

Report provided to GW Solutions Inc. and Mid Vancouver Island Habitat Enhancement Society
December 22, 2015. By Christopher M. Stephens Consulting, Parksville, British Columbia.

Appendix 1

City of Parksville water wells in relation to sensitive areas

City of Parksville water wells in relation to sensitive areas

Part of the City of Parksville water supply system includes the well field, a water tower (and associated infrastructure) as well as secondary well sites and test wells on the 51 acre, non-covenant portion of the 84 ALR property that also includes the 32 acre Ermineskin Nature Park. It contains the riparian zone of Romney Creek and a 1.93 ha swamp with apparent hydrological connections to the Parksville Wetlands and likely a source of groundwater recharge and a contributor to nearby water features.

The main well sites are located on a very small remainder site that was previously located on the Ermineskin Property, but is now owned by the city. The Parksville wetlands have drawn significant conservation interest and have become the subject of concerted conservation efforts and discussions involving the local community and City of Parksville. This report provides valuable information. The author of the report, acting as the Parksville Wetlands Initiative, has previously engaged the City of Parksville, who expressed support for the securement and management of the site as a key watershed conservation resource for the community. Based on a preliminary description of the site, the City took actions towards conserving the property following presentations to council and pro bono consultation.

The west edge of the Parksville wetlands is located 255 m from the test well located in the center of the Ermineskin Property. The most westerly well on City of right of way borders the Ermineskin Property and is the well closest to the wetlands at 150 m from the east edge of the Parksville Wetlands. The center of the main well field facility is 690 m from the east edge of the Parksville Wetlands.

Appendix 2

Further considerations for specific wetlands

Parksville Wetland and Ermineskin Nature Park

Being located amongst and adjacent to the City of Parksville's Springwood water well field, the Parksville Wetlands and Ermineskin Nature Park swamp complex form a prime location of interest for data logger installation to obtain data on surface water and groundwater dynamics. Soil analysis may shed further light on potential groundwater recharge considerations and possible contributions to flows in the Englishman River, with regards to the wetland forest areas. Investigation and description of flooding concerns close to the Parksville Wetlands and potential impacts of nearby development to date would be of relevance.

Investigation on the significance of the Parksville Wetlands as the headwaters of Carey Creek and the nature of the hydrological relationships between the Parksville Wetlands, Ermineskin Nature Park Swamp and Carey Creek would be warranted. Investigation of the relationship of these wetlands and watercourses to Aquifer 216 below is of relevance. Biodiversity surveys would provide relevant information on the habitat values. Existing baseline data on bird, fairy shrimp and selected mammal and amphibian species use, is available through the Parksville Wetlands Initiative.

Investigation of seasonal water levels, drainage patterns and water chemistry would provide hydrological and ecological information of value. Potential pollution, drought patterns and ecosystem stressors may be determined.

As this site does not fall within a formal protected area, with the exception of the swamp on the Ermineskin Nature Park parcel, conservation planning considerations and investigation of site protection and securement potential is of importance. This shallow wetland provides habitat values rare in the Oceanside area.

Doehle

The Doehle Avenue wetlands warrant further investigation to determine seasonal water levels, drainage patterns and water chemistry, as well as potential capture of pollution from nearby developments. As the site is not within a protected area, further review of land status and potential site specific conservation planning approaches and securement strategies is of interest.

Relation to groundwater recharge at a later date may be of interest, but this is a lesser priority as the site does not immediately adjoin water wells. Evaluation of the location of this wetland in relation to nearby aquifers is of relevance. Soil sampling would be indicated to determine ratios of mud, organics and sediment relative to clay and the potential of this site to provide groundwater recharge values.

Biodiversity surveys would provide relevant information on the habitat values present, particularly with regard to birds and amphibians. The wetland is fairly unique in the Parksville area with its combination of willow swamp habitat and bulrush stands, and may warrant further assessment as a sensitive ecosystem.

Rathtreavor Northwest Wetland

At both Rathtreavor wetlands, soil sampling would provide information about ratios of mud, organics and sediment relative to clay. Analysis of soil may shed further light on potential groundwater recharge. This research may be of interest as the wetlands are close to the Englishman River and San Pareil water wells. Installation of data loggers to obtain surface water and groundwater recharge information may be particularly appropriate at this site, particularly for the northwest wetland which is closest to San Pareil.

Investigation of seasonal water levels, drainage patterns and water chemistry would provide information of value. Biodiversity surveys would provide valuable information on the habitat values. Specifically, for the southeast wetland, dumping on the bluff which transitions at the base directly into the cedar swamp habitat with pools of water and adjacent willow section of the wetland is a noteworthy conservation concern. Contamination of the wetland through toxic dumping or plastic waste is a concern considering the range of waste that has been dumped down the slope, some of which ends up in the wetland due to the sharp transition between the slope and pools.

Englishman River Estuary

At the wetland forest the water quality testing to determine pesticide, street related runoff and organic pollution may be of further interest given historical concern over findings of pollutants in the Englishman River Estuary. An unidentified culvert located at 10UTM 0405595.00m E, 5463983.00m N leads to a stream area extending 98 meters towards a saltwater tidal channel. Identification of the watercourse, reasons for the presence of the culvert and salinity, pH and organic content of the watercourse may be of research and conservation interest. Further west by about 85 meters, close to the south boundaries of the shrubby wetland zone and wetland forest areas (10 UTM 0405721.0 m E, 5463970.0 m N) is a freshwater channel containing Pacific Water Parsley *Oenanthe sarmentosa*.

For all wetlands at the Englishman River estuary, investigation of seasonal water levels, drainage patterns and water chemistry would provide valuable information. Potential organic and petroleum based pollution from nearby streets, residential areas and urban runoff may indicate testing to determine pollutant capture by these wetlands.

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Biodiversity surveys would provide relevant information on value of the habitat.

Soil sampling should be conducted to determine ratios of mud, organics and sediment relative to clay. Analysis of soil type may shed further light on potential groundwater recharge and possible contributions to flows in the Englishman River, with regards to the wetland forest areas.

Further investigation on the habitat use and water retention values of the dugout pond for the ecosystem may be of interest, although the contribution of this pond to general watershed values are expected to be insignificant compared to the natural wetlands located, mapped and described.

Appendix 3

Conservation Planning

Conservation Planning

Parksville has two significant protected wetland areas on the east side of the City near the Englishman River. These wetlands are described as the Englishman River Estuary with two freshwater wetland areas and Rathtrevor with two large wetlands consisting of significant marsh and swamp ecosystems. However, on the west side of Parksville, near one of its well field, there are two significant areas not located within established conservation areas, with the exception of the swamp in the Erminskin Nature Park. The protection of the Parksville Wetlands near the City's water source, which has been identified as an important conservation objective by the City of Parksville and the Doehle Avenue Wetland, are logical conservation priorities for the west side of Parksville.

The mapping of the four main wetland areas in the City of Parksville, selected as the initial study areas for the Lower Englishman River Watershed and described in this report provides essential documentation about these wetlands. The completed work is essential as a basis for further investigation of the relationship between surface and groundwater, ecosystem health and watershed health. Along with a summary of ecological and watershed values present, this report identifies areas that could face potential threats from development, climate change or hydrological stress on the watershed.

In addition, the contributions of these wetlands to local groundwater recharge, water filtration, water retention and flood mitigation should be further assessed. Their importance to local resiliency against climate change, biodiversity loss, drought and habitat loss merit further consideration.

Documentation of these wetlands provides concrete information that can be used to support wetland conservation planning and habitat protection efforts within the Lower Englishman River Watershed, which may involve key stakeholders including non-profit conservation organizations including MVIHES, GWS, local landowners and commercial developers and also significantly, the City of Parksville, who has taken steps to protect wetlands following work with the City by the Parksville Wetlands Initiative.

Studies of the groundwater and surface water relationship through the installation of data loggers is particularly recommended in the Parksville Wetlands near the well field and one of the Rathtrevor park wetlands.

The Rathtrevor Park Wetlands and Englishman River Estuary Wetlands are within officially designated conservation areas, with the exception of the Mills Street Marsh, which is on private property and of possible interest for securement under a conservation covenant. The owners were contacted and proved to be very open to conversation and supportive of protection of the wetlands. The wetlands at Rathtrevor are buffered from adjacent sources of pollution by

surrounding trees. Potential invasive species arrival, damage to vegetation through human disturbance and off trail activities and fire are possible threats to the site. Increasing drought, reduced canopy cover, changes in surface water flows, declines in groundwater and climate change may impact the hydrology of these wetlands, especially affecting seasonal water levels.

The Englishman River Estuary wetlands face threats through adjacent residential land use and related invasive species arrival and human disturbance. Human and dog disturbance is a possible concern near trails. Water quality concerns have been noted in previous watershed health discussions in Parksville relating to urban runoff into the Englishman River Estuary where the wetlands are located. Littering and illegal camping, including a case where a small camp stove was used in the protected forest near the wetlands poses noteworthy pollution and fire hazard concerns. Insufficient surrounding forest cover, windfall and erosion could damage the resiliency and functionality of these wetlands. Increased temperatures and reduced water quality, together with drought, groundwater depletion, surface water flow changes and climate impacts could reduce the watershed values provided by these wetlands. No known concerns relate to the condition or management of the dugout pond.