### Survey of 2 Tributary Creeks in the Courtenay River Estuary

# **DRAFT Final Report**



Prepared for: Fish and Wildlife Compensation Program

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### **EXECUTIVE SUMMARY:**

In 2016, the Comox Valley Project Watershed Society (CVPWS) obtained seed funding from the Fish and Wildlife Compensation Program (FWCP) to update mapping and surveying of habitat features for two tributary streams, Glen-Urquhart and Mallard Creeks, both of which enter into Dyke Slough and then the K'ómoks Estuary. This data collection was a necessary first step to help identify restoration opportunities and guide future restoration planning. It was also an information gap that was recognized by a local stakeholder committee organized by the Comox Valley Regional District (CVRD). This committee is looking at the functioning of the tide gates, which control saltwater intrusion into the Dyke slough, and how the workings of the gates could be modified to improve the area for fish and wildlife.

Landowners along both creeks were contacted by CVPWS, either directly or through a mail-out, and asked for permission to access their property in order to conduct the necessary stream survey work. These property owners were also informed of the project rationale and the potential for future habitat restoration or enhancement works. Landowners were receptive to this work and some synergistic opportunities to address their specific issues and/or concerns, while at the same time improving habitat for fish and wildlife, were identified.

A team from Ecofish Research Limited (Ecofish) and the K'ómoks First Nation undertook the field survey work of the two creeks in the fall. CVPWS provided Ecofish with all the background documentation required to conduct this work including the previous mapping and report. Ecofish verified the mapping data previously collected on the system and recorded habitat features, issues of concern and some opportunities for improving habitat. The final deliverables included updated field verified ArcGIS and Excel SHIM datasets for Glen-Urquhart and Mallard Creeks, and associated maps and georeferenced feature photos as well as drone surveys of both these streams. CVPWS reviewed and complied the field data received from Ecofish in order to create and update reports for these two systems with photos, as well as potential restoration and/or enhancement opportunities along these systems. This information will be passed along to the CVRD committee in order to inform their decision making process about the management of the tidal gates and the estuary floodplain. It will also be vetted through the CVPWS Technical Committee in order to prioritize future restoration planning along these two systems.

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### **INTRODUCTION:**

Historically the Comox Slough / Dyke Slough was a tidal slough in the K'ómoks Estuary. Over time the surrounding land was diked and converted to agricultural land. The remnant slough remained a brackish-freshwater wetland with water sources from Glen-Urquhart and Mallard Creeks which flow into the slough and subsequently through flap gates underneath Comox Road (see Figures 1) into the Courtenay River and then the K'ómoks Estuary. While both of the streams are salmon bearing, the connection of the slough to the Courtenay River is restricted for fish access (returning spawners as well as out-migrating and over-wintering juveniles) due to the flap gates (see Figure 2). These top-hinged gates close during incoming (flood) tides to prevent tidal waters from moving upland. During outgoing (ebb) tides the gates open to allow upland water to flow through the culverts under Comox Road and into the slough. Therefore this type of gate is generally open only 50% of the time<sup>1</sup> and limits the movement of fish between the slough and estuary. However, the flap gates provide socio-economic and ecological benefits to the slough by reducing the risk of tidal inundation (saltwater intrusion) to the farmland, facilitating drainage and creating a wetland that is used by a diversity of freshwater species.



Figure 1 - Glen-Urquhart and Mallard Creeks flowing into Dyke Slough.



*Figure 2 - Photo of Dyke Slough flap gates underneath Comox Road.* 

In 2015 the Comox Valley Regional District (CVRD) convened a committee of relevant stakeholders to determine if and how tidal inundation can be introduced to the slough to facilitate more fish access, while maintaining the freshwater values of the slough and addressing socio-economic issues of farming around field drainage and the risk of saltwater intrusion. The committee, known as the Courtenay Flats Drainage Service Stakeholders Committee, consisted of representatives from the CVRD, Fisheries and Oceans Canada (DFO), Ducks Unlimited Canada (DUC), the Comox Valley Project Watershed Society (CVPWS), the K'ómoks First Nation (KFN), The Nature Trust of BC, the BC Ministry of Land, Air and Water Protection and local biologists. Their proposed approach to this issue was to identify high priority studies to be undertaken to address current gaps in knowledge, followed by an active adaptive management strategy whereby small amounts of tidal inundation would be introduced. At the same time, the area would be actively monitored for changes. One of the high priority studies that was identified as required was an updated topographic survey of both Glen-Urquhart and Mallard creeks.

Glen-Urquhart and Mallard Creeks, both of which originate from groundwater sources in East Courtenay, are two of the most heavily degraded salmonid streams in the Comox Valley and both have been severely impacted by upstream urban development and agricultural activity along their lower reaches. Despite the fact that their habitat has been compromised by human activity, Glen-Urquhart and Mallard Creeks both still manage to sustain salmonids. Glen-Urquhart Creek is known to support spawning populations of both chum and coho salmon<sup>2</sup>. Mallard Creek used to support spawning coho, but it is unknown if this is still the case. However, Mallard Creek is utilized by juvenile coho for overwintering habitat<sup>3</sup> and a study that assessed juvenile fish usage in Dyke Slough, among other parameters, noted that the highest number of coho juveniles were captured in February, and the majority of these were caught in Mallard Creek <sup>4</sup>. In addition to coho juveniles, cutthroat trout fry have also been found in Mallard Creek <sup>3</sup>.

In 2016, CVPWS obtained seed funding from the Fish and Wildlife Compensation Program (FWCP) to undertake an updated topographic survey of Mallard and Glen-Urquhart creeks. This funding was obtained through the FWCP Puntledge Salmonid Action Plan and the primary action addressed by the project is to 'restore habitat in the Courtenay River and estuary (e.g., address channelization and naturalize the river banks, instream complexing, and restoration of tributary habitats)<sup>5</sup>. The purpose of this survey work and data acquisition is twofold: First it will feed into the CVRD stakeholder committee process providing important data to help guide the committee in tackling the issue of how to balance increased saltwater inundation and not negatively impact existing freshwater habitat or farming opportunities. Second it is needed to determine existing habitat types, limiting factors to salmonid production, and stream restoration options in both Glen-Urquhart and Mallard Creeks. The topographic surveys of Mallard and Glen-Urquhart creeks will provide baseline data and information which will support identification of restoration opportunities and guide any future restoration planning for these systems.

#### **METHODS:**

#### LANDOWNER CONTACT

The first step in the project planning was to secure permission from the relevant landowners, whose property Mallard and Glen-Urguhart Creeks cross, to access their land in order to conduct the necessary stream survey work. This was also an opportunity to inform property owners of the rationale for the project and the possibility of future fish habitat restoration work along the creeks. This landowner contact and communication was important to build buy-in and support for the project. This type of outreach can also reveal issues of importance to the landowner and help build dialogue on issues of common concern. In terms of the two systems, Mallard, which flows mainly through agricultural land, has fewer property owners and these tend to own or lease large tracts of land. In addition, much of the lower reaches of Mallard flows through conservation lands which are held by Ducks Unlimited Canada (DUC) and the Nature Trust of BC (TNTBC). Contrarily, most of Glen-Urguhart Creek flows through a more urbanized and densely populated area, thus there are many landowners that have the creek flowing through and/or adjacent to their property. Because of the two types of land ownership, two different approaches were used by CVPWS to connect with the local landowners to secure permission for our team to access their properties: direct contact and mass mail-out.

# DIRECT CONTACT

For Mallard Creek a map of the property boundaries around the creek was obtained and an updated list of landowners was developed with input from the local DUC representative and other knowledgeable members of the Estuary Working Group (EWG). The EWG is an ad hoc committee which meets monthly and was formed as an outcome of a symposium on the estuary which was held in 2008. The EWG consists of representatives from 12 different organizations including stewardship groups, government organizations, first nations, independent businesses and others concerned with the long term health of the K'ómoks Estuary. Once the current property ownership was determined the individual landowners, only nine in total, were contacted directly, either by e-mail or phone, and informed of the project. All of these landowners responded positively, although some indicated that they wanted to be informed of when we would be on-site to undertake the survey work. These landowners and other stakeholders were also invited to a field reconnaissance of TNTBC and DUC conservation lands - two of the largest landowners along the lower reaches of Mallard Creek. CVPWS conducted an on-site field reconnaissance on June 10, 2016 with interested stakeholders to walk most of Mallard Creek. Those that attended this meeting included representatives from DUC, TNTBC, Fisheries and Oceans Canada, the Vancouver Island Conservation Land Management Program, the Comox Valley Regional District and the K'ómoks First Nation.

### MASS MAIL-OUT

As there are many individual property owners along Glen-Urquhart Creek, a form letter and mass mail-out was chosen as the method by which to contact these landowners and secure permission to survey the creek where it bisects their properties. In order to determine the recipients of the letter, an updated property ownership list, based on the 2015 property taxes, was obtained from the City of Courtenay. We then sent the 27 property owners a letter explaining the project and asking permission for our team to access the creek through their property. The letter also encouraged them to get involved with the local Glen-Urquhart Streamkeepers group in order to protect and restore this local aquatic habitat (see Appendix 1).

### FIELD SURVEY WORK

Sensitive Habitat Inventory Mapping (SHIM) was previously completed by CVPWS for Glen-Urquhart Creek (map and report) and Mallard Creek (map only) in 1999/2000 making this work outdated. Therefore this SHIM data and mapping needed to be verified and updated prior to being used as a guide for restoration works or other habitat management actions. The original proposal was to have a local professional surveyor work with CVPWS volunteers in order to collect the field data and ground truth the two systems. However, the decision was made to partner with Ecofish Research Ltd. (Ecofish) in order to complete this work. Ecofish staff had volunteered with CVPWS on a saltmarsh restoration project previously, and CVPWS learned that they are experts in fresh water stream habitat and hydrology, so we asked if they would be interested in assisting with this project. They agreed to help us at a reduced cost and provided much in-kind support to the project, with the understanding that they would partner with us on future restoration work.

The methodology that Ecofish employed to meet the project goals was to ground-truth the original datasets for Glen-Urquhart and Mallard creeks by verifying the identified features and mapped stream centerline, updating the issues and recommendations previously identified, and updating the SHIM data. The main focus of the field verification was on the lower reaches where the streams bisect conservation lands or other private lands that provide restoration or other conservation opportunities. Cross sections were also collected in lower Mallard Creek, from the Dyke slough up to Back Rd. The field verification was conducted in October and November of 2016 and the final deliverables included updated field verified ArcGIS and Excel SHIM datasets for Glen-Urquhart and Mallard Creeks, and associated maps and geo-referenced feature photos. In addition, Ecofish provided updated restoration recommendations for the two systems. CVPWS provided Ecofish with all the background documentation required to conduct the work. This included shapefiles and associated SHIM databases for the two creeks and an updated map of the lower reaches of Mallard Creek within the conservation and private lands that were of interest for additional data collection.

#### DATA COLLECTION AND COMPILATION

The Ecofish crew along with a member of the K'ómoks Guardian Watchman program surveyed approximately 800 meters of Mallard Creek and 3000 meters of Glen-Urquhart Creek (Figures 3 and 4). Habitat features such as pools and riffles, substrate and riparian cover were recorded, in addition to human made features such as ponds, weirs, bank stabilization infrastructure, drains, and culverts, and invasive species. The majority of these features were photographed in GPSKit loaded on an iPad, and the locations and attributes of data points verified with GISPro loaded on the iPad. All new or modified data points were captured with GISPro, and the updated ArcGIS compatible shapefile exported. The photos were exported from GPSKit into geo-referenced kmz files that can be projected in Google Earth. The few data points that were not verified with the iPad were photographed and the waypoints verified with a Garmin GPS and paper maps. The updated field-verified features shapefile was then projected in ArcGIS and quality assurance (QA) conducted by ensuring that all points collected or modified in the field were included and updated in the shapefile, verifying that points were accurately positioned over the stream and that data and recommendations were accurate. The updated shapefiles were then displayed on a map of each creek respectively (see Appendices 2 and 3).



*Figure 3 - Ecofish Crew member Kyle Milburn conducting field survey work.* 



Figure 4 - K'ómoks First Nation Guardian Tony Billie next to Back Rd. culverts.

In addition to mapping features along the length of the stream, cross section measurements were collected for the lower sections of Mallard creek where reed canarygrass (RCG) has started to encroach and fill in the channel. The data files including all mapped features and cross-sections are provided in Appendices 4 and 5.

### DRONE WORK

A drone flight of the upper reaches of Glen-Urquhart Creek was also conducted to link in with previous footage taken in order to have a complete drone video of this system. This drone footage can be viewed at: <u>https://youtu.be/WLRXFhSUzj8</u>. A drone flight over Mallard Creek was also undertaken and this footage can be viewed at: <u>https://youtu.be/WLRXFhSUzj8</u>. Rick Ward of Rikskopter was hired to complete this work. The video footage of these two systems is very useful for obtaining a birds eye view of the systems which provides a useful perspective for understanding hydrological patterns, identifying features that are challenging to see on the ground (e.g., obstructed by blackberry thickets), and better understanding the landscape context of the streams. As such, the footage will help with planning future restoration projects.

#### REPORTING

CVPWS reviewed and complied the field data received from Ecofish in order to create and update the SHIM report for Glen-Urquhart (Appendix 6), as well as provide current photos and describe potential restoration and/or enhancement opportunities. Some of these restoration and enhancement options are discussed in more detail below.

#### **PROJECT OUTCOMES:**

#### MALLARD CREEK

Mallard Creek has cool and reliable water flows, which provide valuable habitat attributes to salmonids. However, the creek has suffered impacts from headwater development, channelization and encroachment by RCG. Along its lower reaches, Mallard Creek is choked with RCG for almost 350 m (before it flows through a culvert for 300 meters under a farm field to connect to the streams upper reaches). In its upper reaches, significant sediment deposits are built up behind weirs. Restoring salmonid (chum, coho and cutthroat) habitat along Mallard Creeks' lower section, in addition to making it more accessible to salmon by modifying the functioning of the floodgates, can help mitigate some of the impacts of this headwater development and channelization<sup>6</sup>.



Figure 5 - Section of Mallard filled in with reed canarygrass.

RCG has become an aggressive invader of aquatic ecosystems in southern B.C., choking and outcompeting native species in streams, irrigation ditches and wetlands. There is conflicting information on whether or not some subspecies RCG are native to specific areas of the Pacific Northwest; however, it is known that European cultivars were widely introduced to the area as hay and forage by early settlers. These sub-species of RCG have since hybridized creating numerous strains that now grow under a variety of environmental conditions. DNA analysis is the only way to differentiate these strains, therefore there is no reliable way to tell the difference between potentially native and introduced populations in the field<sup>7</sup>. RCG encroachment can negatively impact salmonids and their habitat. RCG can form physical barriers to salmonid migration and flooded RCG fields have been known to confound and strand migrating salmon<sup>8</sup>. Furthermore, RCG contributes to increased water temperatures, changes natural stream geomorphology processes, and dense colonies of RCG can decrease water flow while increasing siltation and contributing to flooding<sup>7</sup>.

Removal of RCG from the channel bottom, banks and riparian area of Mallard Creek is one of the restoration options which has been identified for this system in order to improve habitat for salmonids (see Appendix 7). The landowners that have RCG growing on their property have been supportive of managing and removing this invasive plant. Removal will have to adopt a phased, multifaceted and adaptive approach to be successful. Removal of RCG can be done with several different techniques<sup>8</sup>, however, to be effective removal must be paired with planting of riparian shrubs and trees<sup>9</sup>. Keys to long-term success in the elimination of RCG in the creek will include on-going monitoring and removal of new plants until riparian trees and shrubs have successfully established in RCG dominated riparian areas. Once re-established these trees should provide adequate shading to limit RCG regrowth and reduce the need for continued maintenance of the site (refer to Appendix 7 Mallard Creek Restoration Options for more detailed recommendations).

#### GLEN-URQUHART

Glen-Urquhart originates from groundwater sources in East Courtenay in heavily urbanized residential areas. A perched culvert located along the escarpment that parallels Back Road was previously thought to be the limit of anadromous fish access to the creek<sup>2</sup>, and likely still limits access to the upper reaches in years when fall flows are average to below seasonal norms. Human activities associated with urbanization and agriculture have resulted in many impacts to the natural instream and riparian habitat. In the upper drainage, much of the stream has been channelized and lacks the channel complexity that would be expected in a natural stream, riparian vegetation cover is lacking, does not have appropriate species or structural composition, or is not as extensive as it should be<sup>10</sup> to provide functions associated high quality fish habitat (e.g., mature coniferous trees with large roots to stabilize the bank, regulate the temperature, provide nutrient and litter drop and coarse woody debris contributions), several storm drains flow into the creek potentially introducing toxic substances, and invasive plant species are present. Similarly, along the lower reaches, the stream has been channelized and riparian vegetation cleared in order to allow for agricultural activity. This has resulted in a main channel that lacks complexity (e.g., pools, meanders etc.) and many of the functions provided by mature riparian vegetation such as bank stability and temperature moderation.

An opportunity to enhance aquatic and riparian habitat in the lower reaches of Glen-Urquhart Creek has been identified. DUC owns a section of property adjacent to Glen-Urquhart Creek that contains a pond, known as Len's pond, which was created in the early 1990's to provide compensation for lost habitat when a nearby property was developed and an existing wetland pond was filled in. Len's pond was designed to provide off-channel rearing habitat for coho salmon juveniles, which had been identified as a factor limiting the salmon productivity of the system. As such, the pond design incorporated many elements of high quality fish habitat including riparian vegetation, large wood and deep pools and riffle sections<sup>11</sup>. However, the planned water source for the newly created habitat was diverted away from the pond and into a farm drainage ditch by the City of Courtenay at the time of construction, when upland development across Ryan Road occurred. At present there is a small pipe which provides a water source to the pond, but the volume of flow into the pond is limited and much less flow enters the pond than what was expected during project design. Thus the habitat features in the pond are not functioning as intended (e.g. a decrease in circulation has resulted in low dissolved oxygen levels, which has negatively impacted water quality). If the water that is currently entering the drainage ditch could be piped back to the pond this would improve the circulation and the functioning condition of the pond. The pond habitat could also be redesigned to improve its functioning condition as a bio-retention wetland pond that stores, filters and slowly releases stormwater, as off-channel rearing habitat for coho, habitat for other fish and wildlife species, and potentially additional spawning habitat for salmon.

Other recommendations made and presented in the updated SHIM report include locations for planting riparian habitat, improving fish passage, and complexing the stream channel (see Appendix 6).

### CONCLUSION AND RECOMMENDATIONS

The removal and shading out of RCG from the lower reaches of Mallard Creek and improvement of the functioning condition of Len's pond adjacent to Glen-Urquhart Creek are two potential habitat restoration and enhancement opportunities that have been identified though this project. The survey work that has been undertaken is an important first step in providing up-to-date information on existing habitat features, limiting factors to salmonid production and stream restoration options in both of these systems. Moreover the information gathered will be forwarded to the CVRD Courtenay Flats Drainage Service Stakeholders Committee to feed into the work they are doing and to help inform their decision-making process on changes to the functioning of the tide gates to improve and enhance the Dyke Slough for fish and wildlife. In terms of next steps, the information gathered through this project will be vetted through the CVPWS Technical Committee, in order to prioritize future restoration projects for these degraded systems. Once the priorities have been determined CVPWS will apply to FWCP, and potentially other sponsors, for funding in the fall of 2017.

### COMMUNICATION / RECOGNITION OF FWCP FUNDING:

As part of our outreach to private property owners along Glen-Urquhart Creek we sent a letter asking permission for our survey crew to access the creek through their properties. This letter acknowledged the funding support received from FWCP for this work (Appendix 1). As well, we highlighted the project and the funding received from FWCP in a blog posted to our website: https://projectwatershed.ca/update-on-mallard-and-glen-urquhart-stream-surveys/

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# **APPENDICES:**

# Attached Separately:

- Appendix 1 Glen-Urquhart landowner letter;
- Appendix 2 Glen-Urquhart Map;
- Appendix 3 Mallard map;
- Appendix 4 GU field data spreadsheet;
- Appendix 5 Mallard field data spreadsheet;
- Appendix 6 Updated SHIM report for Glen-Urquhart;
- Appendix 7 Mallard Creek Restoration Options.