Western Painted Turtle Surveys and Stewardship Activities on Vancouver Island in 2012

Western Painted Turtle at Airport Wetlands, Alberni Valley, September 2012. Photo by K. Ovaska.

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Executive Summary

Western Painted Turtles (*Chrysemys picta bellii*) on the Pacific coast are endangered in Canada (COSEWIC 2006) and on the provincial Red List of species at risk in British Columbia. The turtles occur within populated and highly modified landscapes in the southwestern part of the province, where they are faced with numerous threats. More information is needed on the species' distribution, habitat use, and nesting ecology, to facilitate conservation and management activities.

This report presents the results of wetland surveys, habitat enhancement, and stewardship activities carried out on Vancouver Island during the 2012 field season. This study is part of Habitat Acquisition Trust's (HAT) Species At Risk Program and represents the 2nd year of a 3-year project funded by Environment Canada's Habitat Stewardship Program. The project builds on previous studies on the Western Painted Turtle conducted by HAT biologists since 2008.

The objectives for 2012 were as follows:

- Conduct surveys for the Western Painted Turtle to clarify its distribution and to assess threats in focal areas within CRD and Alberni Valley.
- Continue enhancement and monitoring of nesting areas.
- Continue enhancement of aquatic habitats by installing basking structures and monitoring their effectiveness.
- Involve landowners, managers, and community members in stewardship activities.

Distribution and threats:

In 2012, we conducted turtle surveys in 34 wetlands located in CRD, Alberni Valley, and Nanaimo area and encountered Western Painted Turtles at four sites. Two of the sites represent new distribution records for the species: Sumner Lake in the Alberni Valley and Eagle Lake in the Highlands area of CRD. In both cases, anecdotal information suggested the presence of the Western Painted Turtle at these sites, highlighting the importance of engaging local communities. Overall, since 2008, we have surveyed a total of 102 water bodies/wetlands as part of this project and have confirmed the presence of the Western Painted Turtle at 17 of these sites.

Threats to turtle populations vary among regions. In the Alberni Valley, occupied sites are mostly within forestry lands subjected to active logging. Potential disruption of migration routes by logging activities and roadkill mortality of migrating turtles on logging roads are the main concerns. In the Capital Regional District, Western Painted Turtles inhabit water bodies within urbanized landscapes, where they are exposed to various threats including road mortality, disturbance by pets and from recreational activities, pollution, and introduced species. CRD Regional Parks and other protected areas, such as the Swan Lake and Christmas Hill Nature Sanctuary, provide important refuges for turtles within a modified and fragmented landscape, but management is needed to

alleviate threats from introduced species and recreational activities and to maintain condition of nesting and aquatic habitats.

Nesting habitat enhancement

At Elk/Beaver Lake Regional Park, we continued to monitor turtle nesting activity in 2012, focusing on previously enhanced nesting habitats. As in previous years, hatchling turtles emerged in spring with peak hatching in April. In total, we found 23 emerged nests from 17 March to 12 June 2012.

At a communal turtle nesting site by East Pond, we have investigated the effectiveness of tilling as a method for nesting habitat enhancement for Western Painted Turtles from 2010-2012. Habitat enhancement consisted of experimentally tilling small (1 m^2) circular plots. We have detected a total of 32 nests in the experimental plots since the beginning of the experiment; of these, nests, 78% were in recently tilled plots, while the remaining were in plots tilled in previous years. In 2012, there were 12 new nests on the experimental plots, of which all but two were in the recently tilled plots. The results show that turtles consistently and preferentially nested in the newly tilled plots each year, suggesting that tilling is an effective method for nesting habitat enhancement at this site. Habitat enhancement was also carried out at equestrian grounds, co-managed by CRD Parks and EBLES, in 2011. In 2012 at least four Western Painted Turtles nested at the site.

At Swan Lake and Christmas Hill Nature Sanctuary, habitat restoration and monitoring of turtle activity continued at a nesting area that was restored in 2010. Sanctuary staff removed encroaching weeds from the site and experimentally planted native bunching grasses (Lemmon's Needlegrass, *Achnatherum lemmonii*) to help stabilize the soil, while leaving patches of bare ground suitable for nesting turtles. The restored habitat was used by a small numbers of turtles in 2010 and 2011. Sanctuary staff noted an emerged nest at the site on 2 April 2012, but no new nests were documented this year. Monitoring of the nesting area with a time-lapse camera is desirable in the future, as nesting often occurs in the evening and is easy to miss.

In Alberni Valley, we investigated turtle nesting activity at "Airport Wetlands", a site that contains the largest known Western Turtle population in the area and where habitat was enhanced in 2011. Two visits in 2012 revealed that most nesting activity occurred at a previously identified nesting area on an old spur road. No evidence of turtle nesting activity was observed at the restored site, but more frequent monitoring would be needed to confirm this. It is possible that the sand used as substrate was too soft for the construction of nesting chambers, in which case the site would benefit from the addition of clay or other firmer material.

Basking habitat enhancement:

Installation of basking structures is a method for enhancing aquatic habitat for turtles at sites where natural basking sites are in short supply. In 2012, we continued efforts began in 2010 to augment existing basking sites by adding log structures and monitoring the condition of structures installed in previous years. We collaborated with

Camosun College Environmental Technology Program students to design and test a new design for long-lasting and durable basking boards. Observations of the students in Swan Lake and Christmas Hill Nature Sanctuary showed that turtles readily used the new composite boards; a total of 160 observations of turtles on the boards were made in April – June. In paired experiments, turtles preferentially used boards that were immediately adjacent to the shoreline rather than those that were 5 m away in the open water. Hence, we recommend that basking structures are installed adjacent to the shoreline but ensuring that the sites are secluded and away from trails and land access points.

Subsequently in 2012, we installed composite basking boards were installed in two ponds at Elk/Beaver Lake Regional Park to supplement eight previously installed basking logs that still remain functional. We also installed composite basking structures at two new sites, Phillippa Lake near Prospect Lake and a pond in Metchosin on a property managed by the Boys and Girls Club. At Trevlac pond, abutting Calvert Municipal Park, all previously installed basking boards, constructed of mill-end slabs, remained functional in 2012.

The new composite basking boards are relatively easy to construct from recycled materials and easy to handle and install. However, their durability over time is untested. They are particularly suitable for use in ponds and small water bodies without road access. However, whenever financially or logistically feasible, we recommend using natural large logs, as they are longer-lasting, provide basking opportunities for many turtles, and require little or no maintenance once in place.

Outreach and Stewardship:

In 2012, HAT continued an ongoing outreach campaign to create local awareness of species at risk, to solicit reports from the public, and to help landowners manage for species at risk and their habitats. In CRD and Alberni Valley, we collaborated with large and small landowners/managers, students, and local volunteers to survey for turtles and monitor and enhance turtle habitat. Guidelines including recommendations for habitat restoration and for best management practices were prepared for Western Painted Turtles at Swan Lake and Christmas Hill Nature Sanctuary.

Recommendations:

The following priorities were identified for 2013:

- Within CRD and Alberni Valley, fill in survey coverage in areas where data gaps remain, and follow up leads from anecdotal observations reported to HAT by the public.
- Explore options to increase survey efforts to areas to the east coast of Vancouver Island north of CRD.
- At Elk/Beaver Lake Regional Park in CRD, continue monitoring and maintaining enhanced nesting habitat at the East Pond and equestrian grounds sites, including

experimental tilling at East Pond; use time-lapse cameras to monitor nesting activity by females at both sites.

- At Swan Lake and Christmas Hill Nature Sanctuary, continue nesting habitat enhancement/restoration and mitigate threats, including road mortality.
- At Airport Wetlands in Alberni Valley, modify the previously enhanced turtle nesting site by adding silt or other soil to the existing sand to make the substrate more suitable; use time-lapse cameras to monitor turtle use of the site, which cannot be monitored adequately by repeated visits due to its remoteness.
- At Elk/Beaver Lake Regional Park, Swan Lake and Christmas Hill Nature Sanctuary, and other sites within CRD, continue monitoring condition of basking structures installed from 2010 – 2012, including new composite boards.
- Explore opportunities to install basking structures to additional sites where turtles are deemed to benefit from this action and where educational opportunities are enhanced by increased visibility of turtles to site visitors.
- Continue HAT's landowner and outreach campaigns to raise awareness of turtles and involve residents in habitat stewardship.
- Continue working with existing habitat stewards, including large landowners and managers who collaborated in habitat enhancement and threat mitigation projects in 2011 and 2012.

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Introduction

The endangered Pacific Coast Population of the Western Painted Turtle (*Chrysemys picta bellii*) occurs in southwestern British Columbia, where its range overlaps with landscapes that are heavily modified by residential and agricultural developments, road building, and forestry (COSEWIC 2006). Much of the distribution of the turtles is on private lands, and stewardship by landowners and managers is essential to conserve the species.

This report presents the results of wetland surveys, habitat enhancement, and stewardship activities carried out on Vancouver Island during the 2012 field season. This study is part of Habitat Acquisition Trust's (HAT) Species At Risk Program and represents the 2nd year of a 3-year project funded by Environment Canada's Habitat Stewardship Program and by CRD Parks. HAT added the Western Painted Turtle as a focal species in 2008 (Engelstoft and Ovaska 2008), and studies have been conducted annually since then (Ovaska and Engelstoft 2009, 2010, 2012, Engelstoft and Ovaska 2011). The activities in 2012 continued to fill in data gaps in distribution and to work with partners in habitat stewardship and restoration activities. Partners of the project include the Capital Regional District (CRD) Regional Parks, Swan Lake and Christmas Hill Nature Sanctuary, Island Timberlands, and other private landowners/managers.

Goal and Objectives

The overall goal of the project is to ensure recovery of the Western Painted Turtle populations on Vancouver Island and the Gulf Islands by conducting surveys and habitat enhancement activities, and engaging landowners and community members in stewardship.

The objectives for 2012 were as follows:

1. Conduct surveys for the Western Painted Turtle to clarify its distribution and to assess threats in focal areas within CRD and Alberni Valley.
2. Continue enhancement and monitoring of nesting areas.
3. Continue enhancement of aquatic habitats by installing basking structures and monitoring their effectiveness.
4. Involve landowners, managers, and community members in stewardship activities.

Chapter 1: Distribution and Threat Assessment

Corresponding Objective:

Objective 1: Conduct surveys for the Western Painted Turtle to clarify its distribution and to assess threats in focal areas within CRD and Alberni Valley.

Rationale

The distribution of the Western Painted Turtle on Vancouver Island is incompletely known, hindering conservation efforts. The focus of the surveys in 2012 was to fill in data gaps identified in previous years and to assess threats at newly discovered occupied sites. Adequate knowledge of the distribution of a species is an essential first step towards conservation.

Approach & Methods

We selected water bodies for surveys based on gaps in survey coverage in the focal areas and followed tips of turtle sightings reported to HAT. In 2012, a new focus area was the Sooke area on southwestern Vancouver Island, which contains numerous lakes and wetlands that have received little or no previous survey coverage for turtles. The survey protocol was as in previous years (Engelstoft and Ovaska 2011, Ovaska and Engelstoft 2012). One or more observers visually searched for basking or swimming turtles either from a boat or from vantage points on land using binoculars and/or a spotting scope, as appropriate. We timed each survey to quantify the search effort and collected information on weather conditions, such as air and water temperature, percentage of cloud cover, and precipitation.

Following methods from previous years, we conducted a habitat assessment during the first visit to each site (Engelstoft and Ovaska 2011). At sites where the Western Painted Turtle was found, we assessed potential threats from the following sources: roads (paved or unpaved); recreation (motorized or non-motorized); pets; exotic species (bullfrogs and alien turtle species); residential or other development; urban activities; agriculture; forestry; grazing; water withdrawal; other sources.

Results & Discussion

Overview of surveys

In 2012, we surveyed 34 wetlands for turtles, of which 13 were surveyed for the first time (Table 1). In total, there were 39 wetland surveys, during which 33.6 person-hours were spent actively searching for turtles (Table 1). The average air temperature during the surveys was 20°C, ranging from 11 to 27.5° C (Table 2). Most of the surveys were conducted from the shore, but about a third was from a canoe or kayak.

Two new sites for the Western Painted Turtle were found: Eagle Lake in the Highlands within CRD and Sumner Lake in the Alberni Valley. The Western Painted Turtle was also found at two previously known sites: Beaver Lake in Elk-Beaver Lake Regional Park in CRD, and at a site colloquially known as Airport Wetlands in the Alberni Valley.

The introduced Red-eared Slider (*Trachemys scripta*) was widespread and was found at nine sites (Table 2). Figure 1 shows survey effort and results in 2012 in relation to previous surveys; Figures 2 and 3 show a summary of sites that have been surveyed from 2008 – 2012 and where the Western Painted Turtle (Figure 2) and introduced Sliders (Figure 3) have been found.

Table 1. Summary of water bodies searched for turtles on Vancouver Island in 2012.

Area	# sites surveyed	# of surveys	Survey effort (person-hours)
Alberni Valley	8	8	11
CRD	22	28	19.7
Malahat	1	1	1.2
Nanaimo	2	2	1.7
Total	33	39	33.6

Table 2. Conditions and results of turtle surveys conducted in 2012.

Site name	Date	Start time	Search time (p-min)	Air temp (°C)	Water temp (°C)	Cloud cover (%)	Survey Method	Western Painted Turtle (#)	Red-eared Slider (#)
Alberni Valley:									
"Airport Wetlands", N of Great Central Lake	7-Sep-12	11:45	60	22	18	>50	Foot	26	0
Dickson Lake, SE end	7-Sep-12	16:20	200	24	19	>50	Foot	0	0
Moran Lake	7-Sep-12	15:30	60	30		>50	Foot	0	0
Pond near Moran Lake	7-Sep-12	14:50	80	32		>50	foot	0	0
Sproat Lake, bay at NW end	7-Sep-12	10:45	40	21	20	>50	Foot	0	0
Sumner Lake	7-Sep-12	13:40	60	25	25	<50	Foot	9	0
Ward Lake	7-Sep-12	9:40	120	20	21	>50	Foot	0	0
Winer Wetland, by Sproat Lake	7-Sep-12	11:00	40	22		>50	Foot	0	0
Capital Region District:									
Durrance Lake	5-Aug-12	9:30	180	20		0	Swim	0	2
Durrance Lake	25-Sep-12	13:46	39	21	19	0	Boat	0	1
Eagle Lake	27-Mar-12	13:15	5	12		80	Foot	0	0
Eagle Lake	28-Jun-12	15:30	10	18		100	Foot	1	0
Langford Lake	2-Oct-12	10:52	64	19	16	0	Boat	0	0
Matheson Lake	15-Sep-12	10:30	90	15	17	0	Boat	0	1
Beaver Lake	9-Apr-12	14:00	220	14		20	boat	22	23
Beckwith Park pond	5-Jul-12	12:03	30	21.5	19.1	0	Foot	0	15

Site name	Date	Start time	Search time (p-min)	Air temp (°C)	Water temp (°C)	Cloud cover (%)	Survey Method	Western Painted Turtle (#)	Red-eared Slider (#)
Blenkinshop Lake	5-Jul-12	12:52	38	27.5	21.5	0	foot	0	0
Kings Pond	5-Jul-12	13:51	8	27	21	0	Foot	0	3
Maltby Lake	19-Jul-12	10:15	20	20		0	Foot	0	0
Philippa (Little Maltby) Lake	28-Jun-12	16:00	10	18		100	Foot	0	0
Philippa (Little Maltby) Lake	19-Jul-12	11:30	60	20		0	Boat	0	0
Philippa (Little Maltby) Lake	2-Oct-12	14:51	10			25	Foot	0	0
Pond on Spencer Rd., Langford	31-Jul-12	9:30	15	20	20	30	Foot	0	0
Pond NW of Weekes Lake	18-Jul-12	13:00	20	19		100	Foot	0	0
Prospect Lake	3-Oct-12	9:07			14	5	Boat	0	0
Thetis Lake	12-Jul-12	13:30	6	25		0	Boat	0	3
Trevlac Pond	27-Mar-12	13:39	5	12		80	Foot	0	0
Trevlac Pond	28-Jun-12	14:35	50	19		100	boat	0	0
Viaduct Pond	17-Sep-12	9:40	20	20		0	Foot	0	0
Sooke Area:									
John Phillips Memorial Park	17-May-12	10:25	20	18		0	Foot	0	1
Kemp Lake	17-May-12	11:40	150	17	18	0	Boat	0	1
Kings Creek Pond	17-May-12	13:15	20	18		0	Foot	0	0
Poirier Lake	17-May-12	13:55	30	19		0	Foot	0	0
Rainwater Park pond	17-May-12	11:00	20	17		0	Foot	0	0
Throup Cr. wetland	17-May-12	15:30	20	19		0	Foot	0	0
Wingfield Park	17-May-12	14:45	20	18		0	Foot	0	0
Malahat:									
Spectacle Lake	18-Jul-12	14:48	70	20	21	100	Boat	0	0
Nanaimo:									
Frames Rd/HWY pond	2-May-12	15:15	90	11			Foot	0	0
Frontage Rd pond	2-May-12	15:05	10	11			Foot	0	0

Figure 1. Sites surveyed in 2012 and in previous years (purple symbols) and sites where the Western Painted Turtle (WPT) was found in 2012 (green symbols).

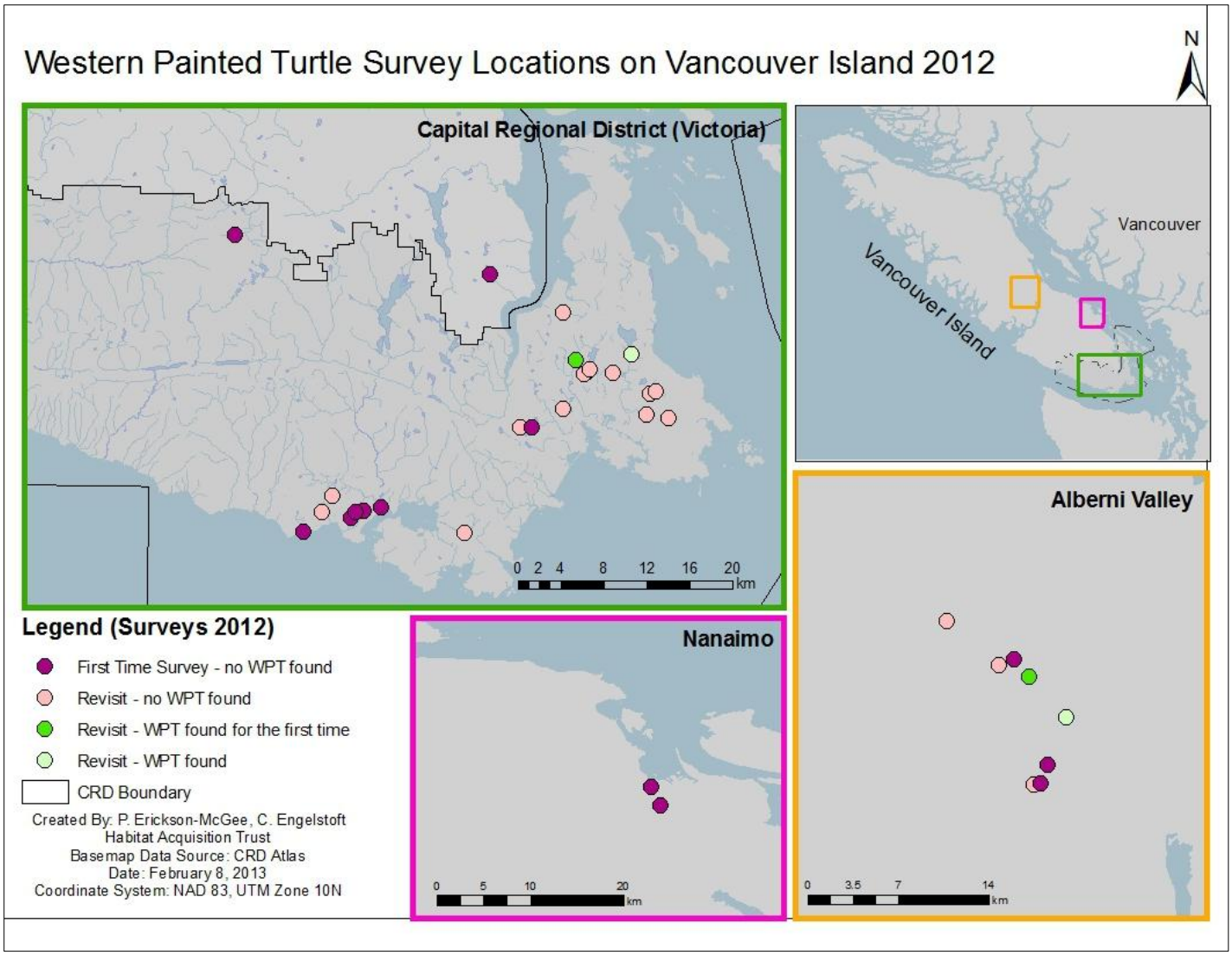


Figure 2. Summary of survey sites, 2008 – 2012, indicating sites where the Western Painted Turtle (WPT) has been found.

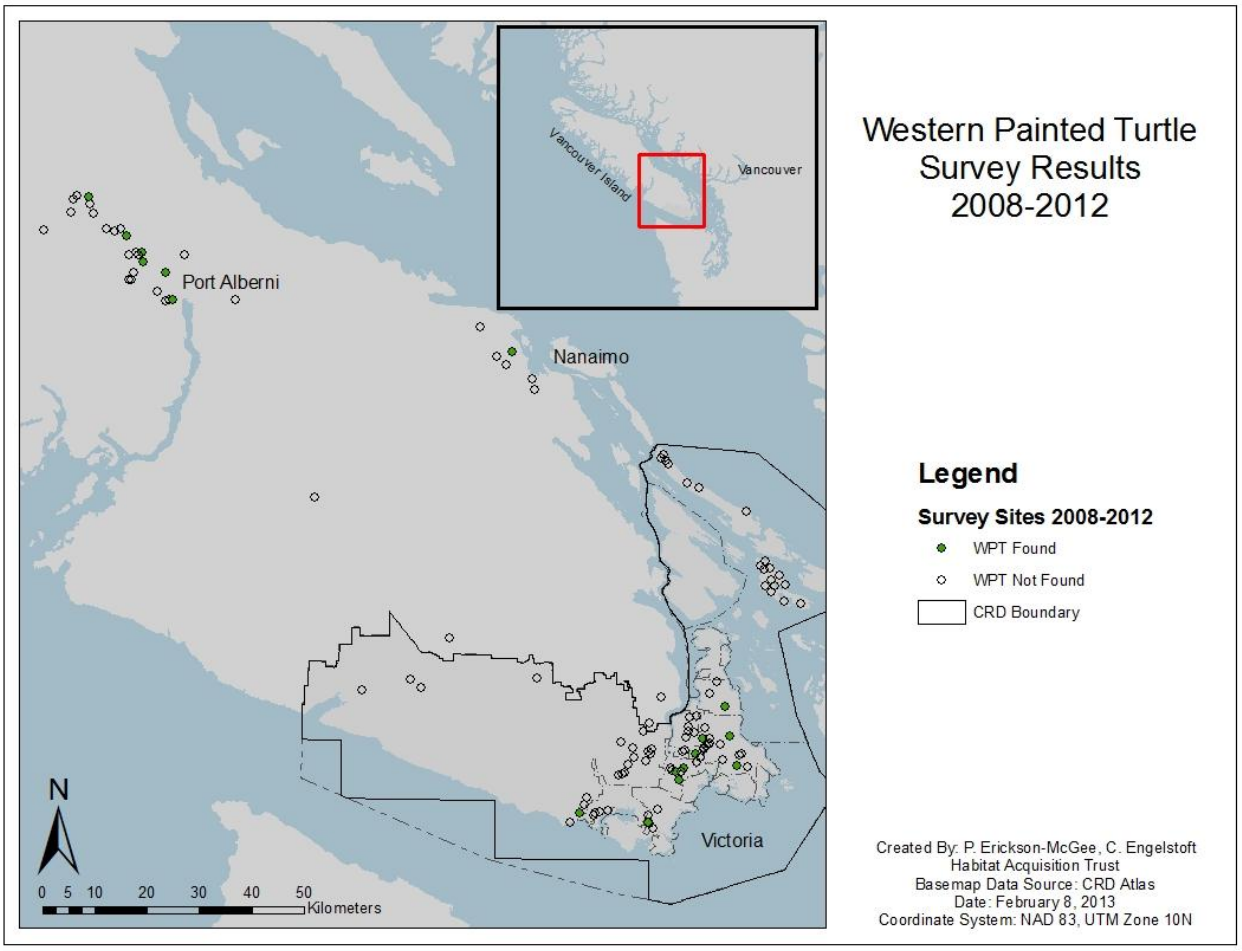
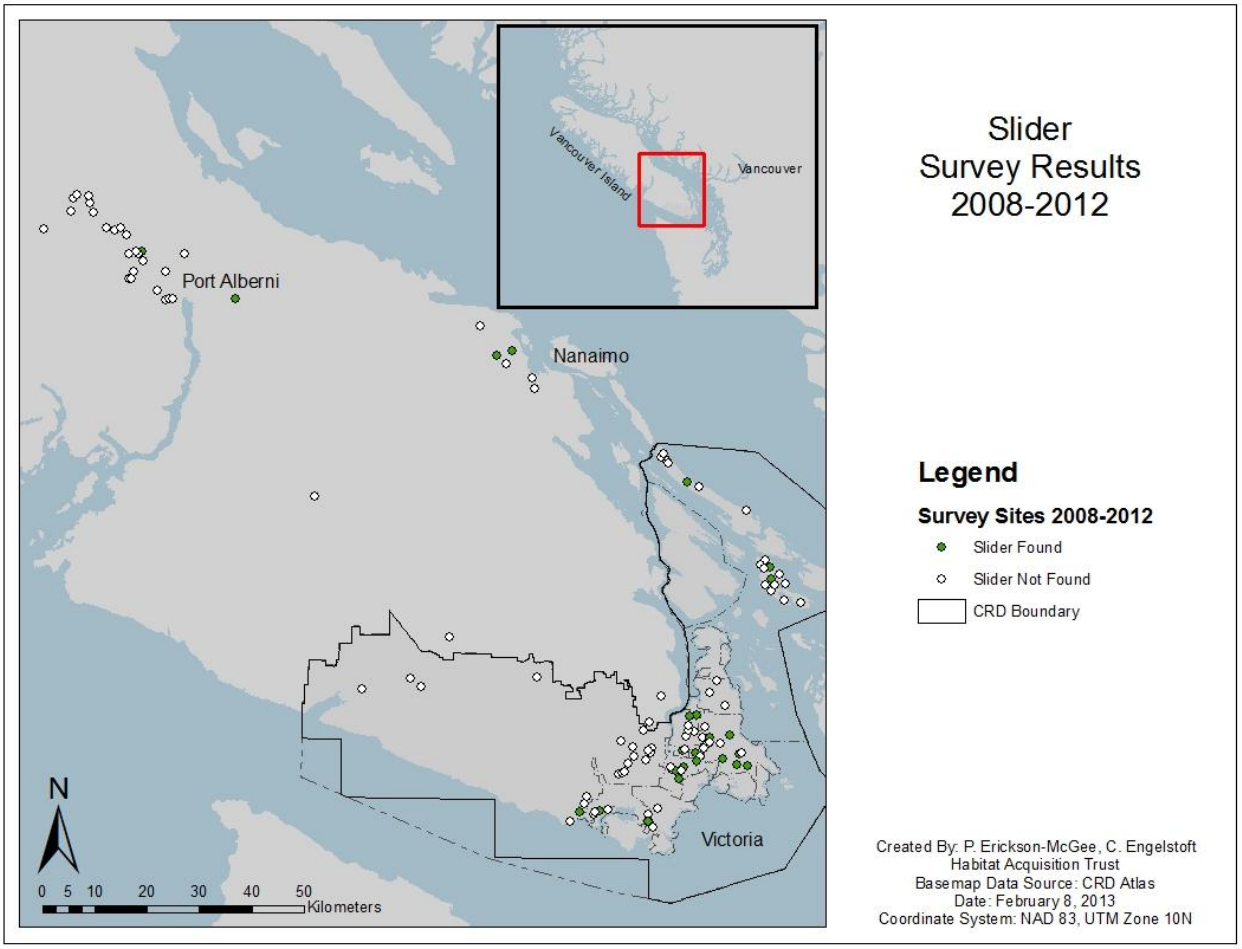


Figure 3. Summary of survey sites, 2008 – 2012, indicating sites where Pond Sliders have been found.



Capital Regional District

In CRD, we surveyed a total of 23 wetlands, of which six were visited for the first time in 2012 (Figure 1). One additional site was surveyed in Malahat, just north of the CRD boundary. Within the focal area in Sooke, we found no Western Painted Turtles. The sites visited included Kemp Lake, where we have previously found the species. However, we have observed only one Western Painted Turtle in Kemp Lake (in May 2010), raising doubts about whether there is a population at the site.

A revisit to Eagle Lake in the Highlands resulted in a new distribution record of the Western Painted Turtle. One adult turtle was observed basking on a log on 28 June 2012. Eagle Lake is a small, shallow lake, which is connected to a more expansive wetland and marsh area within a rural, residential landscape. A portion of the lake is within a municipal park with walking trails and a small parking area. Previously, residents have reported turtle sightings from their properties and have sighted turtles crossing the road in the vicinity of Eagle Lake, but this is the first time the Western Painted Turtle is confirmed to occur in the lake.

Within CRD Regional Parks, we surveyed the following lakes: Beaver Lake, Durrance Lake, Matheson Lake, Poirier Lake, and Thetis Lake (Table 2). The Western Painted Turtle was found only at Beaver Lake, which is known to support a relatively large population of the species. In Beaver Lake, on 21 April, we observed 22 Western Painted Turtles, which is approximately the same number as in previous years. The Western Painted Turtle has been observed in previous years in Matheson Lake and its vicinity in small numbers but was not found there during the 2012 survey. Park visitors reported a turtle nesting on a small island in the lake, but the species of turtle was unconfirmed (T. Carnahan pers. comm. 2012). This island was previously identified as a turtle nesting area, based on turtle diggings seen on the bluff (Engelstoft and Ovaska 2008). We found the introduced Red-eared Slider in all the lakes surveyed in CRD Regional Parks (Table 2), except in Poirier Lake, where we have found no turtles in 2012 or in previous years.

Alberni Valley

We surveyed eight wetlands in the Alberni Valley in 2012, of which four were surveyed for the first time (Figure 2). The Western Painted Turtle was found at Airport Wetlands, which supports a relatively large population of the species; 26 turtles were observed during a visit on 7 September 2012.

The Western Painted Turtle was found for the first time in Sumner Lake in 2012. Sumner Lake is one of a series of small, relatively shallow lakes just north of the Great Central Lake. The Western Painted Turtle has been observed in a number of these lakes both historically and recently (Engelstoft and Ovaska 2008, 2011, Ovaska and Engelstoft 2010, 2012). Sumner Lake is connected to Patterson Lake, where the Western Painted Turtle is present, through series wetlands along the outlet creek. We have surveyed Sumner Lake previously in 2008 and 2009 with local naturalists Rick and Libby Avis, who reported finding an old turtle shell there in the past (species of turtle

undetermined). During a visit in 2012 with the Avis's, we sighted nine Western Painted Turtles along the shoreline and in the shallows.

Nanaimo area
In conjunction with a restoration project in Nanaimo, an opportunity arose to conduct turtle surveys at two wetlands (Table 2). No turtles were seen at either site.

Threat assessment
Threats to Western Painted Turtles were assessed at the two new sites found during the 2012 surveys. At Eagle Lake in CRD, the greatest threat to the turtles was assessed to be from a paved road that flanks the lake on one side. There are many reports from residents of turtles crossing this road. The lake and associated wetlands are within a rural residential landscape, and turtles face additional potential threats from pets and urban activities when nesting or moving through the landscape. Introduced bullfrogs are prevalent in the area, including Eagle Lake, and also pose a potential threat. At Sumner Lake in Alberni Valley, there is a small campsite and dock at the road access point, and logging has taken place recently on the north and south sides of the lake. Threats from the gravel access road, recreation, and logging activities were all assessed as low for this site.

Overall, threats to turtle populations vary among regions. In the Alberni Valley, occupied sites are mostly within forestry lands subjected to active logging. Potential disruption of migration routes by logging activities and roadkill mortality of migrating turtles on logging roads are the main concerns. Logging roads are often immediately adjacent to the shoreline, and turtles are exposed to mortality when crossing the road during migrations between water bodies and nesting areas or when attempting to nest on the sides of logging roads. A turtle nesting ground at the Airport Wetlands, which supports the largest known population in the Alberni Valley, is located across a main logging road from the wetland; we have observed turtles on the road on numerous occasions. Island Timberlands has posted turtle crossing signage at this and at another potential problem area along the same road. In addition, through collaborative efforts with Island Timberlands and HAT biologists, attempts have been made to re-direct turtles to alternative nesting areas, where habitat enhancement has been carried out (Ovaska and Engelstoft 2012). The effectiveness of these measures is currently unknown.

In the Capital Regional District, continued habitat alteration and fragmentation pose greatest threats to turtles. Western Painted Turtles inhabit water bodies within urbanized landscapes, where they are exposed to various threats including road mortality, disturbance from recreational activities and pets, pollution, and introduced species. The species occurs in several CRD Regional Parks and other protected areas, such as the Swan Lake and Christmas Hill Nature Sanctuary, which provide important refuges within a modified and fragmented landscape. However, many threats remain, including those posed by introduced species.

Conclusions and Recommendations

In 2012, we conducted turtle surveys in 34 wetlands located in CRD, Alberni Valley, and Nanaimo areas and encountered Western Painted Turtles at four sites. Two of the sites represent new distribution records for the species: Sumner Lake in the Alberni Valley and Eagle Lake in the Highlands area of CRD. In both cases, anecdotal information suggested the presence of the Western Painted Turtle at these sites, highlighting the importance of engaging local communities. Overall, since 2008, we have surveyed a total of 102 water bodies/wetlands as part of this project and have confirmed the presence of the Western Painted Turtle at 17 of these sites.

We recommend the following actions for 2013:

- Within CRD and Alberni Valley, fill in survey coverage in areas where data gaps remain, such as on the Saanich Peninsula and Metchosin where many small unsurveyed water bodies exist.
- Follow up leads from anecdotal observations reported to HAT by the public.
- Explore options to increase survey efforts to areas to the east coast of Vancouver Island north of CRD.
- Document road mortality by soliciting information from the public and identify potential problem sites.

Chapter 2: Nesting Ground Monitoring and Restoration

Corresponding Objective:

Objective 2: Continue enhancement and monitoring of nesting areas.

Rationale

Availability of suitable, safe nesting areas is a limiting resource for Western Painted Turtle populations in many areas, including eastern Vancouver Island. Relatively little is known of nesting ecology of the Pacific Coast Population that inhabits an environment very different from that in interior B.C. Information is needed on nesting ecology and on habitat enhancement measures that are effective for turtles in our area.

Approach & Methods

During the 2012 field season, we monitored nesting habitat at four sites that were previously enhanced or restored as part of this project (Ovaska and Engelstoft 2010, 2012). Two sites were in Elk/Beaver Lake Regional Park (East Pond site: enhanced in 2010 – 2011; Equestrian grounds site: 2011), one site was in Swan Lake and Christmas Hill Nature Sanctuary (enhanced in 2010), and one site was at Airport Wetlands in Alberni Valley (enhanced in 2011). With help from CRD Parks and Elk-Beaver Lake Equestrian Society volunteers, additional enhancement and maintenance activities were conducted in May 2012 at the two nesting areas in Elk/Beaver Lake Regional Park (see Appendix 1 for a description of these activities).

At Elk/Beaver Lake Regional Park, we either visited the nesting areas regularly or used a time-lapse camera to record turtle activity. At Swan Lake, we relied on staff, interns and visitors to report turtle nesting activities. We visited the nesting area at Alberni Valley twice in 2012 with help from local naturalists Rick and Libby Avis. During the visits, we surveyed the sites and their vicinity for turtles or signs of nesting.

At one of the sites in Elk/Beaver Lake Park, we experimented with the use of a time-lapse camera (Primos® DPS Model No 63070) to monitor turtle nesting activities. The camera was set to take a picture every 30 s (the longest time interval option available) between sunrise and sunset. The exact time of activation and deactivation was determined by the camera's light sensor. The camera was placed in a box resembling a bird nest-box to discourage vandalism and installed on top of a 3 m-tall pole. Analysis of the JEPX formatted pictures was done with the software provided with the camera ("At a Glance Photo Viewer", Build 1.2), and pictures of interest were saved in JPG format. Turtle activity was categorized as exploration or nesting, and date and time (start and finish) were noted from the stamp on the picture. Nesting duration was calculated from the time a turtle entered the site to when it left, even though turtles sometime meandered before settling to dig a nest.

To locate nests captured in the images in the field, we examined any landmarks visible on the printed images and matched them with features on the ground. We then measured the location of the nests from two fixed points, using the same method as for nests located by other means (see Engelstoft and Ovaska 2011 for details).

Results & Discussion

Elk/Beaver Lake Regional Park:

Overview and timing of emergence and egg-laying

From 17 March to 12 June 2012, we found 23 emerged nests within the communal turtle nesting area by East Pond. Additionally, there was one emerged nest along the side of the driveway to the caretaker's house, and two nests on EBLES equestrian grounds that were inadvertently dug up during site maintenance (see ***Nesting habitat enhancement at EBLES site***, below). We documented 16 new Western Painted Turtle nests from 10 June to 26 July, most of which were at the East Pond site, but four were within the restored site at the EBLES equestrian area. On 11 June, we observed one introduced Red-eared Slider nesting at the East Pond site, outside the communal nesting area.

As in previous years, emergence of hatchling turtles occurred in the spring, indicating that hatchlings overwintered in the nests. We have found no evidence of fall emergence at this or other sites. In 2012, the emergence of hatchlings occurred mainly in April, with a few nests emerging in March and in May – June (Figure 3). Egg-laying by females was relatively late when compared to previous years and more than half of the nesting

observations were in July (Figure 4). The separation of the timing between emergence and egg-laying provides only a narrow window for habitat enhancement activities.

At East Pond, nesting success, based on percentage of nests from which at least one hatchling emerged, was relatively low when compared to previous years (Table 3). However, the total number of emerged nests found in spring 2012 was higher than in previous years, suggesting that the apparent low nest success was an artifact of the small sample size.

Figure 4. Frequency distribution of monthly turtle nest emergence at East Pond, Beaver/Elk Lake Regional Park, from 2009 to 2012.

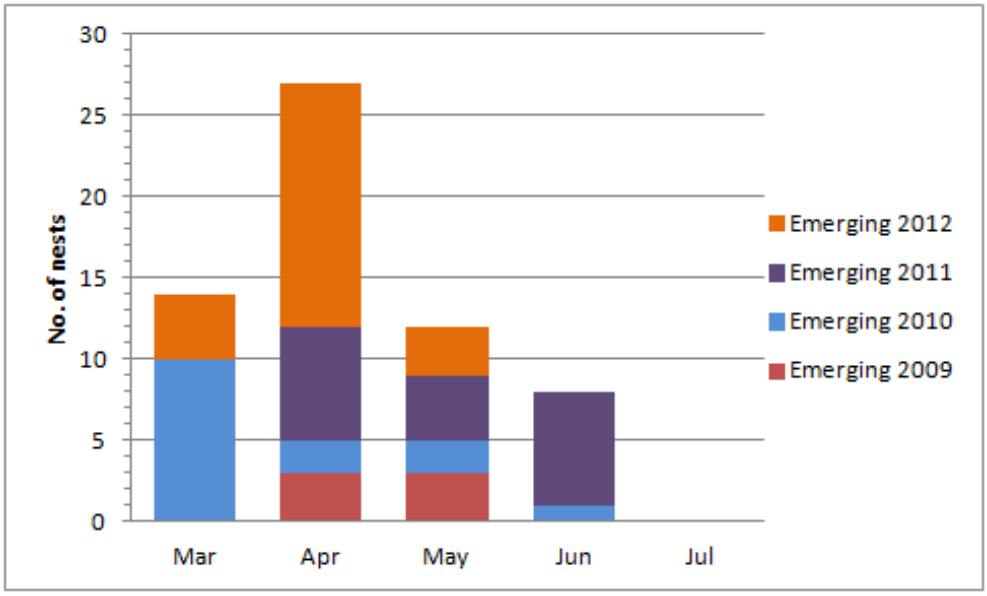


Figure 5. Frequency distribution of number of females digging nests at East Pond, Beaver/Elk Lake Regional Park, from 2009 to 2012.

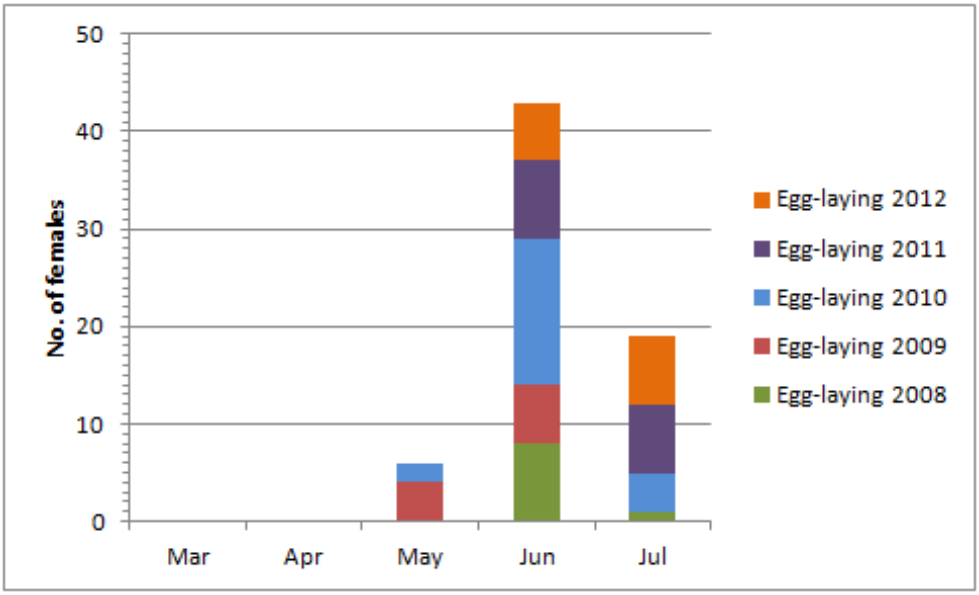


Table 3. Nesting success at East Pond communal nesting area in Elk/Beaver Lake Regional Park, 2009 - 2012.

Note: Emergence occurs in spring of the year following egg-laying; follow shaded cells diagonally downwards to calculate hatching success (shown in Column 4).

Year	# new nests (with eggs) found	# emerged nests known from previous year	% nests emerged	Total # emerged nests found
2008	10	NA	NA	4*
2009	9	5	50.0	14
2010	19	7	77.8	15
2011	13	12	63.2	15
2012	12	6	46.2	23

*Under-estimate; found late in the season (19 June)

Experimental nesting habitat enhancement at East Pond

In spring 2010, we began an experiment to investigate the effectiveness of tilling as a method for nesting habitat enhancement at this site where encroachment by grass and weeds was identified as a problem. The experiment was repeated in 2011 and again in 2012. Habitat enhancement consisted of experimentally tilling small (1 m^2) circular plots by East Pond, where turtles nest communally within an area of approximately 10 m x 12

m. The entire nesting area was fenced in 2011 by CRD Parks to prevent inadvertent disturbance to nesting turtles and emerging hatchlings by park visitors and their dogs.

The experimental plots were in 4 rows of 3 plots (Figure 5), and plots within each row were initially in 2010 randomly assigned to treatments. The tilled plots have been rotated among years, as described below. Initially in 2010, there were three sets of plots: 1) recently tilled plots, 2) plots centered on existing bare patches of ground from where hatchlings had successfully emerged, and 3) undisturbed, grassy control plots. In 2011, we tilled the control plots that were never used by turtles in 2010, but did not weed or manipulate the 2010 treatment plots. In 2012, we tilled the plots that had bare patches and successful nests in 2010, and left the plots tilled in 2010 and 2011 unmanipulated. Thus, in 2012, there were plots tilled in 2010, 2011, and 2012.

From 2010 – 2012, we have observed Western Painted Turtles nesting at the East Pond site on 43 occasions. Of these, 22 were within the 1 x 1 m experimental plots, while 21 were in the areas between the plots. Including nests identified by sign (wet, flattened bare patches found the morning following egg-laying), we have found 32 nests on the experimental plots since the beginning of the experiment (Table 4). Of these nests, 78% were in the recently tilled plots, 13% were in the plots that were tilled the previous year, and 9% were in the plots that had not been tilled for 2 years. In 2012, there were 12 new nests in the experimental plots, of which all but two were in the recently tilled plots. The results show that turtles consistently and preferentially used the newly tilled plots each year. Figure 5 shows the distribution of new nests at the site in 2012.

Figure 6. Locations of Western Painted Turtle nests found at the experimental nesting habitat enhancement site by East Pond in 2012.

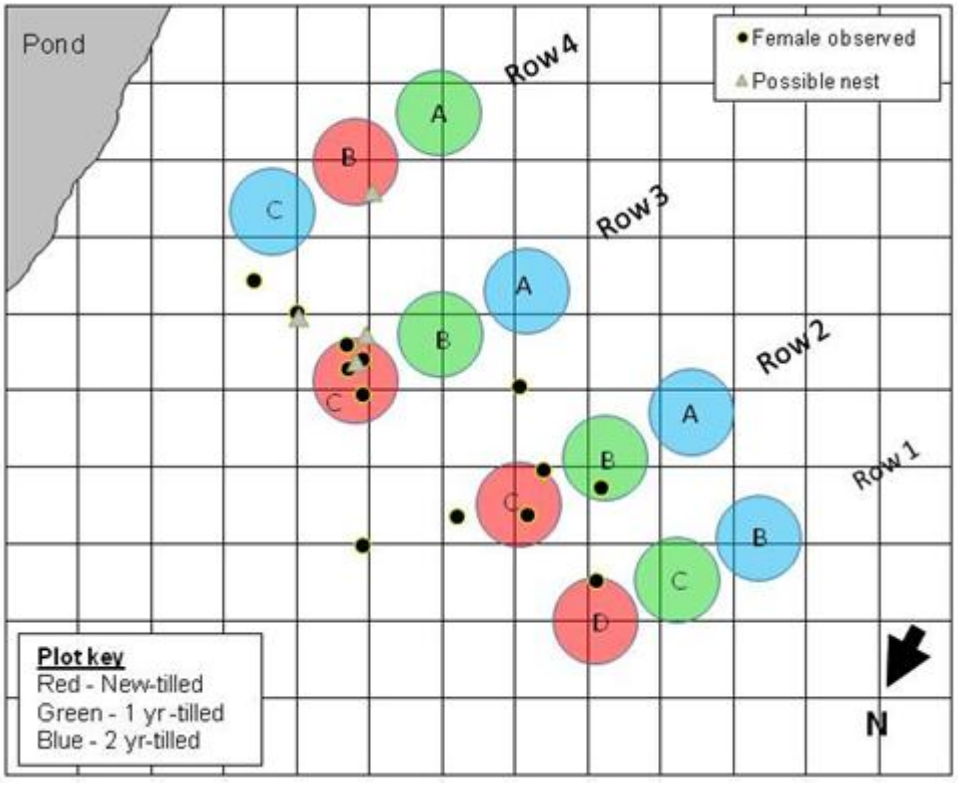


Table 4. Western Painted Turtle nests detected in experimental habitat enhancement plots at the East Pond site from 2010 – 2012.

Treatment	2010: turtle seen nesting	2010: sign of nesting	2011 turtle seen nesting	2011 sign of nesting	2012 turtle seen nesting	2012 sign of nesting	Total
Tilled in spring of same year	5	1	4	5	7	3	25
Tilled 1 yr ago or previously used by turtles in 2010*	3	0	0	0	1	0	4
Tilled 2 yrs ago or in 2010 control**	0	1	2	0	0	0	3
Total	8	2	6	5	8	3	32

*In 2010, these plots were base patches of disturbed ground from where hatchling turtles had successfully emerged that spring; these plots were tilled in 2012.
**In 2010, these plots were grassy controls; these plots were tilled in 2011.

Turtle nesting activity monitoring with time-lapse camera

At East Pond, a time-lapse camera was deployed on 11 June 2012 and operated continuously until 23 July 2012. It collected 80,213 pictures (approximately 1910 images/day), providing a fine resolution record of activity of turtles at the site (see Figure 6 for an example). From the camera images, we identified ten Western Painted Turtles completing nests from 11 June to 6 July, eight of them from 21 June to 6 July. Of the ten nests, five were within the experimental plots.

Figure 7. Two nesting Western Painted Turtles captured on a time-lapse camera image at the East Pond nesting habitat enhancement site, 2012.

The time of day and duration of nesting have implications for the level of disturbance that turtles might encounter in this relative busy park. Data from the time-lapse camera provide an opportunity to investigate timing of nesting. Most turtle activity at the nesting area took place in late afternoon or evening, and nine females entered the area after 15:30 h. One female nested in the morning (starting at 7:00 h). Nesting took from 1 h 21 min to 4 h 56 min; the average time was 2 h 49 min (Standard Deviation = 58 min, n = 10 nesting events). While some turtles went directly to their nesting site and started digging, others meandered before settling. The camera data suggest that some turtles made several exploration arrays on land before selecting a site.

Previously, we had assumed that abandoned nest holes complete with a nesting chamber resulted from disturbance to nesting turtles, but the camera data suggest otherwise. Of five prematurely terminated nesting attempts, only one might be attributed

to a disturbance (a passing visitor with a dog on leash). This turtle first started to dig at one site but abandoned the site after 8 min to re-settle at a new site, where she stayed for 47 min before leaving an unfinished nest. There was one particularly interesting observation of a nesting turtle that finished digging but left without covering the nest and deposited five eggs by the nest on the ground surface and none in the nest itself. No obvious disturbance was noted in this case.

There is some evidence that turtles that abandon nests come back at a later time. On several occasions, a turtle completed nesting within a day of previous unsuccessful nesting attempts. Unfortunately it is not possible to identify the individual turtles on the time-lapse camera pictures, so it remains unconfirmed whether these were the same turtles.

The camera captured images of a Red-eared Slider, which we had seen nesting above the communal nesting area and outside the fenced area during a check of the site. The camera images showed the slider exploring the experimental plot before disappearing from view towards the observed nest site and then returning through the plot 3 h 25 min later towards the pond.

Nesting habitat enhancement at EBLES site

In 2011, turtle nesting habitat was enhanced and surrounded by a fence within equestrian grounds maintained by EBLES (Ovaska and Engelstoft 2012). Subsequent site maintenance consisted of removal of blackberry bushes from the surrounding area in fall 2011 and weeding in April – May 2012 by CRD Parks and EBLES volunteers (Appendix 1). A layer was added to the cedar snake fence surrounding the nesting area to deter disturbance by people, horses, and dogs.

The initial impetus for the enhancement of this site came from an observation of turtles nesting in the riding and lunge ring areas in unsafe locations. In 2011, a pile of sand was inadvertently placed on top of a turtle nest, and another turtle nested on the path in a well-used area. During maintenance activities that included pulling thistles from the restored site in 2012, the nest from the sand pile and another unknown nest were inadvertently uncovered. The nest in the sand pile contained mostly dead hatchlings, while the other nest contained live hatchlings, which were released in the adjacent pond.

At least four Western Painted Turtles nested in the restored habitat in June 2012. Sixteen surveys by us from March to June resulted in observations of two females nesting within this site. EBLES reported two additional nesting females from the site. Our attention to the latter observations was drawn through EBLES Facebook website, where a photo of a turtle in the lunge ring abutting the restoration site was posted. Reportedly, two turtles were subsequently seen digging at the restored site. More intensive monitoring using a time-lapse camera is recommended for this site.

B. Swan Lake and Christmas Hill Nature Sanctuary and Capital City Allotment Gardens

At Swan Lake and Christmas Hill Nature Sanctuary, nesting habitat that had overgrown with weeds was restored in 2010 (Engelstoft and Ovaska 2011). In 2012, Sanctuary staff removed encroaching weeds from the site, taking care to disturb the soil as little as possible. They also experimentally planted native bunching grasses (Lemmon's Needlegrass, *Achnatherum lemmonii*), to help stabilize the soil, while leaving patches of bare ground suitable for nesting turtles. Songbirds were noted using the site for dust bathing, an activity that may help maintain a mosaic or vegetated and bare patches.

The site has been used by a small number of turtles since its creation: at least 3 females nested there in 2010 and 4 females in 2011. The Sanctuary staff noted an emerged nest at the site on 2 April 2012, but no new nests were documented in 2012. Monitoring of the nesting area with a time-lapse camera is desirable in the future, as nesting often occurs in the evening and is easy to miss.

In addition to the restored nesting habitat, nesting has been documented on gently sloping terrain in the native plant gardens and along trails on the north side of the Swan Lake (Engelstoft and Ovaska 2011; Ovaska and Engelstoft 2012). There is evidence that at least occasionally turtles leave the Sanctuary and nest at locations farther from the lake. There are anecdotal observations of turtles in the surrounding residential area, and one report of a turtle (a Slider) digging a nest in the backyard of a house adjacent to the Sanctuary.

Radio-telemetry of a small number of turtles in Swan Lake (Engelstoft and Ovaska 2011, Ovaska and Engelstoft 2012), provides more conclusive evidence of nesting outside the Sanctuary. Six Western Painted Turtles were equipped with radio-transmitters in August 2010 and have been followed regularly with help from the Sanctuary staff and volunteers; four turtles were still followed in 2012. In May-June 2012, one radio-tagged female turtle travelled to the Capital City Allotment Gardens on Kent Road, where it nested in a potato bed on 11 June 2012 and then returned to Swan Lake. The two sites are connected by Swan Creek, outlet of Swan Lake, but travel between them requires either crossing a busy highway (Patricia Bay Highway) or swimming through an approximately 150 m long, angled culvert under the highway. We were alerted to the presence of the turtle at the new location by gardeners, who observed the turtle in Swan Creek and in the surrounding landscape on many occasions. The turtle left Swan Lake sometime in late May – early June; it was located in Swan Lake on 25 May but not on 6 June, and had been seen by gardeners for a few weeks before 11 June, when we became aware of its presence there. It was found at the Allotment Gardens in the morning of 15 June but, by the afternoon, it was back in the Sanctuary, in a pool in Swan Creek between Swan Lake and the highway, having successfully negotiated the highway. It is highly plausible that the turtle swam through the culvert, but crossing the highway cannot be ruled out, an extremely hazardous endeavor. It is unknown how frequently turtles from Swan Lake leave the Sanctuary. There are previous anecdotal observations of turtles in the Allotment Gardens and

Swan Creek, and one such observation of a turtle on the shoulder of the highway on the Swan Lake side, indicating that this may occur regularly.

C. Alberni Valley: Nesting habitat enhancement at Airport Wetlands

In 2011, nesting habitat was enhanced at an abandoned gravel pit that received turtle use but where habitat was deemed poor due to very hard, rocky substrate (Ovaska and Engelstoft 2012). Two sand dunes (approximately 12 m long, 3.5 m wide) were created, each with a gentle slope facing south along the long axis.

In 2012, the site was visited in spring and early fall, and the enhanced site and other previously identified nesting areas around the wetland were inspected for signs of turtle nesting activity. On 4 April, Rick and Libby Avis found no obvious signs of emerged nests. They did note a few possible nest holes at the restored site, but could not confirm whether they were emerged nests. The emergence of hatchlings probably occurred later in spring this year, as no emerged nest holes were found elsewhere during the April visit, including an old spur road where turtles have nested previously. Subsequent examination of the area on 7 September supported this notion and revealed that most nesting activity had been on this spur road. At the abandoned gravel pit, we counted approximately 30 turtle diggings or nesting attempts (test holes) on the hard ground surrounding the dunes, but observed no sign of turtle nesting activity on the dunes themselves. It is possible that emerged nest holes could have collapsed in the soft substrate over the summer, obliterating all sign of them by the time of our visit in the fall. It is also possible that the sand used for the dunes was too soft for the construction of nesting chambers, and turtles did not use them. A further possibility is that the deactivation of the spur road leading to the gravel pit, which was carried out the same time as the creation of the dunes, posed barriers to movements and made it difficult for turtles to access the nesting area.

We suggest that silt or other soil be added to the sand dunes. Soil can be obtained from the vicinity of the site, for example from the deactivated road, and then added to portions of the dunes. More intense monitoring of the site will help better understand how the turtles use the site. Adequate monitoring has been difficult due to the remoteness of the site, and we suggest that time-lapse cameras be deployed in the future. Such cameras were successful in documenting turtle nesting activity at another site (Elk/Beaver Lake Regional Park in Victoria) in 2012 (see previous section).

Conclusion and Recommendations

At Elk/Beaver Lake Regional Park, we continued to monitor turtle nesting activity in 2012, focusing on previously enhanced nesting habitats. As in previous years, hatchling turtles emerged in spring with peak hatching in April. In total, we found 23 emerged nests from 17 March to 12 June 2012.

At a communal turtle nesting site by East Pond, we have investigated the effectiveness of tilling as a method for nesting habitat enhancement from 2010-2012. Habitat

enhancement consisted of experimentally tilling small (1 m^2) circular plots. We have detected a total of 32 nests in the experimental plots since the beginning of the experiment; of these, nests, 78% were in recently tilled plots, while the remaining were in plots tilled in previous years. In 2012, there were 12 new nests on the experimental plots, of which all but two were in the recently tilled plots. The results show that turtles consistently and preferentially nested in the newly tilled plots each year, suggesting that tilling is an effective method for nesting habitat enhancement at this site. Habitat enhancement was also carried out at equestrian grounds, co-managed by CRD Parks and EBLES, in 2011. In 2012 at least four Western Painted Turtles nested at the site.

In Alberni Valley, we investigated turtle nesting activity at "Airport Wetlands", a site that contains the largest known Western Turtle population in the area and where habitat was enhanced in 2011. Two visits in 2012 revealed that most nesting activity had been at a previously identified nesting area on an old spur road. No evidence of turtle nesting activity was observed at the restored site, but more frequent monitoring would be needed to confirm this. It is possible the sand used as substrate was too soft for the construction of nesting chambers, in which case the site would be benefit from the addition of clay or other firmer material.

We recommend the following actions for 2013:

- At Elk/Beaver Lake Regional Park, continue monitoring and maintaining enhanced nesting habitat:
    - Continue the experiment at East Pond site for one more year to examine tilling as a method for enhancing nesting habitat.
    - Conduct weeding at the enhanced habitat at the equestrian area in late May during the time window between hatchling emergence and egg-laying by females.
    - Monitor both above sites for hatchling emergence from March to May and for egg-laying by females in June – July.
    - Use time-lapse cameras to monitor egg-laying by females at both above sites.

- At Airport Wetlands, modifying the design of the enhanced habitat based on monitoring results and monitor turtle use of the habitats more intensively:
    - Consider adding firmer substrates to the existing sand dunes to create a more stable substrate for nest construction; this activity should be carried out in late spring before the start of the egg-laying season.
    - Use time-lapse cameras to monitor turtle use of the enhancement site; because of the remoteness of the site, it is not possible to monitor the site adequately by repeated visits.

Chapter 3: Enhancement of Aquatic Habitat

Corresponding Objective

Objective 3: Continue enhancement of aquatic habitats by installing basking structures and monitoring their effectiveness.

Rationale

Turtles are ectothermic (i.e., derive their body heat from the environment rather than from internally generated heat as in birds and mammals) and bask in the sun to elevate their body temperature; basking aids digestion and other vital processes (COSEWIC 2006). Several sites within the CRD have been identified that would benefit from additional basking opportunities. Activities in 2012 continued previous efforts to provide basking sites for turtles at selected sites and to monitor the condition and turtle use of structures that were installed in previous years.

Approach & Methods

In 2010 2011, we worked with land managers and owners to augment basking sites for turtles and installed basking logs at four sites in CRD. Turtles immediately began to use the new basking sites, but inspections in 2011 revealed that many of the structures, especially those constructed mostly of mill-end slabs, had sunk and become unusable. In 2012, we collaborated with Camosun College Environmental Technology Program students to design and test a more durable design that would be easy to install and also aesthetically pleasing. The students built and tested the new structures at Swan Lake and Christmas Hill Nature Sanctuary. The students also compared the use by turtles of basking structures that were placed at the shoreline with those that were in open water 5 m away from the shore, using a paired experimental design. They monitored the use of the basking structures by a combination of visual inspections and time-lapse cameras mounted on a pole by the basking structure. Subsequently, in 2012, these basking structures were installed at four other sites within CRD.

Results & Discussion

Camosun student project at Swan Lake and Christmas Hill Nature Sanctuary
The design of the new basking structures (referred to as composite boards) consisted of a 180 cm-long center board with a wooden platform at one end, suspended by Styrofoam floats (see Appendix 1 for photos). In the water body, the structures were secured in place by two anchor lines. A report prepared by the Camosun College students (Umphrey et al. 2012) provides a detailed description of the structures and their construction. The students installed four pairs of the composite boards in Swan Lake in spring 2012 and monitored their use by turtles. They made 160 observations of basking turtles on the composite boards and 52 observations at other sites away from these boards during 24 site visits from 9 April – 11 June. Turtles preferentially used the structures that were adjacent to the shoreline (122 observations) rather than those in open water (38 observations) (Umphrey et al. 2012).

By 2012, most of the basking sites in Swan Lake, installed in 2010 and consisting of mill-end slabs, had sunk and were no longer usable by turtles. Water-logging of the relatively thin boards, together with heavy seasonal growth of aquatic vegetation, contributed to their deterioration. In contrast, a large log installed by the sanctuary staff in 2010 continued to be functional and used by turtles and other wildlife in 2012.

Elk/Beaver Lake Regional Park
In 2010, we installed eight basking sites, consisting of mill-end slabs and log structures, in two ponds at the south end of Beaver Lake. The basking structures were immediately used by turtles and other wildlife, and most of them (three of four in each pond) continued to be functional in 2012. The exception was two slabs, one in each pond, which had disappeared and probably sunk in 2011.

With help from Camosun College students, we added one new composite basking structure to each pond on 28 June 2012. Subsequently, the students made eight observations of turtles on the new boards during four visits (Umphrey et al. 2012).

Other sites
In Trevlac Pond, which borders Calvert Municipal Park, we installed five basking sites, consisting of mill-end slabs, in 2010. A survey on 28 June 2012 revealed that all were still functional, although one structure needed repositioning and a few others were starting to show signs of water-logging.

In 2012, we installed basking structures at two new sites: Phillippa Lake near Prospect Lake, and a pond in Metchosin on a property managed by the Boys and Girls Club, a site of youth summer camps and outdoor activities. At Philippa Lake, we installed three basking sites: two composite basking structures and a log structure created by tying together two logs that were found floating in the lake. All structures were anchored adjacent to the shoreline on the far side of the lake, where they are least likely to be disturbed by people. At the Boys and Girls Club, we installed one composite basking structure in the pond on 21 August 2012. In addition to enhancing habitat for turtles, it is hoped that the basking structure will provide opportunities for the children to observe turtles.

Conclusion and Recommendations

In 2012, we continued efforts began in 2010 to augment existing basking sites by adding log structures and monitoring the condition of structures installed in previous years. We collaborated with Camosun College Environmental Technology Program students to design and test a new design for long-lasting and durable basking boards. Observations of the students in Swan Lake and Christmas Hill Nature Sanctuary showed that turtles readily used the new composite boards; a total of 160 observations of turtles on the boards were made in April – June. In paired experiments, turtles preferentially used boards that were immediately adjacent to the shoreline rather than those that were 5 m away in the open water. Hence, we recommend that basking

structures are installed adjacent to the shoreline, but ensuring that the sites are secluded and away from trails and land access points.

Subsequently, two composite basking boards were installed in two ponds at Elk/Beaver Lake Regional Park to supplement eight previously installed basking logs that still remain functional. We also installed composite basking structures at two new sites, Phillippa Lake near Prospect Lake and a pond in Metchosin on a property managed by the Boys and Girls Club. At Trevlac pond, abutting Calvert Municipal Park, all previously installed basking boards, constructed of mill-end slabs, remained functional in 2012.

The new composite basking boards are relatively easy to construct from recycled materials and easy to handle and install. However, their durability over time is untested. They are particularly suitable for use in ponds and small water bodies without road access. However, whenever feasible, we recommend using natural large logs, as they are long-lasting, provide basking opportunities for many turtles, and require little or no maintenance once in place. If large logs are not available on site, or if heavy equipment has to be used to lift them into water, the cost may be prohibitive, and small basking structures can be substituted.

We recommend the following actions for 2013:

- Continue monitoring condition of basking structures installed from 2010 – 2012, including new composite boards.
- Explore opportunities to install basking structures to additional sites where turtles are deemed to benefit from this action and where educational opportunities are enhanced by increased visibility of turtles to site visitors.

Chapter 4: Outreach and Stewardship

Corresponding Objective

Objective 4: Involve landowners, managers, and community members in stewardship activities.

Overview of outreach activities

In 2012, HAT continued an ongoing outreach campaign to create local awareness of species at risk, to solicit reports from the public, and to help landowners manage for species at risk and their habitats. HAT personnel gave public outreach events highlighting turtle conservation, including presentations to naturalist groups and municipal governments. Outreach and restoration activities pursued by HAT biologists and local volunteers were outlined on HAT's website and newsletters, as well as in local media.

Stewardship activities in CRD and Alberni Valley

We collaborated with large landowners, students, and local volunteers at several sites to improve nesting and aquatic habitat for turtles (see Chapters 2 and 3 for details). At Elk/Beaver Lake Regional Park, in April – May 2012, volunteers helped in nesting habitat maintenance and enhancement activities. A brochure (shown in Appendix 1) was prepared of these activities, distributed to the stakeholders and participants, and displayed at HAT's website.

At Swan Lake and Christmas Hill Nature Sanctuary, the staff, an intern, and volunteers monitored turtle nesting activities, conducted habitat restoration, and spent numerous hours tracking movements of radio-tagged turtles. HAT partnered with the Camosun College Environmental Technology Program, and a group of students helped with surveys at Swan Lake and prepared their final project on enhancing basking habitat at this site (Umphrey et al. 2012). With help from HAT biologists, the students designed basking structures and monitored their use by turtles using innovative techniques. The students also helped in the installation of basking structures at other sites, including two ponds in Elk/Beaver Lake Regional Park. Their project was judged the best of all student projects at the department in 2012 and was awarded the first prize at the annual student presentations.

Other on-the-ground collaborations included working with the Capital City Allotment Gardens at Kent Road. Through a poster (see Appendix 2) and personal contacts, we solicited observations and increased awareness of nesting turtles in the area. A radio-tagged turtle from Swan Lake nested at the gardens in spring 2012, providing additional incentive for the gardeners to report observations and identify and protect nest sites.

In the Alberni Valley, we continued collaboration with Island Timberlands, whose private forestry lands overlap with most of the known distribution of the Western Painted Turtle in the valley.

Best management guidelines for turtles at Swan Lake and Christmas Hill Nature Sanctuary

Swan Lake and Christmas Hill Nature Sanctuary provides an important refuge for Western Painted Turtles within an urbanized and fragmented landscape. Since 2008, the Sanctuary has sponsored studies of the Western Painted Turtle, carried out within the framework of HAT's species at risk program. In 2012, we developed recommendations for habitat restoration and best management practices for the Western Turtle population at Swan Lake, based on the above studies, turtle biology, and discussions with the Sanctuary personnel. These guidelines are intended as a living document, to be updated and refined as new information becomes available. The following is a synopsis of the guidelines from a report prepared for Swan Lake and Christmas Hill Nature Sanctuary (Engelstoft and Ovaska 2013), which provides details of the activities and site-specific recommendations.

I. Recommendations for Habitat Restoration (Swan Lake)

1. Restoring turtle nesting habitat:

- Restore nesting habitat by removing invasive grasses and exposing bare soil at selected sites, focusing on sites with previous turtle use on the north and east side of Swan Lake, and an alternative nesting site on the west site of the lake.
- Restore access for turtles to above nesting sites by controlling Reed Canary Grass in the intervening area.
- At the restored sites, plant native plants, such as clumping grasses that will result in minimal shading and stabilize the soil, but leave patches of substrate unvegetated.
- Fence the restored areas with a cedar-log stack fence, as needed, to discourage visitors from inadvertently entering the nesting habitat.
- Display interpretive signage to inform visitors about the enhancement activities.
- Investigate other suitable locations for nesting area enhancement.

2. Blocking turtle access to roads:

- Plan and install turtle barrier along Patricia Bay highway at west end of Swan Lake.
- Concurrently, create a safe nesting area on the Swan Lake side of the highway at the nearest suitable location.

3. Enhancing basking opportunities:

- Find a source for appropriately sized logs or use logs from the site as available. The diameter should not be less than 30 cm, and length should be at least 3 m.
- Experiment with various ways to transport the logs to the lake shore.
- Prepare the logs (cut notches for the stabilizing cross boards; install an anchoring point on the underside) and anchors with ropes.
- Assemble the log and board using heavy gauge nails. This might be easiest to do at the lakeshore just before the log is launched.
- Drag logs to the chosen sites and anchor them next to the shoreline.

4. Maintaining restored sites:

- Control weeds at restored turtle nesting areas to prevent the sites becoming overgrown by vegetation and to maintain bare patched of soil.
- Plant and maintain suitable native plants that help stabilize the soil at restored turtle nesting areas.
- Inspect and maintain any turtle barrier or fences that have been installed.
- Inspect basking logs and structures that have been installed in the lake for shoreline vegetation overgrowth, proper anchoring, and position.

5. Monitoring:

- Monitor turtle use of restored nesting grounds using a time-lapse camera during the nesting season in summer (June-July).
- Monitor emergence of hatchlings on nesting grounds in spring (March – May).
- Protect known nests, e.g., with stucco wire.
- Conduct turtle surveys in April – May using standard methods for long-term monitoring of population trends; note use of installed basking structures.

II. Best Management Practice (BMP) Guidelines (Swan Lake)

1. General guidelines:

- Before undertaking new infrastructure developments, repairs, or maintenance activities, check for known Western Painted Turtle occurrences or nesting grounds on the Sanctuary's GIS system or database.
- Conduct surveys for turtles, including signs of nesting, before any activities near sensitive turtle habitat are undertaken and assess risks to turtle populations.

2. Maintenance of trails, roads and parking lots:

- In the vicinity of known and potential turtle nesting areas, conduct grading and repairing of trails, roads, and parking lots after hatchling have emerged and adult females are laying eggs, when these activities are likely to cause least harm to turtle nests.
- Avoid piling of materials, such as gravel, sand or cedar chips, in known or potential turtle nesting habitats.
- Survey for signs of turtle nesting activity before starting work.

3. Construction of new trails:

- Avoid placing new trails in or near sensitive turtle habitats, such as nesting areas.
- If trails must be placed close to the lake, ponds and wetlands in known or potential turtle habitat, conduct surveys for turtle nesting grounds so that they can be avoided, and do not encircle the entire water body with roads.
- Follow standard practices when crossing streams and creeks and installing culverts to minimize natural hydrological patterns in turtle habitats.

4. New infrastructure development or replacement:

- Exclude known or potential turtle nesting habitats from the construction area.
- Minimize the footprint of the construction activities to avoid damage to the ground in the surrounding area from trampling or machinery.
- Avoid storing or piling construction materials in known or potential turtle nesting habitat.

5. Public access management:

- Fence off access to the public to active nesting sites. Use wire grates on top of known nests.
- Install seasonal signage, such as “turtle crossing” on roads and trails on sites, where there is a known or suspected turtle migration routes. Signs are more effective if in use only when needed, rather than permanently.
- Conduct outreach to engage sanctuary neighbours to participate in turtle stewardship activities.

6. Beaver management:

- Where possible, maintain beavers in the lake ecosystem, as their activities can create side ponds and quiet waters preferred by turtles and other wetland species.
- If it necessary to take out beaver a dam, do it when turtles are not hibernating.
- Rather than eliminating or reducing beaver numbers, use a specially constructed “beaver baffler” to discourage beavers from fixing leaks in their dams.

Recommendations

- Continue HAT’s landowner and outreach campaigns to raise awareness of turtles and involve residents in habitat stewardship.
- Continue working with existing habitat stewards, including large landowners and managers who collaborated in habitat enhancement and threat mitigation projects in 2011 and 2012.
- Encourage students to undertake projects that benefit turtles and their habitats within the framework established by this project.

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Habitat Enhancement for Turtles in Elk/Beaver Lake Regional Park, April - May 2012

Elk/Beaver Lake Regional Park supports a population of the endangered Western Painted Turtle, which has been studied since 2008 as part of Habitat Acquisition Trust's (HAT's) species at risk program. The turtles nest within areas used for multiple recreational activities. In April – May 2012, in collaboration with CRD Parks, Elk-Beaver Lake Equestrian Society (EBES) and volunteers, HAT biologists (Christian Engelstoft and Kristiina Ovaska) engaged in nesting habitat enhancement in the park. Additionally, Camosun College Environmental Technology students installed basking sites for turtles in ponds adjacent to the nesting areas.

One enhancement site is within the EBES riding area, where turtles have been nesting on paths and in other unsafe areas. A turtle nesting area was created at this site in June 2011. In April

2012, volunteers cleared the area of invading thistles and blackberries.

An additional tier was added to the cedar “snake” fence to reduce disturbance.

The volunteers returned in May for more thistle pulling.

The site is getting overgrown with grass and weeds including broom, and bare patches of ground preferred by nesting turtles are disappearing. Thanks to volunteer efforts, the site is now broom-free.

In 2010 and 2011, we experimentally weeded and turned over four 1 m^2 plots within this area, and turtles preferentially nested in these bare patches. In May 2012, we continued this approach and tilled additional small patches of ground.

The site is ready for the 2012 breeding season. We will monitor egg-laying in June – July and hatchling emergence from nests the following spring. Hatchlings overwinter in the nests.

Welcome turtles!

In May 2012, a group of Camosun College Environmental Technology Program students installed a basking site for turtles in two small ponds within the park. The new sites augment logs that we had placed in the ponds previously. Thestudents have tested the new basking sites in Swan Lake Nature Sanctuary, where turtles and a variety of other wildlife use them, as documented by a monitoring camera.

The basking structures were placed near the shoreline in sunny, safe sites and anchored to the bottom.

Turtles wasted no time in trying out the new structures.

A big “thank you” to all volunteers who came out to help! Support from CRD Regional Parks, Elk-Beaver Lake Equestrian Society, Vancouver Island Retriever Club, and volunteers from CRD Parks made this project possible. Colleen Long (CRD Parks volunteer coordinator) did a fabulous job organizing volunteers. Volunteers in 2012 included Heidi Leckenby, Colleen Long, Bob McAree, Stephanie McFadden & friend, Mladen Milijkovic, Emilie Vautrin, and Robert Yerbury.

Prepared by Kristiina Ovaska and Christian Engelstoft, June 2012. Photos by C. Engelstoft, C. Long, and K. Ovaska.

Project sponsors:

CRD Regional Parks

Appendix 2. Poster prepared for Capital City Allotment Gardens.

The endangered Western Painted Turtle is the only remaining native turtle on Vancouver Island. Since 2008, Habitat Acquisition Trust (HAT) has undertaken habitat restoration and monitoring activities to help conserve turtles and their habitats.

Females come on land to lay their eggs. You may see them wandering on lawns or gardens, looking for a warm, bare patch of ground in which to dig a nest. The clutch of 8 -12 eggs will hatch in the fall, but the young will dig themselves out of the nest the following spring.

HAT biologists have equipped a small number of turtles with radio-tags to learn more about their movements and habitat use. A female turtle, tagged at Swan Lake, recently migrated to the allotment gardens and has nested in a potato bed! If you encounter this turtle, please don't disturb her. **If you see this or another turtle digging a nest, please report the observations.**

To report observations, please contact us:
christian@hat.bc.ca or 250- 652-9770 (Christian)
kristiina@hat.bc.ca or 250-727-9708 (Kristiina)
For more information, visit HAT's website: http://www.hat.bc.ca

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