Western Painted Turtle Surveys and Stewardship Activities on Vancouver Island in 2014

Western Painted Turtle laying eggs in experimentally tilled plot (time-lapse monitoring camera photo)

Prepared for

Habitat Acquisition Trust, Victoria, B.C.

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Executive Summary

Western Painted Turtles on the Pacific coast are listed as endangered in Canada and are on the Red List of species at risk in British Columbia. On Vancouver Island, their distribution overlaps with residential and forestry landscapes, where they face numerous threats from habitat loss, road mortality, introduced species, and/or human disturbance. Much of the habitat is on private lands, and involving landholders in stewardship activities is essential for conserving the species. Since 2008, we have carried out annual studies in the CRD and Alberni Valley with the goal of helping recover Western Turtle populations as part of Habitat Acquisition Trust's Species At Risk Program. Here we present a summary of surveys, habitat enhancement, and stewardship activities carried out in focal areas on Vancouver Island during the 2014 field season. This report also incorporates the results of turtle surveys carried out in 2014 for Cowichan Land Trust, expanding the survey coverage north of CRD to Cobble Hill, Duncan, Shawnigan, and Cowichan Valley.

Distribution:
Adequate knowledge of distributions is an essential first step for conservation of species at risk. From 9 April to 18 September 2014, we surveyed a total of 31 water bodies, 11 for the first time. We located Western Painted Turtles at seven previously known sites (CRD: 3 sites; Alberni Valley: 4 sites), but found no new sites. Introduced Sliders were observed in six water bodies across the focal areas. Since 2008, we have surveyed 162 water bodies for turtles, many of them multiple times, and located Western Painted Turtles at 23 of these sites.

Nesting habitat enhancement and monitoring:
During the 2014 field season, we continued enhancement, maintenance, and monitoring of nesting habitat, focusing on sites with previous work. Two sites were in Elk/Beaver Lake Regional Park, two were in Swan Lake and Christmas Hill Nature Sanctuary, and one was at Airport Wetlands in Alberni Valley. All these areas support relatively large Western Painted Turtle populations and provide an opportunity both to help maintain populations and to improve methodologies as part of adaptive management.

In Elk-Beaver Lake Regional Park, turtles nest communally within an area of approximately 10 m x 12 m by a small pond (referred to as East Pond). In spring 2014, we found 14 emerged nests (from eggs laid in summer 2013). Emergence occurred from 28 March – 18 May 2014 with a peak in April, continuing the pattern in previous years. Subsequent turtle nesting activity (including egg-laying) was monitored by a time-lapse camera, which revealed 19 nesting events, 11 of which were completed and eight were interrupted for unknown reasons. Egg-laying occurred from 27 May to 7 July, with a peak in June, similar to previous years.

An experimental approach was taken at the East Pond study site in Elk-Beaver Lake Regional Park, where encroachment by grass on nesting areas was identified as a

threat. The results of this study, from spring 2010 to 2014, showed that Western Painted Turtles preferentially selected nesting sites on plots that had been tilled in spring immediately prior to the nesting season over plots that were either tilled in previous years or left unmanipulated for two or more years. The number of emerged nests (an index of nesting success) was also highest in the recently tilled plots. The results indicate that tilling is a useful method for nesting habitat enhancement at this and other sites in similar habitats.

At the Swan Lake-Christmas Hill Nature Sanctuary, two nesting areas were enhanced previously by clearing sites with a warm exposure close to the lake of grass and weeds to expose bare ground. During a site visit in spring 2014, we observed one emerged turtle nest at one of these sites (by the Nature House), and in summer, Swan Lake staff reported a Slider digging a nest at this site. Monitoring of the site with a wildlife camera is desirable to provide more consistent coverage. Inspection of the other enhanced site indicated that the substrate remained too wet, and its relocation is desirable.

In the Alberni Valley, hard, compacted substrates at a turtle nesting area at Airport Wetlands were deemed a problem, and two sand dunes were created at the site in 2011. Initial monitoring in 2012 and 2013 suggested that the substrate may now be too soft, but by spring 2014, the dunes had compacted considerably and were well used by nesting turtles. Wildlife cameras deployed at this and a nearby nesting area on a spur road from 17 May – 3 July 2014 showed a total of 110 occasions of Western Painted Turtle activities. Most activity (71 occasions) was at the enhanced nesting area with a total of 34 nests completed; 22 of them were on the two sand dunes. Although the cameras did not detect predation events, nest predation need to be further monitored on the dunes.

<u>Aquatic habitat enhancement:</u>
In 2014, we continued previous efforts to provide basking sites for turtles in water bodies where basking opportunities were deemed to be in short supply. The activities consisted of securing and anchoring 72 basking logs installed in Swan Lake in January 2014, and monitoring the condition and restoration of structures that were installed in 2010 – 2012 at other sites as part of this project In a private pond in Metchosin, previously installed small basking structures were replaced with more durable, large logs, and their number was increased.

<u>Recommendations for 2015:</u>

- Within the CRD, Alberni Valley, and Cowichan Valley continue to fill in data gaps in survey coverage and follow up leads from anecdotal observations reported to HAT and Cowichan Land Trust by the public.
- Explore options to increase survey efforts to areas on the east coast of Vancouver Island north of Cowichan Valley.
- At Elk-Beaver Lake Regional Park:
    - Continue maintaining enhanced nesting habitat at the East Pond and equestrian grounds sites by clearing excessive vegetation growth.

    - Continue monitoring turtle nesting activities at the enhanced sites, including use of time-lapse cameras.
    - Install 1 – 2 basking logs in beaver ponds used by turtles.
    - Explore options to control bullfrog populations in ponds located close to Western Painted Turtle nesting sites.
- At Swan Lake and Christmas Hill Nature Sanctuary:
    - Maintain the nesting area free of excessive vegetation.
    - Monitor use of enhanced nesting area by the Nature House and consider enhancing additional nesting habitat at selected sites.
    - Monitor the condition and use of installed basking logs.
- At Airport Wetlands in Alberni Valley:
    - Continue monitoring the condition of the enhanced turtle nesting site
    - Use time-lapse cameras to monitor the use of identified nesting areas and the migration route across a main logging road at this relatively remote site.
- Continue HAT's landowner and outreach campaigns to solicit for anecdotal turtle observations, raise awareness of turtles, and involve residents in habitat stewardship.
- Continue working with existing and new habitat stewards in habitat enhancement and threat mitigation projects for turtles.

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1.0 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.

The Western Painted Turtle is a focal species in Habitat Acquisition Trust's program aimed at protecting species at risk and their habitats through community involvement and partnerships with landowners. This report presents the results of wetland surveys, habitat enhancement, and stewardship activities carried out on Vancouver Island during the 2014 field season, continuing previous work carried out annually since 2008 (Engelstoft and Ovaska 2008, 2011, 2013, 2014; Ovaska and Engelstoft 2009, 2010, 2012). Surveys in Cobble Hill and Cowichan Valley were carried out in collaboration with Cowichan Land Trust and BC Ministry of Forest, Lands and Natural Resources Operations.

2.0 Goal and Objectives

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

The objectives were as follows:

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

3.0 Approach and Methods

3.1 Distribution and threat assessment

The distribution of the Western Painted Turtle on Vancouver Island is incompletely known, hindering conservation efforts. The focus of the surveys in 2014 was to continue filling in data gaps within the focal areas in CRD and Alberni Valley. This year, additional surveys north of CRD in Cobble Hill and Cowichan Valley were also conducted.

We identified wetlands for surveys from orthophotos and followed tips of turtle sightings from naturalists, residents, and the public. The survey protocol was as in previous years (Engelstoft and Ovaska 2008, 2011, 2013, 2014): 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. At sites where the Western Painted Turtle was found, we assessed the condition of habitat and noted potential threats.

3.2 Nesting habitat enhancement

During the 2014 field season, we continued enhancement, maintenance and monitoring of nesting habitat, focusing on sites with previous work. Two sites were in Elk/Beaver Lake Regional Park (East Pond site: enhanced in 2010 – 2013; EBLES - Equestrian grounds site: enhanced in 2011), two sites were in Swan Lake and Christmas Hill Nature Sanctuary (enhanced in 2010 and 2013), and one site was at Airport Wetlands in Alberni Valley (enhanced in 2011).

At Elk/Beaver Lake Regional Park, we visited the nesting areas regularly during the period when hatchlings emerged in spring, and used a time-lapse camera to record turtle activity during the egg-laying period in summer at both enhancement sites. At the East Pond site, the camera (Wingscape Model WCT-00122) was mounted on a 3 m-tall pole, as in previous years, and was set to take an image every 5 minutes (Engelstoft and Ovaska 2013). At the EBLES site, the camera (Wingscapes®) was mounted in a nearby tree with a view of the enhancement area and was set to take an image every 10 minutes. With help from CRD Parks volunteers, additional enhancement and maintenance activities were conducted in May 2014 at the two nesting areas in Elk-Beaver Lake Regional Park. At Swan Lake, we mostly relied on staff, interns, and visitors to report turtle nesting activities.

In the Alberni Valley, the enhancement site at Airport Wetlands was monitored with two time-lapse sensor cameras: one camera (Wingscapes®; set to take an image every 10 minutes) was mounted in a tree at height of ~6 m to provide an overview of the site; the second camera (Simmons® ProHunter Trail Camera, model: 119421C) was mounted on a sign post at height of ~2.5 m to provide a closer view of a portion of the site. A third camera was in a tree with a view of a nearby, previously identified turtle nesting area on an old spur road. The motion sensor was also set on the Simmons® camera. All cameras were tilted down towards the ground and, with the exception of the Simmons®, placed in wooden boxes resembling bird nest-boxes to discourage vandalism and to provide weather protection.

3.3 Aquatic habitat enhancement

In 2014, we continued previous efforts to provide basking sites for turtles in water bodies where basking opportunities were deemed to be in short supply. The activities

consisted of securing and anchoring 72 basking logs installed in Swan Lake in January 2014, and monitoring the condition and restoration of structures that were installed in 2010 – 2012 at other sites as part of this project (Ovaska and Engelstoft 2010, 2012; Engelstoft and Ovaska 2011, 2013, 2014). In a private pond in Metchosin, previously installed small basking structures were replaced with more durable, large logs, and their number was increased.

4.0 Results

4.1 Distribution and threat assessment

4.1.1 Overview of surveys

In 2014, we surveyed a total of 31 water bodies for turtles on southern Vancouver Island (Figure 1). Of these, 11 were surveyed for the first time, while the remaining surveys were revisits (Table 1). In total, we spent 32 person-hours searching for turtles during 36 surveys.

The surveys were conducted from 9 April to 18 September 2014 with most of the surveys (n= 29) in April – May, when turtles are often readily detected when basking on logs or along the shoreline. Air temperatures during the surveys ranged from 9 – 20°C (mean = 16°C; Standard Deviation = 3°C; Table 2). Most of the surveys were conducted from vantage points on the shore (n=32), but a few were from a boat (n= 4).

Table 1. Summary of water bodies searched and turtle observations on Vancouver Island in 2014.

Area	NGO*	# of new sites	Total # of sites	# of surveys	# of sites with WPT^	# of sites with Sliders
Alberni Valley	HAT	1	7	9	4	1
Capital Regional District	HAT	2	11	13	3	2
Cobble Hill	HAT	4	4	4	0	2
Cowichan Valley	CLT	4	9	10	0	1
Total		11	31	36	7	6

* HAT = Habitat Acquisition Trust; CLT = Cowichan Land Trust
^ WPT = Western Painted Turtle

We observed Western Painted Turtles at seven sites, all at sites with previous observations, in Alberni Valley and CRD (Table 1). No new sites were found. The species was not found at any of the 14 sites surveyed in Cobble Hill and Cowichan Valley. Introduced Sliders (*Trachemys scripta*) were detected at six sites across the study areas (Table 1).

From 2008 – 2014, we have surveyed a total of 162 water bodies for turtles (414 surveys, of which 358 were part of this project). The Western Painted Turtle was found at a total of 23 sites (

Figure 2). There are a few additional confirmed records of Western Painted Turtles from the CRD as reported by residents or the public or observed on roads. Introduced turtles, mostly Sliders, were recorded in 33 water bodies throughout the areas surveyed (Figure 3).

Table 2. Conditions and results of surveys conducted from April – September, 2014.

Area and site	Date	Start time	Person-min	Air temp °C	Cloud cover (%)	Survey method	WPT^ #	Slider #	# of sites with WPT^
Alberni Valley:			*386*				*42*	*1*	*7*
Airport Wetlands	16-May	17:50	20	13	100	Foot	0	0	
Airport Wetlands	17-May	15:40	20	15	>50%	Foot	37	0	
Ash 77, 2 Mile Lake	17-May	10:20	120	16	>50	Foot	0	0	
Ash Main, pond at 26 km mark	16-May	13:40	30	14	100	Foot	0	0	
Ash Main, pond at 26 km mark	17-May	12:30	40	15	>50%	Foot	2	0	
Ash Main, Pond at 31 km	16-May	14:30	20	15	100	Foot	0	0	
Little Turtle Lake	17-May	13:10	40	16	>50%	Foot	2	1	
McLauglin Lake	16-May	15:10	20	14	100	Foot	0	0	
Turnbull Lake (backwaters)	16-May	15:22	76	14	100	Foot	1	0	
Capital Regional District:			*915*				*45*	*11*	*11*
Beaver Lake (CRD Parks)	11-Sep	13:00	120	19	5	Boat	4	2	
Blinkhorn Lake	14-May	14:30	30	17	0	Foot	0	0	
Boys & Girls' Club Pond	24-May	10:00	80	14	3	Foot	4	0	
Cordova Bay Golf Course	09-Jul	10:30	240	20	1	Foot	0	0	
Durrance Lake (CRD Parks)	18-Jul	11:20	15	18	50	Foot	0	0	
Glen Lake	14-May	14:50	20	18	0	Foot	0	0	
Glinz Lake	24-May	11:15	30	16	<50	Foot	0	0	
Langford Lake	14-May	11:10	180	18	0	Boat	37	9	
Langford Lake	18-Sep	15:00	60		0	Boat	0	0	
Quantine Lake	08-Jul	12:15	60	18	0	Foot	0	0	
Spencer Rd. pond	14-May	13:00	20	18	0	Foot	0	0	
Swan Lake	10-Sep	13:30	30	19	0	Foot	0	0	
Swan Lake	17-Sep	10:30	30	18	>50	Foot	0	0	
Cobble Hill:			*80*				*0*	*2*	*4*
Chapman Rd Pond	22-May	15:25	10	18	90	Foot	0	0	
Arbutus Ridge Golf Club Ponds	01-May	10:45	20	20	5	Foot	0	0	

Area and site	Date	Start time	Person-min	Air temp °C	Cloud cover (%)	Survey method	WPT^ #	Slider #	# of sites with WPT^
Jim's Pond	22-May	15:50	20	18	90	Foot	0	1	
Merileys Nature Park	01-May	10:00	30	20	5	Foot	0	1	
Cowichan area:			*540*				*0*	*2*	*10*
Culverton Rd	09-Apr	14:00	60	13	0	Foot	0	0	
Crofton Lake	09-Apr	12:50	60	10	20	Foot	0	0	
Crofton Lake	01-May	12:00	60	20	5	Foot	0	0	
Grant Lake	09-Apr	15:50	16	13	0	Foot	0	0	
Kwassin Lake	09-Apr	15:59	22	13	0	Foot	0	2	
Little Crofton Lake	01-May	12:55	40	20	5	Foot	0	0	
Mayo Lake	04-Apr	12:31	30	12	50	Foot	0	0	
Municipality Pond N	09-Apr	11:30	60	9	10	Foot	0	0	
Quamichan Lake	01-May	14:35	170	20	5	Foot	0	0	
Wake Lake	04-Apr	13:40	22	12	100	Foot	0	0	
Total			**1921**				**87**	**16**	**36**

^ WPT = Western Painted Turtle

4.1.2 Capital Regional District (CRD)

In the 2014, we surveyed 11 water bodies in CRD, two of which were visited for the first time (Table 1, Table 2). The Western Painted Turtle was observed in three wetlands, all with known populations (Table 1). We surveyed a golf course following reports from the public. While we did not see any turtles during the visit, the grounds keeper showed us a site where he had observed nesting attempt of a turtle in a sand pit (species unknown).

In 2014, we conducted surveys in Durrance Lake and Elk-Beaver Lake regional parks (Table 2). The Western Painted Turtle was observed in Beaver Lake but not in Durrance Lake. We have observed Western Painted Turtles regularly in the Elk/Beaver Lake Regional Park, where we also carried out turtle nesting and basking habitat enhancement activities (see Sections 4.2 and 4.3). We have not found the Western Painted Turtle at Durrance Lake despite surveys in multiple years and anecdotal observations of the species. A photo of a Painted Turtle digging a nest on a trail there, taken several years ago, is of an Eastern Painted Turtle (introduced).

4.1.3 Alberni Valley

In Alberni Valley in 2014, with assistance from local naturalists Rick and Libby Avis, we surveyed seven wetlands, one of which was visited for the first time (Table 1; Table 2). We observed Western Painted Turtles at four previously documented sites. Most observations (37 of 42 turtles seen) were at Airport Wetlands, known to support a relatively large turtle population. Of interest are observations of Western Painted Turtles

at Turnbull Lake and Little Turtle Lake, where we have observed the species previously only once. We encountered an introduced Red-eared Slider in Little Turtle Lake during the 2014 surveys, but not at the other sites surveyed.

Figure 1. Overview of Western Painted Turtle survey sites on Vancouver Island in 2014.

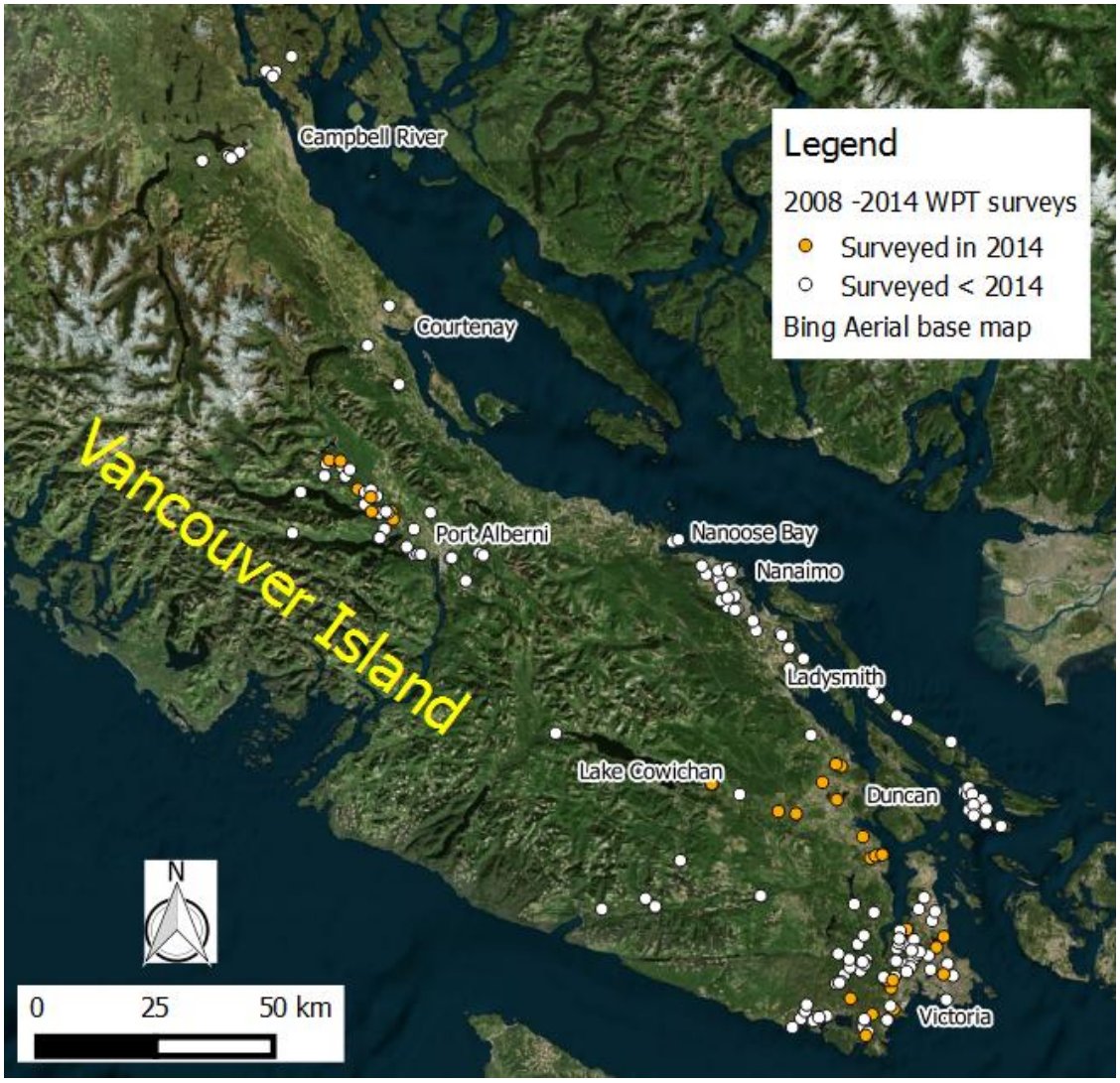


Figure 2. Summary of Western Painted Turtle observations and survey locations 2008 – 2014.

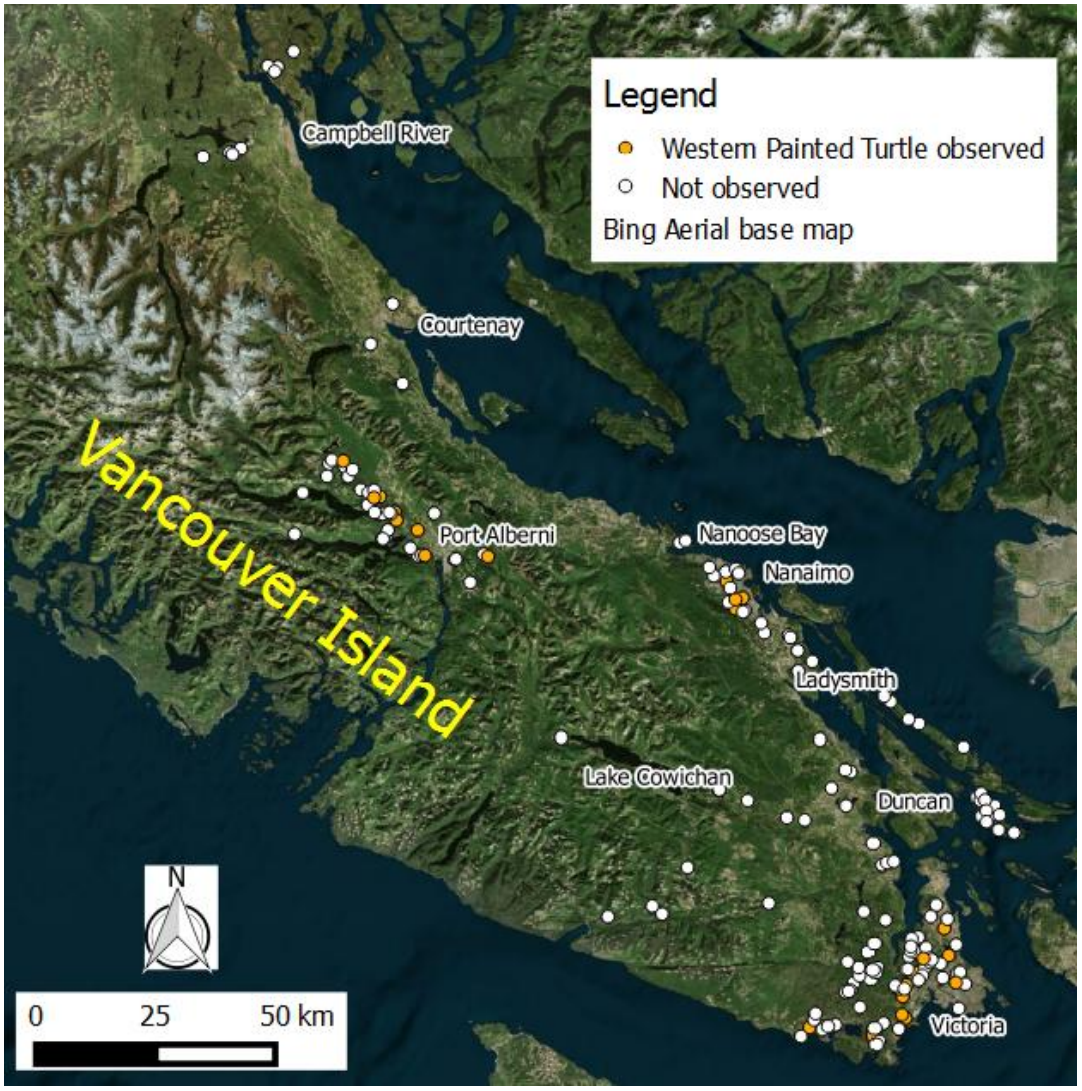
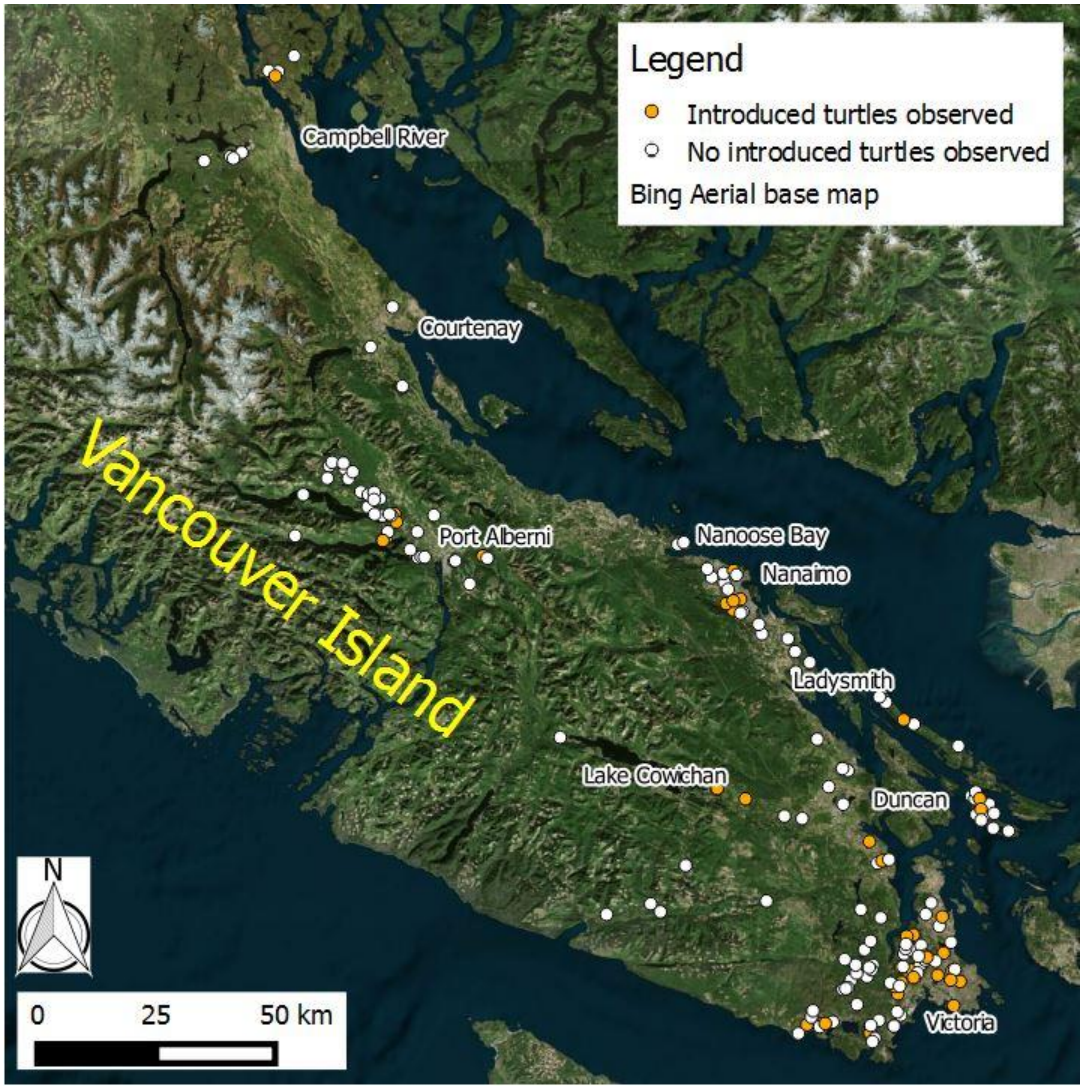


Figure 3. Summary of introduced turtle observations and search locations from 2008 – 2014.



4.1.4 Cobble Hill, Cowichan Valley, and surroundings

In 2014, we conducted five surveys in Cobble Hill and ten in Cowichan Valley (Table 1; Table 2). Four sites in each area were surveyed for the first time. We observed no Western Painted Turtles but found Sliders in three ponds. At one pond, where two Sliders were seen basking on 27 January 2015, a landowner showed us a picture of 20 basking sliders taken previously. The Mississippi Map Turtle (*Graptemys pseudogeographica*), another introduced species, was found at one site (Mayo Lake) and is now known from a total of three sites on Vancouver Island (the other sites aer Beacon Hill Park and Prospect Lake in the CRD). There are also Sliders at each of these sites.

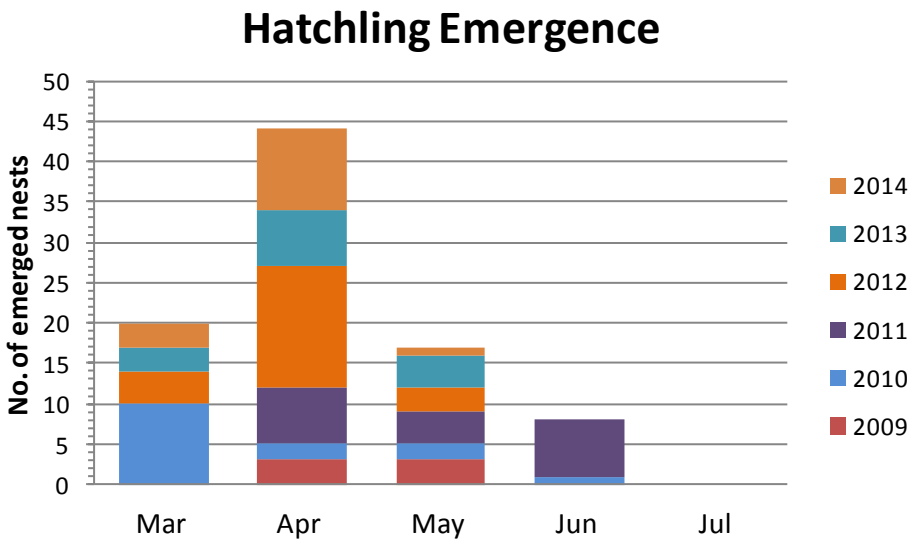
4.2 Nesting ground monitoring and restoration

4.2.1 Elk/Beaver Lake Regional Park: East Pond

Turtles nest communally by a small pond (referred to as East Pond) within an area of approximately 10 m x 12 m. The 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. Habitat enhancement by tilling small plots was conducted at this site (see Habitat enhancement by tilling, below).

Hatchling emergence:
Hatchlings overwintered in the nests and were from eggs laid the previous summer. In spring 2014, we searched the nesting area 15 times from 28 January to 24 July and found a total of 14 emerged nests. Emergence occurred from 28 March – 18 May 2014 with a peak in April (Figure 4), which continues the pattern seen in previous years.

Figure 4. Monthly distribution of emerged nests by East Pond, 2009 – 2014.



We calculated nesting success as the proportion of emerged nests of all nests that were located at the site soon after egg-laying (and the location of which we could map with accuracy) the previous summer. Nesting success ranged from 50 – 26% from 2009 – 2013). It could not be calculated for 2014 because of a monitoring camera failure in 2013, when the eggs hatching in spring 2014 were laid. Hatching in spring 2015 was still in progress at the time of writing of this report and therefore is not reported here.

Egg-laying:
In 2014, turtle nesting activity at the site was monitored by a time-lapse camera (see Figure 5 and cover photo for examples). The analysis of 7396 pictures revealed 19

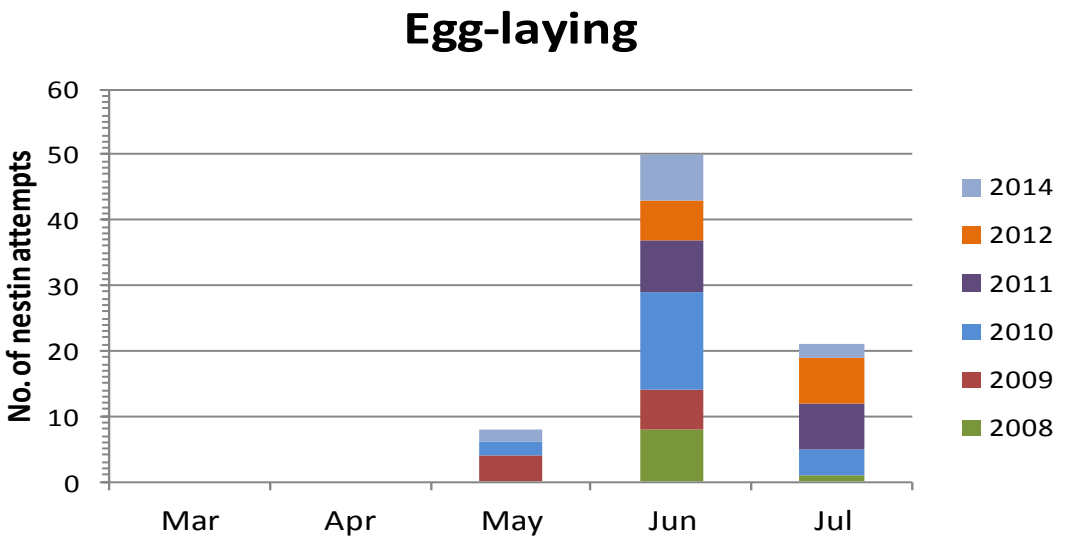
nesting events, of which 11 were completed and eight were interrupted for unknown reasons. One nest was found on the day of deploying the camera, resulting in a total of 20 nesting events recorded at the site in 2014. Egg-laying occurred from 27 May to 7 July, with a peak in June, similar to previous years (Figure 6). Most nesting activities started between 16 – 18:00 h (Figure 7).

All except one of the turtles nesting at the site were Western Painted Turtles. On 6 July, a Slider dug a nest at one of the newly tilled experimental plots (1C) and in the process appeared to have dug up previously laid Western Painted Turtle eggs; desiccated eggs were found on the surface upon inspection of the site on 24 July. No nest predation was noted.

The beaver activity that flooded the lower portion of the nesting area in 2013 (Engelstoft and Ovaska 2014) created lush growth that forced the turtles to move beyond the flooded zone. No turtles were seen digging nests in the area closest to the pond in 2014 (Row 4 in Figure 9).

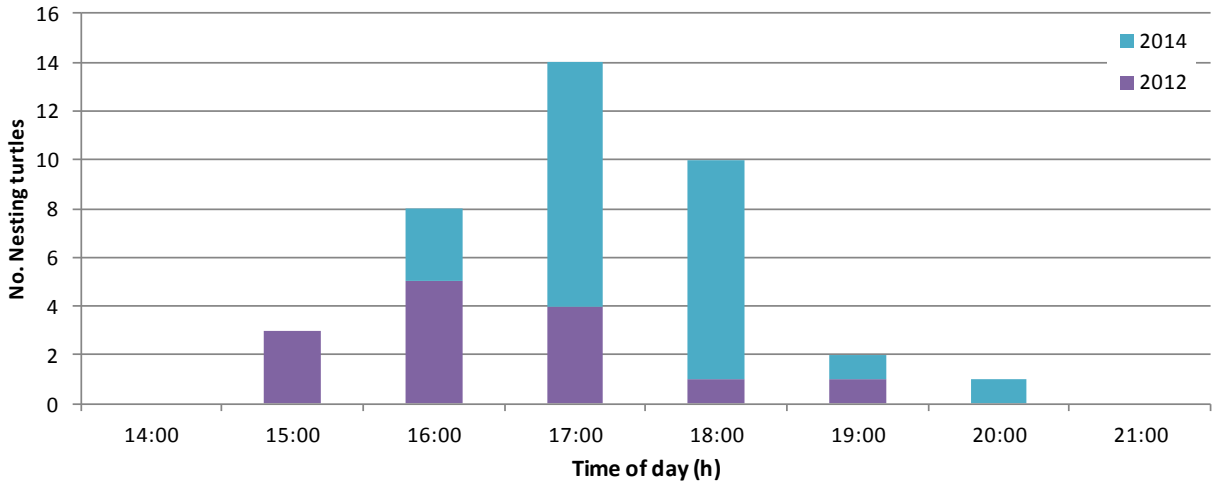
Figure 5. Western Painted Turtle digging a nest in an experimentally tilled plot at East Beaver Pond, 26 May 2014.

Figure 6. Monthly distribution of the number of females digging nests at East Pond, 2008 – 2014.



Note: no records obtained in 2013.

Figure 7. Time of day when Western Painted Turtles started digging nests at East Pond as revealed by monitoring camera, 2012 and 2014.



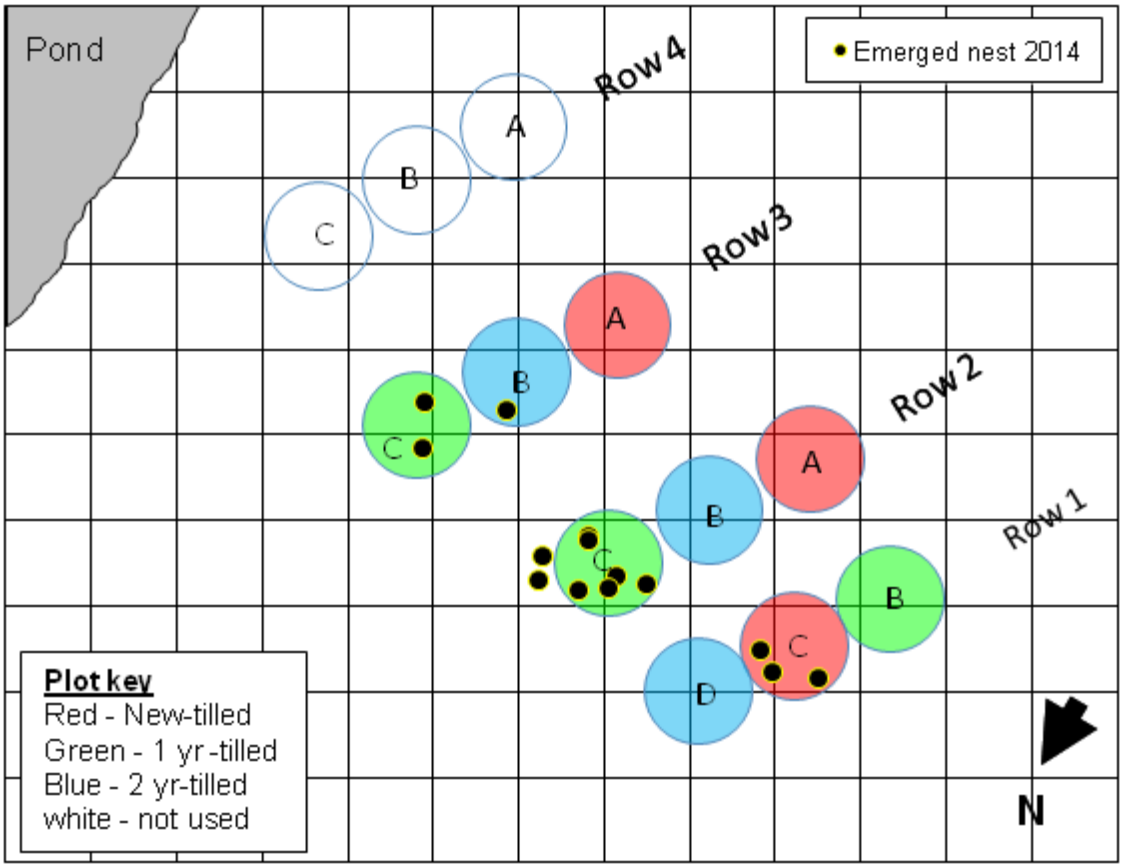
Habitat enhancement by tilling:

In May 2010, we began to investigate the effectiveness of tilling as a method for nesting habitat enhancement at the communal egg-laying site at East Beaver Pond, where encroachment by grasses and weeds was identified as a problem. Habitat enhancement consisted of experimentally tilling small (1 m^2) circular plots. The

experimental plots were in four rows of three plots. One plot from each row was tilled each year from 2010 to 2013, its position rotating among the years.

In spring 2014, 12 of the 14 emerged nests (from eggs laid the previous summer) were within the experimental plots. The nests were clustered, with most nests within and around Plot C in Row 2 (Figure 8). Eight of the emerged nests were in the plots tilled the year before egg-laying (in May 2012), while four were in the plots tilled immediately before the eggs were laid (in May 2013).

Figure 8. Locations of emerged nests found at the experimental plots by East Pond in spring 2014.

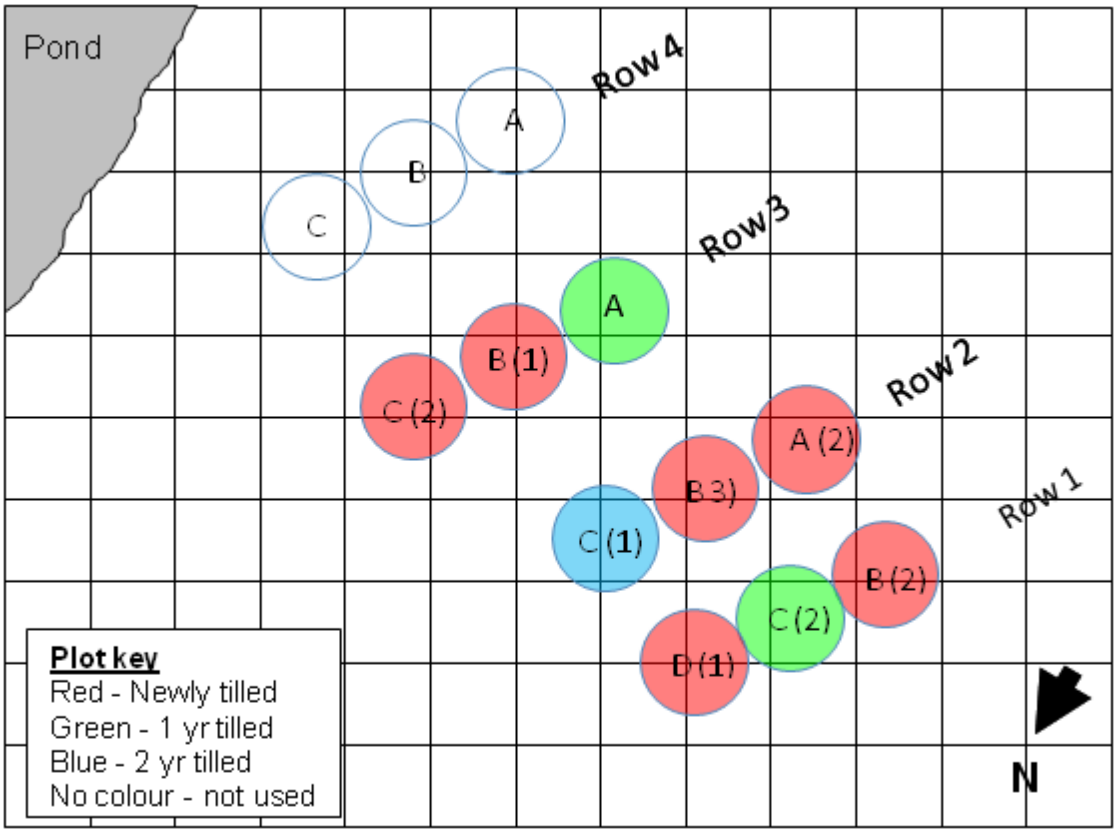


After the spring 2014 hatchling emergence period, the experiment was discontinued, and in 2014 two plots per row were tilled to increase nesting habitat (Figure 9). The row closest to the pond was not included this year due to risk from flooding, as observed in 2013. The enhancement was carried out with help from CRD Parks volunteers on 25 May 2014 after hatchlings had emerged from previous year's nests but before adult females had started egg-laying.

In summer 2014, turtles continued to use both the newly tilled plots and those that were tilled the previous years (Figure 9). The latter had remained largely free of vegetation, but some weed growth was seen. Nesting activity by turtles also helped to keep the ground bare, and the clustering of nests in this and previous years may have reflected attraction of turtles to ground recently disturbed by other nesting turtles.

Figure 9. Nesting habitat tilling pattern and number of new, completed nests per experimental plot (# after letter) at East Pond, Elk-Beaver Lake Regional Park in 2014.

Nest locations outside the experimental plots (n=4) could not be determined accurately from monitoring camera images and are not shown.



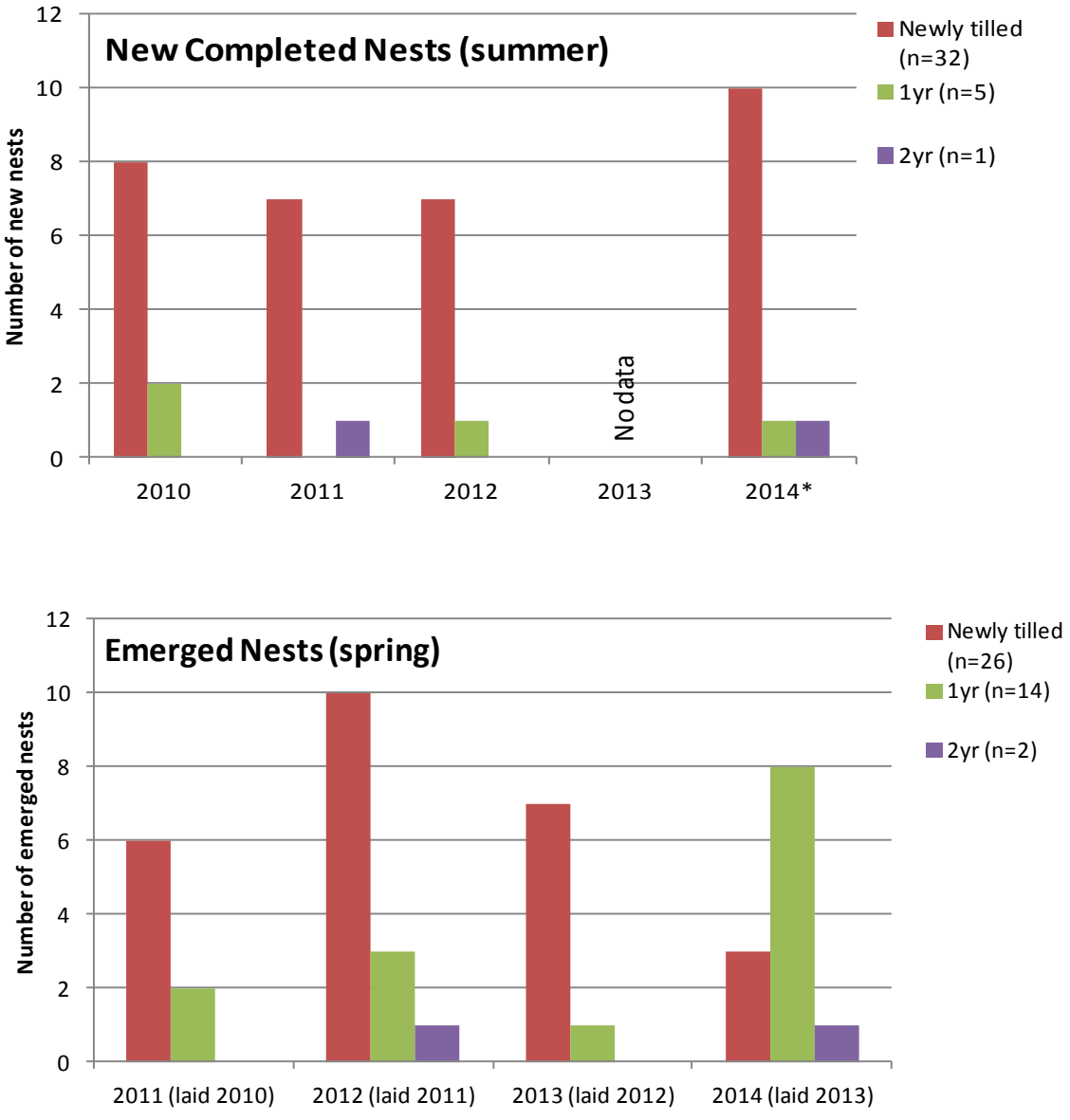
During the course of the experiment (up to spring 2014; excluding nests from summer 2014 with a different tilling pattern), we have recorded a total of 47 newly dug nests at this site, of which 24 were on the experimental plots. Of these, 85% were on the newly tilled plots, 12% were on plots tilled the year before, and 4% were on plots tilled two years before (or controls in 2010) (Figure 10, top). There are no data of egg-laying in 2013 due to monitoring camera failure.

The proportion of nests that emerged successfully is a better measure of the effectiveness of the habitat enhancement method, as it includes a measure of reproductive success. Up to spring 2014, we have found a total of 60 emerged nests at this site, 42 of which were on the experimental plots. Of these, 62% were within the

recently tilled plots (tilled immediately before egg-laying), while 33% were on plots tilled 1 year prior to egg-laying; only 5% (1 emerged nest) was on plots tilled two years prior to egg-laying within this period (Figure 10, bottom).

Figure 10. Summary of new nests completed by females (top) and emerged nests (bottom) on experimental plots at East Pond in Elk-Beaver Lake Regional Park.

The timing of treatments (tilling) is in respect to egg-laying.



*Tilling pattern was changed in May 2014 from tilling 1 plot to 2 plots per row.

4.2.2 Elk/Beaver Lake Regional Park: EBLES site

In 2011, turtle nesting habitat was enhanced and surrounded by a fence within equestrian grounds maintained by EBLES (Ovaska and Engelstoft 2012). The enhancement was prompted by turtles nesting in unsafe sites on the adjacent trail and in riding rings. In 2014, maintenance of the enhanced site consisted of weeding and removal of blackberry bushes from the surrounding area, carried out in May and June 2014 by CRD Parks volunteers; we further cleared the nesting site of thistles and other weeds in September 2014.

In 2014, we checked the area five times from 28 January – 25 May but found no emerged nests. A time-lapse camera was operated on the site from 2 June – 24 July 2014 to observe nesting turtles (Figure 11). No turtles were seen in any of the 3478 images obtained.

Figure 11. Enhanced nesting habitat by a horse exercise ring at the EBLES site in Elk-Beaver Lake Regional Park, 2014.

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

Two nesting areas were enhanced at the Swan Lake-Christmas Hill Nature Sanctuary, one in 2010 by the Nature House and another in 2013 along the north side of the lake (Engelstoft and Ovaska 2011, 2014). The enhancement consisted of clearing sites with a warm exposure close to the lake of grass and weeds to expose bare ground. During a site visit in spring 2014, we observed one emerged turtle nest (species unknown) at the enhanced site by the Nature House but found no evidence of turtles at the other site. In summer 2014, Swan Lake staff reported observing a Slider nesting along the edge of the restored site by the Nature House (on 5 Jun 2014; J. Rastogi, pers. comm.). Inspection of the enhanced site on the north side of the lake in spring 2014 and 2015 indicated that the substrate was too wet to be suitable for turtle nesting activity, and relocation should be considered.

4.2.3. Alberni Valley

In Alberni Valley, the enhanced nesting area was located in an abandoned gravel pit, where habitat was deemed poor due to a hard, rocky substrate (Ovaska and Engelstoft 2012). To enhance the area for turtles, two sand dunes (approximately 12 m long, 3.5 m wide) were created in 2011, each with a gentle slope facing south along their long axis.

The enhanced nesting area and its surroundings were inspected three times from 2 April – 16 May 2014 with help from local naturalists Rick and Libby Avis. A total of 11 emerged nests were found at the enhanced site. Due to the softness of the material used to create the nesting dunes, we might not have been able to see emerged nest holes that had collapsed before our arrival. One emerged nest was found on a nearby abandoned spur road.

During a site visit on 16 May 2014, we observed signs of recent nesting activity by turtles at the enhanced site. Turtle tracks crisscrossed the dunes, and there were signs of 3 – 7 recently completed nests. Three time-lapse cameras (one also with a motion sensor) deployed at the site from 17 May – 3 July 2014 recorded 15857 images of the two nesting areas and showed a total of 110 occasions of Western Painted Turtles (Table 3; Figure 12). Most activity was observed at the enhanced nesting area with a total of 34 nests completed; 22 of them were on the two sand dunes created as part of habitat enhancement (5 on the west and 17 on the east dune). On four occasions, the images revealed turtles nesting on a separate, hard-packed gravel mound behind the sand dunes; this gravel mound was the only site where we found successful (emerged) nests prior to the enhancement. The cameras did not provide a complete coverage of the nesting area; in particular the northern backsides of the dunes were not shown, and visibility of the hard-packed gravel mound behind the dunes was poor.Figure 12. Western Painted Turtle activity at enhanced nesting habitat at Airport Wetlands, May 2014. Top – turtle digging a nest as revealed by a monitoring camera' bottom: turtle tracks crisscrossing both dunes.


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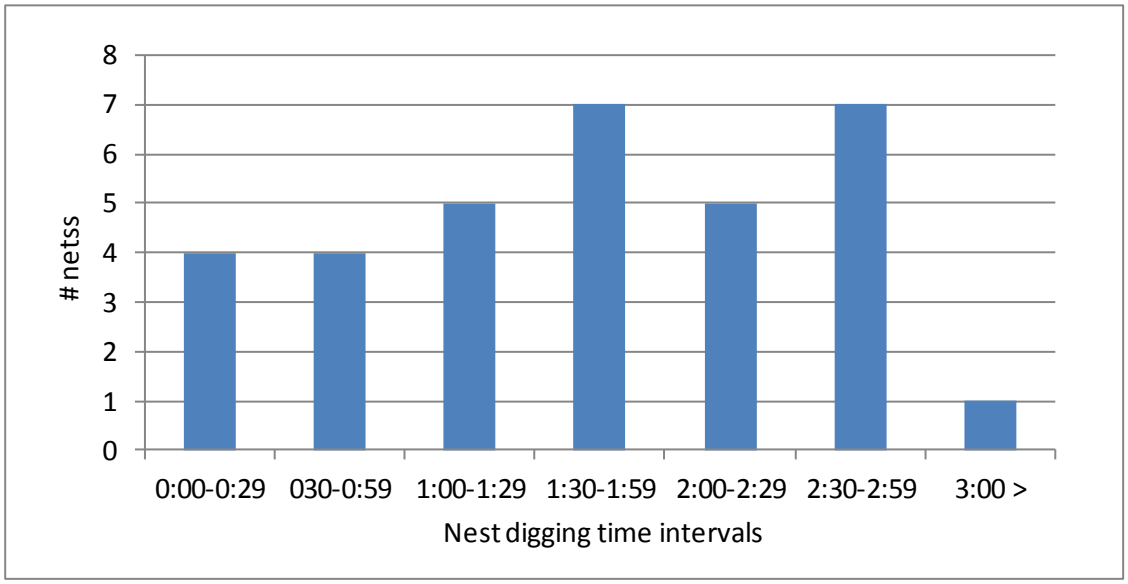
Table 3. Western Painted Turtle nesting activity from images from time-lapse and motion-sensor cameras at nesting sites in the Alberni Valley, 2014

Site	Exploring (meandering)	Digging (but not completing nesting)	Completing nesting
Enhanced area (dunes)	36	1	34
Spur road nesting site	19	8	12
Total	55	9	46

The duration of nesting by Western Painted Turtles (from starting to dig to covering the nest and leaving) varied from less than half an hour to more than 3 hours (Figure 13), 76% of the nests took over one hour to complete.

Figure 13. Duration of nesting by Western Painted Turtle in the Alberni Valley, 2014, as revealed by monitoring camera images.



Other animals revealed by the monitoring cameras on the nesting grounds in 2014 included a cougar (on 14 June), a raccoon, deer, rabbits, ravens, and squirrels. Raccoons and ravens are potential predators of turtle eggs and hatchlings, but the camera images showed no nest predation incidents. However, on a visit to the site on 16 May 2014, prior the deployment of the cameras, we observed several apparently predated nests on the dunes (diggings and egg shells strewn on the surface).

4.3 Enhancement of Aquatic Habitat

4.3.1 Elk-Beaver Lake Regional Park

Basking opportunities for turtles were previously enhanced in two ponds by the addition of three types basking structures: small logs or log/boards structures (installed in 2010; Ovaska and Engelstoft 2011), mill-end slabs placed perpendicular to the shoreline and

anchored to the shoreline vegetation at one end (installed in 2011; Engelstoft and Ovaska 2012), and composite boards, consisting of a center board with a wooden platform at one end, suspended by styrofoam floats, designed by Camosun College students (installed in 2012; Engelstoft and Ovaska 2013; Umphrey et al. 2013).

In 2014, we inspected these basking structures in the two ponds. Unfortunate, all but two boards were non-functional or had disappeared, and we suggest that more durable larger logs be installed to replace the existing structures. One or two logs per pond would be sufficient given the small size of the ponds. The installation should be carried out from August - February to avoid disturbing nesting turtles.

4.3.2 Swan Lake-Christmas Hill Nature Sanctuary

In Swan Lake, basking habitat enhancement for turtles began in 2010 (Ovaska and Engelstoft 2011, Engelstoft and Ovaska 2013), and in January 2014, together with Swan Lake staff, we placed a total of 72 large logs in the lake (Engelstoft and Ovaska 2014). During spring 2014, the logs were secured in place more permanently to prevent damage to infrastructure such as boardwalks by drifting logs; this activity was carried out largely by Swan Lake personnel, who also monitored their use by turtles. Anchoring the logs together in pairs proved to be a successful way of stabilizing them and keeping them from drifting. Over winter 2014 – 2015, only one log had dislodged and had to be repositioned (J. Rastogi, pers comm. 2015). Turtles have been seen using the logs throughout the lake but seem to bask together on preferred logs (J. Rastogi, pers comm. 2015). The logs also provide platforms for a variety of other wildlife, including herons and waterfowl and enhance viewing opportunities for visitors to the sanctuary.

4.3.3 Other sites

Previously installed basking logs were inspected at sites in Metchosin and Saanich and restored where needed. In spring 2013, we received a report of 12 turtles on an installed log structure in a private pond in Metchosin; on a subsequent visit to the site on16 April 2013, we observed ten Western Painted Turtles on this log. In 2014, large round logs were installed to the pond, providing additional and longer lasting basking platforms for the turtles and other wildlife.

5.0 Discussion

5.1 Distribution and threats

In 2014, we continued surveys of water bodies on southern Vancouver Island to fill in gaps in survey coverage, but no new sites for the Western Painted Turtle were found. Interestingly, while the turtles continued be found at previously known sites both in CRD and Alberni Valley, they were not encountered during surveys in the intervening area in Cobble Hill and Cowichan Valley; their distribution there appears to be patchy and confined to only a few sites.

Turtles face numerous threats within the urbanized and fragmented landscapes in CRD, including habitat fragmentation and loss, disturbance by humans and pets, introduced, invasive species, and road mortality during seasonal migrations. In Alberni Valley, activities associated with forestry and logging roads pose potential threats to the turtles. In 2014, we continued working with landowners on habitat management for turtles in CRD and Alberni Valley and prepared a site-specific management plan for an additional site in Saanich.

5.2 Nesting Habitat Enhancement

The availability of suitable nesting habitat was previously identified as a limiting factor for turtle populations at most sites on Vancouver Island (Ovaska and Engelstoft 2010; Engelstoft and Ovaska 2011). Since 2010, together with landowners/managers, we have engaged in nesting habitat enhancement in Saanich, Highlands, Metchosin, and Alberni Valley. In 2014, we continued working with large landholders in Elk-Beaver Lake Regional Park, in Swan Lake – Christmas Hill Nature Sanctuary, and on forestry lands in Alberni Valley managed by Island Timberlands to enhance nesting habitat. All these area support relatively large Western Painted Turtle populations and provide an opportunity both to help maintain populations and to improve methodologies as part of adaptive management. Continued monitoring of the condition of the enhanced habitat is also important, because some degree of maintenance is required to ensure that the areas are remain functional and are not overtaken by vegetation.

An experimental approach was taken at the East Pond study site in Elk-Beaver Lake Regional Park, where encroachment by grass on nesting areas was identified as a threat. The results of this 4-year study, from spring 2010 to 2014, showed that Western Painted Turtles preferentially selected nesting sites that had been tilled in spring immediately prior to the nesting season over plots that were either tilled in previous years or left unmanipulated. Furthermore, the number of emerged nests the following spring was also highest in the recently tilled plots, indicating that the plots were not reproductive sinks (i.e., used by nesting turtles but with reduced survival of young). The experiment was concluded in spring 2014 after the emergence of hatchlings from nests from the previous summer. In May 2014, with help from CRD Parks volunteers, we tilled additional plots to improve habitat. Nests in the recently tilled plots were often along their edges, against the more compact substrate, and tilling of ground in strips or in a mosaic pattern that maximizes edge is a preferred method of habitat enhancement at this site.

In the Alberni Valley, we used a different method of enhancing nesting habitat because the pre-existing conditions (hard, compacted substrates) were different than at the enhancement sites in CRD, where grass and weed encroachment were a problem. Initially, the sand dunes that were constructed to improve nesting habitat received little use by turtles, and we postulated that the substrate was too soft to be used by females and to maintain the structure of the nest cavities (Engelstoft and Ovaska 2013). However, by spring 2014, the substrates had compacted considerably, and direct observations and time-lapse monitoring cameras revealed that the dunes were well

used by nesting turtles. Further compaction is expected with time, improving the habitat for turtles. Although the cameras did not detect predation events, nest predation need to be further monitored. Nests in the dunes may be particularly vulnerable to predation because of the still relatively soft substrates.

5.3 Aquatic Habitat Enhancement

Since 2010, we have added turtle basking platforms to water bodies where opportunities for basking were deemed to be limited. While turtles readily used the platforms, smaller structures in general were not durable and either became water-logged or flipped over after 1 – 2 years, requiring frequent maintenance. Therefore, in January 2014, we began using large round logs as basking structures. While more cumbersome to handle and install, they are expected to last for many years and require little or no maintenance.

In addition to helping turtles, basking logs benefit a variety of wildlife, including herons and waterfowl. If properly placed in sunny but secure locations at vantage points, they also facilitate viewing of turtles and other wildlife by visitors, performing an important outreach function.

6.0 Recommendations

The following priorities were identified for 2015:

- Within the CRD, Alberni Valley, and Cowichan Valley continue to fill in data gaps in survey coverage and follow up leads from anecdotal observations reported to HAT and Cowichan Land Trust by the public.
- Explore options to increase survey efforts to areas on the east coast of Vancouver Island north of Cowichan Valley.
- At Elk-Beaver Lake Regional Park:
    - Continue maintaining enhanced nesting habitat at the East Pond and equestrian grounds sites by clearing excessive vegetation growth.
    - Continue monitoring turtle nesting activities at the enhanced sites, including use of time-lapse cameras.
    - Install 1 – 2 basking logs in beaver ponds used by turtles.
    - Explore options to control bullfrog populations in ponds located close to Western Painted Turtle nesting sites.
- At Swan Lake and Christmas Hill Nature Sanctuary:
    - Maintain the nesting area free of excessive vegetation.
    - Monitor use of enhanced nesting area by the Nature House and consider enhancing additional nesting habitat at selected sites.
    - Monitor the condition and use of installed basking logs.

- At Airport Wetlands in Alberni Valley:
    - Continue monitoring the condition of the enhanced turtle nesting site
    - Use time-lapse cameras to monitor the use of identified nesting areas and the migration route across a main logging road at this relatively remote site.
- Continue HAT's landowner and outreach campaigns to solicit for anecdotal turtle observations, raise awareness of turtles, and involve residents in habitat stewardship.
- Continue working with existing and new habitat stewards in habitat enhancement and threat mitigation projects for turtles.

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