Western Toad Roadkill Mitigation in Kentucky-Alleyne Provincial Park, July – August 2013

Photo by K. Ovaska

Prepared for

BC Parks, Thompson-Cariboo Region

Collaborative project by

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The underpass structure was donated by BC Timber Sales and procured, repaired and installed under the supervision of BJ Moore of the Ministry of Forests, Lands and Natural Resource Operations.

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HABITAT CONSERVATION TRUST FOUNDATION

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Kentucky Alleyne Provincial Park contains a communal breeding site of the Western Toad (*Anaxyrus boreas*), a species listed as Special Concern in Canada and on Schedule 1 of the *Species At Risk Act*. The toads are vulnerable to roadkill during their migrations between aquatic breeding sites and upland foraging and hibernation areas. In May 2013, BC Parks installed an underpass on a park road where previous monitoring results from our 2012 study indicated that large numbers of newly metamorphosed toadlets crossed the road and were subjected to mortality. Here we report the results of follow-up monitoring conducted in July – August 2013 to investigate the effectiveness of the underpass in facilitating migratory movements of toads across the road.

The underpass consisted of a semi-cylindrical "half-culvert" with an earthen floor (length across the road: 366 cm; width of opening at ground level: 180 cm; height of opening: 50 cm; height from top of opening to road surface: 30 cm). Drift fences constructed of black landscaping cloth supported by wooden stakes were used to lead the toads towards the tunnel and, once through the tunnel, away from the road and into the forest (height of fence: 30 cm; longest arm, tunnel entrance side: 60 m).

In 2013, adult toads were observed in the process of egg-laying on 20 May, and periodic subsequent checks revealed masses of tadpoles in the breeding pond, located between the two main lakes in the park. The migration of metamorphosed toadlets away from the pond began earlier in 2013 than in 2012 with the first wave of movement after a heavy downpour on 18 July. A second much larger peak occurred after the next rain event and peaked on 1 – 3 August. Time-lapse camera data revealed that toad movements occurred mostly in the morning and evening, with greatest overlap with traffic on the road from 8:00 h – 10:00 h and from 17:00 h – 21:00 h.

Both the time-lapse camera data and direct observations indicated that toadlets used the underpass extensively. A total of 7481 toadlets were counted from camera images at the tunnel entrance, while during 19 transect counts, 1212 toadlets were counted at the tunnel entrance and 1988 at the exit; both the camera and the transect counts represent only a sample of the toads that used the tunnel. During the peak migration, there was a steady stream of toadlets going through the tunnel. The toadlets entered the tunnel with no apparent hesitation and seemed to use it as a refuge at night. Its large diameter, earthen floor, and relatively short length, probably contributed to its attractiveness. The drift fences were effective in directing movements of toads towards the underpass as indicated by transect counts along the fence line, but spillage onto the campsites and road occurred around the east end of the fence.

Road transect surveys from 19 July to 5 August resulted in a count of 561 live and 1492 dead toadlets. The vast majority (88%) of the roadkill occurred during the second wave of toadlet movements on 1 – 3 August, mostly where the toadlets went around the end of the east arm of the drift fence. Comparisons of roadkill between 2012 and 2013 are tenuous at best, because the migration was much larger in 2013, but clearly the underpass facilitated movements of the toads across the road.

Dedicated volunteers from Nicola Naturalist Society spent a total of 184 hours in July and August 2013 constructing and inspecting drift fences, counting toads along the road and fence transects, opportunistically searching other areas of the park for toads, and explaining the project to park visitors. The project was featured in local media and CBC radio programs. Not only did the underpass facilitate movements of toads across the road, but it also acted as a show case and point of interest for park visitors, providing educational opportunities about the importance of amphibians and their conservation.

Recommendations for 2014 include the construction of more permanent, aesthetically pleasing drift fencing and extending the east arm of the funnel to direct more of the migration movement towards the underpass. Monitoring of the effectiveness of the system also needs to be continued. We recommend the use of time lapse cameras at the entrance and exit to the tunnel as the main method, supplemented by counts of dead and live toadlets along the road during the peak migration period. The outreach and educational opportunities provided by the underpass system should be optimised with the placement of an information sign on the toad migration, problem with roadkill, and the mitigation provided by the tunnel and fencing.

1.0 INTRODUCTION

The Western Toad (*Anoxyrus boreas*) is listed as “Special Concern” in Canada by COSEWIC (2002, 2013) and is on Schedule 1 under the federal *Species at Risk Act*. The toads are vulnerable to roadkill during their migrations to and from aquatic breeding sites and upland foraging and hibernation areas.

Western Toads breed communally in one of the ponds (referred to as West Pond) between the two main lakes in Kentucky Alleyne Provincial Park. The park is closed to visitors during the spring migration of adults to the breeding pond. However, newly transformed toadlets leave the pond *en masse* in late summer during the peak visitor period and cross the park road leading to the Kentucky Lake campsites, where they are subject to roadkill. After spending several years in the surrounding landscape, they return to the breeding sites as mature adults, starting the cycle over again. Surveys in adjacent ponds within and around the park have failed to locate toads, suggesting that the West Pond is an important breeding site for the local toad population (Ovaska *et al*. 2012). Mitigating roadkill in the park not only helps conserve the toad population across the landscape but also acts as a show case and point of interest and sends a message to park visitors and the public that amphibians are important and that impacts of human activities on their populations need to be mitigated.

In May 2013, BC Parks installed a wildlife underpass, donated by BC Timber Sales, in the park at a location suggested by Biolinx Environmental Research and Nicola Naturalist Society (2012), based on monitoring of the movements of toads in 2012. Here we report the results of follow-up monitoring conducted in July – August 2013 to investigate the effectiveness of the underpass in facilitating migratory movements of toads across the road. The project was carried out as a collaborative effort by the Nicola Naturalist Society, Biolinx Environmental Research Ltd., and BC Parks. The project was conducted within the framework of a broader community-based amphibian monitoring program started in the area in 2011 (Ovaska *et al*. 2011, 2012).

2.0 OBJECTIVES

The objectives for 2013 were as follows:

- Monitor the use of the underpass by newly metamorphosed toadlets during their migration away from the breeding pond.
- Monitor roadkill mortality with focus on the previously identified travel route across the park road leading to Kentucky Lake campsites.

- Examine possible entrapment or predation events associated with the underpass and drift fencing.
- Provide recommendations for refinements to the drift fence set-up and for further monitoring.

3.0 METHODS

3.1 Installation of underpass and drift fences

On 6 May 2013, BC Parks installed an underpass across the paved park road leading to the Kentucky Lake campsites (Figure 1). The underpass consisted of a semi-cylindrical "half-culvert" with an earthen floor (length: 366 cm; width at ground level: 180 cm; height of opening: 50 cm; height from top of opening to road surface: 30 cm). The tunnel was placed in a natural depression along the toad migration route, as determined previously (Nicola Naturalist Society and Biolinx Environmental Research 2012).

Figure 1. Underpass installation by BC Parks. Photo by Andrea Lawrence.

On 17 – 18 July 2013, Nicola Naturalist Society volunteers, with help from Biolinx Environmental Research Ltd biologists, installed temporary drift fencing intended to direct toads from the breeding pond to the underpass (Figures 2 & 3). On the pond (or tunnel entry) side, the drift fencing formed a wide funnel with a 60 m long east arm and a 30 m long north arm; the funnel was intended to contain the majority of the toadlets as they moved upward and away from the pond. On the exit side, an inverted funnel

directed the toadlets away from the road and into the forest. The west arm of the exit funnel was approximately 30 m long; the east arm consisted of a 2 m long fence that joined a large downed log perpendicular to the road, forming a natural barrier. The drift fences were constructed of black landscaping cloth supported by wooden stakes, which were tilted inwards to prevent toads from climbing over the fence. The fence was circa 30 cm high above ground and buried to a depth of circa10 cm. It was removed after the migration was over.

Figure 2. Volunteers helping to erect drift fencing.

Figure 3. Overview of the underpass location and tunnel entry with drift fencing. Note the camera in the tree above the entry. The flagging was intended to keep curious by-standers at a distance.

3.2 Transect surveys

To determine the effectiveness of the underpass and drift fence system in directing toadlets safely across the road, Nicola Naturalist Society volunteers conducted surveys along the fences and at the tunnel entrance and exit. The two arms of the funnel on the pond side were divided into approximately 10 m intervals, and toadlets visible inside and outside of the fence within each section were counted while walking slowly along the perimeter of the fence line on the outside. Toadlets within approximately 2 m from the tunnel entrance and exit were counted from the road. Volunteers conducted surveys from 19 July to 5 August 2013, with multiple surveys per day during the peak migration period.

As in 2012, a 180 m long transect was established along the park road leading to the Kentucky Lake campsites (referred to as Kentucky Campside Road) to monitor roadkill. Toads (live and dead) encountered on the road surface were counted within each 10 m section of the transect; the location of each dead toad was marked with white chalk to avoid double counting during subsequent surveys. The observers also checked the boat launch and beach areas along Kentucky Lake and were instructed to record any toads seen opportunistically in other areas of the park. The road and fence transects and other search areas are shown in Figure 4 (see Appendix 1 for the volunteer datasheet and Appendix 2 for survey times and conditions).

3.3 Time-lapse cameras

Two time-lapse cameras (Reconyx PC900), loaned to the project by the Ministry of Transport, were used to monitor the timing of toadlet migration and their use of the underpass, from 19 July to 2 September 2013. One camera was placed at the entrance to the tunnel in a tree, facing downwards (Figure 3). The camera view covered a portion of the entrance; a higher position that would have shown the entire entrance was not feasible because of the small size of the toadlets, impeding their detectability in images taken from farther away. A second camera was placed at the end of the west arm of the exit fence but was moved on 26 July to a location closer to the exit. Unfortunately, this camera failed after the move. A light layer of sand was placed in the camera view areas at the entrance and first exit location to increase contrast between toadlets and the ground in the images.

The cameras were initially set to take an image every 5 min throughout the 24 h period but were switched to a 15 min interval on 26 July. Only photos taken every 15 min were used in analyses. In addition to time-lapse, the camera motion sensor was set to monitor activity by potential predators and human disturbance. The images were

analyzed by flipping back and forth between subsequent images to improve detection and counting the number of toadlets at pictures taken every 15 min.

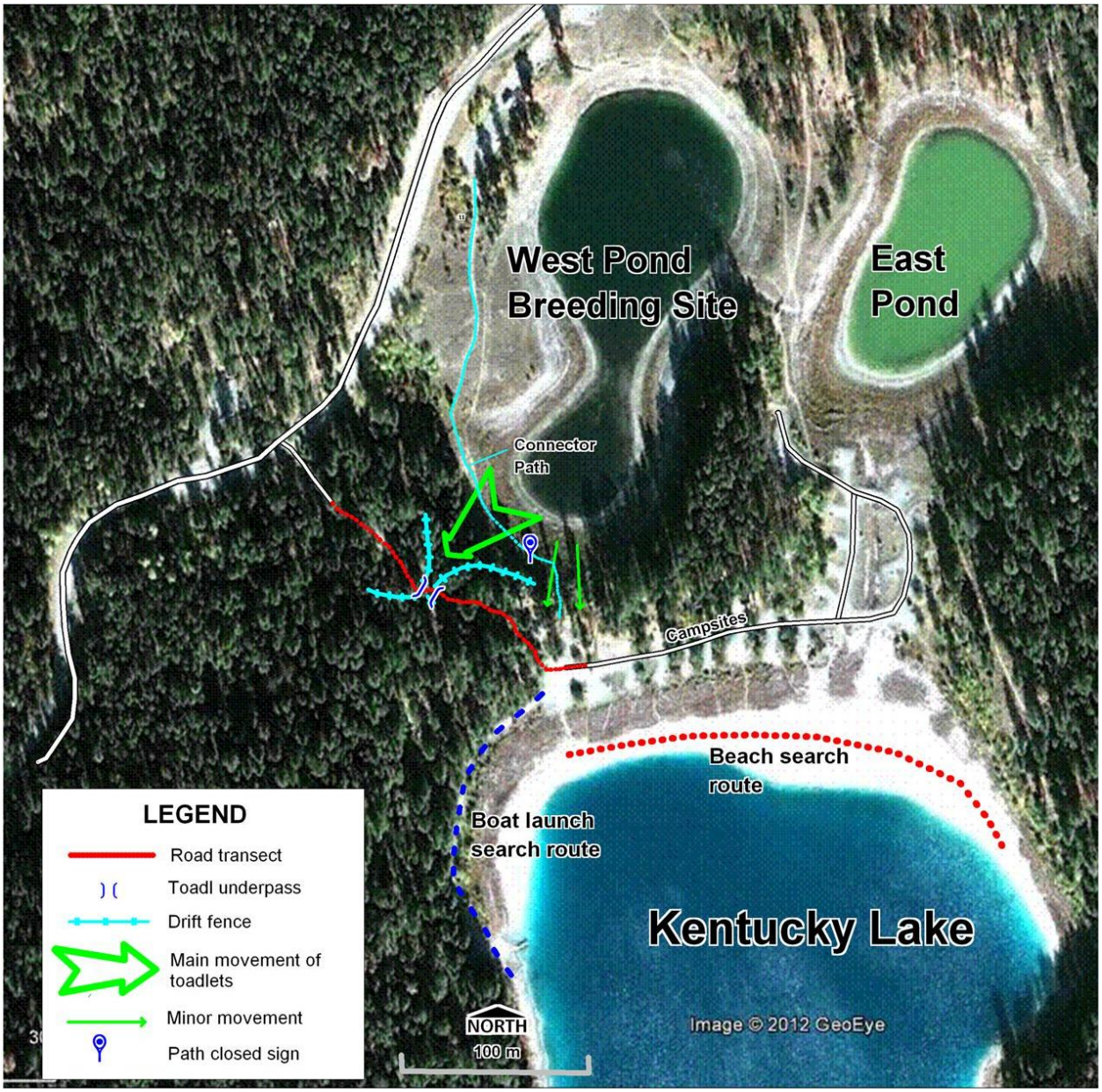


Figure 4. Overview of the study site with the direction of toad movements, underpass with drift fences, and search areas shown.

4.0 RESULTS

4.1 Timing of migration

In 2013, adult toads were observed in the process of egg-laying on 20 May in the south end of the breeding pond, and periodic subsequent checks revealed masses of tadpoles in the pond. The start and end dates of regular surveys were determined from reconnaissance checks at the breeding pond through observations of the timing of metamorphosis and toadlet activity. The toadlets begin to congregate on the shoreline before moving *en masse* away from the pond. The first wave of movement began after a heavy downpour of rain and hail on 18 July, following a dry period, on the day the drift fencing was installed. A second, much larger peak occurred after the next rain event and peaked on 1 – 3 August (Figure 5), emptying the breeding pond of toads.

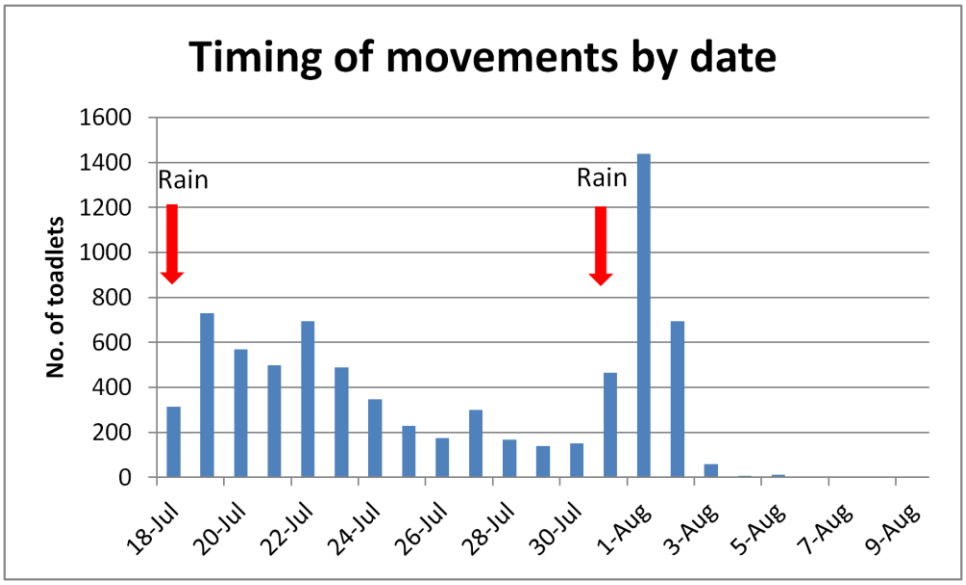


Figure 5. Timing of toad migration as determined from time-lapse camera set at the tunnel entrance.

The camera data revealed that toad movements occurred mostly in the morning, peaking from 6:00 h – 10:00 h, and in the evening, peaking from 17:00 h – 22:00 h (Figure 6). Comparing the timing of movements to vehicle counts obtained in August 2012 from a traffic counter on the Kentucky Campsite Road, the times of the day when the toads are most vulnerable to roadkill are in the morning from 8:00 h – 10:00 h and again in the evening from 17:00 h – 21:00 h (Figure 6).

Movements of toadlets occurred during a wide range of air temperatures (Figure 7). Rainfall, rather than temperature, appeared to be more important in triggering movements.

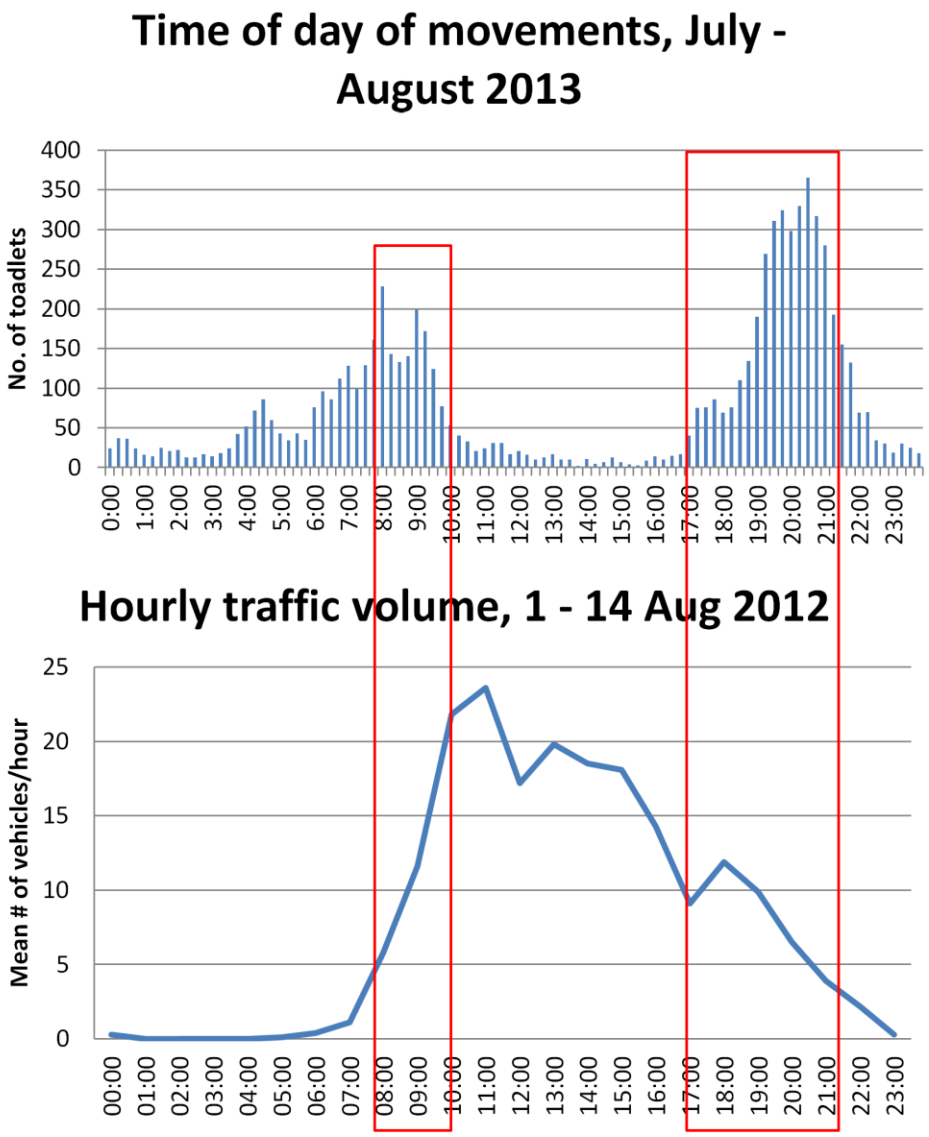


Figure 6. Time of day of toadlet movements as revealed by time-lapse camera data at the tunnel entrance in relation to hourly traffic volume measured in August 2012 (as per 2012 monitoring study).

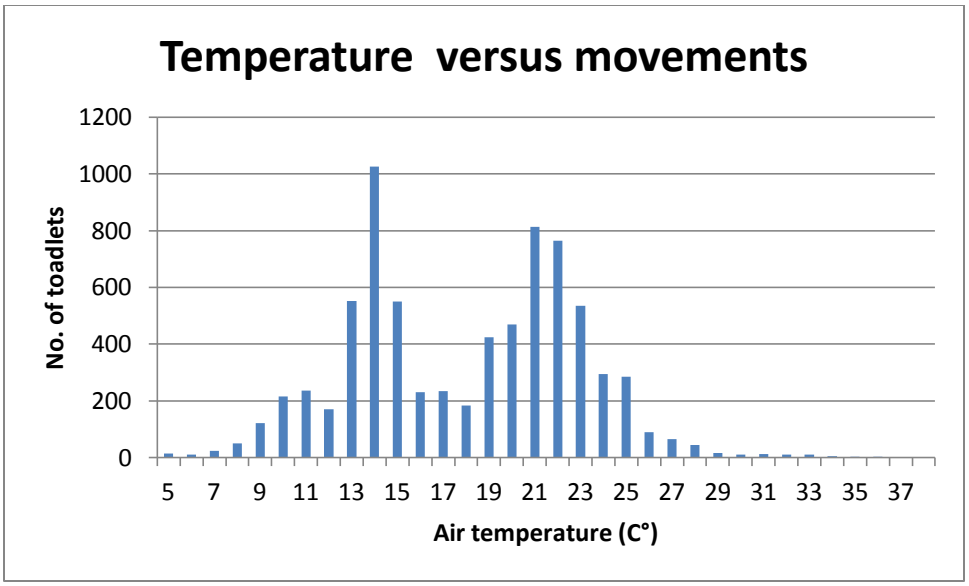


Figure 7. Movements of toadlets in relation to air temperature, as recorded by the time-lapse camera at the entrance of the tunnel in July – August 2013.

4.2 Use of the underpass

Both the camera data and direct observations indicated that toadlets used the underpass extensively (Figures 5 and 9). A total of 7481 toadlets were counted from camera images at the entrance and moving towards the tunnel. During 19 transect counts from 19 July to 5 August 2013, a total of 1212 toadlets were counted at the entry and 1788 at the exit (Figure 9). Both camera data and direct observations indicated that toadlets showed no hesitation in entering the tunnel; in fact, they appeared to use it as a refuge during the night. On cool mornings, toadlets were often seen leaving the tunnel while none were seen entering it, suggesting that they had spent the night there, explaining the discrepancy in counts at the two ends of the tunnel.

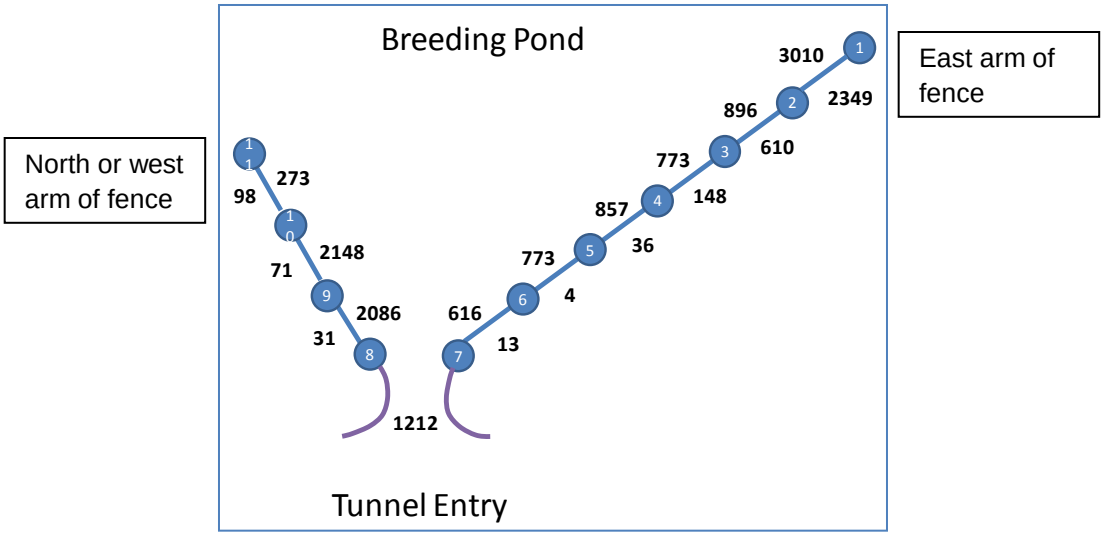


Figure 8. Number of toadlets counted on the inside and outside of the drift fence funnel during transect surveys from 19 July to 5 August 2013. Blue circles indicate fence section markers, which were circa 10 m apart.

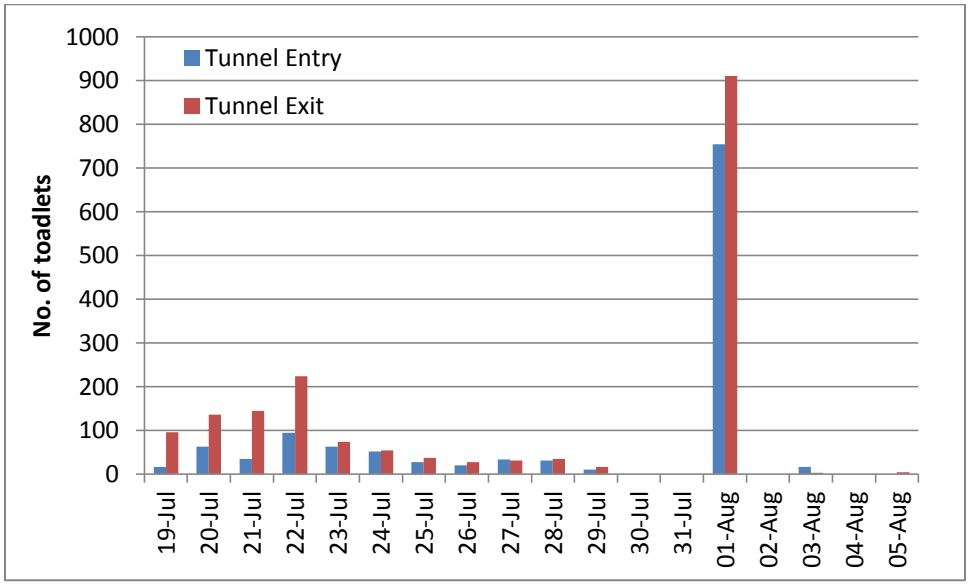


Figure 9. Summary of counts of toadlets at tunnel entrance and exit from transect survey data. See Figure 5 for corresponding time-lapse camera data at the tunnel entrance.

No predation events associated with the tunnel or fencing were observed during the surveys or based on camera data. The motion sensor images at the tunnel entrance revealed occasional ground squirrels, chipmunks, and a deer fawn. On few occasions there were people at the tunnel entrance. Most of the human intrusions occurred towards the end of August after the toad migration was over.

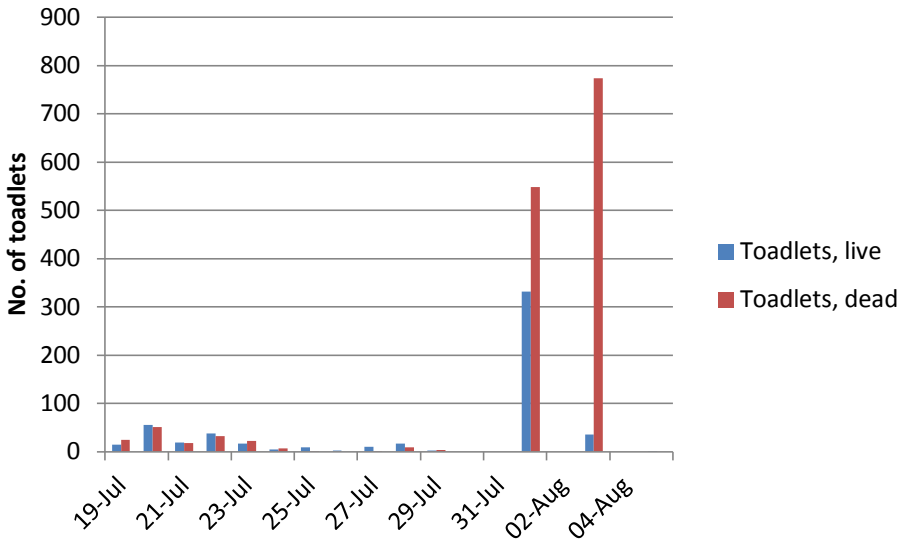
4.3 Effectiveness of the drift fencing in channeling movements

The drift fences were highly effective in directing movements of toadlets towards the underpass, as indicated by transect counts along the fence line (Figure 8). However, many toadlets in the east end of the fence ended up on the wrong side of the fence and thus were not captured by the funnel. Some toadlets also went around the fence at the west end, but the numbers were much smaller.

4.4 Overview of toad movements and roadkill

Road transect surveys from 19 July to 5 August resulted in a total count of 561 live and 1492 dead toadlets on the Kentucky Campsite Road. The vast majority of the roadkill (88%) occurred during the second wave of toadlet movements on 1 – 3 August and mostly near Kentucky Lake, where toadlets went around the end of the east arm of the drift fence funnel (Figure 10). Searches along the shoreline of Kentucky Lake during the peak movement period revealed concentrations of toadlets under boats and logs, indicating that many had successfully crossed the road.

Figure 11 shows a summary of migration movement routes in July – August 2013.



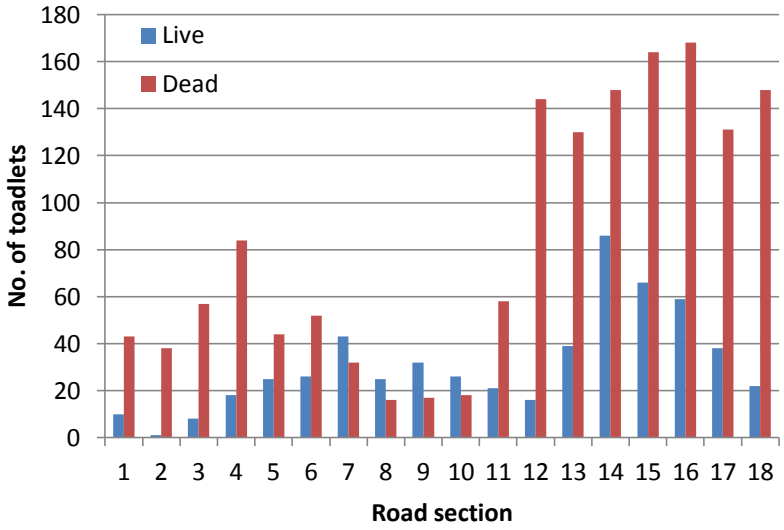


Figure 10. Counts of toadlets on the road surface of the Kentucky Campsite Road during transect surveys; transects were numbered from west (left) to east (right). Top panel – toadlet counts by date; Bottom panel – toadlet counts by 10 m section of the road from west to east.

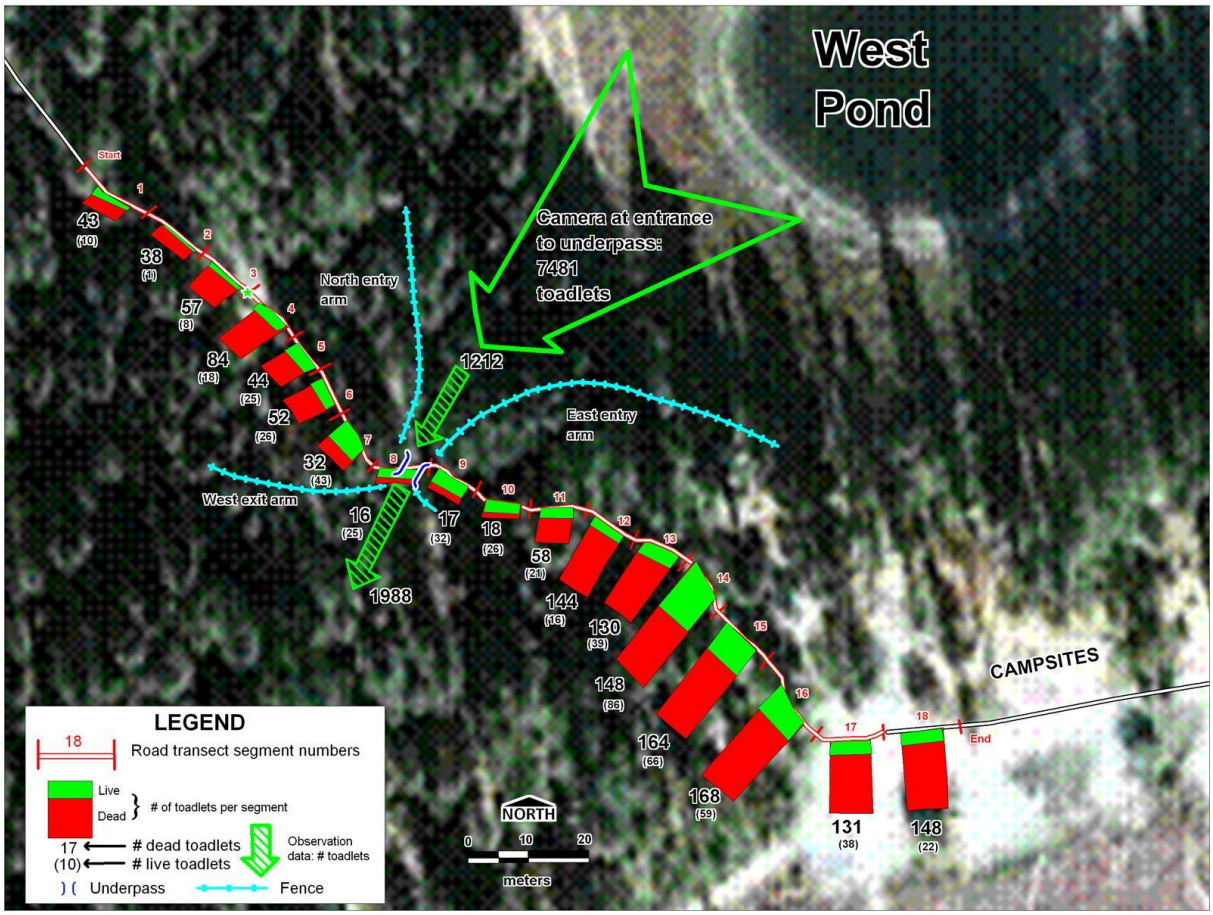


Figure 11. Overview of migration movements and roadkill locations of Western Toads in Kentucky-Alleyne Provincial Park in 19 July – 5 August 2013. The numbers refer to counts from transect surveys unless otherwise noted.

5.0 COMMUNITY SUPPORT AND VOLUNTEER EFFORTS

Dedicated volunteers from Nicola Naturalist Society participated in all aspects of this project and were instrumental in making it a success. In July and August 2013, 11 volunteers spent a total of 184 hours constructing and inspecting drift fences, counting toads along road and fence transects, opportunistically searching other areas of the park for toads, and explaining the project to park visitors (Figure 12). A home-school student who participated in the project produced a short film of the project, available on You-Tube (https://www.youtube.com/watch?v=Pg4PrMSE8t8). Two biologists from Biolinx Environmental Research Ltd. donated 5.5 person-days during the drift construction and migration periods to guide volunteer activities.

Figure 12. Volunteers and biologists after installing drift fencing.

The underpass attracted interest from park visitors, and many people walked up to the underpass from the campsites to view the toad migration. This provided an excellent opportunity for outreach and to respond to questions about the toads in general, their migration, and the efforts by BC Parks to mitigate threats from roadkill.

The project was featured in local media and in three CBCRadio interviews in June - August 2013.

6.0 DISCUSSION

The general pattern of the migration in 2013 was similar to that in 2012, but the numbers of toads were much greater and the migration began somewhat earlier (Biolinx and Nicola Naturalist Society 2012). In 2012, the peak occurred from 6 – 9 August and there were few movements earlier, while in 2013, the peak occurred on 1 – 3 August and the migration began on 19 July. In 2013, relatively large aggregations of toadlets were observed also at other breeding sites in the area (Ovaska *et al*., in prep). Toad numbers typically show much variability among years (COSEWIC 2013), reflecting variability in environmental conditions and patterns of survivorship of adults and young. There are anecdotal observations from campsite visitors and staff of huge migrations in the park in the past with masses of toadlets covering the campsites and the road.

In 2013, the major migration movement in the park was towards southwest from the breeding pond and apparently through the underpass. To avoid disturbing toads, we

monitored toadlet movements only along the road and fence lines and not in the middle of the funnel by the breeding pond. Surveys in 2012 along the trail connecting Kentucky and Alleyne Lake campsites (Connector Path in Figure 11) revealed large movements from the pond to the southwest; in 2013, such movements would have been contained within the drift fence funnel and directed towards the underpass. BC Parks temporarily closed the path to foot traffic during the toad migration and to mitigate mortality from inadvertent trampling (Figure 13), but it was not feasible to close the road leading to the campsites.

Figure 13. Temporary sign erected by BC Parks on a path where the toads crossed to reduce mortality and disturbance.

Both camera monitoring and direct observations indicated that toadlets readily used the underpass. During the peak migration, there was a steady stream of toadlets going through the tunnel. Time-lapse camera images showed 7481 toadlets entering the tunnel. These numbers represent only a fraction of the toads that used the tunnel because of the rapidity of their movements and, more importantly, because only a portion of the tunnel entrance was within the camera view for logistical reasons. The proportion of the total population leaving the breeding pond that used the tunnel is unknown, and obtaining accurate estimates would require intensive study using mark-recapture methods.

A downpour that appeared to trigger the initial wave of movements saturated the substrate within the tunnel, and it remained moist, probably accounting for its attractiveness as a refuge to the toads. The design of the tunnel, including its semi-

cylindrical shape, large diameter, earthen floor, and relatively short length, probably also contributed to its attractiveness. We also observed large concentrations of toadlets sheltering under the root-mass of a large uprooted tree near the north end of the drift fence within the funnel area. When leaving the tunnel, the toadlets dispersed and disappeared into dense herbaceous vegetation in the moist depression where the tunnel was located. The availability of suitable cover and moist refuges is probably very important for migrating toadlets, protecting them from predation, dehydration, and temperature extremes. Volunteers occasionally encountered apparently dehydrated dead toadlets in exposed areas both in 2012 and 2031.

In 2013, road mortality was initially low but increased substantially during the second wave of movements on 1 – 3 August. Most mortality occurred on the road by the campsites where the toadlets went around the east end of the drift fence. A longer fence would be needed to capture this movement. The total number of roadkill toads counted was 1258 in 2012 and 1492 in 2013. These values are minimum estimates, as some carcasses might have been missed, disintegrated, or scavenged. Unfortunately, direct comparisons between roadkill in 2012 and 2013 are not possible because the overall number of toads was much larger in 2013, and comparable estimates of relative abundance are lacking. However, clearly the underpass facilitated movements of the toads, as indicated by the transect counts and camera data.

7.0 CONCLUSIONS

- Toadlets used the underpass extensively, and overall, it appeared to be effective in facilitating their movements across the road.
- No predation or entrapment events associated with the tunnel or drift fences were noted.
- Roadkill still occurred, mostly outside of the drift fence catchment area to the east.
- The underpass was highly effective as an outreach tool for park visitors.

8.0 RECOMMENDATIONS

- Longer and a more permanent, “natural” drift fence is desirable. In particular, the east arm of the funnel needs to be extended to contain more of the toad movements. Ready-made, inter-locking fence sections designed especially for amphibian road crossings could be deployed at the tunnel entrance and exit (ACO 2013). A new design is currently under testing in Pacific Rim National Park and, if effective, might provide a cheaper option (Beasley, pers. comm. 2013).

Away from the tunnel, the fence could be made of large logs and other natural barriers, which would blend into the landscape. The fence construction should be undertaken after the spring migration of adult toads in May but well before the toadlet migration in late July.

- Monitoring of the effectiveness of the system needs to be continued in 2014. We recommend using time lapse cameras at the entrance and exit to the tunnel as the main method. Counts of dead and live toadlets along the Kentucky campsite road during peak migration period should also be conducted. Reserving Campsite 1 in the immediate vicinity of the migration route for the monitoring crew would be desirable.
- Once in place, periodic examination of the condition of the drift fences is required.
- The outreach and educational opportunities provided by the underpass system should be optimised with the placement of an information sign explaining the movements of the toadlets, the problem with roadkill, and the mitigation provided by the tunnel and fencing.

9.0 LITERATURE CITED

ACO Wildlife. 2013. http://www.acousa.com/wildlife/index.htm (accessed Dec 2013).

Biolinx Environmental Research Ltd. and Nicola Naturalist Society. 2012. Western Toad monitoring study in Kentucky Alleyne Provincial Park, July – August 2012. Report prepared for BC Parks, Thompson-Cariboo Region. http://www.nicolanaturalists.ca/files/Kentucky-Alleyne-Toad-Report-FINAL-Dec-2012.pdf (accessed De 2013).

COSEWIC. 2002. COSEWIC assessment and status report on the Western Toad *Bufo boreas* in Canada. Committee On the Status of Endangered Wildlife In Canada, Ottawa.

COSEWIC. 2013. COSEWIC assessment and status report on the Western Toad *Anaxyrus boreas* in Canada. Committee On the Status of Endangered Wildlife In Canada, Ottawa.

Ovaska, K., Sopuck, L., and Engelstoft, C. 2011 Community-based amphibian monitoring program in multi-use landscapes in south-central B.C. Progress Report, 2011. Report prepared by Biolinx Environmental Research Ltd. for Nicola Naturalist Society with funding from Habitat Conservation Trust Fund. 19 pp. Web site:

http://www.nicolanaturalists.ca/files/Nicola-amphibian-monitoring-rep-website-version-Dec-11.pdf (accessed De 2013).

Ovaska, K., Sopuck, L., and Engelstoft, C. 2012 Community-based amphibian monitoring program in multi-use landscapes in south-central B.C. Annual Report, 2011. Report prepared by Biolinx Environmental Research Ltd. for Nicola Naturalist Society with funding from Habitat Conservation Trust Fund. 19 pp. Web site: http://www.nicolanaturalists.ca/files/Nicola-Amphibian-Monitoring-2012-WEB-version-18-Apr-13-COMPR.pdf (accessed Dec 2013).

Personal Communications

Beasley, Barb. 2013. Personal and email communication with K.Ovaska. March and October 2013. Biologist. Ucluelet, BC.

Govindarajulu, Purnima. 2013. Conversation with K. Ovaska and C. Engelstoft in March and September 2013. Small Mammal and Herpetofauna Specialist, BC Ministry of Environment, Victoria, BC.

Appendix 1. Volunteer datasheet used for toadlet counts on road and fence transects within Kentucky Alleyne Provincial Park in July – August 2013.

Observer name: ____

Date: _______________ **Start time** __________ **End time** __________

Air temp (°C): _____ **Wind (circle):** calm light moderate high

Cloud cover (circle): clear <50% >50% overcast

Rain (circle): none drizzle light moderate heavy

Time since rain (# days/hours; approx.):

Transect or Road[1]	Section[2]	# toadlets, live[3]	# toadlets, dead[4]	**Notes** (predators, e.g., crows; adult toads; people or cars during survey)
A) Kentucky Rd Transect	1-2			
10 m sections Starts at square in road about 30 m below the top road junction with Bates Rd. Flagging is on the right side of the road going down the hill.	2-3			
	3-4			
	4-5			
	5-6			
	6-7			
	7-8			
	8-9			
	9-10			
	10-11			
	11-12			
	12-13			
	13-14			
	14-15			
	15-16			
Flagging crosses the road	16-17			
	17-18			
Blue trash container	18-end			
Totals				

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If you check the campsite roads please also complete this section – whether or not you find any live or dead toadlets. Tick each road checked. If you find live or dead toadlets then enter this information in the spaces below – use one line for each section that has live or dead toadlets present. Start time________ End time________

BL – Boat Launch Road KC – Kentucky Campsite Road WP – West Pond Campsite Rd

AC – Alleyne Campsite Rd BR – Bates Road
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Road name (see above)	**Nearest campsite post #**	**# toadlets, live**	**# toadlets, dead**	**More info on location or notes** (predators, e.g., crows; adult toads)

Notes on data entry

[1] Refer to map for transect numbers and road names.

[2] Transect stakes or flagging tape mark sections. For camp site roads use the camp site numbers, e.g., 15-16

[3] Count toads on road surface between markers; if too many to count, estimate abundance.

[4] As for live toadlets; to avoid double-counting, circle roadkills with chalk. Don't count previously marked roadkills.

Fence checks: Start time_____ End time_____

Do the survey in the orde listed below	# toadlets **inside funnel** (pond side of fence)	# toadlets **outside funnel** (road side of fence)	Photo of large aggregatio n (if # toads estimated)	Notes
Fence A - start at bottom	----------			
Section 1-2				
2-3				
3-4				
4-5				
5-6				
6-7				
Tunnel entry		NA		
Tunnel exit		NA		
Fence B - start at top	----------			
Section 8-9				
9-10				
10-11				
Totals				

Notes on methods:

- Park your vehicle at the top of the road at the park entrance by the welcome board.
- Walk slowly on the outsides (road side) of the funnel fence, counting toadlets up to 1 m. from both sides of the fence as you go. Do not step inside the funnel or the tunnel. Check the fence and make repairs if needed.
- For tunnel counts, stand on the asphalt to 1 side of the tunnel for approx. 1 minute and count toadlets in the downhill space (entry) and then the uphill space (exit) to a distance up to the first flagged section (about 2 m). **If you stand in the middle of the culvert, right over the toadlets you'll cause them to scatter and hide.**
- You can do more than 1 survey, leaving an hour in between start times to avoid double-counting.
- Note any toads activities that you see – the more info the better. Have fun and thank you!
- Pls. leave data sheets in the black folder in the tent at campsite #1. Check that you have filled in all details.

Appendix 2. Dates and survey conditions for transect surveys at Kentucky Alleyne Provincial Park, July - August 2013.

BL: Boat Launch Road; CON: Connector Path; Fence: drift fence; KC: Kentucky Campsite Road (see Figure 4); Wind: 1- calm; 2- light; 3 moderate; 4-heavy; Cloud cover: 1-clear; 2-<50%; 3>50%, 4-overcast

Date	Transects searched	Time start	Temp. (air, C°)	Wind (code)	Cloud cover (code)	Time since rain (days or hours)
19-Jul-2013	KC, Fence	7:14:00	18	1	1	1.5D
19-Jul-2013	KC, Fence	9:16:00	19	1	1	2D
19-Jul-2013	KC, Beach, Fence	11:17:00	25	1	1	2D
20-Jul-2013	KC, Fence	6:15:00	10	1	1	3D
20-Jul-2013	KC, Fence	7:22:00	16	2	1	3D
20-Jul-2013	KC, Fence	8:25:00	18	2	1	3D
20-Jul-2013	KC, Fence	11:03:00	24	2	1	3D
20-Jul-2013	KC, CON, Fence	18:00:00	24	3		3D
20-Jul-2013	KC, Fence	20:05:00	20-21	2	1	3D
20-Jul-2013	KC	21:45:00				
21-Jul-2013	KC, Fence	6:19:00	10	1	1	4D
21-Jul-2013	KC, Fence	8:06:00	17	2	1	4D
21-Jul-2013	KC, Fence	10:18:00	22	2	1-2	4D
21-Jul-2013	KC, Fence	18:09:00	24	3	1	4D
21-Jul-2013	KC, Fence	19:41:00	21	3	1	4D
21-Jul-2013	KC	23:50:00	17	3	1	5D
22-Jul-2013	KC, Fence	6:00:00	10	2	1	5D
22-Jul-2013	KC, Beach, Fence	7:47:00	15	2	1	5D
22-Jul-2013	KC, Fence	9:28:00	20	2	1	5D
22-Jul-2013	KC, Fence	18:11:00	24	2	1-2	5D
22-Jul-2013	KC, Fence	20:37:00	20	2	1	5D
22-Jul-2013	KC	22:00:00		2		5D
23-Jul-2013	KC, BL, Fence	6:26:00	11	2	1-2	6D
23-Jul-2013	KC, BL, Fence	8:04:00	13	2	1	6D
23-Jul-2013	KC, BL, Fence	10:00:00	22	2	1	6D
23-Jul-2013	KC, BL, Fence	18:20:00	27	2	1	6D
23-Jul-2013	KC, Fence	20:24:00	25			6D
24-Jul-2013	KC, Fence	19:18:00	24	1	2	6D
24-Jul-2013	KC, Fence	8:00:00	9	1	1	7D
24-Jul-2013	KC, Fence	9:13:00	18	1	1	7D
24-Jul-2013	KC, Beach, BL, Fence	17:53:00	27	1	2	7D
25-Jul-2013	KC, CON, Fence	19:10:00	24	3	1	7D
25-Jul-2013	KC, Beach, Fence	17:20:00		2		7D
25-Jul-2013	KC, CON, Fence	21:05:00	20	2	1	7D
25-Jul-2013	KC, Fence	6:45:00	9	2	1	7D
25-Jul-2013	KC, Fence	9:15:00	18	3	1	7D
26-Jul-2013	KC, Beach, Fence	11:13:00	23	2	1	8 D

Date	Transects searched	Time start	Temp. (air, C°)	Wind (code)	Cloud cover (code)	Time since rain (days or hours)
26-Jul-2013	KC, Beach, Fence, CON (start)	8:20:00	15	1	1	
26-Jul-2013	KC, BL, Fence	19:30:00	22	3	1	8D
26-Jul-2013	KC, Fence	17:52:00	24	3	1	8D
26-Jul-2013	KC, CON, Fence	6:15:00	6	1	1	8D
26-Jul-2013	KC, Fence	3:20:00	9.5	2	1	8D
27-Jul-2013	KC, Fence	10:00:00	18	2	2	9D
27-Jul-2013	KC, BL, Fence	9:00:00	16	2	2	9D
27-Jul-2013	KC, BL, Fence	7:50:00	12	1	2	9D
27-Jul-2013	KC, BL, Fence	6:30:00	8	1	3	9D
27-Jul-2013	KC, Fence	5:30:00	10	1	1	9D
28-Jul-2013	KC, BL, Fence	17:45:00	20	2	2	10D
28-Jul-2013	KC, Fence	19:32:00	18	2	2	10D
28-Jul-2013	KC, Fence	9:00:00	16	2	2	10D
28-Jul-2013	KC, Fence	8:00:00	14	1	2	10D
28-Jul-2013	KC, BL, Fence	6:57:00	10.5	2	2	10D
29-Jul-2013	KC, Fence	10:03:00	17	2	2	11D
29-Jul-2013	KC, BL, Fence	9:04:00	16	2	2	11D
29-Jul-2013	KC, Fence	8:05:00	12	2	2	11D
29-Jul-2013	KC, BL, Fence	6:10:00	5	2	2	11D
1-Aug-2013	KC, BL, Fence	9:05:00	18	1	3	1H
1-Aug-2013	KC, BL, Fence	7:50:00	15	1	4	
1-Aug-2013	KC, BL, Fence	10:45:00	20	2	4	2H
3-Aug-2013	KC, BL, Fence	8:18:00	12	2	4	
3-Aug-2013	KC, BL, Fence	10:06:00	14			
5-Aug-2013	KC, BL, Fence	8:55:00	16	2	2	12-14 H
5-Aug-2013	KC, BL, Fence	7:50:00	12	2	3	12H