

Summary of Minnehada Park Association's 2023 Western Toadlet Monitoring Program



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Background

Minnekhada Park Association (MPA) is a citizens-empowered organization, incorporated as a society in Victoria, B.C. In partnership with Metro Vancouver, MPA's mission is to preserve, protect and enhance the natural environment of Minnekhada Regional Park, while advocating respect, appreciation and enjoyment of the Park's natural and historic attributes as well as recreational resources. As part of this work, MPA develops and implements a variety of events and programs. This report provides an overview of one of these programs, "Trail Hoppers", and a summary of the inaugural 2023 monitoring results.

Minnekhada Regional Park contains a communal breeding site of the Western Toad (*Anaxyrus boreas*). Western Toads gather in large numbers at various stages of their life cycle which may give a misleading appearance of extreme abundance¹. In actuality these groupings can represent every single breeding adult or all young produced for the entire area that year¹. During these mass congregations at breeding sites and during mass migration between breeding and foraging/over wintering areas, Western Toads are incredibly vulnerable to disturbance and mortality¹. Western Toads are a species of interest from a conservation perspective and are both provincially listed Yellow² and federally listed as Special Concern under the Species at Risk Act³.

While Western Toads have been observed and reported informally in Minnekhada Regional Park by both park users and environmental professionals for over a decade, formal monitoring to date has been minimal. Western Toads were incidentally observed at sites designated for Western Painted Turtle monitoring activities conducted by the Coastal Painted Turtle Project starting in 2009⁴. As a result one season of toadlet monitoring was completed in 2015 by the Coastal Partners in Conservation⁴. The project identified both crossing hotspots and toadlet mortalities. In partnership with Metro Vancouver informational brochures and seasonal signage were developed and implemented as a result of this work⁴. Seasonal signage is still used by Metro Vancouver to encourage the public to use caution while recreating in the park during peak toadlet migration. Other recommendations included installation of bridges and/or boardwalks in strategic locations along pathways, however no such work has been completed to date. Coastal Partners in Conservation more recently completed limited monitoring toadlet movements in 2023 and adult toad migration in 2022.

At Minnekhada Park toadlets emerge from the marsh by the thousands during the summer, coinciding with hiking season and peak park usage. This leaves the toadlets vulnerable to being trampled by park users and subject to vehicle mortality, particularly on Quarry Road. There is less currently known about impacts to adult toads during their

spring migration because their migration occurs in the evening when the park is closed. Vehicle traffic in the area is likely low after dark offering the mature toads some protection against roadkill mortality. However road-killed breeding age toads have been observed anecdotally on the lane leading to Minnekhada Lodge from Oliver Road. This lane experiences isolated high traffic before and after private events at the Lodge which occur in the evening when adult toads are on the move. There are also concerns that vehicle traffic on Quarry Road may increase as the area develops in preparation for the opening of Widgeon Marsh Regional Park and the proposed expansion of Gilley's Quarry. That said, planned improvements and upgrades to Quarry Road may provide an opportunity for MPA to engage with decision makers to advocate for Western Toad conservation to be considered with the road design (toadlet underpass, fencing, etc.).

In order to learn more about West Toad migration in Minnekhada Park, MPA developed and implemented a pilot toadlet monitoring program. The program builds on the 2015 work of the Coastal Partners in Conservation and considers other similar toadlet monitoring programs in British Columbia. 2023 was the inaugural year of the "Trail Hoppers" program and was made possible through financial support of the Metro Vancouver Regional Parks Foundation as part of the Fire Recovery fundraising campaign and with the organizational support of Metro Vancouver Regional Parks.

Purpose

The Western Toad population at Minnekhada is regionally significant. This is in large part because of the somewhat unique topography. Minnekhada Marsh is in a basin surrounded almost completely by forested, higher terrain on all sides. This provides an almost perfect setup to support the Western Toad life cycle, which in turn greatly enhances the food web. Adults thrive in the surrounding rainforest environment and then return to the marsh to reproduce in late spring. Water moving slowly through the marsh provides nutrients for tadpoles and toadlets. In turn, the mass emergence of toadlets, before and after their metamorphosis, provides a substantial food source for other local species. If the Western Toad does not continue to thrive, it is safe to say this will have a negative impact on other parts of this ecosystem.

Unfortunately for the Western Toad, this perfect home is also enjoyed by an increasing number of humans, and the toads must cross pathways and roads in order to complete their objectives. This results in a level of mortality, which we are aware of but has not, recently at least, been quantified. That is the overall purpose of this program. To better understand the human impacts to the Western Toad life cycle. By understanding and quantifying this perhaps we can help to identify ways to mitigate the level of human caused mortality. Over the span of the program, focus areas will be;

- Where are the "hotspots" where high levels of human caused mortality occur or are likely to occur?
- Are there specific pathways they follow or do they more or less distribute randomly?
- Do these change over time?
- What are the environmental triggers for adult toads to begin their migration to the marsh and for toads/toadlets to migrate to the forest?
- What might be the impacts of increased road traffic, specifically on Quarry Road adjacent to the marsh?
- What other species most benefit from these patterns?
- Are there invasive species present that pose a substantial threat?

The results of this first year of study will not come close to answering all of these questions. As such it is planned to be a multi-year initiative and each year may have somewhat different objectives and timelines as a result. Recommendations for possible changes and mitigation efforts will likely not come until a more complete picture is in place.

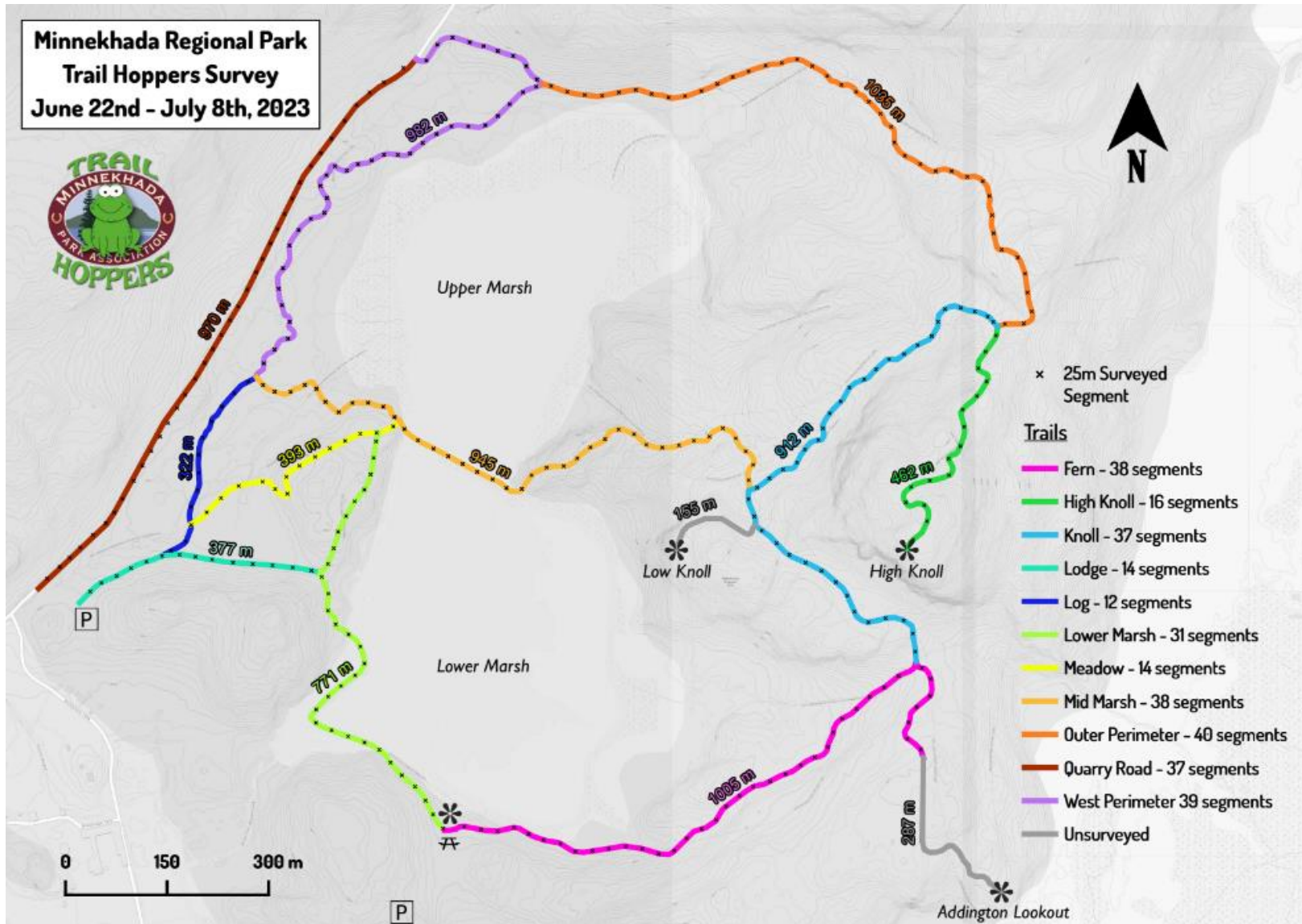
Methods

Survey transects were established around Minnehada Regional Park to determine where the Western Toadlet migration crosses trails within the park (Fig 1). The transects are roughly 1- 1.5 km and follow the established trail system within the park. The transects were then divided further into 25 m segments. For example, the Mid Marsh transect was split into 38 - 25 m segments, while the Lower Marsh transect has 31 - 25 m segments. Segments were measured using either a measuring wheel (Milwaukee Tool 12-in Digital Measuring Wheel) used on flat, relatively smooth transects, or a 50 m measuring tape used for rough and inclined transects. For the Outer Perimeter transect GPS points were used to measure the 25 m segments.

Surveys were conducted over the two-week toadlet migration period using volunteers (June 22nd to July 8th). Surveys were conducted in the morning (8:00 am – 11:00 am) or the evening (5:00 pm – 8:00 pm) when the toadlets were most active. Volunteers were instructed to record the date, start and end time, weather conditions, water temperature where applicable, number of live toadlets observed per segment, and number of dead toadlets observed per segment (Appendix 1).

Volunteers went out in a minimum of groups of three per transect. With three volunteers; one oversees measuring out the 25 m segments, one focuses on counting live toadlets, and another focuses on counting dead toadlets. If there were four volunteers available per segment then two volunteers would focus on counting live toadlets. Volunteers were given clickers to keep count of the toadlets per segment. Volunteers were asked to toss any dead toadlets to the side of the trail to avoid double counting the dead toadlets. In places where toadlet numbers were too high to count (e.g. Lower Marsh transect), volunteers were instructed to use preassigned abundance categories as follows: N (none), VL (very low) <10, L (low) 10-100, M (medium) 100 – 500, H (high): 500 – 1000, and VH (very high) >1000. All data was collected using datasheets and then transferred into an Excel spreadsheet. Several maps showing the relative abundance of live and dead toadlets along the transects were created using the data collected over the migration period.

Figure 1: Map of Minnehada Regional Park separated into 10 transects for toadlet migrations survey.



Results:

Monitoring was conducted over 7 days. All 10 transects were monitored at least once during the season. Where time and resources allowed transects were surveyed twice. Raw data is included in Appendix 2. While the data set is fairly limited, hotspots for both live and dead toadlets were documented. Both mortality and overall abundance were highest at the Lower Marsh transect. This was expected given the proximity to known breeding sites. Other hotspots of toadlet activity in both abundance and mortality were identified in the Mid Marsh Trail 1 and 2 transects. Along the West Perimeter transect there was also high overall abundance of toadlets, but not as many mortalities. This result can be due to the fact that the West Perimeter transect has less foot traffic and is less exposed than the Lower Marsh and Mid Marsh Transects, allowing more toadlets to survive. The toadlet hotspots were found along waterways and often followed small streams coming into the marsh. The following maps (Figures 2-4) visualize where toadlets were observed in the greatest abundance.

Figure 2: Toadlet Counts (alive and dead)

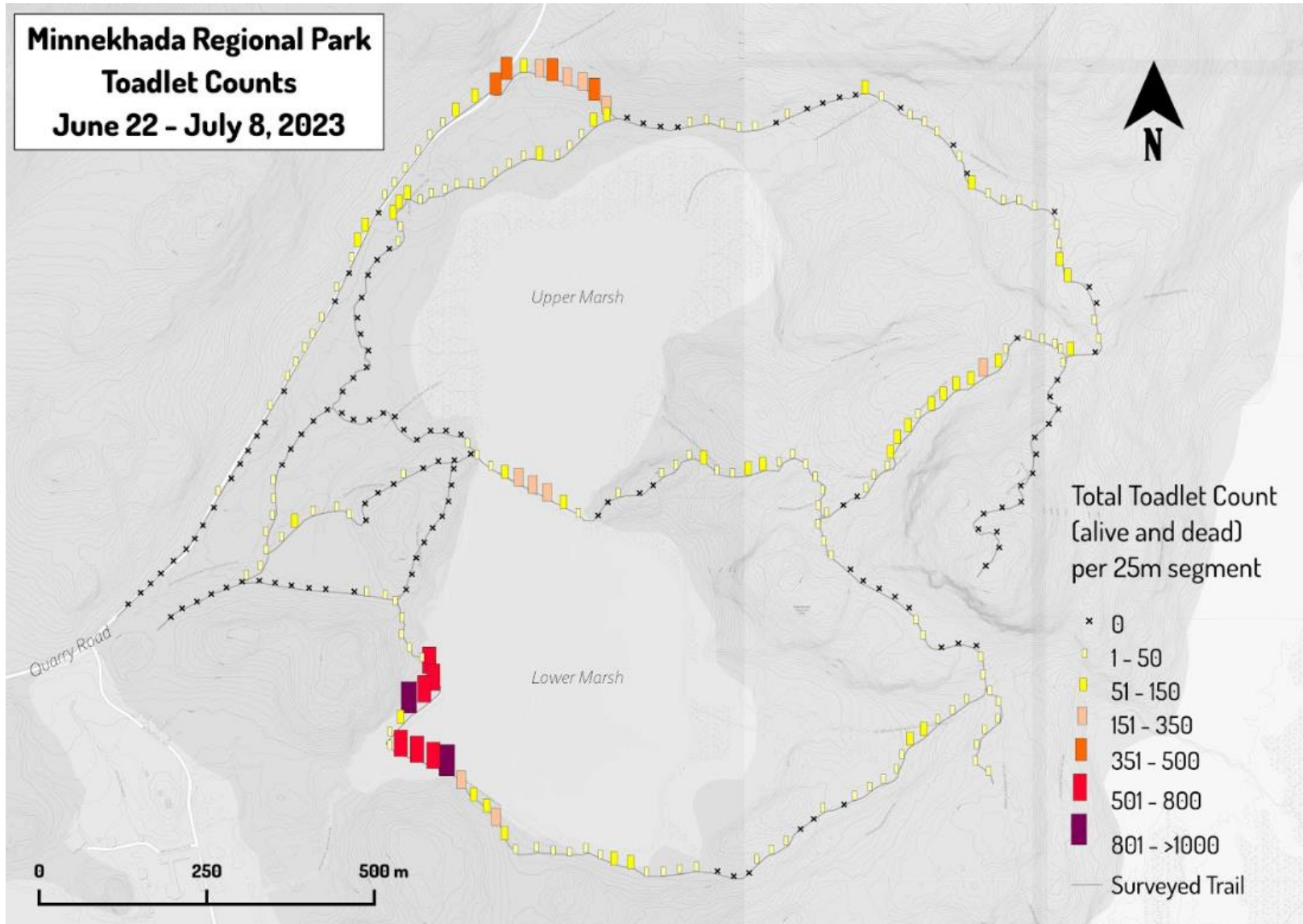


Figure 3: Live Toadlet Counts

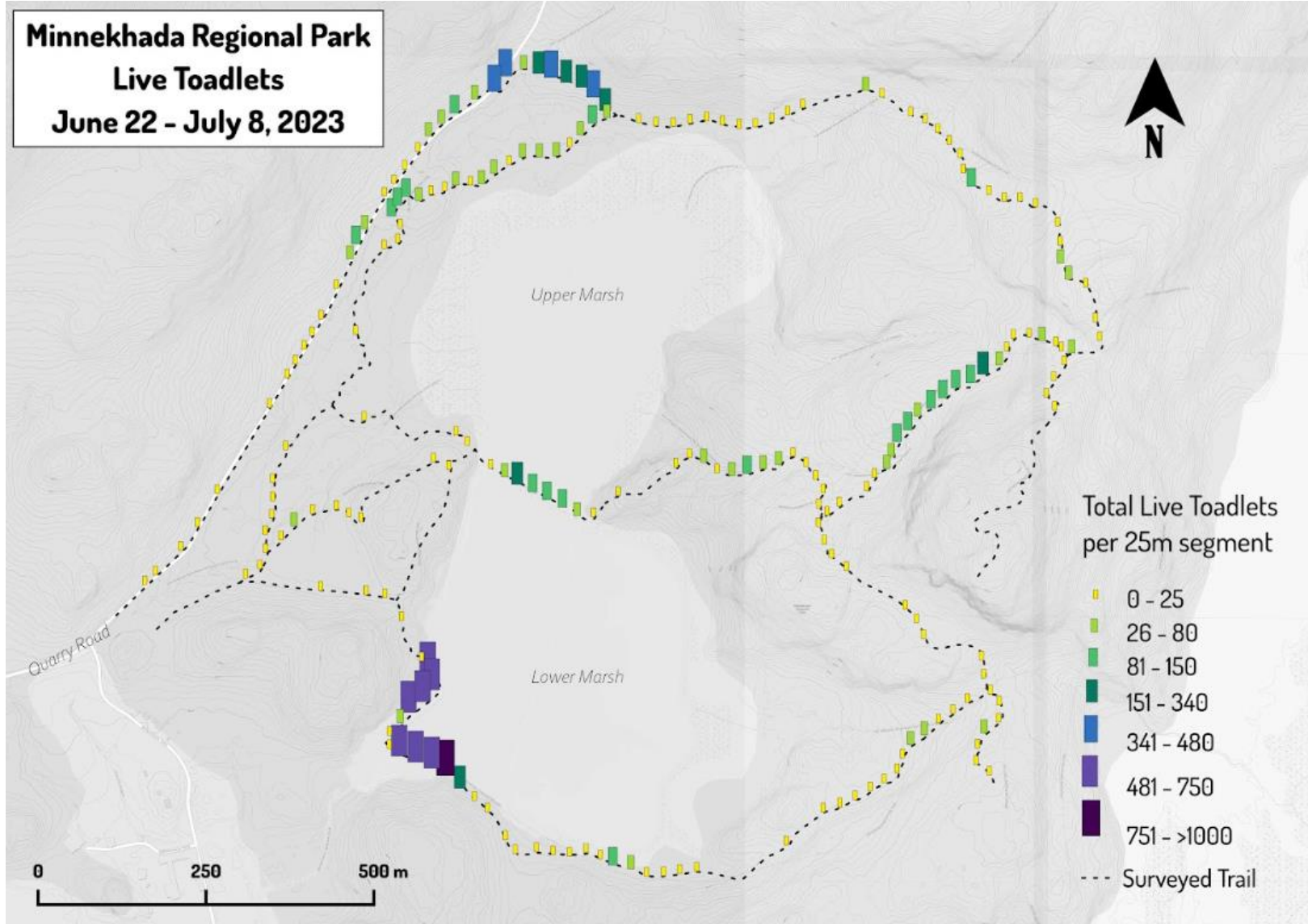
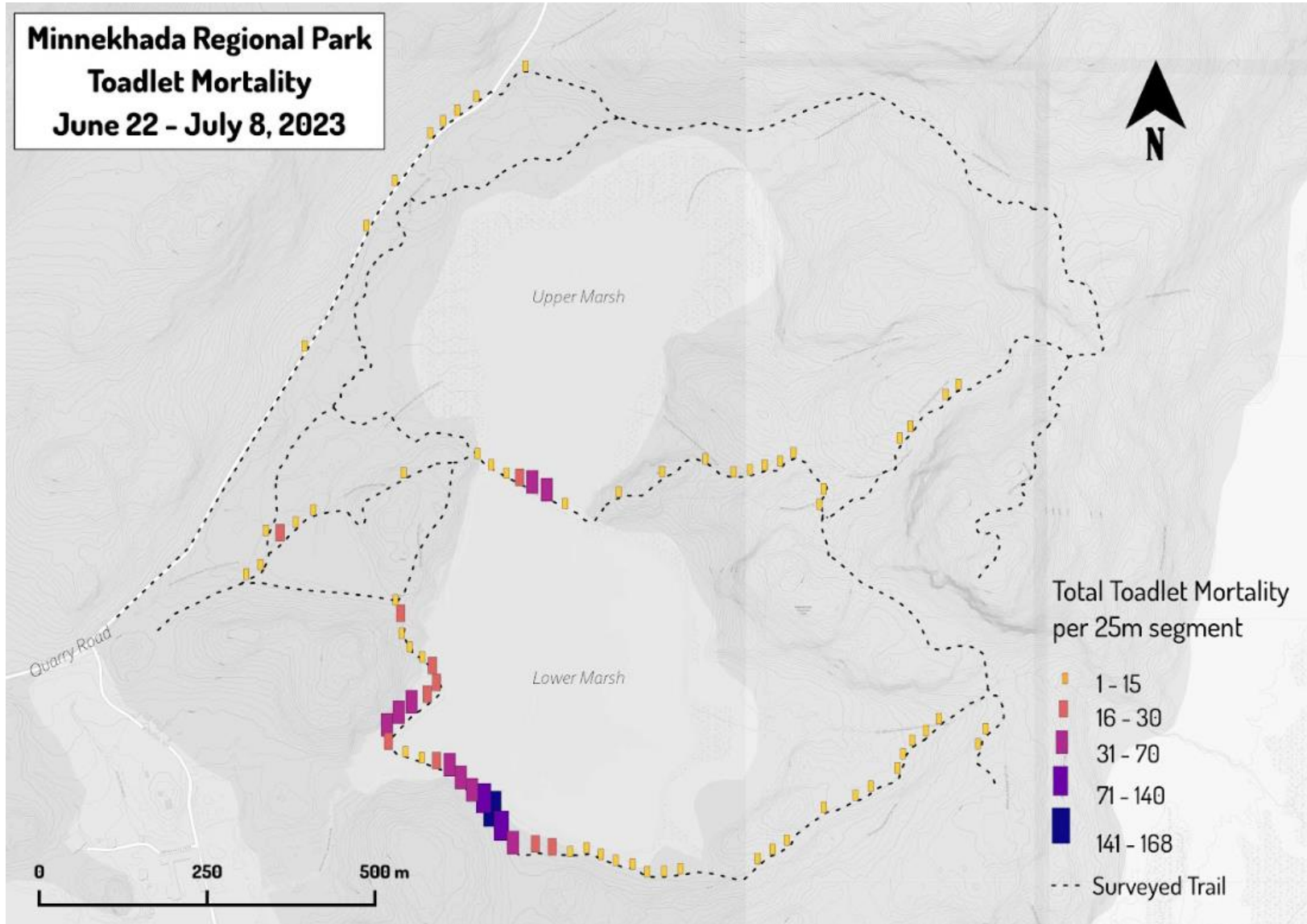


Figure 4: Toadlet Mortality Counts



Next Steps:

Toadlet migration timing can vary based on a variety of factors and as such MPA recognizes that multiple years of monitoring is needed to establish patterns. We also recognize the high conservation value of mature, breeding aged toads versus toadlets. Female Western Toads produce an average of 12,000 eggs, or as many as 16,500 eggs, in a single clutch². When it comes to the toadlets more than 99% won't survive to adulthood². Therefore the impact of losing a breeding age female versus immature toadlets is significant. As such next steps focus on continuing the established toadlet monitoring program and expanding monitoring efforts to learn more about adult Western Toads. Recommended next steps are as follows:

- Continue toadlet monitoring to grow existing data set
- Expand the Trail Hoppers Program to include monitoring of adult toad migrations
 - Evening visual surveys focusing on vehicle road crossing locations
- Breeding surveys by land and water (non-motorized watercraft)
- Continue to engage park users and promote the Trail Hoppers program via pop-up "Nature Tables" alongside breeding surveys and volunteer opportunities
- Engage Metro Vancouver, City of Coquitlam and other stakeholders/decision makers to collaborate on Western Toad conservation with particular focus on future upgrades to Quarry Road and mitigation measures within the park (culverts, bridges, fencing)
- Explore new technologies and survey methods such as use of wildlife camera
- Share findings and explore opportunities to collaborate with other local conservation and naturalist groups such as Coastal Partners in Conservation, Fraser Valley Conservancy and the Burke Mountain Naturalists.

Acknowledgments:

This work would not have been possible without the support of our volunteers!

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References

1. <http://www.nicolanaturalists.ca/files/Kentucky-Alleyne-Toad-Report-FINAL-Dec-2012.pdf>
2. <https://www.env.gov.bc.ca/wld/documents/westerntoad.pdf>
3. <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/management-plans/western-toad-2020.html>
4. https://www.minnehada.ca/wp-content/uploads/sites/22/2023/06/Copy-of-Western-Toad-Summary-Report_2015-16-Aimee-Mitchell.pdf

Appendix 1: Datasheet Used



Observer(s) name..... Date

Time (start): _____	Time (end): _____
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Air temp (°C): _____ Water temp (°C): _____ Wind (circle): calm light moderate high Rain (circle): none drizzle light moderate heavy Cloud cover (circle): clear <25% Moderate 25%-50% Overcast >50%
Toad abundance categories (if large numbers seen; otherwise count): N (none); VL (very low) <10; L (low): 10 – 100; M (medium): 100 – 500; H (high) 500- 1000; VH (very high) >1000

Transect Name ¹	Section	# Toadlets, Live (N, L, M, H, VH, EH) ²	# Toadlets, Dead ³	Direction of Travel (N, E, S or W)	Notes (predators, e.g bull frogs, adult toads, people)
	1				
25 m sections (explanation of how to space 25 m here)	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				

You are about halfway there!	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
32					
33					

Notes on data entry

¹ Refer to the map for transect names.

² Count toads on the trails within each 25 m segment; estimate abundance using categories shown on top of the data sheet.

³ Count roadkill toadlets; to avoid double-counting toss any dead toadlet to the side of the trail

Transect Name	Date	Segment	Alive Toadlets	Dead Toadlets	Direction of Toadlet Movement
Lower Marsh Trail	6/22/23	1	4	43	SW
Lower Marsh Trail	6/22/23	2	9	113	SW
Lower Marsh Trail	6/22/23	3	0	168	SW
Lower Marsh Trail	6/22/23	4	3	140	SW
Lower Marsh Trail	6/22/23	5	3	68	SW
Lower Marsh Trail	6/22/23	6	223	31	SW
Lower Marsh Trail	6/22/23	7	VH	32	
Lower Marsh Trail	6/22/23	8	H	16	
Lower Marsh Trail	6/22/23	9	H	9	
Lower Marsh Trail	6/22/23	10	H	2	
Lower Marsh Trail	6/22/23	11	1	30	
Lower Marsh Trail	6/22/23	12	1	31	
Lower Marsh Trail	6/22/23	13	54	51	
Lower Marsh Trail	6/22/23	14	H	51	
Lower Marsh Trail	6/22/23	15	H	22	
Lower Marsh Trail	6/22/23	16	H	26	
Lower Marsh Trail	6/22/23	17	H	28	
Lower Marsh Trail	6/22/23	18	3	8	
Lower Marsh Trail	6/22/23	19	0	3	
Lower Marsh Trail	6/22/23	20	0	3	
Lower Marsh Trail	6/22/23	21	10	18	
Lower Marsh Trail	6/22/23	22	0	10	
Lower Marsh Trail	6/22/23	23	0	0	
Lower Marsh Trail	6/22/23	24	0	0	
Lower Marsh Trail	6/22/23	25	0	0	
Lower Marsh Trail	6/22/23	26	0	0	
Lower Marsh Trail	6/22/23	27	0	0	
Lower Marsh Trail	6/22/23	28	0	0	

Lower Marsh Trail	6/22/23	29	0	0	
Lower Marsh Trail	6/22/23	30	0	0	
Lower Marsh Trail	6/22/23	31	1	0	
Mid Marsh Trail	6/23/23	1	1	8	West
Mid Marsh Trail	6/23/23	2	4	4	West
Mid Marsh Trail	6/23/23	3	15	0	West
Mid Marsh Trail	6/23/23	4	15	1	West
Mid Marsh Trail	6/23/23	5	10	10	West
Mid Marsh Trail	6/23/23	6	34	2	West
Mid Marsh Trail	6/23/23	7	78	5	West
Mid Marsh Trail	6/23/23	8	89	2	West
Mid Marsh Trail	6/23/23	9	34	2	
Mid Marsh Trail	6/23/23	10	25	1	
Mid Marsh Trail	6/23/23	11	53	3	
Mid Marsh Trail	6/23/23	12	3	1	
Mid Marsh Trail	6/23/23	13	5	1	
Mid Marsh Trail	6/23/23	14	0	2	
Mid Marsh Trail	6/23/23	15	0	0	
Mid Marsh Trail	6/23/23	16	0	0	
Mid Marsh Trail	6/23/23	17	7	3	
Mid Marsh Trail	6/23/23	18	0	1	
Mid Marsh Trail	6/23/23	19	1	0	
Mid Marsh Trail	6/23/23	20	44	1	
Mid Marsh Trail	6/23/23	21	88	13	
Mid Marsh Trail	6/23/23	22	87	64	
Mid Marsh Trail	6/23/23	23	102	52	
Mid Marsh Trail	6/23/23	24	282	22	
Mid Marsh Trail	6/23/23	25	71	12	
Mid Marsh Trail	6/23/23	26	5	9	
Mid Marsh Trail	6/23/23	27	0	3	
Mid Marsh Trail	6/23/23	28	2	0	

Mid Marsh Trail	6/23/23	29	1	0	
Mid Marsh Trail	6/23/23	30	0	1	
Mid Marsh Trail	6/23/23	31	0	0	
Mid Marsh Trail	6/23/23	32	0	0	
Mid Marsh Trail	6/23/23	33	0	0	
Mid Marsh Trail	6/23/23	34	0	0	
Mid Marsh Trail	6/23/23	35	0	0	
Mid Marsh Trail	6/23/23	36	1	0	
Mid Marsh Trail	6/23/23	37	0	0	
Mid Marsh Trail	6/23/23	38	0	0	
Fern Trail	6/24/23	1	13	26	
Fern Trail	6/24/23	2	15	22	
Fern Trail	6/24/23	3	20	12	
Fern Trail	6/24/23	4	7	7	
Fern Trail	6/24/23	5	6	8	
Fern Trail	6/24/23	6	100	8	
Fern Trail	6/24/23	7	72	5	
Fern Trail	6/24/23	8	18	2	
Fern Trail	6/24/23	9	17	2	
Fern Trail	6/24/23	10	21	2	
Fern Trail	6/24/23	11	7	1	
Fern Trail	6/24/23	12	0	0	
Fern Trail	6/24/23	13	0	0	
Fern Trail	6/24/23	14	0	0	
Fern Trail	6/24/23	15	0	3	
Fern Trail	6/24/23	16	0	3	
Fern Trail	6/24/23	17	4	3	
Fern Trail	6/24/23	18	0	0	
Fern Trail	6/24/23	19	0	0	
Fern Trail	6/24/23	20	1	2	
Fern Trail	6/24/23	21	1	0	

Fern Trail	6/24/23	22	11	2	
Fern Trail	6/24/23	23	8	3	
Fern Trail	6/24/23	24	16	1	
Fern Trail	6/24/23	25	14	8	
Fern Trail	6/24/23	26	14	4	
Fern Trail	6/24/23	27	60	5	
Fern Trail	6/24/23	28	70	6	
Fern Trail	6/24/23	29	23	3	
Fern Trail	6/24/23	30	7	0	
Fern Trail	6/24/23	31	16	0	
Fern Trail	6/24/23	32	13	1	
Fern Trail	6/24/23	33	11	0	
Fern Trail	6/24/23	34	15	0	
Fern Trail	6/24/23	35	27	3	
Fern Trail	6/24/23	36	9	2	
Fern Trail	6/24/23	37	10	1	
Fern Trail	6/24/23	38	15	1	
Knoll Trail	6/24/23	1	10	0	
Knoll Trail	6/24/23	2	8	0	
Knoll Trail	6/24/23	3	0	0	
Knoll Trail	6/24/23	4	0	0	
Knoll Trail	6/24/23	5	0	0	
Knoll Trail	6/24/23	6	5	1	
Knoll Trail	6/24/23	7	2	0	
Knoll Trail	6/24/23	8	1	0	
Knoll Trail	6/24/23	9	0	1	
Knoll Trail	6/24/23	10	0	0	
Knoll Trail	6/24/23	11	0	0	
Knoll Trail	6/24/23	12	1	0	
Knoll Trail	6/24/23	13	10	0	
Knoll Trail	6/24/23	14	15	0	

Knoll Trail	6/24/23	15	11	0	
Lodge Trail	6/25/23	1	0	0	
Lodge Trail	6/25/23	2	0	0	
Lodge Trail	6/25/23	3	0	0	
Lodge Trail	6/25/23	4	0	0	
Lodge Trail	6/25/23	5	0	0	
Lodge Trail	6/25/23	6	0	0	
Lodge Trail	6/25/23	7	0	0	
Lodge Trail	6/25/23	8	0	0	
Lodge Trail	6/25/23	9	0	0	
Lodge Trail	6/25/23	10	0	0	
Lodge Trail	6/25/23	11	1	0	
Lodge Trail	6/25/23	12	0	1	
Lodge Trail	6/25/23	13	2	0	
Lodge Trail	6/25/23	14	12	0	
Meadow Trail	6/25/23	1	0	0	
Meadow Trail	6/25/23	2	0	0	
Meadow Trail	6/25/23	3	1	0	
Meadow Trail	6/25/23	4	0	0	
Meadow Trail	6/25/23	5	0	2	
Meadow Trail	6/25/23	6	0	0	
Meadow Trail	6/25/23	7	0	0	
Meadow Trail	6/25/23	8	0	0	
Meadow Trail	6/25/23	9	1	0	
Meadow Trail	6/25/23	10	2	1	
Meadow Trail	6/25/23	11	4	0	
Meadow Trail	6/25/23	12	12	3	
Meadow Trail	6/25/23	13	57	14	
Meadow Trail	6/25/23	14	2	28	
Log Trail	6/25/23	1	1	5	
Log Trail	6/25/23	2	16	8	

Log Trail	6/25/23	3	5	1	
Log Trail	6/25/23	4	2	6	
Log Trail	6/25/23	5	3	1	
Log Trail	6/25/23	6	3	1	
Log Trail	6/25/23	7	2	1	
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Log Trail	6/25/23	10	0	0	
Log Trail	6/25/23	11	0	0	
Log Trail	6/25/23	12	0	0	
Mid Marsh Trail	6/25/23	19	0	0	
Mid Marsh Trail	6/25/23	20	0	0	
Mid Marsh Trail	6/25/23	21	275	7	
Mid Marsh Trail	6/25/23	22	375	64	
Mid Marsh Trail	6/25/23	23	155	37	
Mid Marsh Trail	6/25/23	24	29	8	
Mid Marsh Trail	6/25/23	25	50	0	
Mid Marsh Trail	6/25/23	26	16	1	
Mid Marsh Trail	6/25/23	27	13	3	
Mid Marsh Trail	6/25/23	28	5	0	
Mid Marsh Trail	6/25/23	29	0	0	
Mid Marsh Trail	6/25/23	30	11	0	
Mid Marsh Trail	6/25/23	31	0	0	
Mid Marsh Trail	6/25/23	32	0	0	
Mid Marsh Trail	6/25/23	33	0	0	
Mid Marsh Trail	6/25/23	34	0	0	
Mid Marsh Trail	6/25/23	35	0	0	
Mid Marsh Trail	6/25/23	36	0	0	
Mid Marsh Trail	6/25/23	37	2	0	
Mid Marsh Trail	6/25/23	38	0	0	
West Perimeter Trail	6/25/23	1	0	0	

West Perimeter Trail	6/25/23	2	0	0	
West Perimeter Trail	6/25/23	3	0	0	
West Perimeter Trail	6/25/23	4	0	0	
West Perimeter Trail	6/25/23	5	1	0	
West Perimeter Trail	6/25/23	6	0	0	
West Perimeter Trail	6/25/23	7	0	0	
West Perimeter Trail	6/25/23	8	0	0	
West Perimeter Trail	6/25/23	9	0	0	
West Perimeter Trail	6/25/23	10	1	0	
West Perimeter Trail	6/25/23	11	2	0	
West Perimeter Trail	6/25/23	12	22	0	
West Perimeter Trail	6/25/23	13	150	0	
West Perimeter Trail	6/25/23	14	124	0	East
West Perimeter Trail	6/25/23	15	106	1	
West Perimeter Trail	6/25/23	16	39	0	
West Perimeter Trail	6/25/23	17	12	0	
West Perimeter Trail	6/25/23	18	8	0	
West Perimeter Trail	6/25/23	19	29	0	
West Perimeter Trail	6/25/23	20	11	0	
West Perimeter Trail	6/25/23	21	27	0	
West Perimeter Trail	6/25/23	22	37	0	
West Perimeter Trail	6/25/23	23	17	0	
West Perimeter Trail	6/25/23	24	38	0	
West Perimeter Trail	6/25/23	25	58	0	
West Perimeter Trail	6/25/23	26	37	0	
West Perimeter Trail	6/25/23	27	17	0	
West Perimeter Trail	6/25/23	28	39	0	
West Perimeter Trail	6/25/23	29	92	0	North
West Perimeter Trail	6/25/23	30	67	0	
West Perimeter Trail	6/25/23	31	200	0	North
West Perimeter Trail	6/25/23	32	380	0	

West Perimeter Trail	6/25/23	33	340	0	
West Perimeter Trail	6/25/23	34	270	0	
West Perimeter Trail	6/25/23	35	450	0	
West Perimeter Trail	6/25/23	36	310	1	
West Perimeter Trail	6/25/23	37	56	2	
West Perimeter Trail	6/25/23	38	480	0	
West Perimeter Trail	6/25/23	39	375	0	
Quarry Rd	6/30/23	1	0	0	
Quarry Rd	6/30/23	2	0	0	
Quarry Rd	6/30/23	3	1	0	
Quarry Rd	6/30/23	4	1	0	
Quarry Rd	6/30/23	5	0	0	
Quarry Rd	6/30/23	6	1	0	
Quarry Rd	6/30/23	7	0	0	
Quarry Rd	6/30/23	8	1	0	
Quarry Rd	6/30/23	9	0	0	
Quarry Rd	6/30/23	10	15	1	
Quarry Rd	6/30/23	11	0	1	
Quarry Rd	6/30/23	12	0	0	
Quarry Rd	6/30/23	13	0	0	
Quarry Rd	6/30/23	14	0	0	
Quarry Rd	6/30/23	15	0	0	
Quarry Rd	6/30/23	16	6	0	
Quarry Rd	6/30/23	17	0	0	
Quarry Rd	6/30/23	18	7	0	
Quarry Rd	6/30/23	19	14	0	
Quarry Rd	6/30/23	20	18	3	
Quarry Rd	6/30/23	21	5	0	
Quarry Rd	6/30/23	22	24	0	
Quarry Rd	6/30/23	23	0	0	
Quarry Rd	6/30/23	24	4	0	

Quarry Rd	6/30/23	25	0	0	
Quarry Rd	6/30/23	26	26	0	
Quarry Rd	6/30/23	27	81	0	
Quarry Rd	6/30/23	28	45	10	
Quarry Rd	6/30/23	29	0	0	
Quarry Rd	6/30/23	30	2	0	
Quarry Rd	6/30/23	31	8	3	
Quarry Rd	6/30/23	32	2	0	
Quarry Rd	6/30/23	33	11	0	
Quarry Rd	6/30/23	34	46	4	
Quarry Rd	6/30/23	35	36	7	
Quarry Rd	6/30/23	36	96	8	
Quarry Rd	6/30/23	37	62	9	
Knoll Trail	7/5/23	16	2	0	
Knoll Trail	7/5/23	17	1	0	
Knoll Trail	7/5/23	18	0	0	
Knoll Trail	7/5/23	19	3	0	
Knoll Trail	7/5/23	20	4	0	
Knoll Trail	7/5/23	21	28	0	
Knoll Trail	7/5/23	22	51	1	
Knoll Trail	7/5/23	23	127	3	
Knoll Trail	7/5/23	24	106	5	
Knoll Trail	7/5/23	25	27	0	
Knoll Trail	7/5/23	26	96	0	
Knoll Trail	7/5/23	27	123	6	
Knoll Trail	7/5/23	28	106	2	
Knoll Trail	7/5/23	29	112	1	
Knoll Trail	7/5/23	30	193	0	
Knoll Trail	7/5/23	31	64	1	
Knoll Trail	7/5/23	32	2	0	
Knoll Trail	7/5/23	33	1	0	

Knoll Trail	7/5/23	34	9	0	
Knoll Trail	7/5/23	35	28	0	
Knoll Trail	7/5/23	36	9	0	
Knoll Trail	7/5/23	37	5	0	
High Knoll Trail	7/5/23	1	11	0	
High Knoll Trail	7/5/23	2	1	0	
High Knoll Trail	7/5/23	3	1	0	
High Knoll Trail	7/5/23	4	1	0	
High Knoll Trail	7/5/23	5	0	0	
High Knoll Trail	7/5/23	6	0	0	
High Knoll Trail	7/5/23	7	0	0	
High Knoll Trail	7/5/23	8	0	0	
High Knoll Trail	7/5/23	9	0	0	
High Knoll Trail	7/5/23	10	0	0	
High Knoll Trail	7/5/23	11	0	0	
High Knoll Trail	7/5/23	12	0	0	
High Knoll Trail	7/5/23	13	0	0	
High Knoll Trail	7/5/23	14	0	0	
High Knoll Trail	7/5/23	15	0	0	
High Knoll Trail	7/5/23	16	0	0	
Outer Perimeter Trail	7/8/23	1	0	0	
Outer Perimeter Trail	7/8/23	2	1	0	
Outer Perimeter Trail	7/8/23	3	1	0	
Outer Perimeter Trail	7/8/23	4	1	0	
Outer Perimeter Trail	7/8/23	5	4	0	
Outer Perimeter Trail	7/8/23	6	13	0	
Outer Perimeter Trail	7/8/23	7	20	0	NE
Outer Perimeter Trail	7/8/23	8	17	0	NE
Outer Perimeter Trail	7/8/23	9	5	0	NE
Outer Perimeter Trail	7/8/23	10	1	0	
Outer Perimeter Trail	7/8/23	11	5	0	

Outer Perimeter Trail	7/8/23	12	1	0	
Outer Perimeter Trail	7/8/23	13	0	0	
Outer Perimeter Trail	7/8/23	14	0	0	
Outer Perimeter Trail	7/8/23	15	0	0	
Outer Perimeter Trail	7/8/23	16	51	0	
Outer Perimeter Trail	7/8/23	17	3	0	
Outer Perimeter Trail	7/8/23	18	0	0	
Outer Perimeter Trail	7/8/23	19	4	0	
Outer Perimeter Trail	7/8/23	20	1	1	
Outer Perimeter Trail	7/8/23	21	5	0	
Outer Perimeter Trail	7/8/23	22	1	0	
Outer Perimeter Trail	7/8/23	23	2	0	
Outer Perimeter Trail	7/8/23	24	1	0	
Outer Perimeter Trail	7/8/23	25	113	0	
Outer Perimeter Trail	7/8/23	26	6	0	
Outer Perimeter Trail	7/8/23	27	14	0	
Outer Perimeter Trail	7/8/23	28	22	0	
Outer Perimeter Trail	7/8/23	29	13	0	
Outer Perimeter Trail	7/8/23	30	19	0	
Outer Perimeter Trail	7/8/23	31	16	0	
Outer Perimeter Trail	7/8/23	32	57	0	
Outer Perimeter Trail	7/8/23	33	70	0	
Outer Perimeter Trail	7/8/23	34	1	0	
Outer Perimeter Trail	7/8/23	35	0	0	
Outer Perimeter Trail	7/8/23	36	10	0	
Outer Perimeter Trail	7/8/23	37	2	0	
Outer Perimeter Trail	7/8/23	38	0	0	
Outer Perimeter Trail	7/8/23	29	0	0	
Outer Perimeter Trail	7/8/23	40	64	0	
West Perimeter Trail	6/30/23	1	1	0	
West Perimeter Trail	6/30/23	2	4	0	

West Perimeter Trail	6/30/23	3	2	0	
West Perimeter Trail	6/30/23	4	5	0	
West Perimeter Trail	6/30/23	5	0	0	
West Perimeter Trail	6/30/23	6	0	0	
West Perimeter Trail	6/30/23	7	4	0	
West Perimeter Trail	6/30/23	8	4	1	
West Perimeter Trail	6/30/23	9	2	0	
West Perimeter Trail	6/30/23	10	4	0	
West Perimeter Trail	6/30/23	11	12	0	
West Perimeter Trail	6/30/23	12	6	4	
West Perimeter Trail	6/30/23	13	40	3	
West Perimeter Trail	6/30/23	14	4	0	
West Perimeter Trail	6/30/23	15	0	1	
West Perimeter Trail	6/30/23	16	7	5	
West Perimeter Trail	6/30/23	17	3	1	
West Perimeter Trail	6/30/23	18	0	0	
West Perimeter Trail	6/30/23	19	6	5	
West Perimeter Trail	6/30/23	20	74	0	
West Perimeter Trail	6/30/23	21	30	2	
West Perimeter Trail	6/30/23	22	43	6	
West Perimeter Trail	6/30/23	23	39	5	
West Perimeter Trail	6/30/23	24	71	4	
West Perimeter Trail	6/30/23	25	100	6	
West Perimeter Trail	6/30/23	26	31	1	
West Perimeter Trail	6/30/23	27	114	4	
West Perimeter Trail	6/30/23	28	53	3	
West Perimeter Trail	6/30/23	29	45	2	
West Perimeter Trail	6/30/23	30	5	0	
West Perimeter Trail	6/30/23	31	0	0	
West Perimeter Trail	6/30/23	32	0	0	
West Perimeter Trail	6/30/23	33	0	0	

West Perimeter Trail	6/30/23	34	5	0	
West Perimeter Trail	6/30/23	35	14	0	
West Perimeter Trail	6/30/23	36	17	0	
West Perimeter Trail	6/30/23	37	270	8	
West Perimeter Trail	6/30/23	38	64	0	
West Perimeter Trail	6/30/23	39	71	1	

Appendix 3: Detailed Transect Maps

Figure 3-1: Detailed map of the toadlet count on the Western Perimeter Transect

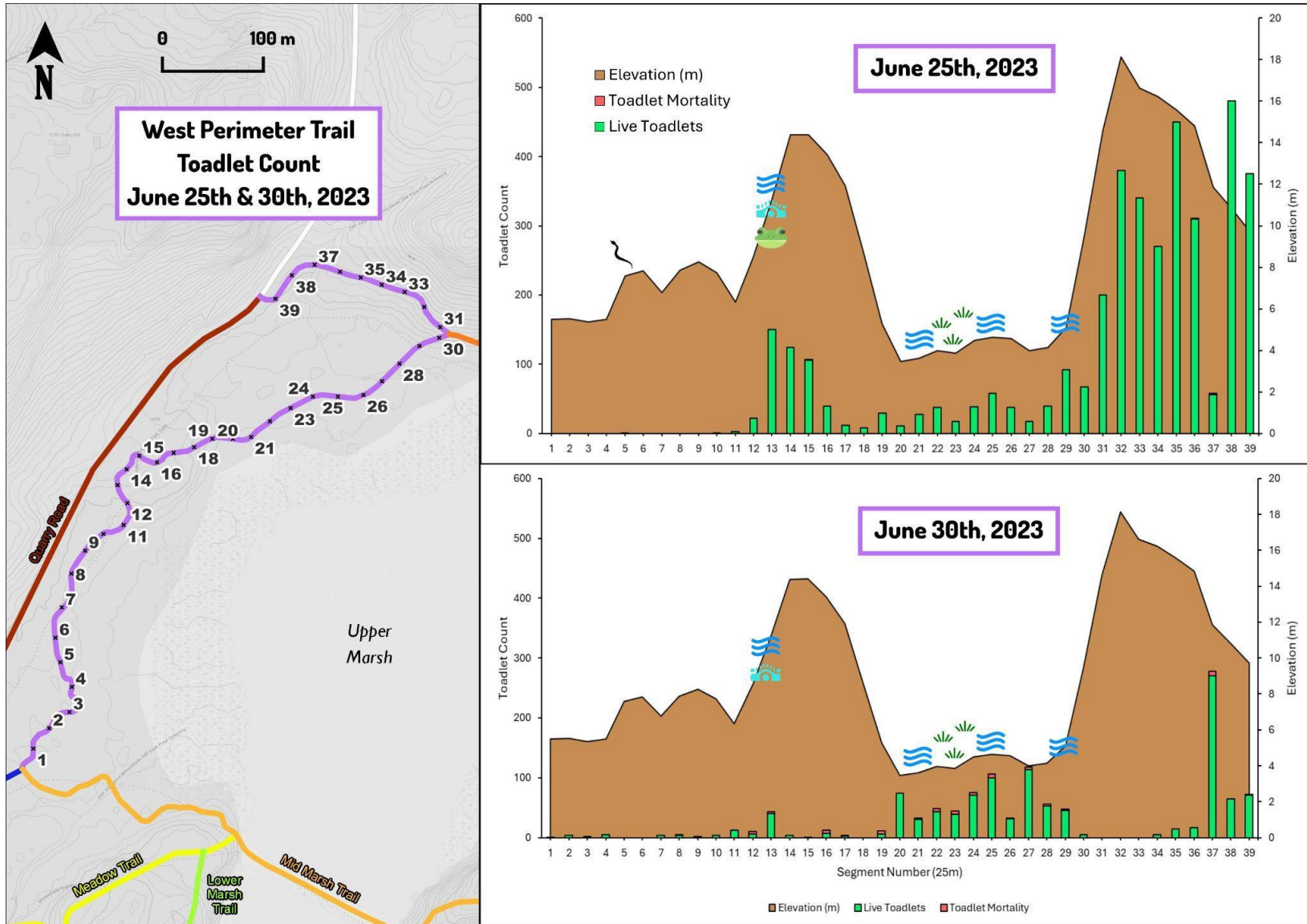
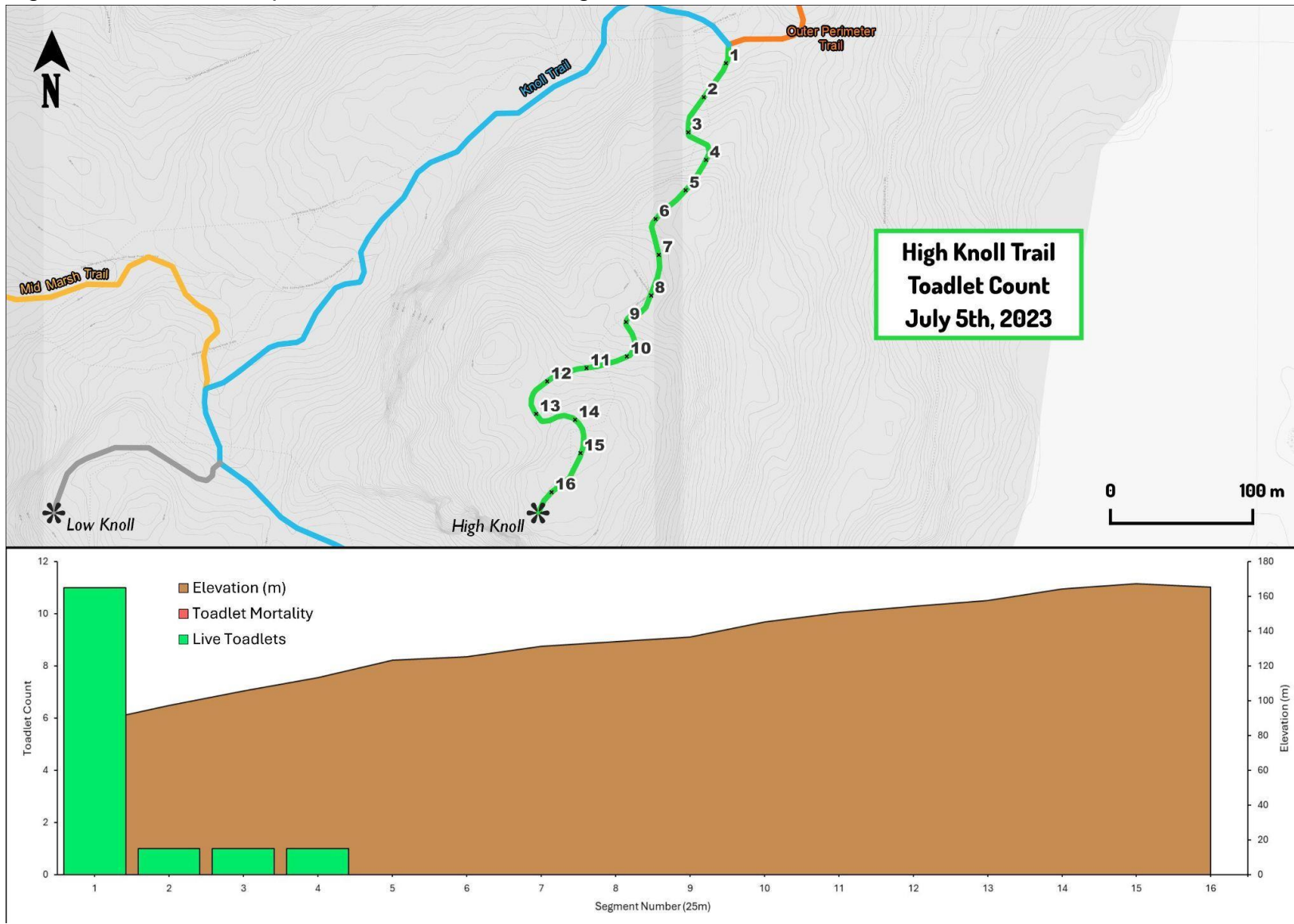


Figure 3-2: Detailed map of toadlet count on the High Knoll Transect



Figure

3-3: Detailed map of toadlet count on the Knoll Transect

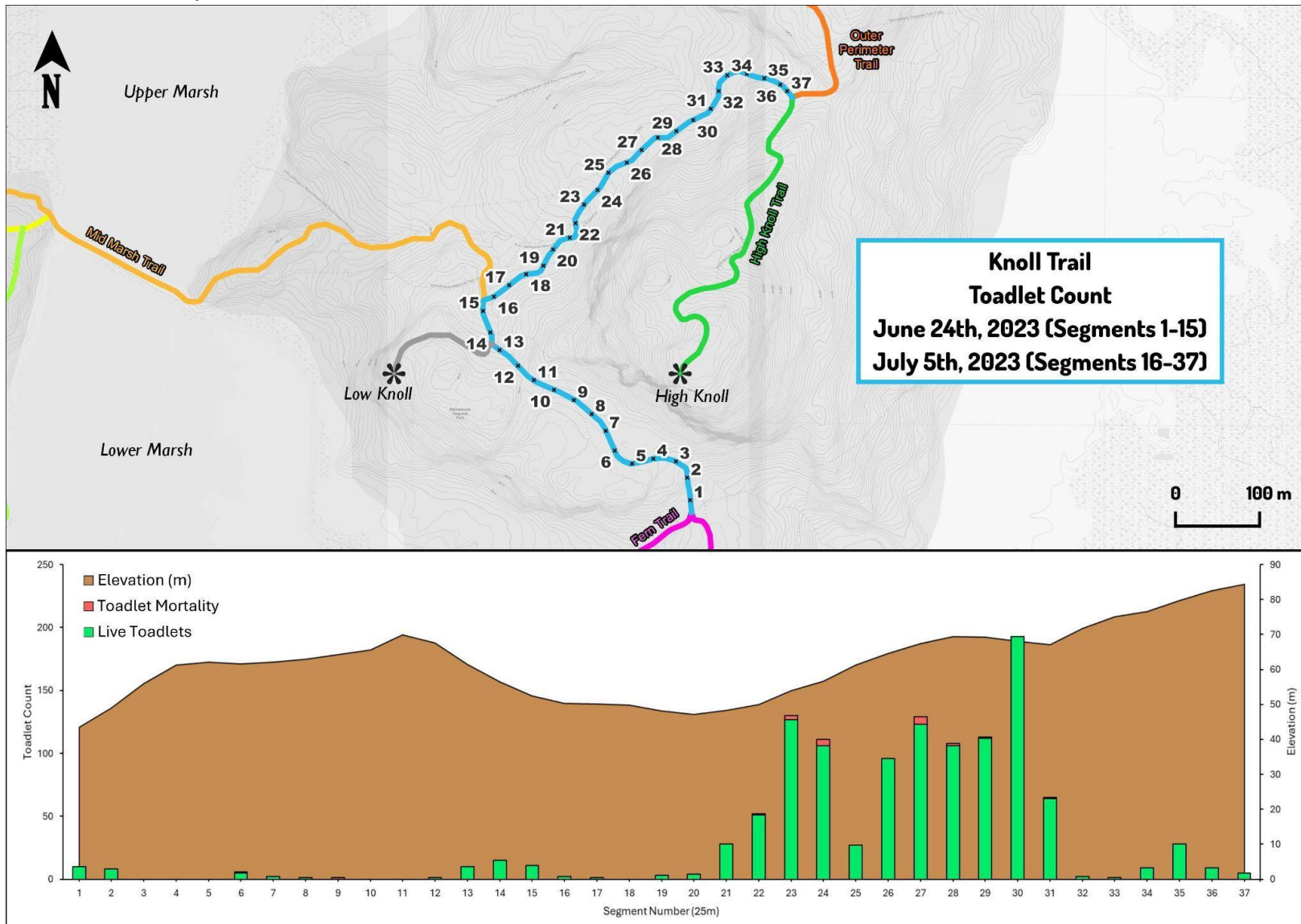
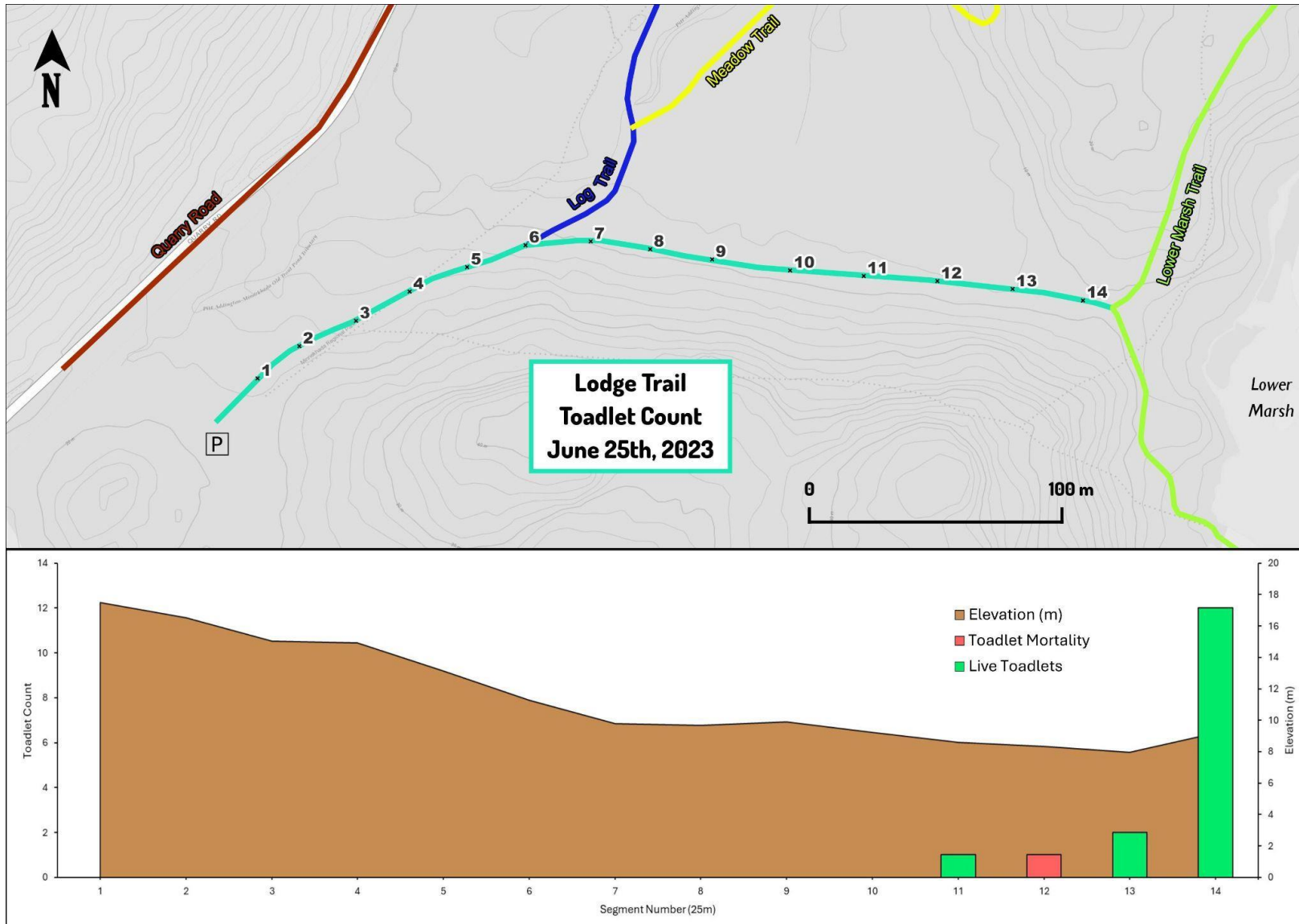


Figure 3-4: Detailed map of toadlet count on the Lodge Transect



Figure

3-5: Detailed map of toadlet count on the Log Transect

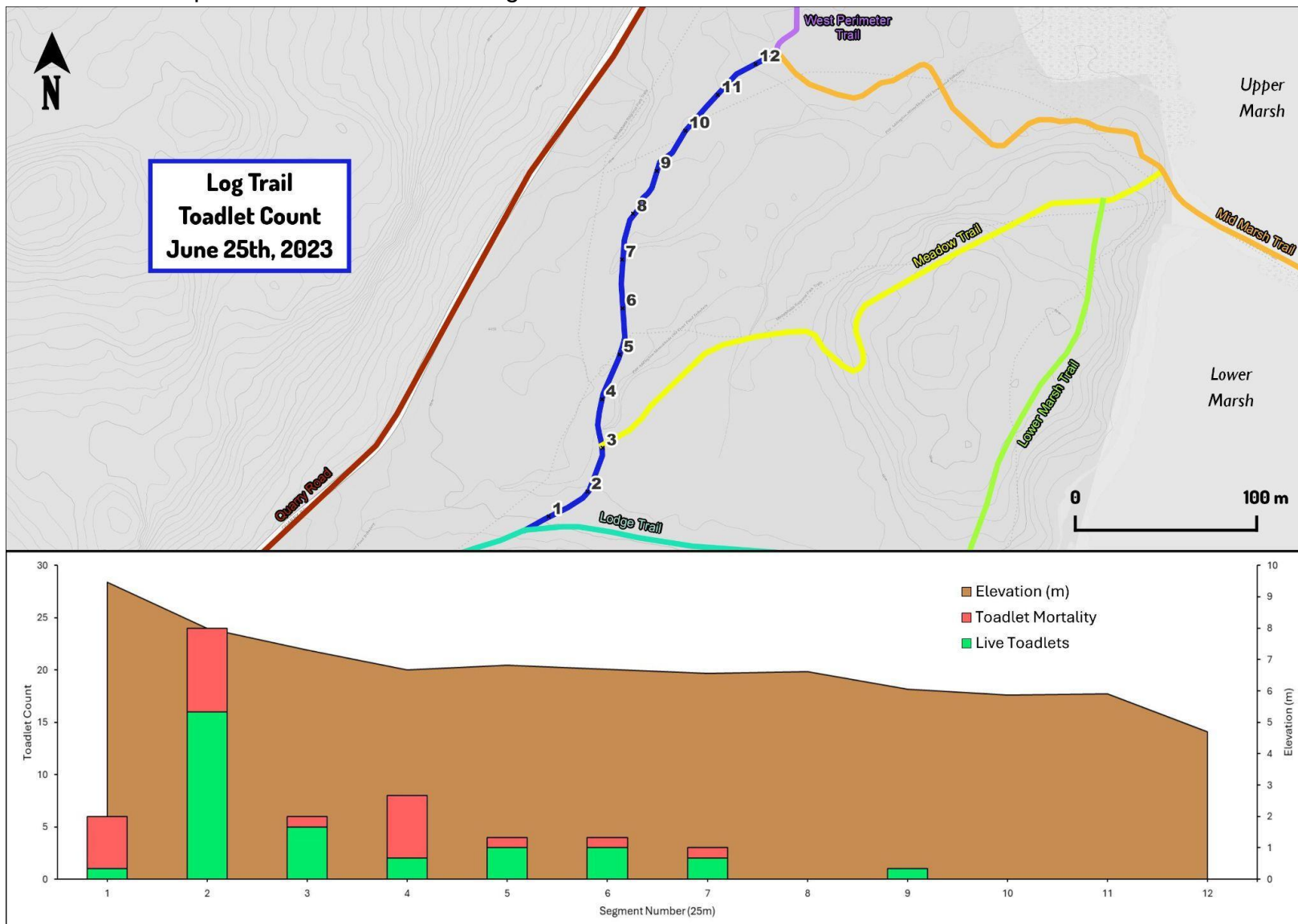


Figure 3-6: Detailed map of toadlet count on the Lower Marsh Transect

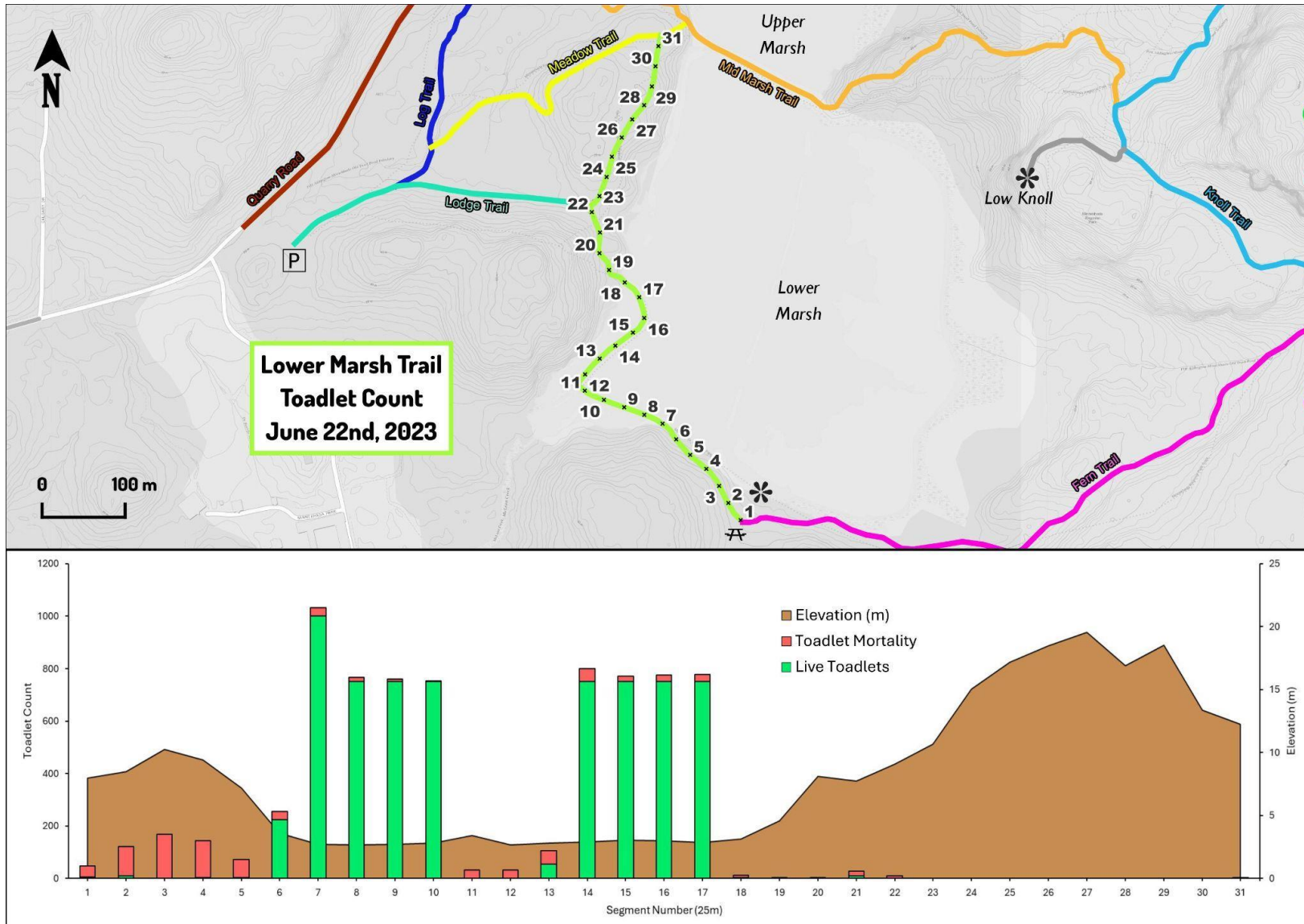
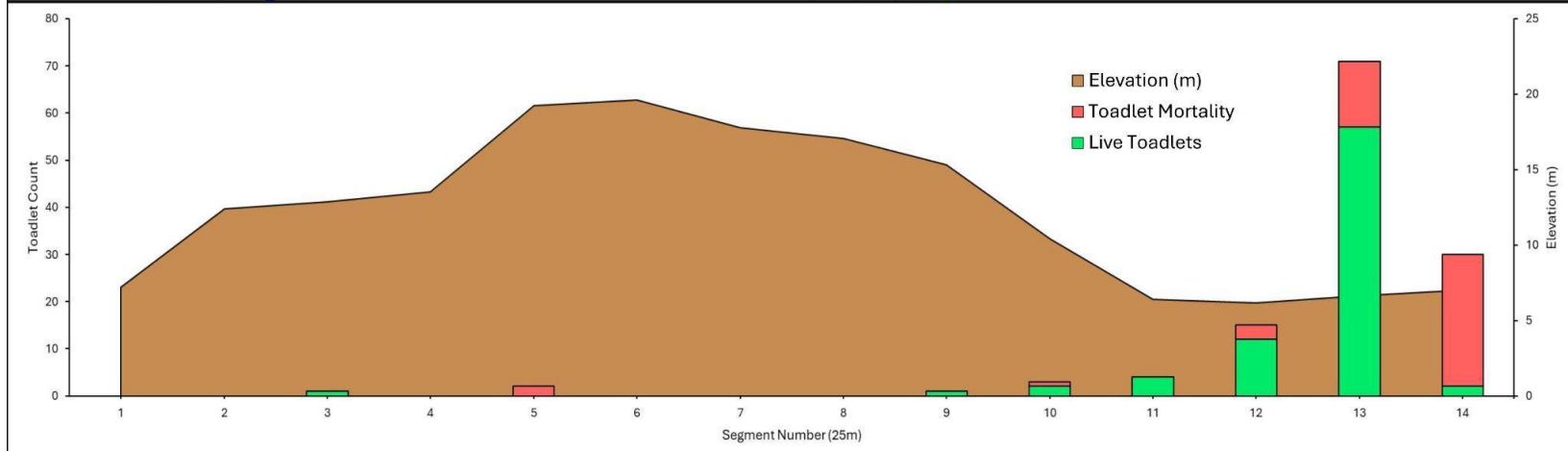
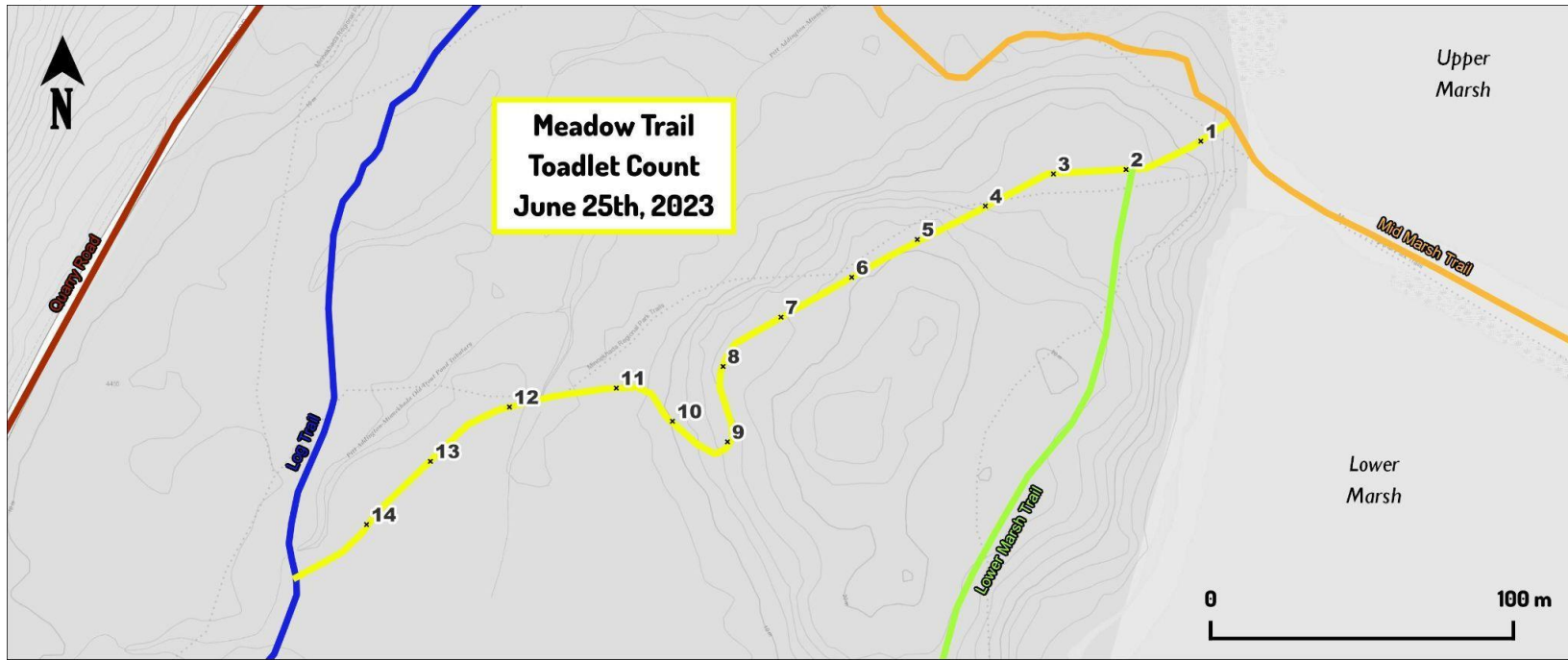
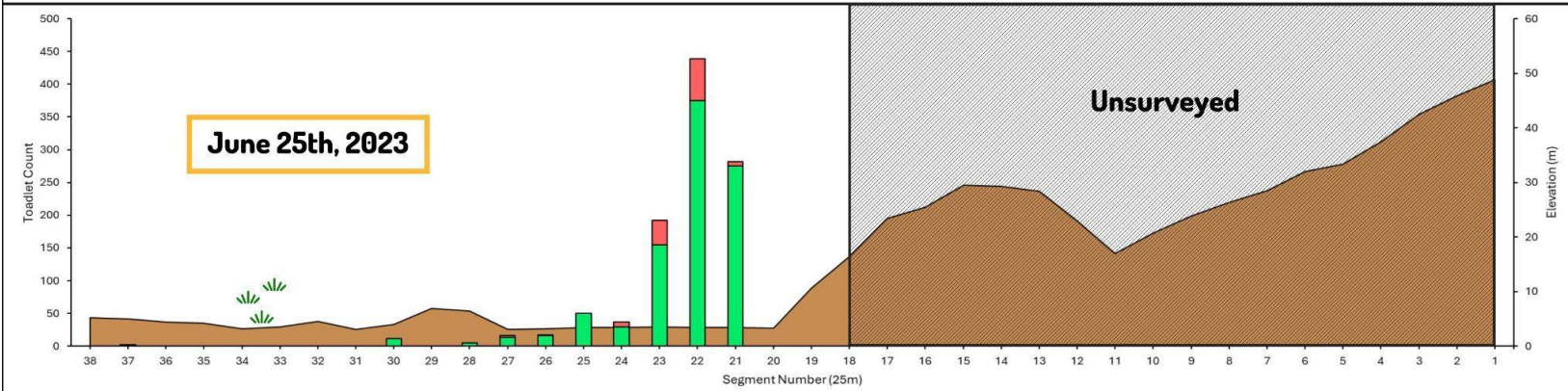
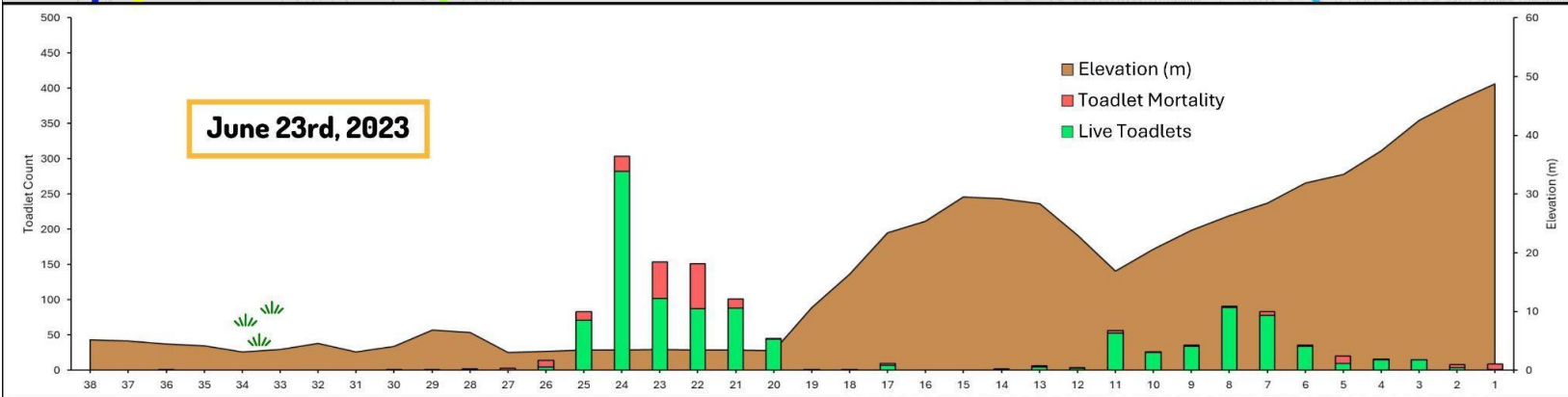
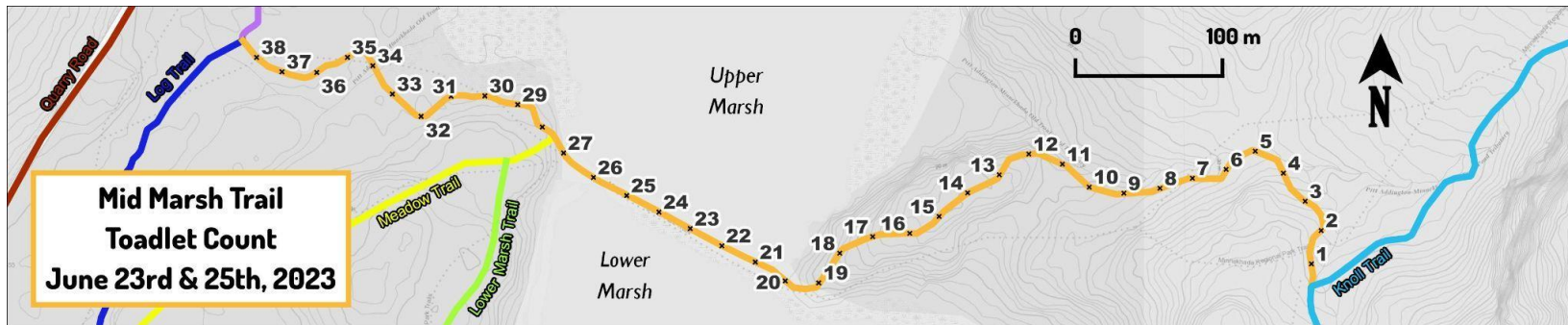


Figure 3-7: Detailed map of toadlet count on the Meadow Transect



3-8: Detailed map of toadlet count on the Mid Marsh Transect

Figure



Figure

3-9: Detailed map of toadlet count on the Outer Perimeter Transect

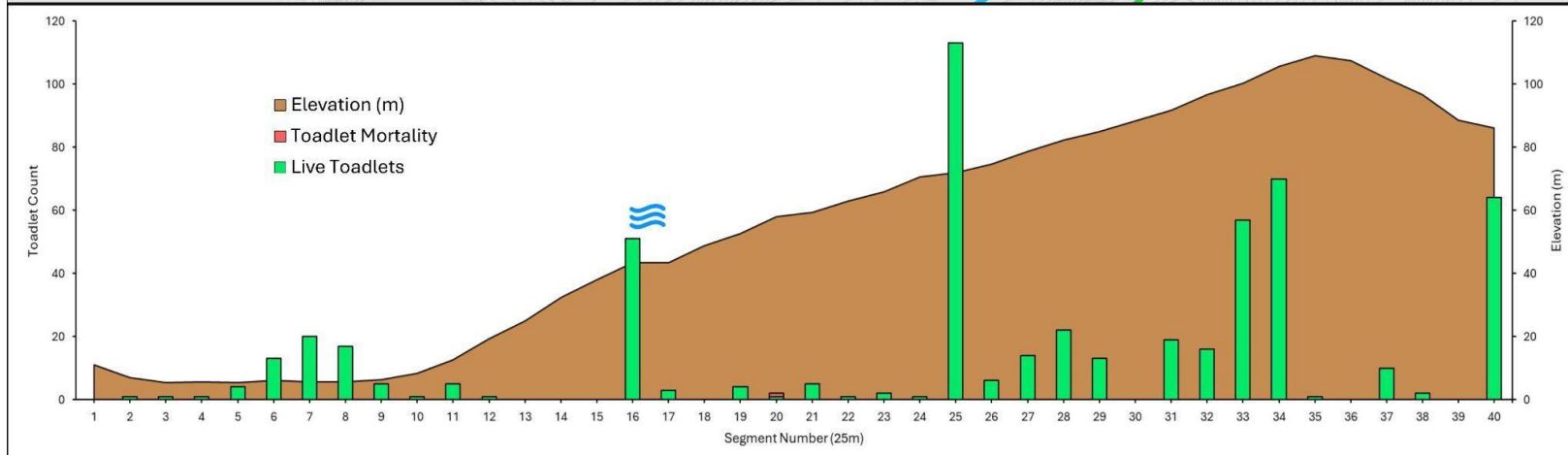
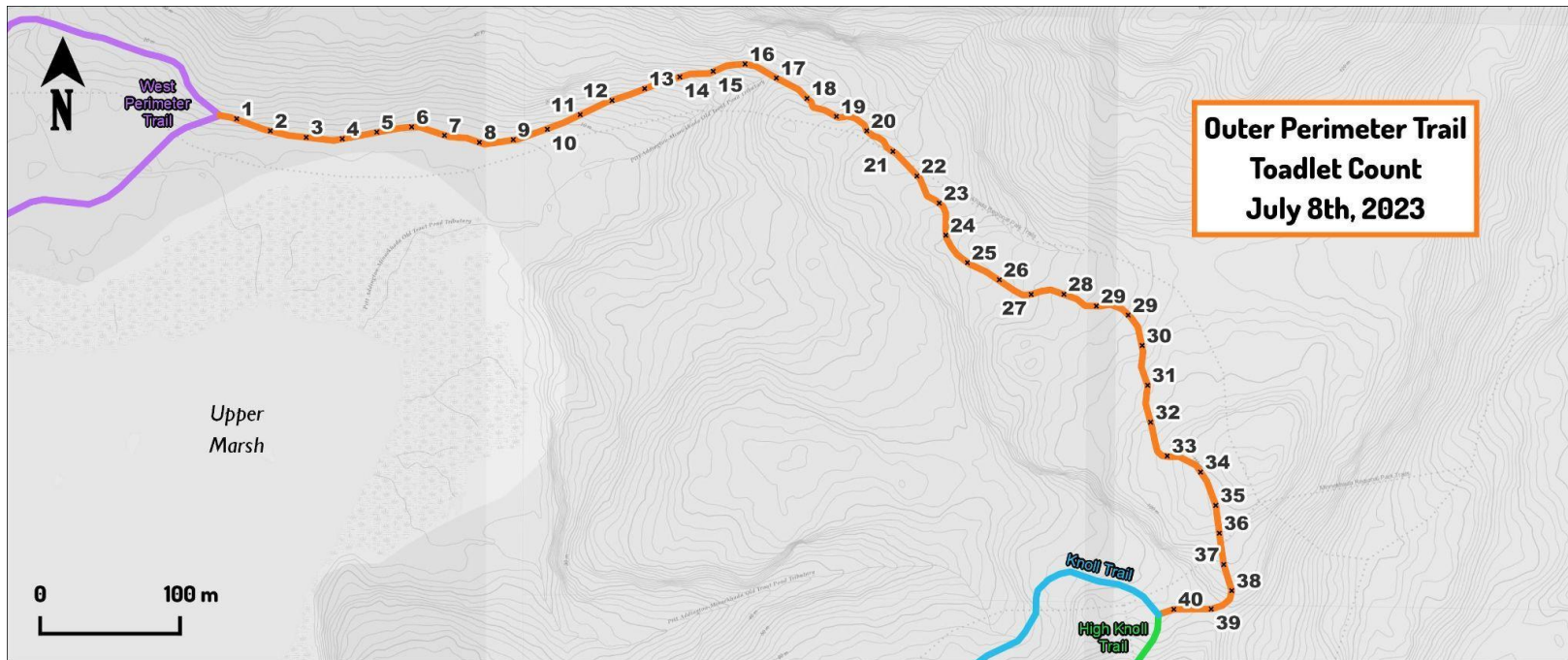


Figure 3-10: Detailed map of toadlet count on the Quarry Transect

