Snake Population Survey
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Summary: I collected data on how recent years of increased flooding at Nahant Marsh, which is a result of climate change, has potentially affected reptile populations, like snakes. Comparing previous data to this current year I was able to calculate population differences per species.
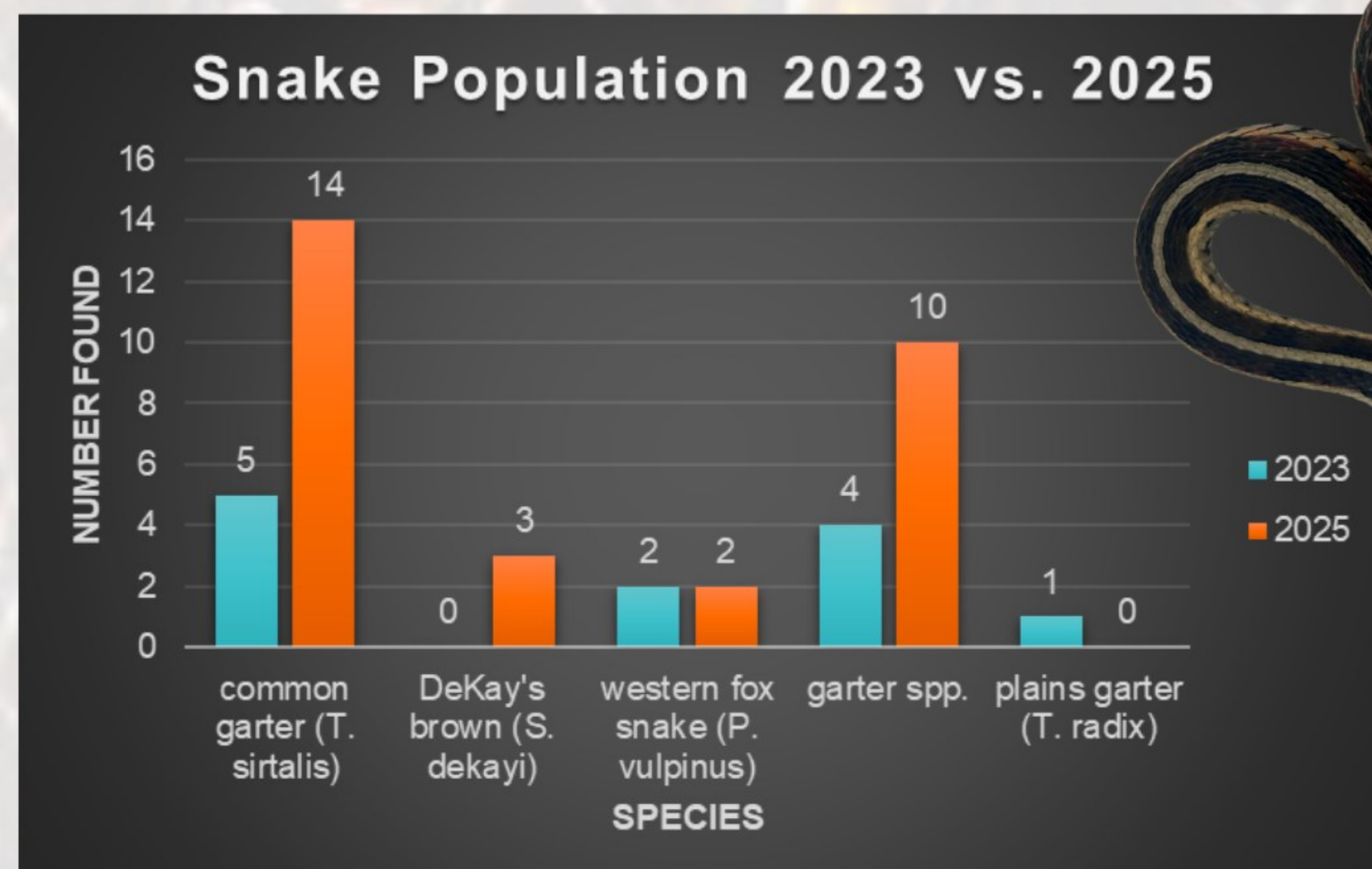

Figure 1: Species and amount found in 2023 vs. 2025

T. sirtalis

Introduction: There has been an increase in the frequency and duration of flooding at Nahant marsh and notable out of season flooding such as during the summer of 2024 (Fig 2). In 2023, when the last snake survey was performed, flood levels reached 21.4ft. These high levels can negatively affect snake populations by decreasing their habitats and access to food. This study is a continuation of the 2023 survey to see if flooding has depleted snake populations. Species that are inhabitants of Scott County, IA include: western fox snake (*Pantherophis vulpinus*), DeKay's brown snake (*Storeria dekayi*), black rat snake (*Pantherophis obsoletus*), bullsnake (*Pituophis catenifer sayi*), common garter snake (*Thamnophis sirtalis*), copperbelly water snake (*Nerodia erythrogaster neglecta*), eastern massasauga rattlesnake (*Sistrurus catenatus*), Graham's crayfish snake (*Regina grahamii*), milk snake (*Lampropeltis triangulum*), northern water snake (*Nerodia sipedon*), and plains garter snake (*Thamnophis radix*). My hypothesis is that out of the species found there will be a decrease in the amount of snakes that preferred drier environments and an increase the amount of snakes that prefer wetland environments, due to the previous years of flooding and climate change.

Methods: There are 21 marked locations at Nahant Marsh where both wood and metal cover boards were placed as shelter for snakes early spring/summer. They are located in or on the edges of either prairie or forest areas. These cover boards were checked at least three times weekly between June 2-July 18, 2025 for snake species. Temperature readings under cover boards, air temperature, and average daily humidity were also documented. If snakes were present they were captured and measurements were taken (snout to vent length and tail length), mass, and all were checked for PIT (Passive Internal Transponders) tags. If a snake did not have a PIT tag, one was placed for further research. PIT tags were not placed if the tag would exceed 5% of the animal's body width or thickness to avoid discomfort or migration. They were then returned back to the area where they were found.

S. dekayi

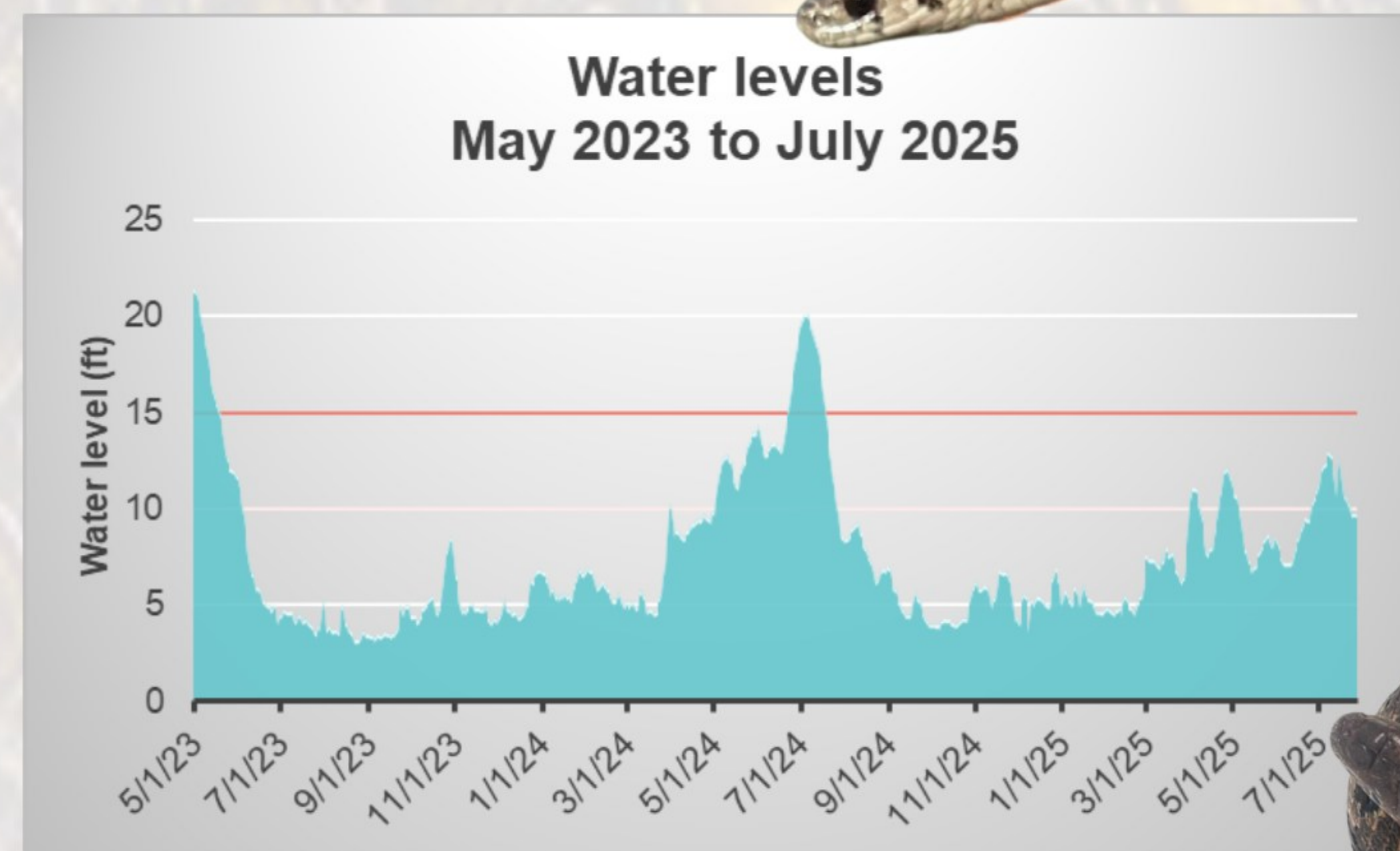Figure 2: Water levels measured at the Rock Island Arsenal gauge. Min. flood stage 15ft, Major flood stage 18ft.

P. vulpinus

Results: Each species documented included 14 common garter snakes, 3 DeKay's brown snakes, 2 western fox snakes, 10 unspecified garter species, and 0 plains garter snakes(Fig. 1). New PIT tags were placed in 8 snakes total. No PIT tagged snakes were recaptured. Using the Daily Historical Data on the US Army Corps of Engineers website, I was able to form a graph showing the flood levels ranging from May 1st, 2023 to July 18th, 2025(Fig. 2). This data concluded that there was significant flooding during May 1-19, 2023 and June 27–July 2023, 2024. Flooding in 2023 ranged from 15.04ft to 21.40ft and flooding in 2024 ranged from 15.01ft to 20.09ft. At a water level of 15ft snake boards affected are 2, 13, & 16(Fig. 3&5), at 21.5ft all are affected except 18–21(Fig. 3-6). Currently in 2025, the highest water level recorded was on July 13th at 12.89ft (Fig. 2). The temperature under cover boards where snakes were found in 2025 averaged at 26.3℃, and in 2023 the temperature averaged 26.1℃. Air temperature in 2025 averaged 26.1℃(21.1℃ to 31.1℃) and in 2023 air temperature averaged 26.6℃(18℃ to 34.8℃). Average daily humidity when snakes were found was 75%, and days where no snakes were found averaged 77%. Species were found either under cover boards or near forest or prairie edge. Cover board 1 had the most activity and was the only board where multiple snakes were found(14 total). Other cover board locations where snakes were found were located at 3, 4, 6, 8, 9, 11, 12(Fig. 3-6). All western fox snakes were found without cover boards. Mass averaged 91g (20g to 410g), snout to vent lengths averaged 48.2cm (28cm to 92cm), tail lengths averaged 13.5cm (8cm to 16cm). Sexing of species was unconfirmed due to invasive nature of probing, but visually there appeared to be 6 males, 5 females, and 14 unknown.

Discussion: An increase was observed from 2023 to 2025 in the amount of all species except for plains garter snakes. Plains garter snakes are known to prefer drier environments, so the flooding in the previous two years could explain their decline. There were 10 garter spp. that were not officially identified in 2025 and 4 in 2023 due to lack of capture(Fig. 1). Without confirmation of species there may be some variance in the plains or common garter totals, but the increase of DeKay's was significant. The increase in DeKay's brown snakes supports a recent study(Huang et al. 2024, *Biological Journal of the Linnean Society*) showing that this species is predicted to have range expansion due to climate change. With expansion there are less species to fill niches, which can lead to ecosystem decline. Hopefully, with the change in environment, plains garter snakes would fill those niches in drier habitats. Changes in flooding but not in temperatures under the cover boards could suggest that humidity could have an effect, as I found a 2% increase in the average humidity between days where snakes were found and days where no snakes were found. A two-sample T-test comparing the humidity levels showed a p-value of 0.4713, so the average between the two humidity levels is not statistically significant. However, my sample set was small and there is no previous data on a possible correlation between presence of snakes and humidity levels, so this could be the focus of a future study at Nahant Marsh. Reptiles like snakes use cover boards for thermoregulation, protection against predators, and extreme environmental conditions. Nahant also has prevalent availability of natural cover including rock piles, tree stumps, low shrubs, and vegetation, which would explain the increase in numbers and lack of recaptures for those who were previously PIT tagged. In the future, this study would help determine if DeKay's brown snakes populations will continue to grow and plains garter snakes populations continue to decline due to the changing environment. This survey helped me understand the connection to species decline and climate change; conducting animal surveys allows others to monitor local fauna and how populations are affected by issues like climate change. Future studies would help put together plans for restoration efforts like creating hibernaculum and monitoring fall to early spring behaviors. These keystone reptiles help keep ecosystems in line by filling certain niches, which is why their populations are so important.
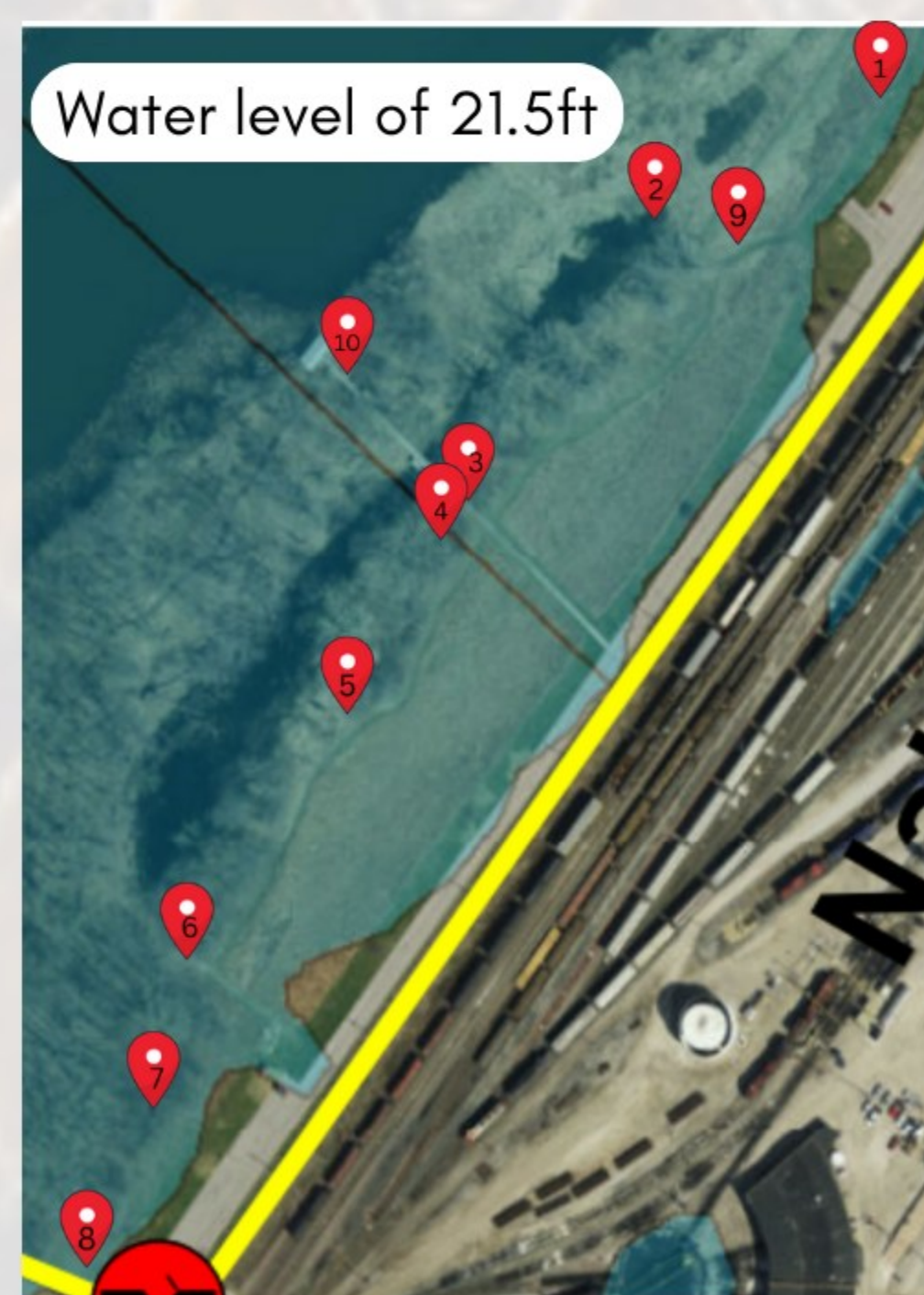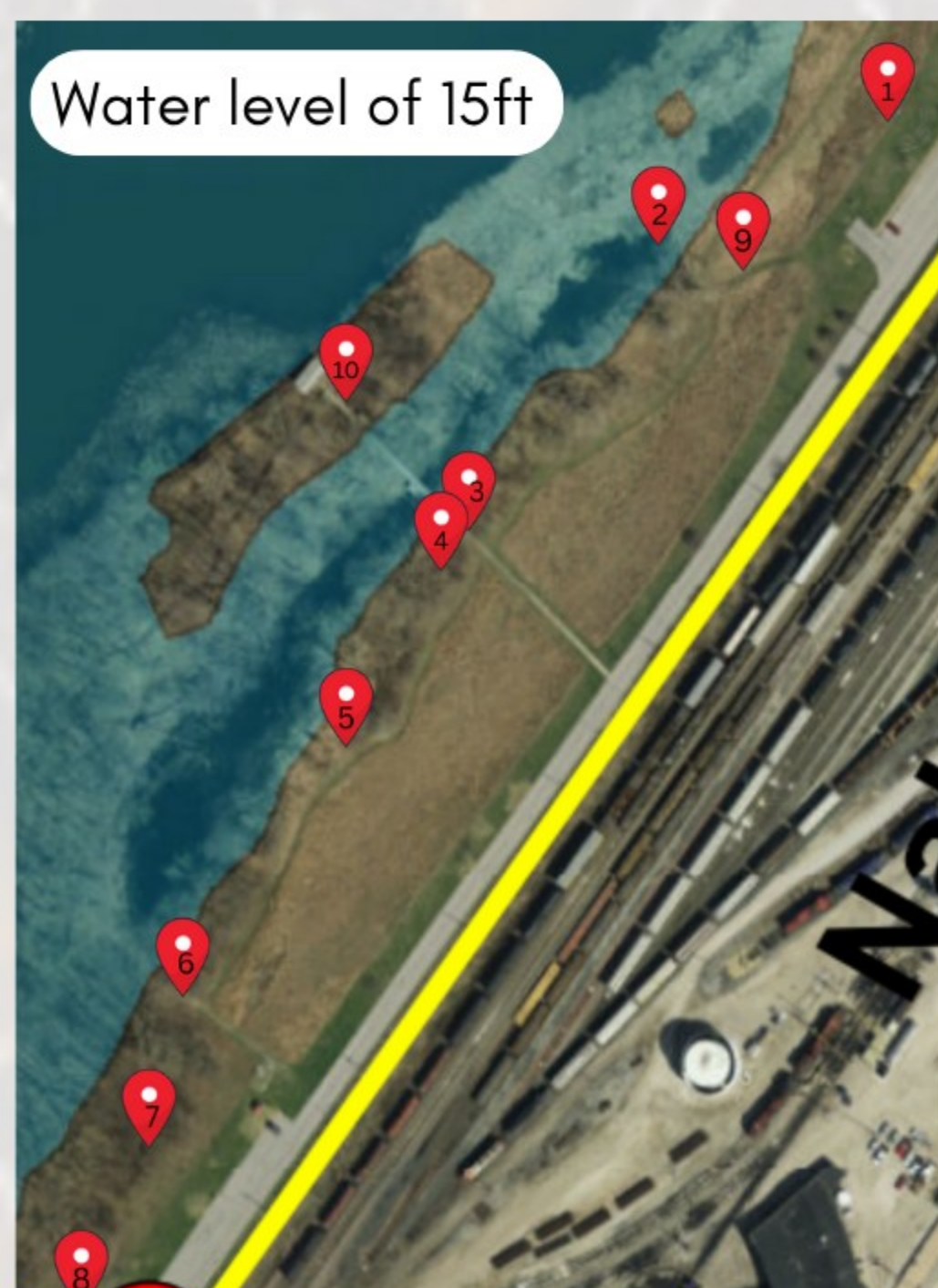

Water level of 15ft
Water level of 21.5ft
Figure 3 & 4: Water level at Nahant at 15ft(Minor flood stage) & 21.5ft(Major flood stage). Snake boards 1–10

Water level of 15ft
Water level of 21.5ft
Figure 5 & 6: Water level at Nahant at 15ft(Minor flood stage) & 21.5ft(Major flood stage). Snake boards 11–21