Apple Snail management: a critical need for population not reproductive level targets

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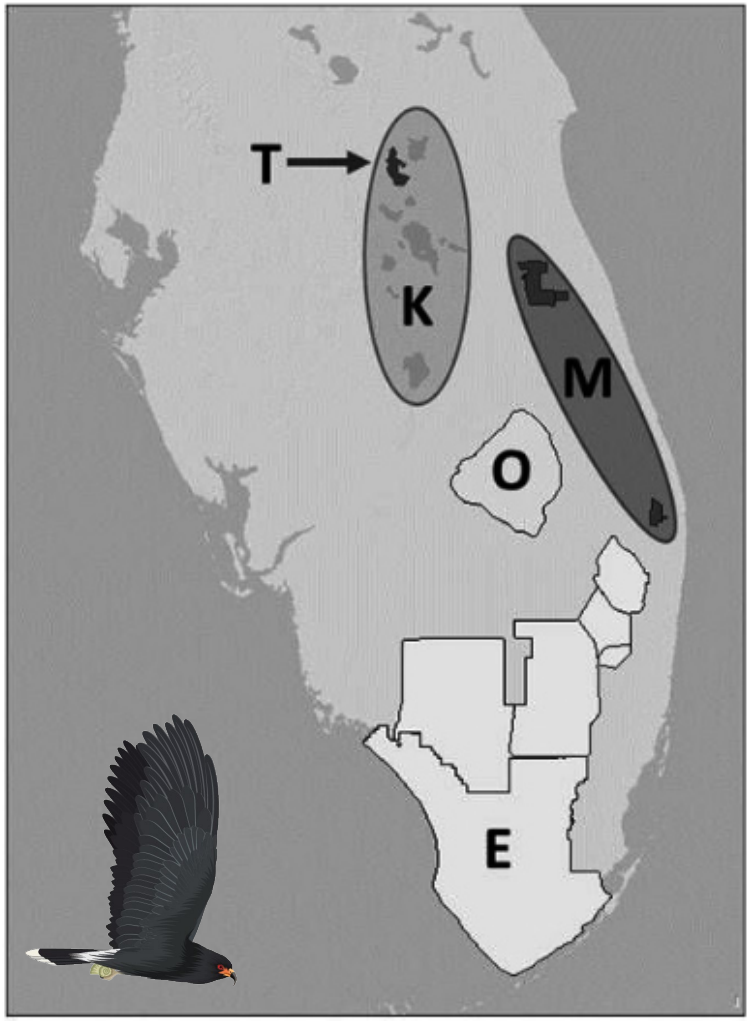
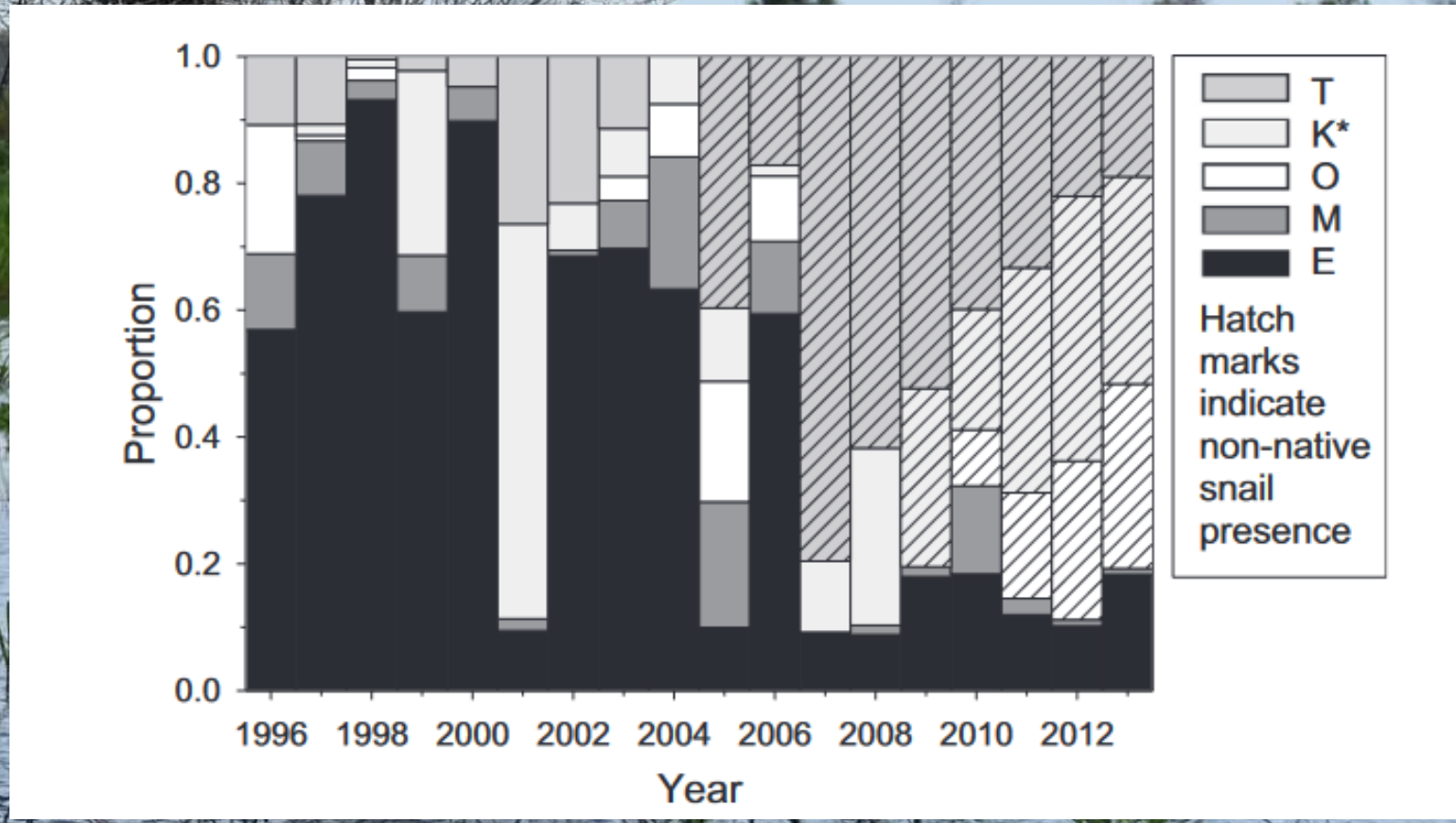
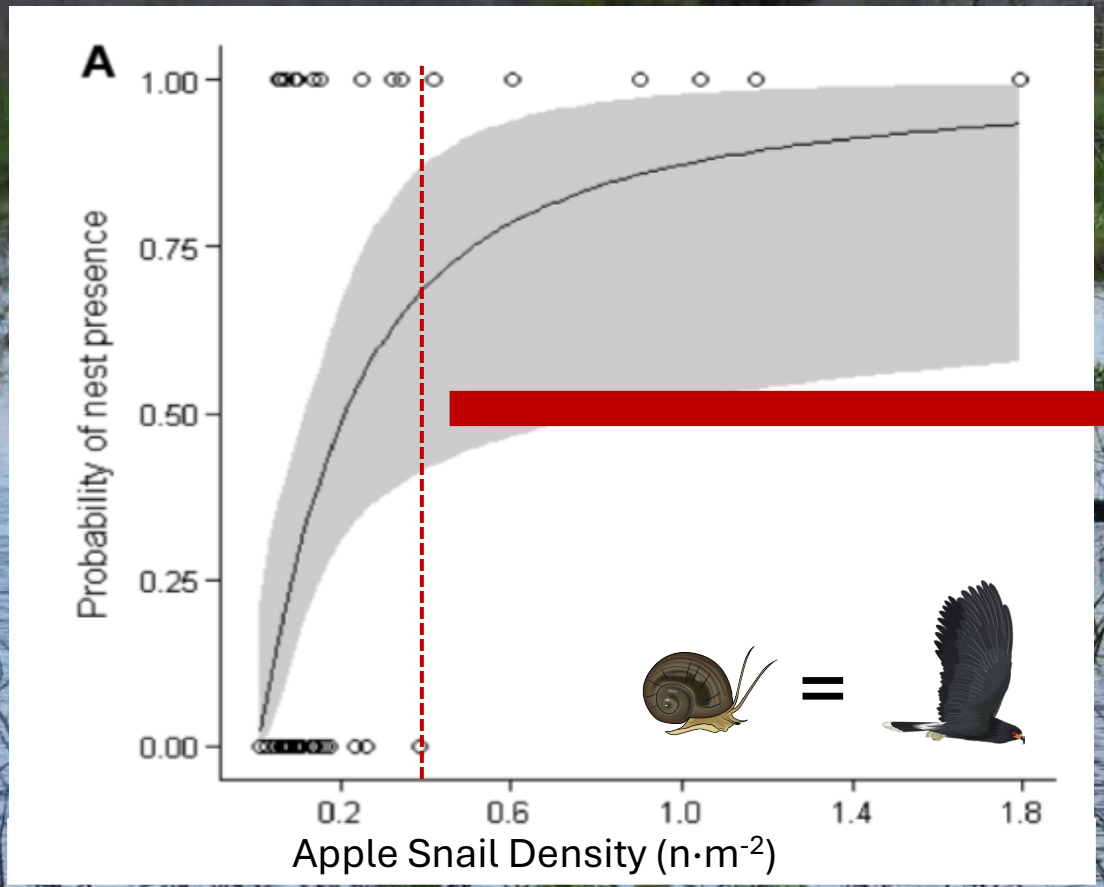
Snail kite nesting has moved away from the Everglades





(Cattau et al., 2016- Ecological Applications)

Kite nesting is linked to apple snail densities



The probability of a kite nesting at a site is near 100% when apple snail densities are greater than 0.4 snails m^{-2}.

(Cattau et al., 2014- The journal of Wildlife Management)

If  =  , then how can management ↑  to get ↑  .

Water management targets apple snail reproduction

This reproductive based target assumes that egg laying is what limits apple snail populations, which has not been tested.

pecies
-3A

Metrics
ximize
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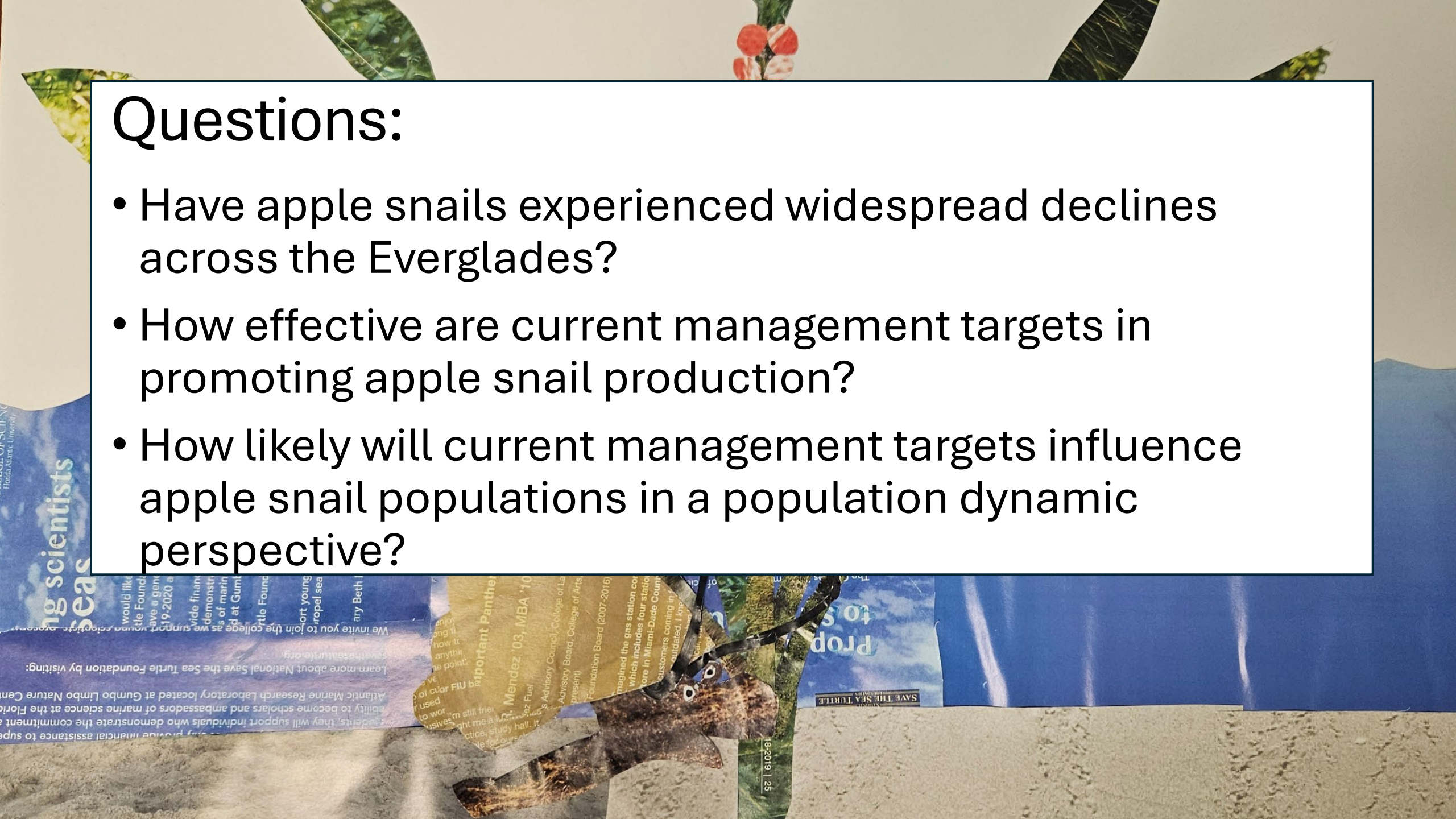
rom

maximize egg laying.

(Darby et al., 2008, Barrus et al., 2023)

Questions:

- Have apple snails experienced widespread declines across the Everglades?
- How effective are current management targets in promoting apple snail production?
- How likely will current management targets influence apple snail populations in a population dynamic perspective?

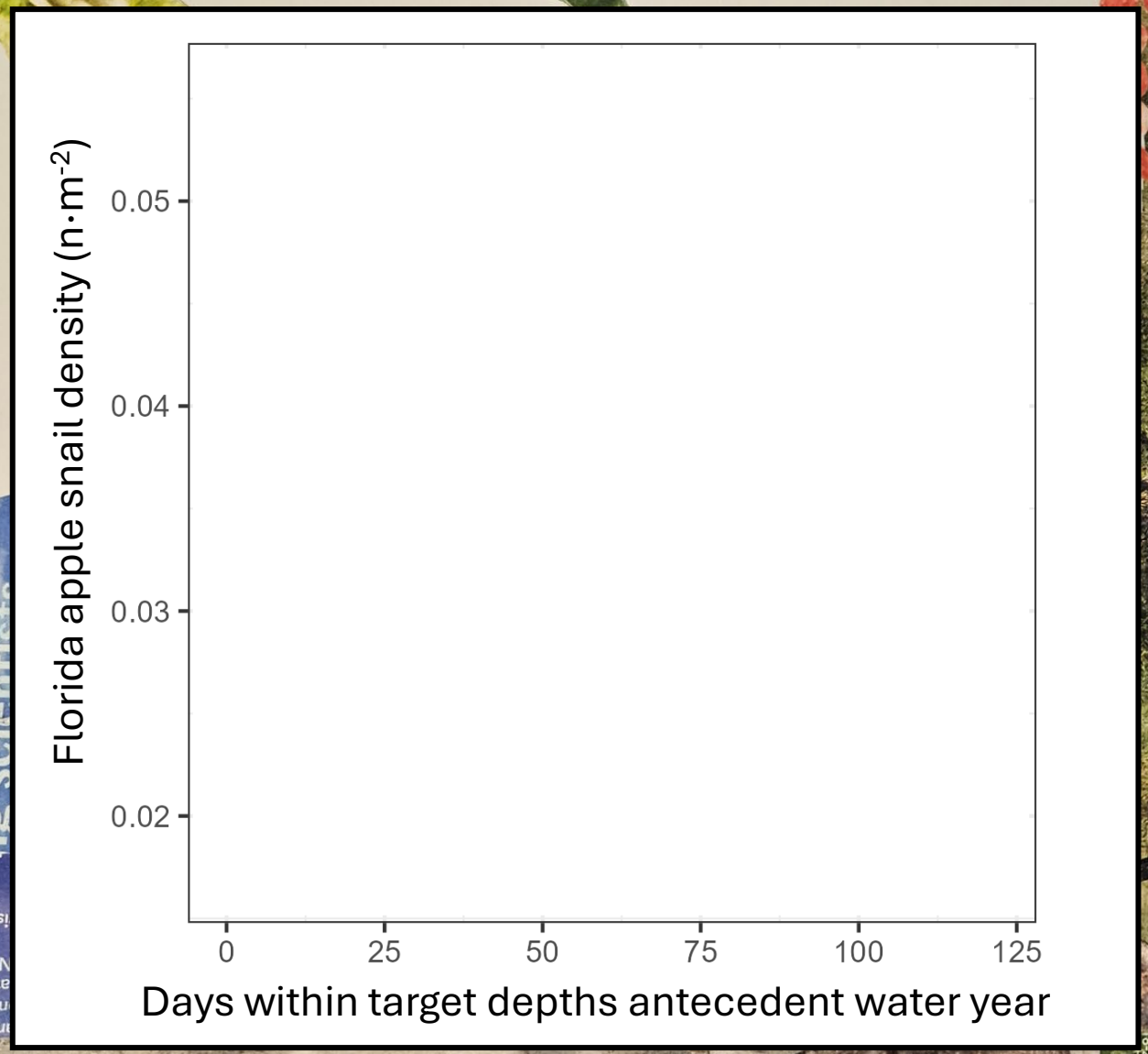


Using modified water delivery monitoring (MWD) for apple snail trends

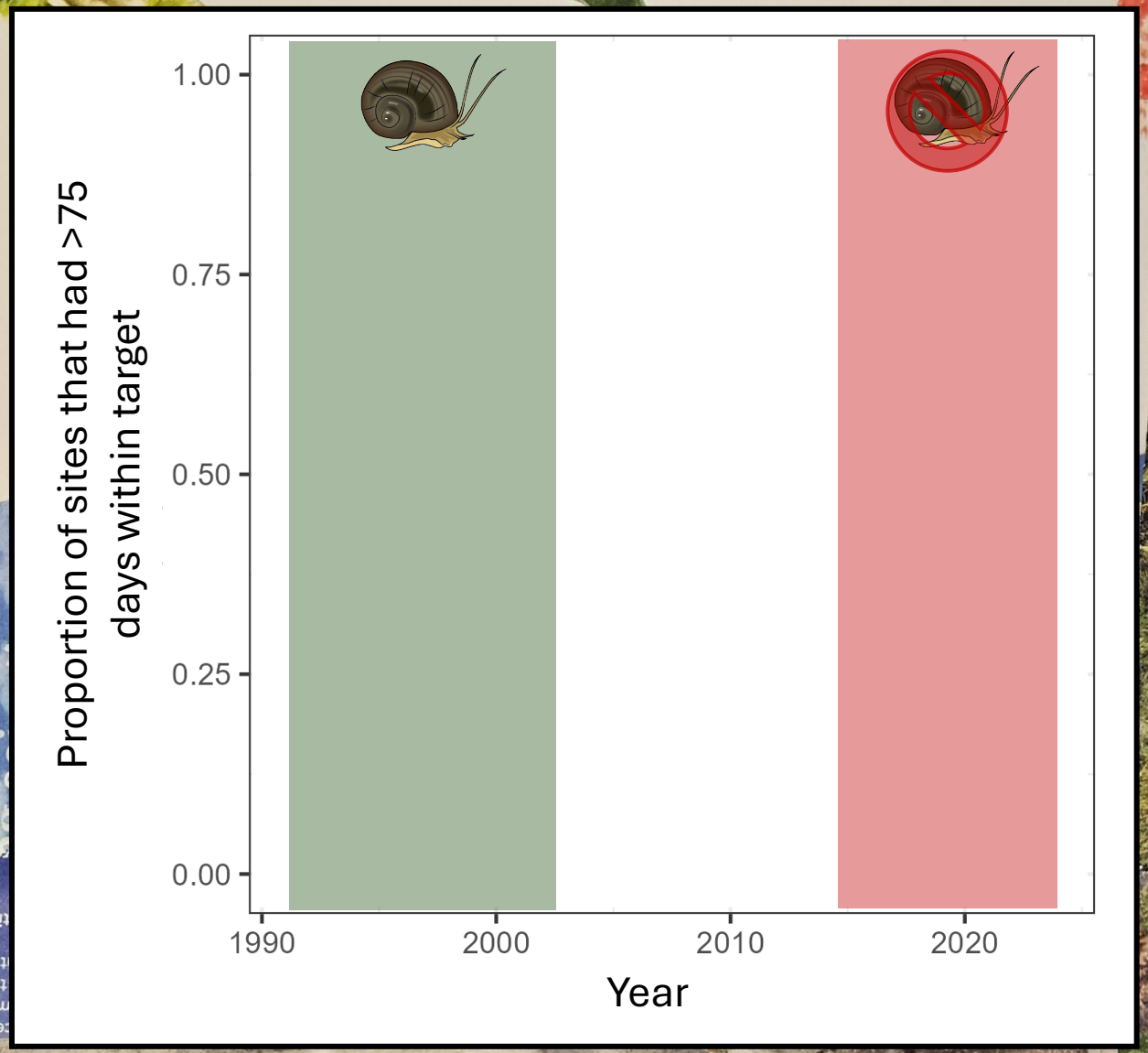
5 times a year

The only systematic dataset that tracks apple snail abundance during kite nesting declines and it spans three regions within the kites southern range!

Widespread declines in apple snail abundance in WCA3, Shark River Slough, and Taylor Slough.



The numbers of days within target depths is positively related to apple snail densities until ~75 days.



Apple snail densities remain low despite increases in the number of sites reaching 75 days within depth target.

Questions:

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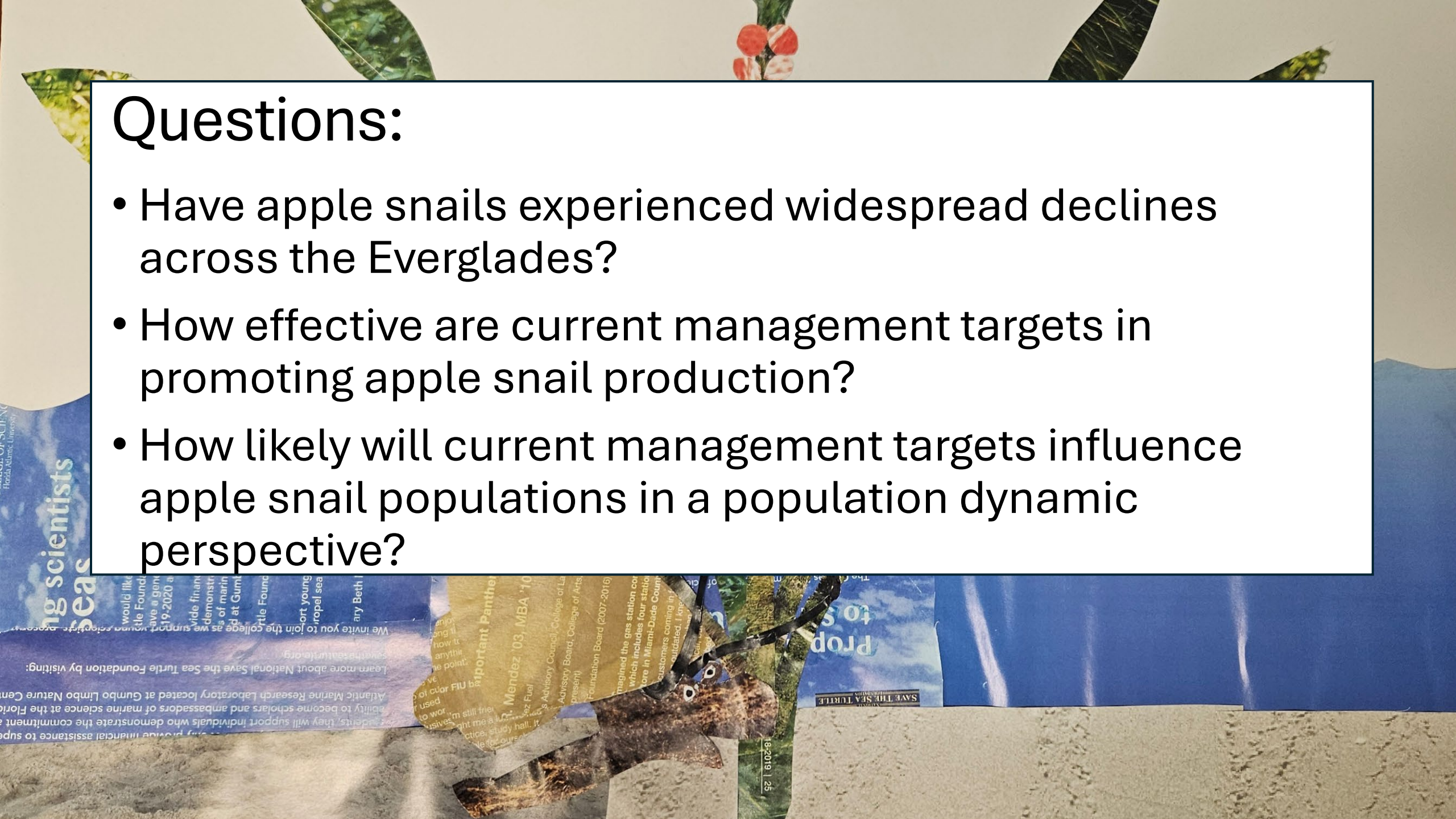
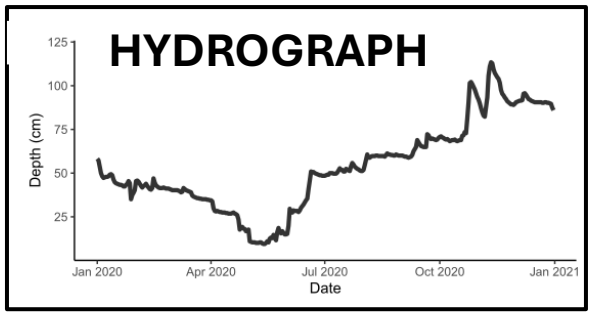


Eversnail

Survival rate (3-10 mm SL)

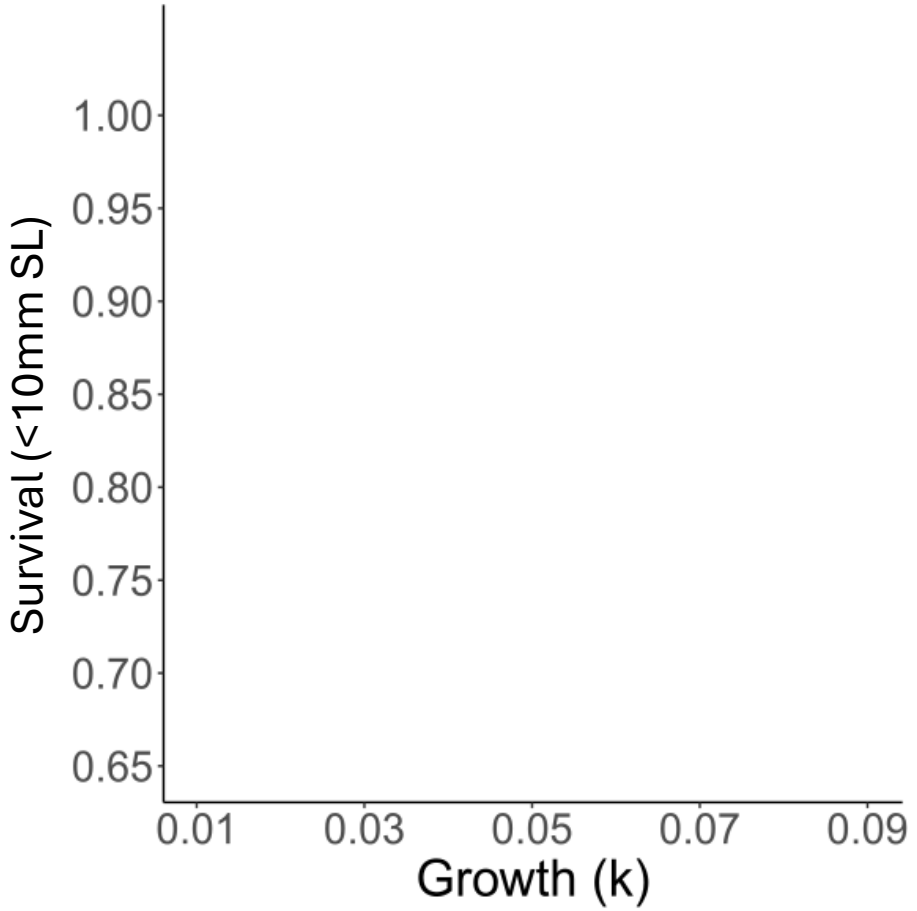
Growth rate (k)



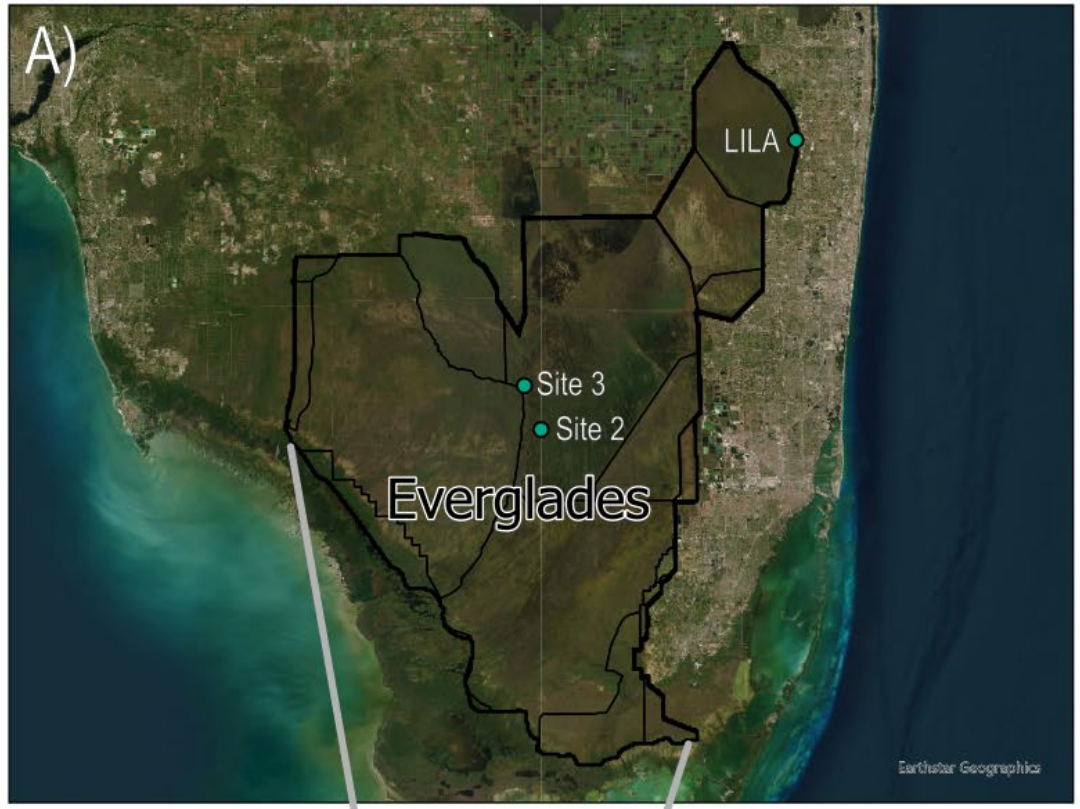
$$A = \begin{vmatrix} n_1 \\ n_2 \\ n_3 \\ . \\ n_i \\ n_{i+1} \\ n_{i+2} \\ . \\ n_{499} \\ n_{500} \end{vmatrix} \begin{vmatrix} 0 & 0 & 0 & . & f_i & f_{i+1} & f_{i+2} & . & f_{499} & f_{500} \\ a_{12} & 0 & 0 & . & 0 & 0 & 0 & . & 0 & 0 \\ 0 & a_{23} & 0 & . & 0 & 0 & 0 & . & 0 & 0 \\ . & . & . & . & . & . & . & . & . & . \\ 0 & 0 & 0 & . & 0 & 0 & 0 & . & 0 & 0 \\ 0 & 0 & 0 & . & a_{i,i+1} & 0 & 0 & . & 0 & 0 \\ 0 & 0 & 0 & . & 0 & a_{i+1,i+2} & 0 & . & 0 & 0 \\ . & . & . & . & . & . & . & . & . & . \\ 0 & 0 & 0 & . & 0 & 0 & 0 & . & 0 & 0 \\ 0 & 0 & 0 & . & 0 & 0 & 0 & . & a_{499,500} & 0 \end{vmatrix}$$

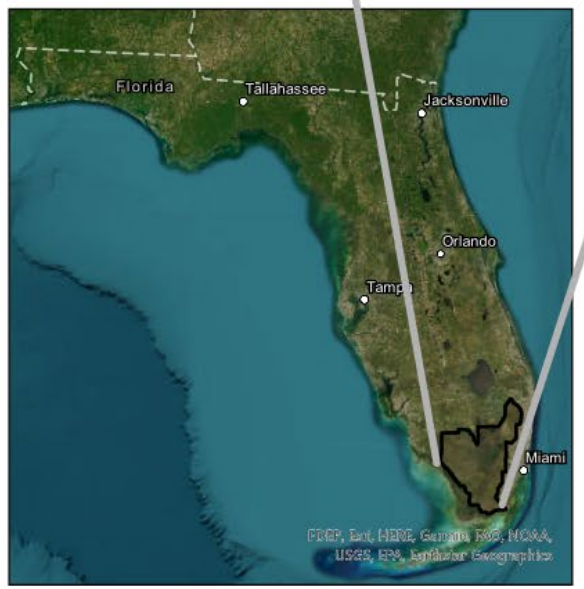
Darby et al. 2015

Isocline Analysis



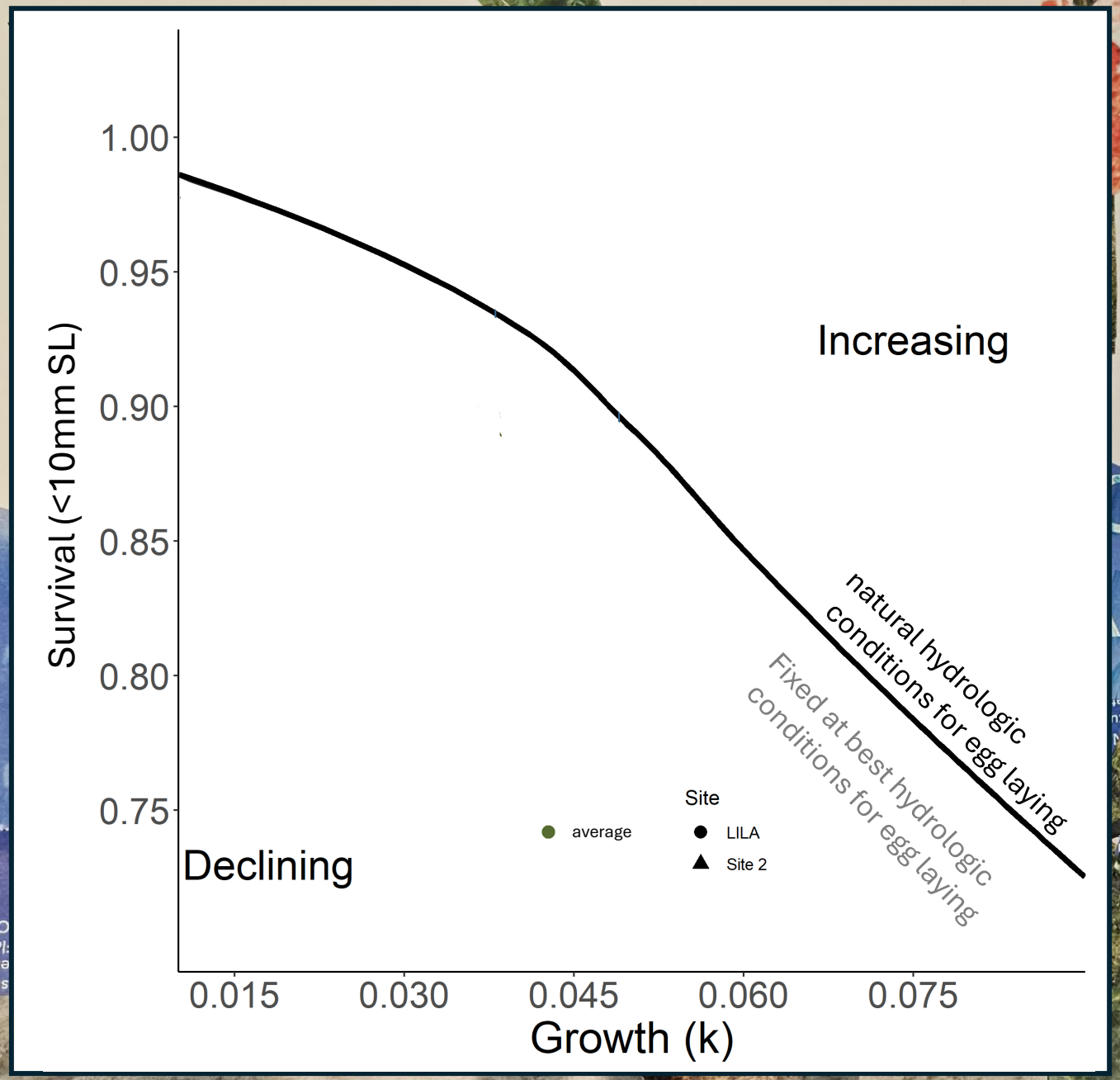
Barrus et al. in review





Legend

- Sites
- Everglades



Apple snails can at best maintain population sizes when holding hydrology at ideal depths for egg laying

Barrus et al. in review

Summary, Implications, and next steps.

- Florida apple snails have declined system wide, and may have been extirpated from portions of the Everglades.
- Hitting 75 days within depth targets does benefit snails, but apple snails have not rebounded despite hitting 75 days within the depth target more frequently across sites
- Population dynamics suggest that hydrologic management focused on egg laying will minutely affect apple snail production.


Questions?
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