A conservation genetic assessment of the Florida snail kite

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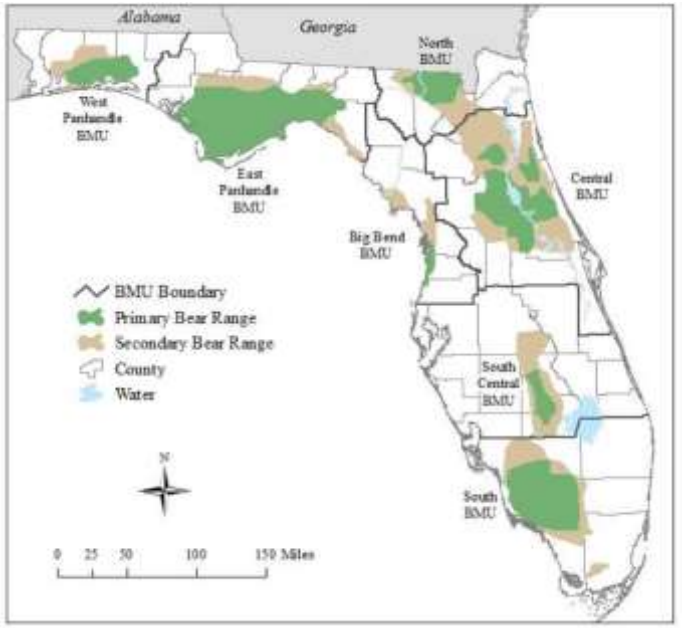
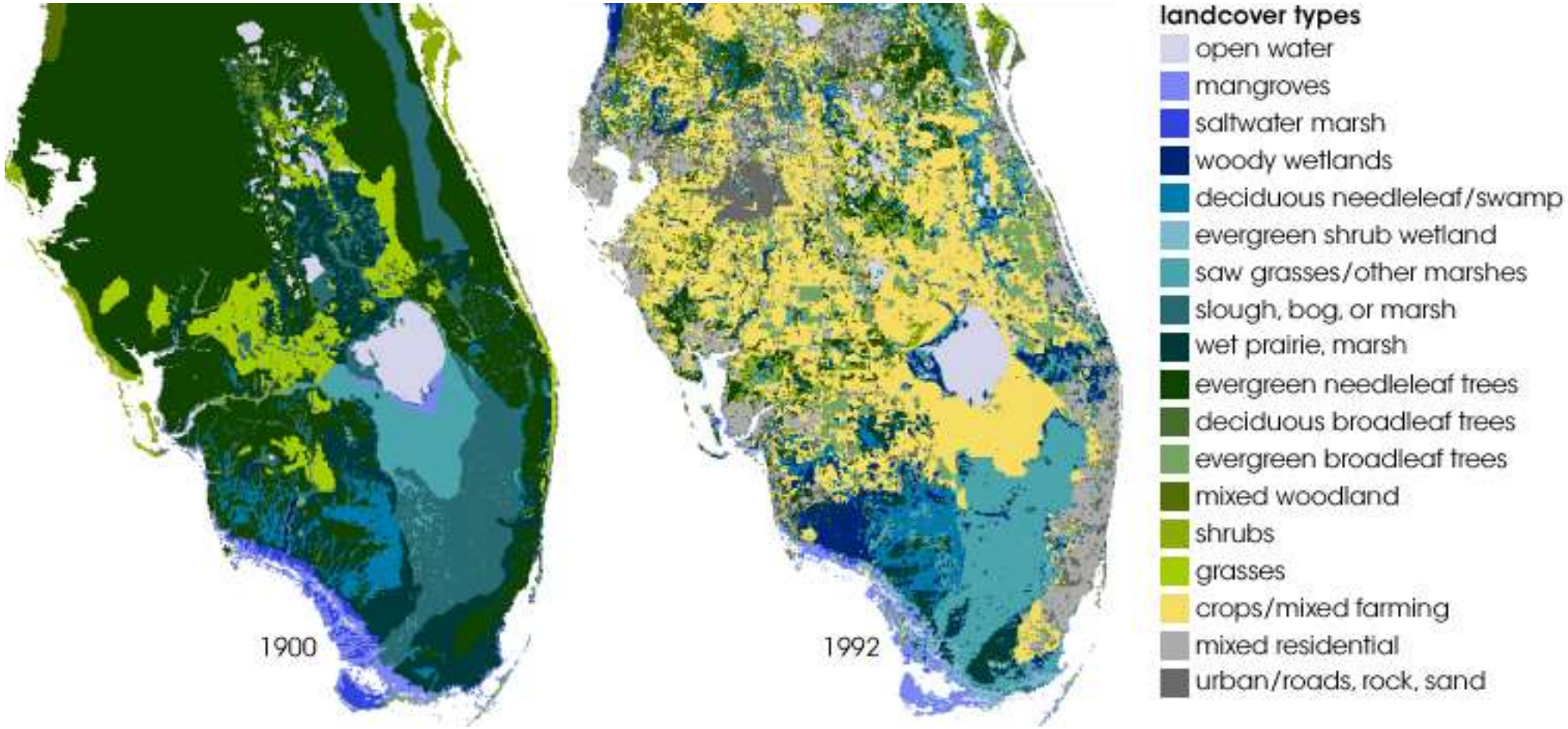
Conservation genetics

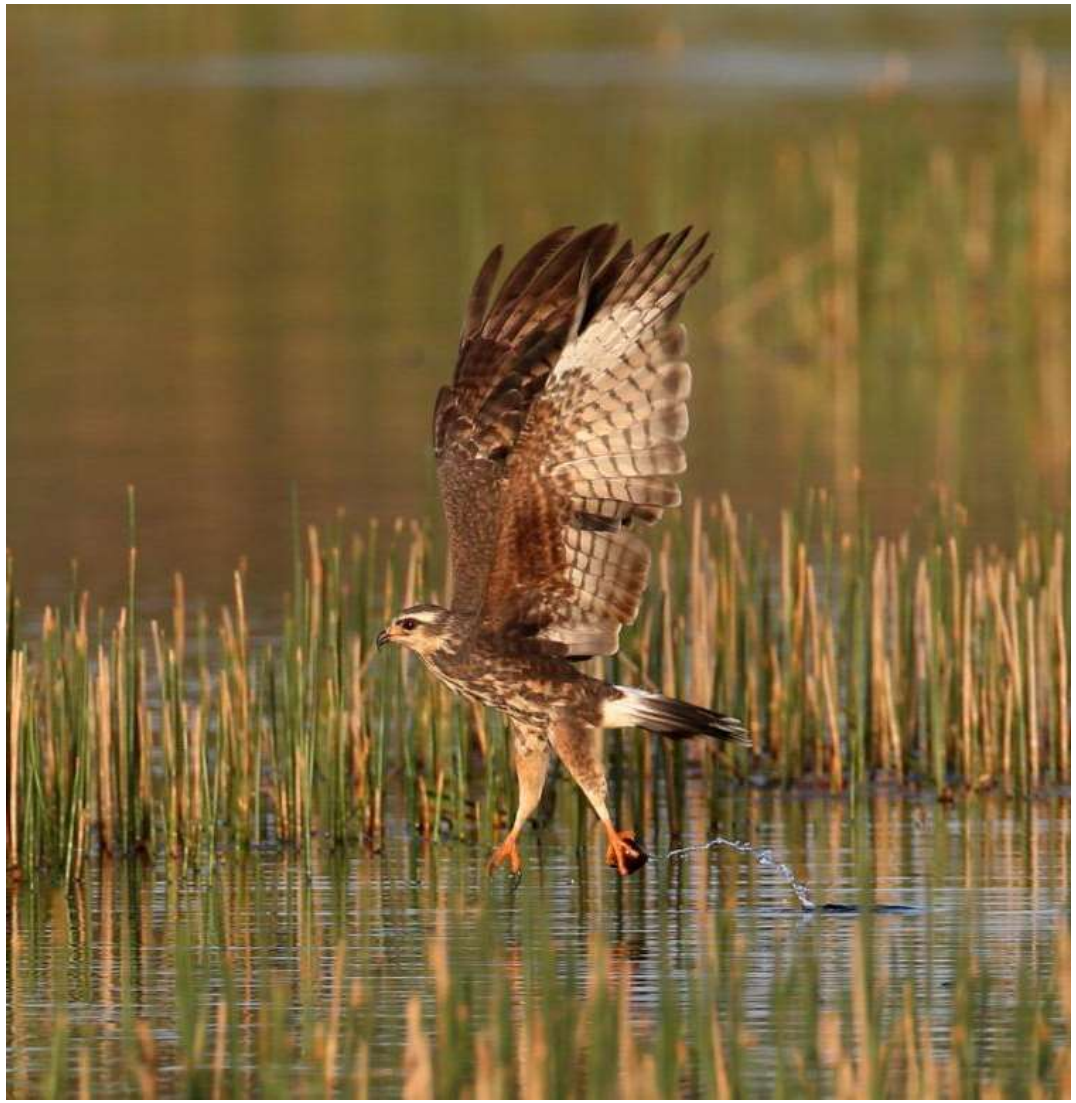
- Genetic structure
  - delineating management units
- Genetic diversity
  - indicator for potential genetic problems
    - inbreeding
    - reduced evolutionary potential

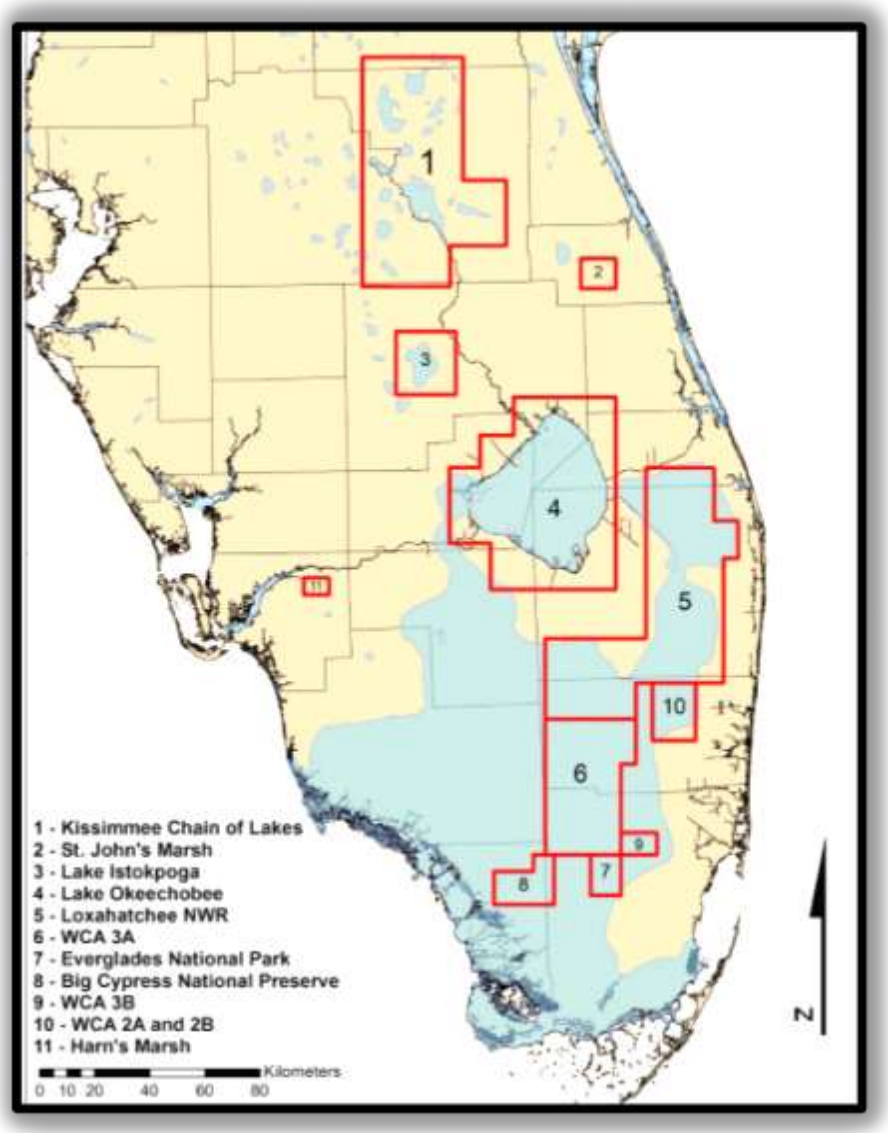


Florida: potential for genetic changes:



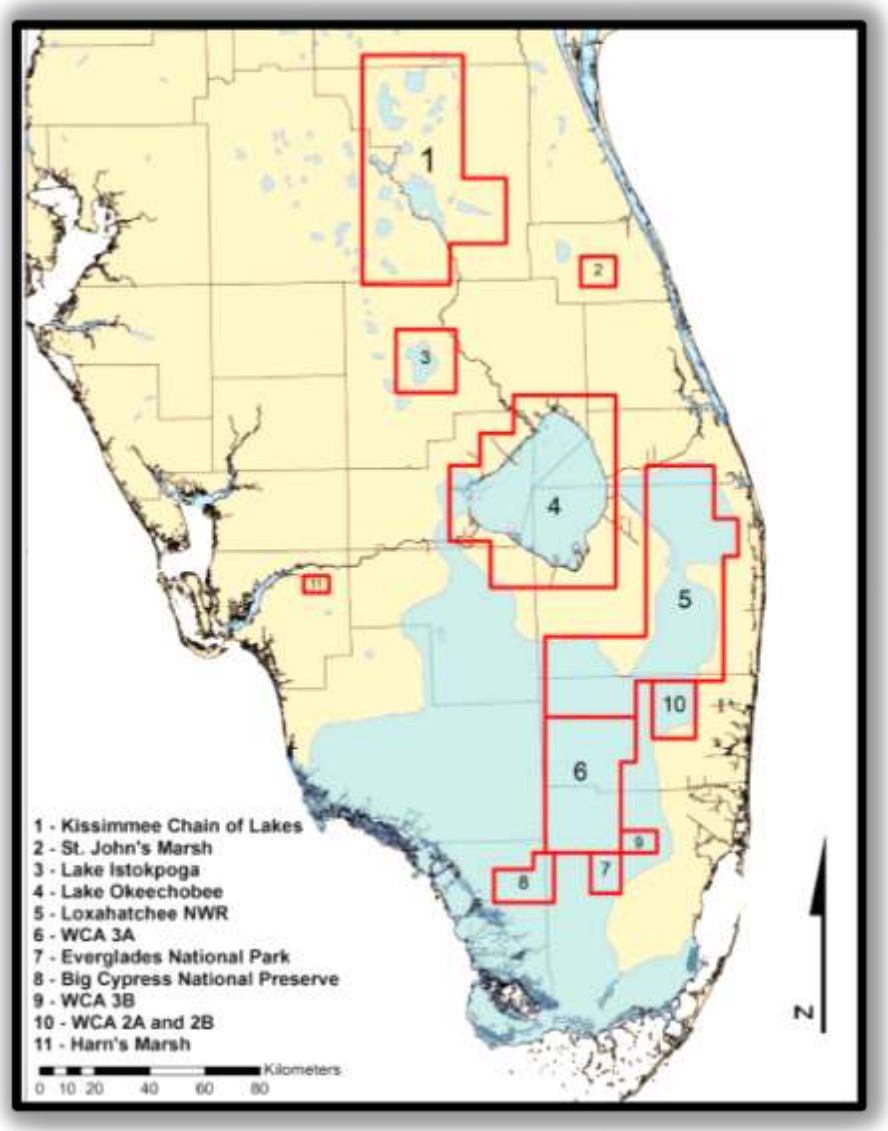
Snail kites (*Rostrhamus sociabilis plumbeus*)



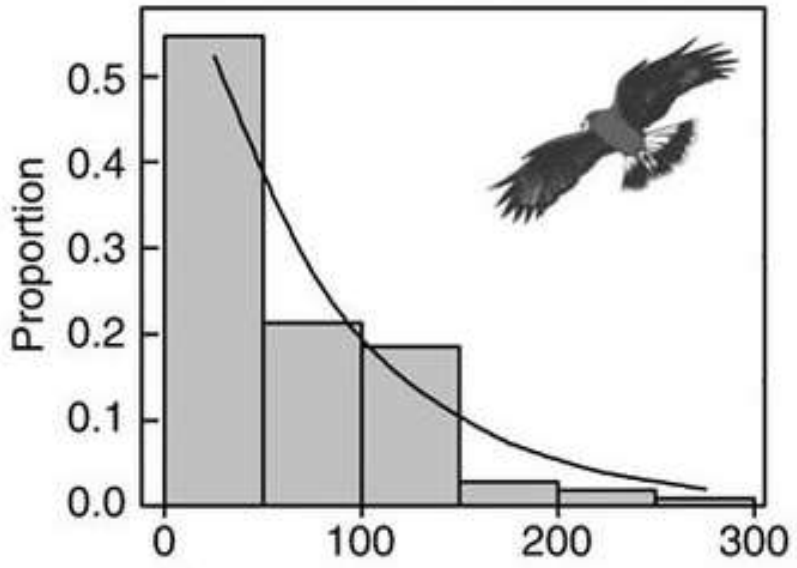


The monitoring program

Standardized mark-resight surveys and nest finding across the geographic range

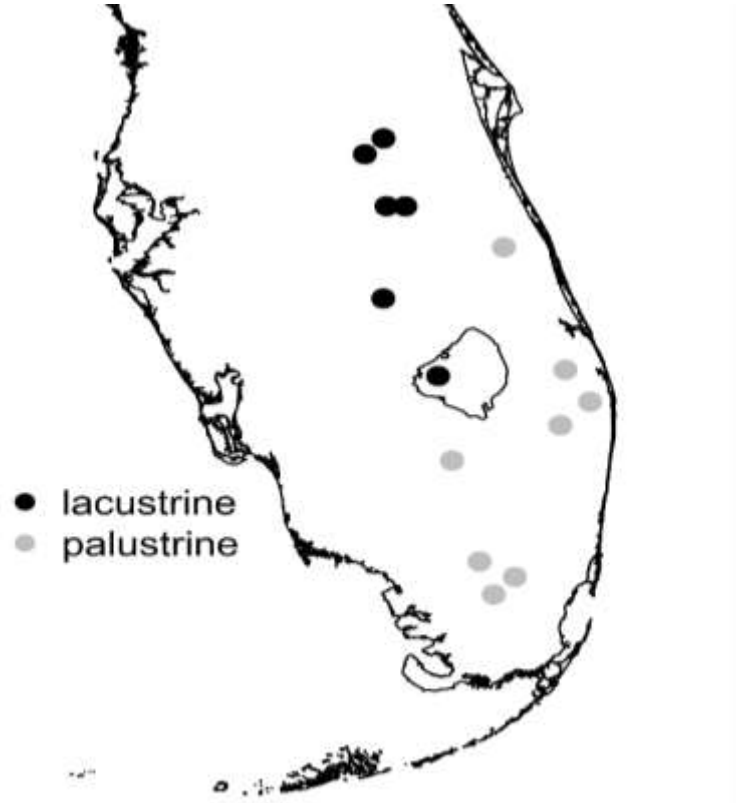


Movements are fairly frequent and widespread but still potentially structured



Histogram of movements

Fletcher et al. 2013



Fletcher *et al.* 2015

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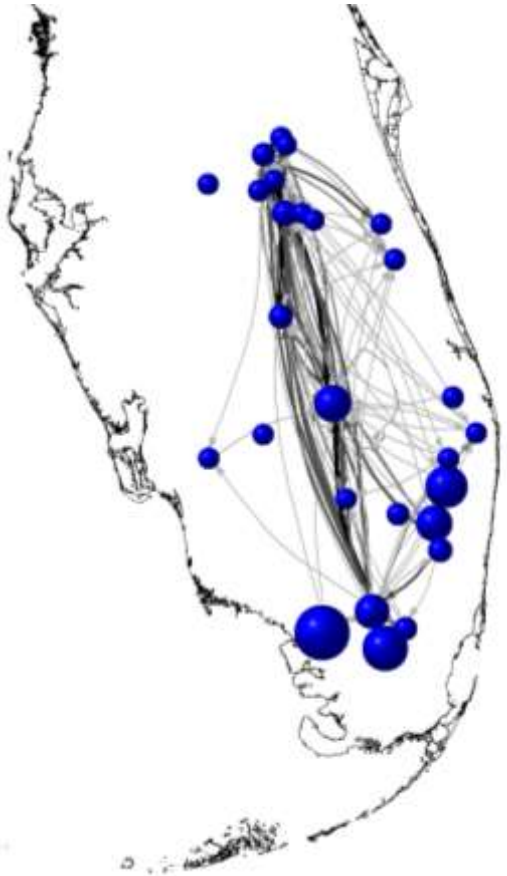
Movement



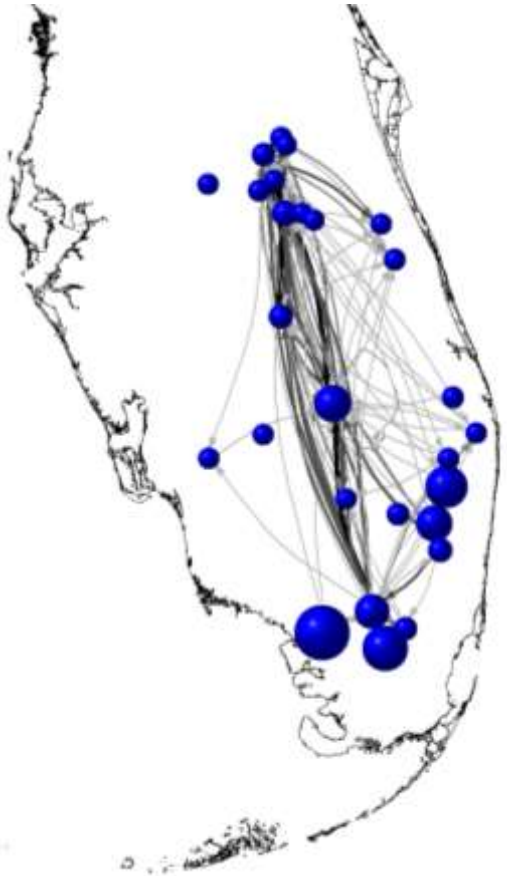
dispersal + successful reproduction

Effective dispersal:

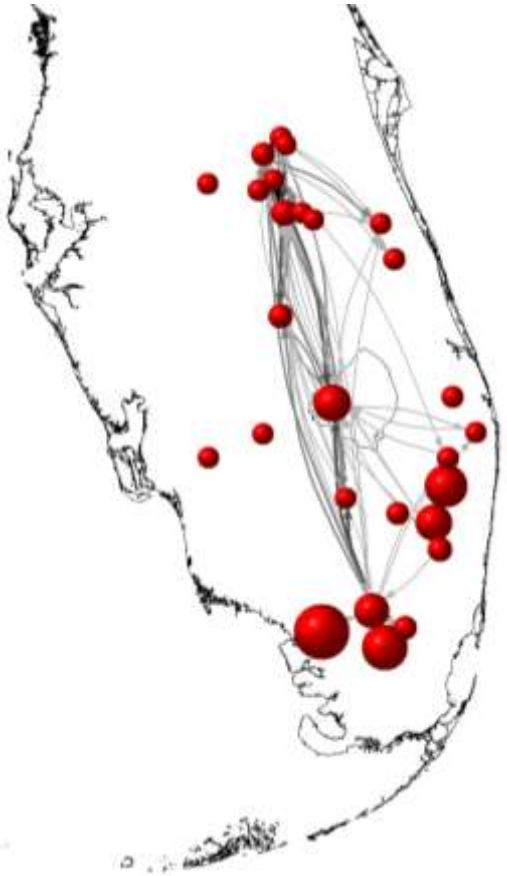
dispersal + successful reproduction

Reproduction following movement is less frequent and less widespread

Movement



Movement + Nesting Attempt (dispersal)



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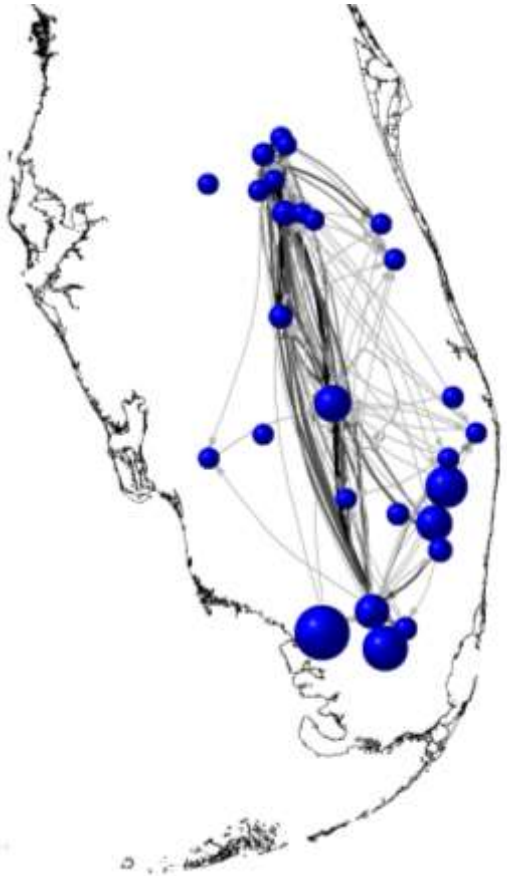

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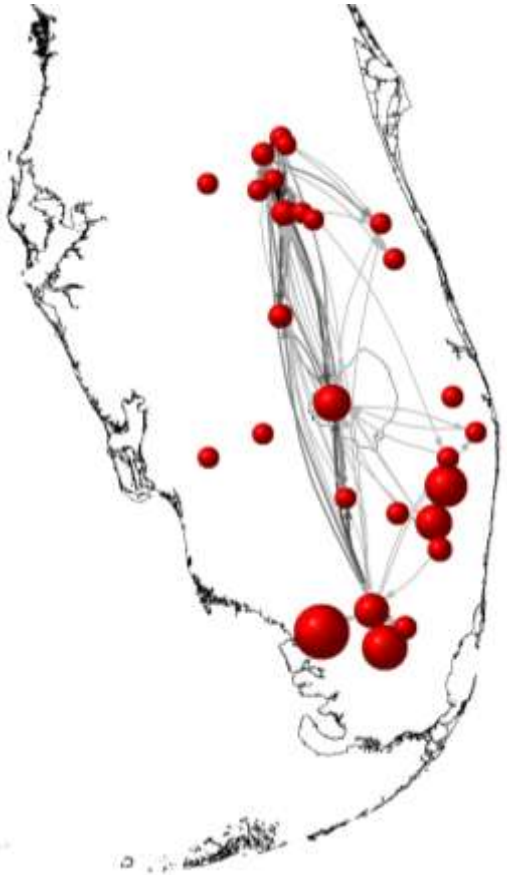
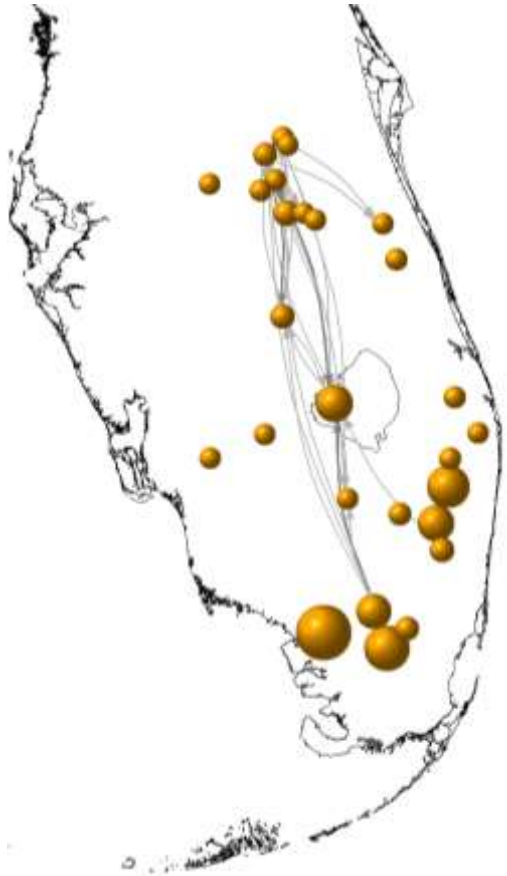


Movement + Successful Nesting (effective dispersal)

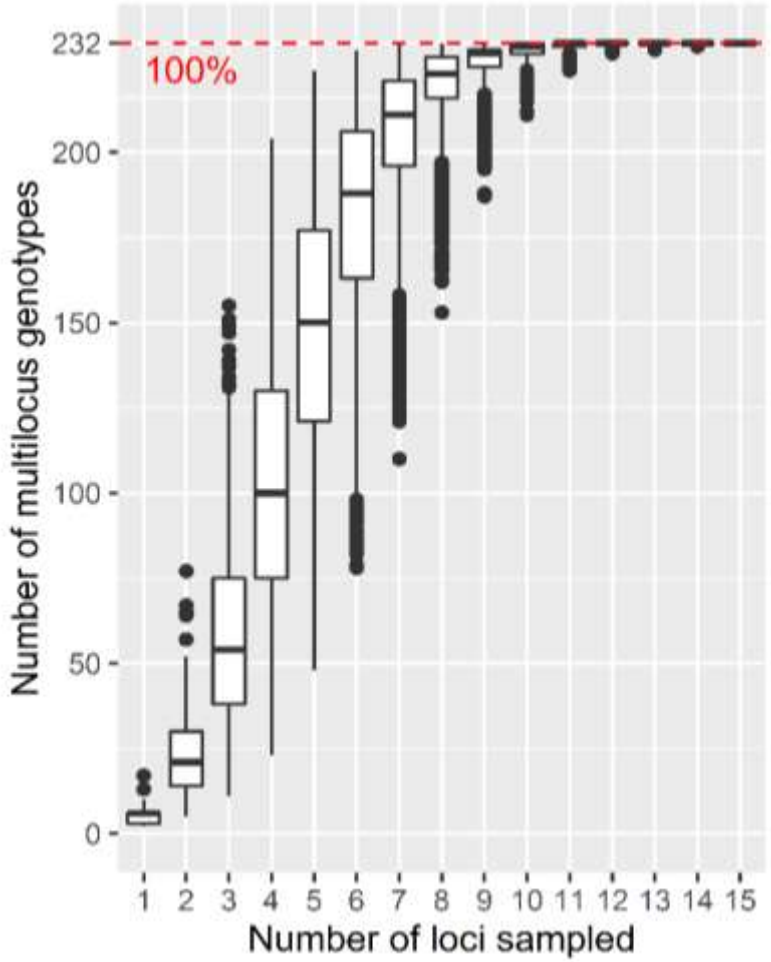


Is there genetic structure in Florida snail kites?

- Developed microsatellite markers:
  - 235 feather samples (from nestlings)
  - 2013 (N = 114) and 2014 (N = 121)
  - 14 wetlands across the breeding range

15 microsatellite markers

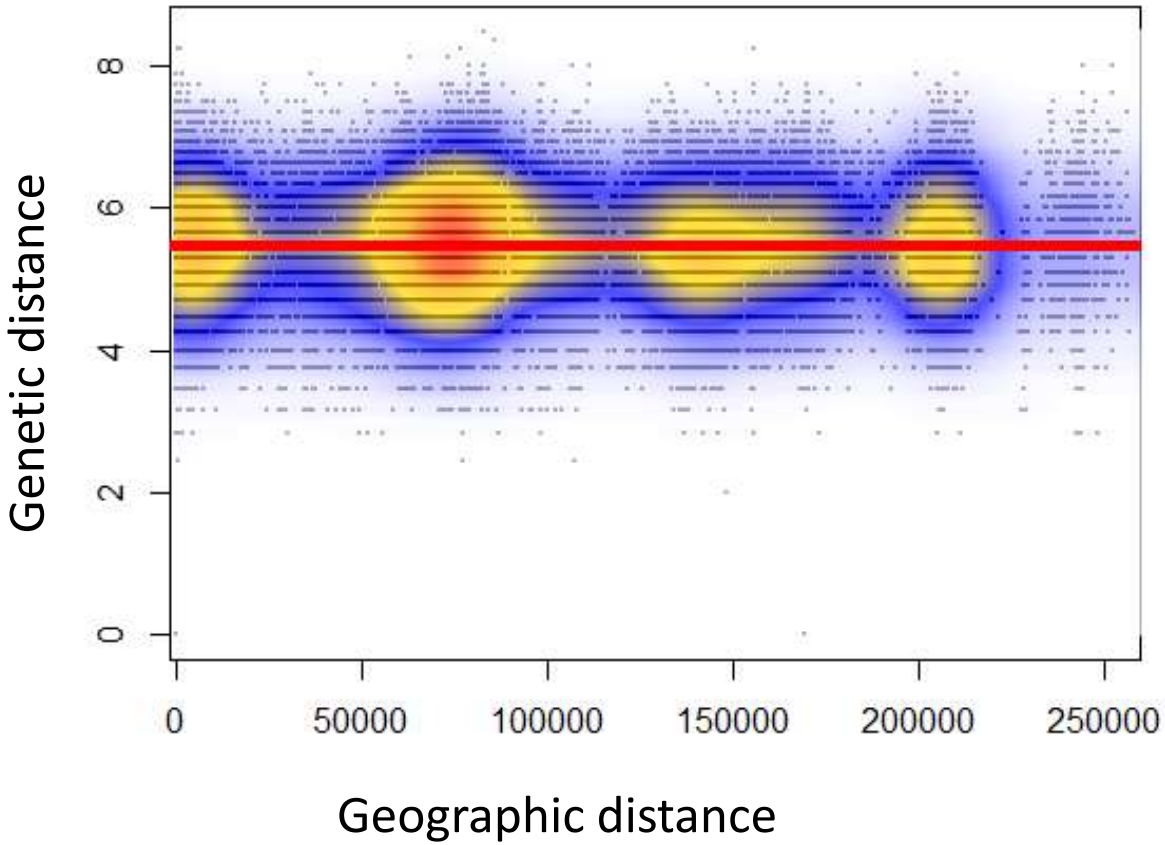
- HWE
- Linkage equilibrium
- Checked for null alleles, allelic dropout
- Genotyping error
  - Repeated PCR and genotyping on 19% of samples



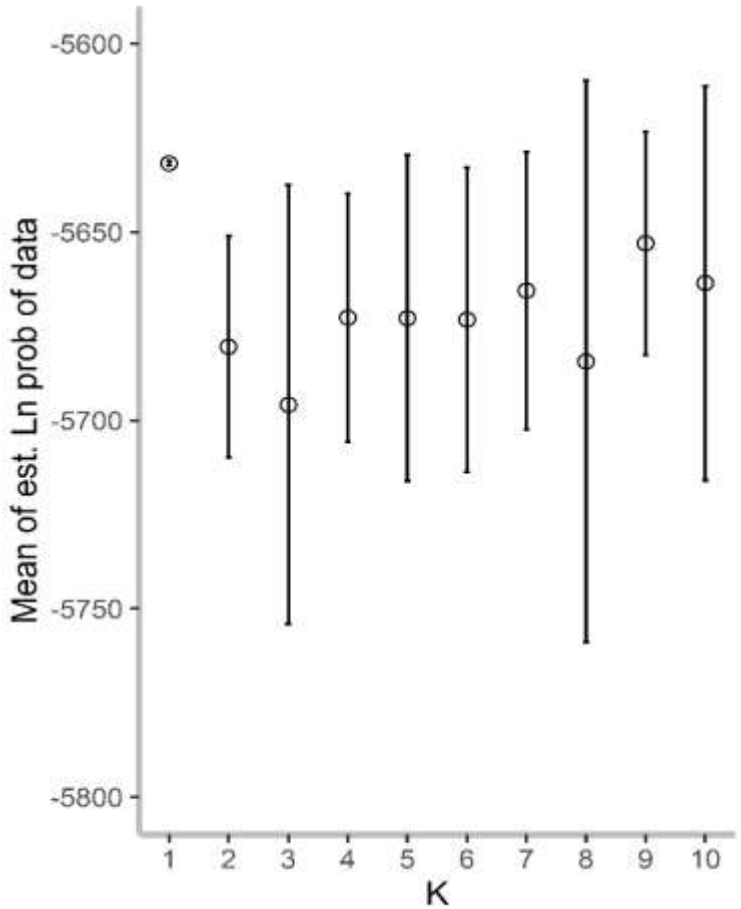
Spatial analyses:

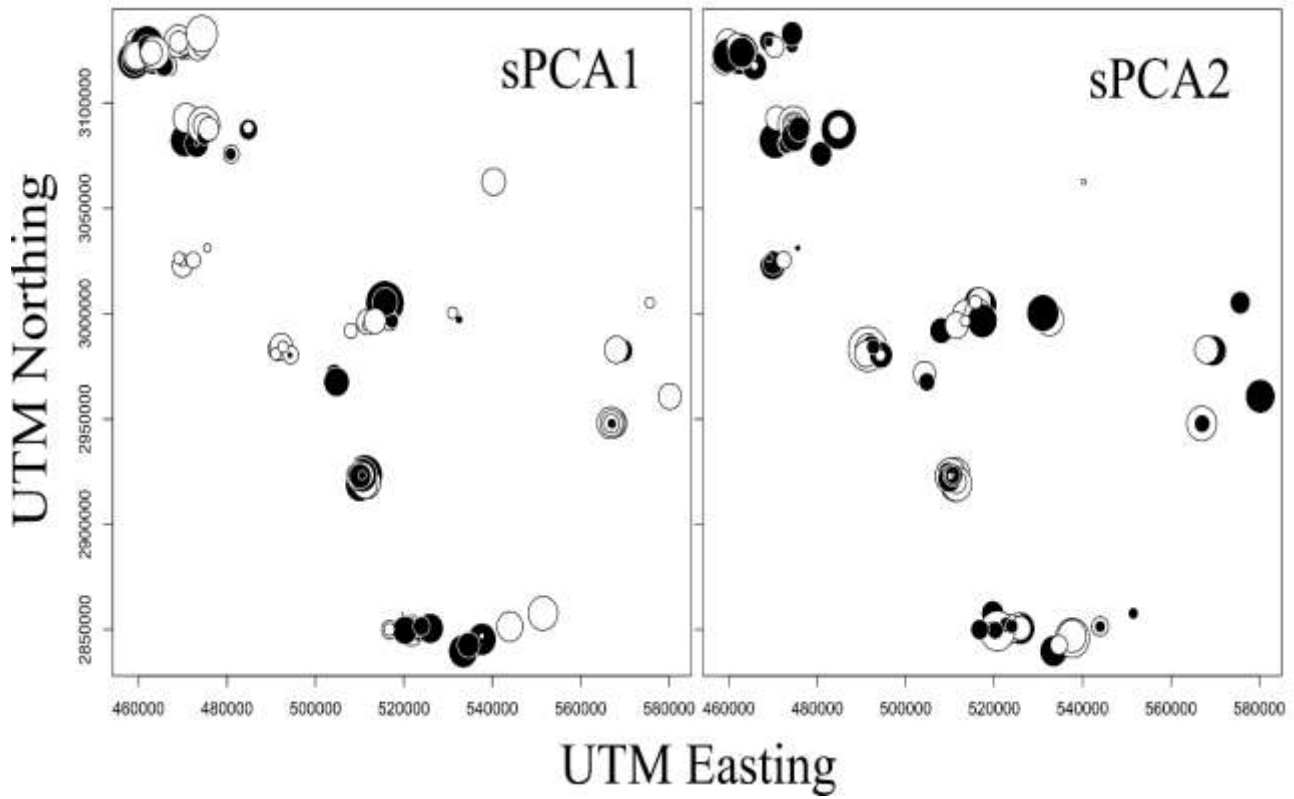
- Isolation by distance
  - Mantel test
- Structure
  - Program Structure
  - Geneland
    - spatial coordinates as a prior
  - Ordination
    - Spatial Principal Component Analysis (sPCA)
    - Memgene
  - Spatial autocorrelation

No evidence for genetic isolation by distance



No evidence for genetic structure

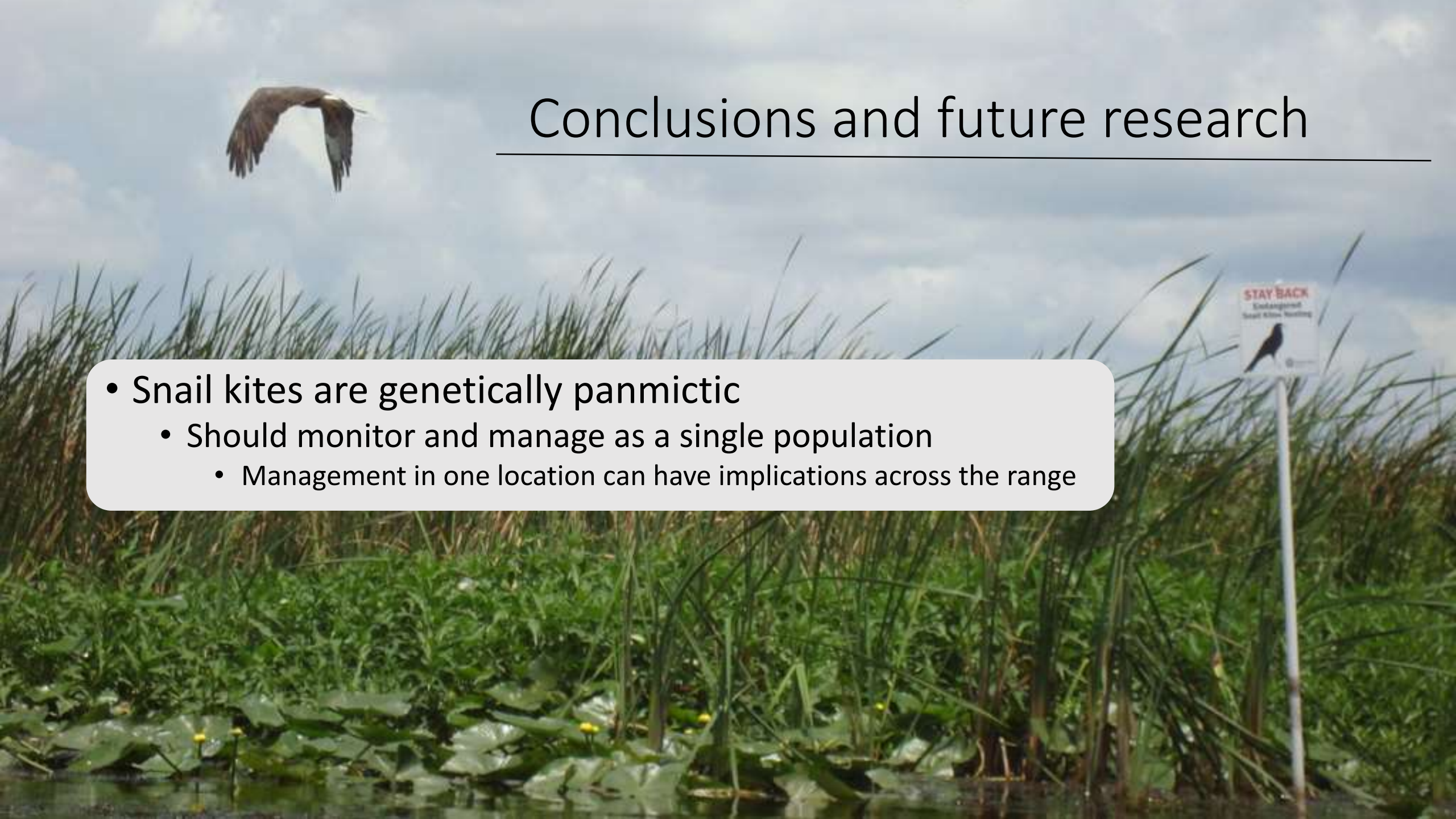




Low genetic diversity relative to other rare raptors

Species	IUCN Status	A	Ar	N (for Ar)	He
snail kites	**least concern**	**2.5**	**2.28-2.61**	**8-60**	**0.37**
northern goshawk	least concern	10.4	NA	NA	0.81
bearded vulture	near threatened	4.3-6.0	NA	NA	0.54-0.68
common kestrel	least concern	4.8-7.8	4.5-5.0	14-28	0.63-0.71
peregrine falcon	least concern	4.25	NA	NA	0.51
Spanish imperial	vulnerable	4.9	4.9	10-20	0.55
Egyptian vultures	endangered	NA	2.4-3.0	143-242	0.44-0.56
golden eagle	least concern	4.62	NA	NA	0.49
mountain hawk-eagle	least concern	3.67	NA	NA	0.56

Conclusions and future research



- Snail kites are genetically panmictic
  - Should monitor and manage as a single population
    - Management in one location can have implications across the range

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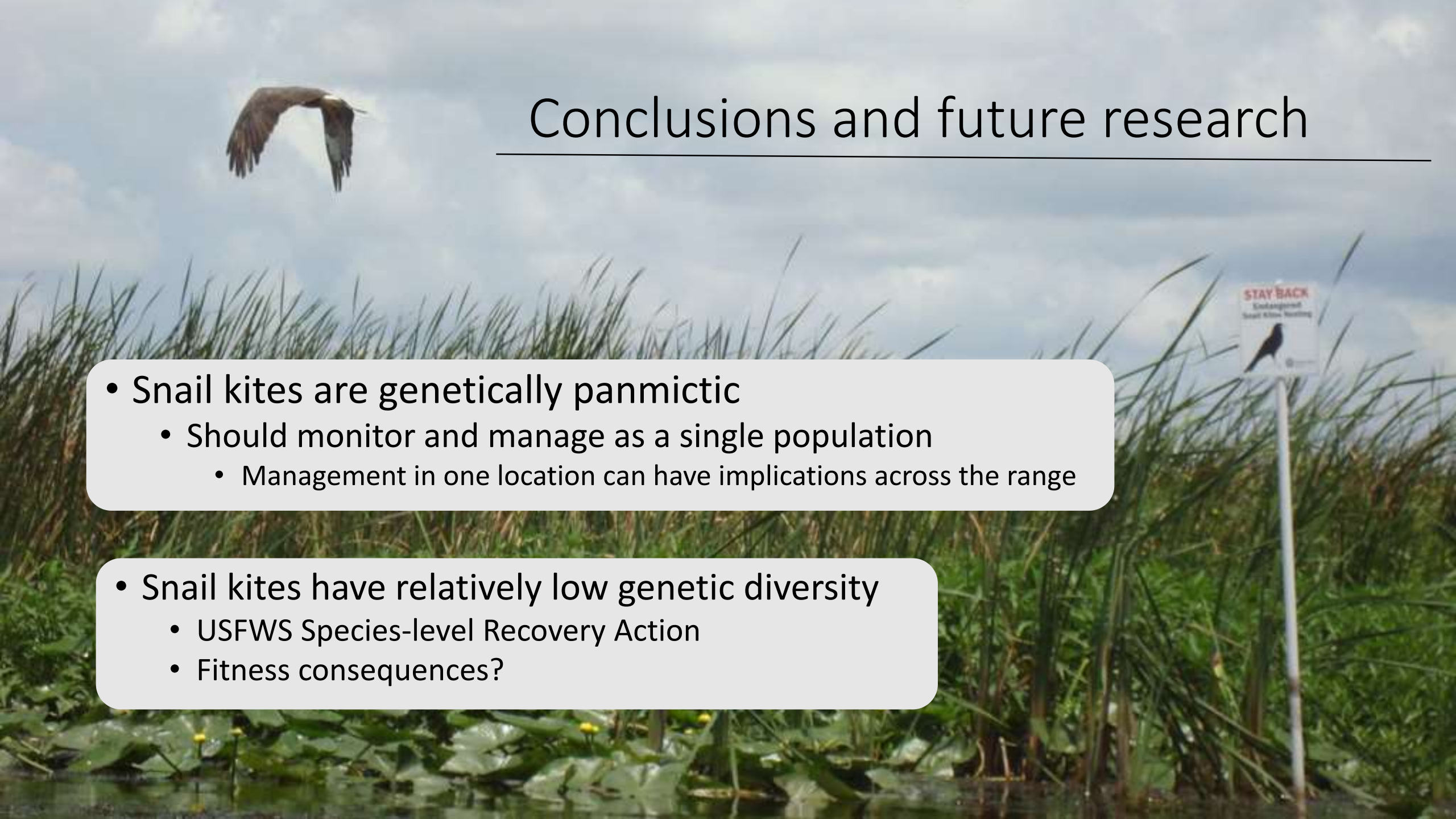

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  - Should monitor and manage as a single population
    - Management in one location can have implications across the range

- Snail kites have relatively low genetic diversity
  - USFWS Species-level Recovery Action
  - Fitness consequences?

Acknowledgments

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Why the disconnect between dispersal and genetics?

- These are different metrics:
  - can be time lags (ecological vs evolutionary time scales)
  - only a small amount of dispersal can result in low genetic differentiation

- Genetic structure is also affected by effective population size (N_e) through genetic drift

- Complicated system that is likely not at equilibrium
  - a possible bottleneck in mid-1900s
  - recent range expansion (with exotic snail)

Potential drivers of reduced effective dispersal?