Diamond Y Preserve

Habitat Associations, Abundance, and Distribution of Endangered Aquatic Invertebrates at the Diamond Y Preserve west Texas, USA

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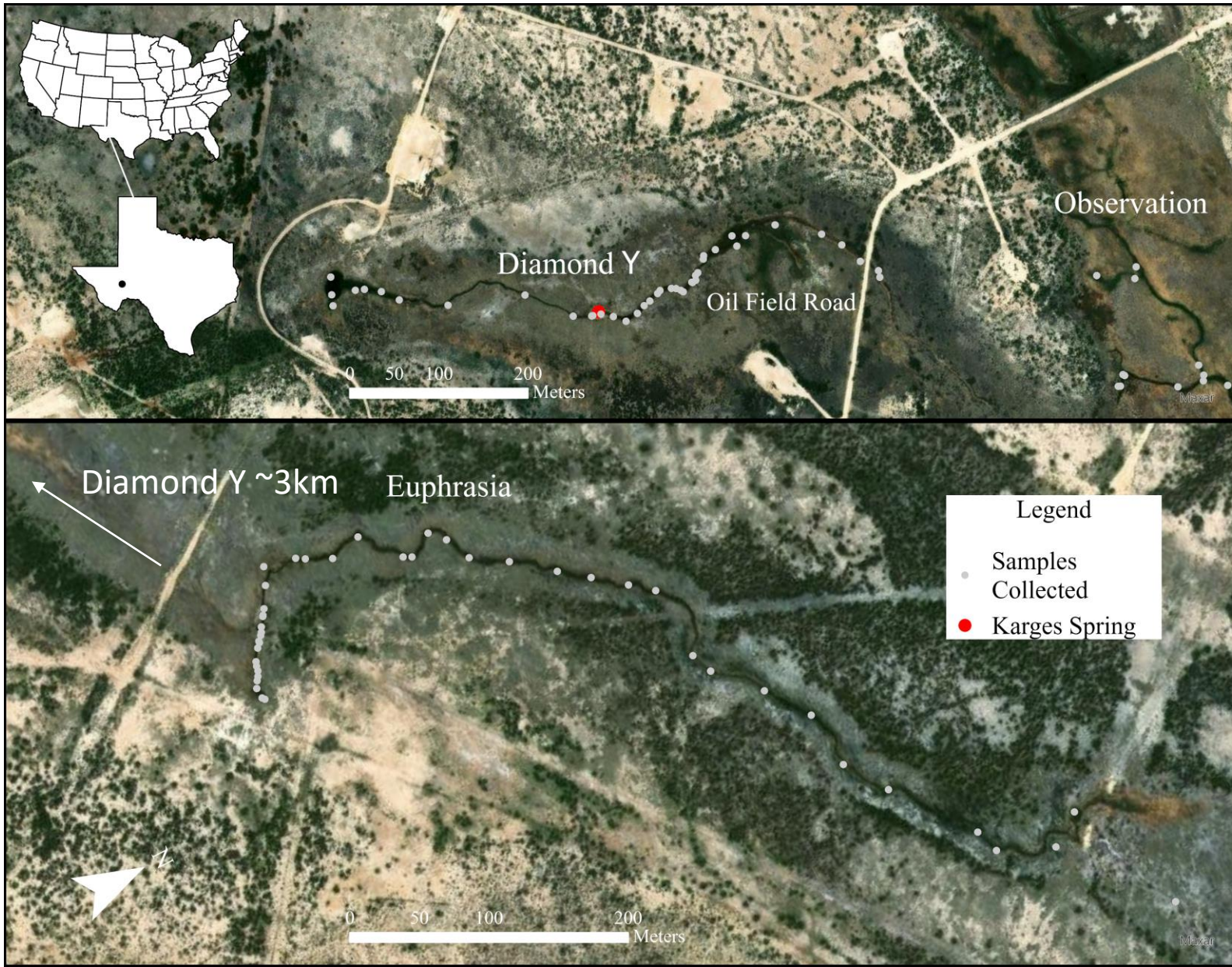
Diamond Y Preserve

- Diamond Y Preserve created in 1991
- Just north of Comanche Spring
- Surrounded by large petroleum infrastructure
- Rediscovery for Leon Spring pupfish
- Pecos sunflower and Pecos assiminea
- Three main spring areas
- Historically divided into upper and lower watercourses
- Few studies on inverts

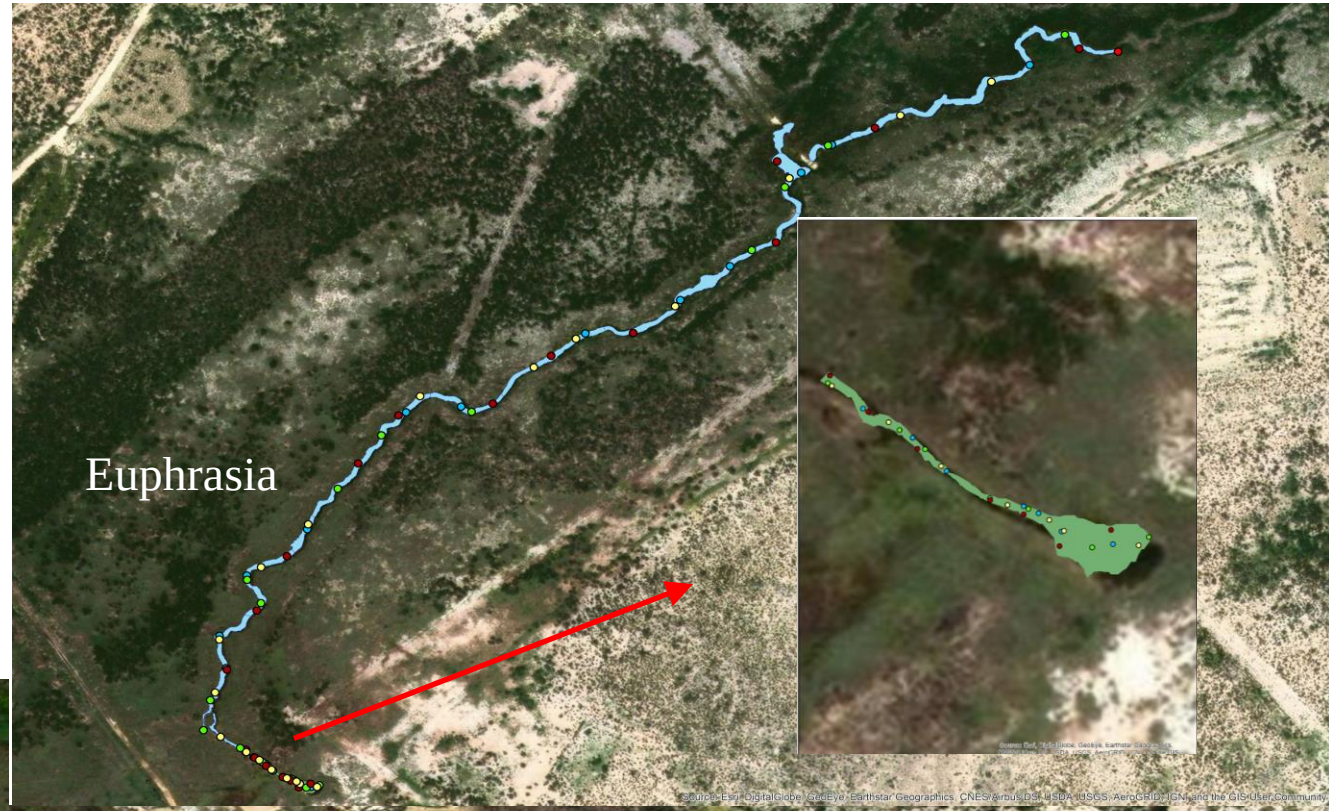


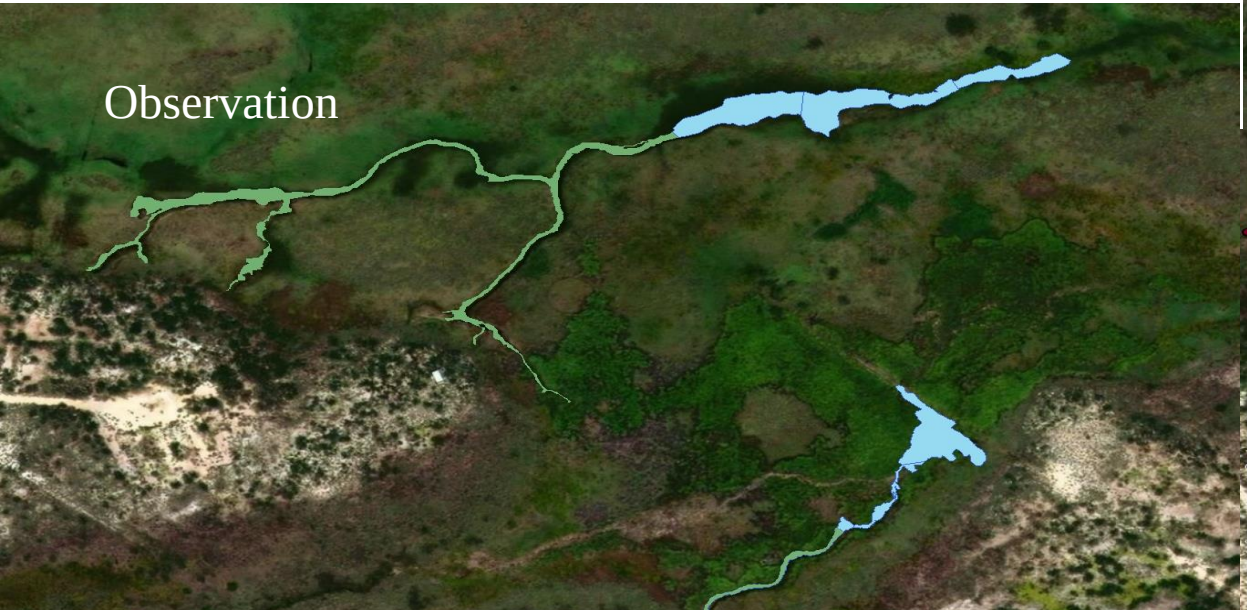
Three Federally Endangered Invertebrates

- All listed in 2013
- *Gammarus pecos (Cole and Bousefield 1970)*
- *Tryonia circumstriata (Leonard & Ho 1960)*
- *Pseudotryonia adamantina (Taylor 1987)*

Methods

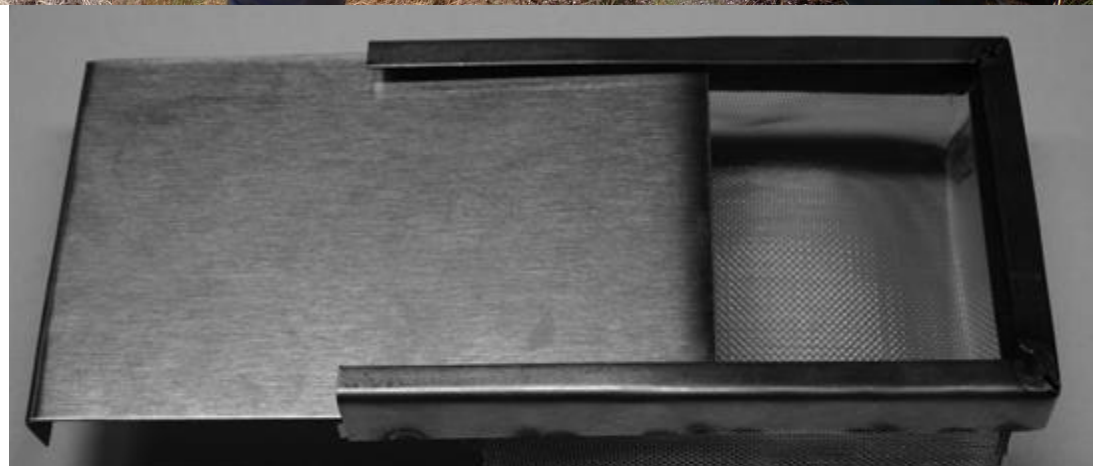
- Diamond Y about 630 m
- Euphrasia about 725 m
- Divided up each spring area into upper and lower sections
- Partitioned effort based on area





Methods

- Samples collected using snail pail (4 in x4 in; Lang)
- Water quality
- Primary substrate
- Vegetation presence and type
- Samples returned to lab
- Larger samples subsampled
- Dissection required for some samples
- Canonical correlation analysis, ANOVA, univariate relationships, abundance estimates by Mean ±(1.96*(StandError/Sqrt(n))).

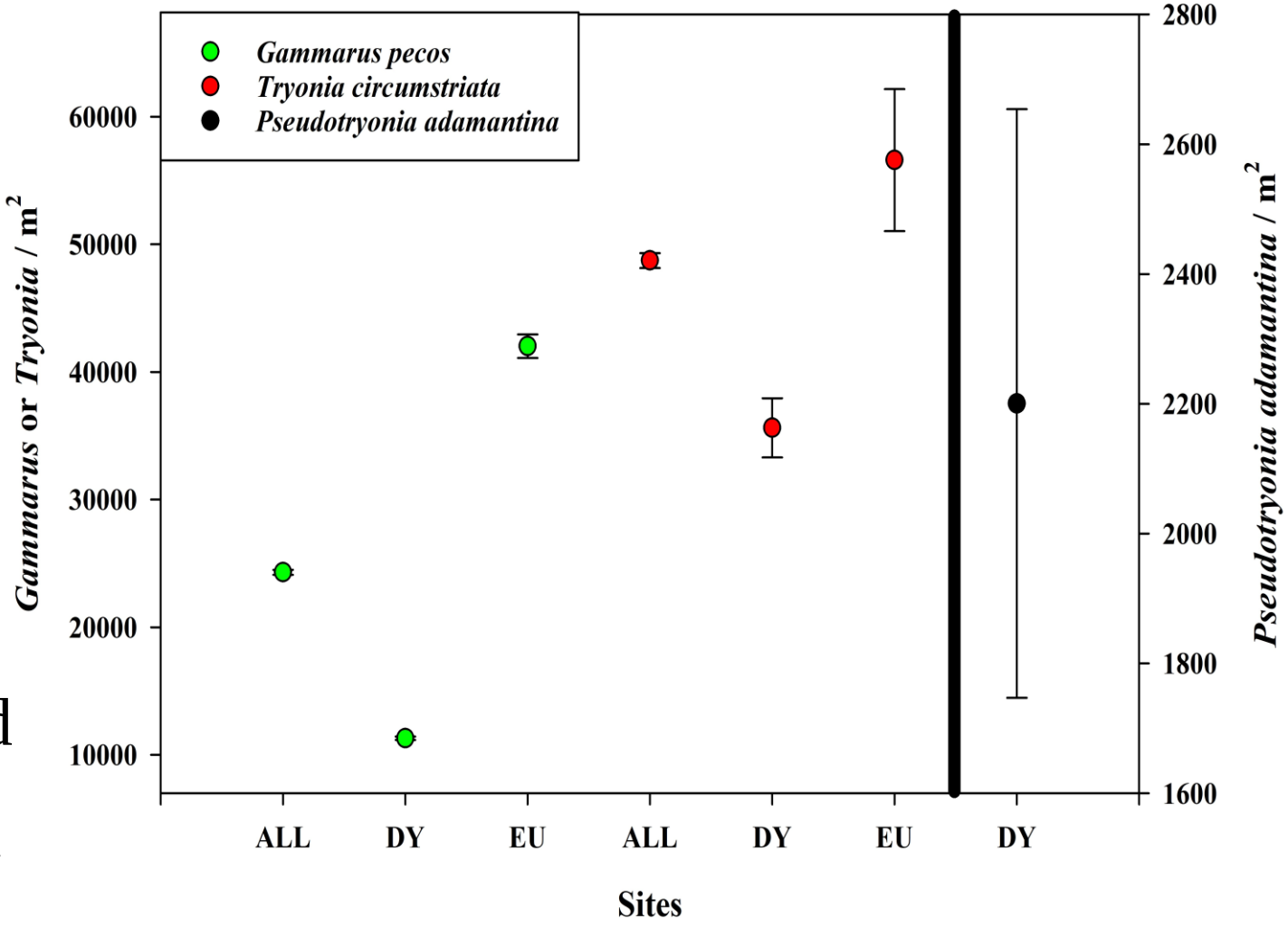


Results DYP

- May, August, and November 2022
- A total of 112 samples for WQ
- A total of 97 for invertebrates
  - Obs = 12; Euphrasia = 44; Diamond Y = 41
- *T. circumstriata* in 36% off all 97
  - DY = 37%; EU = 45% (10,824)
- *P. adamantina* = 17% of DY (108)
- *G. pecos* in 52% of all 97
  - DY = 75%; EU = 47% (9,949)
- *M. tuberculata* = 34% DY

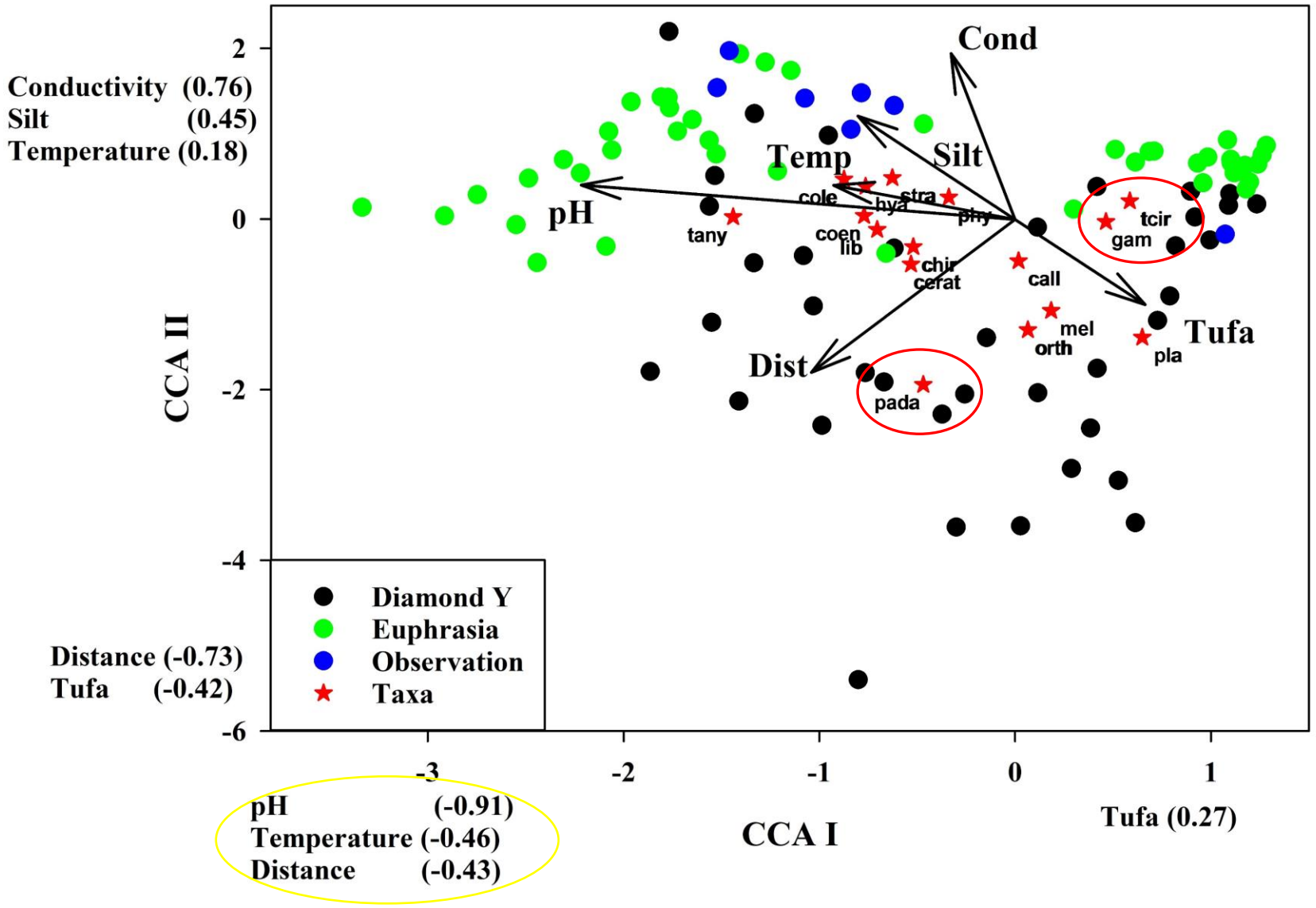
Results DYP – Abundance

- *T. circumstriata*
  - All = 48,727 ind/m^2 ± 586; 32
  - DY = 35,620 ind/m^2 ± 2,317; 12
  - EU = 56,592 ind/m^2 ± 5,564; 20
- *P. adamantina* = 2,200 ± 453; 7
- *G. pecos*
  - All = 24,298 ind/m^2 ± 186; 52
  - DY = 11,303 ind/m^2 ± 125; 30
  - EU = 42,019 ind/m^2 ± 924; 22
- StDev larger for all except Pada and Gpec
- Taylor 1985 ~59,000 ind/m^2 for EU



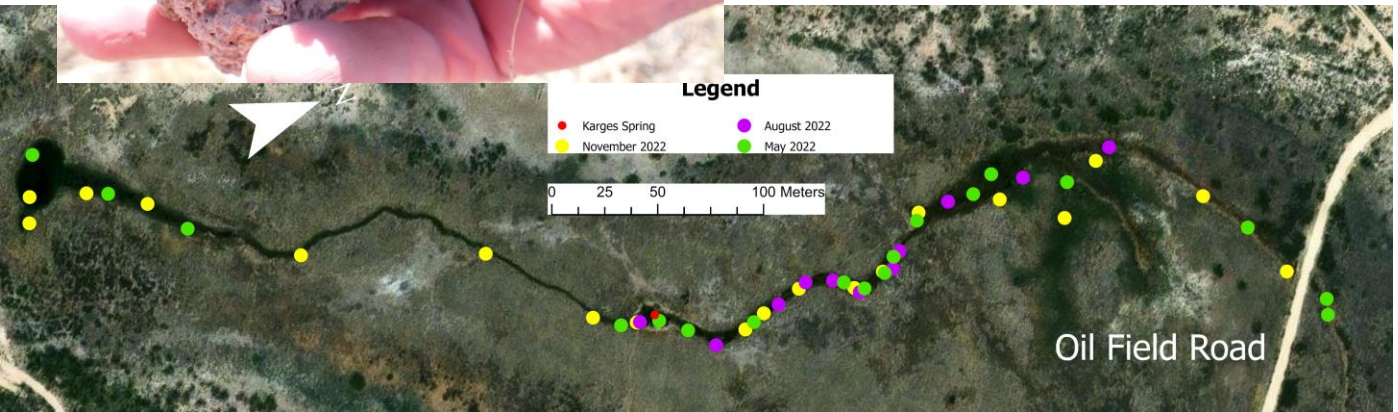
Results DYP – Habitat Associations

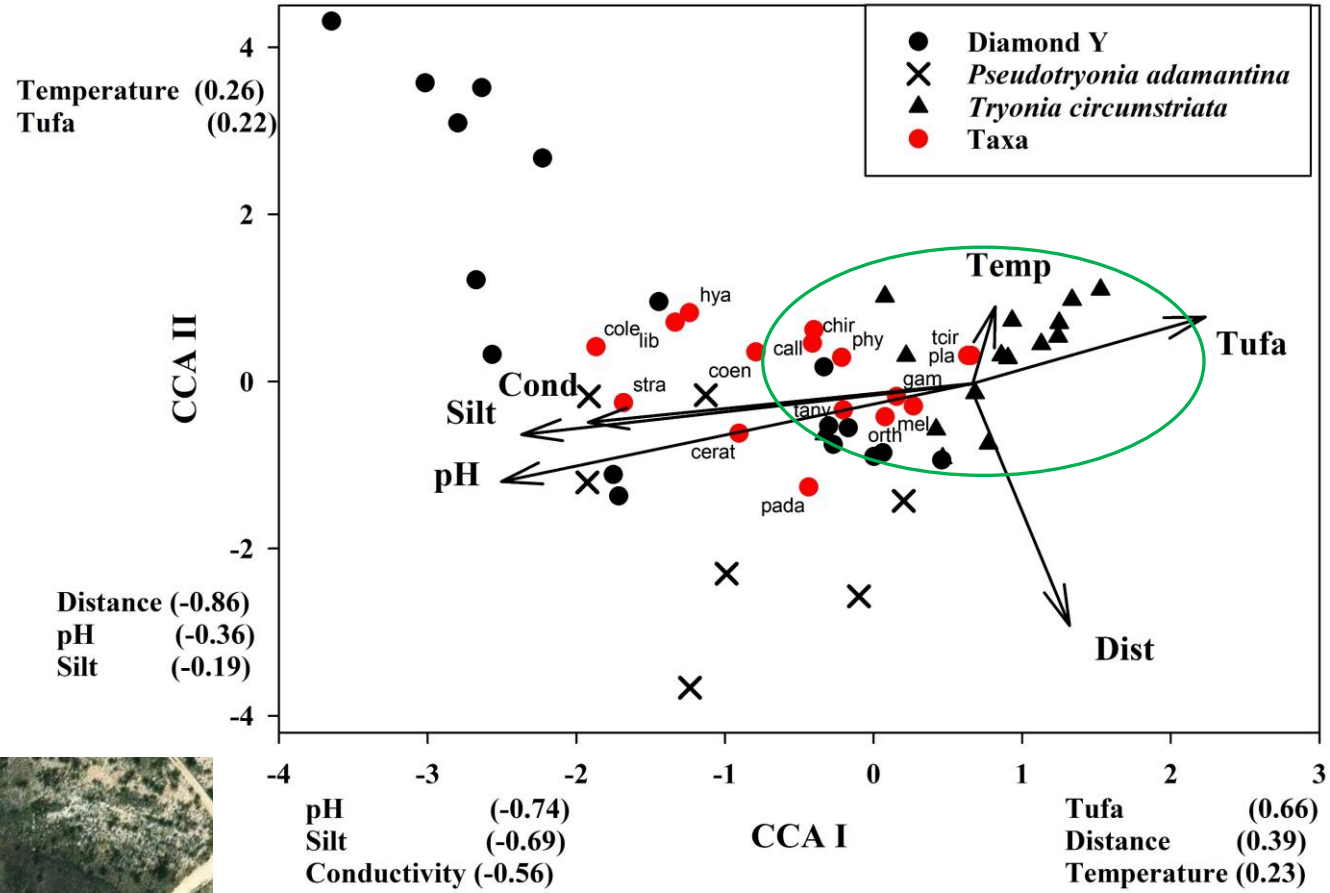
- CCA = 21%; 15%; 6%
- Both axis significant
- Some overlap
- Unique DY sites CAII
- ANOVA for WQ
- No diff = Temp or DO
- Conductivity (df = 1; F-stat = 23.95; p = <0.0001)
- pH (df = 1; F-stat = 18.72; p = <0.0001)



Results DY – Habitat Associations

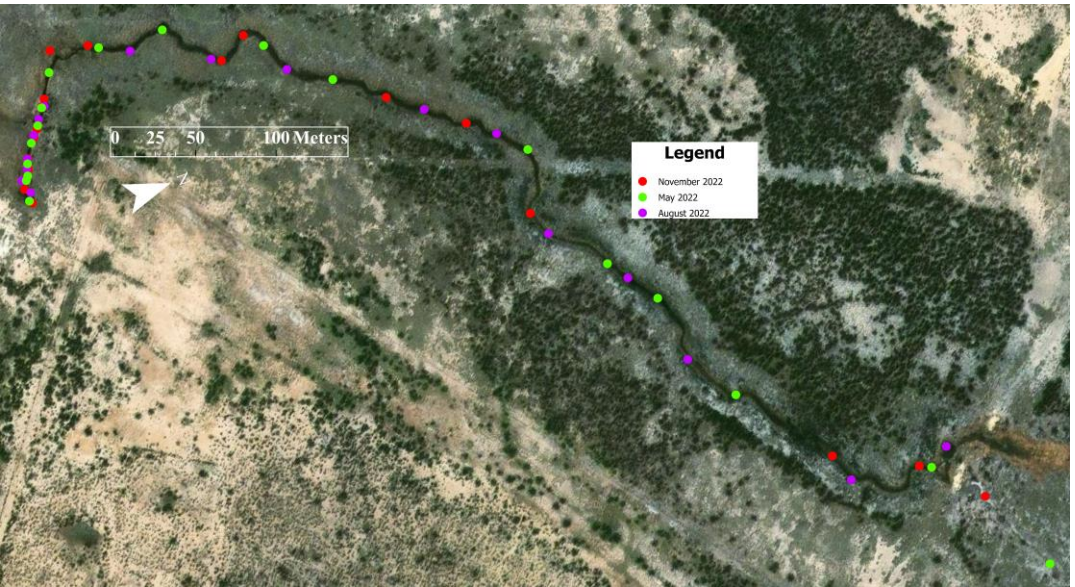
- CCA = 22%; 14%; 8%
- CCA I only significant
- ~630 m of area longitudinally sampled
- *G. pecos* ubiquitous at origin

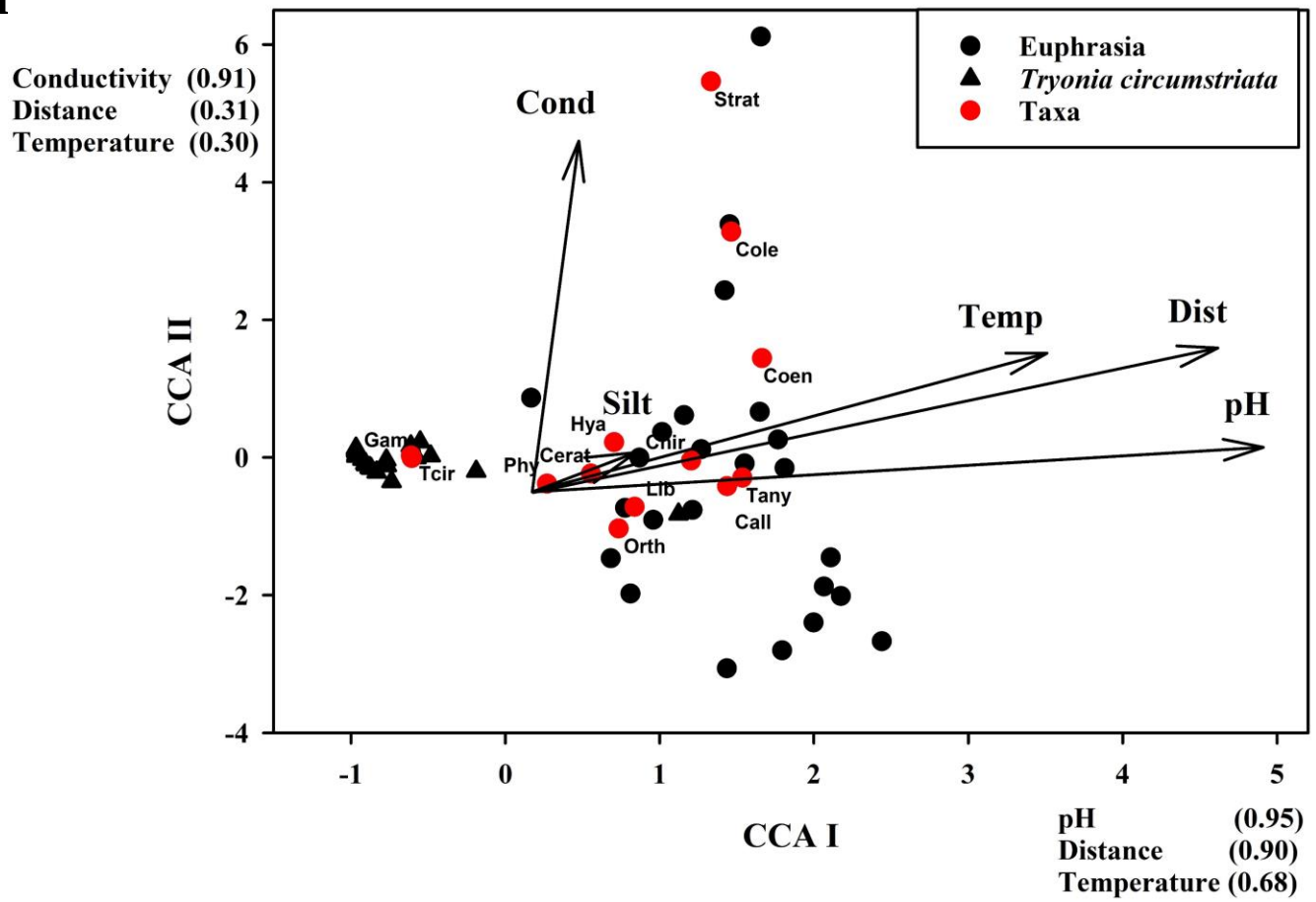




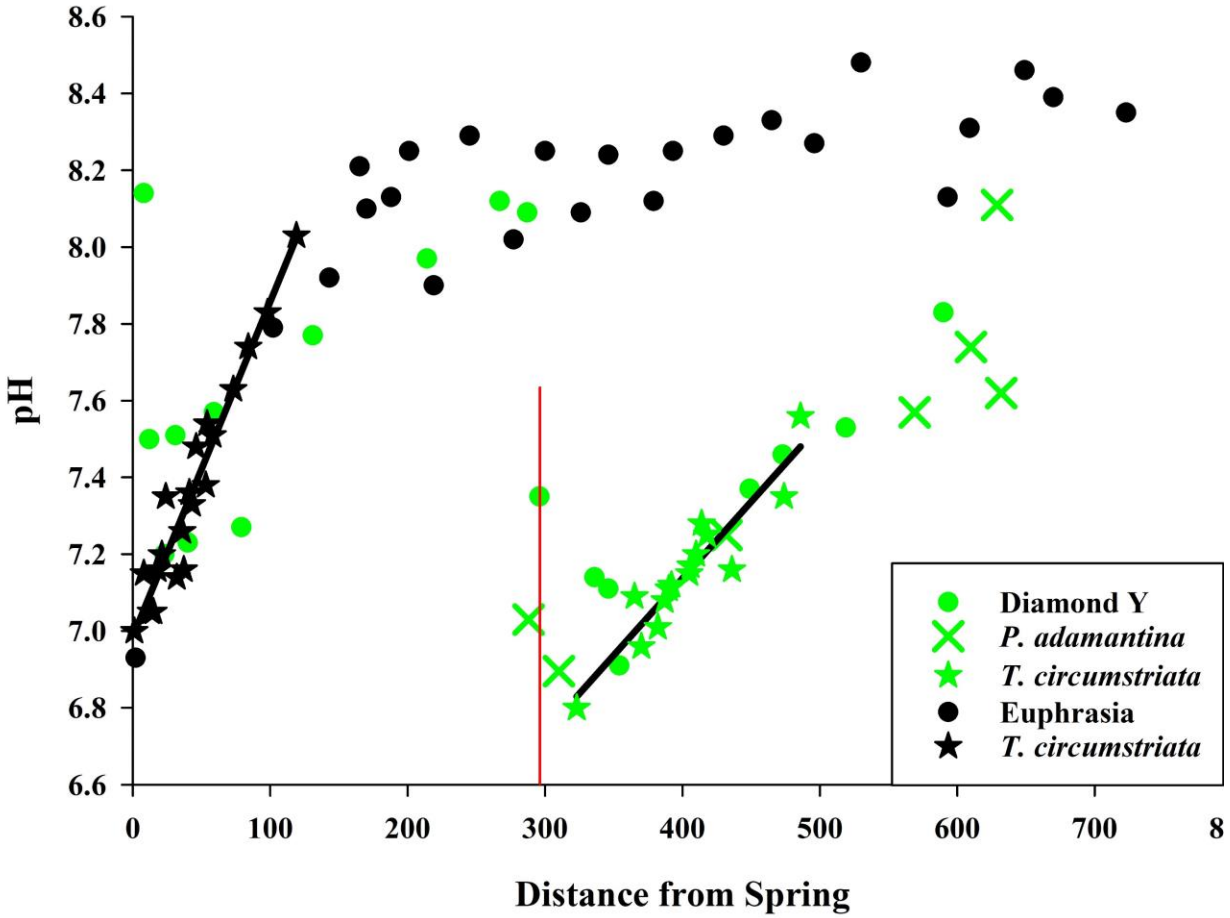
Results Euphrasia – Habitat Associations

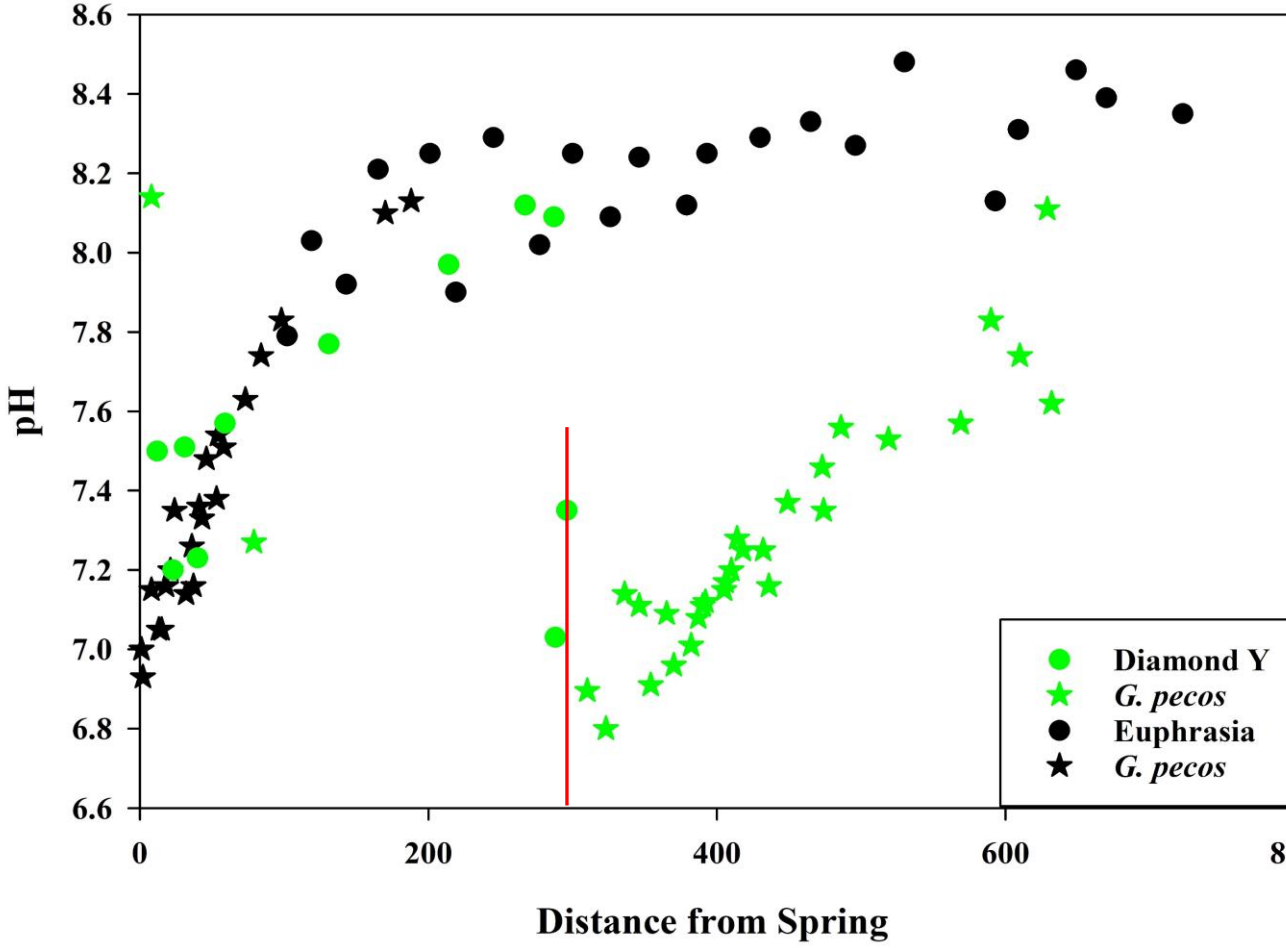
- CCA = 42%; 36%; 6%
- Both axis significant
- ~725 m of area longitudinally sampled
- 97% of samples silt = primary sub
- Strong pH gradient





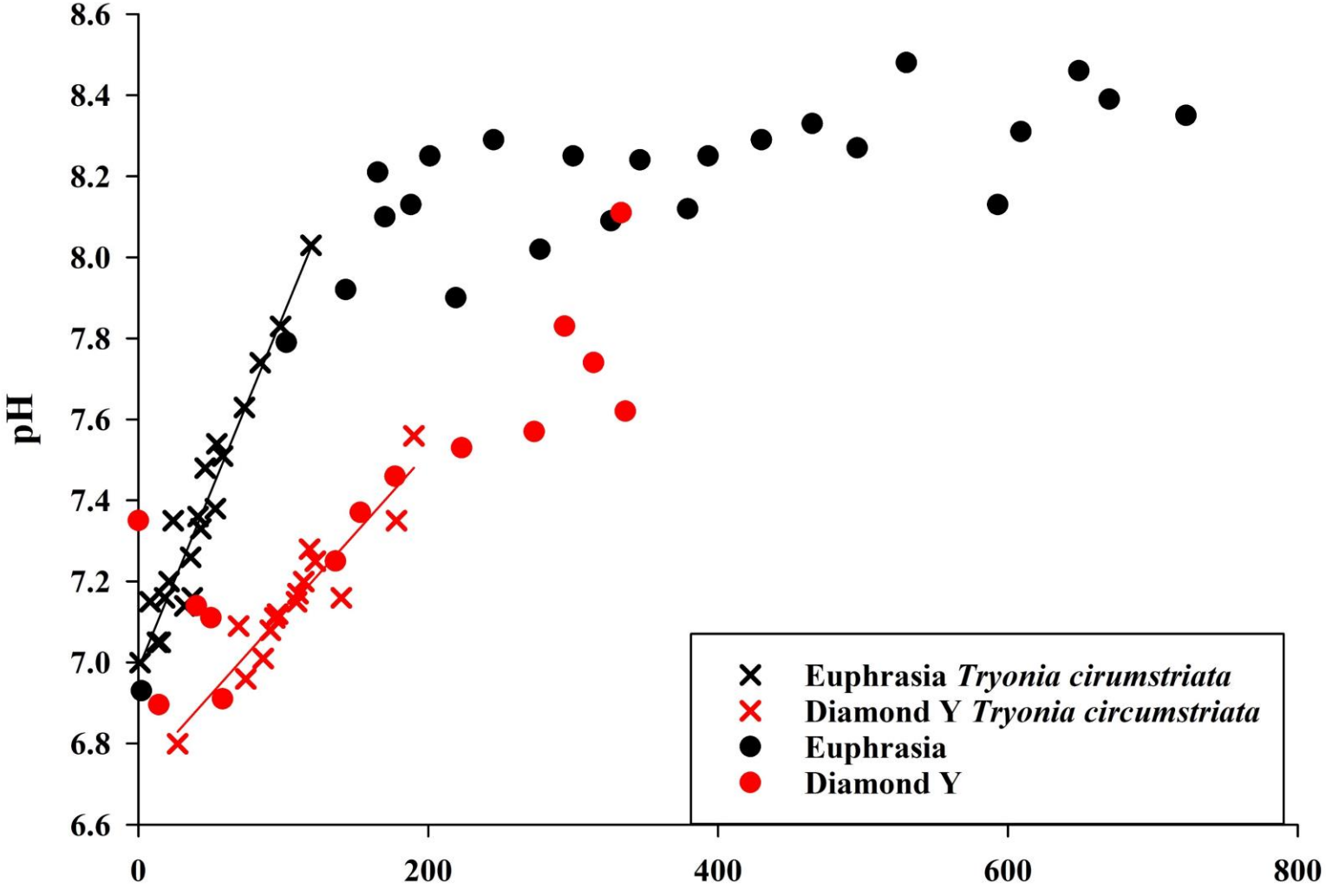
Results – Univariate pH





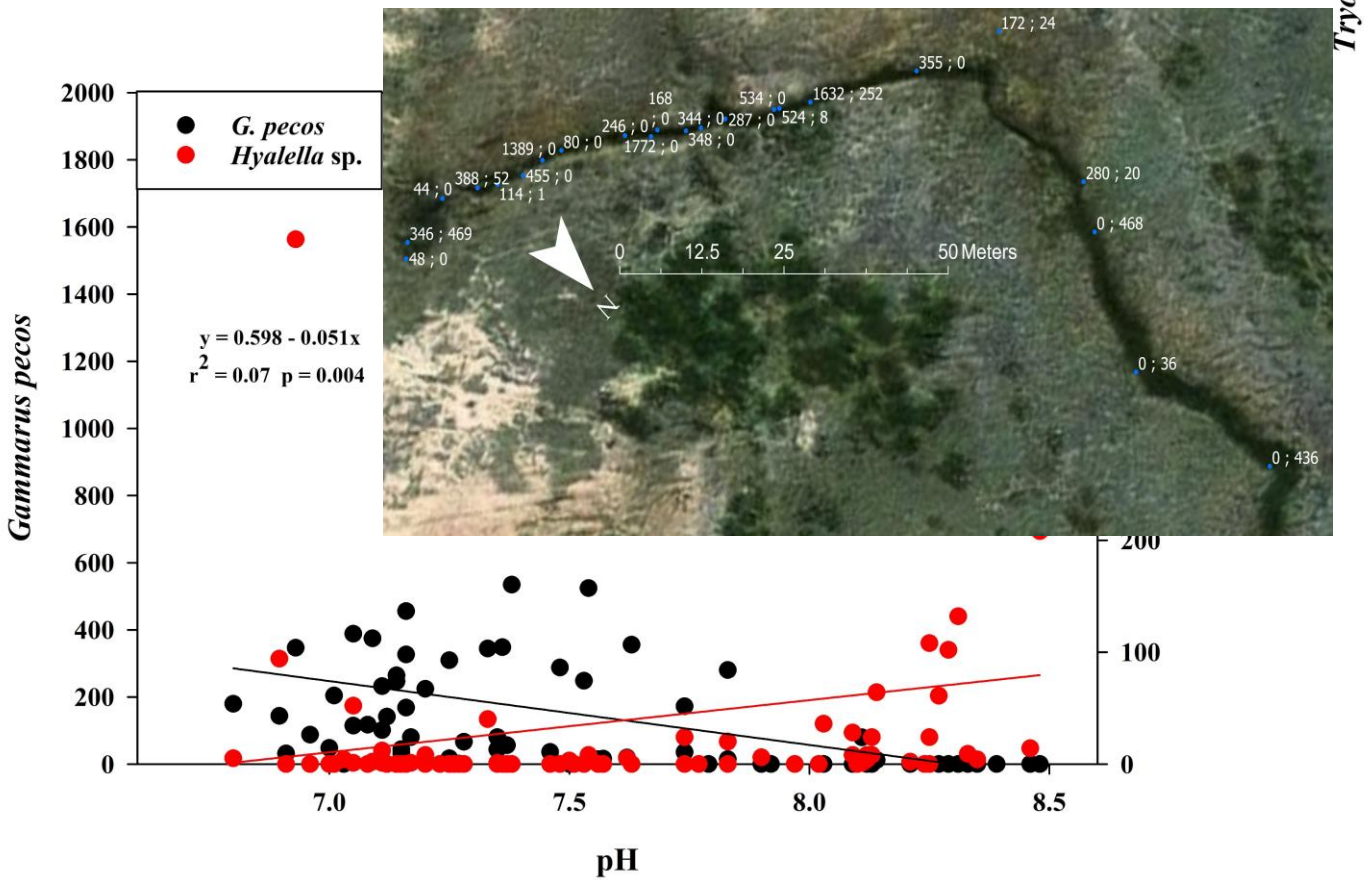
Results – Univariate pH

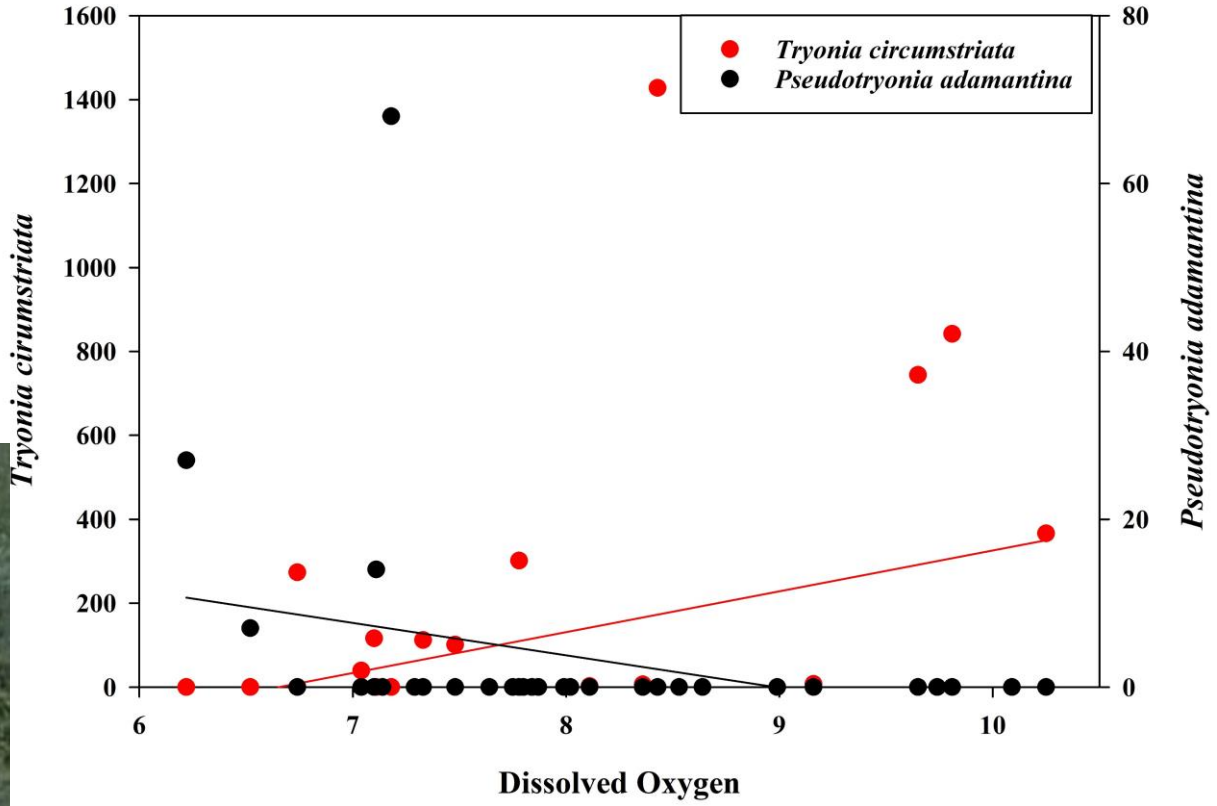
- *T. circumstriata* has a strong relationship with pH
- *G. pecos* relationship with pH at Euphrasia only
- Area above Karges goes dry
- Euphrasia pH sig higher
- Habiat is lost longitudinally faster at Euphrasia ($t = -6.88$; $df = 35$; $p < 0.0001$).



Results – Univariate

- Relationship between *G. pecos* and *Hyallela* sp.
- *Hyalella* tolerant

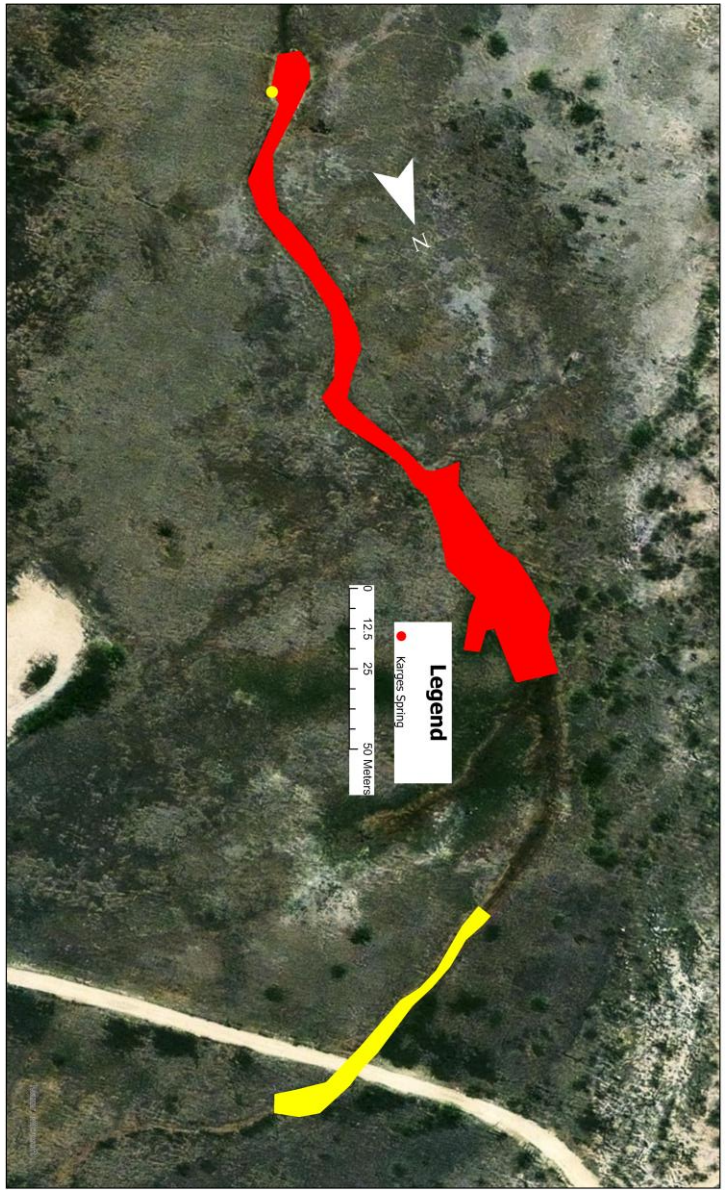




- Relationship between *T. circumstriata* and *P. adamantina* at DY (+0.3)
- May highlight spring seeps

Discussion

- Habitat associations appear to be driving segregation of *P. adamantina* and *T. circumstriata*
- *T. circumstriata* thought to be introduced to DY? Probably not? Found in Pecos sediment samples. Just not detected?
- Higher flows would potentially extend the pH gradient at Euphrasia and increase the longitudinal distribution of *G. pecos* and T. *circumstriata*
- Both snails are in only 14% of the wetted habitat at each spring however in different places at DY
- Sampling without collection?



Thanks

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- SMARC – Justin Crow; Randy Gibson for review and help in the field
- TNC – Ryan Smith for logistical and map data

DY	mean	367.6667	35619.55	
12	median	106.5	10317.72	
	Standard er	42.26356	4094.494	
	-5	343.7538	33302.87	
	5	391.5795	37936.22	
EU	mean	481.875	46684.05	56592.45
8	median	535.5	51879.24	48149.36
	Standard er	39.68686	3844.863	12696.28
	-5	454.3734	44508.61	51028.06
	5	509.3766	49348.4	62156.84
All	mean	413.35	40045.35	48727.61
20	median	305	29548.4	36717.52
	Standard er	21.75698	2107.817	1694.141
	-5	403.8146	39121.56	48140.62
	5	422.8854	40969.14	49314.6