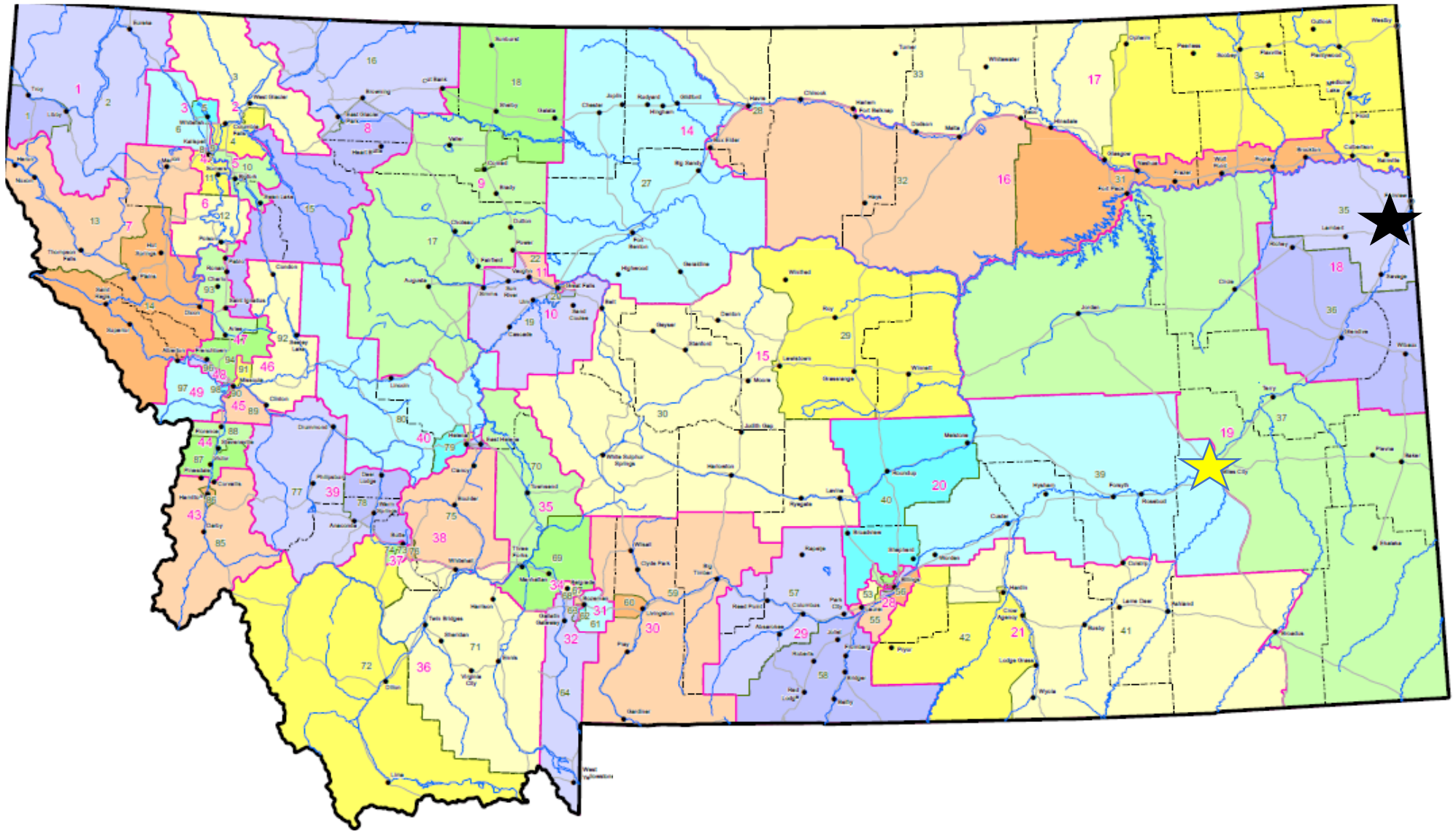
Arthropod Associations Shift in Response to Russian Olive Management

Natalie M. West[1*], David H. Branson[1], Mark K. Petersen[2], Jennifer M. Muscha[2], Erin K. Espeland[1]

[1]USDA Agricultural Research Service, Pest Management Research Unit, Sidney, MT

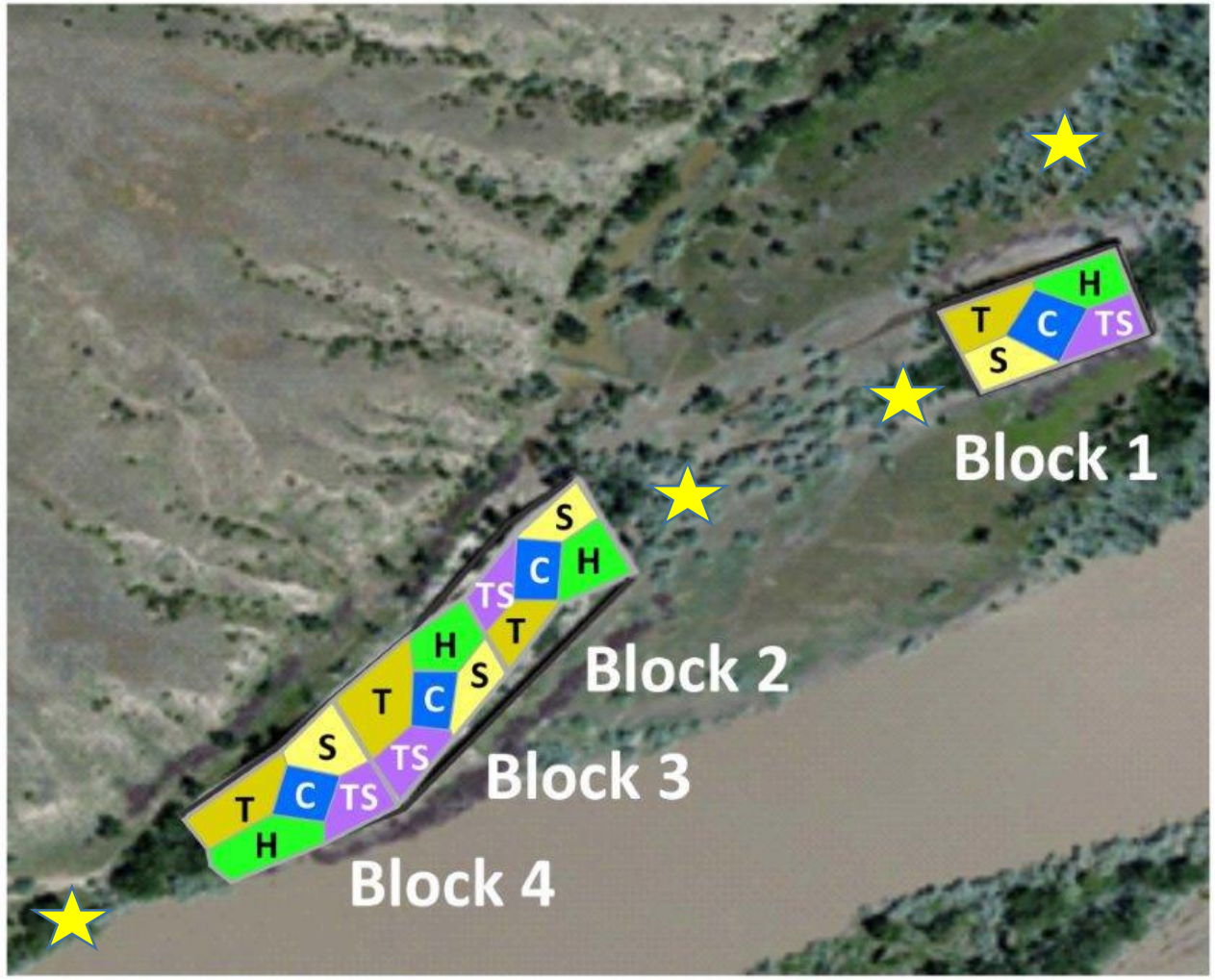
[2]USDA Agricultural Research Service, Livestock and Range Research Laboratory, Miles City, MT

Russian olive along the Yellowstone: variable but ever-present



Ongoing research and demonstration project…

- Revegetation after removal
- Integrated management: fire, grazing for post-removal control
- Invasion dynamics: dispersal, seed longevity, regeneration niche, influence of flooding dynamics
- Impacts of invasion and vegetation change on associated trophic communities



Ongoing research and demonstration project…

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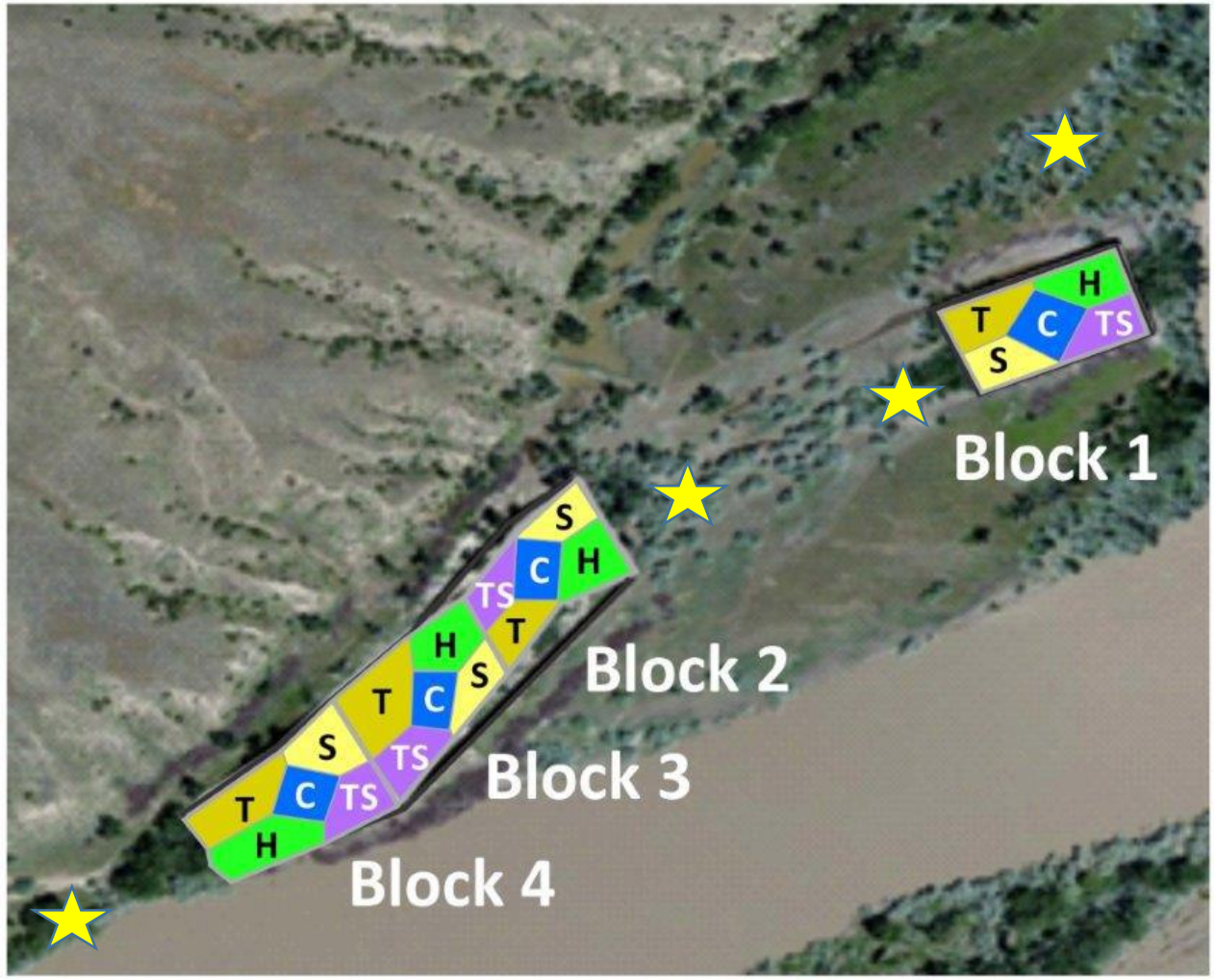
- **Impacts of invasion and vegetation change on associated trophic communities**



Recovery from the removal disturbance takes time; re- and secondary invasion are likely.

2012

2018

Weeds → Plant Community → and then…?

Impacts on other associated communities are harder to identify.

Overview

- Vegetation change as the backdrop
  - Changes in plant community composition over time
  - Russian olive re-invasions
- Insect communities after removal
  - Early transient effects
  - 5 year time point

Removal and Four Revegetation Treatments

1. Herbaceous
2. Herbaceous & Shrub
3. Herbaceous & Tree
4. Herbaceous & Shrub & Tree

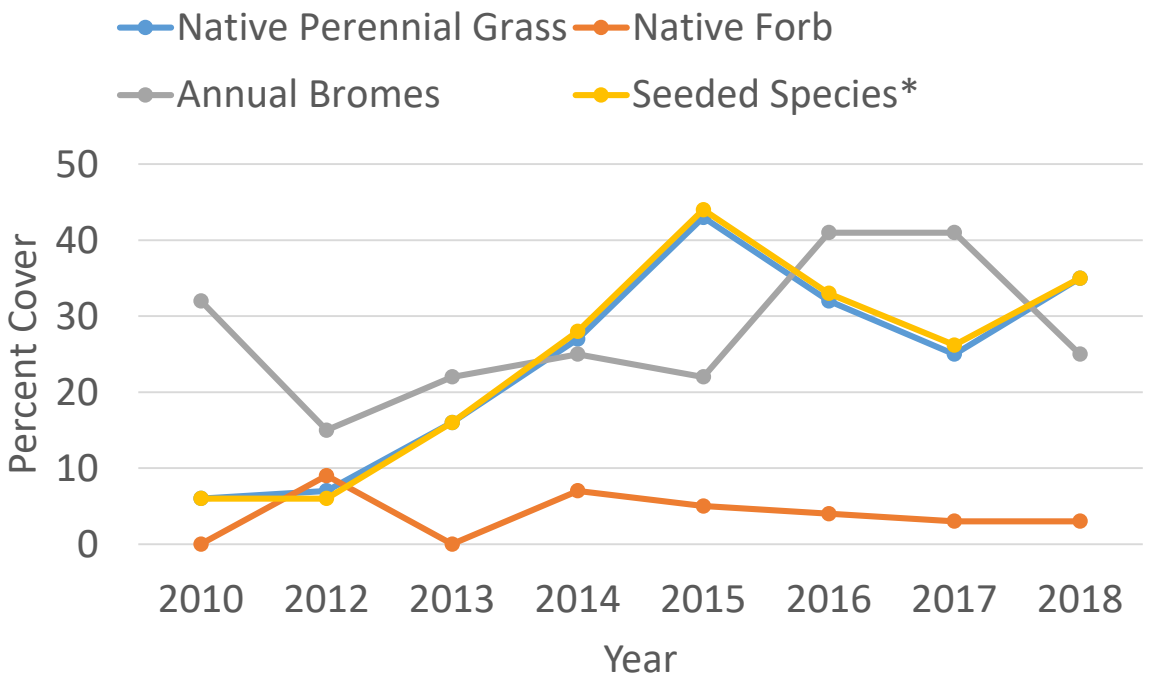
and……..

No revegetation (control)

Plots sprayed Roundup Fall

Herbaceous planting spring, woody planting 2012

Applied triclopyr, basal bark oil as needed



Revegetation Response

- 2 failed species establishments
- All increased initially; Forbs decreasing
- Annual bromes a problem; more in un-revegetated controls
  - Regional issue
  - 2019: Grazing

Tree/Shrub	Planted	Live in 2016	% survival
Green Ash	111	96	86
Buffaloberry	107	80	75
Boxelder	28	24	86
Cottonwood*	6	2	33
Chokecherry	80	58	73
Golden Currant	181	138	76
Rose	274	119	43

Year	RO Seedlings	
2012	515	
2013	238	
2014	983	
2015	5,383	*hand pulled
2016	618	
2017	no count	
2018	81	*9/14

Vegetation Summary

- Planting of cottonwoods was not necessary – germinating naturally with disturbance
- Plots need grazing treatment - high litter increased brome germination which reduced forb and native plant cover
- Control Russian olive re-sprouts/seedlings every year or every other year until ?????
- Revegetation vs. no revegetation – revegetation increased diversity and native plant cover, decent shrub survival

- Future Research – incorporate grazing treatment – will it help with control of weeds and Russian olive seedlings?

So what about the arthropods??

- Vegetation change as the backdrop
  - Changes in plant community composition over time
  - Russian olive re-invasions
- **Arthropod communities after removal**
  - **Early transient effects**
  - **5 year time point**

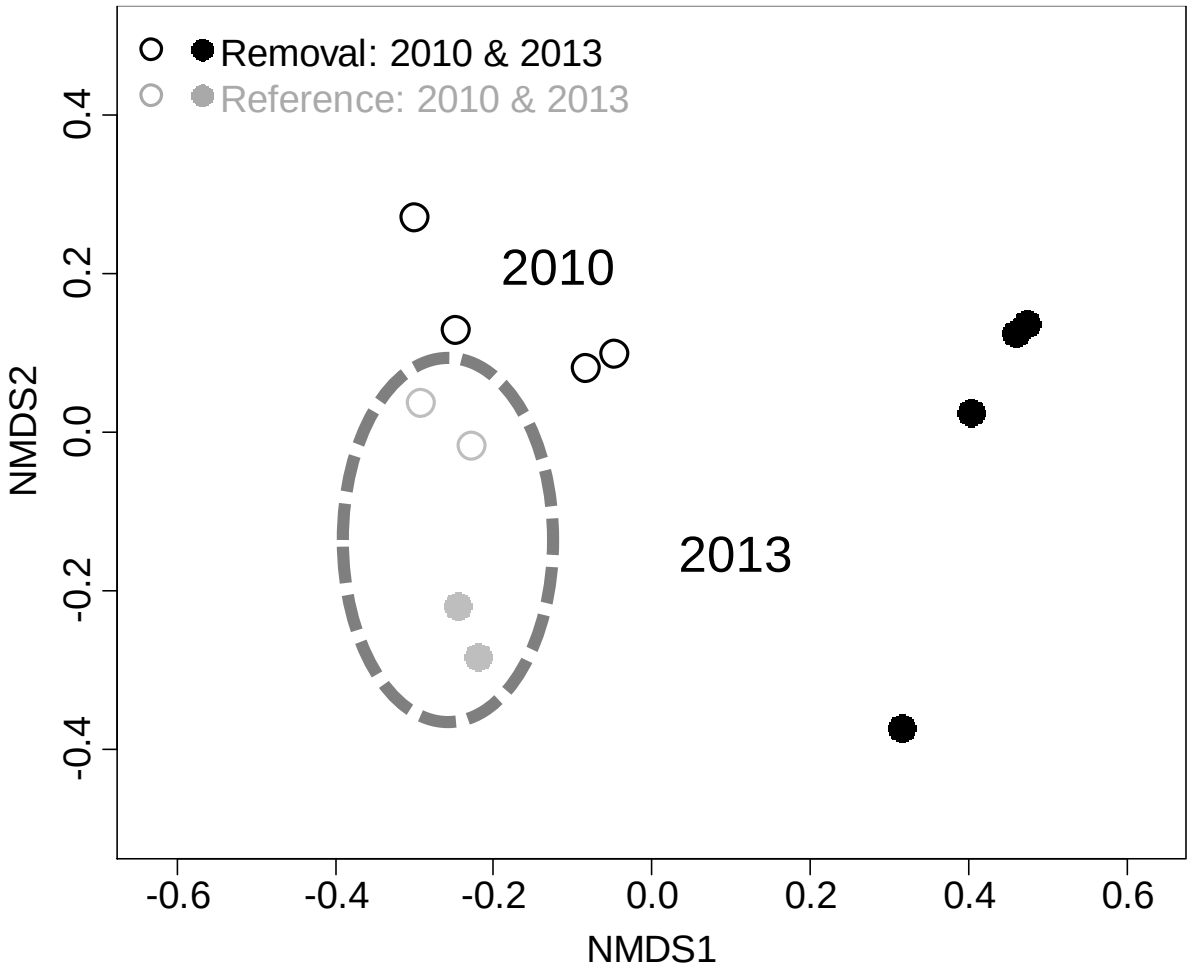
Community Establishment: Year 1

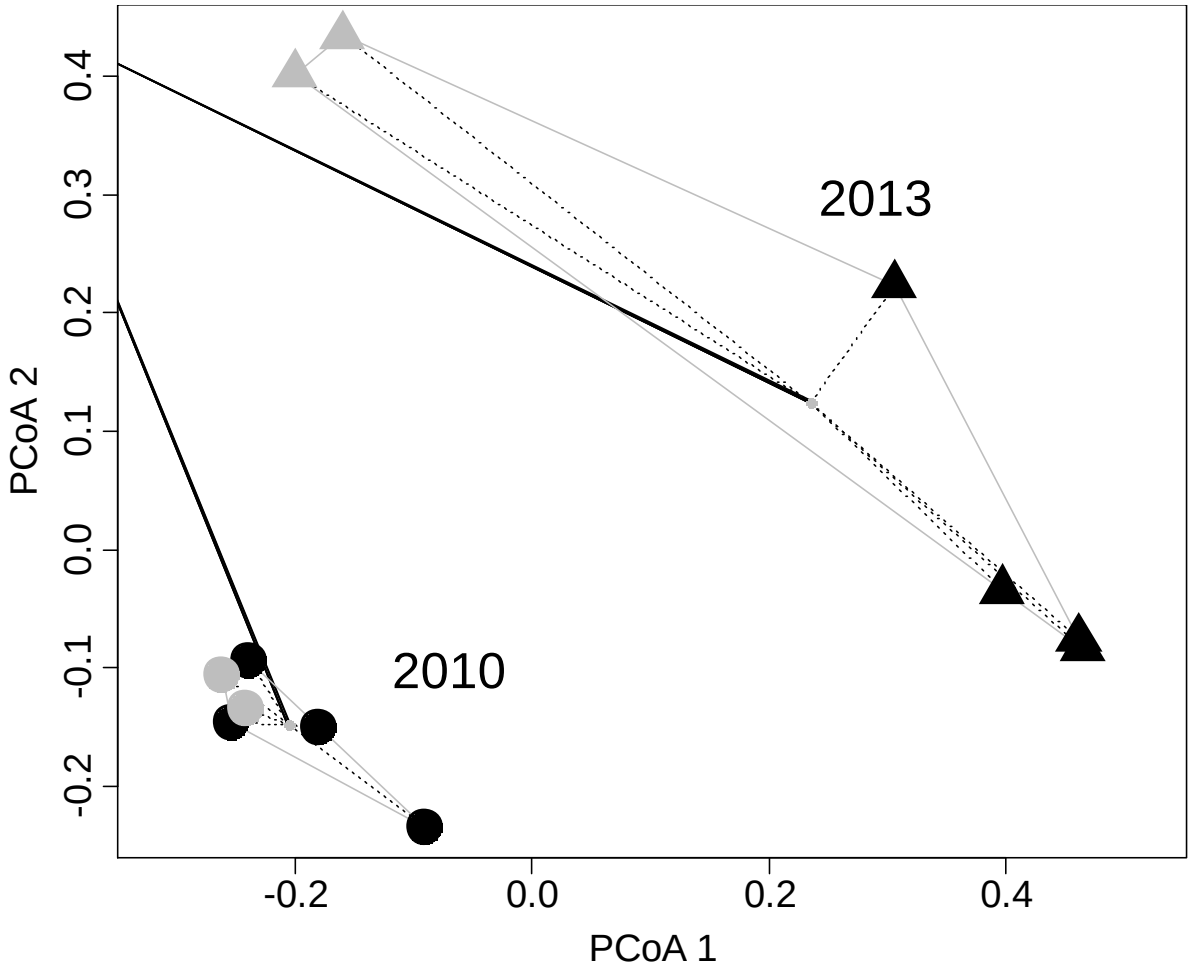
August 2012

June 2013

August 2013

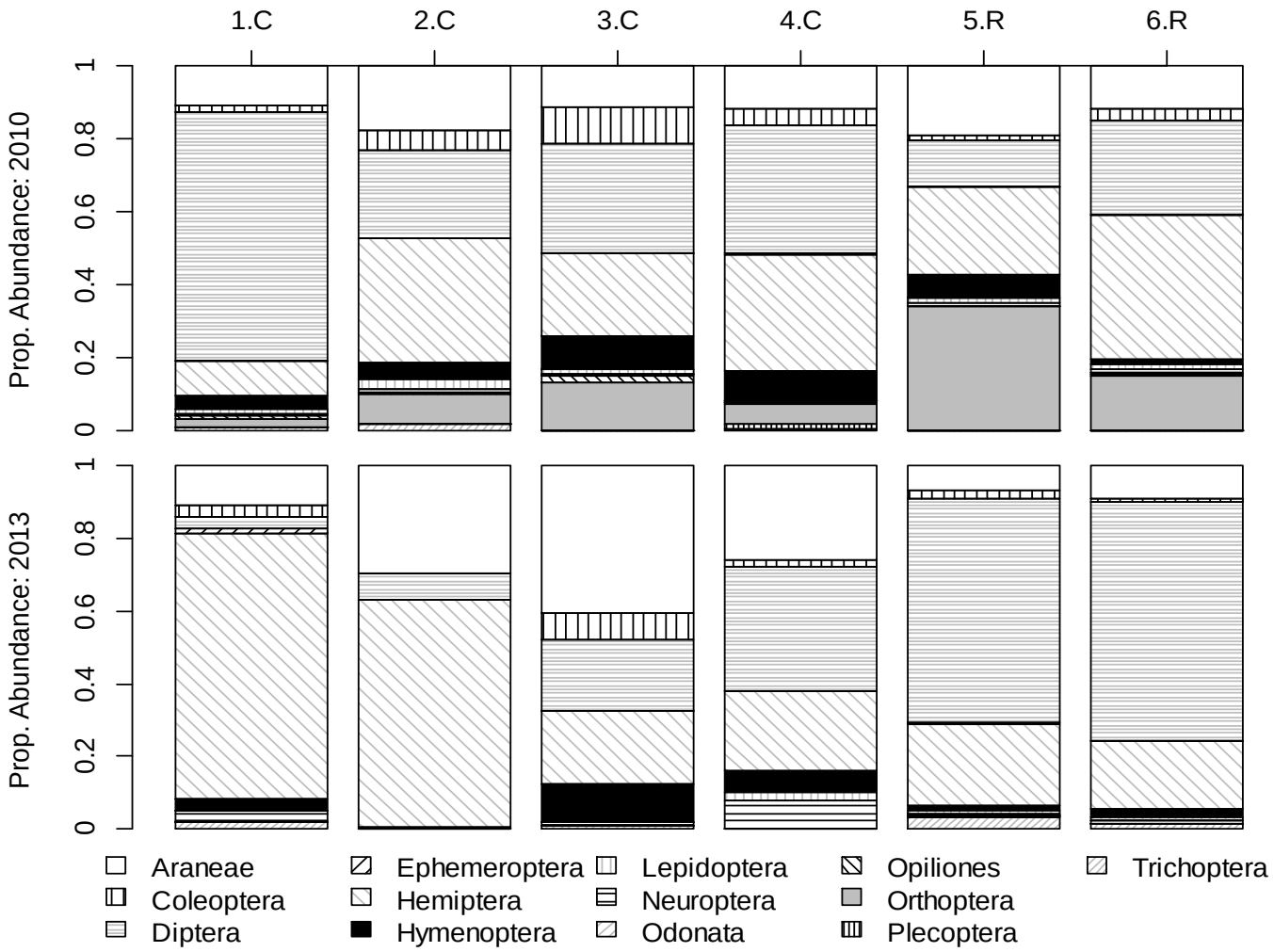
Removal matters: Arthropod communities diverge





West, et al. (*in review*)

Change in Prevalence of Orders with Time and Removal



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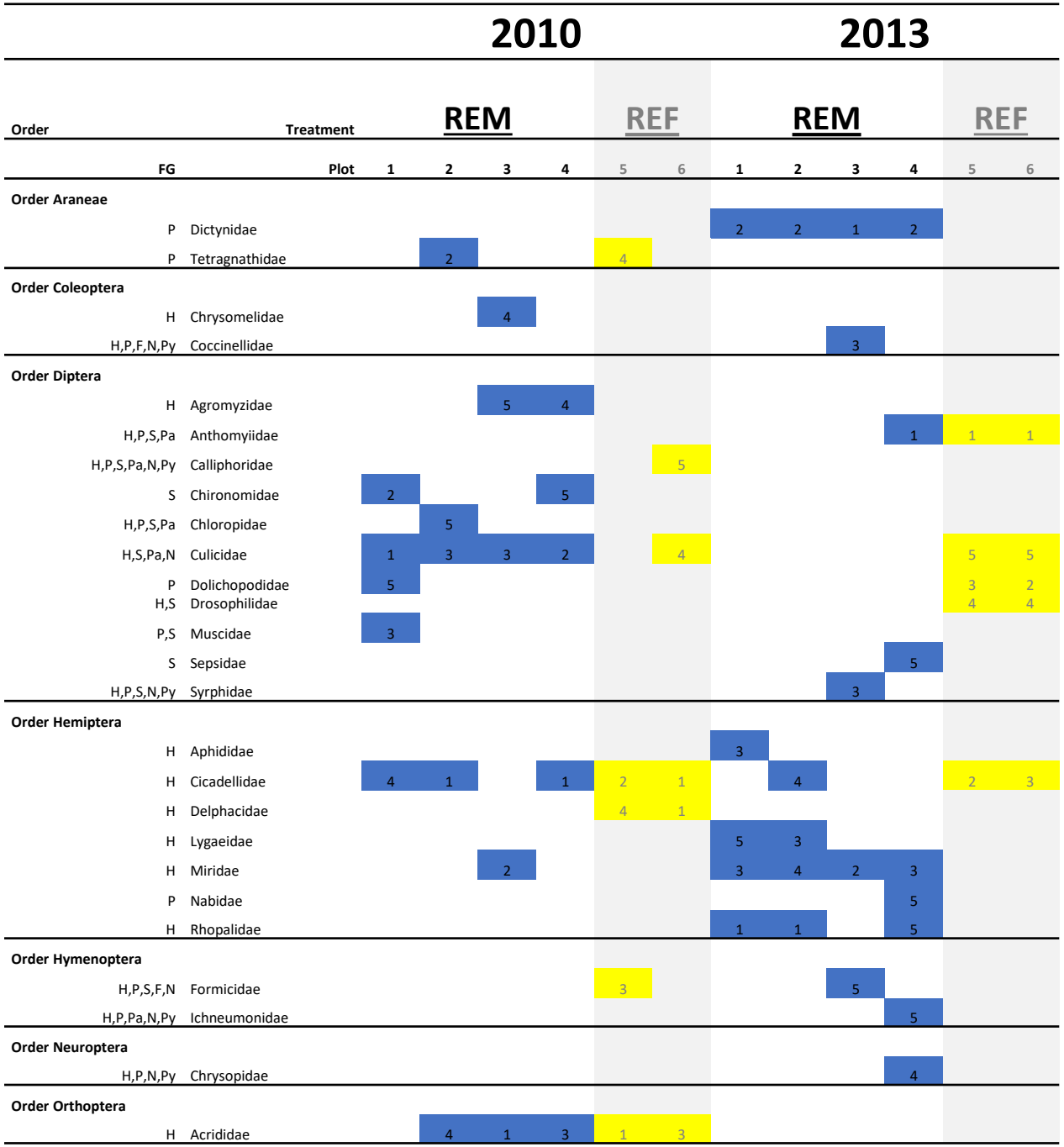
Changes in prevalence, not diversity or richness



Araneae

Dictynidae (mesh webs)

Diptera

Culicidae (mosquitoes)

Hemiptera

Cicadeliidae (leafhoppers)

Removal (REM)

Reference (REF)

West, et al. (*in review*)

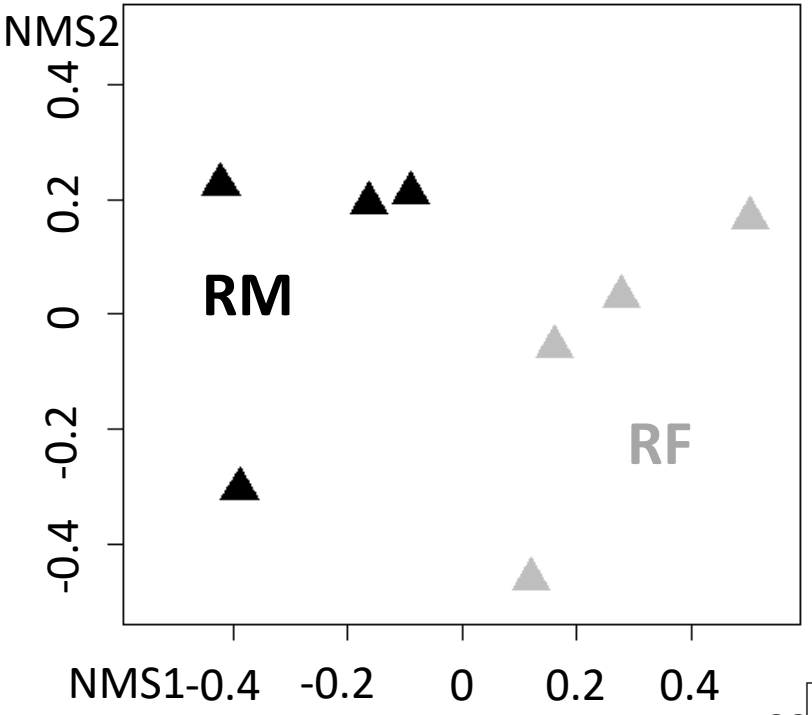
Community establishment after 5 years

August 2014

August 2015

August 2016: 5 years

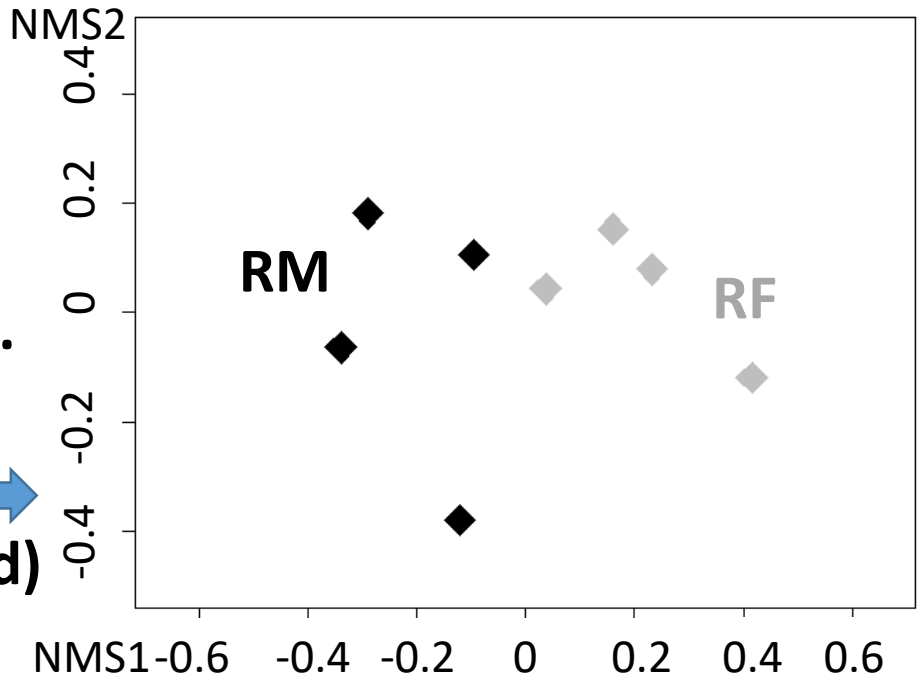
- Added additional reference plots
- Sampled multiple strata



Malaise (Air)

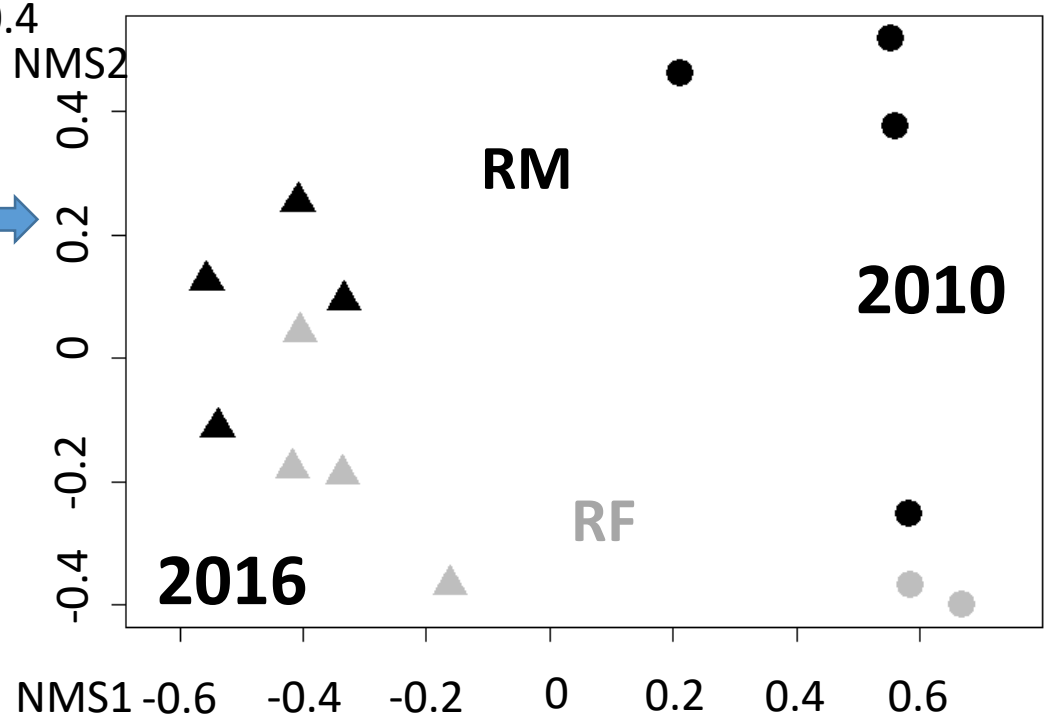
RM v RF differences persist.

Pitfalls (Ground)



Sweeps: 2010 v 2016

- Continued dissimilarity
- RM plots more different over time



Take Home:

- Compositional shifts, not richness or diversity
- Patterns more nuanced
  - More groups and individuals
- Treatments blurred into Controls
  - Still disentangling…

Summary

- Veg change continues…
- Removal does relate to shifts in arthropod community structure
  - Ranks change, richness not so much
  - Shifts in community subsets, functional implications?
- Changes in structure increase variability initially
  - May lessen over time
  - Disturbance versus composition?

5 Year Mark (2016)

- Removals differed from Reference
- No strong differences among Restoration treatments
- More variability within Removals