

Vegetation Development in Restoration Sites

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Research Questions

- Are planted restoration sites trending toward high quality riparian forest?
 - *Is habitat complexity developing?*
 - *Are invasive species a problem?*
 - *How do restoration sites compare to naturally-established remnant riparian forest?*

Methods

- 102 Permanent plots in sites planted in 1993 and 1994 by TNC, 600m²
- Complete vegetation inventory (cover, stem density of woody species)
- Soil core to 20' or refusal
- Plots read in 2003 and 2008

- Sites: Rio Vista (27 plots), River Unit (25), Sam Slough (29), Princeton (21)

- Remnant forests inventoried in similar way



Sampling in restored sites



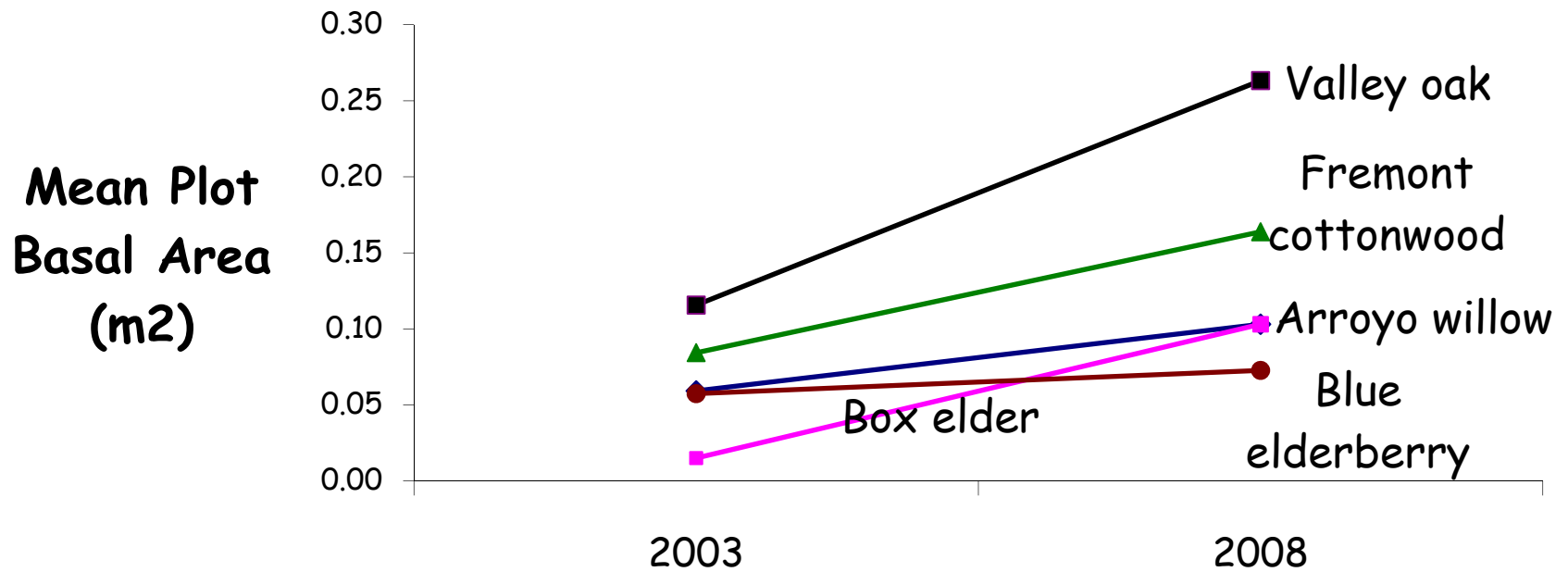
Star thistle and other non-natives on gravelly soil;
note forest developing on better soil in background

Results

Restoration Site	# plots	Mean Basal Area (m ² /ha) 2003	Mean Basal Area (m ² /ha) 2008
River Unit	25	9.4	16.8*
Princeton	21	4.8	11.4*
Rio Vista	27	3.1	6.9*
Sam Slough	29	8.5	15.7*

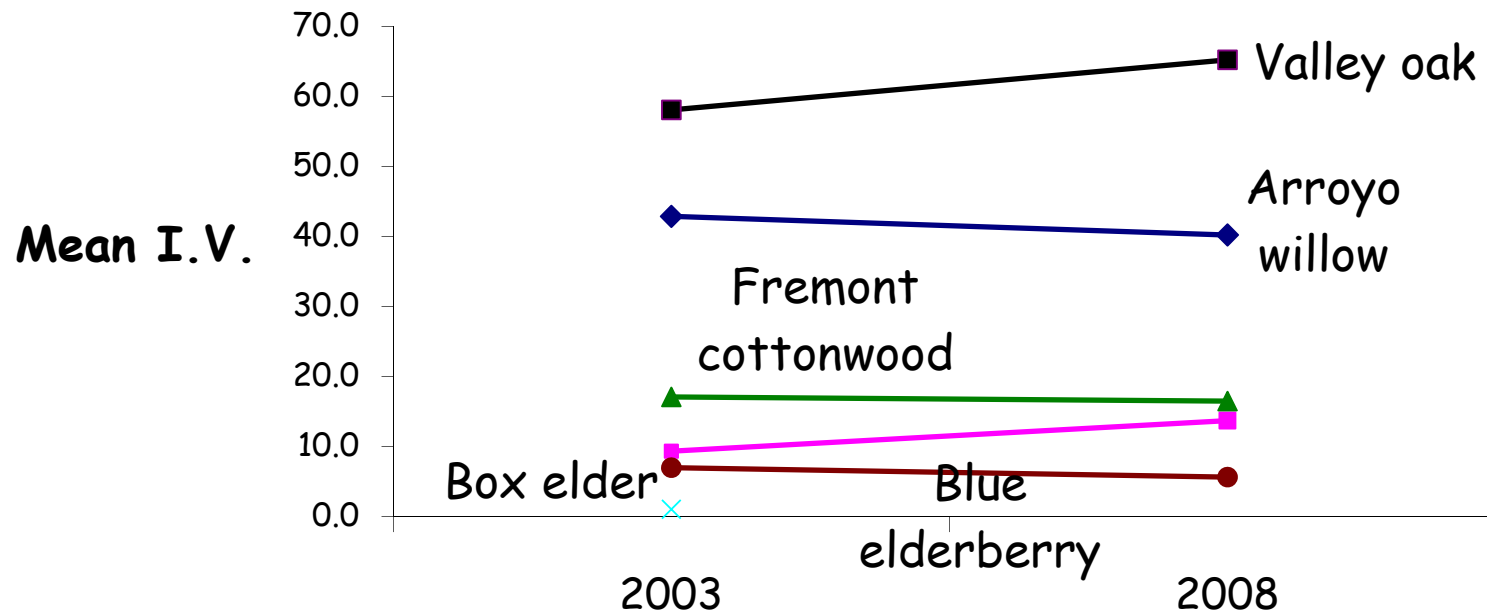
*Statistically significant increase

Growth of Woody Species in Restoration Sites

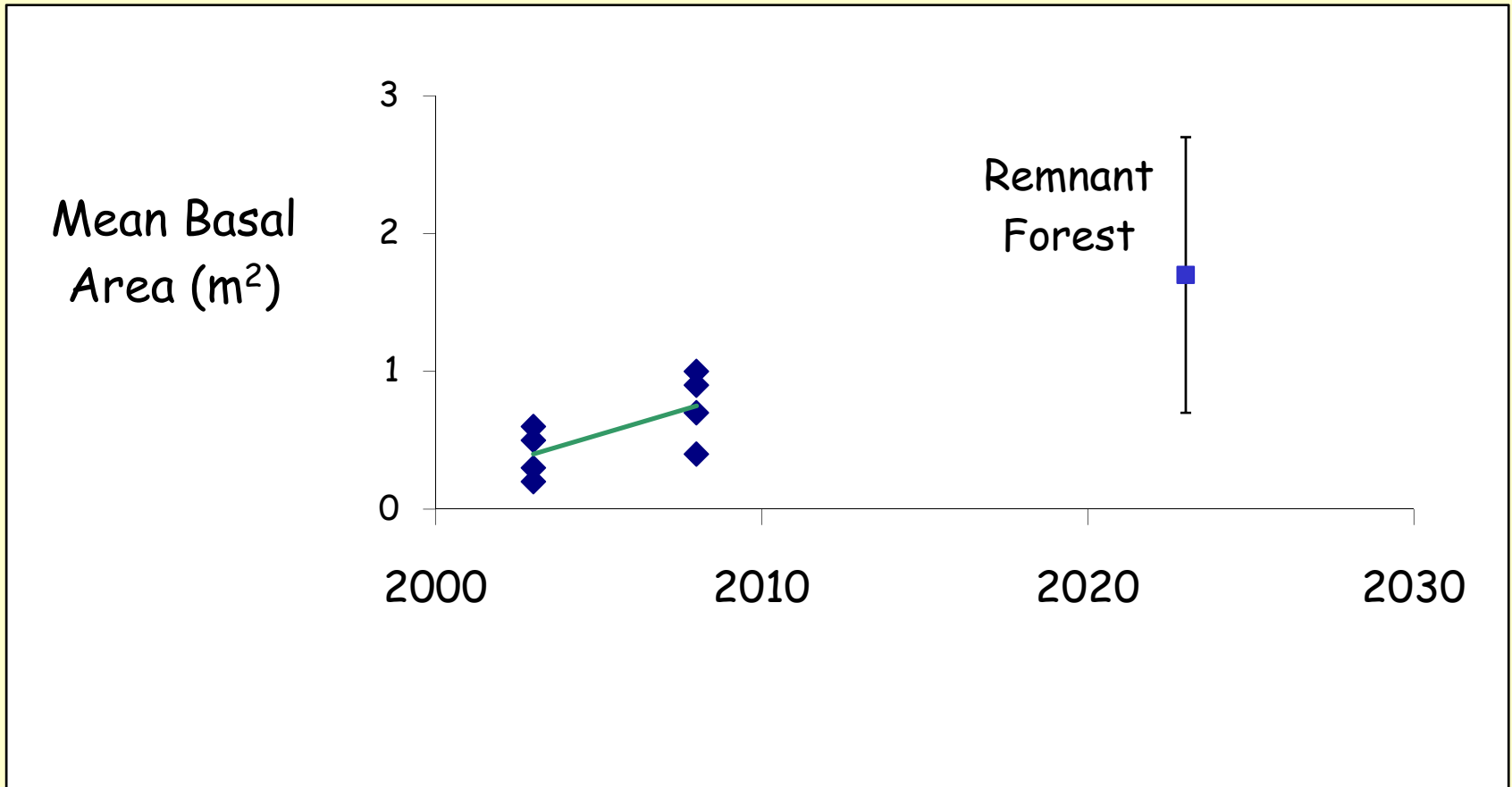


Note: black walnut increased from 0.001 to 0.003 (not shown)

Importance Values of Woody Species in Restoration Sites



Woody species composition of restoration sites is relatively stable as the canopy matures



Woody volume of restoration plots is tending towards that of remnant forest.

CONCLUSIONS

- Where soil conditions permit, forest growth continues to be good and appears to achieve the desired habitat complexity for wildlife
- Both total basal area and stem density are strongly related to refusal type (sand, gravel, water)
- Plots with no or limited forest development in 2003 remained that way in 2008. Understory vegetation remains non-native
- Invasive species (California black walnut, *Arundo*, edible fig, star thistle) remain minor components but are increasing