Planting and sparing the right flowers for native bees

Native bee use of native and exotic plants in restoration plantings

By Corey Shake, Partner Biologist, Point Blue & USDA-NRCS

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Building on native vs. exotic plant use studies

Williams et al. (2010) in *Basic and Applied Ecology*:

No native bee preference—used in proportion to availability

"…conservation programs that rapidly remove alien plants without restoring native plant populations could have deleterious impacts on native bees…"

Morandin and Kremen (2012) in *Restoration Ecology*:

Native bees preferred native plants, but

"…in regions where exotic plants dominate, they can be an important resource for native…bees"

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Study objectives

Primary: Monitor restoration project performance and improve design for

Yolo Creek and Community Partnership

Point Blue Conservation Science

YOLO COUNTY RCD
Yolo County Resource Conservation District

Putah Creek Council

CENTER for LAND-BASED LEARNING

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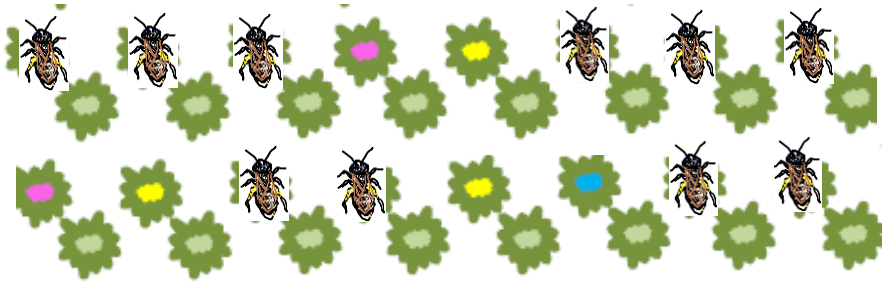
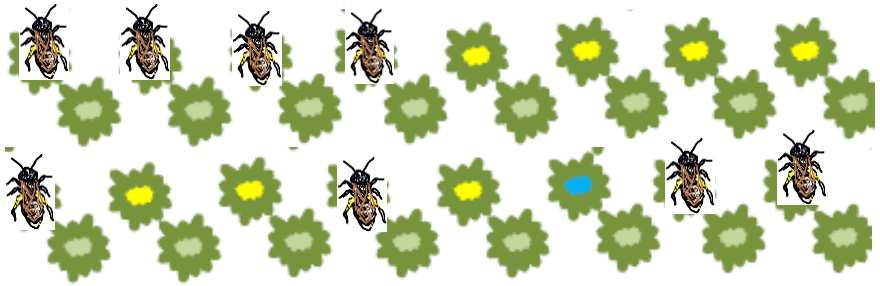
Sub-objective: Evaluate native bee preference for common native and exotic plants





Project selection

2019-2021

- 8 projects

2022-2024 (in progress)

- 10 new projects (2 same farms)

All implemented 1-8 years prior, in Yolo Co., CA, <300 ft. elev., and all but 1 at cropland edge.

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1-4 rows of woody plants, native grass understory, along seasonal waterway

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1 rows of woody plants, 1 row of perennial herbaceous wildflowers, 1 row native deergrass

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Discrete plot where native perennial and annual wildflowers were densely transplanted/seeded, some native grass and young shrubs

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Field Methods and Effort

Bees - Streamlined Bee Monitoring Protocol *

- Paired 30 x 1-m plots
- 7.5 min. count of **native bees visiting flowers**
- Record which flower species visited by bees

Effort

- 3-6 pairs/site, 3 seasons/year
- 2019-21: 400 plots
- 2022-23: 342 plots

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* Ward et al. 2014

Field Methods and Effort

Plants

	2019-21	2022-23
For each blooming plant species at each count plot, we visually estimated:	Floral unit abundance bins:	Floral unit abundance bins
	1 – 1-10	N = No. of floral units
	2 – 10-100	D = Avg. diam. of floral units
	3 – 100-1000	**Floral Area** = N x [π x $(D/2)^2$]
	4 – 1000+	

1937 blooming plant records

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Native bee plant preference analysis

Compare use vs. availability by rankings

From the set of all plots where a given plant was blooming, we calculated:

USE	Native Bee Occupancy (OCC) = Proportion w/ a visit by a native bee
AVAILABILITY	Mean Floral Abundance (FAB) = Average of bin numbers (ALL YEARS)
	Mean Floral Area (FAR) = Average of floral areas (2022-23 only)

Species	Rank OCC	Rank FAB	OCC - FAB
Yellow	1	1	0
Blue	2	2	0
Pink	3	3	0

Rank OCC	Rank FAB	OCC - FAB
3	1	2
2	2	0
1	3	-2

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Common Name	Native/ Exotic	No. plots blooming	OCC	FAB	FAR 2022-23	Rank Diff. (OCC-FAB)	Rank Diff. (OCC-FAR)	Avg. of Rank Diffs
valley gumplant	N	150	0.61	1.7	0.017	-9	-5	-7
summer mustard	E	132	0.42	2.3	0.007	-3	-5	-4
narrow-leaved milkweed	N	65	0.20	2.0	0.003	-1	-5	-3
field bindweed	E	116	0.20	1.3	0.007	-5	-1	-3
Cleveland sage	N	41	0.39	2.0	0.001	-3	-2	-2.5
California poppy	N	71	0.35	1.7	0.171	-6	2	-2
California rose	N	63	0.08	1.3	N/A	-1	N/A	-1
Italian thistle	E	40	0.15	1.6	0.002	-1	1	0
California buckwheat	N	81	0.53	3.3	0.084	1	0	0.5
yellow starthistle	E	125	0.17	2.0	0.008	1	1	1
yarrow	N	41	0.17	2.3	0.035	4	3	3.5
mustard (*B. nigra* & no ID)	E	64	0.25	2.4	0.021	4	4	4
hairy vetch	E	55	0.09	2.3	0.027	8	7	7.5
blue elderberry	N	40	0.08	2.4	N/A	11	N/A	11

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Other Notable Species

2019-21 Analysis

Common Name	Native/ Exotic	No. plots blooming	Rank Diff (OCC-FAB)
tree tobacco	E	30	3
perennial pepperweed	E	21	7
quailbush	N	22	12

2022-23 Analysis

Common Name	Native/ Exotic	No. plots blooming	Avg. of Rank Diffs
Fluellin (*Kickxia*)	E	24	-10
turkey-mullein	N	17	-4.5
arroyo lupine	N	24	3.5
chick lupine	N	41	9.5
blueblossom	N	71	12

Low sample size (10-20 plots), higher occupancy (>0.2): California aster, California goldenrod, horehound, heliotrope (native *H. curassavicum* and exotic *H. europaeum*), rock phacelia (*P. californica*), western vervain

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Best Practices

Incorporate high-value native wildflowers more often, for more area

- Plant perennial wildflowers along woody plant irrigation lines
- Seed or transplant in intensively managed plots
- Seed robust competitors like gumplant, poppy, lupine

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Yolo County Hedgerow at Farm Edge
By Hillary White

Best Practices

Leave as much exotic floral resources as is tolerable to achieve your goals, especially if you haven't replaced the exotic forage with natives!

- Know species, then compare risk vs. pollinator value
- Many late season weeds are valuable and threaten less
- Limit spraying and mowing to only areas most critical to success
- Get to know your butterfly host plants, native and exotic

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Yolo County Hedgerow at Farm Edge
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Literature Cited

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Butterfly Species and Host Plants

	Scientific Name	Common Name	Total Count	Larval host plants
1	*Pieris rapae*	cabbage white	228	mustards
2	*Colias eurytheme*	orange sulphur	92	alfalfa, Fabaceae
3	*Junonia coenia*	buckeye	74	fluellin, plantain
4	*Everes comyntas*	eastern tailed blue	43	vetch, lotus, clover
5	*Plebejus acmon*	Acmon blue	34	lotus, knotweed, buckwheat
6	*Pyrgus communis*	common checkered skipper	32	cheeseweed, alkali mallow
7	*Brephidium exile*	western pygmy blue	22	Russian thistle, quailbush
8	*Vanessa sp.*	painted lady	14	many
9	*Papilio rutulus*	western tiger swallowtail	10	sycamore, ash, other trees
10	*Strymon melinus*	common hairstreak	6	cheeseweed, lotus, many
	Lycaenidae sp.	unidentified blue	35	

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