

Commercial Pollinator Mix Comparison Summary

Valerie Bullard, PMC Agronomist, NRCS Lockeford Plant Materials Center, Lockeford, CA 7/5/17

Objective: To evaluate eight commercially available seed mixtures for adaptation, integration into almond orchard operations, and production of suitable pollinator habitat in California’s Central Valley.

County: San Joaquin County

Average Annual Precipitation: 17.24 inches

MLRA: 17

Practice: 340-Cover Crop; 327-Conservation Cover

Dominant Soil Type: Columbia fine sandy loam

Slope: 0-2%

Aspect: N/A

Elevation: 71 feet

Seedbed Preparation: Disked and cultipacked prior to planting.

Seeding Date: 11/25/14

Seeding Rate/Cost: See Table 1

Seeding Method: Belly grinder and rolled after planting.

Acres Seeded or Plot Design: 10x100 foot plots (non-replicated).

Previous Site History: Fallow area

Fertilizer: None

Irrigation: None

Monitoring Date: Feb-June 2015 and 2016.



Figure 1. Photo of a bumblebee taken on 5/5/15

Table 1. Commercial Pollinator Mixes used for the trial with cost/acre at recommended seeding rates. Percent cover for the planted seeds and weeds shown during March for the two years of the trial.

Mix Type	Mix Name	Cost/acre	Seeding Rate (lbs./ac)	Cover (%) 3/10/15		Cover (%) 3/14/16	
				Mix	Weeds	Mix	Weeds
Almond	Project Apis m. Clover Mix	\$52	15	50	48	62	38
	Project Apis m. Mustard Mix	\$28	12	48	34	15	56
	Kamprath Seed Almond Mix	\$248	12	60	40	40	60
	Xerces Almond Mix	\$177	12	50	34	60	36
Central Valley	PV Flowering Pollinator Mix	\$654	22	82	16	68	30
	PV Native Pollinator Mix	\$872	22	74	22	52	42
	Renee’s Garden Pollinator Mix	\$938	7	54	28	60	15
	Xerces Central Valley Mix	\$696	16	52	40	74	22

PV = Peaceful Valley

Introduction:

Pollinator mixes can be of great benefit when used within agricultural systems as cover crops by increasing organic matter, water infiltration, and nutrient availability, and provide an additional forage source to honey bees and native bees. Pollinator plantings include a variety of plant species and provide near continuous floral resources for pollinators throughout the growing season. Forage habitat for pollinators either adjacent to, or within a pollinator dependent crop can lead to increased yields due to assistance from wild pollinators, in addition to honey bees.

This study evaluated eight commercially available seed mixtures over two years for adaptation and production of suitable pollinator habitat in California's Central Valley. Included were four almond mixes composed of annuals for early bloom and rapid decomposition to provide a 'clean' orchard floor prior to almond harvest, and four Central Valley mixes, which contained both annual and perennial species to bloom for a longer period (Table 1). Vendor recommended seeding rates were used in this study in order to simulate grower utilization (Table 1). Prices of mixes did not include preparation work, labor, fuel, or equipment costs. These plots were planted in the fall of 2014. No irrigation was applied over the 2 year study and plots were flail mowed after bloom in August 2015.

Canopy cover, percent bloom and bloom duration, and bee visitation were observed and recorded in order to evaluate plant species persistence and forage quality for pollinators. Both native and honey bee visitation was recorded using the *Streamlined Bee Monitoring Protocol for Assessing Pollinator Habitat*. Assessments were conducted twice per year from April through June at each commercial pollinator habitat plot. At each site, two 100 foot transects were walked over a period of 7.5 minutes while observing the number of native and honey bees visiting flowers. This data can be coupled with the bloom assessment data to look at flower species attractiveness, by comparing the dominant flowers in bloom to number of native or honey bees visits. For a complete species component list or copy of the detailed final report, please contact the CAPMC.

Results:

All of the evaluated mixes had a long bloom duration providing forage resources for extended periods of time during the growing season. Native bee populations were higher during the second year of the project, which likely reflects an increase in nesting sites in pollinator plantings. All almond mixes started blooming in February, but peaked in April – June after almond bloom, and dried down by late June. The almond mixes all regenerated from seed during the second year, apart from the mustard mix that would need to be replanted (Table 1). Most Central Valley mixes had high visitation rates and a wide variety of floral resources for pollinators throughout the growing season. The Central Valley mixes were either, a mixture of native and non-native, or only native species that bloomed from February through late June. Renee's Garden Pollinator Flowering Mix, had a relatively low honey bee visitation rate when compared to the other Central Valley mixes (Figure 3). The Xerces Central Valley mix in particular, had the highest number of native bee visitations late into the season of 2016 due to continuous availability and high percentage of wildflower bloom.

Summary and Discussion:

All of the pollinator mixes evaluated would be appropriate for attracting a variety of pollinators and increasing pollinator habitat if applied in the appropriate setting and considerations of site suitability, seedbed preparation, and competing vegetation are taken into account.

The almond pollinator mixes were successful in providing a variety of forage resources for pollinators during the appropriate window for integration into an almond orchard operation. Most of the almond mixes would be easily managed as a cover crop within a bearing tree orchard and are recommended to be planted on select rows, or on orchard edges to bring in native pollinators and beneficial insects. These mixes dry down and would be ready to mow by late June, resulting in a clean floor for harvest.

The mustard mix is not recommended for use in a bearing tree orchard, but would be suitable between young non-bearing trees, on orchard margins, in adjacent areas, or when trees are being taken out of production. In addition to being another source of pollinator forage, these mixes can contribute to soil health within the orchard. No problems were seen with invasiveness of plant species in these mixes.

The Central Valley pollinator mixes all provided foraging resources and potential habitat for native pollinators if left undisturbed. These mixes all had high seed costs when compared to the almond pollinator mixes; however, they are meant to be long term investments that provide pollinators with habitat for several years and require little to no maintenance. Weed encroachment could potentially become a problem in the future if these mixes are used for long term habitat. Some selective herbicide use and management strategies (mowing, burning, hand hoeing) may be necessary in order to maintain a high seeded species population and long term plant diversity. Considerations for pollinator habitat plantings include proximity to nearby farms and awareness of typical farm management practices such as insecticide use and potential drift, which could cause harm to pollinator species.

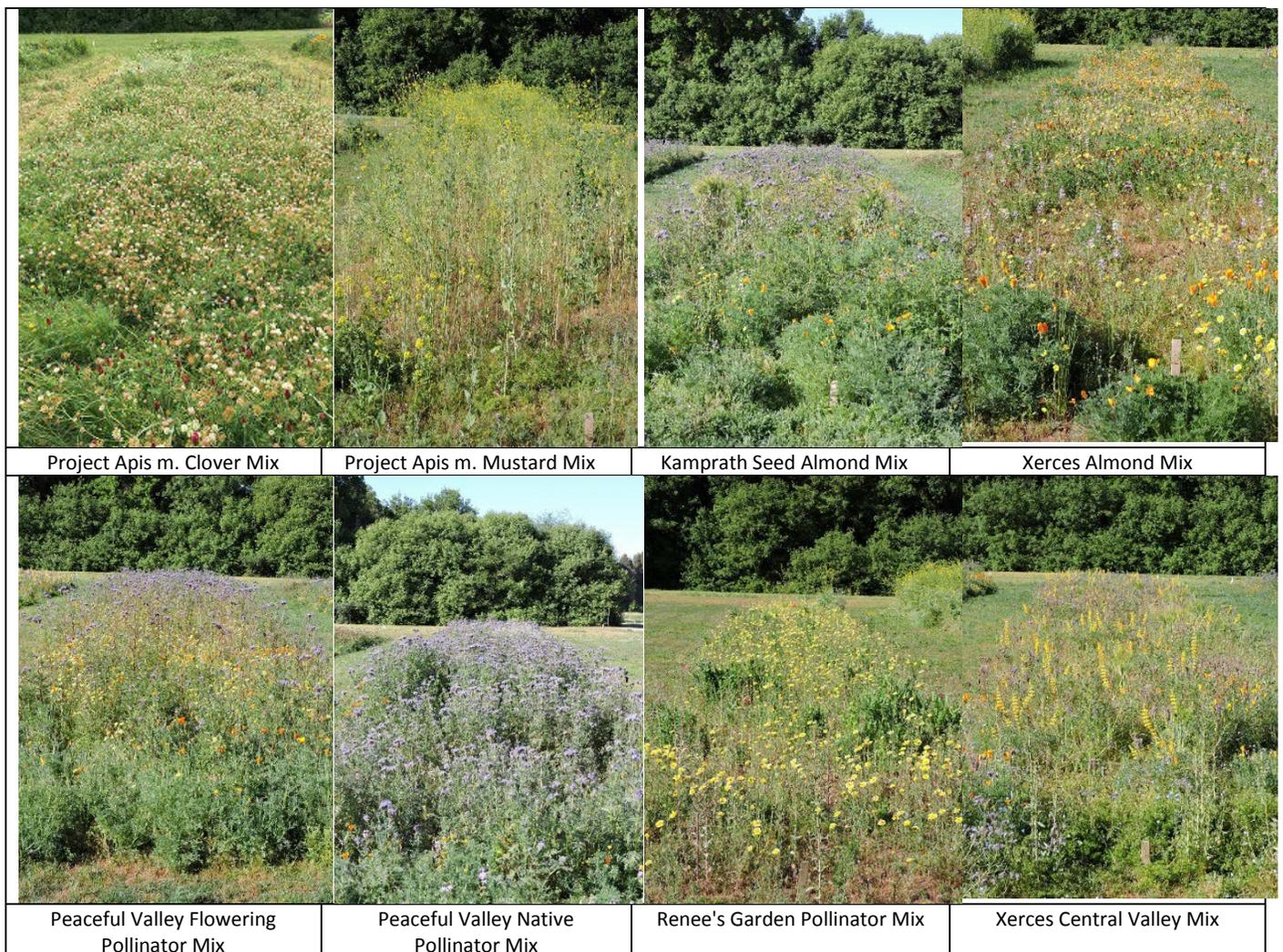


Figure 2. Commercial Pollinator Plots on 4/16/16.

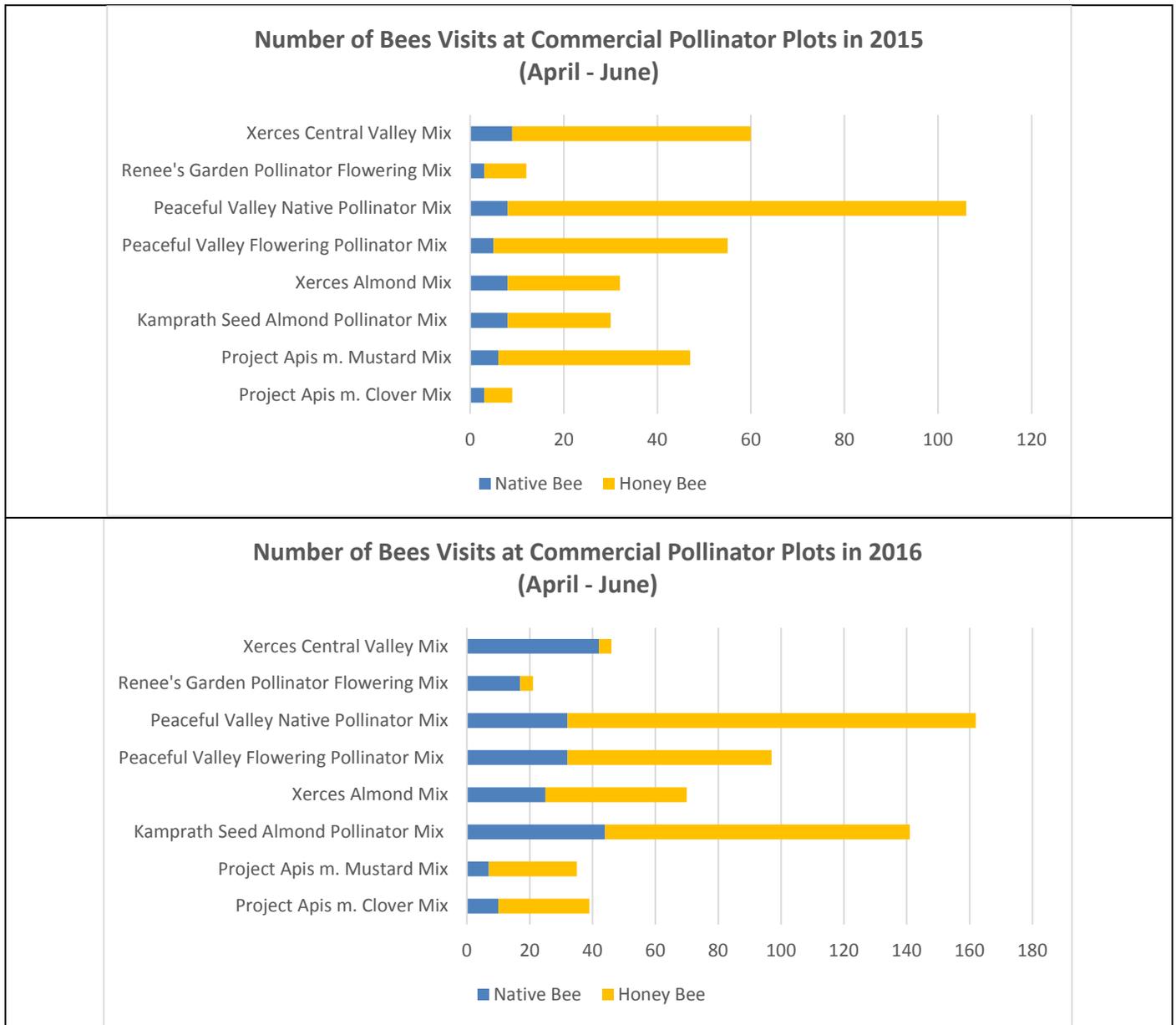


Figure 3. Number of Bees Visits at Commercial Pollinator Plots in 2015 & 2016.