

Section II: Bees and Pollinators

INTEGRATION OF NATIVE BEE POLLINATOR CONSERVATION WITH PASTURE ENRICHMENT

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Native bees provide valuable pollination services for agricultural crops and for native plants in natural habitats. In recent years, native bee populations have been reported to have declined due to loss of habitat, pathogens, and exposure to toxic pesticides. Bee conservation efforts have been directed towards establishment of ‘bee habitat’, such as flowering hedgerows near agricultural fields, for providing bees with food resources. However, these are often restricted in size due to availability of land, and thus the impacts are limited. In contrast, pastures provide a unique opportunity for bee conservation on a large scale. By adding a diversity of flowering plants that bloom at different periods, native bee populations can be enhanced on grass-dominated pastures. Also, by inclusion of clovers, the soil can be enriched with the nitrogen fixed in the plants, while the increase in protein content can benefit grazing animals. The objective of this study was to evaluate the impact, on native bee pollinators, of adding flowering plants to pastures.

Methods: This study was conducted at four ranches in the Willamette Valley in western Oregon. In fall 2014, at each ranch, one paddock was planted with a seed mix consisting of 22 plant species provided by Grassland Oregon, while a second paddock was maintained as a control with no addition of the seed mix. The following spring, observations were made on native bee populations and plant bloom for determining the impact of the addition of the seed mix to the pastures.

Native bee diversity and abundance around pastures. Native bee abundance and diversity were assessed by placement of two blue vane traps (Figure 1) at each seeded and control paddock. Bees captured over a one week period in April and May were collected and identified. In addition, for assessing nesting by mason bees, two nesting blocks with 12 nesting reeds (Figure 2) were set up in each paddock in March, and collected in August. The numbers of plugged reeds and mature cocoons were recorded. The cocoons are being maintained over the winter for emergence of adults.



Figure 1. Blue vane trap for monitoring native bees.

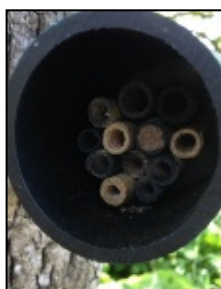


Figure 2. Mason bee nesting block with reeds.

Native bee foragers on flowering plants in pastures. For assessing food resource availability for native bees, plants in bloom and the abundance of bloom in each species, in seeded and control paddocks, were estimated using 0.5 m x 0.5 m grid. For assessing plant utilization by bees, counts of bee foragers on flowers were made during a 10-minute walk in each paddock. Foraging bees and flowers on which they were present were recorded.

Results

Native bee diversity and abundance around pastures. Across the four ranches, blue vane traps captured honey bees and 19 species of native bees belonging to nine genera in the families Andrenidae, Apidae, Halictidae and Megachilidae (Table 1). At Ranch B, three of the nesting blocks had six plugged reeds with 34 cocoons while at Ranch C one nesting block had four plugged reeds with 26 cocoons.

Native bee foragers on flowering plants in pastures. Of the 22 plant species in the seed mix, 12 plant species belonging to three plant families were observed in bloom in the seeded paddocks during the study (Table 2). At each ranch, three to eight plant species were observed in bloom but only balansa clover was observed blooming at all four ranches. The greatest number of plants was observed in bloom during May.

Native bees belonging to at least 13 species in eight genera, besides honey bees, were observed foraging on flowers of 10 plant species in the seeded paddocks across the four ranches (Table 2). A few foraging bees could not be identified due to their rapid flight. The genera *Andrena*, *Bombus*, *Halictus* and *Synhalonia* were observed foraging on at least four plant species (Table 2). However, some species such as *B. mixtus*, *B. nevadensis*, *A. texanus* and *A. virescens* were observed foraging on a single plant species. Plants visited by most species of bees included purple top turnip and radish. Although alsike and persian clover were observed in bloom, no bee foragers were recorded on them. In the control paddocks, white clover and hairy vetch were recorded in bloom and 6 pollinator visits by honey bees, *Andrena* sp, and *Synhalonia* sp. were recorded.

Summary. Based on observations made in spring 2015, a greater diversity and abundance of native pollinators was observed in paddocks planted with the seed mix compared to the control paddocks. Bloom was observed in 12 plants included in the seed mix, and 10 of these were visited by at least 13 species of native bees and honey bees. *Bombus appositus* and *Osmia* spp. that were present in the surrounding regions, based on blue vane trap captures, were not observed foraging on flowers in the seeded paddocks during the sampling periods. In contrast, *B. griseocollis*, *B. nevadensis* and *Nomada* sp. that were observed foraging on flowers were not captured in the traps. This could be because trapping periods and the flower observation periods did not always coincide. Based on preliminary observations made in the study, pastures have the potential for large scale native bee conservation.

Table 1. Average numbers of bees captured in blue vane traps at four ranches in the Willamette Valley in western Oregon in spring 2015.

Bee Family	Bee species ²	Number of bees ¹							
		Ranch A		Ranch B		Ranch C		Ranch D	
		Control	Seeded	Control	Seeded	Control	Seeded	Control	Seeded
Andrenidae	<i>Andrena</i> sp.	---	---	1.67	---	---	0.67	---	---
Apidae	<i>Apis mellifera</i>	0.33	---	2.33	0.67	0.33	---	2.33	2.00
	<i>Bombus appositus</i>	---	0.33	---	0.33	---	---	---	---
	<i>Bombus californicus</i>	---	---	1.33	0.33	0.33	2.00	---	1.00
	<i>Bombus mixtus</i>	---	0.33	1.00	1.00	---	0.67	---	---
	<i>Bombus vosnesenskii</i>	---	---	---	0.67	0.33	0.33	---	0.33
	<i>Ceratina acantha</i>	---	---	---	47.00	---	---	8.33	0.33
	<i>Ceratina micheneri</i>	---	---	---	---	---	---	1.00	---
	<i>Synhalonia</i> sp.	0.33	0.67	0.33	3.00	2.00	1.33	0.67	0.67
Halictidae	<i>Agapostemon texanus</i>	---	---	---	1.33	0.67	1.00	0.67	---
	<i>Agapostemon virescens</i>	2.00	1.67	1.33	1.33	11.00	7.00	3.33	6.33
	<i>Halictus farinosus</i>	---	---	3.00	---	---	---	0.33	---
	<i>Halictus ligatus</i>	---	---	---	1.33	---	---	0.33	3.33
	<i>Halictus rubicundus</i>	---	---	0.67	1.00	---	1.67	---	---
	<i>Halictus tripartitus</i>	---	2.33	14.33	98.67	---	0.67	---	0.33
	<i>Lasioglossum</i> spp. (2)	9.67	15.67	18.67	21.67	4.33	2.00	1.67	14.33
	<i>Sphecodes</i> sp.	---	---	0.67	0.67	---	---	---	0.33
Megachilidae	<i>Osmia</i> spp. (2)	---	1.33	0.33	0.33	---	0.33	0.33	---

¹ Average numbers of bees/trap/week.

² Numbers in parenthesis represent the estimated numbers of species.

Table 2. Blooming period of plant species in seeded paddocks and genera of bees observed foraging on them.

Plant Family	Plant species	Plant Bloom			Bee species foraging on flowers
		March	April	May	
Apiaceae	Parsley				
Asteraceae	Blanket flower				
	Chicory				
	White Yarrow				
Brassicaceae	Forage rape		X		<i>Halictus</i> spp.
	Kale		X		<i>Andrena</i> sp., <i>Apis mellifera</i> , <i>Bombus californicus</i> , <i>Halictus</i> spp.
	Purple top turnip	X	X	X	<i>Agapostemon texanus</i> , <i>Andrena</i> sp., <i>Apis mellifera</i> , <i>Bombus griseocollis</i> , <i>B. vosnesenskii</i> , <i>Halictus</i> spp. <i>Lasioglossum</i> spp., <i>Nomada</i> sp., <i>Specodes</i> sp.
	Radish	X	X	X	<i>Andrena</i> sp., <i>Apis mellifera</i> , <i>Bombus californicus</i> , <i>B. griseocollis</i> , <i>B. mixtus</i> , <i>B. vosnesenskii</i> , <i>Halictus</i> sp., <i>Synhalonia</i> sp.
Fabaceae	Alfalfa				
	Alsike Clover			X	
	Balansa Clover		X	X	<i>Agapostemon virescens</i> , <i>Apis mellifera</i> , <i>Bombus griseocollis</i> , <i>B. vosnesenskii</i> , <i>Halictus</i> spp., <i>Synhalonia</i> sp.
	Berseem Clover				
	Birdsfoot Trefoil				
	Crimson Clover		X	X	<i>Apis mellifera</i> , <i>Bombus californicus</i> , <i>B. griseocollis</i> , <i>B. nevadensis</i> , <i>B. vosnesenskii</i>
	Hairy Vetch			X	<i>Andrena</i> sp., <i>Apis mellifera</i> , <i>Synhalonia</i> sp.
	Persian Clover			X	
	Red Clover				
	Rose Clover			X	Unidentified ¹
	Strawberry Clover				
	White Clover			X	<i>Andrena</i> sp. , <i>Synhalonia</i> sp., Unidentified ¹
	Yellow Sweet Clover				
Hydrophyllaceae	Lacy Phacelia			X	<i>Apis mellifera</i> , <i>Bombus vosnesenskii</i> , <i>Halictus</i> spp., <i>Lasioglossum</i> spp.

¹ Unidentified due to rapid movement.