Pollinator Benefits

Shrub Willows Support a Wide Diversity of Bees

Pollination is a vital ecological service provided by a wide range of insect species including bees, wasps, flies, butterflies, beetles and moths. Recent estimates show that about 88% of all flowering plants and 35% of the global plant-based food supply relies on pollinators to be successful. Bees are the most important group of pollinators for wild plants and agricultural crops, and are in need of conservation. When bees emerge in the spring, they require a food source. Shrub willow is one of the earliest flowering plants in temperate regions around the world. Willow cultivars produce either male or female flowers that appear in thin, cylindrical clusters called catkins. Willow flowers contain pollen and nectar, both valuable resources for a wide variety of bee species and other pollinators.

Figure 1: Flowers on a shrub willow plant in willow bioenergy planting in spring.

While bees are often seen in willow biomass crops in the spring, there is little data about the number and types of bees that are found in willow, and if there are differences in bee activity around different willow cultivars. To better understand the interactions between willow and bees, a study was conducted by SUNY-ESF in a willow biomass planting that contained 30 different cultivars from five different genetic diversity groups. The results showed a remarkably diverse bee community in the willow that included 57 wild bee species from five different families and 13 genera. Several of the bees identified in the willow were rare or in decline in the northeastern U.S. The richness and diversity of bee species did not vary among the willow cultivars, but there was an indication that abundance did vary among cultivars. Male willow plants had a higher number of bees and more bee species than female willows. Catkins on male willow produce both nectar and pollen, which may make them more attractive to bees than female willow, which only produce nectar. Pollen is an important source of protein for bees. This research indicates a robust and diverse bee assemblage was associated with the willow biomass crops.

Figure 2: Wild bees feeding on pollen and nectar from willow plants

Wild bee pollinators can deliver the majority of crop pollination in various land-uses. Bioenergy crop cultivation, if strategically planned, can enhance biodiversity, ecosystem services, and potentially crop yield. Incorporating plantings of willow across the landscape, especially near commercially grown fruit and berry crops, may be an effective way to promote pollinator populations and provide a nutrient resource for pollinators at a time early in the spring when few other plants are flowering. These willow plantings could also be designed to

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serve other functions such as nutrient buffers in fields near riparian areas, and living snow fences. This research suggests that including representatives from various pedigrees and both male and female willows can help maximize bee abundance and diversity. With proper planning, portions of the willow across the landscape could be harvested each year while other portions are left to grown and flower in the spring.

Willow Planting Strategies for Bee Habitat Enhancement

- Favor male willow at establishment, as males produce nectar and pollen while females only produce nectar, but include a diversity of cultivars and both male and female willow.
- Spread the harvesting cycle for biomass across the landscape to ensure that there is consistent availability of flowers each spring.
- Native crop species planted within or near bioenergy areas can provide for pollinators when willow is not in flower.
- Reduce the use of insecticide, herbicide and fungicide, particularly during the willow flowering period, to minimize negative impact on bees.
- Planting willow near commercial crops (such as apples) may enhance pollination of those crops by establishing a robust bee population.

Figure 3: Flowers on a shrub willow plant

Additional Resources

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Northeast Woody/Warm-Season Biomass Consortium
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