2016

08. Strengthening Karner Blue Butterfly Metapopulations

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ABSTRACT Wild lupine (*Lupinus perennis*) is the obligate host plant for larvae of the Karner blue butterfly (*Lycaeides melissa samuelis*). The purpose of this study was to determine whether planting wild lupine in dry prairie sites (areas previously devoid of wild lupine but having appropriate habitat structure for its growth) would result in colonization from existing populations of Karner blue butterflies over time, thereby adding to metapopulation stability. The newly planted sites were on private and public land and ranged in area from 0.81 to 8.1 ha (from 2 to 20 acres). They were located within about 3.2 km (2 mi) of existing Karner blue butterfly–occupied sites.

KEY WORDS Karner blue butterfly, lupine, *Lupinus perennis*, *Lycaeides melissa samuelis*, metapopulation

The federally endangered Karner blue butterfly (KBB; *Lycaeides melissa samuelis*) has its largest population in central Wisconsin (Figure 1). The Wisconsin Statewide Karner Blue Butterfly Habitat Conservation Plan was formulated to conserve habitat for the butterfly's sole host, lupine (*Lupinus perennis*), a native species dependent on specific habitat conditions (Wisconsin Department of Natural Resources 2000).

A series of prairie restoration efforts, including planting of wild lupine, were initiated in 1988 at an approximately 40.5-ha (100-acre) site in the central sand plains of Wisconsin. KBBs had moved from adjacent established sites to the 1988 restoration site by 1993. After 1998, 11 additional prairie restorations from 0.81 to 24.3 ha (from 2 to 60 acres) were undertaken within a 3.2-km (2-mi) radius of the 1988 restoration site. All restorations included lupine and were colonized by KBBs. The prairie restorations occupied a variety of habitats from xeric to wet prairie and included two rivers and six wetlands (Figure 2).

We documented the KBB colonization of these plantings via abundance surveys from 1996 to 2007. This colonization was determined by mapping distances traveled by the butterflies and by mapping the terrain over which they traveled (Shillinglaw and Shillinglaw 2008). It may be important for long-term reproductive success that KBBs have access to habitat that varies in composition. In dryer years, they may need more mesic habitat and in wetter years more xeric habitat. The restorations together comprise this variation. KBBs have been documented traveling distances greater than 1.5 km (0.9 mi) (King 1998), and their ability to populate these restoration sites indicates an adaptability that may help secure a viable metapopulation.

A new study was begun in fall 2008 to determine whether planting wild lupine only on selected properties, without other restoration activities, would be colonized and result in new populations of KBBs.

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METHODS

Lupine seeding was done on private and public properties with appropriate habitat. The sites were from 0.8 to 6.4 km (from 0.5 to 4 mi) from known populations of KBBs and had no lupine or KBBs before planting. Other than planting the lupine, no other restoration techniques were used, thereby saving time and money. Wild lupine was planted on 10 new sites ranging from 0.81 to 8.1 ha (from 2 to 20 acres) in November 2008 and November 2010 in eastern Waushara County, Wisconsin (Figure 3). The seeds, after being scarified with sandpaper, were raked in approximately 2 cm (0.8 in.) and tamped down on 15–30 1-m (3.3-ft) patches across the acres planted. The patches were usually where there was sparse to no vegetation (Figure 4). The sites were monitored annually. On all sites, lupine seedlings were present the summer after planting, and blossoms appeared the following summer. The sites were monitored for KBBs (presence or absence) during the first and second flight periods from 2009 to 2015.

Figure 1. Karner blue butterflies: male (left) and female (right).

Figure 2. Lupine habitat. Note that scattered clumps of oak occur on the site.

RESULTS

KBBs first appeared on two of the newly planted sites in 2012 (Figure 5). These two sites were about 1.3 km (0.8 mi) from a previously occupied site. The butterflies have persisted at these two sites to summer 2016. During both flights in 2013, butterflies were present at an additional new site about 2.6 km (1.6 mi) from a known occupied site and have remained. In 2015, KBBs appeared at a fourth site about 1 km (0.6 mi) from a previously occupied site.

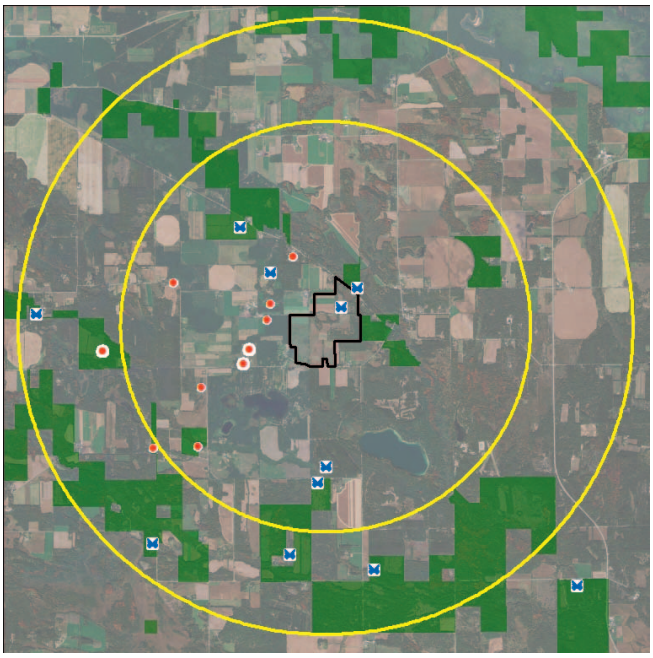

Figure 3. Two- and 3-mi-radius (3.2- and 4.8-km-radius) circles centered on an approximately 40.5-ha (100-acre) prairie restoration site in central Wisconsin. Blue butterfly icons indicate observed Karner blue populations before 2008. Red dots indicate lupine plantings in 2008 and 2010 at sites where neither lupine nor Karner blue butterflies had been observed. Highlighted red dots indicate subsequent colonization of planting sites by Karner blue butterflies.

Figure 4. Emerging seedlings in spring 2008 from seeds planted in fall 2007.

DISCUSSION

This "Johnny Appleseed" approach may be of value in a fragmented landscape with many small parcels, thereby avoiding the expense of seeding a native prairie grass and forb mix (Schweitzer 1994). Motivated private landowners can maintain habitat for KBBs over time by intensive management on small parcels (Smallidge and Leopold 1997). KBBs thrive in patches of habitat less than 2 ha (5 acres), and a metapopulation structure can be strengthened if there is a mosaic of these small patches. Using small private lupine sites in combination with lupine on the relatively small Wisconsin Department of Natural Resources holdings of the Mecan River fishery area could significantly expand the habitat for KBBs.

Figure 5. Karner blue butterfly feeding on nectar. Photographed in May 2012.

In summary, KBBs will colonize new sites where wild lupine had not previously been present. King (1998) showed that these butterflies will travel distances greater than 1.5 km (0.9 mi). This approach of planting lupine in patches across the landscape represents a management strategy that may strengthen KBB populations over time. It may also motivate some private landowners to plant wild lupine in appropriate sites on their properties.

ACKNOWLEDGMENTS

Photographs by J. Shillinglaw. Editorial assistance by C. Shillinglaw.

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