

2021 Karner Blue Butterfly Summer Survey Results

Chelsea Weinzinger WDNR



MONITORING:

Within the WDNR Karner blue butterfly Recovery Program, monitoring throughout the Karner's range consists of two types of survey efforts, population surveys, which are conducted using a highly intensive survey method (distance sampling) and occupancy surveys, which are conducted using less intensive survey methods (occupancy-presence/absence) (Figure 1). Population surveys allow us to view a snapshot of what a specific site (not entire property) population level is estimated to be at that point in time. Occupancy surveys allow us to survey a greater number of sites and estimate the occupancy rates and metapopulation dynamics (local colonization and extinction rates, ie. turnover) of the species. These estimates give us a larger picture view of the status of Karner's in Wisconsin across a range of site characteristics.

Population Surveys (distance sampling):

In 2021, 583 acres across 15 sites were surveyed using the higher intensive survey method of distance sampling in order to estimate population size. Of those 15 sites, 6 sites increased, and 9 sites decreased when compared to 2020. A total population of 60,304 individuals were estimated which is 11% higher than 2020 despite more acreage surveyed in 2020 (591 acres) (Table 1). Due to the varying number of acres surveyed each year the data required standardization. This was done by calculating butterflies per acre. When comparing butterflies per acre, 2021 followed an increasing trend, with 103 butterflies per acre, since a drop in 2018 (Figure 2). These data can be further broken down by recovery unit (see Appendix map for recovery unit breakdown). Most of the increase in butterflies per acre was due to the Glacial Lake (GL) Recovery Unit, while the remaining units saw decreases. Some of these decreases were due to habitat improvements occurring such as prescribed burns. This is the case in the Escarpment & Sandstone Plateau (ESP) Recovery Unit. A special note about the Superior Outwash (SO) Recovery Unit should be mentioned; despite an increase in the number of individuals counted during the 2021 surveys, the population estimates decreased. This contradiction is likely due to the fact that surveys at one site in this recovery unit violated the assumption of the model that requires detections to decrease with distance from the observer, which was not the case at the Fish Lake site (Figures 3-7).

2021 Karner Surveys

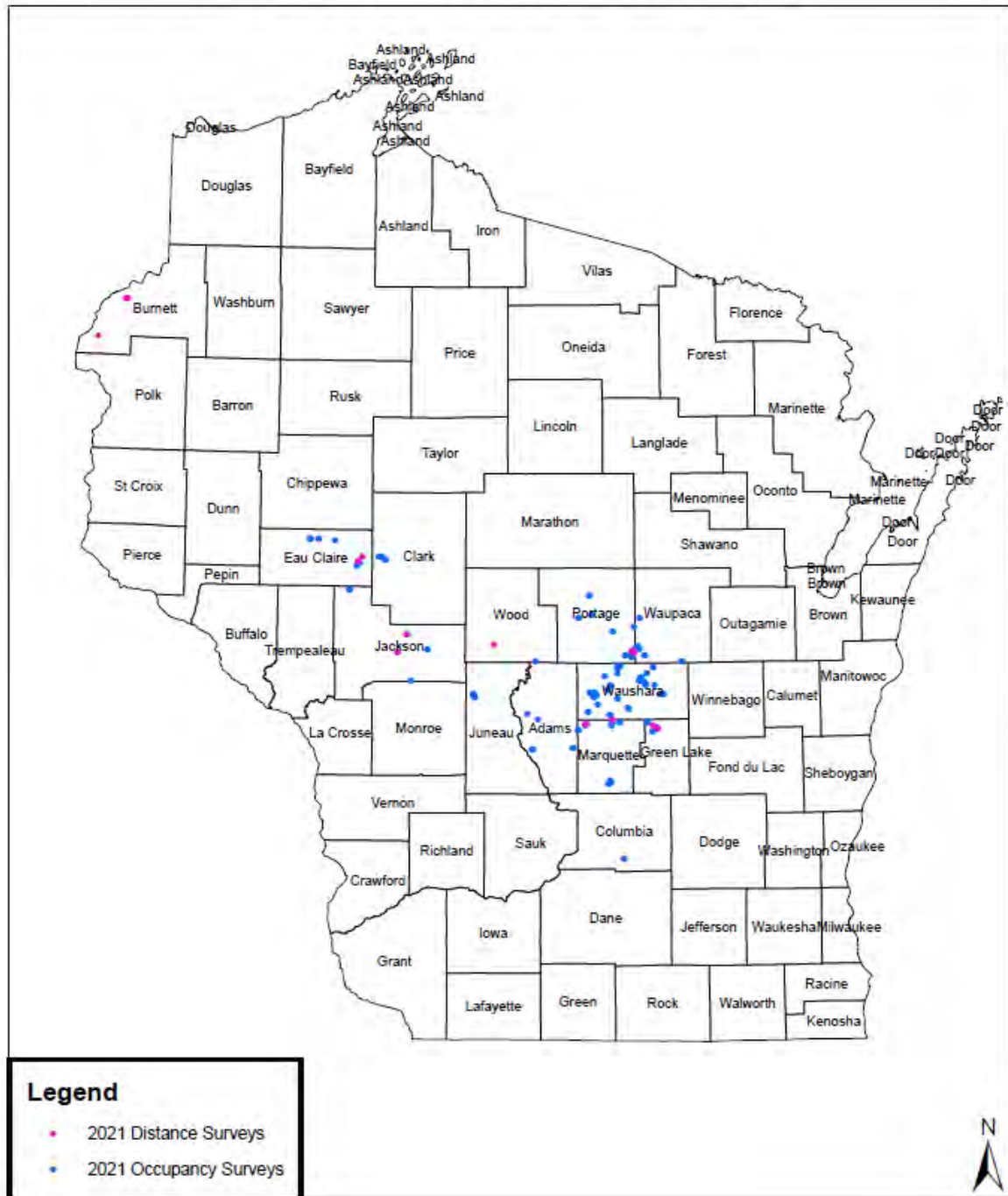


Figure 1. Karner blue butterfly monitoring effort in 2021.

Table 1. Annual Karner population estimates based on distance data collected at each recovery property. Note, number of sites refers to the number of sites surveyed in 2021. The population estimates for each property refer to only the area surveyed, not the entire property.

WI KBB Population Estimate by Recovery Property																
RU	Property	# sites	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
GL	Sandhill W.A.	1	12,065	10,185	22,799	11,057	7,771	3,839	-	57,852	76,347	53,971	12,692	3,159	18,066	32,504
MS	Emmons Creek F.A.	3	4,089	1,921	4,395	3,452	5,597	4,733	697	1,335	3,002	4,781	1,629	4,173	3,933	1,939
	Hartman Creek S.P.		420	381	407	454	-	409	371	-	380	-	-	-	-	-
	Welch	1	706	1,207	1,417	2,497	2,842	2,611	-	6,239	10,856	4,773	3,183	10,154	5,361	5,660
	Greenwood W.A.		-	-	-	-	771	-	366	-	-	-	-	-	-	-
	White River W.A.	2	2,171	2,225	2,583	7,175	7,994	5,264	4,384	5,197	7,748	1,756	1,987	6,124	1,560	3,286
	Private Property 1	1	-	-	4,474	6,622	8,587	599	610	760	4,302	3,580	2,356	2,433	4,973	3,058
	Private Property 2	1	-	-	-	-	-	3,710	3,281	1,729	5,674	4,431	1,860	3,889	1,487	2,140
	Private Property 3		-	-	-	-	-	-	-	-	-	386	1,030	1,677	1,093	-
WCD	Black River S.F.	1	-	651	1,309	1,758	782	261	-	-	2,492	4,648	5,375	4,852	6,568	2,476
	Bauer Brockway SNA	1	-	-	-	1,837	-	316	-	-	3,336	2,346	372	0	569	1,209
SO	Crex Meadows W.A.	1	-	-	1,097	4,801	1,228	213	427	567	2,054	865	871	355	2,935	2,430
	Fish Lake W.A.	1	-	518	2,042	5,617	2,421	-	1,043	626	1,691	1,690	1,186	1,216	3,006	2,256
ESP	Canoe Landing Prairie SNA	1	-	-	-	-	-	-	-	-	-	-	-	-	2,203	1,567
	Coon Fork Barrens SNA	1	-	-	-	-	-	-	-	-	-	-	-	-	2,816	1,779
Total Population Estimate		15	19,451	17,088	40,523	45,270	37,993	21,955	11,179	74,305	117,882	83,227	32,541	38,032	54,570	60,304

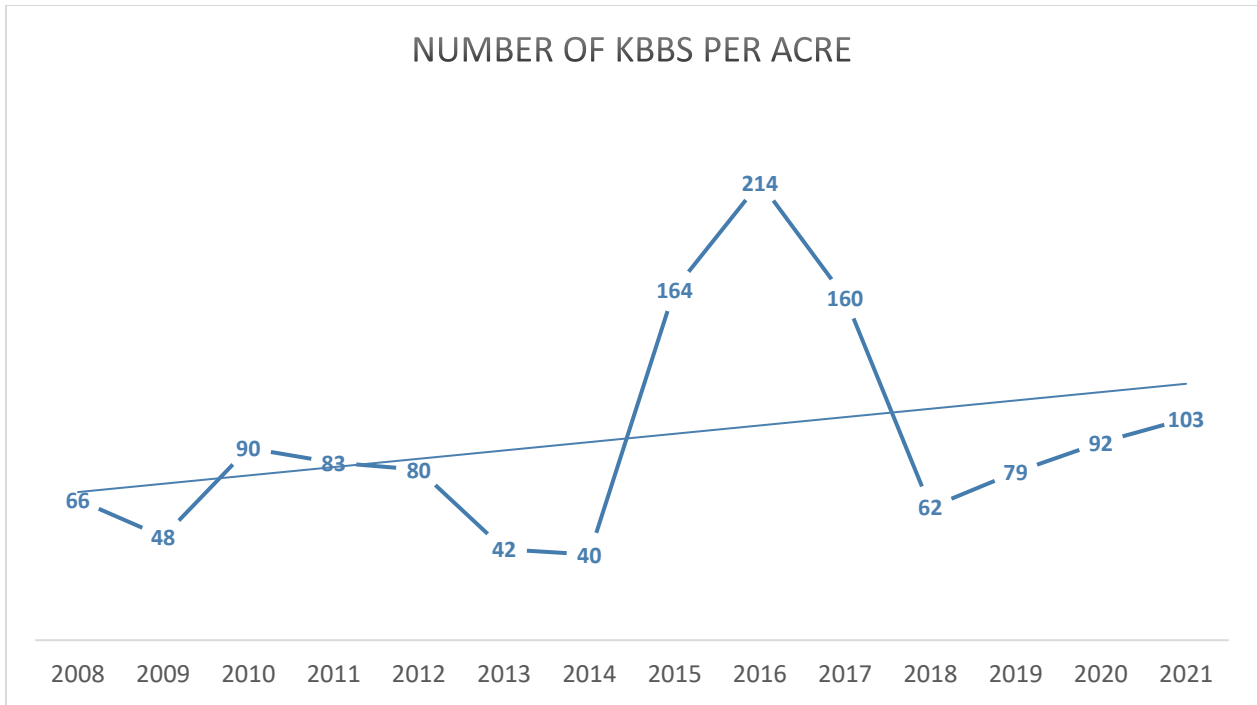


Figure 2. Annual number of Karner blue butterflies per acre at all sites surveyed with linear trend.

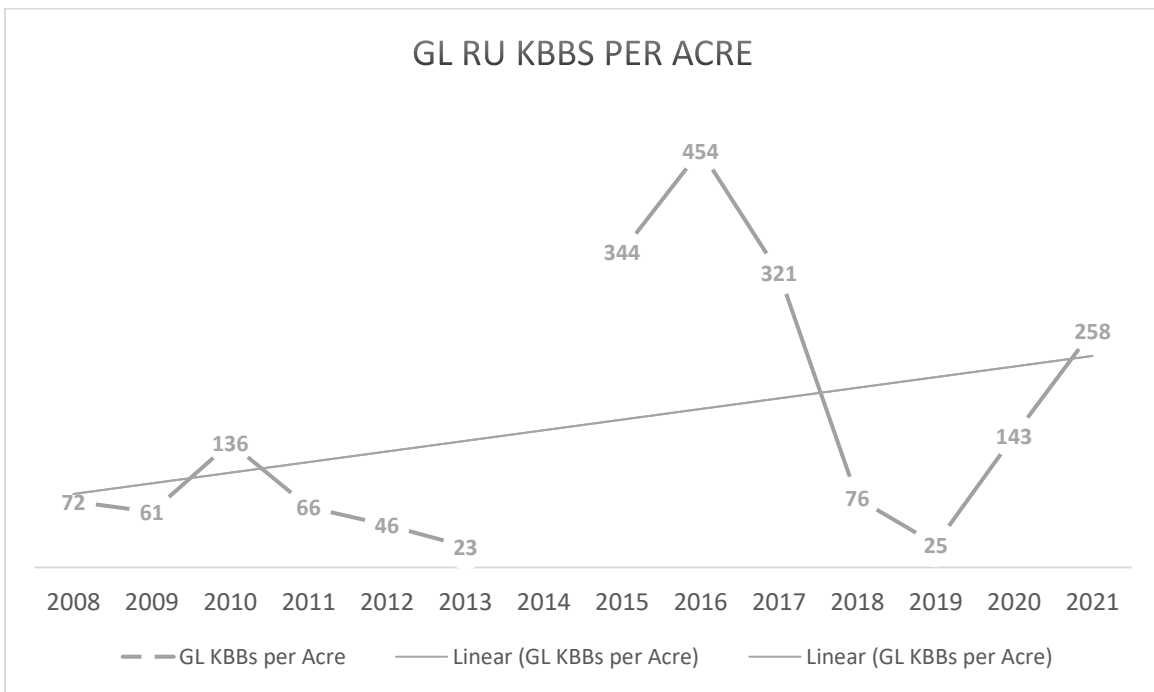


Figure 3. Annual number of Karner butterflies per acre at all sites surveyed in the Glacial Lake Recovery Unit with linear trendline.

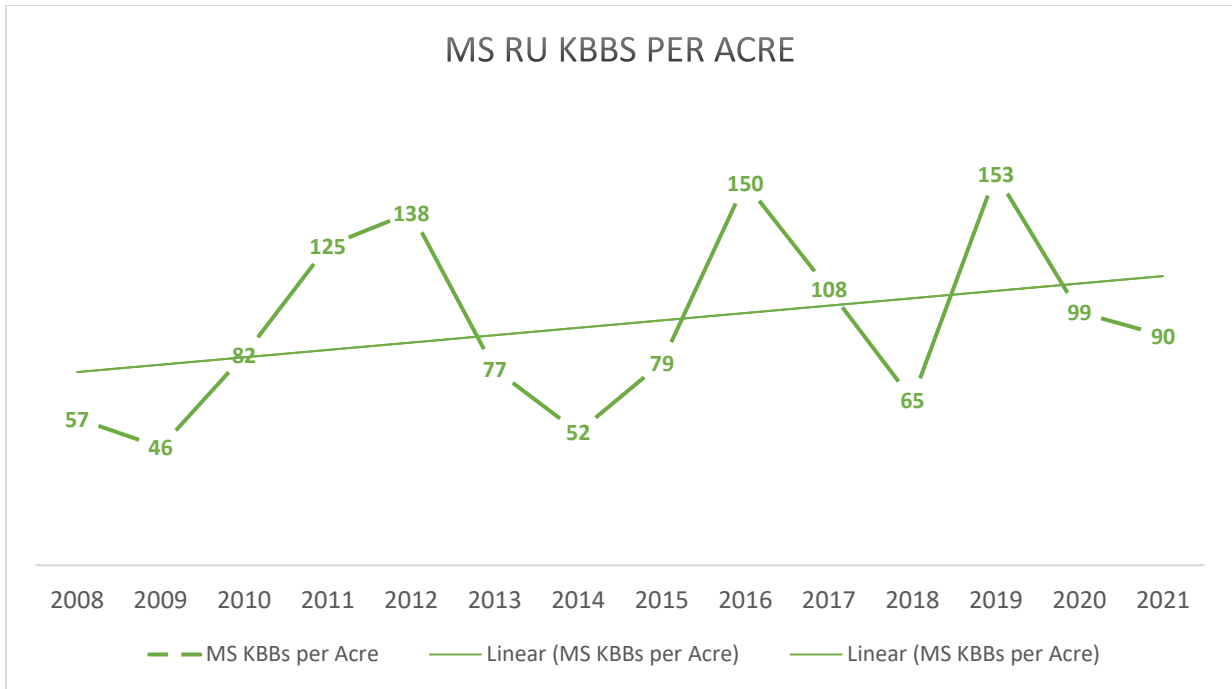


Figure 4. Annual number of Karner butterflies per acre at all sites surveyed in the Morainal Sands Recovery Unit with linear trendline.

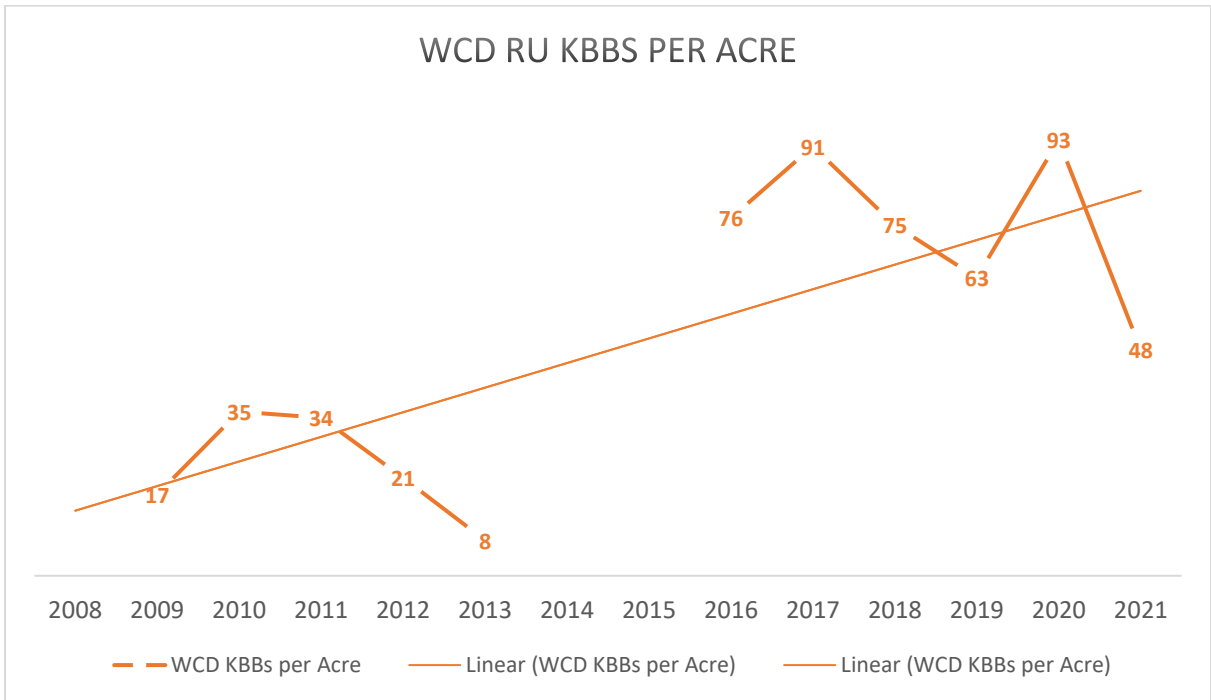


Figure 5. Annual number of Karner butterflies per acre at all sites surveyed in the West Central Driftless Recovery Unit with linear trendline.

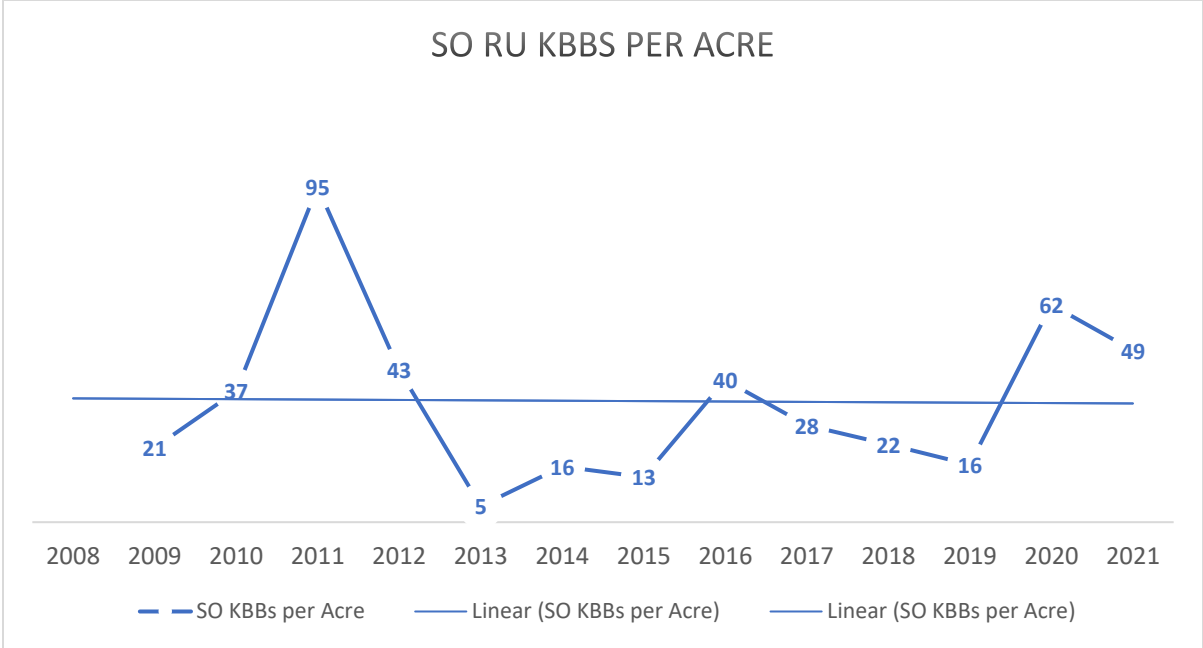


Figure 6. Annual number of Karner butterflies per acre at all sites surveyed in the Superior Outwash Recovery Unit with linear trendline.

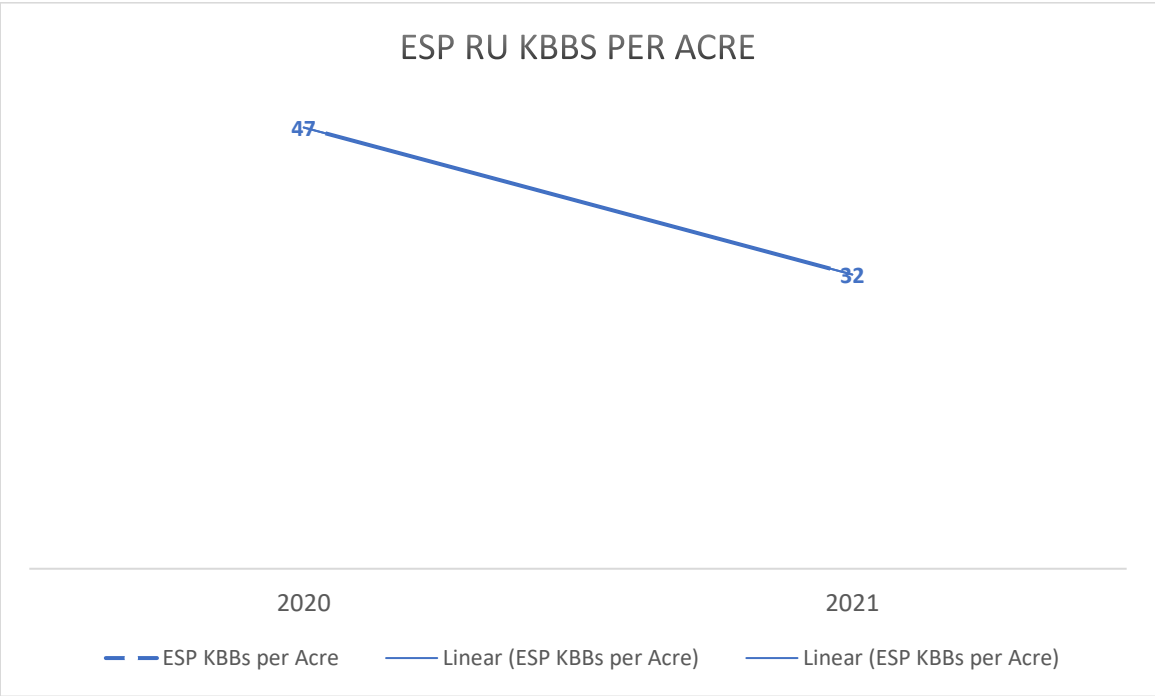


Figure 7. Annual number of Karner butterflies per acre at all sites surveyed in the Escarpment & Sandstone Plateau Recovery Unit with linear trendline.

Occupancy Surveys:

For the 2021 field season, 619 acres were surveyed using the lower intensive sampling method. These observations come from a variety of sources including DNR staff, contract crews, and citizen scientists. A total of 173 observations were submitted which is 30% more than 2020. Volunteers continue to play a large role in this type of data collection with 41% of the total observations coming from participants in the [Karner Volunteer Monitoring Program](#). Contracted crews submitted 35% and DNR staff contributed 24%. Observers visited 92 sites in 2021 and of those, 80 sites had Karners present. During these surveys over 3,000 individual butterflies were counted. Utilizing these data, we can estimate occupancy rate (proportion of sites that are occupied), colonization rate (proportion of successful colonizations of previously surveyed but unoccupied sites), and extinction rate (proportion of formerly occupied sites becoming unoccupied). Based on these data, Karners have stayed consistently detectable while the occupancy rate each year has increased. The colonization rate has also increased while the extinction rate has decreased suggesting Karners are not only persisting, but possibly growing within their Wisconsin metapopulations (Figure 8). It should however be noted that site selection for occupancy surveys is not entirely random and has to date been focused on sites that appear to have suitable habitat for Karners. This could lead to inflated detection probabilities and occupancy rates. One potential improvement of Karner monitoring in Wisconsin could be to create a stratified random site selection protocol that will improve our estimates of detection, occupancy, and turnover rates.

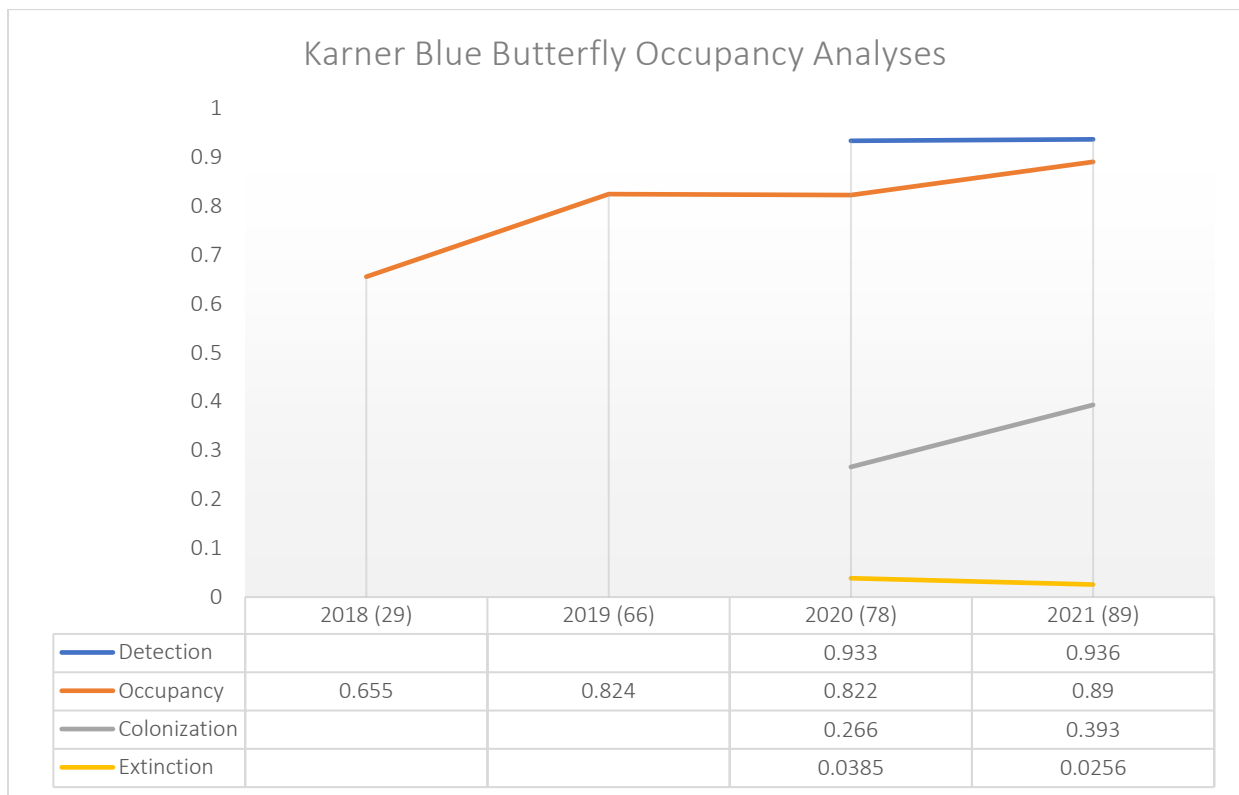


Figure 8. Detection, occupancy, colonization and extinction rates for Karner blue butterfly surveys from 2018-2021. Number of usable site data listed in parenthesis.

