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Subject: Summer 2021 monarch butterfly and other pollinator surveys on private lands managed for Golden-winged Warblers

Hello Greg and Mark,

The purpose of this letter is to thank you for providing me access to the public land in Carlton County, 3 alder-sheard sites (53.6 ac, 20.2 ac, and 20.9 ac) during last summer (June-August 2021) to conduct my master's research on monarch butterflies and pollinators. Also, I would like to share with you a brief summary of what my team and I observed at these sites during our surveys. This project wouldn't have been possible without your cooperation! In the future when I defend my thesis, I will send out an invite to all landowners and managers that participated in my study, if you would like to watch it virtually and learn more about my project and the results. Thanks again for all that you do!

Thanks,

Emma Keele



Photo: Monarch nectaring on orange hawkweed.
Photo taken by Eric Bastidas.

Summary of 2021 Field Work

Purpose of Research Project

The purpose of this research project is to assess if monarch butterflies, and other pollinators benefit from habitat management that has been conducted for the Golden-winged Warbler through the USDA-NRCS Regional Conservation Partnership Program. The monarch is our species of focus because many scientific studies and reports have shown that the monarch population is severely declining. The two leading causes of decline are habitat loss and poor-quality existing habitat. One solution to this problem is to find strategies to increase high-quality habitat for monarchs. This is where habitat management for the Golden-winged Warbler comes into the story. Golden-winged Warblers require young habitat types to breed. The creation of these young habitat types can provide short-term high-quality habitat for monarchs and other pollinators. Many other scientific studies also support that these young habitat types benefit pollinators by providing abundant flowers and an open landscape for movement and warmer microclimate. In summary, my project will determine if these young habitat types are benefiting monarchs and it will also provide recommendations on how to improve management for monarchs and other pollinators within Golden-winged Warbler managed areas by the NRCS Regional Conservation Partnership Program.



Photos of monarchs that we saw throughout the summer.

Left photo: Monarch about to lay an egg (oviposit) on common milkweed.

Middle photo: Monarch nectaring on water hemlock.

Right photo: Monarch nectaring on joe-pye-weed.



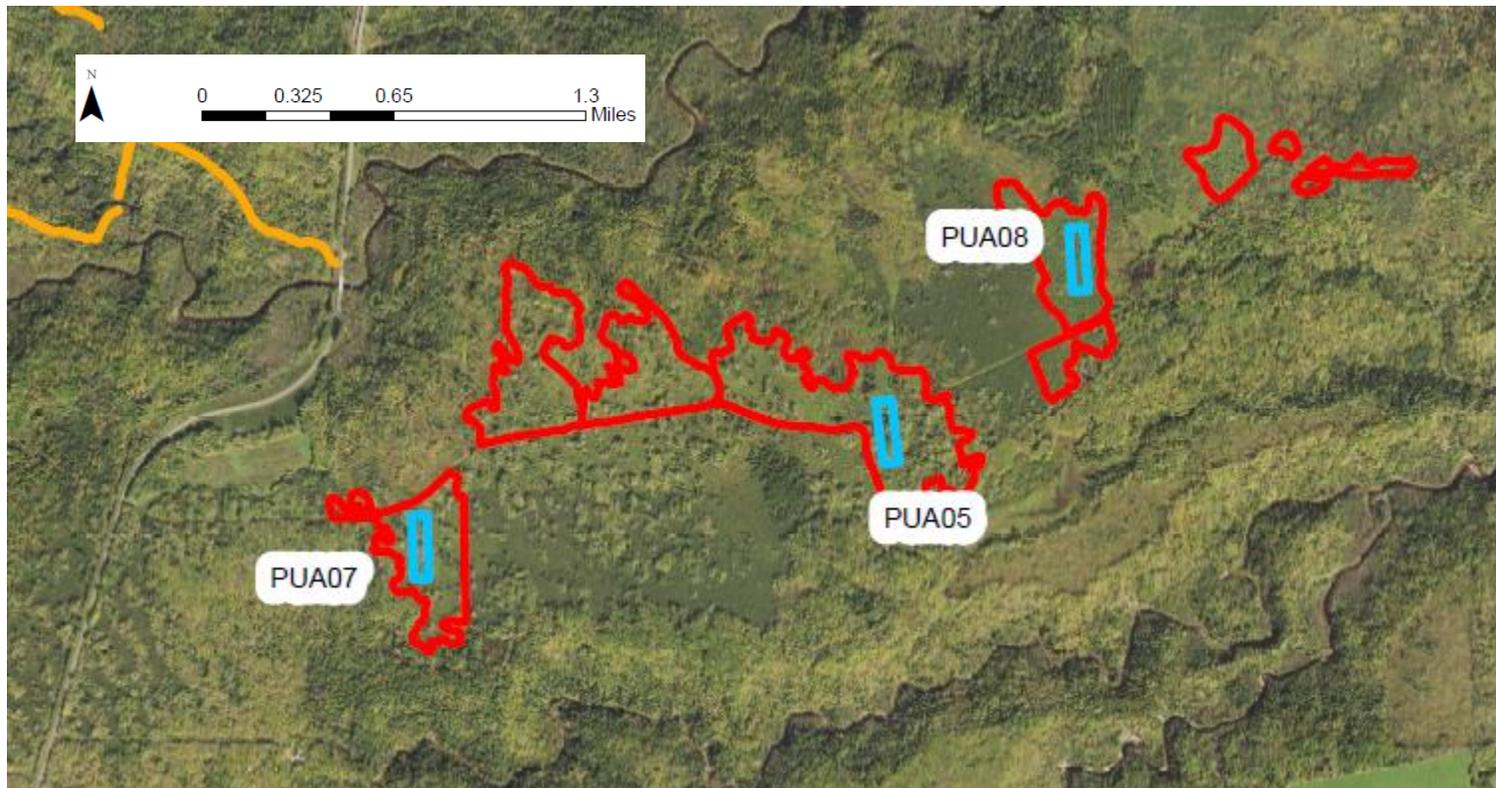


Photo 1. Maps of where pollinator and blooming nectar plant surveys were conducted on public lands in summer 2021. The red polygon is where the Golden-winged Warbler management took place and the blue polygon is where we conducted the surveys to search for monarchs, other pollinators, and blooming nectar plants.

Review of surveys

The Golden-winged Warbler managed area on your property (young aspen forest or shrub-sheared alder) (Photo 1) was visited three times during the summer 2021 (approx. once in June, July, and August). During each of these three visits we conducted two different surveys: (1) pollinator and milkweed survey and (2) blooming nectar plant survey.

For the first survey, pollinator and milkweed survey, this was completed by walking a predetermined 500-meter route that was timed for 25 minutes. While walking this route, we recorded if we saw any monarchs, other butterflies, and bumble bees (Photo 2). Additionally, during this survey we also searched for milkweed plants (*Asclepasis spp.*). Milkweeds are the monarch's host plant, which means that monarchs need milkweed to lay their eggs on and the milkweed plant provides food for monarch caterpillars before turning into a butterfly. If we saw any milkweed plants, we searched the whole plant and recorded if we saw any monarch eggs or caterpillars (Photo 3).



Left, Photo 2. A white admiral and large fritillary we recorded during the pollinator survey.

Right, Photo 3. An image of me searching a common milkweed plant for monarch eggs and caterpillars.

For the second survey, blooming nectar plant survey, this was completed to quantify the abundance of floral resources and floral diversity within the Golden-winged Warbler managed area. To complete this survey, we walked three transects (500-meters) and every 5-meters we laid down a one-meter² subplot (Photo 4) and identified all flowering plant species and counted the number of flowers for each species. As a result, we searched for flowers within 100 subplots.



Photo 4. An image of me laying down a one-m² subplot to search for flowers during the blooming plant survey. If I found a blooming plant, I would identify the species and count the number of flowers.

Observations

Table 2. This table includes the total count of each butterfly species and bumble bee that we observed during all three visits (June, July, August) on the public lands site. Butterfly species were identified at least to subfamily and if we were able to individuals were identified to genus and species. We did not identify bumble bees to species, only to genus (*Bombus*). Dashes “-” indicate not being identified to that level.

Common Name	Subfamily	Genus	Species	Count
blue	Polyommatae	-	-	1
Bumble bee	Apidae	<i>Bombus</i>	<i>sp.</i>	62
checkerspot	Nymphalinae	<i>Chlosyne</i>	<i>sp.</i>	15
crescent	Nymphalinae	<i>Phyciodes</i>	<i>sp.</i>	3
eastern tiger swallowtail	Papilioninae	<i>Papilio</i>	<i>glaucus</i>	2
large fritillary	Heliconiinae	<i>Speyeria</i>	<i>sp.</i>	27
monarch	Danainae	<i>Danaus</i>	<i>plexippus</i>	1
satyr	Satyrinae	-	-	13
skipper	Pyrginae or Hesperinae	-	-	37
small fritillary	Heliconiinae	<i>Boloria</i>	<i>sp.</i>	24
white	Pierinae	-	-	6
			<i>arthemis</i>	
white admiral	Limnitiidae	<i>Limnitis</i>	<i>arthemis</i>	3



These photos show all the different stages of immature monarchs that we were looking for when we were searching the milkweed plants.

Top left: Two monarch eggs on the underside of a common milkweed leaf. **Top middle:** First instar monarch caterpillar. **Top right:** Second instar monarch caterpillar. **Bottom left:** Third instar monarch caterpillar. **Bottom middle:** Fourth instar monarch caterpillar. **Bottom right:** Fifth instar monarch caterpillar.



These photos include other butterflies and bumble bees that we saw throughout the summer.

Top left: Baltimore checkerspot resting.

Top middle: A viceroy resting. This is a mimic of the monarch. Differing characteristic is the heavy black vein through the middle of the hind wing.

Top right: Hairstreak resting.

Middle: Bumble bee nectaring on a thistle.

Bottom: Small fritillary resting with its wings spread out.

Table 3. This table includes all flowering plants that we observed during the three visits (June, July, August) at the public lands site. Each species includes their common name, family, and scientific name (genus and species). When we could not identify to species we recorded “sp.” in the Species column. Count refers to the total number of flowers we counted for each plant species during the three visits. For plants identified to species, the status column refers to if that plant is native or non-native. Dashes “-” indicate not being able to determine native/non-native status because that plant was not identified to species.

Common Name	Family	Genus	Species	Count	Status
arrow-leaved tearthumb	Polygonaceae	<i>Polygonum</i>	<i>sagittata</i>	57	Native
bedstraw	Rubiaceae	<i>Galium</i>	<i>sp.</i>	3094	-
black snakeroot	Apiaceae	<i>Sanicula</i>	<i>sp.</i>	20	-
blue violet	Violaceae	<i>Viola</i>	<i>sp.</i>	5	-
bugleweed	Lamiaceae	<i>Lycopus</i>	<i>sp.</i>	651	-
Canada mayflower	Liliaceae	<i>Maianthemum</i>	<i>canadense</i>	33	Native
chickweed	Caryophyllaceae	<i>Stellaria</i>	<i>sp.</i>	2	-
common yarrow	Asteraceae	<i>Achillea</i>	<i>millefolium</i>	75	Native
cream pea	Fabaceae	<i>Lathyrus</i>	<i>ochroleucus</i>	27	Native
dewberry	Rosaceae	<i>Rubus</i>	<i>flagellaris</i>	47	Native
flat-topped white aster	Asteraceae	<i>Doellingeria</i>	<i>umbellata</i>	620	Native
golden ragwort	Asteraceae	<i>Packera</i>	<i>aurea</i>	9	Native
goldenrod	Asteraceae	<i>Solidago</i>	<i>sp.</i>	2003	-
hooked buttercup	Ranunculaceae	<i>Ranunculus</i>	<i>recurvatus</i>	3	Native
jewelweed	Balsaminaceae	<i>Impatiens</i>	<i>capensis</i>	1	Native
large-leaved aster	Asteraceae	<i>Eurybia</i>	<i>macrophylla</i>	3	Native
lesser stitchwort	Caryophyllaceae	<i>Stellaria</i>	<i>graminea</i>	22	Non-native
marsh marigold	Ranunculaceae	<i>Caltha</i>	<i>palustris</i>	2	Native
nannyberry	Caprifoliaceae	<i>Viburnum</i>	<i>lentago</i>	120	Native
nodding trillium	Liliaceae	<i>Trillium</i>	<i>cernuum</i>	1	Native
red baneberry	Ranunculaceae	<i>Actaea</i>	<i>rubra</i>	10	Native
rubus	Rosaceae	<i>Rubus</i>	<i>sp.</i>	84	-
sarsaparilla	Araliaceae	<i>Aralia</i>	<i>nudicaulis</i>	110	Native
starflower	Pimulaceae	<i>Trientalis</i>	<i>borealis</i>	1	Native
swamp thistle	Asteraceae	<i>Cirsium</i>	<i>muticum</i>	24	Native
yellow avens	Rosaceae	<i>Geum</i>	<i>aleppicum</i>	4	Native



Top and Bottom: Photos of study sites