Densities of Wild Lupine and Karner Blue Butterflies After Reconductering the Cobb to Brickyard Line: 2010

Prepared by:
Joelle Gehring, Ph.D.

Michigan State University
Michigan Natural Features Inventory
Steven Mason Building, P.O. Box 30444
Lansing, MI 48909
GehringJ@michigan.gov

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Executive summary

The Karner blue butterfly (*Lycaeides melissa samuelis* Nabokov) is a small silvery-blue colored butterfly that specializes on wild lupine (*Lupinus perennis*) (Rabe 2001). This butterfly population uses sandy, oak savannah areas of Michigan and has historically declined in numbers as land use changes increased the amount of fire control; thereby allowing savannah areas to develop into forest ecosystems. The Karner blue butterfly is now a federally endangered species and a threatened species in Michigan (United States Fish and Wildlife Service 2003).

In 2005 a 4.07-mile section of ITC's ROW where Karner blue butterflies had been previously observed was reconductored (metal poles replaced with wooden poles). In collaboration with Environmental Consulting and Technology (ECT), Michigan Natural Features Inventory (MNFI) conducted post-reconductoring population surveys and population monitoring for the Karner blue butterfly and wild lupine. Population surveys focused on the previously disturbed 4.07-mile section of the ROW.

In 2010 we surveyed during both flight periods of the Karner blue butterfly life cycle using methods established and standardized by the Michigan Department of Natural Resources and Michigan Natural Features Inventory (MNFI).

The ROW of the ITC Transmission Company, in Muskegon and Newaygo Counties, Michigan is still providing habitat for the Karner blue butterfly and its host plant, wild lupine, despite 2005 reconductoring activities. In the 2006 surveys ENSR International documented a total of 22 Karner blue butterflies during the first flight period and 60 butterflies during the second flight period (Hart and Groves 2006). In collaboration with ECT, MNFI successfully conducted 2007 population surveys and detected 173 Karner blue butterflies during the first flight and 187 during the second flight period (Gehring 2007). In this survey season (2010), 169 Karner blue butterflies were detected in the first flight period and 190 in the second flight period. These numbers were consistent with the 2007 survey numbers and significantly higher than the 2005 levels. The survey data from 2005, 2007, and 2010 suggest that the Karner blue butterfly population increased and now has become more consistent.

Table of contents **Page**

Introduction

The Karner blue butterfly (*Lycaeides melissa samuelis* Nabokov) is a small silvery-blue colored butterfly that specializes on wild lupine (*Lupinus perennis*) (Rabe 2001; Figures 1 and 2). Historically, this butterfly inhabited the sandy, oak savannah areas of eastern Minnesota and northeastern Iowa extending east to New York, Massachusetts, and New Hampshire. Their range overlaps specifically with the northern

edge of the wild lupine range (Swengel and Swengel 2005). The increase in agriculture and urban development has resulted in the fragmentation and elimination of oak savannahs and the suppression of fires which caused open savannahs to become closed forest habitats. Considering that wild lupine is a fire dependent species, both wild lupine and Karner blue butterfly populations have declined dramatically as a result of these land use and land cover changes. The Karner blue butterfly is now a federally endangered species and a threatened species in Michigan (United States Fish and Wildlife Service 2003).

In an effort to restore and increase populations of this rare species partnerships and collaborations have been formed to manage and maintain their unique habitat. Because utility or highway rights-of-way (ROW) are typically maintained in an early stage of succession (i.e., tree growth is prevented) they have the potential to provide important habitat for species that specialize in savannahs or prairies. The Karner blue butterfly and wild lupine have been documented along a portion of the ROW of the ITC Transmission Company, in Muskegon and Newaygo Counties, Michigan. In 2005 a 4.07-mile section of ITC's ROW was reconductored (metal poles replaced with wooden poles). In collaboration with Environmental Consulting and Technology (ECT), Michigan Natural Features Inventory (MNFI) conducted post-reconductoring population surveys and population monitoring for the Karner blue butterfly and wild lupine. Population surveys focused on the previously disturbed 4.07-mile section of the ROW. Through this monitoring we provided data that can be used to determine the level of disturbance and recovery related to the reconductering of the powerline.

Figure 1. Karner blue butterfly surveys were conducted in Newaygo and Muskegon Counties, MI. Photo credit: J. Gehring

Figure 2. Wild Lupine is critical to the life history of the Karner blue butterfly. Photo Credit: J. Gehring

Study Area

The area that we surveyed was a 4.07-mile portion of the ITC transmission line starting just north of the Muskegon County Sewage Reclamation Area (east-central Muskegon County) and continuing into the southwest corner of Newaygo County. Specifically, the Township 10 North, Range 15 West, Sections 1,2,11 and Township 11 North, Range 14 West, Section 31. Previous research at this site separated the 4.07 mile into 3 sections (Table 1).

Table 1. The area in Muskegon and Newaygo Counties, MI that was surveyed for Karner blue butterflies was divided into 3 sections. Surveys were conducted in May and July 2010.

Section	Start	End
A	Northern End	Maple River Tributary
B	Maple River Tributary	Mosquito Creek
C	Mosquito Creek	Southern End

Methods

We surveyed during both flight periods of the Karner blue butterfly life cycle using methods established and standardized by the Michigan Department of Natural Resources and Michigan Natural Features Inventory (MNFI). Because the exact flight periods of the Karner blue butterfly vary by as many as 2 weeks from year to year we maintained contact with other researchers conducting conspecific work in the same region. We were then able to time our surveys to capture the peak of the flight period (i.e., time with the most butterflies present).

Following the standardized procedures for conducting surveys for this rare species, we limited our surveys to between 800 hours and 1800 hours, when temperatures were above 60^{o} F, with no cloud cover or rain, and when winds were less than 20 miles per hour. We collected data on the location of every Karner blue butterfly observed using Garmin map76 units. We also mapped the patches of lupine along the ROW using the Garmin map76 units. We recorded data and completed data forms separately for each of the 3 sections of the ROW.

Results

Joelle Gehring, Kristen Walters, and Dan Morris of MNFI surveyed for the Karner blue butterfly in Sections A, B, and C of the Cobb Brickyard sites on May 27, 2010 (first flight) (Figures 3, 4, 5, and 6) and on July 20, 2010 (second flight) (Figures 7, 8, 9, and 10). Both surveys were successfully completed with appropriate weather conditions and within the designated optimum survey time period.

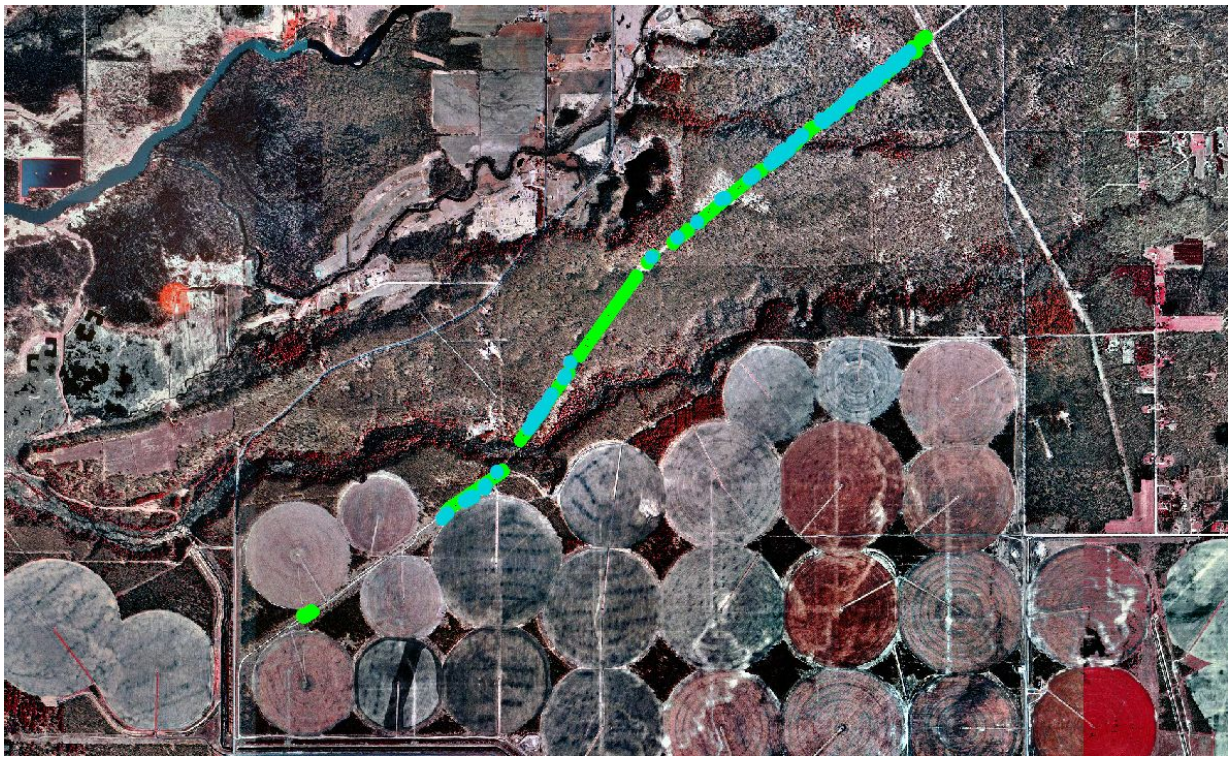

Figure 3. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (green areas) on 27 May 2010 (all Sections) Cobb to Brickyard Line, Michigan, USA.

First flight

Section A

The survey was conducted between 943 and 1050 hours. Weather conditions were ideal for conducting the survey with low winds, clear skies, and a mean temperature of 70 ^{o} F. Lupine was flowering and abundant and we detected 86 Karner blue butterflies (Figs. 4, 11 and Table 2). The gender ratio was approximately equal which suggests that we met our goal of surveying at the peak of the first flight. Forty-six males were detected, 39 females, and 1 butterfly of unknown gender. The wild lupine had a distribution pattern of five.

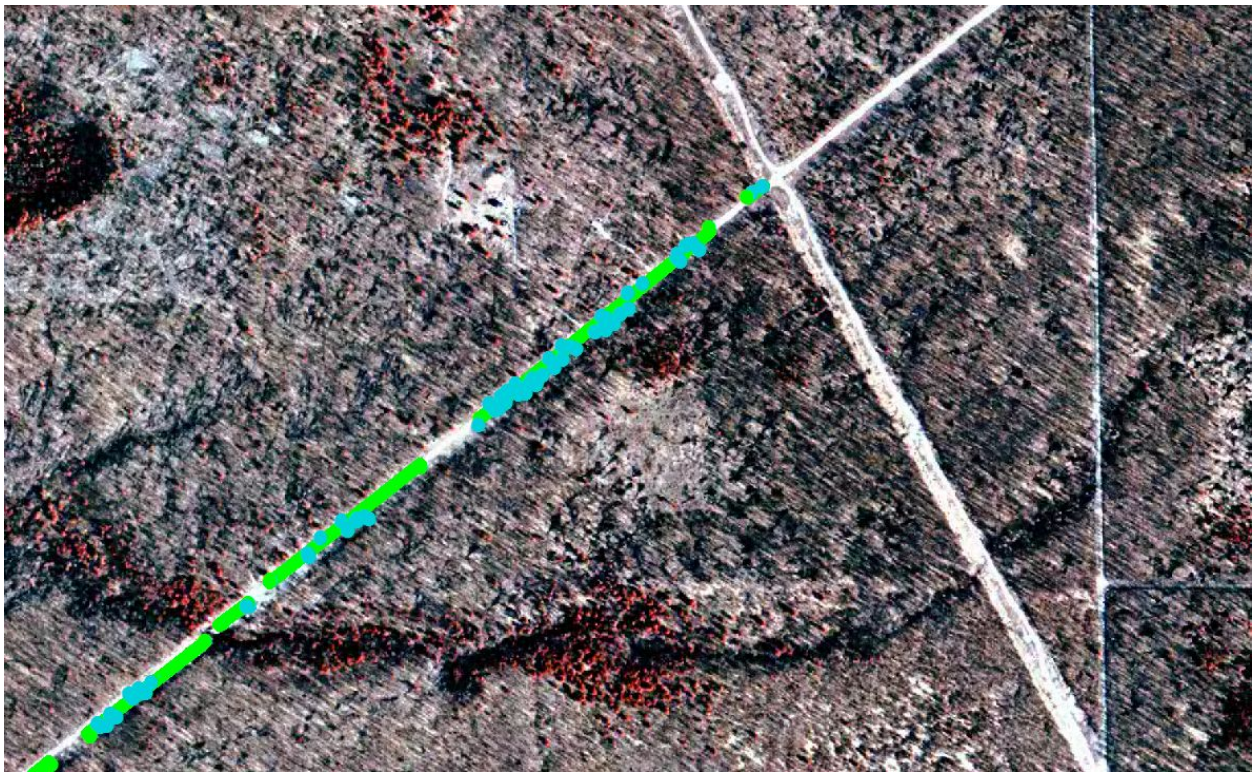
Figure 4. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (green areas) on 27 May 2010 (Section A) Cobb to Brickyard Line.

Section B

The survey was conducted between 1051 and 1203 hours. Weather conditions were ideal for conducting the survey with low winds, clear skies, and a mean temperature of 75 ^{o} F. Lupine was flowering and abundant and we detected 65 Karner blue butterflies (Figs. 5, 12 and Table 2). Forty-six males were observed, 16 females, and 3 butterflies of unknown gender. The wild lupine had a distribution pattern of four.

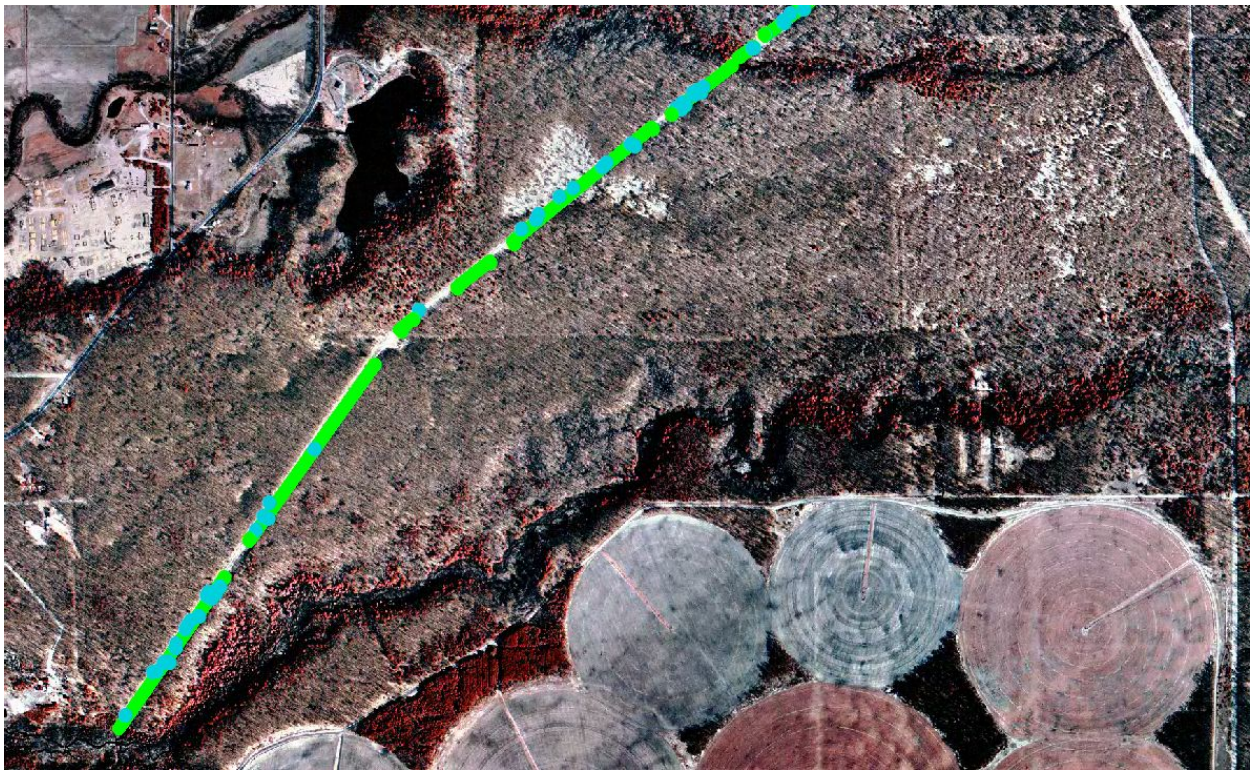

Figure 5. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (green areas) on 27 May 2010 (Section B) Cobb to Brickyard Line.

Section C

The survey was conducted between 1425 and 1525 hours. Weather conditions were ideal for conducting the survey with low winds, clear skies, and a mean temperature of 80 ^{o} F. Lupine was present and flowering but in lower concentrations than the other two sections. We detected 18 Karner blue butterflies (Fig. 6, Appendix 1, and Table 2). Nine males were observed, nine females, and zero butterflies of unknown gender. The wild lupine had a distribution pattern of one.

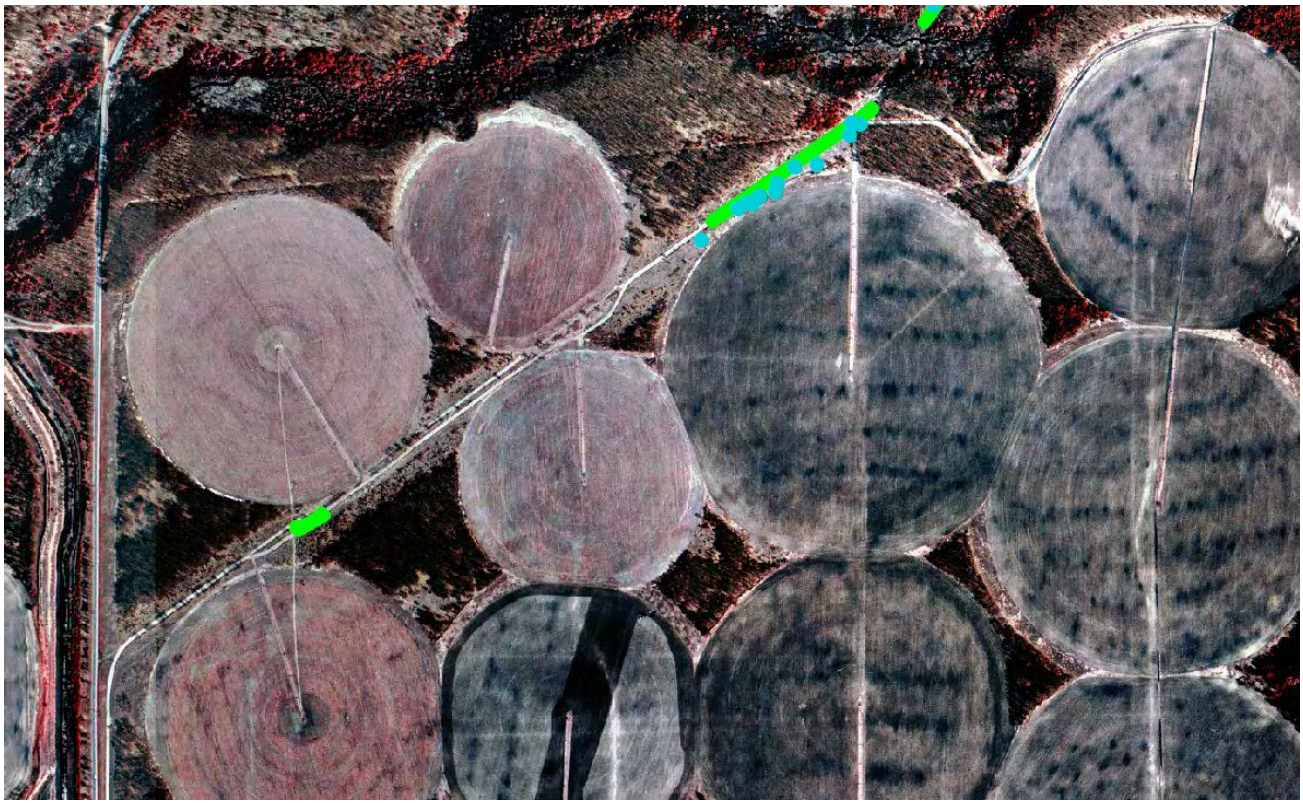

Figure 6. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (green) on 27 May 2010 (Section C) Cobb to Brickyard Line.

Table 2. Karner blue butterflies were surveyed in Muskegon and Newaygo Counties, MI in May 2010. Surveys were conducted in an effort to monitor butterfly populations after a reconductering of a powerline rights-of–way in 2005.

Karner blue butterflies	No. of males	No. of females	No. of unknown gender	No. of total
Section A	46	39	1	86
Section B	46	16	3	65
Section C	9	9	0	18

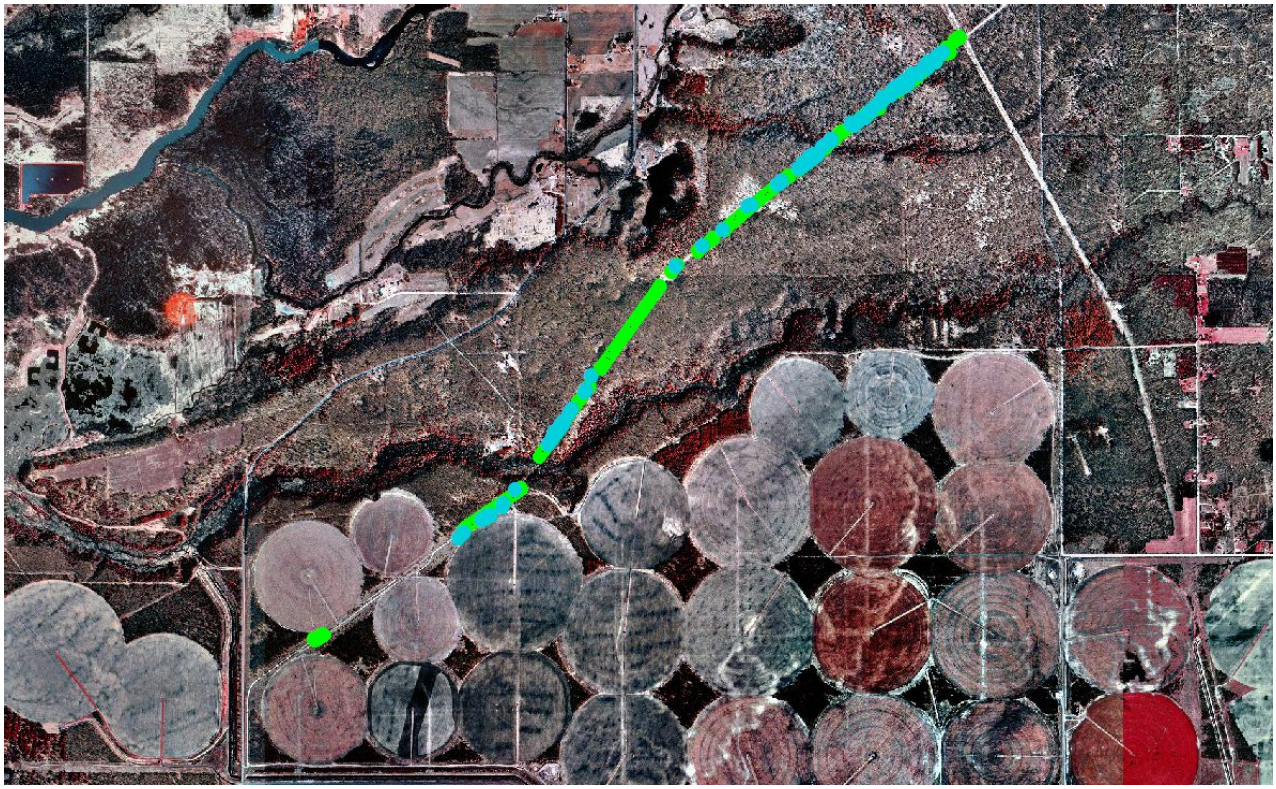

Figure 7. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (green areas) on 20 July 2010 (all Sections) Cobb to Brickyard Line.

Second flight

Section A

The survey was conducted between 1145 and 1305 hours. Weather conditions were ideal for conducting the survey with low winds, clear skies, and a mean temperature of 75 ^{o} F. Lupine had completed its flowering stage. We detected 116 Karner blue butterflies (Fig. 8, Appendix 1, and Table 3). Thirty-one males were observed, 69 females, and 16 unknown.

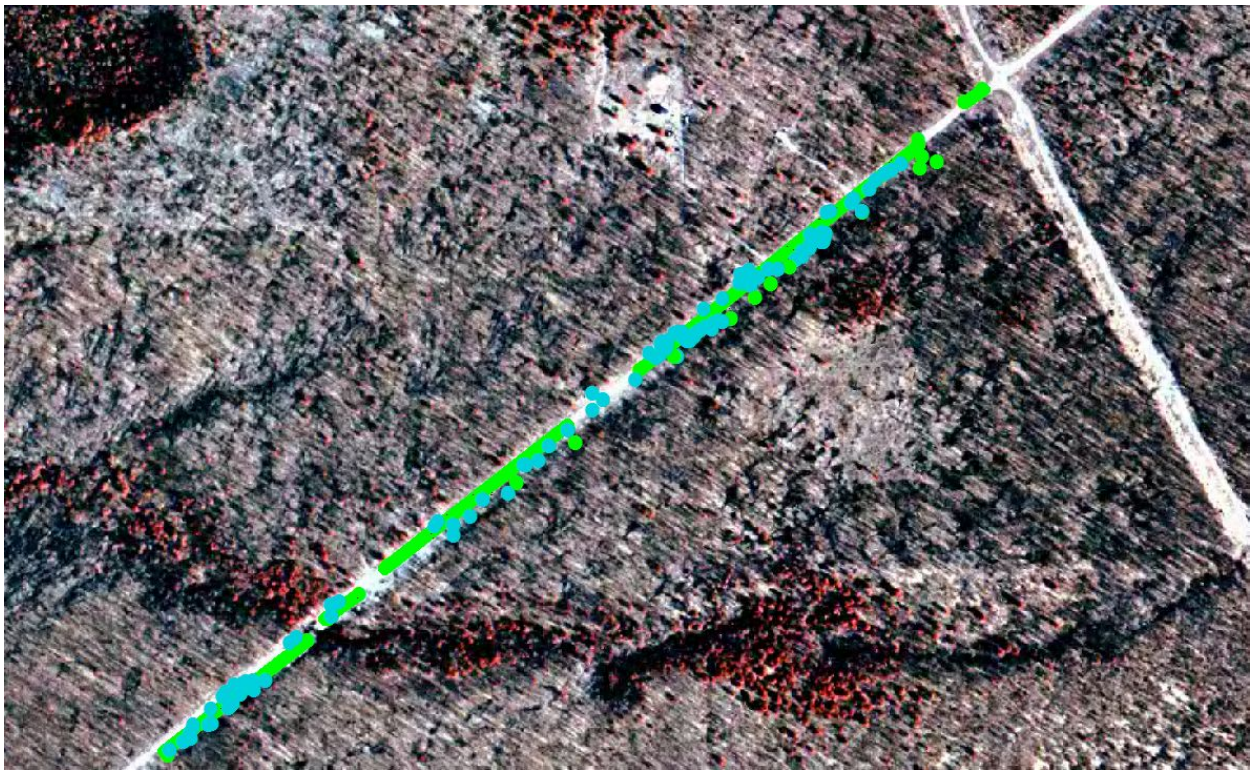

Figure 8. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (green areas) on 20 July 2010 (Section A) Cobb to Brickyard Line.

Section B

The survey was conducted between 1306 and 1415 hours. Weather conditions were ideal for conducting the survey with low winds, clear skies, and a mean temperature of 76 ^{o} F. Lupine had completed its flowering stage. We detected 61 Karner blue butterflies (Fig. 9, Appendix 1, and Table 3). Twenty-two males were observed, 30 females, and 9 butterflies of unknown gender.

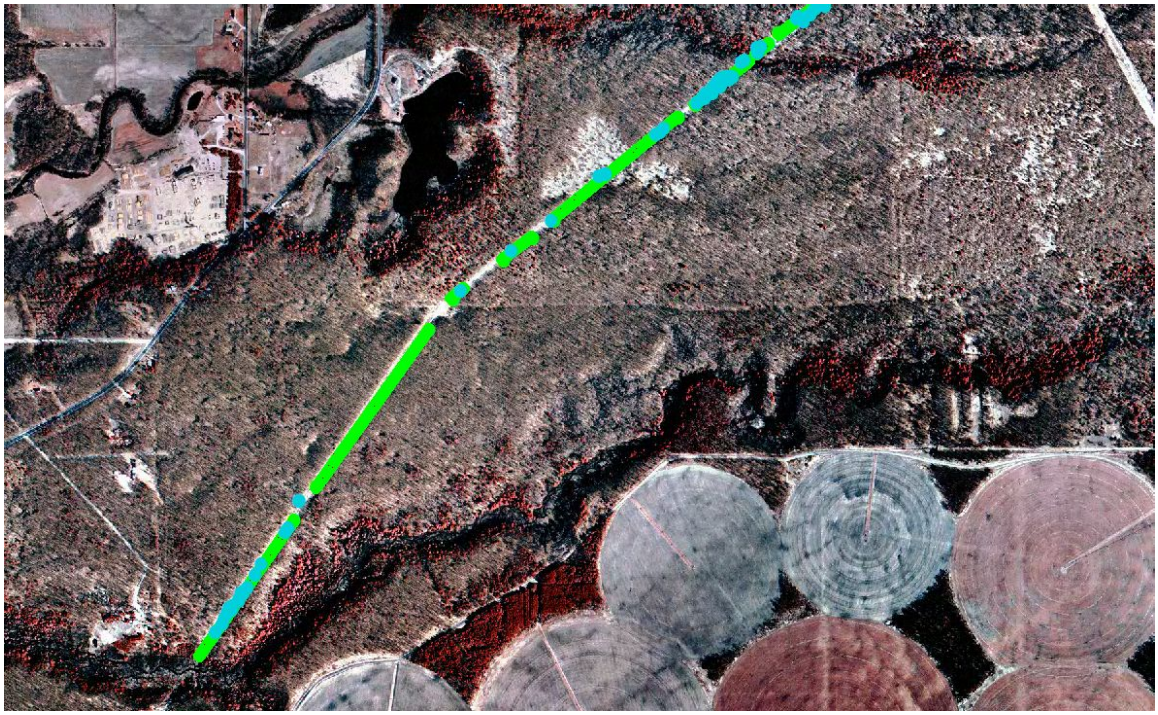

Figure 9. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (green areas) on 20 July 2010 (Section B) Cobb to Brickyard Line.

Section C

The survey was conducted between 1500 and 1545 hours. Weather conditions were acceptable for conducting the survey with medium winds, partially cloudy skies, and a mean temperature of 76 ^{o} F. Lupine had completed its flowering stage but was still low in density, as we observed in the May 2010 survey period. We detected 13 Karner blue butterflies (Fig. 10, Appendix 1, and Table 3). Three males were observed, five females, and five butterflies of unknown gender.

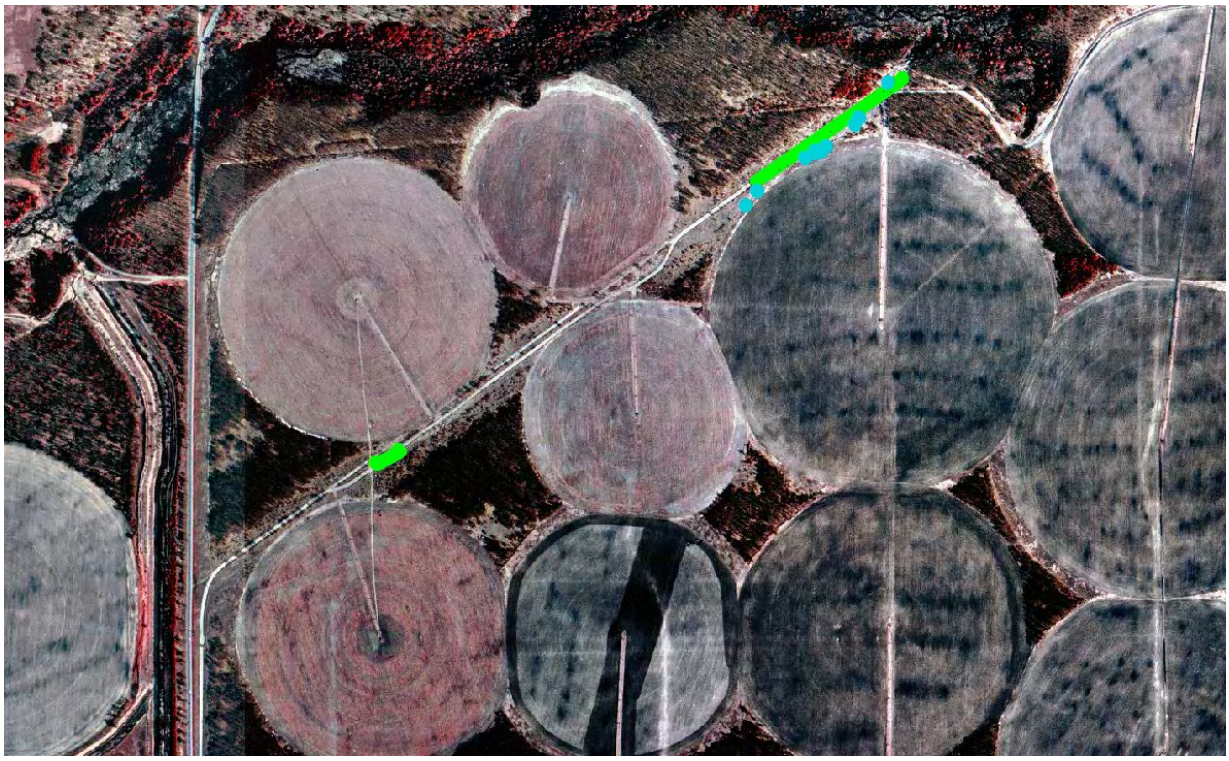

Figure 10. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (blue areas) on 20 July 2010 (Section C) Cobb to Brickyard Line.

Table 3. Karner blue butterflies were surveyed in Muskegon and Newaygo Counties, MI in July 2010. Surveys were conducted in an effort to monitor butterfly populations after a reconductering of a powerline rights-of–way in 2005.

Karner blue butterflies	No. of males	No. of females	No. of unknown gender	No. of total
Section A	31	69	16	116
Section B	22	30	9	61
Section C	3	5	5	13

Conclusion

The ROW of the ITC Transmission Company, in Muskegon and Newaygo Counties, Michigan is still providing habitat for the Karner blue butterfly and its host plant, wild lupine, despite 2005 reconductoring activities. In the 2006 surveys ENSR International documented a total of 22 Karner blue butterflies during the first flight period and 60 butterflies during the second flight period (Hart and Groves 2006). In collaboration with ECT, MNFI successfully conducted 2007 population surveys and detected 173 Karner blue butterflies during the first flight and 187 during the second flight period (Gehring 2007). In this survey season (2010), 169 Karner blue butterflies were detected in the first flight period and 190 in the second flight period. These numbers were consistent with the 2007 survey numbers and significantly higher than the 2005 levels. The higher densities in the second flight period were consistent with the life cycle of the Karner blue butterfly, as the overwintering eggs are more likely to die than the freshly laid eggs of the first flight butterflies. The fresh eggs provide the individuals for

the population of the second flight butterflies. The survey data from 2005, 2007, and 2010 suggest that the Karner blue butterfly population increased and has now become more consistent in size since 2005.

Literature Cited

Gehring, J. 2007. Densities of Wild Lupine and Karner Blue Butterflies After Reconductering the Cobb to Brickyard Line: 2007. Report for ECT. 33 pp.

Hart, L. and M. Groves. 2006. Letter to Robert Schultz, subject: Wild Lupine Density and Karner Blue Butterfly Survey at Cobb to Brickyard Line 2006. ENSR, international. September 14, 2006.

Rabe, M. 2001. Special animal abstract for Lycaeides melissa samuelis (Karner blue). Michigan Natural Features Inventory. Lansing, MI 6 pp.

Swengel, A. and S. Swengel. 2005. Long-term population monitoring of the Karner blue (Lepidoptera: Lycaenidae) in Wisconsin, 1990-2004.

United States Fish and Wildlife Service. 2003. Final recovery plan for the Karner blue butterfly (*Lycaeides melissa samuelis*). Dept. of Interior, U.S. Fish and Wildlife Service, Fort Snelling, MN.

Appendix 1. Datasheets from 27 May 2010 and 20 July 2010 Karner blue butterfly survey Cobb to Brickyard Line.

Transcription Number_____

KBB and LUPINE SURVEY FORM

Fill out this section after the survey has been completed

KBB Present?: NO_____ Why? (see codes and circle all that apply) L N W S

YES X Certainty of location: >95% (location gps'd*) X 80 – 95%_____ 20 – 80%_____ 0 – 20%_____ UNKN_____

SURVEYOR AND LOCATION INFORMATION

Survey date: 2010-05-27	Time from: 943 to: 1050	SITENAME: Section A	Sourcecode: F _____ M I U S

Surveyors (principal surveyor first, include first & last name): Joelle Gehring and Kristen Walter

TOWNSHIP:	RANGE:	SECTION:	QUARTER SECTION:
OWNERSHIP:		QUAD CODE:	

Weather (see codes page): Begin Temp: 70 Begin Wind code: 1 Begin Sky code: 0

End Temp: 73 End Wind code: 1 End Sky code: 0

SITE CONDITION INFORMATION

Use space provided on back to sketch the area surveyed.

Type of opening (ROW, clearing, field, barrens, lawn): ROW Size of opening: 35m wide

Vegetation surrounding opening (wooded, agriculture, etc.): wooded

Has the area been disturbed? (burn, cut, planted): yes, transmission company maintains ROW

Other threats to the area? (ORV, Mechanical, Horses, etc.) ORV and motorized traffic

Light: open X partial___ filtered___ shade___ Moisture: moist (mesic)___ dry-mesic X dry (xeric)___

Ground cover description (Density, % bare soil, % grass/forb/fern): 30% bare soil, 50% grass, 15% forbs, 5% ferns

WOODY VEGETATION ENCROACHMENT: Tree/shrub/stump species and form	Height	Distribution	Notes
white oak	0.5m	Sparse	
red oak	0.5 in	sparse	
sassafras	0.5 in	sparse	
sand cherry	1 m	sparse	

EXOTICS ENCROACHMENT Species	Distribution	Notes
spotted knapweed	abundant	

KARNER BLUE BUTTERFLY OCCURRENCE

Mark occurrence on map using a * to indicate an occurrence

Total number of KBB adults: Male	Female	Unknown	% of opening occupied	Survey effort: Time spent in opening	% of area surveyed	Notes, observations, etc.:
46	39	1	90%	67 min	70%	

*If the location(s) were gps'd, fill out this section, otherwise leave blank

Type of unit: Garmin Unit number: GPS map 76

Waypoint name/# (when using Garmin) _____ File name (when using Trimble)_____

OPTIONAL: Latitude _____ Longitude _____

FEATURE INFORMATION (mandatory) Point : <12.5 m in both dimensions Line: >12.5 m in one dimension Polygon: >12.5m in both dimensions

Source Feature (circle one): Single Source EO _____ Multi-Source EO ___ Conceptual Feature Type (circle one): Point _____ Line _____ Polygon

LUPINE OCCURRENCE

Map lupine distribution. Use a ● for scattered plants, an X for clumps, and circle (0) dense areas

Overall distribution pattern (see codes): 5

Estimated % of area covered: 35% Caterpillar feeding damage (circle) Y (N)

Estimated% of lupine blooming or in seed: 75% Ants present: no major mounds Evidence of Browse: slight

Comments: _____

NECTAR SPECIES PRESENT

List nectar species observed at this site. Note the number of plants and blooms where possible.

Species 33	Blooming? Yes	No 34	Distribution 35	Notes, observations, etc. 36
daisies	✓		sparse	
dewberry	X		abundant	
hawkweed	X		dense	

OTHER SPECIES PRESENT

List other species observed at this site. Note especially listed species and potential predators.

Species: 37	Number Observed	Notes, observations, etc. 39
black swallowtail	3 ~~38~~	

Sketch the boundary of the area visited. Mark your survey route or area, KBB ( ) and lupine (● X 0) occurrences and note other pertinent information.

40

Transcription Number_____

KBB and LUPINE SURVEY FORM

Fill out this section after the survey has been completed

KBB Present?: NO_____ Why? (see codes and circle all that apply) L N W S

YES X Certainty of location: >95% (location gps'd*) X 80 – 95%_____ 20 – 80%_____ 0 – 20%_____ UNKN_____

SURVEYOR AND LOCATION INFORMATION

Survey date: 2010-05-27	Time from: 1051 to: 1203	SITENAME: Section B	Sourcecode: F _____ MIUS
Surveyors (principal surveyor first, include first & last name): Joelle Gehring and Kristen Walter			
TOWNSHIP: T11N/T10N	RANGE: R14W/R15W	SECTION: 31/2	QUARTER SECTION:
OWNERSHIP:		QUAD CODE: 43086 31	

Weather (see codes page): Begin Temp: 73 Begin Wind code: 1 Begin Sky code: B

End Temp: 76 End Wind code: 2 End Sky code: B

SITE CONDITION INFORMATION

Use space provided on back to sketch the area surveyed.

Type of opening (ROW, clearing, field, barrens, lawn): ROW Size of opening: 25m wide

Vegetation surrounding opening (wooded, agriculture, etc.): wooded

Has the area been disturbed? (burn, cut, planted): yes - utility poles + maintained ROW

Other threats to the area? (ORV, Mechanical, Horses, etc.) ORV traffic

Light: open X partial___ filtered___ shade___ Moisture: moist (mesic)___ dry-mesic X dry (xeric)___

Ground cover description (Density, % bare soil, % grass/forb/fern): 25% bare soil 50% grass, 15% forbs 10% ferns

WOODY VEGETATION ENCROACHMENT: Tree/shrub/stump species and form	Height	Distribution	Notes
red oak	1m	5%	abundant
Sassafras	1m	2%	scattered
white oak	1m	2%	scattered

EXOTICS ENCROACHMENT Species	Distribution	Notes
spotted knapweed	3%	

KARNER BLUE BUTTERFLY OCCURRENCE

Mark occurrence on map using a * to indicate an occurrence

Total number of KBB adults: Male	Female	Unknown	% of opening occupied	Survey effort: Time spent in opening	% of area surveyed	Notes, observations, etc.:
46	16	3	70%	72 min	80%	

*If the location(s) were gps'd, fill out this section, otherwise leave blank

Type of unit: Garmin Unit number: GPS Map 76

Waypoint name/# (when using Garmin) _____ File name (when using Trimble)_____

OPTIONAL: Latitude _____ Longitude _____

FEATURE INFORMATION (mandatory) Point : <12.5 m in both dimensions Line: >12.5 m in one dimension Polygon: >12.5m in both dimensions

Source Feature (circle one): Single Source EO _____ Multi-Source EO ___Conceptual Feature Type (circle one): Point _____ Line _____ Polygon

LUPINE OCCURRENCE

Map lupine distribution. Use a ● for scattered plants, an X for clumps, and circle (0) dense areas

Overall distribution pattern (see codes): 5

Estimated % of area covered: 25% Caterpillar feeding damage (circle) Y (N)

Estimated% of lupine blooming or in seed: 70% Ants present: none observed Evidence of Browse: slight

Comments: _____

NECTAR SPECIES PRESENT

List nectar species observed at this site. Note the number of plants and blooms where possible.

Species 33	Blooming? Yes	Blooming? No 34	Distribution 35	Notes, observations, etc. 36
hawkweed	✓		~~scattered~~ sparse	
dewberry	✓			

OTHER SPECIES PRESENT

List other species observed at this site. Note especially listed species and potential predators.

Species: 37	Number Observed 38	Notes, observations, etc. 39
swallowtails	7	

Sketch the boundary of the area visited. Mark your survey route or area, KBB ( ) and lupine (● × 0) occurrences and note other pertinent information.

40

Transcription Number_____

KBB and LUPINE SURVEY FORM

Fill out this section after the survey has been completed

KBB Present?: NO_____ Why? (see codes and circle all that apply) L N W S

YES X Certainty of location: >95% (location gps'd*) X 80 – 95%_____ 20 – 80%_____ 0 – 20%_____ UNKN_____

SURVEYOR AND LOCATION INFORMATION

Survey date: 2010-05-27	Time from: 1425 to: 1515	SITENAME: Section C	Sourcecode: F _____ MIUS
Surveyors (principal surveyor first, include first & last name):			
TOWNSHIP: T10N	RANGE: R15W	SECTION: 2 + 11	QUARTER SECTION:
OWNERSHIP:		QUAD CODE:	

Weather (see codes page): Begin Temp: 80 Begin Wind code: 4 Begin Sky code: 1

End Temp: 80 End Wind code: 4 End Sky code: 1

SITE CONDITION INFORMATION

Use space provided on back to sketch the area surveyed.

Type of opening (ROW, clearing, field, barrens, lawn): ROW Size of opening: 30 m

Vegetation surrounding opening (wooded, agriculture, etc.): wooded + sewage treatment facility

Has the area been disturbed? (burn, cut, planted): maintained ROW

Other threats to the area? (ORV, Mechanical, Horses, etc.) ORV

Light: open X partial___ filtered___ shade___ Moisture: moist (mesic)___ dry-mesic X dry (xeric)___

Ground cover description (Density, % bare soil, % grass/forb/fern): 40% bare soil, 40% grass, 5% fern, 15% forb

WOODY VEGETATION ENCROACHMENT: Tree/shrub/stump species and form	Height	Distribution	Notes
red oak	0.8m	scattered	
white oak	0.8m	scattered	
sassafras	0.5m	scattered	

EXOTICS ENCROACHMENT Species	Distribution	Notes
Spotted Knapweed	abundant	

KARNER BLUE BUTTERFLY OCCURRENCE

Mark occurrence on map using a * to indicate an occurrence

Total number of KBB adults: Male	Female	Unknown	% of opening occupied	Survey effort: Time spent in opening	% of area surveyed	Notes, observations, etc.:
9	9	0	10%	50 min	80%	

*If the location(s) were gps'd, fill out this section, otherwise leave blank

Type of unit: Garmin Unit number: GPSmap76

Waypoint name/# (when using Garmin) _____ File name (when using Trimble)_____

OPTIONAL: Latitude _____ Longitude _____

FEATURE INFORMATION (mandatory) Point : <12.5 m in both dimensions Line: >12.5 m in one dimension Polygon: >12.5m in both dimensions

Source Feature (circle one): Single Source EO _____ Multi-Source EO ___Conceptual Feature Type (circle one): Point _____ Line _____ Polygon

LUPINE OCCURRENCE

Map lupine distribution. Use a ● for scattered plants, an X for clumps, and circle (0) dense areas

Overall distribution pattern (see codes): 7

Estimated % of area covered: 5% Caterpillar feeding damage (circle) Y (N)

Estimated% of lupine blooming or in seed: 70% Ants present: none seen Evidence of Browse: none

Comments: _____

Pa

NECTAR SPECIES PRESENT

List nectar species observed at this site. Note the number of plants and blooms where possible.

Species ~~33~~	Blooming? Yes	Blooming? No ~~34~~	Distribution 35	Notes, observations, etc. 36
milkweed		X	patchy	
hawkweed	X		sparse	
goldenrod		X	patchy	
yarrow		X	patchy	
hoary alyssum	X		sparse	

OTHER SPECIES PRESENT

List other species observed at this site. Note especially listed species and potential predators.

Species: ~~37~~	Number Observed 38	Notes, observations, etc. 39
5 black swallowtail	5	

Sketch the boundary of the area visited. Mark your survey route or area, KBB ( ) and lupine (● X 0) occurrences and note other pertinent information.

40

Transcription Number_____

KBB and LUPINE SURVEY FORM

Fill out this section after the survey has been completed

KBB Present?: NO_____ Why? (see codes and circle all that apply) L N W S

YES X Certainty of location: >95% (location gps'd*) X 80 – 95%_____ 20 – 80%_____ 0 – 20%_____ UNKN_____

SURVEYOR AND LOCATION INFORMATION

Survey date: 2010-07-20	Time from: 1050 to: 1200	SITENAME: Section A	Sourcecode: F _____ M I U S

Surveyors (principal surveyor first, include first & last name): Dan Morris and Joelle Gehring

TOWNSHIP:	RANGE:	SECTION:	QUARTER SECTION:
OWNERSHIP:		QUAD CODE:	

Weather (see codes page): Begin Temp: 78 Begin Wind code: 1 Begin Sky code: 2

End Temp: 79 End Wind code: 1 End Sky code: 2

SITE CONDITION INFORMATION See May data forms

Use space provided on back to sketch the area surveyed.

Type of opening (ROW, clearing, field, barrens, lawn):_____ Size of opening:_____

Vegetation surrounding opening (wooded, agriculture, etc.):_____

Has the area been disturbed? (burn, cut, planted):_____

Other threats to the area? (ORV, Mechanical, Horses, etc.)_____

Light: open___ partial___ filtered___ shade___ Moisture: moist (mesic)___ dry-mesic___ dry (xeric)___

Ground cover description (Density, % bare soil, % grass/forb/fern): _____

WOODY VEGETATION ENCROACHMENT: Tree/shrub/stump species and form	Height	Distribution	Notes

EXOTICS ENCROACHMENT Species	Distribution	Notes

KARNER BLUE BUTTERFLY OCCURRENCE

Mark occurrence on map using a * to indicate an occurrence

Total number of KBB adults: Male	Female	Unknown	% of opening occupied	Survey effort: Time spent in opening	% of area surveyed	Notes, observations, etc.:
31	69	16	45%	70	85%	

*If the location(s) were gps'd, fill out this section, otherwise leave blank

Type of unit: _____ Unit number:_____

Waypoint name/# (when using Garmin) _____ File name (when using Trimble)_____

OPTIONAL: Latitude _____ Longitude _____

FEATURE INFORMATION (mandatory) Point : <12.5 m in both dimensions Line: >12.5 m in one dimension Polygon: >12.5m in both dimensions

Source Feature (circle one): Single Source EO _____ Multi-Source EO ___Conceptual Feature Type (circle one): Point _____ Line _____ Polygon

LUPINE OCCURRENCE See May data forms

Map lupine distribution. Use a ● for scattered plants, an X for clumps, and circle (0) dense areas

Overall distribution pattern (see codes):_____

Estimated % of area covered:_____ Caterpillar feeding damage (circle) Y N

Estimated% of lupine blooming or in seed:_____ Ants present: none Evidence of Browse:_____

Comments: _____

NECTAR SPECIES PRESENT

List nectar species observed at this site. Note the number of plants and blooms where possible.

Species 33	Blooming? Yes	Blooming? ~~34~~ No	Distribution ~~35~~	Notes, observations, etc. 36
Spotted Knapweed	X		abundant	
butterfly weed	X		Sparse	
black-eyed susan	X		Scattered	
bergamot	X		Sparse	

OTHER SPECIES PRESENT

List other species observed at this site. Note especially listed species and potential predators.

Species: 37	Number Observed ~~38~~	Notes, observations, etc. 39
~~Eat~~ American Copper	12	
White Cabbage	15	

Sketch the boundary of the area visited. Mark your survey route or area, KBB ( ) and lupine (● × 0) occurrences and note other pertinent information.

40

Transcription Number_____

KBB and LUPINE SURVEY FORM

Fill out this section after the survey has been completed

KBB Present?: NO_____ Why? (see codes and circle all that apply) L N W S

YES X Certainty of location: >95% (location gps'd*) X 80 – 95%_____ 20 – 80%_____ 0 – 20%_____ UNKN_____

SURVEYOR AND LOCATION INFORMATION

Survey date: 2010-07-20	Time from: 1201 to: 1400	SITENAME: Section B	Sourcecode: F _____ M I U S

Surveyors (principal surveyor first, include first & last name): Dan Morris and Joelle Gehrig

TOWNSHIP: 11N/10N	RANGE: 14W	SECTION: 31/1	QUARTER SECTION:
OWNERSHIP:		QUAD CODE: 4308631	

Weather (see codes page): Begin Temp: 79 Begin Wind code: 1 Begin Sky code: 2

End Temp: 80 End Wind code: 1 End Sky code: 2

SITE CONDITION INFORMATION See May data

Use space provided on back to sketch the area surveyed.

Type of opening (ROW, clearing, field, barrens, lawn):_____ Size of opening:_____

Vegetation surrounding opening (wooded, agriculture, etc.):_____

Has the area been disturbed? (burn, cut, planted):_____

Other threats to the area? (ORV, Mechanical, Horses, etc.)_____

Light: open___ partial___ filtered___ shade___ Moisture: moist (mesic)___ dry-mesic___ dry (xeric)___

Ground cover description (Density, % bare soil, % grass/forb/fern): _____

WOODY VEGETATION ENCROACHMENT: Tree/shrub/stump species and form	Height	Distribution	Notes

EXOTICS ENCROACHMENT Species	Distribution	Notes

KARNER BLUE BUTTERFLY OCCURRENCE

Mark occurrence on map using a * to indicate an occurrence

Total number of KBB adults: Male	Female	Unknown	% of opening occupied	Survey effort: Time spent in opening	Notes, observations, etc.:
22	30	9	40%	120 min	
				% of area surveyed 90%	

*If the location(s) were gps'd, fill out this section, otherwise leave blank

Type of unit: _____ Unit number:_____

Waypoint name/# (when using Garmin) _____ File name (when using Trimble)_____

OPTIONAL: Latitude _____ Longitude _____

FEATURE INFORMATION (mandatory) Point : <12.5 m in both dimensions Line: >12.5 m in one dimension Polygon: >12.5m in both dimensions

Source Feature (circle one): Single Source EO _____ Multi-Source EO ___Conceptual Feature Type (circle one): Point _____ Line _____ Polygon

LUPINE OCCURRENCE See May data

Map lupine distribution. Use a ● for scattered plants, an X for clumps, and circle (0) dense areas

Overall distribution pattern (see codes):_____

Estimated % of area covered:_____ Caterpillar feeding damage (circle) Y N

Estimated% of lupine blooming or in seed:_____ Ants present:_____ Evidence of Browse:_____

Comments: _____

NECTAR SPECIES PRESENT

List nectar species observed at this site. Note the number of plants and blooms where possible.

Species 33	Blooming? Yes	Blooming? No 34	Distribution 35	Notes, observations, etc. 36
goldenrod spp.	X		scattered	
bergamot	X		sparse	
hawkweed	X		scattered	
butterfly weed	X		scattered	
spotted knapweed	X		abundant	

OTHER SPECIES PRESENT

List other species observed at this site. Note especially listed species and potential predators.

Species: 37	Number Observed 38	Notes, observations, etc. 39
sphinx moth	3	
cabbage white	16	
black swallowtail	5	

Sketch the boundary of the area visited. Mark your survey route or area, KBB ( ) and lupine (● X 0) occurrences and note other pertinent information.

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Transcription Number_____

KBB and LUPINE SURVEY FORM

Fill out this section after the survey has been completed

KBB Present?: NO_____ Why? (see codes and circle all that apply) L N W S

YES X Certainty of location: >95% (location gps'd*) X 80 – 95%_____ 20 – 80%_____ 0 – 20%_____ UNKN_____

SURVEYOR AND LOCATION INFORMATION

Survey date: 2010-07-20	Time from: 1500 to: 1600	SITENAME: Section C	Sourcecode: F _____ M I U S
Surveyors (principal surveyor first, include first & last name): Dan Morris and Joelle Echeverria			
TOWNSHIP: 10 N	RANGE: 15 W	SECTION: 2 + 11	QUARTER SECTION:
OWNERSHIP:		QUAD CODE: 4308631	

Weather (see codes page): Begin Temp: 80 Begin Wind code: 2 Begin Sky code: 2

End Temp: 80 End Wind code: 2 End Sky code: 2

SITE CONDITION INFORMATION

See May data

Use space provided on back to sketch the area surveyed.

Type of opening (ROW, clearing, field, barrens, lawn):_____ Size of opening:_____

Vegetation surrounding opening (wooded, agriculture, etc.):_____

Has the area been disturbed? (burn, cut, planted):_____

Other threats to the area? (ORV, Mechanical, Horses, etc.)_____

Light: open___ partial___ filtered___ shade___ Moisture: moist (mesic)___ dry-mesic___ dry (xeric)___

Ground cover description (Density, % bare soil, % grass/forb/fern): _____

WOODY VEGETATION ENCROACHMENT: Tree/shrub/stump species and form	Height	Distribution	Notes

EXOTICS ENCROACHMENT Species	Distribution	Notes

KARNER BLUE BUTTERFLY OCCURRENCE

Mark occurrence on map using a * to indicate an occurrence

Total number of KBB adults: Male	Female	Unknown	% of opening occupied	Survey effort: Time spent in opening	% of area surveyed	Notes, observations, etc.:
3	5	5	5%	60 min	80%	

*If the location(s) were gps'd, fill out this section, otherwise leave blank

Type of unit: Garmin Unit number: Map 76

Waypoint name/# (when using Garmin) _____ File name (when using Trimble)_____

OPTIONAL: Latitude _____ Longitude _____

FEATURE INFORMATION (mandatory) Point : <12.5 m in both dimensions Line: >12.5 m in one dimension Polygon: >12.5m in both dimensions

Source Feature (circle one): Single Source EO _____ Multi-Source EO ___Conceptual Feature Type (circle one): Point _____ Line _____ Polygon

LUPINE OCCURRENCE

See May data

Map lupine distribution. Use a ● for scattered plants, an X for clumps, and circle (0) dense areas

Overall distribution pattern (see codes):_____

Estimated % of area covered:_____ Caterpillar feeding damage (circle) Y N

Estimated% of lupine blooming or in seed:_____ Ants present: Yes Evidence of Browse:_____

Comments: _____

NECTAR SPECIES PRESENT

List nectar species observed at this site. Note the number of plants and blooms where possible.

Species 33	Blooming? Yes	Blooming? No 34	Distribution 35	Notes, observations, etc. 36
spotted knapweed	X		patchy	
goldenrod spp.	X		scattered	
butterfly weed	X		scattered	
hoary alysum	X		sparse	

OTHER SPECIES PRESENT

List other species observed at this site. Note especially listed species and potential predators.

Species: 37	Number Observed 38	Notes, observations, etc. 39
cabbage White	10	
Sulfur spp.	5	
blackswallowtail	1	
Sphynx moth	1	

Sketch the boundary of the area visited. Mark your survey route or area, KBB ( ) and lupine (● × 0) occurrences and note other pertinent information.

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