Densities of Wild Lupine and Karner Blue Butterflies After Reconductering the Cobb to Brickyard Line: 2007

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Michigan Natural Features Inventory

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 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. 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 can 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), the 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 will be able to determine the level of disturbance and recovery related to the reconductering of the powerline.

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.

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, Jennifer Olson, and Brandon Noel of MNFI surveyed for the Karner blue butterfly in Sections A, B, and C of the Cobb Brickyard sites on May 30, 2007 (first flight) (Figures 3, 4, 5, and 6) and on July 18, 2007 (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.

First flight

Section A

The survey was conducted between 1020 and 1205 hours. Weather conditions were ideal for conducting the survey with low winds, clear skies, and a mean temperature of 77^{o} F. Lupine was flowering and abundant and we detected 100 Karner blue butterflies (Figure 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. Thirty-nine males were observed, 30 females, and 31 unknown. The wild lupine had a distribution pattern of five.

Section B

The survey was conducted between 1210 and 1350 hours. Weather conditions were ideal for conducting the survey with low winds, clear skies, and a mean temperature of 82^{o} F. Lupine was flowering and abundant and we detected 61 Karner blue butterflies (Figure 12 and Table 2). Twenty-three males were observed, 15 females, and 23 unknown. The wild lupine had a distribution pattern of four.

Section C

The survey was conducted between 1610 and 1750 hours. Weather conditions were ideal for conducting the survey with low winds, clear skies, and a mean temperature of 86^{o} F. Lupine was present and flowering but not as abundant as the other sections. We detected 12 Karner blue butterflies (Figure 13 and Table 2). Two males were observed, five females, and five unknown. The wild lupine had a distribution pattern of one.

Table 2.

Karner blue butterflies	No. of males	No. of females	No. of unknown gender	No. of total
Section A	39	30	31	100
Section B	23	15	23	61
Section C	2	5	5	12

Second flight

Section A

The survey was conducted between 925 and 1125 hours. Weather conditions were ideal for conducting the survey with low winds, clear skies, and a mean temperature of 74 ^{o} F. Lupine had completed its flowering stage. We detected 74 Karner blue butterflies (Figure 14 and Table 3). Twenty-eight males were observed, 35 females, and 11 unknown.

Section B

The survey was conducted between 1128 and 1325 hours. Weather conditions were ideal for conducting the survey with low winds, clear skies, and a mean temperature of 81 ^{o} F. Lupine had completed its flowering stage. We detected 85 Karner blue butterflies (Figure 15 and Table 3). Forty-one males were observed, 31 females, and 13 unknown.

Section C

The survey was conducted between 1500 and 1700 hours. Weather conditions were acceptable for conducting the survey with medium winds, partially cloudy skies, and a mean temperature of 82 ^{o} F. Lupine had completed its flowering stage but was still low in density. We detected 28 Karner blue butterflies (Figure 16 and Table 3). Five males were observed, 15 females, and 8 unknown.

Table 3.

Karner blue butterflies	No. of males	No. of females	No. of unknown gender	No. of total
Section A	28	35	11	74
Section B	41	31	13	85
Section C	5	15	8	28

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 Environmental Consulting and Technology (ECT), the Michigan Natural Features Inventory (MNFI) successfully conducted 2007 population surveys and detected 173 Karner blue butterflies during the first flight and 187 during the second flight period.

These numbers are significantly higher than the 2005 levels. The higher densities in the second flight period are 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.

Literature Cited

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

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.

Figure 1. Karner blue butterfly. Photo credit: Mary Rabe

Figure 2. Wild Lupine in flower from Cobb to Brickyard line 2007. Photo Credit: Joelle Gehring

Figure 3. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (purple areas) on 30 May 2007 (all Sections) Cobb to Brickyard Line.

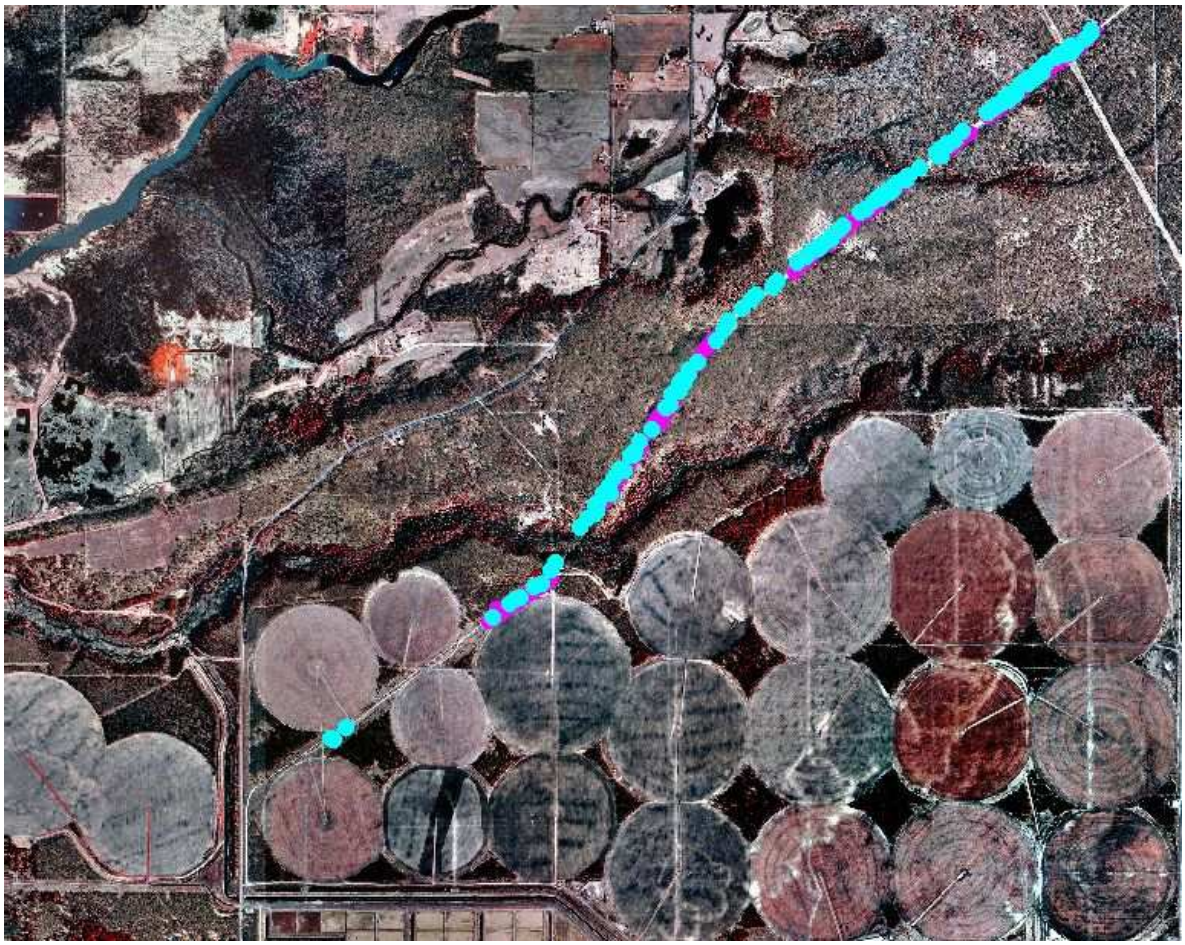

Figure 4. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (purple areas) on 30 May 2007 (Section A) Cobb to Brickyard Line.

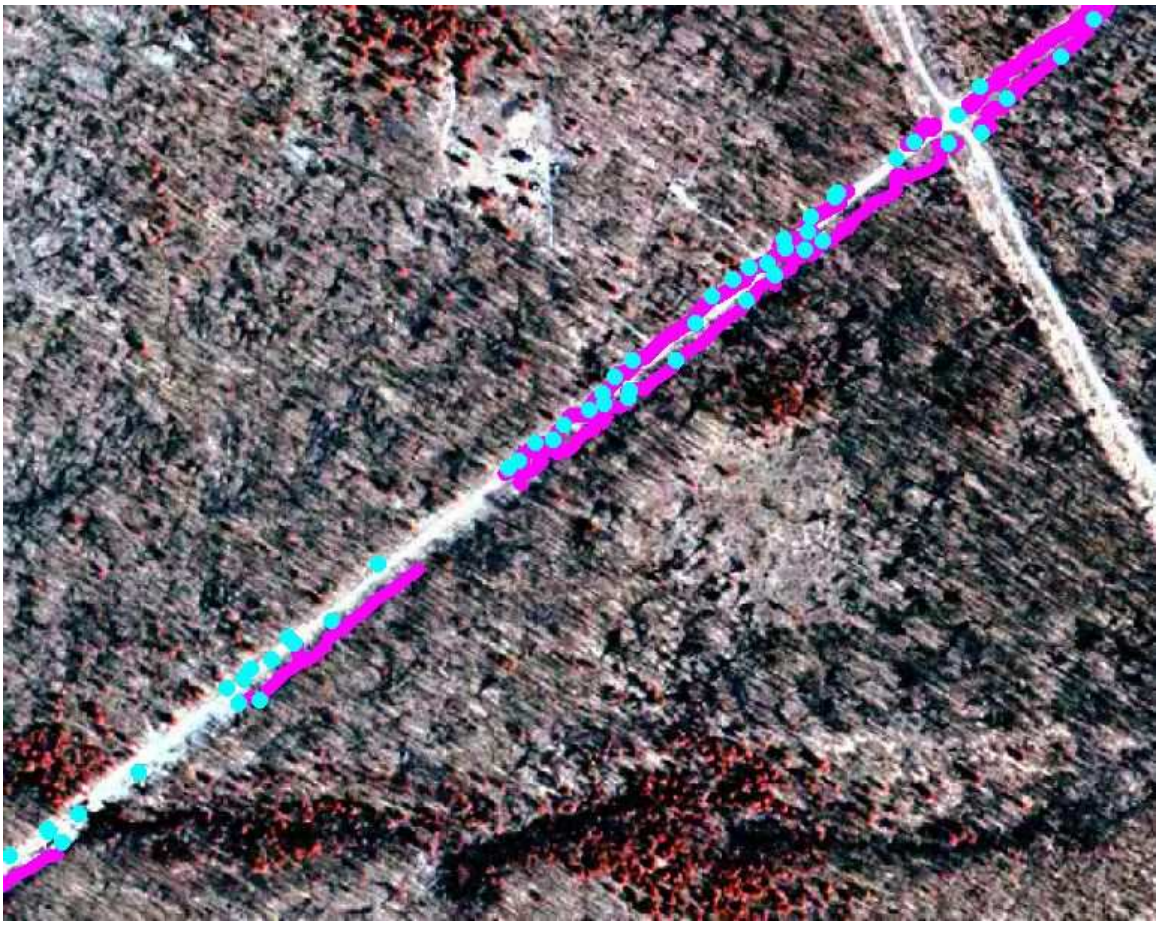

Figure 5. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (purple areas) on 30 May 2007 (Section B) Cobb to Brickyard Line.

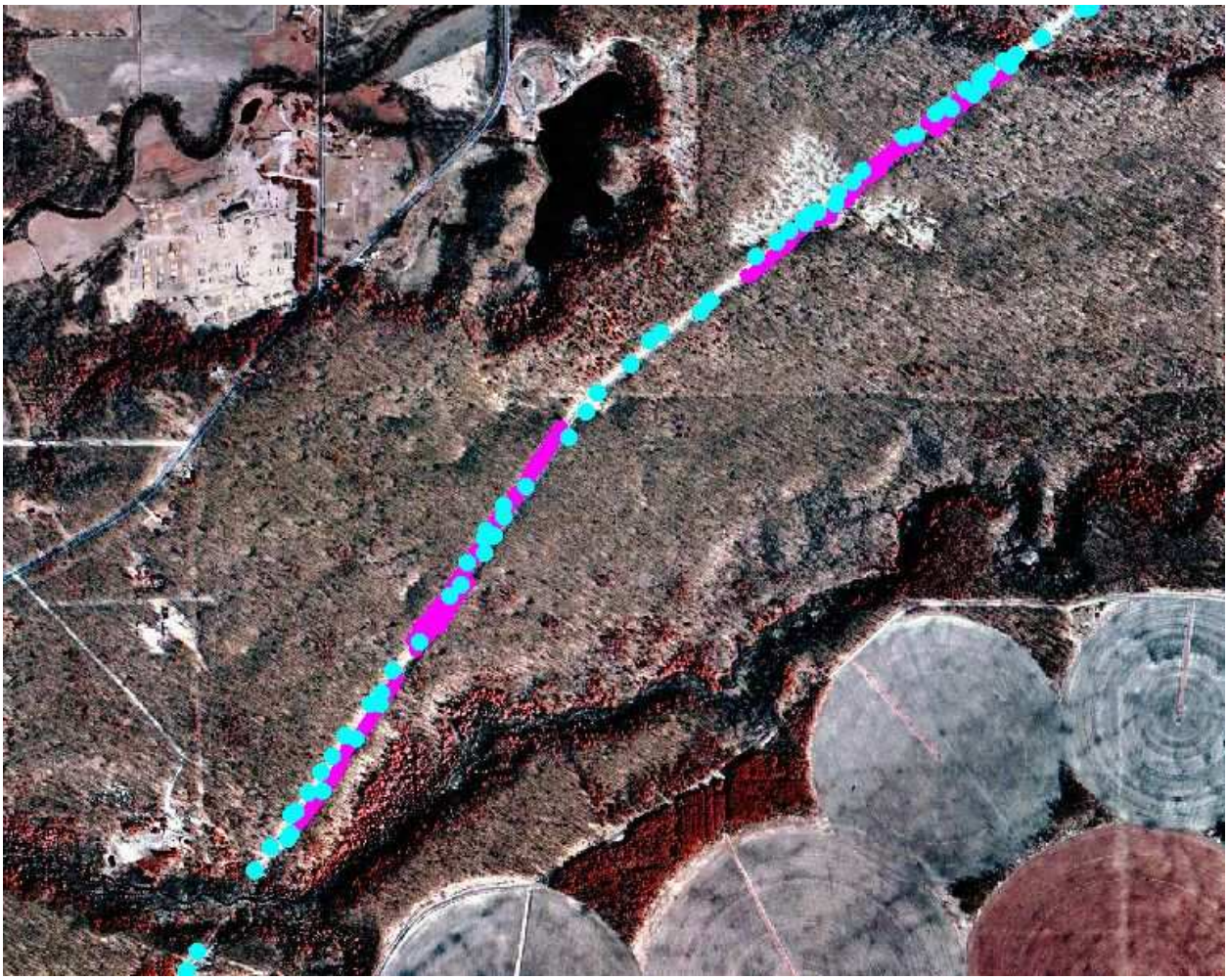

Figure 6. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (purple areas) on 30 May 2007 (Section C) Cobb to Brickyard Line.

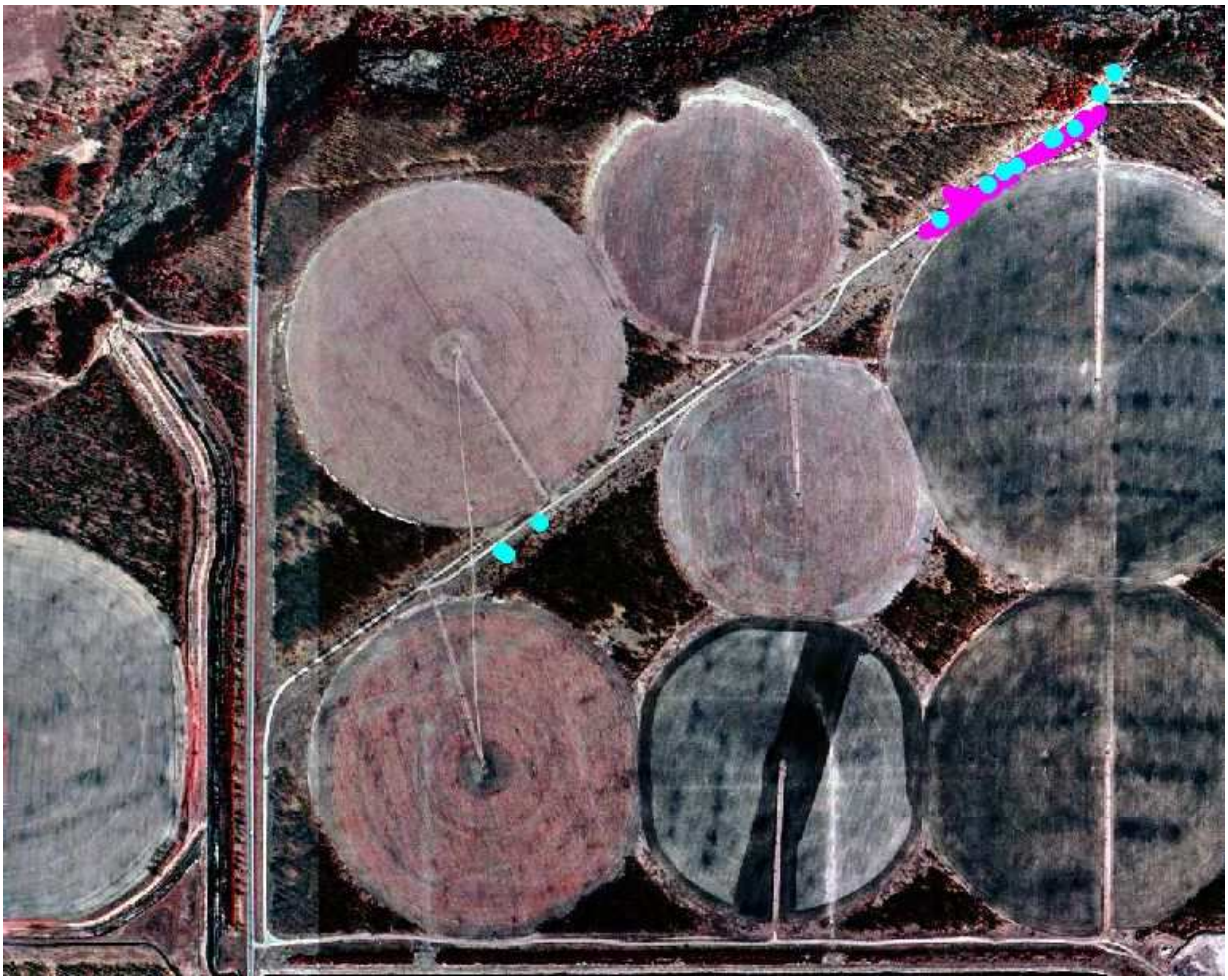

Figure 7. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (purple areas) on 17 July 2007 (all Sections) Cobb to Brickyard Line.

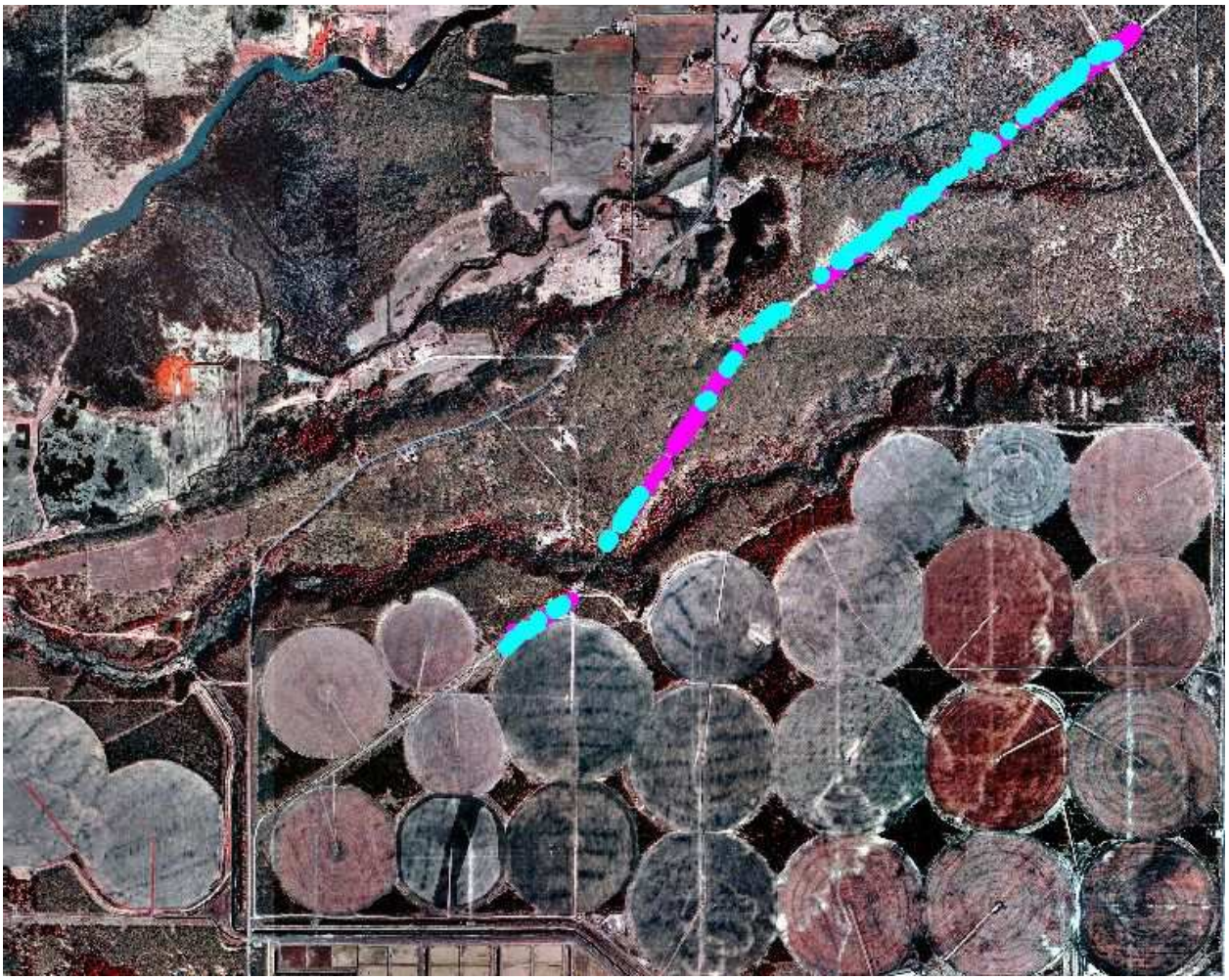

Figure 8. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (purple areas) on 17 July 2007 (Section A) Cobb to Brickyard Line.

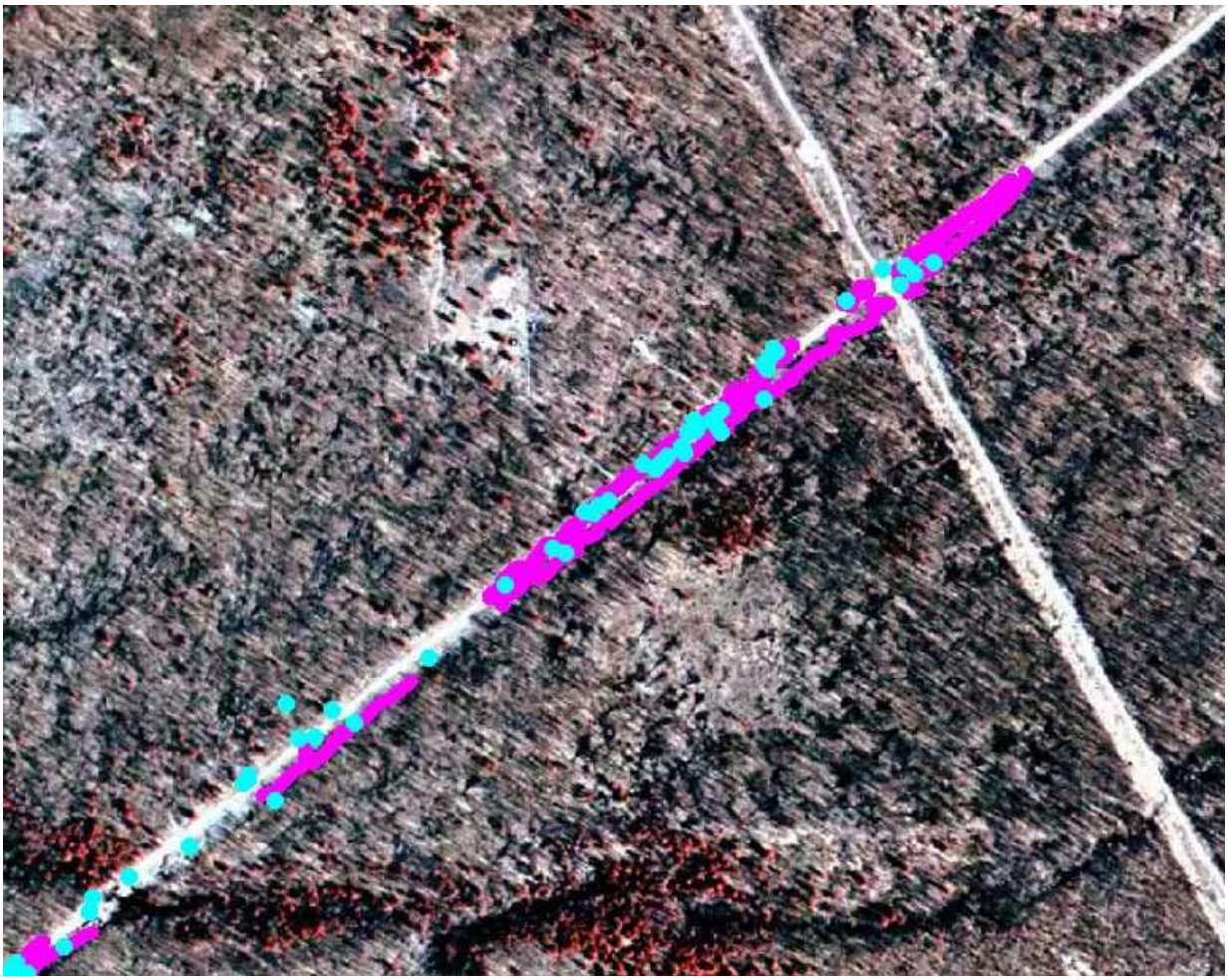

Figure 9. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (purple areas) on 17 July 2007 (Section B) Cobb to Brickyard Line.

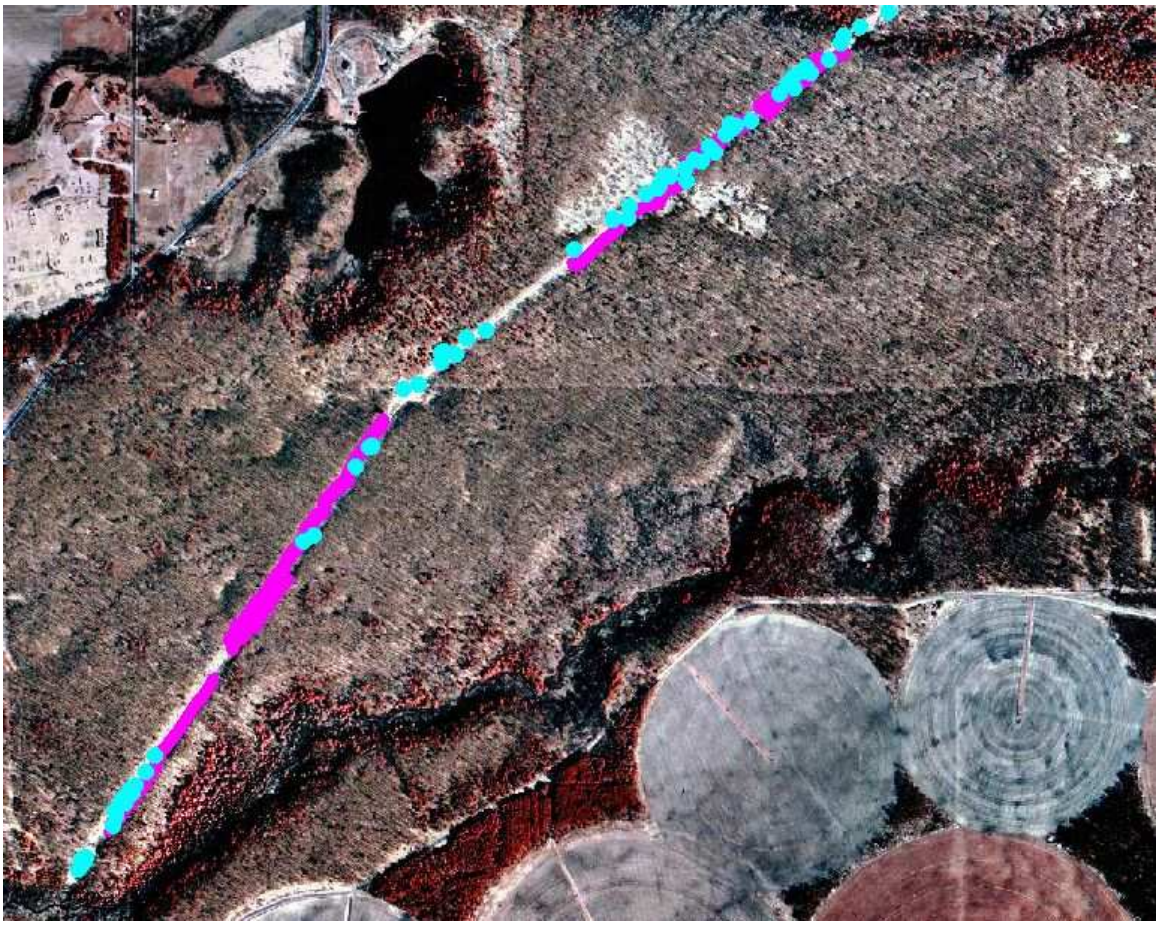

Figure 10. Aerial image of Karner blue butterfly (blue dots) survey observations and wild lupine areas (purple areas) on 17 July 2007 (Section C) Cobb to Brickyard Line.

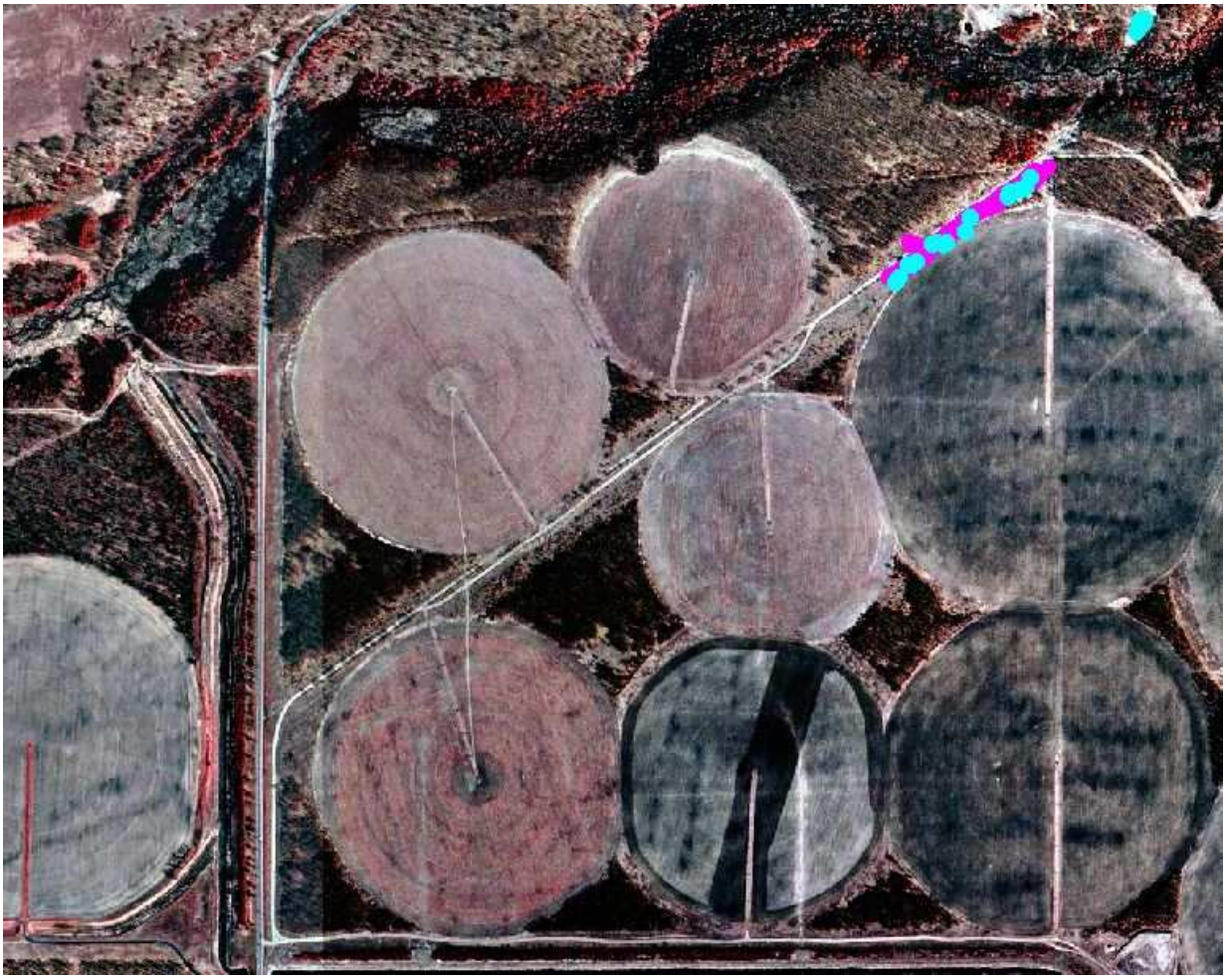

Figure 11. Datasheets from 30 May 2007 (Section A) Karner blue butterfly survey Cobb to Brickyard Line.

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: 2007-05-30	Time from: 10:20 to: 12:05 pm	SITENAME: Section A	Sourcecode: F _____ MIUS

Surveyors (principal surveyor first, include first & last name): Jennifer Olson & Joelle Gehring

TOWNSHIP: T11N	RANGE: R14W	SECTION: 31 & 32	QUARTER SECTION:
OWNERSHIP:		QUAD CODE: 4308631	

Weather (see codes page): Begin Temp: 75° Begin Wind code: 2 Begin Sky code: 0

End Temp: 80° End Wind code: 4 End Sky code: 0

SITE CONDITION INFORMATION

Use space provided on back to sketch the area surveyed. ETC report indicates 66 feet ROW

Type of opening (ROW, clearing, field, barrens, lawn): ROW Size of opening: Joelle paced ~35 meters wide

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

Has the area been disturbed? (burn, cut, planted): yes – transmission company maintains ROW w/ mowing no signs of this

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

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

Ground cover description (Density, % bare soil, % grass/forb/fern): 35% bare soil, 50% grass, 10% forbs, 5% ferns

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

EXOTICS ENCROACHMENT Species	Distribution	Notes
spotted knapweed	abundant	
garlic mustard	patchy	where tree stumps were dumped near stre

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.:
39	30	31	90%	1hr 45min.	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 × for clumps, and circle (0) dense areas

Overall distribution pattern (see codes): 5

Estimated % of area covered: 30% Caterpillar feeding damage (circle) Y (N)

Estimated% of lupine blooming or in seed: 70% Ants present: no major mounds Evidence of Browse: not much, very little

Comments: _____

Transcription Number_____

NECTAR SPECIES PRESENT

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

Species	Blooming? Yes	Blooming? No	Distribution	Notes, observations, etc.
hawkweed	X		dense	
dewberry	X		abundant	
daisies	X		sparse	

OTHER SPECIES PRESENT

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

Species:	Number Observed	Notes, observations, etc.
wood satyr	~5	
black swallowtail	~10	

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

Figure 12. Datasheets from 30 May 2007 (Section B) 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: 2007-05-30	Time from: 12:10 to: 1:50pm	SITENAME: Section B	Sourcecode: F_____ MIUS
Surveyors (principal surveyor first, include first & last name): Jennifer Olson & Joelle Gehring			
TOWNSHIP: T11N/T10N	RANGE: R14W/R15W	SECTION: 31/1	QUARTER SECTION:
OWNERSHIP:		QUAD CODE: 4308631	
Weather (see codes page): Begin Temp: 80°F Begin Wind code: 4 Begin Sky code: 0			
End Temp: 84°F End Wind code: 4 End Sky code: 0			

SITE CONDITION INFORMATION

Use space provided on back to sketch the area surveyed. ETC report indicates 66 foot ROW

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

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

Has the area been disturbed? (burn, cut, planted): yes – electric transmission company maintains ROW w/ mowing

Other threats to the area? (ORV, Mechanical, Horses, etc.) ORV traffic no signs of this present

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

Ground cover description (Density, % bare soil, % grass/forb/fern): 20% bare soil, 55% grass, 15% forbs 10% fern

WOODY VEGETATION ENCROACHMENT: Tree/shrub/stump species and form	Height	Distribution	Notes
red oak	0.5m	5%	abundant
sassafras	1m	2%	scattered
white oak	0.5m	1%	sparse

EXOTICS ENCROACHMENT Species	Distribution	Notes
spotted knapweed	3% scattered	not encroaching much
garlic mustard	1% sparse	near stump piles near tributary to Mill Creek

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.:
23	15	23	60%	1 hr. 40 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): 4

Estimated % of area covered: 20% Caterpillar feeding damage (circle) Y (N)

Estimated% of lupine blooming or in seed: 70% Ants present: no major mounds Evidence of Browse: little bit, not much

Comments: _____

Transcription Number_____

NECTAR SPECIES PRESENT

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

Species	Blooming? Yes	Blooming? No	Distribution	Notes, observations, etc.
hawkweed	X		abundant	
dewberry	X		scattered but abundant	

OTHER SPECIES PRESENT

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

Species:	Number Observed	Notes, observations, etc.
possible dusted skipper	~2	
black swallowtail	10	

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

Figure 13. Datasheets from 30 May 2007 (Section C) 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: 2007-05-30	Time from: 4:[illegible] to: 5:50	SITENAME: Section C	Sourcecode: F_____ M I U S
Surveyors (principal surveyor first, include first & last name): Jennifer Olson & Joelle Gehring			
TOWNSHIP: T10N	RANGE: R15W	SECTION: 2 & 11	QUARTER SECTION:
OWNERSHIP: SECTION C		QUAD CODE: 4308631	

Weather (see codes page): Begin Temp: 85°F Begin Wind code: 4 Begin Sky code: 1

End Temp: 86°F End Wind code: 2 End Sky code: 0

SITE CONDITION INFORMATION

Use space provided on back to sketch the area surveyed. ETC report indicates 66 foot ROW

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

Vegetation surrounding opening (wooded, agriculture, etc.): woods and agricultural fields no signs of this

Has the area been disturbed? (burn, cut, planted): yes - transmission company maintains ROW w/ mowing ~~[illegible]~~

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

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

Ground cover description (Density, % bare soil, % grass/forb/fern): 45% bare soil, 240 grass, 10% forb, 5% fern

WOODY VEGETATION ENCROACHMENT: Tree/shrub/stump species and form	Height	Distribution	Notes
red oak	.5 m	scattered	
white oak	.5 m	scattered	
Sassafras	.5 m	scattered	
sand cherry	.5 m	sparse	

EXOTICS ENCROACHMENT Species	Distribution	Notes
spotted knapweed	abundant	
autumn olive	sparse	

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.:
2	5	5	5%	1.5 hrs	
				% of area surveyed 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): 1

Estimated % of area covered: ~3% Caterpillar feeding damage (circle) Y (N)

Estimated% of lupine blooming or in seed: 50% Ants present: no major mounds Evidence of Browse: no

Comments: fewer in bloom than in other sections (Section A+B)

Transcription Number_____

NECTAR SPECIES PRESENT

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

Species	Blooming? Yes	Blooming? No	Distribution	Notes, observations, etc.
milkweed		X	patchy	along ag fields
coreopsis	X		sparse	
hawkweed	X		sparse	
dewberry	X		scattered	
goldenrod		X	patchy	
sweet clover		X	sparse	along ag field
crown vetch		X	sparse	
yarrow		X	sparse	
hoary alyssum	X		sparse	
Helianthus spp		X	patchy	

OTHER SPECIES PRESENT

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

Species:	Number Observed	Notes, observations, etc.
wood satyr	~20	
black swallowtail	~8	
unknown skippers	~3	
orange sulphur	1	

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

Figure 14. Datasheets from 17 July 2007 (Section A) 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: 2007-07-18	Time from: 9:25 to: 11:25	SITENAME: Section A	Sourcecode: F_____ MIUS
Surveyors (principal surveyor first, include first & last name): Jennifer Olson & Joelle Schuring + Brandon Noel			
TOWNSHIP: 11N	RANGE: 14W	SECTION: 31 & 32	QUARTER SECTION:
OWNERSHIP:		QUAD CODE: 4308631	

Weather (see codes page): Begin Temp: 70°F Begin Wind code: 1 Begin Sky code: 3

End Temp: 78°F End Wind code: 1 End Sky code: 1

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.:
28	35	11	40%	2 hrs	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 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: yes Evidence of Browse:_____

Comments:_____

Transcription Number_____

NECTAR SPECIES PRESENT

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

Species	Blooming? Yes	Blooming? No	Distribution	Notes, observations, etc.
spotted knapweed	X		abundant	
butterfly weed	X		sparse	
black-eyed susan	X		sparse	
flowering spurge	X		scattered	
horsemint	X		sparse	
St. Johnswort	X		patchy	
bergamot	X		sparse	near creek
Phlox sp.	X		patchy	

OTHER SPECIES PRESENT

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

Species:	Number Observed	Notes, observations, etc.
red-spotted purple	2	
American copper	10	
unknown skipper	5	
unknown white	15	
monarch	5	
yellow swallowtail	5	
black swallowtail	5	

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

Figure 15. Datasheets from 17 July 2007 (Section B) 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: 2007-07-18	Time from: 11:28 to: 1:25pm	SITENAME: Section B	Sourcecode: F_____ M I U S
Surveyors (principal surveyor first, include first & last name): Joelle Gehring + Jennifer Olson + Brandon Noel			
TOWNSHIP: 11N / 10N	RANGE: 14W	SECTION: 31 / 1	QUARTER SECTION:
OWNERSHIP:		QUAD CODE: 4308631	

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

End Temp: 83°F End Wind code: 1 End Sky code: 1

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.:
41	31	13	45%	2 hrs.	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: yes Evidence of Browse:_____

Comments:_____

Transcription Number_____

NECTAR SPECIES PRESENT

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

Species	Blooming? Yes	Blooming? No	Distribution	Notes, observations, etc.
Goldenrod spp.	X		sparse	
bergamot	X		sparse	
black eyed susan	X		scattered	
daisies	X		sparse	
hawkweed	X		sparse	
St. Johnswort	X		scattered	
butterfly weed	X		patchy	
harebell	X		sparse	
spotted knapweed	X		patchy	

OTHER SPECIES PRESENT

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

Species:	Number Observed	Notes, observations, etc.
Buckeye	1	
monarch	4	
American copper	10	
uknown skipper	5	
unknown white	7	
black swallowtail	8	
Eastern tailed blue	2	

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

Figure 16. Datasheets from 17 July 2007 (Section C) 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: 2007-07-18	Time from: 3:00 to: 5:00	SITENAME: Section C	Sourcecode: F _____ M I U S

Surveyors (principal surveyor first, include first & last name): Joelle Gehring + Jennifer Olson + Brandon Noel

TOWNSHIP: 10N	RANGE: 15W	SECTION: 2 + 11	QUARTER SECTION:
OWNERSHIP:		QUAD CODE: 4308631	

Weather (see codes page): Begin Temp: 81°F Begin Wind code: 4 Begin Sky code: 2

End Temp: 83°F End Wind code: 3 End Sky code: 1

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.:
5	15	8	3%	2 hrs.	
				% of area surveyed 70%	

*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: yes Evidence of Browse:_____

Comments:_____

Transcription Number_____

NECTAR SPECIES PRESENT

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

Species	Blooming? Yes	No	Distribution	Notes, observations, etc.
horsemint	X		patchy	
Spotted knapweed	X		patchy	
goldenrod spp.	X		sparse	
butterfly weed	X		sparse	
aster sp.	X		patchy	
coreopsis	X		sparse	
St. Johnswort	X		sparse	
flowering spurge	X		scattered	
hoary alyssum	X		patchy	
Phlox sp.	X		patchy	
Helianthus sp.	X		sparse	

OTHER SPECIES PRESENT

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

Species:	Number Observed	Notes, observations, etc.
cabbage white	15	
American copper	10	
Eastern tailed blue	20	
black swallowtail	5	
sulphur spp.	2	
monarch	2	
unknown skipper	2	

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