

THE OHIO LEPIDOPTERISTS

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LONG-TERM MONITORING OF BUTTERFLIES
INSTRUCTIONS FOR RECORDERS

Table of Contents

Rationale	1
Introduction	2
Starting A Transect.....	3
Sections.....	5
Map	5
Habitat Notes	6
Management	6
Photography.....	6
Identification.....	7
Recording.....	7
Field Notes.....	11
When To Record.....	11
Table Of Recording Weeks	12
Interpretation Of Data	15
Voucher Specimens	20
Records	23
Assistance	24
References And Guides To Identification.....	24
Notes	27

Figures

1. Transect.....	5
2. Census Volume.....	8
3. Time.....	13
4. Weather.....	14
5A. Abundance by Week (Species).....	15
5B. Abundance by Week (Individuals).....	16
6. Most Common Butterflies.....	17
7. European Skippers.....	18
8. Little Wood Satyrs.....	19
9. Butterflies by Section.....	19
10. Butterflies Which Should Be Vouchered.....	21

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LONG-TERM BUTTERFLY MONITORING PROJECT
INSTRUCTIONS FOR RECORDERS

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RATIONALE

It is widely believed that some kinds of butterflies and moths are in danger of disappearing from Ohio (or have already disappeared). In 1987, four butterflies were reported as endangered in Ohio (persius dusky wing, frosted elfin, Karner blue, swamp metalmark), one species as threatened (silver-bordered fritillary), and four of special concern (grizzled skipper, olympia marblewing, Edward's hairstreak, regal fritillary; Shuey *et al.*, 1987). The Karner blue disappeared from Ohio since 1975, and the regal fritillary, which was widely distributed in Ohio prior to the early 1970s, has not been sighted in Ohio for several years.

Proposed reasons for declines in abundance include habitat changes and pesticide use. Long-term data that track regional and local trends in abundance are essential to revealing population declines before their final stages. Declines are hard to detect when they occur slowly and/or lag years behind their causes.

Long term data can provide a wealth of information including: fluctuations in numbers due to short-term and long term effects, colonization and extinction as habitats undergo progression, expansion and contractions of range, migrations, immigrations of non-native species, flight periods of butterflies, seasonal variations in abundance, and overall health of the butterflies of Ohio. Most of what is currently known about the butterflies of Ohio is based on museum specimens,

which tend to be freshly emerged specimens, and anecdotal recall from experienced lepidopterists. There is still much to be learned over time.

INTRODUCTION

The method described in this booklet was devised to enable individuals with relatively little experience to assess the changes in abundance of butterflies in their locality. This booklet follows closely the one distributed to independent recorders by the British butterfly monitoring scheme (Marney Hall, 1981).

The method was originally developed at Monks Wood Experimental Station in Great Britain, and the details were published (Pollard and Yates, 1993). Routine periodic transect counts are used in the monitoring scheme which is a national scheme organized by the Institute of Terrestrial Ecology (ITE) at Monks Wood Experimental Station, and supported jointly by the ITE and the Nature Conservancy Council.

Approximately ten years ago, a group of naturalists started a monitoring program in the vicinity of Chicago, Illinois, U.S.A.

A similar butterfly monitoring scheme was developed by Sonja Teraguchi and Mark Rzeszotarski at the Cleveland Museum of Natural History. An initial transect was established in 1995 at Koelliker Fen, a Museum preserve in northeastern Ohio. Data from the first year were analyzed, and the methodology for conducting a survey using parameters suitable for Ohio was defined. The first instruction handbook for recorders was written in early 1996. The program was expanded in 1996 to include transects from the Cleveland Museum of Natural History, Lake County, Lorain County and Cleveland Metroparks, the Ohio Division of Wildlife, and the Cuyahoga Valley National Recreation Area. In 1997, twelve sites were included in the survey. As of 2006, there have been 93 different sites monitored, with about 60 active monitoring sites during 2006.

A workshop on Long Term Butterfly Monitoring was held in April of 1998. The Ohio Division of Wildlife, The Ohio Lepidopterists, the Cleveland Museum of Natural History and the Ohio Biological Survey jointly sponsored the workshop, which was held at Killdeer Plains Wildlife Area near Marion, Ohio. Workshops have been held annually since 1998 in other parts of Ohio. Check the website for information on the date and location of the next one. At the present time, only Ohio has a state sponsored Long Term Butterfly Monitoring Program in the United States.

This booklet explains simply how a count is made and how to use and interpret the results. It is important to follow the instructions exactly to ensure a standard method of recording which is, as far as possible, independent of observers. In order to obtain useful information from a transect, several years' data covering complete seasons are needed to provide the comparisons between the numbers of butterflies from year to year.

A site information form is included in the booklet and is to be filled out by each site that conducts a survey. The form and the required attachments should be mailed to the contact person listed under records at the end of this booklet when the site is first established. This provides a mechanism for keeping in touch with the sites. It should be reviewed annually to insure that the information on file is correct.

STARTING A TRANSECT

The transect is a fixed route along which walks are made. Once chosen, the route should not be altered. If modification of the transect is needed, any modifications should be made as soon as possible and the new path description documented and sent to the committee chairman. Adjustments in the first year will have minimal impact on a 20 year program. Comparisons are dependent on continuity from week to week and year to year. The transect route should be chosen to be reasonably representative of the locality as a whole. However, it is interesting to include areas

which are managed differently, or, perhaps, have more species present than others, or contain a population of a particularly interesting or local species.

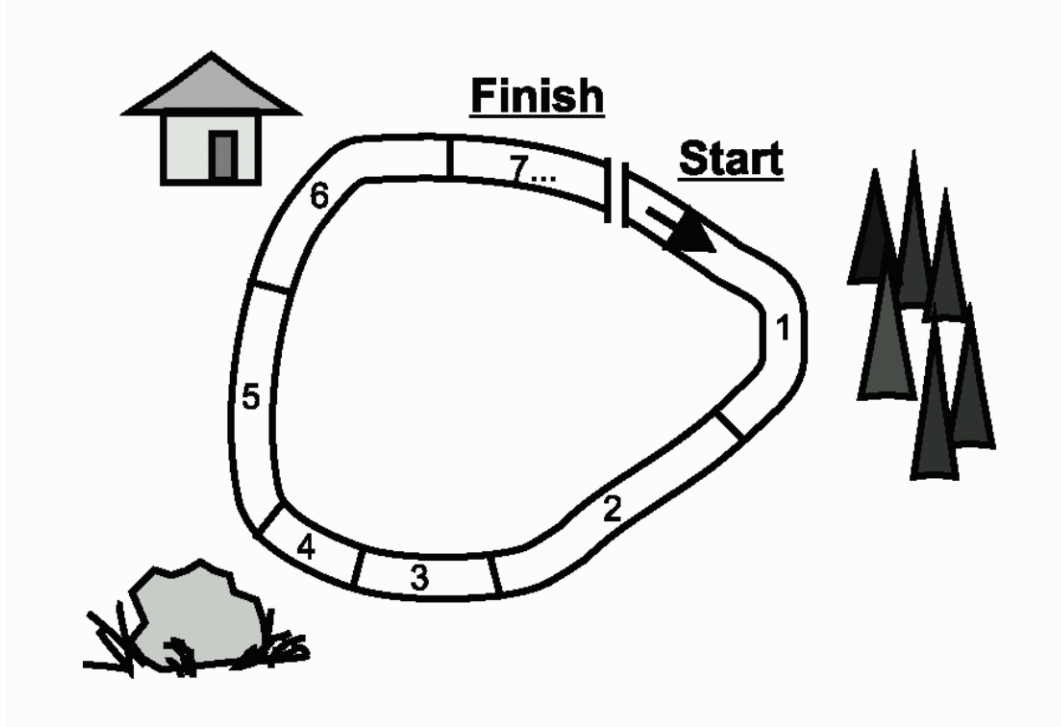
Permission or a formal permit must be obtained from the landowner. Voucher specimens which are not legally obtained cannot be deposited in museums.

The transect should be only as long as is easily manageable, bearing in mind:

1. It must be walked at least once a week.
2. At the height of the season, when there are many butterflies on the wing, counting will take longer than earlier in the year.
3. Someone else may take over the transect or substitute for a week or so in the absence of the regular recorder.

It is better to restrict the route to paths, the boundaries of which are obvious. In more open habitats, established paths may be used and the butterflies counted within limits which are judged by eye. The precise width is not important, but recording becomes more difficult if the width is over about 15 feet. The width should be fixed for a given transect. Ideally, use a total width of approximately 15 feet (7.5 feet to either side). A fixed route can be marked out, using posts or canes, to ensure that the same path is followed. Buried steel rods can be used in public parks to provide long-term identification of the route using a metal detector. If the route chosen makes it necessary for some sections to be covered twice due to overlapping paths, butterflies should be recorded only on the first occasion that the section is covered. A loop is ideal.

Figure 1



SECTIONS

Once the route has been chosen, it should be divided into sections. (See Figure 1) A maximum of 15 sections is recommended. Each section may be a discrete habitat type, or a subdivision of the same habitat which is being managed differently. The counts for each species can then be subdivided according to section and the results used to investigate management or habitat differences. Once the sections have been defined, they should not be changed from year to year. A marker at the start of each section is useful for keeping track of the sections. A small ribbon of a neutral color can be used in public areas.

MAP

After the transect route has been subdivided into sections, an accurate map should be made. The length of each section should be recorded. Record any landmarks at the beginning of each section and also record the lateral limits of the transect. This

level of detail ensures that another recorder can follow the route. The information on the map should, in fact, be sufficiently detailed to permit the route to be relocated and used even after a lapse of some years. For this reason, the landmarks chosen should be reasonably permanent. Whenever possible a Global Positioning System (G.P.S.) map should be made of the transect. A GPS unit to measure the latitude and longitude of the transect is available to members. In addition, several members have their own GPS units. Contact the committee chairman if you need assistance with determining this information.

HABITAT NOTES

A short description of the different habitat types in each section is essential for the transect records. It is also useful to have a short list of the plant species which are most abundant in each section. Particular attention should be given to butterfly food plants, *e.g.*, milkweeds, nettle, or violets, and popular nectar sources such as dogbane, thistles, or teasels. The aim of these records is not to acquire quantitative information on the abundance of plants but to help in a general way, with the interpretation of results.

MANAGEMENT

The effects of management are easily overlooked if not noted regularly. Even such routine management as path cutting may have an effect if, in the process, stands of nectar producing flowers are cut. For this reason, it is advisable to note, on the recording forms, the changes which take place as they happen.

PHOTOGRAPHY

A photographic record of the transect route is recommended. As a minimum, each section should be individually photographed at its starting point. A variable section may require more than one photograph. Initially photographs should be taken early in the season (April/May) and midseason (July/August). In subsequent years, photos might be taken to show other timing or maintenance events (mowing, brush

hogging, etc.). It is also desirable to take a set of slides to facilitate presentation of the key features of the transect at a meeting. These photographs show more clearly than any written record the changes which have taken place. Make duplicates, and turn in one copy of the photos with your data collection sheets.

IDENTIFICATION

Ohio is fortunate in having an excellent publication on its butterflies and skippers (Iftner *et al.*, 1992). The field guide by Glassberg provides a good introduction to identification in the field. Recommended guides to identification and natural history are listed at the end of this booklet. Others may be acceptable as well.

It is essential to know as much as possible about the habits and distribution of the butterflies which occur on the transect route. For example, are they single or double-brooded, common or infrequent? Do they overwinter as an egg, larva, pupa, or adult butterfly? Are the butterflies recorded breeding in the area, or are they breeding some distance away? A familiarity with this sort of information will enable fuller interpretation of the data.

Many butterflies remain in the vicinity of their larval host plant or near available nectar sources. Familiarize yourself with the common flowers and host plants in your area using an appropriate field guide (Newcomb, 1977; Henn, 1998).

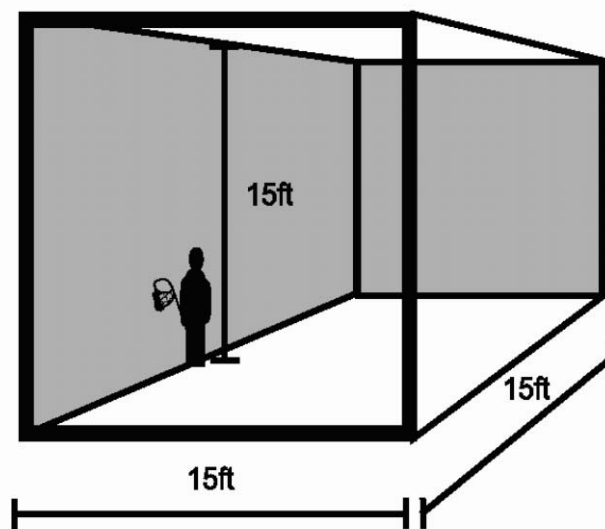
RECORDING

The recording form is attached to the center of this booklet. An example of a completed form is also provided. Before beginning the transect, complete the top two lines of the form. See the AWhen to Record@ section later in this manual for information about wind speed, etc. Make sure you satisfy the time, temperature and sunshine requirements for this study. Recording sheets, a pen or pencil, a watch, compass and thermometer are needed to record starting and ending information. In addition, glassine envelopes, close focusing binoculars, a camera and insect repellent are useful.

The transect should be walked at an even pace and only the butterflies which come within 15 feet of the recorder should be counted. Imagine yourself walking along in a box, 15 feet wide, 15 feet tall, and extending 15 feet ahead of you. (See Figure 2) Only butterflies in this volume should be counted. As you walk, note any butterflies seen by 'scoring' in the appropriate square. Make sure that the correct total is clearly legible in the appropriate square as each section is completed. Do not record a butterfly which is flying more than 15 feet farther ahead, even if it is identifiable, as it may have moved away by the time you reach the spot. It is okay to follow a butterfly which leaves your recording volume if you need to have a better look at it for identification purposes. Begin counting again when you return to where you left off.

Figure 2

Census Volume



Carry a net, so that you can examine some butterflies more closely, to be sure of identification. Retain one or more voucher specimens of any species of which you are uncertain so identifications can be verified. Attempt to collect freshly emerged individuals whenever practical. All vouchers should be deposited in the Cleveland

Museum of Natural History. Final disposition must be in a publicly accessible collection. This insures that future researchers will have access to the historical record. Voucher specimens are very important in providing confirmation of your observations. They are also useful to museum researchers and provide a snapshot of the diversity of the population at the time of collection. Collect sparingly, but try to obtain representative specimens from your site over time. Much of what we know about Ohio's butterflies is from the study of museum specimens. Specimens must be fairly fresh in order for them to be properly identified. Consult a butterfly field guide (Opler and Malikul, 1998) for details about properly collecting a specimen or request the information from the Chairman. Be especially aware that a museum specimen is of no value if the locality and date information are not provided with the specimen. This should be in the form of a small tag or label. The specimens can be placed in glassine envelopes. You are not required to spread or mount the specimens. In some cases, only a spread specimen will give a positive identification (especially with the duskywing skippers and certain hairstreaks). If the monitors want to learn how to prepare museum specimens, contact members of The Ohio Lepidopterists or your local museum.

It may be necessary to stop or retrace your steps in order to capture an individual, in which case recording should resume where the initial stop was made. If you are in doubt about the identification of an individual, record it as a number (sp.5, spp.5, *Erynnis* spp.5 etc.), enter a short description in the field notes and take a voucher if the butterflies are fresh. If an individual butterfly is encountered more than once and you are certain that it is the same one seen previously, record it only once. Record butterflies you see and identify them at least to the family level if possible (e.g., hairstreak, swallowtail, etc.).

When the walk has been completed, complete the third line from the top of the form. Verify that all of the top of the form entries have been completed. In addition, make sure a weather code has been placed in each section that you walked. If no butterflies were observed, write that across the form, but include it

with your data, since information about when butterflies are not flying is also important.

The shade temperature should be recorded in the space at the top of the form at the beginning and end of the walk. The temperature recorded should be in units of degrees Fahrenheit.

The percent cloudiness should be estimated by examining the sky from horizon to horizon. Ten percent clouds mean that 10% of the sky is covered in clouds, and 90% of the sky is devoid of clouds. Sunshine should be recorded section by section in the Weather Codes section at the bottom of the form. As the transect progresses, fill in the boxes. If a shadow is cast, then record the condition as S for sunny. If no shadows are cast, then record the condition as O for overcast. If rain commences, record the condition as R for rain.

As the transect progresses and butterflies are observed, record the species name using the scientific or common name for each species observed. Names should be those used in the checklist or Glassberg (1999). Fill in the I.D. line for each species by placing a letter in the box signifying how the butterfly was identified: O for identified by observation, N for net & release, and C for collected. Place a P in the box if a photograph is taken, so it can be matched up later with your pictures.

Record via codes the sections where larvae are observed. Also note some of the common energy sources the butterflies are currently using. This may include both nectar sources and other sources such as sap, feces, *etc.* You do not need to specify codes for each section. As an example, suppose milkweed is blooming in sections 3 and 5. Write milkweed as energy source number one, and place a 1 in the larva/energy sources code box for sections 3 and 5. Try to list several energy sources each time you do a survey. If there are none, make a note to that effect in the field notes.

Under “Flowers Currently in Bloom,” identify one or more common flowers which are currently blooming. They need not be nectar sources used by butterflies, and can include trees. This data is used to gauge the progression of the growing season, which varies across the state. List plants or trees which are likely to be found across the state (*e.g.*, New England aster, dogwood, blackberries.).

At the end of the transect, check that the records for temperature, sunshine, time of start, *etc.*, are complete. Make sure all entries are legible. If necessary, rewrite the form to insure that a clear record is provided.

FIELD NOTES

Field notes are very important and can include butterflies that could not be included in the regular record (because they were outside the survey area), or any observations of other animals and interesting plants.

Comments concerning variation within a season may be particularly valuable because they can document differences between years caused by temperature and rainfall. Such information would include the appearance of different growth stages of plants including buds and flowers. Unusual weather events can also be mentioned. These would include storms, sustained unusual weather, or lack of rain on preceding days.

Any disturbances of the habitats can also be recorded. This would include deliberate management actions, floods, horse and deer damage, treefalls, turkey scratches, gypsy moth spraying *etc.*

WHEN TO RECORD

The season starts on 1st of April and finishes on October 31. You may begin recording earlier and carry on later if you wish, provided there are butterflies to record. At some sites, it may be difficult to start at the beginning of April due to cool temperatures, but recording should commence on the first suitable day after

April 1. Turn in a recording form from each day that you go out. It is also important to document when you do not see butterflies.

TABLE OF RECORDING WEEKS

***Note that weeks 5, 9, 18, 22 and 27 begin in one month and end in the next.**

Week	Month	Days	Week	Month	Days
1	April	1 - 7	17	July	22 - 28
2		8-14	18 *		29-31
3		15-21	18 *	August	1 - 4
4		22-28	19		5-11
5 *		29-30	20		12-18
5 *	May	1 - 5	21		19-25
6		6-12	22 *		26-31
7		13-19	22 *	September	1
8		20-26	23		2 - 8
9 *		27-31	24		9-15
9 *	June	1 - 2	25		16-22
10		3- 9	26		23-29
11		10-16	27*		30
12		17-23	27*	October	1-6
13		24-30	28		7-13
14	July	1 - 7	29		14-20
15		8-14	30		21-27
16		15-21	31		28-31

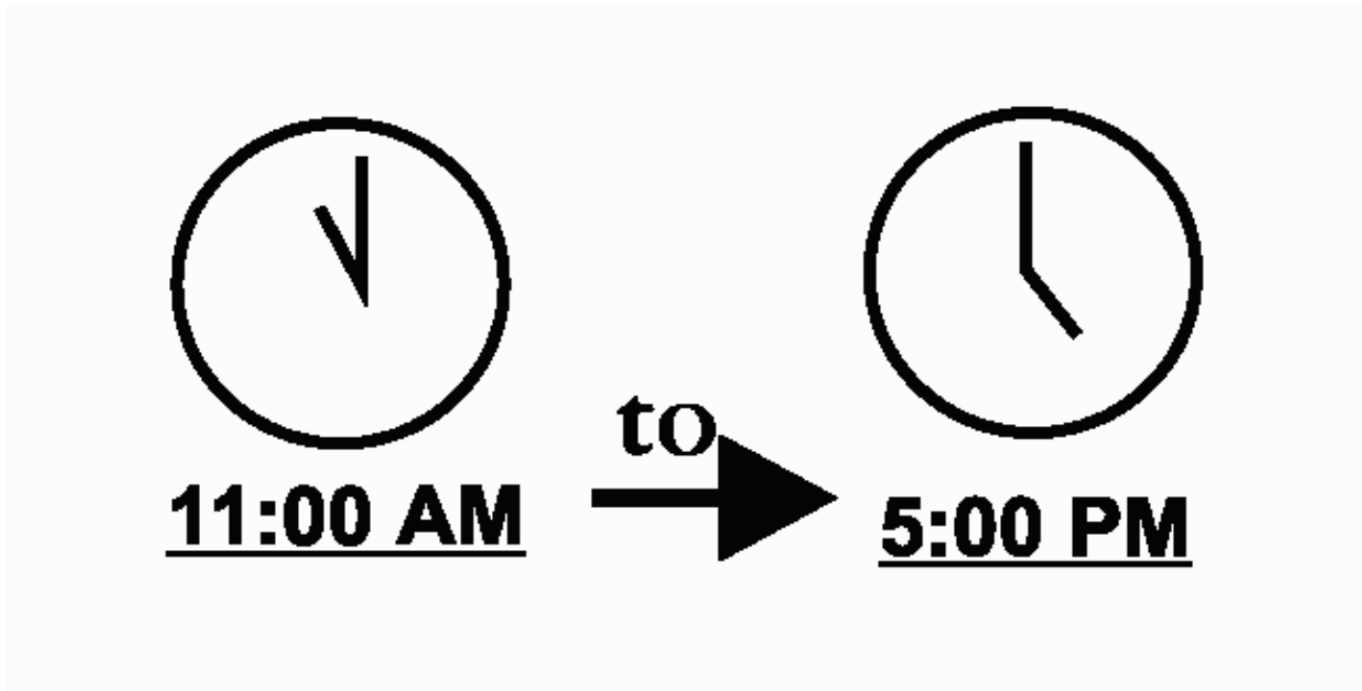
Recording weeks start on April 1st. Week one runs from the 1st to 7th of April, week 2, 8th to 14th of April, and so on regardless of the day of the week on which 1st April falls. This ensures that week one in 1999 can be compared directly with the same week in any other year. At least one transect walk should be completed in

each recording week. If for some reason you have to miss a week, this should be noted, with the reason (e.g., “no suitable weather”). If a week is missed, two counts the following week will provide better data than only one count.

You can record on any day of the recording week. It may be day seven of week one and day one of week two. Do not try to set aside special days for recording, but rather walk the transect at the first opportunity which presents itself each recording week whenever possible. If your schedule is flexible, base it on suitable weather conditions.

Time of recording is restricted to a period around the middle of the day (Figure 3). Start after 11:00 and end before 17:00 (Eastern Daylight Time; add one hour to the recorded time if Eastern Standard Time is in effect). The recorder’s judgement is needed as a 10 AM start on a hot dew-less morning in early July will likely not be a problem but a cool dewy 10 AM start in September should probably be delayed. Correspondingly, in October the lower sun angle may shade some transect sections late in the day so if possible counts need to be timed accordingly.

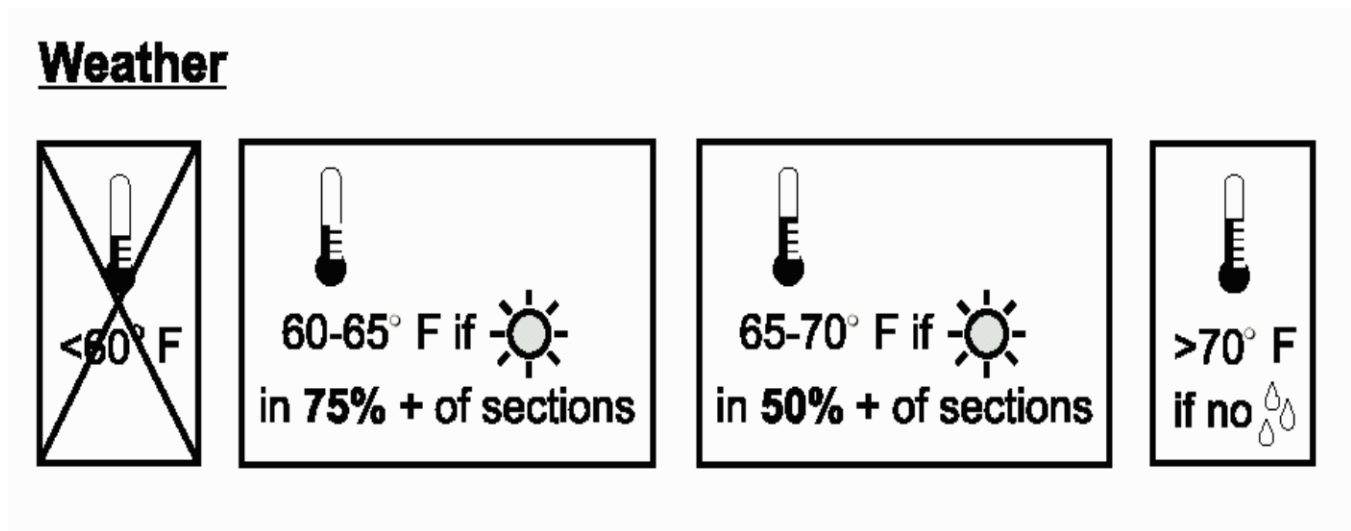
Figure 3



Weather conditions have a considerable effect on the numbers of butterflies seen (Figure 4). To ensure that the counts are standardized as much as possible:

1. Do **NOT** walk a transect when the temperature is less than 60°F.
2. Between 60-65° F, a transect may be walked providing it is sunny for at least 75% of the sections.
3. Between 65-70° F, a transect may be walked provided it is sunny for at least 50% of the sections.
4. Above 70° F, a transect may be walked in any conditions, providing it is not actually raining.

Figure 4



Wind speed should be estimated using the Beaufort scale, at the beginning and end of the walk. Wind direction is the direction from which the wind is blowing. For example, SW wind direction means the wind is blowing from the southwest toward the northeast. It is inadvisable to record butterfly numbers when wind speed is in excess of 19-24 mph:

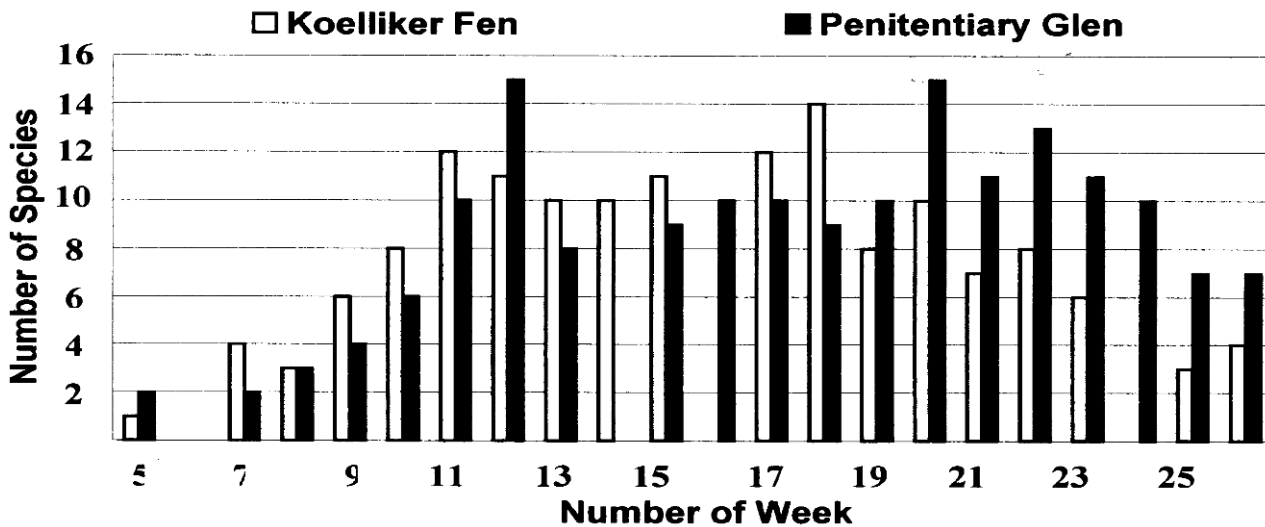
Here is the Beaufort estimated wind speed observation:

- <1 mph no perceptible movement
- 1-3 mph leaves barely move
- 4-7 mph leaves rustle/wind felt on face
- 8-12 mph leaves and twigs move
- 13-18 mph small branches move
- 19-24 mph small trees sway/large branches move
- 25-31 mph large branches move continuously, wind begins to whistle

INTERPRETATION OF DATA

There is no requirement that individual sites evaluate or interpret the data. Nonetheless, some sites have chosen to do so and some of this information is provided here as examples of what can be done. The long term goal is to make all of the data available statewide.

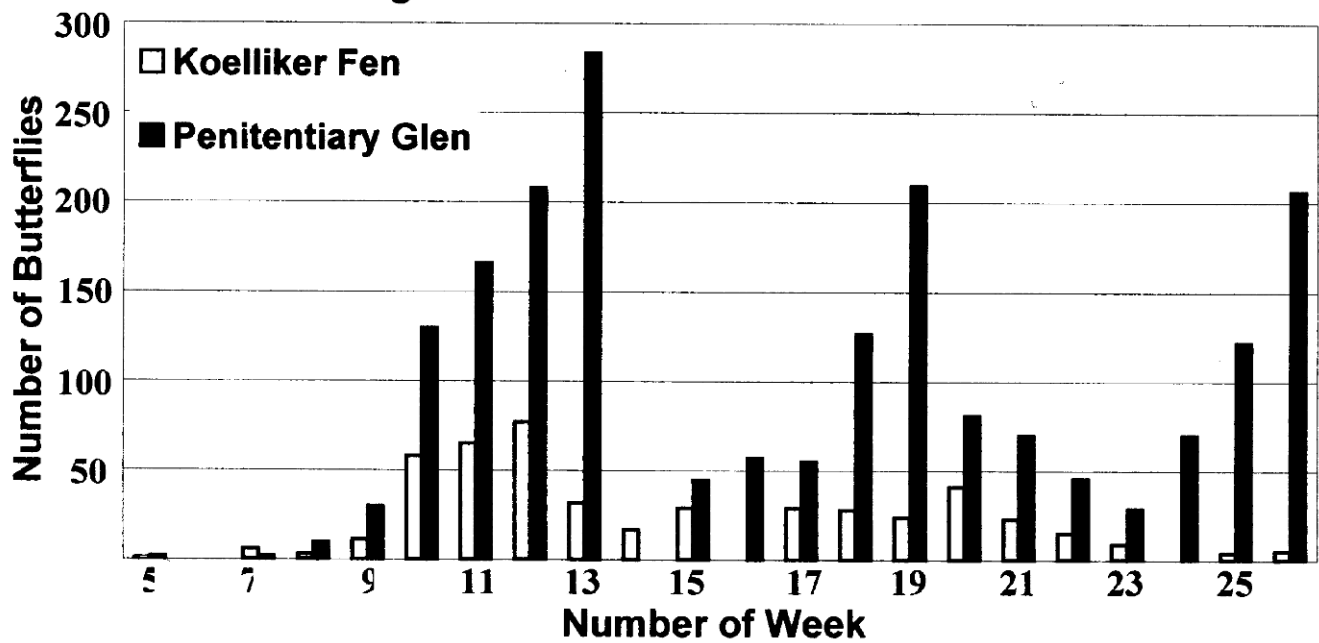
Figure 5A: ABUNDANCE BY WEEK



Here is a little background data based on what has already been learned about abundance monitoring in Ohio. First, the beginning surveyor may be intimidated by the number of species of butterflies in Ohio, but one should understand that at any one site the diversity is much smaller.

For example, Figure 5A demonstrates the number of different species seen in a given week at two distinctly different transects. Koelliker Fen is a wetland habitat with little available nectar late in the season. Penitentiary Glen is primarily open meadow habitat with about 40% woods. At the beginning of the season, there are few species of butterflies flying. This provides an opportunity for the beginner to sort out a few species before things get more confusing during the middle of the season, when perhaps twenty to twenty-five species may be present if the habitat is suitable.

Figure 5B: ABUNDANCE BY WEEK



Notice that the number of species seen per week was not that different for the two sites shown in Figure 5A. Figure 5B shows the same sites but gives number of butterflies instead of number of species. The meadow habitat has significantly more butterflies at certain times of the year. Follow the Penitentiary Glen data for a moment. There is a peak at week 13 and a low point at week 15, which marks the end of first brood butterflies. Another peak appears with the second brood butterflies on week 19. The final peak is due to a late season brood of orange and clouded sulphurs. They peaked at week 26 and show why we recommend counting in October.

It is useful to know which butterflies are most common and to learn to recognize these first, since they will be the most often counted. Figure 6 lists the 21 most commonly observed butterflies in Ohio based on the first 7 years of transect data. Frequency will vary from year to year for example the red admiral is in 11th place primarily due to year 2001 and would otherwise be far down on the list. The top five represent 58% of the butterflies counted, the top ten 75% and the top 15 represent 85% of all butterflies counted.

Figure 6. Most Common Butterflies

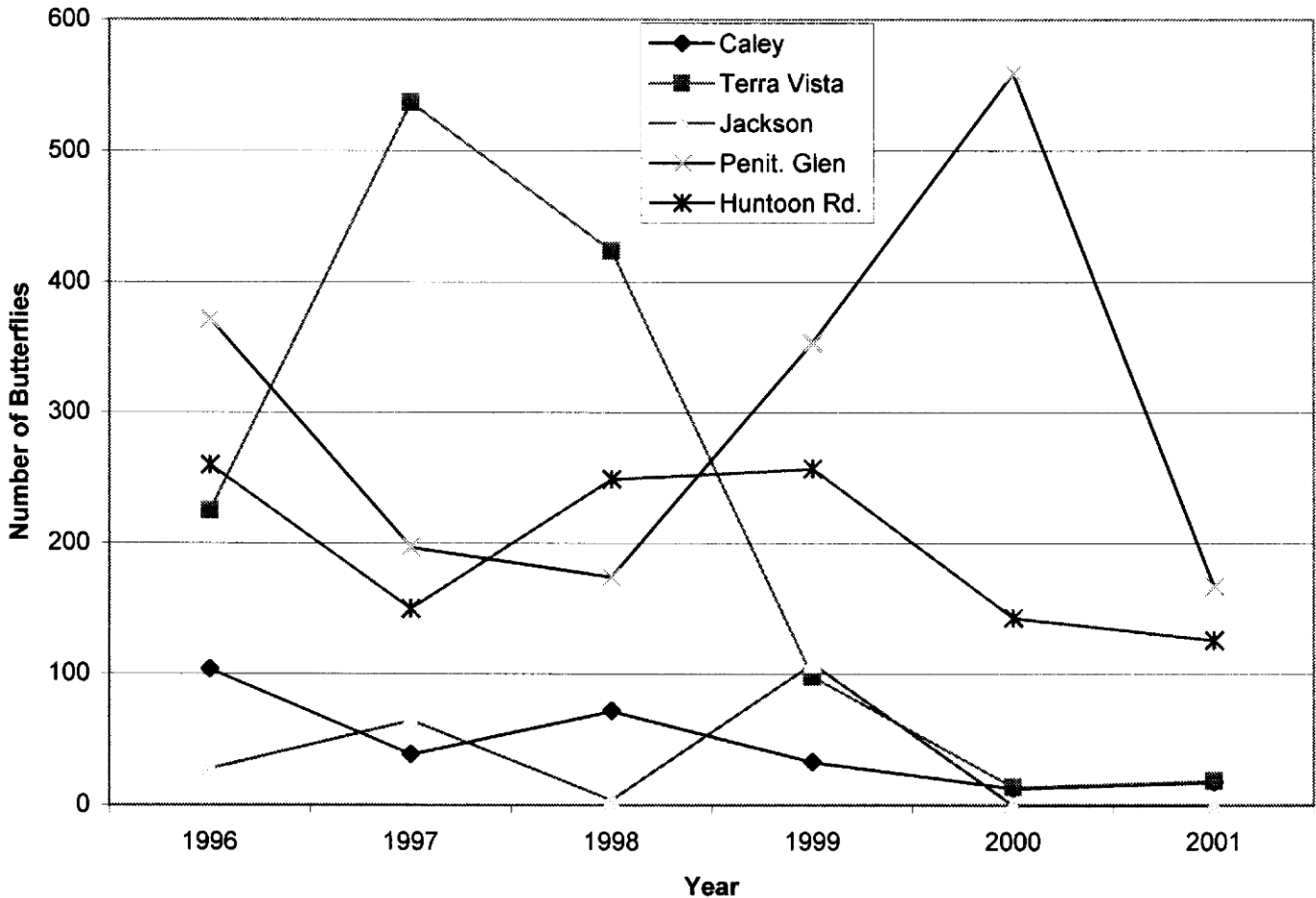
- | | |
|------------------------------|-------------------------------|
| 1. Cabbage White | 12. Eastern Tailed Blue |
| 2. Pearl Crescent | 13. Common Wood Nymph |
| 3. Little Wood Satyr | 14. Eastern Tiger Swallowtail |
| 4. European Skipper | 15. Peck's Skipper |
| 5. Orange Sulphur | 16. Spicebush Swallowtail |
| 6. Great Spangled Fritillary | 17. Least Skipper |
| 7. Monarch | 18. Hobomok Skipper |
| 8. Silver Spotted Sipper | 19. Viceroy |
| 9. Clouded Sulphur | 20. Black Swallowtail |
| 10. Spring/Summer Azure | 21. Hackberry Emperor |
| 11. Red Admiral | |

One of the goals of butterfly monitoring is to measure population trends. Figure 7 shows the number of European skippers at 5 sites across a 6 year period. The two Lake County sites, Penitentiary Glen and Huntoon Road

have high, stable populations. The two Cuyahoga County sites, Terra Vista and Jackson Field, had high and moderate populations, respectively, until 2000 when the population crashed. No improvement is seen in year 2001. The Caley transect in Lorain County also has a much reduced population in 2000-2001. Since the counts are in neighboring counties, weather conditions do not explain the drop.

Perhaps spraying or parasites decimated the population. Certainly seeing zero European Skippers at Jackson Field for 2 years in a row bears some investigation.

Figure 7: European Skippers

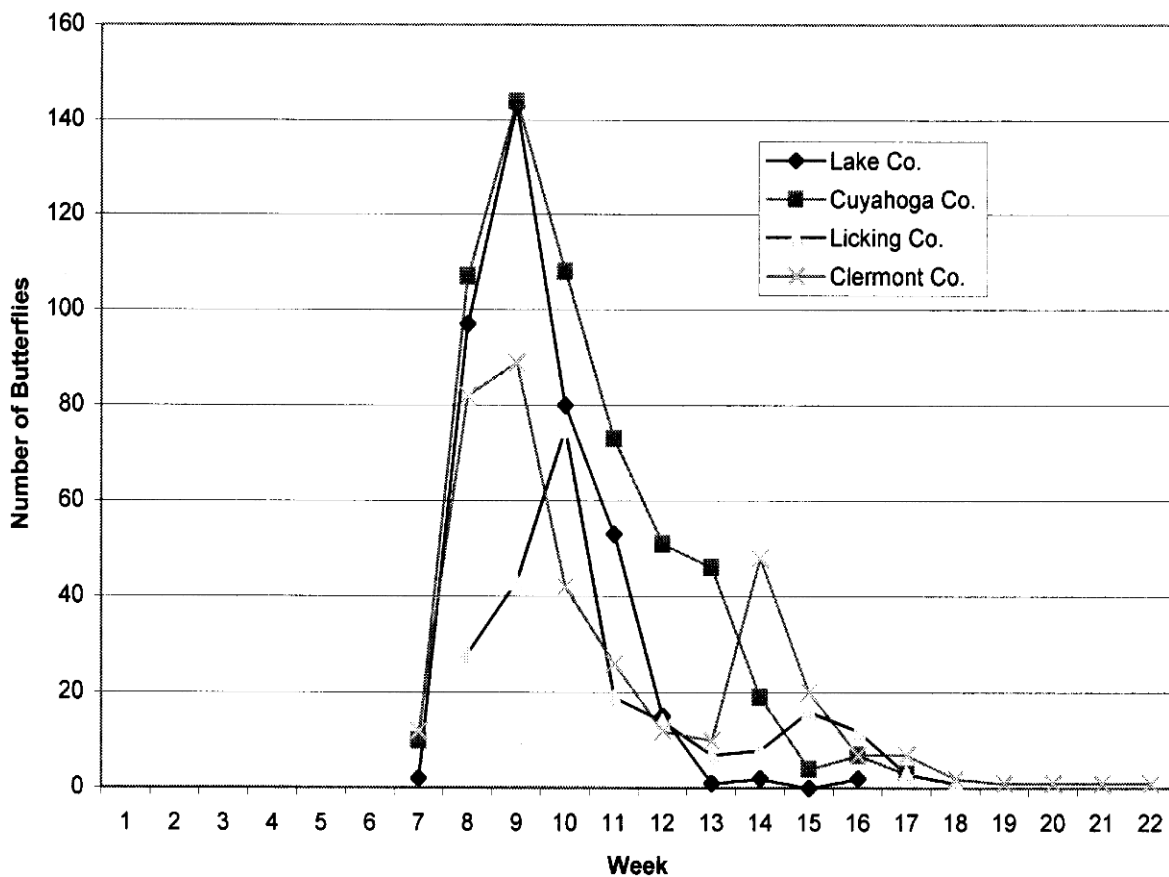


Another useful result of long term butterfly abundance monitoring is to get more information regarding the flight period of individual species. Most of this information is currently based on fresh museum specimens and anecdotal recall from experienced lepidopterists. The database can easily provide this type of information. See Figure 8 which shows the abundance of little wood satyrs at 4 sites across Ohio.

These 4 sites were selected to represent different parts of the state, because they had complete data for the flight period and because they had over 200 little wood satyrs

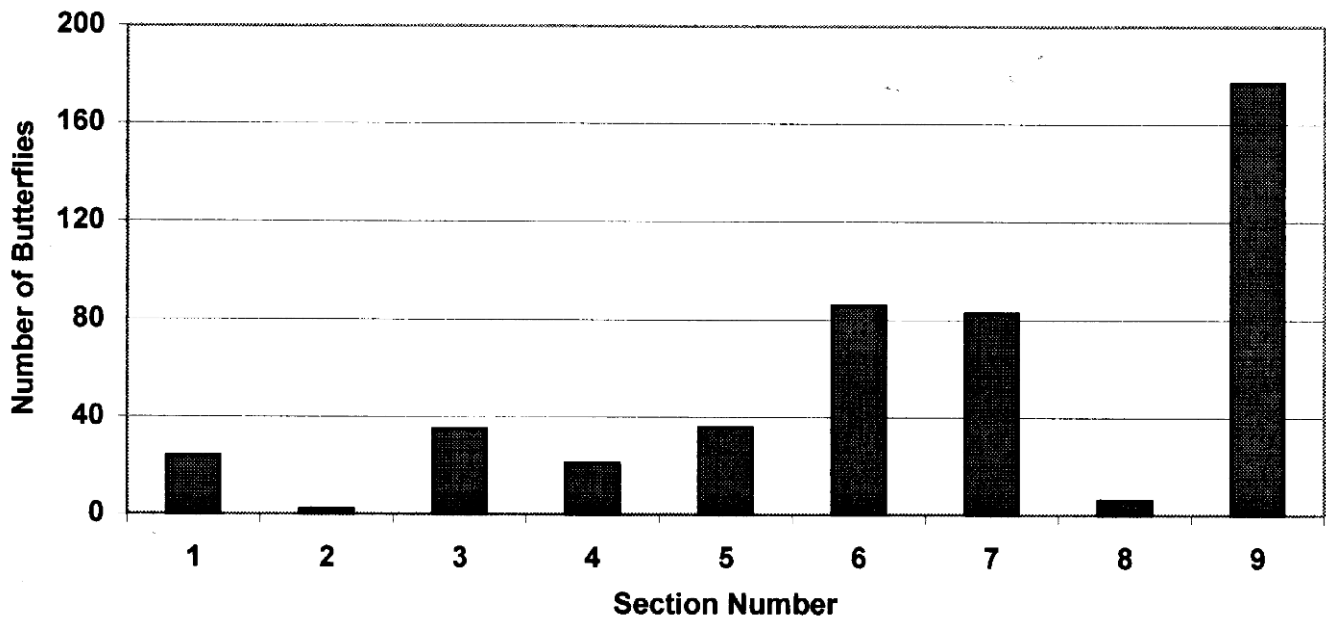
observed in year 2000. Sites are Penitentiary Glen, close to Lake Erie in Lake County, Terra Vista further from the lake in Cuyahoga County, Alrutz Loop in Licking County which is close to Columbus and Cincinnati Nature Center in Clermont County. First it is clear from the figure that there is no climatic shift in emergence for this species since both north and south butterflies emerged on week 7. Secondly, notice that at weeks 14-16 there is a second peak for the southern locations and a small bump for the northern locations. This represents a partial second brood. Also notice this peak for the second brood occurs 2 weeks earlier in Cincinnati than along the North Coast, perhaps because of warmer summer temperatures speeding their growth.

Figure 8: Little Wood Satyrs



Finally, the abundance within a given transect also provides useful information which may help direct land management of an area. This is illustrated in Figure 9. The number of butterflies counted in each of nine sections comprising the Koelliker Fen transect are presented. Section one is the edge of a woods and has transition zone butterflies present. Sections two and eight are woods, which are relatively devoid of butterflies. Section three is the fen, which supports primarily unique wetland butterflies. Sections six, seven and nine represent open meadow habitats and are the most supportive of high butterfly densities at the present time. Over time, the relative abundance in each section will change as succession and land management changes occur.

Figure 9: Butterflies by Section



There is much to be learned over time. It is hoped that many sites will continue monitoring for ten to twenty years so that long term effects can begin to be understood. Ohio is in a unique position to lead this effort through this study.

VOUCHER SPECIMENS

While it is desirable to voucher all species, it is critical to voucher the rarities. To assist in assessing what is a rarity, the following list was prepared. Butterflies

common in the north may be rare in the south or visa versa. It is these “out of their normal range” butterflies that we wish to document. Who knows, perhaps you have found a county record. Butterflies outside their normal range are probably not viable so one should not be hesitant about taking a voucher specimen. It is hard to do DNA testing or other techniques on a picture although good pictures are suitable vouchers in some cases. For example, a picture of a Spring or Summer Azure would not prove identity but coupled with the date of observation, identification should be possible from a photo.

Please verify the presence of these species via voucher if there is a V in your quadrant. For quadrants the east/west line is north south through Columbus and the north/south line is I - 70.

Figure 10: Butterflies Which Should Be Vouchered

<u>Butterfly</u>	<u>NW</u>	<u>NE</u>	<u>SW</u>	<u>SE</u>
West Virginia White	V		V	V
Olympia Marble	V	V	V	V
Falcate Orange Tip	V	V	V	
Dog Face Sulphur	V	V	V	V
Cloudless Sulphur	V	V		
Orange Barred Sulphur	V	V	V	V
Sleepy Orange		V		
Dainty Sulphur	V	V	V	V
Purplish Copper		V	V	V
Acadian Hairstreak				V
Hickory Hairstreak			V	V
Edward's Hairstreak	V	V		V
Northern Hairstreak	V	V	V	V
Brown Elfin	V	V		
Frosted Elfin	V	V	V	V
Henry's Elfin	V	V		
Pine Elfin	V	V		
Juniper Hairstreak	V	V		

<u>Butterfly</u>	<u>NW</u>	<u>NE</u>	<u>SW</u>	<u>SE</u>
Red-Banded Hairstreak	V	V		
Early Hairstreak	V	V	V	V
Marine Blue	V	V	V	V
Appalachian Blue	V	V	V	V
Dusky Blue	V	V		
Silvery Blue	V	V		
Karner Blue	V	V	V	V
Northern Metalmark	V	V		
Swamp Metalmark	V	V	V	V
Gulf Fritillary	V	V	V	V
Diana	V	V	V	V
Regal Fritillary	V	V	V	V
Atlantis Fritillary	V	V	V	V
Silver Bordered Fritillary			V	V
Harris Checkerspot	V		V	V
Gray Comma			V	V
Compton Tortoiseshell			V	V
Goatweed Butterfly	V	V	V	V
Hackberry Emperor		V		
Tawny Emperor		V		
Northern Eyed Brown			V	V
Appalachian Eyed Brown			V	V
Gemmed Satyr	V	V		
Carolina Satyr	V	V		
Mitchell's Satyr	V	V	V	V
Queen	V	V	V	V
Long Tailed Skipper	V	V	V	V
Gold Banded Skipper	V	V	V	
Confused Cloudy Wing	V	V	V	V
Hayhurst's Sooty Wing	V	V		V
Mottled Dusky Wing	V	V		
Persius Dusky Wing			V	V
Grizzled Skipper	V	V	V	

<u>Butterfly</u>	<u>NW</u>	<u>NE</u>	<u>SW</u>	<u>SE</u>
Swarthy Skipper	V	V		
Cobweb Skipper	V	V	V	
Indian Skipper	V		V	
Long Dash			V	V
Sachem	V	V		
Mulberry Wing		V	V	V
Broad Winged Skipper			V	V
Dion Skipper			V	V
Dukes Skipper		V	V	V
Black Dash			V	V
Two Spotted Skipper			V	V
Dusted Skipper	V	V		
Pepper And Salt Skipper	V	V		
Brazillian Skipper	V	V	V	V
Ocola Skipper	V	V	V	V

RECORDS

At the end of the season, all data sheets and pertinent information for the site should be organized and assembled into a coherent package. Records should be mailed or dropped off no later than December 1 of each season. Original data sheets are preferred since transcription can introduce errors. Copies are acceptable if legible. All data sheets, maps, photos, permits and/or permissions and all voucher specimens should be mailed to:

Curator of Entomology
 Cleveland Museum of Natural History
 1 Wade Oval Drive
 Cleveland OH 44106
 216-231-4600 ext. 315
 Fax 216-231-5919

If you have not filled out a site information form or the information has changed since the previous year, fill out the site information form and include it with your mailing.

ASSISTANCE

If you have difficulties at any stage of the procedure please contact

Jerry Wiedmann, Chairman, Butterfly Monitoring Committee
12764 Huntoon Road
Painesville OH 44077
440-254-4230 evenings 440-357-4646 day
440-357-4661 fax 440-413-3778 cell
E-mail: wiedmannj@iskbc.com

A web site has been established to facilitate communication between participants. It also has downloadable forms, manuals and some summary information. You can reach it at the URL: <http://www.butterflymonitoring.org>

Another useful URL with natural history, distribution and photos of many species is available at: http://www.butterfliesandmoths.org/map?ds=36&_dcs=1

REFERENCES AND GUIDES TO IDENTIFICATION

It is recommended that each monitor have access to 2 or 3 reference books to verify identifications of butterflies. A plant identification book may also be useful. Many of these books are available through The Ohio Lepidopterists Sales Program. A more complete list is available on request. Books marked with an asterisk (*) are recommended.

Allen, Thomas J. 1998. *The Butterflies of West Virginia and Their Caterpillars*. Pitt Series in Nature and Natural History. 388 p. [Good reference for immature forms, adult pictures not so good.]

- Allen, Thomas J., Jim Brock & Jeffrey Glassberg.** 2005. Caterpillars in the Field and Garden. Oxford University Press, New York, New York. 232 p. 1010 pictures. [Food plants]
- *Brock, Jim P. and Kenn Kaufman.** 2003. Butterflies of North America. Houghton Mifflin Company. 384 p. [Kaufman Focus Guide, organized by regions, shows color variations, easy to carry]
- Daniels, Jaret C.** 2004. Butterflies of Ohio. Adventure Publications Inc., Cambridge, Minnesota. 344 p. 145 color plates. [Arranged by color]
- *Glassberg, Jeffrey.** 1999. Butterflies Through Binoculars: The East. Oxford University Press. 242 p. [Can be carried conveniently and shows live butterflies.]
- Henn, Robert L.** 1998. Wild Flowers of Ohio. Indiana University Press. Bloomington, IN. 215 p.
- *Iftner, David C., John A. Shuey and John V. Calhoun.** 1992. Butterflies and Skippers of Ohio. Ohio Biological Survey Bulletin. NS. 9(1) 212 p. [Has flight times and county distributions, spread specimens so all details are visible.]
- Hall, Marney, L. 1981.** Butterfly monitoring scheme. Instructions for independent recorders. Institute of Terrestrial Ecology. Cambridge, Lancashire, England. 14p.
- Mikula, Rick.** 2000. The Family Butterfly Book. Storey Books, Pownal, Vermont. 166 p. [Life cycles of 40 species, misc. info.]
- Mitchell, Robert T. and Herbert S. Zim.** 1987. Butterflies and Moths. A Golden Nature Guide. Golden Press, New York, NY. 160 p. [Good basic book for beginners, also brief details on vouchering.]
- Neilsen, Mogens C.** 1999. Michigan Butterflies & Skippers. MSU Extension, Michigan State University, E. Lansing, MI. 248 p. [Pictures and text together on same page.]

Newcomb, Lawrence, 1977. *Newcomb's Wildflower Guide*. Little, Brown and Company, New York. 490 p.

Opler, Paul A. and Vichai Malikul. 1998. *Field Guide to the eastern Butterflies* (revised edition). Houghton Mifflin Company. 486 p. [Peterson Field Guide, info on collecting]

Parshall, David K., Horace B. Davidson and John T Watts. 2002. Ohio Department of Natural Resources, Division of Wildlife Publication 204. 50 p. [39 common butterflies and skippers plus 3 of special concern.]

Pollard, Ernest and Tina J. Yates. 1993. *Monitoring Butterflies for Ecology and Conservation*. Chapman and Hall, Inc. New York, NY. 274 p. [Describes similar monitoring in England.]

***Wagner, David L**. 2005. *Caterpillars of Eastern North America*. Princeton University Press, Princeton, NJ. 512 p. [70 p. butterflies, rest moths, many adults shown]

***Video Guide to Eastern Butterflies**. Directed by Michael Godfrey. Written by Kenn Kaufman. Nature science Network, 108 High Street, Carrboro, North Carolina.

***A Video Guide to Skippers of the Northeast**. 1995, Richard K Walton. 7 Concord Greene #8, Concord Massachusetts.

This project is supported by the Ohio Division of Wildlife with funds donated to the Wildlife Diversity & Endangered Species Program.

NOTES



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