MOTH STUDY OF SCHMEECKLE RESERVE
(UNIVERSITY OF WISCONSIN-STEVENS POINT, PORTAGE CO., WI.)

Fall Semester 1992 to Spring Semester 1995

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Compiled Spring Semester of 1996

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Abstract: A moth study was conducted at the University of Wisconsin-Stevens Point's Schmeeckle Reserve from the fall semester of 1992 through the fall semester of 1995, with data recorded from each fall and spring semester included in this interval. The primary objectives of this study were to provide information on the species diversity of this locality as well as information on the habitat association, flight season, and to the extent possible the relative abundance of the various species. What survey techniques worked for finding the different species and what weather conditions they were found under was also studied. Moths were collected with ultraviolet lights, bait, around flowers, and by netting individuals flushed up or on the wing during the day and night.

Of the material identified so far, including all known species collected in the superfamilies Drepanoidea, Geometroidea, Bombycoidea, Sphingoidea, and Noctuoidea, 377 species have been recorded from Scheeckle Reserve. Data for this project also includes all moths collected on the UW-Stevens Point campus which borders the reserve, and a few of the species are recorded solely based on specimens collected on the campus.. Additional species could be included in the genera Eupithecia (Geometridae), Feltia, and Rynchagrotis (Noctuidae), as series of material in these genera remain unidentified. 375 of the total species are identified to species, and the remaining two have only been identified to genus at this point (Sutyna sp. and Rynchagrotis sp.) but are known to be different species because none of the other species in the total are members of these genera.

Seventeen of the species recorded are believed to be strays or migrants to central Wisconsin, having originated from states south or west of Wisconsin. An additional nine to thirteen species are suspected to be dispersers into the reserve, since based on the current understanding of their host plants and/or habitat requirements Schmeeckle Reserve is unlikely to contain suitable habitat for these species. However, these species are likely to be residents of central Wisconsin. For some of the other species, whether the individuals collected represent dispersers or residents of the reserve is questionable. The adult flight seasons of eight of the species recorded are not part of the survey time, but these species were added to the list by collecting larva, pupa, or finding dead specimens associated with buildings.

Site Description:

Schmeeckle Reserve (T 24N R 8E Sec 27) is a 208 acre reserve owned by the University of Wisconsin-Stevens Point located within the city of Stevens Point (adjacent to the UW-Stevens Point Campus) in Portage County, Wisconsin. The reserve is divided into an east and west section by a four lane divided north/south highway going through the middle of the reserve. Forest (dominated by Oak, Pine, and Maple) is the dominant habitat, particularily moist forest, however the reserve also contains significant acreage of sedge meadow and wetlands as well as some small open areas.

Materials and Methods:

Moths were collected in the field by a variety of methods, including ultraviolet light sheet setups, UV light traps, bait traps, bait trails, searching for moths around certain species of flowers, flushing moths out during the day, and netting specimens on the wing. A detailed discussion of these survey techniques follows. What species were found by each survey technique is included in the systematic checklist of moth species collected in the reserve. Comments on how often different survey methods were used and their success is included in the Discussion of Survey Techniques section.

UV Light Sheet Setup: This survey technique exploited the ability of ultraviolet lights to attract various species of moths. Nylon twine was tied between two large trees, and was used to erect a white sheet

UV Light Sheet Setup: This survey technique exploited the ability of ultraviolet lights to attract various species of moths. Nylon twine was tied between two large trees, and was used to erect a white sheet perpendicular to the ground by attaching it to the twine with clothes pins. Alternatively, the sheet was put up with a frame constructed from plastic pipes. Another white sheet was placed on the ground under the upright sheet. Blacklights were then hung on each side of the upright sheet, with the most common setup including a 22 watt BioQuip circuline blacklight on one side and a 15 watt BioQuip tubular blacklight on the other side. The lights were powered by Deep Cycle Marine Outboard Batteries. After dark, the sheet was watched for moths periodically between searching with other survey methods. Moths were collected in jars as they flew around the sheet or landed on it.

UV Light Traps: These traps used the same BioQuip 15 watt ultraviolet lights and batteries as described above. The traps consisted of a sawed off tractor fueling funnel clamped to a cylindrical galvanized metal pipe above, such that the pipe formed about a half circle above the funnel with the other side open. The black light was then hung vertically from the top of the trap along the back of the pipe. The funnel opened into a plastic container containing a drain or cup under the funnel hole (to catch rainwater) and a wick containing Ethyl Acetate to quickly subdue the moths. Paper towels were placed in the bottom of the plastic container to minimize the loss of scales by moths going into the trap. In general, these traps were operated by DC photoeclectric cells which turned the lights on when it became dark and off after sunrise. Thus, when the batteries were strong enough these traps collected throughout the night. The two traps used most frequently were put up by setting them on the ground next to a tree and tying them to the tree, however a similar design that could be hung from a tree several feet off the ground was developed during the spring of 1995 and sometimes used. Another kind of UV trap, a BioQuip pail trap, was used infrequently during from the fall of 1992-fall of 1993, but generally wasn't very successful relative to the other traps.

Another method of collecting moths attracted to lights was to search lighted campus buildings. Many buildings bordering the reserve have powerful large lights on top and less powerful lights within reach from the ground. Many of the lights, however, are sodium vapor lights which emit light in a spectrum less attractive to moths, however some moths did come to these lights and to the white lights on campus. Moths were collected sitting on buildings or flying around campus lights. In some cases, moths could be found perched on the buildings the following day, especially if conditions were cool and the side of the building was not in the sun.

Bait Trail: A mixture of sugar bait was made and the bait was applied to trees along trails with a paint brush. After dark, the bait trail was walked with a flashlight and selected moths were collected off of trees with jars or netted as they flew off and around baited trees. The bait used during this project was a mixture of bananas, brown sugar, and apple cider vinegar, and rarely with a touch of beer. During the fall semester of 1993, the concentrations of ingredients were changed to make the mixture thicker than what had been used previously, which had required redoing the bait trail once or twice when survey continued for many hours. The thicker mixture could be put up anytime during the day and last all night, and depending on weather conditions sometimes the same trail could be used several nights in a row without redoing the bait.

Bait Traps: Two types of bait traps were used, inverted cone traps and minnow traps. Inverted cone traps consisted of a net cylinder with a solid top and an inverted cone with an open hole on the bottom end. One trap was made out of all light netting, whereas the other trap had the cylinder green and the top and cone lighter (more effective). A wooden platform was attached to the bottom of the net trap with a distance of a couple inches between the platform and bottom of the cylinder. A dish of bait, either a rotten banana or a rotten banana and the bait trail mixture combined, was placed on the platform centered under the inverted cone. Some moths which came to the bait would fly up through the cone and become caught in the trap. Moths could be retrieved by a zipper opening on the side of the cloth cylinder. These traps were put up in trees with nylon twine, and were usually several feet off the ground.

The other type of bait trap used was merely a minnow trap purchased at fleet farm. This was a screen trap with lateral inward projecting cones on each end with a hole in the center. Due to the size of the screen holes, some of these traps were only effective in retaining larger moths, mostly Catocala. However, one trap used was covered with finer netting and could retain smaller moths as well. Bait was placed in a dish at the bottom center of the trap, and the traps were put up high in trees with nylon twine thrown up
screen holes, some of these traps were only effective in retaining larger moths, mostly Catocala. However, one trap used was covered with finer netting and could retain smaller moths as well. Bait was placed in a dish at the bottom center of the trap, and the traps were put up high in trees with nylon twine thrown up
over branches.

Flowers: A number of the species reported exhibited crepuscular nectaring activity at various species of flowering plants during the fall. In addition, some species were found nectaring at certain flowers after dark, or both at dusk and after dark. During the fall, on many survey dates stands of these flowers were searched regularly at dusk and then later as well. Flowers of interest included Petunias in flower beds on the UW-SP campus, and in Schmeeckle Reserve Spotted Knapweed, White Snakeroot (Eupatorium rugosum), Eupatorium perfoliatum, Joe Pye Weed (Eupatorium purpureum), Goldenrod (Solidago sp.), Asters, and Fleabane (to a much lesser extent). Two species, Cisseps fulvicollis and Hemaris thysbe were most often found by searching flowers during the day, but few other species were active at flowers diurnally and all of them uncommonly, with many more individuals found at night. Hence, most flower searches were conducted at dusk or after dark. The crepuscularly active species usually had to be netted, whereas during some of the later activity landed moths could be collected off of blossoms with a jar.

Some moths were collected by being spotted in a flashlight beam and netted on the wing, and were not associated with any natural or artificial means of attraction. However, only Operophtera bruceata hyperborea was found solely by this method..

To a much lesser extent than night surveying, some moths were surveyed for during the day by flushing them out of the vegetation. Also, some moths were netted on the wing during daylight or spotted perched on vegetation.

Key To The Systematic Checklist of the Moths of Schmeeckle Reserve

The Systematic Checklist of the Moths of Schmeeckle Reserve contains a taxonomicly arranged list of all moths species recorded from the reserve in the superfamilies Drepanoidea, Geometroidea, Bombycoidea, Sphingoidea, and Noctuoidea. In addition, there are columns for the status, abundance, habitat, survey methods used, and flight season for each species. In addition, this list contains symbols to indicate other information of interest for certain species (see below).

Key to symbols appearing to the left of the species name:

**	First Wisconsin record for this species.
*	This species is only recorded based on one or two specimens.
#	The flight season for this species was at its extreme end or beginning during the survey period, and may not have included the survey period during most years. Few records were obtained.
@	This species is represented by one record only, but more may have been seen but were flying too high up to collect.
*2	A record for this project was the second specimen of this species ever recorded from Wisconsin.
*2+	Same as above, but additional specimens were also collected.

Note: Multiple symbols are used for some species in the checklist.

Key to symbols appearing in [brackets] to the immediate right of the taxa name:	
[number]	The number of species recorded in a family or subfamily.
[L]	This species is recorded based on larva specimens only, or adult specimens reared from a larva collected during the survey period. The flight season column is not applicable to these species.
[P]	Same as above, except refers to specimens taken in the pupal stage.
[UNV]	Unverified record. This species was identified by the author from plated specimens and descriptions in the literature or from specimens of species poorly represented in the author's personal collection. Ideally, the identification of these specimens should be confirmed by an authority with more experience identifying these species.
[D]	The only record(s) of these species are based on dead specimens associated with buildings. The flight season of these species is outside of the survey period.

Status:

This column is used to differentiate between residents and nonresident species recorded from the reserve. Nonresident status was determined by information in the literature or correspondence with other lepidopterists indicating this species is a stray or migrant as far north or east as central Wisconsin, or based on the current understanding of larval hosts and/or habitat requirements, the absence of these hosts or habitats in Schmeeckle Reserve. Resident status was assigned based on some combination of the following considerations: known larval hosts are present in the reserve, likely breeding habitat occurs in the reserve, the species is currently believed to be a Wisconsin resident as far north or south as the reserve, the species was recorded regularly without highly erratic changes in flight season or abundance from year to year, the species overwinters as an adult and has been recorded in the fall and early spring a number of times, the condition of specimens throughout the flight season was suggestive of resident status (at the beginning of the flight season all individuals are in fresh condition, later there is a mix of fresh and more worn specimens, and near the end of the flight season individuals tend to be in a more worn condition), or the presence of pupa or overwintering larva ([L] or [P] records). Note that most of these considerations are suggestive of resident status but do not necessarily guarantee it. In cases where I believed the evidence of resident status to be weak (although this may be the most likely status) the chart indicates the status is questionable. Future additions to information on host plants and habitat requirements for various species could potentially alter the designations given to certain species.

Key to Symbols in the Status Column:

R Resident species.

R? Probably a resident species, but evidence to support this is poor, often due to few records.

M A migrant species to the reserve, unable to survive the winter in any life stage-all individuals perish with the onset of cold weather. Recorded in the reserve most years or in considerable numbers. Individuals enter the reserve from more southerly locations.

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M(B) Migrant that probably established temporary breeding populations in the reserve due to the appearance of numbers of adults in very fresh condition and the presence of suitable larval hosts..

S Stray, found outside of the range from which it is normally recorded. It is unusual to find this species is central Wisconsin, or it had never been found there previously. Never recorded in numbers (except for Rachiplusia ou), but by isolated records.

D Disperser into the reserve. A possible resident of central Wisconsin, however its host plants or suitable habitat are not known to occur in the reserve.

? Status unknown.

Abundance:

An attempt is made to give a relative abundance for the various species recorded from the reserve to indicate if a species is common, rare, or at some point in-between. Note for the purposes of this report abundance terms are never used to indicate factors such has habitat specificity, local populations, imperiled status, etc. is as often done by government natural resource agencies. Rather, these terms are reserved solely to indicate how commonly or rarely a species is encountered in the field. Note that the abundance recorded does not necessarily reflect a species' abundance in nature relative to other species, as how often a species was found and the numbers it was found in largely reflect the effectiveness of the survey methods used to find it. For example, a nocturnally active species poorly attracted to lights, bait, and/or flowers would have probably been found rarely if at all, even if it is common in nature.

Abundance can be assigned by consideration of the numbers of individuals found and the number of survey dates a species was found on. Unfortunately, the process of assigning an abundance term involves considerable subjectivity. Quantitative data exists for the later (see flight season charts), but not the former. While attempts were made to record all the species found on a given night (except for some species during the first three semesters, for which only the flight season was determined-not each date the species was found), collecting all the individuals found would have been totally impractical and resulted in huge series of common and worn specimens, and attempting to identify species in the field does not produce reliable or verifiable data. However, the series collected do to some degree show species that were more common relative to other species, and some of the more common and diagnostic species that were not retained in large numbers are nonetheless recorded from many survey dates.

Some other factors can influence perceptions of abundance. Some species appeared to have lower temperature tolerances for activity than others, and therefor for two equally common species, one may be found far more often because more nights have temperatures within its tolerance range for activity. Species also have varying flight season lengths from other species, from year to year, and/or the amount of the flight season for a species included in the survey window can vary from year to year as well as between different species. Hence, a quantitative assignment of abundance based on just the number of survey dates a species was recorded on was deemed to be of little value. The below system attempts to take these factors into consideration and also indicates when the abundance is based on the extreme beginning or end of the flight season (some species recorded uncommonly in the reserve at the very end or beginning of their flight season have been found commonly in similar habitats later or earlier in the season).

Some species were difficult to designate abundance for because their abundance tended to be erratic during a single season and/or from season to season, and this can't be explained only by obvious varying weather conditions. Sometimes, a range of abundances is given for these species. A discussion of species that had notably different abundances during different seasons (not due to varying overlaps of the flight season and survey period) is discussed in a separate section. It should be noted that for any species, it is more likely to be found and found in greater numbers based on how favorable the weather conditions are
that had notably different abundances during different seasons (not due to varying overlaps of the flight season and survey period) is discussed in a separate section. It should be noted that for any species, it is more likely to be found and found in greater numbers based on how favorable the weather conditions are
for using the survey technique best suited for finding it. Also, the amount of survey devoted to various habitats (sometimes changes in habitat quality for a species are subtle or unknown) affects how often a species is found and the numbers it is found in. In addition, many species change in abundance over their flight season, and may be in high numbers in the middle and low numbers at the end, and/or be found regularly during the prime of their flight season but only occasionally at the ends. Furthermore, for some species data on the numbers found in and how many dates the species was found can favor contradictory abundance ratings; for example a species may be found in high numbers on few survey dates or in low

numbers on many survey dates, or be found consistently but in highly inconsistent numbers not clearly based on weather. Species for which these situations occur are generally assigned a range of abundances.

In light of above, the following system is intended to provide an indication of the relative abundance of the various species in Schmeeckle Reserve based on the survey techniques used by considering how often a species was found, the numbers it was found in, and the other factors noted above. It must be stressed that the following are generalizations and approximations rather than precise categories, and are not a claim to abundance levels in nature.

Key to Abundance Designations:

VR Very Rare. Few records, unlikely to be found in any habitat at any time of the year under any weather conditions. Applies to all "*" species not in the "#" category.

R Rare. Recorded on few survey dates for any given year, and generally only one or at most two individuals found on the dates it was recorded.

U Uncommon. Not recorded on many survey dates, even under favorable weather conditions and in seemingly appropriate habitat. Generally found in low numbers when recorded.

NU Not uncommon. An in-between abundance. Found on a considerable number of survey dates and sometimes in considerable numbers. However, generally not one of the more numerous species, and not recorded on a number of survey dates during its flight season when weather conditions seemed adequate and appropriate habitat was surveyed.

FC Fairly Common. Found on many dates during its flight season and often in considerable numbers.

C Common. Recorded on most dates during its flight season in appropriate habitat under favorable weather conditions. Generally one of the most numerous species during the prime of its flight season.

X-Y Abundance was variable and hard to generalize, but at any given time could usually be described by one of the abundance designations in the indicated range from X to Y, where X and Y reprensent one of the above abundance ratings..

* Not applicable. The column does not include the recorded flight season of the adults of this species.

X>Y Begins at abundance X, but as flight season progresses during the survey time changes to abundance Y.

>X Abundance X applies only to the end of the flight season. Earlier survey (before the start of the fall semester) may have yielded a different abundance rating.

X> Abundance X applies only to the beginning of the flight season. Had survey continued past this point (end of the spring semester) abundance may have increased.

X> Abundance X applies only to the beginning of the flight season. Had survey continued past this point (end of the spring semester) abundance may have increased.

Habitat:

This column indicates which of the general habitat types occurring in Schmeeckle Reserve species were collected in. A lower case letter indicates relative to the habitat(s) designated with upper case letters, a species was found in this habitat much less frequently and in lower numbers. Note that the "B" habitat designation received less survey than the other habitat types (see "Notes on Habitat Association" section).

One problem with these designations is the habitat types in Schmeeckle Reserve occur in close proximity. Traps in wetlands and open areas were also very close to forested areas, and these traps were generally on the forest wetland interface to cut down on light pollution. Hence, every species trapped in wetlands and open areas could also be designated in the forested habitat category, and many of the species found in wetlands may in no way be associated with this habitat. Species widely believed to be wetland obligates that were found exclusively in wetlands are only designated as being found in wetlands.

Key to Habitat Designation Symbols:

F Found in forested habitat.

FM Forest margin, grassy or brushy areas bordering forested areas.

W Found in open wetlands or sparsely forested wetland/sedge meadow habitat.

B Open area with some characteristics of a poor quality small barrens remnant, located west of the main trail between Maria and North Point Drives on the far north end.

H Grassy hill covered with *Spotted Knapweed* next to the shelter building on Maria Drive. This area was surveyed by flower searches only.

O Open area not included in the above categories.

C Found on the UW-SP campus; only used for species with few records where at least one record is from campus.

* This species is designated [D], and thus none of the above apply.

Survey Method:

This column designates which basic survey techniques described in the Materials and Methods section were successful in collecting each species recorded and to distinguish the few species that were active diurnally. Upper and lower case letter symbols are used the same way as above. All moths were nocturnally active unless otherwise designated and species collected at lights and bait were all nocturnally active. Note a differentiation is made for a couple species were the males and females were found by entirely different survey means, although for specimens collected of all but a couple species gender was not determined.

Key to symbols in the Survey Method Column:

UV Collected at Ultraviolet lights in traps and/or at a sheet set up.

B Collected at Bait, either on the bait trail and/or in bait traps.

L Either collected exclusively on lighted buildings or a significant portion of the total records were from lighted buildings rather than UV lights (designated: UV,L). Species found frequently at UV

L Either collected exclusively on lighted buildings or a significant portion of the total records were from lighted buildings rather than UV lights (designated: UV,L). Species found frequently at UV lights are not included in this category, even if some were also found on lighted buildings.

F Collected in association with nectaring activity at Flowering plants.

D Active Diurnally (not due to being disturbed from resting site).

Fh Collected primarily by being Flushed from vegetation during the day.

R Collected at <u>R</u>est on natural or manmade structures (only used if not found by other survey means; doesn't apply to moths on lighted buildings).

(f) This symbol following a survey technique indicate the survey technique was used to collect females of that species (applies to wingless females for some Geometridae).

N A species was not found by any of the above survey techniques.

<u>Flight Season</u>:

This column summarizes flight season data for each species over the entire project. Note the flight seasons given may include a period when a species was not recorded for one or more years (specific flight dates appear in a separate chart. Also, since dates at the extreme end of August were only surveyed during 1992 and 1993 (30 and 31 August only) the August portion of a species flight season is omitted unless a species was found only during one of these two days during 1992 and 1993. In addition, note if species were found only at the borderline of one of the below categories and nearly all records were earlier or later, the next category appears as the cutoff for the flight season summarization. For example,<u>Aethalura intertexta</u> was recorded as early as 19 April only once but was common later, hence its flight season is summarized as L April-M May as opposed to M April-M May.

E Early: the first 10 days of a month.

M Mid: days 11-20 of a month.

L Late: days 21-31 of a month.

DESCRIPTION OF FLIGHT SEASON CHARTS

The flight season data is separated into three charts covering L August-October, November-M December, and March-M May. At the top of each chart (below the title on the first page of a chart) the cutoffs for each month are listed on the first line, the tens digit of the flight dates on the second line, and the ones digit of the flight date on the third line. An "X" in a cell means at least one specimen of a particular species was collected on the corresponding date during a particular year. If an interval is reported rather than specific day by day flight season data, it is designated "X\\\\\\\\\\\\X" with the X on each end representing the beginning and ending dates the species was collected on during that interval (this is only used for some species during the first three semesters, for the remainder of the project attempts were made to document the occurrence of a species throughout its entire flight season). Pertaining to the September-October chart, if a species was also found in November the last date it was found on in October is designated "X>" unless the last date it was collected on in October is 31 October. If a species was found in the fall during a given year but not until November, a ">" appears in the 31 October column.

SYSTEMATIC CHECKLIST OF THE MOTHS OF SCHMEECKLE RESERVE By Hugo L Kons Jr.

Superfamilies Drepanoidea, Geometroidea, Bombycoidea, Spingoidea, and Noctuoidea

September-Mid May, Fall of 1992 to Fall of 1995

Compiled spring 1996

			Abundance Rating				1992-1995
	Species [377]	**Status**	**Spring**	**Fall**	**Habitat**	**Survey**	**Flight Season**
THYATIRIDAE [1]							
	Euthyatira pudens	R	U-R	*	F	UV,B	E-M May
DREPANIDAE [2]							
	Drepana arcuata	R	U>	VR	F	UV	M May, E Sept.
	Drepana bilineata	R	U-NU	*	F	UV	L April-M May
GEOMETRIDAE [81]							
Archierinae [1]							
*@	Archieris infans	R	VR	*	F	D	E April
Oenochrominae [1]							
*	Alsophila pometaria [UNV]	R	VR	N	C	L	M April
Ennominae [46]							
	Itame pustularia	R	*	>U	F	UV	E Sept.
*#	Semiothisa aemulataria	R	R>	*	F	UV	M May
	Semiothisa pinistrobata	R	*	>R	F	UV,D	E-M Sept.
	Aethalura intertexta	R	FC-C	*	F	UV	L April-M May
	Anacamptodes vellivolata	R	U-NU	*	F	UV	M May
	Ectropis crepuscularia	R	C	*	F	UV	M April-M May
	Melanolophia canadaria	R	?	*	F	UV,B	E-M May
	Melanolophia signitaria	R	?	*	F	UV,B	E-M May
	Lycia ursaria	R	R-U	*	F	UV	M April-E May
	Phigalia titea	R	C	*	F	UV, R(f)	M April-M May
	Phigalia strigitaria	R	U-FC	*	F	UV	M April-E May
*2+	Paleacrita merricata	R	R-U	*	F,C	UV,L	L March-L April
	Paleacrita vernata	R	U	*	F,C	UV,L	M March-L April
	Erannis tiliaria	R	*	C	F,W	UV, R(f)	E Oct.-E Nov.
	Lomographa semiclarata	R	NU	*	F,O	D,uv	M May
	Lomographa vestaliata	R	U>	*	F,O	D,UV	M May
	Lomographa glomerularia	R	C	*	F	UV	L April-M May
	Cabera erythemaria	R	*	>R	F,W	UV	E Sept.
	Cabera variolaria	R	*	>R	F,W	UV	E Sept.
*	Apodrepanulatrix liberaria	D?	*	VR	F	UV	M Sept.
#	Xanthotype urticaria	R	*	>R	W	UV	E-M Sept.
*#	Pero honestaria	R	*	>R	B	UV	E Sept.
	Campaea perlata	R	*	>U	F,W,b	UV,b	E-M Sept.
	Ennomos magnaria	R	*	NU	F,W,b	UV	E Sept.-E Oct.
*	Epirranthis substriataria	R	VR	*	F	UV	E May
	Petrophora subaequaria	R	NU-FC	*	F,W	UV	L April-M May
	Tacparia detersata	R	R>	*	F	UV	E-M May
*#	Homochlodes fritillaria	R	R>	*	F,W	UV	M May
	Petrophora subaequaria	R	NU-FC	*	F,W	UV	L April-M May
	Tacparia detersata	R	R>	*	F	UV	E-M May
*#	Homochlodes fritillaria	R	R>	*	F,W	UV	M May
	Metanema inatomaria	R	NU>	*	F	UV	M May
	Metanema determinata	R	NU>	*	F	UV	M May
	Metarranthis duaria	R	U>	*	F	UV	M May
*#	Anagoga occiduaria	R	R>	*	F	UV	M May
	Probole alienaria	R	U>	*	F	UV	M May
	Probole nyssaria	R	U>	*	F	UV	M May
	Plagodis serinaria	R	R>	*	F	UV	M May
	Plagodis phlogosaria	R	R>NU>	*	F	UV	E-M May

			Abundance Rating				1992-1995
Species [377]		Status	Spring	Fall	Habitat	Survey	Flight Season
	Plagodis alcoolaria	R	U>NU>	*	F	UV	M May
*#	Besma quercivoraria	R	*	>R	C	L	E Sept.
	Lambdina fiscellaria	R	*	R(92),FC	F,w,b	UV,F	E Sept.-E. Oct.
*	Cingilia catenaria	?	*	VR	C	L	M. Sept.
	Nepytia canosaria	R	*	NU-FC	F,w,b	UV	E Sept.-E Oct.
*	Nepytia pellucidaria	?	*	VR	F,W	UV	E Sept.
#	Eusarca confusaria	R	*	>R	W	UV	E Sept.
	Eutrapela clemetaria	R	U>FC-C	*	F	UV	E-M May
	Prochoerodes transversata	R	*	R-U	F,w,b	UV,F	E-L Sept.
	Nematocampa limbata	R	*	>U	F,b	UV	E Sept.
Geometrinae [2]							
*#	Chlorochlamys chloroleucaria	R	*	>R	O	D	L August
	Mesothea incertata	R	FC	*	B,O	Fh	M May
Sterrhinae [5]							
	Pleuroprucha insulsaria	R	*	U-FC	F,W,b	UV,B	E Sept.-M Oct.
	Cyclophora pendulinaria	R	NU>	*	F,B	UV	M May, E-M Sept.
	Haematopis grataria	R	*	R	F,H,B,O	UV	E-M Sept.
#	Scopula limboundata	R	*	>R	F	UV	E Sept.
*#	Scopula inductata	?	*	>R	F	UV	E Sept.
Larentiinae [26]							
*	Dysstroma citrata	?	*	VR	FM	F	M Sept.
*#	Eulithis diversilineata	R	*	>R	F	UV	M. Sept.
	Eulithis testata	R	*	U-NU	F,W,B	UV	E-M Sept.
	Hydriomena renunciata	R	U>	*	F	UV	M May
	Hydriomena transfigurata	R	U>	*	F	UV	M May
	Hydriomena ruberata	R	U>FC	*	F	UV	E-M May
	Triphosa haesitata affirmaria	R	R-U	R-U	F	BT	E-M May, E-M Oct.
	Coryphista meadii	R	*	R	F,FM	F,B	E-M Sept.
*	Anticlea vasiliata	?	VR	*	F	UV	M May
*	Stamnodes gibbicostata	?	*	VR	FM	F	M Sept.
*#	Xanthorhoe labradorensis	?	*	>R	F	Shelter bld.	E Sept.
	Xanthorhoe ferrugata	R	NU	>R	F,b,w	UV	M May, E Sept.
	Xanthorhoe lacustrata	R	FC	*	F	UV	L April-M May
	Orthonama obstipata	R	*	NU-C	F,w,b	UV,B	E Sept.-E Nov.
	Orthonama centrostrigaria	R	*	R>U-FC	F,w,b	UV,B	E Sept.-E Nov.
	Venusia comptaria	R	C	*	F,b	UV	L April-M May
*#	Trichodezia albovittata	R	R>	*	F	D	M May
	Operophtera bruceata hyperborea	R	*	U	F	N	L Oct.-E Nov.
	Eupithecia columbiata	R	?	*	F	UV	L April
	Eupithecia swettii	R	?	*	F	UV	E May
	Eupithecia miserulata	R	*	U-NU	F	B,uv	E Sept.-E Nov.
	Eupithecia ravocostaliata	R	FC	*	F,b	UV	L April-M May
	Cladara limitaria	R	U(93),FC-C	*	F	UV	L April-M May
	Cladara atroliterata	R	C	*	F,b	UV	M April-M May
	Eupithecia ravocostaliata	R	FC	*	F,b	UV	L April-M May
	Cladara limitaria	R	U(93),FC-C	*	F	UV	L April-M May
	Cladara atroliterata	R	C	*	F,b	UV	M April-M May
	Lobophora nivigerata	R	U>NU>	*	F	UV	L April-M May
	Dyspteris abortivaria	R	R>	*	W	UV	E May
LASIOCAMPIDAE [3]							
	Tolype velleda	R	*	U	W,F	UV	E-M Sept.
	Tolype laricis	R	*	R-U	W,F,b	UV	M Sept.
	Phyllodesma americana	R	U-NU	*	F	UV	E-M May
SATURNIIDAE [3]							
*#	Dryocampa rubicunda	R	R>	*	F	UV	M May

	Species [377]	Status	Abundance Rating Spring	Fall	Habitat	Survey	1992-1995 Flight Season
*	Hemileuca maia	?	*	VR	On Main Trail	N	L Sept.
	Hyalophora cecropia [P]	R	*	*	F	*	*
SPHINGIDAE [9]							
*	Manduca sexta	S	*	VR	C	F	M Sept.
*	Sphinx eremitus	S	*	VR	C	F	M Sept.
*#	Sphinx kalmiae	?	*	VR	C	F	E Sept.
	Smerinthus jamaicensis	R	R>	*	F	UV	M May
	Smerinthus cerisyi	R	U-FC>	*	F	UV	E-M May
*#	Poanias excaecatus	R	*	>R	W	UV	M Sept.
	Hemaris thysbe	R	R>	>R	O	F	M May, E Sept.
	Deidamia inscripta	R	R>	*	F,W	UV	M May
	Hyles lineata	M?	*	R-FC	C,H,b	F,uv	E Sept.-E Oct.
NOTODONTIDAE [11+1?]							
	Clostera albosigma	R	NU	*	F	UV	E-M May
*#	Clostera strigosa	R?	R>	*	F	UV	E May
	Clostera apicalis	R	?	*	F	UV	M May
	Notodonta simplaria	R	R-U	*	F	UV	E-M May
*	Ellida caniplaga	?	VR	*	F	UV	E May
	Gluphisia septentrionis	R	NU>	>R	F,w,b	UV	E-M May, M Sept.
	Gluphisia avimacula	R	FC	*	F	UV	E-M May
	Gluphisia lintneri	R	R-NU	*	F	UV	M April-E May
	Furcula occidentalis	R	R>	*	F	UV	M May
	Furcula modesta	R	R-U>	*	F	UV	M May
	Heterocampa guttivitta	R	R>	*	F	UV	M May
ARCTIIDAE [10]							
#	Crambidia pallida	R	*	>R	W	UV	M Sept.
#	Hypoprepia fucosa	R	*	>R	W	UV	E-M Sept.
	Pyrrharctia isabella [L]	R	*	*	F,O	*	*
*#	Spilosoma virginica	R	*	VR	C	L	M Oct.
*#	Phragmatobia fuliginosa	R	R>	*	On Main Trail	N	M May
*#	Grammia celia	D	R>	*	F	N	M May
*	Grammia arge	D?	*	VR	C	L	E Sept.
#	Halysidota tessellaris	R	*	>R	C,W	UV	E Sept.
	Ctenchua virginica [L]	R	*	*	F,O	*	*
	Cisseps fulvicollis	R	*	U-FC	W,O,F,H	F,UV	E Sept.-M Oct.
LYMANTRIIDAE [3]							
*	Orygia antiqua	?	*	VR	W,F	UV	M Sept.
	Orygia definita	R	*	U	W,F	UV	E-M Sept.
	Orygia leucostigma	R	*	U	W	UV	E-L Sept.
NOCTUIDAE [254]							
Herminiinae [6]							
	Idia americalis	R	*	C	F,w	B,UV	E Sept.-L Oct.
	Idia aemula	R	*	C	F,w	B,UV	E Sept.-L Oct.
#	Zanclognatha ochreipennis	R	*	>R	W,O	UV	E Sept.
	Idia americalis	R	*	C	F,w	B,UV	E Sept.-L Oct.
	Idia aemula	R	*	C	F,w	B,UV	E Sept.-L Oct.
#	Zanclognatha ochreipennis	R	*	>R	W,O	UV	E Sept.
*#	Zanclognatha jacchusalis [UNV]	?	*	>R	W	UV	E Sept.
*#	Bleptina caradrinalis	R	*	>R	B	UV	E Sept.
*#	Palthis angulalis	R?	*	>R	F	UV	M Sept.
Rivulinae [1]							
	Rivula propinqualis	R	*	>R	W,F	UV	M Sept.
Hypenodinae [2]							
**	Hypenodes caducus [UNV]	R	*	R-U	W	UV	E-M Sept.
*	Hypenodes fractilinea [UNV]	?	*	VR	W	UV	M Sept.

	Species [377]	Status	Abundance Rating Spring	Fall	Habitat	Survey	1992-1995 Flight Season
	Hypeninae [5]						
*#	Bomolocha baltimoralis	R		>R	C	UV	E Sept.
*	Bomolocha abalienalis	R	*	>R	F	UV	E Sept.
*#	Lomonaltes eductalis	R	R>	*	F	UV	M May
	Hypena humuli	M?	R>	U-FC	F,b	B,uv	L Apr-M May, E Sep-L Oct
	Plathypena scabra	R	*	C	F,W,b	B,uv	E Sept.-E Nov.
	Catocalinae [38]						
*#	Calyptra canadensis	R	*	>R	B	UV	M Sept.
	Scoliopteryx libatrix	R	NU-C	NU-C	F	B,uv	L Apr-M May, E Sep-E Nov
	Phoberia atomaris	R	NU-FC	*	F	UV,B	L April-M May
	Cissusa spadix	R	U>NU>	*	F	UV	E-M May
*#	Drasteria adumbrata [D]	D	*	*	Visitor Cntr.	*	*
	Zale lunata	R	*	FC-C,R(93)	F	B,uv	E Sept.-E Nov.
	Zale undularis	?	R>	*	F	B	E May
	Zale minerea	R	U-NU	*	F	B,UV	E-M May
	Zale phaeocapna	R	U	*	F	UV,b	L April-M May
	Zale submediana	R	R-U	*	F	UV,B	E-M May
	Zale duplicata	R	C	*	F	B,UV	E-M May
	Zale helata	R	U	*	F	B,UV	E-M May
	Zale lunifera	R	C	*	F	B,UV	L April-M May
	Zale unilineata	R	R-U	*	F	B,UV	E-M May
	Parallelia bistriaris	D?	*	VR	F	B	M Sept.
	Caenurgina crassiuscula	R	NU	R	F,W,O	D,UV	E-M May, M Sept.
	Caenurgina erechtea	R	FC	R	F,W,O,B	D,UV	E-M May, E-M Sept.
*	Mocis latipes	S	*	VR	F	B	L Sept.
*	Mocis texana	S	*	VR	F	B	E Sept.
*	Catocala innubens	S	*	VR	C	L	M Sept.
	Catocala antinympha	R	*	>R-NU	B,F,w	B,uv	E-L Sept.
*	Catocala subnata	D	*	VR	F	B	M Sept.
*	Catocala neogama	D	*	VR	F	B	M Sept.
	Catocala ilia	R	*	>R-NU	F	B	E-M Sept.
	Catocala cerogama	R	*	>R-FC	F	B	E-M Sept.
	Catocala relicta	R	*	FC	F,w	B,uv	E Sept.-E Oct.
	Catocala unijugua	R	*	C	F,w	B,uv	E Sept.-M Oct.
	Catocala parta	R	*	>R-FC	F	B,uv	E Sept.-E Oct.
	Catocala briseis	R	*	>R-NU	F	B	E-M Sept.
	Catocala meskei	R	*	R	F	B,L	E-M Sept.
	Catocala cara	R	*	R-U	F	B	E-L Sept.
	Catocala concumbens	R	*	NU-C	F,w	B,uv	E Sept.-L Oct.
	Catocala amatrix	R	*	R	F	B	E-L Sept.
*#	Catocala sordida [D]	R	*	*	*	*	*
	Catocala ultronia	R	*	>R	F	B	E Sept.
	Catocala grynea	R?	*	>R	F	B	E Sept.
	Catocala amatrix	R		R	F	B	E-L Sept.
*#	Catocala sordida [D]	R	*	*	*	*	*
	Catocala ultronia	R	*	>R	F	B	E Sept.
	Catocala grynea	R?	*	>R	F	B	E Sept.
*#	Catocala praeclara	R	*	>R	F/W	UV	E Sept.
*	Catocala lineella	R	*	>R	F	UV	M Sept.
	Plusiinae [14]						
	Trichoplusia ni	M	*	R-FC	H,FM,O	F,uv	E Sept.-E Oct.
*	Ctenchoplusia oxygramma	S	*	VR	FM,W	F	E-M Sept.
	Pseudoplusia includens	S	*	R	FM,H,C	F,l	E-M Sept.
	Rachiplusia ou	S	*	NU(92)	H,C	F,l	E-L Sept.
	Allagrapha aerea	R	*	>R	FM,B	F,UV	E-M Sept.
*	Autographa biloba	S?	*	VR	H	F	M-L Sept.

	Species [377]	Status	Abundance Rating Spring	Fall	Habitat	Survey	1992-1995 Flight Season
	Autographa precationis	R	*	C	H,FM,F,W	F,uv,b	E Sept.-M Oct.
*2 *	Autographa californica	S	*	VR	F	B	M Oct.
	Anagrapha falcifera	R	*	NU	F,FM,H,W	F,uv	E-L Sept.
*	Syngrapha epigaea	?	*	VR	O/F	L	M Sept.
*#	Syngrapha microgamma [D]	D	*	*	Visitor Cntr.	*	*
	Plusia putnami	R	*	R	H,W	F,UV	E-M Sept.
*	Plusia contexta	?	*	VR	W	UV	E Sept.
*	Plusia venusta	R	*	VR	W	UV	E Sept.
	Sarrothripinae [2]						
	Baileya doubledayi	R	U>NU>	*	F	UV	M May
	Nycteola frigidana	R	R	VR	F,b	UV	M Apr-M May, L Oct.
	Nolinae [2]						
*#	Meganola miniscula	R	R>	*	F	UV	M May
	Nola triquetrana	R	NU-C	*	F	UV	L April-M May
	Acontiinae [7]						
#	Lithacodia albidula	R	*	>R	B,W	UV	M Sept.
	Pseudostrotia carneola	R	*	U-NU	F,W,B	UV,B	E-M Sept.
#	Maliattha synochitis	R	*	>R	B,W	UV	M Sept.
#	Anterastria teratophora	R	U>	*	F	UV	M May
	Homophoberia apicosa	R	*	R	W/F	UV,B	E Sept.
*	Amyna octo	S	*	VR	W	UV	M Sept.-E Oct.
	Tarachidia erastrioides	R	*	>R	W	UV	L Aug.-M Sept.
	Pantheinae [2]						
*#	Panthea furcilla	R	R>	*	F	UV	M May
	Raphia frater	R	U>	>R	F,w,b	UV	M May, E-M Sept.
	Acronictinae [8]						
	Acronicta americana [L]	R	*	*	F	*	*
	Acronicta grisea	R	R>	*	F/W	UV	M May
*#	Acronicta laetifica	?	R>	*	F	B	M May
#	Acronicta hasta	R	R>	*	F	B	M May
*#	Acronicta noctivaga	?	R>	*	F	UV	M May
	Acronicta impressa	R	R,FC(95)	*	F	UV,b	L April- M May
#	Acronicta oblinata	R	U>	*	F	UV	M May
#	Simyra henrici	R	R>	*	W	UV	M May
	Amphipyrinae [46]						
	Apamea dubitans	R	*	>R-U	F	B,UV	E Sept.
#	Apamea devastator	R	*	>R-U	F	B,UV	E Sept.
*#	Eremobina jocasta	R	*	>R	W	UV	L Aug.
	Oligia modica	R	*	R	F	F,UV,B	E Sept.
*#	Oligia bridghami	D?	*	>R	O/F	L	L Aug.
	Oligia mactata	R	*	C	F,W,b	B,f,uv	E Sept.-M Oct.
*	Oligia illocata	?	*	VR	F	B	E Oct.
	Meropleon diversicolor	R	*	R-U	W	UV	E-L Sept.
	Lemmeria digitalis	R	*	NU-FC	W	UV	M Sept.-E Oct.
*	Oligia illocata	?	*	VR	F	B	E Oct.
	Meropleon diversicolor	R	*	R-U	W	UV	E-L Sept.
	Lemmeria digitalis	R	*	NU-FC	W	UV	M Sept.-E Oct.
	Archanara oblonga	R	*	R	W	UV	E-M Sept.
*	Archanara laeta	D	*	VR	C	L	M Sept.
	Helotropha reniformis	R	*	C	F,W	B,UV,f	E Sept.-L Oct.
*	Papaipema cataphracta	R	*	VR	W	UV	L Sept.
	Papaipema arctivorens	R	*	>R	W,F,H,b	UV,f	E-M Sept.
	Papaipema impecuniosa	R	*	R-U	W	UV	E Sept.-M Oct.
*	Papaipema leucostigma	?	*	VR	W	UV	E Sept.
	Papaipema lysimachiae	R	*	R	W,B	UV	E-L Sept.

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	Papaipema pterisii	R	*	C,R(92)	F,W,B,FM	UV,f,b	E-L Sept.
** *	Papaipema speciosissima	R	*	VR	W	UV	E Oct.
	Papaipema inquaesita	R	*	C	W,F,b	UV,b	E Sept.-M Oct.
*	Papaipema baptisae	R	*	VR	W	UV	M Sept.
	Papaipema birdi	R	*	U	W,F/W	UV	E-L Sept.
	Papaipema nepheleptena	R	*	U	W	UV	M Sept.-E Oct.
	Papaipema furcata	R	*	R	W,C	UV,L	E-M Sept.
	Papaipema nebris	R	*	R	W,C	UV,L	E-M Sept.
*	Papaipema necopina	R	*	VR	FM,B	F,UV	E Sept.-E Oct.
	Papaipema maritima	R	*	VR	F,B	UV	E-M Oct.
	Papaipema eupatorii	R	*	U	W	UV	M Sept.-M Oct.
	Papaipema unimoda	R	*	R-NU	W	UV	E Sept.-M Oct.
	Phlogophora periculosa	R	*	>R-NU	F,b	B,uv	E Sept.-E Oct.
	Enargia decolor	R	*	FC	F,W,B	UV,b,f	E Sept.-E Oct.
	Ipimorpha pleonectusa	R	*	>R	C	UV	E Sept.
	Hyppa xylinoides	R	C(94)	R-U	F,b,w	B,uv	E April, M May, E Sept.-E. Oct.
	Nedra ramosula	R	R>	*	F	UV	M May
	Magusa orbifera	M(B)	*	NU(93),R(95)	F	B,uv	E Sept.-M Oct.
	Amphipyra pyramidoides	R	*	C	F,W,B	B,UV,f	E Sept.-L Oct.
*	Amphipyra tragopoginis	?	*	VR	F	B	E Sept.
	Proxenus miranda	R	*	R	W,C	UV,L	E-L Sept.
*	Platyperigea meralis [UNV]	?	*	VR	F	UV	M Sept.
	Platyperigea extima	R	*	U	F,b	UV	E Sept.-L Oct.
	Platyperigea multifera? [UNV]	?	*	R	F,C,B	UV	L Sept.-L Oct.
	Spodoptera frugiperda	M	*	U-C	F	B,uv,f	E Sept.-L Oct.
	Spodoptera ornithogalli	M	*	R-C	F	B	E Sept.-E Nov.
	Galgula partita	R	U	NU	F,W	B,uv	L Apr-M May, M Sep-E Nov
	Platysenta vecors	R	*	R	F	B,uv	E Sept.-M Oct.
	Ogdoconta cinereola	R	*	R-U	F,W,b	UV,B	E-M Sept.
	Cucullinae [54]						
	Xylena nupera	?	R(94)	U(93)	F	B	E Apr-E May, L Sep-L Oct
	Xylena curvimacula	R	NU-C	U-C	F,w,b	B,UV	M Mar-M May, E Oct-E Nov
*	Xylena cineritia	D	*	VR	F	B	M-L Oct.
	Lithomoia solidaginis	R	*	NU-FC	F,W,B	B,UV	E Sept.-L Oct.
	Homoglaea hiricina	R	R	*	F	UV,b	L March-E May
	Lithophane semiusta	R	R-FC	R-FC	F	B,uv	M Mar-E May, E-M Oct.
	Lithophane patefacta	R	U	U	F	B,uv	M Mar-E May, M Sep-E Oct
	Lithophane bethunei	R	R-U	U-C	F,w	B,uv	M Mar-E May, E Sep-E Nov
	Lithophane innominata	R	U-FC	U-C	F	B,uv	M Mar-M May, E Sep-L Oct
	Lithophane petulca	R	NU	NU-C	F,b	B,uv,f	M Mar-M May, M Sep-M Nov
	Lithophane amanda	R	R	R	F	B,UV	M Mar-E May, M Sep-M Oct
	Lithophane disposita	R	U-NU	U-FC	F	B,uv	M Mar-E May, M Sep-E Nov
	Lithophane hemina	R	C	C	F,w,b	B,UV,f	M Mar-M May, E Sep-E Nov
*2+	Lithophane oriunda	R	R-U	R	F	B,uv	M Mar-E May, E-L Oct
	Lithophane hemina	R	C	C	F,w,b	B,UV,f	M Mar-M May, E Sep-E Nov
*2+	Lithophane oriunda	R	R-U	R	F	B,uv	M Mar-E May, E-L Oct
	Lithophane baileyi	R	R,(FC Mar 94)	R-U	F,w	B,uv	M Mar-E May,M Sep-L Oct
	Lithophane tepida	R	R	R	F	B	M Mar, M Sep-E Oct
	Lithophane antennata	R	U-FC	U-FC	F	B,uv	M Mar-M May, M Sep-E Nov
	Lithophane laticinerea	R	R-FC	C	F,b	B	M Mar-L Apr, E Oct-M Nov
	Lithophane grotei	R	R-U	C	F,b,w	B	M Mar-M Apr, E Oct-M Nov
	Lithophane unimoda	R	R-C	R-NU	F,w	B,uv	M Mar-E May, E Oct-E Nov
	Lithophane fagina	R	U	R	F,w	B,uv	M Mar-L Apr, M Oct-E Nov
	Lithophane pexata	R	R-U	R-U	F	B,uv	M Mar-E May, M Sep-E Nov

	Species [377]	Status	Abundance Rating Spring	Fall	Habitat	Survey	1992-1995 Flight Season
	Lithophane thaxteri	R	R	R	F	B,uv	M Mar-E Apr, L Sep-L Oct
	Pyreferra hesperidago	R	U-NU	R-NU	F,w	B,uv	M Mar-M May, E Oct-E Nov
	Pyreferra citromba	R	U-FC	U-FC	F,W,b	B,uv	M Mar-M May, E Oct-E Nov
*	Pyreferra pettiti	?	*	VR	F	B	L Oct.
	Eupsilia vinulenta	R	C	C	F,w	B,uv	M Mar-M May, E Oct-M Dec
	Eupsilia sidus cmplx.*(1)	R	R-U	R-U	F	B,uv	M Mar-M May, E Oct-E Nov
	Eupsilia tristigmata	R	U-FC	U-FC	F,w	B,uv	M Mar-M May, E Oct-M Nov
	Eupsilia morrisoni	R	C	C	F,w	B,uv	M Mar-M May, L Sep-M Dec
	Eupsilia devia	R	U	R	F	B,uv	M Mar-E May, M Sep-E Nov
*	Xystopeplus rufago	D	*	VR	F	B	M Oct.
*	Epiglaea apiata	?	*	VR	W	UV	M Sept.
	Chaetaglaea sericea	R	*	U	F,w	B,uv	M Sept.-L Oct.
	Eucirroedia pampina	R	*	R-NU	F,w,b	B,uv	E Sept.-M Oct.
	Sunira bicolorago	R	*	C	F,FM,W,B	B,F,UV	E Sept.-M Nov.
	Anathix ralla	R	*	U-NU	F,B,W	B,UV	E-L Sept.
	Anathix puta	R	*	R-FC	F,W	B,uv	E Sept.-E Oct.
*	Anathix aggressa	?	*	VR	H	F	M Sept.
	Xanthia togata	R	*	U	W,F	B,UV	M Sept.-M Oct.
*	Pachypolia atricornis?	?	*	VR	F	B	M Sept.
*	Xylotype acadica	?	*	VR	F	B,UV	M Sept.-M Oct.
*	Sutyna sp.	?	*	VR	F	UV	E Sept.
	Brachionycha algens	R	*	>R	C	L	L Aug.
	Feralia major	R	R-U	*	F	UV	M-L April
	Brachionycha borealis	R	VR	*	F	UV	L April
	Psaphida rolandi	R	R-C	*	F	UV	M April-E May
	Psaphida styracis	R	R-FC	*	F,b	UV	L March-L April
	Psaphida resumens	R	R-C	*	F	UV	M April-E May
	Psaphida thaxteriana	R	VR	*	F,C	UV,L	M April
	Copivaleria grotei	R	U	*	F	UV	M April-M May
*	Adita chionanthi	?	*	VR	W	UV	E Sept.
	Cucullia asteroides	R	*	R-U	F,C	F,L,uv	E Sept.-M Oct.
#	Cucullia convexipennis	R	*	>R	C,H	F	E-M Sept.
Hadeninae [29]							
	Discestra trifolii	R	*	NU(95)	F,C	L,UV,b	E-M Sept.
	Polia purpurissata	R	*	>R-NU	B,f,w	UV	E-M Sept.
	Polia latex	R	R>	*	F	B	M May
*#	Lacanobia subjuncta	R	*	>R	F	UV	L Aug.
*#	Melanchra adjuncta	R	*	>R	B	UV	M Sept.
*#	Trichordestra legitima	?	*	>R	O/F	L	E Sept.
	Lacinipolia meditata	R	*	U-NU	F,H,FM,B	F,UV	E-M Sept.
	Lacinipolia renigera	R	*	U-FC	F,W,B	UV,f	E Sept.-L Oct.
	Lacinipolia olivacea	R	*	U-NU	F,b	UV	E-L Sept.
*#	Faronta diffusa	R	*	>R	C	L	L Aug.
	[illegible]	R	*	[illegible]	[illegible]	[illegible]	E Sept.-E Oct.
	Lacinipolia olivacea	R	*	U-NU	F,b	UV	E-L Sept.
*#	Faronta diffusa	R	*	>R	C	L	L Aug.
	Aletia oxygala	R	*	R-U	W	UV	E Sept.-E Oct.
	Pseudaletia unipuncta	R	U-C	C	F,w,b	B,uv,f	M Apr-M May, E Sep-M Nov
*#	Leucania linita	R	R>	*	W	UV	M May
*	Leucania linda	?	*	VR	F	B	M Oct.
#	Leucania multilineata	R	*	>R	W	UV	M Sept.
#	Leucania commoides	R	*	>R	C,O/F	L	L Aug.
	Orthosia rubescens	R	C	*	F	UV,B	M April-M May
	Orthosia garmani	R	NU-FC	*	F	UV	M April-E May
	Orthosia revicta	R	FC-C	*	F,w,b	UV,b	M April-M May

	Species [377]	Status	Abundance Rating Spring	Fall	Habitat	Survey	1992-1995 Flight Season
	Orthosia alurina	R	U-NU	*	F	UV,b	M April-E May
	Orthosia hibisci	R	C	*	F	B,UV	L March-M May
	Crocigrapha normani	R	FC	*	F	UV,b	L April-M May
	Egira dolosa	R	FC-C	*	F	UV	M April-M May
	Achatia distincta	R	U-NU	*	F	UV	M April-M May
	Morrisonia evicta	R	C	*	F	UV,b	M April-M May
	Morrisonia confusa	R	U-NU>	*	F	UV,b	E-M May
	Nephelodes minians	R	*	C	F,W,B	UV,b	E-L Sept.
	Protorthodes oviduca	R	NU>	*	F	UV	M May
#	Orthodes cynica	R	R>	*	F	UV	M May
Noctuinae [36]							
*	Agrotis vetusta	D	*	VR	W,C	UV,L	E Sept.
	Agrotis gladiaria	R	*	VR	W	UV	M Sept.
	Agrotis venerabilis	R	*	C	W,F,b	UV	E Sept.-E Oct.
	Agrotis ipsilon	R	R	C	F,w,b	B,uv	E-M May, E Sep-M Nov
	Feltia jaculifera	R	*	NU-FC	F,W,B	UV,F	E-M Sept.
	Feltia heriles	R	*	?	F,W,B	UV,F	E-M Sept.
	Euxoa messoria	R	*	U-NU	F,b,w	UV,B,f	E Sept.-E Oct.
*	Euxoa mimallonis	?	*	VR	On Pond	N	L Aug.
*#	Euxoa scholastica	R	*	>R	F	UV	E Sept.
	Euxoa velleripennis	R	*	NU	F,W,b	UV,B	E-M Sept.
*#	Euxoa tessellata [D]	R	*	*	Visitor Cntr.	*	*
	Euxoa albipennis	R	*	R-U	F,W,b,h	UV,f	E-L Sept.
	Euxoa niveilinea	?	*	R	F,C	UV,L	E-M Sept.
	Euxoa perpolita	R	*	U	F	UV,B	E-M Sept.
	Ochropleura plecta	R	R>	R	F	UV,B	M May, E Sep-M Oct.
	Euagrotis illapsa	R?	*	>R	W,B	UV	E-M Sept.
	Peridroma saucia	R	U-NU	C	F,b,w	B,uv	E Apr-M May, E Sep-L Nov
*	Actebia fennica	?	*	VR	C	F	L Aug.
	Spaelotis clandestina	R	*	U	F,W,B	B,uv	E Sept.- E Oct.
*#	Graphipora haruspica	R	*	>R	F	B	E Sept.
	Xestia c-nigrum adela	R	*	NU	F,W,B	B,uv,f	E Sept.-L Oct.
	Xestia dolosa	R	*	U	F,w,b	B,uv,f	E Sept.-L Oct.
	Xestia normaniana	R	*	U-FC	F,B,W	UV,F,b	E-M Sept.
	Xestia smithii	R	*	C	F,W,B	UV,F,b	E-L Sept.
	Xestia bicarnea	R	*	R	F,W,b	UV,f	E Sept.
	Xestia tenuicula	R	*	R-U	F,W,b	UV,f	E-M Sept.
	Xestia collaris	R	*	U-C	B,f,w	UV,f	E-L Sept.
	Xestia badinodis	R	U	U	F,W,b	BT,UV,f	E-L Sept.
	Anomogyna badicollis	R	R	R	F,W,B	UV	E-M Sept.
	Anomogyna dilucida	R	R	R	F,W,B	UV	E Sept.
	Eugraphe subrosea	R	R	R	F,W,B	UV	E-M Sept.
	Cerastis tenebrifera	R	C	*	F,w	UV,b	M April-M May
	Metalepsis salicarum	R	C	*	F,w	UV,b-once	M April-M May
	Eugraphe subrosea	R	R	R	F,W,B	UV	E-M Sept.
	Cerastis tenebrifera	R	C	*	F,w	UV,b	M April-M May
	Metalepsis salicarum	R	C	*	F,w	UV,b-once	M April-M May
*#	Protolampra brunneicollis	R	*	>R	F,B	UV	M Sept.
	Abagrotis alternata	R	*	NU	F,B,W	UV,b,f	E-M Sept.
	Rynchagrotis sp.	R	*	U	F,B	UV	E-M Sept.
Heliothinae [2]							
	Helicoverpa zea	M	*	U-FC	H,W,O,C,b	F,uv	E Sept.-M Oct.
** *	Schinia chrysella	?	*	VR	W	UV	M Sept.

*(1): E.sidus was not distinguished from E. cirripalea or an undescribed species near E. sidus. Only E. sidus is recognized from Wisconsin, however cmplx. denotes no attempt was made to sepatate species in this species complex.

FLIGHT SEASON DATA FOR MOTHS COLLECTED IN SCHMEECKLE RESERVE																																L AUG to OCTOBER													1992 to 1995																				
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DREPANIDAE																																																																	
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GEOMETRIDAE																																																																	
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Cabera erythemaria	93	X																																																														
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Cabera variolaria	93	X										X																																																			
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Apodrepanulatrix liberaria	94													X	X																																																
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Pero honestaria	92												X																																																		
Campaea perlata	92	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																																													
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Besma quercivoraria	92											X																																																			
Lambdina fiscellaria	92																																								X																								
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Cingilia catenaria	92																			X																																											
Nepytia canosaria	92		X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																									
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Nepytia pellucidaria	94							X	X																																																							

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sarca confusaria	92																	X																																																				
choerodes transversata	92	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																																					
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matocampa limbata	92	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																																																				
prochlamys chloroleucaria	93		X					X																																																														
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pilosoma virginica	95																																																	X																			
rammia arge	95												X																																																									
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elanchra adjuncta	92																															
chordestra legitima	92																															
cinipolia meditata	92																															
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cinipolia renigera	92	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X								
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cinipolia olivacea	92																															
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ronta diffusa	92																															
tia oxygala	92	\	\	\	\	\	X																									
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eudaletia unipuncta	92	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	>
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	94		X	X	X	X	X				X	X	X	X			X	X	X	X	X							X				X
	95		X		X	X				X		X	X							X												
ucania linda	94																	X														
ucania multilinea	92																															
ucania commoides	92																															
phelodes minians	92																															
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rotis vetusta	94																															
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| | | 3 | | 0 | | | | | 0 | | | | | | | | | 1 | | | | | | | | | | 2 | | | | | | | | | | 3 | | 0 | | | | | | | | | 1 | | | | | | | | | | 2 | | | | | | | | | | 3 | |
ECIES	YR	0	1	1	2	3	4	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
otis venerabilis	92	X	\	\	\	\	\	:	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																									
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otis ipsilon	92	X	\	\	\	\	\	'	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	>
	93			X	\	\	\	'	X	\	\	\	\	\	\	\	\	\	\	\	\	\	X	\	\	\	\	\	\	\	\	\	\	\	\	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X	\	\	\	\	X	\	\	\	>
	94							:					X	X	X	X			X	X	X	X				X	X	X	X	X					X						X	X	X	X	X				X	X	X	X			X	X	X	X	X							X				X
	95					X	X	:			X	X	X	X	X				X	X	X	X	X	X	X	X		X	X				X	X	X	X					X		X	X				X		X	X	X						X												
ia jaculifera	92	X	\	\	\	\	\	'	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																																													
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ia heriles	92	X	\	\	\	\	\	'	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																																													
ia heriles?	93		X		X			(		X																																																											
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oa messoria	92	X	\	\	\	\	\	'	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																															
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oa mimallonis	92		X					(																																																														
oa scholastica	94							)					X																																																									
oa velleripennis	92			X	\	\	\	\	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																																														
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oa albipennis	92													X				X				X	X				X		X																																							
	93				X					X																																																												
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oa niveilinea	94							)					X							X			X																																													
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oa perpolita	93				X					X							X																																																				
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opleura plecta	92					X	\	\			X	\	\	\	\	\	\	\	\	\	\	X																																															
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ECIES	YR	0	1	1	2	3	41	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
agrotis illapsa	92																				X	\	X																																																
	93				X				X																																																														
ridroma saucia	92	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	>
	93		X	\	\	\	\X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X	\	\	\	\	\	\	\	X	\	\	\	X	\	X	\	\	\	\	X	X	\	\	>
	94											X	X	X	X			X	X	X	X	X			X	X	X	X	X					X		X				X	X	X	X	X				X	X	X	X			X	X	X	X	X							X				X
	95											X	X	X				X	X	X	X	X	X	X	X		X					X	X	X	X					X		X	X			X		X	X	X						X												
ebia fennica	92	X																																																																				
aelotis clandestina	92	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																																														
	93																												X	X			X										X																										
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aphiphora haruspica	92					X				X																																																										
	93	X																																																																		
stia c-nigrum adela	92	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X				
	93		X	\	\	\	\X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																																								
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stia dolosa	92	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X								
	93															X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																									
	94																																								X		X	X				X	X	X							X												
	95												X					X															X																	X		X																		
stia normaniana	92																				X	\	X																																															
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stia smithii	92	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																																								
	93		X	X	\	\	\	X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X																																													
	94											X	X	X	X			X	X		X	X																																															
	95					X				X		X	X					X	X	X	X	X	X																																														
stia bicarnea	92																				X	X																																															
	93													X																																																							
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stia tenuicula	92																X	\	\	\	X																																																
	93													X																																																							
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ECIES	YR	0	1	1	2	3	4	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
stia collaris	92																			X	X																																																		
	93			X					X					X	X													X																																																
	94													X	X		X	X																																																						
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stia badinodis	92																			X	|||||X																																																
	93																			X							X			X		X																																										
	94												X	X					X		X																																																				
	95																			X					X							X																																										
omogyna badicollis	92																				X																																																				
	93													X		X																																																							
	94											X	X		X																																																							
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omogyna dilucida	92															X																																																					
	93			X					X																																																												
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raphe subrosea	92																	X			X																																																		
	94											X	X																																																							
	95																		X																																																			
tolampra brunneicollis	92																				X																																																				
grotis alternata	92											X			X					X		X				X	X																																																	
	93			X	X				X	X						X	X				X																																																		
	94											X			X					X		X				X	X																																																	
	95											X		X					X	X			X			X																																																	
chagrotis sp.	92			X					X								X																																																								
	93																	X																																																			
	94													X	X																																																							
	95											X	X											X																																																			
coverpa zea	92	X	||||||||||||||||||||||||||||||||||||||||||X																								
	93																													X		X												X																															
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inia chrysella	93																			X																																																				

FLIGHT SEASON DATA FOR MOTHS COLLECTED IN SCHMEECKLE RESERVE NOV to DEC 1992 to 1995																																																
		November																															December														
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SPECIES	YR	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
GEOMETRIDAE																																															
Erranis tiliaria	94		X																																												
Orthonama obstipata	94		X																																												
Orthonama centrostrigaria	94		X					X	X																																						
	95						X																																								
Operophtera bruceata	93		X	X																																											
	94	X	X																																												
	95						X																																								
Eupithecia miserulata	93		X																																												
NOCTUIDAE																																															
Plathypena scabra	93			X																																										
	94	X	X	X				X	X	X																																				
Scoliopterx libatrix	94							X																																						
Zale lunata	94		X	X					X																																					
Spodoptera ornithogalli	94		X	X																																											
Galgula partita	94		X																																												
Xylena curvimacula	93			X																																										
	94		X	X					X																																					
Lithophane bethunei	93			X	X																																									
Lithophane petulca	93		X		X														X																											
Lithophane disposita	94			X																																										
Lithophane hemina	93			X	X																																									
	94		X	X																																											
Lithophane antennata	94	X	X	X				X	X	X																																				
Lithophane laticinerea	92	\	\	\	\	\	\	\	\	X																																				
	93	X	X	X					X					X																																
	94	X	X	X				X	X	X																																				
	95						X																																								
Lithophane grotei	92	\	\	\	\	\	\	\	\	X																																				
	93	X	X	X										X																																
	94		X				X	X	X						X			X		X																										
	95						X																																								
Lithophane unimoda	94		X	X				X																																						
Lithophane fagina	94			X																																										
Lithophane pexata	93				X																																									
Pyreferra hesperidago	93			X	X																																									
Pyreferra citromba	93			X	X																																									
	94			X																																										
Eupsilia vinulenta	93		X	X	X								X							X																									X		
	94	X	X	X				X	X					X	X		X	X			X													X	X	X										
	94			X																																										
Eupsilia vinulenta	93		X	X	X								X							X																									X		
	94	X	X	X				X	X					X	X		X	X			X													X	X	X										
	95						X																																								
Eupsilia sidus	93				X																																									
	94			X																																										
Eupsilia tristigmata	93			X	X																																									
	94		X	X				X	X	X				X	X		X	X			X														X	X										
Eupsilia morrisoni	93		X	X	X								X						X																						X						X
	94	X	X	X				X	X	X				X	X	X	X	X			X												X	X	X	X										
	95						X																																								

		November																													December														
		0									1										2										3		0									1					
SPECIES	YR	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
Eupsilia devia	94							X									X																														
Sunira bicolorago	93				X																																										
	94	X	X	X				X	X					X				X																													
	95						X																																								
Pseudaletia unipuncta	92	\	\	\	\	\	\	\	\	X																																					
	93	X	X	X										X																																	
	94	X	X	X				X	X	X				X		X	X	X																													
Agrotis ipsilon	92	\	\	\	\	\	\	\	\	X																																					
	93	X	X																																												
	94	X	X	X				X	X	X				X	X			X																													
Peridroma saucia	92	\	\	\	\	\	\	\	\	X																																					
	93	X	X	X										X																																	
	94	X	X	X				X	X	X				X	X	X	X	X			X																										

FLIGHT SEASON DATA FOR MOTH SPECIES COLLECTED IN SCHMEECKLE RESERVE DURING THE SPRING 1993 TO 1995

		March																		April																														May																		
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SPECIES	Yr	0	1	2	3	4	5	6	7	0	1	2	4	6	7	8	9	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
THYATIRIDAE																																																																					
Euthyatira pudens	93			None																																																															
	94																																																	X							X									X
	95																																																X					X				X							X	
DREPANIDAE																																																																				
Drepana arcuata	93																																																												2	6		May			
	94																																																										X								X	
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Drepana bilineata	93																																																			X			X											
	94																																												X																X	X						X	X
	95																																																											X					X		X	
GEOMETRIDAE																																																																				
Archieris infans	93			None																																																														
	94			None																																																															
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Alsophila pometaria	95																															X																																				
Semiothisa aemulataria	93		None																																																																
	94																																																																X		
	95		None																																																																
Aethalura intertexta	93																																																X			X		X			X											
	94																																				X				X			X							X	X	X	X			X	X		X	X				X	X	X	X
	95																																												X					X	X	X							X	X	X			X	X		X	
Anacamptodes vellivolata	93																																																								X	X	X									
	94																																																															X		X	
	95																																																													X				X	X	
Ectropis crepuscularia	93																																														X					X		X			X		X									
	94																													X							X	X					X		X							X	X	X			X	X			X					X	X	X
	95																																																		X	X	X			X			X	X	X		X	X	X			
Melanolophia canadaria	93																																																							X											
	94		Unidentified																																																																	
	95		Unidentified																																																																	
Melanolophia signataria	93																																																					X			X				X							
	94		Unidentified																																																																	
	95		Unidentified																																																																	
Lycia ursaria	93																																														X		X																			
	94																																				X							X									X																
	95																																										X																									
Phigalia titea	93																	X																			X				X			X		X	X	X	X				X															
	94																															X	X	X		X	X	X	X			X	X	X							X	X	X					X	X									
	95																														X							X				X		X	X	X				X	X	X	X							X	X			X				
Phigalia strigitaria	93																																																X																			
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Paleacrita merricata	93		None		93		None																																																													
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Paleacrita vernata	93				93																		X																		X																																	
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Lomographa semiclarata	93				93																																																											X	X						
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Lomographa vestaliata	93				93																																																												2	6		May		
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Lomographa glomerularia	93				93																																										X		X				X		X			X				X							
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Epirranthis substriataria	95				95																																																X																			
Petrophora subaequaria	93				93																																																			X			X				X	X						
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Tacparia detersata	93				93																																																						X											
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	95		None		95		None																																																													
Homochlodes fritillaria	93				93																																																												2	6		May		
	94				94																																																															X
Metanema inatomaria	93		None		93		None																																																													
	94				94																																																															X	X
	95				95																																																															X	
Metanema determinata	93		None		93		None																																																												
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	95				95																																																															X	
Metarranthis duaria	93		None		93		None																																																												
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Anagoga occiduaria	93		None		93		None																																																												
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	95				95																																																															X	
Probole alienaria	93		None		93		None																																																												
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	95		None		95		None																																																												
Probole nyssaria	93		None		93		None																																																												
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	95		None		95		None																																																												
Plagodis serinaria	93		None		93		None																																																												
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Plagodis phlogosaria	93																																																									X	X		X							
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Plagodis alcoolaria	93																																																									X		X							
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Eutrapela clemetaria	93																																																					X		X				X							
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	95																																																						X				X	X		X		X	X	X	
Mesothea incertata	93																																																										X	X	X	X						
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Cyclophora pendulinaria	93																																																														2	6		May		
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	95																																																												X				X		X	
Hydriomena renunciata	93			None																																																																
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Hydriomena transfigurata	93																																																																			
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Hydriomena ruberata	93			None																																																															
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Triphosa haesitata	93			None																																																															
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Anticlea vasiliata	93			None																																																															
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Xanthorhoe ferrugata	93																																																										X									
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Xanthorhoe lacustrata	93																																																				X			X		X									
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Venusia comptaria	93																																													X	X	X				X		X			X											
	94																																									X		X	X						X	X				X	X	X	X	X					X		X
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Trichodezia albovittata	93			None																																																															
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Eupithecia columbiata	93																																																X																			
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SPECIES	Yr	0	1	2	3	Yr	0	1	2	3	4	5	6	7	0	1	2	4	6	7	8	9	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Eupithecia swettii	93					93																																																			X																	
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Eupithecia ravocostaliata	93					93																																															X				X		X			X											
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Cladara limitaria	93					93																																																			X		X														
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Cladara atroliterata	93					93																																														X					X			X											
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Lobophora nivigerata	93			Nor		93			None																																																															
	94					94																																										X														X	X						X	
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Dyspteris abortivaria	93					93																																																							X										
	94			Nor		94			None																																																															
	95			Nor		95			None																																																															
LASIOCAMPIDAE																																																																									
Phyllodesma americana	93					93																																																						X				X							
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SATURNIIDAE																																																																									
Dryocampa rubicunda	93			Nor		93			None																																																																
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	95			Nor		95			None																																																																
SPHINGIDAE																																																																									
Hemaris thysbe	93					93																																																										X							
Smerinthus jamaicensis	93					93																																																								X									
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Smerinthus cerisyi	93			Non		93			None																																																																
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Deidamia inscripta	93					93																																																										X							
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NOTODONTIDAE																																																																									
Clostera albosigma	93					93																																																					X											
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Clostera strigosa	93			Non		93			None																																																			X											
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Clostera apicalis	93			Non		93			None?																																																		X											
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SPECIES	Yr	0	1	2	3	Yr	0	1	2	3	4	5	6	7	0	1	2	4	6	7	8	9	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Notodonta simplaria	93					93																																																			X											
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Ellida caniplaga	93					93																																																			X											
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Gluphisia septentrionis	93			No		93			None																																																												
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Gluphisia avimacula	93					93																																																X			X		X									
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Gluphisia lintneri	93					93																																									X																					
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Furcula occidentalis	93					93																																																														
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Furcula modesta	93					93																																																														
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Heterocampa guttivitta	93			Nor		93			None																																																												
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ARCTIIDAE																																																																				
Phragmatobia fuliginosa	93			Nor		93			None																																																												
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Grammia celia	95					95																																																													X	
NOCTUIDAE																																																																				
Lomonaltes eductalis	93			Nor		93			None																																																												
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Hypena humuli	93					93																																						X																								
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Scoliopteryx libatrix	93					93																																																			X											
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Phoberia atomaris	93					93																																									X	X	X					X			X											
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Cissusa spadix	93				93																																																	X	X		X									
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Zale undularis	93				93																																																		X											
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Zale minerea	93				93																																																		X		X	X								
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Zale phaeocapna	93				93																																																		X		X									
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Zale submediana	93				93																																																				X									
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Zale duplicata	93				93																																																	X	X		X	X								
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Zale helata	93				93																																																		X											
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Zale lunifera	93				93																																														X		X		X			X								
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Zale unilineata	93			No	93			None																																																										
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Caenurgina crassiuscula	93				93																																																		X	X			X							
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Caenurgina erechtea	93				93																																																		X	X			X							
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Baileya doubledayi	93			No	93			None																																																										
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Nycteola frigidana	93				93																																												X		X																	
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Meganola miniscula	93				93																																																							X							
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Nola triquetrana	93				93																																											X	X			X		X			X	X										
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Anterastria teratophora	93			No		93			None																																																																
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Panthea furcilla	93			No		93			None																																																															
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Raphia frater	93			No		93			None																																																																
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Acronicta grisea	93			No		93			None																																																															
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Acronicta laetifica	95					95																																																											X			
Acronicta hasta	93			Nor		93			None																																																															
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Acronicta noctivaga	93			Nor		93			None																																																															
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Acronicta impressa	93					93																																														X																
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Acronicta oblinata	93			Nor		93			None																																																															
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Simyra henrici	93			Nor		93			None																																																															
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Hyppa xylinoides	93			Nor		93			None																																																															
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Nedra ramosula	93			Nor		93			None																																																															
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Galgula partita	93					93																																																		X												
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	95			Nor		95			None																																																																
Xylena nupera	93			Non		93			None																																																															
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Xylena curvimacula	93					93											X		X			X																									X						X		X												
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Homoglaea hiricina	93					93																	X							X																																											
	94					94											X																					X												X																						
	95					95																																			X																				X													
Lithophane semiusta	93					93																																				X				X		X	X																							
	94					94											X																		X			X																																		
	95				X	95				X		X	X																												X									X					X		X																	
Lithophane patefacta	93			Nor		93			None																																																																	
	94					94											X																				X																				X																	
	95			X	X	95			X	X		X	X																																													X					X										
Lithophane bethunei	93					93																																				X							X																									
	94					94											X									X	X																														X	X	X																
	95				X	95				X	X	X	X																								X																									X			X									
Lithophane innominata	93					93																															X									X																											
	94					94					X						X										X	X				X																								X	X						X	X						X			
	95				X	95				X		X	X																														X														X				X		X	X	X	X	X	X		X	X		
Lithophane petulca	93					93																	X													X	X												X					X																					
	94					94											X																	X			X	X				X															X	X						X						X	X	X	
	95				X	95				X		X	X																								X																										X	X		X		X		X			
Lithophane amanda	93			Nor		93			None																																																																
	94					94																													X																																							
	95					95							X																								X																					X	X																
Lithophane disposita	93					93																	X								X						X									X																											
	94					94											X																				X	X																				X		X				X										
	95				X	95				X	X																										X													X								X	X	X					X									
Lithophane hemina	93					93																X	X						X			X					X					X				X	X		X				X								X			X											
	94					94					X						X																	X	X	X	X	X									X		X							X	X	X												X			X
	95				X	95				X	X	X	X	X																							X											X			X					X			X			X		X	X		X		X				X	
Lithophane oriunda	93					93																																																						X																
	94					94																																																					X			X													
	95				X	95				X	X		X																																																														
Lithophane baileyi	93			Non		93			None																																																																
	94					94																																X				X																															
	95		X	X	X	95		X	X	X		X	X																												X																X																	
Lithophane tepida	93			Non		93			None																																																																
	94			Non		94			None																																																																
	95				X	95				X																																																															
Lithophane antennata	93					93																															X					X				X		X																										
	94					94											X																	X	X		X	X																				X	X								X								
	95				X	95				X	X	X	X																												X																																		
Lithophane laticinerea	93					93																																											X																										
	94					94											X																	X			?	X																																			
	95		X			95		X				X															X															X																																
Lithophane grotei	93			Non		93			None																																																																
	94					94											X																				?	X																																			
	95				X	95				X																																																																

SPECIES	Yr	March 10	11	12	Yr	March 10	11	12	13	14	15	16	17	20	21	22	24	26	27	28	29	30	31
Lithophane unimoda	93				93																	X	
	94				94											X							
	95			X	95			X	X	X	X	X											
Lithophane fagina	93				93																X		
	94				94											X							
	95		X		95		X		X		X	X											
Lithophane pexata	93				93																		
	94				94																		
	95			X	95			X	X		X	X								X			
Lithophane thaxteri	93				93																		
	94			Nc	94			None															
	95				95				X														
Pyreferra hesperidago	93				93																		
	94				94											X							
	95				95					X	X	X											
Pyreferra citromba	93				93																X	X	
	94				94					X						X							
	95				95					X	X	X	X										
Eupsilia vinulenta	93				93															X			
	94				94					X				X		X							
	95		X	X	95		X	X	X	X	X	X	X							X			
Eupsilia sidus	93			Nc	93			None															
	94				94																		
	95			X	95			X	X	X	X	X											
Eupsilia tristigmata	93				93															X	X	X	
	94				94					X				X		X							
	95		X		95		X		X	X	X	X	X										
Eupsilia morrisoni	93				93															X	X	X	
	94				94					X				X		X							
	95		X	X	95		X	X	X	X	X	X	X							X			
Eupsilia devia	93				93																X		
	94				94											X							
	95			X	95			X	X		X	X											
Feralia major	93				93																		
	94				94																		
	95				95																		
Brachionycha borealis	93				93																		
	94				94																		
	95				95																		
Psaphida rolandi	93				93																		
	94				94																		
	95				95																		
Psaphida styracis	93				93																		
	94				94																		
	95				95														X				

SPECIES	Yr	April 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Lithophane unimoda	93																		X				X								
	94																														
	95																														
Lithophane fagina	93													X																	X
	94													X	X																
	95																														
Lithophane pexata	93					X																									
	94																		X												
	95													X										X							
Lithophane thaxteri	93					X																									
	94																														
	95																														
Pyreferra hesperidago	93																		X						X					X	
	94												X	X	X				X												
	95																		X								X				
Pyreferra citromba	93																					X									
	94													X	X	X			X					X			X				
	95																X	X													
Eupsilia vinulenta	93					X		X											X		X	X	X	X		X			X		
	94												X	X				X	X		X			X	X						
	95																	X							X		X				X
Eupsilia sidus	93																														
	94																														
	95																														
Eupsilia tristigmata	93			X		X	X		X				X						X		X		X								
	94										X	X	X	X	X				X		X			X	X						
	95													X				X		X				X	X		X	X			
Eupsilia morrisoni	93					X			X				X	X					X	X	X								X		
	94											X	X	X	X			X	X	X	X		X	X	X						
	95												X	X				X		X				X	X		X	X			
Eupsilia devia	93								X														X								
	94											X	X	X																	
	95													X																	
Feralia major	93																												X		
	94																		X						X	X					
	95																										X				
Brachionycha borealis	93																														
	94																						X		X						
	95																										X				
Psaphida rolandi	93																														
	94														X				X							X	X				
	95																							X							
Psaphida styracis	93								X																						
	94																		X	X			X	X							
	95																														

SPECIES	Yr	May 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Lithophane unimoda	93																			
	94																			
	95				X															
Lithophane fagina	93																			
	94																			
	95																			
Lithophane pexata	93																			
	94																			
	95			X				X			X	X								
Lithophane thaxteri	93																			
	94																			
	95																			
Pyreferra hesperidago	93					X			X											
	94			X	X				X			X						X	X	
	95		X		X							X			X		X			
Pyreferra citromba	93			X		X			X											
	94			X		X				X	X	X								
	95		X												X		X			
Eupsilia vinulenta	93																			
	94		X	X	X						X									
	95			X	X						X		X							
Eupsilia sidus	93																			
	94														X					
	95													X						
Eupsilia tristigmata	93								X											
	94		X	X	X				X		X		X				X			
	95	X	X	X	X					X	X	X	X	X	X					
Eupsilia morrisoni	93																			
	94			X	X				X	X										
	95	X	X	X	X					X	X	X	X	X	X					
Eupsilia devia	93																			
	94				X															
	95																			
Feralia major	93																			
	94																			
	95																			
Brachionycha borealis	93																			
	94																			
	95																			
Psaphida rolandi	93																			
	94																			
	95			X																
Psaphida styracis	93																			
	94																			
	95																			

		March				March																			April																														May																		
		1				1									2								3		0									1										2										3	0								1									
SPECIES	Yr	0	1	2	Yr	0	1	2	3	4	5	6	7	0	1	2	4	6	7	8	9	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Psaphida resumens	93			N	93			None																																																																
	94				94																																X	X	X		X	X																												
	95				95																																												X																X							
Psaphida thaxteriana	93			N	93			None																																																																
	94				94																															X	X																														
	95				95																																																																	
Copivaleria grotei	93				93																																X		X																												
	94				94																																X	X						X	X																								
	95				95																																												X										X	X			X				X							
Polia latex	93				93																																																									X									
	94			N	94			None																																																																
	95			N	95			None																																																																
Pseudaletia unipuncta	93				93																																X	|||||||||||||||||||||||X							
	94				94																														X		X																				X	X	X														
	95				95																																	X					X			X				X	X		X			X		X	X	X	X	X	X	X	X			
Leucania linita	93			N	93			None																																																																
	94				94																																																															X	
	95			N	95			None																										None																																					
Orthosia rubescens	93				93																																														X	X	X	X		X		X			X		X									
	94				94																												X	X			X					X	X	X	X						X	X	X				X	X	X	X	X						X	X
	95				95																																							X			X	X			X	X	X	X	X			X		X	X	X	X	X	X	X	X	X	X	
Orthosia garmani	93				93																																														X	X	X					X															
	94				94																																X		X		X	X		X	X						X	X	X																
	95				95																																	X				X			X	X			X	X	X	X	X			X					X								
Orthosia revicta	93				93																																														X	X	X		X	X		X			X		X									
	94				94																																X	X	X		X	X	X	X	X						X	X	X				X	X		X	X						X	X
	95				95																																							X		X	X	X			X	X	X	X	X			X		X	X	X	X	X			X			
Orthosia alurina	93				93																																														X																							
	94				94																																X		X		X				X																											
	95				95																																														X			X	X	X	X			X												
Orthosia hibisci	93				93																			X																				X				X			X				X				X					X												
	94				94													X																X	X		X	X	X		X	X	X	X		X	X	X	X	X						X	X	X					X		X						X	
	95				95																														X				X		X				X	X	X	X	X			X	X	X	X	X			X		X	X	X	X		X				
Crocigrapha normani	93				93																																																	X		X			X			X											
	94				94																																X						X	X	X																X	X	X					X	X	X	X
	95				95																																																	X		X			X		X	X	X	X	X	X	X	X	X	X	
Egira dolosa	93				93																																															X	X							X												
	94				94																																X						X	X	X									X				X		X		X						X	X
	95				95																																																	X	X	X			X		X	X	X	X	X		X	X	X	X	
Achatia distincta	93				93																																																	X	X		X		X	X		X									
	94				94																																X								X																	X	X							
	95				95																																																X	X		X			X				X	X				X		X	
Morrisonia evicta	93				93																																																									X		X		X						
	94				94																																X					X	X	X	X							X						X		X	X				X		X	X
	95				95																																																X	X		X			X			X	X	X	X		X	X	X	X	

		March					March																		April																														May																		
		1					1								2								3		0									1										2										3	0									1									
SPECIES	Yr	0	1	2	3	Yr	0	1	2	3	4	5	6	7	0	1	2	4	6	7	8	9	0	1	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Morrisonia confusa	93					93																																																							X	X										
	94					94																																																																X	X
	95					95																																																											X				X		X	
Protorthodes oviduca	93			Nor		93			None																																																															
	94					94																																																														X		X
	95			Nor		95			None																																																																
Orthodes cynica	93			Nor		93			None																																																																
	94					94																																																																X
	95			Nor		95			None																																																																
Agrotis ipsilon	93					93																																																																	
	94					94																																																						X														
	95					95																																																											X									
Ochropleura plecta	93			Nor		93			None																																																																
	94			Nor		94			None																																																																
	95					95																																																															X			
Peridroma saucia	93					93																																				X			X	X			X		X	X		X																			
	94					94																								X																												X																	
	95					95																																																						X					X	X									
Cerastis tenebrifera	93					93																																														X	X			X	X																
	94					94																																				X	X	X		X	X		X	X						X	X	X				X	X	X		X							
	95					95																																									X			X	X			X	X	X	X	X			X		X	X	X	X	X	X		X	X	X	
Metalepsis salicarum	93					93																																				X	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	\	X											
	94					94																																				X	X	X		X	X	X	X	X						X	X					X	X	X	X								
	95					95																																									X		X	X	X			X	X	X	X	X			X		X	X	X	X							

DISCUSSION OF PRIMARY SURVEY TECHNIQUES

Ultraviolet Lights: Two survey techniques (described in the Materials and Methods Section) relied on the use of ultraviolet lights to attract moths. The following are some comments on blacklighting (using UV lights to collect moths) in Schmeeckle Reserve.

Blacklighting in Schmeeckle Reserve was complicated by light pollution from the city of Stevens Point, decreasing the effectiveness of the lights. The reserve is surrounded by brightly lighted buildings and streetlights, and the divided highway passing through the center is also lit by a row of streetlights. City light pollution was lowest on clear nights and highest on cloudy nights, presumably because more light reflects down from the clouds. In addition, moonlight decreases the effectiveness of blacklighting, and moonlight is less on cloudy nights. Hence, around the time of a sizeable moon, light pollution was a major problem regardless of if it was clear or cloudy, unless the moon had not yet risen or had already set. Optimal conditions for blacklighting at Schmeeckle Reserve were clear skies with little or no moon. This is in contrast to blacklighting where light pollution is less severe, where optimal conditions include high humidity and cloudy skies.

The degree of canopy closure had a noticeable effect on the number of moths coming to lights, as conditions are much darker in the reserve's forested areas than the open wetlands. However, in the fall a number of interesting species were associated with the open wetlands, hence blacklighting in these brighter areas increased the number of species recorded over all substantially, although a light source in a darker area tended to attract more individual moths.

UV Sheet Setup: This survey method was most effective when the sheet was watched continuously, as some of the moths coming to the sheet would fly away after a short while or fly into the surrounding vegetation or land on the ground beyond the reach of the sheet placed on the ground. However, a considerable number of individual moths also would land on the sheet and remain there for some time. The amount of time spent watching the sheet as opposed to checking bait or flowers varied with how well the sheet setup was attracting moths and how well the other survey techniques were working. The combination that was deemed likely to yield the greatest number of species on a given night was usually attempted.

The sheet setup attracted far more individual moths during the spring semester than during the fall, and was used regularly during the spring on most survey dates where the temperature was at least in the low 50s (F) or upper 40s (F) after dark. UV lights were generally less effective when the temperature dropped below the mid 50s (F), however during the spring a sheet setup could add significantly to the nightly species total even if the temperature was only in the 40sF. During the spring, most moth activity at the sheet usually occurred before 12:00 at night, but ended sooner or later depending on temperature conditions. In general, most of the spring species coming to the sheet on a given night could be obtained as long as survey continued until activity had slowed drastically from earlier in the night, with few if any additional species added if the sheet was watched all night or long after activity was really slow (however, getting into May periods of higher activity began to last long past midnight on the warmer nights). On most spring survey dates, using a UV sheet setup resulted in a higher nightly species total than if only bait and UV traps had been used.

The sheet setup was far less effective in the fall, and used much less frequently. Activity at sheets during the fall was usually slow, and, except for nights when the temperature dropped rapidly, activity was not concentrated during the first half of the night. Instead, a lower rate of activity occurred throughout the night, and many of the species of interest were recorded after 12:00 and often much later (such as after 2:30am) as was determined by checking UV traps at these times and again the next day as well as by
during the fall was usually slow, and, except for nights when the temperature dropped rapidly, activity was not concentrated during the first half of the night. Instead, a lower rate of activity occurred throughout the night, and many of the species of interest were recorded after 12:00 and often much later (such as after 2:30am) as was determined by checking UV traps at these times and again the next day as well as by
observing the sheet. Also, compared to the spring fewer moths remained landed on the sheet as opposed to flying away or landing some distance from the sheet, hence checking the sheet periodically was less effective. Thus, during the fall reliance on the light traps (see next section) was much greater, allowing for more time to be spent checking flowers and bait where activity was usually higher. Also, due to academic commitments watching a sheet all night was generally not feasible, especially with activity usually being slow. However, it is noteworthy that a small number of species found during the project were only found at the sheet. Regarding frequency of use, during the fall this method was only used occasionally during

1992 and 1995, fairly regularly during the time blacklight surveys were occurring during 1994, and on most of the warmer nights during 1993 (there only were a limited number of warm nights during the fall of 1993). The sheet was never watched continuously, as bait and usually flowers were being checked regularly as well, however when the sheet was run late into the night it was watched more continuously after 11:00pm when activity at bait and flowers had slowed. During the spring, a sheet setup was used almost every night survey was conducted during each semester from 1993-1995, although during 1995 blacklight surveys did not begin until 19 April (although bait surveys began as soon as temperatures were warm enough for moth activity and there were few warm nights prior to this except during mid March).

During the fall semesters, the sheet was often located on the west side of the reserve west of the main north/south trail on a forest/sedge meadow interface, however the semi barrens area (see notes on habitat association) received some sheet survey during 1992 and open wetlands were surveyed with a sheet as well. During the spring, the sheet was often run in either Chilla Woodlot on the west side or on the interface between a drier upland Oak forest and swampy Oak-Pine forest on the east side, and to a much lesser extent on the west side on a wetland/forest interface east of the main north/south trail.

UV Light Traps: During the fall semesters of 1992 and 1993 a variety of localities were tried for UV traps. A trap in a sedge meadow containing Eupatorium purpureum near the first boardwalk east of the main north/south trail was run consistently during all four fall semesters. The small semi barrens area received considerable survey during 1992 and 1993, but little in subsequent years. During 1993, the forested tract bordering the sedge meadow south of the semi barrens opening was found to be a good trap location, and this area received regular survey from 1993-1995 with either a sheet or a trap. The south end of the sedge meadow containing the trap used all four years (the southernmost end of this wetland is separated by the area bordering the boardwalk on the south by a row of trees) received regular survey by a third UV trap during 1995 (when a sheet was rarely used) and limited survey during 1994. Areas on the east side of the reserve received only limited survey with traps during the fall as they contained less interesting wetland habitat, and no fall species were ever trapped exclusively on the east side. For most of the project, two or three traps (often only two when a sheet was used) were used on most survey dates during September and on into October when weather permitted, however during 1995 three traps were almost always used. Note that during the fall of 1994 only, UV light surveys were not conducted after 29 September.

During the spring semesters two UV traps were usually used once the weather warmed up, and the number was increased to three during the latter part of the survey window (in May) except during 1993 when three traps were used only occasionally (the third trap was a less effective BioQuip pail trap during this year). During the spring of 1993, all trapping was done on the west side of the reserve. However, during subsequent years two traps were run regularly on the east side near the observatory tower in swamp forest habitat and along the interface near where the sheet was placed as mentioned above. The third trap locality (when three traps were used) was usually on the interface between a sedge meadow east of the main north/south trail on the west side of the reserve and a stand of White Pine. Considerable trapping was also done in Chilla woodlot, especially during 1993 (this area was surveyed more often with a sheet in later seasons).

Bait: Except for the fall semester of 1992, a bait trail was used during almost every survey night when I was able to get out in the field. While bait trails were tried all over the reserve, the most effective area was the trail system west of the first boardwalk east of the main north south trail, and this bait trail was run regularly (other bait trails were put up in addition to, not in place of this trail). Sometimes the bait trail was extended past the boardwalk to the east, and in fact this area was part of the regular trail during the spring semester of 1993 and the trail south of the boardwalk was not used until the fall of 1993 when it largely regularly (other bait trails were put up in addition to, not in place of this trail). Sometimes the bait trail was extended past the boardwalk to the east, and in fact this area was part of the regular trail during the spring semester of 1993 and the trail south of the boardwalk was not used until the fall of 1993 when it largely replaced the area east of the boardwalk. The other successful bait trail, used during the spring only, was along the trail passing by the observatory tower on the east side of the reserve, although this segment was generally less effective for adult hibernating Cucullinids than the west side section. In the spring, this trail was used when a sheet was run on the east side of the reserve, however the bait trail on the west side was usually put up and checked occasionally as well. Bait trails were also tried in Chilla woodlot and around the semi barrens area, with relatively little success. Bait trails put up in the Jack Pine area east of the divided highway attracted little more than Pseudaletia unipuncta during the few times they were tried during the spring semesters. Bait trails attempted south of Chilla woodlot (in a former clear cut area) and in the forested tract between the semi barrens and sedge meadow west of the main north/south trail worked poorly the few times they were attempted. Note regarding the unsuccessful bait trails, the regular bait trails were used the same nights successfully that the other experimental bait trails did poorly, hence a good comparison of effectiveness was obtained.

The following are some general comments about using a bait trail in Schmeeckle Reserve based on field notes (see also section on adult hibernating Cucullinae). While activity at bait generally increased with temperature, it was repeatedly observed that humid and cloudy conditions with light rain greatly increase activity at bait. Activity under these conditions was often far higher than activity under clear skies at the same temperature, and even higher than activity under clear skies for somewhat higher temperatures. While evidence strongly shows moonlight significantly reduces activity at lights, it is somewhat doubtful that it has a major affect on activity at bait-at least for Cucullinids. Notable activity was observed despite significant moonlight a number of times. During the spring, bait was very effective during some of the first warm weather, but at some point during April activity abruptly dropped off to almost nothing but then gradually picked up again and by sometime in early May bait was working well again. During 1994, 18 April was the night bait abruptly began to work poorly, and likewise the same situation occurred on 19 April in 1995. However, by 2-4 May and 4 May in 1994 and 1995, respectively, bait was working quite effectively again. One hypothesis for this observation is an increase in natural food sources could occur around this time, decreasing the effectiveness of bait. Lights show no change in effectiveness during this period for any species.

It is interesting to note that the west side bait trail mentioned above attracted many adult hibernating Cucullinids, however blacklighting in this area attracted considerably less than in Chilla Woodlot and in the forest between the semi barrens and sedge meadow where bait was much less effective. Hence, while surveying for some of the same species of Cucullinids, the best bait areas were not the best UV light areas and vice versa.

An inverted cone bait trap was run almost nightly in a Pine tree near the shelter building during every fall semester, and sometimes a second inverted cone trap would be run in wetlands or other forested areas. During the fall semester of 1992 several of the minnow trap type of bait traps were run regularly high in the forest in forested overhangs, but during later semesters when the bait trail received more time these were largely abandoned. During the spring of 1994 and 1995, either minnow traps and/or inverted cone traps were run near the locations UV light traps were placed. In the fall, the inverted cone and minnow traps were very effective in trapping Catocala, and some other species of moths which also came readily to the bait trail (especially Sunira bicolorago), and frequently did add species to the nightly total. However, these traps worked poorly for trapping adult hibernating Cucullinids in the fall, and almost never added species to the nightly total. In the spring, the bait traps rarely collected high numbers of moths, but occasionally added adult hibernating Cucullinid species or Zale species to the nightly total.

Flowers: Flower surveys were conducted regularly on the reserve's west side and on the UW-Stevens Point campus during the fall semesters. On some nights, moths collected at various species of flowers were retained in separate jars in order to document what species were using various kinds of flowers, and when an unusual species was taken at flowers the species of flower was always recorded in field notes. Moths were determined to be nectaring at flowers by observing the extension of the tongue onto the petals for landed species, however this was difficult to see for hovering species such as Sphingids and Plusinines. However, the behavior indicative of nectaring activity for these species precluded the necessity of actually seeing the tongue extended to determine nectaring was occurring.

The species of flower that attracted the greatest diversity of species was White Snakeroot (Eupatorium rugosum) which attracted the following species for nectaring: Campaea perlata, Lambdina fiscellaria,

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The species of flower that attracted the greatest diversity of species was White Snakeroot (Eupatorium rugosum) which attracted the following species for nectaring: Campaea perlata, Lambdina fiscellaria,
Prochoerodes transversata, Pleuroprucha insulsaria, Dysstroma citrata, Stamnodes gibbicostata, Cisseps fulvicollis, Trichoplusia ni, Ctenchoplusia oxygramma, Pseudoplusia includens, Rachiplusia ou, Allagrapha aerea, Autographa precationis (one of the most common species at this flower), Anagrapha falcifera, Oligia modica, Oligia mactata, Helotropha reniformis, Papaipema pterisii, Papaipema necopina, Enargia decolor, Amphipyra pyramidoides, Spodoptera frugiperda, Lithophane petulca, Lithophane hemina, Sunira bicolorago (many would be found nectaring on a given night), Pseudaletia unipuncta, Lacinipolia meditata, Lacinipolia renigera, Feltia jaculifera, Feltia heriles? (or another Feltia species other than F. jaculifera), Euxoa messoria, Euxoa albipennis, Xestia c-nigrum adela, Xestia dolosa, Xestia

normaniana, Xestia smithii, Xestia bicarnea, Xestia tenuicula, Xestia collaris, Xestia badinodis, Abagrotis alternata, and Helicoverpa zea. Granted, some of these species were rarely found nectaring relative to other survey techniques, and some species were found nectaring only once (including some species with few or only one record for the project), the minimum number of species collected nectaring on this species of flowering plant alone is 42 species. Most of the species were found landed on this flower, however the Plusinines were more likely to be found flying between blossoms.

Spotted Knapweed was an effective flower for attracting Plusinines but also attracted one Arctiid and rarely Sphingids. The species collected nectaring at this flower include: Hemaris thysbe (diurnal), Hyles lineata (rarely), Cisseps fulvicollis (diurnally only), Trichoplusia ni, Pseudoplusia includens, Rachiplusia ou, Autographa precationis, Autographa biloba, Anagrapha falcifera, and Plusia putnami. All the moths nectaring on this flower had to be collected in flight or would land only briefly with their wings vibrating, except for Cisseps fulvicollis.

Petunias were only attractive to species which nectar while hovering or in flight. The species taken at Petunia include: Manduca sexta, Sphinx eremitus, Sphinx kalmiae, Hyles lineata, Rachiplusia ou, Autographa precationis, Anagrapha falcifera, Cucullia convexipennis, and Helicoverpa zea. In general, the Plusinines were poorly attracted to Petunias and most nights no Plusinines were found nectaring on them. Marigolds were in some of the same flower beds as the Petunias, and the latter four species minus C. convexipennis were more likely to nectar on Marigolds than Petunias.

Records were also kept of some species collected nectaring on Goldenrod (Solidago species). At a minimum, the following species were found landed on this flower with their tongue extended: Coryphista meadii, Cisseps fulvicollis, Lithophane petulca, Sunira bicolorago, Lacinipolia meditata, Feltia jaculifera, and Feltia heriles? Autographa precationis and Ctenchoplusia oxygramma were taken at Eupatorium purpureum, however there was little of this blooming during the survey time but I have found this flower to be attractive to many species earlier in the season at other localities. Most of the moths found at Aster were Autographa precationis, and Cisseps fulvicollis during the day. Flea Bane was not very effective in attracting moths, and only Autographa precationis was found at this flower at dusk and after dark.

Overview of Schmeeckle Reserve Moth Species

A total of 377 species in the superfamilies Drepanoidea, Geometroidea, Bombycoidea, Sphingoidea, and Noctuoidea were recorded from Schmeeckle reserve during the fall semesters from 1992 to 1995 and the spring semesters from 1993 to 1995. In addition, many specimens of microlepidoptera have been collected and prepared, but as yet I have been unable to get these specimens identified. Also, additional species may be included in the genera Eupithecia (Geometridae), Feltia (Noctuidae), and Rynchagrotis (Noctuidae) as sizeable series of unidentified material have been collected for these genera. In addition, one species possibly in the subfamily Catocalinae of Noctuidae has not yet been identified to genus.

Two species in the genera Sutyna, and Rynchagrotis have only been identified to genus, but are included in the species total as none of the other species reported are members of these genera. Also, I was able to get some determinations for the following species: Melanolophia signitaria, Melanolophia canadaria, Eupithecia columbiata, Eupithecia swettii (all of Geometridae) and Feltia heriles (Noctuidae) for the fall of 1992 and spring of 1993 only, and large series of what may be these or related species have not been determined. Hence, these species are included in the systematic checklist and flight season charts but the data associated with them is incomplete. In addition, five species are reported as unverified records. The identifications of these species are considered to be accurate, however due to lack of previously determined material of these species in my reference collection ideally these determinations should be verified by other authorities. The identifications of two species, Platyperigea multifera and Pachypolia atricornis, are questionable at this point, however Pachypolia atricornis is probably correct (det. L. A. Ferge and George J. Balogh 1996).

The species recorded from Schmeeckle Reserve include resident species, species that may occur in central Wisconsin but presumably dispersed into the reserve as it lacks their host plants or suitable habitat, and species not residents of Wisconsin which originated from areas south or west of the state. For a considerable number of species represented by few occurrences in the reserve, their status in the reserve is largely unknown. Based on the criteria discussed in the explanation of the status designations, 308 of the total species are believed or suspected to be resident species of Schmeeckle Reserve. At least nine species are dispersers from habitats not contained within the reserve, and another four species are suspected of being dispersers as well. 34 species for which few records were attained are not given any status designation. These species could be dispersers or rare resident species (rarely found by the surveying techniques used for this project). At least fourteen species were recorded which are not resident species of Wisconsin. Nine species are considered strays, and are rarely recorded from central Wisconsin or had never been recorded there previously. These species are residents in the southern United States, except for Autographa californica which is a western species. The remaining five species are unable to overwinter as far north as Stevens Point, but may appear regularly during the fall and often in appreciable numbers, at least during some years. The migrant Magusa orbifera apparently established a temporary breeding population in the reserve during 1993, as evidenced by the appearance of appreciable numbers of adults in very fresh condition during the fall. This species may be able to use *European Buckthorn* as a larval host (L. Ferge, pers com 1993). Note that all strays and migrants were collected during the fall semesters, with the possible exception of Hypena humuli (if this species really is a migrant) which was found primarily during the fall but two spring records were also obtained.

Several species are also likely migrants or strays, but I was unable to confirm this in the literature or in correspondence with other lepidopterists. Autographa biloba was found twice during the fall of 1992 and is a member of a subfamily (Plusinae of Noctuidae) containing strong fliers that often stray far from their point of origen. Based on my experience in Wisconsin this species has no predictable flight season, is seldom encountered, and is not found in a locality consistently, hence I have designated it as a questionable is a member of a subfamily (Plusinae of Noctuidae) containing strong fliers that often stray far from their point of origen. Based on my experience in Wisconsin this species has no predictable flight season, is seldom encountered, and is not found in a locality consistently, hence I have designated it as a questionable stray to Schmeeckle Reserve. Two other species I consider questionable migrants to the reserve are Hyles lineata and Hypena humuli. Both of these species may be found in numbers and on many dates, however my flight season data from Portage and Outagamie County is suggestive of migratory status, as the first date of the season for these species (taking Outagamie and Portage Counties into consideration) varies from the end of May to the beginning of September, an extremely inconsistent flight season for species which may be found regularly.

Of the 377 species recorded, 88 are represented by only one or two records for the entire project. For 38 of these species, the survey time barely included any of their flight season, only the extreme beginning or end during perhaps no more than one semester. For an additional fourteen species few records were obtained for the same reason, however more than one or two individuals were found. Of the remaining 51 species found only once or twice, at least 21 are strays or dispersers and it is unusual to record these species in central WI or in the habitats contained in Schmeeckle Reserve, respectively. There is little to go on to explain the rarity of the remaining 32 species, and many have been assigned a questionable status in the reserve. Several of these species are poorly known in Wisconsin.

Eight species were recorded from the reserve even though the survey period doesn't include any of these species' adult flight season. Four species were found dead in association with buildings in the fall- the adults had come to the buildings and died earlier in the season. These species are Drasteria adumbrata, Catocala sordida, Syngrapha microgamma, and Euxoa tessellata. Larva of Ctenchua virginica and Pyrrharctia isabella (Arctiidae) and Acronicta americana (Noctuidae) were collected in the spring and reared to adults, which emerged outside of the survey time for this project. Pupae of Hyalophora cecropia were found during the fall semesters and emerged the following June.

New State Records and Second State Records for Wisconsin

Three species were collected which were formerly unknown from Wisconsin, and another species was the first verified WI record although I later determined other Wisconsin specimens to be this species as well. Three additional species were found which had only been found in the state once before. These species are treated in more detail below.

New State Records

Papaipema speciosissima (Noctuidae: Amphipyrinae): One record of this species was obtained on 1 October 1992 in a wetland on the west side of the reserve. It was found on a cool morning around 9:15am sitting on the black light tube of a UV light trap. This trap had been checked after 2:00am the night before, hence this individual came to the black light late in the night. The host plants of this species are Osmunda fern species (Covell 1984, Rings et. all 1992), and Osmunda claytoniana is prevalent in the reserve. In addition to the presence of host plants the specimen was in very fresh condition (indicative of recent emergence) hence I consider this species a resident of the reserve. The same UV trap location where this species was found was used throughout the project, and other UV light setups targeted areas with an abundance of Osmunda claytoniana, however no subsequent records were obtained. This species had been formerly thought to reach the eastern limits of its range in Michigan and Indiana (Covell 1984). The above specimen was verified by Leslie A. Ferge in 1993.

Schinia chrysella (Noctuidae: Heliothinae): The record of this species was one of the most unusual records for the entire project. A single specimen was collected in a UV light trap on 14 September 1993 in the same location as the above species. This species came to the trap sometime after about 2:00am when the trap had been reset due to heavy rains. The weather conditions on this date were warm and humid with light to heavy rains, and few other moths were trapped on this date presumably due to the bright conditions in the reserve and considerable rainfall. Prior to this record, this species was apparently not recorded from anywhere near Wisconsin, and the closest records I am aware of are specimens from Missouri (collected by Dr. George Balogh, pers correspondence 1994). The larval hostplant of this species is unknown, and this combined with the single record and lack of proximity to its previously recorded range make assigning a
Dr. George Balogh, pers correspondence 1994). The larval hostplant of this species is unknown, and this combined with the single record and lack of proximity to its previously recorded range make assigning a
status for this species impossible at present. However, the specimen was in flawless condition, making it doubtful it had traveled any great distance or been active for long. As Schinia species often cryptically perch on flowers, several species of white flowers in bloom at the time were searched during the day and night, however no additional specimens were found. Some Schinia species come very poorly to lights, which may complicate surveying for this species. In addition to extensive blacklighting at Shmeeckle Reserve, I have done limited surveying in more extensive wetlands with characteristics of the reserve's wetlands in Outagamie County and southeast Wisconsin, but found no further examples of this species. At

present, this species ranks among Wisconsin's most poorly known lepidopterans. The identification of the specimen of this species was determined by Dr. George J. Balogh in 1994.

Hypenodes caducus (Noctuidae: Hypenodinae) [Unverified Records]: The first WI record of this species is a specimen taken on 14 September 1992 at UV light in the same wetland the above two species were found. It was also found at blacklights in the Reserve's west side wetlands during each subsequent season. This species was only found in small numbers and most of the specimens were not in fresh condition, indicating the survey period only includes the end of this species flight season. Actually, based on other survey work in Wisconsin, I have found this species to be a fairly common and widespread species in the state, and from July to September I have now recorded it from Portage, Outagamie, Waukesha, Walworth, Kenosha, Forest, Marinette, and Douglas Counties, and commonly in some places during August. Consistent with Schmeeckle Reserve data, the primary habitat seems to be wetlands, however in addition to sedge meadows it is found in bogs, wet prairies, and swamp forests. This species had probably been overlooked in WI in the past due to its very small size.

Drasteria adumbrata (Noctuidae: Catocalinae): The sole specimen of this species was found dead in association with the Visitor Center during the fall of 1992. Hence, unfortunately there is no flight date to report for this species. The habitat for this species in Wisconsin is likely to be barrens and the flight season part of June or possibly including late May (L. Ferge, pers com 1993). The only area resembling barrens in the reserve is the small area located to the west of the main north/south trail on the west side. This area, near the Visitor Center, and other open areas in the reserve were surveyed during the day (according to L. Ferge this species may be flushed up during the day) on 26 May 1993 however no additional records were obtained. While the specimen is in fairly fresh condition (it is not faded on the upper surface since it was found with its wings parallel and pointing up from the body) due to the lack of barrens habitat in the reserve I consider it to be a disperser to the reserve. Many species in this subfamily (Catocalinae of Noctuidae) are strong fliers and frequently found away from their breeding habitat. I have also searched for this species on barrens in southeastern Portage County (Emmons Creek Public Hunting Area) during late May, mid and late June, however I found only a related species, Drasteria graphica. However, on 24 June 1995 I did obtain an additional Wisconsin record in a UV light trap on an extensive Oak Barrens in Marinette County. The identification of the Schmeeckle Reseve specimen was determined by Leslie A. Ferge in 1993.

After having the Schmeeckle Reserve specimen identified, I discovered 4 specimens in the UW-Stevens Point insect collection were incorrectly labeled Drasteria graphica and were actually this species. The data on three of these specimens stated: 9 June 1959, Stevens Point, Wis., J. W. Barnes, placing this species in the Stevens Point area over three decades ago (the fourth specimen unfortunately lacked a data label). Unfortunately, the designation Stevens Point is very vague and could be anywhere in an area of many square miles, hence it is impossible to revisit the site these specimens were found in. However, this information suggests the Schmeeckle Reserve specimen could have originated in the Stevens Point area, and is the basis for designating it as a disperser and not a stray. Prior to the Schmeeckle Reserve and Stevens Point records, this species was unknown south of Upper Michigan at this longitude (G. Balogh, pers com 1994).

Species With One Previous WI Record

Autographa californica (Noctuidae: Plusinae): The single record obtained for this species on 19

Species With One Previous WI Record

Autographa californica (Noctuidae: Plusinae): The single record obtained for this species on 19 October 1993 is a stray from the western United States (L. Ferge, pers com 1994). The specimen was collected on a baited tree. Autographa are rarely found at bait, however by this date no flowers were blooming hence there were no nectaring sources available, and several specimens of the common Autographa precationis were found coming to bait as well. Despite the large distance this individual must have traveled, the specimen is in good condition. The specimen was verified by Leslie A. Ferge in 1994.

Lithophane oriunda (Noctuidae: Cucullinae): This species has been recorded in low numbers from the reserve every spring and fall semester, including the spring of 1996 (data not yet compiled) except for the fall of 1992 and 1995. It is usually taken on baited trees in swamp forest habitat, but there are a couple records from UV light from both the east and west side of the reserve (all UV light records are from the spring). To date, counting a 1996 record, this species has been recorded from 6 dates in the spring and 5 dates in the fall with a total of 15 specimens. In addition, I have collected two specimens of this species from a swamp forest in Outagamie County on 7 October 1993. At this point it is apparent this is a resident species of Wisconsin which may be found rarely but consistently at Schmeeckle Reserve, and the habitat requirement seems to be swamp forest. A specimen taken on 24 October 1993 was identified by Leslie A. Ferge during 1994.

Paleacrita merricata (Geometridae: Ennominae): I discovered this species in the state on 23 April 1993 at Emmons Creek Public Hunting Area in southeastern Portage Co., where one specimen was taken in a UV trap. The following spring, I obtained additional records from Schmeeckle Reserve and also found this species there during the spring semesters of 1995 and 1996. This species comes to UV lights in forest habitat on both the east and west side of the reserve, and specimens have been found on lighted buildings on the UW-SP campus. While this species is uncommon to rare, it doesn't seem to have a high degree of habitat specificity, and it is curious to note that its previously reported range is well south of Wisconsin in the western part of its range (Ontario to Florida west to Montana and Texas) (Covell 1984). The original specimen from Emmons Creek was verified by Dr. George Balogh in 1994.

Species Considered Dispersers or Possible Dispersers to Schmeeckle Reserve

Discussion and Basis for the Disperser Status

Apodrepanulatrix liberaria: This species is a questionable disperser, and feeds on Ceanothis in the larval stage. Ceanothis was recorded in the reserve at one time, but has not been seen there in many years and it is unknown if any of this plant still occurs there (R. Freckman, pers com 1996). The two records obtained in 1994 were taken at blacklights in the wooded area bordering a sedge meadow west of the main trail immediately south of the small semi barrens area. Ceanothis does occur in the Stevens Point area several miles southeast of Schmeeckle Reserve (R. Freckman, pers com 1996), hence this is a possible source of origin for the Schmeeckle Reserve specimens.

Grammia arge: This species is also reported as a questionable disperser. While the survey time included this species' flight season during every fall semester, only one specimen was found (on a lighted campus building). With my experience collecting elsewhere in WI and corresponding with other WI collectors, this species is associated with dry upland forests, barrens, or prairies, which are all habitats not significantly represented in the reserve.

Grammia celia: Wisconsin data thus far has indicated this species is restricted to high quality barrens, prairies, or sand dunes and Schmeeckle Reserve contains no habitat of these types. The only specimen found in the reserve was captured during the day after it was seen flying into some vegetation in the bottom of an Oak Forest on the East side. While the flight season of this species barely includes the survey time, thus far Wisconsin data suggests that this species would not be a resident of the habitat types found in Schmeeckle Reserve.

Drasteria adumbrata: See previous section.

Parallelia bistriaris: This species is another one of the questionable dispersers. This species' flight season

Drasteria adumbrata: See previous section.

Parallelia bistriaris: This species is another one of the questionable dispersers. This species' flight season extends into September and it is generally not a rare species where it is a resident, especially when surveyed for with a bait trail. Yet over four fall semesters only one record was obtained, and the specimen was somewhat worn. As a member of the subfamily Catocalinae of Noctuidae, it is likely this species has the ability to disperse considerable distances (a characteristic of this subfamily). While survey data is strongly suggestive of a disperser status, I am unable to preclude the possibility of resident status based on habitat alone, hence the questionable disperser status.

Two species in the genus Catocala (Catocala neogama and Catocala subnata) are reported as dispersers based on lack of appropriate larval hosts in the reserve. Members of this genus are known to be strong fliers capable of dispersing far from their point of origin, and these species are residents at least as close as western Outagamie County. These two species are associated with deciduous forest, with Catocala subnata host specific on Bitternut Hickory in the eastern U.S., and Catocala neogama feeding on Black Walnut and Butternut (host plant information from Rings et all 1992).

Syngrapha microgamma: This species is a bog obligate (L. Ferge, pers com 1993) and therefor definitely not a resident of Schmeeckle Reserve which contains no bogs. Possible sources of origin include bog habitat to the north in Dewy Marsh or Fogerty Marsh to the west. Members of this species' subfamily (Plusiinae of Noctuidae) are generally strong fliers and dispersers, and I have also collected this species miles from any known bog on barrens in Marinette Co. (23 June 1995).

Oligia bridghami: This species is likely another bog obligate based on my experience, and most of my Wisconsin records of this species have been collected in bogs. However, I have also collected this species in deciduous forest habitat once in Waukesha County. Since this species was at the extreme end of its flight season during the survey time, the single project record does not necessarily support a disperser status as the lack of additional records could also be due to missing the flight season. Hence, while this species is probably a bog obligate in central Wisconsin, I didn't feel there was sufficient evidence to remove the question mark from its disperser status in the systematic list. Its larval host(s) are unknown (Rings et. all 1992).

Archanara laeta: The single project record from this species is from a lighted building on the UW-SP campus, and no specimens were ever collected in the reserve's wetlands. This is a local species associated with extensive high quality sedge meadow habitats, however it is also a strong disperser and was collected twice in urban Appleton during 1995 (the same year it was found on the UW-SP campus) indicating populations of this species were dispersing during 1995. In addition to the consideration that this species seems to only be a resident of more extensive wetlands than are found within Schmeeckle Reserve, with all the blacklight trapping in the reserve's wetlands, it is unlikely no records would have been obtained there during the entire project if this species was a resident there (Archanara readily come to UV lights).

Xylena cineritia: This species associated with barrens habitat in Wisconsin (L. Ferge, pers com 1993). I have encountered it commonly on barrens in the northern part of the state, but only two late October records were obtained for Schmeeckle Reserve. The specimens are in fresh condition, but hibernating Cucullinids tend not to become worn until the spring. No spring semester records were ever obtained (this is an adult hibernating species), and Schmeeckle Reserve contains no significant barrens habitat.

Xystopeplus rufago: This species is also a barrens obligate, and only one record was obtained for Schmeeckle Reserve. Previous documentation via a record from urban Appleton in Outagamie County collected by the author indicates this species has the ability to disperse considerable distances (no barrens are known to occur in the vicinity of Appleton).

Agrotis vetusta: This species was found twice during the project, once on campus during the fall of 1994 and another time in the Eupatorium purpureum containing sedge meadow area south of the Wetland Trail boardwalk in the fall of 1995. This species is a barrens obligate, and thus the reserve lacks suitable habitat. There is a series of this species in the UW-SP collection labeled as being collected in Stevens Point from 1958-1959
boardwalk in the fall of 1995. This species is a barrens obligate, and thus the reserve lacks suitable habitat. There is a series of this species in the UW-SP collection labeled as being collected in Stevens Point from 1958-1959.

General Notes on Dispersers: Of the dispersers found within the reserve, five species are barrens associated (Grammia celia, Drasteria adumbrata, Xylena cineritia, Xylstopeplus rufago, and Agrotis vetusta) and Apodrepanulatrix liberaria may have originated from barrens habitat as well. Two of these species have been found by the author at Emmons Creek Public Hunting area in southeastern Portage County, an area containing considerable Scrub Oak barrens blanketed by Wild Lupine, although survey at this site has been limited. Due to the considerable number of barrens associated species found in Schmeeckle Reserve, this raises the possibility a quality barrens habitat supporting habitat restricted lepidopterans could occur near by.

Three of the dispersers are likely to have originated from bogs (Syngrapha microgamma, Oligia bridghami, and Epiglaea apiata). As noted above, this type of habitat occurs several miles north of the reserve in Dewy Marsh and west of the reserve in Fogerty Marsh, however no lepidoptera inventories have yet been conducted in these localities to determine if these species are present there.

Notes On Habitat Association

Wetland Associated Species

While Schmeeckle Reserve's open wetlands are not extensive, they were found to be supporting populations of a number of wetland associated species. However, most of these species are rare or uncommon (with the only major exception being Lemmeria digitalis), but note also that blacklights were less effective in open wetlands due to light pollution. The open wetlands where wetland associated lepidopterans were found include a sedge meadows with Eupatorium east of the main north/south trail on the west side of the reserve (this is the largest sedge meadow in the reserve, and is divided by a boardwalk for the Wetland Trail) and the sedge meadow south of the small semi barrens area west of the same trail. Pertaining to the larger sedge meadow, the areas where most of the wetland species were found are in the south section (south of the board walk) with an abundance of Joe Pye Weed and Goldenrod. Another Eupatorium containing sedge meadow occurs on the east side of the reserve however it is bordered by the double highway containing a row of streetlights, hence blacklight traps yielded few if any moths in the limited number of attempts to survey this wetland. However, one specimen of Agrotis gladiaria and two specimens of Lemmeria digitalis were trapped here. Another open sedge meadow on the east side of the reserve near the lake was not surveyed, and appeared less interesting for lepidoptera.

Of the species which were collected in wetlands as indicated on the systematic checklist, at least fifteen wetland restricted species are completely dependent on the reserve's open sedge meadows for breeding habitat (as determined by presence of larval hosts or the current state of knowledge on the habitat restrictions of certain species). In addition, Papaipema cataphracta and Papaipema nebris appear to be restricted to these habitats in the reserve, although they may be residents of dry habitats elsewhere in Wisconsin. Some species often associated with wetlands in Wisconsin seem to be more associated with moist forest margins in the reserve. Papaipema maritima and Papaipema necopina are Helianthus feeders, and Helianthus is found along moist forest margines in the reserve. Papaipema inquaesita is also wetland associated, and its foodplant (Sensitive Fern) is common both in open wetlands and in parts of the moist forest, and this species was collected in both habitat types. While Papaipema speciosissima was collected only in an open wetland, its foodplants (Osmunda ferns) also occur both in open wetlands and in the moist forest. Papipema birdi was found in both the open wetlands and moist forest areas, however based on data from Fallen Timbers Environmental Center in Outagamie County, this species may be actually more associated with moist forests (this species is more common in this locality, and rarely taken there in the open wetlands but rather found most often in the moist forest area). Its larval hosts are Umbellates (Rings et all 1992) which occur along moist forest margins in the reserve. Catocala praeclara and Xylena nupera are also wetland associated but are associated with the forested wetlands and I am uncertain if they depend on the open sedge meadows. Hemileuca mai, of questionable resident status in the reserve, is wetland associated and the immatures feed on Willows (Covell 1984), which occur in the reserve's open wetlands.
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The species found in Schmeeckle Reserve which are totally dependent on the open sedge meadows include Hypenodes caducus (only found in this habitat), Plusia venusta, Simyra henrici, Eremobina jocasta, Merópleon diversicolor, Lemmeria digitalis, Archanara oblonga, Xanthia togata, leucania linita, Agrotis gladiaria, and a number of species in the genus Papaipema including Papaipema impecuniosa, Papaipema lysimachiae, Papaipema baptisae, Papaipema nepheleptena, Papaipema eupatorii, Papaipema unimoda, and possibly some of the species mentioned above (especially Papaipema cataphracta and Papaipema nebris). In addition, these open wetlands provide nectaring sources for moths which may be less dependent upon them for breeding habitat. While the Joe Pye Weed flowers were generally almost done blooming when survey work was conducted, numerous moths were seen nectaring on these flowers in early September, and observations in Outagamie County have shown a wide variety of species use this plant as a nectaring source. However, it must be noted that the moist forested margins, especially along the main north/south trail on the west side of the reserve, also contained many flowering plants used as a nectar source by a wide variety of species.

Open Areas and Semi Barrens Habitat

The small semi barrens area noted in the key to habitats in the systematic checklist was not found to have any species restricted to this area, but there were a few species more common in this area than elsewhere in the reserve. Note that this area was surveyed during 1992 and 1993, and light pollution was a significant factor for surveying with UV lights, however this problem could be reduced somewhat by locating traps on the south forested margin of the opening. Xestia collaris was common in this area, and generally uncommon in forested areas. Two other species more common here than elsewhere in the reserve were Catocala antinympha and Polia purpurissata. The former is host specific on Sweetfern, and this is a larval host for the latter as well, and this area contains a concentrations of this plant. However, Sweetfern is also widely distributed in the reserve along forest margins. Another species found in association with Sweetfern was Mesothea incertata. This species was found in both this area and another opening containing sweetfern located to the east of the main north south trail on the west side of the reserve. Unlike most Geometridae, this species did not come to lights but was found only by walking through Sweetfern and flushing it up. It is noteworthy this species was found only in these two openings and not along the forested margins with Sweetfern, although this species' flight season only included the last few days of the survey time and thus there was only limited opportunity to investigate this.

The two open areas above also appeared to be the primary habitat for Caenurgina erechtea and Caenurgina crassiuscula, which were occasionally taken at UV lights but found mostly by walking through these open areas and flushing them up during the day. These species have been found commonly in some open wetlands in Wisconsin, but this was not the case in Schmeeckle Reserve. Both these species are common and widespread in open fields in Wisconsin.

Another open area worth mentioning is the grassy hill located by the shelter building along Maria Drive. While this area was uninteresting in terms of breeding habitat, it attracted many species due to the presence of nectaring sources, particularly a concentration of Spotted Knapweed combined with other flowering plants. While the nonindigenous Spotted Knapweed occurs in open areas all over the reserve, it is especially concentrated on this hill and in the surrounding vicinity, and this was the reserve's most productive area for finding crepuscularly nectaring Plusinines and Hyles lineata (Sphingidae).

Forested Habitat

The sizeable majority of the moth species recorded from Schmeeckle Reserve are forest associated, and utilize one or more forest plants as their larval host (although some of these species may depend on adjacent open areas for nectaring in the adult stage). Likewise, forest is the dominant habitat in Schmeeckle Reserve. The forested areas surveyed which were productive for moths include Chilla Woodlot, a forested area between the small semi barrens area and a sedge meadow on the north side of Chilla Woodlot, the trail systems east of the main north/south trail on the west side of the reserve (mostly surveyed by bait except along the margins of wetlands where many UV surveys were done), and a moist forest and adjacent drier Oak forest on the east side of the reserve beyond the monotypic Jack Pine Area. Forested areas which received limited survey because they were found to be unproductive for moths with
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both UV light and bait surveys include the forested area south of Chilla woodlot and a largely monotypic Jack Pine area adjacent to the divided highway on the east side of the reserve. Forested areas around the lake were not surveyed by either lights or bait and did not appear to contain lepidoptera habitats different from those which were surveyed.

During the spring, most of the species found in forests on the west side of the reserve were also found in forests on the east side of the reserve. However, with UV light surveys more individuals were often found on the east side forests on nights when both the east and west sides were being surveyed. However areas where lights were set up on the east side often appeared darker than on the west side, hence this could be a result of increased effectiveness of lights rather than higher concentrations of moths. However, one spring species which was found commonly on the east side and infrequently on the west side is Cladara limitatia. In fact, during the spring of 1993 when all survey was done on the west side, few records were obtained for this species. However, during subsequent seasons it was found on most dates during its flight season when it was warm enough for it to be active, based on east side surveys with UV sheets and/or traps. In addition, most records for Smerinthus ceryisii, the Clostera species, and Gluphisia lintneri were obtained from the east side of the reserve. The east side forests received limited survey during the fall semesters, however no moths were ever recorded there that were not also found on the west side during the fall.

Variations in Abundance from 1992-1995

There were no trends in abundance changes recorded over this interval, such as a species becoming progressively more or less common. This suggests that no species are currently in the process of colonizing the reserve, and no lepidoptera habitats have been declining or improving in quality over this time period enough to be changing lepidoptera populations. However, some species had years when they were notably more or less common than during other years, and these species are discussed below. Note that the flight season data charts show many of the moth species surveyed for with bait were found much less frequently in 1992 than subsequent years, however these are the species that were found primarily with the use of a bait trail, and only bait traps were used for bait during 1992. Hence, this pattern is due to a modification of survey technique, not an increase in abundance. Also, it must be noted that effort with various survey techniques could not be constant throughout a season or from year to year due to academic and other commitments of the author, however taking this into account the below species appeared to be at notably different abundances during certain years. In addition, recall during the spring of 1993 the east side of the reserve (which is often darker and therefor more productive for blacklighting) was not being surveyed, hence for this reason some spring species were taken in greater numbers after 1993 not due to a reduced abundance during 1993. Also, note that for species infrequently found during every year (designated VR, R, or U on the systematic checklist), there is insufficient data to be able to identify a change in abundance. In addition, especially in the late fall or early spring, note that differences in the number of survey dates a species was found on between different years may be due to differences in the number of warm nights. Finally, note some species were recorded more during the beginning of a particular fall semester or end of a spring semester due to changes in flight season, and this is discussed in the next section.

Spring Semester 1993-Spring Semester 1995

Three species appeared to be notably less common during the spring of 1993 than the next two seasons: Phigalia strigitaria, Scoliopteryx libatrix, and Orthosia alurina. Phigalia strigitaria was not recorded on many dates during 1994 or 1995, however on some warm nights in April it was found in considerable numbers. In contrast, during 1993 this species was only found on one date and few specimens were obtained. During 1994 and 1995, Scoliopteryx libatrix was found at bait and occasionally at lights on many dates during may. However, during 1993 no specimens of this species were found at bait and only a few were taken at lights, and on only one date. Finally, Orthosia alurina is recorded by only a single specimen in 1993, and while this species was not common any year, it was found on more survey dates and in some numbers during 1994 and 1995.

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Three species in tribe Psaphidini of Cucullinae were found in far higher numbers during 1994 than during 1993 and 1995. These species are Copipanolis styracis, Psaphida resumens, and Eutolype rolandi. However, these higher numbers were found on few survey dates, and 18 April 1994 when temperatures reached 83 F during the day produced the most records of any night during the project. These species were taken in considerable numbers at a sheet on the west side in Chilla woodlot and in traps in forests on the reserve's east side. These species were also found in numbers on a few subsequent dates (see flight season charts). Only one specimen of Copipanolis styracis was found during 1993 and 1995 (one each year).

Eutolype rolandi was not found at all during 1993 and only on two dates when few specimens were obtained during 1995. Psaphida resumens was also not found during 1993 and found on only two dates during 1995. However, note that on 17 April 1995 the temperature got into the 60s F during the day and remained warm after dark, yet I was unable to put up UV lights on this date (these species only come to UV lights). In 1993 and 1995 Copipanolis styracis was recorded earlier than in 1994 as was Eutolype rolandi. However the 1995 Psaphida resumens specimens were recorded beyond the 1994 flight dates. Hence, these species were not found together around the same time of year as they were during 1994. It is interesting to note that April of 1994 was much warmer than the other two years, and perhaps this was favorable for these early spring species.

Acronicta impressa was found in much higher numbers during 1995 than during the two previous seasons. In 1995 this species was found on eight survey dates and in numbers on most of the later dates, however only one specimen was found during 1994 and only a few on one date during 1993 (however the 1993 semester ended sooner and included less of this species' flight season than 1995). This species was found during 1995 at both lights and bait and in forests on both the east and west sides of the reserve.

Fall Semester 1992-Fall Semester 1995
(Excluding migratory species)

One species was found only once during 1992 which was found in considerable numbers from 1993-1995, Papaipema pterisii. While more trapping was done in areas with concentrated Pteridium (the larval host) during the later seasons, some of the same trap locations where this species was found in numbers from 1993-1995 were used during 1992. During the later seasons, this was one of the most common Papaipema species, and was found in numbers on many nights during its flight season when black lights were placed in the vicinity of Pteridium (it was found on fewer dates during 1993 because there were fewer warm nights when traps were in these areas, however it was found in numbers on warmer nights at lights in Pteridium areas) and it was occasionally found in lower numbers in traps not in Pteridium areas as well.

Two species were found singly during 1993 that were found in numbers during the other seasons, Zale lunata and Phlogophora periculosa. Zale lunata was found most commonly during 1994 at the bait trail, but was also found in considerable numbers in bait traps during 1992 and at the bait trail during 1995 beginning in early October. Pertaining to this species, this phenomena was also noted in Outagamie County and southeast Wisconsin during 1993, when I found few examples of this normally more common species. The case of Phlogophora periculosa is more puzzling, as this species was found in numbers in other parts of Wisconsin during 1993. The other years, this species was found occasionally at lights but most often at bait. It was regular at bait trails from 1994-1995 but a number of records were obtained from bait traps during 1992.

Catocala cerogama had an especially good year during 1994 when it was found notably more often and more commonly than during the previous two seasons (this species' flight season was advanced during 1995 and over by the start of Schmeeckle Reserve surveys, hence no comparison was obtained for 1995). This species was found every night a bait trail was put up during 1994 from 5-20 September, and in numbers on most nights except those at the very end of its flight season. In contrast, it was found on only one night during 1993 and occasionally during 1992 in bait traps or on buildings.

A wetland associated species rare from 1992-1994 was slightly more numerous during 1995, Papaipema unimoda. This species was recorded by two specimens in 1992 and by one specimen in 1993 and 1994, however eleven specimens were found in 1995. Most of the specimens were found in the same traps run during prior seasons, but the increase is small enough to be due to chance. Hence, while wetlands were a subject of regular survey by blacklights during each season, it is unclear if populations of this species were actually higher during 1995.
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More noticeable increases were noted during 1995 for Pleuroprucha insulsaria and Anathix putta. The situation for the former was similar during the beginning of the fall semester for all four years, however this species was much more common during October in 1995. Over 15 specimens were found (the majority at bait but some at lights) on some dates it was recorded from 2 October through 12 October. In contrast, there are only single October records for 1994 and 1993 and none for 1992 (however no bait trail was used during 1992, so the comparison is only valid for the later three seasons). Anathix putta was rare from 1992-1994, however from 5-16 September 1995 it was found on six of nine survey dates and in numbers on each date with records from lights, the bait trail and bait traps.

Adult Hibernating Species

Assessing changes in abundance for these species can be difficult, as while the fall semester and subsequent spring semester are the same generation of adults, many times individuals of a species are found much more commonly in the spring or the reverse situation in the case of Lithophane grotei and Lithophane laticinerea. Weather conditions can dramatically affect how often these species are found in the late fall and early spring. For this section, the fall of 1992 is not considered as no bait trail was used, and most of these species were found almost exclusively at the bait trail during the fall. Also, atypical patterns for a number of species during the fall of 1995 are discussed in a section devoted to these species. Included below are two species which had a distinctly higher abundance during one fall/spring pair than was recorded for the rest of the project.

Xylena nupera: The situation for this species is puzzling, as it was recorded during only one fall/spring semester pair, the fall of 1993 and spring of 1994. All specimens were found at the bait trail on the west side of the reserve, in moist forested areas near wetlands. It was found on ten dates in the fall and three dates in the spring, with a single individuals found on most dates. It was found on identical portions of bait trail that were used during the spring of 1993 and 1995 and fall of 1994 and 1995, yet no specimens were found during any of these years. It seems highly unlikely that with all the effort given to the same bait trail during earlier and later seasons, and with this species being recorded from 13 different dates during a fall/spring semester pair, that chance alone could explain this data even though this was an uncommon species. It also is unlikely this species could be a resident and not be found during all the other semesters with all the bait trail work done. Perhaps this species had an exceptionally good year during the fall of 1993 and its populations dispersed outward during both the fall and following spring. This species is wetland associated, and a survey of other wetlands in the Stevens Point area to determine if this species is a regular resident would be needed to add weight to this hypothesis.

Eupsilia sidus: Even with all the bait trail work done during the spring of 1993, this species was not encountered in the reserve until November of 1993, when one specimen was found. An additional specimen was collected the following spring semester. However, in October of 1994 this species started to become more numerous, and during the fall of 1994 it was found on five dates with multiple specimens on several dates. The following spring, during the unseasonably warm weather from 12-16 March this species was found in numbers on every date, and another unusually late specimen was found that May. No examples of this species were found during the fall of 1995, but at least one was collected during the spring of 1996 (more may be found as material is examined). Hence, this species has been quite rare in Schmeeckle Reserve for most of the survey period, however during the fall of 1993 and spring of 1994 it was found in considerable numbers. A number of other usually rare species were found in numbers during the March of 1995 interval, however the records of Eupsilia sidus from the preceding October suggest the elevated numbers found for this generation were not merely due better sampling conditions.

Variations in Flight Season from 1992-1995

Note for the purpose of flight season analysis, a species must be found regularly during its flight season

Note for the purpose of flight season analysis, a species must be found regularly during its flight season by at least one survey method to get a good indication of its flight season. For uncommon species, only scattered records are obtained and it is not possible to determine flight season intervals. However, worn specimens of species found at the tail end of their flight season during the delayed seasons of the fall of 1992 and 1993 are noted in this section.

Spring Semesters of 1993-1995

For spring semester flight season data analysis, it is important to note that the last survey dates varied for the different years. The last survey nights for 1994 and 1995 were similar, and were 19 May and 18 May, respectively. However, the last survey night for 1993 was 12 May, which was a cool night with few moths found. Also, for 11 May 1993 the only survey was for lighted campus buildings and a couple of bait traps, hence the last good survey night of 1993 with considerable survey effort was 10 May.

In analyzing flight season data for the spring semesters from 1993-1995, one aspect which stands out is the number of species found in April of 1994 that had flight seasons notably advance from 1993 and 1995, generally by one week or longer. From the interval from 11-26 April 1994, of the species for which good flight season data was obtained 23 species were considerably advanced in their flight season. These species, in taxonomic order include Drepana bilineata, Aethalura intertexta, Ectropis crepuscularia, Phigalia strigitaria (no comparison with 1993 due to lack of records), Petrophora subaequaria, Xanthorhoe lacustrata, Eupithecia ravocostaliata, Cladara atroliterata, Lobophora nivigerata, Gluphisia lintneri (no comparison with 1993 due to lack of records), Scoliopteryx libatrix, Phoberia atomaris, Zale phaeocapna, Zale lunifera, Nola triquetrana, Pseudaletia unipuncta, Orthosia rubescens, Orthosia revicta, Crocigrapha normani, Egira dolosa, Achatia distincta, Morrisonia evicta, and Cerastis tenebrifera. However, seven species found in this interval had first flight dates in 1994 almost the same as during the other seasons, including Phigalia titea, Lomographa glomerularia, Venusia comptaria, Cladara limitaria, Copivaleria grotei (note that this species is less common, hence recorded flight season intervals may not be as close to actual flight season intervals as for the other species), Orthosia garmani, and Metalepsis salicarum. Another exception which fits neither of the above patterns is Orthosia hibisci, which was first found in 1993 on 31 March (based on one specimen) but then not found again until 18 April 1993, and in 1995 was first found on 13 April compared to 10 April in 1994. The large number of species with advanced flight seasons during April of 1994 can be explained by the relatively warmer April this year had compared to 1993 and 1995 (above average temperatures have been correlated with lepidopterans emerging earlier than normal many times) however what is noteworthy is how some species had advanced flight seasons whereas others emerged during the same time of year as during the seasons with colder Aprils. Hence, it seems evident that above average temperatures in April have a notable impact on the flight seasons for some species but seem to affect other species not at all. An interesting subject of future investigation would be to see if the same species do and do not have advanced flight seasons during a future April with above average temperatures.

By early May the 1993 and 1995 seasons were caught up with the 1994 season, and only two species, Smerinthus cerisyi (which was only found in 1994 and 1995 on the east side of the reserve, hence no comparison exists for 1993) and Gluphisia septentrionis (not yet emerged when survey ended in 1993) were found notably earlier in 1994 than during the other seasons, however the early record for the latter is based on one specimen, and this species was not found in numbers during 1994 until within one day of when it was found in numbers in 1995. In fact, by mid May some species were found to have notably delayed 1994 flight seasons relative to 1993 and 1995 These species include Lomographa semiclarata (active mostly diurnally, how representative first flight dates recorded are of actual first flight dates is somewhat questionable), Xanthorhoe ferrugata, Cissusa spadix (this species hadn't even been found when survey ended in 1994), and Morrisonia confusa. The beginning of May of 1993 was unseasonably warm, and a couple species emerging in early May of 1993 were found notably earlier than the subsequent seasons, including Plagodis alcoolaria and Cissusa spadix (slightly earlier than 1995, not yet emerged when survey ended in 1994). Two species, Zale undularis and Polia latex emerged during the hot weather in early May of 1993, but apparently had not yet emerged when survey ended in both 1994 and 1995.
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However, aside from these two exceptions many species were recorded in mid May during 1994 and 1995 that hadn't been found when survey ended in early May of 1993. A number of species were found during the last survey dates of 1994 that weren't found by the time survey ended in 1995 and vice versa, including species found in considerable numbers at these times. This indicates that during this time during 1994 and 1995 some species' flight seasons were advanced from where they had been the other year and other species' flight seasons were delayed.

To summarize conclusions drawn from the spring data, an unusually warm period in the spring will cause some species to have advanced flight seasons, but other species will emerge at a similar time as during a cooler year. If the flight season is delayed in April relative to a warmer year, it can quickly catch up with some warm weather in early May. Data from May shows that all three years had species with advanced and delayed flight seasons relative to the other two years.

If spring temperatures were the only factor affecting emergence for species which had advanced or delayed flight seasons during a year, one would expect if some species were advanced in year A over year B, no species in year B would be advanced over year A. However, flight season data from May conflicts with this expectation. For example, Hyppa xylinoides was common from 16-19 May during 1994 and there was yet no trace of this species when survey ended on 18 May, 1995. However, Cissusa spadix was found in numbers as early as 10 May and also on 16 and 18 May during 1995, but apparently hadn't emerged yet when survey ended in 1994. Hence, it is probable other factors besides temperature are affecting the first emergence dates for certain species.

On one final note, an unusually early record for Hyppa xylinoides taken on 3 April, 1993 is worthy of mention. This single specimen was found on a campus building during the day, and is well over a month earlier than any other records for this species, which emerged in numbers on 16 May during the same year. In fact, only one other non adult hibernating macrolepidopteran, Paleacrita vernata, was found this early during 1994. That this individual could have emerged so much earlier than the other members of its species seems highly unusual. One hypothesis to explain this record could be the specimen was transported via a delivery arriving from the southern part of the country where it would emerge earlier, and then flew to a lighted building where it was stymied by cooler temperatures.

Fall Semesters from 1992-1995

The first survey dates for both 1992 and 1993 were 30 August, however during 1992 intensive survey at Schmeeckle Reserve with lights and bait traps did not begin until after the first several days of the semester (many of the early 1992 records are from lighted buildings on campus, flowers on campus, or sitting under lights on the visitor center). The first 1994 survey date was 5 September, and the first 1995 survey date was 3 September.

The seasons were at different points when survey began during the different years. The summers of 1992 and 1993 were cooler than normal and the flight seasons for many species were delayed by early September. 1992 seemed to be more delayed than 1993, and while intensive survey began later in 1992 more earlier season species not usually on out as adults this late in the season were found during 1992 than 1993. 1995, by contrast, was one of the hottest summers on record, and the flight seasons for a number of species found during the other years had ended by the time survey began in 1995.

Fifteen species that normally would not be expected to be on the wing as late as the start of the 1992 fall semester were found only during 1992. These species are Pero honestaria, Besma quercivoraria, Eusarca confusaria, Hypoprepia fucosa, Halysidota tessellaris, Lithacodia albidula, Maliattha synochitis, Raphia frater, Oligia bridghami, Melanchra adjuncta, Trichordestra legitima, Faronta diffusa, Leucania multilinea, Leucania commoides, and Protolampra brunneicollis. During 1993, seven species were found at the tail end of their flight season that were not recorded during the other survey years, including Scopula limboundata, Poanias excaecatus, Catocala grynea, Catocala praeclara, Apamea devastator, Eremobina jocasta, and Lacanobia subjuncta. Six species at the tail end of their flight season were found during both 1992 and 1993, including Nematocampa limbata, Gluphisia septentrionis, Tarachidia erastrioides, Cucullia convexipennis, Euagrotis illapsa, and Graphiphora haruspica. Some of the above species' flight seasons extended into mid September, while others were found only on one or more of the first few survey dates. In general, specimens of these species were in a worn, tattered, or faded condition on the last or only dates they were recorded.

extended into mid September, while others were found only on one or more of the first few survey dates. In general, specimens of these species were in a worn, tattered, or faded condition on the last or only dates they were recorded.

A number of species were found in numbers during the beginning of September during 1992-1994, but there flight seasons were apparently over by the time Schmeeckle Reserve surveys started in 1995 (this is further supported by surveys done in August in Outagamie County and northeastern Wisconsin, where only worn specimens of these species were being found earlier in the season, indicating their flight season was almost over). At least seven species fit into this category, including Itame pustularia, Campaea perlata, Catocala ilia, Catocala cerogama, Catocala ultronia, Hyppa xylinoides, and Polia purpurissata. Two possible additions are Cabera variolaria and Cabera erythemaria, however these species were not found during all of the prior seasons and were recorded too infrequently to be certain.

In addition, some species' flight seasons ended earlier in the season during 1995 or during both 1994 or 1995. The most notable examples are Lambdina fiscellaria (the flight season ended much earlier in 1995 than 1993, and 1994 was inbetween; good flight season data was not obtained during 1992 due to lack of records), Catocala antinympha (flight season ended earlier in 1994 and 1995 when two and one worn specimens were found, respectively), Catocala relicta (flight season ended much earlier in 1995) and Catocala concumbens (flight season ended earlier in both 1994 and 1995). Note that for all these species their flight season begins prior to the start of the Schmeeckle Reserve surveys.

During 1992 and 1993, the flight season of Sunira bicolorago began well after the start of survey work in Schmeeckle Reserve, on 14 and 24 September, respectively (excellent flight season data can be obtained for this species as it is found commonly at bait traps, the bait trail, and also shows up in numbers at lights in the reserve). However, during 1994 and 1995 this species was found in Outagamie County prior to the start of surveys in the reserve, and was thus found on the first survey dates for 1994 and 1995.

One species which did not fit into the delayed season/advanced season pattern for the fall semesters is Orthonama obstipata. This species is multibrooded in Wisconsin (the exact number of broods is unknown) and may be found in the state as early as May during some years. From 1992-1994, this species was found as soon as survey work started, indicated survey work began during a brood of this species. However, in 1995 it was not found until 25 September. However, it is unknown how many late season broods of this species were present, and the brood beginning on 25 September 1995 may not have been the equivalent brood found earlier during the prior seasons.

Another interesting situation is the 1995 flight season for Agrotis venerabilis was actually delayed over the other years. As this species is taken regularly at UV lights, the start of its flight season during each year is well known, and during 1994 it emerged at least four days later than 1993, six days later than 1994, and much later than during 1992 when this species was on the wing already when survey began at the very end of August. This data indicates while many species have an advanced phenology during warmer years, at least some do not fit this pattern and may have delayed phenology over a cooler season.

Adult Hibernating Species of the Subfamily Cucullinae of Noctuidae

Very high diversity was recorded in Schmeeckle Reserve for those species in the subfamily Cucullinae of Noctuidae which hibernate as adults. A total of thirty species were recorded (although Xylena cineritia and Xystopepla rufago are dispersers and Pyreferra pettiti, found only once, may be as well; Xylena nupera is also a suspected disperser) including every species recorded from Wisconsin with the exception of Xylena thoracica, a northern barrens obligate. The vast majority of the fall semester records for these species were taken at the bait trail, however during the spring semester UV lights obtained a considerable number of records as well, and were especially important during parts of the spring when the bait was not very effective. Some information compiled from nightly field notes on these species is included below.

As shown in the flight season charts, many species were recorded during September a number of times, however during 1993 and 1994 these species were found in low numbers until early October. Very abruptly, on 3 October during both 1993 and 1994, these species suddenly became much more numerous as a group, with Lithophane, Eupsilia, Pyreferra, and Xylena numerous on the warmer nights. However, this pattern was altered to some extent during 1995. Some species were found in numbers during 1995 earlier than the other seasons, while others did not appear in numbers until much later. In fact, 19 October was the first night during 1995 that hibernating Cucullinids as a group were found in high numbers (unfortunately, however, due to extremely demanding academic commitments no survey was conducted from 14-18 October 1995, hence the first date of high activity could actually have been several days
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earlier), and 6 November was the only night after this date when conditions were warm enough for significant moth activity. On this date the temperature was only 36F, however it was humid with a light drizzle and Lithophane grotei, Lithophane laticinerea, Eupsilia morrisoni, and Eupsilia vinulenta were out in considerable numbers. Eupsilia tristigmata, found on many fall dates during 1993 and 1994, was surprisingly found on only one fall date during 1995. However, looking ahead to 1996 data (not yet compiled) this species was found commonly on a number of nights during the following spring.

The times when activity for these species as a group was the highest were during unseasonably warm weather during March of 1994 and 1995, in particular 11-16 March 1995 and to a lesser extent 22 March

1994. On some of these nights the temperature was in the low 60sF or 50sF after dark, and literally 15-50 individuals would be present at a time on some of the baited trees. While not all species were unusually numerous during these periods, species diversity for some nights was the highest of any time during the project. For example, on 13 March 1995, 17 species of Lithophane were found in one night and a total of 25 species of adult hibernating Cucullinids were found (the highest number of these species ever recorded on a single night in Schmeeckle Reserve). 16 March 1995 was similar, with 16 species of Lithophane recorded and a total of 24 species of hibernating Cucullinids. All the records for March of 1995 were from the bait trail (unfortunately no UV lights were run) however during 22 March 1994 lights and bait were tried but the UV lights obtained few records. Also, some species that were normally rare throughout the project were found in better numbers during the March of 1995 interval, and a similar number of records were obtained for Lithophane baileyi and Lithophane oriunda as for the entire remainder of the project. Also, this was the only time Eupsilia sidus was encountered in numbers during Schmeeckle Reserve surveys. In addition, these periods of warm weather during March were the only times Lithophane laticinerea and Lithophane grotei were found in numbers during the spring, although these species were common during part of every fall semester. It appears that if temperatures are high enough to allow for significant activity during mid March, bait is far more effective in attracting individuals of these species than during any other time of the year.

The genus Eupsilia was the most cold weather tolerant of the hibernating Cucullinid group, and when temperatures after dark were in the 30sF or 40sF Eupsilia would account for most of the hibernating Cucullinid individuals at the bait trail. However, during the fall Lithophane grotei and Lithophane laticinerea would also be found in numbers on some colds nights when the only other species found in numbers were Eupsilia, however November data showed Eupsilia morrisoni and Eupsilia vinulenta are more cold weather tolerant than these Lithophane species. As a result, Eupsilia were often found in numbers later in the fall or earlier in the spring than the other genera. Barring Lithophane laticinerea and Lithophane grotei, other species of hibernating Cucullinids were generally not found in numbers unless the temperature was at least in the mid 50sF after dark, although different species appeared to have different temperature tolerances, with Lithophane semiusta one of the least likely species to be found on cooler nights. During the fall period of high adult hibernating Cucullinid activity, for the first part of this period Lithoiphane generally accounted for the highest number of individuals, however as the fall porgressed many more Eupsilia were found than all the other genera combined.

Snow cover did seem to correlate with hibernating Cucullinid activity at the bait trail. A number of surveys were conducted on nights when part of the bait trail was densely covered with snow but other parts had substantially less snow cover, and considerably more individuals were found in the areas with less snow cover (although individuals were found in the snow covered areas as well).

Except for after periods of prolonged cold weather and inactivity, some hibernating Cucullinids were usually found if the temperature was 40F or higher after dark, however if conditions were humid with light rain individuals were found when the temperature was as low as 34F after dark, however this was not always the case.

Recommendations for Management: The integrity of the sedge meadow habitats must be retained to perpetuate populations of the wetland associated species discussed in the "Notes on Habitat Association" section. The past practice of manually cutting invading plants should be continued as opposed to burning. Burning has been documented to negatively impact lepidoptera populations in the burned areas, and because the wetlands are fairly small and the wetland species are uncommon it is unadvisable to conduct any burns in the sedge meadows. Also, I recommend against conducting burns in the open area west of the main north/south trail on the west side of the reserve near Northpoint Drive (the semi barrens area), as this
because the wetlands are fairly small and the wetland species are uncommon it is unadvisable to conduct any burns in the sedge meadows. Also, I recommend against conducting burns in the open area west of the main north/south trail on the west side of the reserve near Northpoint Drive (the semi barrens area), as this
area is also small and some lepidoptera were found more commonly here than elsewhere in the reserve. Burning only small areas at a time in the forested habitats will assure minimal impact on lepidoptera populations associated with this habitat. Finally, the divided highway going through the reserve is very brightly lit, potentially reducing the use of habitats bordering this highway by nocturnal moths (very few moths were seen flying at night in the areas brightly lit up by this highway other than a few individuals attracted to the street lights) including wetland habitat. This light pollution also impedes scientific research

in the reserve by reducing the effectiveness of UV lights used for sampling. If possible, the amount of lighting used for this road should be reduced substantially.

Disposition of Voucher Specimens: Examples of all species collected for this project have been retained in the author's personal research collection. In addition, series of specimens of some species have been deposited in the Milwaukee Public Museum and the University of Wisconsin-Stevens Point collection. An additional donation has been prepared for a yet to be determined source.

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