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Natural Heritage

PROGRESS REPORT

BASELINE DATA COLLECTION ON THE LEAF LITTER BEETLES (COLEOPTERA) AND OTHER INSECTS OF AN UNBURNED OAK WOODLAND AND RECENTLY BURNED OAK SAVANNA

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INTRODUCTION

This study was initiated as part of a co-operative project to collect pre-burn baseline information on oak woodland and savanna plant and animal communities in northeastern Illinois. The objective of this study was to collect baseline data for use in determining the effects of prescribed burning on the leaf litter beetle fauna (Coleoptera) of a degraded oak woodland (Reed-Turner Woodland Nature Preserve) and a high quality oak savanna (Middlefork Savanna). Secondary goals were to make comparison between the two areas in species composition and relative abundance of the beetles and to identify any bettles which may have a negative impact on the natural vegetation. Prescribed burning has been used as a control technique on insect pest speices (Wright, 1986). The insects must be sampled preceeding and immediately following a prescribed burn to gain information on the effects of the prescribed burning. Any effects observed would be immediate and would not necessarily give any implications as to long-term effects.

Initial sampling was completed for Reed-Turner Woodland (burned fall, 1986) and Middlefork Savanna (to be burned spring, 1987). Although the field work is finished identification of beetles and sorting of other invertebrate groups as well as analysis of data for leaf litter beetles is still in progress.

Although pitfall trapping has not been considered a good method of quantifying invertebrate population numbers (Southwood, 1966), this method may be useful in comparison of relative numbers among species within a site and between similar habitat areas (Snider and Snider, 1986). If some idea of the relative population numbers of certain species at each natural area can be gained before a burn, it would be possible to determine differences

in relative abundance of these species in the year following a burn. Follow-up studies must be done on dates corresponding to the initial study as insect population numbers are greatly affected by the seasons.

MATERIALS AND METHODS

Insects were sampled using pitfall traps along four randomly located parallel transects in Reed-Turner Woodland and two parallel random transects in Middlefork Savanna. The transects used for the insect portion of the study at Reed-Turner Woodland Nature Preserve were located one meter to the east of the permanent stratified random transects established for the vegetation sampling portion of this project. Traps consisted of smooth-sided, clear plastic, 8 ounce cups 10 cm in diameter with a 50/50 mixture of ethylene glycol (antifreeze) and water used as the killing/preserving agent. In Reed-Turner Woodland, traps were placed 10 m apart along each transect. The distance between traps at Middlefork Savanna was 5 m. Each area used 10 traps/transect. In Reed-Turner Woodland, half the traps were place in burn transects and half were placed in "non-burn" control areas. All trapping at Middlefork Savanna occurred in areas which will be burned. Cups were placed with rims level with the soil surface. Weather permitting, sampling occurred at approximately 2 week intervals throughout the summer. Reed-Turner Woodland was sampled seven times; Middlefork Savanna, five. Traps were placed in the ground during the day and collected the following day. As a result, each sampling covers a period of approximately 24 hours. Some traps were overturned/uprooted by racoons, etc. These traps were elmininated from statistical analysis.

After collecting, trap contents were strained through squares of nylon tricot, and stored in 70% ethyl alcohol (EtOH) until sorting in the laboratory.

Contents of each trap were examined under a microscope. All invertebrates were removed, labelled by transect and trap numbers, and stored in glass vials with 70% or 95% EtOH. When excessive amounts of mud and debris had entered traps, some Collembola and other microscopic invertebrates inevitably were missed in the sorting process. Initial sorting separated all adult Coleoptera which were later point-mounted or pinned as preparation for identification. Other invertebrates were grouped as insects (including Collembola) and "non-insects" and are available for further sorting and identification as time and need allow.

All adult beetles have been identified to family and, where possible, to genus and species with the aid of the research collection at the University of Wisconsin-Madison. Beetles which could not be identified to species will be sent to other taxonomists for identification during 1987.

Species composition between the two sites was compared by the Jaccard Index of Similarity: IS_J = shared species / combined total (Mueller-Dombois and Ellenberg, 1974). The diversity of beetles within each site is expressed with the Shannon Diversity Index (H) giving the observed diversity as a proportion of the maximum possible diversity (J) (Zar, 1974).

RESULTS AND DISCUSSIONS

Qualitative differences in insect species composition between oak woodland and oak savanna can be compared without complete identification since apparent species have been sorted and enumerated. The Jaccard Index of Similarity is 7.1% between the two sites. Lists of species collected at Reed-Turner Woodland and Middlefork Savanna (Tables 1 and 2) show the two sites share only four species: two are introduced European beetles (*Barypeithes pellucidus* and *Sciaphilus muricatus*); one is a common ground

beetle (Pterostichus lucublandus); one is an as yet unidentified weevil.

The four major families of beetles found in Reed-Turner Woodland were Carabidae (ground beetles), Staphylinidae (rove beetles), Scarabaeidae (scarab beetles), and Curculionidae (weevils). J is equal to 0.30. Cicindellidae (tiger bettles) Carabidae, Staphylinidae, and Curculionidae comprised the major groups at Middlefork Savanna. J is equal to 0.93. Members of all of these families are generally known from leaf-litter and other ground dwelling situations such as dung and dead animal carcasses and their prevalence is expected.

The weevil, Barypeithes pellucidus, was the most abundant beetle collected. The 381 specimens from Reed-Turner Woodland and 4 specimens from Middlefork Savanna totalled more than all other beetles combined. This beetle is polyphagous on low-growing plants; it can cause mortality when feeding on the tender bark of young seedlings of both dicotyledonous trees and conifers (Browne, 1968). Damage from this beetle has occurred on seedlings of certain pines and tamarack in Britain, and it is a general pest of forest nurseries (Browne, 1968).

Only one host plant has been documented for B. pellucidus beetle in the United States. Galford (1986) found it to be associated with dead or dying red oak (Quercus rubra) seedlings in a red oak plantation in central Ohio. He found that other than rodent damage, B. pellucidus was the only other source of seedling mortality in his sample. The possible impact of this beetle on regeneration of oaks in Reed-Turner Woodland should be examined.

To determine the effects of prescribed burning on these two areas, a follow-up study is recommended for 1987. This follow-up would replicate useful 1986 field sampling, but the final two sampling dates in late summer would be omitted. From the information given in Table 1, it is clear that the number and species of beetles collected at Reed-Turner Woodland has

dropped dramatically since early summer. Resampling during these dates would not be an efficient use of time or money. Second, by omitting these dates, time will be available to add two more sample transects at Middlefork Savanna, which was insufficiently sampled last year. In 1987, four transects will be sampled at each site on five different occasions corresponding as closely as possible to the first five sampling dates at Reed-Turner Woodland.

LITERATURE CITED

Browne, F.G. 1968. Pests and diseases of forest plantation trees: an annotated list of the principal species occurring in the British Commonwealth. Clarendon Press: Oxford. 1330 pp.

Galford, J.R. 1986. The weevil Barypeithes pellucidus (Coleoptera:Curculionidae) feeds on northern red oak, Quercus rubra, seedlings. Ent. News. 97(3):113-114.

Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley & Sons: New York. 547 pp.

Snider, R.M. and R.J. Snider. 1986. Evaluation of pit-trap transects with varied trap spacing in a northern Michigan forest. Great Lakes Entomol. 19(2):51-61.

Southwood, T.R.E. 1978. Ecological methods: with particular refernce to the study of insect populations. Wiley: New York. 524 pp.

Wright, S.L. 1986. Prescribed burning as a technique to manage insect pests interfering with oak regeneration (Ohio). Restoration and Management Notes 4(2):75.

Wright, S.L. 1986. Prescribed burning as a technique to manage insect pests of oak regeneration. In: Proceeding of Prescribed Burning in the Midwest: State of the Art. University of Wisconsin-Stevens Point.

Zar, J.H. 1974. Biostatistical anlaysis. Prentice-Hall, Inc.: Englewood Cliffs, NJ. 620 pp.

TABLE 1: Number/transect, total, and % frequency of beetles collected from pitfall traps at Reed-Turner Woodland Nature Preserve. All traps are pooled by transect for each sample date.

Sample Date:	5-30				6-13				6-28				7-11				7-25				8-22				9-9					
Transect #:	1	3	5	8	1	3	5	8	1	3	5	8	1	3	5	8	1	3	5	8	1	3	5	8	1	3	5	8	TOT	%F
Carabidae																														
Bembidion quadrimaculatum	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.4
Platynus sp.	1	2	1	3	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	2.1
Pterostichus lucublandus	1	2	1	1	1	1	-	-	1	-	-	1	2	-	-	1	1	-	-	-	-	-	1	-	-	-	-	-	14	2.9
Pterostichus sp.	-	-	-	-	-	-	-	-	-	-	-	1	3	1	-	1	-	-	-	1	1	2	-	-	-	1	-	-	11	2.3
Staphylinidae																														
Staphylinus badipes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	1	1	-	-	-	-	-	5	1.0
Unknown A	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.4
Unknown B	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	2	0.4
Unknown C	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	0.4
Unknown D	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Unknown E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Unknown F	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Unknown G	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Unknown H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	0.2
Unknown I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Unknown J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	0.2
Unknown K	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	0.2
Unknown L	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	0.4
Histeridae																														
Hister sp.	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Cantheridae																														
Unknown A	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Nitidulidae																														
Glischrochilus fasciatus	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Omosita sp.	-	1	-	-	2	2	1	1	-	-	-	-	-	-	1	-	-	-	-	1	-	-	1	-	-	-	-	1	11	2.3
Unknown A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	0.2
Coccinellidae																														
Unknown A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	0.2
Mordellidea																														
Mordellistena sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2	0.4
Tenebrionidae																														
Mercantha contracta	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	0.4
Xylopinus saperidioides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	0.2
Scarabaeidae																														
Geotrupes splendidus	2	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1.0
Onthophagus sp.	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	3	0.6
Phyllophoga balia	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Troxariolatus	-	-	-	-	-	1	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0.8
Chrysomelidae																														
Unknown A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	0.2
Curculionidae																														
*Barypeithes pellucedus	29	107	80	104	6	17	17	11	2	2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	381	78.7
Hormorus undulatus	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0.6
*Sciaphilus muricatus	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Unknown A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	0.2
Unknown B	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Unknown C	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	4	0.8
TOTAL	37	117	83	111	10	24	20	12	8	4	5	5	7	3	3	4	4	6	1	4	1	5	5	-	2	1	1	1	484	100

* European introduction

TABLE 2: Number/transect, total, and % frequency of beetles from pitfall traps at Middlefork Savanna. All traps are pooled by transect for each sample date.

Sample Date:	6-13		7-11		7-25		8-22		9-9			
Transect #:	1	2	1	2	1	2	1	2	1	2	TOT	%F
Cicindellidae												
Cicindeia sexguttata	5	-	-	-	-	-	-	-	-	-	5	9.8
Carabidae												
Pterostichus lucublandus	-	1	2	1	-	-	1	-	1	-	6	11.8
Staphylinidae												
Paedarus littoraius	1	2	-	-	1	1	-	-	-	-	5	9.8
Stenus sp.	-	-	1	-	-	-	-	-	-	-	1	2.0
Unknown L	1	-	-	-	-	-	-	-	-	-	1	2.0
Unknown M	-	-	-	-	-	-	-	1	-	-	1	2.0
Unknown N	-	-	-	-	-	-	1	-	-	-	1	2.0
Unknown O	-	-	1	1	-	1	-	-	-	-	3	5.9
Unknown P	-	-	-	-	-	-	-	-	-	1	1	2.0
Unknown Q	-	-	-	-	-	-	-	1	-	-	1	2.0
Unknown R	-	-	-	-	-	-	-	1	-	-	1	2.0
Unknown S	-	-	1	-	-	-	-	-	-	-	1	2.0
Cantheridae												
Unknown B	-	-	-	-	-	-	1	-	-	-	1	2.0
Elateridae												
Unknown A	1	-	-	-	-	-	-	-	-	-	1	2.0
Buprestidae												
Unknown A	-	-	-	-	-	1	-	-	-	-	1	2.0
Cucujidae												
Unknown A	-	-	-	-	-	-	1	-	-	-	1	2.0
Mordellidea												
Mordellistena sp.	-	-	-	-	-	2	-	-	-	-	2	3.9
Mordellistena sp.	-	-	-	-	1	-	-	-	-	-	1	2.0
Scarabaeidae												
Onthophagus hecate	-	-	1	-	-	-	-	-	-	-	1	2.0
Chrysomelidae												
Exema sp.	-	-	-	-	-	-	-	-	-	1	1	2.0
Trirhabda sp.	-	-	1	-	-	-	-	-	-	-	1	2.0
Unknown B	-	-	-	-	-	-	1	-	-	-	1	2.0
Unknown C	-	-	-	-	-	-	-	-	2	-	2	3.9
Curculionidae												
Apion sp.	-	-	-	-	-	1	-	2	1	-	4	7.8
*Barypeithes pellucidus	3	1	-	-	-	-	-	-	-	-	4	7.8
Conotrachelus anaglypticus	-	1	-	-	-	-	1	-	-	-	2	3.9
*Sciaphilus muricatus	-	-	-	-	-	-	1	-	-	-	1	2.0
	11	5	7	2	2	6	7	5	4	2	51	100

* European introduction