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Spiders Collected from Abandoned Mine Tunnels in the Ouachita National Forest

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& Culwell, Early stages of prairie restoration on a 1.5 hectare field in Faulkner Co., Ark., Proc. Ark. Acad. Sci. 36:80-81, 1982). Following a late winter burn, early spring is heralded on this prairie by the blooming of such plants as bluets (Houstonia pusila) , prairie ragwort *(Senecio tomentosus)*, Indian paintbrush *(Castilleja coccinea)*, and lance-leaved violet *(Viola lanceolata)*. Late spring produces flowers of self-heal *(Prunella vulgaris)*, Sampson's snakeroot *(Psoralea psoralioides)*, wild garlic *(Allium canadense* var. *mobilense)* and milkwort *(Polygala sanguinea)*. The profusion of spring colors subsides a bit as summer arrives with the blooming of wild petunia *(Ruellia humilis)*, hoary pea *(Tephrosia onobrychoides)* and black-eyed susan *(Rudbeckia hirta)*. Mid summer finds the more subdued rattlesnake master *(Eryngium yuccifolium)*, as well as the more stately and brilliant ironweed *(Vernonia missurica)*, button snakeroot *(Liatris pycnostachya)* and ashy sunflower *(Helianthus mollis)* in bloom. Fall colors are dominated by the white heath aster *(Aster pilosus)*, the big blue lobelia *(Lobelia puberula)* and the yellow of narrow-leaf sunflower *(Helianthus angustifolius)*. This progression of seasonal flower development will vary in years when there is less regular rainfall and periodic drought. The Figure shows seasonal flower development for most of the flowering plants exclusive of the grasses and sedges on the Nature Reserve Prairie (only *Castilleja coccinea* was introduced during restoration); timing of bloom may vary tremendously as one can note when comparing this seasonal development in 1982 with that recorded for the Roth and Konecny Prairies in 1976 (Irving & Brenholts, An ecological reconnaissance of the Roth and Konecny Prairies. Prepared for Ark. Nat. Her. Com., 1977).

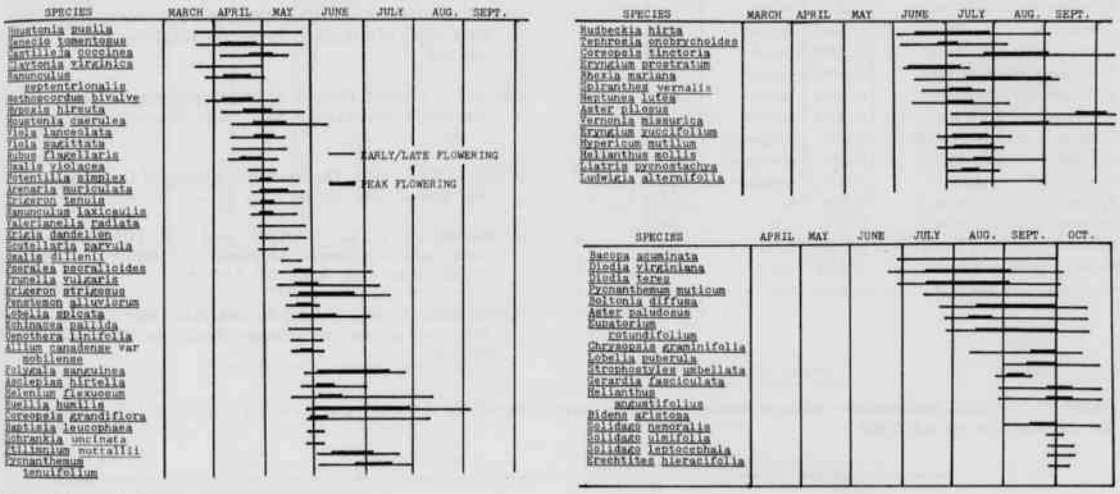

Figure. Seasonal flower development of 1982.

Restoration of the Jewel E. Moore Nature Reserve Prairie and the Prairie on Interstate 40 at Conway (Wright & Culwell, 1982) has involved mass sowing of seed. Seed of prairie species not present on the restoration sites or those present in only small numbers was collected in the fall of 1982 from Arkansas sites of railroad prairies between Hazen and Carlisle, and Conway and Mayflower. In an effort to assess what germination and growth can be expected during this growing season of 1983, germination tests were run on both stratified and unstratified seed. With the exception of five species, a four-week stratification period increased the percentage of germination of twenty species.

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SPIDERS COLLECTED FROM ABANDONED MINE TUNNELS IN THE OUACHITA NATIONAL FOREST

Although much attention has been given to the caves of Arkansas, Dunivan et al. (1982), McDaniel et al. (1979), McDaniel and Smith (1976), Grove (1974), Barnett (1970), Hubricht (1950), few scientific efforts have been made to document the fauna of mine tunnels.

In this study, six species representing four genera of spiders were collected from abandoned silver, gold and manganese mine tunnels in Garland, Montgomery and Polk counties within the boundary of the Ouachita National Forest, Arkansas, from December 1982 to March 1983 (Table). Spiders were collected from tunnels that varied from 10 to 150 meters in length, 2 to 3 meters in height and 1 to 2 meters in width. Temperatures averaged 15.5 degrees Centigrade and rarely varied. All of the tunnels contained seepage areas which provided enough moisture to maintain humidity near 100 percent and several of the tunnels received enough seepage to have small streams flowing from their entrances throughout the study period. The amount of organic debris found in these tunnels was variable, usually consisting of a small accumulation of leaves and/or crossties and wooden tunnel supports. Specimens were collected by standard methods and put directly into vials containing 70 percent alcohol and transported to the laboratory for identification.

The members of the genus *Dolomedes* are referred to as the "fishing spiders" and in each case these spiders were found where pooled water occurred in the tunnels. They were often observed poised directly above the waterline of these pools and were apparently catching aquatic insects which were seen utilizing pool areas. These spiders do not construct webs.

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Achaearanea and *Prolinyphia* species are web builders that were found hanging in their webs at the top and along the walls of the tunnels apparently trying to trap small flying insects. Specimens of *Achaearanea porteri* (Banks) collected during this study represent the only known localities for this spider from the Ouachita Mountain area and only the second collection of this species in the state. Interestingly, the only other report of this spider from Arkansas was by Barnett (1970) who found this species utilizing similar habitat within Mansell Cave in Randolph county.

Members of the genus *Amaurobius* were found primarily under stones and in rock fissures or wall crevices. Dark areas of the tunnels near the entrances were preferred. Specimens of *Amaurobius ferox* (Walckenaer) collected during this study represent a new state record.

Assistance from Darrell Heath and Teresa Beggs in collecting specimens is gratefully acknowledged.

Table. Data concerning spider collections from mine tunnels.

Taxon	Date	County	Distance in Meters From Entrance
Amaurobius ferox (Walck.)	12/20/82	Garland	0-8
Dolomedes vittatus (Walck.)	1/08/83	Polk	0-8
Achaearanea porteri (Banks)	1/18/83	Garland	0-8
Amaurobius ferox (Walck.)	2/20/83	Garland	17-50
Prolinyphia marginata (Koch)	2/20/83	Garland	0-8
Achaearanea porteri (Banks)	2/20/83	Garland	0-8
Achaearanea tepidariorum (Koch)	2/20/83	Garland	0-8
Achaearanea tepidariorum (Koch)	2/20/83	Montgomery	0-8
Dolomedes vittatus (Walck.)	2/20/83	Montgomery	0-20
Amaurobius ferox (Walck.)	2/20/83	Montgomery	0-50
Dolomedes vittatus (Walck.)	2/12/83	Polk	0-50
Dolomedes vittatus (Walck.)	2/12/83	Polk	0-50
Dolomedes tenebrosus (Hentz)	3/26/83	Polk	0-10
Dolomedes vittatus (Walck.)	3/26/83	Polk	0-10
Amaurobius ferox (Walck.)	3/26/83	Polk	0-10

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FLAT PLATE SOLAR THERMAL COLLECTORS: A COMPARISON OF EFFICIENCIES OF VARIOUS COLLECTOR CONFIGURATIONS

In a previous study, collectors were installed vertically in a south-facing single glazed laboratory window. The dual functions were as a thermal solar collector and as an insulator for the window. Results included an energy saving from the insulation property of approximately 19 dollars per year and an experimental solar energy collection income of approximately 2 dollars per year (Eichenberger, Energy Conv. & Mgt., 20:197-199, 1980).

The purpose of this study was to compare the efficiencies, energy collected, and construction cost for various practical collector configurations and materials.

The inside configuration and materials used in converting solar radiation to heat energy were varied for comparison. Cover plate materials were also varied for comparison. Materials tested were relatively inexpensive building materials suitable for self-construction and installation. The material cost per thermal power delivered (watt) was also calculated since this is an important consideration in solar utilization.

Two solar collectors were constructed to provide a side-by-side test situation. The collectors were both 1.22 meter by 1.22 meter outside dimensions. One collector served as the control and the other as the experimental model on which the internal material and cover plates were changed. Solar insolation was measured with a meter which was calibrated using a reference source on the same date and time and extrapolated for the same latitude (Anderson, Solar energy; fundamentals in building design, p. 292, 1977). Each collector was fitted with an electric blower rated at 16 watts and 0.99 cubic meter per minute of free air; it delivered a measured 0.42 cubic meter per minute of air flow when connected to the collector. The flow rate of the blower was measured with a Dwyer flow meter. This measured rate was compared with a mechanical anemometer and a fan. Results of the two flow rate measurements were with 5%. Ambient temperatures and output air temperatures were measured. Heat delivered was calculated and the input solar energy was measured with the meter and used in calculating the efficiencies.

In the first stage of the experiment, both collectors were fitted with identical double glaze polycarbonate covers. The inside absorber configurations were changed for comparison of efficiencies and thermal power produced. The control collector had aluminum screen placed 2.5 centimeters above a styrofoam insulation board in the back. Both the aluminum screen and the insulation board were painted flat black with inexpensive carbon and silicate-based paint. Air was forced from the back through the screen toward the cover plate, and then pulled back through the screen absorber by a fan and a baffle and out the back (see Fig. 1). The experimental collector was also fitted with a 2.5 centimeter thick styrofoam insulation panel covering the back. Then 2.5 centimeter high styrofoam channels were attached to the insulation board. These channels were designed to produce a serpentine air flow across the collector (see Fig. 2). The entire board and channels were covered with aluminum foil and

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