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Abstracts

- **Odor as a Factor in Nut Discovery by Fox Squirrels.** John Luft, Joseph Malinowski, John Briggs, and Christopher Smith, Division of Biology, Kansas State University, Manhattan, Kansas 66506.

Walnuts and bur oak acorns were buried in alternate positions in a 10-x-10 grid in a riparian forest with 10-m spacing between nuts. Bur oak acorns soaked in walnut extract and walnuts were buried in a second grid of similiar spacing.

Fox squirrels removed walnuts fastest and at the same rate in both grids, whereas acorns soaked in walnut extract were removed faster than unsoaked acorns but slower than walnuts. In the light of earlier studies, these observations are interpreted as showing that squirrels can smell buried walnuts from a greater distance than buried acorns.

- **Photoperiod Influences Vegetative Growth of *Heuchera* Cultivars (Saxifragaceae).** M.L. Albrecht and Delores M. Crockett, Department of Horticulture, Forestry and Recreation Resources, Waters Hall, Kansas State University, Manhattan, Kansas 66506-4002.

Heuchera sanguinea Engelm. 'Torch', 'Firefly', and *H. micrantha* Dougl. ex Lindl. 'Palace Purple' were studied to examine the influence of photoperiod and cold temperature storage on vegetative and reproductive growth. Petioles were longer and total leaf area was greater when plants were grown under a 15-h photoperiod than under a 9-h photoperiod. There was no photoperiod x plant maturity interaction with regards to reproductive growth. Plants held in a 7°C night greenhouse flowered sooner than those stored in a constant 4°C cooler. Mature plants produced more inflorescences and flowered earlier than young plants. Storage in the cooler had a detrimental effect on the number of florets per inflorescence of 'Palace Purple' plants. 'Torch' plants produced significantly more inflorescences per plant when held in the cold greenhouse before forcing. More vegetative growth occurred under long photoperiods greater than 12 hours. Long days of 15 h accelerated flowering after exposure to cold storage.

- **Crayfish Species from Creeks and Rivers of Cherokee County, Kansas.** Francis Earl Durbian III, Benjamin J. Frey, and Dwight W. Moore, Schmidt Museum of Natural History and Division of Biological Sciences, Emporia State University, Emporia, Kansas 66801.

Crayfish were collected from 24 of 28 creek and river sites sampled in Cherokee County, Kansas, during the summer 1991. A total of 894 individuals representing two species, *Orconectes virilis* and *Orconectes neglectus*, was collected. *Orconectes neglectus* is present only in the Spring River and its tributaries in the extreme eastern part of the county, whereas *O. virilis* occurs throughout the county, except on the Ozark Plateau in the extreme southeastern corner of the county. Both species are abundant in a majority of the sites where present and are represented by healthy populations.

- **Metal Pollution Associated with a Landfill: Concentrations in Water, Sediment, Crayfish, and Fish.** James R. Morrissey and David R. Edds,

Division of Biological Sciences, Emporia State University, Emporia, Kansas 66801.

Water, sediment, crayfish (*Orconectes nais*), and orangespotted sunfish (*Lepomis humilis*) samples from four sites in the vicinity of a Lyon County, Kansas, landfill were analyzed for total recoverable Pb, Cd, Al, Zn, and Cu. Analytical data provided no evidence that the landfill is a source of metal contamination for water, crayfish, or fish. However, concentrations of Pb, Cd, Al, Zn, and Cu in sediment were significantly higher immediately downstream from the landfill than upstream.

- **Timing and Magnitude of Changes in Runoff for Kansas Watersheds, 1940-1990.** John R. Ratzlaff, Department of Geosciences, Fort Hays State University, Hays, Kansas 67601.

The hydrology of many watersheds in Kansas has changed within the past 30-35 years. Mass and double-mass diagrams of hydrologic data indicate that watersheds began to adjust to different environmental conditions in the late 1950s and continued throughout the 1960s. Comparison of long-term mean annual runoff between a 19-year period prior to 1959 and a 20-year period after 1970 for 27 watersheds throughout Kansas illustrates the magnitude and spatial distribution of change. With respect to the older comparison period, runoff for watersheds in western Kansas during the recent period has declined from 42 to 93 percent; in central Kansas, runoff is generally ± 20 percent of the amount during 1940-1958; and runoff for eastern Kansas watersheds has increased by as much as 52 percent. Comparison of mean annual precipitation amount shows only slight differences between the two comparison periods.

- **Numbers and Extent of Black-Tailed Prairie Dog Towns in Kansas.** Jennifer L. Vanderhoof and Robert J. Robel, Division of Biology, Kansas State University, Manhattan, Kansas 66506-0802.

A survey was conducted in 1992 to determine the number and extent of black-tailed prairie dog (*Cynomys ludovicianus*) towns in Kansas. Feed grain aerial transparencies made for the Agricultural Stabilization and Conservation Service (ASCS) were examined for evidence of prairie dog towns in 60 counties across the range of prairie dogs in Kansas. Ground truthing a portion of the sites identified as prairie dog towns determined the accuracy of the technique and was the basis for estimating the numbers of prairie dog towns and areas they occupy in each of the counties. These efforts, plus data from a 1990 survey of prairie dog towns in 8 counties, determined that approximately 1017 prairie dog towns covering 18,843 ha existed in Kansas during 1990-1992. Suggestions are

provided for conducting future surveys of prairie dog towns using ASCS feed grain transparencies.

- **Size and Location of Black-Tailed Prairie Dog Towns in Meade and Gray Counties, Kansas.** Kenneth L. Powell and Robert J. Robel, Division of Biology, Kansas State University, Manhattan, Kansas 66506-4901.

We conducted a survey in 1990 to determine the number, locations, and sizes of black-tailed prairie dog (*Cynomys ludovicianus*) towns in Gray and Meade counties in Kansas. We located 16 prairie dog towns in Gray County covering 533 ha and 47 towns in Meade County covering 1039 ha. The largest prairie dog town in Gray County covered 138.5 ha whereas, the largest in Meade County covered 202.3 ha. This survey provides baseline data against which results of future prairie dog surveys can be compared.

- **Mineral Springs and Well Waters of Eastern Kansas and Their Relation to the Geothermal Field.** A. Förster,¹ D.F. Merriam,² and R.J. Sampson²

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²Kansas Geological Survey, The University of Kansas, Lawrence, Kansas 66047.

In Kansas, geothermal data in the sedimentary cover were measured and preliminarily interpreted within the scope of different studies. Based on this knowledge, we looked for additional information from other data sources that are available but not checked. Mineral waters from springs and wells recorded at the turn of the 20th century and a map of geothermal gradients based on BHT values were considered and checked using trend analysis. The results are related to a 2-D temperature depth model computed on two cross sections in the area. On the basis of this model and on BHT depth plots, it can be determined that the BHT gradient map can lead to misinterpretation of the geothermal field. Because of the use of uncorrected BHT values in computing the gradients, in the situation of the Ozark Dome, too high gradients compared to the actual temperature conditions are indicated; conversely in the Hugoton Embayment, the gradients seem to be too low. The spring and water well data set shows only that there is a general temperature increase with depth. However, the relation of temperatures to stratigraphic units can be described in the context of the two regional water-flow systems in southeastern Kansas. Additional geothermal, geochemical, and hydrological data are necessary to confirm our preliminary interpretations.

- ***Gossypianthus tanuginosus* (Poir.) Moq. in A.DC. (Amaranthaceae) in Kansas.** Mike D. Proctor and Robert A. Nicholson, Fort Hays State University, 600 Park, Hays, Kansas 67601.

Specimens of cottonflower (*Gossypianthus lanuginosus*) were acquired in 1990 from southeastern Sumner County, Kansas. This acquisition documents a probable northward range extension of the otherwise widely distributed taxon. Plants were growing on salt-affected soils (slick spots), which supported little other plant life.

- **Development and Testing of Cultivar-Specific Tillering Coefficients for Sorghum.** A. Coulibaly and R.L. Vanderlip, Agronomy Department, Kansas State University, Manhattan, Kansas 66506-5501.

Tillering is an important yield component of grain sorghum [*Sorghum bicolor* (L.) Moench]. Temperature greatly influences tillering, and variability occurs among cultivars. Growth rate has been used to describe mathematically cultivar tillering abilities for a range of environments. Our objectives were to develop tillering coefficients for a range of temperate and tropical grain sorghum cultivars and to test the accuracy of these coefficients in predicting productive tiller numbers using independent field data. Eight grain sorghum cultivars of temperate (DK 39Y, DK 46, RS 610, and Pioneer 8500) and tropical adaptation (AT x 623 x RT x 430, DK E57, Segalane, and CSM 63) were grown in a growth chamber at Manhattan under three day/night temperature regimes (20/15°C, 25/20°C, and 30/25°C) to determine the relationship between dry matter required per tiller and daily minimum air temperature. Field experiments at St. John and Manhattan were used to determine the effects of dates and rates of planting on tillering of the same cultivars. The results were used to evaluate the accuracy of the tiller dry matter requirements. Growth chamber results showed that the number of tillers was related linearly to daily rates of dry matter accumulation per plant. These dry matter requirements per tiller were related linearly to daily minimum air temperature, with differences among cultivars. Predicted number of productive tillers per plant was approximately 7 to 12 times actual tiller numbers in the field experiments. This was accounted for by low cultivar-specific tillering coefficients, which were not representative of the dry matter requirement of productive tillers.

- **Reproductive Traits of the Neosho Madtom, *Noturus placidus* (Pisces: Ictaluridae).** Darrin G. Pfingsten and David R. Edds, Division of Biological Sciences, Emporia State University, Emporia, KS 66801.

Reproductive traits of the Neosho madtom, *Noturus placidus*, were studied in the Neosho River in east-central Kansas, and in static and flow aquaria from May through July 1992. Artificial substrata were placed in riffle and pool areas of the Neosho River, and in simulated riffle and pool environments in our laboratory. On 13 July, a clutch of 63 eggs was discovered under a cinder block in the flow aquarium at water temperature 26.5°C. Observations were made of habitat and substrate utilization by nesting adults, and morphological and developmental characteristics of breeding adults and their eggs.

- **Dielectric Characterization of Cosolvents Containing N, N-dimethylformamide.** Orland W. Kolling, Natural Science Division, Southwestern College, Winfield, Kansas 67156.

Four binary solvent systems were investigated which contain N, N-dimethylformamide (DMF) as the aprotic highly dipolar component in common. These were: DMF-acetone, DMF-acetonitrile, DMF-tetrahydrofuran, and DMF-1, 2-dimethoxyethane. The trends in the dielectric constant data for the cosolvent pairs were compared in terms of the shifts in the Kirkwood-Onsager and Block-Walker reaction field parameters with changing solvent composition. Two situations showing some of the characteristics of dielectric continua were identified.

- **Mean Annual Precipitation, Runoff, and Runoff Ratio for Kansas, 1971-1990.** John R. Ratzlaff, Department of Geosciences, Fort Hays State University, Hays, Kansas 67601.

The term, runoff ratio, is the percent of drainage basin precipitation that becomes streamflow. The isoline map of runoff ratio is based on isoline maps of mean annual precipitation and runoff. Intersections of runoff isolines and isohyets define runoff ratio data points. Maps of all three hydrologic elements are characterized by isolines that trend primarily north-south and by numerical values with strong east-west gradients. Runoff ratio ranges from 0.1 percent in extreme western Kansas to 35 percent in southeastern Kansas. Runoff ratio is a function of the interactions among precipitation, evapotranspiration, slope, soil characteristics, and land use/land cover.

- **Surface Burrow Densities in a Sample of Black-Tailed Prairie Dog Towns in Gray and Meade Counties, Kansas.** Kenneth L. Powell and Robert J. Robel,¹ Division of Biology, Kansas State University, Manhattan, Kansas 66506-4901.
Kenneth E. Kemp, Department of Statistics, Kansas State University, Manhattan, Kansas 66506-0802.

M. Duane Nellis, Department of Geography, Kansas State University, Manhattan, Kansas 66506-0801.

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We conducted surveys on sites (towns) of 27 individual colonies of black-tailed prairie dogs (*Cynomys ludovicianus*) in southwestern Kansas to determine burrow-entrance densities. Mean size of the prairie dog towns surveyed was 16 ha. Estimated mean active burrow-entrance densities were 206/ha, higher than reported for Colorado, Oklahoma, Wyoming, New Mexico, and South Dakota. Active prairie dog burrow-entrance densities are among the criteria used to select reintroduction sites for black-footed ferrets (*Mustela nigripes*) potentially making the existence of towns with high burrow-entrance densities in Kansas of interest for such efforts if other reintroduction criteria can be met.

- **The Ranque Vortex Effect in a Rotating Plasma.** R. Jones, Physics Department, Emporia State University, Emporia, Kansas 66801.

The Ranque-Hilsch vortex tube effect is observed in a rotating magnetoplasma.

- **Allozyme Variation in a Solitary Sweat Bee.** E. William Schweiger, Marla Downing, and Tom Guilfoyle, Department of Systematics and Ecology, University of Kansas, Lawrence, Kansas 66045-2106.

Our present understanding of the population structure and biology of *Nomia triangulifera*, a solitary halictine sweat bee, suggests that genetic variability should exist, however we determined that eight allozyme loci were monomorphic both within a nesting site and among five discrete populations. Further study may reveal that polymorphisms exist at other loci, or that populations have sufficient gene flow between them to preclude variability. *Nomia triangulifera* may have low levels of polymorphisms because of haplodiploidy, reduced effective population size, or from occupying homogeneous niches which tend to produce selection pressures favoring monomorphism.

- **Solvatochromic Response of an Aminobenzoxazinone in the Visible Region.** Orland W. Kolling, Natural Science Division, Southwestern College, Winfield, Kansas 67156.

The bathochromic spectral shift by one of the aminobenzoxazinones, that is 7-dimethylamino-3(4-dimethyl aminostyryl)-1, 4-benzoxazin-2-one, (BOZNMe₂) has been measured in 21 nonaqueous solvents. For BOZNMe₂ in nonpolar and polar aprotic and hydrogen bonding solvents, the solvatochromic response of

the solute conforms exactly to the requirements of the Kamlet-Taft linear solvation free energy model of solvent-solute interactions. Likewise, it follows the generally parallel predictions of a molecular orbital interpretation of the reaction field effects as well.

- **Vitrinite Reflectance of Pennsylvanian Coals in Southeastern Kansas as a Measure of Depth of Burial.** Wolfgang Scherer and Daniel F. Merriam, Intevp, SA, P.O. Box 76343, Caracas, Venezuela and Kansas Geological Survey, The University of Kansas Lawrence, Kansas 66047.

Vitrinite reflectance was measured on coal samples from eight Pennsylvanian stratigraphic units from the Bluejacket Coal (Cherokee Group, Desmoinesian) to a coal in the West Branch Shale (Admire Group, Virgilian). A depth-burial gradient of 0.206% km was computed using these data. This value was extrapolated to the surface and it was determined that for Chautauqua County in southeastern Kansas, approximately 1750 ft. of overburden has been removed.

- **Plasma Heating with Electrically Biased Plasma Guns.** R. Jones, Physics Department, Emporia State University, Emporia, Kansas 66801.

Electrically biased plasma guns firing across the magnetic field are an effective way to heat a magnetically confined plasma.

- **Effect of Sodium on Seed Choice by Deer Mice, White-footed Mice, and Hispid Cotton Rats.** Elly L. Rustiati and Donald W. Kaufman, Division of Biology, Kansas State University, 232 Ackert Hall, Manhattan, Kansas 66506-4901.

Effect of sodium content on seed use was tested for deer mice (*Peromyscus maniculatus*), white-footed mice (*P. leucopus*), and hispid cotton rats (*Sigmodon hispidus*) using sodium-enriched pearled barley seeds (*Hordeum vulgare*). Each trial included the choice of four types of barley seeds [1.6 (control), 4.8, 7.1, and 16.8 mg sodium/g seed]. Seed use by deer mice and white-footed mice differed with sodium concentration but was not affected by locality (eastern versus central Kansas) or gender. In contrast, seed use by cotton rats was not influenced by sodium content and, although seed use differed between males and females (females tested were larger than the males), relative use of seed types was not affected by gender. Average sodium concentration of seeds used did not differ with locality or gender for either deer mice or white-footed mice, or among deer mice (6.6 mg/g), white-footed mice (5.6 mg/g) and cotton rats (6.2 mg/g).

- **Natural History Observations of the Spider, *Pisaurina dubia* (Hentz) (Araneae: Pisauridae), in Northeastern Kansas.** Hank Guarisco, Snow Entomological Museum, University of Kansas, Lawrence, Kansas 66045.

Information concerning habitat, fecundity, and phenology of the nurseryweb spider, *Pisaurina dubia*, in northeastern Kansas is presented. The nurseryweb spider of this species is described for the first time.