

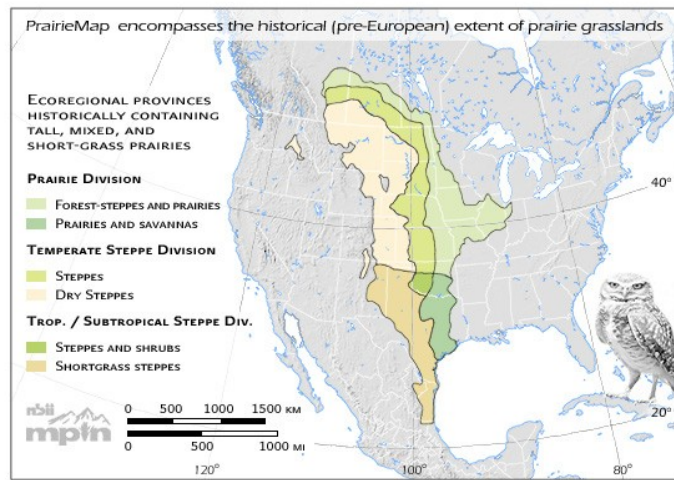
From Hilltops to Swamps: Insects in Missouri's Rarest Prairies

Ted C. MacRae

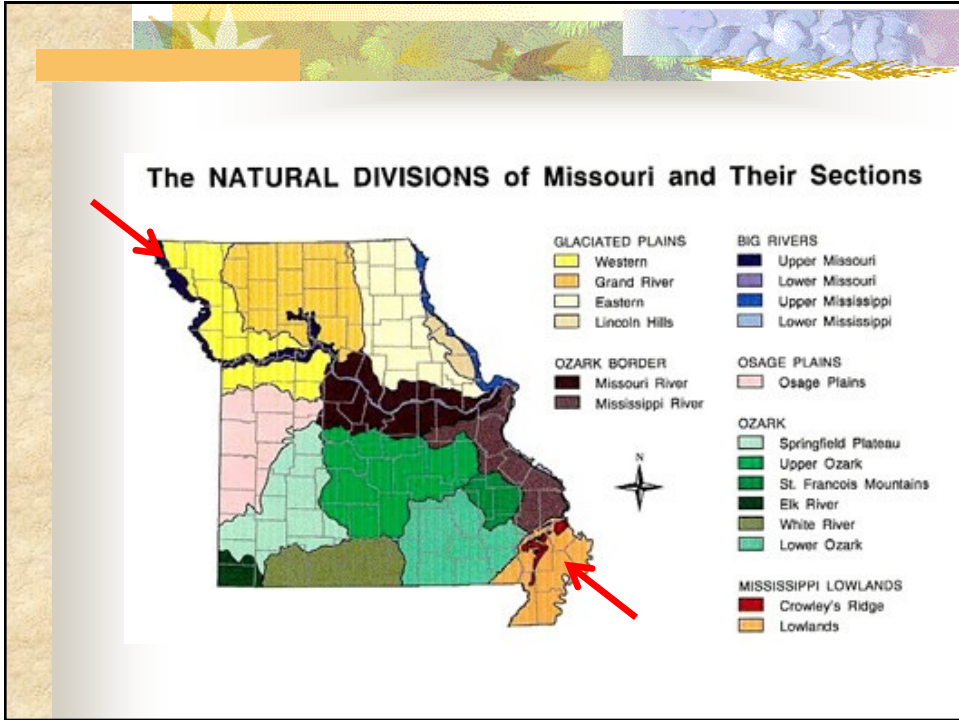


Missouri Master Naturalists
Confluence Chapter
9 December 2014

Missouri: where forest yields to prairie



Adapted from: Ecoregions of the United States. (map). 1994. Washington DC: USFS. 1:7,500,00. By Robert G. Bailey.

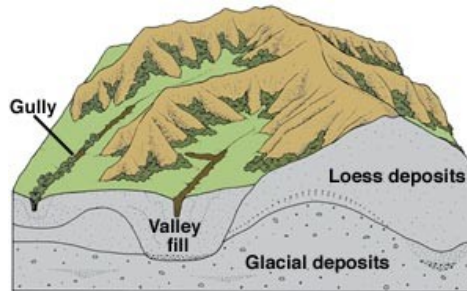


The Loess Hills

"The term Mountains in Miniature is the most expressive one to describe these bluffs. They have all the irregularity in shape, and in valleys that mountains have, they have no rocks and rarely timber."

Thaddeus Culbertson, missionary, 1852

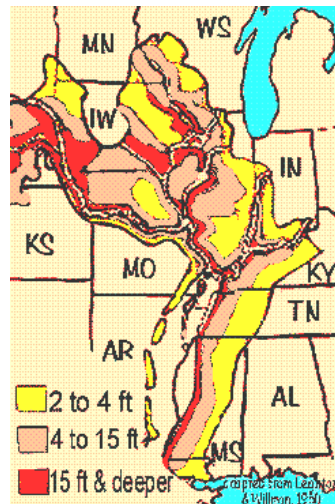
Loess Hills structure



Block diagram of the present landscape of the Loess Hills showing features above and below the surface. Adapted from Landforms of Iowa, Jean C. Prior, Geological Survey Bureau, Iowa Department of Natural Resources. (University of Iowa Press, Iowa City, 1991). Illustration by Patricia J. Lohmann, p. 49.

The Loess Hills are a unique landform

- The Loess Hills formed during the glacial advances of the Pleistocene epoch (2.5 million to 10,000 years ago)
- Loess soil is common. However, only along the western edge of Iowa and northern Missouri are loess deposits deep enough and extensive enough to obliterate any influence by the underlying bedrock and dictate the form of the landscape.



Loess Hill boundaries

- Stretches 200 miles north and south, only 3-10 miles wide
- Western boundary sharply delimited by the Missouri River valley (now halted by channelization of the river)
- Eastern boundary harder to delimit – dependent of depth of loess deposits (minimum thickness of 60 feet)
- Southern terminus in Missouri is the most arbitrary boundary – deep loess deposits in discontinuous patches



Why are the Loess Hills special?

- Shaped over the past 10,000 years by wind and water
- Due to the unique physical properties of loess soil
 - Glacial “flour” – homogeneous, fine-grained, quartz silt
 - Fine-grained and cohesive
 - Natural tendency to slump and sheer in vertical planes
- Ecotonal position results in dynamic balance between forest and prairie
 - North-south gradient - temperature & moisture
 - East-west gradient – forest versus prairie biomes
- Valleys and north/east facing slopes favor woody plants
- Hilltops and south/west facing slopes create xeric conditions – favored by prairie plants

“A sharp, angular, corrugated landscape”



Loess hilltop prairies in Missouri

- Restricted to Atchison and Holt Counties in extreme northwestern corner
- Discontinuous patches of deep loess terrain occur as far south as Kansas City, but dry hilltop prairies, common in the north, are gradually replaced by woodland in the south and disappear completely just north of St. Joseph.



Prairie plants in the Loess Hills



White prairie clover, *Dalea candida*



Purple prairie clover, *Dalea purpurea*

Milkweeds in the Loess Hills



Green milkweed, *Asclepias viridiflora*



Whorled milkweed, *Asclepias verticillata*



Common milkweed, *Asclepias syriaca*

Shrubs in the Loess Hills



Lead plant, *Amorpha canescens*

Insects in the Loess Hills



- Snakeweed grasshopper, *Hesperotettix viridis*
- Prairie May beetle, *Phyllophaga lanceolata*
- Common milkweed beetle, *Tetraopes tetraphthalmus*



More Insects in the Loess Hills



- Longhorned beetle, *Typocerus octonotatus*
- Jewel beetle, *Acmaeodera pulchella*
- Common claybank tiger beetle, *Cicindela limbalis*



Hypsithermal relicts

- Relicts from hypsithermal period that began 9,000 yrs ago
- Include skeletonweed (right) and soapweed yucca (*Yucca glauca* var. *glauca*)
- More than a dozen plant species occurring in Missouri's dry loess prairies are listed as species of conservation concern
 - Reptiles - Great Plains skink
 - Mammals - Plains pocket mouse
 - But no insects!
- Considered endangered due to great rarity of dry loess prairie



Skeletonweed, *Lygodesmia juncea*

A Possible Insect Candidate?

Antistrophus lygodesmaepisum, a cynipid gall wasp



Other Possible Insect Candidates?



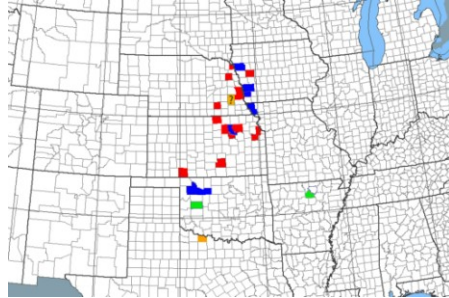
Robber fly, *Ospricerus abdominalis*



A prairie-obligate cicada, *Beameria venosa*

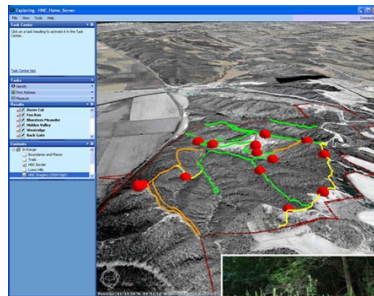
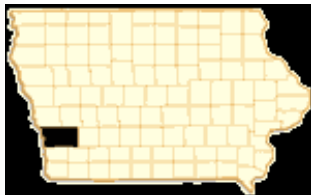
Cicindela celeripes – swift tiger beetle

- One of North America's rarest tiger beetles
- Recorded only from the eastern and southern Great Plains
- Adults are flightless
- Flint Hills population remains strong, other populations have suffered severe declines
- Apparently extirpated from Nebraska
- Recently found in the Loess Hills in Iowa
- New populations found Oklahoma & Missouri



Hitchcock Nature Center

- *Cicindela celeripes* discovered at Hitchcock in early July 2008



Hitchcock Nature Center

- Acquired by Pottawattamie County in 1991
- Harbors some of the largest remaining prairie remnants in Iowa
- Previously grazed
- Woody growth removed using mechanical removal and rotational burns



Cicindela celeripes habitat

“That’s tiger beetle land down there!”



“I thought I saw something flash across a bare patch out of the corner of my eye - was that it?”

Cicindela celeripes

“Within a few more minutes I saw the flash again - this time there was no doubt as to what it was”



“I started slapping the ground frantically as the little guy darted erratically under, around, and over my hands.”

Cicindela celeripes adult female with egg

“I was simultaneously exuberant at having succeeded in finding it, utterly astounded by its speed and evasiveness, and desperately afraid that it was getting away - swift tiger beetle, indeed!”



Finding *C. celeripes* in Missouri

- Intensive surveys conducted in northwest Missouri during June 2009
- Apparent need for large expanses of open habitat
 - Flightlessness limits dispersal capabilities and increases chances of localized extinctions in small parcels
 - Needs disturbance?
- Found at three localities:
 - Brickyard Hill
 - Star School Hill Prairie
 - McCormack Loess Mounds
- Used Google Maps to identify most suitable microhabitats within parcels
- Repeated visual searches by day



Photo © Christopher R. Brown 2008

Missouri Habitats for *C. celeripes*



- Brickyard Hill Loess Mounds Natural Area
- Star School Hill Prairie Natural Area
- McCormack Loess Mounds Natural Area

Not all Loess Hilltop Prairies support *C. celeripes*!



A sampling of *C. celeripes* populations



 MOVIE
P1030244.MOV

a. Iowa (Hitchcock Preserve); b–c. Oklahoma (Alabaster Caverns); d. Missouri (Brickyard Hill).

Sand Prairies of southeast Missouri

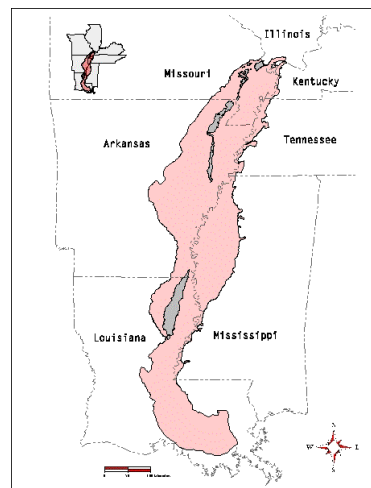
"Southeast Missouri receives more rain than any other part of the state, but it also harbors the rarest of dry habitats--sand prairies."

A.J.Hendershott, 2004



Sand prairies in Missouri

- Sand prairies are scattered throughout Missouri
- Occur primarily in the Mississippi Alluvial Plain, the northern tip of which extends into extreme southeastern Missouri
- Two main sand ridges – Sikeston Sand Ridge and Malden Sand Ridge
- Only the Sikeston Sand Ridge still contains significant sand prairie remnants



Sand prairie plants - summer



Camphorweed, *Heterotheca camporum* or *subaxillaris*



Plains puccoon, *Lithospermum carolinense*



Spotted beebalm, *Monarda punctata*

Milkweeds in the sand prairies



Clasping (sand) milkweed, *Asclepias amplexicaulis*



Green milkweed, *Asclepias viridiflora*



A milkweed beetle – *Tetraopes quinquemaculatus*



Sand prairie plants - autumn



Splitbeard bluestem,
Andropogon ternaries



Small southern jointweed, *Polygonella americana*



Butterfly pea, *Clitoria mariana*

Sand prairies in autumn

“Seas of verdant green morph to muted shades of amber, tawny, and beige”



Charleston Church Camp, September



Charleston Church Camp, October

My able assistant!



Tiger beetles of the sand prairies

- Big Sand tiger beetle
Cicindela formosa
- Oblique-lined tiger beetle
Cicindela tranquebarica
- Twelve-spotted tiger beetle
Cicindela duodecimguttata



“All the better to see you with, my dear”





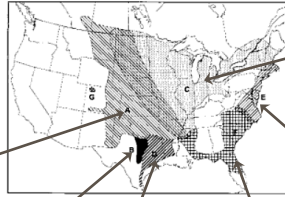
The big sand tiger beetle is one of my favorite tiger beetles in Missouri



Photo by Mathew Brust

Ellipsoptera lepida (ghost tiger beetle)
Only “all white” species in Missouri

Cicindela scutellaris – festive tiger beetle North America's most polytopic species of tiger beetle



Map 43 Festive Tiger Beetle, *Cicindela* (*Cicindel*)
scutellaris; A, *C. s. scutellaris*; B, *C. s. flavoviridis*;
C, *C. s. lecontei*; D, *C. s. rugata*; E, *C. s. rugifrons*;
F, *C. s. unicolor*; G, *C. s. yampae*.



Cicindela scutellaris – an intergrade population



Other sand prairie insects



Bembix americana (Crabronidae)



Stichopogon trifasciatus (Asilidae)



Chelinidea vittiger (Coreidae)



Ammophila procera (Sphecidae)

Sand loving neuropterans



Ascalaphidae (owflies), *Ululodes macleayanus*



Myrmeleontidae (ant lions), *Myrmeleon* sp.

Dusky hog-nosed snake

- Only recently (2004) discovered in the southeast Missouri
- Critically imperiled in the state due to the near complete destruction of its sand prairie habitat
- Disjunct from the main population further west
- Continued survival depends upon the survival of these small sand prairie remnants



An anthropogenic landscape?

- Native Americans regularly cleared and burned the land - without such intervention, would sand ridge communities remained sand woodlands and forests?
- Does not explain the presence of rare sand prairie endemics that do not occur in the sand woodlands
- Have not succeeded back to sand woodland despite 150 years of post-settlement fire suppression



Restoration efforts are underway

- Originally, as much as 150 to 175 square miles of sand prairie occupied the sand ridges.
- Today less than 2,000 acres remain (not even 1% of the original amount)
- Relicts likely represent the sandiest (and driest) examples of the original sand prairie
- Rotational burns being used to promote native vegetation
- Continued threats:
 - Invasion by exotics
 - Abuse by ATVs



Acknowledgment

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- Field companions
 - Richard Thoma & Madison MacRae
- Thanks also to land stewards at Hitchcock Nature Preserve and Missouri Department of Conservation for granting access.

Thanks! Questions?



Beetles in the Bush

See more of my
photographs at:

Beetles in the Bush

<http://beetlesinthebush.wordpress.com>

(just Google it!)