

Flitting With Disaster

HUMANS AND HABITAT ARE KEYS TO OUR STATE BUTTERFLY'S FUTURE

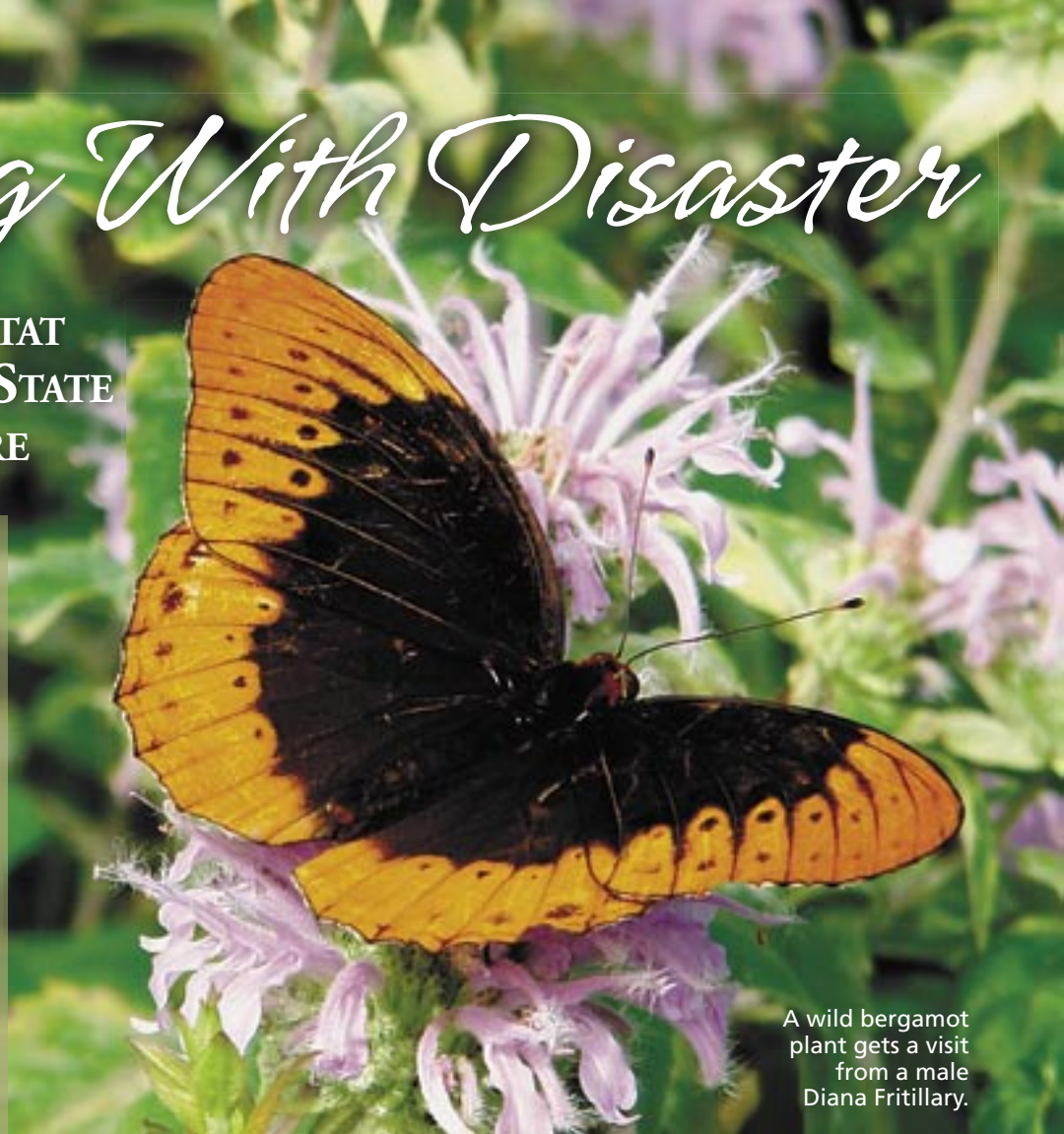
Who was thinking about habitat when Gov. Mike Beebe signed House Bill 1005 Feb. 28?

The Diana fritillary became the state butterfly that day, which is all well and good, but Dianas – like elk, turkeys, bass and bears – need habitat.

William Baltosser knows a little about butterfly habitat.

He's a professor in the

University of Arkansas at Little Rock biology department who's studying the population, habitat and genetics of the Diana fritillary and the great spangled fritillary, two large, colorful butterflies. His work is part of and partially funded through the Arkansas Wildlife Action Plan. Each state has developed such a plan – known as comprehensive wildlife conservation strategies – to address the status of wildlife and habitat.



A wild bergamot plant gets a visit from a male Diana Fritillary.

ARTICLE AND PHOTOGRAPHS BY WILLIAM BALTOSSER, PH.D.

My interest in butterflies began many years ago while I was making a collection for a zoology course. When I finished the class, I spent two weeks in Mexico collecting numerous tropical species, some of which were quite impressive.

I became more fascinated when I was hired to backpack the Gila Wilderness of southwestern New Mexico for a summer, to search for peregrine falcons and to inventory butterfly species. I was about to enter graduate school and was seriously considering studying the Nokomis fritillary. This butterfly is rare, sexually dimorphic (males and females do not

resemble one another) and found in the mountains not far from my hometown.

Although I chose to study birds in graduate school, I maintained a strong interest in butterflies, especially those of the *Speyeria* genus. They are ecologically and evolutionarily interesting, and they have become politically important because of their shrinking

A female Diana fritillary, with wings folded, feeds on field thistle, a plant critical to the butterfly's survival.



population.

This current investigation of the Diana fritillary, which in many respects is an eastern counterpart to the Nokomis fritillary, will tell us more about its distribution, abundance, genetics and habitats in Arkansas. I visited places where the Diana historically occurred, searched for new areas where they occur and tagged butterflies in other areas.

The results will help resolve the status of the species in the state, aid conservation efforts and provide guidance for the management of the Diana.

Two Worlds

The Diana fritillary is split into two geographically defined populations. One lives among the Appalachian

Mountains in the eastern U.S. and the other lives in the Ouachita and Ozark mountains of Arkansas and extreme eastern Oklahoma. This is an interesting aspect of the study because of the genetics of the two groups. My colleague, John M. Bush, and I are studying the genetics of various samples from throughout Arkansas.

Dianas and great spangles range across western Arkansas, although the range of the Diana is a little more confined.

A male (orange) and a female (blue) Diana fritillary – note the white tags attached by researchers to the bottom of the wings. Their wingspans can reach more than 4 inches.



One Habitat

Diana fritillaries generally live among open woodlands that, in some areas, are interspersed with prairies. The woodlands that make good habitat have a common trait: Brush cover is periodically reduced. Land management practices that cut the encroachment of brush, while spurring the germination of plants that produce nectar, are essential.

The periodic use of fire has been

shown to be beneficial to maintaining fritillary habitat. Based on my ongoing study, it appears to be the most consistent means of producing and maintaining optimal habitat. Mechanical and chemical approaches can produce open areas, although they do not appear to be as beneficial to the Diana fritillary because they destroy the roots of high-quality nectar plants.

Of course, habitat must be maintained to be effective, which

means predictability from year-to-year and seasonally. An array of plants capable of providing nectar from late May through mid-October is critical.

Interestingly, patches of high-quality nectar supplies such as field thistle do not have to be large to support Dianas, as long as the plants are interspersed throughout the habitat. There is evidence that extensive patches of high-quality nectar supplies, if too distant from wooded components,

A stand of horsemint has attracted a female Diana fritillary.



may be avoided or never found by Dianas, although this does not appear to be the case for the great spangled fritillary.

The Human Factor

Fritillaries are touched by a complex blend of human effects. Urbanization, roads, power lines and gas lines change habitat.

Some activities clearly have negative effects but others, presumed to be

detrimental, actually may prove to be beneficial.

For example, during the 2006 field season, a thriving Diana fritillary population that was under study was dealt a major setback. Within a period of just a few months, an area that supported good numbers of Dianas was subdivided into 3-acre lots for an upscale housing development. Much of this habitat is gone and what remains is too limited to support Dianas.

In contrast and perhaps somewhat surprisingly, Dianas often forage on power-line and gas-line corridors, as long as these openings are not too wide and are managed properly. Roadside corridors also have potential for habitat if they are not excessively mowed and if mowing occurs during an appropriate season.

Picky Eaters

Preliminary data suggest that the Diana is much more selective than the great spangled when it comes to feeding on nectar. The great spangled uses almost 50 species of plants, more than twice as many as the Diana. The great spangled uses some species more than others, but the ones frequented most often are the same as those used by the Diana.

The abundance of nectar-producing plants species varies from year-to-year, seasonally and within a season from one geographic area to another. Among the seasonal progression of

plants favored by the Diana are:

- purple coneflower
- buttonbush
- butterfly weed
- horsemint
- wild bergamot
- frostweed
- field thistle

These and other species are important but field thistle is undoubtedly the fritillaries' bread and butter throughout late summer and early fall. It's also a common target for eradication.

Life Story

Speyeria butterflies live in four stages: egg, caterpillar/larva, chrysalis/pupa, and adult. Violets are the

only host plants, although unlike many species of butterflies, the eggs of fritillaries are not necessarily laid on the host plant.

Eggs most often are laid on pine straw on the ground. In this study, less than 3 percent of eggs were laid on violets. Eggs hatch in September and early October as the caterpillar eats through the egg

casing.

Caterpillars about a millimeter long enter a stage of arrested development soon after hatching and spend winter in this state. When they begin to grow again, usually during mid-March, caterpillars consume large quantities of violets and develop rapidly through a series of molts, triggered when the skin becomes taut.



Diana fritillary in the pupal stage, attached to a branch.





Diana fritillaries generally live among open woodlands that, in some areas, are interspersed with prairies.



A male great spangled fritillary (upper left), a male Diana fritillary and a coral hairstreak butterfly (lower left) feed together.

At the end of the caterpillar state, they usually crawl to a branch and attach themselves in a “J” posture, head down. A day or two later, the skin falls away and reveals the chrysalis, the last step before adulthood.

Plenty of Potential

A female fritillary can lay as many as 2,000 eggs. Despite the potential, most eggs do not survive to become adults. Given the high mortality rate, relatively few females were removed during the study. The collection of females for propagation was timed so most eggs would have been deposited in the field.

Learning about stages of life before adulthood gives important insight.

For example, a great spangled was removed from the wild Oct. 4 and she

died Nov. 10. The first eggs were laid Oct. 6; the last Nov. 4. She laid 843 eggs in captivity, 733 hatched and 60 were used to establish a winter colony. Hatching time ranged from 15 to 20 days, 52 of the 60 caterpillars formed a chrysalis and 40 of the 52 became adults.

Close Relatives

The genetic variation among butterflies from different places is an important part of the ongoing study. Before we looked at the various populations, John Bush and I wanted to determine how closely the Diana fritillary resembled the great spangled fritillary. We also wanted to put these species in context with the regal fritillary, which historically occurred in Arkansas (at least sporadically) but appears to be

absent.

Our initial findings indicate that the Diana and the great spangled differ by 4 to 4.5 percent. Both differ from the regal by about 6.5 percent. Two other species of fritillary not in the *Speyeria* genus were included as “outgroups” to help put the three *Speyeria* into context.

Wing patterns also are being examined for differences to see if variation correlates to genetic differences. If it does, there may be a tangible means to recognize and characterize various populations. Since Dianas are localized, anything that helps assess gene flow is worth study. Such information also can greatly assist conservation efforts to ensure that the species remains viable. **AW**