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Butterfly Conservation Management in Midwestern Open Habitats

Part 1: What am I writing about, and why?
by Ann B. Swengel

Summary. My subjects here are the compelling problems of butterfly declines as well as good news you can use to reduce or reverse them. A variety of reports indicate losses not just in the developed landscape but also in large nature preserves even as some populations of the same species persisted more recently in more urban parks. Over the years, nature lovers, scientists, managers, and agency staff have asked me many questions about habitat management and butterfly conservation in the Midwest. Based on my field research and scholarship, as well as enjoying wildflowers and hiking and camping around North America, I'd like to share my perspectives on how butterfly populations and their habitats persist and change over time, and how habitat management affects those outcomes. Even though the patterns are complex and variable, butterflies demonstrate reliable and orderly patterns. We can't make butterflies play by our rules, but if we learn their rules, there's great potential for our conservation efforts to retain and even enhance the butterflies that also call our region home.

A female Ottoe Skipper nectaring on pale purple coneflower. This prairie specialist has declined greatly in the Midwest—not just in the unconserved landscape, and not just in small, isolated parks, but also in large, high-quality nature preserves managed for conservation.

Perhaps you recently read in *American Butterflies* about widespread losses of butterflies in southern Florida, including disappearances in large preserves such as Everglades National Park. This was not just the developed landscape overwhelming last outposts of wilderness. Author Marc Minno pointed out that some populations persisted more recently in more urban parks. Jaret Daniels similarly portrays the situation in Florida in *Wings* (periodical publication of the Xerces Society). Perhaps you remember a similar situation described by Tim Orwig and Dennis Schlicht some years ago in *American Butterflies* about skipper losses in Iowa prairies. Dr. Art Shapiro's astonishing decades-long dataset of butterfly surveys in California has also made the news. The highly developed lowlands have become impoverished not just of more sensitive species but even of some once common butterflies, with montane species retreating ever farther upland.

"Yet I witnessed more examples of butterflies depleted from inappropriate management of 'conserved' land than from any other factors besides outright development or intensive agriculture." Perhaps these summary words of Dr. Robert Michael Pyle caught your eye in the afterword of *Mariposa Road: The First Butterfly Big Year* (2010, Houghton Mifflin Harcourt, Boston, pages 542-543). He finished his thought this way. "Fire, especially—both wildfire and intentional, "controlled" burns conducted too large, too often, and too hot—endangers our aridland endemics and grassland specialties. Will Ottoe [Skipper, a prairie species] and Hermes [Copper, of southern California] survive the flames, intentional and otherwise?" Dr. Jeffrey Glassberg also mentioned the risk of excessive burning in habitat management in his field guide, *Butterflies through Binoculars: the East* (Oxford University Press: New York, Oxford; 1999).

Old timers will remember Tim McCabe's insight in the *Journal of the Lepidopterists' Society* way back in 1981 that habitat preservation in practice involves two management impacts. First, light agricultural management (if any), such as grazing and haying, prior to preservation is discontinued. If long-standing, this prior management is implicated as favorable for specialists if they occurred in the site in good numbers at preservation. Second, new management (burning) is started. He advised that fire be excluded from primary areas of egg-laying by the particular specialist(s) of concern. Since these areas can vary from year to year, they must be determined annually. Of course, these prior light agricultural managements are not representative of the kinds of agriculture typically done in the wider landscape. They are special unusual cases. But then sites selected to be preserves are also not representative of the typical average sites existing in the landscape either. It's because these sites are noteworthy that they come to the at-

tention of conservationists.

I've also contributed my share to the doom and gloom, including several articles in *American Butterflies*. But I've also documented some good news—some rare butterflies faring distinctly better than this abysmal if pervasive background of biodiversity disaster. What hasn't worked? What has? What do both of these tell us about how to proceed next? It's necessary to care, but that's not enough. We need to know how to turn that caring into effective help that works for butterflies struggling to persist in our modern landscape. These are my subjects here: the compelling problems and how they've come about, as well as good news you can use to reduce or reverse them.

The principle of maintaining a butterfly population is easy to state, but for butterflies of conservation concern (localized, sensitive species), the details and implementation are not. A butterfly population can persist long-term in an area if the resources and conditions it requires occur *consistently* in sufficient amount when it needs them and enough individuals of the butterfly exist *continuously* to utilize them. But what exactly are those conditions and resources? Which microclimatic conditions are most suitable? What growth conditions and locations of what caterpillar food plants provide the best production of caterpillars? What are the ways these conditions and resources can be maintained consistently so that enough individuals of the butterfly survive to use them? What is so special about these particular places where the butterfly species lives now that explains why it's here, and what is or was wrong with many other seemingly suitable places that explains why it's not there?

Over the years, nature lovers, scientists, managers, and agency staff have asked me many questions about habitat management and butterfly conservation in the Midwest. This article is meant to address those questions by expanding on the following articles on the NABA website:

Straight Talk about Butterfly Population Biology
Straight Talk about Butterfly Habitat Management
Butterflies & Ecosystem Management
Managing for Butterflies in Prairie, or, What do I do now, that I want to manage for butterflies?
Poweshiek Paradise Lost

My goal here is to provide my best understanding of what the science says about what works and what doesn't for butterflies, and what the science is not able to answer very well yet.

Why is this article so long? What may seem like a straightforward issue actually is way more complicated and interesting than that. That's sure how it's felt for me in over two decades of field work studying butterflies. While I've learned a lot, there's way more to learn. That's why I'm psyched to keep on surveying! I've tried to break this into pieces, so that what you want to find won't get lost amongst everything else.

About the author: An enthusiast of butterflies since childhood, I became serious about them in the mid-1980s, with the encouragement of ornithologist Scott Swengel, whom I met then and married. Scott encouraged me to apply myself more seriously to butterfly observation. He did volunteer surveys for birds, so I wanted to do the same for butterflies. At the time, the only formal survey program was the 4th of July Butterfly Count (then sponsored by the Xerces Society, now by NABA). But we wanted to do more "formal" and site-specific surveying. Conservation agencies stated as a high priority then, as now, additional surveying of prairies and savannas for invertebrates, both to find out what lived there and how management affected them. In the late 1980s we began such surveys for butterflies, just as Wisconsin was proceeding to list some butterfly species as legally threatened or endangered and as the move was underway to list the 'Karner' Melissa Blue as federally endangered. (Also called simply the Karner Blue, this butterfly has been considered by some to be its own full species, which is gaining more support in the scientific literature, as recently reported in the news.) It turns out that we really enjoy surveying butterflies as well as birds. Over the years, we've surveyed in seven states and one province (Manitoba), most of all here in Wisconsin. Scott and I appreciate your understanding that on our field days, we are very busy completing formal monitoring surveys (or catching our breath while awaiting appropriate conditions). If you see us, we greatly appreciate your understanding that we need to continue uninterrupted, as we never have enough time and energy when the weather and timing are right! In fact, we're ready year-round to go out in the field. Our first and longest running project is late winter nocturnal surveying for forest owls.

Field partners in bird and butterfly surveys ever since, Scott and I have published a number of peer-reviewed scientific papers on butterfly detection, habitat associations, timing and fluctuations, and responses to site management. We've summarized these in non-technical articles, especially in *American Butterflies* and on the NABA website. We've read a great deal of technical scientific literature from around the world, and presented our work at four international symposia on conserving Lepidoptera. A past vice president of the North American Butterfly Association and past co-editor of the annual 4th of July Butterfly Count report, I am currently honored to serve on the editorial board of the *Journal of Insect Conservation*. Based on these studies and experiences, as well as enjoying wildflowers and hiking and camping around North America, I'd like to share my perspectives on how butterfly populations and their habitats persist and change over time, and how habitat management affects those outcomes.

Why do butterflies matter? Butterflies "do" many things for us humans. They contribute to pollination and food chains, although a few species can also be horticultural

or agricultural pests. Butterflies also provide beauty and enrichment for our hobbies. But the most useful thing butterflies do for me is serve as accessible and well known representatives of invertebrate biodiversity. To conserve nature more effectively, we need to understand nature more fully. A vast number of insect species live rather unobtrusively all around us. They have short life spans (usually a year or less) and complex life cycles (multiple life stages, each often looking different and having different requirements to survive). Being less known, invertebrates are commensurately less represented in our concepts of nature and ecology. Yet their very existence demonstrates important points about how nature and ecosystems have "worked" in the past.

Butterflies have been effectively demonstrated as "canaries in the coal mine" of biodiversity status. As butterflies go, so go similar species (terrestrial invertebrates with short live spans) in similar locations, and so eventually will go other species there, such as birds and vascular plants, that may show a longer lag in response to environmental change due to their longer life spans than butterflies have. But butterflies also have their limits. They are terrestrial, completing their life cycles in places with vegetation emergent above the water or soil surface. They occur from sea-level wetlands to mountain top tundra, from the tropics to the far North and South, but they don't have much to do with lakes, rivers, and oceans. Butterflies' closest relations, moths, are much more speciose and occupy a much wider array of niches, with caterpillars that may mine leaves or bore roots and with adults that are usually not limited by sunniness for warmth and activity. Thus, butterflies (like all other groups of biodiversity, including wildflowers and birds), need to be studied specifically in order to understand and conserve them effectively.

Why else should you care about declining butterflies, even if you're not into butterflies? Eventually, if endangered, at least some butterflies may have a sufficient interest base to become legally protected, which may put you out as a landowner or business operator or tax payer, whether that imposition obtains effective conservation for the butterfly or not. How about we benefit the butterflies now, and maybe prevent the need for legal listing, and not put you out at all? For those butterflies that are in trouble, all of us should be interested in more efficient use of tax and charitable dollars to obtain effective conservation.

What kinds of butterflies am I focusing on here? My specialty is "specialist" butterflies: species that are localized and hard to find in average places in the landscape. The particular species I focus on are ones that live mostly or only in native herbaceous vegetation (grasses and wildflowers) that may have some, little, or no shrubs and trees in it. These butterflies are "resident" (non-migratory) species that live year-round in or near where we find them, surviving the winter in a dormant immature life stage. I'm not a snob. I adore my yard birds and butterflies that share the small urban lot I call home. I appreciate my Cabbage Whites that

A Monarch nectaring on purple coneflower in my front yard. I enjoy the butterflies in my garden but they are not habitat specialists in the Midwest and so are not the species I'm focusing on here.

manage to persist here and provide me with more kinds of animals to enjoy at home. While an "alien" species, they are no less native than I am to North America. Rather, specialists are typically the species most in need of conservation now. Furthermore, research shows that successfully targeting the spots where these hardest to find species occur can efficiently "capture" the rest of an area's native species. In other words, the sites that have the most specialist species tend to be richest in the "regular" species that also use the same habitat. But please note this important qualification. When a site has a variety of habitat types, such as scrub and forest, the site may have a greater total number of species than a site that is all prairie. But the prairie may have many specialist species while the other site may have none.

What habitats am I talking about here? Prairie consists of native herbaceous plants (grasses and wildflowers), with some native short shrubs and occasional trees. In lowlands it can grade into wetlands. Prairie in areas of average soil moisture is called mesic, and upland prairie is called dry, as is prairie on sandy well drained soil. The degraded version of prairie is an "old field", a weedy reversion from intensive agricultural usage, the "old" referring to some time elapsed since last plowing or heavy grazing. (A "new" field is a planting on freshly tilled soil.) Savanna consists of prairie-like vegetation with more shrubs and trees (up to about half prairie and half trees/shrubs). Some assert this is its own ecosystem. Others view savanna as a gradient between prairie and forest. It appears to me that butterflies mostly treat savanna as a gradient, with some species occurring in both prairie and savanna, while others occur in both savanna and more forested areas. But a few butterfly species primarily occur only in savanna. Pine barrens are a kind of savanna that occurs on sandy soil. Oak savanna is the label typically applied to savannas on other soil types. Degraded or human-altered versions include scrub and clearcut regrowths. Both prairie and savanna are "open" habitats, as

opposed to "closed" habitats (forests) which have a substantial cover of overstory canopy closing over them.

Some view these open habitats in the Midwest as early successional or disturbance-dependent ecosystems that naturally require periodic events such as fires to persist, becoming forest if these events do not occur. I do not; I view this as symptomatic of the widespread human degradation of our modern landscape. Back when these ecosystems occurred naturally as intact large-scale configurations complete in their flora and fauna but had no intensive agriculture (mechanically plowed fields, heavy protracted grazing by domesticated livestock), these ecosystems met the definition of a climax community, persisting consistently over large areas for millennia. Now many browsing and grazing animals are missing or much reduced, except for deer. I do not view the routine activities of porcupines, beavers, elk, bison, and Passenger Pigeons, to name a few examples, as a special ecological "disturbance" or "process." I view their activities as routine and normal to their habitat, no more special or ecological (or optional to include or exclude) than what plants and carnivores "do" as impacts on their surroundings. These herbivores used to break and/or eat more trees and shrubs than they do now, and these activities affected the vegetation in ways that contributed to the openness of their habitat. There is a considerable range of view in understanding the occurrence and abundance of these and other animals in the Midwest pre-Columbus. But that's the point. None of these views, or any other views about any other aspect of that former landscape, can be proven as fact. But all of these animal species are documented as native to the Midwest, whether they still occur here or not.

I view the severe alteration of the midwestern fauna as a degradation of the ecosystem, not a successional process. In other words, I do not take how prairie and savanna behave now in our highly altered landscape to be normative throughout the entire time and space these ecosystems have existed, including the long-gone vast landscape of prairie plants and animals here before Columbus explored the western hemisphere. But as a result of how our degraded landscape functions today, as prairie and savanna occur now in the Midwest, they are often management-dependent.

I'm not covering forests and marshes. It's not that these habitats don't matter. It's that Scott and I haven't done as much field work there and aren't as well read in the subject.

"Habitat" is a touchy word. I must apologize to my international colleagues in insect conservation biology, who may be wincing at my blithe use of the term "habitat" so far. Simply defined, "habitat" means the place where a species lives. It's useful to define characteristics of that habitat, as this helps us understand what it is about a site that makes it possible for the species to live there or not. It's how we go about describing that habitat, and how well these descriptions include where the species lives and excludes where it doesn't, that has my colleagues rightly engaged. The vegetative approach describes butterfly occurrence in relation to vegetative classifications. In fact, vegetation types are often equated with ecosystems, even though the latter should really encompass all species, not just flora. The resource-based approach takes a species-specific approach, identifying the particular resources and conditions required by the butterfly. The downside of this approach is that it can be overwhelming. For many species, about all that may be known are vegetative associations and caterpillar food plant(s), and not necessarily from this geographic area. Plus, only some of these resources and conditions are "limiting" (bottlenecks that prevent the butterfly from being more abundant), while the remaining multitude of resources and conditions used by the butterfly are interesting, to be sure, but not strongly affecting the outcome for the butterfly. The downside of the vegetative approach is that it is either too general, so that the butterfly actually only uses certain parts of it, or inadequate, excluding some areas used by the butterfly. Furthermore, when vegetation (flora) is equated with an entire ecosystem, it's easy to assume that whatever looks like a good idea for the plants must also be OK for the animals. On the other hand, I've found that vegetative classifications are quite useful for targeting where to survey in search of undiscovered populations and for organizing butterfly species into predictably co-occurring communities. I expect some of the terms my international colleagues recommend as alternative to these various slippery meanings of "habitat", like "biotope" (an approximate synonym to "vegetation"), will leave you even more perplexed, since those terms just aren't used here. In the meantime, I'll continue using this word "habitat" in its simplest sense, where a species lives, since that's how this word is widely used here.

What particular specialists am I talking about here? These are prairie and savanna specialists in the Midwest:

PRIMARILY IN PRAIRIE
Regal Fritillary
Uhler's Arctic
Poweshiek Skipperling
Garita Skipperling
Uncas Skipper
Ottoe Skipper
Dakota Skipper
Arogos Skipper
Byssus Skipper
Swamp Metalmark (also in fen wetlands)

PRIMARILY IN SAVANNA
Frosted Elfin
Henry's Elfin
Northern Blue

'Karner' Melissa Blue
Chryxus Arctic
Persius Duskywing

IN BOTH PRAIRIE AND SAVANNA
Olympia Marble
Gorgone Checkerspot
Mottled Duskywing
Leonard's Skipper
Cobweb Skipper
Dusted Skipper
Common Branded Skipper

These are less specialized species also of conservation interest in the Midwest:

PRIMARILY IN PRAIRIE
Gray Copper

PRIMARILY IN SAVANNA
Sleepy Duskywing

WIDELY IN BOTH PRAIRIE AND SAVANNA
Aphrodite Fritillary
Edwards' Hairstreak
Silver-bordered Fritillary
Long Dash
Crossline Skipper

If the focus here is on specialists, but a particular site has none, then this article doesn't apply there? I think specialists have a lot to teach us about understanding what less specialized species require to live in our cities, suburbs, and farms—landscapes that can turn species that used to be widely occurring into localized specialties. Although Scott and I focus on specialists, we pay attention to all butterflies, and have studied butterfly species across the whole spectrum from most to least specialized. Watching how species across this spectrum respond to the same landscape has been very interesting. Specialists are generally the most sensitive and tend to disappear the quickest due to adverse or inconsistent conditions, which includes both management cessation and adverse management. But once those specialists unravel, other species are next in line to decline and disappear. As I define it, my category of "specialist" (primarily in native herbaceous flora) is more exclusive than other researchers typically use. Many of my "grassland" species (widely occurring in both native and degraded herbaceous flora) are on others' lists of sensitive species, and indeed they are, once the situation is no longer hospitable to my specialists. Plus, some species I don't call specialists may register vulnerability at least as quickly as some specialists, especially at range edge (for example, range-edge "grassland" Aphrodite Fritillary compared to specialist Regal Fritillary in core range in Iowa). Some of my "grassland" species, such as Gray Copper, may do relatively better in weedy old fields than in examples of native flora, which used to be a more reliable lifestyle than in our ever more developed landscape today. Context is what makes a butterfly a specialist, as I've learned from butterflies restricted in Wisconsin to bogs—specialists here but usually not farther north. What makes a butterfly a specialist and how it functions in that landscape provide insight to how populations of other kinds of butterfly species persist, or not, in landscapes that offer limited habitat and resources.

A Gray Copper nectaring on butterfly weed. Although this butterfly is not restricted to native prairie vegetation, it is geographically restricted to the mid-continent and is of conservation interest here.

Why manage habitat at all? Since conservation is preserving nature, why not just preserve a site and let nature take its course? Especially if there's confusion and contention about how to manage, why not just do nothing? Doing nothing can be a viable alternative, although it is not the same as keeping something in the same condition indefinitely. In a human medical context, doing nothing may be appropriate ("first, do no harm"), even though the patient may deteriorate in the absence of treatment. If no known available treatment passes the test of not doing harm, there may be nothing that can be done because nothing can be identified that will likely do any good. In a less drastic situation, doing nothing is often a good idea medically, to figure out better what is going on, so that a more specifically focused course of action can be developed. However, doing nothing can result in the site changing. This is apparent in many prairie fragments with no active management today. As our highly human-altered landscape functions today, many examples of prairie and savanna in the Midwest today are often management-dependent, requiring active human intervention (land use or management) to maintain the ve-

getation as native and open. When no active human intervention occurs, these patches may deteriorate due to increased brush and weeds, and decreased diversity of native flora. Doing nothing is not the best scientific option for an obese or diabetic or cardiac patient (or all of the above). Instead, it's about weighing options of one regime over another, even though we know less now than we will know in the future about treating these conditions successfully. Likewise, enough is known about prairie and savanna management to weigh the pros and cons of different regimes, not just for plants and vertebrates but also for butterflies, even though there's lots left to learn on this.

What about natural management? That's part of the problem. What is natural? When I see a large wilderness area, that's pretty natural, whether I can articulate exactly what all that means. But when I see a prairie, by definition on the messed-up end of the meter, what exactly is natural for that? I see native grassland plants and animals there, so in that sense, that's natural. But what is the natural configuration of that community? If the grass is 3-4 feet or more tall, is that natural? Aesthetically valued as this is, I think not so much, if other natural inhabitants of prairie, such as bison and elk, were present now, as they once were naturally in the past. Pioneer diaries written before extirpation of bison in a specific area include accounts describing lack of forage for their stock; accounts written after bison extirpation include descriptions of tall grass. Could bison gain access to steep slopes where many prairie fragments now occur? Yes, just as well as the "goats" for which these sites are also often named. Bison were reported in the mammal literature to be more nimble of foot than we may expect. Elk, which browse on woody plants as well as graze on herbaceous flora, were also native throughout the Midwest and their ability to handle steep terrain can be observed in the Rockies today. But it's highly likely that native grazers had uneven effects on the landscape, due to access, forage quality, proximity of water, and so on, not to mention fluctuations in abundances due to climate.

Is it more natural to let all these prairie grasses grow tall in the absence of native grazers or more natural to let domesticated stock of some sort (easier to pasture on prairie than bison and elk) restore some form of grazing? Whichever one you pick, you have some natural and unnatural features as well as unknowns in your choice, since no one can study today how native grazers occurred in undegraded, unfragmented tallgrass prairie, since this landscape is long gone.

More important in conservation than naturalness (a subjective concept) is how successful these management are at maintaining specialists of that community, and this can be objectively measured. You may think I am stuck on some semantic principal, but I'm not. As is widely reported, prairie skippers do poorly in heavy grazing as found on farmland, but some skipper specialists also appear scarce or absent in thick tall grass as found on some preserves where they used to occur more abundantly. For some habitats, you may have a site on the messed-up end of the meter, but other unmessed-up sites also exist. But for tallgrass prairie, that option is precluded. There is no vast North American Serengeti we can visit to see what a large Denali-sized prairie looks like when it has a good representation of both its native flora and fauna.

Even though the patterns are complex and variable, butterflies readily demonstrate reliable and orderly patterns. I've spent a lot of effort studying the complexities and variabilities of butterflies. It's certainly true that there's lots left to learn. That's why Scott and I keep surveying so much. Every year, there are certainly surprises and mysteries in our results. But all along the way in my butterfly studies, I've also had a marvelous sense of order. I advise keeping an open mind, and obtaining lots of data out of which to form ideas. But remember that there's actually a lot of predictive power about when and where to go next year to find them, and what associates with more or fewer found. That's how we butterfliers can order our lives, to be able to have an agenda for when to go where to find what. That's why I find the "logic of the species' life", a phrase I've picked up from Japanese lepidopterist Dr. Toshitaka Hidaka, such a compelling concept. It's so rewarding to study and conserve butterflies because there is a beautiful order to what happens. I may not be able to explain it all, but I do know that with more knowledge, more will be understood. Butterfly "logic" is also unrelenting—unforgiving like gravity. Or perhaps the better analogy is to chemistry. I can experience surprises because I don't know the chemical content of certain substance, or I may not know how those chemicals interact with each other. But the underlying "rules" are reliable and non-negotiable. There's both much caution and much hope in this. We can't make butterflies play by our rules, but if we learn their "rules", there's great potential for our conservation efforts to retain and even enhance the butterflies that also call our region home.

Published by the Southern Wisconsin Butterfly Association (SWBA), a chapter of the North American Butterfly Association. To find out about field trips and meetings, please visit http://www.naba.org/chapters/nabawba/