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STRAIGHT TALK ABOUT BUTTERFLY HABITAT MANAGEMENT

by Ann Swengel, 2003

Degradation and development of the landscape continue to cause many butterfly populations to decline or disappear. But if we apply what has been learned about butterfly biology, there is great potential to slow this decline, and possibly even reverse it. Decades and centuries of intensive agriculture, industrialization, and urbanization in North America have changed the landscape butterflies live in. Studies here and elsewhere around the world indicate that some butterfly species can tolerate and even prosper in human-modified landscapes, while other butterfly species do not. Sometimes, by chance, conservation efforts for other purposes benefit butterfly populations living in the same places, but sometimes the specific requirements of particular butterfly species aren't maintained serendipitously. *The only way to ensure that a butterfly species is secure is to survey it, monitor its status and trend, learn its biological requirements, and maintain these requirements. Where this has been done, both in North America and elsewhere, populations of butterfly species at risk of decline and loss have been stabilized and sometimes expanded, even in landscapes intensively used by humans.*

Most butterfly species are resident year-round in or near the places where they're found, and have rather limited dispersal tendencies–only a minority of butterfly species have strong dispersal abilities. Relatively few butterflies are "*immigrant*" species, such as the Painted Lady, that travel long distances across the continent. Even rarer in the butterfly world are true *migrants*, such as Monarchs, which move regularly each year between their summer breeding range and their overwintering range. Immigrant and migrant butterflies do not require the same exact breeding areas to be suitable for their use each generation. They can use different breeding sites in different gene-

The Monarch is one of the relatively few butterfly species that travels large distances across the continent.

Familiar and beautiful, the Eastern Tiger Swallowtail (shown here, an eastern species), and the similar Canadian Tiger Swallowtail (a northern species) and Western Tiger and Two-tailed Swallowtails (western species), are resident butterflies that live year-round in a wide variety of habitats.

tions. But most butterflies are "*resident*" species that are non-migratory and live year-round in or near the sites where the adult butterflies are seen. "*Sedentary*" or "*localized*" ("*specialist*") residents spend their entire life cycle in a very small area; even though they may fly very energetically, they do not travel (disperse) far from a particular area–usually only up to about 1-2 miles. These localized butterflies are typically the ones of most conservation concern, because their habitat requirements are more exacting and their ability to colonize new sites is more limited.

Butterflies are usually not capable of prolonged dormancy during unusually lengthy adverse conditions. Most climates include a season of the year unsuitable for butterfly activity and growth, usually because of cold or drought. Most butterfly species survive this not by migrating out of the region but by waiting out such periods (entering dormancy or "*diapause*"). The life stage (*egg*, *caterpillar* or *larva*, *pupa* or *chrysalis*, *adult*) in which butterflies diapause varies among the species, depending on the seasonal timing of their life cycle. But butterflies do not normally undergo prolonged dormancy lasting more than part of a year–unlike many plants that may be dormant for many years, existing only as roots, bulbs, or seeds until favorable conditions return. However, some individ-uals of some desert butterfly species are able to continue viably in diapause for several years during exceptionally protracted droughts.

The Clouded Sulphur (shown here) and Orange Sulphur are generalist species that use a wide variety of caterpillar food plants and live in a wide range of natural and man-made habitats.

The conditions and resources needed by resident butterfly populations must be consistently available in the same area, season after season and year after year. For each butterfly generation, the necessary resources and conditions must exist when and where the butterflies need them, in order for the population to persist in the site. Each butterfly life stage (*egg*, *caterpillar* or *larva*, *pupa* or *chrysalis*, *adult*) can have particular resource, climate, and habitat requirements. For example, in the case of Gillett's Checkerspot, adequate supplies of the primary initial caterpillar food, twinberry honeysuckle (*Lonicera involucrata*), must exist in the warmest microclimates for the caterpillars to be able to complete development within the short growing season of their habitat, high mountain meadows.

The Ottoe Skipper is an example of a localized specialist butterfly that is more restricted in occurrence than its caterpillar food plants, which are widespread native prairie grasses.

It's important to know the butterfly species' caterpillar food plant(s). Caterpillars are usually pickier about food than the adults they grow up to become. Many adults feed mostly on flower nectar, and vary by butterfly species as to how much or how little they appear to prefer particular species of nectar flowers. Other butterfly species rarely visit flowers but feed instead as adults on moist dirt, sap, dew, animal droppings, rotting fruit, and carrion. The food that caterpillars eat is called the *caterpillar* (larval) *food plant*. The caterpillars of the most flexible ("*generalist*") butterfly species feed on many plant species (or "*hosts*"). Even so, these flexible butterflies usually feed mostly on plants belonging to

only one or a few plant families. The caterpillars of the most particular ("*specialist*" or localized) butterfly species may eat only one plant species in a region or even throughout the species' entire range.

It's even more important to understand why the butterfly doesn't occur in all seemingly suitable places containing its caterpillar food plant. The food plant does not equal the butterfly! Particular plant species are not the only resources butterflies require. They may prefer certain vegetation types for protective perches, hibernation spots, basking locations, and territorial stances. These depend not just on the particular plant species, but on the structure and growth condition (e.g., short turf, brushy scrub) they occur in. In arid climates, the limited sources for moisture may concentrate the location of some butterfly populations to places near seeps and riparian areas. Butterfly species relate to the other animals in their habitat both in competitive and cooperative (mutualistic) relationships. For example, many blue butterflies are well known for their mutualism with ants–the ants "tend" and to some extent protect the blue caterpillars, which secrete liquids the ants eat. Sometimes one or both of these types of relationships can affect where a butterfly species can and can't maintain populations. Rarely have all the resources a particular butterfly species requires been thoroughly documented. But it has often turned out that some critical resource or condition, such as vegetational structure or microclimate, can be a seemingly minor yet crucial feature of a butterfly's habitat.

The 'Karner' Melissa Blue caterpillar feeds on only one plant throughout this butterfly's range: wild lupine (*Lupinus perennis*). This caterpillar is also being tended by ants. The ants defend the caterpillar, which secretes liquids the ants eat.

Also significant in explaining the absence of localized butterflies from suitable habitat with sufficient caterpillar food plants is the history at the site that caused these vegetational structures to come into their current condition. For example, a sandy barren may have been plowed decades ago. The attempt at crops failed quickly, allowing much of the native flora to re-establish, from plants along the edges of the field and seeds still in the soil. But the temporary destruction of the barren eliminated the most sensitive species of butterflies requiring that habitat. If no other populations of those butterflies exist near enough to recolonize the barren, then those butterflies will remain eliminated from the site even though the plants have returned and the barren is suitable as habitat again. One of the most important research topics in butterfly conservation biology is deciphering why a localized butterfly species is absent from seemingly suitable sites with an adequate amount of habitat and caterpillar food plants–so that those causes of population loss can be prevented at the remaining populations.

The more localized–and limited in dispersal–the butterfly species is, the more important large population size is for the long-term persistence of that species' populations. The size of a butterfly population corresponds to how much and how consistently the resources and conditions required by the species are available. Larger populations tend to be more successful at surviving unfavorable conditions such as

adverse weather. However, large populations can decline relatively quickly into small populations, or extinct populations, under persistent adverse conditions. Several small populations connected to each other by "dispersal corridors" may behave as if they are one larger population.

The more localized–and limited in dispersal–the butterfly species is, the less likely the species will recolonize a site after disappearing from it. If a population goes extinct (becomes "*extirpated*") at the site, it can naturally re-establish only if individuals from another population successfully recolonize the site. Recolonization is more likely if another population (the "*source*") is near the extinct site, connected by a short "dispersal corridor" the butterflies are able and willing to cross. These corridors usually must be about the same vegetational structure (e.g. grassland, scrub, forest) as the habitat the species requires. A dispersal corridor is more likely to be used if it offers some sort of resource, such as preferred adult food, that lures the butterflies in and through it. Successful recolonization is more likely if the source is a large population, as more individuals are likely to disperse out of it and find the extirpated site. But if the cause for extinction of the original population has not been corrected, any newly re-established population in the same site is likely to decline and disappear for the same reason.

Regal Fritillary caterpillars feed on grassland violets, such as birdfoot violet (*Viola pedata*, above), which can lose out when tall grasses and brush cover them.

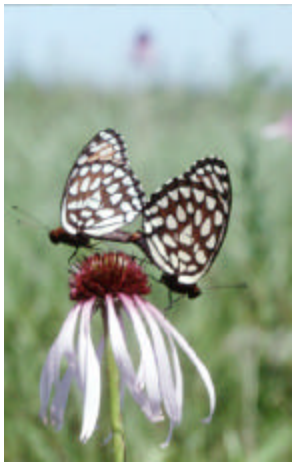
Identifying threats and problems endangering a butterfly population at a site is useful. The smaller the population, the more likely there are threats to its continued existence. If the threats become too prolonged or too acute, the population could disappear. Obvious threats are building construction, pavement, and plowing, which destroy habitat outright. Less obvious are threats that change the habitat, even subtly. For example, grasses and/or brush could be increasingly overtopping and outcompeting grassland violets, the caterpillar food plant for Regal Fritillaries. A drainage ditch could be drying out a wetland, causing swamp thistle and its associated butterfly, Swamp Metalmark, to decline. The more these threats and problems can be reduced or eliminated *in a way compatible with the continued existence of the butterflies themselves*, the better for that butterfly population.

The localized and rare Swamp Metalmark, which inhabits wet prairies and fen wetlands, is more restricted in occurrence than its caterpillar food plants, swamp thistle (*Cirsium muticum*) and tall thistle (*C. altissimum*).

It's even more useful to understand what's going *right* for the butterfly population at the site. The larger the population, the more likely that some factors are primarily going right in the site for the population. But even for smaller populations, some factors must be going right enough for the population to exist at all, compared to sites where the butterfly has already disappeared or never lived. Small populations are more vulnerable to extinction than large ones, so it is even more important to identify the factors going *right* for such populations, and keep these factors going right. For example, graz-

ing by domesticated animals might seem unnatural and therefore a logical threat. But if the grazing is light enough to allow the native plants to persist, this grazing might be what is preventing grasses and brush from overtopping and outcompeting the grassland violets which Regal Fritillaries require for caterpillar food. At a wetland, a ditch might be storing excess runoff from pavement surrounding the site, allowing immature Swamp Metalmark life stages to have some locations in the wetland where they can avoid inundation. *The more the factors going right in the site are identified and allowed to continue, the better for the butterfly population.*

Abundant butterfly conservation experience in North America and around the world indicates that butterfly populations can disappear not just when the habitat obviously deteriorates or changes, but also when the site doesn't seem to have changed at all. What doesn't look like change to human eyes can be a subtle change that causes some required condition or resource to disappear or be out of synchrony with the butterfly species' annual cycle. A persistent climatic change could make the site somewhat wetter, drier, cooler, or warmer. The other animals in the site may have changed, to increase competition or predation on the butterfly population. The amount of suitable habitat available for the butterfly population to use may have become too small for the population to survive. It can take years for the consequences of habitat reduction to result in butterfly population extinction. But the likelihood of extinction is set in motion once that often unknown threshold of small habitat size gets crossed.



Regal Fritillaries are localized butterflies that benefit from management favorable both for the survival of the butterflies themselves and the maintenance of their grassland habitat.

Butterfly conservation experience in North America and around the world indicates that site preservation does not equal persistence of butterfly populations present in the site at the time it was preserved. A focus on preserving sites and protecting habitat may not ensure the continued existence of the specific conditions and requirements a particular butterfly population needs. Furthermore, preservation can mean not just protection from destruction (that is, ensuring the site stays just as it is), but also change in land use/management that is now permitted and/or implemented at the site. For example, grazing might stop at the site, but this grazing might be what creates the microhabitat required by the butterfly, as for the Regal Fritillary described above. These changes may be unavoidable or well-intentioned. But the consequence of change in land use/management can be change in the suitability, for better or for worse, of the habitat for butterflies living there. **That's why it's essential to study the butterfly species' requirements, monitor its populations for changes in size, and manage the land to ensure that the butterflies themselves (in all their life stages) are unharmed and that their habitat requirements consistently exist for their use.**