

Part 4: How do I recommend proceeding forward?

Summary Version

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GETTING STARTED

- There is no one-size-fits-all answer for managing a vegetation type or a butterfly species.
- Optimizing habitat for one species can reduce resources required by another species.
- Given the incompleteness of available knowledge, it's not possible to know the full consequences of your choices.
- Be prepared to change course in the face of new information, known as "adaptive management."
- Study up, weigh pros and cons, and hedge bets by avoiding doing the same thing everywhere and by avoiding drastic choices of either action or inaction, unless the case is compelling.
- Instead of focusing on what should or shouldn't be blamed for poor butterfly outcomes (what's bad), focus instead on what's been found to work better for butterflies that need conservation help (what's good).
- What helps butterflies most are site selection and management based on detailed knowledge of the butterfly in all its life stages and long-term butterfly population monitoring. That is, prime sites for the butterfly need to be managed according to this detailed knowledge, with butterfly surveys to monitor results.
- If that detailed knowledge isn't available, the next best is knowledge based on consistent butterfly surveys of many entirely separate populations of that species (preferably at least 10-20) for multiple years (preferably at least 5-10 years). Those butterfly observations need to be cross-referenced to vegetation type and management characteristics in order to infer the butterfly's habitat and management preferences and restrictions.
- Aim for "consistent diversity." Consistency means sticking with those components of the land use/management history of a site that were favorable for maintaining its native flora and fauna for the last century. Diversity of management *among areas of the same vegetative type* hedges against unexpected or unavoidable adverse results from one of those managements.
- If you take responsibility for management of a site, and as a result for particular species in that site, *then you need to monitor and study those species*. I advise that at least 50% of resources should go toward data collection, with the remainder toward management.
- Don't do things just because that's "how it's done." Instead have a reason specific to the site and its species.

BUTTERFLY SURVIVAL

- The more consistent your management approach is with the long-term management history of your site, and the more consistently you maintain the vegetation as it already exists in your site, the less risk to those butterfly species living there now.
- The more your management is aimed at changing the vegetation within your site or the more drastic (lethal) your management methods, the riskier your management is for butterflies living in your site right now.

- You must be all the more mindful to ensure the viable survival of localized butterflies already living in your site that depend on the type of vegetation you are trying to increase or improve in your site.
- Otherwise, "your" butterflies may not survive the management process to benefit from the vegetative result. In that case, you are counting on someone else in your landscape neighborhood doing a better job of catering to those butterflies' immediate needs than you did, so that "their" butterflies can recolonize your site and re-establish there.
- If there's one lesson I've learned from our modern landscape, it's that you shouldn't count on someone else doing a better job at anything than you do, especially where rare butterflies are concerned.

HETEROGENEITY

- Habitat heterogeneity means a diversity of habitat types and conditions—wet and dry, shaded and sunny, managed and idled, and so on.
- Heterogeneity provides more niches for more species in a site, but this may be at the expense of specialist species requiring a large area of a particular habitat type and condition.
- Restoration efforts that reduce habitat heterogeneity may have conservation benefit, even if they reduce the number of species in a site, if rare species benefit.
- Do not do heterogeneity for the sake of it. Instead, focus on the consistency of resources and conditions required by the species you are targeting. Many species benefit from some variety in these resources and conditions, and out of that, habitat heterogeneity results.
- When you research your site's history, you may learn about mosaics and heterogeneity that traditionally existed in your site—for example, one area traditionally hayed and another traditionally grazed. Following that site history encourages habitat heterogeneity likely to be beneficial to the biodiversity still in your site.

BURNING

- I do not recommend burning for butterfly conservation in the Midwest, even if done in rotation.
- However, if a site is fire managed, maintain a never-fire-managed area (permanent non-fire refugium) in core habitat for specialist butterflies. Use un-intensive consistent alternative management (mowing/haying and/or grazing, described below) as needed to control brush and weeds and maintain adequate caterpillar resources.
- If a never-fire-managed area is not available, a formerly fire-managed patch can be made into a permanent non-fire refugium. This requires at least 6-8 years since last fire to start serving as such, and may not be as effective as a never-fire-managed area.
- In the absence of that, designate an effective temporary refugium each time a fire is done. This refugium needs to encompass where immatures of the target species primarily occur now (at the time of the fire) as determined in recent field surveys to ensure that these critical areas do not burn in the specific fire being planned.
- Some sites are so small (on the order of 10-15 acres or less) that any fire becomes risky and so burning should be avoided and prevented.
- In larger sites, size of contiguous burned area also matters. That could mean a 1-acre fire if

it's a 20-acre site, a 10-acre burn in a 200-acre site, and individual burns not bigger than 100 contiguous acres each if the site is 2000 or more acres.

- Divide each burn by vegetative type to permanently protect a portion of each type from fire and to ensure only a minority of the remainder gets burned in any given year.
- Protect rare biodiversity from unplanned wildfire by maintaining firebreaks with mowing/haying or grazing.

MOWING/HAYING

- A mowing or a haying (mowing with removal of the cut vegetation) is more favorable for more midwestern butterfly species than a similar size burn.
- Conservation mowing/haying is done as a single cut per year in a part of a site of native herbaceous vegetation, not the entire patch and not more often than that.
- In areas degraded by weeds or brush, it may be appropriate to do more frequent cutting in those localized problem areas.
- Mowing/haying or certain regimes of mowing/haying are not favorable for all specialist butterflies in the same vegetation type. All sites of a vegetation type should not be managed the same way!
- Mowing/haying should be done in rotation, not treating the entire site in any one year, in fact not treating all of a particular vegetation *type* in the same year.
- To ameliorate the negative impacts of mowing/haying, vary the timing of the cut, but in a consistently diverse manner, not a random one. That is, cut each unit consistently at about the same seasonal timing, but vary that seasonal timing *among* units. For example, designate three units for a three-year rotation of mid-July mowing, one unit cut then per year. But designate three other units for a similar rotation but mowed in September.
- Another method of reducing negative effects of mechanical cutting is to increase the heterogeneity of the cut unit by cutting in strips (cut one strip, skip one or more strips, and keep alternating that way through the unit).
- Mowing in summer increases negative impacts on insects but also appears to favor flower diversity by reducing dominance of grasses.
- Mowing in fall reduces negative impacts on insects but may favor dominance of grasses.

GRAZING

- Grazing presents the most variables: continuous or rotational; broadcast or localized; season, duration, stocking rates, species/breed of stock. Temporary electric fencing allows great flexibility in paddock location and size.
- A brief period (a few days or weeks) of heavy grazing, at least focused on the brushier weedier places, may improve the native floristic condition afterward. But heavy grazing has a greater negative impact on butterflies, as well as a lot of native flora too.
- I advise against protracted months of heavy grazing of primarily native herbaceous flora. But in old fields (already degraded herbaceous flora), this can be beneficial for brush control, especially following a mow or burn of that brush to stimulate palatable fresh growth.
- Light to moderate grazing in the growing season each year or most years has the benefit of reducing immediate negative impacts on both plants and animals that come from heavier

grazing, while also reducing overshadowing grass, brush, and palatable tall weeds. On the other hand, such sites are often "scruffy" (moderately degraded), especially with unpalatable weeds, which leads to concern about possible long-term deterioration.

- Use mosaics, both rotating over years (with ungrazed years in between) and varying grazing intensity among plots (including some areas not grazed at all).
- Avoid random grazing mosaics. Have a starting point for why you need to do a management that involves particular species and specific habitat goals.
- Designate units so that core areas for a butterfly are distributed among several management units, rather than concentrated into a single unit.
- The mosaic could include a permanent non-grazing refugium, managed another way to control brush and weeds if and as needed.
- Placement of watering areas can also lead to gradients of grazing intensity across a site, which increases the heterogeneity of the grazing mosaic.
- More research is needed on grazing before I can provide more recommendations. That means there's lots of benefit to proceeding ahead cautiously while taking lots of notes on the kinds of grazing done and the corresponding plant and butterfly responses.

IDLING AND LOCALIZED TREATMENTS

- Idling (doing nothing) may be inadvertent, due to an oversight or lack of resources, but it can be deliberate until an obvious deleterious change in the habitat or butterfly population is evident. In that case, a broadcast management (burning, grazing, mowing/haying) may occur, or a localized (spot) treatment (bush-hogging, mowing, spot-herbicide) only in the problem area.
- Idling is useful for grassland animals because of the relative consistency in vegetation year to year, even though over the long run the vegetation may still gradually change. Accumulated dead plant litter is a valuable resource.
- Brush development is a concern, but some idled plots are relatively unbrushy, and if so, and if the sod and litter are dense, then brush may be slow to establish and expand. Initiating a management that disturbs or bares the soil surface may invite expansion of brush as well as weeds instead of achieving the desired result of inhibiting them.
- During a management idling period, surveys and monitoring can occur while management is studied, available resources assessed, and site history learned.
- Long-term idling in conjunction with localized treatments as needed can be a viable long-term management plan especially in relatively stable vegetation.
- Caution: Vegetation that looks stable to humans may not be so in the subtle ways that may matter to a particular butterfly. However, active management is also fraught with uncertainty.

TIMBER HARVEST

- Since it's outside my expertise to make specific recommendations on how to do tree cutting, my comments address options following tree cutting.
- Avoid disturbing the soil surface if possible.
- Remove slash (cut tree material) from areas of herbaceous flora, either by removing slash

- entirely from the site or hauling it to shaded areas in the site under trees you plan to retain.
- If slash removal from herbaceous flora is not an option, pile slash to reduce the area it's covering. Do not burn these piles as that can kill the herbaceous flora underneath and sterilize the soil. That invites weed proliferation in those sterilized spots, which in turn poses the risk of spread outward from there.
 - Cutting a large contiguous area would more likely cater to grassland species while cutting smaller strips or patches would more likely cater to savanna species.
 - Log landings (loading zones) should be placed in a lower-value area as these are highly disturbing to the ground layer.
 - While it may be more efficient to cut all the trees at once, more gradual cutting reduces the risk of weed and brush proliferation.
 - Studies vary on whether burning a large clear-cut area is vegetatively useful or not. This may depend on whether the burning is useful for obtaining the desired vegetative result for the butterflies you hope will benefit.
 - It's also possible that useful vegetative effects from fire aren't due to the burning but due to it being a second treatment of any kind (in addition to the initial cut). In that case, another treatment (such as more cutting or more removal of slash) may also obtain the desired result, and potentially with less mortality to butterflies surviving within the managed area.

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