

Determining Butterfly Responses to Management Practices in Bandelier National Monument

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I. Response of butterflies to a piñon-juniper woodland restoration treatment.

At Bandelier National Monument, studies are underway to evaluate the use of a mulching treatment as a restoration tool for increasing wild flowers and grassy plant cover in degraded piñon pine and juniper woodlands. In 1999 and 2001, we evaluated the effect of the mulching treatment upon the number and variety of butterflies. The influence of elk and deer was also evaluated. We observed a total of 1992 butterflies belonging to 29 species. Dainty Sulphurs, Checker White, Reakirt's Blues, and Lupine Blues were the most common butterflies observed. For the two years sampled, butterfly richness, butterfly abundance and percent wildflower and grass cover significantly increased in the areas receiving a mulch treatment. Deer and elk had no significant effect on cover and variety of wild flowers, nor on the number and variety of butterflies. Our results indicate that the increased number of wild flowers resulting from the mulching treatment is beneficial to butterfly populations. As indicators of landscape health, these butterfly numbers suggest that the use of the mulching treatment is helpful for restoring biodiversity in degraded piñon-juniper woodlands.

II. Response of butterflies to elk browsing

Browsing and grazing by deer and elk influence plant communities, but less is known about how changes in plant communities affect the number and variety of butterflies. At Bandelier National Monument we used fenced exclosures in aspen-mixed conifer forests and ponderosa grasslands to measure the response of butterflies to high numbers of elk during 1999-2001. At each site we counted butterflies and nectar producing flowers by species. We monitored habitat use by radio-collared elk using a fixed-wing aircraft. We observed a total of 1879 butterflies belonging to 44 species. The number and variety of butterflies differed among times of year in ponderosa grassland sites, and differed among both times of year and elk numbers in mixed conifer sites in 2001. We found that the number and variety of butterflies increased with abundance of wild flowers and with the density of aspen stems between 1.5-6.0 feet (0.5-2.0 m) tall. The number of mid-summer flying butterflies increased with increasing numbers of blooming cinquefoil plants and other wild flowers. Our results suggest that the number and variety of butterflies was best explained by the richness of blooming wild flowers that produce nectar and by aspen regeneration that is not being browsed by elk. Our results suggest that elk may indirectly impacts butterfly populations and that management of elk populations may be necessary for protection of biological diversity in some aspen-mixed conifer forests.

III. Compiled butterfly species list for Bandelier National Monument (includes species observed on Valles Caldera National Preserve). See list on official USGS website <http://www.npwrc.usgs.gov/resource/1999/insect/bandel.htm> and below.

**Butterflies of Bandelier National Monument
and Valles Caldera National Preserve
Los Alamos and Sandoval Counties, New Mexico**

Survey area ranges from 6100-10,000' and includes grassland/scrub, piñon-juniper woodlands, ponderosa pine grasslands, mixed conifer forests, wet and dry montane meadows. Butterflies from Bandelier National Monument are indicated by the symbol BNM, while those from Valles Caldera National Preserve as indicated by the symbol VCNP.

**Swallowtails (Family Papilionidae)
Swallowtails (Subfamily Papilioninae)**

- Black Swallowtail -- (*Papilio polyxenes*) — BNM, VCNP
- Old World Swallowtail -- (*Papilio machaon bairdii*) — BNM, VCNP
- Western Tiger Swallowtail -- (*Papilio rutulus*) — BNM, VCNP
- Two-tailed Swallowtail -- (*Papilio multicaudata*) — BNM, VCNP
- Pale Swallowtail -- (*Papilio eurymedon*) — BNM

**Whites and Sulphurs (Family Pieridae)
Whites (Subfamily Pierinae)**

- Pine White -- (*Neophasia menapia*) — VCNP
- Checkered White -- (*Pontia protodice*) — BNM, VCNP
- Margined White -- (*Pieris marginalis*) — VCNP
- Cabbage White -- (*Pieris rapae*) — BNM

Sulphurs (Subfamily Coliadinae)

- Clouded Sulphur -- (*Colias philodice*) — BNM, VCNP
- Orange Sulphur -- (*Colias eurytheme*) — BNM, VCNP
- Queen Alexandra's Sulphur -- (*Colias alexandra*) — VCNP
- Sleepy Orange -- (*Eurema nicippe*) — BNM
- Dainty Sulphur -- (*Nathalis iole*) — BNM, VCNP

**Gossamer-wing Butterflies (Family Lycaenidae)
Coppers (Subfamily Lycaeninae)**

- Tailed Copper -- (*Lycaena [Tharsalea] arota*) — BNM, VCNP
- Purplish Copper -- (*Lycaena helloides*) — VCNP

Hairstreaks (Subfamily Theclinae)

- Colorado Hairstreak -- (*Hypaurotis crysalus*) — VCNP
- Behr's Hairstreak -- (*Satyrrium behrii*) — BNM

- Banded Hairstreak -- (*Satyrium calanus*) — BNM, VCNP
- Western Green Hairstreak -- (*Callophrys affinis*) — BNM
- Western Pine Elfin -- (*Callophrys [Incisalia] eryphon*) — BNM, VCNP
- Juniper Hairstreak -- (*Callophrys [Mitoura] gryneus siva*) — BNM
- Gray Hairstreak -- (*Strymon melinus*) — BNM, VCNP

Blues (Subfamily Polyommatae)

- Western Pygmy-Blue -- (*Brephidium exile*) — BNM
- Marine Blue -- (*Leptotes marina*) — BNM, VCNP
- Ceraunus Blue -- (*Hemiargus ceraunus*) — BNM
- Reakirt's Blue -- (*Hemiargus isola*) — BNM, VCNP
- Western Tailed-Blue -- (*Everes amyntula*) — BNM, VCNP
- Spring Azure -- (*Celastrina "ladon"*) — BNM, VCNP
- Western Square-dotted Blue -- (*Euphilotes battoides centralis*) — BNM
- Spalding's Dotted-Blue -- (*Euphilotes spaldingi*) — BNM
- Silvery Blue -- (*Glaucopsyche lygdamus*) — BNM, VCNP
- Melissa Blue -- (*Lycaeides melissa*) — BNM
- Greenish Blue -- (*Plebeius saepiolus*) — BNM, VCNP
- Boisduval's Blue -- (*Plebeius [Icaricia] icarioides*) — BNM, VCNP
- Lupine Blue -- (*Plebeius [Icaricia] lupini*) — BNM, VCNP
- Arctic Blue -- (*Agriades glandon*) — BNM, VCNP

Metalmarks (Family Riodinidae)

- Nais Metalmark -- (*Apodemia nais*) — BNM

Brush-footed Butterflies (Family Nymphalidae)

Heliconians and Fritillaries (Subfamily Heliconiinae)

- Variiegated Fritillary -- (*Euptoieta claudia*) — BNM, VCNP
- Great Spangled Fritillary -- (*Speyeria cybele*) — BNM, VCNP
- Northwestern Fritillary -- (*Speyeria hesperis*) — BNM, VCNP
- Mormon Fritillary -- (*Speyeria mormonia*) — BNM, VCNP

True Brush-foots (Subfamily Nymphalinae)

- Silvery Checkerspot -- (*Chlosyne nycteis*) — BNM, VCNP
- Pearl Crescent -- (*Phyciodes tharos*) — BNM
- Field Crescent -- (*Phyciodes pratensis*) — BNM
- Mylitta Crescent -- (*Phyciodes mylitta*) — BNM
- Satyr Comma -- (*Polygonia satyrus*) — BNM

- Green Comma -- (*Polygonia faunus*) — BNM, VCNP
- Hoary Comma -- (*Polygonia gracilis*) — BNM, VCNP
- California Tortoiseshell -- (*Nymphalis californica*) — BNM, VCNP
- Mourning Cloak -- (*Nymphalis antiopa*) — BNM, VCNP
- Milbert's Tortoiseshell -- (*Nymphalis [Aglais] milberti*) — BNM, VCNP
- American Lady -- (*Vanessa virginiensis*) — BNM, VCNP
- Painted Lady -- (*Vanessa cardui*) — BNM, VCNP
- Red Admiral -- (*Vanessa atalanta*) — BNM, VCNP
- Common Buckeye -- (*Junonia coenia*) — BNM, VCNP

Admirals and Relatives (Subfamily Limenitidinae)

- Weidemeyer's Admiral -- (*Limenitis weidemeyerii*) — BNM, VCNP
- California Sister -- (*Adelpha bredowii*) — BNM, VCNP

Leafwings (Subfamily Charaxinae)

- Goatweed Leafwing -- (*Anaea andria*) — BNM

Satyrs (Subfamily Satyrinae)

- Common Ringlet -- (*Coenonympha tullia ochracea*) — BNM
- Common Wood Nymph -- (*Cercyonis pegala*) — BNM
- Small Wood Nymph -- (*Cercyonis oetus*) — BNM, VCNP
- Chryxus Arctic -- (*Oeneis chryxus*) — BNM, VCNP

Monarchs (Subfamily Danainae)

- Monarch -- (*Danaus plexippus*) — BNM, VCNP
- Queen -- (*Danaus gilippus*) — BNM

Skippers (Family HesperIIDae)

Spread-wing Skippers (Subfamily Pyrginae)

- Silver-spotted Skipper -- (*Epargyreus clarus*) — BNM, VCNP
- Northern Cloudywing -- (*Thorybes pylades*) — BNM
- Mexican Cloudywing -- (*Thorybes mexicana*) — BNM, VCNP
- Rocky Mountain Duskywing -- (*Erynnis telemachus*) — BNM, VCNP
- Pacuvius Duskywing -- (*Erynnis pacuvius*) — BNM, VCNP
- Afranius Duskywing -- (*Erynnis afranius*) — BNM
- Persius Duskywing -- (*Erynnis persius*) — BNM
- Common Checkered-Skipper -- (*Pyrgus communis*) — BNM
- Common Sootywing -- (*Pholisora catullus*) — BNM

Grass Skippers (Subfamily Hesperinae)

- o Garita Skipperling -- (*Oarisma garita*) — BNM, VCNP
 - o Edwards' Skipperling -- (*Oarisma edwardsii*) — BNM, VCNP
 - o Draco Skipper -- (*Polites draco*) — BNM, VCNP
 - o Tawny-edged Skipper -- (*Polites themistocles*) — BNM, VCNP
 - o Snow's Skipper -- (*Paratrytone snowi*) — BNM, VCNP
 - o Taxiles Skipper -- (*Poanes taxiles*) — BNM, VCNP
 - o Dun Skipper -- (*Euphyes vestris*) — BNM, VCNP
 - o Dusted Skipper -- (*Atrytonopsis hianna*) — BNM
 - o Viereck's Skipper -- (*Atrytonopsis vierecki*) — BNM
 - o Orange-headed Roadside-Skipper -- (*Amblyscirtes phylace*) — BNM
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