Landscaping for Insects .... or not!

How Planting Selection Can Impact Insect Populations in Your Landscape
Plants can support populations of desirable insect species.

Plants may be contribute to incidence of pests that limit plant value.
Garden plantings can affect incidence of:

- Butterflies
- Hummingbird moths
- “Miller” moths
- Honey bees
- Bumble bees
- Various solitary bees
- Natural enemies of insect pests
- Nuisance invaders of buildings
- “Double or Nothing” species

...............
Insect Needs

• Food for their young
• Food for the adults
• Shelter (some species)
Insect Needs

Food for the young
Larval Food Example: Painted Lady

Larval host plants are thistles, hollyhock, mallow, occasionally legumes and some other plants.
Insect Needs

Food for the adults
Adult Food Example: Many predators of garden pests (biological controls)
Insect Needs (for some species)

Shelter/Nest Sites
Shelter Example: Nest cavities for leafcutter and mason bees
In the beginning there was…
Butterfly Gardening
Parsleyworm – my Gateway Bug to butterfly gardening
Parsleyworms are interesting caterpillars to find in the garden.
When disturbed the parsleyworm everts a scent gland (osmeterium) from behind the head.
Bill and Sam checking out a parsleyworm
When full grown, the caterpillars retreat to a sheltered area and prepare for the next stage – the pupa (chrysalis or chrysalid)
Chrysalid (pupal form) of the parsleyworm
The adult form of the parsleyworm is known as...
Black Swallowtail

*Papilio polyxenes*
Butterfly Gardening
Principles of Butterfly Gardening

• Provide for food needs of adults
• Provide for food needs of larvae (caterpillar)
• Avoid use of harmful insecticides
• Provide mud puddling habitat?
Foods Used by Butterflies:

*Nectar, fruit juices, oozing sap*....
Some *Annual Plants* Commonly Used by Butterflies

- Zinnia
- Larkspur
- Cosmos
- Verbena

- Sunflowers
- Asters
- Coreopsis
- *Some marigolds*
Some *Perennial Plants* Commonly Used by Butterflies

- Butterfly Bush
- Milkweeds
- Sedums
- Lilac
- Purple coneflower
- Thistles
- Monarda
- New England aster
Massed plantings are most often visited by butterflies
Foods Used by Butterflies:

*Nectar, fruit juices, oozing sap.*
Brushfooted butterflies (Nymphalidae) will visit a variety of foods, in addition to nectar-bearing flowers.....

Hackberry butterfly on a dead raccoon

Butterfly and honey bee visiting wild hog dropping
Ripe fruit is visited and used for food by many brushfooted butterflies
Foods Used by Caterpillars:

Leaves of their host plant
Resource used for promotion of butterfly gardening in Colorado since the mid 1980s

## Table 2: Food used by common Eastern Colorado butterflies and skippers.

<table>
<thead>
<tr>
<th>Butterfly</th>
<th>Flight period</th>
<th>Caterpillar food</th>
<th>Common nectar plants, adult food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black swallowtail (Papilio polyxenes)</td>
<td>April-September</td>
<td>Dill, parsley, fennel, carrot</td>
<td>Butterfly weed, alfalfa, thistle</td>
</tr>
<tr>
<td>Checkered skipper (Pyrgus communis)</td>
<td>April-October</td>
<td>Mallow, hollyhock</td>
<td>Verbena, dandelion, Canada thistle, aster</td>
</tr>
<tr>
<td>Checkered white (Pontia protodice)</td>
<td>April-November</td>
<td>Tumble mustard</td>
<td>Alfalfa, mustards, bee balm</td>
</tr>
<tr>
<td>Clouded sulfur (Colias philodice)</td>
<td>April-November</td>
<td>Alfalfa, clover</td>
<td>Alfalfa, phlox, rabbitbrush, aster, marigold</td>
</tr>
<tr>
<td>Edwards fritillary (Speyeria edwardsii)</td>
<td>June-September</td>
<td>Nuttall’s violet</td>
<td>Rabbitbrush, gaillardia, bee balm</td>
</tr>
<tr>
<td>European cabbage butterfly (Pieris rapae)</td>
<td>April-October</td>
<td>Broccoli, cabbage (mustard family)</td>
<td>Many</td>
</tr>
<tr>
<td>Gorgone checkerspot (Charidryas gorgone)</td>
<td>May-September</td>
<td>Sunflowers</td>
<td>White clover, dandelion, Canada thistle</td>
</tr>
<tr>
<td>Gray hairstreak (Stytonia melinus)</td>
<td>May-October</td>
<td>Many</td>
<td>Many</td>
</tr>
<tr>
<td>Hackberry butterfly (Asterocampa celtis)</td>
<td>May-September</td>
<td>Hackberry</td>
<td>Rotting fruit, sap flows</td>
</tr>
<tr>
<td>Melissa blue (Lycaeides melissa)</td>
<td>April-October</td>
<td>Wild licorice, alfalfa, etc.</td>
<td>Bee balm, sweet clover</td>
</tr>
<tr>
<td>Monarch (Danaus plexippus)</td>
<td>June-October</td>
<td>Milkweed</td>
<td>Cosmos, Canada thistle, rabbitbrush, etc.</td>
</tr>
<tr>
<td>Mourning cloak (Nymphalis antiopa)</td>
<td>February-November</td>
<td>Willow, aspen, cottonwood, elm</td>
<td>Rabbitbrush, milkweed, sap</td>
</tr>
<tr>
<td>Orange sulfur (Colias eurytheme)</td>
<td>April-October</td>
<td>Alfalfa, vetch, pea</td>
<td>Alfalfa, marigold, zinnia</td>
</tr>
<tr>
<td>Painted lady (Vanessa cardui)</td>
<td>April-October</td>
<td>Thistle, hollyhock, sunflower</td>
<td>Grape hyacinth, cosmos, zinnia, alfalfa, many flowers</td>
</tr>
<tr>
<td>Silver-spotted skipper (Epargyreus clarus)</td>
<td>May-July</td>
<td>Wild licorice, locust, etc.</td>
<td>Lilac, dogbane, zinnia, sweet pea, Canada thistle</td>
</tr>
<tr>
<td>Two-tailed swallowtail (Papilio multicaudatus)</td>
<td>April-August</td>
<td>Green ash, chokecherry</td>
<td>Geranium, thistle, milkweed</td>
</tr>
<tr>
<td>Variegated fritillary (Euptoieta claudia)</td>
<td>April-October</td>
<td>Various, including pansy</td>
<td>Rabbitbrush, Canada thistle</td>
</tr>
<tr>
<td>Weidemeyer’s admiral (Limenitis weidemeyerii)</td>
<td>June-September</td>
<td>Willow, aspen, cottonwood</td>
<td>Sap flows, snowberry, dung</td>
</tr>
<tr>
<td>Western tiger swallowtail (Papilio rutulus)</td>
<td>May-July</td>
<td>Willow, cottonwood, chokecherry</td>
<td>Zinnia, lilac, butterfly bush, thistle, milkweed</td>
</tr>
</tbody>
</table>
Black Swallowtail butterfly

Parsleyworm
Twotailed Swallowtail

*Papilio multicaudata*
Eggs are laid on ash, chokecherry, hoptree

Hosts of the related western tiger swallowtail include chokecherry, ash, aspen, and willow
Late stage caterpillars have a different appearance.

Twotailed swallowtail caterpillar everting osmeteria (repellent scent glands).
Asclepias tuberosa

Asclepias incarnata

Photos courtesy of Monarch Watch
Wyoming is at the edge of where the Monarch butterfly ranges in summer.
Painted Lady

An annual migrant that originates from areas of NW Mexico

Larval host plants are thistles, hollyhock, mallow, occasionally legumes and some other plants
Variegated fritillary

Larval host plants are pansies, purslane, some *Passiflora*, some *Sedum*, others

Photo courtesy of Johnny N. Dell

Photo courtesy of Jerry Payne
Melissa blue develops on various legumes.

Ruddy copper develops on dock and other plants in the buckwheat family (Polygonaceaeaeaeae).

Photographs by Robert Hammon.
Larval host plants are various wild buckwheats (*Eriogonum* spp.)

**State Insect of Wyoming**

**Sheridan’s Green Hairstreak**

*Callophrys sheridani*

Photo Credit: Walter Siegmund (talk) - Own work, CC BY 2.5, https://commons.wikimedia.org/w/index.php?curid=4939863
Butterfly Houses – Do they provide benefits to butterflies?
Butterfly Houses – Do they provide benefits to butterflies?

Very dubious value
European paper wasp

Polistes dominula

European paper wasp was first found in eastern Colorado in 2001
Paper wasps feed their young freshly killed insects (mostly caterpillars) that they capture and chew.
Impacts on yard/garden Lepidoptera
Common garden caterpillars, such as the cabbageworm and tomato hornworm, are well controlled by paper wasps.
The European paper wasp has also impacted butterfly gardening at residential sites.
Butterfly houses

Soil well covered by mulch

Quality pollinator habitat?
Gardening for Hummingbird Moths
Hummingbird Moth

- A type of sphinx/hawk moth that flies during the day
Hornworms, Sphinx Moths (and Hummingbird Moths)
Lepidoptera: Sphingidae
Hornworms are large caterpillars. Most have a “horn” on the end of the body.

Two species can be damaging pests of tomatoes – the tomato hornworm and the tobacco hornworm.
Caterpillars of the tomato hornworm and tobacco hornworm feed on leaves on tomato and other nightshade family plants.
Hornworms turn into ................. Sphinx moths.
You like this....

..but not this.
Colorado has about two dozen kinds of hornworms.

Most hornworms are not “pest” insects.
Hummingbird Moth

- A type of sphinx/hawk moth that flies during the day
Most sphinx moths fly only at night – and thus are not “hummingbird moths”

This includes the two species that damage garden crops
Whitelined sphinx

*Hyles lineata*

The most common hummingbird moth of the western US – and common throughout North America.
Whitelined Sphinx
"hummingbird moth" of the West
Hummingbird clearwing sphinx
Hemaris thysbe

“Bumble Bee” Clearwing Sphinx Moths

Snowberry clearwing
Hemeris diffinis
Some plants most often visited by hummingbird moths include:

- Four o’clocks
- Evening primrose
- Larkspur
- Gentian
- Nasturtium
- Catmint
- Datura
- Wild bergamot
- Many *Agastache* spp.
- Honeysuckle…
Army cutworm

*Euxoa auxiliaris*

The predominant cutworm of the High Plains/Rocky Mountain region

…..and the common “Miller Moth” of the west
Army cutworm larva – the most common spring feeding cutworm in the region
Army cutworm pupa

Pupae are present from March through late May.
Adult form of the army cutworm – the ’Miller Moth’
Miller Moth

Term applied to any species of moth that is locally abundant.

Term refers to the scales on moth wings that dislodge – like flour on the smock of a miller.
Army cutworm moths have variable wing patterning
Next Task….

Follow the flowers and stay cool
The Annual Migration

Move from the Plains to the mountains in May-June
The Annual Migration

Move from the Plains to the mountains in May-June

Return to the Plains in September and early October
Swallows at the intersections?

It's Miller Time!
Plants Commonly Used as Miller Moth Nectar Sources

- Lilac, Chokecherry and other *Prunus*
- Spirea
- Euonymus
- Cotoneaster
- Russian olive
Plants commonly used as daytime shelter areas for miller moths

- Densely growing pines
- Spruce
- Dense evergreen deciduous shrubs (e.g., cotoneaster)
Landscaping for Biological Control Agents
Principles of Gardening for Natural Enemy/Bio-Control Insects

• Learn to recognize them – and don’t kill them
• Provide for food needs of adults
• Provide for food needs of immature stages
• Provide nest sites, if required
Principles of Gardening for Natural Enemies of Insect Pests

- **Learn to recognize them – and don’t kill them**
- Provide for food needs of adults
- Provide for food needs of immature stages
- Provide nest sites, if required
Lady Beetle Life Stages

- Adults
- Eggs
- Larvae
- Pupae
Lady beetles lay masses of eggs near sources of food for their young
Lady Beetle Larvae
Principles of Gardening for Natural Enemies of Insect Pests

• Learn to recognize them – and don’t kill them

• Provide for food needs of adults

  • Provide for food needs of immature stages
  • Provide nest sites, if required
Lady beetles

(“Lady bugs”, “Lady birds”....)
Lady beetle adults feed on nectar and pollen.
Green Lacewings

Neuroptera: Chrysopidae
Most adult green lacewings maintain themselves on nectar and pollen.
Flower (Syrphid) Flies
CAUTION

Insect Mimicry in Action!
Syrphid flies are excellent mimics of bees and wasps.

Honey Bees

Flower (Syrphid) Flies
Adult flower flies sustain themselves on nectar and pollen.
Adults of many predators use flowers (nectar, pollen) for sustenance.
Parasitoid wasps maintain themselves on nectar and pollen.
Tachinid fly adults sustain themselves on nectar and pollen.

Larvae develop within and kill other insects.
Natural Enemies of Japanese Beetle for Potential Introduction into Colorado?

*Istocheta aldrichi* – tachinid fly parasitoid of Japanese beetle adults
*Istocheta aldrichii* requires accessible nectar/pollen resources when the adults are active

– late June-July
Small, accessible flowers are most commonly used by natural enemies of garden pest insects.
Some plants useful for providing food for adult stages of insect natural enemies

- Most Apiaceae - (dill, fennel, coriander, Ammi, Queen Anne’s lace, etc.)
- Yarrow (some)
- Many sedums
- Spurges
- Sweet alyssum
- Basket-of-gold
- Thyme, several herbs
Two personal favorites for good insect action

Ammi (white cultivars)

Mooncarrot
Principles of Gardening for Insect Natural Enemies

• Learn to recognize them – and don’t kill them
• Provide for food needs of adults

• Provide for food needs of immature stages
• Provide nest sites, if required
Spirea aphids on my bridal wreath spirea shrub – A pest??
Perennial plants that consistently provide predator food sources in my garden
Principles of Gardening for Insect Natural Enemies

• Learn to recognize them – and don’t kill them
• Provide for food needs of adults
• Provide for food needs of immature stages

• Provide nest sites, if required
Hunting Wasps
Families Sphecidae, Crabronidae, Pompilidae
Hunting Wasp Habits

• Mother (usually) prepares some nest cell for rearing young
• Mother hunts specific prey, paralyzes it and returns it to the nest cell
• Larvae of the hunting wasp consume the paralyze prey provided by the mother
Ammophila wasp digging nest (left), carrying caterpillar prey (lower left), at nest entrance with prey (below)
Bembix wasp digging while holding horse fly prey
Golden Digger Wasp – Predator of longhorned grasshoppers/katydid
*Pemphredon* wasps nest in plant stems and hunt small insects.
*Pemphredon* wasps nest in plant stems and hunt small insects.
Condominium Project for Pith Nesting Pempredon Wasps
An excellent publication by the Xerces Society on improving habitat for natural enemies of insect pests.

Search conservation biological control for other sources on this subject.
Landscaping and Pollinators
Primary Groups of Flower Visitors and Pollinators

- Bees
- Flies
- Beetles
- Butterflies and Moths
Bees (946 CO species)

- Rear young on nectar and pollen
  - Often seen carrying pollen on their body
- Have a hairy body
- Some produce wax
- Capable of stinging
  - Social bees have painful sting
  - Solitary bees have mild sting
Gardeners can help various species of bees by expanded use of high value flowering plants.
Honey Bee *Apis mellifera*
Gardening for Honey Bees – or Not
Honey bees – and most bees – collect nectar as their primary energy source.
Honey bees – and most bees – use pollen as their primary source for proteins, fats and most other nutrients.

Pollen carried in pollen sac on hind legs.
Principles of Gardening for Bees

- Provision of high quality sources of nectar
- Provision of high quality sources of pollen
- Provision of nesting sites
Principles of Gardening for Bees

- Provision of high quality sources of nectar
- Provision of high quality sources of pollen
- Provision of nesting sites
Top Ornamental Plants Visited by Honey Bees in CO include:

- Blue mist spirea
- *Cleome* (bee plant)
- *Agastache foeniculum*
- *Penstemon eatonii*
- *Ocimum (basil)*
- *Nepeta*
- *Salvia*
- *Linden*

- *Aster novae-angliae*
- *Sedum spectabile*
- *Cotoneaster*
- *Allium tangitucum*
My top three ornamental plants for providing consistent sources of nectar and/or pollen:

- Catmint
- New England Aster
- Salvia nemorosum
Principles of Gardening for Bees

• Provision of high quality sources of nectar
  – Sources need to be available throughout the growing season!

• Provision of high quality sources of pollen
  – Sources need to be available throughout the growing season!

• Provision of nesting sites
Some important pollinator resource plants early in the season

- Dandelion
- Perennial or winter annual brassicas
- Early flowering Prunus spp.
- Silver maple and other Acer spp.
Some early season, predominantly trees and shrubs can be very important early season pollen sources for honey bees

*Salix* spp. (willow)

*Acer* spp. (maple, boxelder)

*Alnus* spp. (alder)
Several very early flowering bulbs in Iridaceae, Amaryllidaceae and Liliaceae were important early season pollen sources.
Maples are an exceptionally important early season source of pollen.
Some plants heavily visited by honey bees late in the season:

- Rubber Rabbitbrush
- *Thymus coccineum*
- Blue Mist Spirea
- Monarda
Hemp can provide a major, late summer pollen resource for bees in agricultural areas.
Lawns can be an important resource site from many pollinating insects!
Pollinator assemblages on dandelions and white clover in urban and suburban lawns

Jonathan L. Larson · Adam J. Kesheimer · Daniel A. Potter

Received: 30 January 2014/ Accepted: 30 August 2014
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Abstract Flowering weeds, though often deemed undesirable in turfgrass lawns, provide food resources for declining pollinator populations in urbanized landscapes. We sampled bees and other pollinators directly from flowering common dandelion (Taraxacum officinale) and white clover (Trifolium repens) in lawns of similar characteristic value to that of surrounding areas. Fostering public awareness of the diversity of bees and other pollinators that visit flowering lawn weeds might help nurture a sociocultural shift toward more pollinator-friendly lawn care practices.
>50 total species collected
Some discretion can be important when siting plants highly favored by honey bees
To the left:  
*Sedum spectabile*

To the right:  
*Caryopteris x candonensis*
Plants *not favored* by honey bees include:

- Doubled flower cultivars
- Flowers with long corollas
- Many common bedding plants
  - Viola
  - Phlox
  - Vinca
  - Petunia
Bumble Bees

*Bombus* species
Bumble Bee Life History
Providing nesting sites for bumble bees?
Various plans exist to construct bumble bee nests
Bumble bee colonies are sold for the pollination of certain crops.
Some plants (e.g. the tomato) are dependent on buzz pollination.
Providing nesting sites for bumble bees?
Plants heavily visited by bumble bees include:

- Echinacea
- Echinops
- Russian sage
- Hypericum frondosum
- Cleome
- Caragana
- Foxgloves

- Most Penstemons
- Agastache rupestris
- Campanula
Cultivar differences can be great, depending on features such as flower color.

Highly favored by bumble bees – and painted lady butterflies.

“Kudos Silver Blue”
Cultivar differences can be great, depending on features such as flower color.

Favored but less visited – Rosie Posie

Very little visitation – Kudo’s Gold

Little visited – Kudo’s Ambrosia
The greatest number of kinds of bees are solitary bees.
Solitary Bee Life Stages

- Egg
- Larva
- Pupa
- Adult
Most solitary bees are ground nesters.
Some ground nesting bees nest in open sites of bare ground.

Some ground nesting bees nest in a patch of soil near the base of a plant.
Favorable digger bee nesting site
Digger bee nesting site near Purgatoire River (Otero County)
Andrenidae – Mining Bees
Andrenid bee nest site
Sweat Bees
Halictid bee nest sites in backyard patio area
Some ground nesting bees nest in open sites of bare ground.

Some ground nesting bees nest in a patch of soil near the base of a plant.

Very few – if any – will nest in a site that has a thick mulch layer.
Very few ground nesting solitary bees will be able to establish nests at sites with heavy mulch.
Butterfly houses

Soil well covered by mulch

Quality pollinator habitat?
Other bees use aboveground cavities for nest sites
Family Megachilidae
Leafcutter, mason, carder bees
Leafcutter bee working sweet pea flower.

Note how the anthers become exposed as the bee pushes the flower while nectaring.
Leafcutter bee collecting pollen
All members of the family Megachilidae (leafcutter, mason, carder bees) carry pollen on the underside of the abdomen.
Leafcutter Bees
Pith Nesting by Leafcutter Bees

Nest cells in pith of rose cane

Nest cells with pollen in stem of weed

Photograph courtesy of David Shetlar, Ohio State University
Soft, rotting wood is often excavated for nest sites.

Leafcutter bee nest sites
Leafcutter bee excavation in rotten garden timber
Leafcutter bees cut fragments from the edges of leaves that are suitable for nest building.
Rose, lilac and Virginia creeper are among the plants most favored by leafcutter bees for nest materials.
Leafcutter bee carrying leaf fragment
Leafcutter bee returning with leaf fragment
Cut leaves are used for nest construction.

All leaf fragments are oriented with the smooth side inwards.
For nest construction:

- 3-4 rectangular pieces, crimped for the base
- Oval pieces along the sides of the cell
Leafcutter bees collect pollen and nectar, carry it to the nest site, and use it to fill a leaf-lined nest cell.
For nest construction:

- 3-4 rectangular pieces, crimped for the base
- Oval pieces along the sides of the cell
- Nearly perfect circles used to cap the cell
Nesting sites for leafcutter bees
Mason Bees
(Osmia species)
Predrilled wood for nesting by mason bees
Nest cells produced by mason bees in hollowed plant stems
Nesting habitat may be limiting activity of many native bees (leafcutter bees, mason bees, carder bees, carpenter bees)
A variety of hole sizes can be used to attract a variety of species.

Start at **about 5/8-inch**, then go up and down for hole width.

Make the holes deep, 6-inches is good.
Too much of a good thing?
Excellent publication on the subject of North American bees!
Gardening for Native Bees in Utah and Beyond

James H. Cane
Research Entomologist, USDA ARS
Pollinating Insect-Biology, Management, Systematics Research

Linda Kervin
Logan, UT

Do You Know?

- 900 species of native bees reside in Utah.
- Some wild bees are superb pollinators of Utah’s tree fruits, raspberries, squashes, melons and cucumbers.
- Few of our native bees have much venom or any inclination to sting.
- Our native bees use hundreds of varieties of garden flowers, many of them water-wise.
- A garden plant need not be native to attract and feed native bees.

Utah is home to more than 20 percent of the 4,000+ named species of wild bees that are native to North America. Except for bumblebees and some sweat bees, our native bees are solitary, not social, many with just one annual generation that coincides with bloom by their favorite floral hosts. In contrast, the familiar honeybee is highly social, has perennial colonies.

An outstanding – and free – publication from Utah State University
Excellent publication on how to improve habitat for native pollinators.
Two Books at the Silent Auction!

*Check them out!*