Some of the people working on rare plants and pollinators in Colorado:

- Vince Tepedino and colleagues at USU
- Sarah Clark, USU
- Becky Hufft Kao, Anna Sher, and colleagues at DBG
- CNAP
- USFWS
- Susan Panjabi and colleagues at CNHP
- Krissa Skogen, CBG
- Ron Abbott
# Key Rare Plant Genera in Colorado

- **Astragalus** (45 spp)
- **Penstemon** (28 spp)
- **Carex** (24 spp)
- **Physaria** (19 spp)
- **Eriogonum** (18 spp)
- **Draba** (16 spp)
- **Oreocarya** (13 spp)
- **Botrychium** (12 spp)
- **Mentzelia** (8 spp)
- **Aletes** (8 spp)
- **Oenothera** (8 spp)
- **Phacelia** (8 spp)
- **Asclepias** (7 spp)
Today we’ll talk about...

- Astragalus (45 spp)
- Penstemon (28 spp)
- Carex (24 spp)
- Physaria (19 spp)
- Eriogonum (18 spp)
- Draba (16 spp)
- Cacti
- Orchids
- Conservation

But won’t have time to go into:

- Oreocarya (13 spp)
- Botrychium (12 spp)
- Mentzelia (8 spp)
- Aletes (8 spp)
- Oenothera (8 spp)
- Phacelia (8 spp)
- Asclepias (7 spp)
Astragalus (45 spp)

- Papilionaceous
- Bumblebees, digger bees, mason bees, honeybee.
- Dipterans (flies) and Coleoptera (beetles) are not likely to be important pollinators
- Some Geitonogamy, some obligate outcrossers
Astragalus schmolliae G1S1

- Anthophorid bees, Megachilid bees
- Flowers are “tripped” by the bees
• White, blue, and purple Penstemons: Bees, and the wasp *Pseudomasaristas vespoides*.

• Pink and Red Penstemons: Hummingbirds

*Penstemon* (28 spp)

The Insects That Visit Penstemon Flowers

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Plate 9: Common pollinators of plants in the genus *Penstemon* (photographs by Paul Wilson).

Bulletin of the American Penstemon Society Vol. 68
Penstemon grahamii G2S1

- Specialized flowers
- May be Self-compatible, autogamous and geitonogamous

Pseudomasaris wasp visiting P. grahamii
Photo by Dee Malone
• Specialized flowers
• *Osmia* appears to be extremely important for their pollination
• Self-compatible, autogamous and geitonogamous
• But far better seed production when outcrossing


Photos by Pam Smith
Carex (24 spp)

- Wind pollinated
- Carex is the ancestor of Cyperus, which can be insect pollinated

Physaria (19 spp)

- **Physaria congesta**
  - Requires pollination
  - Most pollinators are bees

Dudley Bluffs Bladderpod by Sarah Clark, USU

Physaria

- **Physaria obcordata**
  - Requires pollination
  - Most pollinators are native ground nesting bees (Andrenidae and Halictidae)

Physaria
Eriogonum (18 spp)

Aquilegia

Newsletter of the Colorado Native Plant Society


Eriogonum (18 spp)

• Some species propagate clonally
• Most Eriogonum species throughout Western North America are pollinated by a broad range of generalist pollinators
• *E. pelinophilum*, G1S1 has the highest number of pollinator species observed in the genus (Taliga and Glenne 2011).
• No clear examples of specialization

Eriogonum brandegeei G1G2S1S2

Photo: Michelle De Pringer-Levin

Photo: Susan Panjabi
Eriogonum brandegeei

- Floral Visitors to *E. brandegeei* (Panjabi 2004)

Draba (16 spp)

- Apomixis - asexual reproduction through seeds
- “Microspecies” concept by Grant (1981)
- Pollination is not required but may play a role in gene flow


Photo by Bernadette Kuhn
Draba
• *Sclerocactus wetlandicus* and *brevispinus*
  • Oucrossed and self incompatible.
  • Pollinated largely by native (ground nesting) halictid bees.

“Why do Orchids have so many perfect contrivances for their fertilisation? I am sure that many other plants offer analogous adaptations of high perfection; but it seems that they are really more numerous and perfect with the Orchideae than with most other plants.” –Charles Darwin (1888)
Most Cypripediums: Female Andrena haemorrhhoa bees

C. parviflorum: male lesser carpenter bees (Ceratina calcarta)

How important are pollinators?

- Astragalus (45 spp) **Critically important**
- Penstemon (28 spp) **Critically important**
- Carex (24 spp) **Not important**
- Physaria (19 spp) **Critically important**
- Eriogonum (18 spp) **Really important**
- Draba (16 spp) **Probably not important**
- Oreocarya (13 spp) **Usually important**
- Botrychium (12 spp) **Not relevant**
- Mentzelia (8 spp) **Critically important**
- Aletes (8 spp) **Probably important**
- Oenothera (8 spp) **Critically important**
- Phacelia (8 spp) **Many poorly known, important in most**
- Asclepias (7 spp) **Critically important**
Pollinators are a critical part of the equation for successful conservation of rare plants.
Pollinator Conservation

- **Research**
  - More funding needed

- **Incentives**
  - NRCS: Pollinator practices
  - Million Pollinator Garden Challenge
  - NWF

- **Education**
  - Xerxes Society, USFS

- **Regulation**
  - neonictinoid insecticides

- **Policy**
  - Helping Pollinators
    - Bee boxes near rare plant occurrences
Pollinator Conservation

- Education
  - American Mountaineering Center
Impacts on native bees and other pollinators remain poorly understood.

### Table 5.1 Toxicity of Neonicotinoids

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<thead>
<tr>
<th>Neonicotinoid</th>
<th>Known Toxicity to Honey Bees¹</th>
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<tbody>
<tr>
<td></td>
<td>Contact LD₅₀</td>
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<tr>
<td>Acetamiprid</td>
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<td>Clothianidin</td>
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<td>Dinotefuran</td>
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<td>Imidacloprid</td>
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<td>Thiacloprid</td>
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</tr>
<tr>
<td>Thiamethoxam</td>
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</table>

H = highly toxic; M = moderately toxic
Toxicity: Highly toxic: LD₅₀ < 2 µg/bee; Moderately toxic: LD₅₀ 2–10.99 µg/bee; Slightly toxic: LD₅₀ 11–100 µg/bee; Practically non-toxic: LD₅₀ >100 µg/bee.

Colorado’s Landscape Disturbance Index
Acknowledgements

Susan Panjabi
Becky Hufft Kao
Bernadette Kuhn
Delia Malone
Jill Handwerk
Lee Grunau
Steve Olson
Thank You!

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