On-farm needs and post-fire fates of bees that pollinate our restoration forbs

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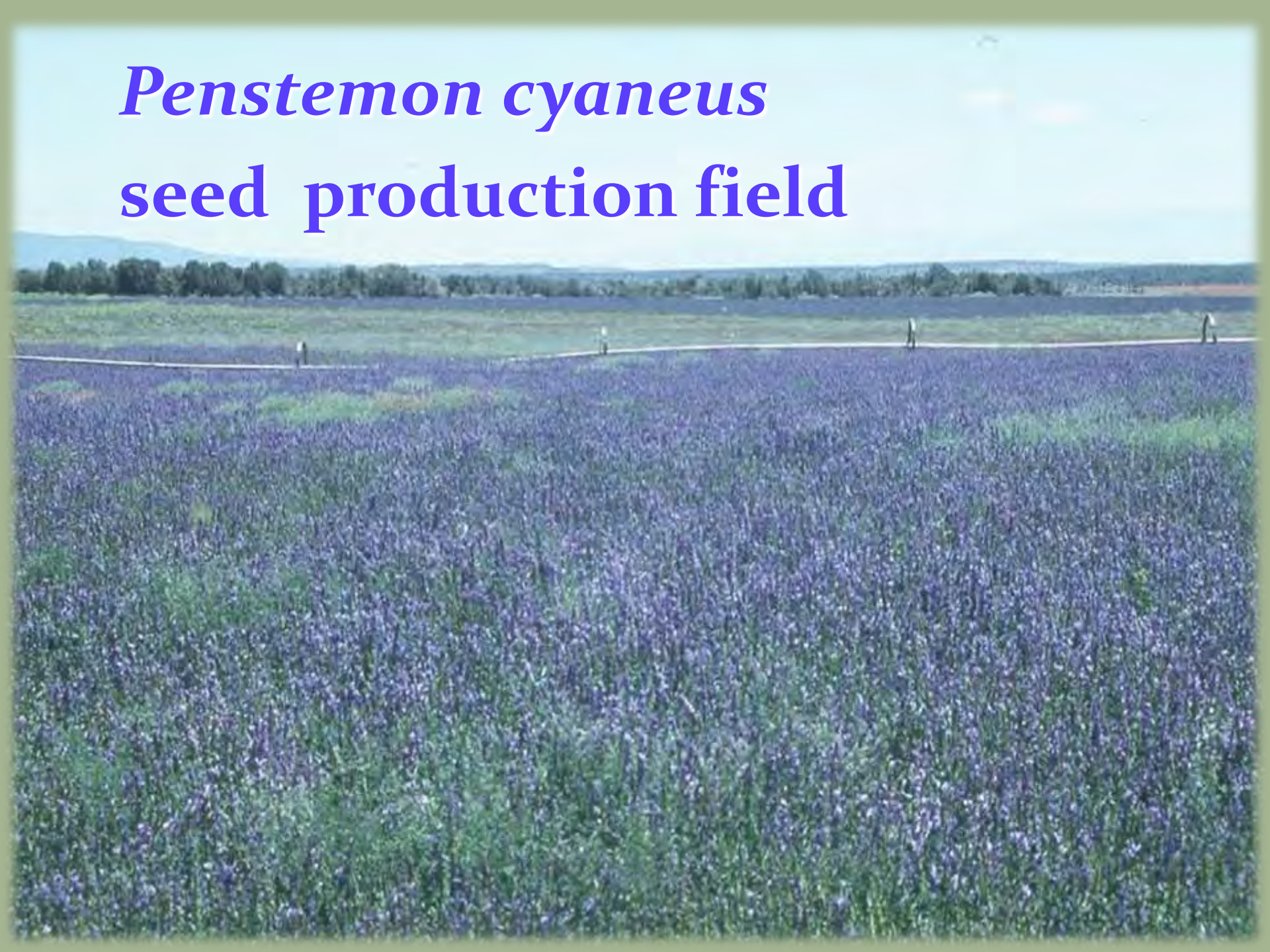
Wind-pollinated
Sagelands
VINEYARD
CABERNET SAUVIGNON
COLUMBIA VALLEY

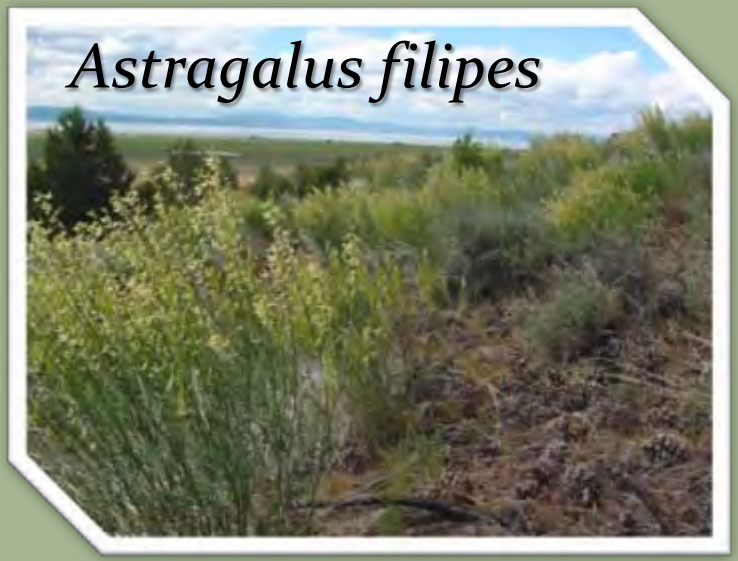
"The management implications are that sustainability of these [sagebrush] eco-systems will depend on maintaining or restoring the perennial herbaceous species."

Chambers et al. 2007. Ecological Monographs 77:117-145.

Hedysarum boreale seed field


Penstemon cyaneus
seed production field

Fabaceae (legumes)



Lupinus

Asteraceae


Crepis
(Asteracae)

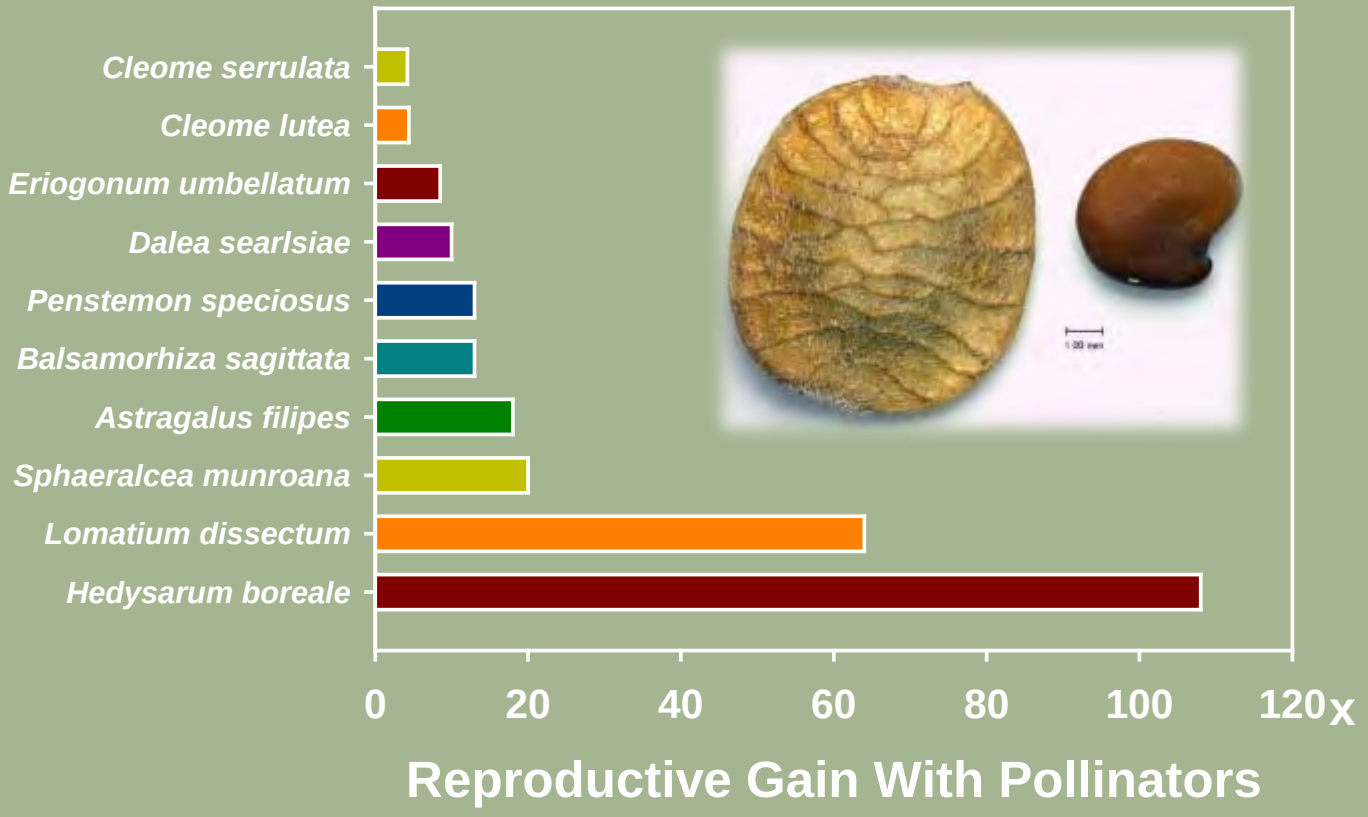

Balsamorhiza
sagittata


Chaenactis
douglasii

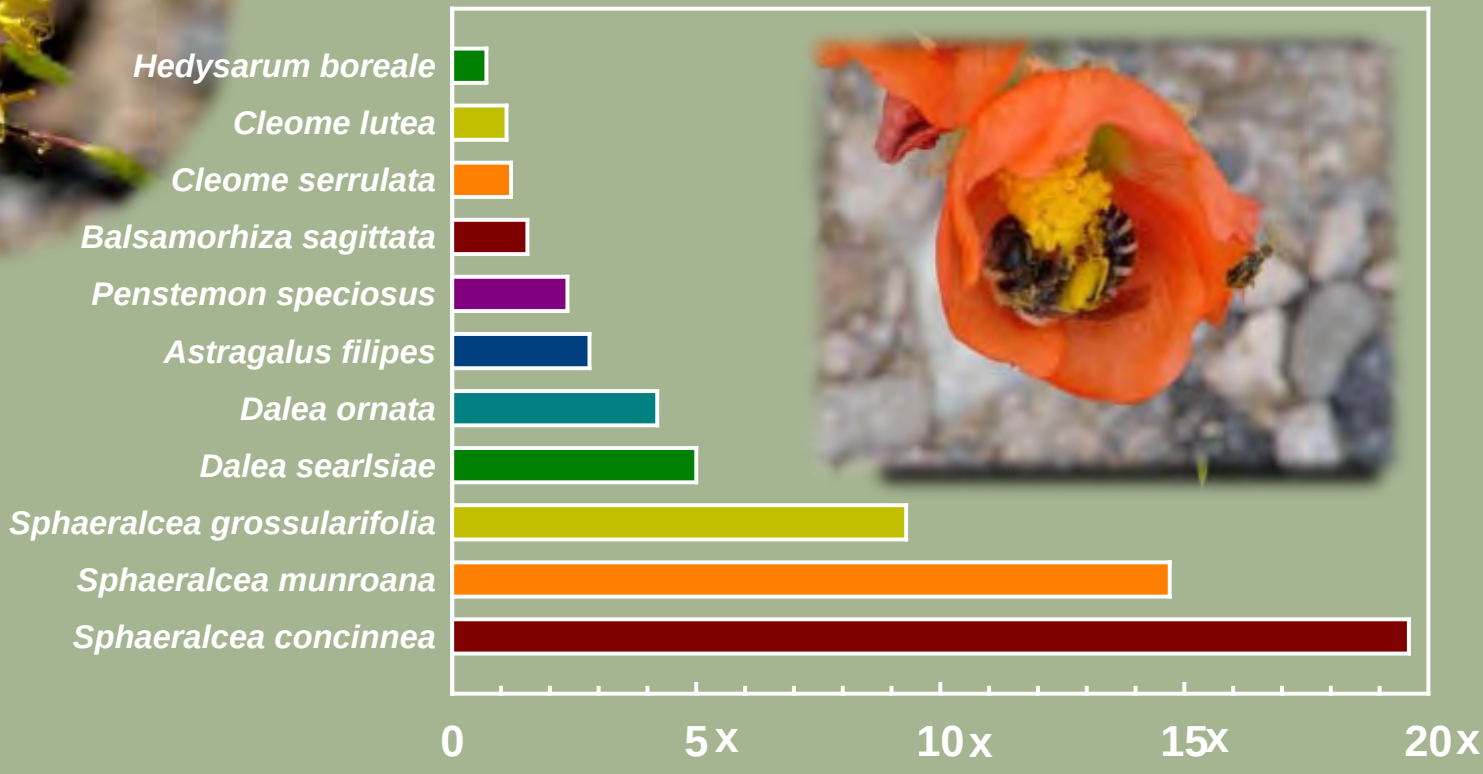
Familial hodgepodge

Eriogonum

Need for pollinators



Benefits of cross-pollination



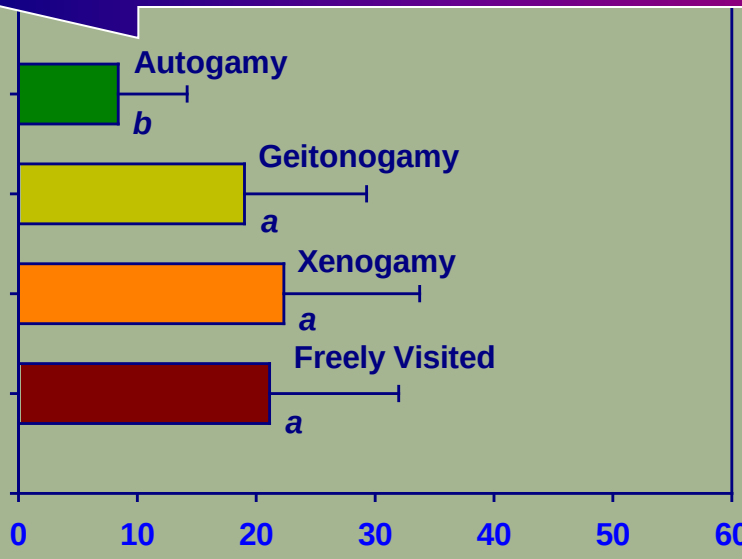
Reproductive Gain With Cross-Pollination

Outcrossing Advantage

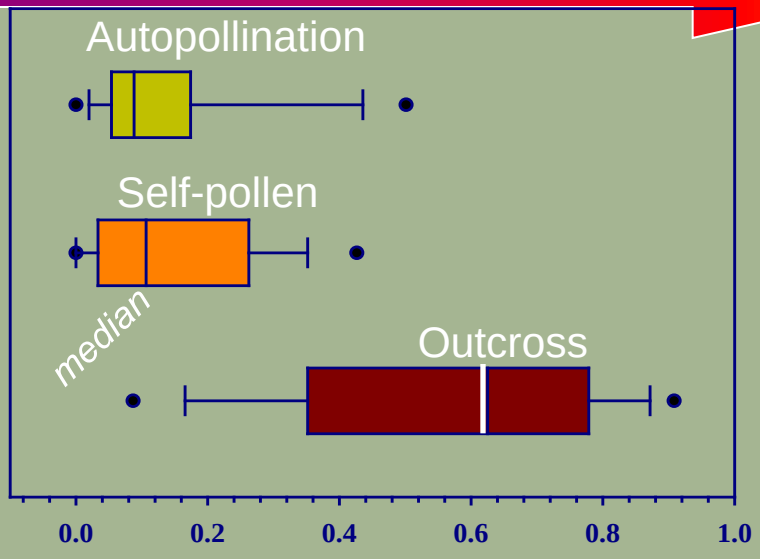
Cleome serrulata

Chaenactis douglasii

Self-fertile — Self-incompatible



Seeds per Silique (pod) (Mean + 1 std dev.)



Fraction of Filled Achenes Produced per Capitulum

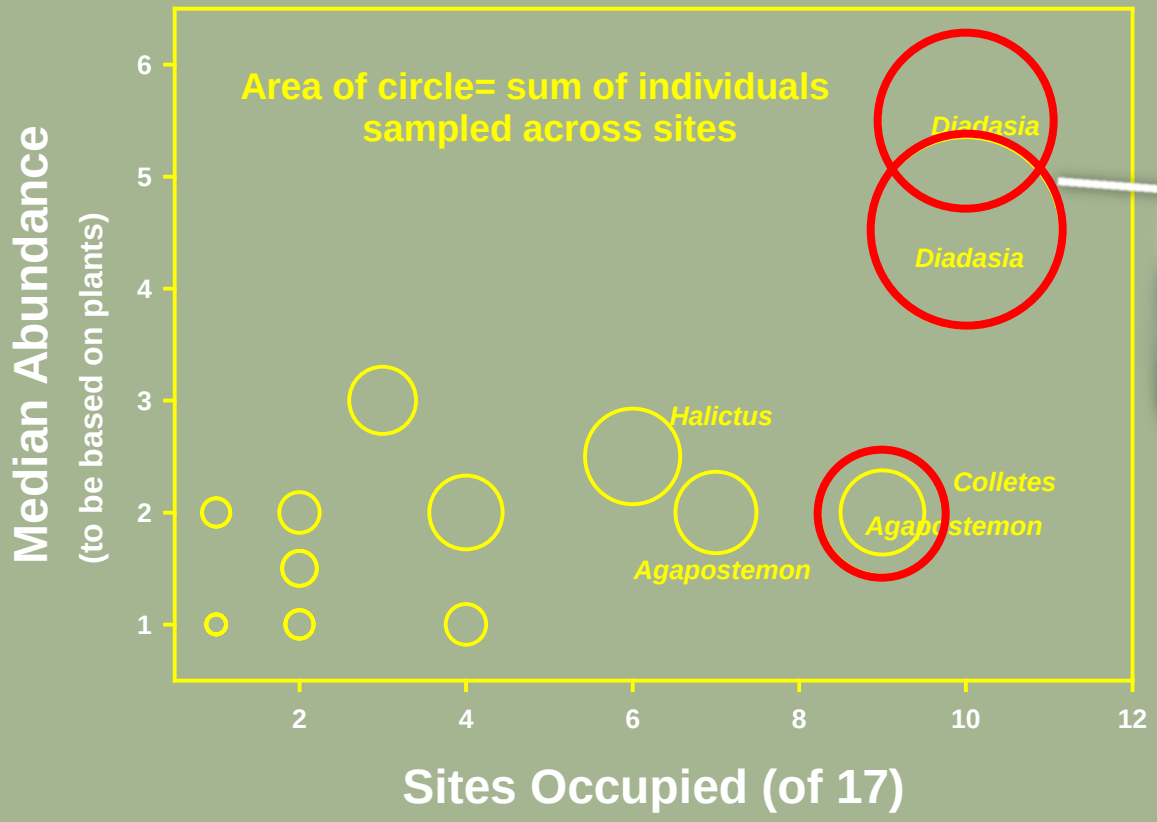
Bees Rule, but with exceptions

Pseudomasaris pollen wasps at *Penstemon*

Syrphids, other flies at *Lomatium*

Plants share some bees

Other plants depend on specialist bees



Diadasia diminuta at *Sphaeralcea*

Multiplying wild specialists : *Diadasia*

Deliver 33-45 pollen grains per stigma

Bees for Farming Native Forbs

- Hived **honeybees**, useful for pollinating several wildflower species
- Often not best, but usually much better than no bees

Bees for Farming Native Forbs

- **Alfalfa leaf-cutting bees** useful for several summer-blooming species such as *Dalea*

Wild Bees for Farming Native Forbs

- **Other *Osmia*** bees can be managed to pollinate various Fabaceae, Asteraceae and more

17,000 progeny in 2010

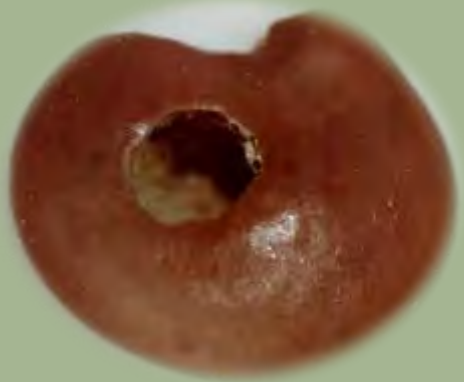
Osmia sanrafaelae nest in straw

Nesting shelter with nesting holes

Bees for Farming Native Forbs

- ***Stewardship of wild bees that you can't manage***
- May multiply on other cultivated flowering species

Seed predators (weevils , other beetles)



Weevil exit hole in seed of *Hedysarum*

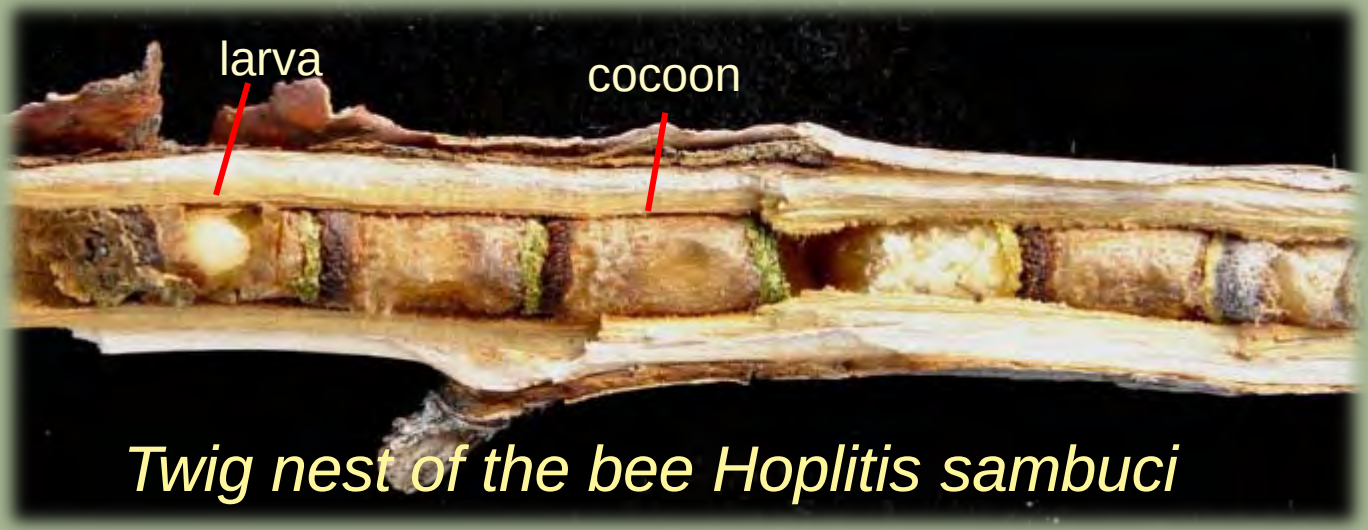
adults

Weevils that attack *Dalea* seed

egg

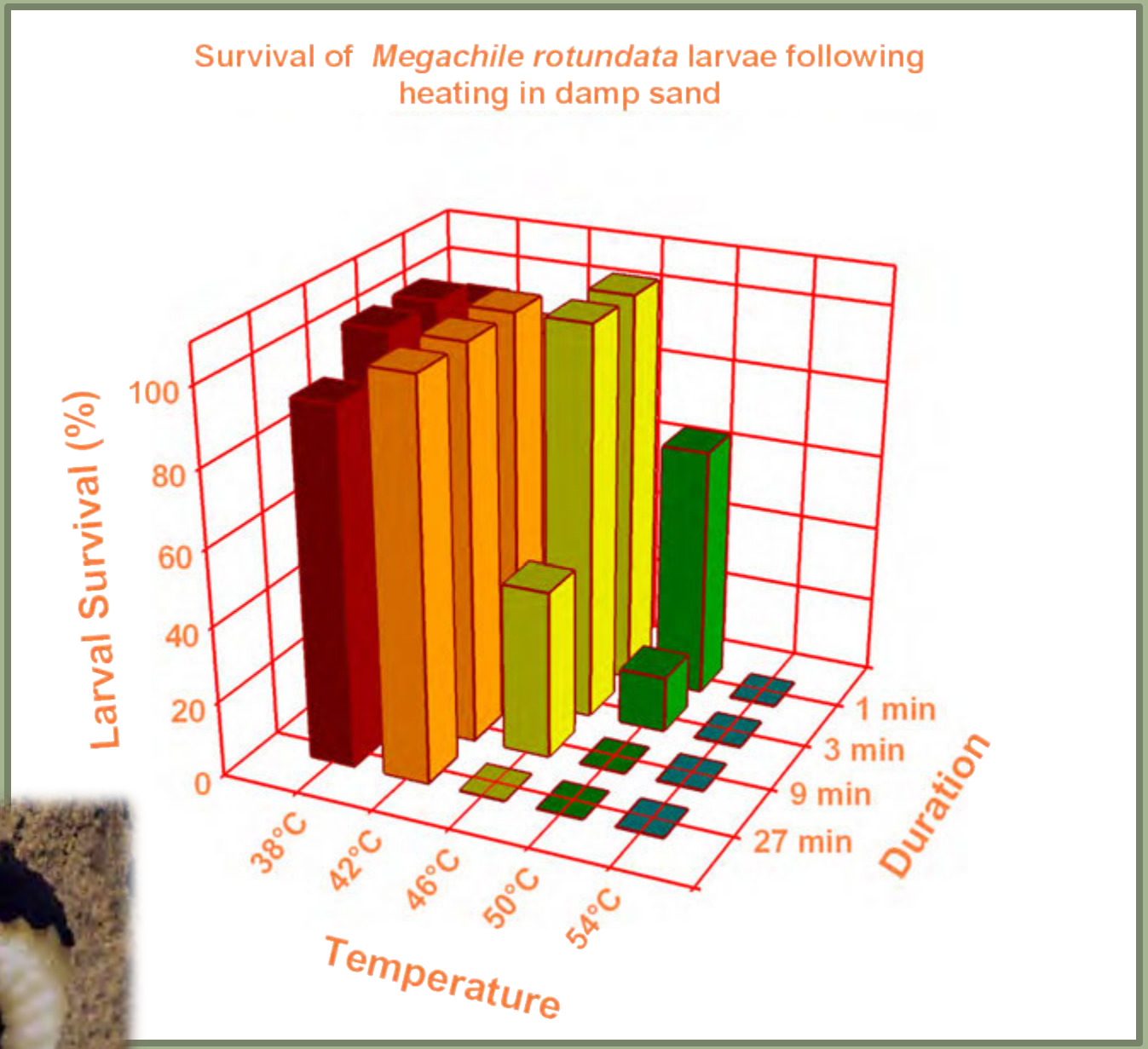
larvae


Fates of wild bee
communities after fire

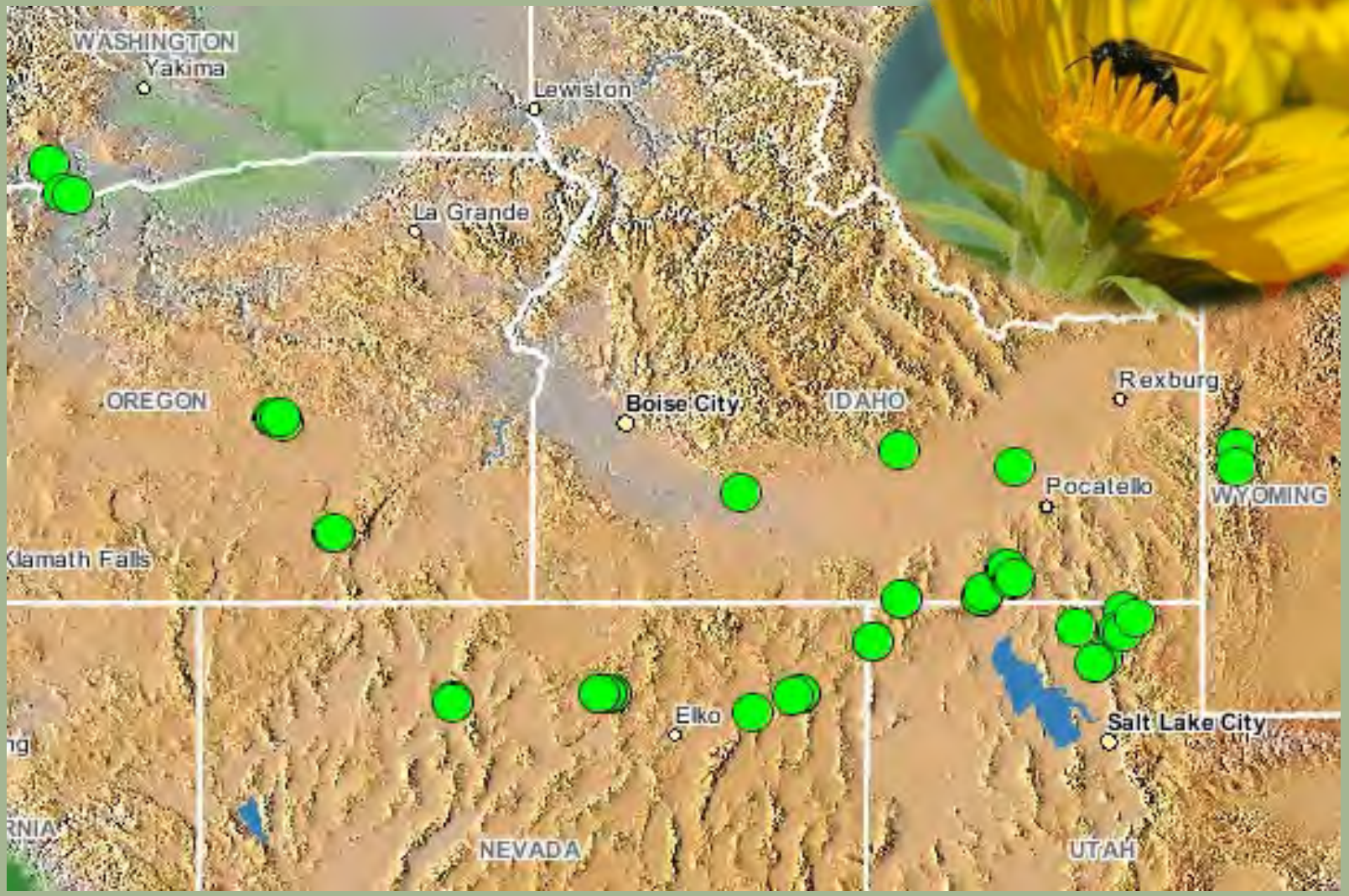


Twig nest of the bee Hoplitis sambuci

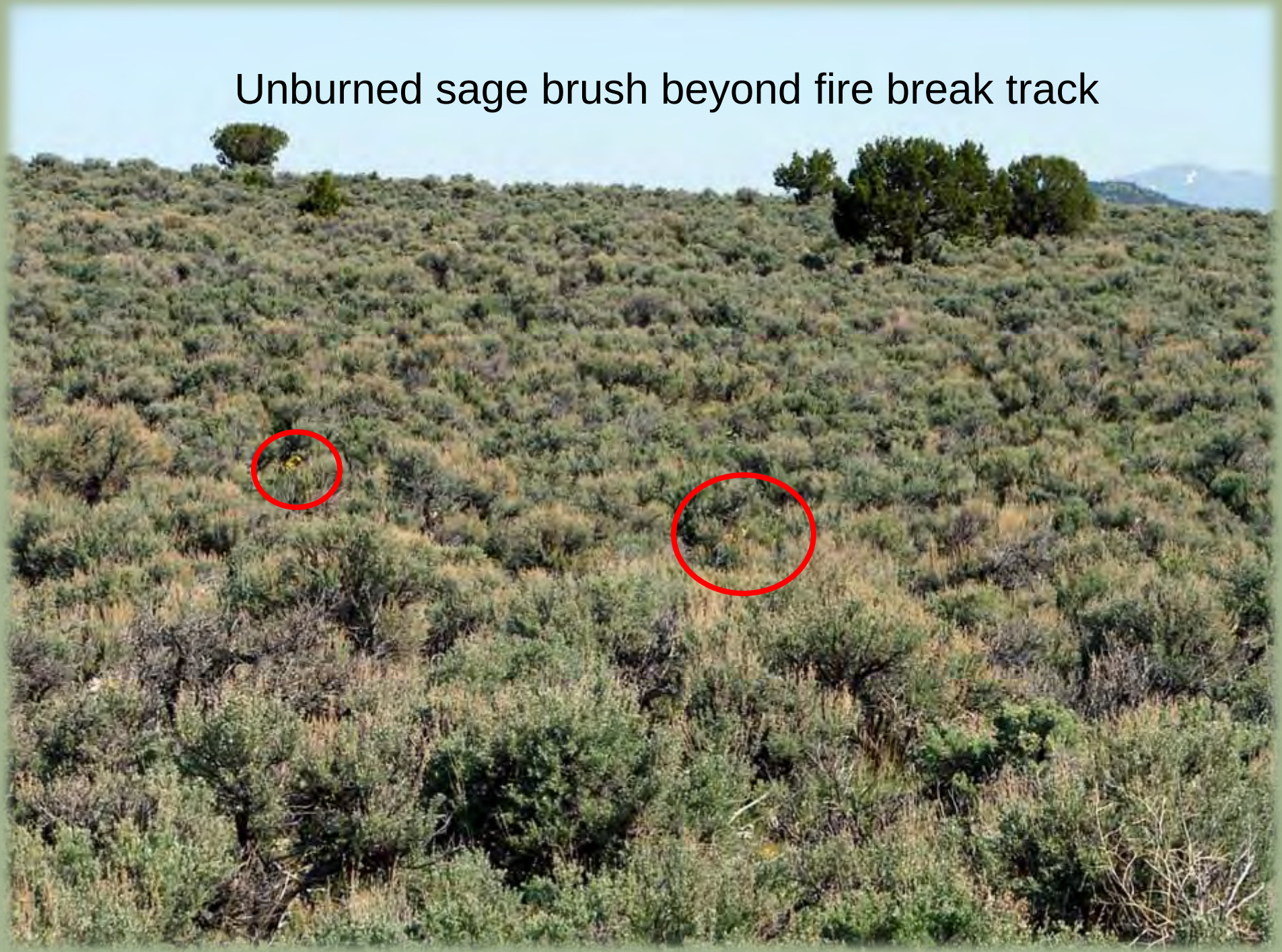
>85% of bee species nest in the ground



Balsamorhiza



Unburned sage brush beyond fire break track




Vegetation some years
after wildfire

	Intact	Burned '08
Bees sampled	40	39
Plants surveyed	71	65
% *Osmia*	70%	77%

Osmia californica

- 54 native bee species in total
- 20 other paired sites in 5 state region
- fire chronosequence of 20 years

For much much more, see poster by Byron Love

Fig. 3. Dasypoda plumipes Pz., ♀ — Hosenbienennest im Sandboden, traubenförmig. Liegstadt, nach Müller. Der Pollenballen zeigt die 3 Füßchen zum Schutz gegen Schimmelpilze; die meisten Zellen zeigen das Ei dem Pollen eng anliegend, 2 (unten) schon Larven; die leere Zelle barg 3 Schmarotzerfliegenlarven, daher die 3 braunen Tönnchen außerhalb der Zelle. 1/3 nat. Gr. (Original).

Fig. 1. Prosopis communis L., ♂♀. Maskenbienennest in trockenem Rubusstengel; Zellen aus seidenhautigem Stoff. 1/1 nat. Gr. (Original).

Fates of Bees after Fire

Conclusions for American sage-steppe

- Dominant wildflowers need bees for pollination
- Cannot predict pollination needs or pollinators
- Seed growers need bees
  - honey bee, sometime cases alfalfa leaf-cutting bee
  - managed cavity-nesting native *Osmia*
  - wild bees
- Ground-nesting bees predominate, survive fire
- Bee communities need bloom year after fire

Indispensable Worker Bees

- Stephanie Miller
- Byron Love
- Melissa Weber
- Katie Swoboda
- Kristal Watrous
- Glen Trostle
- Summer students

GREAT BASIN
Restoration Initiative