



The Seeds  
Pile Project's

# Seedling Guide





# Seedling identification

## Cotyledons

The first leaves that appear when a seed germinates are called cotyledons. These special leaves are actually part of the plant embryo inside the seed! Cotyledons are often different than true leaves, but they still have distinctive shapes.

*seed\* before germination*



*seed coat reveals cotyledons and root grows down into soil*



*seed coat gone and stem emerges between the two cotyledons*



*\*This is a spaghetti squash seed, much bigger than the seeds in the Seed Pile Project!*



# Seedling identification

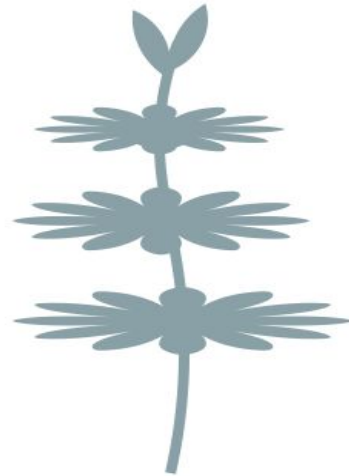
## Common leaf arrangements



*Alternate*



*Opposite*

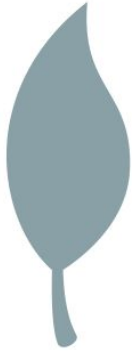


*Whorled*



# Seedling identification

## Leaf edges & types



*Smooth*



*Toothed/  
serrated*



*Lobed*



*Palmate*



*Pinnate*

*Simple leaves*

*Compound leaves*



## Things to remember before you start...



- **Tons of tiny green sprouts?** Don't be overwhelmed! We only need count estimates, so try and get your best guess.
- **Zero sprouts at all?** That's OK! "No data" gives us just as much information as lots of sprout data.
- **Seeds germinate** (begin to grow into a plant) based on environmental cues; meaning, they feel the world around them and wait for the right time to start growing. These seeds will be looking for a cold and wet period, so expect more sprouts after the next big rain.
- **Can't tell the plants apart?** Just give it your best guess -- it will get easier as the plants grow and produce more true leaves and flowers.
- **Can't tell the seed pile plants from weeds or other sprouts?** We totally get it... it's not always easy for us either! Just try your best and check the "I'm not sure" box if needed.



# Instructions

1. Wait **one week or longer** to collect seedling data after dropping your seed pile.
2. Go to your **seed pile location** (the exact spot you dropped your seed pile previously).
3. See whether it looks like there has been any **major changes, management, or disturbances** in the area since you last entered data. Examples would be herbicide spraying, dirt removal, burning, clean up, etc.
4. Note whether there is a **change in weeds** or other non-seed pile vegetation.
5. Focus on **one plant species at a time** -- we suggest going in the order of the seedling guide (and this form).
6. Look around in a **5 foot radius** (5 feet is about two small adult steps; one tall kid or short adult lying on the ground; or the length of a park bench). How many of that type of sprout do you think you see?
7. **Estimate** how many seedlings you see of that plant type (0; 1-5; 6-10; 11-20; or 20+).
8. Make a note of the **types of substrates (ground type)** they are on (e.g. dirt, asphalt, gravel, etc.).
9. **Repeat** for each of the 10 seed pile species. This should take 15-30 minutes. It will go even quicker as you become familiar with the plants and as fewer seedlings make it to maturity.



# California poppy, *Eschscholzia californica* (young)



Cotyledons are:

- Straight/smooth
- Forked (bifid)
- Bright green



True leaves are:

- Blue-green
- Alternate
- Highly lobed (fingers)





# California poppy, *Eschscholzia californica* (mature)



*Mature plants grow:*

- *In mounds*
- *Bright orange/yellow four-petaled flowers*

© Miridae



© Kier Morse 2008  
via Calscape

*After flowering:*

- *Petals drop*
- *Seed pod (plant ovary/pistil in center of petals) grows*
- *When mature and browning, seed pod explodes, scattering seeds!*



© Zoya Akulova  
2011 via Calscape





# Common Yarrow, *Achillea millefolium*



*Cotyledons are:*

- Smooth & oval
- Fall away quickly for toothy true leaves

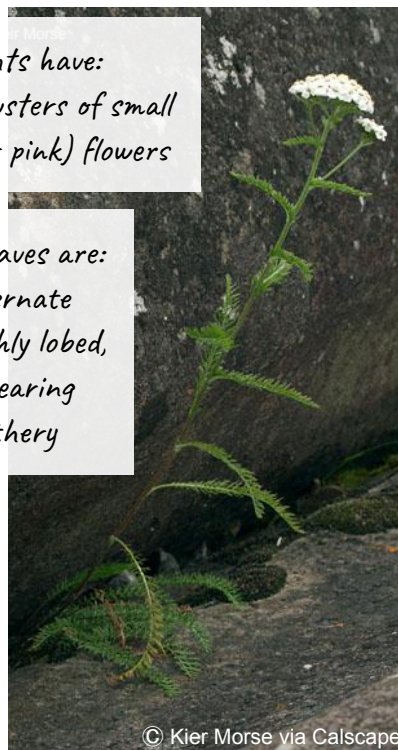


*Mature plants have:*

- Dense clusters of small white (or pink) flowers

*True leaves are:*

- Alternate
- Highly lobed, appearing feathery



© Pentham via Calscape



© Sierra Pacific Industries via Calscape



## Common Yarrow, *Achillea millefolium*



© Pentham via Calscape

*Mature plants have:*

- *Dense clusters of small white (or pink) flowers*



© Zoya Akulova  
2015 via Calscape



© American Meadows

*After flowering:*

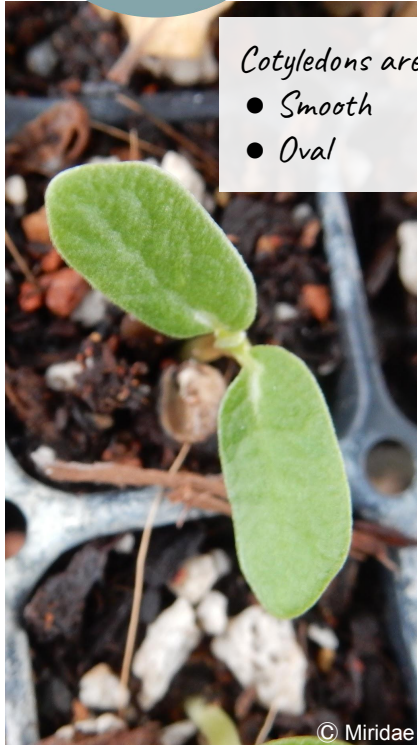
- *Petals drop*
- *Remaining seed head is golden colored*
- *Tiny seeds fall when shaken*



# Arroyo/succulent lupine, *Lupinus succulentus*

Cotyledons are:

- Smooth
- Oval



© Miridae

True leaves are:

- Alternate
- Palmate (multiple leaflets, like a palm)



© Miridae

Flowers are:

- Clusters of purple/blue flowers whorled around stem



© Barry Breckling  
2015 via Calscape



© Calscape 2010



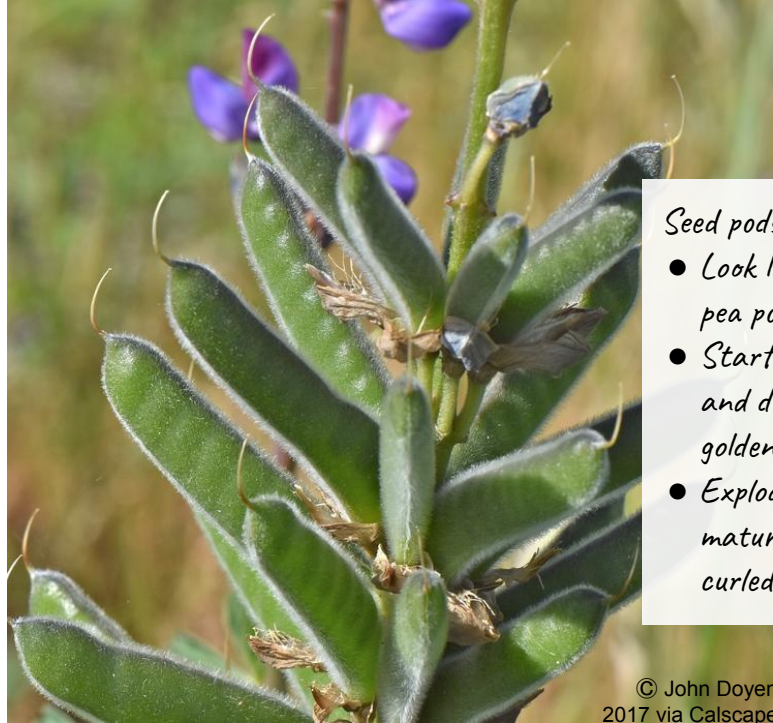
# Arroyo/succulent lupine, *Lupinus succulentus*

Flowers are:

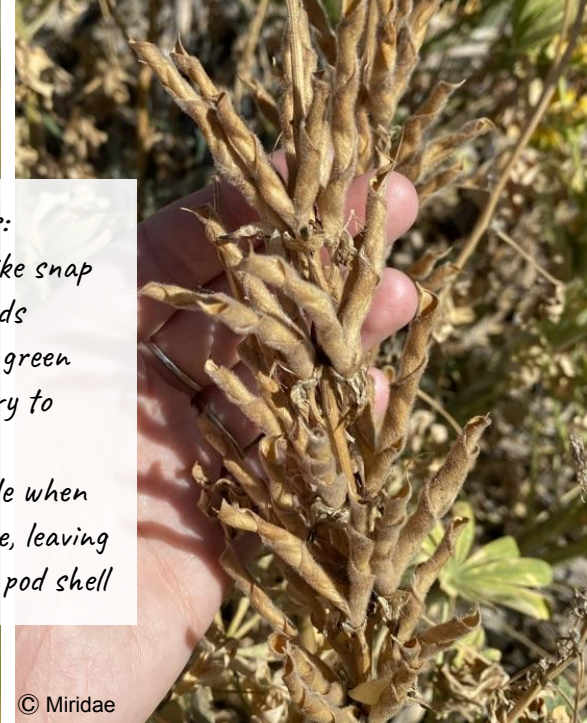
- Clusters of purple/blue flowers whorled around stem



© Miridae



© John Doyen  
2017 via Calscape



© Miridae

Seed pods:

- Look like snap pea pods
- Start green and dry to golden
- Explode when mature, leaving curled pod shell



# Dense-flowered lupine, *Lupinus microcarpus* var. *densiflorus*



© Miridae

Cotyledons are:

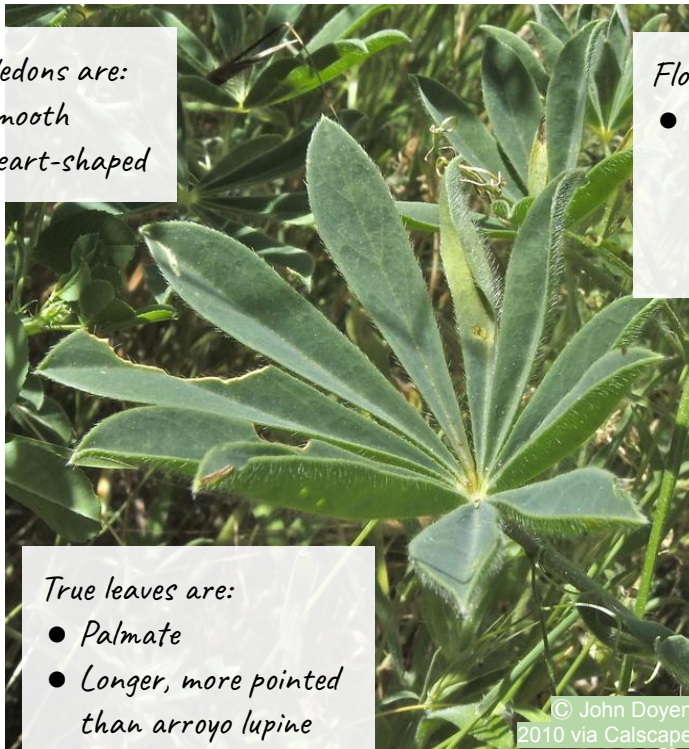
- Smooth
- Heart-shaped



© Miridae

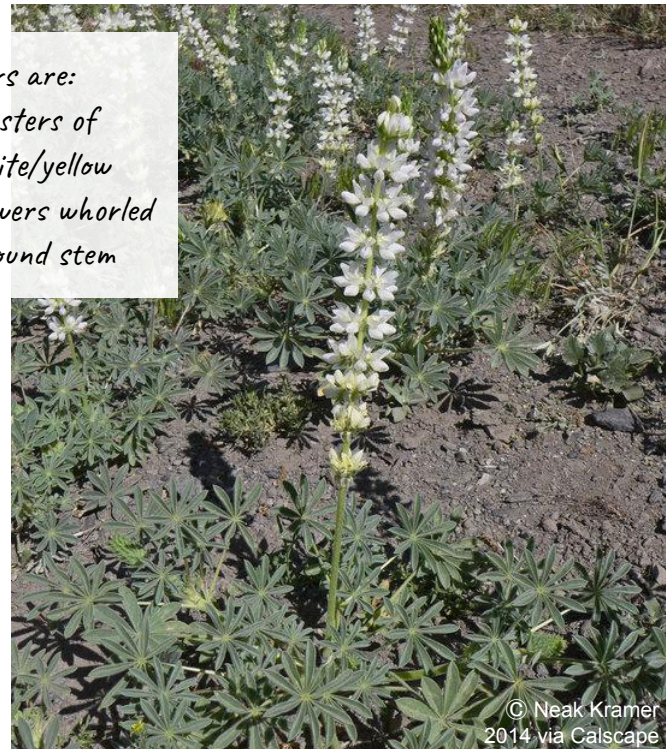
True leaves are:

- Palmate
- Longer, more pointed than arroyo lupine

© John Doyen  
2010 via Calscape

Flowers are:

- Clusters of white/yellow flowers whorled around stem

© Neak Kramer  
2014 via Calscape



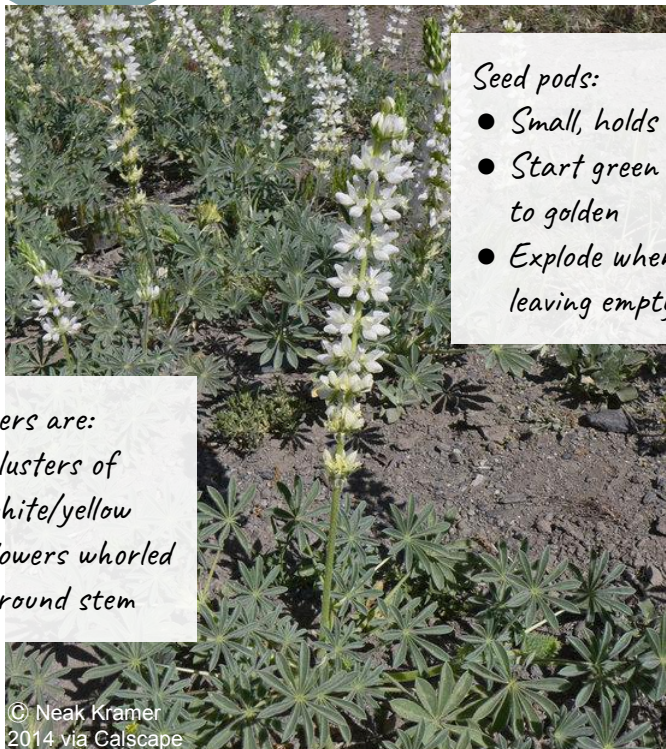
## Dense-flowered lupine, *Lupinus microcarpus* var. *densiflorus*

### Seed pods:

- Small, holds 2 seeds
- Start green and dry to golden
- Explode when mature, leaving empty pod shell

### Flowers are:

- Clusters of white/yellow flowers whorled around stem



© Neak Kramer  
2014 via Calscape



© Neak Kramer  
2015 via Calscape



© Charles Webber  
1998 via Calscape



## Menzie's fiddleneck, *Amsinkia menziesii*



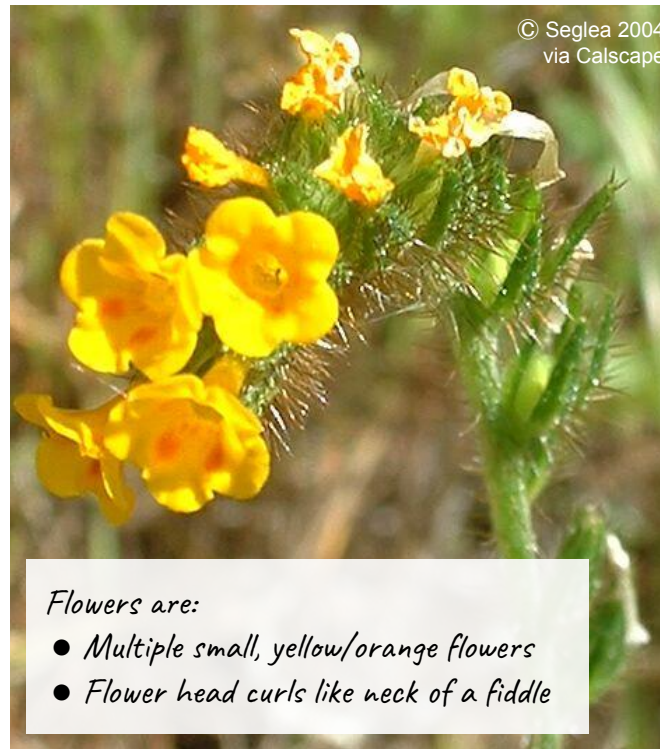
*Cotyledons*

are:

- Lobed
- Y-shaped

*True leaves are:*

- Alternate
- Long with smooth edges
- Covered in bristly hairs (stem also hairy)



© Seglea 2004  
via Calscape

*Flowers are:*

- Multiple small, yellow/orange flowers
- Flower head curls like neck of a fiddle



## Menzie's fiddleneck, *Amsinkia menziesii*



Flowers are:

- Multiple small, yellow/orange flowers
- Flower head curls like neck of a fiddle



© ID Tools

After flowering:

- Plant dries, petals drop
- Four small, bumpy seeds ("nutlets") produced per flower





# Imbricate/mountain phacelia, *Phacelia imbricata*



Cotyledons are:

- Oval
- Fuzzy (tiny hairs)



True leaves are:

- Covered in stiff hairs
- Divided into leaflets
- Alternate in a spiral around stem

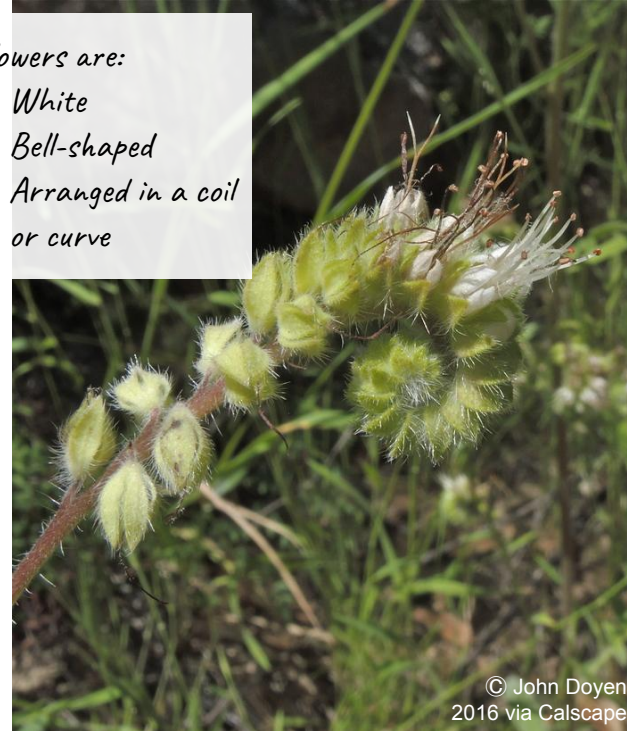
© Miridae



© Neal Kramer  
2008 via Calscape

Flowers are:

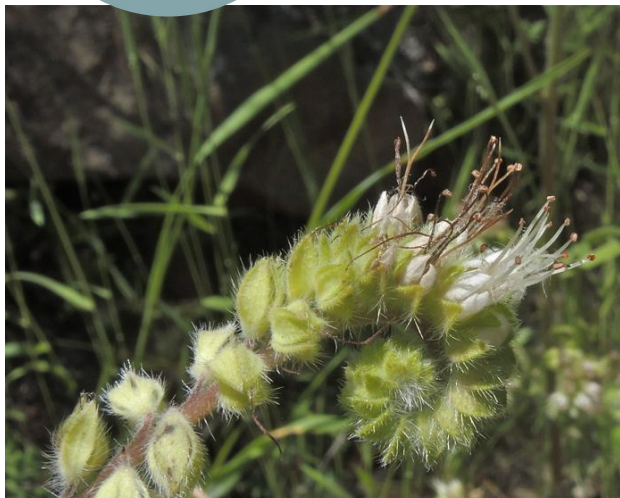
- White
- Bell-shaped
- Arranged in a coil or curve



© John Doyen  
2016 via Calscape



# Imbricate/mountain phacelia, *Phacelia imbricata*



Flowers are:

- White
- Bell-shaped
- Arranged in a coil or curve

© John Doyen  
2016 via Calscape



© Natl. Park Service  
2004 via Calscape



© World Botanical 2016

After flowering:

- Plant dries to brown
- Petals drop leaving seed capsules remain with variable numbers of seeds per capsule



# Common woolly sunflower, *Eriophyllum lanatum*





# Common woolly sunflower, *Eriophyllum lanatum*

© Miridae



Flowers are:

- Yellow
- One flower on each stalk

© Hedgerow Farms



After flowering:

- Plant dries to grey
- Outer and inner petals (or, ray and disk florets) drop, leaving a circle of seeds

© Jean Pawek  
2017 via Calscape



© Steve Matson  
2005 via Calscape



© Zoya Akulova  
2009 via Calscape



# Yellow rayed lasthenia/goldfields, *Lasthenia glabrata*



Cotyledons are:

- Long
- Smooth

© Applewood Seeds



True leaves are:

- Opposite
- Smooth, linear

© Keir Morse  
2013 via Calscape



Flowers are:

- Yellow
- Solitary or loosely clustered on stalk

© John Doyen  
2017 via Calscape



© John Doyen  
2016 via Calscape



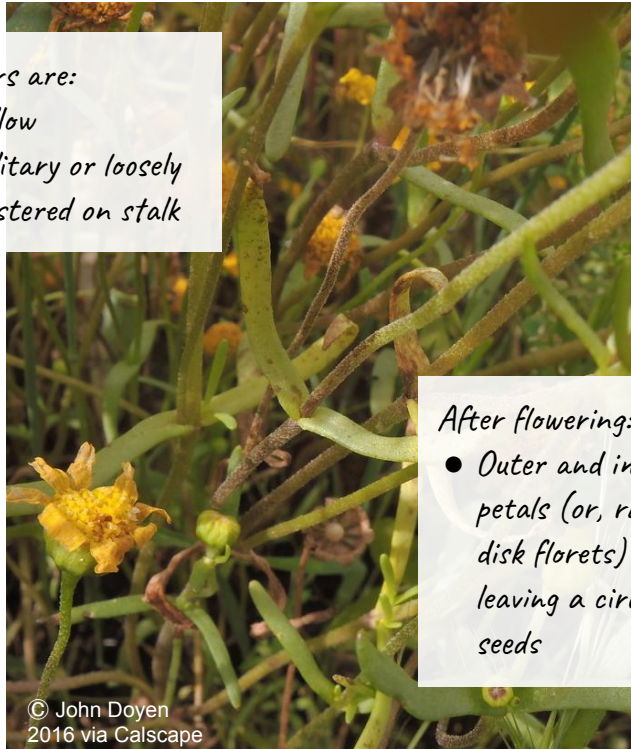
# Yellow rayed lasthenia/goldfields, *Lasthenia glabrata*



Flowers are:

- Yellow
- Solitary or loosely clustered on stalk

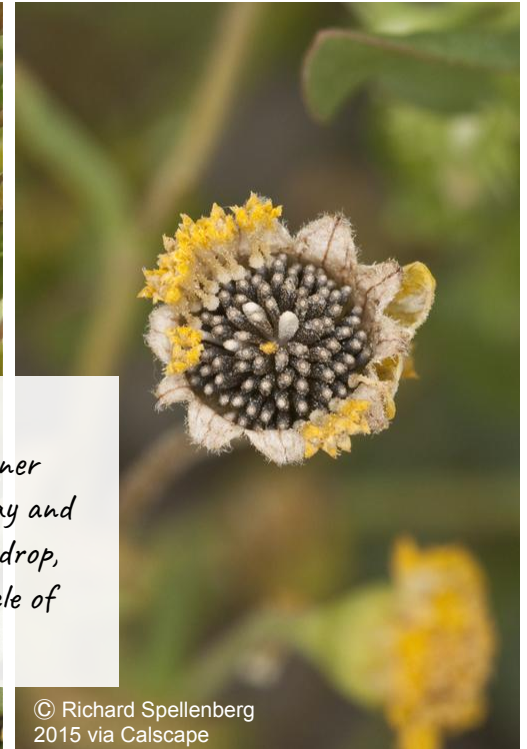
© John Doyen  
2016 via Calscape



After flowering:

- Outer and inner petals (or, ray and disk florets) drop, leaving a circle of seeds

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2016 via Calscape



© Richard Spellenberg  
2015 via Calscape



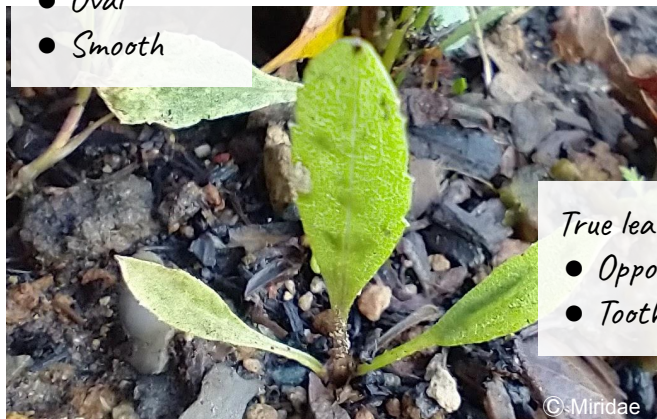
# Great valley gumweed, *Grindelia camporum*



Cotyledons are:

- Oval
- Smooth

© Miridae



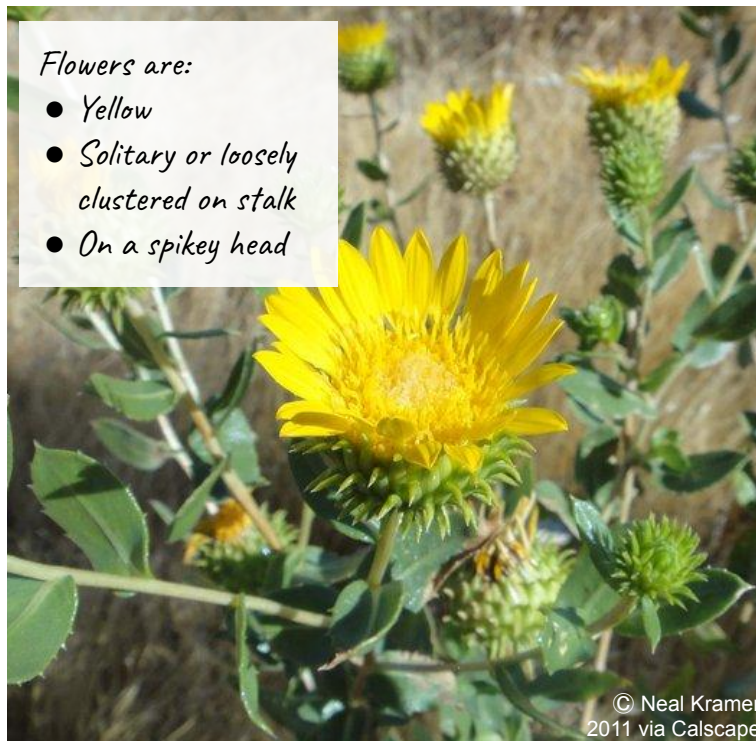
True leaves are:

- Opposite
- Toothed

© Miridae



© Miridae



Flowers are:

- Yellow
- Solitary or loosely clustered on stalk
- On a spikey head



## Great valley gumweed, *Grindelia camporum*

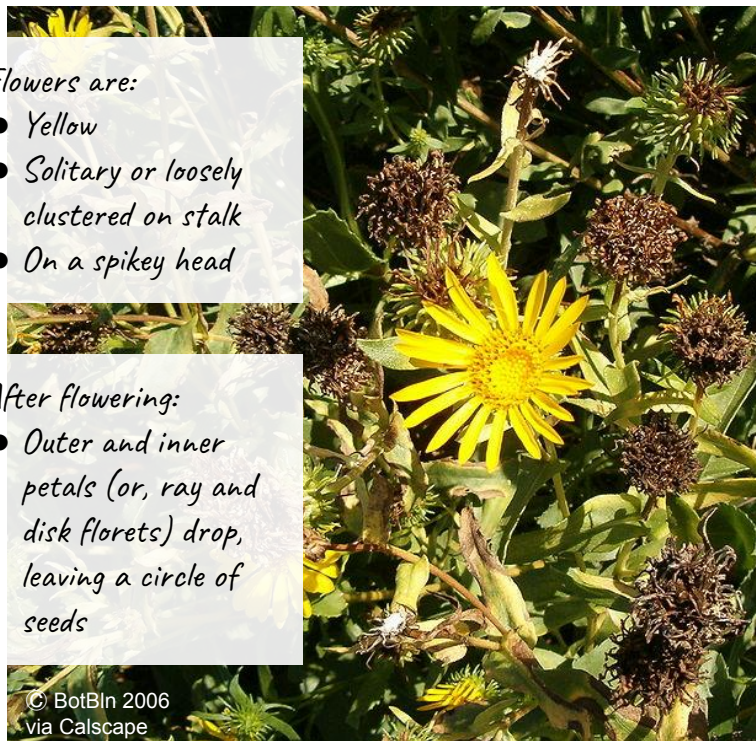


Flowers are:

- Yellow
- Solitary or loosely clustered on stalk
- On a spikey head

After flowering:

- Outer and inner petals (or, ray and disk florets) drop, leaving a circle of seeds



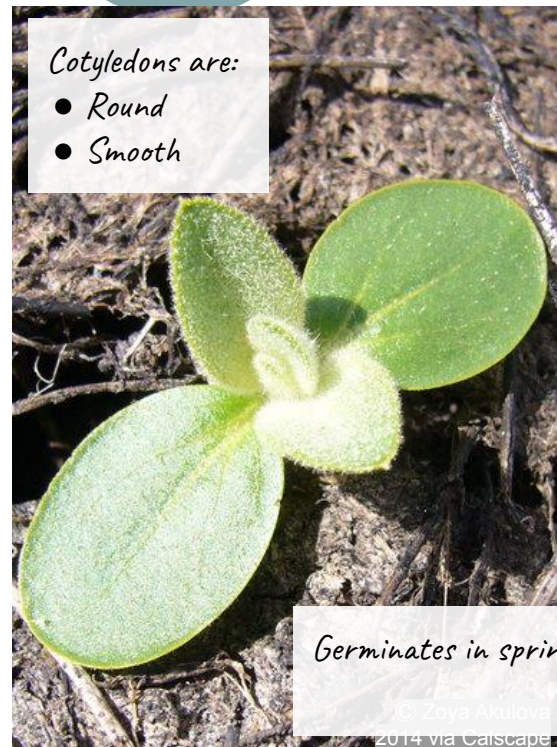




# Turkey mullein, *Croton setigerus*

*Cotyledons are:*

- Round
- Smooth



*Germinates in spring!*

© Zoya Akulova  
2014 via Calscape

*True leaves are:*

- Fuzzy
- Round
- Pale green



© Neal Kramer  
2012 via Calscape

*Mature plants grow:*

- In low-to-ground mounds
- Tiny, white, petalless flowers



© Neal Kramer  
2009 via Calscape



# Turkey mullein, *Croton setigerus*



Mature plants grow:

- In low-to-ground mounds
- Tiny, white, petalless flowers

© Natl. Park Service  
2004 via Calscape

*Germinates in spring!*



© Charles Webber  
1998 via Calscape

Seed capsules:

- Near leaf base
- Contain two seeds
- Appear burst when seeds have been dropped



© Jean Pawek  
2010 via Calscape