



# Landscaping for Pollinators as a Restoration Practice

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# OUTLINE

Bee diversity overview

Pollinator/insect declines

Conservation in towns?

Lawns, native plants and  
“keystone species”

Honey bee PSA











Wild bees are the world's most important pollinators





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NATIVE BEES ARE SUPER DIVERSE





# How many bee species?

20,000 worldwide

4,000 in North America

600+ in Montana (230+ in Missoula Co.)

Nest preferences (70% ground)

Flower preferences (specialist/generalists)

Social structure (90% solitary!)

*Honey bees are unique (and non-native!)*



**Central-place foragers** – like birds!

# Parallel Declines in Pollinators and Insect-Pollinated Plants in Britain and the Netherlands

J. C. Biesmeijer,<sup>1\*</sup> S. P. M. Roberts,<sup>2</sup> M. Reemer,<sup>3</sup> R. Ohlemüller,<sup>4</sup> M. Edwards,<sup>5</sup> T. Peeters,<sup>3</sup> A. P. Schaffers,<sup>7</sup> S. G. Potts,<sup>2</sup> R. Kleukers,<sup>3</sup> C. D. Thomas,<sup>4</sup> J. Settele,<sup>8</sup> W. E. Kunin<sup>1</sup>

## Bee declines driven by combined stress from parasites, pesticides, and lack of flowers

Dave Goulson,\* Elizabeth Nicholls, Cristina Botías, Ellen L. Rotheray

## Patterns of widespread decline in North American bumble bees

Sydney A. Cameron<sup>a,1</sup>, Jeffrey D. Lozier<sup>a</sup>, James P. Strange<sup>b</sup>, Jonathan B. Koch<sup>b,c</sup> and Terry L. Griswold<sup>b</sup>

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*Insect Conservation and Diversity* (2020) 13, 595–605

doi: 10.1111/icad.12429

## Wild bee declines linked to plant-pollinator network changes and plant species introductions

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PNAS

RESEARCH ARTICLE

ECOLOGY

OPEN ACCESS



## Recent and future declines of a historically widespread pollinator linked to climate, land cover, and pesticides

William M. Janousek<sup>a,1,2</sup>, Margaret R. Douglas<sup>b</sup>, Syd Cannings<sup>c</sup>, Marion A. Clément<sup>d</sup>, Casey M. Delphia<sup>e</sup>, Jeffrey G. Everett<sup>f</sup>, Richard G. Hatfield<sup>g</sup>, Douglas A. Keinath<sup>d</sup>, Jonathan B. Uhuad Koch<sup>h</sup>, Lindsie M. McCabe<sup>h</sup>, John M. Mola<sup>i</sup>, Jane E. Ogilvie<sup>j</sup>, Imtiaz Rangwala<sup>k</sup>, Leif L. Richardson<sup>g</sup>, Ashley T. Rohde<sup>h</sup>, James P. Strange<sup>l</sup>, Lusha M. Tronstad<sup>m</sup>, and Tabitha A. Graves<sup>a,1</sup>

Edited by Brian D. Inouye, Florida State University, Tallahassee, FL; received July 13, 2022; accepted November 1, 2022 by Editorial Board Member Susan P. Harrison



### Interaction Disruption

Climate change is affecting ranges globally. Here ants are invading and consuming wildlife in cloud forest never before exposed to these marauders.

### Nitrification

Fertilizer and products of fossil fuels combustion are nitrifying the planet, challenging the biotas adapted to low-nutrient conditions.

### Fire

Global warming elevates fire risk. Fires in Australia, Amazonia, and California burned an unprecedented >5 million hectares of forest in 2019.

### Storm Intensity

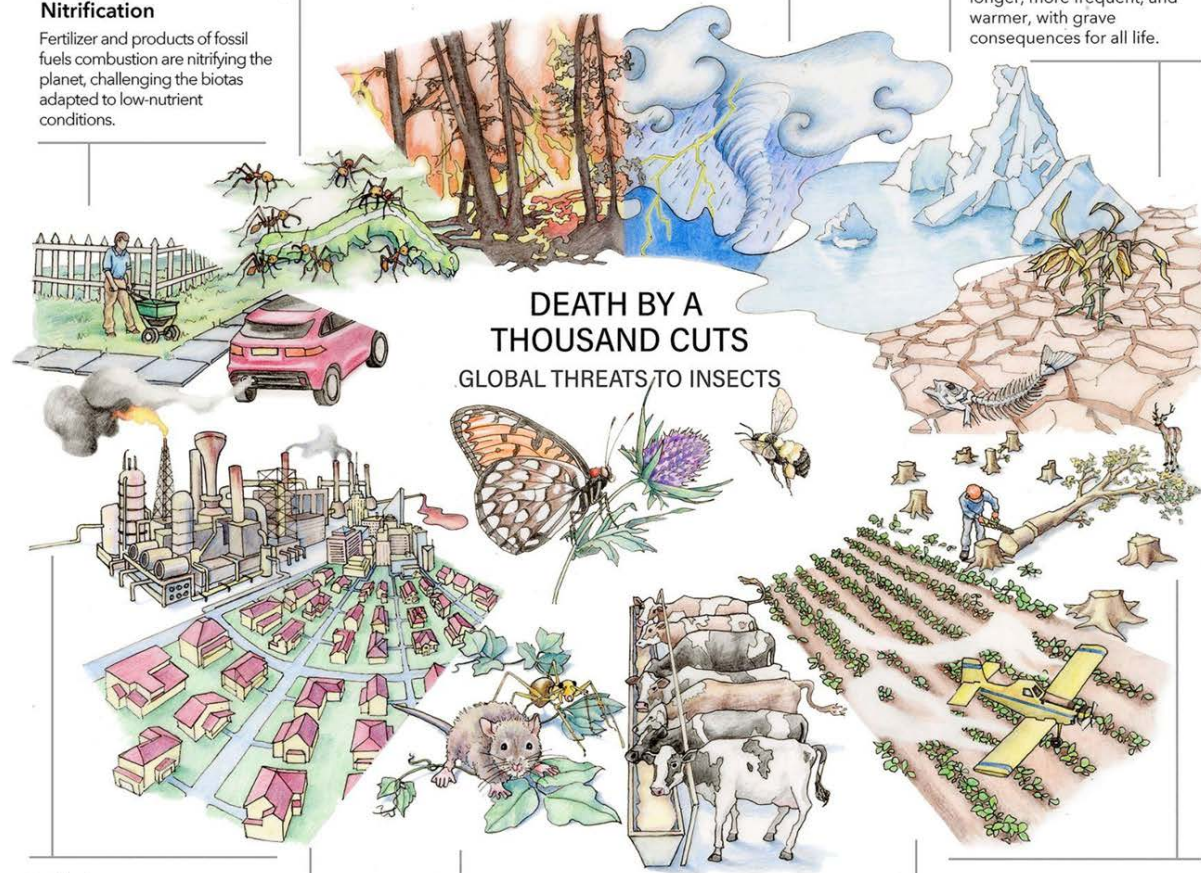
Climate changes bring stronger, more frequent storms and hurricanes; more fire-igniting lightening; and damaging flooding.

### Global Warming

Arctic sea ice is declining precipitously, arctic-alpine and other cold-adapted communities are contracting, while sea-level rise threatens coastal ecosystems.

### Droughts

Periods with diminished precipitation are becoming longer, more frequent, and warmer, with grave consequences for all life.



### Pollution

Chemical, light, and sound pollution of water, air, and soil are impacting plant and animal life worldwide.

### Introduced Species

Global trade is accelerating the movement of pernicious plants, animals, and pathogens to new regions—often with devastating consequences.

### Agricultural Intensification

Industrialized agriculture, with its attendant increases in scale, monoculturalization, nutrient input, and pesticide use, is becoming increasingly nature unfriendly.

### Deforestation

The tropics lost 11.9 million hectares of forest in 2019, mostly to agriculture.


### Insecticides

Modern, industrialized agriculture, with its increasing reliance on chemical insecticides, has led to chronic contamination of wildlands and impacts to non-target insects.

### Urbanization

Our global population of 7.8 billion, spread planet-wide, comes at great cost to biodiversity and wildlands. Already, over 500 vertebrates have been driven to extinction.



An aerial photograph of a suburban neighborhood. A multi-lane highway runs diagonally across the center. To the left of the highway is a winding river. The surrounding area is filled with residential housing, mostly in the form of small, uniform houses arranged in neat rows. There are some larger commercial buildings and parking lots interspersed among the residential areas. The landscape is a mix of green grass, brown soil, and grey pavement.

**Urban and suburban  
land-use types are  
the *fastest growing*  
*ecosystems* in the  
world.**

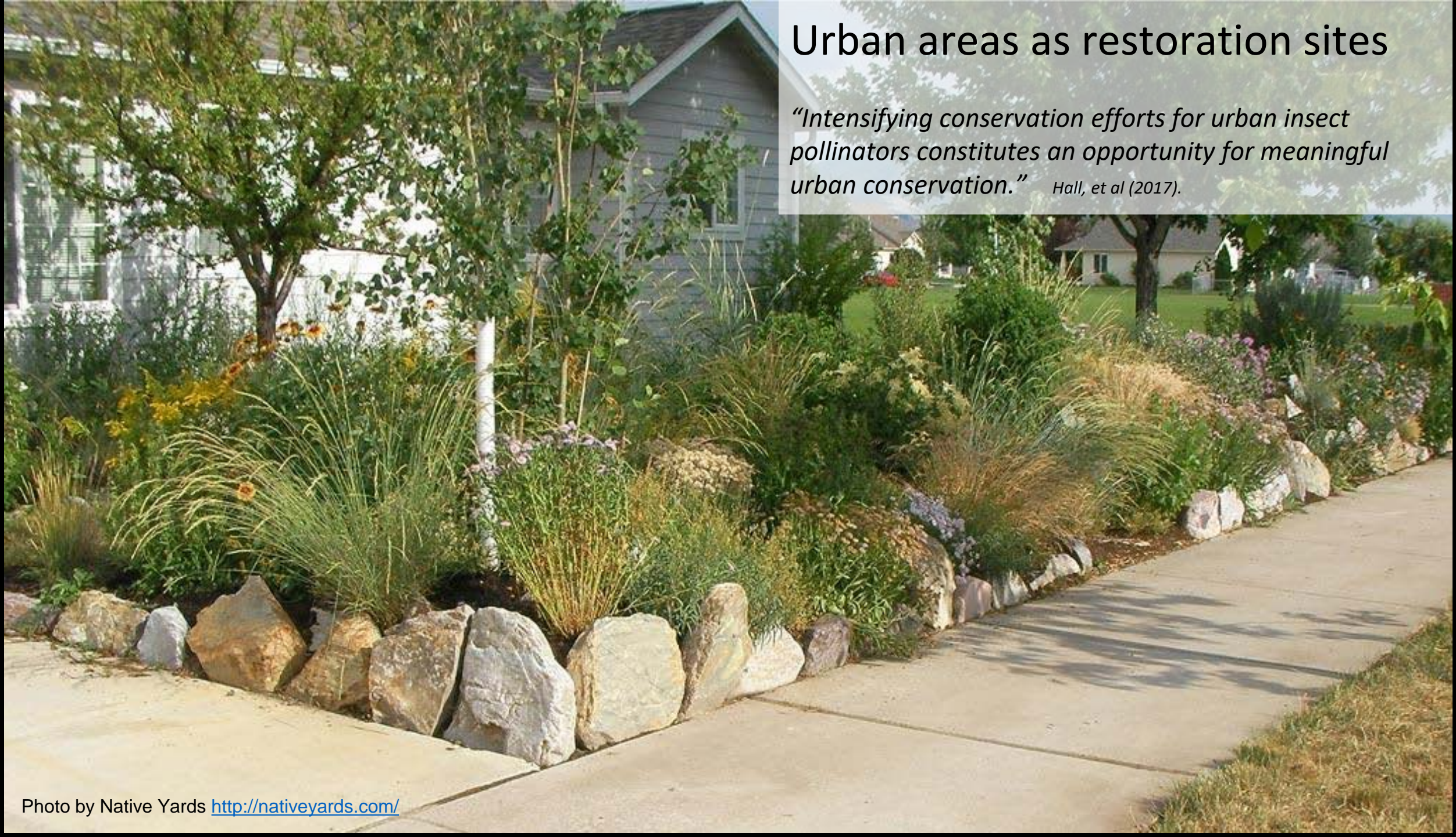
But *can* support a  
surprising richness and  
abundance of bees!

Tonnietto, et al (2011); Hall, et al (2017).



# Urban areas as restoration sites

*"Intensifying conservation efforts for urban insect pollinators constitutes an opportunity for meaningful urban conservation."* Hall, et al (2017).



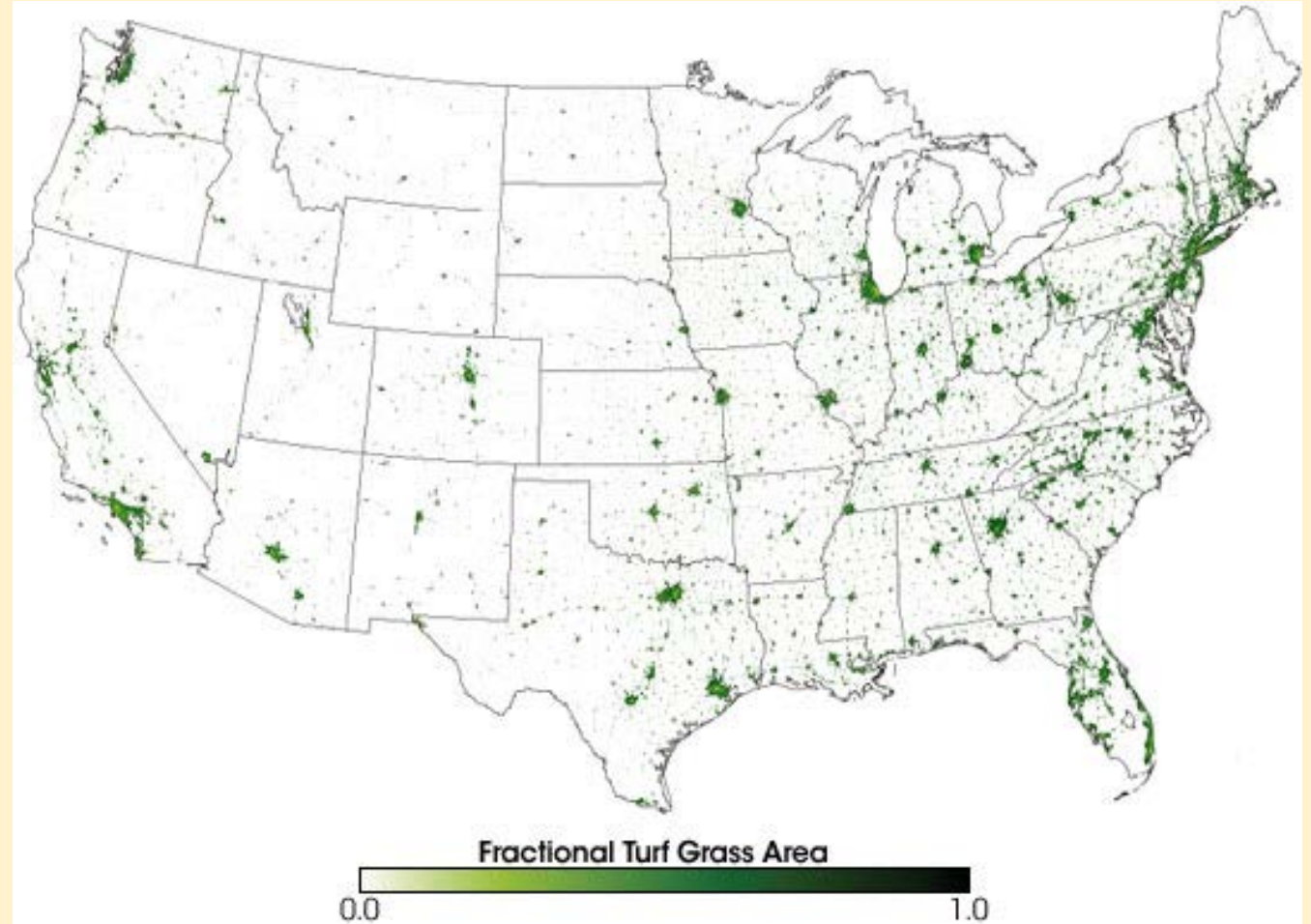






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3x more acreage of irrigated lawn than corn





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**9 BILLIONS** gals water used *each day*,  
mostly for residential irrigation

- **50%** of that water is lost or wasted



[https://www.ttownmedia.com/tracy\\_press/news/water-restrictions-take-effect/article\\_0d00e220-2746-11e5-8bb8-17972fcb5bbc.html](https://www.ttownmedia.com/tracy_press/news/water-restrictions-take-effect/article_0d00e220-2746-11e5-8bb8-17972fcb5bbc.html)



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**800 million gals fuel burned + 17 million  
gal *spilled* each year**

- **5% of total air pollution in US**



<https://lawnmowerguru.com/wp-content/uploads/2021/07/Can-You-Run-a-Lawn-Mower-Without-A-Gas-Cap.png>



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(10x more than are used on crops)**

**125 million lbs pesticides, mostly herbicides**



<https://www.naturalgreenlawnandpest.com/blog/most-common-questions-professional-weed-control-maryland>



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**70 hrs/person/year on lawns**



<https://westseattleblog.com/2020/05/neighborhoods-pitching-in-at-a-park/>







# Missoula County Flowering Lawn Project

- U of MN Extension Bee Lawn Program
- Application process - over 90 applicants in 2022!
- 2 yr commitment
- Flowering Lawn seed for 400 sqft
- Attend 3 workshops
- Provide us with info!

## Outgrow Your Lawn!

We need your help initiating the Flowering  
Lawn Project in Missoula County!



Help us improve urban and suburban habitats by establishing a flowering pollinator lawn that can provide floral resources for bees and other pollinators.

## Unlock your Pollinator Potential

Establishing these lawns will help support a diversity of pollinators by incorporating low-growing perennial flowering plants into existing turfgrass lawns.

Interested in participating?





# Flowering Lawns

Typical turfgrasses mixed with flowers

Low-growing, resilient to foot traffic

Less watering

Less mowing

No additional fertilizer

**NO HERBICIDES OR INSECTICIDES**





Native grassland near Florence, Montana





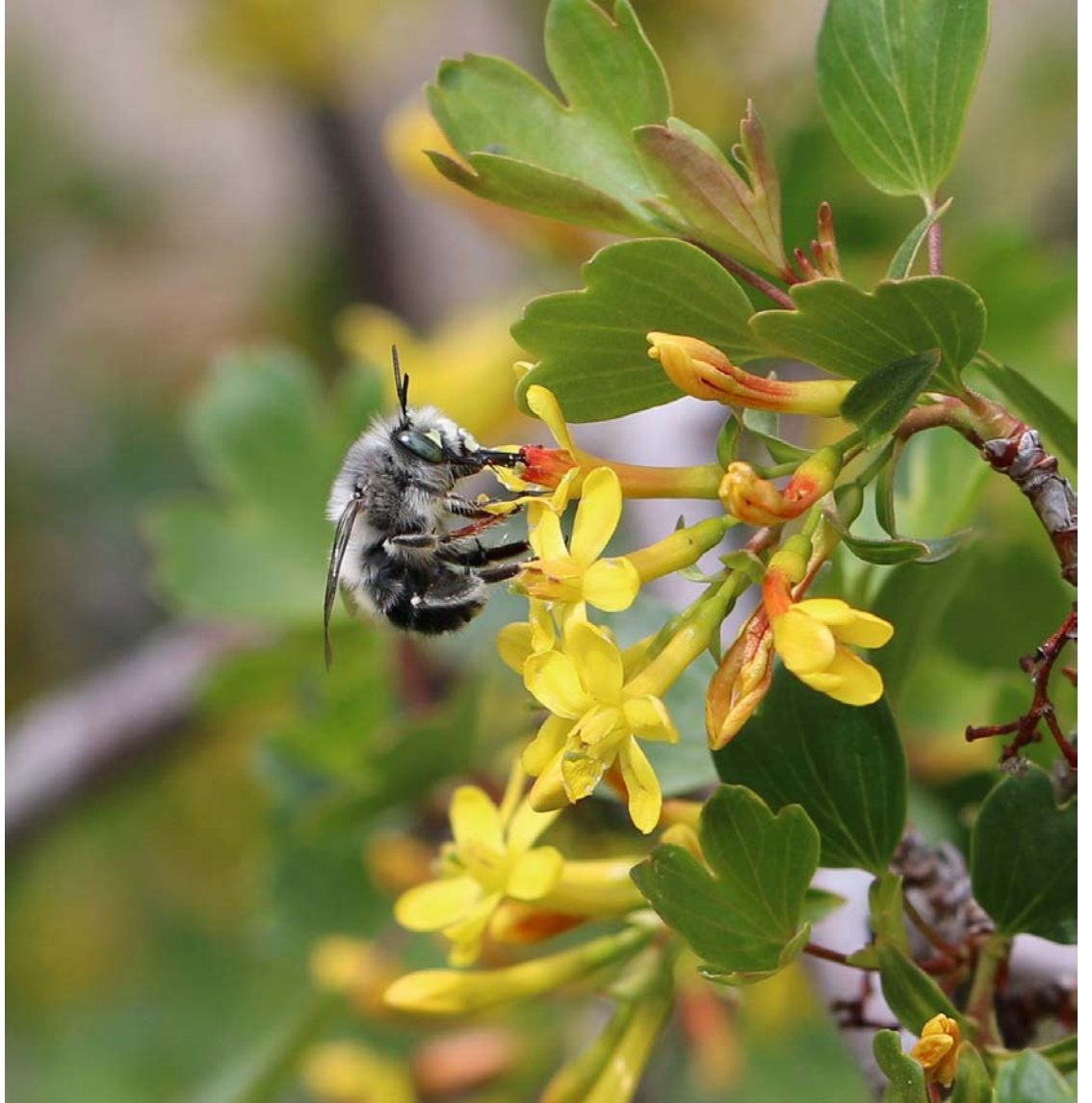
# ReWild Your Yard!



Missoula County  
**DEPARTMENT OF  
ECOLOGY & EXTENSION**




**“Keystone plants”** - *native plants critical to food webs and that are necessary for many species to complete their life cycles.*






# Partnerships with local native plant nurseries



Fill out the form below to schedule your Design Consultation!


Home Services ▾ Projects ▾ Company ▾ Contact Us

Call 406-543-2532 for a FREE Consultation




**Native Planters**

406.880.8809 | POTOMAC, MONTANA




Home Plant Care Speaking Consultations Contact About

**Pollinator Friendly Plants**











Hera Buckmoth



Availability & Ordering Services Contact Us About Us Terms More

## Purchase Plant Packs and Seed Mixes

 <p>Western Montana Native Grass Mix</p> <p>Drought tolerant, workhorse grasses native to the Bitterroot Valley &amp; Western MT</p> <p>Western MT Native Grass Mix (seed)</p> <p>\$18.00 \$18.00 / 1lb</p>	 <p>Western Montana Meadow Mix</p> <p>Iconic, Western MT wildflowers &amp; grasses that support wildlife.</p> <p>Western Montana Meadow Mix (seed)</p> <p>\$50.00 \$50.00 / 1lb</p>	 <p>Hot Pocket (small) - Plants for Full Sun</p> <p>\$60.00</p>	 <p>Hot Pocket (large) - Plants for full sun</p> <p>\$115.00</p>
 <p>Butterfly Snacks (small) - to Attract Butterflies</p> <p>\$60.00</p>	 <p>Butterfly Snacks (large) - Plants to Attract Butterflies</p> <p>\$115.00</p>	 <p>Shady Plants for Cool People (small) - Plants for Partial Shade</p> <p>\$60.00</p>	 <p>Shady Plants for Cool People (large) - Plants for Partial Shade</p> <p>\$115.00</p>

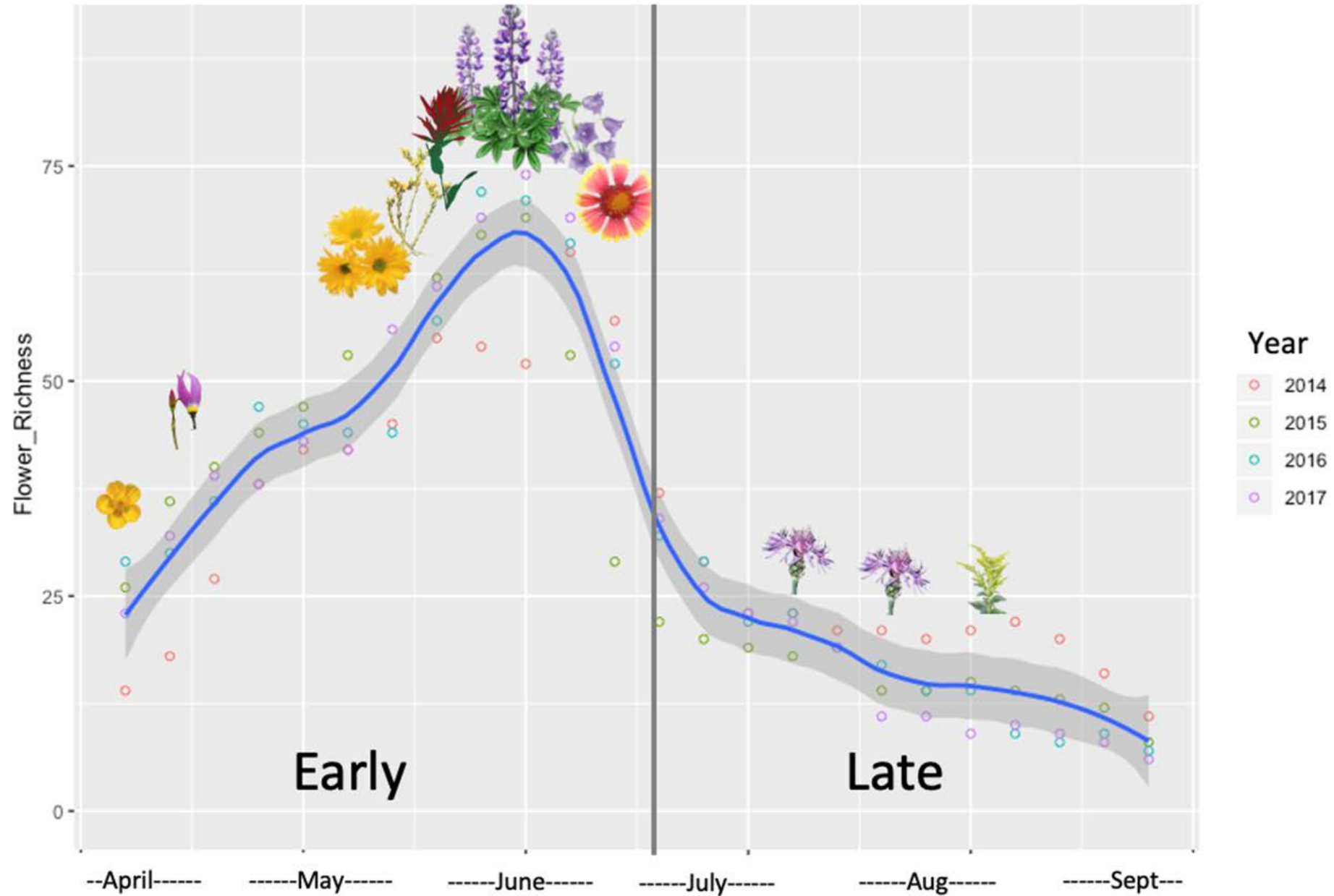


Urban landscapes can support a wide diversity of pollinators!





# Flowering Richness at MPG Ranch, April - September





Bloom periods of native plants match  
with flight periods of native bees





# Bee City USA & Bee Campus USA

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Connecting Communities and Pollinators

<https://beecityusa.org/>







# \*LIVESTOCK\*



Western honeybee (*Apis mellifera*) **NON-NATIVE DOMESTICATED ANIMAL**



# Environments where honeybees are necessary: large-scale agricultural areas













Keeping honeybees to “help the pollinators” is like  
keeping chickens to “help the birds”





# Resources for pollinator-friendly lawns and yards

## Bee Lawns and alternative turfgrasses

- Missoula County Weed District “Flowering Lawn Project”
- University of Minnesota Extension “Flowering Bee Lawns”
- MT Native Plant Society “Water-wise grasses”

## Info about native bees and other pollinators

- Xerces Society for Invertebrate Conservation
- Pollinator Partnership

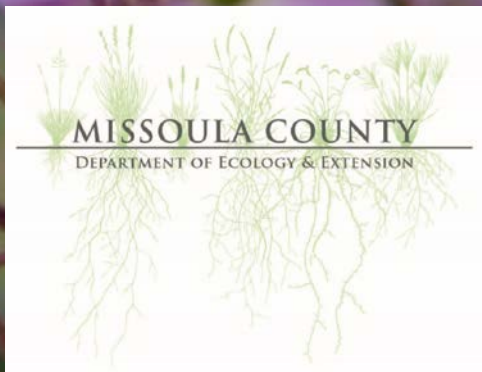
## Info about native plants for Montana landscaping

- Montana Native Plant Society website
- Xerces Society website
- Great Bear Native Plants, Mount Jumbo Nursery

## Info about making bee hotels

- Xerces Society website

# Questions?





# 70% of bee species nest in the ground







# NATIVE BEES HAVE DIFFERENT NESTING REQUIREMENTS

90% of North American bee species are **solitary** nesters





Arizona Carpenter bee (*Xylocopa californica arizonensis*)



Nesting – solitary, cavity-nesting



# Solitary Bee Life Cycle

Female bee lays  
egg on pollen and  
nectar ball

Larva feeds  
on pollen and  
nectar ball

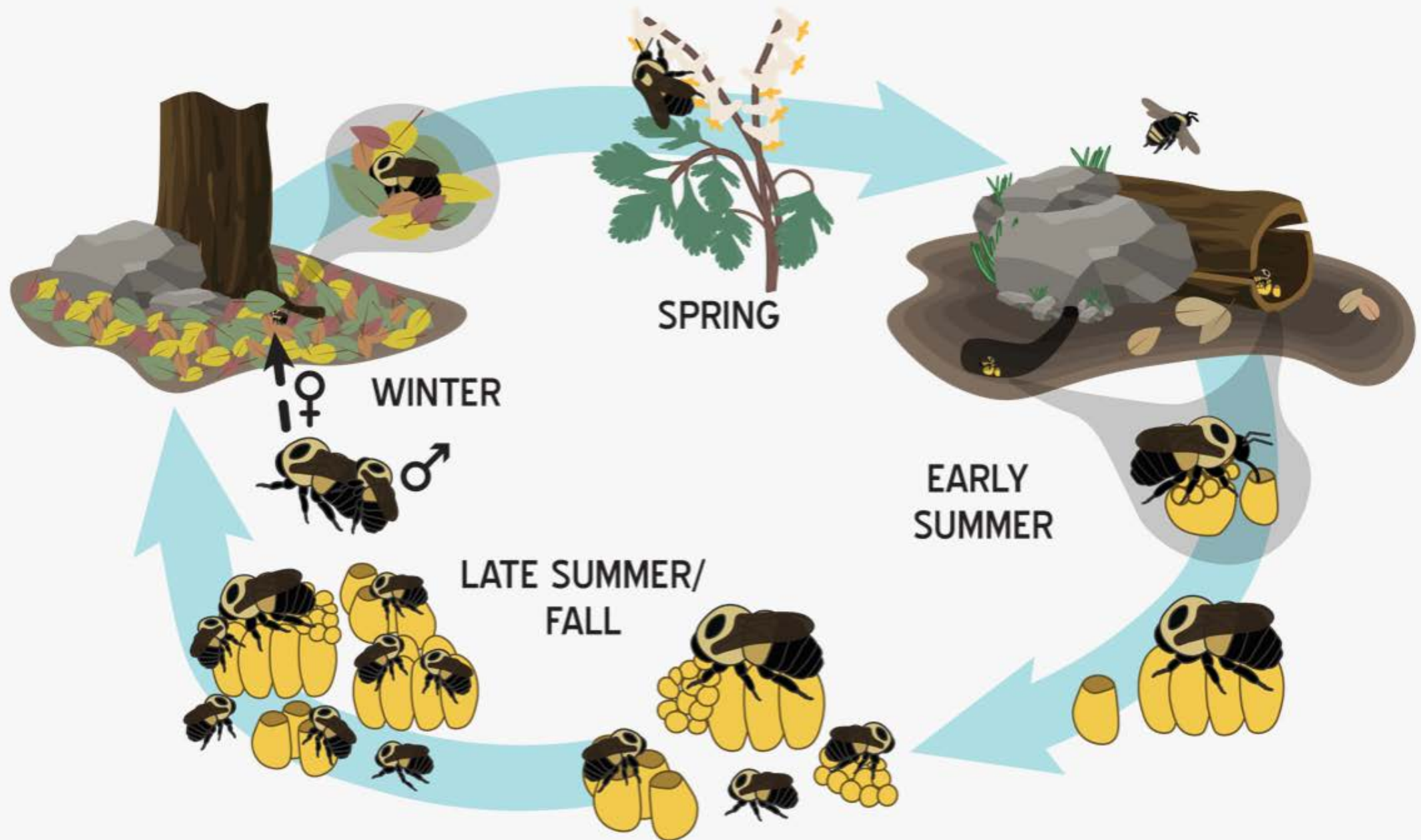
Larva develops  
into a pupa

The pupa emerges  
as an adult the  
next season





# Bumble Bee Colony Life Cycle







[https://www.reddit.com/r/Beekeeping/comments/8v0mi9/bumble\\_bee\\_nest\\_for\\_those\\_who\\_have\\_not\\_seen\\_a/](https://www.reddit.com/r/Beekeeping/comments/8v0mi9/bumble_bee_nest_for_those_who_have_not_seen_a/)







What about Dandelions?

*Fine, but encourage other plants*

