This Field Guide Belongs To:

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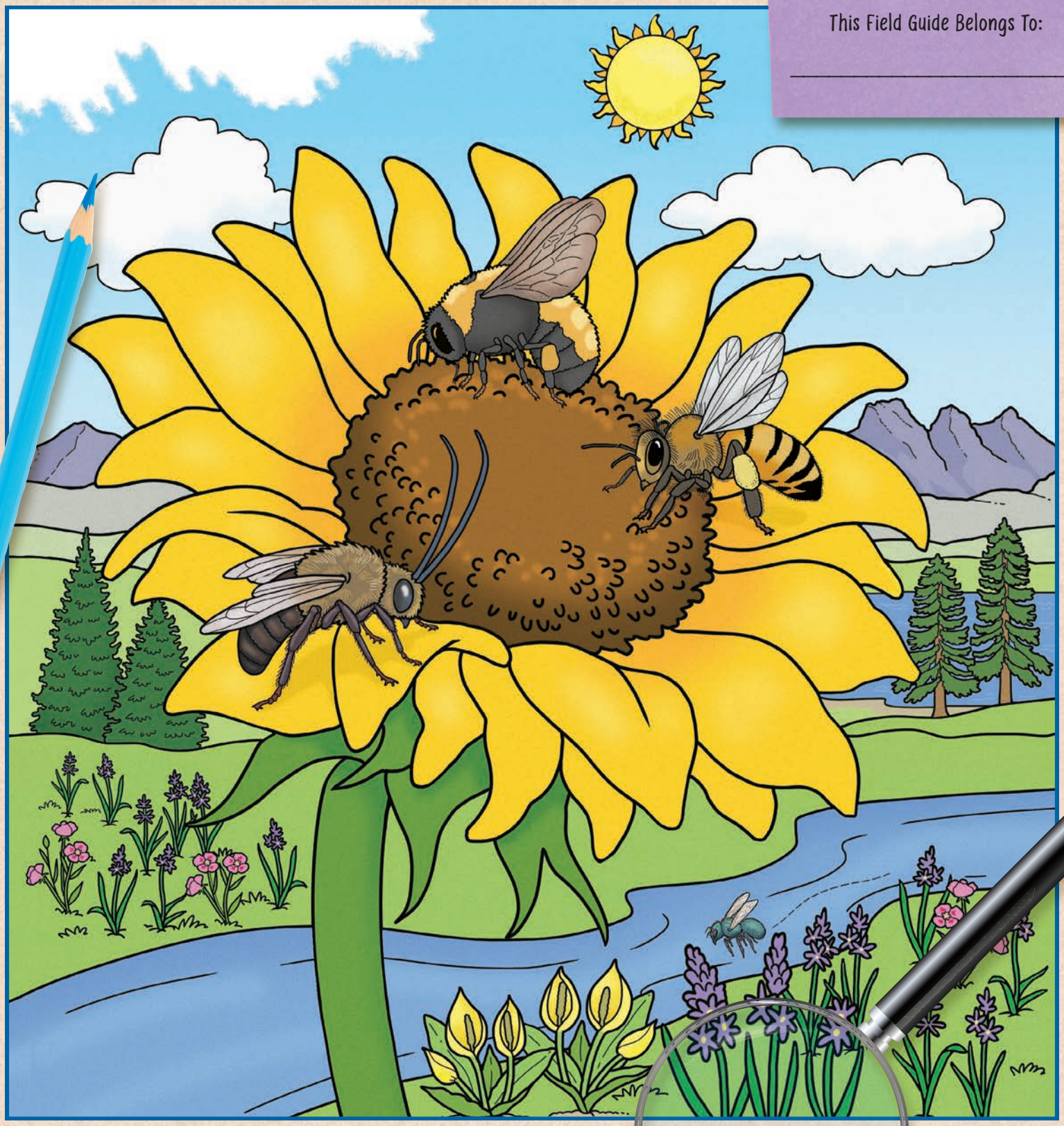

Explore the Bees of Oregon

and how they help make our food

Oregon State University Extension Service

FOOD HERO FoodHero.org

OREGON HARVEST for SCHOOLS

THE OREGON BEE PROJECT

OREGON BEE ATLAS

EPA United States Environmental Protection Agency

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Meet our nine featured bees.

They are all different sizes. Number them from largest to smallest size:

☐	**Squash Bee** 11 to 14 mm in length	**Mason Bee** 6 to 12 mm in length	☐
☐	**Leafcutter Bee** 6 to 22 mm in length	**Long-Horned Bee** 9 to 15 mm in length	☐
☐	**Leafcutter Cuckoo Bee** 8 to 12 mm in length	**Alkali Bee** 12 to 13 mm in length	☐
☐	**Green Metallic Sweat Bee** 7 to 12 mm in length	**Honey Bee** 12 to 15 mm in length	☐
☐	**Bumble Bee** 11 to 23 mm in length		

In science, the metric system is used for measuring length, such as with centimeters and millimeters.

1 Centimeter (cm) = 10 Millimeters (mm)

Math Challenge

Convert from one metric unit to the other.

How many mm would a 10 cm Cuckoo bee be?_____

How many mm would a 6 cm Mason bee be?_____

Circle the bee above that is closest in size to a quarter.

Penny = 19 mm | Dime = 18 mm | Quarter = 24 mm

We would love to hear from you!

Email us at: food.hero@oregonstate.edu

Bumble bee

FOOD HERO

Leafcutter bee

Honey bee

Camas field

This book is aligned to 4th grade education standards but includes content for all ages. The book does not supplant Oregon Department of Education Tribal History/ Shared History but is a great supplement to that content.

Hello! My name is Josh, and my family has a food truck! 12
We sell great tasting lunches to customers from our truck. My little sister, 25
Jocelyn, and I help our parents. We work in our garden to grow many of the 41
foods we need for **ingredients**. We also help order the foods we don't grow. 55
Jocelyn and I go to school during the day. We help when there is no school 71
and on the weekends. It's hard work but we all love it. 83

Do you have a favorite meal? Jocelyn and I have different favorites. We couldn't 97
make any of them without local farmers and animals like chickens, cows and sheep. 111
Maybe the most important helpers of all are . . . bees! That's right! Bees **pollinate** 124
clover for cows to eat—you will learn what the word pollinate means later! Then 139
the cows give us milk and meat. Bees also help plants grow fruits like berries, 154
cherries, apples, peaches, pears, plums and watermelons. We use fruit in the 166
smoothies and salsas we make in our food truck. All our lunches include vegetables. 180
We grow many of our own vegetables from seeds. Bees pollinate our vegetable 193
plants. The vegetable we use the most is onions. Guess what? Without bees to 207
pollinate onion flowers, we wouldn't have seeds to grow onions. 217


Leafcutter bee

Clarkia (Oregon native)

We have a lot of customers, so we make a lot of food. Do you like math? 234
It's my favorite subject in school, but sometimes I need help. We often have to double or triple 252
the ingredients in our recipes! My family asks me to figure out the right amounts to practice 269
my math. Sometimes we run out of an ingredient. When that happens, I get 283
to figure out how much of a different ingredient to use. This book has the 298
eight most popular recipes we use for our food truck. I hope 310
you can help me with some math for each recipe! 320

Honey bee

In reading this year, we are building our fluency with Mr. Traylor! We read the same passage each day for a week with a partner. Try reading my passage above out loud and track how many words you can read correctly in a minute. Find a partner if you can. The numbers at the end of the lines are a guide to how many words you read. See if you can improve your score in five days!

Fluency Tracker

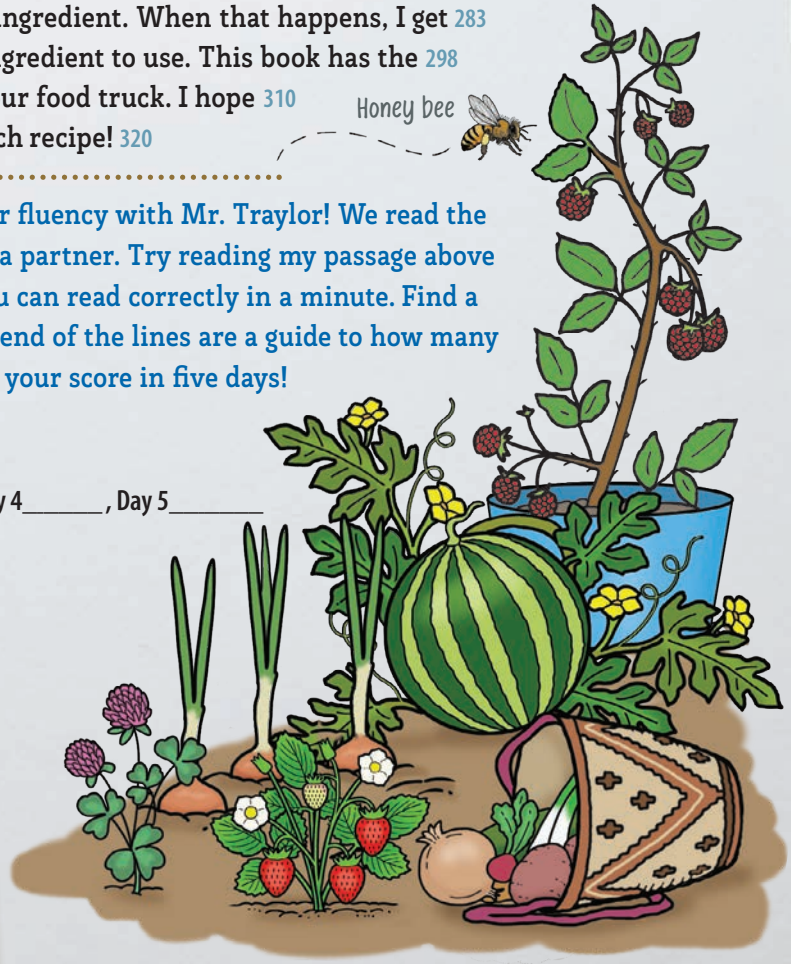
Day 1_____, Day 2_____, Day 3_____, Day 4_____, Day 5_____

what do you want to know about bees and how they help make our food?

_____

_____

_____



Cedar wapas basket used for gathering by **Indigenous** people. Some are woven so well they can hold water.

What Bees Do for Us

Bumble bee and camas (Oregon native)

Next time you take a bite out of an apple or eat a tasty berry, thank a bee!

Bees are a very important group of insects that help make some of our favorite foods. How do they do this? By spreading **pollen** from flower to flower. This is called **pollination**. Bees pollinate many different plants we eat, including types of fruits, vegetables, nuts and seeds. Bees also help produce milk, eggs, cheese and meat—we'll explain how later in this book. Every year, beekeepers from Oregon bring their bees to other states to help pollinate their crops. For instance, they bring honey-bee hives to California to pollinate the almonds that are grown there. There are over 780 **species** (types) of bees in Oregon, 4,000 in the United States and 20,000 in the world! In this book, you will get to know nine of the bee species in Oregon. You'll learn why they are so important to farmers, gardeners, restaurants and chefs and everyone around the world.

Bees help make our food! **Color in the foods shown below that you like to eat.**

Why do you like these foods? _____

Find out about Oregon Pollinator License Plates at: oregonbeeplate.org

Help Jocelyn and Josh and their family design and name their new food truck! They want their **Pacific Northwest** customers to know that bees help make everything they sell. Where would be a great place to park the food truck and sell food?

_____

Plant Parts: Flowers

Bees at Work

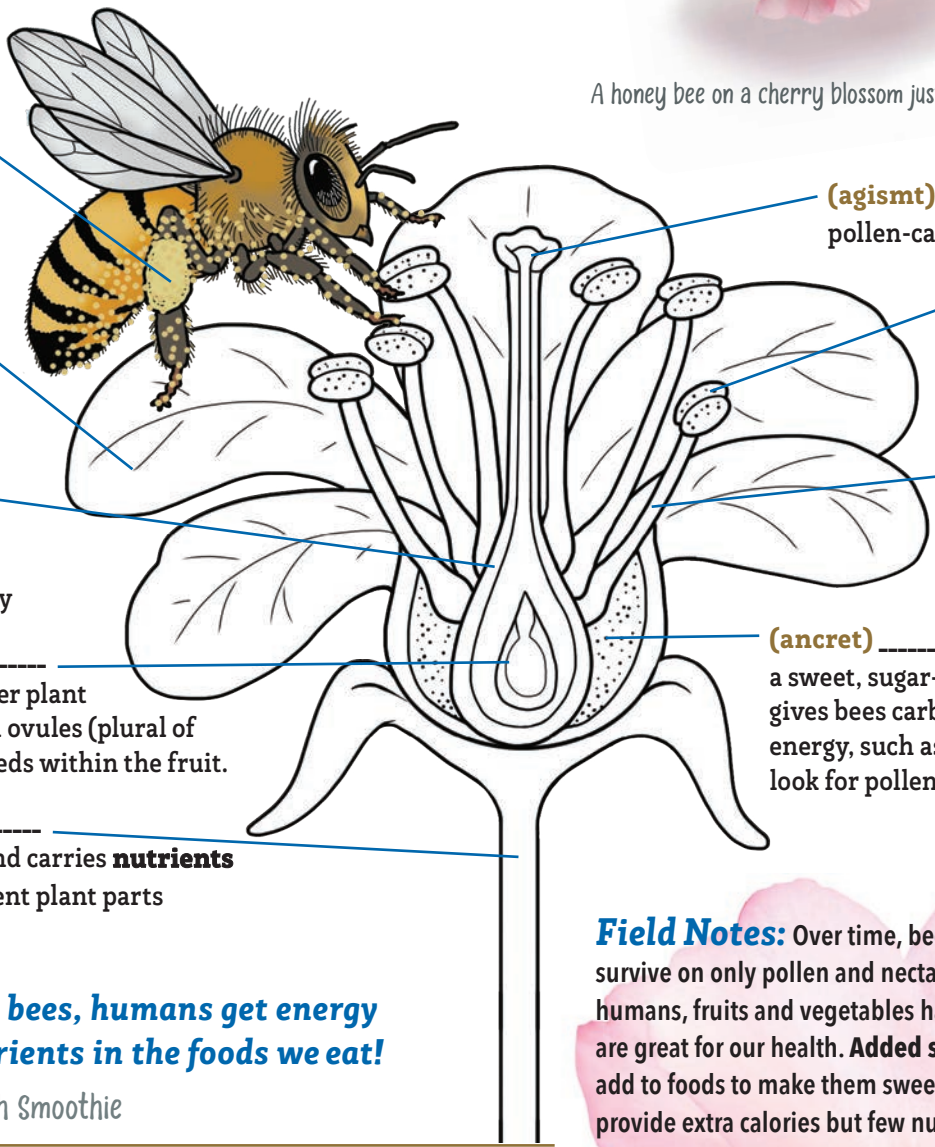
Why do bees visit flowers?

Bees—especially female nest-building bees—**forage** on flowers. This means they collect pollen and **nectar** to feed themselves and their **offspring** (babies) When bees go in search of food, the fuzzy hairs on their bodies pick up and leave behind pollen. Bees often move pollen this way from one flower to another. This is called cross-pollination. Sometimes, the pollen from one flower makes it to the stigma of another flower of the same species. When that happens, the flower is **fertilized** and starts making seeds. Seeds are one of the ways plants make more plants (**reproduce**) like how the fruits we eat are made.

A honey bee on a cherry blossom just like in the drawing below!

The Parts of a Flower Unscramble

Unscramble the words to match the flower part with the definition. If you get stuck, check the word bank below! Then color in each flower part the same color as its label in the word bank.



(lnloep) _____
a dusty powder that gives bees **protein** to feed their offspring

(tleap) _____
color attracts pollinators

(iilpts) _____
the female part of the plant made up of the stigma, style and ovary

(rovya) _____
develops into fruit after plant is fertilized. The small ovules (plural of ovary) develop into seeds within the fruit.

(tesm) _____
supports the flower and carries **nutrients** from the soil to different plant parts

(agismt) _____
pollen-catching platform

(tanerh) _____
where the pollen forms

(laftimen) _____
holds up the anther

(ancret) _____
a sweet, sugar-rich liquid that gives bees carbohydrates for energy, such as to fly around and look for pollen and then fly home

Just like bees, humans get energy and nutrients in the foods we eat!

Carrot Peach Smoothie

Word Bank:

Anther, Nectar, Ovary, Petal, Pistil, Pollen, Filament, Stem, Stigma

Field Notes: Over time, bees have **adapted** to survive on only pollen and nectar, a natural sugar. For humans, fruits and vegetables have natural sugars and are great for our health. **Added sugars**, which humans add to foods to make them sweet, are different. They provide extra calories but few nutrients. They can crowd out nutrient-rich foods and lead to poor health (like obesity, diabetes and heart disease). Nutrition Facts labels list the amount of added sugars in a food.

Plant Parts

Fruits and Vegetables

Vegetables are plant parts—roots, leaves, stems and flower buds. For instance, carrots are roots, lettuce is leaves, and celery stalks are stems! Broccoli has stems and flowers that both taste great! Broccoli heads are made of little flowers that have yet to open (see picture).

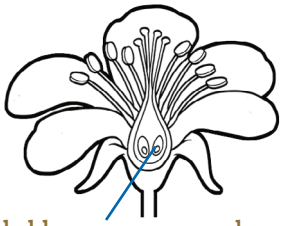
Fruits are made from plant parts, too. For some plants, after their flowers are pollinated, in time, a fruit is formed (see picture). For instance, this happens with apples, cherries and squash. In nature, fruit helps plants spread their seeds for miles: animals come to the plant to eat the tasty fruit and then spread its seeds in their poop.

In cooking and nutrition, some fruits are called vegetables. That's true for tomatoes, green beans, peppers and squash. This is because their taste and the nutrients they provide are more like vegetables than fruits. For example, green beans—also called string beans—are green, fleshy pods that grow around the seeds of a bean plant. People think of them as a vegetable, but plant experts think of them as a fruit.

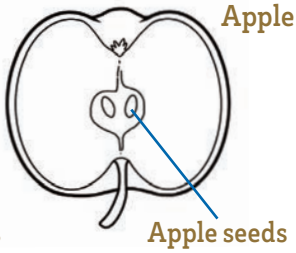
Diadasia (mallow bee) on mallow flower. Many plants and bees need each other to survive; they are **interdependent**.

A closer look: *How some flower blossoms turn into fruit*

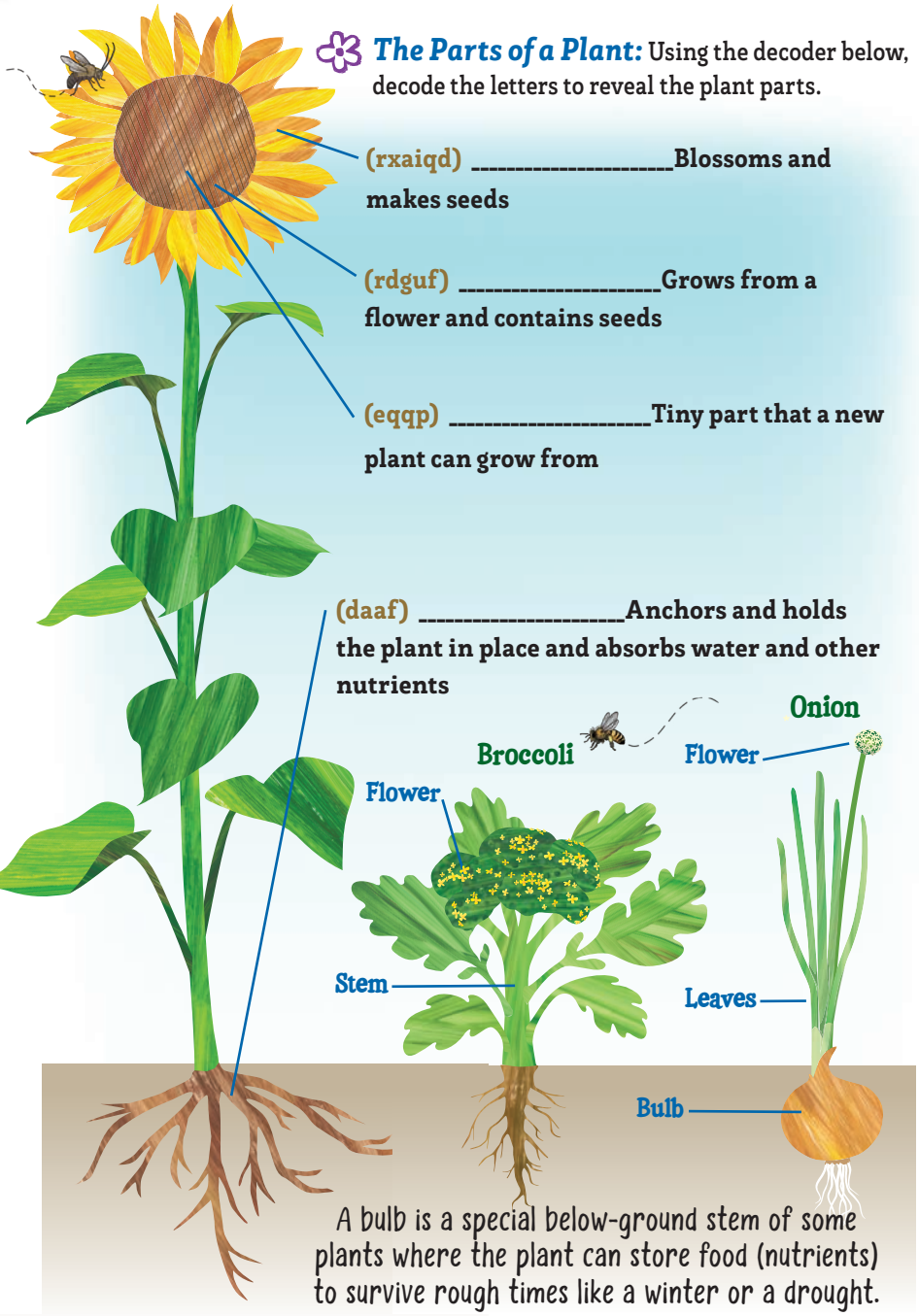
A flower that is pollinated ----> turns into a fruit with seeds.



Apple blossom ovary and ovules



After pollination the ovary swells up to ripen into a fruit. The ovules turn into a fruit's seeds.



The Parts of a Plant: Using the decoder below, decode the letters to reveal the plant parts.

(rxaiqd) _____Blossoms and makes seeds

(rdguf) _____Grows from a flower and contains seeds

(eqqp) _____Tiny part that a new plant can grow from

(daaf) _____Anchors and holds the plant in place and absorbs water and other nutrients

A bulb is a special below-ground stem of some plants where the plant can store food (nutrients) to survive rough times like a winter or a drought.

Decoder:

m=a	r=f	x=l	a=o	e=s	g=u
p=d	u=i	y=m	d=r	f=t	i=w
q=e					

More About Seeds and a Plant Part Recipe

A seed contains everything that is needed for a plant to grow except water, healthy soil, air and sunshine. Bees help make seeds. In return, seeds can grow into plants that make pollen and nectar to feed bees. Seeds are high in protein. Pumpkin and sunflower seeds are great as a snack or in a salad, cereal or yogurt topper!

Fun Seed Facts!

- You can carve a pumpkin and roast and eat its seeds, or dry the seeds out and save them to plant.
- Sunflowers are also a plant with seeds we can eat or dry out and plant.
- Did you know that strawberries have their seeds on the outside? A strawberry flower is made of many tiny flowers fused into one big flower. The little dots on the surface of a strawberry are the seeds of each flower.
- How big are seeds? Seeds come in all shapes and sizes. Avocados have one large seed.

Recipe: Plant Part Funny Face Sandwich

1. Cover a slice of bread with a spread.
2. Design a face on top using plant parts.

Spread, such as nut or sunflower butter, hummus, or cream cheese
Leaves, such as lettuce, herbs, or even pesto
Roots, such as shredded carrots, radish slices or jicama sticks
Flowers, such as broccoli or cauliflower florets or nasturtiums
Stems, such as celery or chard stems
Fruit, such as apple slices, berries or peppers
Seeds, such as roasted sunflower or pumpkin seeds

Draw your sandwich!

Recipe Planning - Read the recipe above. Below, write down the ingredient you would choose for each plant part if you made the recipe.

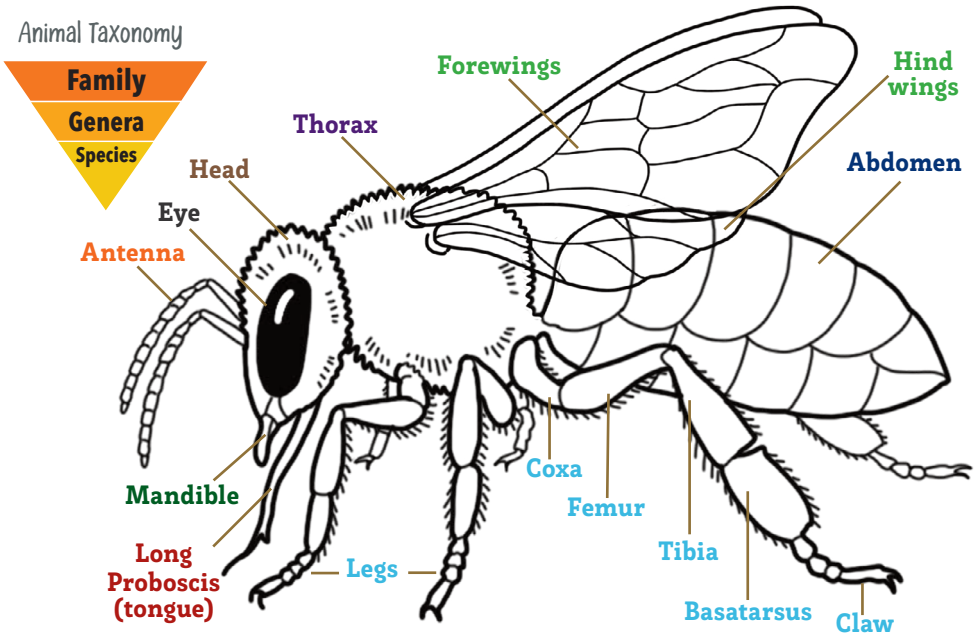
- Flower _____
- Fruit _____
- Leaf _____
- Root _____
- Seed _____
- Stem _____
- Choose a spread: _____

Anatomy of a Bee and an Acrostic Poem

Did you know? All insects, like bees, are animals! Each type of bee is called a species. All bees have 2 antenna, 3 body segments (head, thorax, **abdomen**), 4 wings (2 sets), 5 eyes and 6 legs. Teams of scientists who study bees (**mellitologists**) use the parts of a bee to identify them. To help understand how alike or different they are, scientists put similar species together into a group called a genus. Similar genera (plural of genus) fit into one of the seven bee family groups. In this book, you'll learn about a few of the most common **genera** in Oregon.

WOW ***Bees are like superheroes with body parts adapted to help them find flowers for food, and collect and spread pollen to help make our food.***

Urbane digger bee sheltered from the rain in a gentian flower



Color each body part on this honey bee the same color as its label.

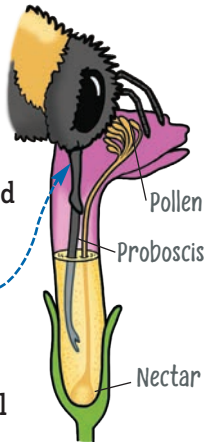
A Closer Look

Antennae - A bee's two antennae are connected to the brain and swivel in all directions. The tiny hairs on them respond to touch, taste and smell, like floral scents. Bees have stereo smelling, meaning they can tell which direction a smell comes from with the help of the antennae on either side of their head!

Pollen dusted bee

Mandibles - These strong mouth-parts help bees to hold onto plants, cut leaves for nesting, carry nesting materials and cut holes in flowers so they can get closer to the nectar. Honey bees use them to shape wax.

Proboscis - A bee's tongue-like proboscis is a thin and hairy tube. It can reach into flowers to suck nectar out like a straw, lick up water and taste. Some bees have a longer proboscis to help reach the nectar in flowers that have narrow and deep floral tubes. It also helps bees communicate!



A bumble bee eating from red clover

Thorax - The middle segment of the bee that includes their wings and legs and controls movement.

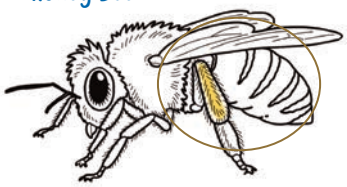
A carpenter bee

Wings - A bee's wings help it to fly up, down, forward and backward and to hover. Bees have a set of front and back wings. The sets attach with hooks when the bee takes flight.

Three Types of Pollen-Carrying Structures:

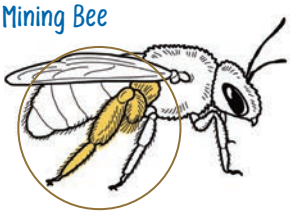
Most species of female bees have pollen-carrying structures like in the examples below:

Honey Bee



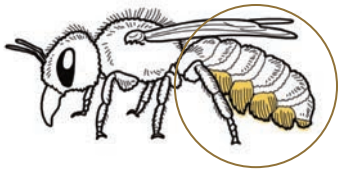
1 ***Corbicula (pollen basket)-*** The corbicula is a shiny, concave spoon-like area, with hair fringed on the sides to hold in pollen.

Mining Bee



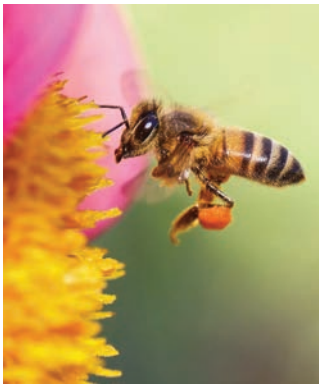
2 ***Scopa (dense hairs on back leg)***

Leafcutter Bee



3 ***Scopa (dense hairs beneath the abdomen)***

The word scopa comes from the Latin word for "broom." The scopa is like thick broom bristles sweeping up pollen.



A pollen ball on the leg of a honey bee. Only female bees collect pollen. Male bees of all species lack structures to carry pollen.

Acrostic Poem

What is it? An ***acrostic*** is a poem in which the first letter of each line spells out a word. Often, that word is the title of the poem. Here's an example:

Cherry

Cool-weather blossoms
Helped to grow by mason bees
Excellent fresh or in fruit salad or parfait
Ruby red, pink or yellow
Ripe in midsummer
You can't eat just one!

Mason Bee

Your Turn!

Try writing an acrostic poem about your favorite fruit or vegetable that bees help make! First, write your title on the top line, then write it again in large letters, one letter at a time, in the blocks on the side of the page. Use as many blocks as you need. Now write something you like about your fruit or vegetable or the bee that helps make it that begins with the letter at the start of each line.

Find someone to read your poem to!

A honey bee and Cherry blossoms

Would you rather have bee vision or human vision?

Pretend you are a bee. How would you see the world? Bees see in a unique way. Bees special vision helps them see flowers from afar to find food (nectar and pollen), but also to find their way around. Here are four different ways bee vision and human vision differ.

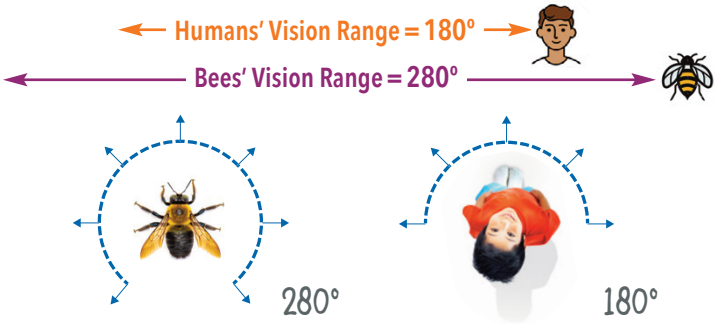
1 How many eyes do you have?

Bees have five eyes!

- **Two compound** complex large eyes with thousands of tiny lenses each. Compound eyes help bees form images like how they "see" the shape, color and features of flowers. Compound eyes also help bees navigate (find their way) using patterns of light they see the sky.
- **Three ocelli** simple small eyes arranged in a triangle between the compound eyes. Ocelli have one lens each and detect light (brightness), not images. Ocelli help bees navigate using the sun as a guide.

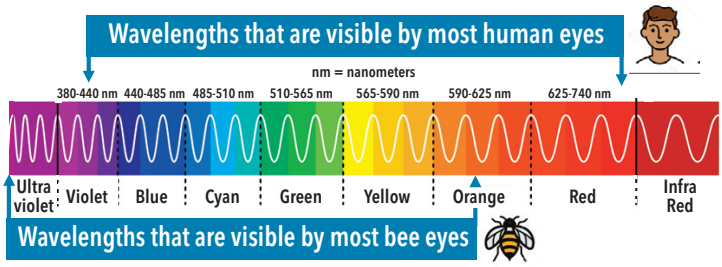
2 How far around you can you see?

Bees can see 280 degrees (°) around them. Humans can see 180°. So bees can see more flowers when they are hungry!



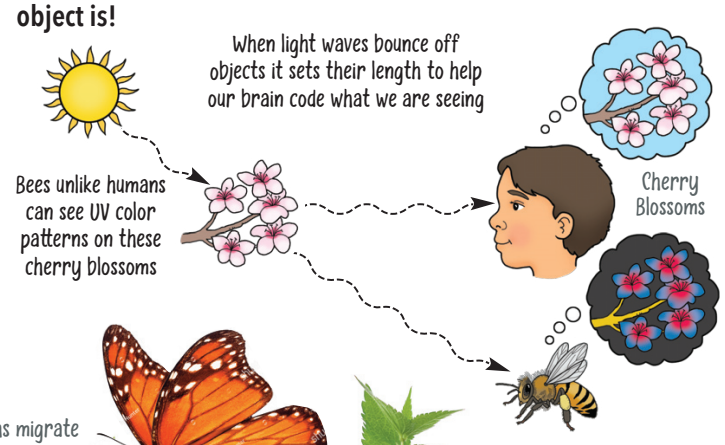
3 Which colors can you see?

Wavelength color chart

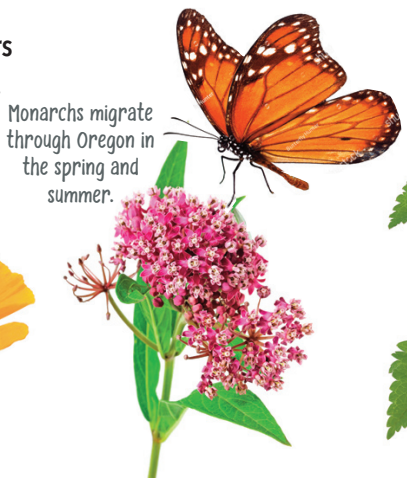


Since bee and human eye cells code differently they see some objects as different colors. Humans, unlike bees, can see all shades of red. Bees, unlike humans, can **perceive** all shades of violet and UV light. Some flowers have UV color patterns on them, also called nectar guides, which guide bees to a flowers pollen or nectar. Humans cannot see a flowers nectar guides.

Did you know light moves in waves? Colors show up in different sized wavelengths of light that we can see. Light waves bounce off objects, like flowers, to enter our eyes. Our eye cells then code how long the wavelength is to tell our brain what color that object is!



Use the color chart above to decode how a human might see the flowers on this page different than a bee does.



4 Can you see light patterns in the sky?

As bees leave their house (nest) they have a sense of what time it is and where the sun is in the sky to help them navigate. Bees also use light patterns in the sky to navigate between flower patches and their nest with their compound eyes. As light passes from the sun through the small particles and gasses in our atmosphere (layer of gases around the earth of other planet) bees perceive patterns. These light patterns are why the sky looks blue or a sunset looks orange to humans. How bees navigate with light patterns is like how some people use the stars to navigate, since **time immemorial**.

A bee looking at this **habitat** of Rowena Crest viewpoint near the Hood River would see the colors different than humans. Plus, a bee can see patterns in the sky to help them find their way home!

Be a Food Hero! Bees and humans use their senses (hearing, sight, smell, taste, touch and bees have the extra sense of magnetic or electric field) to decide which foods to eat. A great way for humans to be Food Heroes is to try new foods! If you're not ready to taste a new food, you can also try it by looking at it, touching it, or smelling it. Describe in detail a time when you were nervous about a food or drink you had not tried before. What did you try? How did you test it using your different senses?

Bee ID Color-by-Number and Blueberry Bling Recipe

Huckleberries (genus Vaccinium spp.) are a native blueberry species, the same genus as blueberries that you buy in the store.

A bee's colors can help us identify (ID) it.

Help Jocelyn identify which bees are pollinating the blueberry bushes. Use the recipe to solve the twelve math problems to find out what to color each section in the picture below!

A. How many Tablespoons of brown sugar would be needed if the Blueberry Bling recipe was tripled? _____ **black**

B. How many total seconds does the recipe need to bake? _____ **brown**

C. How many square inches are in the baking dish? _____ **red**

D. How many total cups of oats and blueberries would there be if the recipe was doubled? _____ **orange**

E. How many teaspoons of butter would there be if the recipe was quartered? _____ **yellow**

F. How many teaspoons of cinnamon would be needed if the recipe was cut into a fourth? _____ **light green**

G. How many total teaspoons of brown sugar, cinnamon, and butter are needed for the recipe? _____ **dark green**

H. How many cups of blueberries would there be if the recipe was quadrupled? _____ **light blue**

I. If the recipe was halved how many cups of blueberries would there be? _____ **dark red**

J. If the recipe was multiplied by five, how many teaspoons of cinnamon would be needed? _____ **dark blue**

K. If the recipe was quadrupled, how many cups of oats would there be? _____ **purple**

L. If the recipe was halved, how many cups of oats would be needed? _____ white

These bees pollinate blueberries:

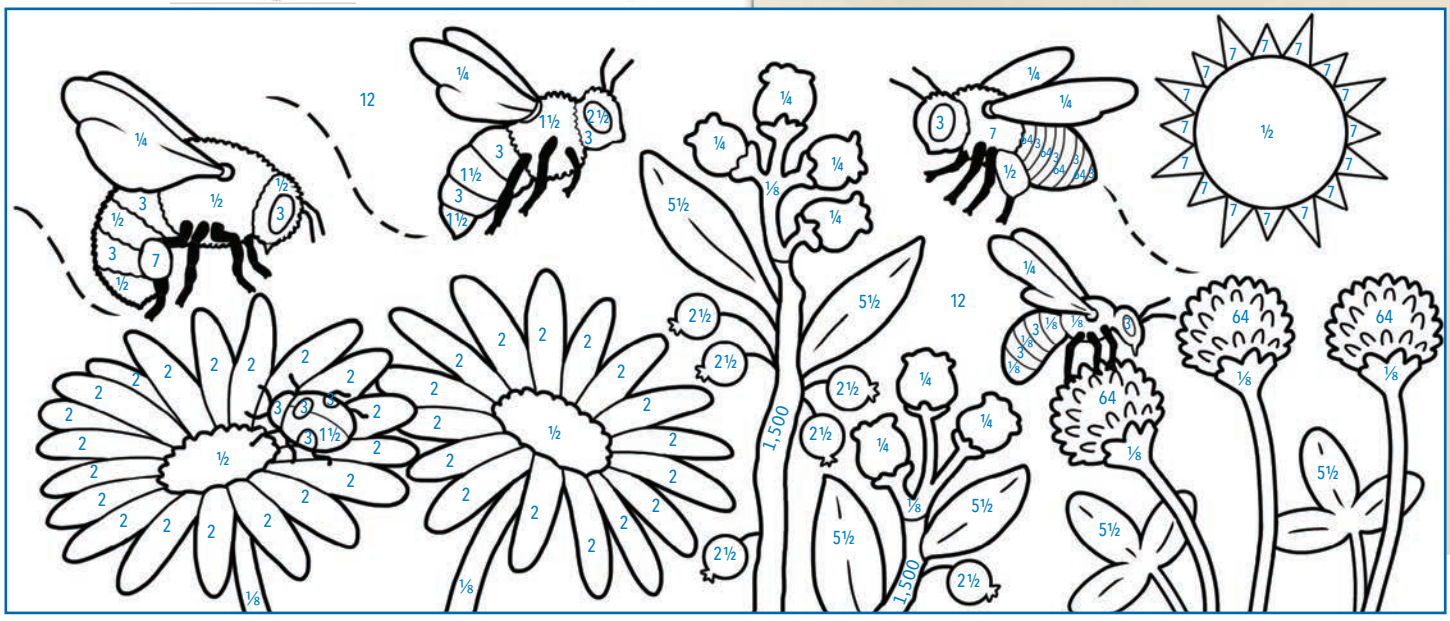
Blueberries

Recipe: Blueberry Bling

Blueberries, 3 cups fresh or frozen
Margarine or butter, softened, 2 teaspoons
All-purpose flour, 1 Tablespoon
Brown sugar, 1 Tablespoon
Cinnamon, 1/2 teaspoon
Old fashioned rolled oats, 1/2 cup

Bling bee

1. Preheat oven to 375 degrees F.
2. Put the blueberries in a 9-inch pie plate or 8x8-inch baking dish.
3. In a small bowl, use a fork to mix the rest of the ingredients.
4. Sprinkle the oat mixture over the berries.
5. Bake for about 25 minutes.



The picture shows (left to right) a mining bee in the genus Andrena, a wild bumble bee, genus Bombus, a small carpenter bee, genus Xylocopa, a sweat bee, genus Lasioglossum, and a ladybug, as well as asters, blueberry blossoms and crimson clover.

Take a Closer Look:

Mystery Photos Bee and Plant ID

Photographers help scientists and all of us learn more about bees through their photos

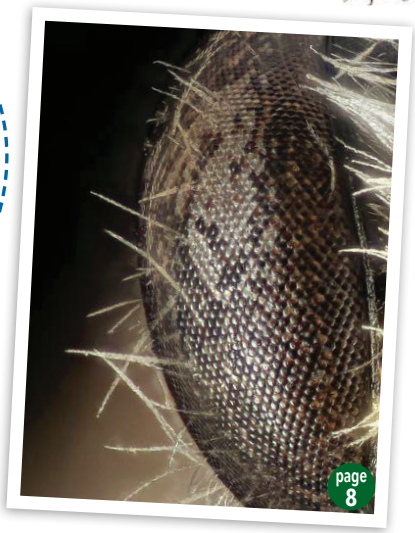
Nemophila or Baby Blue Eyes and a mason bee

Pretend you are smaller than a bee. What would the world look like to you?

1. Look at these close-up photos. **2.** Guess what you're looking at.
3. Write down your guesses on the lines below the photos.
4. Go to the page numbers listed in the green circles for clues as to what the photos are!

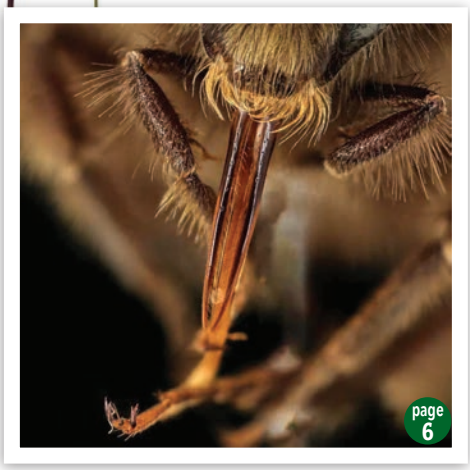
A. _____

_____



B. _____

_____



C. _____

_____

D. _____

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E. _____

_____

F. _____

_____

G. _____

_____

H. _____

_____

I. _____

_____

A. Bee antennae where they attach to the bee's head; **B.** Bee's compound eye; **C.** Bee tongue (proboscis); **D.** Pollen grains on an anther with the filament below; **E.** Pollen grains of different plants; **F.** Bee claw; **G.** Bee wing tip; **H.** A nemophilia flower seen through a bee's eyes (in ultraviolet light) and through a humans eyes on the top of this page!; **I.** Loaded pollen basket of a foraging bee.

Images A, B, C, F, G and I courtesy of the United States Geological Service Bee Inventory and Monitoring Lab. Retrieved from https://www.flickr.com/people/usgsbiml/. Image H Svea Bruslind, Oregon State University.

Healthy Habitat

Bees thrive and food grows!

A habitat is a home to living things like plants and animals. It provides what they need, like shelter, water and food. A bumble bee, for example, needs the right kind of place for a nest and the right kinds of plants close by to provide nectar and pollen. In **ecosystems**, a habitat's living things connect with the larger **environment's** non-living things, like water, soil, air and sunlight. Ecosystems can have more than one habitat. In some ecosystems, bees are a "keystone" species. This means that without them, the ecosystem would break down and foods that grow there would not survive.


Mason bee


Bumble bee


Small carpenter bee


Yarrow


Kinnikinnick


Chokecherry


Wild strawberry

Write a Ballad about cooking with foods bees make!

What is it? A **ballad** is a poem or song with four lines that rhyme. Words that rhyme end with the same sound. For example, **plot** and **lot** rhyme. In many ballads, the first and third lines rhyme with each other, and the second and fourth lines share a different rhyme.

Here's an example of a ballad:

Making Pollination Pizza

My class makes pizza from our garden plot
with herbs bees helped grow–tomatoes, too!
We spread the crust with sauce, then add a lot
of veggies on the top. It's fun to do!

Try writing a ballad about food that bees help make. First give your poem a title. Find someone to share your ballad with!

Title: _____

_____

_____

_____

_____

_____

A Tradition of Cultural Burning

Cultural burning is a method Indigenous People have used for thousands of years to restore the health of a land area by burning it with a gentle, controlled fire. The method promotes the growth of healthy native plant and animal habitats, and helps lower the chance of wildfires. Indigenous Peoples use their deep knowledge of the land, plants and animals to decide where and when to use cultural burning. As a result of the Great Fire of 1910, cultural burning was made illegal in Oregon the next year. Forestry science slowly caught up with Indigenous knowledge. Now, with the support of Indigenous knowledge-holders, Oregon government forestry teams have been using cultural burning to restore some lands.

Indigenous Traditional Ecological Knowledge (ITEK).

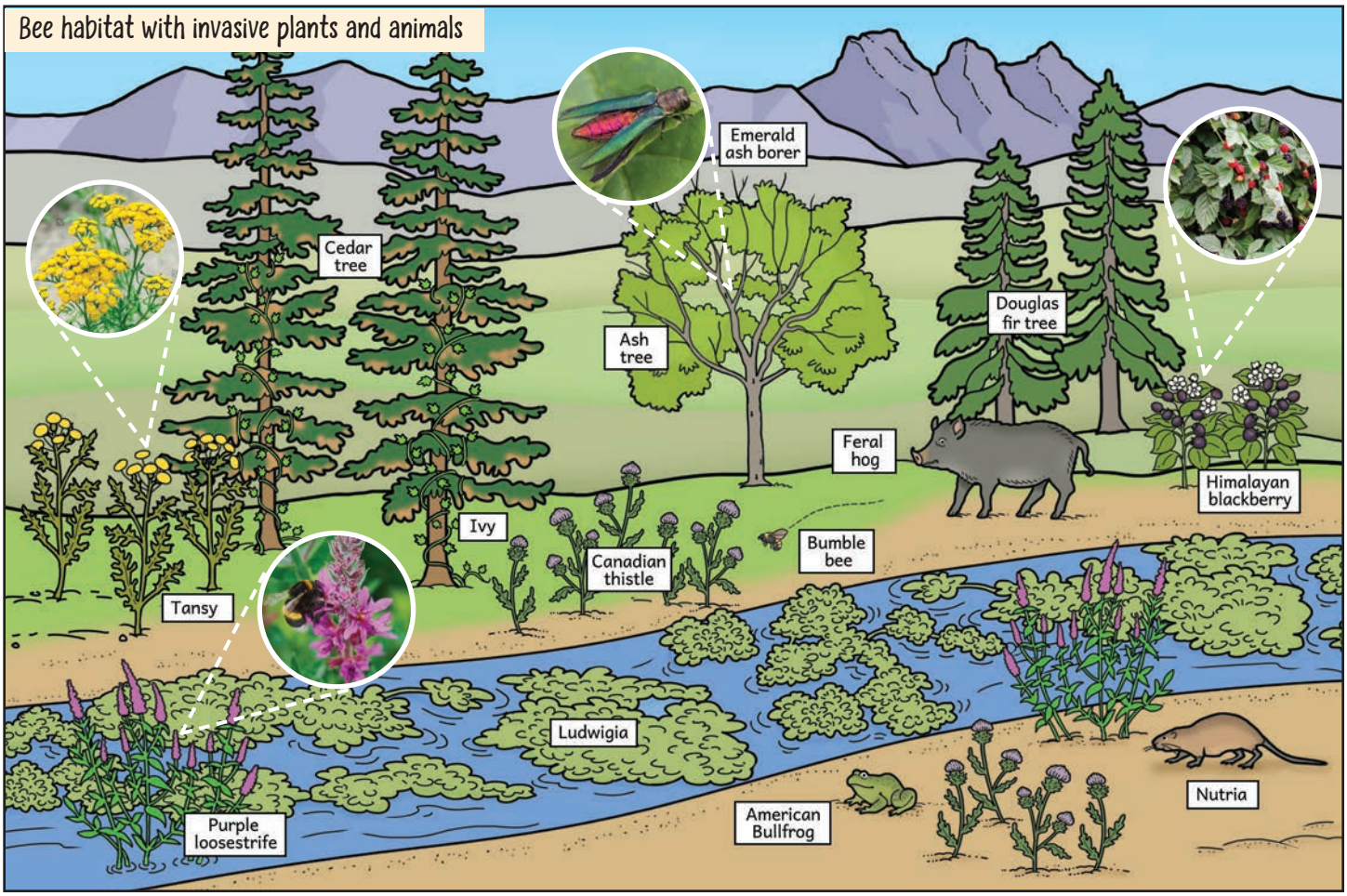
Some kinds of non-native plants and animals cause trouble when they are released outside their normal range. We call these "invasive species." Once they have settled in a new area, invasive species can displace native plants and animals and damage the environment, the **economy** and human health. Gardeners, farmers and scientists manage invasive species in four different ways. These are: 1) ***mechanical*** (pull up the invasive plants), 2) ***chemical*** (use a pesticide), 3) ***cultural burning*** (conduct a controlled burn over an area and replant with native plants) and 4) ***biological*** (release predators or herbivores [plant-eating animals] of the invasive species). Often these methods are combined to control invasive species and bring an ecosystem back into balance.

Bumble bee on Penstemon

Some pesticides are toxic to bees! Pesticides that target plants (herbicides) are used to keep bee-friendly plants growing or to keep bee habitats free of invasive weeds. Only adults should handle pesticides! If pesticides are needed, they should be used in a place and time that does not harm bees. Adults should read the label on each pesticide container looking for instructions or warnings that will help protect bees. If you have questions about pesticides, such as if a pesticide is safe to use around bees, contact the **National Pesticide Information Center** (NPIC) at http://npic.orst.edu or call **1-800-858-7378**.

Sometimes habitats become unhealthy!

Compare the habitat below to the restored healthy habitat on page 67! Mark the differences below. At the bottom of the page, check your answers.



1. Fir trees choked by ivy **2.** Ash tree canopy with fewer leaves **3.** Fewer types of pollinators (notice the Western meadowlark, cinnabar moth and bees) **4.** River clogged with invasive plants (notice the purple loosestrife) **5.** Fewer species of bees **6.** More invasive animals (notice the feral hog, nutria, emerald ash borer beetle and American bullfrog) **7.** Fewer native animals (notice the rainbow trout and American beaver [the state animal] and black bear [the state bear]) **8.** More invasive plants (notice the Himalayan blackberry, tansy and Canadian thistle) **9.** Fewer native plants, including edible plants (notice the camas, salmon berries, stinging nettle, yampah [wild carrot] and cattails) **10.** Loss of hiking trail for outdoor recreation

What Bees Do for Oregon-Grown Food

This map of Oregon can give you an idea of the many types of crops statewide that bees help produce.

Map Legend

- Alfalfa seed
- Apples
- Beef
- Blueberries
- Caneberries
- Carrot seed
- Cherries
- Chickens/eggs
- Clover seed
- Cranberries
- Crimson clover seed
- Dairy
- Meadowfoam
- Mustard seed
- Onions
- Peaches
- Pears
- Pumpkins
- Sheep
- Vegetable/flower seed
- Watermelon

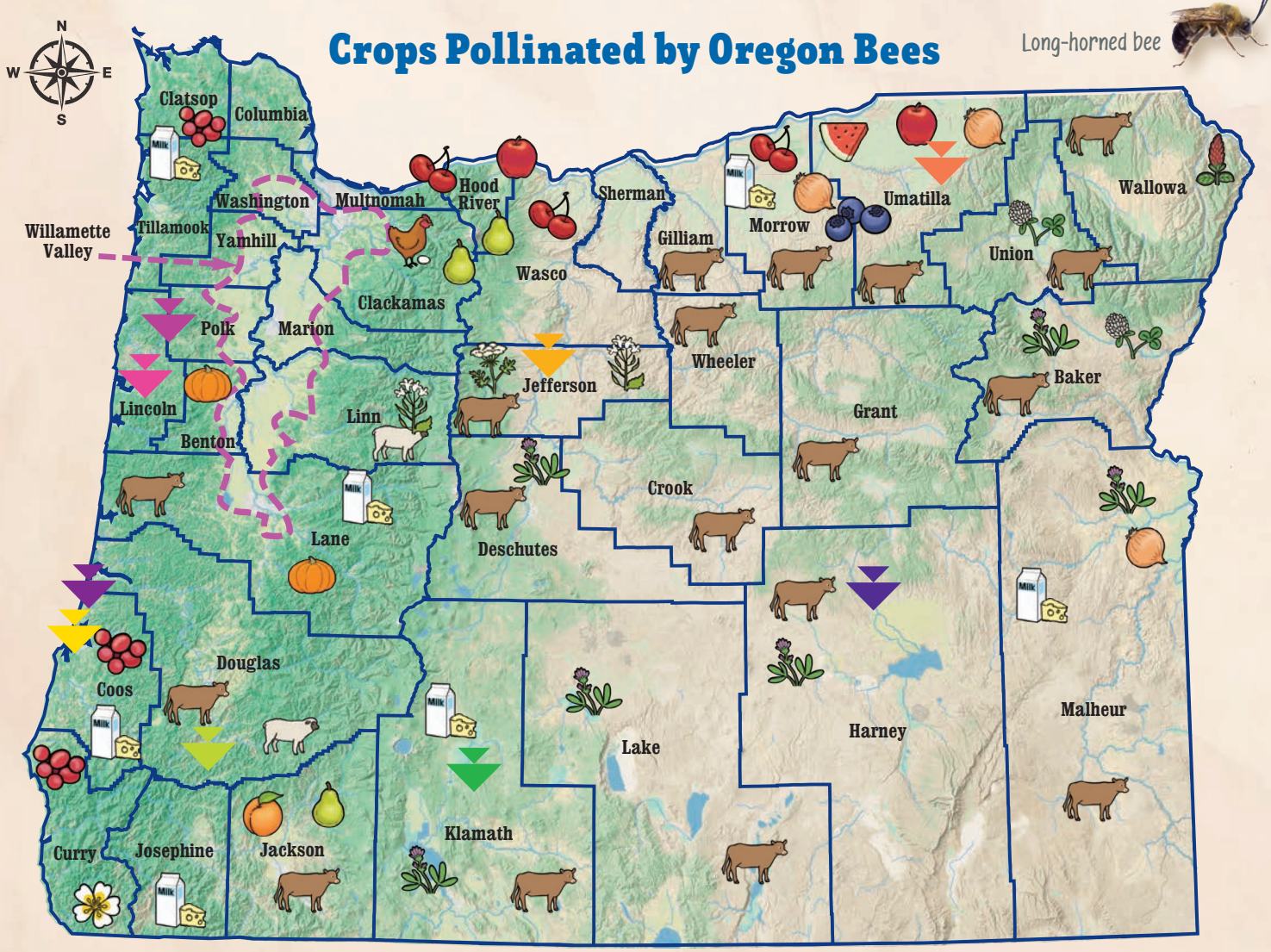
Native/Indigenous People live all over Oregon. They **harvest** foods bees help produce and have done so for thousands of years. The symbols on the map represent nine federally recognized Tribal Headquarters in Oregon but not all of the tribes' current and historical lands or the many unrecognized tribes.

- Burns Paiute Tribe
- Confederated Tribes of Coos, Lower Umpqua and Siuslaw
- Confederated Tribes of Grand Ronde
- Confederated Tribes of Siletz
- Confederated Tribes of Umatilla
- Confederated Tribes of Warm Springs
- Coquille Indian Tribe
- Cow Creek Band of Umpqua Tribe of Indians
- Klamath Tribes

Ladybug on Camas

Crops Pollinated by Oregon Bees

Long-horned bee



Adapted from the Oregon Agriculture in the Classroom Foundation's *Grown in Oregon* map.
View an interactive map online here: https://oregonaitc.org/resources/oregon-resources/oregon-map/

Oregon Agriculture in the Classroom Foundation

Flies (Conopidae or flower fly)

Bumble bee

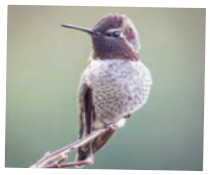
Field Notes:

Bees are champion pollinators in habitats across Oregon, moving pollen from plant to plant. But, they don't work alone. A team of pollinators like those shown here and even humans work with bees to make food. This team of pollinators may move pollen in different ways, but together they help plants reproduce and make our food!

How many different pollinators you can find in this field guide?

Find a favorite Oregon-grown food and where bees help pollinate it!

Bats (brown bat)



Birds (Anna's hummingbird)

Beetles (Seven-spotted lady beetle)

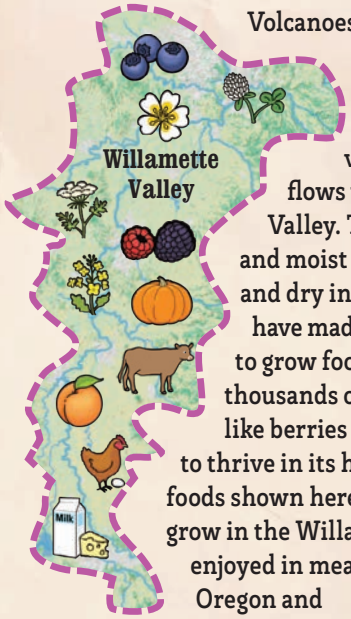
Butterflies (Taylor's Checkerspot Butterfly)

Wasps (Beewolf)

Clearwing moth on yarrow. Moths don't sting. Clearwing moths mimic wasps and bees to avoid being eaten by animals who think they will sting.

Why are animals and dairy on the map? Bees are important pollinators of alfalfa and clover flowers. Farmers grow these plants to feed many types of animals that give us milk, cheese, meat and eggs. Wild animals like elk and deer also eat foods bees help make.

Food Grown in the Willamette Valley



Volcanoes and glaciers enriched the soil of the Willamette Valley and helped create the Willamette River, a vast water supply that flows the full length of the Valley. The Valley's climate is cool and moist in the winter and warm and dry in the summer. These **traits** have made it one of the best places to grow food in the world. For thousands of years, **traditional** foods like berries and camas have continued to thrive in its healthy habitats. All the foods shown here and more than 150 others grow in the Willamette Valley and are enjoyed in meals across Oregon and the world.

Jory soil, the state soil of Oregon, is a volcanic soil rich in clay and nutrients. It is often found on the hillsides of the Willamette Valley.

Write a Haiku About the Bees of Oregon

A haiku is a poem with three lines. It was invented in Japan. Often, it is about nature. Most haiku have 17 syllables. A syllable is a sound that you say on its own. The word "bee" has only one syllable. The word "springtime" has two. The first and third lines of a haiku each have five syllables, and the middle line has seven syllables: 5 + 7 + 5 = 17.

Here's an example:

Apple Tree
In springtime, it blooms.
Bees and blossoms make apples.
In fall, we make sauce!

Your turn. Try writing a haiku about how food grows. It can describe a farm, a garden or any fruit or vegetable you like. Try a raspberry bush or a pumpkin patch! First give your poem a title. Then write three things about it, one on each line. Count your syllable. Find someone to read your poem to!

TITLE: _____

_____

[5 syllables]

_____

[7 syllables]

_____

[5 syllables]

Reader's Theater

Presents:

A Read-Aloud Script About Oregon Bees

"Sometimes It's Tough Bee-ing Different"

Specialist and Generalist Bees

Directions: Read from the script aloud. You can help make the story even more fun by getting into character. Use a unique voice, and use your body and face to help act out the story. Find a group of up to twelve actors to play the bees or have each actor play more than one role.

Cast of 12 Characters:

- **Sweat Bees: (Olympias)** Ashley, Maddy, Ali and Timberly
- **Mason Bee:** Jen
- **Squash Bees:** Samantha, Sierra
- **Fairy Bees (Perditas):** Paul, Pablo, Parwana
- **Carpenter Bee:** Colton
- **Lava Hole Bee:** Rocky (no lines)

Setting: Blue Nectar Elementary School cafeteria, with bee kids buzzing about getting their lunch, visiting with their friends and finding their seats.

Script: ***The four sweat bees (Olympias) enter the cafeteria talking and giggling.***

Ali with a Camas Pollen smoothie

Timberly: Did you color your proboscis purple, Ali!?

Ali: Aw, you noticed Timberly!

Jen: It looks so-o-o-o buzziful, Ali.

Ashley: I'm so happy it's May and the cafeteria has camas nectar smoothies for us now!

Ali: The other drinks don't taste as good as my favorite, the camas pollen smoothie. For sure it's the most *buzztastic*!

Maddy: For real! I can't wait for later in the summer when the meals feature our other favorites like wild onion, yarrow and raspberry nectar smoothies.

Timberly: Right?!! They cater a ton to the "**specialists**" like Rocky, the lava hole bee. What in the world is penstemon anyway?

Maddy: It doesn't even look like real bee food. More like grasshopper grub!

Ashley: Obvs. There's a reason Rocky is sitting by himself.

The squash bees approach the sweat bees, who have stopped right next to a table. Samantha squeezes behind them, followed by Sierra.

Samantha: Uh, excuse me, Olympians.

Mason bee

Sierra: Sorry girls, coming through!

The sweat bees act annoyed, roll their eyes dramatically, and mock the squash bees.

Maddy: Ugh! As if??! Those squash bees almost touched us.

Ashley: If they had, we'd be washing off "squash germs" all day.

Ali: Seriously. Who do they think they are?

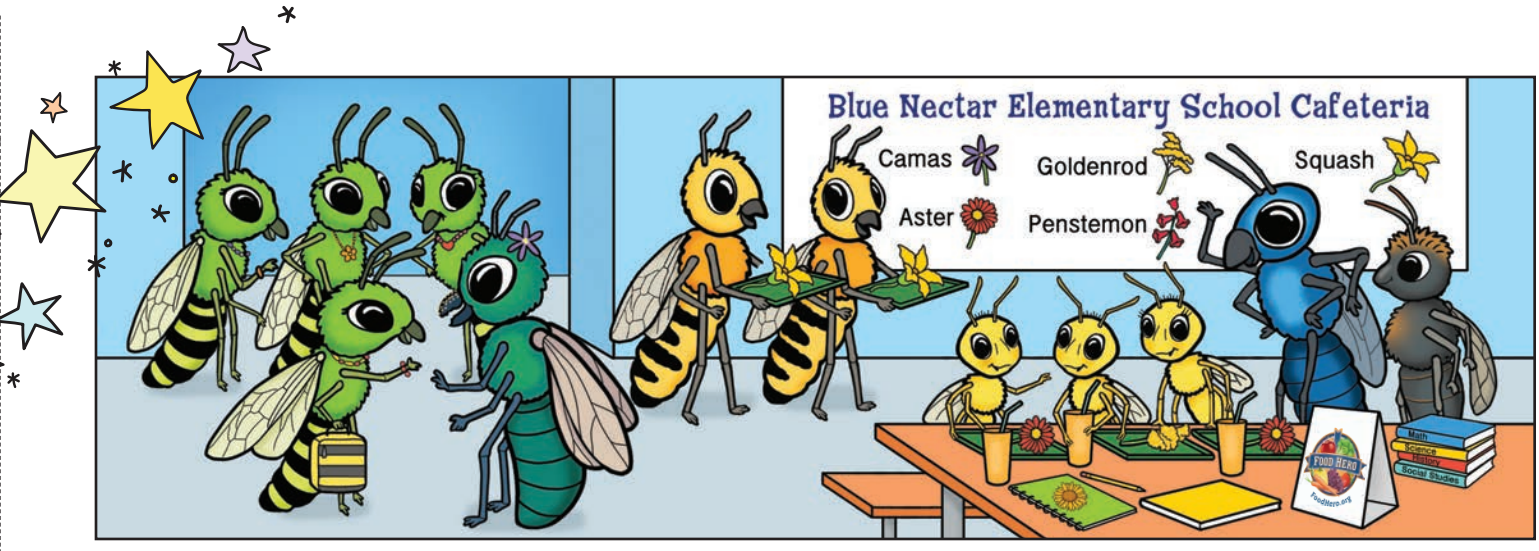
Rocky with penstemon for lunch

Paul, Parwana, and Pablo (the fairy bees) approach the sweat bees, who are still standing, blocking the table.

Paul: Hi, Olympians! Are you girls going to sit here or are these seats open?

Green metallic sweat bee

Maddy: Well, not if YOU'RE sitting here!!



In the cafeteria, left to right: Ashley, Maddy, Timberly, Jen and Ali chatting together, Samantha and Sierra carrying trays with squash, Paul, Pablo and Parwana with asters for lunch, Colton and Rocky.

Ali: Right, I don't wish to be sitting near aster and goldenrod grub, thank you very much!

Paul looks hurt.

Colton carpenter bee walks up posturing and puts one leg up on the bench while still posturing.

Colton: Why, Ashley, Maddy, Alley and Timberly! Do my antennae deceive me? Surely my sensitive body hair has led my hearing astray.

Small Carpenter Bee

The Olympians all blush and fidget nervously.

Colton: You CAN'T be giving these bees a hard time about liking foods that are different from your favorites, can you?

Timberly: Oh Colton, you know . . . we . . . I mean, they just . . .

Colton: Sheeeooot, I'm not a very picky eater myself. I mean, after a hard day of work, I'll eat almost anything. And I know you girls aren't all that picky either. We're generalists. But some bees are specialists! Did you know that? They have superpowers! Without them, some plants wouldn't ever be pollinated! And there are many types of specific plants like the many types of squash.

Sierra: Right! I love the winter for the huge number of squash options.

Samantha: Exactly! You have butternut, pumpkin, hubbard, delicata . . .

Sierra: . . . kabocha, acorn and spaghetti.

Samantha: And that's just winter!

Colton: Everyone has different things they like and different things they're good at. Every bee is different, just like every human is different. Some even have allergies or intolerances, so they can't eat certain foods. Would YOU want to be made fun of for that?

Ali: Well, of course not, Colton.

Paul: It's crazy how some of us only pollinate certain things, and we all need sugary nectar, whereas humans HAVE to eat lots of different foods to stay healthy, and they DON'T need sugary liquids!

Colton: That's right, Paul! Now, why don't you Olympians have a seat with me here and get to know Pablo, Paul and Parwana? They are pretty awesome bees and really great friends!

Ashley: *(Sheepishly)* I guess I never really thought of other bees like that before, Colton. I'm . . . I'm sorry, Perditas.

Ali: Yeah, me too.

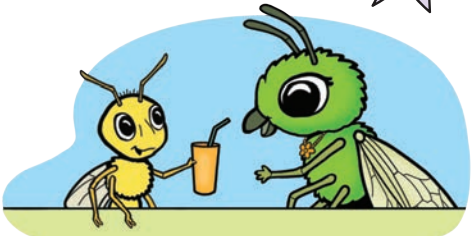
Perdita bee enlarged

Timberly: Totally guys. I'm sorry.

Maddy: Can I try some of your drink, Parwana?

Parwana: Sure! My mom says that's how you discover new things that you like.

Pablo: Thanks, Colton! You're the best!!



Parwana offering Maddy a smoothie.

Wild Bees and Fun with Words

Can you decode the words to answer the riddle?

Unscramble the words in the boxes below; each word is a made in part by wild bees. When you've finished, add each numbered letter into the mystery word to answer the riddle. At the bottom of this page, check your unscrambled words.

Riddle question:
What is a bee's favorite sport?

Juicy, ripe plums thanks to the help of blue orchard mason bees shown below

ESPEPRPO

1

Blue Orchard Mason Bee

NCOIRLTA

EBEULBRISRE

Red Flowering Currant (Oregon native)

PLSAES

5

UFLLWACREOI

2

GSGE

6

OOTTSEAM

AHSUQA

The Red Currant flowers become purple-black, edible berries.

GPTNALEG

3

EFBE

4

Riddle answer: ___ ___ ___ ___ ___ ___

1 2 3 4 5 6

Blue orchard mason bees (Osmia lignaria) are an Oregon wild bee that excels at pollinating fruit crops like this plum blossom, and they are managed for this purpose.

Wild bees are: 1) not kept by people, 2) solitary (live on their own) and 3) nest under the ground. Bees started to appear in Oregon after continents began to spread apart around 60 million years ago. They **evolved** together with flowering plants in a process called co-evolution. Over millions of years, these bees and plants helped each other thrive in the forests, savanna and deserts of Oregon. Wild bees are important for the pollination of native plants as well as crops, which are often closely related.

There are hundreds of different wild bee species. Some are smaller in size than a grain of rice and some have not been identified yet. Wild bees help native plants reproduce. Many farmers rent boxes of managed honey bees to pollinate their crops, but wild bees can help pollinate food crops too! In fact, they both help make the foods featured in this book.

The smallest bees in Oregon are the fairy bees, genus Perdita. They are only as long as a grain of rice! ---->

Perdita, enlarged

Word Bank: Apples, beef, blueberries, cauliflower, cilantro, eggplant, eggs, peppers, squash, tomatoes.

Fun Facts About Bees in a Bee Word Game

Find a partner. Choose one person to be the "reporter" and one to be the "author." Without reading the story aloud, the reporter asks the author to think of a word for each prompt under the blank lines below. The reporter writes in the author's words. Then choose one person to read your very own funny story out loud! Or try and add in the facts for each blank line — you will find the answers throughout the book!

There are so many _____ (adjective) kinds of bees!  **Squash bees** are _____ (adjective)-sized bees and feed only on nectar and pollen from _____ (plural noun). The squash bee had never been seen in Oregon until the year _____ (number).

 **Mason bees** pollinate almonds, apples, _____ (plural noun) and more. They use mud and _____ (noun) to build their nests, which is where they get their name. One super _____ (adjective) bee is the  **green metallic sweat bee**! These bees pollinate the flowers on many _____ (adjective) plants and wildflowers. They also _____ (verb) the sweat of mammals. If you have alfalfa or _____ (adjective) plants you need pollinated, then  **leafcutter bees** are the bees for you! They _____ (verb) out small pieces of leaves and use them to build their _____ (plural noun).

 **Bumble bees** help us by choosing berries, apples, tomatoes and _____ (plural noun)! They are large and _____ (adjective) bees that are black, yellow, orange or _____ (color).  **Long-horned bees** are _____ (adjective) medium-sized bees that are very _____ (adjective). The males have long _____ (plural noun). Females have large, brush-like hairs on the back of their legs that they use to carry _____ (plural noun). They love sun _____ (plural noun). One world-wide pollinator of _____ (adjective) crops is the  **honey bee**! That's because honey bees pollinate _____ (adjective) different kinds of plants and are _____ (adjective) to manage. They make _____ (noun), which is where they get their _____ (noun). Not all bees are hardworking, upstanding pollinators!  **Cuckoo bees** _____ (verb) their pollen from other bees! When they are ready to reproduce, females wait for females of another species of bee to go search for pollen or_____ (plural noun). While she is gone, they _____ (verb) into the nest and lay their eggs next to the other bee's _____ (plural noun). When the **larvae** _____ (verb), they will destroy the other bee's offspring and eat up all the _____ (noun) left by the other bee.  **Alkali bees** nest in the _____ (place). They are very picky and love salty, moist, _____ (adjective) soil. The alkali bees of the Pacific Northwest are the only ground-_____ (verb ending in -ing) bees in the _____ (place) managed by _____ (a group of people).

Bees need bee _____ (plural adjective)!

Adjective: A word that describes a noun, such as its color, age or texture.
Noun: A word that is used to name a person, place or thing. **Verb:** A word that identifies an action or a state of being.

Seed-To-Food Life Cycle and More About Strawberries

Field Notes:

Since time immemorial, Native Indigenous Peoples have gathered wild strawberries and use the entire plant in different ways: to eat the berries fresh or dried; and using other parts of the plant for medicines like teas and salves. Wild strawberries also provide nutrition for birds, bees, butterflies, deer and other animals. Several species of bees visit strawberries and help pollinate them. Non-wild strawberries—meaning strawberries that are planted in gardens and on farms—have been grown as crops in Oregon since the first plants were brought from Iowa in 1847 by settlers. Oregon is now the third-highest strawberry-growing state in the United States. Strawberries also grow well in containers and in the ground in home, school and community gardens across Oregon!

Some pollinators of strawberries

1 Seed
Inside of a seed is a plant that has not yet grown.

Germination
As seeds take in nutrients (like water and oxygen) in a friendly environment with the right temperature, many start to sprout into seedlings.

2

3 Seedling
A seedling has small plant parts (stem, leaves and roots), and needs sunlight or lamp light to grow.

4 Plant
As the seedling takes in more nutrients in a friendly environment, it grows bigger and stronger and becomes a plant.

5 Flowers
Flowers bloom on the plant and are pollinated by bees, other animals, the wind or people.

6 Fruit
After pollination, fruit begins to grow.

7 Harvest
Fruit has seeds that can grow into new plants and the fruit can be harvested to eat and put in recipes like _____.

Some seeds make new plants!

A Closer Look
Although strawberries can self-pollinate with the help of wind, bees help spread the pollen around the flower, which makes a larger and juicier fruit. Here's how: If you look closely at a strawberry, you'll see tiny black seeds all over the surface. The more of them that get pollinated, the bigger the fruit.

Jocelyn is in the science fair building this seed-to-food life cycle to show how a seed in her garden turns into food with the help of bees! Lets help her finish her project:

1. Add more flowers to the plant in step 5.
2. Add bees that like to pollinate those flowers.
3. Label plant parts.
4. In step 7, add a favorite strawberry recipe name in the blank.

Plant Part Herbal Tea

What tea would you want to try?

_____

_____

_____

Green Metallic Sweat Bee and Clover

Since time immemorial, people have been making tea with plant parts. The plant parts of many herbs provide great food for bees like the sweat bee. Simple ways to enjoy fresh herbs are to make tea and plant a tea garden.

Ingredients

1 to 2 Tablespoons dried or 2 to 4 Tablespoons fresh **plant parts,** blended or single plant part (ideas below)

Boiling **water**

Directions

1. Wash hands with soap and water.
2. Rinse plant parts under running water.
3. Place plant parts in a teacup or mug.
4. Fill the cup with boiling water to cover the plant parts. Let steep (sit) for 10 minutes or longer for stronger flavor.
5. Cover the tea while it steeps, such as with a saucer or clean towel. This helps keep the plant oils in the tea.
6. Enjoy the tea warm or cold. Strain the plant parts from the water if desired.
7. Refrigerate leftovers within 2 hours.

Dried Nettle leaves

Makes 1 cup of tea

Prep time: 10 to 15 minutes

Herbal plant part tea ingredient ideas

- Leaves: anise, hyssop, basil, bee balm, cilantro, clover, dried nettle, lemon verbena, lavender, lemongrass, mint, parsley, rosemary, sage, stevia, thyme, yarrow
- Flowers: calendula, chamomile, clover, echinacea, fireweed, hibiscus, lavender, yarrow
- Seeds: cardamom, coriander, fennel (grind or chop first)
- Roots: calendula, chicory, dandelion, elecampane, fireweed, ginger (chopped), marshmallow
- Stems: yarrow

Although not herbs, roses (petals and hips) and berries (fruit and leaves) are also common plant parts used in tea.

Use only tea ingredients that you know are safe to consume.

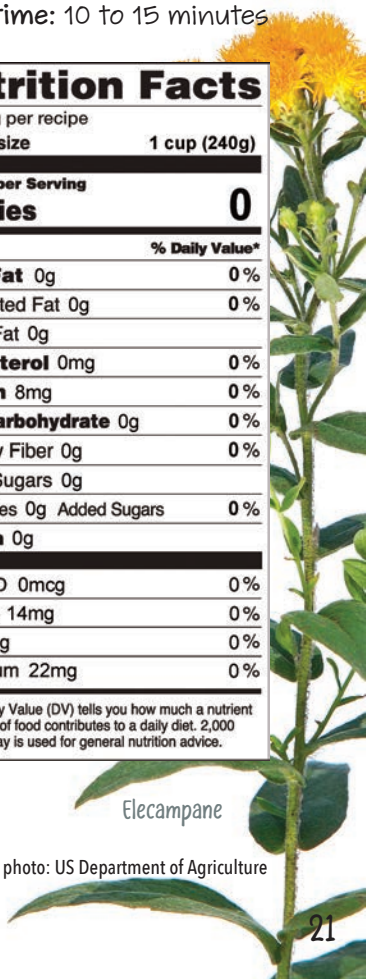
Herb bouquet

Nutrition Facts

1 serving per recipe

Serving size	1 cup (240g)
Amount per Serving	
Calories	**0**
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 8mg	0%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Total Sugars 0g	
Includes 0g Added Sugars	0%
Protein 0g	
Vitamin D 0mcg	0%
Calcium 14mg	0%
Iron 0mg	0%
Potassium 22mg	0%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.



Elecampane

Green metallic sweat bee photo: US Department of Agriculture

Solitary Bees

Solitary bees are bees that build their own nest and raise their own young. Most bees found in Oregon are solitary bees.

Mason, leafcutter, long-horned and alkali bees are some examples of solitary bees. After mating, a solitary female bee, all on her own, will build her nest, forage for pollen and nectar, and lay her eggs. The solitary female bees in the illustrations down below and on the top right are making their nests in three different places: **A** a tunnel in the ground, **B** an old tree stump and **C** a plant stem.

A closer look - solitary bee life cycle steps

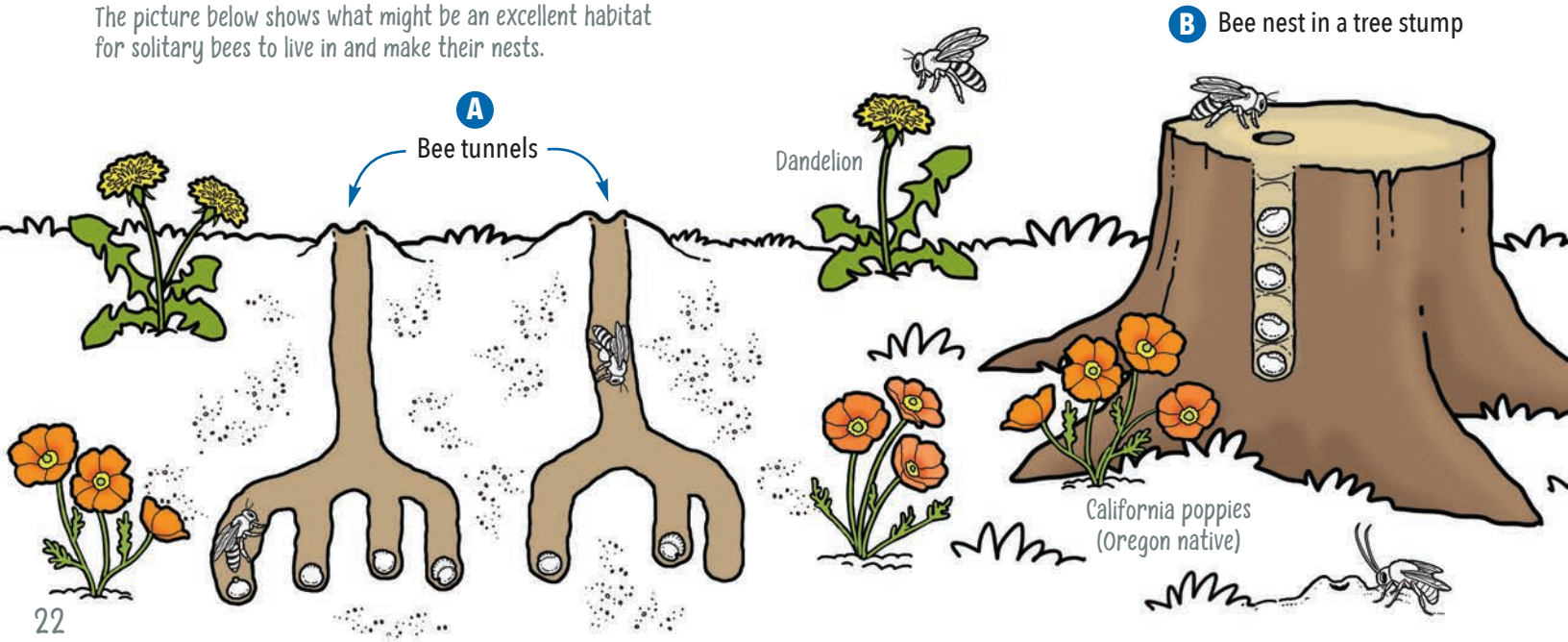
Bee **larva** (immature grub) in a leafcutter bee nest cell.

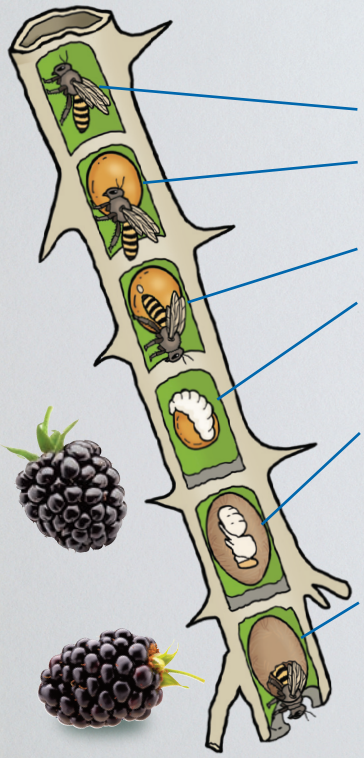
Mason bee emerging from a cocoon.

A wild female bee with nectar on her tongue that she will mix with pollen for her nest.

Common dandelions *(Taraxacum officinale)* Unlike the horned dandelion (Oregon native), the common dandelion is not indigenous to North America. In the 1600s, colonists brought common dandelion seeds with them from Europe, as they believed the plant could cure many illnesses. In time, some people came to view the common dandelion as a weed that crowds out native plant species. Other people, including Indigenous Peoples, still see it as a great source of food and medicine. Did you know that you can eat dandelions from flower to root? They are a healthy source of vitamins A and C. One cup of dandelion greens contains almost twice as much iron as spinach! Look for dandelion greens and teas at local stores. In the kitchen, you can use the greens in salads, soups, bread, pesto, smoothies and desserts. Dandelions can also be used to make oils, teas, jellies, salves and traditional medicines. Plus, honey bees (social not solitary) that pollinate dandelions make honey! Dandelions are a food source for many types of bees as they grow in so many places, and start blooming early in the spring before many other flowers and through the fall.

The picture below shows what might be an excellent habitat for solitary bees to live in and make their nests.





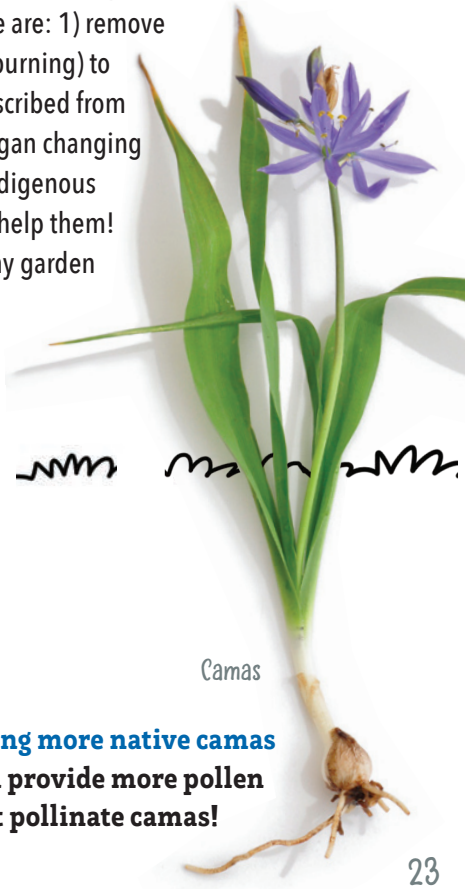
C Bee nest in a blackberry stem made from leaves cut by a leafcutter bee.

Steps in the Life Cycle of Solitary Bees

No matter where a solitary female bee nests, these steps happen:

1. The bee creates a chamber or cell where she can safely lay an egg.
2. In any chamber she creates, she mixes and stores a ball of pollen and nectar that will later feed her offspring.
3. She lays an egg on each ball, seals up the nest and then leaves.
4. When an egg hatches (its membrane dissolves), out comes a tiny larva (the first growth stage of a bee). The larvae feed on their pollen balls and grow bigger.
5. When the larvae have grown big enough, they undergo **metamorphosis** (a change in shape). The bee larvae slowly change from immature (not done growing yet) grubs to adult bees. Just like caterpillars, bee larvae spin silk cocoons before they go through this process.
6. The adult bees chew out of their cocoons and then cells and **emerge**. Males and females will then mate with bees from other nests. Mated females start new nests of their own.

Camas *(Camassia quamash)* a type of native lily flower in the asparagus family, have been a key part of ecosystems for thousands of years. Camas have been a special traditional food for many Indigenous people. Wild camas most often grow on **prairies**. Camas are a food source for many types of bees who in return pollinate camas flowers. This includes sweat bees, mason bees, European honey bees and bumble bees. Indigenous Peoples have long used traditional methods to protect Camas prairies. These are: 1) remove invasive plant species, 2) turn the soil to allow air in and 3) use traditional burning methods (cultural burning) to promote new plant growth. These methods work: camas fields used to be so widespread they were described from afar as "seas of blue." Colonization removed Indigenous Peoples from their homelands and people began changing the prairie lands for **agricultural** use. Now less than 1% of native prairies in Oregon remain. Today, Indigenous Peoples and others are working to restore camas habitats for people and bees into the future. You can help them! Camas can be grown in your yard or a community or school garden. You can find seeds or bulbs at many garden stores and native plant nurseries.



Color in the habitat while adding more native camas flowers and bees. The flowers will provide more pollen and nectar for the bee species that pollinate camas!

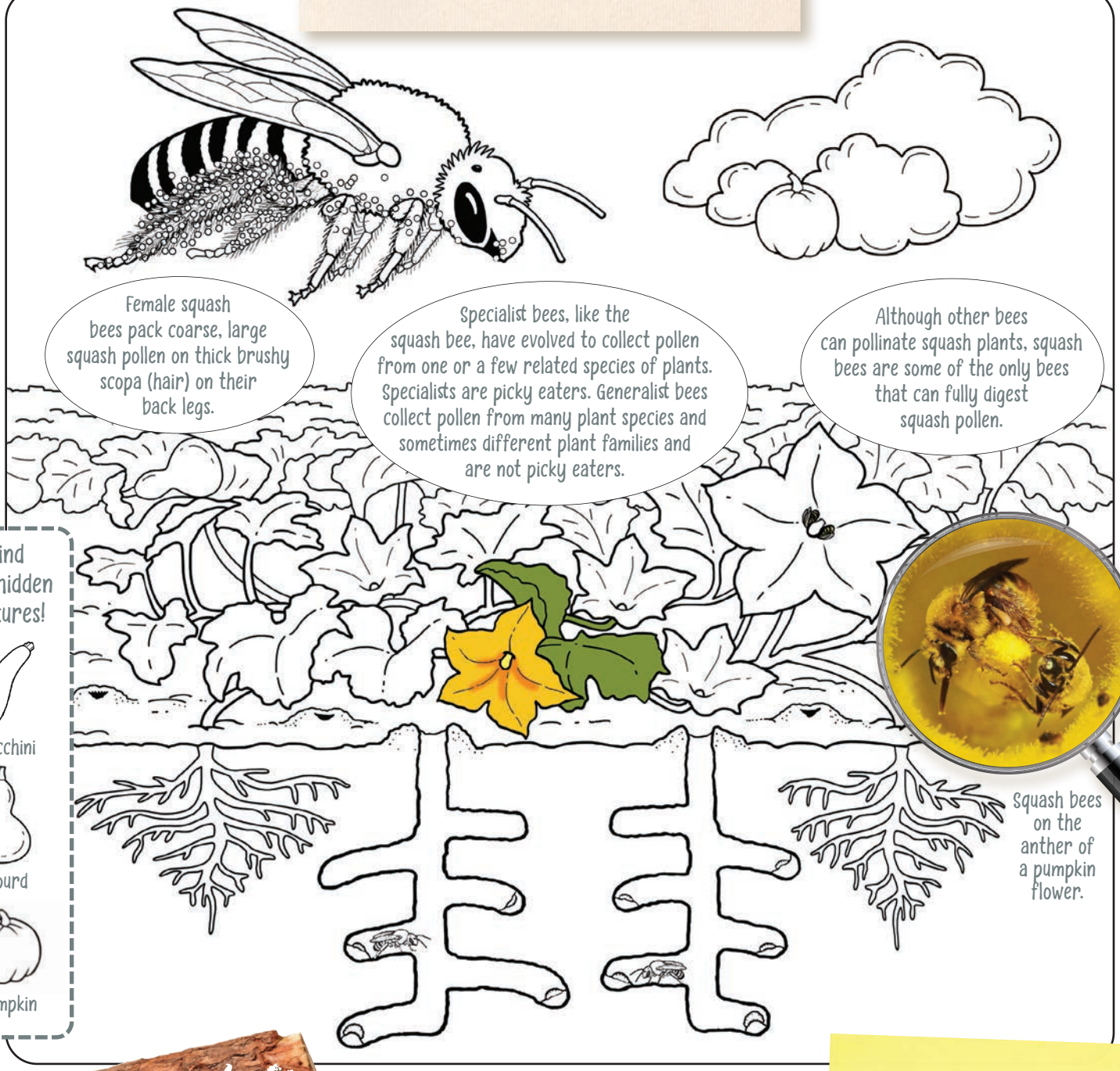
Solitary Bees

Squash Bees

Genus: *Peponapis*

(pronounced *pep-on-A-pis*)

Squash Bee
11 to 14 mm in length



Find the hidden pictures!


Zucchini


Gourd


Pumpkin

Field Notes:

Squash bees found in Oregon are medium-sized, fast and fuzzy bees that feed only on the pollen and nectar of plants in the squash family. They spend their whole lives around the plants they pollinate. Females nest in the ground beneath squash plants and males even sleep inside squash blossoms. In fact, the best way to find squash bees is by looking inside squash blossoms in the cool of the morning when the bees are still asleep. Squash bees are new to Oregon and are still making their way around. Can you find squash bees in your community?

Why do you think the squash bee prefers squash?

A trait of this bee is that it is **fuzzy**.

Name a **synonym** and **antonym** for **fuzzy**:

_____

Squash blossoms are edible! They can be enjoyed raw or cooked.

Squash Bee and Squash Flower

Three Sisters Soup

Which of the **ingredients** for this recipe would you most want to grow? Why?

_____

_____

_____

The Three Sisters—squash, corn and beans—thrive when planted together. Many traditional foods of Native Indigenous Peoples, past and present, need wild bees, like the squash bee, to grow. Some of these foods include the Three Sisters, blackberries, blueberries, camas, chokecherries, cranberries, dandelions, huckleberries, pumpkins, stinging nettle, sunflowers, tomatoes and many more.

Ingredients

Winter squash: Butternut

- 1 1/2 Tablespoons **vegetable oil** (or olive oil)
- 3/4 cup diced **carrot** (1 medium carrot)
- 1 cup chopped **onion** (1 medium onion)
- 1 teaspoon **garlic powder** or 4 cloves **garlic**, minced
- 2 cups diced **summer** or **winter squash** (fresh or frozen). Peel and remove seeds from winter squash before dicing
- 1 1/2 cups **corn** (fresh or frozen) or a 15-ounce can (drained and rinsed)
- 1 1/2 cups **cooked beans** (any type) or a 15-ounce can (drained and rinsed)
- 1 can (15 ounces) diced **tomatoes** or 2 cups diced fresh
- 3 1/2 cups low-sodium **broth** (any type)
- 1/4 teaspoon **pepper**

Summer squash: Zucchini and blossoms

Indigenous Peoples keep adding large amounts of knowledge to what we know about the plant world and how best to keep it healthy.

Directions

1. Wash hands with soap and water.
2. Heat oil in a large pan on medium heat. Add carrot and onion and sauté until onions have begun to turn slightly brown, about 8 to 10 minutes.
3. Add garlic, squash and corn. Stir for another 3 to 4 minutes.
4. Add beans, tomatoes, broth and pepper. Allow soup to come to a boil.
5. Turn heat down. Simmer until all vegetables are tender (15 to 30 minutes, depending on the vegetables used).
6. Refrigerate leftovers within 2 hours.

Makes 8 cups
Prep time: 15 minutes
Cook time: 30 minutes

Nutrition Facts

8 servings per recipe

Serving size	1 cup (297g)
Amount per Serving	
Calories	**170**
	% Daily Value*
Total Fat 4g	5%
Saturated Fat 0.5g	3%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 130mg	6%
Total Carbohydrate 28g	10%
Dietary Fiber 3g	11%
Total Sugars 7g	
Includes 0g Added Sugars	0%
Protein 8g	
Vitamin D 0mcg	0%
Calcium 50mg	4%
Iron 1mg	6%
Potassium 494mg	10%
Vitamin A 294mcg	33%
Vitamin C 16mg	18%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Recipe Math Challenge

Today two friends come to eat lunch at the food truck. Each friend orders a 2-cup bowl of Three Sisters Soup. How many milligrams (mg) altogether will the friends consume of:

Potassium _____ Vitamin C _____

Hint: use the Nutrition Facts label servings per recipe to help you solve the math!

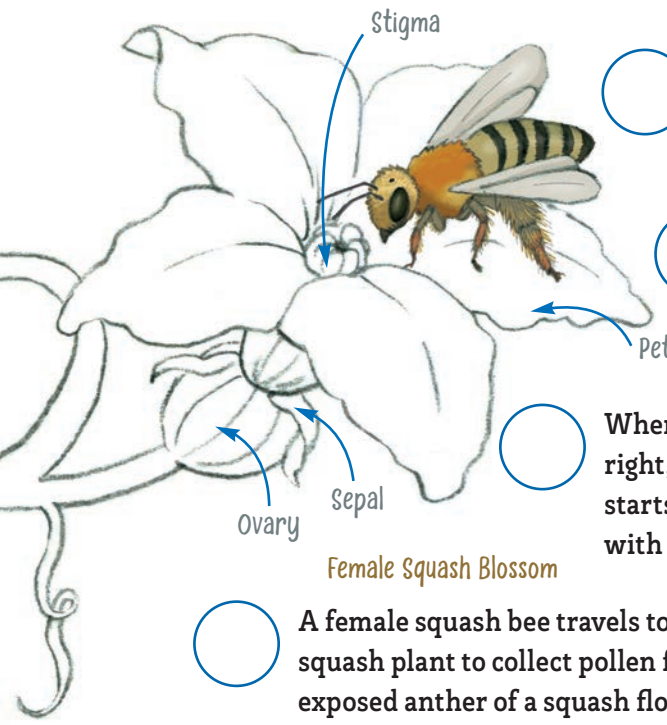
Bonus: Round your answers to the nearest 1000 mg (potassium) and 10 mg (Vitamin C).

Pollination in Action

The Pollination of a Squash Plant

Follow this ***species*** of squash bee, *Peponapis pruinosa*, as it pollinates a squash flower. **In the circles below, enter the numbers 1 through 6 to put the steps of pollination in order.** Step 1 has been filled in for you. When you've finished, color in the flower!

Pollen is produced on anthers and nectar is made at the base of the flower on floral nectaries.



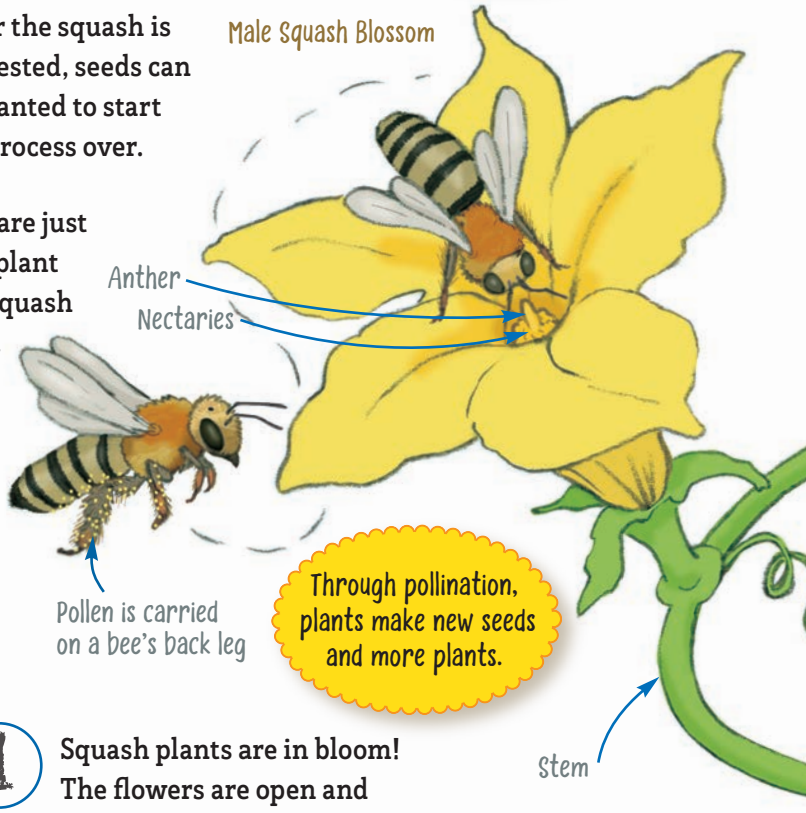
Pollen collected from the first flower falls on the stigma of the second flower.

After the squash is harvested, seeds can be planted to start the process over.

When conditions are just right, the squash plant starts growing a squash with seeds inside.

A female squash bee travels to a squash plant to collect pollen from an exposed anther of a squash flower.

The bee travels to another squash plant nearby. Female and male squash blossoms are needed for a squash plant to grow fruit.



1 Squash plants are in bloom! The flowers are open and the anthers are exposed.

Follow squash bees as they move into Oregon at:
https://beav.es/sbs

The Story of Squash and Squash Bees in Oregon

We would not have squash bees if not for squash plants and the Indigenous Peoples who formed a reciprocal relationship (taking care of each other) with the plants. This reciprocal relationship began over 10,000 years ago in Central America. As the people slowly **cultivated** the land to grow squash for food and for trade, they created a **migration** of squash to the north and the bees followed!

Squash was not originally part of the traditional diet of Indigenous Peoples of the Pacific Northwest. Only in recent years has enough squash been grown in the region to attract squash bees. In 2017, squash bees were first spotted in Oregon by kids in a garden in Ashland!

Three Sisters


Mason bee

Bees play a vital role in the existence and balance of all life on earth. -**Erin Angus, 7 Waters Canoe Family**

The border features Iroquois symbols for the seasons and friendship. This represents the friendly community relationships created by the three sisters agricultural method – among the plants, the changing seasons, pollinators and those who benefit from the harvest.

Three Sisters is a companion planting method—these plants grow better when planted together. The corn stalk creates a trellis for the beans vine. Meanwhile, pole beans bring in nitrogen (a key nutrient for plant growth) from the air. At the same time, the wide squash leaves keep the soil cool, moist and free of weeds. The Three Sisters way of planting, as well as the traditional Three Sisters Soup recipe, originated from Indigenous People. These included farmers from the ***Haudenosaunee*** Nation (pronounced hoe-dee-no-SHOW-nee), also known as the ***Iroquois*** Confederacy.

Label a pollinator (bee, wind or self-pollinated) likely to pollinate the featured plants. Find hints on pages 24 and 37:

Green beans _____ Pumpkin _____ Corn_____ Crookneck Squash_____

Answers: squash bee (pumpkin and crookneck), wind (corn) and self-pollinated (green beans). But in many cases more than one type of pollinator helps out!

The Mason

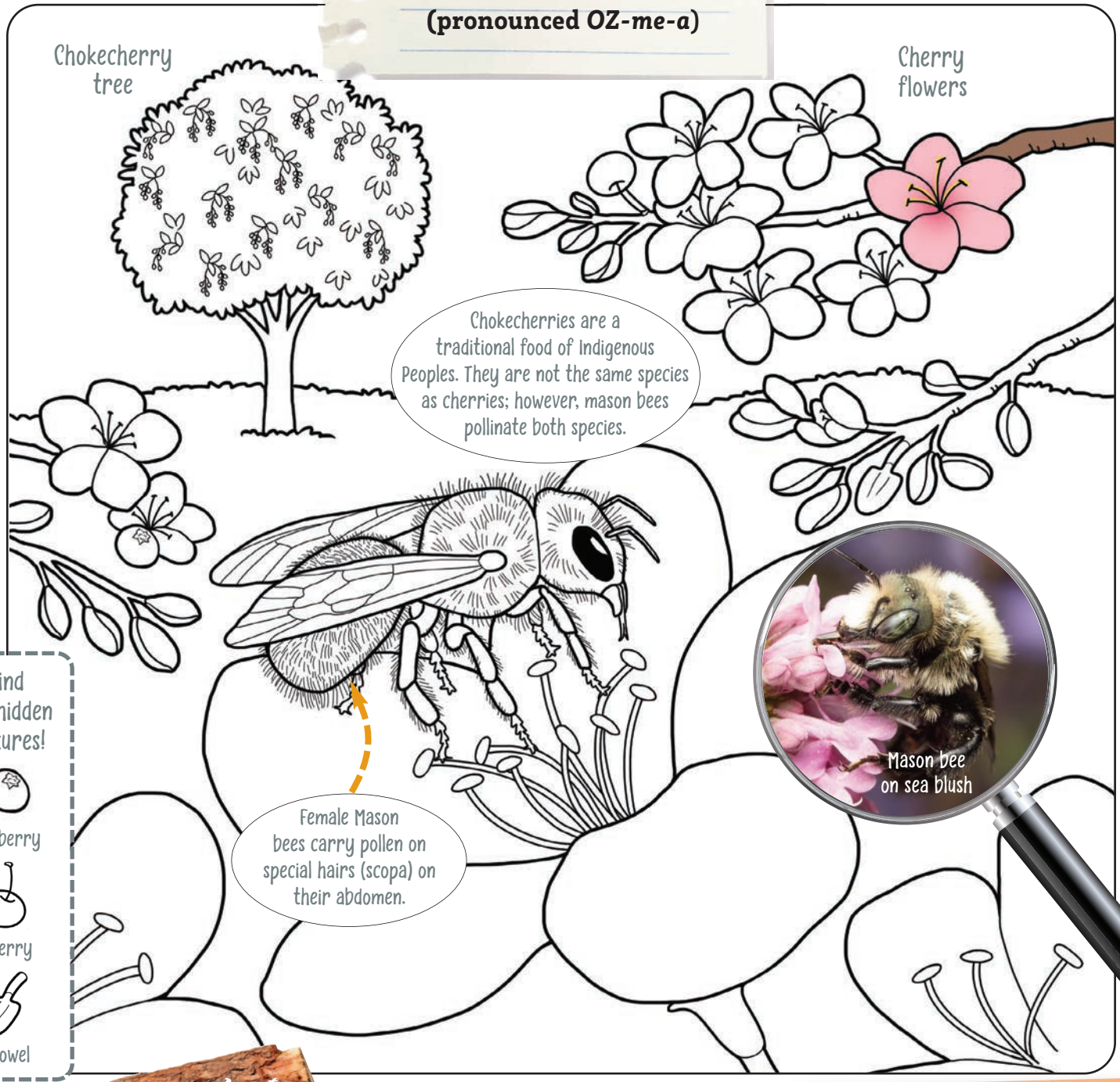
Solitary Bees

Mason Bees

Genus: Osmia

(pronounced OZ-*me*-*a*)

Mason Bee
6 to 12 mm in length



Find the hidden pictures!

Blueberry

Cherry

Trowel

Field Notes:

Mason bees are small to medium-sized bees that are colored in bright metallic blues and greens and sometimes black. In Oregon, they are most often used to pollinate cherries. Some mason bees are also pollinators of almonds, apples, blueberries, camas, chokecherries, raspberries and more. They are called mason bees because they use mud or clay to build their nests, just like a mason. A mason is a person who uses bricks and mortar to build homes and other buildings. Mason bees work quickly, in some habitats and ecosystems they can pollinate three times as many flowers as a honey bee in the same amount of time.

Does the mason bee remind you of another animal? A friend? Why?

A trait of this bee is that it is a **fast** pollinator.

Name a synonym and antonym for **fast:**

_____

Mason Bee and Cherry Flowers

Super Sundae

Do you think you could make this recipe without the help of bees? How?

_____

_____

_____

Cherries bloom in early spring when the weather can still be cold and frosty. Mason bees do some of their best work pollinating cherry trees while most other bees are still sleeping in their warm nests.

Ingredients

1 cup low-fat plain or flavored **yogurt**
2/3 cup chopped **peaches** (fresh, frozen, or canned and drained)
2/3 cup **cherries** (fresh or frozen)
2 Tablespoons **granola**

Directions

1. Wash hands with soap and water.
2. Divide yogurt between 2 clear glasses or dishes.
3. Spoon half of the fruit on top of the yogurt.
4. Sprinkle each sundae with granola.
5. Refrigerate leftovers within 2 hours.

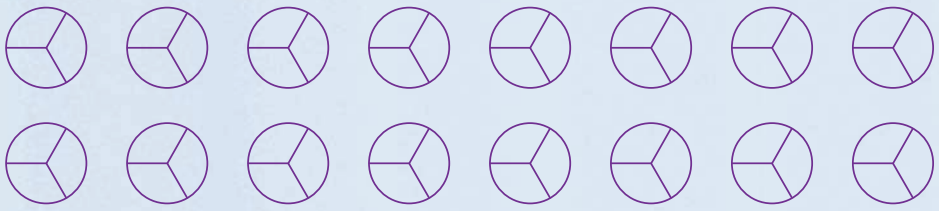
Make this recipe your own - Use any type of fruit, granola and yogurt. Sprinkle nuts, seeds or dry fruit on top!

Makes 2 cups
Prep time: 10 minutes

Recipe Math Challenge

Today the food truck is at the farmers' market. We did the math and found out we need 16 cups of fruit to make this recipe for our customers! We have 8 cups of cherries and 1⅓ cups of chopped peaches from our fruit trees. We decide to use frozen peaches for the missing peaches. How many cups of frozen peaches will we need to make this recipe?

Bonus: Check your work by using the fraction models below.



Nutrition Facts

2 servings per recipe

Serving size	1 cup (231g)
Amount per Serving	
Calories	**150**
	% Daily Value*
Total Fat 3g	4%
Saturated Fat 1.5g	8%
Trans Fat 0g	
Cholesterol 5mg	2%
Sodium 90mg	4%
Total Carbohydrate 24g	9%
Dietary Fiber 2g	7%
Total Sugars 18g	
Includes 1g Added Sugars	2%
Protein 8g	
Vitamin D 0mcg	0%
Calcium 231mg	20%
Iron 0mg	0%
Potassium 430mg	10%
Vitamin A 27mcg	3%
Vitamin C 6mg	6%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Solitary Bees

Long-Horned Bees

Genus: Melissodes

(pronounced *mel-eh-SOH-dees*)

Long-Horned Bee
9 to 15 mm in length

Sunflowers

Photo by Hilary Kearney

Find the hidden pictures!

Clarkia

Sunflower Seeds

Primrose

There are many native plants in the sunflower family including goldenrod, rabbitbrush and gumweed.

This is a male long-horned bee (you can tell because of the long antennae). Females have shorter antennae.

Field Notes:

Long-horned bees are beautiful medium-sized ground-nesting bees that are very fuzzy. They are dark with yellow, black or white hairs. Males have long antennae (horns) like the bee shown. Females have large, brush-like hairs (scopa) on their back legs that they use to carry pollen. Bees in the genus Melissodes like to visit plants in the sunflower family the most. Some species also visit the native plants primrose and clarkia. Planting sunflowers in your community, and watching the blooms, is the best way to find these bees in Oregon.

Which animal do you think could *cohabitate* with (live in a habitat with) a long-horned bee? Why?

A trait of this bee is that they are **beautiful**.

Name a synonym and antonym for **beautiful**:

_____

Cranberry Oatmeal Balls

Long-Horned Bee and a Sunflower

What is your favorite ingredient in this recipe? Why?

_____

_____

_____

Long-horned bees visit different species of sunflowers. You can choose different ingredients to use in this no-bake treat! Think about the hard work of pollinator teams as you enjoy this super flexible treat!

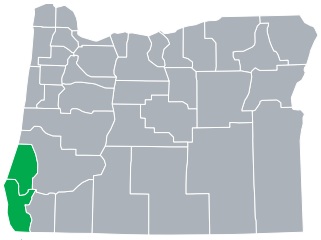
Ingredients

1 cup **oats** (quick-cooking or old fashioned rolled)
1/3 cup dried **cranberries** or other dried fruit
1/3 cup **sunflower seeds** or other seeds or nuts
1/3 cup **peanut butter** or sunflower seed butter
3 Tablespoons **honey**. (Honey is not recommended for children under 1 year old.)

Directions

1. Wash hands with soap and water.
2. In a medium bowl, add all ingredients.
3. Stir until well mixed.
4. Form about 2 Tablespoons of mixture into a ball and place on a plate. Repeat with the rest of the mixture.
5. Refrigerate for 30 minutes and until ready to eat.

❁ Use any combo of fruit, nuts or seeds!



Coos and Curry counties

Honey bees and bumblebees are top pollinators of cranberries along Oregon's southern coast.

Makes 16 balls
Prep time: 15 minutes
Chill time: 30 minutes

Nutrition Facts

8 servings per recipe

Serving size	2 balls (43g)
Amount per Serving	
Calories	**180**
	% Daily Value*
Total Fat 7g	9%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 65mg	3%
Total Carbohydrate 24g	9%
Dietary Fiber 3g	11%
Total Sugars 12g	
Includes 6g Added Sugars	12%
Protein 6g	
Vitamin D 0mcg	0%
Calcium 23mg	2%
Iron 1mg	6%
Potassium 84mg	2%
Vitamin A 0mcg	0%
Vitamin C 0mg	0%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Recipe Math Challenge

If the recipe were to be doubled, how much of each ingredient would you need?

❁ Oats_____

❁ Honey_____

❁ Sunflower seeds, peanut butter or cranberries

_____

Bonus: If you want to make 208 cranberry oatmeal balls, how much of each ingredient would you need?

The Salty Dog

Solitary Bees

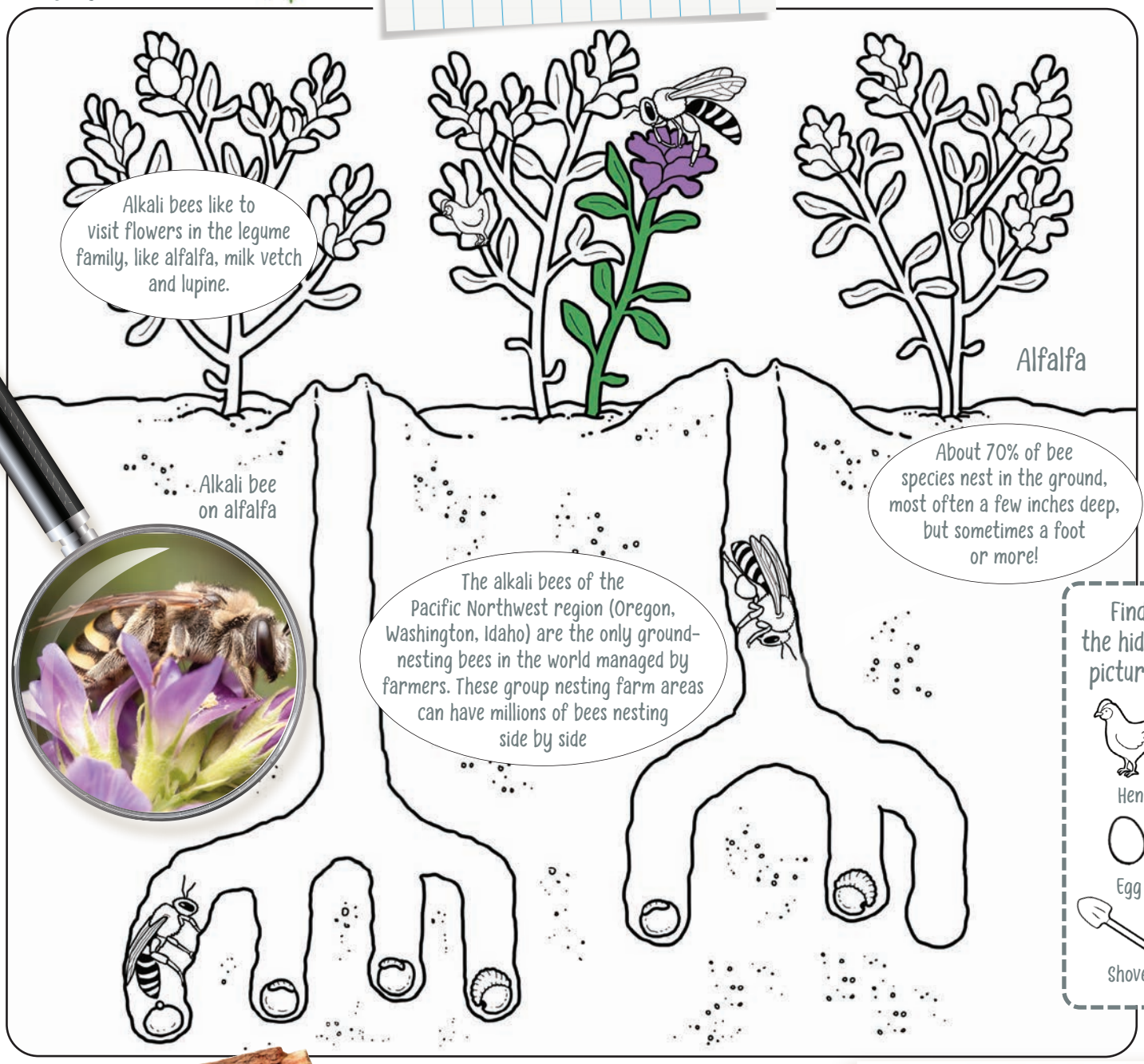
Alkali Bees

Genus: Nomia

(pronounced *NO-mi-a*)

Alkali Bee
12 to 13 mm in length

Photo courtesy of Washington Native Bee Society



Find the hidden pictures!

Hen

Egg

Shovel

Field Notes:

Alkali bees, like leafcutter bees, pollinate alfalfa flowers to make alfalfa seed. From the seed, farmers grow hay to feed many different types of animals. Even chickens like alfalfa hay! Alkali bees nest in the ground and are very picky; in the wild they love salty, moist and crumbly soil. Some farmers have figured out how to create this environment in the soil on their farms. At these sites, thousands of females build nests side-by-side, packing their nests with alfalfa pollen. After the females lay an egg, the hungry alkali bee larvae consume the pollen and complete their life cycle to adult bees underground.

What specific physical trait(s) make alkali bees unique?

A trait of this bee is that it makes its nest in the **ground.**

Name a synonym and antonym for **ground:**

_____

Baked Cauliflower Tots

Look up what "Alkali" means in the dictionary. What is the definition? What part of language is it?

_____

_____

_____

_____

Alkali Bee

People throughout Oregon and beyond keep chickens for the eggs they lay. If the chickens are fed alfalfa there is a good chance they have alkali bees to thank! Alfalfa is the only crop alkali bees pollinate. Can you believe female alkali bees can pollinate up to 4 alfalfa flowers per minute (that's 2,000 flowers per 8-hour day of flying)!

Ingredients

2 cups grated or finely chopped **cauliflower** (about half a medium head)
1 **egg**
3 Tablespoons **flour**
1/4 cup grated **cheddar cheese**
1/4 teaspoon **salt**

An alkali bee popping its head out of its ground nest.

Makes 15 tots
Prep time: 10 minutes
Cook time: 20 minutes

Directions

1. Wash hands with soap and water.
2. Preheat oven to 400 degrees F.
3. Lightly grease a baking sheet.
4. In a medium bowl, combine all ingredients and mix well.
5. Press mixture together to make about 15 tots. Place tots on the baking sheet with space between each one.
6. Bake for 20 minutes or until cooked through. For extra crispy tots, broil for an extra 2 minutes. Watch closely to avoid burning. Tots taste great eaten right away and with or without a dipping sauce like salsa or herbed yogurt.
7. Refrigerate leftovers within 2 hours.

Freezing tip: tots can be frozen in an airtight container before or after they are cooked and then cooked from frozen or reheated.

Alfalfa

Nutrition Facts

3 servings per recipe

Serving size	5 tots (110g)
Amount per Serving	
Calories	**70**
	% Daily Value*
Total Fat 2.5g	3%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 40mg	13%
Sodium 200mg	9%
Total Carbohydrate 9g	3%
Dietary Fiber 2g	7%
Total Sugars 2g	
Includes 0g Added Sugars	0%
Protein 5g	
Vitamin D 0mcg	0%
Calcium 67mg	6%
Iron 1mg	6%
Potassium 296mg	6%
Vitamin A 30mcg	3%
Vitamin C 43mg	48%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Recipe Math Challenge

How many total cups of cauliflower, cheese, and flour would be used if the recipe was quadrupled? **Hint:** 4 Tablespoons equals 1/4 cup.

Bonus: How many tots would the quadrupled recipe make?

Scissor Head

Swiss cheese

Solitary Bees

Leafcutter Bees

Genus: Megachile

(pronounced *me-ga-KY-lee*)

Leafcutter Bee
6 to 22 mm in length

Alfalfa flowers

Oregon has many species of leafcutting bees. They go to a wide range of wild plants mostly in the sunflower and bean families.

A leafcutter bee cutting leaves for a nest

Photo by Aiden Hersh

Leafcutter bees and mason bees belong to a family of bees called Megachilidae (meg-a-KILL-ih-dee), meaning "large jaw," referring to their large mandibles that act like teeth.

They are called leafcutter bees because they cut out small pieces of leaves to use to build their nests.

Find the hidden pictures!

Milk

Scissors

Hamburger

Field Notes:

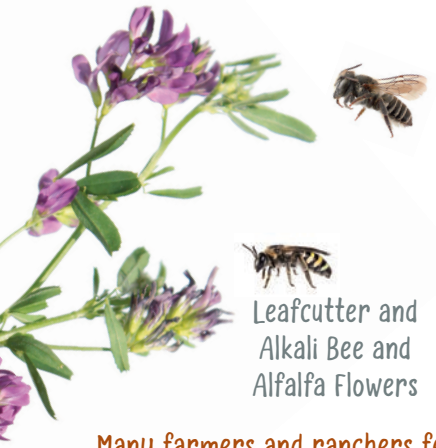
Leafcutter bees are pollinators of alfalfa and many wild plants. Leafcutter bees are darkly colored, small to medium-sized bees. In Oregon, they are important pollinators of alfalfa grown for seed. Farmers buy the seed to grow alfalfa plants, which are fed to cows, chickens, sheep and other **livestock** (animals raised on a farm) that give us milk, cheese, yogurt, eggs, meat and more.

Name at least one trait of the leafcutter bee that differs from a trait of a bee on another page. Name at least one trait that is the same.

A trait of this bee is that it can cut leaves for its nest.

Name a synonym and antonym for cut:

_____



Leafcutter and Alkali Bee and Alfalfa Flowers

Stuffed Potatoes

If you could substitute one ingredient in this recipe, what would it be? Why?

Many farmers and ranchers feed their livestock alfalfa hay. Alfalfa is a legume loaded with loaded with nutrients like protein, vitamins and minerals that help the animals produce high-quality meat and dairy products. Oregon leafcutter and alkali bees help produce the alfalfa seed to grow the hay that these farms animals eat.

Ingredients

2 medium **potatoes** or sweet potatoes

3/4 cup **salsa**

1 cup **broccoli** (frozen or fresh)

1 cup **cooked beef** or pinto or black beans (cooked or canned, drained and rinsed), or a mixture

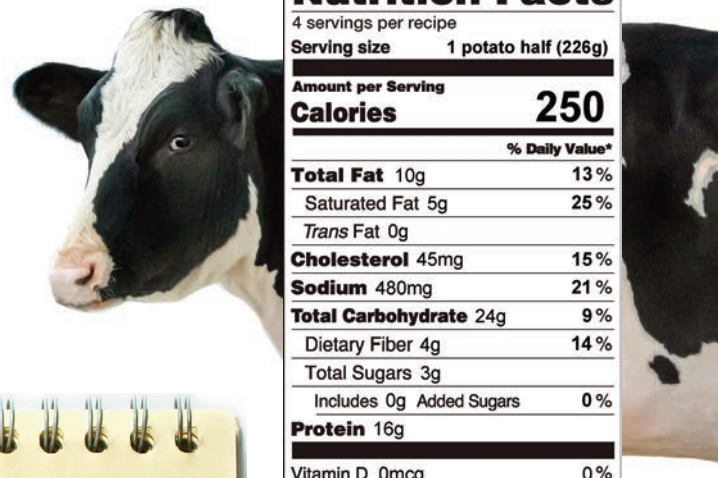
1/2 cup shredded **cheese** (try cheddar, feta or pepper jack)

Directions

1. Wash hands with soap and water.
2. Scrub potatoes well. Poke each potato with a fork 2 or 3 times.
3. Microwave on HIGH for 5 minutes. Turn potatoes over, and microwave another 3 to 5 minutes, or until easily pierced with a fork. Set aside.
4. In a microwave safe bowl combine salsa, broccoli and beef and/or beans. Microwave for 2 to 3 minutes, stopping once or twice to stir, until heated through.
5. Cut potatoes in half length-wise and fluff with a fork.
6. Divide salsa mixture between the halves.
7. Sprinkle halves with cheese and serve warm. Refrigerate leftovers within 2 hours.

A fun way to serve this recipe is with a toppings bar!
Topping ideas that bees help make: low-fat plain yogurt or sour cream, pesto, hot sauce or hot honey, avocado, chili, chopped green onions, chives, cilantro, or other herb.

Makes 4 potato halves
Prep time: 5 minutes
Cook time: 10 minutes



Nutrition Facts

4 servings per recipe

Serving size	1 potato half (226g)
Amount per Serving	
Calories	**250**
	% Daily Value*
Total Fat 10g	13%
Saturated Fat 5g	25%
Trans Fat 0g	
Cholesterol 45mg	15%
Sodium 480mg	21%
Total Carbohydrate 24g	9%
Dietary Fiber 4g	14%
Total Sugars 3g	
Includes 0g Added Sugars	0%
Protein 16g	
Vitamin D 0mcg	0%
Calcium 131mg	10%
Iron 2mg	10%
Potassium 667mg	15%
Vitamin A 67mcg	7%
Vitamin C 41mg	45%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Recipe Math Challenge

The food truck sells an average of 56 stuffed potato plates every day, seven days a week. One plate contains two halves of a potato. How many stuffed potato plates will you sell in the month of July which always has 31 days?

Bonus: How many cups of cheese do you need to buy to make 56 stuffed potato plates?

Leafcutter Bee Photo:
New Zealand Arthropod Collection

Sly

Cuckoos steal their pollen instead of foraging for it.

Leafcutter Cuckoo Bee

Solitary Bees

Cuckoo Bees

Genus: Various

Bees from different genera have cuckoos. Cuckoo describes a bee behavior trait and not a physical trait.

Long-horned Cuckoo Bee

8 to 10 mm in length

Not all bees are pollinators or help make food. Cuckoo bees are **kleptoparasites.** Klepto means "to steal" and a parasite is a living creature that feeds off another living creature.

Over 13% of all bee species have a cuckoo "lifestyle", like this Nomada cuckoo. Cuckoos in the genus nomada are easy to spot.

Cuckoo bees have evolved over time without any pollen-carrying structure. Since they steal their pollen, they don't need to carry it on their body.

Cuckoo bees are part of the long history of the evolution of bees. Many cuckoos are closely related to the bees they target. This suggests that the cuckoo pattern developed many times in the history of bees. Can you think why a bee might evolve into a cuckoo? Why don't all bees become cuckoos?

Find the hidden pictures!

Armor

Thief Mask

Cuckoo Bird

Field Notes:

Cuckoo bees don't forage for pollen. They have found a way to steal it. When a Nomada female reproduces (has babies), she looks for a nest that is being built by a specific species of host bee. Once she finds a nest, she waits for the female bee who made it to go forage. Then she sneaks inside and quickly lays her own eggs, right next to some of the other bee's eggs. In case she confronts another bee, cuckoos exoskeletons which all insects have are boosted (reinforced) for defense. Each of her eggs will hatch into a larva (the early stage of a bee that looks like a caterpillar), destroy the offspring of the other female and eat pollen left by the female who made the nest. Cuckoo bees got their name from cuckoo birds, which lay their eggs in other birds' nests.

What specific behavioral trait(s) make Cuckoo bees unique?

Epeolus Cuckoo Bee

A trait of these bees is that they are **sneaky.** Name a synonym and antonym for **sneaky:**

_____

Cuckoo bee

Savory or Sweet Skillet Granola

What seasoning would you choose for this recipe? Why?

_____

_____

_____

_____

Animals, plants and habitats have many unique features! Cuckoo bees, unlike all the other bees featured in this book, do not pollinate plants. What's more, not all plants need pollinators. Some plants can self-pollinate or are wind pollinated like the oats in this granola recipe plus barley, corn, grapes, green beans, hazelnuts, snap and snow peas, walnuts and wheat.

Ingredients

1/3 cup **vegetable oil** or **butter**

3 Tablespoons **honey**, brown sugar or maple syrup

4 cups **old fashioned rolled oats** or **quick oats**

1/2 cup **sunflower seeds** or other seeds or nuts

1 cup **raisins** or other dried fruit

2 Tablespoons (or to your taste) **seasoning** savory or sweet, such as cinnamon, vanilla, chili powder, ginger or a mixture. If using salt, add up to 1 teaspoon.

Directions

1. Wash hands with soap and water.
2. Warm oil and honey in a skillet for one minute over (300 degrees F in an electric skillet).
3. Stir in oats and seeds. Mix until coated with honey mixture.
4. Heat over medium heat, stirring, until oats are slightly brown.
5. Take off heat. Stir in raisins and seasoning.
6. Cool mixture. Store in an airtight container.

Bees help make seasoning like chili powder, ginger root and cinnamon.

Makes 5 cups
Prep time: 10 minutes
Cook time: 10 minutes

Nutrition Facts

15 servings per recipe

Serving size	1/3 cup (50g)
Amount per Serving	
Calories	**220**
	% Daily Value*
Total Fat 9g	12%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 31g	11%
Dietary Fiber 4g	14%
Total Sugars 10g	
Includes 3g Added Sugars	6%
Protein 4g	
Vitamin D 0mcg	0%
Calcium 18mg	2%
Iron 1mg	6%
Potassium 205mg	4%
Vitamin A 0mcg	0%
Vitamin C 0mg	0%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Recipe Math Challenge

The food truck is catering a huge event at Oregon State University. We need to prep for 4,000 servings, 1/3 cup each of skillet granola. How much of each ingredient will be needed?

- Vegetable oil _____
- Vanilla _____
- Raisins _____
- Honey _____
- Rolled oats _____
- Powdered milk _____
- Sunflower seeds _____

Bonus: If all 4,000 servings get eaten, how many grams of protein, total sugars, total carbohydrates and cholesterol will be consumed?

Chef Lynette's Any Season Recipes

Chef Lynette Pflueger is inspired by the harvest of the seasons on the homelands of the Spokane Tribe of Indians, her ancestors, where she resides. She invites you to get creative with this recipe. Connect with your local bees by using fresh, local ingredients they have worked hard to pollinate.

Mason bees can help pollinate many ingredients in this recipe: onions, apples, tomatoes, roses and jalapeno peppers

Any Season Fresh Stewed Vegetables

Fresh vegetables release their own liquid while cooking which turns into a flavor-packed gravy.

Ingredients:

2 Tablespoons oil (olive, vegetable, avocado or coconut oil or butter or ghee)

1 onion, diced, or garlic, ginger, leeks or shallots

2 green apples, diced (or any type)

1 red or green tomato, diced

1 zucchini, diced (or any summer squash like yellow crookneck, patty pan, or white scallop)

¼ to ½ of a Jalapeño pepper, de-seeded and minced (or other chili pepper, ¼ teaspoon chili powder or use ½ bell pepper for a mild dish)

2T cornstarch or arrowroot powder or ¼ to ½ cup rose hip powder

Salt and pepper to taste

Directions:

1. Wash hands with soap and water. Gather ingredients and cooking tools.
2. Heat oil in a large pot over medium heat. When oil is shiny, add onion and cook until softened and starting to turn brown, 4 to 5 minutes.
3. Add apples and tomatoes and cook until slightly softened.
4. Add the zucchini and peppers. Stir for 3 to 4 minutes.
5. Sprinkle rosehip powder over mixture, cook, and stir often, to thicken.
6. Season with salt and pepper to taste.

Make it a meal: serve over pasta, rice, couscous, baked potato or other grain and top with granola and plain or spiced yogurt with fresh or dried herbs.

Chef's Favorite Way

"This dish is one of my favorite recipes to cook and share with others. The ingredient options are endless. Choose the ingredients based on what ingredients you have on hand, what vegetables are fresh, or what flavors you are craving. I love to make a tart by spreading plain yogurt or goat cheese over a puff pastry crust, adding stewed vegetables on top and baking at 400° F until the crust is browned. Top with Savory Granola made with the Forest Seasoning Blend."

Forest Seasoning Blend

Mix ingredients well and store in an airtight container.

¼ cup brown sugar

1 t salt

1 T male alder catkins, roasted and ground) optional

1 ½ t citrus zest (or try fir tips (any type), dried and ground)

1 T cocoa powder

½ t paprika

¼ t garlic powder

¼ t ground cumin

⅛ t cayenne or chili powder

Fir tips are wind-pollinated

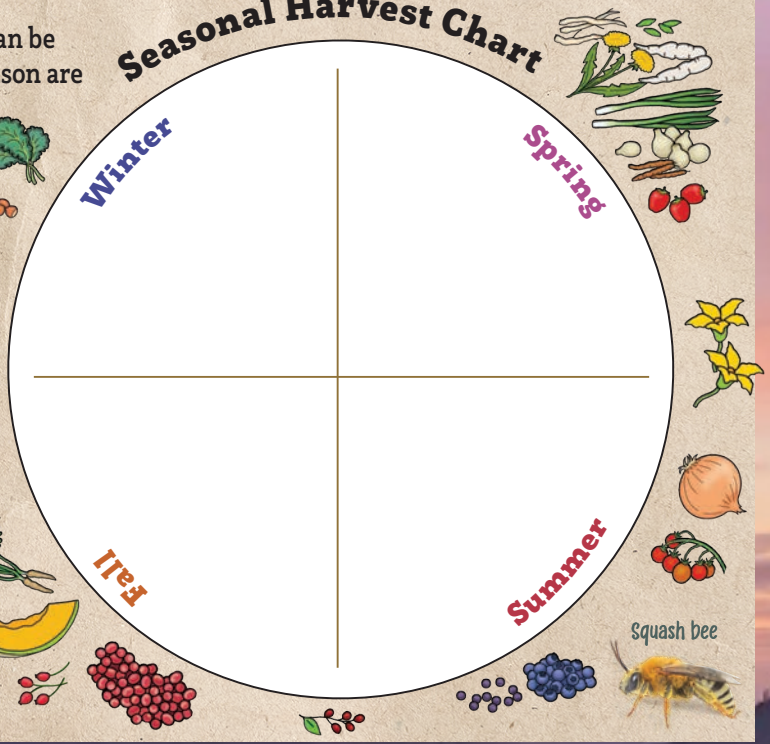
Male Alder Catkins, wind-pollinated and early bees forage for pollen on them

Seasonal Rounds

A yearly complex cycle Indigenous Peoples continue to use, for thousands of years, to know when and where to gather, fish and hunt for food with respect to the land and others. In partnership, bees pollinate flowers from plants we eat that are in bloom season to season.

Osmia Montana

Examples of what can be harvested season to season are shown around the chart. In the chart, list foods you enjoy eating each season.



A closer look - In late spring and early summer male spring long-horn bees and large black sunflower specializing mason bees (Osmia Montana) can be found foraging on arrowleaf balsamroot. Osmia Montana bees make their nest cell plugs with masticated (chewed up) leaf material instead of mud. Mud is hard to find in the sandy soils of the Gorge and eastern Oregon.

Honey bee

Squash bee

One of the many waterways of the Pacific Northwest alongside arrowleaf balsamroot (Oregon Sunflowers). Every part of balsamroot is used for food or medicine and has been for thousands of years by native/Indigenous Peoples.

More Stewed Vegetable and Granola Seasonal Ingredient Ideas from Chef Lynette

Fall Squash and Orchard Fruits

- **Granola:** coconut oil, maple syrup, oats, pumpkin seeds, ½ cup walnuts, ½ cup dried apples or apricots (add dried fruit after granola has cooled), pumpkin spice.
- **Stewed Vegetables:** butter, leeks, apples, roasted pumpkin, sage and rose hip powder.

Early Spring Harvest

- **Granola:** butter, agave syrup, oats, almonds, breadcrumbs, fennel seeds.
- **Stewed Vegetables:** butter, shallots, garlic, asparagus, fennel, herbs de Provence.

Winter Warming Curry Inspired

- **Granola:** coconut oil, honey, oats, sesame seeds, peanuts, dried ginger (add after granola has cooled), curry powder or garam masala
- **Stewed Vegetables:** sesame oil, carrots, potatoes, bell peppers, jalapeño, ginger, curry powder or garam masala
- **Pro tip:** add a layer of seasoned yogurt (salt, lime zest and juice)

Rose hips are the fruit of the rose that can be used in recipes in many ways.

Bumble bee

Select a season to cook Stewed Vegetables in. List an ingredient you would choose and why.

Season: _____ Ingredient idea: _____

_____

Social Bees

Social bees are bees that live together as a family.
They share the work of building a nest, foraging for food and caring for young. Honey bees and bumble bees are examples of social bees.

What do superheroes have in common? They all have superpowers! 10
Can you guess what honey bees' superpower is? 18

When Jocelyn came into the lunchroom and spied her brother, Josh, 29
reading a book, she asked him what he was reading. 39

"It's my favorite superhero's new comic book," he answered. "I love it 51
when he teams up with other superheroes to help people!" 61

"You know," Jocelyn said, "social bees are kind of like superheroes. They 73
work together on jobs like foraging for food, caring for their young and 86
building their nests." 89

A brand new bee emerging from her cell.

"You mean bees have nests—like birds?" Josh asked. 98

Jocelyn shook her head. "Not exactly. The nest of social bees like honey bees is called a 115
hive. Honey bees fill their hive with honeycomb. It's made of wax with little cells shaped 131
like hexagons. In the wild, bees make their own hives, but people make hives for bees, too." 148

Josh frowned. "Why would people do that?" 155

"So they can harvest the honey, the wax or even the honeycomb and the bees can pollinate 172
their crops or gardens." 176

"Where does the honey come from?" 182

"First," Jocelyn explained, "the older worker bees collect nectar from flowers. They swallow 195
the nectar, fly back to the hive, and spit it up into the mouth of a younger worker bee. That's 215
called **trophallaxis** (tro-ful-AK-sis)." 218

"EWWWW!" Josh responded. "That's disgusting!" 223

"No kidding!" Jocelyn said. "But that's not all! The younger bee swallows the nectar, then 238
travels to an open section of honeycomb and spits it out again. Bees' spit has chemicals called 255
enzymes. As the nectar sits in the honeycomb, the enzymes make its sugars easier to digest." 271

Josh was impressed. "How do you know all this?" 280

Jocelyn giggled. "By BEE-ing an excellent listener in Mrs. Moran's class! But there's more. 294
Other bees take turns fanning the nectar with their wings. This makes the water in the nectar 311
evaporate—it dries up and changes to gas. The nectar gets stickier and sweeter and, in a few 329
days, it turns into honey! And if the honey doesn't get wet, it stays good to eat for a long time. 350
That's why worker bees cover the honey in the honeycombs with wax." 362

"What do you mean?" Josh asked. 368

"The wax keeps water out of the honey. Bees eat their stored honey when it's too cold to go 387
outside. It helps them survive the winter. They may also come out of their hive to look for food 406
any day with the temperature above 55° F, even in December! 416

"Wow!" Josh exclaimed. "Bees really are superheroes. Even if they don't have capes!" 429

"Honey bees don't fight crime," Jocelyn said. "But now you know why they're superheroes! 443
They make honey and help plants make our food!" 452

A honey bee forages on early blooming winter heath after a snowfall

Fluency Tracker

Day 1_____, Day 2_____, Day 3_____, Day 4_____, Day 5_____

Honey bees making honey and more!

1 During the spring and summer, older worker bees leave the hive to search for flowers.

Bees fly up to 5 miles away from the hive

2 By visiting these flowers they also pollinate them. Many of these pollinated flowers become the food we eat!

3 These worker bees swallow nectar from up to 100 flowers per flight! They store it in their honey stomach. Once full of nectar and pollen, they fly back to the hive.

4 They pass the nectar from their stomach to a younger worker bee who swallows it into their stomach. The younger worker bee takes it and spits it into an open honeycomb cell.

Honeycomb with six-sided (hexagon) cells

5 Younger worker bees fan the nectar, so water evaporates. The **dehydrated** nectar gets thicker and sweeter and begins turning to honey.

6 They cap the honey with wax to keep it from spoiling (going bad) so that they can eat it throughout the winter.

7 Honey can be harvested for people to eat. Beekeepers leave some honey in the hive for the bees, too!

Bees have to visit about 2.6 million flowers to make a pound of honey!

Fun Fact! The type of flower the nectar comes from affects the color, flavor, texture and smell of the honey! Wildflower honey, the most common honey, is from nectar from a mix of flowers.

Carrot, Pumpkin, Meadowfoam, Blueberry, Blackberry, Sage

Honey bees live in hives.

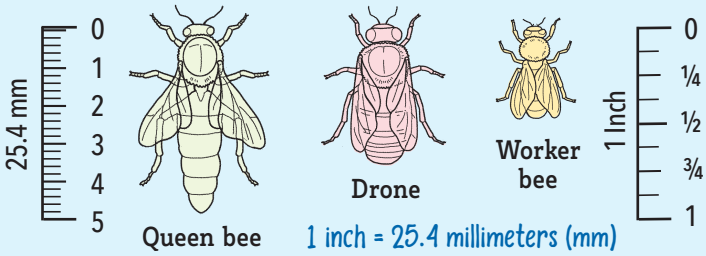
A hive can be made by people, or it can be made by bees in the wild. Inside, bees make honeycomb cells, where they raise their young and store honey and pollen.

Only honey bees make honey and wax.

Beekeeper Hilary Kearney took many photos in this field guide!

Who is in the hive?

Honey bee hives have caste systems (fixed roles bees are born into) made up of a queen bee, drones and worker bees. These bees play different roles in the hive. Each relies on the others to keep the hive healthy.



1 inch = 25.4 millimeters (mm)

- ***Queen bee*** (about 1 inch long): The queen is the mother of all the bees in the hive. Her job is to lay eggs to make more bees. Most queen bees leave the hive only once in their life, when it's time to mate. Queens can live several years.
- ***Drones*** (about ¾ inch long): Male honey bees are called drones. They are produced in the summer and their job is to mate with queens from other hives. They do not have a stinger, don't work or gather food and are fed by worker bees.
- ***Worker bees*** (about ½ inch long): Worker bees are all female and have different jobs depending on their age. When they are young, they start off cleaning the hive and then caring for and feeding young larvae. In their last stage of life, they become foragers, bringing in nectar and pollen to feed the bees in the hive. They send messages to each other (communicate) using a round dance (circular dance pattern) for flowers closer to the nest and waggle dance (figure-eight dance pattern) when flowers are further afar.

Honey bee on Meadowfoam, an Oregon native

Waggle Dancer

Social Bees

Honey Bees

Genus: Apis

(pronounced A-pis)

Honey Bee
12 to 15 mm in length

The average honey-bee hive contains around 25,000 bees.

Photo by Hilary Kearney

A honey bee gathers nectar (forages)

Find the hidden pictures!

Carrot Seed Packet

Carrot

Honey Pot

Honey bees use their legs to move flower parts, push pollen around their body, clean their head and antennae with windshield wiper like movements and pass pollen from their pollen baskets to other workers in the hive.

Carrot flowers

Did you know that one honey-bee hive can produce up to 80 pounds of honey a year?

Field Notes:

Honey bees are top pollinators of agricultural crops worldwide. That's because they pollinate many different types of plants (some other bee species are very picky eaters), and they are easy to manage. For about 150 years, beekeepers have known how to raise them in portable nests that they can move from field to field. Honey bees make tasty honey, too, which is how they got their name. They are medium-sized bees that range in color from black to pale yellow. Colonizing Europeans brought honey bees to North America starting in the 1620s. In Oregon, they are one of the only pollinators of carrots, which Oregon farmers mainly grow not for the vegetable, but for the seeds produced by carrot flowers.

If you could build a home for a honey bee, what would you use? In what season of the year would you put the home outside? Why?

A trait of these bees is that they are **busy**. Name a synonym and antonym for **busy**:

_____

Carrot Peach Smoothie

Honey Bee and Carrot Flower

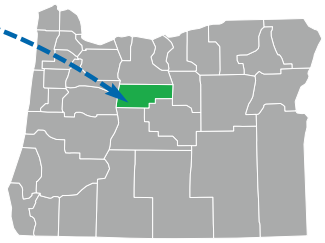
What does this recipe have in common with another recipe in this book?

_____

_____

_____

Honey bees are the main crop pollinators in Oregon. They pollinate everything from coastal cranberries to Willamette Valley berries, Columbia Gorge tree fruits, Hermiston melons and eastern Oregon forage seeds for hay and pasture. Much of the carrot seed used to grow carrots across the United States comes from Jefferson County, Oregon.



Ingredients

1 can (15 ounces) **peaches**, not drained*

1 cup **carrots** (frozen, cooked from fresh, or canned and drained)

1 medium **banana**, peeled (fresh or frozen)

Directions

1. Wash hands with soap and water.
2. Combine all ingredients in a blender or food processor, including juice from the canned peaches.
3. Blend until smooth and serve right away.
4. Refrigerate or freeze leftovers within 2 hours. Try them as popsicles!

Carrot seed

Want to use fresh or frozen peaches instead?
Use 1 1/2 cups fresh or frozen peach slices plus 1/2 to 3/4 cup water or 100% fruit juice.

Makes 3 cups
Prep time: 5 minutes

Nutrition Facts

3 servings per recipe

Serving size	1 cup (208g)
Amount per Serving	
Calories	**130**
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 50mg	2%
Total Carbohydrate 31g	11%
Dietary Fiber 3g	11%
Total Sugars 25g	
Includes 0g Added Sugars	0%
Protein 2g	
Vitamin D 0mcg	0%
Calcium 17mg	2%
Iron 0mg	0%
Potassium 301mg	6%
Vitamin A 324mcg	36%
Vitamin C 6mg	6%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Recipe Math Challenge

The food truck is making free summer lunches for 75 kids and teens. A 1-cup smoothie will be served with each lunch. About how much of each of these ingredients do we need to buy for the 75 lunches?

- Ounces of peaches _____
- Cups of carrots _____
- Whole bananas _____

Bonus: About how many cups of peaches do we need if we use fresh peaches?

Bumbles

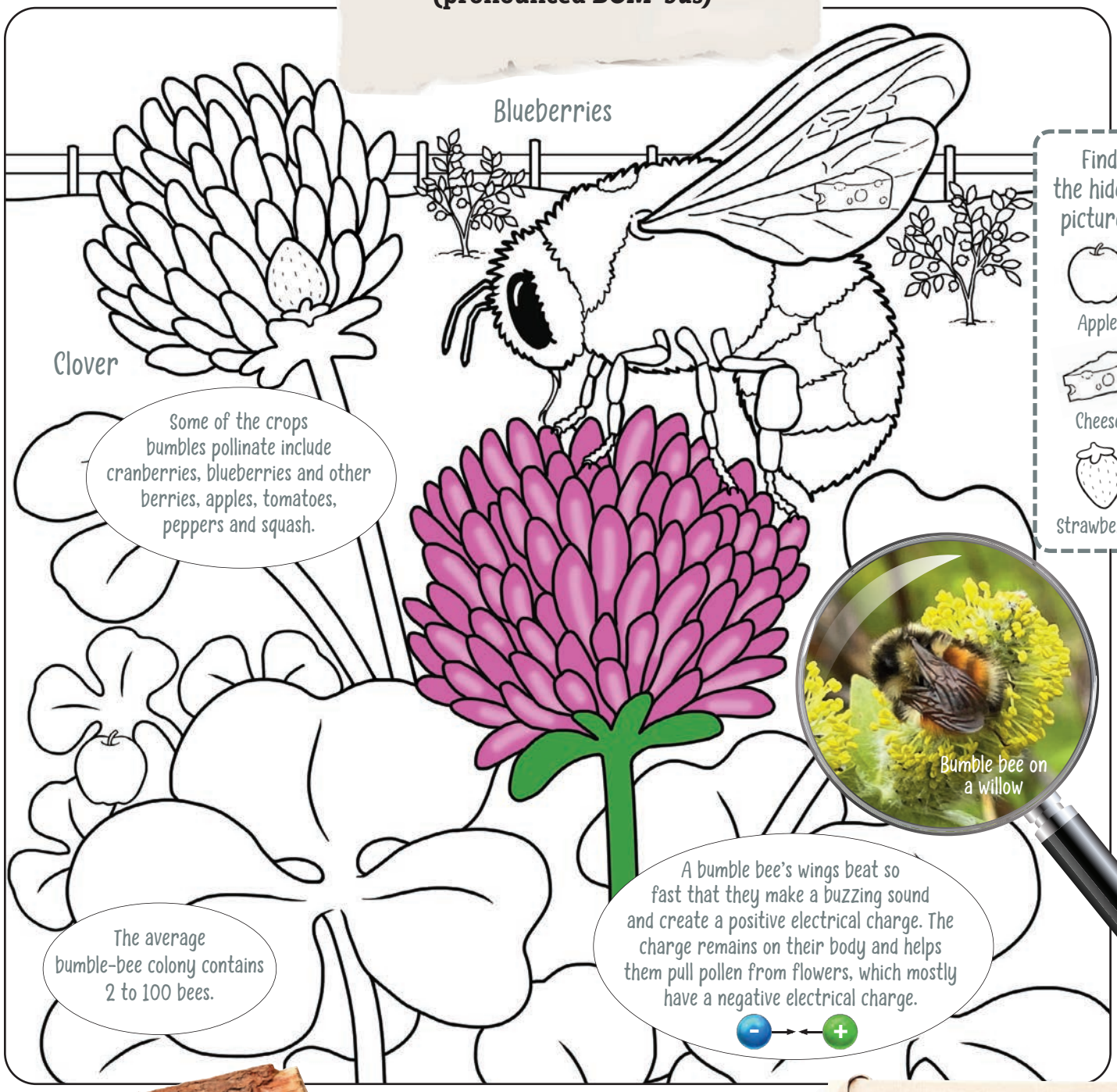
Social Bees

Bumble Bees

Genus: Bombus

(pronounced *BOM-bus*)

Bumble Bee
11 to 23 mm in length



Field Notes:

Bumble bees are important pollinators of many wild and agricultural plants (plants grown by farmers). They are large and fuzzy bees, and their bodies are most often colored with a mixture of black, yellow, orange, brown or white hairs. In Oregon they are important pollinators of red clover. Oregon is one of the largest growers of clover seed in the world. Farmers buy the seed to grow clover plants, which are fed to cows and other livestock that give us milk, cheese, yogurt, eggs and meat.

Have you ever seen a bumble bee? Where? What was it doing?

A trait of this bee is that it is **large**.
Name a synonym and antonym for **large**:

_____

Bumble Bee and Clover

Fruit Pizza

How many different types of plants could the ingredients for this recipe grow on? List them.

_____

_____

_____

Oregon Bumble bees are important pollinators of red clover because their long tongues can reach into the long narrow flowers. They pollinate blueberries in a different way! Blueberries hold pollen tightly inside tube shaped anthers. Bumble bees shake the pollen out of the tubes by buzz pollination – when bees' wings vibrate to release pollen.

Ingredients

1 **English muffin** (try whole-grain), bagel or flatbread

2 Tablespoons reduced-fat **cream cheese**, nut or sunflower butter

2 Tablespoons sliced **strawberries**

2 Tablespoons **blueberries**

2 Tablespoons crushed **pineapple**

Mint is popular with many types of bees and other pollinators.

Directions

1. Wash hands with soap and water.
2. Rinse fresh fruits under running water.
3. Split open the English muffin and toast the halves until lightly browned.
4. Spread cream cheese on both halves.
5. Divide the fruit between the two muffin halves and arrange on top of cream cheese. The pizza tastes great when served right away.

Flavor mix: use any combination of fruit. Top your pizza with a sprinkle of cinnamon, chopped mint or basil or a light drizzle of honey.

Makes 8 cups
Prep time: 5 minutes
Cook time: 15 minutes

Nutrition Facts

2 servings per recipe

Serving size 1/2 muffin+fruit (81g)

Amount per Serving	
Calories	**120**
	% Daily Value*
Total Fat 3g	4%
Saturated Fat 1.5g	8%
Trans Fat 0	
Cholesterol 10mg	3%
Sodium 170mg	7%
Total Carbohydrate 19g	7%
Dietary Fiber 2g	7%
Total Sugars 7g	
Includes 0g Added Sugars	0%
Protein 4g	
Vitamin D 0mcg	0%
Calcium 114mg	8%
Iron 1mg	6%
Potassium 149mg	4%
Vitamin A 25mcg	3%
Vitamin C 8mg	9%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Recipe Math Challenge

The food truck is planning to sell 3,000 fruit pizza plates next month. Each plate is 1 half an English muffin portion. How much of these ingredients do we need?

- Total cups of sliced strawberries, blueberries and crushed pineapple:

_____

- English muffins: _____

Bonus: How many cans of pineapple (1 can = 2 cups pineapple) will you need?

Bling Bee

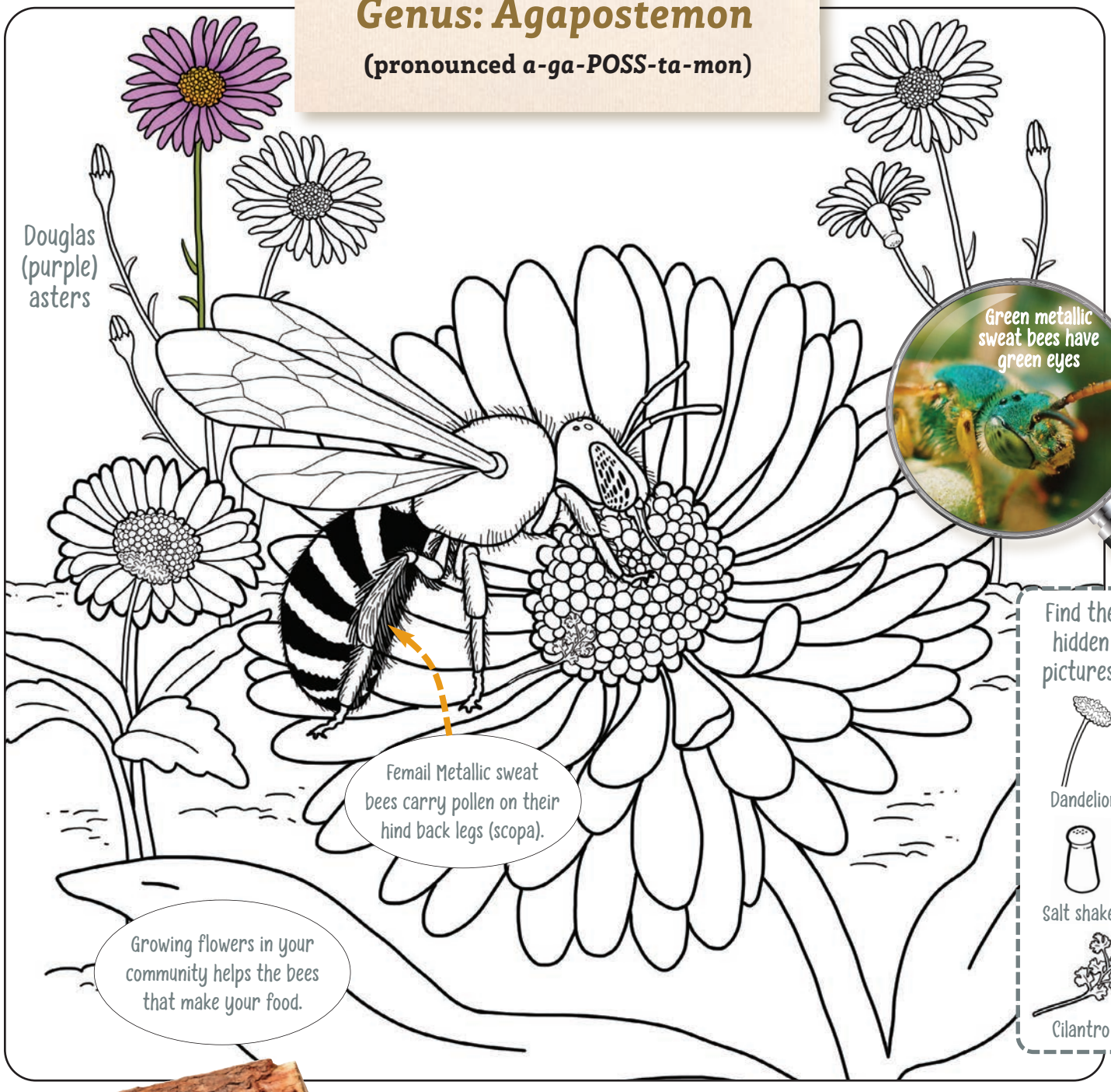
Solitary and Social Bees

Green Metallic Sweat Bees

Genus: Agapostemon

(pronounced *a-ga-POSS-ta-mon*)

Green Metallic Sweat Bee
7 to 12 mm in length



Field Notes:

Green metallic sweat bees pollinate the flowers of many cultivated plants (plants grown on purpose) as well as many wildflowers, like purple asters. Sweat bees have been given this name because they lick the sweat of mammals as a way to add salt to their diet. They are medium-sized and have a bright metallic green color. These bees love open and flat-shaped flowers such as daisies, dandelions, wild roses and blackberry and apple blossoms. They love purple asters, a plant cultivated by many Oregon nurseries. There are also a number of native purple asters in Oregon.

If a green metallic sweat bee visited your garden and you wanted to name it, what would you name it and why?

A trait of this bee is that it is **bright** in color.

Name a synonym and antonym for **bright**:

_____

Quick Tomato Salsa

Green Metallic Sweat Bee and Cilantro

The flowers of many common herbs, like cilantro, mint, rosemary, thyme and basil, provide great food for bees like the sweat bee. They also pack our food with flavor! A great way to enjoy fresh herbs is by adding them to salsa.

If you could substitute one ingredient in this recipe, what would it be? Why?

_____

_____

_____

Ingredients

1 can (15 ounces) **diced tomatoes** or 1 1/2 cups fresh chopped tomato

1/4 cup **onion**, chopped (a 1/4 medium onion or 2 green onions, including green tops)

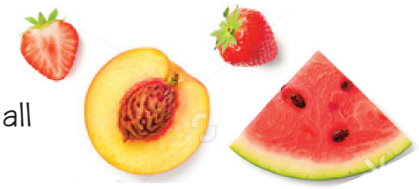
1 clove **garlic**, chopped or 1/4 teaspoon garlic powder

Juice of 1 **lime**

1 can (4 ounces) diced **green chiles**

1/4 cup fresh **cilantro leaves**, (1/3 of a bunch) loosely packed

Try swapping in other bee pollinated fruit in place of the tomatoes!



Directions

1. Wash hands with soap and water.
2. Combine ingredients, except cilantro, in a blender. Blend to the thickness you like.*
3. Stir cilantro into other ingredients.
4. Refrigerate leftovers within 2 hours.

No blender? Make a chunky salsa by cutting all ingredients to desired size before mixing.

Makes 2 cups

Prep time: 5 minutes

Nutrition Facts

16 servings per recipe

Serving size **2 Tablespoons (39g)**

Amount per Serving

Calories **10**

	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 70mg	3%
Total Carbohydrate 2g	1%
Dietary Fiber 1g	4%
Total Sugars 1g	
Includes 0g Added Sugars	0%
Protein 0g	
Vitamin D 0mcg	0%
Calcium 0mg	0%
Iron 0mg	0%
Potassium 59mg	2%
Vitamin A 1mcg	0%
Vitamin C 2mg	2%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Recipe Math Challenge

On Friday the food truck will make lunch for a garden party of 40 people serving each person 1 cup of salsa. About how much of each of these ingredients do we need to buy? **Hint:** Each recipe makes 2 cups.

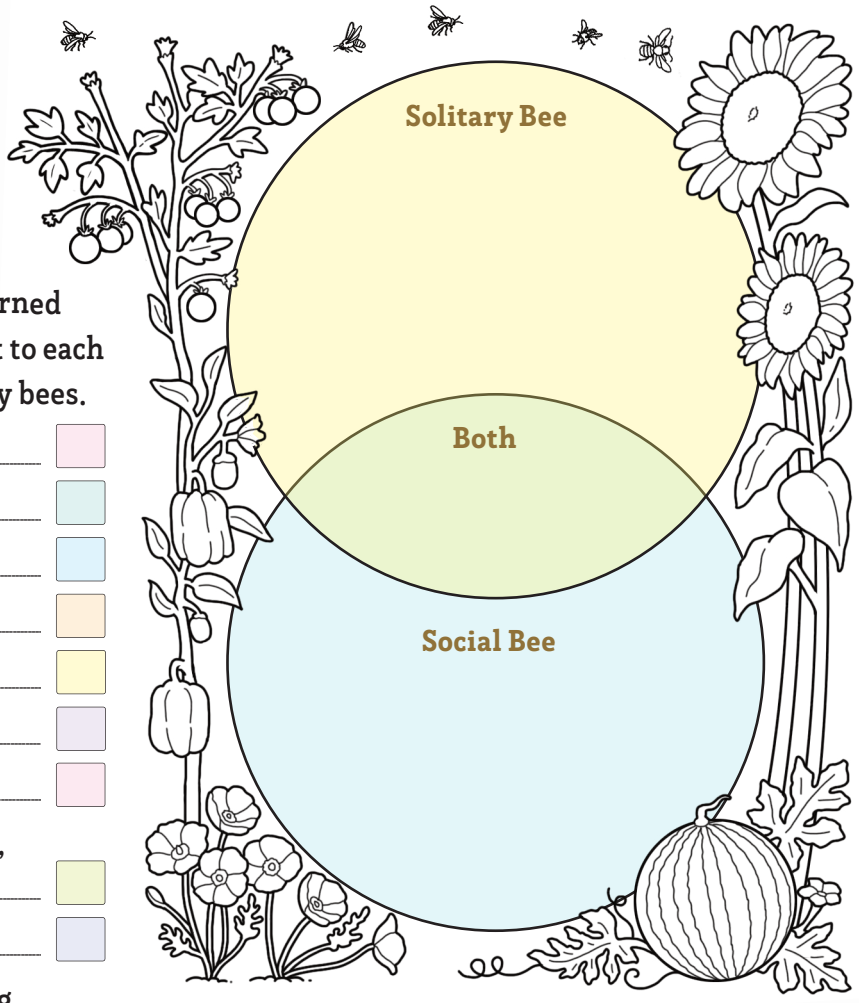
- Ounces of canned tomatoes _____
- Whole limes _____
- Whole green onions _____
- Ounces of canned chiles _____
- Teaspoons of garlic powder _____

Bonus: About how many bunches of cilantro do we need to buy?

Green Metallic Sweat Bee Photo: US Department of Agriculture

What Do You Know About Bees?

Compare Bees List at least one way you will remember how solitary and social bees are alike and different.



Social or Solitary? Use what you have learned in the book. Add a C (social) or L (solitary) next to each statement to note if it explains social or solitary bees.

Leafcutter, long-horned and alkali _____

Do not make honey _____

Produce wax, honey and honeycomb _____

Do not make wax _____

Bees eat stored food in winter (in wax) _____

Mason and bumblebees _____

Live together in a hive _____

Makes nest in different places like plant stems, tree stumps or tunnels in the ground _____

Has a queen, drones and worker bees _____

Leaves the hive to travel up to 5 miles searching for flowers _____

A mining bee on a pear blossom. Pears are the state fruit of Oregon.

True or False – Fun Bee Facts

1. Only female bees can sting.

True! The body part bees sting with (the stinger) is the same body part bees use to lay their eggs. Since only females lay eggs, only females can sting.

A Mining bee on Red Cedar

2. Bees can only sting one time.

True and False! This is true only for honey bees. All other bees can sting more than once. When a honey bee stings you, its stinger, along with a special venom sack, rips off the bee and sticks into you. This kills the bee.

3. Some people are allergic to bee stings.

True! Bee stings hurt for a few minutes, but most people are not harmed by them. Some people are allergic to bee stings and need to be extra careful when they are around bees.

4. Bees like to sting people.

False! Bees would rather not sting you! Bees sting to protect themselves from creatures that want to eat them. Most humans do not threaten bees, so bees rarely sting them. When stings do happen, it's often because someone accidently swats or steps on a bee, or is standing too close to a nest. Most of the time, though, it is safe to observe bees around you.

Create a silly, nonsensical, preposterous, funny, laughable story

Find a partner. Choose one person to be the "reporter" and one to be the "author." Without reading the story aloud, the reporter asks the author to think of a word for each prompt under the blank lines below. The reporter writes in the author's words. Then have the reporter read the story out loud!

Did you know that only _____ (adjective) bees sting? These bees use their _____ (part of their body) to _____ (verb). This is the same part of the body they use to lay _____ (plural noun). While almost all bees can _____ (same verb) multiple times, the _____ (adjective) bee stings only once. That is because when a _____ (same adjective) bee _____ (last verb again) its _____ (noun), along with a special venom sack, _____ (verb) off the bee and _____ (verb) into you. This _____ (verb) the bee. Although bee stings _____ (verb) for _____ (number) minutes, most people are not harmed by them. However, some _____ (plural noun) are allergic to them and as a result have to be _____ (adjective) around bees. Bees only _____ (verb) to _____ (verb) themselves from _____ (noun) that want to eat them. Since most _____ (plural noun) don't threaten bees, they rarely _____ (verb) them. When bees do _____ (same verb) people, it's often because _____ (name of a person in the room) swatted at the bee or _____ (verb) on it. Most of the _____ (noun) it's safe to observe _____ (plural noun) around you.

Explore the bees of Oregon and how they help make our food!

Many wild bees rely on native plants, and thus many native plants we eat rely on certain wild bees. Native plants evolved over thousands of years in defined habitats. There, they live in harmony (like a friendship) with the environment's other species, soil, weather, etc. This **interdependence** allows wild bees to thrive and survive without human care.

Kale can be harvested year round in Oregon!

Find the hidden fork, spoon, knife, dinner plate and drinking glass

Color in the picture above. Add a caption (short description of what is going on in the photo). Use the text from the book to support your answer:

_____

Wild Bees and Native/Indigenous Food Plant Sources

A great way to attract and feed your local wild bees is to support different types of bee-friendly plants that bloom at different times of the year. These plants can be grown in your yard or a community or school garden. You can find seeds or plant starts at many garden stores and native plant nurseries.

For thousands of years Pacific Northwest Native/Indigenous People have used special plants for food and medicine, like those featured here. There is a deep bond between the plants and people who eat them, and the bees that pollinate them. This bond can help protect bees.

Thimbleberry leaf

Name the different plant parts from page 4 that are featured in the Food Use sections below

Flowering Trees and Shrubs

These featured plants are sorted in order of bloom time, which may vary by species

1 Willow
Salix spp.

In bloom: February through May

Bees that visit: A favorite of many bee species such as bees that emerge from their nests or hive early in the year. Also, specialist bees in the mining bee family.

Food use: Willow contains compounds used in Asprin and anti-inflammatory medications. The bark and leaves are used for bitter teas. Catkins, the small flower buds on willows, can be eaten and used in soups.

2 Salal
Gaultheria shallon

In bloom: April into June

Bees that visit: Many different species, like bumble bees, whose long tongues can reach nectar in the bell-shaped flowers.

Food Use: Used in ways you would use other berries, like in smoothies, dried/dehydrated or jams from chopped or blended fruits.

3 Kinnikinnick
Arctostaphylos uva-ursi

In bloom: March through June

Bees that visit: Many species, but most of all bumble bees.

Food Use: Also called Bearberry in the Pacific Northwest. Berries are sweeter when boiled. Can be dried and added to cakes and breads or cooked in oils with deer meats and fish.

4 Huckleberries
Vaccinium spp.

In bloom: March into August

Bees that visit: Many, including bumble bees who buzz pollinate

Food Use: Oregon has 10 related species, all with berries that can be eaten fresh, dried, added to savory dishes, desserts, and drinks. Huckleberries were so valued they have been given as gifts for wedding ceremonies.

5 Oregon Crabapple
Malus fusca

In bloom: April into May

Bees that visit: Many species as the flowers are easy for bees to access pollen and nectar from.

Food Use: Fruit is eaten raw or cooked, can be turned into jelly from fruit juice or dehydrated like raisins. A ceremonial food for some tribes. The entire tree can be used for food, medicine, toys and tool making.

6 Western Chokecherry
Prunus virginiana

In bloom: April into May

Bees that visit: Over 60 species

Food Use: After taking out the pit, and off the skin, the fruit flesh is used in common recipes for **pemmican** (the first energy bars), syrups, jellies, desserts and savory dishes.

Chokecherry

Field Notes

Oregon has nine ecoregions. An ecoregion is a land or water area where the ecosystems are alike. Such as, they have similar plant species, rocks, soil and weather. If we know an area's ecoregion, we can guess what plants and animals grow and thrive there. For example, if you live in the Snake River Plain Oregon grape is growing but you will need to travel beyond the region for Oregon crabapple and huckleberries.

Crabapples and crabapple jelly

Find a favorite featured food below and where bees help pollinate it.

Huckleberry jam

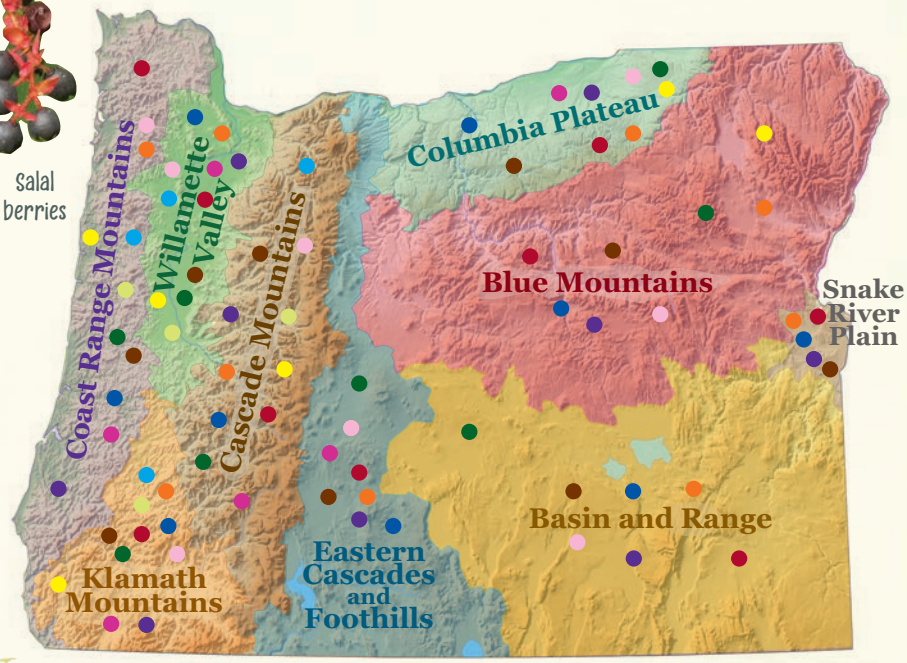
Willow bark tea

Oregon Ecoregion Map:

Flowering Trees and Shrubs Pollinated by Oregon Bees

The dots on the map show the featured plants that live in that ecoregion.

Salal berries



7 Thimbleberry
Rubus parviflorus

8 Salmonberry
Ribes Spp.

In bloom: March into May

Bees that visit: Many species

Food Use: Berries eaten raw or cooked, can be panfried in oil and taste like asparagus. Leaves are used in tea as medicine. Delicate young plants can be peeled for a crunchy treat, older shoots can be chewed to enjoy the healthy tart juice. Colors can be yellow to bright red.

Currants

9 Currant
Ribes spp.

In bloom: April through July

Bees that visit: Bumble, digger, mining and many other bees

Food Use: Berries can be eaten fresh, frozen, dried, or cooked; used in preserves, jams and jellies, mixed with fat and meat to create Pemmican. Young sprouts/seedlings can also be eaten raw or cooked.

10 Oregon Grape
Mahonia

In bloom: May into July

Bees that visit: Many, such as mason and bumble

Food Use: The fruit is really not a grape, and does not look like one. It is a tart fruit. The berries are used in preserves. The root and stems used for medicine.

11 Oceanspray
Holodiscus discolor

In bloom: May into August

Bees that visit: Many forage on it

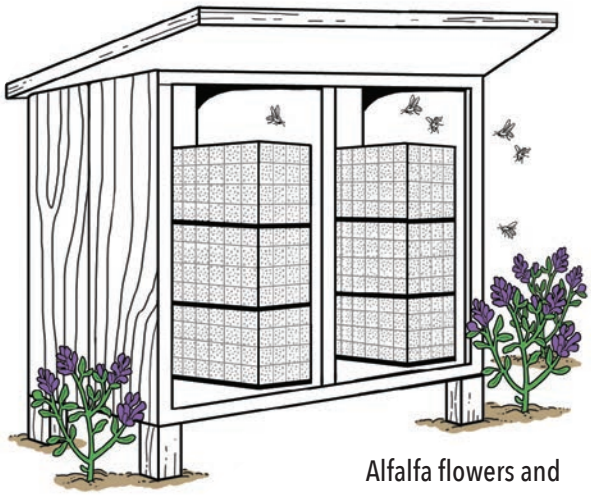
Food Use: Also called Ironwood. Mainly used for making sturdy tools and medicines. Seeds are eaten raw or cooked. Berries used as a medicine. Leaves are boiled with meat and other plants.

For more information on the bees, shrubs and trees featured here visit: https://beav.es/treeshrub

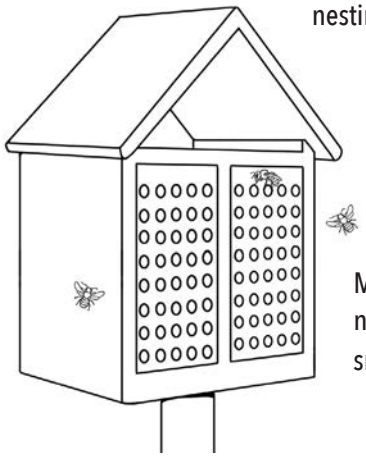
Managed Bees of Oregon

For over 9,000 years, humans have been seeking out wild bee nests. From these nests they gather things like wax and honey. The bees in the nests also help them pollinate their crops. Over time, people also figured out how to raise some wild bee species using structures they built themselves. These bees are called managed bees. In Oregon we have four types of managed bees: honey bees, leafcutter bees, mason bees and alkali bees. Honey bees are raised to make honey and wax and to pollinate crops. Oregon's other managed bees are raised only for pollination. Below are three types of structures used to manage bees and where they live (nest):

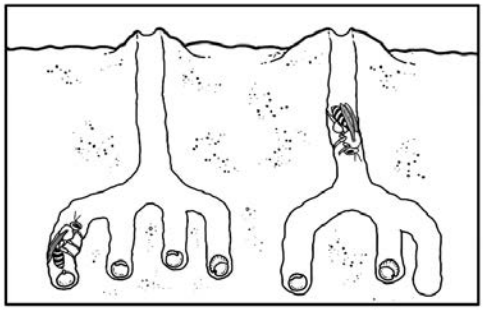
Help Jocelyn and her family color and pattern their nests and hives below!



Alfalfa flowers and leafcutter bees nesting in blocks.



Mason bees nesting in small tubes.



Some farmers paint their hives. Color and patterns help bees find their way back home, and less likely to drift to another hive.

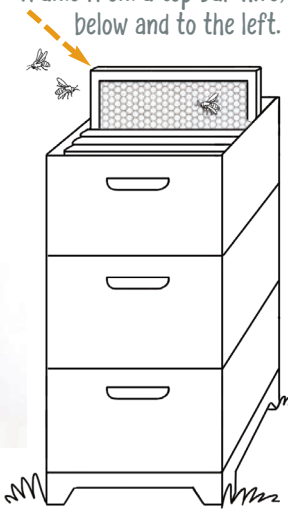
1 Tubes or blocks - Managed leafcutter bees and mason bees nest in small tubes or in blocks with many holes in them. Hundreds of blocks or tubes are often stored next to each other in a bee shelter that protects the nests from rain and wind.

Managed bees do not fly far from their nest. Farmers place these nests next to the flowers being pollinated.

OSU Extension beekeeping students in the Spanish-language tract (Visit https://beav.es/beekeeper)

2 Hives Honey bees are kept in boxes called hives and are the most common managed bee worldwide.

Frame from a top bar hive, below and to the left.



Some farmers grow plants that attract bees near their bee hives, like oregano or lavender which are great for foraging.

3 Underground nests - Alkali bees are raised in underground nests.

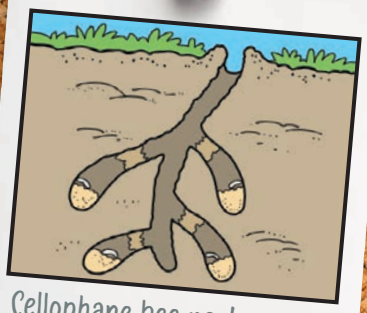
Wild Bees' Nests

What do bees use to make their nests?

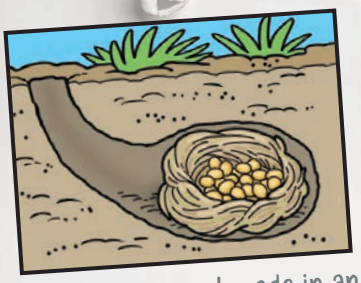
You might know about bees' nests made from wax. But did you know that most species don't even make wax? Most bees make their nests in the soil building tunnels. Others build their nests in plant stems using leaves, flower petals, mud, stones and plant resin to protect their young from predators and parasites!

If you were a wild bee, which nest would you most want to live in? Why?

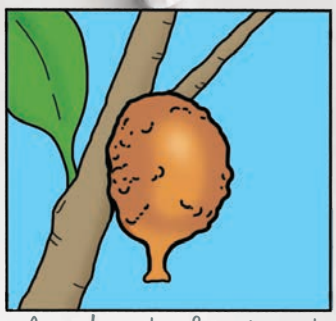
Small Resin bee



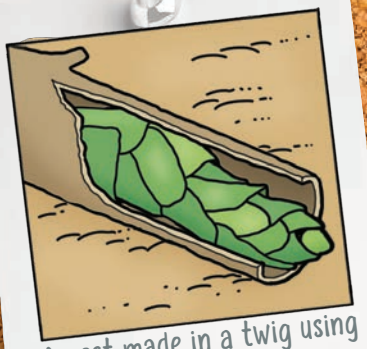
Cellophane bee nest carved out of soil.



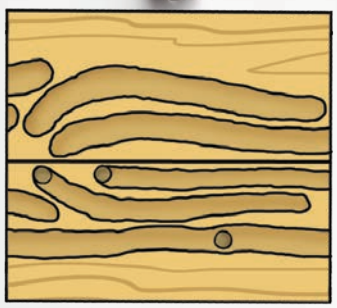
A Bumble bee nest made in an abandoned mouse nest using left over materials like fur.



A nest made of resin and pebbles–built by resin bees



A nest made in a twig using leaves cut by leafcutter bees



Nests made in wood–carved out by carpenter bees

Nests made in the soil–dug out by mining bees

Design a wild bee home

1. What type of bee might have built your nest? Why?

2. Thinking of the bee you listed in #1.
a) What food might this bee help make? How?

b) What plants might be growing near the bee house? Why?

What You Can Do for Bees

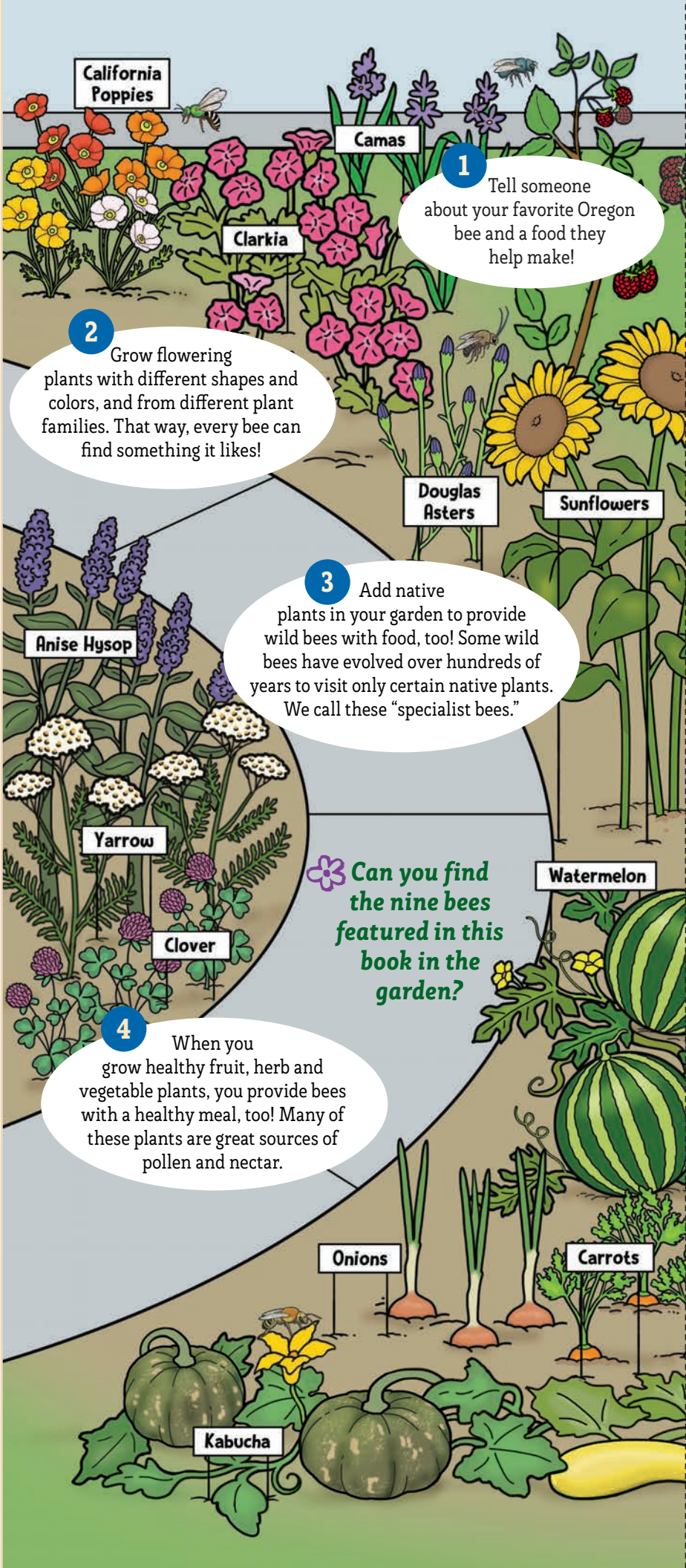
A garden tour of ideas!

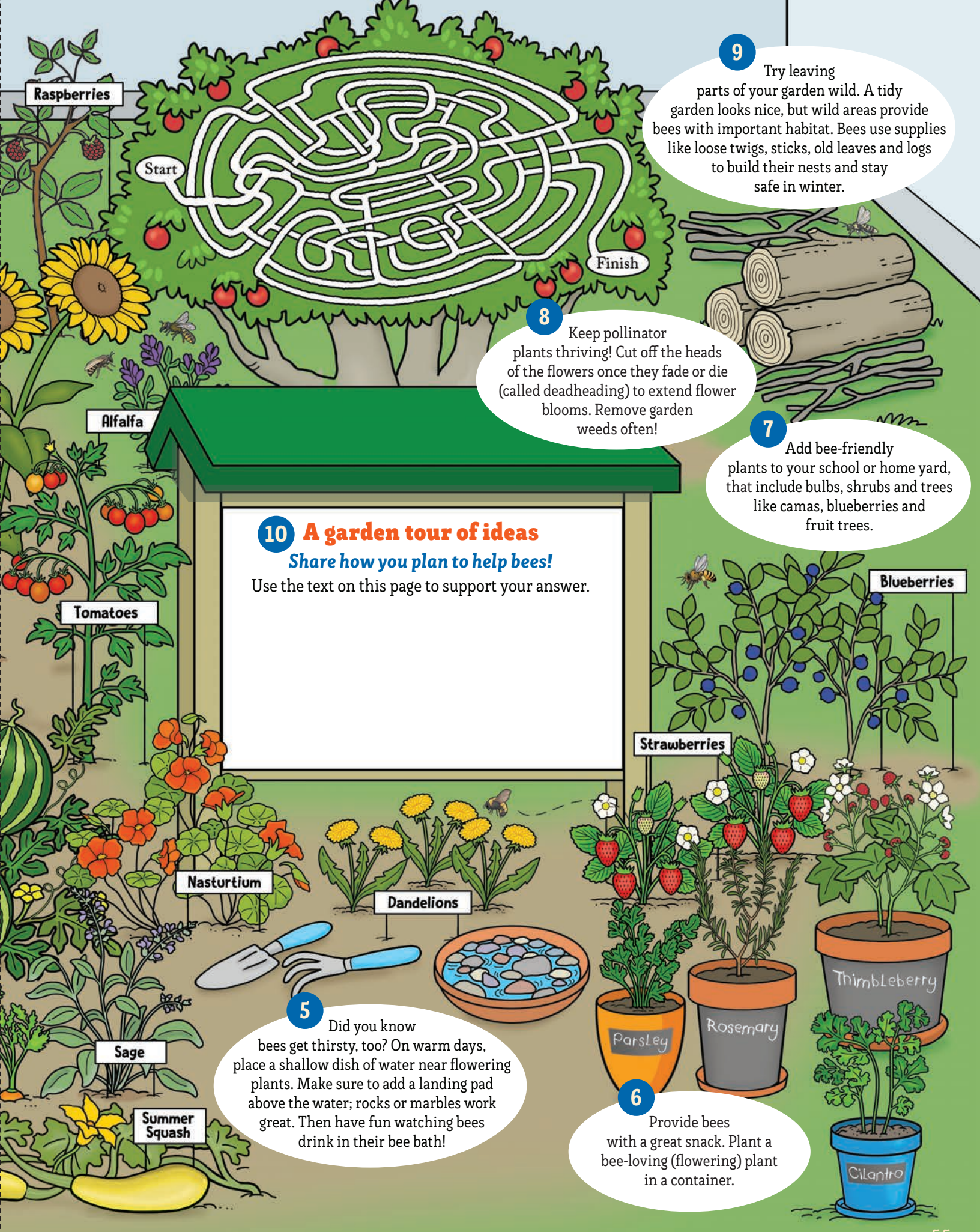
Some bees are active in the spring, some are active in the summer and some are active from early spring through fall. By making sure there is always something in bloom, you can help provide food for them all! This is most important early in the spring and late in the fall when fewer plants are *in bloom* (blossoming).

Design a garden mural to help bring more visitors to the garden! Use what you have learned in this field guide to support your design.

Masked bee

What did you include on your mural? Why?





9 Try leaving parts of your garden wild. A tidy garden looks nice, but wild areas provide bees with important habitat. Bees use supplies like loose twigs, sticks, old leaves and logs to build their nests and stay safe in winter.

8 Keep pollinator plants thriving! Cut off the heads of the flowers once they fade or die (called deadheading) to extend flower blooms. Remove garden weeds often!

7 Add bee-friendly plants to your school or home yard, that include bulbs, shrubs and trees like camas, blueberries and fruit trees.

10 A garden tour of ideas

Share how you plan to help bees!

Use the text on this page to support your answer.

5 Did you know bees get thirsty, too? On warm days, place a shallow dish of water near flowering plants. Make sure to add a landing pad above the water; rocks or marbles work great. Then have fun watching bees drink in their bee bath!

6 Provide bees with a great snack. Plant a bee-loving (flowering) plant in a container.

In the Field with Bees

and How to Safely Watch Them

You can learn a lot about bees by watching them!

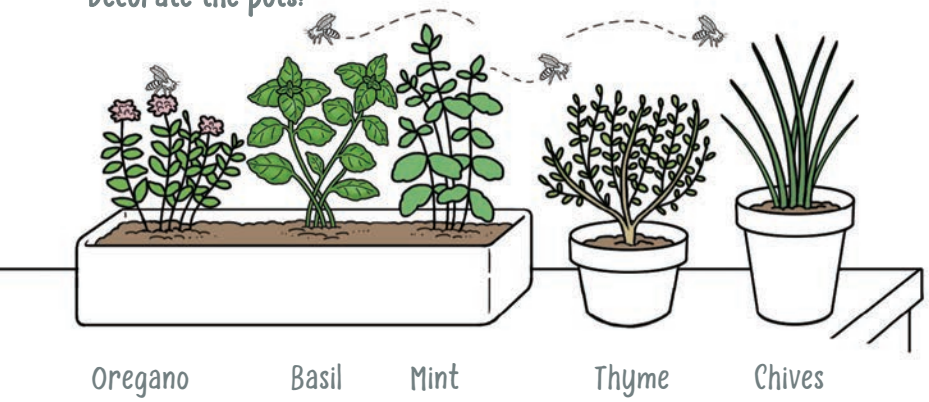
A great way to start is to find a patch of blooming flowers. Then, take a few minutes to watch the flowers to see if any bees appear. If they do, observe what they are doing and:

An Alkali bee on alfalfa

Follow these tips to keep you and the bees safe!

- ✓ Move slowly and watch what's going on around you so you avoid crushing or stepping on the bees.
- ✓ Do not pick bees up! If one lands on you, wait for it to leave on its own or gently brush it away.
- ✓ Do not run away from bees or swat them.
- ✓ Stay at least 10 feet away from bees if you see them coming in and out of a hole in the ground, a hole in a tree or a hole in a building.

Decorate the pots!



Prolong the harvest- You can harvest the leaves of an herb for a longer period of time if you cut the older, outermost leaves and not the leaves in the center of the plant. You can also pinch off flowers to prolong the harvest.

Hi! Welcome back! The food truck is closed today, but I'd like to share a story about Jocelyn and bees 20 when we were buying herbs at the market! 28

Yesterday we went to the farmers' market. So many bees were flying around! Jocelyn got super scared 45 when some of them swarmed around her. She started trying to swat them and shouted, "I don't like bees!" 64 My friend Eli and I told her not to do that. We told her that bees usually don't sting unless they think 86 they're in danger. She didn't believe us. A few minutes later, we saw her teacher, Mrs. Moran, buying 104 flowers. Mrs. Moran backed us up. "Jocelyn," she said, "because of bees we have beautiful flowers to enjoy, 122 and all kinds of tasty fruits to eat, like peaches and berries. Bees also give us honey. I use honey in my 144 baking." She even told Jocelyn that without bees, we wouldn't have pumpkins. Last school year, everybody 160 in Jocelyn's class got a pumpkin. They pulled the seeds out, counted them, and then roasted them to eat. 179 Plus, I read to Jocelyn some pages in my favorite bee book about being scared of bees. They said what to 200 do so you won't get stung! 206

Jocelyn REALLY likes peaches and berries and honey and pumpkins! So now she has become a big fan of 225 bees. In fact, now she loves bees so much, she's been coloring in pictures of them from my bee field 245 guide, and looking for bees all over. You can color the pictures in your book, too, and just like Jocelyn, 265 you can see how many different species of bees you can find. Now Jocelyn is trying to get Mom and Dad 286 to start our own beehive so the bees can pollinate our garden and she can harvest their honey. 304

Fluency Tracker Day 1_____, Day 2_____, Day 3_____, Day 4_____, Day 5_____

Lavender

Name:

Date

Time

Location

Bee Watching Worksheet

Questions to ask while watching bees:

Record what you observe as you sit outside near a flower patch watching bees, or look at the photos on this page!

How many types of bees do you see in this spot?

A sweat bee on Camas.

Do different bees prefer different types of flowers?

Sketch and label a bee pollinating a flower

How do bees collect pollen?

How do bees drink nectar?

A honey bee on a chicory flower.

A leafcutter bee taking a nap in a flower

A queen bumble bee

Native bees like small carpenter bees use thimbleberry and salmonberry stems to nest in.

Thimbleberry blossom

Small Carpenter Bee

Draw a Comic Strip

Starring an Oregon bee you would like to be

Use the text from the book to support your answers. Include flowers your bee pollinates to make food. Add features on your bee that will help your bee thrive. Find someone to share your comic with!

Salmonberry

The _____ bee has _____ and _____ to help it survive.

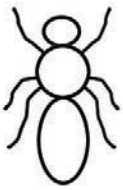
Meanwhile

Bee Body-Part Checklist

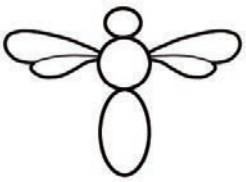
3 body segments

Head
Thorax
Abdomen

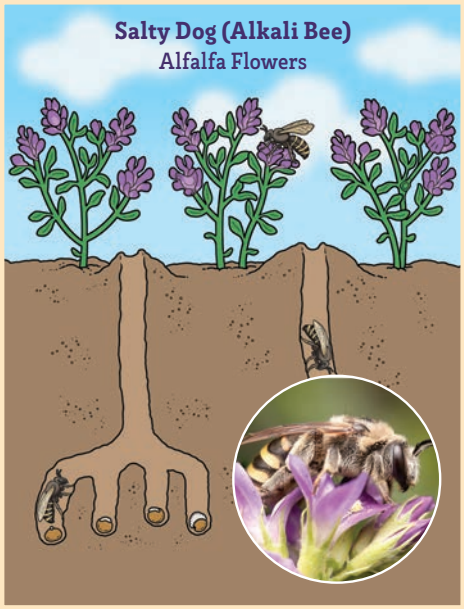
3 sets of legs



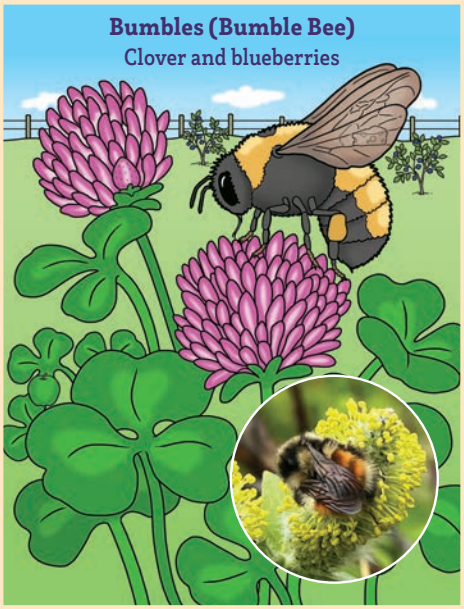
2 sets of wings



Salty Dog (Alkali Bee)
Alfalfa Flowers

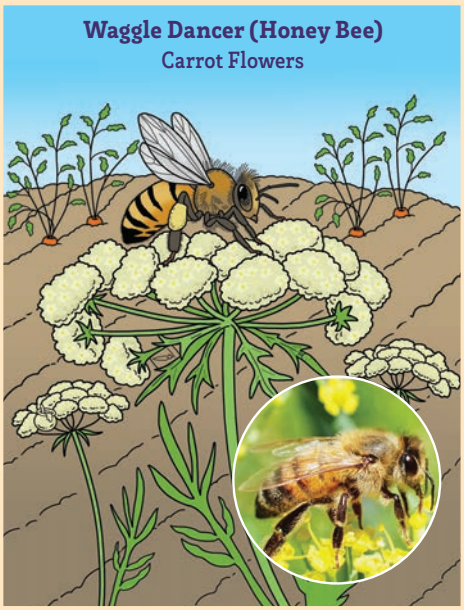


Bumbles (Bumble Bee)
Clover and blueberries



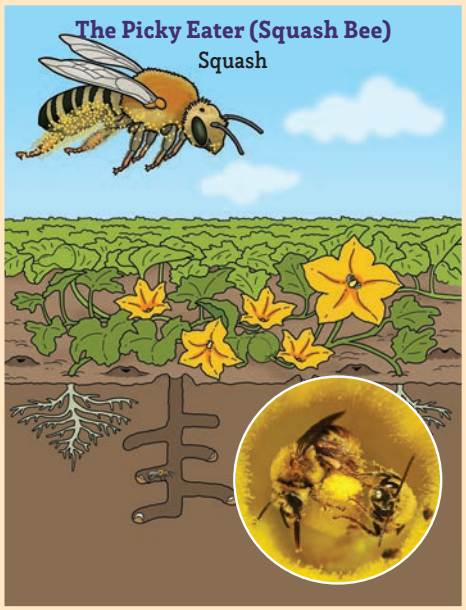
Klepto (Cuckoo Bee)
Cuckoo bees are not pollinators and do not help make our food.

Waggle Dancer (Honey Bee)
Carrot Flowers

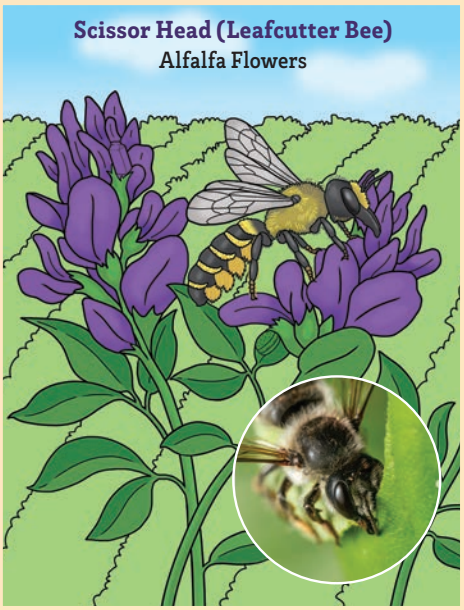


Bling Bee (Green Metallic Sweat Bee)
The flowers of many common herbs provide food for them.

The Picky Eater (Squash Bee)
Squash



Scissor Head (Leafcutter Bee)
Alfalfa Flowers



Long Horns (Long-Horned Bee)
Sunflowers

The Mason (Mason Bee)
Cherry Blossoms

Explore the Bees of Oregon

and how they help make our food

Bees Help Make Our Food: *Word Search*

Calendula

Join Jocelyn and Josh as they cook Food Hero recipes with ingredients bees help make! Use the word word bank to find the hidden words. Words may be hidden horizontally, vertically or diagonally. On the right, name the bee that helps make the ingredients listed. Then color in the picture!

Find the hidden food: Pear, Hazelnut, Cheese, Greenbean

H	K	D	U	C	V	E	E	B	H	S	A	U	Q	S	N	T	S
E	D	M	B	I	M	E	I	B	C	P	Z	S	M	T	I	J	L
E	Z	E	P	L	P	U	M	P	K	I	N	H	J	H	H	Y	M
B	H	Q	E	A	J	N	V	B	E	S	O	O	E	G	J	Z	X
R	X	C	Y	N	Q	M	I	S	Y	U	Y	N	N	M	O	J	A
E	B	Z	F	T	C	W	E	F	L	R	A	E	Z	V	M	M	G
T	T	D	N	R	B	E	K	W	R	O	Z	Y	G	K	A	P	K
T	R	A	D	O	H	A	D	E	X	A	E	B	C	W	L	P	M
U	A	Z	P	C	R	G	H	P	K	E	N	E	M	I	K	C	A
C	Y	X	S	G	R	C	J	P	B	G	T	E	I	I	A	E	S
F	S	N	Y	R	R	E	B	E	U	L	B	S	S	R	L	E	O
A	R	E	P	N	E	U	L	B	R	T	Q	W	R	I	I	B	N
E	W	K	S	O	A	B	E	G	G	S	E	O	R	R	B	O	B
L	R	X	N	B	M	M	X	V	V	A	T	J	Z	U	E	O	E
Z	L	S	H	U	P	A	R	H	T	S	C	N	C	D	E	K	E
U	B	Y	B	D	V	H	E	B	A	Y	F	Y	V	T	W	C	V
Y	C	W	P	S	D	E	E	S	R	E	W	O	L	F	N	U	S
Q	Y	E	E	B	D	E	N	R	O	H	G	N	O	L	R	C	O

Word Bank:

Alkali bee
Blueberry
Bumble bee
Carrots
Cheese
Cherry
Cilantro
Cuckoo bee
Eggs
Honey bee
Leafcutter bee
Long-horned bee
Mason bee
Pumpkin
Squash bee
Sunflower seeds
Sweat bee

Blueberry _____ Bee

Carrots _____ Bee

Cheese _____ Bee

Cherry _____ Bee

Cilantro _____ Bee

Eggs _____ Bee

Pumpkin _____ Bee

Sunflower seeds _____ Bee

Sunflower

what did you learn about bees and how they help make our food?

Honey bee

Bees help make healthy food!

Peachy Keen Water

Ingredients:

¾ cup **pureed or mashed peaches** or strawberries or a mix of fruit, fresh or frozen and thawed (rinse fresh fruit before preparing)

4 cups cold **water**

1 tray regular or herb **ice cubes** (try mint, basil, rosemary or sage)

Directions:

1. Wash hands with soap and water.
2. Combine all ingredients in a pitcher.
3. Stir well and serve right away for best quality. Refrigerate any leftovers within 2 hours. Do not mix batches of flavored water. Use it up, clean the container, then make a fresh batch.

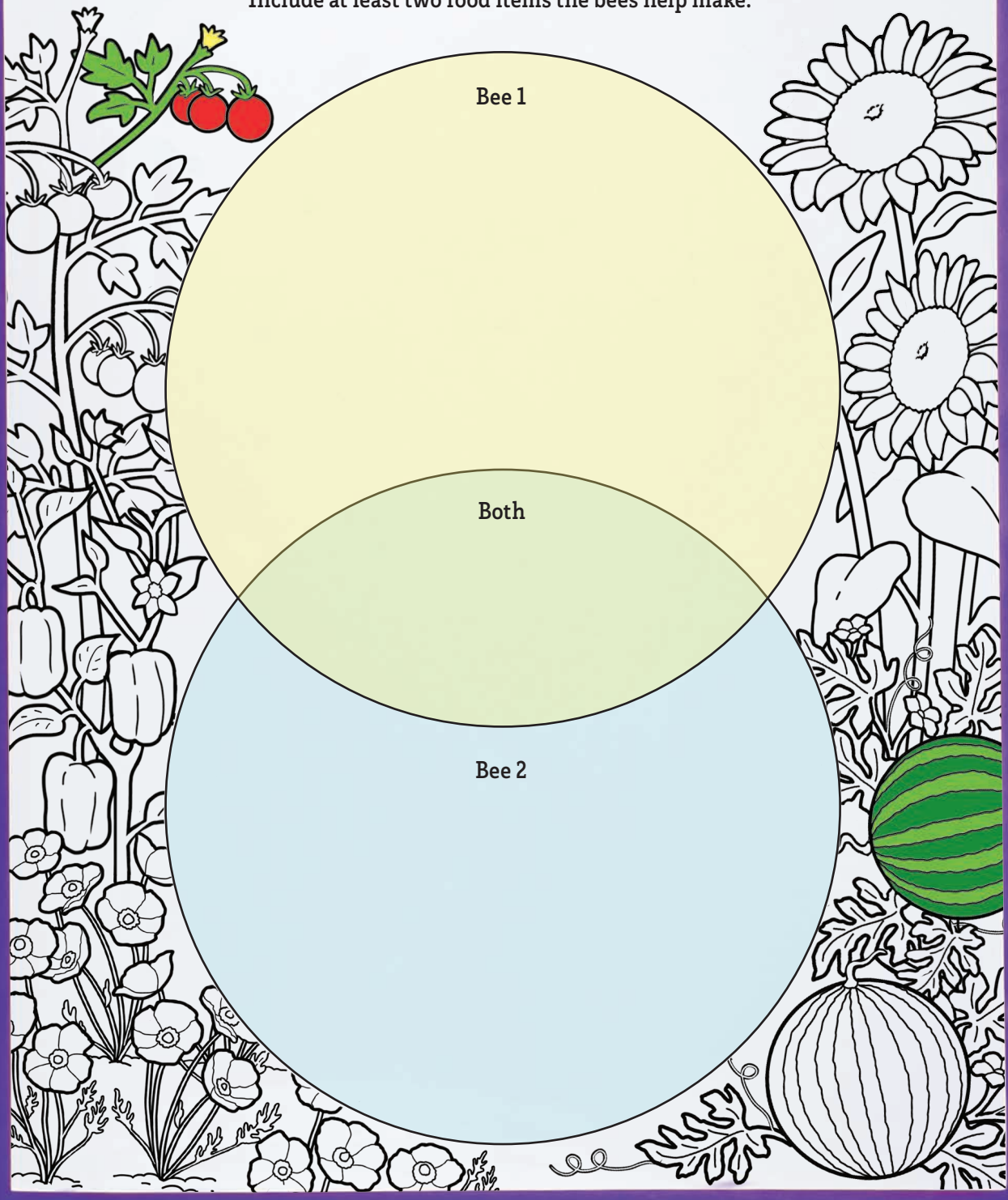
Herb ice cubes:

1. Place a rinsed herb leaf into each ice cube tray hole.
2. Fill the holes up half way with water and freeze solid.
3. After the ice is set, fill the top half of the holes with water. This allows the herb leaves to be frozen in the middle of the ice cube.

A closer look: Peach trees self-pollinate. But, bees can boost the harvest when they add in cross pollination! Peach trees do better when bees bring pollen from a different type of peach tree, giving us more, sweeter and larger peaches.

Compare Bees

Just like bee scientists (mellitologists), let's compare bees! Write down two bees to compare.
List or draw two or more ways your bees are alike and different.
Include at least two food items the bees help make.



Bee Dinner Party

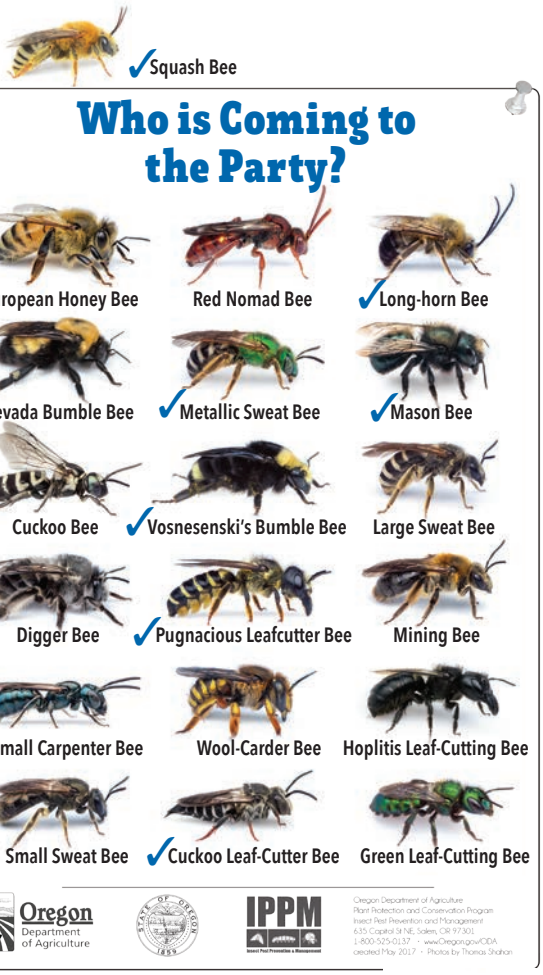
Which featured bee is sitting where?

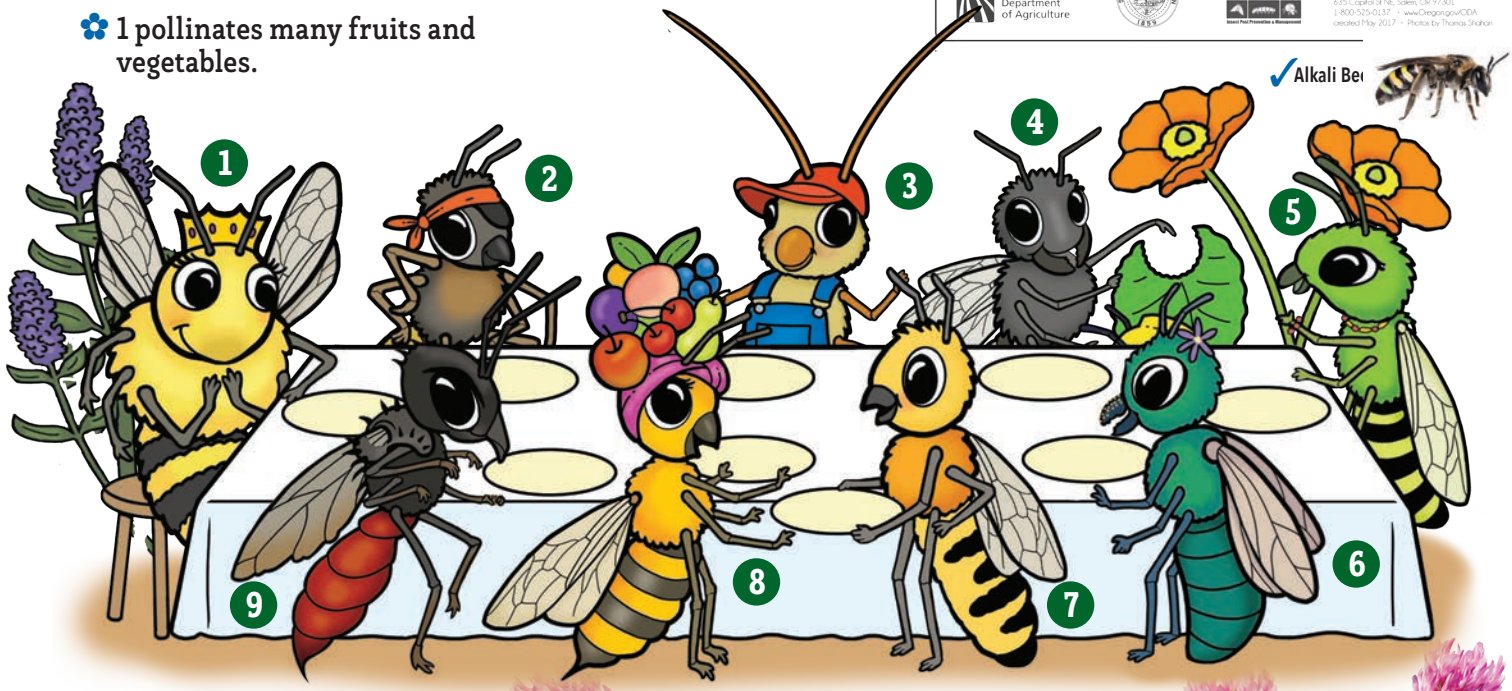
Our featured bees are at a dinner party! On and around the poster to the right every bee who came to the party has a blue checkmark next to their name. Use the clues to figure out which bee is sitting where. On the dinner plates, add the initials of the bee seated in front of each one.

Clues

The bee seated in seat number:

- 1 is the largest bee at the table.
- 6, 7 and 8 love vegetables and fruit blossoms.
- 7 nests in the ground.
- 4 nests in the ground.
- 8 can nest with up to 25,000 other bees.
- 1 pollinates many fruits and vegetables.
- 5 loves salt.
- 2 is not a green metallic sweat bee.
- 3 is not a mason bee.
- 6 can pollinate three times as much as the bee seated in seat 8.
- 9 is pretending to be another bee at the table.





What I learned!

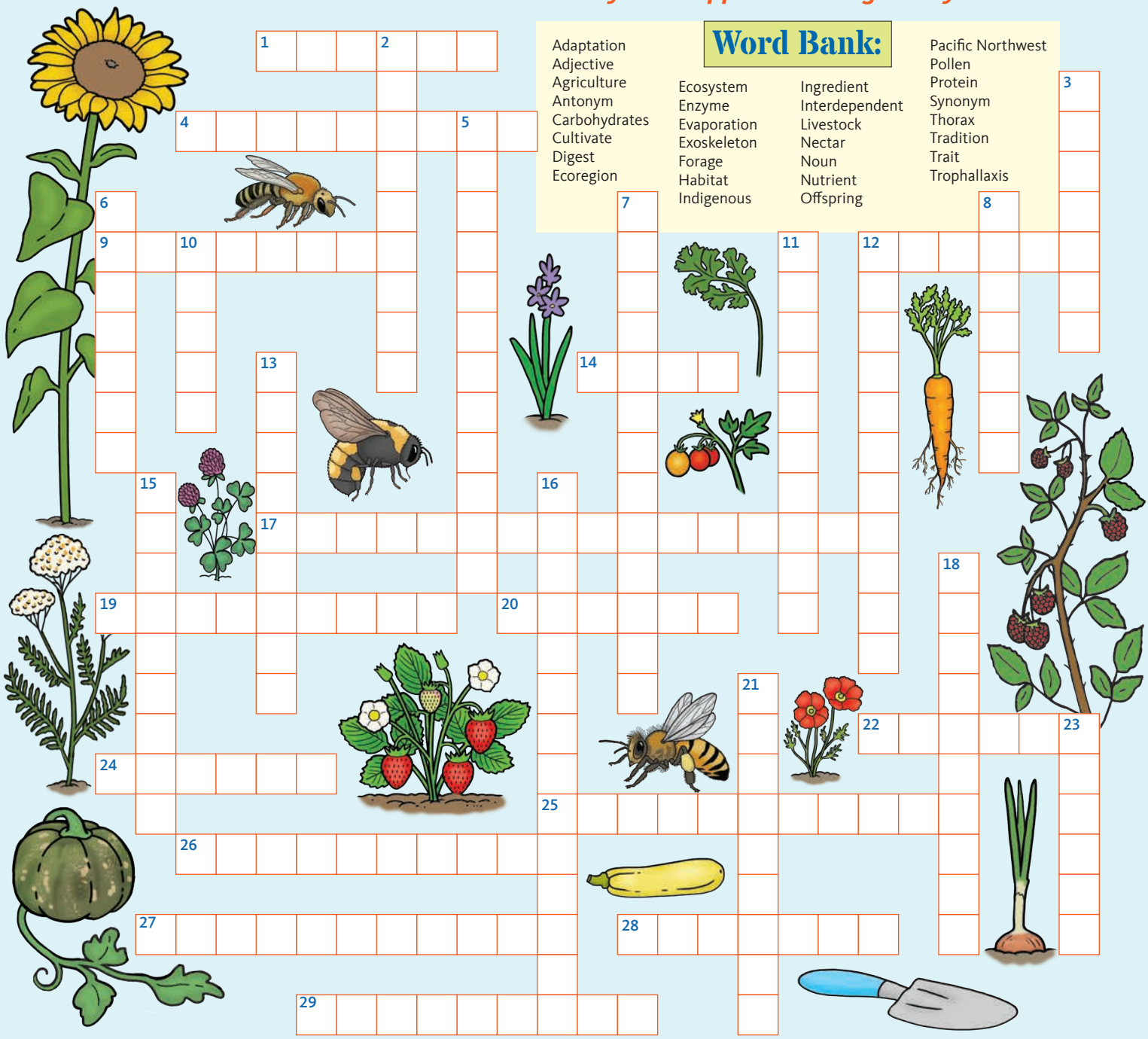
In three paragraphs, summarize a main idea of the book. Include details from the book to support your ideas.

Enhance your response with art before finding someone to share your summary with!

Crossword Puzzle *Every word appears in the glossary!*

Word Bank:

Adaptation
Adjective
Agriculture
Antonym
Carbohydrates
Cultivate
Digest
Ecoregion
Ecosystem
Enzyme
Evaporation
Exoskeleton
Forage
Habitat
Indigenous
Ingredient
Interdependent
Livestock
Nectar
Noun
Nutrient
Offspring
Pacific Northwest
Pollen
Protein
Synonym
Thorax
Tradition
Trait
Trophallaxis



Across

1. A powder moved between flowers by insects, wind, or animals.
4. To till the soil to prepare for planting crops.
9. Substance in food that an organism needs to stay healthy.
12. A type of protein that speeds up chemical reactions.
14. A word that refers to a person, place or thing.
17. Geographic area made up of Oregon, Washington and Idaho.
19. Behavior that has been performed for many generations.
20. A sugary fluid made by flowering plants.
22. To break down food.
24. To seek food.
25. A hard external covering often found in arthropods.
26. A change that helps an organism survive over time.
27. Crops or animals (like corn or cows) raised for money.
28. An animal or plant's natural home.
29. A community of organisms within a specific environment.

Down

2. Bees or farm animals raised for money.
3. In foods, molecules that build your muscles and bones and help your body function.
5. Exchange of spit-up food between insects.
6. A word that means the opposite of another word.
7. In foods, sugars and starches that the body uses for energy.
8. A word that has the same meaning as another word.
10. A characteristic of a species.
11. A part of something greater, like a spice in a soup.
12. The change of a liquid into a gas.
13. A product of an organism's reproduction; a child.
15. An area with similar ecosystems, features and resources.
16. Characteristic of organisms that need each other to survive.
18. Inhabiting a land from the earliest of times.
21. A word like *blue* or *spicy* that describes a noun.
23. In insects, the region of the body between the head and the abdomen.

Honey bees and Douglas asters can be found on Oregon's coastal areas and beaches

The page numbers next to the glossary words indicate the first time that the word appears in the book.

abdomen *(pg. 6)* The segment of an insect's body behind its head and thorax (the middle body part where legs and wings attach).

adapt *(pg. 6)* A change over time in a species to help it survive better in its environment. [adapted]

adjective *(pg. 19)* A word that describes a noun, such as its color, age or texture.

agricultural *(pg. 23)* Referring to the science or practice of farming, including growing crops or raising animals for food, eggs or milk.

antennae *(pg. 6)* A pair of long, thin sensory appendages (external body parts) on the heads of insects; used to smell, hear and feel.

antonym *(pg. 24)* A word that means the opposite of another word.

carbohydrates *(pg. 3)* Words here placeholder maybe need two lines.

cultivate *(pg. 25)* To prepare and use land for farming or gardening; for example, to plant seeds or till the soil. [cultivated]

dehydrated/dried *(pg. 41)* Water removed from.

digest *(pg. 24)* To break down food into parts small enough to be absorbed into the body.

ecoregion *(pg. 51)* A large area of land or water where the climate, rocks, soils and ecosystems are similar.

ecosystem *(pg. 12)* A community of organisms within a particular environment.

emerge *(pg. 23)* *description, placeholder goes here writing and a definition. (Emerging)*

energy *(pg. 3) Fuel or force to do work.*

environment *(pg. 12)* The climate, organisms and physical features (natural and human-made) existing within a region.

enzyme *(pg. 40)* A type of protein that speeds up chemical reactions.

evaporate *(pg. 40)* To convert into vapor (gas); to vaporize.

evolve *(pg. 18)* To slowly change from simple to more complex.

exoskeleton *(pg. 36)* A hard, external covering that supports the body of animals such as shellfish and insects.

fertilize *(pg. 3)* To introduce male reproductive material to an egg in a female animal or plant. [fertilized]

forage *(pg. 3)* To search widely for food or provisions (supplies); to scavenge. [foragers]

genus *(pg. 6)* A category or grouping that ranks above a species and below a family. [genera]

habitat *(pg. 9)* The area where an organism naturally lives and grows.

harvest *(pg. 14)* Gather plants, animals or fish to use as food [harvested].

indigenous *(pg. 1)* Referring to the people, plants or other organisms living on a land from the earliest times; native.

ingredient *(pg. 1)* A component, part or element of something.

interdependent *(pg. 4)* Referring to two or more organisms that are dependent on each other. [interdependence]

kleptoparasite *(pg. 36)* Referring to an animal or insect that compulsively (can't stop themselves) steals.

larva *(pg. 19)* The wingless, worm-like form of an insect that hatches from an egg. [larvae]

livestock *(pg. 34)* Insects and animals cultivated, grown or raised for commercial (to make money) purposes; farm animals.

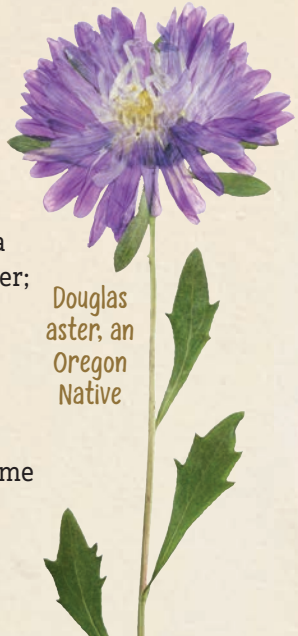
mellitologists *(pg. 6)* Scientists who study bees.

metamorphosis *(pg. 23)* The transformation (change) of one form of organism into another, such as a larva into an adult.

migration *(pg. 8)* The movement of a group of animals from one area to another; relocation [migration].

nectar *(pg. 3)* A sweet liquid made by flowering plants; it is the main substance in honey.

noun *(pg. 19)* A word that is used to name a person, place or thing.



Douglas aster, an Oregon Native

Oregon coastal Digger bee (Habropoda miserablis) nests in sand dunes and likes to forage on coastal wild blueberries.

nutrient *(pg. 3)* A food substance that is essential for an organism to live and grow.

offspring *(pg. 3)* The immediate or first descendant of a person ororganism; child.

Pacific Northwest *(pg. 2)* a United States geographical region that includes the states of Idaho, Oregon and Washington.

perceive *(pg. 8)* To become aware of something by seeing, hearing, smelling, tasting, or feeling it.

pollen *(pg. 2)* A fine powder that flowering plants must make in order to reproduce.

pollinate *(pg. 1)* To deposit pollen on a plant or flower, enabling fertilization. [pollination]

prairie *(pg. 23)* A large area of flat, treeless grassland.

protein *(pg. 3)* A substance made of carbon, hydrogen, oxygen and nitrogen; proteins are essential to bones, muscles and many body functions.

reproduce *(pg. 3)* To produce or make a copy of; to breed.

savory *(pg. 37)* *Salty or spicy food versus sweet*

specialist *(pg. 16)* *Person or animal focuses on a certain subject or action.*

species *(pg. 2)* A group of living organisms that can mate with each other and produce offspring. As a category, a species ranks below a genus.

spoil *(pg. 41)* To destroy the value or quality of something. When food spoils, it is not safe to eat. [spoiling]

synonym *(pg. 24)* A word that has the same or nearly the same meaning as another word.

time immemorial *(pg. 9)* A time so long ago that it is beyond our memory or historical records.

traditional *(pg. 15)* Characteristic of a custom, such as a celebration or method of cooking, that was practiced by earlier generations.

trait *(pg. 15)* A quality such as eye color or shape of leaves that distinguishes one organism or species from another.

trophallaxis *(pg. 40)* The mutual exchange of regurgitated (spit up) liquids between adult social insects or between them and their larvae.

verb *(pg. 19)* A word that identifies an action or a state of being.

Select at least three words from the glossary and create a sentence for each word.

1.

2.

3.

Bonus sentence

Bees help make our food!

Any Berry Sauce

Makes 2 1/4 cups

1/4 cup water
1/3 cup sugar
1 Tablespoon cornstarch
4 cups berries fresh or frozen

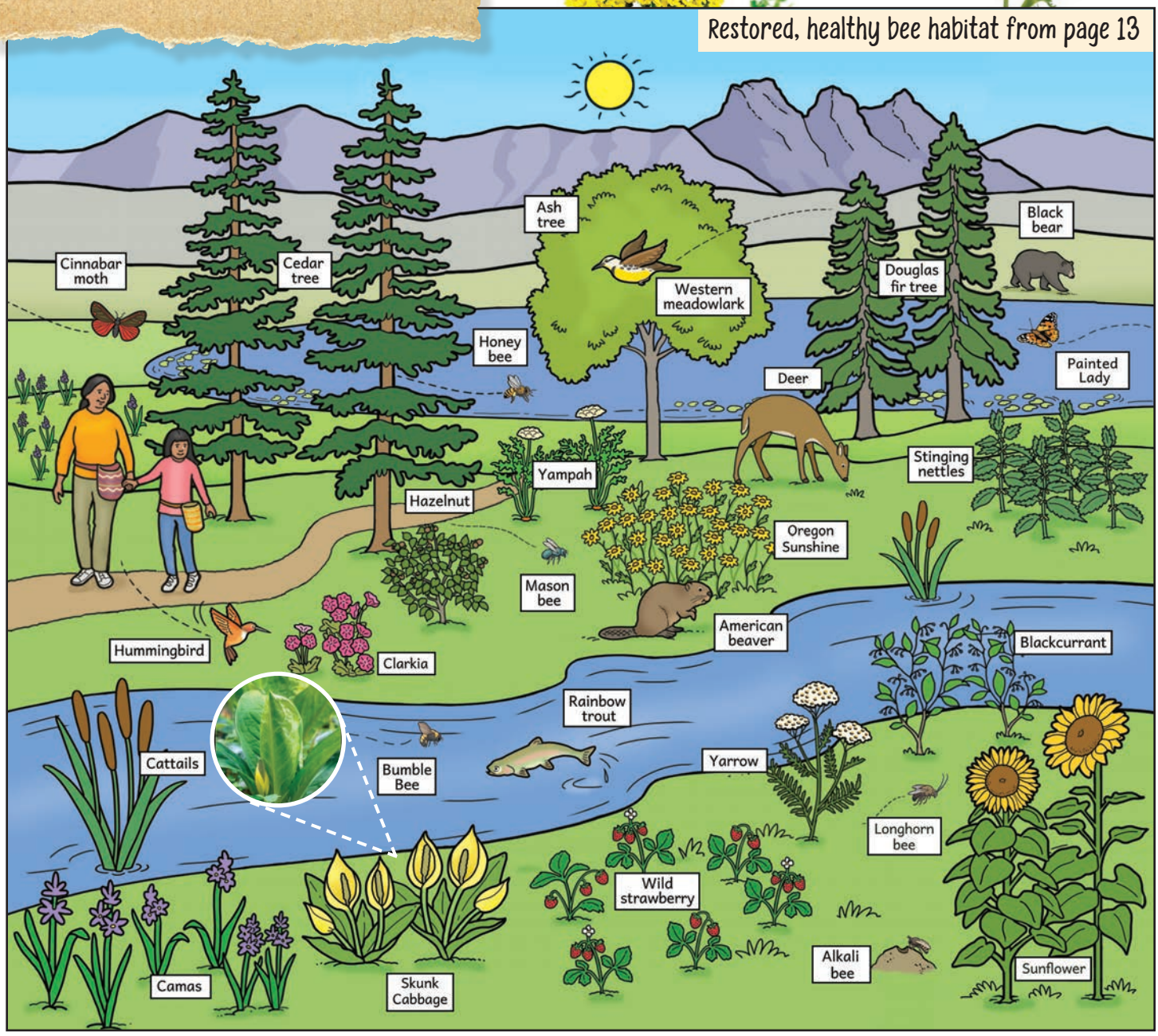
In a saucepan, mix together all ingredients except half the berries. Heat over medium heat, stirring often, until sauce starts to thicken. Remove from heat. Stir in the rest of the berries. Mash if desired. Serve over pancakes, waffles, oatmeal, or yogurt.

Healthy Habitat

Bees thrive and food grows!

Yarrow

Restored, healthy bee habitat from page 13



Explore the Covers!

The plants and animals on the covers of this field guide can be found above.

Shade in the labels of any you can find.

Hazelnuts are wind pollinated but honey bees forage on the pollen of their male catkin flowers (hundreds of flowers per stem) in the winter months. They do not have nectar. This energy source helps restart the growth of honey bee colonies in the spring.

Hazelnuts

Common Bees of Oregon

Field Guide

and foods they help make

Oregon State University Extension Service

Squash Bee

11 to 14 mm in length

Medium-sized, fuzzy bees that feed only on the pollen of squash plants

Squash blossom and butternut squash

Bumble Bee

11 to 23 mm in length

Large, fuzzy bees with bodies most often colored with a mixture of black, yellow, orange, brown or white hairs.

Clover and blueberries

Leafcutter Bee Cuckoo

8 to 12 mm in length

Cuckoo bees are from different species or genera but they always lay their eggs in other birds' nests and do not pollinate or help make food. This cuckoo's pointy abdomen gives its species as a leafcutter away. It nests in a stem like other leafcutters.

Long-Horned Bee

9 to 15 mm in length

Beautiful, medium-sized, and fuzzy, with dark bodies covered in yellow, black, or white hairs. Prefer visiting sunflower family plants and various native plants

Sunflower and sunflower seeds

Mason Bee:

6 to 12 mm in length

Small to medium-sized and often brightly colored in metallic blues, greens, or black. Pollinators of almonds, apples, blueberies, raspberries, cherries, and many wild plants

Cherry blossoms and cherries

Honey Bee

Leafcutter Bee:

6 to 22 mm in length

Darkly colored, small to medium-sized bees. Around 40 different species. Pollinators of alfalfa and many wild plants

Alfalfa

Cheese

Green Metallic Sweat Bee

7 to 12 mm in length

Medium-sized and have a bright metallic green color. Pollinators of many plants like herbs and wildflowers.

Cilantro

Alkali Bee

12 to 13 mm in length

Alkali bees nest in soft, salty soil known as an alkali flat. Growers of alfalfa seed figured out how to make flats to attract them.

Alfalfa plants make alfalfa seeds for hay

Wooly sunflower

(Oregon sunshine), Oregon native

The word sunflower comes from the Greek words for sun (helios) and flower (anthos). But a sunflower is not just one flower! The outer flowers that look like petals are called ray flowers and do not reproduce. The head of the sunflower is made up of many small disc flowers which are tubes with five petals inside them. Each disc flower turns into a seed that we can eat!

"Bee" a Food Hero! A Food Hero leads by example. Food Heroes help prepare meals and snacks using a variety of fruits and vegetables and other foods that depend on bees. They also teach their friends and family members about bees. This field guide is a great tool for Food Heroes! It was created by a team of bee, garden and healthy eating scientists. Native Indigenous experts, farmers, elementary school teachers and elementary and middle school students, Oregon State University students, chefs, artists and writers all helped to make this book special for you!

Field guide: *A book with words and pictures that help readers identify animals, plants, and other living and non-living things found in nature (including bees that help make our food!). The book can be brought outside.*

Visit beav.es/fhbees for more tips, tools and fun!

Blackberries

Marionberries

100% of profits go to support pollinator health and Farm to School in Oregon.

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A Honey bee visits the State Flower of Oregon, the Oregon Grape Flower (Oregon native)