A Year in the Life of a

MOUNTAIN PINE BEETLE

By: Buford the Mountain Pine Beetle

Colorado State Forest Service

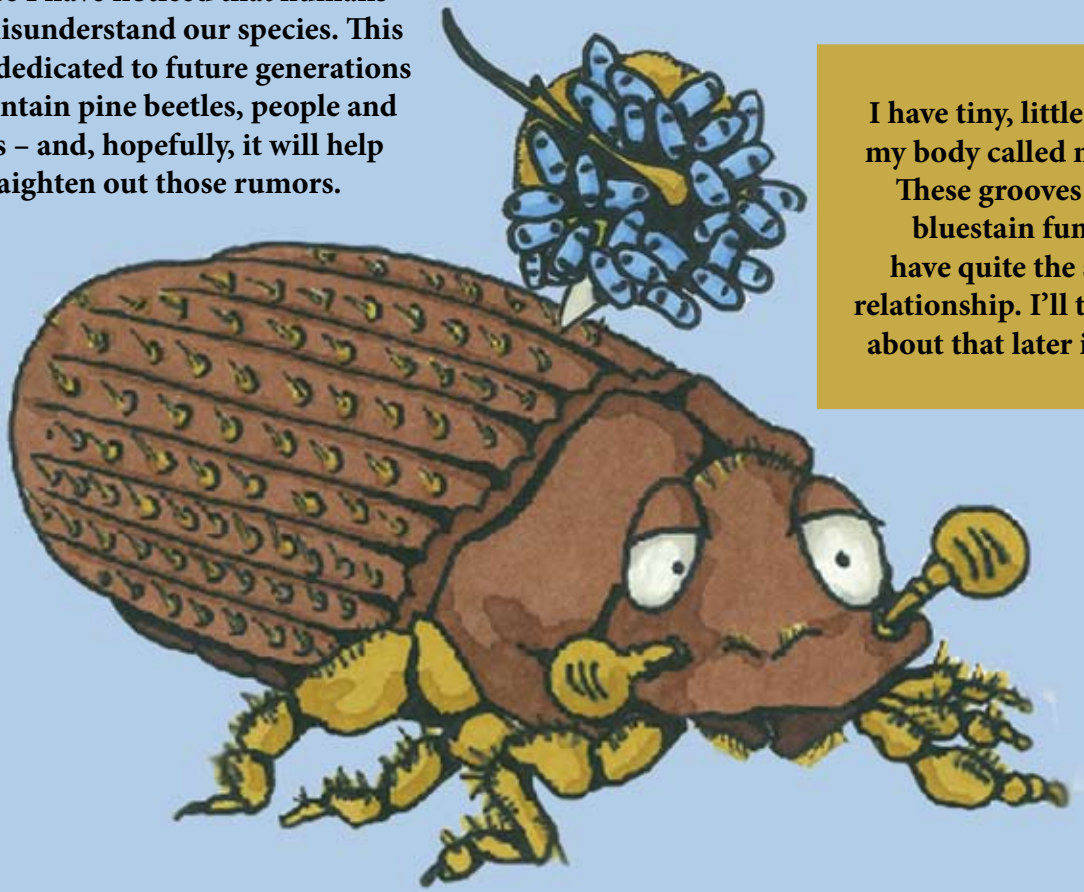
The mission of the Colorado State Forest Service is to provide for the stewardship of forest resources and to reduce related risks to life, property and the environment for the benefit of present and future generations.

Written and Prepared by Lisa Mason and Ingrid Aguayo
Illustrated by Mary Ann Bonnell

A very special thanks to Dave Leatherman, retired Colorado State Forest Service entomologist, for bringing Buford and Bernadette to life — and for sharing his knowledge of mountain pine beetles and his passion for forestry with the citizens of Colorado for over 30 years.

Well, hello there. My name is Buford. I am a mountain pine beetle!

Scientists like to call us *Dendroctonus ponderosae*. I wrote this autobiography because I have noticed that humans often misunderstand our species. This book is dedicated to future generations of mountain pine beetles, people and forests – and, hopefully, it will help straighten out those rumors.



I have tiny, little grooves on my body called mycangium. These grooves carry the bluestain fungus. We have quite the symbiotic relationship. I'll tell you more about that later in the story.

We, mountain pine beetles, play a very important role in our forests. We infest and kill older, larger, stressed trees. This allows more sunlight, nutrients and water to reach smaller trees and help them grow.

To help you understand me better, I want to give you a little background about where I come from. My relatives and I are part of the order Coleoptera. My distant relatives include ladybugs and all other species of beetles. Mountain pine beetles are native to Colorado. We have been here for thousands of years! I also have family throughout Western Canada and all the way down to New Mexico and further West.

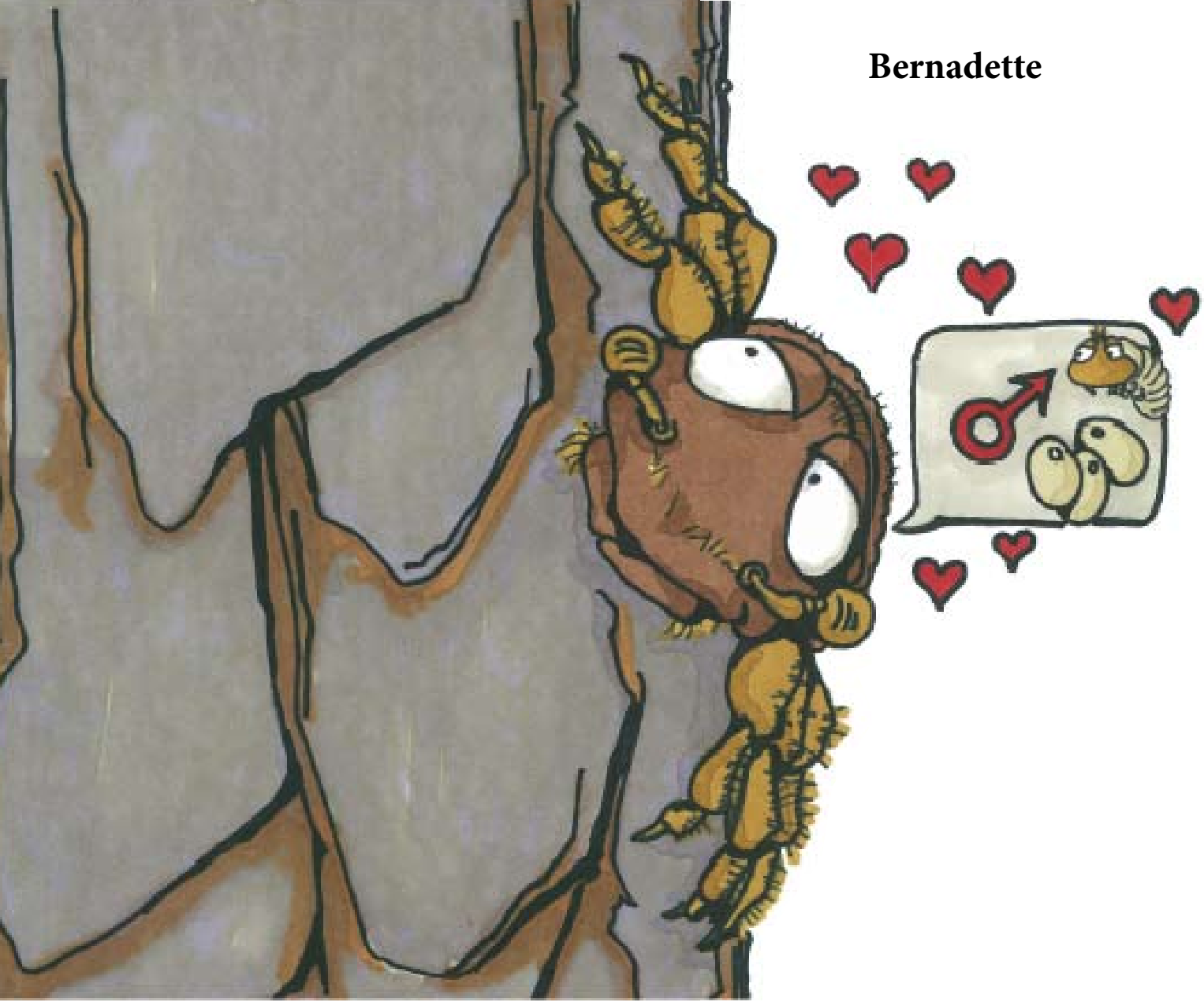
Here is a picture of me. I just became an adult beetle after almost a year of eating and growing. It's time for me to leave the tree I grew up in, so I can find a new host tree and a mate.

Like the rest of my family, I live under the bark of trees. We like to live in a variety of tree species, including: ponderosa pine (*Pinus ponderosae*), lodgepole pine (*Pinus contorta*), limber pine (*Pinus flexilis*), and bristlecone pine (*Pinus aristata*). I have some friends that have tried living in piñon pine (*Pinus edulis*), Scotch pine (*Pinus silvestris*) and Austrian pine (*Pinus nigra*). Some of my friends like those species, but others do not. My family prefers to live in lodgepole pines.

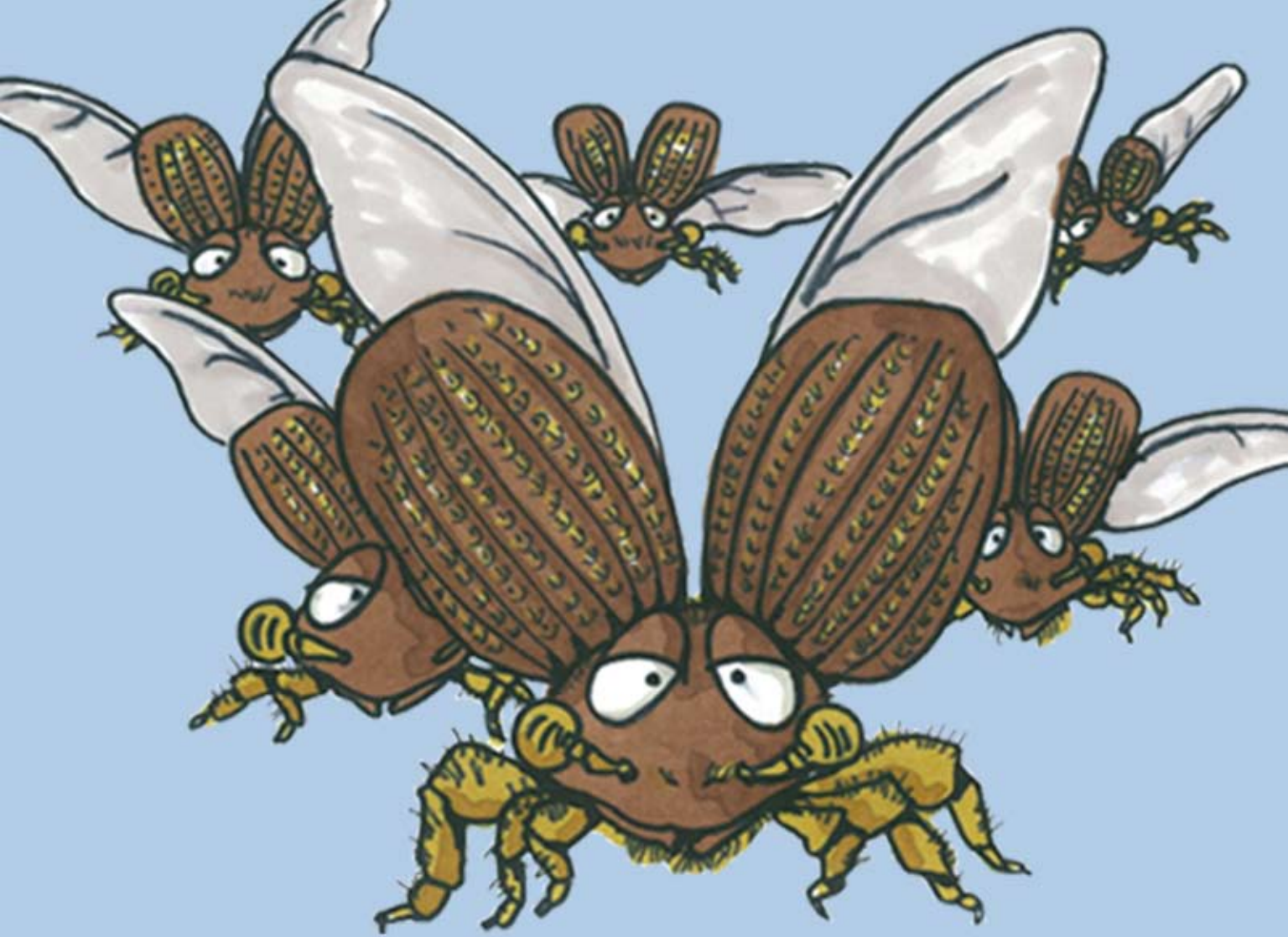
This was my first look at the real world. It's now time for me to take flight and find a new host tree. My instincts told me to find a large, old, or stressed-out tree. Any ideas on how I found the right tree? I looked for wide, vertical silhouettes, in hopes it was a tree. It took awhile. I accidentally ran into a human during my flight, but I didn't hurt him.

It was hard
to narrow down
which tree to pick. Out of a
whole forest, how do you choose?
I relied on tree odors called terpenes.
The mixture of terpenes smell very good in a
dense forests with older trees compared to younger trees. The
chemical compounds shown above are terpenes. Each tree has its own
unique smell, which changes based on age, species and health. Mountain pine
beetles are attracted to trees over 80 years old.

We usually live about one year. During the course of our lives, we go through a complete metamorphosis. Butterflies go through the same cycle, but they get all the fame and glory. Just because they have big, beautiful wings, they are popular among humans. Well, mountain pine beetles go through the same stages! We start off as an egg, and then hatch into a little larva. After hanging out as a pupa, we become adults. This cycle all happens in the protected area under the bark of a tree.



In the meantime, my future mate, Bernadette, has already found a host tree. This tree will provide food for our future children. When our children hatch into larvae, they will feed and grow in the phloem, just under the bark of the tree trunk. The phloem transports food and nutrients to the tree.



So many trees and pheromones...Bernadette, here I come!

Once my fellow beetles and I find a tree, we crawl into the bark. This can be a real challenge. The tree has a set of defenses to keep us out. A tree can produce a high amount of a substance called resin. We could get stuck in the resin. If we can get into the bark, the tree can release an even more toxic resin! I lost brothers and sisters after they got stuck in a sticky tomb of resin. Healthy trees have stronger defenses. This is why we like trees that are older and stressed out.

Bernadette was already successful at entering the tree.

Look at her go!

Once Bernadette was inside the tree, she started producing an attractive smell so I could find her. This smell also attracts other male beetles, so I had a lot of competition. Many other beetles made their home in the same tree. Together, all the beetles helped overcome the tree's defenses.

A tree has limited food and can hold only so many of us. When a tree is full, we work with some microorganisms to produce a scent that repels other beetles. They will have to find another tree for their family.

For Bernadette and me, it was love at first sight! We got to know each other beneath the bark. I made sure to chirp so we could maintain our privacy. Bernadette made an egg gallery, which is a tunnel in the bark we call home. She is a hard worker! After building our home, complete with a nursery, Bernadette crawls up the trunk and lays up to 75 eggs. After this, Bernadette and I will not live much longer. After all, it is time for Bernadette and I to pass on our legacy to our children, whose lives are just beginning.

Here are some of my wonderful children in various stages of growth. They hatched into larvae and some have already turned into pupae. You can see them at the end of their galleries. In this picture, they're burrowing in the inner bark, expanding the gallery. Soon, they will prepare for winter. My kids will be able to produce compounds such as glycerol and sugars to help them survive when the temperatures are extremely cold. These compounds act like antifreeze. Did you know that mountain pine beetles can survive when temperatures reach almost -40 degrees Fahrenheit? After a cold, harsh winter, the kids will start feeding again, until late spring when they molt into pupae. That is similar to when a butterfly enters the cocoon stage.

Winter isn't all that easy. The bark and antifreeze keep us protected. But no matter how quiet we are, birds such as this red-breasted nuthatch always seem to find us. I lost some of my children to woodpeckers and other birds this year.

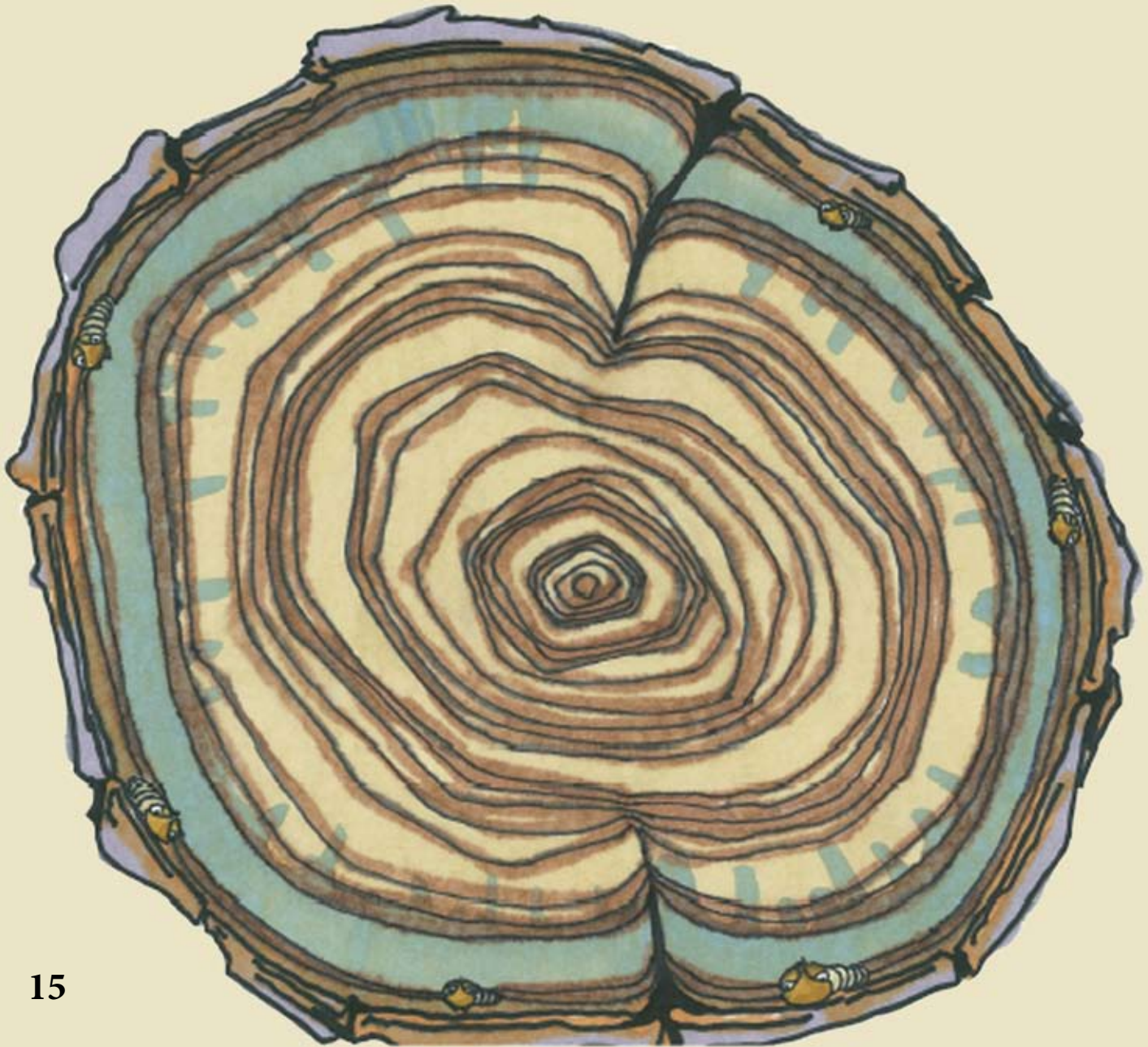
Unfortunately, woodpeckers are not our only enemy.

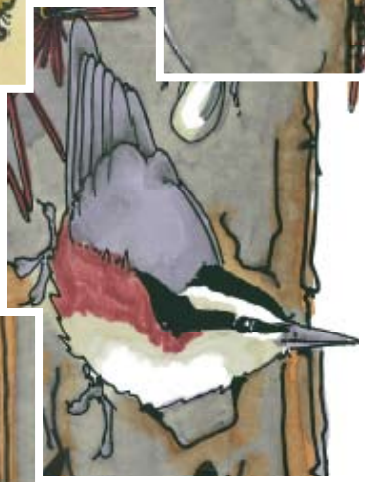
Tiny predatory wasps can detect larvae under the bark, and they lay their eggs in the body of our children. The tiny wasp larvae eat the beetle larvae from inside out.

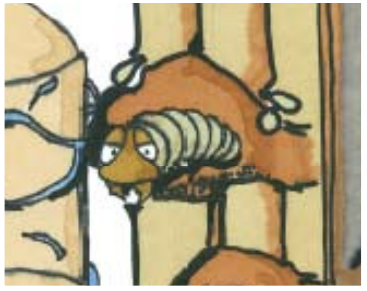
Other predatory beetles also like to prey on us for dinner.

Remember the beginning of the story when I mentioned the great relationship we have with bluestain fungi? Their spores live in little grooves called mycangium on our exoskeleton. As beetles enter the tree, they leave fungi spores along the tunnels they bore. The fungi start growing the moment the beetle enters the tree colonizing the wood and producing a characteristic blue stain, some of which feeds our young. The fungi grow in the phloem area around the beetle and throughout the sapwood of the tree. This relationship works out nicely. The fungi hitch a ride with us, and provide our teenagers with food.

Here's a cross-section of a tree trunk after the winter following a mountain pine beetle infestation. The bluestain fungi grow toward the sapwood. The fungi do not weaken the wood, but they certainly do make it more interesting. Our children, the larvae, are still feeding on the inner bark.

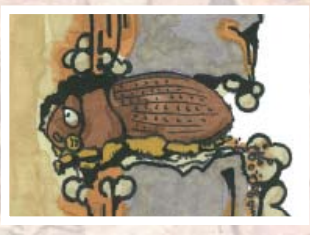






This concludes my life story. I hope it helps you understand my role in the forest. We, mountain pine beetles, play a very important part in a forest ecosystem. For example, lodgepole pines need a disturbance such as an insect infestation or wildfire every 150-300 years to start a fresh, new forest. The trees get old, and it is time to make room for new trees. Mountain pine beetles can sense when the trees are getting old, and it is time for the forest to change. We help make room for water, nutrients and sunlight for the new trees. The cavities of old, dead trees provide homes for wildlife and other organisms such as decay-eating fungi and other insects. With new trees, there is new life and more oxygen. It is one of the many cycles in nature. We depend on the trees, and the trees depend on us. Nature is a dynamic and beautiful process!

Humans can sometimes reduce the risk of our populations growing so large that we kill most trees. This can be done through careful forest management by creating a more diverse forest with different tree species and different ages. That way there will always be green forests for humans to use and enjoy and we will continue to have a home and survive as one of Colorado's native species.



For more information on the Colorado State Forest Service or the mountain pine beetle: www.csfs.colostate.edu