

## **Forest Focus Transcript: Episode 31: Observing Tree Diseases with a Stump Buster**

### **Martin MacKenzie**

I've often heard people say, I hate going for a walk in the woods with you because all I see now is dead trees.

### **Jamie Hinrichs**

This is a voice of a professional observer, Martin McKenzie. Martin detects what most of us would miss - the subtle signs of a dead and dying tree within a sea of evergreen.

### **Martin MacKenzie**

Anybody else standing here would probably look at this stand and see the beautiful Ponderosa in the wonderful incense cedar. But I see a dead spire in the distance. Bleached, bark long since lost. Those are the things in my eyes cue on immediately.

**[piano & cello music begin, bittersweet melody]**

### **Jamie Hinrichs**

Welcome to Episode 1 of Echoes from the Understory. This series is all about forest health: what it means, why it matters, and how it is secured. Audio gives us boots-on-the-ground connections with our public lands where we can immerse ourselves in the soundtrack of forest health.

If you're ready, let's wander into the woods with the tree doctor to discover how observation is essential for forest health. By dedicating himself to observation, Martin sees what others miss in the forest - signs of illness and immunity in trees.

**[piano & cello music fades]**

We find our observation expert in his office in Sonora, California.

**[steps on pavement. knock on a wooden door. door squeaks as it opens]**

### **Martin MacKenzie**

Hi there. Martin Mackenzie. I'm the forest pathologist for the South Sierra Shared Service area. I have a partner who's a professional entomologist, and we cover forest health issues for the Inyo, the Sequoia, the Sierra, the Stanislaus and have I forgotten one? Yes, the Eldorado. Those are my five forests. I started my career in '66 with the New Zealand Forest Service, and I've been with the U.S. Forest Service for 30 years now.

### **Jamie Hinrichs**

As a forest pathologist. Martin can be thought of as a tree doctor, and for 55 years, he has devoted himself to ...

**Martin MacKenzie**

The study of diseases that either kill trees or produce warts or galls or cankers.

**Jamie Hinrichs**

In meeting Martin, we befriend a fusion of Sherlock Holmes and John Muir. He is both a detective of disease and an earnest caretaker of trees. But what is it about forest pathology that has kept him at it for decades?

**Martin MacKenzie**

I get to go out in the forest. I get to ask questions. I get to ask what killed that little white fir there?

**Jamie Hinrichs**

Observation is essential to the work he does outdoors, but it is also foundational to his indoor pursuits.

**Martin MacKenzie**

This is my lab. These are fungi I've been collecting. I'll show you that fungus and the trees and the damage it does. I got a zoo. I will show you my zoo before we head out.

**Jamie Hinrichs**

Martin's zoo is a cabinet of curiosities containing an array of insect specimens. Each is carefully pinned and preserved under glass.

**[drawers slide open, softly]**

He pulls out the drawers so we can meet his menagerie. The most impressive are the smallest truly specks upon the earth. They seem designed to be overlooked, but they did not escape the notice of this keen observer.

**Martin MacKenzie**

That's the world's biggest collection of *Pityophthorus boisei*, it's a twig beetle. And I just found it by accident one day, and I followed it for some years. Okay. Let's head to the woods.

**[Soundbite of calming ambient music, with mostly warm tones from a xylophone-like instrument]**

Stanislaus 52 heading to Cold spring, returning to the office 1600 over.

**Stanislaus NF Dispatch**

Stanislaus copies all. It's zero eight fifty-three.

**[car keys clink. engine starts. low hum of driving]**

**Jamie Hinrichs**

On the drive. Martin tells us a bit about his family and boyhood. His interest in observing nature started early in his life and was with him when his family moved from Scotland, his birthplace, to New Zealand by ship.

**Martin MacKenzie**

The Captain Cook. She was an old Second World War troopship. And I went through the Panama Canal. I remember looking up on the deck, looking for crocodiles. Other people said they saw them, I didn't.

**Jamie Hinrichs**

Our automobile odyssey is taking us up into the forest. There is fresh snow on the ground and the temperature falls as we rise in elevation. Going into the forest to look for symptoms of disease is a regular part of Martin's job. But the methods he has used over the years seem profound because they are so simple. They make me aware of how infrequently I have practiced anything similar to my own forest visits.

**Martin MacKenzie**

I walked down the road making observations and it gave me a greater perspective of forest health.

**[blinker starts]**

This is Forest Road for 4NO1, and this is where I told dispatch I would be.

**[blinker stops. engine turned off. keys removed from ignition. car doors open in close. jacket zipped]**

We've gone up Highway 108 to about 5000 feet on the Stanislaus National Forest. Let's wander up the road a little bit.

**[steps through snow]**

This stand is really in tough shape.

**Jamie Hinrichs**

At first glance, it is hard to see what Martin means to our eyes. The forest looks healthy, crowded with trees and dusted in snow. The cold nips at fingertips and toes. But the shining sun melts the snowflakes from branches, creating a hum of clinking droplets, hitting the snow carpet on the forest floor.

**[droplets hitting snow-covered forest floor]**

**Martin MacKenzie**

That's beautiful. Don't often see melting snow coming down.

**Jamie Hinrichs**

The perfume of damp evergreen freshness is an invitation for wandering and wandered we must, if we are to learn how to see the forest with the eyes of an expert observer.

**Martin MacKenzie**

I hope you would see that the two major diseases are root rots, *annosous*, and blister rust.

**Jamie Hinrichs**

Martin has observed key symptoms of these two diseases in this part of the forest before, and he has taken samples of wood and fungi back to his lab for further study. He returns here regularly to map and monitor the spread of these two diseases. First, we'll take a closer look at root rot, which attacks white fir. In describing how he detects this disease. Martin reveals his alter ego...

**Martin MacKenzie**

I'm a stump buster because the fungus grows inside the cave of the stump. So you've got to break open the stump to find the fungus inside. We'll have a look inside the adjacent stump.

**[scrapes snow off stump]**

I'm scraping the snow off to see if there's a conk in it. I'm going to break it off to find out.

**[pulls at wood fibers. kicks at the stump]**

I'm not going to break it off easy, that's for sure. It's tougher than it looks. That was conk. It's sort of like a woody mushroom. The top has a rind on it, which is dense. The bottom surface was an old pore layer. Broke like biscuit.

**Jamie Hinrichs**

For plant pathologist like Martin, stumps contain silent plotlines that reveal how disease move from one tree to another.

**Martin MacKenzie**

The stumps adjacent to those trees are critical in telling this story.

**Jamie Hinrichs**

Much like many human illnesses, tree diseases can spread in overcrowded conditions.

**Martin MacKenzie**

If the fir trees are close to each other, they will be frequently root grafted and the fungus can get from this stump ... yeah, this stump ... into that adjacent tree. It landed on the stump, grew

down the stump, grew down the root graft, and up into this tree. Once this fungus is in the stand, it is there forever. So density of one species might affect the survival of another species.

**[tense music plays, mostly string instrument]**

**Jamie Hinrichs**

What we are starting to see here is that disease is a reoccurring piece in a domino effect of hazards that are impacting forest health. Overcrowded conditions allow disease to infiltrate more trees, but perhaps more surprisingly.

**[tense music ends]**

**Martin MacKenzie**

Disease can lead to increased fire risk. When these trees die and fall on the ground, they become thousand-hour fuels and they'll burn for a thousand hours when they catch fire. But once you've got dense vegetation in taller trees and low vegetation underneath, it can crown fire. And that's what's the most dangerous. That's what we lose, the greatest number of trees.

**Jamie Hinrichs**

And that's not all. Along with density and wildfire risk disease is linked with another element impacting forest health - insect outbreaks.

**Martin MacKenzie**

We haven't talked about bark beetles, but we're going in here because this is a small cluster of trees that died during the drought.

**Jamie Hinrichs**

Martin shares that drought weakens the defenses of trees, which makes them vulnerable to disease and bark beetle attacks. But the question of which came first is something of a chicken or egg dilemma.

**Martin MacKenzie**

So the root rot stressed the tree first, the beetles attacked it in mass, and pushed it over the edge. This is an argument I have every time I come out with my partner entomologist, she blames my root rots and I blame her insects.

**[breaking bark from a tree trunk]**

Let's see if I can get this piece of bark off. This is mass attack. That's 200, 400, 600, 800,000, 1200 eggs in under eight inches. That's an incredibly large number of eggs that hatch and grow out of little ones.

**Jamie Hinrichs**

We can learn more about these attacks by closely observing the passages under the tree bark

that the mother beetles and her hatchlings carve. These are called galleries. The shape of a gallery varies by species, which helps forest health professionals to identify which type of beetle is impacting the forest. The galleries in this tree are curvy, as if a noodle left an impression in the wood, or, as Martin puts it ...

**Martin MacKenzie**

All squiggly and crooked like spaghetti.

**Jamie Hinrichs**

Through this culinary-themed observation, Martin concludes it is likely a Western pine beetle that attacked this tree because of his...

**Martin MacKenzie**

Method of associating Western pine beetle with spaghetti westerns.

**Jamie Hinrichs**

I know what you're thinking, and I'm not so sure where this is going either. The connections between insects, westerns and Italian food seem questionable. But I'm intrigued to see where Martin might take us. And to follow him into this creative frontier of observation, it turns out we need a bit of film history.

**[Western music begins]**

In the 1960s, Italians pioneered a subgenre of Western films featuring titles such as.

**Martin MacKenzie**

*Fist Full of Dollars, The Good The Bad and the Ugly.* They were called spaghetti westerns.

**Jamie Hinrichs**

A term coined in reference to the Italian food spaghetti. And so when Martin is making observation in the woods and he sees a gallery under the tree bark that is...

**Martin MacKenzie**

All squiggly and crooked like spaghetti.

**Jamie Hinrichs**

He is able to identify the likely attackers by making a mental leap from scenes of spaghetti westerns to visions of Western pine beetles. I, for one, will never look at Clint Eastwood or noodles quite the same.

**[Western music fades]**

With westerns on the mind, we can turn our attention to another disease desperado. While root rot was attacking white fir, this one is attacking a different species of tree.

### **Martin MacKenzie**

See this sugar pine in front of us? I was just walking along and I spotted limbs where the needles have all died. You follow them back and you can usually see a swelling. And if you're really lucky, it'll glisten where the tree has produced resin. And see this dead spot in the main branch here? This is a canker

**[finger touches the canker's stickiness]**

caused by white pine blister rust, this exotic disease that came into this country.

### **Jamie Hinrichs**

This disease is not native to the United States. It came here from Asia by way of Europe in the late 1800s, and it has been spreading westward ever since. It attacks all five needle pines, including the sugar pine we are looking at here. Through observation, Martin, deduces how the disease infiltrated this tree.

### **Martin MacKenzie**

The spores landed on the needle, grew down the needle, grew into the branch, grew into the main stem, and girdled the main stem. No water will get past the girdle, and everything above that will die. All the cones that were produced at the tips of the branches will die too. So there will be no seeds produced. It will eventually sterilize this tree, threatening the future of sugar pines. So my interest as a pathologist was looking to see who is going to replace these big trees. I don't want to see the number of species in a stand decline because the greatest strength of the mixed conifer forest type is diversity.

### **Jamie Hinrichs**

Tree diseases often only infect specific kinds of trees while having no impact on other species. This is why it is so important to have a variety of species in a forest. It creates obstacles for disease transmission.

**[Upbeat music with a ticking plays]**

As we've seen, root rot infects white fir and white pine blister us infects sugar pine. So having a mixture of these two trees along with other species like ponderosa pine and incense cedar makes it harder for either disease to take over the forest. In addition to supporting species diversity, the Forest Service is applying other methods to mitigate the spread of diseases.

**[Upbeat music with a ticking fades]**

### **Martin MacKenzie**

We have a control measure for the root rot. It's native. We know how to handle it. It is a borate treatment of the stumps to kill the spores.

**Jamie Hinrichs**

But other diseases like blister rust require a more complex response.

**Martin MacKenzie**

Blister rust, the only control measure we have at the moment is breeding for resistance. Success will be finding trees that have the genes for resistance to the rust.

**Jamie Hinrichs**

Fortunately, there is evidence of resistance here.

**Martin MacKenzie**

I hope to show you one tree that is the future. It is this tree here. You see the label on this one? Sugar pine blister rust evaluation. This tree has been selected to evaluate genetic resistance to whitepine blister rust, the silviculture group of the Stanislaus sent tree-climbing crews to collect cones. And the cones were grown up at the Placerville Nursery and subjected to blister rust spores. So we've got to make sure that the squirrels don't eat too many of the seeds. So we put aluminum bands on the trees, two or three feet in depth, and the squirrels can't climb because they can't get traction. We only put it on the trees that we know have resistant seed. If they don't have resistant seed, the squirrels can have them. And this is the most valuable tree in the stand. This is the future of the stand. This tree will go on to produce cones. And if its cones are resistant to blister rust, this is one that will produce the next generation.

**[bird chirps]**

**Jamie Hinrichs**

As we leave the forest today. We do so with new eyes. Martin has guided us in how to detect changes in forest health through observation of two diseases root rot and whitepine blister rust. Through our woodland wander we've also gained an ability to notice the silent contributors of disease transmission - overcrowded forest conditions and drought. What was once nearly invisible to us is now a story to be seen and heard within the landscape, such as the transformative power of observation.

Before we leave the forest, Martin shares his own thoughts on observation.

**Martin MacKenzie**

The last year, when I came up here on my own and parked the car at the top of the road and just walked down, I would only get as far as I went. If I saw something that caused me to deviate, I would take my time to spot and observe it and then continuing, knowing that next week I walked slightly further down the road. I was building up an idea of what is normal for this piece of forest. It's the only way I can detect change.

**[piano & cello music begin, bittersweet melody]**



This episode was produced by me, Jamie Hinrichs with story consultation from Claire Schoen. Music is from Pixabay. Keep your eyes and ears out for the next episode of Echoes from the Understory.

**[piano and cello fade]**

**Paul Wade**

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