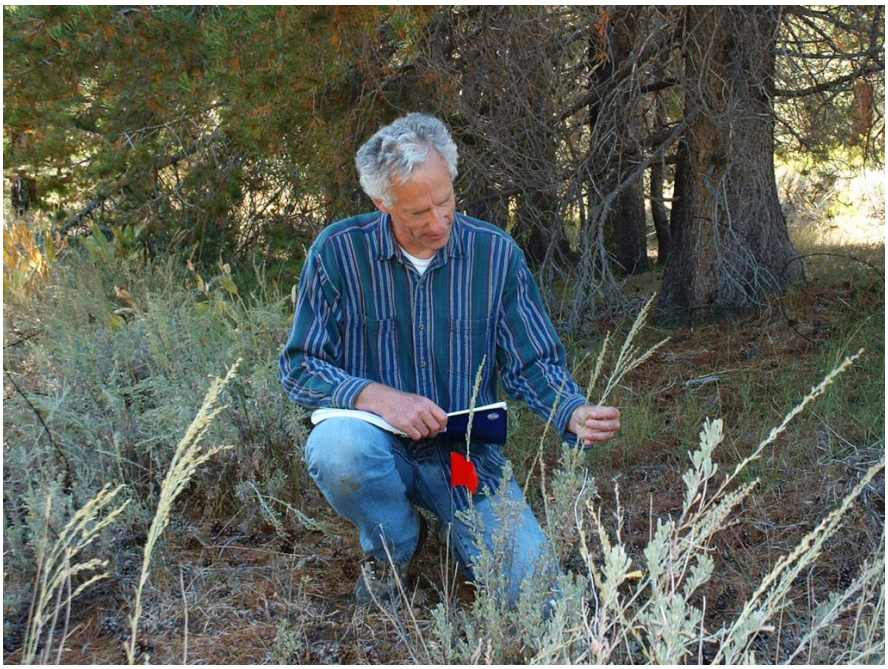

Rick Karban has researched plant communication in sagebrush (Artemisia tridentata) on the east side of the Sierra since 1995.

UCD prof: Plants can eavesdrop, sense danger in their environment

If you've been talking to your plants for years, you're not alone. But know this: Plants can communicate, too. They eavesdrop, sense danger in the environment and can distinguish friend from foe.

A plant under a predatory attack will emit volatile chemical cues, enabling its neighboring plants to adjust their defenses to better protect themselves.

So says ecologist Richard Karban, professor of entomology in the UC Davis department of entomology and nematology, in his newly published book, "Plant Sensing and Communication" (University of Chicago Press).

The 240-page book is a "landmark in its field," said Graeme Ruxton of the University of St. Andrews, in the United Kingdom, co-author of "Experimental Design for the Life Sciences and Plant-Animal Communication."

"Karban seeks to argue that plants behave — that they sense their environment, detect and communicate with an array of different organisms, and respond to their sense of the environment and communication," Ruxton said.

”He is very successful in this, demonstrating that plant sensing and communication is a vibrant area of current research with still plenty more to discover.”

The book is “the first comprehensive overview of what is known about how plants perceive their environments, communicate those perceptions, and learn,” according to the publisher.

“Facing many of the same challenges as animals, plants have developed many similar capabilities: they sense light, chemicals, mechanical stimulation, temperature, electricity, and sound. Moreover, prior experiences have lasting impacts on sensitivity and response to cues; plants, in essence, have memory.”

Added the publisher: “Nor are their senses limited to the processes of an individual plant: plants eavesdrop on the cues and behaviors of neighbors and — for example, through flowers and fruits — exchange information with other types of organisms. Far from inanimate organisms limited by their stationary existence, plants, this book makes unquestionably clear, are in constant and lively discourse.”

What are 10 things to know about plant sensing and communication? According to Karban:

1. Plants sense their environments and respond;
2. Although they lack central nervous systems, they process information and appear to “behave intelligently”;
3. They sense the position of competitors and “forage” for light;
4. They sense the availability of water and nutrients in the soil and “forage” for these resources;
5. Their decisions are influenced by past experiences, akin to memory;
6. They respond to reliable cues that predict future events, allowing them to “anticipate”;
7. Plants respond differently to cues that they themselves produce, allowing them to distinguish self from non-self;
8. They respond differently to close relatives and strangers;
9. Plants that are prevented from sensing or responding experience reduced fitness; and
10. By understanding the “language” of plant responses, we can grow healthier and more productive plants.

Karban has researched plant communication in sagebrush (Artemisia tridentata) on the east side of the Sierra since 1995. His groundbreaking research on plant communication among kin, published in February 2013 in the Proceedings of the Royal Society B: Biological Sciences, drew international attention.

In that study, Karban and his co-researchers found that kin have distinct advantages when it comes to plant communication, just as “the ability of many animals to recognize kin has allowed them to evolve diverse cooperative behaviors.”

“Plants responded more effectively to volatile cues from close relatives than from distant relatives in all four experiments and communication reduced levels of leaf damage experienced over the three growing seasons,” they wrote.

In other words, if you’re a sagebrush and your nearby kin is being eaten by a grasshopper, deer, jackrabbit, caterpillar or other predator, communication is more effective if you’re closely related. Through volatile cues, your kin will inform you of the danger so you can adjust your defenses.

Karban likened this kind of plant communication to eavesdropping.” Plants “hear” the volatile cues of their neighbors as predators damage them.

The most basic form of communication? When a plant is being shaded, it senses the diminished light quality caused by a competitor and responds by moving away, Karban says.

“Plants are smart,” wrote Adrian Barnett of New Scientist in reviewing the book. “But to notice we have to overcome our ingrained cultural biases. … Clearly, we will never play chess with a rose, nor ask the orchid on our window sill for advice. But that is the point: Humans are guilty of serious parochialism, of defining intelligence in terms of a nervous system and muscle-based speed that enables things to be done fast …

“Plants are highly responsive, attuned to gravity, grains of sand, sunlight, starlight, the footfalls of tiny insects, and to slow rhythms outside our range,” Barnett continues. “They are subtle, aware, strategic beings whose lives involve an environmental sensitivity very distant from the simple flower and seed factories of popular imagination.”

Barnett praised Karban’s book as a “timely, highly accessible summary of fast-developing fields.”

Karban is a fellow of the American Association for the Advancement of Science and has published more than 100 journal articles and three books.

He is featured in the Dec. 23-30, 2013, edition of The New Yorker in Michael Pollan’s piece, “The Intelligent Plant: Scientists Debate a New Way of Understanding Plants.”