Bring in the cows

Grazing may be the best hope for a threatened butterfly

A bay checkerspot butterfly (above) on a tidy-tips wildflower on Coyote Ridge near San Jose, California. Conservation biologist Stuart Weiss (right) has found that areas grazed by cattle for a short period, like those on his side of the fence, are better butterfly habitat than ungrazed areas like those across the fence. Facing page, cattle eat invasive grasses on one area of Coyote Ridge, before being moved on to another.
THOMAS NASH

"There they are, the keystone herbivores!" shouts conservation biologist Stuart Weiss. Framed by the front window of his Toyota truck, a small herd of cattle can be seen grazing near the crest of Coyote Ridge, a craggy promontory of serpentine rock that towers over the city of San Jose, Calif., unofficial capital of Silicon Valley. Ten cows and as many calves turn to stare, then go back to cropping grass turned green by winter rains.

No, laughs Weiss, these are not the infamous hooved locusts, tramplers of wildflowers, creators of cowburnt wastelands. These are well-mannered cows that don't overgraze because they are regularly moved from pasture to pasture. As a result, Weiss says, the grass-nibbling they do is beneficial, not harmful. In fact, their presence in these rugged rangelands may well be the only thing standing between an iconic insect, the Bay checkerspot butterfly, and near-certain extinction.

An affable 6-footer who makes his living as an ecological consultant, Weiss has followed the declining fortunes of the Bay checkerspot ever since 1979, when he was a freshman at Stanford University. For the past decade, he has been sounding the alarm about what he now considers the most pernicious threat to the beautiful bug's near-term survival — the unholy synergy between invasive grasses and urban smog.

Smog, Weiss explains, contains not just carbon dioxide, the gas that drives global warming, but also a cocktail of nitrogen-rich compounds. Swept by the winds onto nearby rangelands, these compounds act like spray-on fertilizer, encouraging the rampant growth of Italian rye, wild oats and soft chess. Left unchecked, these aggressive annuals quickly overrun low-lying native plants, including dwarf plantain, the chief food source for Bay checkerspot caterpillars.

And this, of course, is where the cows come in.

To illustrate the point, Weiss parks his truck and hikes into a meadow the bovines have recently mowed. All around him, wildflowers are in various stages of bloom: California poppies, goldfields, red maids, tidy-tips, desert parsley, wild onion. Best of all is the silvery carpet of dwarf plantain that unfurls underfoot, "the most important plant in the world," Weiss calls it. Sure enough, in the midst of the plantain lies a fuzzy caterpillar, enjoying a postprandial nap.

"Isn't that the California lifestyle for you!" Weiss beams. "First you enjoy a salad of tender young greens, then you bask in the sun!"

Suddenly, the 49-year-old scientist starts to run, following a fluttering in the air, and just as

suddenly he skids to a stop. In front of him, on a lichen-speckled rock, an adult Bay checkerspot spreads its wings to reveal a mosaic of orange and white set off by vivid black. Soon, thousands more like it will emerge from their tent-like chrysalises, and, over the course of a lifespan measured in days, they will mate, lay their eggs and die.

Were it not for the cows, Weiss says, these exquisite, ephemeral creatures could easily be the last of their kind.

FOLLOWING A STAIRCASE of hoof prints, Weiss climbs to the top of a rocky knoll that affords a sweeping view of the valley and coastal mountains. Overhead a black-shouldered kite hovers; beneath us, a Black Angus cow and her calf duck into an oak-shaded ravine. Settling down on an inviting patch of ground, Weiss unstraps his backpack and pulls out a sandwich, a bar of chocolate and a thermos of green tea.

For a while we sit in silence, staring down at the cars and trucks streaming along U.S. Highway 101 a thousand feet below. Not visible from here is the full network of roads that connect San Jose and other Silicon Valley cities to the San Francisco Peninsula. Despite tighter emission controls, Weiss says, the vehicles that ply this congested corridor — over 100,000 per day on U.S. 101 alone — generate a significant amount of pollution, which the winds then lob onto Coyote Ridge.

At first, it seems odd to think of nitrogen as pollution. After all, 78 percent of the air we breathe is nitrogen. But that nitrogen is inert. What worries Weiss and others is so-called "reactive" nitrogen.

The compounds that belong to this category — nitrogen dioxide, ammonia, nitrate, nitric acid — are biologically and chemically labile. They bounce from the land to the atmosphere to the ocean and back to the atmosphere again, triggering a complex sequence of chemical reactions. "The nitrogen cascade," University of Virginia environmental scientist James Galloway terms it. Among the cascade's byproducts is low-level ozone, which can be toxic to humans as well as trees.

Both plants and animals require moderate amounts of reactive nitrogen in order to synthesize protein. A judicious addition of nitrogen greatly increases crop yields. But an overload can strip soils of calcium and magnesium, leading to lower fertility as well as acidification. Excess nitrogen can also lead to eutrophication — literally, an enrichment of nutrients — which disrupts both terrestrial and aquatic ecosystems by spurring the growth of some species at the expense of others.

Nature doles out reactive nitrogen parsimoniously. Lightning, for example, produces enough heat to drive the production of nitric oxide. In addition, many microbes release reactive nitrogen as they decompose organic matter. Microbes that colonize the roots of legumes such as soybeans have the additional knack of taking nitrogen from the air and converting it into a form usable by plants.

Around 1970, human emissions of reactive nitrogen surpassed terrestrial emissions from natural sources, then kept on going. At present, human-related sources release around 190 million metric tons of reactive nitrogen per year, compared to an estimated 90 to 120 million metric tons for natural sources. By 2050, our annual contribution could top 270 million metric tons.

"Of all the chemical cycles essential to life on earth, the one we've changed the most is the nitrogen cycle," says Cornell University biogeochemist Jed Sparks.

Reactive nitrogen makes its way into the biosphere in myriad ways. Some of it flows directly into rivers and streams from agricultural runoff and urban sewage spills. Increasingly, though, it wafts into the atmosphere from exhaust pipes, power plants and factories, as well as from fields doused with ammonia-based fertilizer and manure piles associated with cattle feedlots and dairy farms.

As a result, biologically significant quantities of reactive nitrogen are now reaching the highest places. In the Colorado Rockies, reactive nitrogen has upped the metabolic activity of certain soil microbes and overturned once-stable communities of algae in high-altitude lakes. The plants that compose the alpine tundra are also responding. Some species — native bunchgrasses, alpine bluebells — clearly like the extra jolt. Others, however, appear to be losing ground, among them a slow-growing bog sedge.

At lower elevations in the West, introduced grasses stoked by nitrogen are overwhelming many ecosystems, including the coastal scrub of Southern California. Nitrogen is also implicated in the grass invasion occurring in the Mojave Desert, downwind of the smog-filled Los Angeles basin. The grasses expand their range during the winter rainy season, and then, in summer, once the rains end, they dry up. And then, quite often, they burn.

NOT THAT LONG AGO, tens of millions of Bay checkerspots likely fluttered over the Bay area. Then the Spanish arrived, bringing the seeds of Mediterranean pasture grasses. These fast-growing annuals quickly spread everywhere, avoiding only the poorest soils, particularly those derived from serpentine, a class of greenish minerals for which the state rock of California is named. Naturally low in nitrogen, these soils protected the checkerspot until well into the 20th century, when highways, housing developments and shopping malls invaded the serpentine, chopping it into ever smaller, more vulnerable patches.

Like other insects, checkerspots are prone to boom-bust population cycles. A hillside that supports 20,000 caterpillars one year may harbor less than 3,000 a year or two later. Heavy spring rains knock egg masses off stems and prevent adults from feeding. Hot dry springs cause dwarf plantain and flowery nectar sources to shrivel

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early, leading to mass starvation. Stressed by multiple years of bad weather, small, isolated populations can easily go extinct, as happened at Stanford University's Jasper Ridge Biological Preserve in the late 1990s, around a decade after the Bay checkerspot was officially listed as threatened.

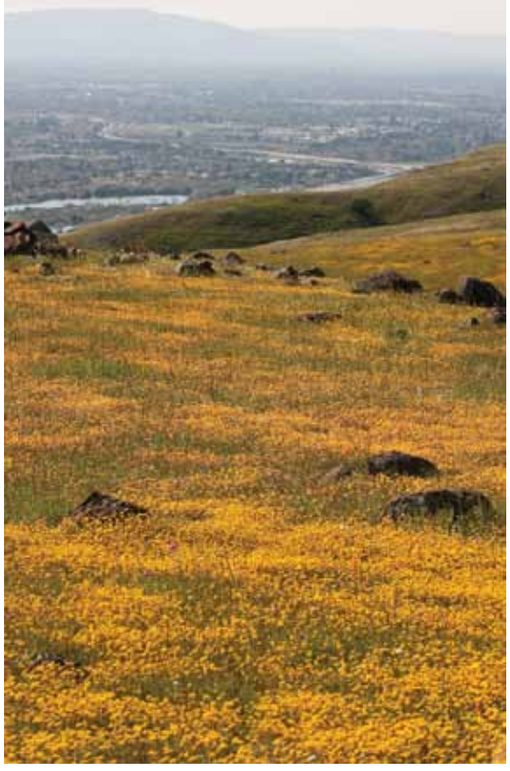
By that point, Weiss was concerned about the fate of much larger Bay checkerspot populations. In the early 1990s, he started monitoring the ecological health of six Coyote Ridge properties. All had extensive stands of dwarf plantain, seemingly healthy checkerspot populations and, as Weiss went on to establish, similarly high rates of nitrogen deposition — between 10 and 20 pounds per acre per year, up to five times the rate measured at a less polluted location.

There was, however, one key difference. At two of the properties, near the northern end of the ridge, grazing had recently stopped. While Weiss looked on, both turned into dense swards of Italian rye grass; as the native plants faded away, so did the Bay checkerspot butterflies.

In 2001, checkerspots vanished from another swath of ungrazed serpentine, this time at Edgewood Park, a nature preserve that borders Interstate-280. Once again, the population crash coincided with the disappearance of dwarf plantain under a smothering cover of grasses. Once again, Weiss measured a high rate of nitrogen deposition, including a big dose of ammonia produced by catalytic converters. Edgewood Park, he says, was a "drive-by extinction."

Alarmed by the rapid downward spiral, Weiss began inviting local conservationists and political leaders to come up and visit Coyote Ridge. One of his goals was to dispel the widespread impression that cows are always bad for conservation. While ill-controlled herds have damaged landscapes across the West, Weiss says, well-managed herds can help preserve native ecosystems, including these flowery grasslands.

Weiss' efforts have had an impact. In 2005, when the Santa Clara Valley Transportation Authority established a 548-acre conservation set-aside on Coyote Ridge, grazing continued as before. Just last year, the Silicon Valley Land Conservancy invited fourth-generation rancher Justin Fields to sic his cows on a grass-choked meadow at nearby Tulare Hill. "This is new, environmentalists telling us we're doing the right thing," says Fields, who also grazes his cows on Coyote Ridge.



Native goldfields and poppies blanket Coyote Ridge above California Hwy. 101, where pollution helps invasive grasses thrive, if they're not kept in check by grazing. THOMAS NASH

WEISS ANGLES HIS WAY ALONG a slope so steep that, here and there, he holds out his arms for balance. For the past couple of hours, he and two assistants have been conducting a series of caterpillar counts. Timed by a stopwatch, eyes on the ground, they walk parallel to each other along imaginary transect lines. Exactly 200 seconds later, when the stopwatch beeps, they record the number of caterpillars they've collectively spotted.

Weiss has worked out a formula: Each caterpillar found per 10 person-minutes can be extrapolated into 100 caterpillars per acre. Given an expanse of more than 5,000 acres — the size of the serpentine at Coyote Ridge — these annual counts can reach impressive numbers. In good years like 2003 and 2004, Weiss says, there may be as many as 2 million caterpillars; in bad years like 1991 or 1996, there may be only 100,000.

This year, the numbers have been coming in on the low end, due in large part to the fact that the spring of 2008 (when these future butterflies hatched) was the fourth driest since 1895. But it's not just climate that regulates the population, Weiss says. Checkerspots also respond to internal rhythms. In some years, for example, caterpillars become so numerous on a particular hillside that they decimate the dwarf plantain, setting the stage for a population crash in the next generation.

What makes Coyote Ridge so valuable is its size. If a newly emerged butterfly finds itself on a slope with few flowers, it can fly off to find a better location without ending up smashed on a windshield or marooned in a grass-choked field. Coyote Ridge is also topographically rugged, another important asset. Flowers on north-facing slopes bloom up to four weeks later than those on south-facing slopes, which extends the seasonal availability of nectar. In similar fashion, dwarf plantain stays green longer in shaded locations.

Weiss is encouraged by the fact that government officials in San Jose and Santa Clara County have gotten behind a plan to preserve much of the South Bay's remaining serpentine grassland, the largest portion of which lies on Coyote Ridge. Significantly, the plan — which envisions protecting some 4,000 acres through conservation easements or outright land purchases — embraces grazing as a management tool.

As lengthening shadows announce the end of the day, Weiss heads back down Coyote Ridge, passing through the series of gates that divide one property from another. At the last gate, I find myself looking back at the ecological equivalent of the border between two countries. Outside the gate lies a monotone of grass; inside, wildflowers have created a canvas worthy of Claude Monet or Vincent van Gogh. "Eye candy," Weiss smiles, and indeed it is, for people and butterflies alike. □

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has posted the various class materials on its Web site in hopes that the framework will be adapted by other tribes throughout the West.

"If we don't learn our culture and values and incorporate them into our life, we won't be a tribe anymore," LaMar says. "That's what this is about. We have to make sure we don't lose that because it's who we are."

Native drums and chanting spill out the door of a trailer not far from LaMar's office on the Tulalip. Inside, people gather to prepare for this summer's upcoming canoe journey: An older woman sits at a sewing machine, adults cut vests and dresses from red and black cloth, while a handful of teens and younger kids sort through stencils and hold out their arms to be measured. Shaula, 13, did the life-skills course after school two years ago. Today, she's cutting red fabric for the regalia she'll wear to dance and sing during this summer's journey. Self-assured, she says that even though a lot of kids at her school — the one off the reservation in Marysville — smoke pot and take pills, she has no interest in such things.

"It's a thing of pride to be able to say you're drug and alcohol free," says Shaula, as she considers whether to use a sun or hummingbird symbol to decorate her dress. An enrolled member of both the Tulalip and Suquamish tribes, she spends a lot of time after school practicing her dance steps for the ceremonies and training for the long hours she'll spend paddling a canoe later this summer. "When you're involved in cultural activities, you're connected to something bigger than yourself, and it helps somehow. I mean, when you're putting your heart and soul into something, why would you want to mess it up?" □

The names of all minors in this story have been changed.

Edgar Martin, 11, of Suquamish carries a paddle ashore at Point Julia in Little Boston during the 2008 Tribal Journeys Canoe Voyage. CAROLYN J. YASCHUR, *KITSAP SUN*