Nature Trails

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The Eugene Natural History Society is based out of the traditional homelands of the Kalapuya peoples who stewarded this land for millennia. Today most Kalapuya people are citizens of the Confederated Tribes of Grand Ronde and the Confederated Tribes of Siletz Indians and continue to play an active role in local communities and in the stewardship of this land.

Work party at the farm, OSU Organic Growers Club. *James Cassidy*

Soil! What It Is and How It Works …

James Cassidy

Department of Crop and Soil Science, Oregon State University, Corvallis

Friday, 17 November 2023, 7:00 pm

This month's meeting will be ZOOM only at our new time, 7:00. The Zoom lecture link is https://zoom.us/j/97499095971?pwd=eE9sdG9hSHMvOHhIUEJuU21wT20rdz09 or see our website at https://eugenenaturalhistorysociety.org/

This Month's Speaker: James Cassidy

Back in 2015, an ENHS member recommended James Cassidy as a speaker. Fortunately, the Board acted on that recommendation. Although Cassidy is from Corvallis and the soil he studies is often a much maligned topic, people in Eugene knew of this Beaver. Attendance at his lecture was an ENHS record for 100 Willamette Hall. Cassidy rocked and rolled that place with one of our most memorable lectures, an enthusiastic combination of science and performance skills honed as a rock-and-roll bassist. This month he'll rock us again with a multicamera Zoom presentation. Following is a slightly updated speaker introduction written for Cassidy's 2015 lecture by former *Nature Trails* editor John Carter.

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James Cassidy grew up in Minneapolis, Minnesota, where he was "a D-plus student in high school. I did a different kind of high school, the school of rock-n-roll and metal." He played banjo and bass in heavy metal bands but eventually became a full-time bassist in Information Society, a synthpop-freestyle band in the 1980s. After 10 years of recording and touring, he quit the music business. In her article about Cassidy that appeared in the Oregon State University student newspaper *The Daily Barometer* in May 2014, Dacotah-Victoria Splichalova penned a great line: "After the rock came the dirt."

Rocks do get worn down into dirt. But how Cassidy got dirty deserves a bit more scrutiny. After bailing out of music he set about figuring out what to do with himself. He had always liked the outdoors and "intuited that the truth was to be found in nature," so he started thinking about forestry or fisheries work. He had visited the Pacific Northwest years earlier and had loved it, so he ended up in the fisheries technology program at Mt. Hood Community College in Gresham. Because of his abject mediocrity in high school, he was rather intimidated and took the work seriously, graduating with straight A's. After the fisheries tech degree, he continued at Mt. Hood CC then transferred to OSU as a junior and finished his B.S. degree in fisheries science.

While working on this degree he had his epiphany. "While doing independent research standing by the stream one day (in the pouring rain!) it dawned on me that most of the rain wasn't falling in the creek, and though I had undoubtedly read it in a book, I realized that all that water was passing through the soil, and that is what determined the quality of the water (duh!). That's when I realized IT'S ALL ABOUT SOIL!!! Our external metabolism! The giver of ALL!!! WE ARE SOIL!!!"

So the rocks began his conversion to dirt. Cassidy became a graduate student in OSU's Department of Crop and Soil Science, obtained his M.S. degree, and got a job in the OSU soil physics laboratory. Then he was given the opportunity to give a lecture in an introductory soils course. "I remember being nervous before my first lecture and then all of a sudden I realized I was in front of an audience, and I was relaxed and totally comfortable. My rock-n-roll years and the skills I learned there, something I thought I had put behind me and mourned the loss of, were suddenly front and center! But this time I wasn't just selling a new record, I was describing the truth that is SOIL!!!"

Cassidy is passionate about soil and is popular with students because of his dynamic speaking style. A teaching assistant once said that Cassidy's passion for soils coupled with his teaching skill means that in every term he gets another 200 or so converts to "his cult of soils." Cassidy has now been an Instructor of Soil Science at OSU for over 20 years. His introductory class has over 100 students each term.

Cassidy is also the faculty advisor for the Organic Growers Club, now in its 24th season. The Club, with 300 student volunteers on its

listserv, runs OSU's student farm and produces over 50 fruit and vegetable crops.

Cassidy rejoined Information Society in 2006. "The best thing I ever did was quit the band. The second best thing I ever did was join the band. The third best thing I ever did was join again!" One of the other founders of the band, Paul Robb, says that Cassidy cannot stop talking about soil. "He's insufferable. Every time we go out on the road with the band now, it basically becomes an extended soil lecture." Information Society continues to tour and record.

And what can ENHS expect from this flamboyant devotee of soil? Cassidy summarized his presentation this way: "It's ALL about soil! Most people have only a vague idea of what soil is and how it works. You will learn more than you ever thought possible from this lecture: the reason you are alive, what nutrients are, how soil stores water and nutrients. The fundamentals that ALL humans on the planet Earth should know!" How can you not be curious enough join us and listen to the only college faculty member in Oregon who has played Radio City Music Hal1?

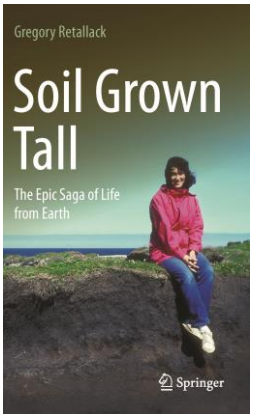
This Zoom lecture can be accessed at https://zoom.us/j/97499095971?pwd=eE9sdG9hSHMvOHhIUEJuU21wT20rdz09 or from our website at https://eugenenaturalhistorysociety.org/

We Are the Thermostat Now

by Gregory Retallack

Ronald Reagan, in remarks made for his 35th wedding anniversary, described meeting his wife Nancy as like coming into a warm room. Like many older relatives, Nancy controlled the thermostat for warmer temperatures. I consider it a metaphor for global warming of our planet by legacy technologies of aging baby boomers. Although warming of our planet has been regarded as inexorable and irreversible, the long record of past climates has revealed global mechanisms for both cooling and warming. The most important planetary thermostat now and in deep geological time has been soil, and farmers are now taking up the mantle of keepers of the thermostat. This grassroots movement is called carbon farming, and it could just save us all.

Soil saved the planet about 16 million years ago, long before humans or farms, when large volcanic eruptions tapped CO_2 in the crust and sent atmospheric concentrations to about 600 parts per million, which we are set to reach again by about the year 2100 with current rates of fossil fuel emission and soil erosion. We know details about this spike and subsequent fall in atmospheric CO_2 16 million years ago from studies of the distribution of pores in fossil ginkgo leaves and from isotopic composition of carbon in calcites of ancient soils. But the ancient soils, preserved in the rocks as paleosols, also tell us about what to expect in the next century as CO_2 soars. Warmer temperatures within rainy climate zones sent tropical forests with their deeply weathered soils as far north as Germany and Washington State and as far south as northern Tasmania. In continental regions too dry for forest, desert shrublands were greened by the invasion of grasses, creating the distinctive soils of sod grasslands with their high organic carbon content and clay within clods the size of rice grains. This increased the global carbon content of rainforests by 10 times and of grasslands by double and consumed twice as much carbon in forest soils and 8 times as much carbon in grassland soils, compared with the past 2 million years. The 16-million-year-old spike in atmospheric CO_2 was reduced back to near modern levels within 100,000 years. This and other stories of climates past is outlined in my recent book *Soil Grown Tall*.



Our news media are now saturated with horror stories of fires, floods, and hurricanes linked to ongoing climate change, but there are also signs that the mechanisms that saved the world 16 million years ago are operating already to redress the balance. In Oregon's open

rangelands of sage and juniper, grasses are displacing sagebrush, and junipers are forming closed canopies. In Oregon's humid western valleys shining geranium and evergreen spurge laurel have been identified as invasive weeds. In both cases the U.S. Bureau of Land Management has targeted woody thickening by invasive trees and grasses for restoration to presettlement vegetation, in a vain attempt that will accelerate greenhouse warming.

About 25% of the land area of our planet is under active management by farmers, and all the rest is managed in some way. Farmers are now well aware that past practices that squandered or reduced soil carbon must be reversed for a new generation of carbon farming. Allan Savory was a key figure in carbon farming, with his insight that animals maintain the unusually carbon-rich soils of grasslands. When Savory was a provincial ranger in Zambia, he advocated elephant culling. Later as a livestock farmer in Zimbabwe he came to view elephant culling as "the saddest and greatest blunder of my life." Loss of elephants allows regrowth of woodlands and reduction of grassy cover, resulting in desertification with less protection against erosion, soils leaner in clay and organic matter, and the formation of erosional gullies. Grazing ungulates were essential for the thick carpet of grasses that preserved soil moisture and carbon. During the wildebeest migrations of Africa, each patch of ground is grazed hard for a short time and then left alone for much of the year as the wildebeest complete their seasonal circuit. Livestock can be used in the same way, bunching them into herds and moving them in a way that mimics wildebeest hard grazing, which drives roots deeper. These roots feed life underground, building a more fertile soil with higher moisture content and less need for irrigation. Savory has argued that land management for soil carbon could potentially reverse ongoing greenhouse warming.

Savory's suggestions can be contrasted with the way in which meat is produced in much of North America in feedlots, where cattle are fed corn or hay from industrial farming. Plumes of methane from cow burps produce the obnoxious smell of feedlots because the methane is not oxidized to CO_2 nor absorbed by native pasture. Worse are the many acres of land farmed to supply the feedlot. The problem starts with plowing of the land so that soil carbon evaporates into the air as CO_2. Then soil dries out or is eroded away from winter-bare fields. Then come massive doses of artificial fertilizer, which scald roots. Then insecticides and fungicides kill the soil microbes, which are the main sources of soil organic matter. This system of scorched earth farming has contributed to the fall of ancient civilizations, as outlined in Bill Ruddiman's book *Plows, Plagues, and Petroleum: How Humans Took Control of Climate*.

The protracted war between farmers and nature is highlighted in Charles Massy's *Call of the Reed Warbler* in which he details many examples of regenerative farming throughout Australia, culminated on his own farm near Cooma with the return of endangered native birds. A Native American religious interpretation of regenerative farming is presented by academic botanist Robin Wall Kimmerer in her charming book *Braiding Sweetgrass*. Hers is yet another example of grass changing the world and our view of life. North Dakota farmer and author Gabe Brown also has sought to work with rather than against nature and finds that he can even turn a profit without government subsidies for traditional plowing and planting. His book *Dirt to Soil* shows clearly that the answer is in healthy soil, as the source of food and forage and of clean air and water. As revealed by iconic photographs showing desert on one side and healthy pasture on the other, land management is more important than local geological or climatic factors.

Farmers such a Gabe Brown have shown that one man can make a difference, but to make a global difference political action is needed. One solution is to analyze farm soils and subsidize farmers for carbon storage. This approach was proposed by Australian prime ministers Julia Gillard and Kevin Rudd from 2011 to 2014, when Australian carbon capture units were awarded for demonstrated carbon storage. Governments already grant subsidies for fertilizer, insecticides, and fungicides, which are clearly counterproductive. Grassland and cropland soil carbon content can be increased substantially in only 1 year using carbon farming techniques, whereas forest lands are much slower

to build carbon in soil and biomass. The bottom line, as memorably emblazoned on the reader board of the Eiffel Tower during the COP 21 climate conference in 2015, is “soil is the solution!”

Independent Navigators by Reida Kimmel

We regard birds as more primitive beings because their brain structure is so very unlike our mammalian model and their priorities are so incomprehensibly different from ours. Yet birds have twice as many nerve cells in their brains than do mammals of a similar size. Important things are happening in there. It was only about a century ago that scientists began to study avian behavior and the intelligence motivating birds’ life strategies. The ongoing discoveries are amazing.

Fulmar and chick, Shetland Island. *Reida Kimmel*

Of the seabirds that spend their lives on the oceans, some such as albatrosses, fulmars, and shearwaters are true creatures of the wind, roaming thousands of miles and using the force and direction of wind currents to power their nearly effortless flight. Others, such as auks, use their wings to “fly” under water and spend more time on the surface, travelling shorter distances but still making astonishing voyages. All seabirds share many traits. They are long lived, form almost permanent pair bonds, raise only one chick each year, and abandon that chick when food is scarce, saving their own lives for a chance to breed another year. Coming ashore only to breed, seabirds seek safety in numbers. In the remotest parts of the North Atlantic coasts, hundreds of thousands of birds cover almost inaccessible sea stacks and cliffs, the paired birds pressed tightly together calling, grunting, and screaming. They are assembled in layers by species: cormorants, razor bills, and guillemots close to the sea, then kittiwakes and fulmars, and finally at the top burrow-nesting shearwaters and Atlantic puffins. Fierce gannets nest nearby and hunt above the deep waters close to shore. Skuas and black-backed gulls are always on the prowl for a tasty chick or egg. Humans have killed breeding birds for meat, eggs, feathers, and fun and still hunt them, even in the face of frightening population declines.

Where are seabirds the rest of the year? The search began in the 1930s, initiated by David Lack. Shearwaters are relatives of albatrosses, fulmars, and petrels. Called tubenoses, all belong to the order Procellariiformes, the “order of the storm birds.” All have exterior nostrils on the upper sides of their beaks. Their sense of smell is acute and vital. Lack banded Manx shearwaters from Skokholm Island, Wales and released them in various places such as Venice (Italy), Cambridge (England), and Boston. Remarkable numbers of these shearwaters swiftly returned to their burrows. Still the question remained, how could they find the way back? Shearwaters proved to have an internal clock that told them the time of day. They definitely relied on their sense of smell to find their way and did not fly at night, even when they were afloat very near their burrows. With daylight, they found their way through the cacophony of the colony and into their own funky, homey, and smelly burrow, where their egg or chick awaited.

Banding revealed more interesting tales, travels not just to Britain but to the Canary Islands and the Bay of Biscay. Recovery of one band revealed that a fledgling had flown 6,000 miles in the 2 weeks between his release and his death. In the 1980s, Michael Brooke at the University of Cambridge traced Manx shearwater travel patterns using 3,600 bands recovered in the Atlantic. Solitary fledglings headed south to Madeira and the Canary Islands where they picked up the northeast trade winds that took them to warm Brazil for the winter. Or farther. Or they could explore other fishing grounds, perhaps the Caribbean. Not breeding for years after fledging allowed the young birds to explore and find good places, perhaps a new feeding ground. The young birds, with no parental help, were letting winds and currents

take them in two loops to the warm south before they headed north to the Grand Banks at the start of the northern summer and ultimately home. Very likely scent told them of underwater sea mounts, upwellings, or tropical lands. Scents would be remembered for a lifetime of travel. The smell of the colony, of the burrow, was the one to travel home to when the time was right.

Explanation of travels as revealed by recovered leg bands came decades later when light logging geolocators were fitted to shearwaters. Each locator weighed only 0.01 ounce, and its internal clock transmitted the time of midday where that bird was located, establishing longitude. Measures of day length established latitude. The geolocators were not very accurate, but they lasted for a year and gave a clear picture of where shearwaters go and how they get there. These journeys were even more complex than imagined. The rich Patagonian waters were a possibility after Brazil. The Caribbean and even the U.S. coast received visits. The shearwaters knew what they were doing and made choices of routes and stops. Propelled by the "Atlantic wind highways," shearwaters could easily travel to feed offshore of southern Africa. Birds could drop out somewhere and then rejoin the wind gyre to travel elsewhere, making choices, making decisions; each individual in charge of her life.

The Atlantic puffin, a small drab grayish bird living alone at sea, changes for breeding into an elaborately costumed member of a complex society, its facial patterning, huge colorful bill, and Day-Glo orange feet proclaiming "this bird is prime." Puffins might resemble comedians, but they will fight fiercely to defend their burrows from other puffins. However, as soon as their puffling is fledged, it is sent off the cliff and into the sea to make a living by itself. The adults shed the layers of their glorious bills, lose their bright plumage, and go back to sea alone. Other auks such as guillemots tend their chicks for several weeks after the fledglings get into the water.

Atlantic puffins, Shetland Island. *Reida Kimmel*

Tim Guilford of the University of Oxford attached tiny geolocators to young puffins. Some birds were refitted for several years, and the patterns of movement were amazing. With absolutely no parental guidance, each puffin made very individualized travels over the year and subsequently usually repeated the previous year's journey. Each bird's pattern was unique. These young birds were learning the geography of their sea world, learning good places to go, and remembering to go there again. Some travelled from Wales up and down the west coast of Scotland, and others went to Greenland. Southern travel patterns included the Mediterranean and the French coast. The west of Ireland also was popular. Surviving birds always came back to their birthplace. This was real learning, not imprinting, not training. Setting out as children, could we have done the same? Of course not. We don't have bird brains!

Upcoming Events

(for complete listings and details, see individual websites)

- **McKenzie River Trust** https://mckenzieriver.org/events/#event-listings or 541-345-2799
  Wednesdays, 9–11:30am. Watershed Wednesdays at Green Island. Projects include invasive species removal, habitat care, planting, and tree establishment. Sign up
  Second Saturdays, March–December, 8:00am–4:00pm. Living River Exploration Days at Green Island. Connect with nature in this special habitat for beavers, river otters, and >150 species of birds.
- **Native Plant Society of Oregon, Emerald Chapter** https://emerald.npsoregon.org/.
  Tuesday, 14 Nov., 4-7pm. Landscaping with Native Plants Webinar. Presenter: Linda Hardison, Oregon State University Extension, Lane County. On Zoom. Preregister here.

Monday, 20 Nov., 7–9pm. Rare Plants and Pollinators of Fern Ridge Reservoir. Presenter: Caity Winterbottom, U.S. Army Corps of Engineers. In person at Amazon Community Center Main Hall, 2700 Hilyard St, Eugene. Bring a snack to share!

Monday, 18 Dec., 7–9pm. Annual Christmas Plant Highlights Party. In person at Amazon Community Center Main Hall, 2700 Hilyard St, Eugene. Bring 15-20 of your favorite photos from this year on a thumb drive to show to the group. We'll celebrate the season with hot cider and Christmas goodies!

Note: You can watch our recent program on how to use the iNaturalist app here. You can also view other previously recorded NPSO programs here, including Dr. Christine Buhl's (Feb. 2023) presentation on the Emerald Ash Bore (a PDF of her presentation is available here).

- **Mt. Pisgah Arboretum** https://mountpisgaharboretum.com/festivals-events or 541-747-3817. See the website for more programs and information.
- **Lane County Audubon Society** www.laneaudubon.org or 541-485-BIRD; maeveanddick@q.com or 541-343-8664
  Saturday, 18 Nov., 8–11am. Third Saturday Bird Walk, with Vijera Thompson at Booth Kelly Path Trailhead, Springfield. For more info: https://laneaudubon.org/event/lcas-third-saturday-bird-walk-11-18-23/
  Tuesday, 28 Nov., 7pm. Birding the Greater Yellowstone Ecosystem—It's Not for the Faint of Heart, with Tim Griffith. In person and Zoom. Campbell Center, 155 High St., Eugene.
  Sunday, 31 Dec., dawn to dusk. 2023 Eugene Christmas Bird Count. For more info see the website or maeveanddick@q.com
- **Nearby Nature** https://www.nearbynature.org/ or 541-687-9699, 622 Day Island Rd., Eugene (Alton Baker Park)
  Monday, Wednesday, Friday mornings. Wonder Keepers. Preschool program outdoors in our Learnscape.
  Tuesdays and/or Fridays afternoons. Natural Neighbors. After-school program outdoors in our Learnscape.
- **Museum of Natural and Cultural History, University of Oregon** https://mnch.uoregon.edu/museum-home
  Ongoing exhibits: Oregon—Where Past Is Present; Explore Oregon; Underwater Forests—Oregon's Kelp Ecosystems.
  Thursday, 16 Nov., 6pm. Outliers and Outlaws Storytelling Series. Celebrated Vows: Lesbian Marriage Then and Now.
  Saturday, 18 Nov., 10am–4pm. Family Day: Oregon's Dino-Story. Uncover the mystery of dinosaurs in Oregon.
- **Friends of Buford Park and Mt. Pisgah** https://www.bufordpark.org/ or 541-344-8450. See the website for programs and information.
- **WREN (Willamette Resources and Educational Network)** https://wewetlands.org
  See the website for programs and information.

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Eugene Natural History Society
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Monthly meetings:
When: September–May: third Friday;
December: second Friday
Where: **221 Allen Hall** (UO campus)
and/or on Zoom
Time: **7:00 pm**
See our website for details.
http://eugenenaturalhistorysociety.org/

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2023–2024 Speakers and Topics

17 Nov.	**James Cassidy**	**Soil! What It Is and How It Works**
8 Dec.	**Gina Roberti**	**Mt. St. Helens Recovery and Bird Life** (cosponsored with the Lane County Audubon Society)
19 Jan.	**John Postlethwait**	**Antarctic Fishes: Icefishes Are Nice Fishes**
16 Feb.	**Ryan Tucker-Jones**	**Soviet Whaling and Science**
15 Mar.	**Ron Larson**	**Natural History of Belize**
19 Apr.	**Lincoln Best**	**Plants and Pollinators** (cosponsored with the Emerald Chapter of the Native Plant Society of Oregon)
17 May	**Marli Miller**	**Amazing Geologic Sites in Oregon**