

Audio Transcript: It's not easy being evergreen

Note: Episodes of Outside/In are made as pieces of audio, and some context and nuance may be lost on the page. Transcripts are generated using a combination of speech recognition software and human transcribers, and may contain errors.

Nate Hegyi: This is Outside/In, a podcast about the natural world and how we use it. I'm Nate Hegyi, here with our producer Justine Paradis.

Justine Paradis: Hello!

Nate Hegyi: And it's high time we open up our listener mailbag, also known as the Outside/Inbox, and this time, the theme is green.

Justine Paradis: Do you remember that old movie "The Fifth Element," Nate?

Nate Hegyi: Uh, yes. I love that movie! I think it's great. Classic.

Justine Paradis: Classic! So if you haven't seen it, it's a trippy post-apocalyptic, Blade-Runner-but-make-it-weird, space movie.

Nate Hegyi: That's a great, that's a great description of it.

Justine Paradis: And I bring it up because: in the world of that movie, the slang word for "cool" is "green" – so, like, instead of stay cool, it'd be, stay green.

So this is perfectly demonstrated in this scene, in which intergalactic radio host Ruby Rhod, played by Chris Tucker, is chastising our main character, Corben Dallas –

Nate Hegyi: Bruce Willis!

Justine: Yeah. He's chastising Corben Dallas for not performing well enough during his interview a few minutes before.

*Ruby Rhod: It was bad, it had no fire, no energy, no nothing!
You know I have a show to run here, and it must pop, pop, pop!
It must be green, okay? Okay?!*

Nate Hegyi: I love that. That is a vibe I want to carry into our environmental podcast.

Justine Paradis: I think it's important that you do, yeah. So, the reason I actually mention it though, is: do you think that the reason that the word for "cool" in that movie is "green", is that, it's a post-apocalyptic world, so there's no green on the planet, so green is rare and special?

Nate Hegyi: Oh, yeah!

Justine Paradis: Or... because it's referring to money? Like the green of cash?

Nate Hegyi: It's probably referring to money.

MUSIC: Toe Jam, Blue Dot Sessions

Corben Dallas: I didn't come here to play pumba on the radio. So tomorrow from 5-7 you're going to give yourself a hand. Green?

Ruby Rhod: Supergreen.

Nate Hegyi: Okay, so "Fifth Element" might be referring to money, but today's questions – which came from listeners – we are talking about "green" a little more literally, right?

Justine Paradis: We got a lotta plant questions today.

Nate Hegyi: Alright, like Ruby Rhod, I gotta show to run here, and it's gotta *pop*.

Justine: It has got to pop.

Nate Hegyi: Green for go.

MUSIC SWELL AND OUT

Nate Hegyi: Let's start with the one you answered for us, Justine.

Justine Paradis: Sure! This one came from Alyssa, who submitted a question during one of those Instagram call-outs. She asked, "how slash why do some plants stay green in the winter? And what's the benefit of being evergreen?"

Nate Hegyi: That is a great question!

Justine Paradis: I agree. And this might be obvious but let's quickly define "evergreen" - it's a plant that keeps its leaves year after year, or growing season after growing season. Compare that to a deciduous plant which sheds its leaves every year.

Nate Hegyi: I feel like the first thing that I think of – when I hear the word "evergreen" is "conifer".

Justine Paradis: totally!

Georgia Silvera Seaman: The trees with needle-like leaves. So you know, maybe a common one for most people are pines.

Justine Paradis: This is Georgia Silvera Siemens. She is an urban forester by training.

Georgia Silvera Seaman: but you also have broadleaf trees that are evergreen. So I'm in New York City, so a broadleaf tree that's evergreen would be a holly.

Justine Paradis: Georgia is the founder of the Local Nature Lab in New York City. And when I asked her what's the benefit of being evergreen, her answer really surprised me because I'd assumed that the answer would be because evergreens retain their leaves all year, that means that they also photosynthesize all year too.

Nate Hegyi: Right, like all winter, maybe Evergreens would be able to keep making plant food, keep turning sunlight and carbon dioxide into sugar.

Justine Paradis: Yeah, but Georgia said not necessarily.

Georgia Silvera Seaman: It's not to say that there is no photosynthesis happening but you have to think about it from the tree's perspective.

Justine Paradis: In order to photosynthesize the tree would have to make itself open to gas exchange, so opening the pores on its leaves, which makes it vulnerable to losing water.

Georgia Silvera Seaman: And so there's this like balancing act. Like how much do I photosynthesize versus how much water can I afford to lose.

Justine Paradis: instead of thinking of being evergreen as a benefit, it's more like, it's just a different life strategy than being deciduous. Each strategy involves trade-offs as to where plants spend their energy so forever. evergreens, they're keeping their leaves for more than one season, so they tend to put a lot into them.

Georgia Silvera Seaman: That's an investment. So they're expensively made.

Justine Paradis: Evergreen leaves are often thick with a protective waxy coating. Sometimes with these very exquisite, resilient needle-like shapes, which minimize surface area.

Georgia Silvera Seaman: So like spending money on a really expensive sweater, you know you're gonna wear it for many years. Versus like fast fashion, which is inexpensively made and the next season there's gonna be something else for you to wear.

Nate Hegyi: It's amazing analogy.

Justine Paradis: I know, although Georgia did make it clear that she's not saying that one is better or worse than the other in this comparison.

Georgia Silvera Seaman: No, not at all. Just a different life strategy.

Nate Hegyi: Yeah, that makes.

Justine Paradis: Yeah. No judgment,

Nate Hegyi: Yeah. A big investment can be a calculated risk, but it's still a risk. And look at it another way. It can be an advantage to shed your leaves every year because maybe a big storm batters your leaves or a hungry caterpillar is coming into your neck of the woods.

Justine Paradis: Yeah, and deciduous trees get to start fresh every spring, but evergreens don't.

Georgia Silvera Seaman: The impact of losing your leaf before its renewal cycle is much more significant for evergreens

Justine Paradis: Evergreens do eventually shed their leaves, though they just don't shed them all in a single season, and that shedding cycle will vary across species.

Georgia Silvera Seaman: Like an eastern white pine might be. Two to three years . There's another species that is somewhere maybe every 10 years.

Justine Paradis: And for example, the needles of the bristle cone pine can last for half a century.

Nate Hegyi: Those trees, by the way, are my favorite trees. I love bristle cone pines. Yeah, they're, they're like ancient. I think there's, among some of the oldest trees in the world. Some of them,

Georgia Silvera Seaman: I think you can look at a tree and see it as the embodiment of its evolution and the 3D resources that have been available to that species.

Nate Hegyi: That is so cool. A tree is an embodiment of its evolution.

Justine Paradis: isn't it so nice?

MUX: Kermit the Frog

It's not easy being green. Having to spend each day that color. Of the leaves. When I think it might be nicer, being red or yellow, or gold...

Nate Hegyi: Oh, you just couldn't resist that outro, could you?

Justine Paradis: I mean, it's not easy being green. I mean, evergreen. What can I say?

Nate Hegyi: Let's pull out our next question. And this one – was reported by the “greenest” member of the Outside/In team, Jeongyoon Han. And by “greenest,” well, Jeongyoon, this is actually your first time on the show!

Jeongyoon Han: Hey there, and yes it is! It's very exciting. So today we've got a call from a listener from Cincinnati, Ohio.

Ned: Hi, my name is Ned.

Jeongyoon Han: And Ned wants to get the record straight on turf grass.

Ned: I heard that it's terrible for a lot of reasons, one of them being with water usage. But I'm curious –

Jeongyoon Han: He's wondering, does turf grass INHERENTLY use up a lot of water?

Ned: Or does that only apply to irrigated turf grass? Thanks!

Jeongyoon Han: Just to be clear Nate, we're talking about real turfgrass, and not the artificial kind.

Nate Hegi: Right, yeah. I'm no expert, but I don't think plastic grass needs any water at all...

Jeongyoon Han: No, they don't. So there are lots of varieties of grass, and they're categorized by the kind of climate that they're suited for: cool season grass, warm, warm season crossover, you get the gist.

Nate Hegi: Yeah.

Jeongyoon Han: And some do need more water than others survive, but it's not like you HAVE to water your lawn — it's just that if you don't, and you don't get enough rainfall, your lawn could be patchy, or brown, or just straight up die.

So a lot of grass is irrigated to keep it green and healthy. In fact, lawn grass is the most irrigated crop in the US, even more than wheat and corn!

Nate Hegi: Yes, I actually, I know this, I did a story on lawns last year and it's, it's just wild to know just how much grass there is.

Jeongyoon Han: For sure. So to learn more about irrigation, I reached out to Dr. Rubab Saher, a postdoctoral research fellow at the Desert Research Institute.

Dr. Saher says there are two common ways to irrigate plants: a typical sprinkler system, and drip irrigation systems, which feed water more slowly and precisely.

Rubab Saher: Its efficiency is higher than the sprinkler irrigation system. In turfgrass we would maybe save water by 10% or 15% because of their irrigation efficiency.

Nate Hegi: Does anybody use drip irrigation for grass?

Jeongyoon Han: Yeah. That's the thing. Dr. Saher says we actually don't, so we're left with an inefficient method for watering grass.

Rubab Saher: Even with the finest irrigation system, your grass consumes more water, relatively more water than a smart landscape.

Jeongyoon Han: So, Dr. Saher research takes this question a further step too. She digs into what environmentalists are calling water smart landscapes — those are landscapes that conserve or recycle water, and keep places cooler, more efficiently than others, which is super important because in some areas drought is threatening water supplies.

Nate Hegi: Oh, absolutely, like where I live in the West, stuff is getting more hot and dry because of climate change.

Jeongyoon Han: Yeah, that's exactly what Dr. Saher tackles.

Rubab Saher: To compensate for all the concrete structures that we have, we need to have vegetation to mitigate those heating challenges.

Jeongyoon Han: So, grass can help keep cities cooler, but it doesn't provide any shade, and it takes a LOT of water. So, a smarter landscape for dry, hot cities out West, Dr. Saher says, would use trees, shrubs, and bushes, which provide a little less cooling than grass, but do provide shade for people, and take less water to grow.

Nate Hegi: Plus they just look cool. I really think xeriscaped landscapes, with the trees and the shrubs and everything else like that, I just think it looks cooler than grass.

Jeongyoon Han: I mean there's more to look at than just a patch of grass, in my mind.

MUSIC IN : Del Verano, Autohacker

Nate Hegyi: Coming up shortly: why exactly do humans see so many subtle shades of green?

But first, before we break, I want to remind you that this is a public radio show.

It is free to listen. It's free to send in questions. We love answering them.

One recent listener review said that the show is "very entertaining and educational: respectful of the issues while having fun."

That is so nice to hear because we work hard to strike that balance. It takes a lot of care and energy, and we're so glad it resonates.

If you agree, please: help keep us going. You can support the show by heading to outsideinradio.org/donate.

And thank you so much. We'll be right back.

// BREAK //

MUSIC IN: OI Promo Theme

Nate Hegyi: Welcome back to Outside/In. I'm Nate Hegyi.

Justine Paradis: And I'm Justine Paradis.

Nate Hegyi: And today, the team is opening up the Outside/Inbox, answering listener questions on the theme of green.

Justine Paradis: The color, the concept, the quality. How it's not so easy being green, or at least evergreen.

Nate Hegyi: And our producer Felix Poon joined me to answer this next one for us.

MUSIC FADE

Felix Poon: So we got a question from Collin in Brandon Manitoba in Canada.

Collin: Do most city buildings have green roofs? And if not, why not?

Nate Hegyi: I imagine he's probably not talking about roofs that are literally painted green, right?

Felix Poon: No, he's talking about green roofs which are basically a roof covered with plants instead of your typical asphalt or a rubber roof.

Nate Hegyi: Okay.

Felix Poon: It could be grass, a bunch of trees, or even an urban farm.

Felix Poon: And the concept goes way back.

Kate England: they were used to help keep buildings warm as far back as the Vikings.

Felix Poon: They may even go as far back as the Hanging Gardens of Babylon in 600 BC, one of the 7 ancient wonders of the world!

Nate Hegyi: Wow so we were like being like, super sustainable way back then...

Felix Poon: I mean we were doing a lot of things more sustainable back then.

Nate Hegyi: That's true, no oil.

Felix Poon: Yeah, anyways, that was Kate England, the city of Boston's director of green infrastructure, and Kate says green roofs have tons of benefits.

Kate England: green roofs help to cool and reduce air conditioning costs....They reduce urban heat island effect.

Felix Poon: Which is why climate experts say that green roofs are a key climate solution for slowing global warming.

Nate Hegyi: Right.

Felix Poon: They even help with storm drainage, and providing habitat for migrating birds.

Nate Hegyi: Okay but, to answer our listener's question though, do most city buildings have green roofs nowadays?

Felix Poon: Well it depends on the city, but finding an actual percentage is a little bit hard.

Felix Poon: Boston, for example, has about 100,000 square feet of green roofs, but like most cities, it doesn't track how much total roof coverage it has, so it's hard to know.

Nate Hegyi: So you didn't like go to a map of Boston and like measure the total square footage of all the roofs in Boston, Felix? I thought we paid you the big bucks to be a reporter?

Felix Poon: I did not do that, but I did call up someone named Abraham Wu, he's a researcher at the Future Cities Lab that's based in Zurich Switzerland.

Abraham Wu: So we've used images captured by satellites or drones. And we did a test for 20 cities using an AI algorithm.

Nate Hegyi: That's kinda cool.

Felix Poon: So basically, in 2021, Abraham used AI software to look at these satellite images of cities to count all of the roofs, and count how many of them are green. So, in one region of Zurich...

Abraham Wu: up to 16% of the buildings there had green roofs

Felix Poon: In one part of Berlin, Germany...

Abraham Wu: that's about 10 to 15 percent

And a section of New York City

Abraham Wu: There's about 8%.

Nate Hegyi: But Felix, what exactly qualifies as a green roof, like does it have to be ALL green, or can it just have a couple of bushes?

Felix Poon: Well New York City counts a building's roof as a green roof if at least 50% of the roof space is covered by vegetation.

Felix Poon: As for the AI, it's definitely not perfect. I cross checked his project with google maps satellite imagery, and it didn't take me long to find roofs that were not correctly labeled as green roofs.

Nate Hegyi: There's the reporter doing reporter stuff. So are there other statistics out there that you think are more accurate?

Felix Poon: The best estimate I could find in my reporting, when it comes to the greenest-roofiest cities in North America, the percentage is just 1%.

Nate Hegyi: Oh...I need that horn that goes womp womp. Just 1%? If there are so many benefits, you'd think this would be a more common practice by now.

Felix Poon: So there's a couple reasons they're not more common. First, with older buildings, they might not have the loading capacity to carry that extra weight.

And then second, they're more expensive to pay for up front, even though in the long run you save money because green roofs last longer

But we should expect to see them more often with a lot of cities offering tax rebates, and some cities even have a mandate that all new buildings must have green roofs – Toronto, Seattle, New York City, Chicago, and Washington DC. Cambridge MA became the first New England city to pass a mandate.

But even here in Boston, Kate says she's noticing a shift. The technology is getting cheaper, and lighter.

Felix Poon: Yeah, and she says developers are showing more interest in them now.

It really gives her hope that some day...

Kate England: when you fly over the city of Boston from above, you'll be seeing these beautiful green spaces on top of our buildings.

MUSIC: Chris Zabriskie, Angie's Sunday Service, 03 Hitchcock Would Have Fucked Up Charade

Justine Paradis: I really love that vision. Like, imagine that possible future of green rooftops everywhere!

Nate Hegyi: I think about that a lot, actually. I was recently in Seattle. And I was like, oh man, it would be so cool, if there was just like, draping vines coming from the tops of these houses or these buildings. It is just really fun to imagine the world, a society we might build if we put a lot of climate solutions into action. Like... imagine living in a city with tons of modern, fast, efficient public transit.

Justine Paradis: It is fun to imagine, what is, sort of, positive outcomes of climate change. What if we had a super-responsive electric grid, where people get alerts, like, "tons of solar energy available right now, it's a good time of day to plug in your stuff."

Nate; We'd be able to plan our entire recording sessions around when the best available energy is.

Justine Paradis: Yeah. Just more connected to how stuff works, maybe. It's fun to think about.

Nate Hegyi: I would love to see more wild parks in cities.

Justine Paradis: Mmm.

Nate Hegyi: Like I really love, it's one of my favorite things about a city, when you enter a space, and it's just trees everywhere, and you can kind of hear cars in the background, but for the most part, it's like, you're in nature in the middle of a city. I would just love to see more greenways flowing through cities.

Justine Paradis: Yeah. I live in a, you know, a very small city here in New Hampshire, but I lived in Montreal last summer, and there's a mountain in the middle of the city. And during that big heat wave last summer, I took a hike up the mountain, and it's so well-known, but it was amazing how quickly the temperature dropped inside the forest. And I was like, oh my god, thank goodness for this forest, I bet it's cooling down the city in ways I don't even realize.

Nate Hegyi: Absolutely.

MUSIC TRANSITION: Mama Funk, spring gang

Nate Hegyi: Alright. Onto our last question of the day. We received this submission during one of our Instagram call-outs. This one came from Bethany, who asked, "Why did our eyes evolve to see *many shades* of green?"

Let's pull in producer Jessica Hunt, who answered this one for us.

MUSIC FADE

Jessica Hunt: Let's talk first about how we perceive color, and then about evolutionary benefits. Nate, have you heard of rods and cones?

Nate Hegyi: I've heard of them... I know that they're in my eyeballs.

Jessica Hunt: Excellent! So, rods and cones are photoreceptor cells on our retina. And "photo" is the Greek prefix for light, so what that means is that these are the cells that are sensitive to light. Rods are for low-light situations, and cones send signals to the brain in bright light. Then the brain decodes and interprets those signals into what we think of as color. And, specifically, red, green or blue. Only those three colors. Humans have evolved to be trichromatic, and that means we build all of the colors we see out of combinations of just those three.

Nate Hegyi: RGB. Yeah computer monitors are in RGB!

Jessica Hunt: So if you ever used a color wheel in art class, or just mixed paints, you know that combinations of primary colors can make secondary colors. And that's where we get orange, and purples, and yellows.

Your photoreceptors are doing the same thing. What our listener sees as shades of green are greens mixed with colors from our other two cones.

Green plus a little red, and maybe you get greenish yellow, a plant that needs a little watering. Or, you add a little blue, and what you see is more of a shade of turquoise.

Nate Hegyi: I imagine that there is some benefit for us seeing so many shades of green and I'm going to guess, Jessica, that it has something to do with the fact that's a lotta green on this ol' planet.

Jessica Hunt: Yes! And so to talk about the evolutionary part of it, I spoke to Adriana Briscoe. She's a professor of evolutionary biology at UC Irvine:

Adriana Briscoe: One of the earliest hypotheses for why there's a benefit to having red-green color vision is that it allows primates to forage for red, conspicuous fruits against green foliage.

Nate Hegyi: Red fruits against a green foliage. So we're able to spot all our strawberries, and our raspberries...

Jessica Hunt: Tomatoes!

Nate Hegyi: All the yummy stuff.

Jessica Hunt: But, as we know, ripe red fruit is not always available.

Adriana Briscoe: Sometimes they fall back onto eating foliage, like leaves.... and young reddish leaves or flowers often have nutritional benefit that is potentially advantageous compared to old tough leaves.

Jessica Hunt: But there's a little wrinkle. Not all humans have evolved to have three color receptors. Some people have only two. The blue and the green, or the blue and red.

Colorblindness is much more common among men than it is women, and I've read different estimates, but it's somewhere between 7 and 8 percent of the total population.

Nate Hegyi: That's a lot more than I would have thought it would be.

Jessica Hunt: Scientists think that those people who only have two types of photoreceptors, have an evolutionary benefit of their own.

Adriana Briscoe: It allows them to be better at detecting and capturing, for example, camouflaged insects... under low illumination ... you're in a group and one part of your troop can detect the ripe fruit against the the green leaves and another one can find these delicious protein-rich insects that are maybe less conspicuous... that there would be potentially a benefit to everybody in the group.

Nate Hegyi: That's kinda like a superhero power.

Jessica Hunt: Yeah! In addition to detecting camouflaged insects, or, you know, different kinds of fruit, someone who doesn't have that red-green combination of photoreceptors might also be better at detecting movement, like a snake moving through the foliage.

Nate Hegyi: Whoa.

Jessica Hunt: That's another ability that benefits the group. And Adriana explained that we're of course not seeing color in isolation.

Adriana Brisco: Shape, size, movement, depth.

Jessica Hunt: So the color green is important, but there are lots of other factors at play in our perception of the world.

MUSIC IN: Toe Jam

Nate Hegyi: Just as a reminder, we are always accepting questions about the natural world, climate change, science – anything even loosely connected to the environment. And you don't have to adhere to a theme, but the prompt we're working with for an upcoming listener question segment is: the deeps.

The deeps. Oooh.

Justine Paradis: So, think: what questions do you have about.... caves, geothermal energy, deep sea, species that dig, mines. Earth's core. Just, life underground, generally.

Nate Hegyi: Deepness.

Justine Paradis: Deepness.

Nate Hegyi: Think deepness.

There are three ways to send in your question.

1) Call our hotline, and leave a voicemail. The number is 1-844-GO-OTTER.

2) You can send a voice memo to our email – outsidein@nhpr.org.

3) Social media. You can follow us on Instagram. Every month or two, we post a call-out for questions in our stories. You can find us there @outsideinradio.

This episode of Outside/In was reported and produced by Justine Paradis, Jeongyoon Han, Felix Poon, and Jessica Hunt. It was edited by Taylor Quimby and Justine Paradis.

Special thanks to Steven Peck.

Music came from spring gang, Molife, Apollo, Autohacker, Diamond Ortiz, and Chris Zabriskie.

Outside/In's theme music is by Breakmaster Cylinder.

Our executive producer is Rebecca Lavoie.

Outside/In is a production of New Hampshire Public Radio.