



3 things NASA is testing for its future moon base camp

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Less than 40 miles from the Grand Canyon, NASA has been testing what daily life on the moon might feel like, including the commute.

Along the barren, volcanic landscape of northern Arizona, NASA's Desert Research and Technology Studies (Desert RATS) tried out a prototype last month for a pressurized lunar rover that will travel with the Artemis mission when astronauts eventually return to the lunar surface.

The current vehicle offers a bumpy ride along the rough terrain, rolling along on six independently rotatable wheels, and has slightly more breathing room than a family van.

Tested in partnership with the Japan Aerospace Exploration Agency, it's designed to take astronauts to "scientific sites of interest," and allow them to work multiple days away from their home base, said Marc Reagan, Desert RATS program mission manager.

NASA has been using northern Arizona as a simulation site since the Apollo program in the 1960s. The similar rock composition and stark landscape makes for an ideal testing ground for astronauts and the equipment they'll use in space.

Early Wednesday morning, **NASA launched its Space Launch system**, the space agency's most powerful rocket ever, that's designed to go to the moon and back as a test run for a future crewed mission. Artemis, approved by **then-President Donald Trump** in 2017, is expected to land the first woman and first person of color on the moon's surface in 2025. But the mission has been criticized for running over schedule and **billions of dollars** over its anticipated budget, leading some to question why NASA wants to send people to the moon again after all these years anyway.

WATCH: Artemis rocket blasts off in big step toward returning astronauts to the moon

"It's what we do," said Jim Free, associate administrator for exploration systems development at NASA. "The moon contains a great deal of the history of the universe."

Landing astronauts on the moon will not only further scientific understanding, but will also act as a stepping stone for eventually landing a person on Mars, and mapping out NASA's longer-term "blueprint for solar system exploration," Free said.

Reagan believes the cost is worth it, and that once people see the fruits of their efforts, they'll believe that too.

"If it were easy, everyone would be doing it," Reagan said. "I think we're building an excellent product that the American people will be proud of."

Here's some of what the team has been testing.

Life on the road

The pressurized rover is designed to be a home away from (lunar) home for astronauts conducting extensive scientific projects.

Reagan explained that the final design of the rover will have to keep the crew warm, keep electronics cool, carry solar panels for recharging, have compartments for the crew to eat and sleep and be able to automatically drive itself to meet astronauts at various locations.



NASA's eventual rover will be a home away from home for the astronauts. The current rover prototype has slightly more breathing room than a family van. Photo by Justin Stabley/PBS NewsHour

“It has to be the entire life support system by itself,” he said.

The prototype rover in Arizona sports a cockpit with a full windowed view of what’s ahead, where the pilot can control the vehicle’s wide range of motion with a joystick. The configuration of the wheels allows for the vehicle to move sideways like a crab or spin in a circle, helping the pilot to navigate the rocky, crater-pocked surface.

While it only has a handful of the expected final features, it still provides important data for the scientists to understand what kind of challenges astronauts may face.

One of the biggest problems right now, Free said, is calculating how long the rover, which will have a planned lifespan of 10 years, needs to operate in different conditions and scenarios.

Figuring out the demands on the rover’s battery capacity, solar recharge time and storage supply capacity will ultimately factor into the final design.

“[So we] come up with a few of those scenarios and see which one of those puts the hardest design constraint on the vehicle and then design around that,” Free said.

The rover operators participating in the Desert RATS mission, some of whom are astronauts who have traveled to space, spent three days living in the vehicle to see what astronauts during a real mission may need and experience.

Reagan said the data will help them become “smarter buyers” for when they approach the contractor to build the final design, which he said they expect to have by summer 2023.

Communication on the moon

An essential part of living on the moon will be reliable communication between astronauts and their equipment, like the rover. On top of maintaining constant communication with Earth and other astronauts on the surface and in orbit, the pressurized rover is expected to function autonomously, and so must also relay information like an extra crew member.

NASA hopes to use similar wireless communication methods that we see on Earth such as WiFi and smartphones, allowing astronauts to interact with familiar technology.

Mike Zemba, NASA research engineer, said such technologies haven’t been truly tested in extraterrestrial conditions compared to the radio transponders used during Apollo, which makes it a unique challenge to predict how they might function on the moon.

“We would like to lean into commercial technologies and all the development that’s been done over the past decades,” he said. “But we need to understand how that stuff is going to perform on the lunar surface.”

WATCH: What going to the moon taught Michael Collins about Earth

One of the main hurdles to building telecommunication infrastructure, Zemba said, is getting the signals across the massive topography on the South Pole.

Shackleton Crater, on the moon’s South Pole, is two and half miles deep, four times as deep as the Grand Canyon.



Volcanic rocks commonly found in northern Arizona where NASA's desert RATS have been testing the prototype pressurized lunar rover and other equipment in 2022. Photo by Justin Stabley/PBS NewsHour

The other main challenge will likely be the radiation, which can scramble binary code, causing audiovisual data to appear choppy or cause programs to malfunction. The moon has little protection against the sun's radiation, which means communication technology must be "radiation hardened," using more resistant materials than what's commonly used on Earth.

Zemba said being able to predict how far a signal can reliably go on the moon will be critical to the astronauts' ability to travel far away from their home base and will help NASA plan for permanent communication infrastructure on the moon and Mars.

"Part of what we want to accomplish [in Arizona] is to have those simulation tools," Zemba said. "We can determine the best points on the terrain to place cell towers to provide coverage for the missions."

Seeing stars

NASA has zeroed in on the lunar South Pole for its planned moon landing in 2025.

Free said the South Pole provides several different opportunities, compared to areas the early Apollo missions visited. From a geological perspective, he said, the rocks on the South Pole are estimated to be about 4.3 billion years old, which would help scientists delve into the history of the universe. From a practical perspective, there might be frozen, accessible water on the moon's poles, which would be a convenient source for a long-term base.

While the **Apollo missions** landed on relatively flat areas of the moon, the South Pole sports massive craters and mountains that, Reagan said, cast "long deep shadows" because of the low angle light coming from the sun.

The high contrast between the brightly lit moon dust and long, black shadows could cause stress on an astronaut's eyes and could be dangerous when walking on uneven terrain or driving the rover, he added.



A visual comparison of the moon's pockmarked South Pole compared to the Grand Canyon. NASA has been using northern Arizona as a simulation site since the Apollo program in the 1960s. Photo by Justin Stabley/ PBS NewsHour

On the moon, most of an astronaut's sensory input comes through vision, Reagan explained, which means that stress-testing for the dramatic light conditions is extremely important.

"It's kind of a treacherous place to operate," Reagan said.

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To simulate these effects, the Desert RATS have performed test missions entirely at night with a large, blinding spotlight cast across the rocky landscape.

Free said one of the proposed plans is to set up a series of smaller bases around the South Pole rather than one large base. If one base ends up in complete darkness as the moon rotates, taking off or landing on the surface becomes difficult. But with multiple landing zones, the astronauts can simply use a different base that's still lit.

In most cases, Regan said, the best way to handle problems during missions in space is to "have the patience to pause and do the right thing."

By – **Justin Stabley**

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6 things to know about Barbie as the new film sets box office records

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When Barbie debuted in the American toy market in 1959, clad in a black-and-white bathing suit, she didn't just make a splash.

It was more like a boom, sending children and parents (and subsequent generations) scurrying to possess this icon of femininity and setting off a decadeslong debate about impossible beauty standards, gender roles, race and role models.

"The doll functions like a Rorschach test; people project wildly dissimilar and often opposing fantasies on it," author and Barbie scholar M.G. Lord wrote in 1995 in "**Forever Barbie: The Unauthorized Biography of a Real Doll.**"

Now the plastic plaything has been brought to life in a new major motion picture by Oscar-nominated writer and director **Greta Gerwig** and starring Margot Robbie and Ryan Gosling. Alongside the movie, creator Mattel has launched an **extensive marketing campaign**, complete with Barbie clothes and accessories and gear sold by several different retailers for fans to play dress-up for themselves. "Barbie" is also the latest entry into a wave of films cashing in on **valuable toy brands** and merchandising opportunities.

READ MORE: 8 things you didn't know about Super Mario Bros.

Across the last 64 years, the toy line has remained a powerhouse. Since 1959, the toy line has **made billions for Mattel. In 2021 alone**, after several years of decline, Mattel sold 86 million dolls, totaling a record high of \$1.7 billion in annual sales. The doll has also been the subject of an **Andy Warhol painting** and Aqua's hit pop single "Barbie Girl."

To understand Barbie's staying power and long (curvaceous) shadow, here are six things you should know.

1. Barbie was based off a gag gift for adults

After Mattel's early hit toys (**like a kid's ukulele and their Burp Gun**), co-founder Ruth Handler had the idea for something new.

She had observed her daughter, Barbara, playing with paper dolls and imagining their lives in an adult world with jobs and relationships, and Ruth wanted to make a 3D version for Mattel. Then, during a trip in Europe in the 1950s, the family came across a set of **Bild Lilli dolls** in a store window. A teenager at the time, Barbara immediately wanted one.

Unbeknownst to Handler, Lilli was a gag gift that men would buy for each other, Lord said. The doll was based on a lascivious comic strip character with a witty sense of humor who was depicted sleeping with wealthy men for money and gifts.

"I didn't know who Lilli was or even that its name was Lilli," Handler told Lord in an interview for her book. "I only saw an adult-shape body that I had been trying to describe for years, and our guys [at Mattel] said couldn't be done."

WATCH: A Brief But Spectacular take on designing toys for kids

Handler's discovery of Lilli led to the design for Barbie, a cool, trendy doll that was named for their daughter. When Barbie became a massive success for Mattel and the Handlers, Lilli's toymaker tried unsuccessfully to sue for infringement, later selling the rights to Mattel.

Geared at kids rather than adults, Barbie's trendy fashions, high heels and bachelorette lifestyle were still often a shock to parents who considered such things too risqué for little girls.

"She came out in 1959, so a lot of women were still homemakers [and nurturers] and wearing more traditional clothing," said Michelle Parnett-Dwyer, a curator at The Strong National Museum of Play in Rochester, New York. "And then all of a sudden you have this blond bombshell in your playroom and it's like, what are you supposed to make of this? And what is she telling your children?"

2. Barbie has been many things... but not a parent

In the 1950s, many toys for girls were very focused on family play — baby dolls that needed caretaking, Handler had observed. Barbie marked a dramatic shift: With her extensive wardrobe, Parnett-Dwyer said, she is considered one of the first fashion dolls, and had a sexy, independent vibe that was unique for the time.

Fashion modeling was, in fact, teenage Barbie's first job, and over the decades she's gone on to pursue many careers. That list includes astronaut, doctor and president of the United States.

But two roles that often have been projected onto women — namely, mother and wife — have never applied to Barbie.

Lord, now the co-host of a brand new podcast series from the LAist called "**The Barbie Tapes**," believes this characterization can be partially attributed to Handler's personal discontent in her role as a housewife, especially during the period when her husband was fighting in World War II and she had to raise their children alone. In Lord's **old recordings** from an in-person interview, Handler said that she "stayed home from '41 to '44 and played mother."

While Barbie has never had a child, her longtime friend Midge was once made with a detachable baby bump, which revealed a newborn baby inside. The toy was quickly taken off the shelves in the United States in 2002, after **some parents complained** that it promoted teen pregnancy.

Meanwhile, Barbie "had a boyfriend, but she never actually got married," Parnett-Dwyer said.

Lord in her book describes that longtime boyfriend Ken as "a lackluster fellow, a mere accessory." In 2004, they split up (yes, we are still talking about dolls) and Mattel introduced a new love interest for Barbie — **an Australian surfer named Blaine** — after asking for public input.

She even got **her own (Dream)house** in 1962, before such an asset was widely available to many American women. Until the **Equal Credit Opportunity Act** passed in 1974, banks could discriminate on the basis of sex or marital status. They could deny credit applications from single women who didn't have a man to cosign, barring many women from accessing **the kind of mortgage** Barbie surely would've required to secure her first home.

For the time, "she was very progressive, which is awesome if you're thinking of it in terms of being a feminist and what you want to teach your children, but if that wasn't your values, that's really uncomfortable for a lot of people," Parnett-Dwyer said.

Part of the rationale of rolling out many different Barbies with many different pursuits is rooted in business. Like any other company, Mattel is aware that more variety equals more opportunity for profit, said Emily Aguiló-Pérez, an assistant English professor at West Chester University of Pennsylvania who wrote the book, "**An American Icon in Puerto Rico: Barbie, Girlhood, and Colonialism at Play.**"

The company has made plenty of missteps, but Barbie's message has always been aspirational, she said, and an invitation for kids to imagine iterations of girlhood and womanhood beyond traditional domestic roles.

Barbie's "branding [and] mottos have been 'Girls can be anything, imagine the possibilities,' Aguiló-Pérez' said. "It's always tried to be about imagining beyond some of the options that girls were given."



Mattel Inc. offices are seen February 2, 2009 in the Los Angeles area community of El Segundo, California. Photo by David McNew/Getty Images

3. The toy line has tried to keep up with social changes

For basically her entire existence, Barbie's popularity has been paired with controversy and critique.

The National Organization for Women **protested in front of a 1972 toy fair**, handing out leaflets that said Barbie, among other dolls, encouraged "little girls to see themselves solely as mannequins, sex objects or housekeepers."

In response to the increasing backlash, Mattel attempted to catch up with contemporary trends, Lord said.

"Mattel is not as retrograde as Mattel seems," she said. Lord, a first-generation Barbie owner, went on to explain that Mattel gave Barbie careers beyond fashion as early as 1961 with the introduction of a flight attendant and nurse Barbie. But Barbie's career-oriented image didn't hit its stride until the 1980s, and the dolls were also still predominantly white.

WATCH: 5 reasons why the Legend of Zelda has stood the test of time

In the 1960s and 1970s, "Mattel had progressively been trying to catch up to culture through the doll, but they haven't really wanted to let go of the idea that Barbie was always thin, white and blonde with blue eyes," said Aria S. Halliday, an assistant professor in the Department of Gender and Women's Studies and Program in African American and Africana Studies at the University of Kentucky.

"Talking Christie," a friend of Barbie's who was Black, **made her debut in 1969**. But it would be another decade until Mattel released a doll in 1979 who was both Black and named Barbie. Her outfit was designed by Kitty Black Perkins, a Black designer at Mattel who went on to become chief designer of fashions and doll concepts for the company, according to **The Strong National Museum of Play**.

After Perkins joined the team in the 1970s, Halliday said, "we began to see the designs of Barbie change."

"They're thinking about texture of hair, they're thinking about color, they're thinking about different outfits and different ways to approach Barbie," she said.

In the 1980s, the **Day-to-Night Barbie** doll could change from its pink executive business suit to a glittery (still pink) evening dress, reflecting the rise in women's workforce participation across the decade. During the Seoul premiere of the 2023 film, Robbie's red-carpet look paid homage to that outfit.



Australian actress Margot Robbie meets fans during a pink carpet event to promote her new film "Barbie" in Seoul on July 2, 2023. Photo by Jung Yeon-je AFP via Getty Images

"Barbie and her chic corporate feminism was more in tune with the times," Lord said.

For her book, Aguiló-Pérez spoke to a group of Puerto Rican women and girls about their lived experiences with, and opinions of, Barbie. They discussed how the doll influenced their identities around conceptions of race, nationalism, femininity and more.

Barbie herself is in many ways viewed as a symbol of whiteness and of the United States as a colonizing force in Puerto Rico, Aguiló-Pérez said. Her participants said they did not see enough of themselves in the Barbies available in the toy aisle, even at points where there were comparatively more dolls of color available.

"The central image was and remains the white, blond Barbie," Aguiló-Pérez said.

Mattel released Puerto Rican Barbie in 1997. Part of the “Dolls of the World” line, it was marketed as more of a collector’s item than a doll to play with, Aguiló-Pérez said. But some group participants who were young at the time of the doll’s debut said that although they didn’t necessarily feel represented by the doll’s looks, they nonetheless embraced the toy, which offered them a sense of national pride.

Between 2011 and 2015, the brand’s **sales dropped** amid a greater cultural desire for more imagery of realistic beauty ideals, and Mattel decided it was time for **another Barbie makeover**. The company introduced a new wave of its existing **Fashionistas line** in 2016, which featured dolls with a variety of body shapes, features and skin tones, plus ones who use wheelchairs and prosthetic limbs later introduced in 2019. The rollout coincided with a **rebound in sales**.



Photo courtesy of Mattel, Inc.

This year, Mattel also released a Barbie with **Down syndrome**. On their website, the company said their work with the National Down Syndrome Society “informed the design process from start to finish.”

Halliday said the focus on the dolls’ various messages largely comes from parents and adults trying to protect their kids from harmful narratives around patriarchy and race. Many Black women she talked to said, “My mom never let me have Barbies,” or “She only let me have the Barbie that looked like me.”

In reality, she said, children draw from a “constellation” of experiences from their childhood when shaping their view of the world, not just from the toys they play with.

“There’s a lot of ways that adult kind of ideas about [how] children are playing creates a narrative about what the doll means,” she said.

4. Barbie’s looks may be flawless, but she’s also made blunders

Alongside its many successes, the Barbie brand has also made missteps.

While Christy is considered the first real Black Barbie, Lord said that there was an “unfortunate iteration” of the existing Francie doll with darker skin that appeared in 1967.

Skipper, Barbie’s younger sister, in 1975 became Growing Up Skipper: Twisting the toy’s arm would make it sprout breasts and grow taller.

Lord believes that after Handler left Mattel, the toy line was aimless for a while, and that some of the men who designed action toys for boys “were taking a stab at Barbie products.”

While Mattel doesn’t shy away from exploring gender and sexual diversity today, the toymaker once inadvertently modeled Earring Magic Ken after queer culture in the 1990s. An effort to give Ken a trendier makeover to appeal more to girls of the era, the resulting rave outfit and accessories appeared to **appropriate queer fashion**.

In the early 1990s, the company released Teen Talk Barbie, which was originally programmed to say phrases like “**Math class is tough!**”, drawing widespread criticism as a result. In 1993, an anonymous group of artists **carefully switched** this particular Barbie’s voice box with that of a G.I. Joe doll and **returned both dolls to their original stores**, which restocked them on shelves.

It’s not clear how many dolls these artists managed to voice-swap, but their goal was to draw attention to the **rigid gender norms** embodied by the dolls that they viewed as detrimental to children.

They pulled off the stunt **just in time for that year’s holiday season**, much to the chagrin of parents whose children had brand-new Barbies that instead said phrases like, “Vengeance is mine,” according to The Strong museum.



Earring Magic Ken, introduced by Mattel as a companion to its Earring Magic Barbie figure, is photographed August 5, 1993 in New York City. Photo by Yvonne Hemsey/Getty Images

A 2010 book called “Barbie: I Can Be A Computer Engineer” drew **delayed criticism for its plotline**, which involved Barbie tapping her male friends for help after she accidentally infects a computer with a virus.

Mattel stopped publishing the book after backlash exploded in 2014. But a site called **Feminist Hacker Barbie** emerged that welcomed users to reimagine the story sans sexism.

5. Barbie has had a prolific film career

While the new film is the first ever live-action version of the character, many who grew up in the early 2000s will remember a massive library of straight-to-video CGI movies, not to mention her role in the “Toy Story” series.

William Lau, a director on eight Barbie films between 2004 and 2013, such as “Barbie as the Princess and the Pauper,” has noted a surge in adults reaching out to him in recent years to talk about how much the films affected them as kids.

“That just warms my heart,” he said.

Lau attributes the resurgence of popularity to the pandemic, when many people were stuck inside and had time to rewatch old favorites and “retreat back to old memories.” He also said social media has helped to push the old movies back into the spotlight, with many people dressing up as the characters and singing the songs.

He was also surprised to see people post memes about Bibble, a small, puffy companion to Barbie’s character in the “Fairytopia” series, and **Preminger**, the main antagonist in “Barbie as the Princess and the Pauper.”

“There’s just something about him; his design, his stature and of course [he’s voiced by] Martin Short. He’s a legend,” Lau said.

6. Barbie showed that video games are for everyone

For decades, video games were marketed **almost exclusively to boys**, setting up a self-fulfilling loop that excluded girls from engaging with the medium for a long time. But Mattel attempted to broaden that appeal through several video game titles, including one recent addition to the World Video Game Hall of Fame — “**Barbie Fashion Designer**,” which debuted in 1996.

Barbie Fashion Designer wasn’t the first Barbie-themed video game Mattel released, but it was “by far the most influential,” said Lindsey Kurano, curator of electronic games at The Strong museum. By 1997, she said the number of video games marketed to girls ballooned from virtually zero to more than 200 titles.

Barbie Fashion Designer featured a unique combination of digital and physical play. Users designed clothing for their dolls on their computers and printed them on a special type of soft, malleable paper. They then cut out the new items and used them to dress up their Barbies. This inventive approach was key to its popularity, Kurano said, and also ahead of its time.

READ MORE: Why developers are designing video games for accessibility

“It’s not just a game [where] you’re clicking around and then you sign off,” she said. “It has play elements outside of the software, and it’s connecting it back to the doll itself.”

Barbie Fashion Designer was also intuitive, Kurano said, which was an important quality for a game at a time when computer literacy wasn’t as common as it is today.

Part of the key to its success was the fact that stores placed the game in the toy aisle rather than the usual video game section, making it more likely to catch the eye of the girls it was geared toward.

“Not only was it better [than prior Barbie games,] but also they sort of realized their mistake,” Kurano said. “Like, ‘If girls aren’t buying video games, why are we putting it in the video game section? Let’s put it with the Barbies.’”

Kurano emphasized that video games are and always have been for everyone — the fact that they were once solely designed with men and boys in mind never stopped other genders from playing them. But the recognition of an undertapped demographic post-Barbie Fashion Designer was nonetheless significant.

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What is xeriscaping? How you can turn your lawn into a sustainable oasis

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In movies, books and other media, the image of the American dream often included a lush green lawn. But, those lawns often need a good deal of water and upkeep — and climate change-induced heat waves and more frequent and longer droughts across the country has some homeowners looking to save money and minimize their environmental impact.

Several Western states that depend on the **critically low Colorado River** are working to cut back on water usage. In California, where lawns use an estimated **40 to 60 percent** of the total water use of an individual household, a **decades-long drought** has pushed local governments to limit outdoor watering. In the face of these limitations, many homeowners have adopted an alternative landscaping method called xeriscaping.

What is xeriscaping?

The **Denver Water Department** said that, in 1981, they coined the term, which means “dry-scaping” in Greek, to describe an alternative to grass yards. At its root, xeriscaping is a landscaping method that aims to use as little water as possible while still maintaining aesthetically pleasing and eco-friendly landscaping.

There are several ways to achieve this goal, Denver Water and others say. Some homeowners in desert regions copy the sparse environment, creating landscapes with artfully placed rocks and pebbles around native cacti and other regional plants. In other parts of the country with more rainfall, homeowners are creating meadows with no-mow grasses and local flowers popular with pollinating insects.

Austin Krcmarik, water conservation specialist at Denver Water, explained that landscapes vary depending on the homeowner’s needs, the surrounding environment and the water supply. He also said a good xeriscaped garden will have diverse native plants for local pollinators, like bees and hummingbirds.



Tara Chhabra from Saratoga Springs, New York said she replaced her lawn with native perennials that are drought tolerant and pollinator friendly. She also said she wants to convert more of her grass but struggles with “peer pressure” to keep a more conventional lawn. Photo by Tara Chhabra

Jillian Steinberger-Foster and her husband run a business in California called Terra Nova Ecological Landscaping where they design and create landscapes mostly using mulch rather than grass.

“We don’t have clients coming to us who really want lawns,” she said. “We have folks coming to us to get rid of their lawns.”

While their business has been around for decades, Steinberger-Foster said she’s seen an uptick in interest over the past few years, in part because of educational programs from utility departments and environmental organizations that have led people toward sustainable landscaping. And while they’re still a small part of the landscaping industry, they feel that xeriscaping is no longer on the fringe the way it once was.

Meg Inglis, president of the Texas Native Plant Society, told the PBS NewsHour that when people think of xeriscaping, they often think of dry, rocky yards. But she said planting native landscapes can be “lush and beautiful.”



Julie D'Agostino from Boise, Idaho said she introduced native, drought-tolerant plants because she wanted to enjoy her front yard more and has met more of her neighbors since she goes outside to check on the plants. Photo by Julie D'Agostino

The Texas Native Plant Society, one of many similarly named societies across the country, promotes the conservation and use of native plants and provides educational resources and workshops for homeowners and growers in the state.

Kim Conrow, former president of the organization, added that landscaping with native, diverse plants pushes you to learn about them, which can “expand your horizons and your understanding about life.”

“Being in nature is so healthy for us,” Conrow said. “When you can look out your window and see life, it helps you be a stronger and healthier person.”

What’s wrong with regular grass lawns?

Grass lawns work well in places like Great Britain, where rainwater has historically been abundant, but in certain parts of America, especially in the West, rivers and lakes are being strained to sustain current demand, said Neal Lurie, president and CEO of **Resource Central** in Colorado.

Studies have shown that grass lawns can be very water intensive, on average requiring around 30 percent of a household’s water consumption.

Overall, Americans use about **30 percent** of all daily water on outdoor uses – about **9 billion gallons** per day.



Sherry Sommer from Louisville, Colorado said she got the plants for free through the “Garden in a Box” program implemented by Resource Central, which took the guesswork and expenses out of the equation. Photo by Sherry Sommer

“We have to go from the English field landscaping concept to being more comfortable with a little bit more diversity,” Inglis said.

READ MORE: How California’s drought is stressing a water system that delivers water to millions of residents

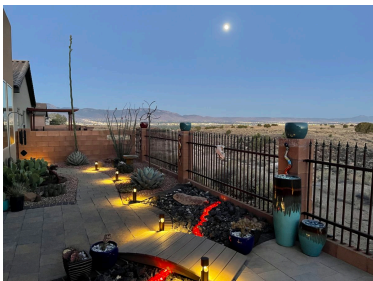
Inglis explained that many popular grasses, like Kentucky bluegrass, have shallow roots, which means a lot of water is required to keep the top layer of soil sufficiently moist.

Other grasses, like buffalo grass, have deeper root systems that can reach more underground water sources and need less frequent watering. They also serve to **prevent soil runoff**. Despite the name, Kentucky bluegrass came from Europe while buffalo grass is native to America’s semi-arid prairie.

But even in areas of the country that don’t have major water issues, maintaining grass lawns can damage the environment.

Many homeowners use nitrogen fertilizers to keep their grass green and lush. While nitrogen is a naturally occurring element in soil, an **excess of nitrogen** can end up in bodies of water causing algae blooms, according to Steinberger-Foster.

Steinberger-Foster also pointed out that gas-powered mowers produce massive amounts of air pollution. According to the EPA, equipment like lawn mowers and leaf blowers emit **242 million tons** of pollutants a year, contributing 29 percent of all global carbon monoxide and 4 percent of all global carbon dioxide emissions annually.



Robert Sullivan from Albuquerque, New Mexico said living in the desert Southwest makes xeriscaping “natural” because it saves water. Photo by Robert Sullivan

One of the biggest issues Inglis mentioned was the depletion of the natural ecosystem, since grass lawns don't necessarily fit into the diet of local wildlife and takes up areas where flowers could exist to draw in pollinating insects.

Where did grass lawns even come from?

While there are grasses native to the American continent, the species recognized as common lawn grass, such as Kentucky bluegrass, arrived alongside European colonists in the 1600s, according to Virginia Scott Jenkins' "The Lawn: A History of an American Obsession." Indigenous Americans in the New England area didn't keep grazing livestock, which meant that newly introduced European livestock quickly ate much of the unprepared native grasses in New England. As early as the 1630s, new settlers had to bring their own grasses for grazing.

"When introduced to the colonies, European livestock decimated the existing grasses, and many animals starved to death during the first winters," Jenkins wrote in her book. "The grasses and field plants destroyed by the settlers' grazing animals were gradually replaced with various types of European grasses and clover."



Nissa Patterson from Albuquerque, New Mexico said her backyard was hard-packed dirt three years ago, and now it's an "alive food jungle." Photo by Nissa Patterson

By the 20th century, Lurie said much of the modern conception of a suburban house with a grass front yard came from homesellers looking to create a quaint image for potential buyers.

"Grass lawns are basically a marketing gimmick ... after World War II where homebuilders were trying to sell the American dream," Lurie said.

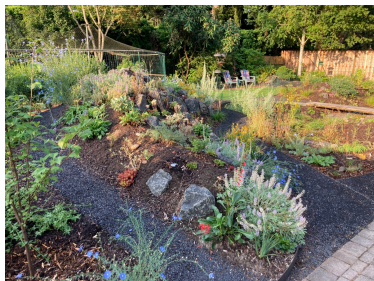
He said grass lawns became an expected part of a house and that while many homeowners still prefer grass lawns, others don't realize they can shift to a more water-efficient and environmentally friendly landscape.

What kind of plants do you use in a xeriscaped yard?

In general, it's recommended to use as many regional, indigenous plants as possible.

Steinberger-Foster said regional plants have evolved to be water efficient for the conditions in their local ecosystem, making them an obvious choice for a xeriscaping project.

Non-native plants from regions with a similar environment and similar water needs can also work well. But Inglis said indigenous plants have developed a balance with native wildlife, better ensuring that both the flora and fauna thrive around each other.



Lynne Heidsiek from Vancouver, Washington landscaped her yard as part of the Homegrown National Park Movement, which promotes the growth of native plants in the pursuit of biodiversity. She expects the plants to be largely self-sufficient in two to three years, which means she'll hardly need to water them. Photo by Lynne Heidsiek

Inglis and Conrow also warned that non-native plants are always at risk of becoming an invasive species if they do too well in a certain climate, which can harm that delicate balance. Purple Loosestrife, for example, was introduced to America in the 1800s as an ornamental garden plant, but has evolved into an invasive species in wetlands. One individual plant is able to produce and distribute **2.7 million seeds per year**. Invasive species can eventually outgrow local plants and ultimately contribute to their extinction.

"If an area becomes overrun with an invasive plant, there's no biodiversity," Conrow said.

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Xeriscaping doesn't have to mean a complete elimination of grass lawns. Conrow said it makes sense to have some grassy areas for playing sports or other activities. She recommends people explore more regional grasses that are better acclimated to the environment while using a part of

a yard for planting other plants.

Ultimately, Steinberger-Foster believes the goal is to balance individual needs with that of the surrounding ecosystem. The presence of birds and insects, which gather to eat or nest in native plants and trees, adds an extra visual element to the yard on top of benefiting the environment.

“When you get the pollinators in the garden, they just add a whole other layer of interest,” she said. “The garden becomes more beautiful; it’s a visual treat.”

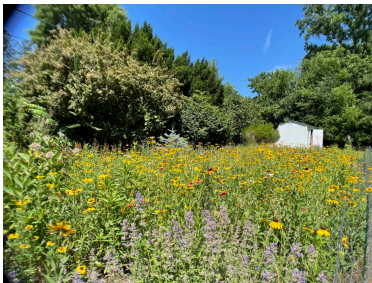
Why haven’t more people adopted this method?

While xeriscaped gardens can be lower maintenance than a grass lawn, Steinberger-Foster emphasized that there is still work required to make the yard look beautiful and keep it in good shape.

“There’s almost never a no-maintenance garden,” she said.

Most yards already have grass which has to be removed, which Lurie said can cost money and time. Instead of mowing, much of the maintenance of a xeriscaped garden involves bending down and clipping the plants. Conrow said this is good exercise for some but isn’t for everyone.

There’s also an issue with finding the plants. Inglis said it can be difficult to find native plants from local nurseries or big box stores because there isn’t as wide of a demand for them. Because of their relative rarity, they can also be more expensive than more common plants — even those that are not indigenous to the area.



Weeks Ringle from Oak Park, Illinois planted a field of rudbeckia on her property in Sawyer, Michigan. She said “its not a transformation that happens overnight,” explaining that it took time and patience to grow. She also said it wasn’t easy finding the native plants she wanted. Photo by Weeks Ringle

Inglis said these problems can be solved by increasing the supply of native plants by showing growers the benefits of offering local species.

“We have to figure out how to get the growers to grow these plants,” Inglis said.

Inglis believes one of the biggest challenges, however, is being accepted by neighbors.

Steinberger-Foster said that neighbors who don’t understand xeriscaping may not appreciate the lack of a more common lawn using water-intensive grass.

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“People have to shift their aesthetic sense,” Steinberger-Foster said. “I think people might mourn the lawn look.”

Some opposition comes from homeowners association bylaws preventing households from planting anything other than lawn grass in their front yards, according to Krcmarik.

Homeowners associations, or HOAs, enforce rules for properties in housing communities and are prevalent in every state. This enforcement can include requiring homeowners to have conventional, water-intensive lawns.

There has been some action to change this. In **2013** and **2021**, Colorado passed laws that **prevent HOAs from prohibiting** homeowners from xeriscaping and installing solar panels. Texas passed a **similar law** also in 2013. But even when the authorities have taken action to protect xeriscaping, Krcmarik worries the policies are not well known.

Conrow and Inglis believe more people, both in the field of landscaping and regular homeowners, are beginning to understand and get interested in alternative landscaping options that include unique native plants.



Christine Bondi-Cerrato, who lives in an HOA suburb in Broomfield, Colorado, said they're trying to "model conservation and resource stewardship" for their children and community. She's taken time to educate her neighbors that Colorado's laws allow for xeriscaping and supersede HOA governing documents. Photo by Christine Bondi-Cerrato

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Steinberger-Foster said there are a lot of neighbors and HOAs that might object to the new landscaping, but early adopters can help others "learn to see a different kind of beauty."

For Lurie, he believes that this adoption of xeriscaping is part of a slow, but steady, process to creating more sustainable landscaping.

"That's how we're going to be able to solve the water scarcity crisis," Lurie said. "One house at a time, one neighbor at a time, one city at a time."

By – **Justin Stabley**

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