Hopi Earth Day

On April 22, 2024, the Hopi Nation's Department of Natural Resources collaborated with the Institute for Tribal Environmental Professionals (ITEP) to bring together Hopi community members, school children, elders, educators, and environmental departments from across the state of Arizona to celebrate Earth Day as a day to honor Mother Earth. The event featured hands-on activities including art projects and games, informational tables from different Hopi, State, and Federal environmental departments, an art contest featuring work from local students, and independent presentations and speeches from those at the Hopi Department of Natural Resources and beyond.

"Hopi values teach us that Earth Day is every single day." – Dr. Carrie Nuva Joseph, Director, Hopi Department of Natural Resources

Hands-on activities engaged students with changes they're seeing in their environment and allowed them to fully understand all the causes and effects of climate change. Activities focused on the water cycle and the effects of drought, soil erosion and sand dune mobility, and the need for a renewable energy transition. Students ranged from kindergarten to middle school, yet the activities had everyone learning something new about their local environment, regardless of age.

Student artwork created for the 2024 Hopi Earth Day Event. The theme was

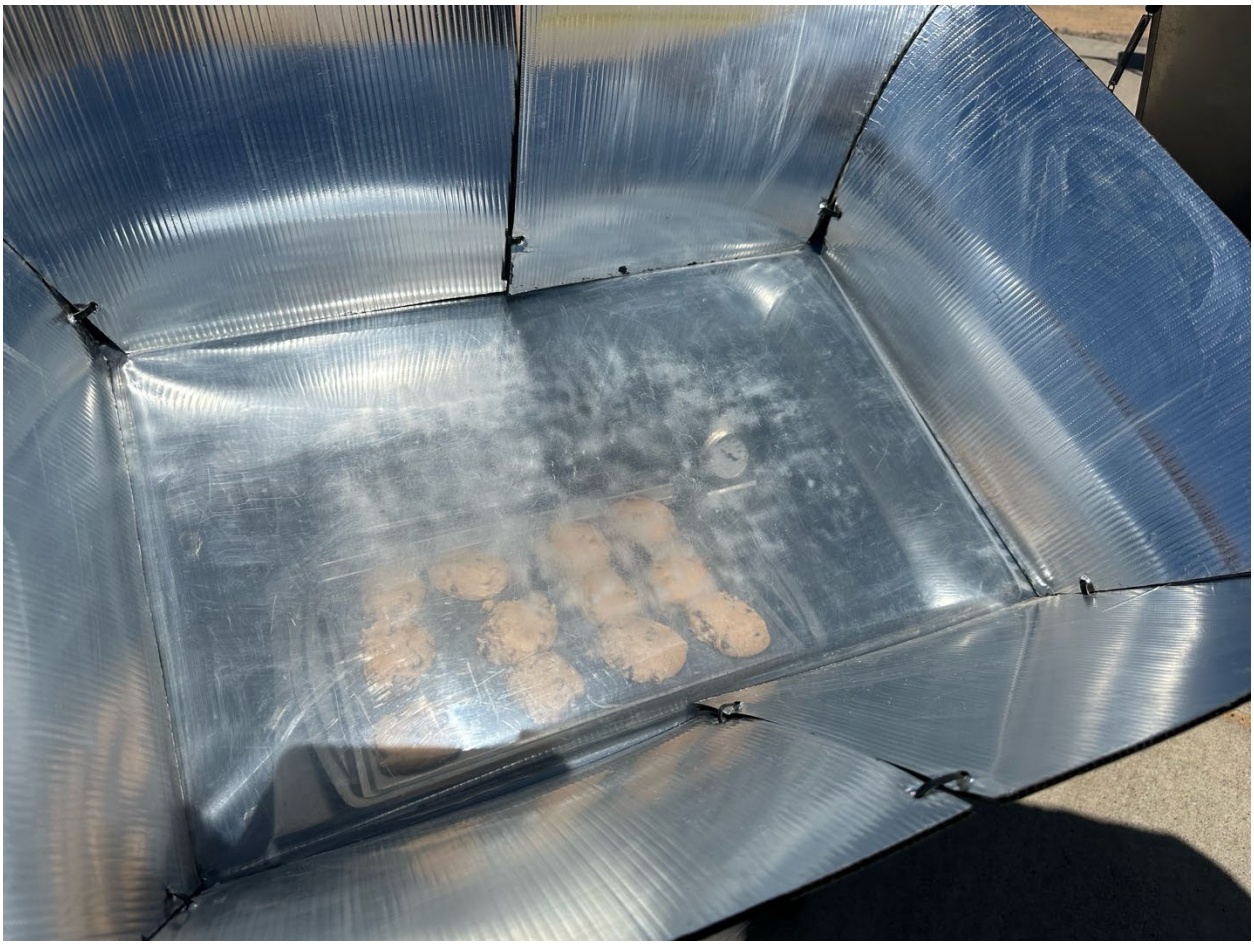
“Tuwaquatsi Hopivewat” which translates to “Earth Day the Hopi Way”

Solar Oven Cookies

Outside, emanating from the border of the paved parking lot and the pale yellow sand dunes, was the smell of fresh baked chocolate chip cookies. After a sack lunch break, students flocked towards the smell, creating a line 10 people long and 5 people deep. While there were cheers from the front of the crowd as children were handed a warm cookie on a paper napkin, and groans from the center as information quickly spread that the next batch wasn’t ready yet, kids approached the back of the crowd with mild apprehension and confusion. Where were these warm cookies coming from? There was no kitchen, no oven. Only two black, Rubbermaid-like containers with cloudy plastic lids, and a long, black tube nestled in a curved mirror. Yet every 20-30 minutes, warm cookies emerged.

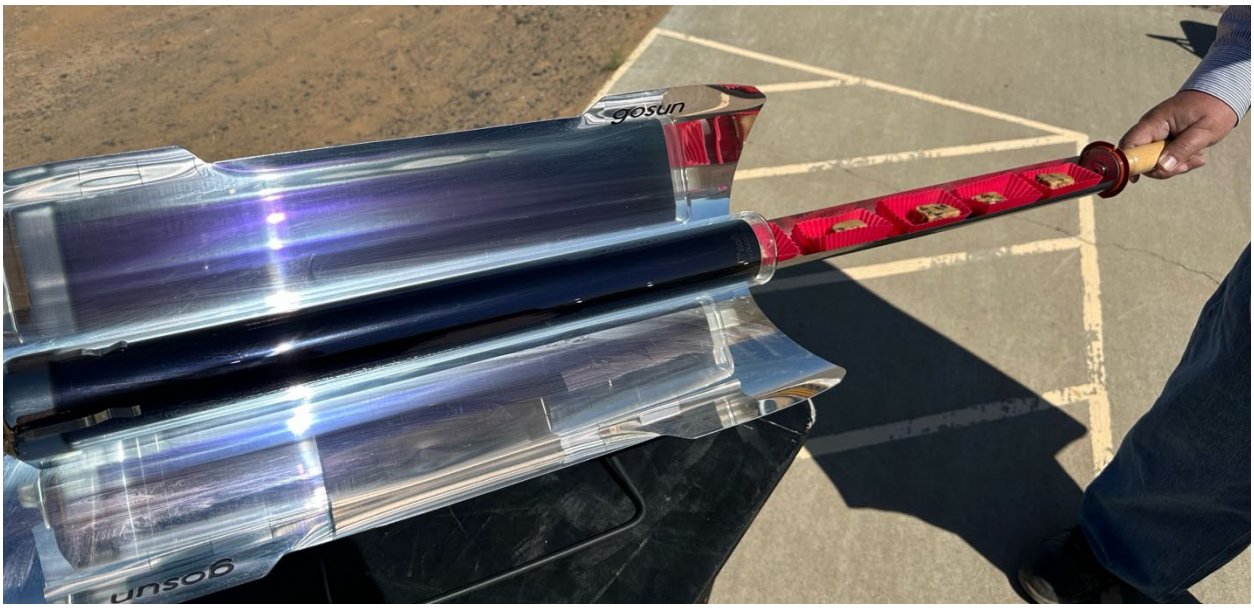
The large, boxy solar ovens with cookies inside

The solar oven display was a favorite among the elementary school crowds and older community members, and not just for the sugary, carbon neutral treat. These alternative energy ovens demonstrated the effectiveness of cooking without fossil fuels or other high polluting fuels such as woody biomass. Two types of solar ovens were on display, the large, boxy oven reaching temperatures of 200-300°F on an 80°F day, and the long, cylindrical oven reaching temperatures of 450°F before being put away, as it’s capable of reaching temperatures of 500-600°F – too hot for cookies.



Close up of the boxy solar oven baking cookies

Some had seen and even used solar ovens before. A Hopi Elder let the volunteers monitoring the oven know that the cylindrical one is perfect for making hot dogs, as her nephew uses his to make them at family gatherings. However, more were unfamiliar with the technology. The boxy solar ovens have a black inside and are insulated to trap UV radiation. The ovens must be rotated frequently to constantly point towards the sun, and while they are more spacious, things take much longer to cook in them than in a traditional oven. The cylindrical oven has sunlight reflected back into the insulated, black tube by the sheet of metal. Regardless of the oven, food needs to be in small pieces to cook through. While many community members questioned the ovens' abilities to cook a whole bird, a stew is more appropriate.



Close up of the cylindrical solar oven

Some elders took notes on the oven models, and even inquired as to whether they could make something similar on their own. One woman let the volunteers know that she doesn't have an oven at home, so a solar oven could make her cooking much faster and easier. This solar oven demonstration provided ideas for a clean energy cooking source that could bring environmental and energy justice opportunities to homes across the Hopi Reservation.

Two Hopi Elders with their warm solar cookies.

The Incredible Journey

Inside, away from the heat and the smell of cookies, were multiple interactive games and demonstrations for elementary school children to engage with larger environmental concepts, with the goal of getting them to think about how these concepts connect to their home environments.

Drought is afflicting the already arid Hopi Reservation and has been for decades[1]. While all of Arizona is facing the risk of water scarcity, the Hopi Reservation receives just 8.5 inches of average annual precipitation[2]. Rising temperatures across the Reservation only exacerbate this issue. Drought is impacting local food supplies, cultural traditions, and is increasing sand dune migration.

To understand drought concepts, kids first need to understand the water cycle. The teaching tool, Incredible Journey, was set up indoors as a hands-on opportunity for them to do just that. Chairs were scattered across the floor, each with a large container of plastic beads on the seat (though beads also ended up scattered haphazardly across the floor). Each chair had a respective color of beads on the seat, corresponding to a water source, such as rivers, groundwater, clouds, and more. While not initially a race, it quickly turned into one as students rolled a die to see where their original water source was traveling next. Collecting beads along the way, students finally stopped and had to reflect on their journey through the water cycle. After careful consideration, many had ideas on how water might travel from a cloud to the ocean, and from a river to an underground well. Getting young students to consider the length to which water travels to become usable to us is essential to ensure that the resource continues to be valued.

"It's nice to see the children smiling as they walk away, with a new understanding of how the world around them works." – Christal Black, Assistant Manager, Institute for Tribal Environmental Professionals

Students at the Incredible Journey activity

Students were encouraged to continue observing the world long after the Earth Day event, and the Hopi Department of Water Resources provided an outlet for these observations. As water contamination and drought continue to be present issues across the Hopi Reservation, the Hopi Department of Water Resources made announcements to all students and community members regarding the value of citizen science, citing the need for everyone to be looking out for drastic changes to water quality and availability.

Hopi Weavers

Presently, Hopi Weavers are experiencing cultural challenges directly related to climate induced drought across the Hopi Reservation. Two Hopi Weavers were present at the event with traditional baskets and textiles for viewing, and traditional toys for children to play with. As climate change impacts this culturally significant practice, synthetic materials are becoming more reliable than traditional materials gathered from the local environment that have been depended on for a millennia.

The baskets, which attendees were encouraged to pick up and observe, are made from rabbitbrush. This shrub grows throughout the Western US and Canada, but is becoming harder to utilize in Hopi weaving. Rabbitbrush growth is dependent on a good rain, so the prolonged and more extreme droughts make finding quality rabbitbrush difficult. The grass must be strong and pliable to weave with, but drought makes it brittle and small.

The textiles on display were made from wool and colored with natural, traditional dyes. However, wool is now hard to come by, as there are fewer Hopi shepherds. The weavers thought back to their childhoods, stating "Hopi men used to have sheep – a lot of them." Given the lack of available wool, weavers are opting to spin and use synthetic yarn from large department stores, such as Walmart, for weaving. The synthetic yarn is pre-dyed, and the commercial dyes allow for a brighter and wider range of colors than natural dyes, which tend to be in higher demand among customers.

This combination of both cultural and environmental factors has led to challenges to maintaining natural weaving techniques, yet the practice of weaving remains strong in the Hopi community. Continued drought will further limit Hopi Weavers' ability to gather traditional weaving materials, which has already led to the evolution of weaving practices as Hopi Weavers depend on the use of synthetic materials for weaving practices.

Sand Dune Mobility and Dust Demonstration

Drought and an increasingly dry climate have led to sand dune migration across the Colorado Plateau region, though the Hopi Reservation and the Southwest corner of the Navajo Reservation are continuously facing the most extreme examples of this migration[3]. To assist in understanding the causes of sand dune migration, an interactive demonstration was presented at the Hopi Earth Day Event. Frank Telles, an intern with the Institute for Tribal Environmental Professionals, brought his own dirt. And his own plastic forks, and rocks.

In three half-full containers, side by side, were replicas of different soil conditions. One container was filled with dry, loose soil, which Frank called ‘dust’. The second container was filled with ‘dust’, some gravel, and had been sprayed with water – though just on the surface. The third container had plastic forks stuck into the ‘dust,’ resembling trees, had been moistened significantly, and had even more gravel than Box #2.

Frank handed an enthusiastic volunteer a hair dryer. “You’re the wind maker!” he chanted, as they blew the top of each box for roughly a minute each. After, all those gathered around observed which box saw the most soil erosion and mobility. They came to the consensus that it’s Box #1. The conditions in Box #1 – the dry soil, the lack of vegetation – closely resembled that of the Hopi Reservation. Understanding the soil mobility in these conditions allows students to consider how it can be prevented.

Frank Telles’ Dust Mobility Activity

As sand dune mobility increases, and factors facilitating this mobility increase in severity, protecting existing vegetation in arid regions, such as the Hopi Reservation, is essential. Sand dunes must be monitored as a geologic hazard, as they can alter drainage patterns, complicate travel, and decrease air quality, perpetuating respiratory ailments. Some communities across the Colorado Plateau are adopting new planting methods to reduce sand dune mobility, though these methods are too new to be determined successful or not. One such method works by laying sand-filled tubes in a grid across sand dunes and planting clay caked seeds in the grid; local communities are hopeful that the water trapped by the tubes will allow the seeds to root, stabilizing the soil.

Hopi Renewable Energy Office

Ultimately, to limit any further impacts of climate change, fossil fuel emissions must be limited to be on track to be halted entirely in the near future. A global renewable energy transition is essential in reducing fossil fuel emissions. The Hopi Renewable Energy Office

was present and focused on educating students and community members on renewable energy technologies and encouraging community members and older students to consider pursuing a career in renewable energy installation and development. Those tabling gave brief demonstrations on how solar and wind renewable energy technologies work. Through these demonstrations, it was expressed that help for a renewable energy transition is needed in many different capacities, whether that be multiple technologies, various forms of labor in this developing workforce, or those able to educate others on the importance of renewable energy.

While the Hopi Nation is making strides to advocate for renewable energy development on the Reservation, their history with mining and energy is tumultuous. The Hopi Nation has been heavily impacted by the irreversible mining efforts from coal extraction at Black Mesa to uranium extraction and processing around the Hopi Nation by the United States for nuclear war. Moving forward, the Hopi Department of Natural Resources expressed that while mining is essential to continue our modern ways of life, mining companies need to be held accountable for properly remediating land and water at inactive mine locations, and use past experiences to advocate for just and responsible mining in the future.

Climate change is continuing to impact Indigenous communities at unprecedented rates, with seemingly unpredictable severity. The Hopi Nation is not shying away from the arising challenges. Emphasizing youth and community education and connection to the environment will be essential in combatting the worst effects of the climate crisis, particularly in a region that is expected to be impacted in a diverse variety of ways – the American Southwest.

References

1. Villarreal, Yezmin. (April 2022) “Arizona’s 27 Year Drought. A guide.” Arizona Luminaria. Available online from: https://azluminaria.org/2022/04/01/arizonas-27-year-drought-a-guide/ [accessed May 9, 2024].

2. Giddens, Joe. (October 2022). “Adapting to climate change on Hopi.” University of Arizona Indigenous Resilience Center. Available online from: https://resilience.arizona.edu/news/adapting-climate-change-hopi [accessed May 9, 2024].

3. USGS. (July 2011). “Monitoring and Analysis of Sand Dune Movement and Growth on the Navajo Nation, Southwestern United States.” USGS. Available online from: https://pubs.usgs.gov/fs/2011/3085/fs2011-3085.pdf [accessed May 9, 2024].

This profile was developed in 2024 by Taryn Bell, Institute for Tribal Environmental Professionals, Northern Arizona University, with financial support from the Bureau of Indian Affairs. The profile is available on the Tribes & Climate Change website: www7.nau.edu/itep/main/tcc/Tribes. The tribal climate change profiles featured on the website are intended to be a pathway to increasing knowledge among tribal and non-tribal organizations interested in learning about climate change mitigation and adaptation efforts.

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