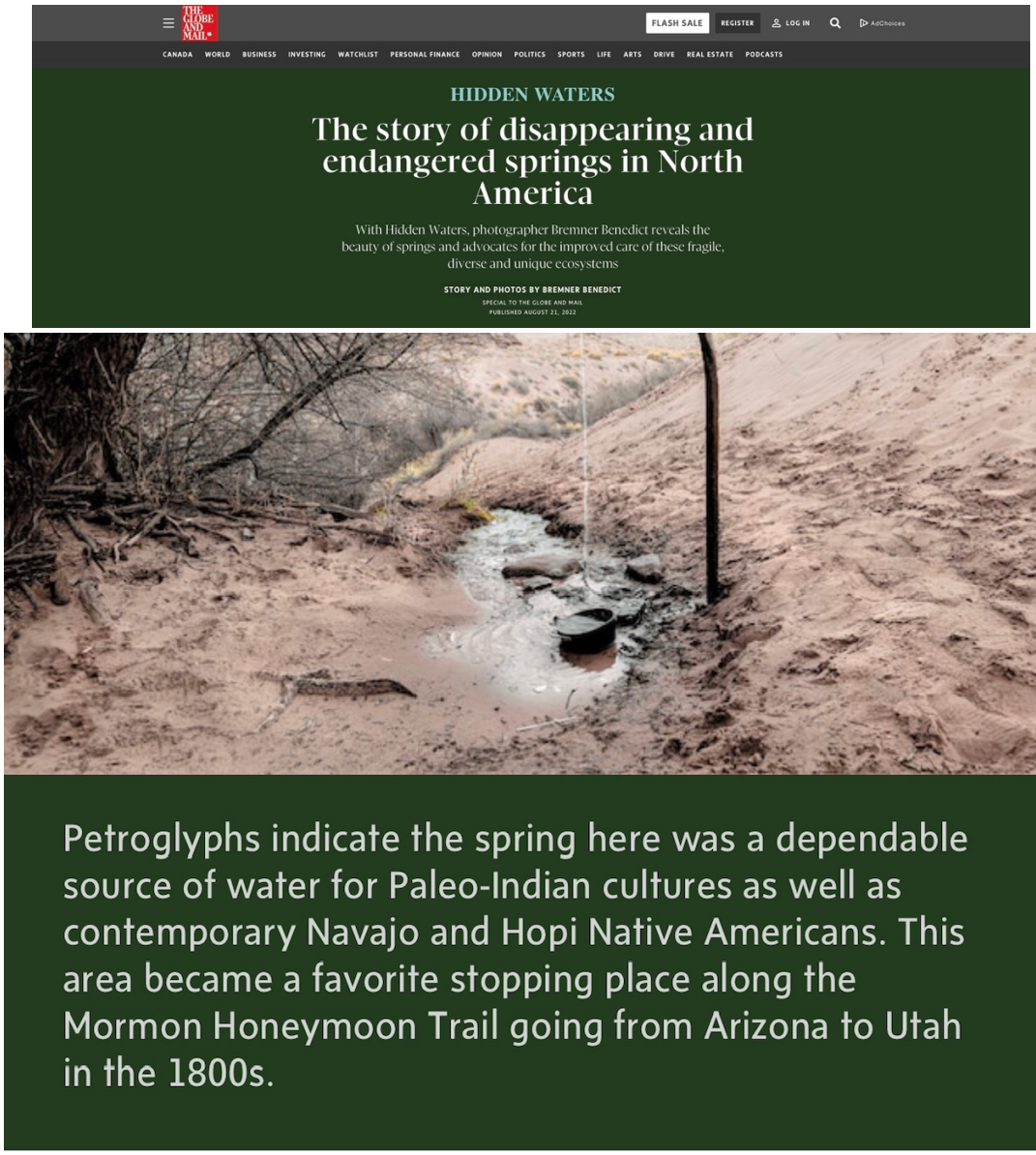

Photographer Bremner Benedict's Hidden Waters project is an artistic investigation that envisions the effects of climate change on the disappearing and endangered springs in the five major arid and semi-arid ecoregions in North America. She wants the series to raise public awareness and serve as a call to action.

What is the Hidden Waters project?

I started this series as an artist interested in the destruction of the environment focusing on the loss of water in natural springs, an easily missed yet important feature in the environment. The more I learned about the scientific complexity and poignancy of their condition, the more science became important to this series.

By blending art and science into a visual narrative, the project evokes a deeper understanding and empathy for the natural world and helps to make the multi-faceted stories of springs more accessible to a non-scientific audience. Reducing the distance between us and the land makes the unknown more familiar with the purpose of beginning a dialogue about their protection.

Springs continue to hold vital clues to the viability of the aquifers we depend on, and the loss of these significant ecosystems will continue to threaten our own ability to live in dry places. It's my hope that by revealing their beauty through art it will help elevate concern for improved care of these fragile, diverse, and unique ecosystems.

Archaeological evidence of Paleo-Indigenous peoples' use of hot springs goes back 10,000 years. These tubs are for cooling the extremely hot water enough for a pleasant mineral soak.

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A spring is the result of an aquifer being filled to the point that the water overflows onto the land surface. They range in size from intermittent seeps, which flow only after much rain, to huge pools flowing hundreds of millions of gallons daily.

– Lawrence E. Stevens, PhD. Director Springs Stewardship Institute

Mammoths drank from these springs where the descendants of prehistoric Amargosa pupfish now live. Recognized as an internationally important wetlands possessing significant value to humanity, this largest intact oasis in Death Valley is a biodiversity ‘hotspot’ and the sole habitat for approximately 25 unique and endemic plants and animals.

How did it come to be?

This project began in serendipitous ways, first after listening to Hopi members of the Black Mesa Water Coalition describe the increasing loss of springs on their reservation, springs on which they depended for drinking water; and second, by participating in a Navajo springs inventory into the arid Chuksa Mountain in northeastern Arizona. There I was introduced to the multi-dimensionality of spring ecosystems, their value and relevance, as well as how climate change and humans threaten their biodiversity and sustainability.

A staggeringly high percentage of North American springs have been impaired or lost, particularly over the past century, and that rate is increasing as groundwater use accelerates. Many springs have been lost due to the construction of roads and buildings, competing groundwater pumping, recreation, livestock grazing, mining, and even wildlife management. The springs that remain are spiritually, culturally and socio-economically valued throughout the world.

Having lived for years in a bone-dry town in Arizona, the constant attention to water – making sure I was drinking enough every day, not using too much when washing dishes – made me acutely aware that water is precious. After discovering that springs on local reservation lands were drying up, I began to think more deeply about the implications for those who live in dry landscapes and decided to record the few remaining springs before they are lost forever.

These experiences led me to become a passionate advocate for climate change issues, particularly as they pertain to water conservation.

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As windows into aquifers, springs can be regarded as ‘the canary’s canary’ of environmental indicators - revealing the health and sustainability of humanity’s last reserves of fresh groundwater.

– Lawrence E. Stevens, PhD. Director Springs Stewardship Institute

Archeological evidence of Paleo-Indigenous settlements near the spring date from 5,000 years ago. Tecopa Hot Springs is a remnant of an early Ice Age lake, roughly two million years ago. When the climate became dryer and hotter, isolated islands of water remained along with an ancestral Desert Pupfish. Today the Tecopa pupfish is an endangered species.

Indigenous Shoshone and Paiutes peoples, along with westward Euro-American colonists, used these waters for bathing. Originally dredged to divert water to local ranches, these springs continue to be 'mined' for their water.

Evidence of Paleo-Indigenous peoples' presence date from 10,000 years ago in this ancient lakebed near the California-Oregon Emigrant Trail of the late 1800s. Roughly 100 years ago farmers drilled a well for irrigation but the water was too hot to use.

How have you been able to relate to these dynamic aspects of diversity?

I discovered that the relationship of springs to their environment plays a key role in developing their distinctive character – a spring influences its surroundings, and those interactions, that relationship, shape a spring's ecological personality. Each spring has a story to tell. It became important for me to visit a diverse variety of dry land ecoregions to find a range of different environments and conditions as well as iconic springs. Their portraits reveal arid land springs' most striking characteristics.

Many Indigenous cultures believe that land holds memory, a belief well-reflected at springs, which often contain thousands of years of evidence of human interactions with nature. Prehistoric, Indigenous, cross-desert trade routes followed paths that lead from spring to spring that were one or two days' walk apart. Anglo-Europeans colonizing the continent in the 1800s followed those same routes, relying on those same springs, and often settling where there was abundant groundwater.

The belief in the mystical and divine nature of springs and their healing power has existed for thousands of years and is profound among all cultures affecting each of us in complex ways. Contemporary Indigenous peoples often view spring waters as alive and sacred. Many consider springs to be living entities of prayer-worthy cultural significance and as sites deserving our utmost respect and protection. Despite being mostly unseen and poorly known in our warming, modern world, springs have taken on a new conservation relevance.

This deep-water sinkhole fed by underground springs is one of a string of nine lakes which were formed from an ancient limestone reef of collapsed caves filled with aquifer water.

> “Springs are among the most structurally complicated, ecologically and biologically diverse ecosystems. They are incredibly productive and evolutionarily provocative, yet they remain some of the most threatened ecosystems on Earth.
>
> *– Lawrence E. Stevens, PhD. Director Springs Stewardship Institute*

Used by Indigenous Shoshone and Paiute Native Americans for over 6,000 years, as locations for religious ceremonies, and social events. Contemporary scientists search these hyper-saline, extremely hot waters for new medicinal compounds while geo-thermal companies with land leases in the area consider exploiting them for energy use.

Why do you consider these issues to be important in the context of climate change?

The critical importance of these waters and the ecological diversity they support is gravely underrecognized, leaving them more susceptible to long-term drought, climate change, overuse and anthropogenic damage. Unfortunately, these invaluable water sources are now facing an uncertain future. About 85 per cent of the world's springs have dried up, and they are now considered one of the

most endangered ecosystems on Earth. The UN and World Resources Institute predict that as much as two-thirds of the world may suffer from water scarcity by 2025 caused by depleted aquifers. Natural ecosystems will be hit even harder.

Since the beginning of human existence, springs have been key to our survival. Despite many being very small in the landscape, they wield tremendous influence in their unique ecological niche. Not only do they host some of the richest diversity of plant and animal life on the planet, but they also contain roughly 20 per cent of the world's endangered species. Called "windows into the Earth," springs serve as a barometer of the quality and endurance of their aquifer/groundwater, thus performing a crucial role in the endurance and viability of human society and all life on earth.

It can be difficult to comprehend the seriousness of water scarcity within modern society, where most of us are able to instantly access water simply by turning a faucet. While we cannot remain ignorant to this reality and the threat that losing natural springs poses in the context of climate change, we still have the ability to intervene before it's too late. If we act quickly, we can restore some springs where the aquifer hasn't been too damaged. All is not yet lost, so long as we soon become inspired to protect and defend the value of springs – for where there is water, there is life.

Rattlesnake Springs is one of the few remaining reliable sources of food and water as a stopover on the central migratory flyway for hundreds of birds on their yearly north-south migrations.

Named for the Mojave chub and endangered desert fish found only in the Mojave River, this spring was a water stop on the arduous 'Old Spanish Trail,' which European colonists from Santa Fe, N.M., to California. This spring is considered possibly a true refugia, which is an area of relative stability where plants and animals endure despite surrounding climatic changes.

As told to Ryan MacDonald. This interview has been edited and condensed.

https://www.theglobeandmail.com/canada/article-endangered-springs-north-america/