Yellowstone Wild through Time

Interview with the Filmmaker, Carol J. Amore

"Curiosity rapidly emerges from being in nature and inspires meaningful discoveries like the hot springs ancient living and fossilized microbes that become a mirror into the universe of life. The Yellowstone Wild through Time film opens the door to this microscopic world within geo-thermals and is also interconnected with expansive wildlife experiences."

Carol J. Amore, Executive Producer & Filmmaker
Ancient Lands and Lives Films
www.YellowstoneWildthroughTime.com

1. What set of Wildlife Film experiences did you have before filming in Yellowstone National Park?

Ancient Lands and Lives-Above the Grand Canyon Rims, Arctic Polar Bear Mothers, TIGERS-Tracking a Legend (Feature Documentary) are some of the award-winning films I have filmed and produced. All filmmaking experiences have tremendous preparation and a deep immersion into the remote location where the wildlife live, especially filming wild India's Bengal tigers, Arctic Polar Bears and Northwest America's Yellowstone's grizzly bears, grey wolves and cougars.

2. How would you best describe this *Yellowstone Wild through Time* film?

Audiences connect through ancient Yellowstone's past and present into an sensory immersive journey of combined high impact visual and enriched musical experiences. This Docu-Music Video is dynamic in how it intertwines realistic wildlife film footage along with custom-designed music to fit with the action.

Some Yellowstone ecosystems include magnificent wildlife predator-prey territorial interactions (grizzly & black bears,

grey wolves, cougars, lynx, red foxes and more),
colorful geo-thermal formations with ancient and evolving microbes,
spectacular hot springs and geyser eruptions,
ever-changing weather patterns, dynamic wind/cloudscapes
as well as amazing celestial night skies.

3. What film approaches enhanced this music-video?

During my on-site Yellowstone National Park experiences,
I wanted to create an upbeat, unique and fast action film/music video to capture international and domestic audiences' attention.

To add more visual depth and excitement for audiences,
advanced film technologies using approved USA lidar drones,
thermal cameras, macro-photography, microscopic filming,
high altitude images, time-lapse and slow motion filming
were used within Yellowstone National Park's extraordinary environments.

4. What inspired the making of Yellowstone Wild through Time?

As a filmmaker/photographer, I have been to Yellowstone National Park several times to explore many of the main spring, summer, fall and winter geothermals as well as its vast landscapes.
The wildlife were often attracted to the geothermals especially for warmth in the winter. I was also there in 1989 to witness new growth after the 1988 Yellowstone Wildfires.
Standing on top of Yellowstone's active Supervolcano gave me a sense of how rare it is to experience actively changing land with large lava chambers contributing to the hydrothermal high temperature changes and fluctuating pressures below.
There is often an element of surprise in being close to geothermals.
The **thermophiles**(heat-oriented microorganisms) live in extreme heat where most living organisms can not survive.
Pressurized water, steam and rock explosions can occur at any time.
Getting splashed by "boiling mud pots" can burn skin and hurt eyes.
Yellowstone's 1400 earthquakes a day are impressive and fortunately the land above does not shake.

Traveling alone in Yellowstone gave me more time for wildlife observation to best understand their movements for feeding in the grassland and forest areas as well a]s Yellowstone's rivers, lakes and and fast-moving waterfall locations.
Patience in observing wildlife and the changing landscapes offers meaningful rewards in capturing many unexpected wildlife encounters.
While filming, remember to always carry bear spray to readily use if a grizzly or black bear makes an aggressive move forward.
Stop anyone from running which would cause the bear to pursue.
Ask others along a trail if they need help if they look in trouble.
Keep everyone calm when problem-solving a potentially difficult situation.

5. What are some Outdoor Survival/Convenience items you might recommend?

Some Outdoor Film/Photo/Personal Travel Tips include:
-**Access physical fitness level** to manage Yellowstone's High Altitude(average 6,500 ft-7,500 ft.).
-**Drink lots of water to proactively prevent dehydration!**
-**Physically train** in advance before arriving at Yellowstone**.**
-Carry **extra Camera Batteries** with ease of access
-Bring extra large storage **SD Memory Cards** for cameras
-Bring extra **Polarized sunglasses** to protect eyes from high altitude UV rays.
-Bring extra strength **eye drops** for the high altitude air dryness.
-**Mylar Hats** also help reduce heat from the sun for those outside throughout the day.
-Provide **electrolytes** in water bottles to sustain personal energy.
-Bring a **nasal spray** for dust, allergies and nasal decongestion.
-Carry **waterproof cover for camera(s)** and oneself to prepare for unexpected rain/wind storms.
-Bring **waterproof hiking boots** with foot orthotics inside for best balance on uneven trails.

-Plan Ahead. Carry a **Starlink Satellite** phone for emergencies and important communication. Each evening at the lodge site and in the car(electrical outlets) advance charge cell phones and camera batteries. Stay ahead of battery power charging and usage needs.
-Carry an **Emergency Survival Signaling** device and **Medical kit**.

6. What are some of the best ways to prepare for experiencing Yellowstone National Park's geological-hydrothermal phenomena?

Advance learn and read everything you can about Yellowstone National Park before traveling there.
Yellowstone Forever stores within the Park have very informative natural history and geology books for people of all ages.

-Prepare yourself to have an interdisciplinary mindset when viewing the Park's geothermals and wildlife.
-Read about Yellowstone's Supervolcano to understand its ancient past and how the lava chambers below impacts the Park today.
-Learn about Yellowstone's Geology of the past and present to see its clues while traveling through the Park.
-**Understand how hydrothermal pressures** influence the geyser eruptions and/or plumbing challenges causing geyser stress.

Be curious about everything and talk to the Park Rangers and volunteers who have practical observational knowledge of the geothermals and wildlife. They care about visitors.

Note: Yellowstone National Park's Mammoth Springs' travertine cascading rock formations shaped from a salty fluid and the ocean's coral colony reef systems sourced from marine limestone and water have similar skelton patterns when microscopically reviewed. They have a shared

mineral element CaCo3 composition called **Aragonite**.
(Source: Bruce Fouke, The Art of Yellowstone Science)

7. What makes the Yellowstone National Park's geothermal microbes unique?

Each hot spring and geyser has their own set of unique current and ancient fossilized microbes. They are like guiding posts into the past, present and future of life on earth. These microbes can further our scientific understanding of potential life on other planets.

Montana State University's Thermal Biology Institute is focused on understanding all aspects of Yellowstone's microbes. ***Living Colors-Microbes of Yellowstone National Park*** is an excellent field guide to use while at the Park.

For instance, Mammoth Springs's dominant microbes that have been intensively studied by leading scientists include **cyanobacteria, sulfurihydrogenibium and thermochromatium**.
The ***Art of Yellowstone Science*** by Bruce W. Fouke Ph.D., leading GeoMedical scientist and Tom Murphy, photographer, have illustrated key research in Mammoth Springs.

Norris Geyser Basin has a large complex array of hot springs unique **only** to this area. Dedicated microbiologists have confirmed some existing and specialized microbes there include:
- Caldisphaera, Crenarchaeota -Cyanidioschyzon, Rhodophyta
- Euglena, Euglenozoa , Hydrogenobaculum, Aquificate

The iconic colorful Grand Prismatic Spring has specialized microbes include:
Calothrix, Cyanobacterium
Synechococcus and Phormidium-orange cyanobacterium.

Each day new exciting Yellowstone microbe discoveries are made that enlighten medical sciences and our understanding of life on earth. Key learnings about past and potential future life on other planets could also be explored from these important Yellowstone microbes.

8. . What did you see that surprised you?

Some Yellowstone's Predator-Prey territorial challenges were action-filled with the unexpected aggression around each river, meadow, forest habitats and mountain areas.

- **Grizzly and wolves feeding together or pushing each other off the food to gain access.**
- **Grizzly fighting Grizzly for food and territory.**
- **Grizzly encountering Black Bear for territorial claim.**
- **Wolf Pack Chases Elk and Pronghorn deer.**
- **Wolf Pack after Moose calf.**
- **Wolf attacking another wolf that may have crossed into their wolf pack's territory.**
- **Wolf attacks coyotes to stop them from eating their prey**
- **Coyote chases and attacks other coyotes due to territorial and food claim challenges.**
- **Red fox fights coyotes for territory and food.**
- **Wolf pack chases Mule Deer and calf.**

9. What was unique about Yellowstone National Park's night skies?

The extra dark night skies allow for exceptional astrophotography capturing celestial constellations,

planets, supermoons and even annual meteor showers.

The seasonal timing of filming the night sky is important.

-A **safe location to film at night** is critical due to wildlife predators in the Yellowstone Park hunting at night.

-While **timing how long of a night film exposure** is involved a filmmaker might need to determine the total length time. (Sometimes for safety, a lodge parking lot can work or filming from the roof of the SUV/car vehicle. Keep no food in the car. Bears still roam through parking areas looking for food.)

-**Watch all around at nighttime for extra personal safety.** (Bears sometimes look for Elk seeking shelter near the Yellowstone lodges.)

-**Use red light headlamps** to avoid interrupting a long exposure photograph while checking camera/film equipment.

-**Camera shake** will impact the image's sharpness. **Use Tripods**.

-Check out the **National Solar Observatory's** website to learn about expected solar flares in the Yellowstone area that could contribute colorful **Aurora Borealis** night sky displays. **Space.com** also offers daily updates on the night skies to see seasonal constellations, planets and meteor showers.

10. What further Yellowstone scientific wonders captured your attention?

In the 1960s, Thomas Brock's microbiology discovery of extremophiles in Yellowstone's hot springs paved the way to learn more about extreme heat bacteria.
Next, the Nobel prize-winning innovation discovered by Kary Mullis found that heat-resistant enzymes could be used to repeatedly copy DNA segments, a process he called PCR.
PCR allowed scientists to create millions of DNA copies needed for gene sequencing, medical diagnosis (like Covid-19 tests), genetic research, forensics and other medical diagnostics.

More significant scientific discoveries are happening each year though dedicated professionals that collaborate with each other.

11. What new fields of ScientificStudy have been inspired by Yellowstone National Parks' geothermals?

Yellowstone hot springs are a continuous window into earth's ancient beginnings. The study of these microbes reveals breakthroughs to understand the origins of the tree of life and their diverse growth. These living and fossilized microbe discoveries are part of earth's life stories and how life thrives even in most hot and hostile environments.

Geobiology and Astrobiology have grown as new interdisciplinary sciences to better understand life on earth and beyond. Remarkably, Mammoth Springs does have a chemical composition similar to seawater.

Shifting of the hot springs water flow impacts where

continued microbial growth will happen and reveal the
white/grey decay of old formations due to restricted water flow.

Some Mammoth Springs areas included within the film are:
At **Mammoth's Palette Springs**, there are multi-tiered formations
with mostly orange and green colors of thermophilic microbes
(bacterial mats) with continuous running water over their many surfaces.
Mammoth's Canary Hot Springs complex is a massive travertine mountain-like structure that produces about one ton of new travertine each day.
Orange Spring Mound has active and changing heated groundwater flowing and seasonal water temperature changes
impacting the color of the microbes (orange, green, ect.)

12. Where does the water source for Mammoth Hot Springs begin?

Yellowstone National Park's Mammoth Springs is fed by a source of snowfall and rain over the **Gallatin Range** on the back of the Rocky Mountains and flows into the ground. This water is then heated by **Yellowstone's Supervolanco magma lava chambers**
and filtered through the **Old Madison Limestone** below.
This thermal water rises to provide a complex and perfect habitat for ***thermophiles and extremophiles*** that thrive at high temperatures such as **200 degrees fahrenheit and above**.

Microbial communities are dynamically built in a wide range of formations such as **scalloped terracettes** and even **filamentous streamers** that become encased in travertine minerals.
Cascading lower temperature travertine features continue to grow
in glassy smooth shallow pools forming ***microterracette*** pools.

Montana State University's Thermal Biology Institute
is actively conducting research to search for further geo-biology
and scientific breakthroughs.

13. How can *Yellowstone Wild through Time* provide an exceptional learning and educational experience for all ages?

The integration of Yellowstone National Park's wildlife, geothermals and scientific microbe discoveries capture people's curiosity through a visual/musical story crafted to have the highest sensory impact.
Learning is inspired through seeing the best action-oriented wildlife images and the unique environment in which they live.

14. Added resources are linked to the film's website, **www.yellowstonewildthroughtime.com**, to allow for the family and an individual to learn a wide range of awesome facts about animals and their habitat.
I would like to acknowledge the resilience, dedication and tremendous capabilities of the entire Yellowstone National Park Team!
Take the opportunity to donate to YellowstoneForever.org that supports the Yellowstone National Park's Mission.

Carol J. Amore

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