



Leaving Traces in Park Waters

Contaminants of emerging concern on the northern Colorado Plateau



HANSEN CAVE, TIMPANOGOS CAVE NATIONAL MONUMENT, NPS PHOTO

Maintaining pristine water quality is crucial to both visitor experience and ecosystems in the national parks. New research shows that even individual park visitors can help make a positive difference by eliminating waste well away from water sources and avoiding contact with low-flow waters.

Background

For many years, it's been apparent that the things we use in everyday life are ending up in the environment. Agricultural pesticides, antibiotics, household microplastics, and even sunscreen and insect repellent are all being found in streams and rivers. It's not too surprising to find those kinds of contaminants near cities or farms—but would you expect to find them in a national park?

Scientists from the National Park Service, Environmental Protection Agency, and U.S. Geological Survey wanted to know. For several years, they sampled waters across the National Park System—everywhere from urban settings to predominately natural landscapes, like the Colorado Plateau.

The samples were tested for contaminants of emerging concern (CECs). CECs are substances that are largely unregulated in the United States but are now commonly found in surface

waters. The study analyzed three kinds of CECs: pesticides, pharmaceuticals and personal care products (PPCPs), and wastewater indicators (WWIs).

What We Found

From 2012 to 2016, hundreds of samples were collected at 21 sites in eight national parks of the Northern Colorado Plateau Network (NCPN; see box for list).

The results showed that even in isolated areas, CECs are not uncommon. Waste is getting into natural aquatic systems where it might not be expected.

At most NCPN sites, at least one PPCP and/or WWI was detected on over half of all sampling visits. However, they were generally found less often, and at lower concentrations, than in urban or agricultural watersheds. The contaminants most frequently detected were DEET, caffeine, household flame retardants, bisphenol A (BPA), fecal indicators, and polycyclic

Northern Colorado Plateau Network parks where CECs were sampled:

Arches NP
Bryce Canyon NP
Canyonlands NP
Capitol Reef NP
Dinosaur NM
Hovenweep NM
Timpanogos Cave NM
Zion NP

aromatic hydrocarbons (byproducts of biofuel combustion from sources like vehicle exhaust, power plants, and wildfires).

At a few sites, the same contaminants showed up over and over (in 50% or more of samples taken). These are referred to here as “chronic.”

- Certain pharmaceuticals were chronic at sites on major rivers with upstream communities and wastewater-treatment discharge (see table). The Colorado River at Potash site, about 15 miles (24 km) downstream from the Moab, Utah, wastewater treatment plant, had the highest number of chronic CECs of any site in the study.

- Personal care products were chronic at two cave locations in Timpanogos Cave NM (see table). Located high in a forested watershed, these two sites receive about 100,000 visitors per year. Consistent visitation, paired with slow atmospheric and cave-water turnover, may contribute to this contamination. (In contrast, samples from The Narrows, at Zion NP, had no chronic CECs, despite thousands of visitors wading in the river each day during the recreation season.)
- The pesticide, triclopyr, was chronic in and near Canyonlands and Arches national parks (see table). This may be associated with the use of a triclopyr-based herbicide to control tamarisk in these parks.
- Fecal indicators were chronic at streams and isolated springs at four parks (see table).

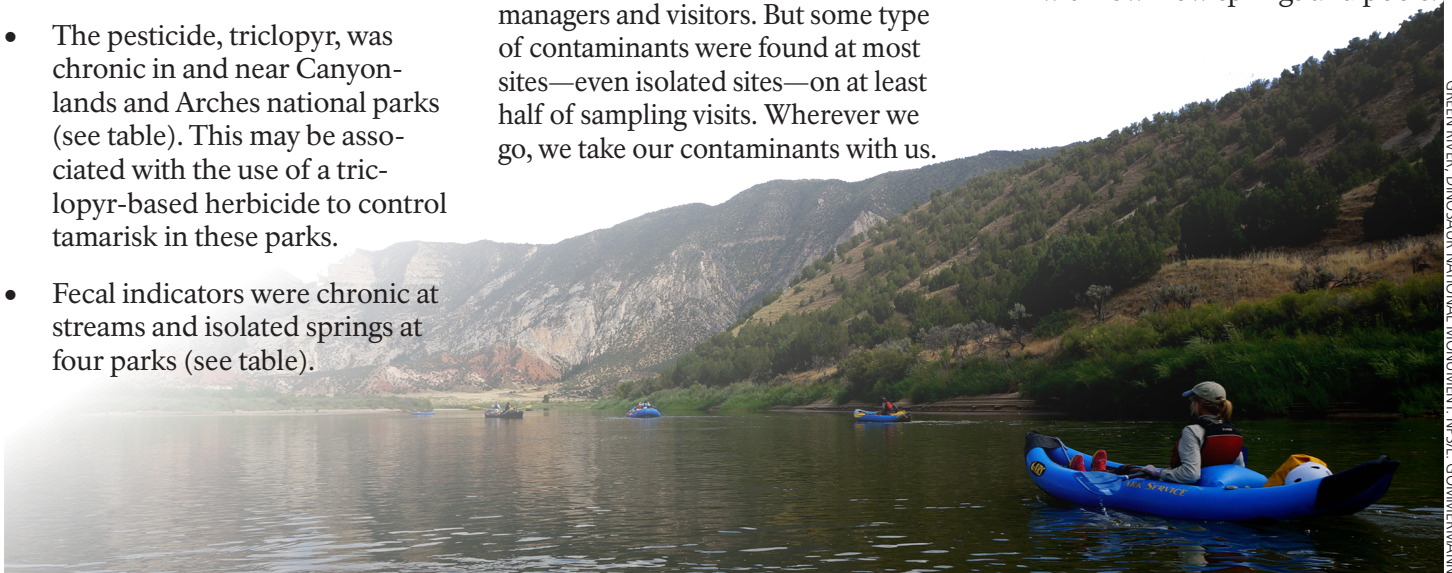
What it Means—and What You Can Do

The amounts of contaminants found in NCPN parks were generally very low. When it does occur, chronic contamination seems most likely if there is a wastewater treatment plant upstream, or in situations with low or stagnant flow, where contaminants can't easily be washed out of the system.

At current levels, the CECs detected aren't likely to affect vertebrates, such as fish or frogs, or be a public health risk. That's good news for park managers and visitors. But some type of contaminants were found at most sites—even isolated sites—on at least half of sampling visits. Wherever we go, we take our contaminants with us.

Every park visitor can make a difference in the quality of park waters on the Colorado Plateau. Because contaminants can come not only from human waste, but also from skin and clothing, there are two important ways visitors can help keep park waters healthy and pristine:

- Whenever possible, answer nature's call (i.e., deposit human waste, whether liquid or solid) at least 200 feet from water sources, and
- Avoid making physical contact with low-flow springs and pools.



GREEN RIVER, DINOSAUR NATIONAL MONUMENT NP&L, GOMMERMAN

Contaminants of emerging concern consistently found in Northern Colorado Plateau Network parks.

CEC	Description/use	Potential source	Site	Park (in/near)	Site type
Pharmaceuticals	Various types	Human	Colorado River at Potash	Canyonlands NP	Major river
			Green River at Mineral Bottom	Canyonlands NP	Major river
			Yampa River at Deerlodge	Dinosaur NM	Major river
Caffeine (dissolved)	Common stimulant	Human	Hansen Cave	Timpanogos Cave NM	Cave pool
DEET	Insect repellent	Human	Middle Cave	Timpanogos Cave NM	Cave pool
Galaxolide	Synthetic fragrance in household products	Human	Middle Cave	Timpanogos Cave NM	Cave pool
Triclopyr	Pesticide	Human	Colorado River at Potash	Canyonlands NP	Major river
			Lower Courthouse	Arches NP	Isolated spring
p-cresol	Colorless solid used in the production of other chemicals	Human/Natural	Upper Courthouse	Arches NP	Isolated spring
			Green River near Jensen, UT	Dinosaur NM	Major river
indole	Fecal indicator	Human/Natural	Sleepy Hollow Spring	Arches NP	Isolated spring
			Sulphur Creek	Capitol Reef NP	Stream
			Green River near Jensen, UT	Dinosaur NM	Major river
			The Grotto	Zion NP	Isolated spring
			North Creek	Zion NP	Stream

Information presented here was summarized from Weissinger, R. H., B. R. Blackwell, K. Keteles, W. A. Battaglin, and P. M. Bradley. 2018. Bioactive contaminants of emerging concern in national park waters of the northern Colorado Plateau, USA. *Science of the Total Environment* 636:910–918.