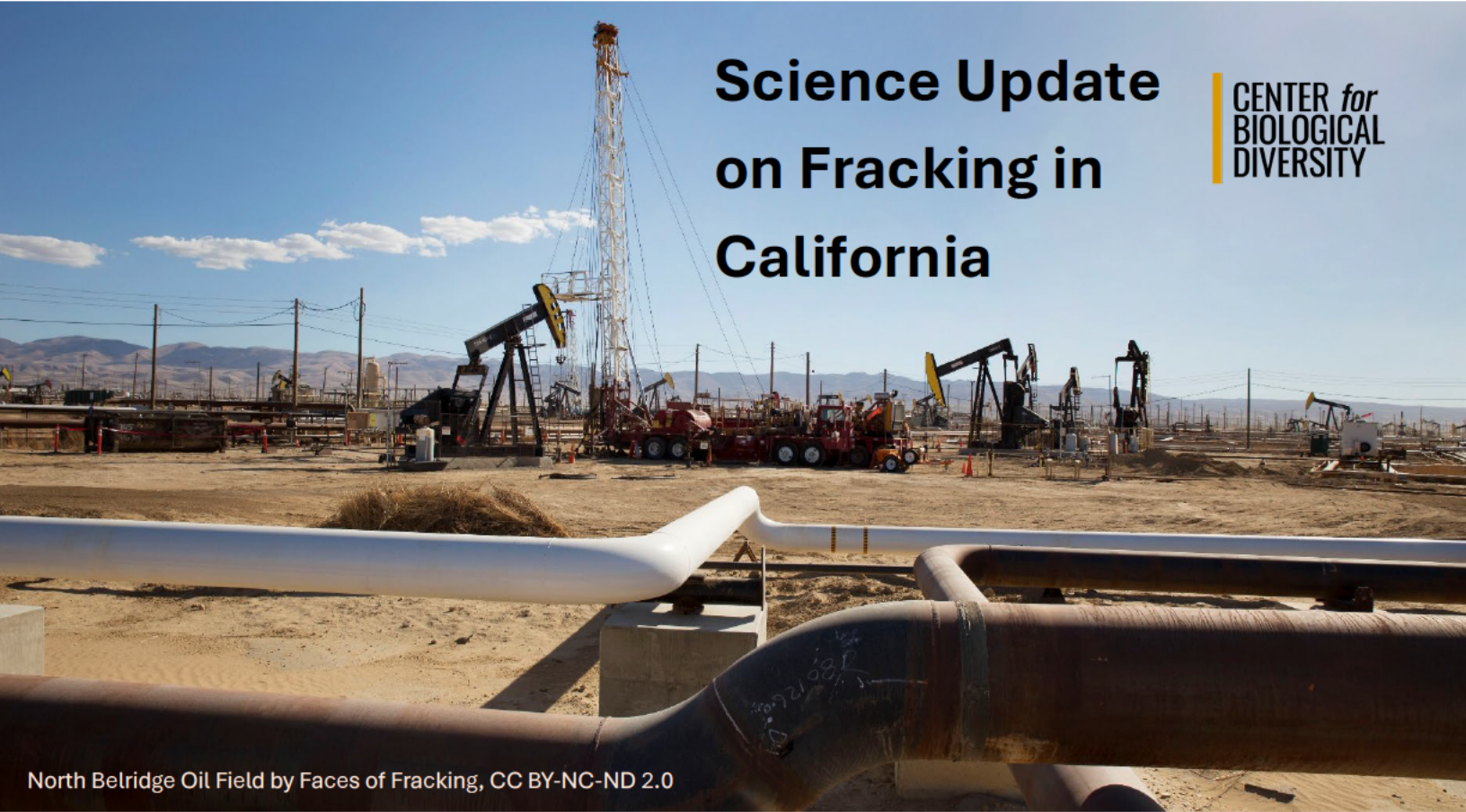


Science Update on Fracking in California

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North Belridge Oil Field by Faces of Fracking, CC BY-NC-ND 2.0

Fracking Is An Extreme Method of Oil and Gas Extraction

During fracking, large volumes of water, sand, and toxic chemicals are blasted into the earth at very high pressure to fracture rock formations and release oil and gas.

Fracking causes serious harms to our health, climate, and environment which led California to ban this extreme extraction practice in 2024.

Extensive scientific research and evidence show:

- Toxic fracking chemicals contaminate our air and water.
- Living near fracking sites is linked to widespread, serious health harms.
- Fracking depletes scarce drinking and irrigation water supplies.
- Wildlife species are harmed by fracking-enabled habitat destruction, pollution, and disturbance.
- Fracking worsens the climate crisis by releasing methane and enabling more drilling.
- Fracking increases earthquake risks.
- Fracking is concentrated in disadvantaged communities.

Fracking in California is particularly inefficient because of the state's complex geology. As a result, fracking was only happening at low levels before the fracking ban was announced. The fracking ban will only make a tiny dent in state oil production (0.4 percent per year) and revenues.

Fracking Uses Toxic Chemicals

Fracking uses toxic chemicals that are harmful to our health. Many chemicals in fracking fluid — such as lead, benzene, toluene, xylene, methanol, and sulfuric acid — are associated with serious harms to our reproductive, developmental, respiratory, neurological, and cardiovascular systems.¹ Known cancer-causing fracking chemicals include benzene, formaldehyde, chromium, and arsenic.² The full extent of toxicity of fracking fluid has been hidden by the oil and gas industry, which uses dubious “trade secret” claims to withhold the identities of chemicals like biocides and corrosion inhibitors that are likely to be toxic.³

Fracking Chemicals Contaminate Our Air and Water

Fracking chemicals pollute our air and water through multiple pathways. During fracking, VOCs (volatile organic compounds) in fracking fluids like benzene and formaldehyde escape into the air.⁴ Fracking operations also release hazardous air pollutants like fine particles, hydrogen sulfide gas, nitrogen oxides, and other chemical precursors of ground-level ozone (smog), a strong respiratory irritant.⁵

Fracking chemicals injected underground return through the well to the surface in wastewater, first as “flowback” fluids and later in vast amounts of “produced water.” Produced water contains fracking chemicals along with toxic heavy metals (e.g., lead), radioactive chemicals (e.g., uranium), BTEX chemicals (benzene, toluene, ethylbenzene, xylene), and polycyclic aromatic hydrocarbons (PAHs).⁶ Fracking wastewater can pollute the land through leaking wastewater storage pits and tanks, spills from tanker trucks and pipelines, and illegal dumping. Fracking wastewater can pollute underground through defective and deteriorating well casings, and the migration of chemicals from underground fractures into groundwater.⁷

Fracking Harms Our Health

A robust body of scientific research has established that living near fracking sites can pose wide-ranging harms to our health.⁸ The closer people live to fracking wells, the higher the exposure risk to toxic chemicals.⁹ A 2023 science review of hundreds of studies concluded that “[p]ublic health problems associated with fracking include prenatal harm, respiratory impacts, cancer, heart disease, mental health problems, and premature death.”¹⁰

Many studies have found that living near fracking operations is linked to a higher risk of problems during pregnancy and health harms to newborns, including preterm births, small-for-gestational-age births, low birth weights, and birth defects.¹¹ In California, a 2021 study of 979,961 births found that prenatal exposure to fracking (i.e., fracking within

one kilometer (0.6 miles) of maternal residence) was associated with increased probability of low birth weight, preterm birth, and small-for-gestational-age birth.¹²

Fracking is linked to respiratory distress and disease. Living near fracking operations is associated with increased asthma attacks and asthma-related hospitalizations, and premature deaths linked to fine particulate pollution.¹³

Fracking is linked to cancer in children.¹⁴ At least 20 fracking chemicals are associated with leukemia or lymphoma.¹⁵ A 2022 study found a two- to three-fold increase in leukemia among children who lived near a fracking well while their mothers were pregnant with them or during early life.¹⁶

Living near fracking sites is associated with more hospitalizations due to heart diseases.¹⁷ A study of more than 12,000 patients found that heart failure patients living near fracking sites were significantly more likely to become hospitalized.¹⁸

Fracking can harm mental health. Living near fracking sites is linked to chronic stress, poor sleep, and self-reported depression.¹⁹

Fracking is linked to premature death. A 2022 study using data from more than 15 million Medicare recipients found that elderly people living near or downwind of fracking operations in all major U.S. fracking regions were at higher risk of early death compared with elderly individuals who didn't live near fracking operations.²⁰

Fracking Pollutes Our Water

Numerous studies show that fracking chemicals, and methane released by fracking, have polluted surface water, groundwater, and drinking water, including in California.²¹ The oil and gas industry's track record of frequent wastewater spills provides pathways for fracking chemicals to contaminate surface water.²² California is particularly susceptible to groundwater contamination because of the industry's "shallow fracking" practice and injection of wastewater into protected aquifers.²³

About three-quarters of fracking in California was "shallow fracking" done in wells less than 2,000 feet (600 meters) deep,²⁴ with some fractures as little as 650 feet deep.²⁵ In California, shallow fracking operations had been permitted directly below drinking water aquifers which has the "inherent risk" of contaminating drinking water.²⁶

Oil and gas companies frequently dispose of wastewater, including wastewater from fracked wells, by injecting it into underground wells. Across California, billions of gallons of wastewater were injected into aquifers that were supposed to be protected under federal law.²⁷ High levels of arsenic, thallium and nitrates — contaminants found in fracking wastewater — have been detected in water-supply wells near these injection operations.²⁸

Fracking Depletes Water Supplies

Fracking depletes water supplies in water-scarce regions. Fracking and fracking-enabled oil extraction in California used up to 4 billion gallons of water each year, 99 percent of which was freshwater,²⁹ equivalent to the annual water use of 45,000 households.³⁰

Fracking had been concentrated in water-scarce, frequently drought-stricken regions of the San Joaquin Valley, leaving less water for residents, agriculture and wildlife.

Fracking Puts Wildlife In Danger

Fracking-enabled oil and gas development harms wildlife.³¹ Habitat destruction and fragmentation push imperiled species out of their homes. Chronic oil spills and wastewater spills kill animals and plants and contaminate habitat,³² while uncovered wastewater pits kill birds and other wildlife.³³ Fracking-related development has been documented to increase the spread of invasive species, lower stream flows and water availability, and increase noise, light pollution, and vehicle traffic. Numerous studies show that animal and plant species have suffered decreased health, reproduction, and survival due to these impacts, which can lead to population declines and local extinctions.

In the San Joaquin Valley, about 150 endangered and sensitive species³⁴ had been at risk from fracking-enabled extraction, including the San Joaquin kit fox, California condor, blunt-nosed leopard lizard, giant kangaroo rat, California tiger salamander, California red-legged frog, monarch butterfly, Temblor legless lizard, and steelhead salmon.³⁵ In Kern County alone, fracking-enabled habitat loss and fragmentation has altered at least 13,400 hectares of natural habitat and 6,700 hectares of other land areas.³⁶ Native species like San Joaquin kit foxes, burrowing owls, short-nosed kangaroo rats, and American badgers have declined as oil development has increased.³⁷

Fracking Worsens Climate Change

Fracking operations are energy-intensive, emitting greenhouse gas pollution. Fracking-enabled drilling can also release large amounts of methane — a climate super-pollutant — through leakage from drilling infrastructure and operations.³⁸ Even small amounts of methane leakage can make the climate impacts of gas worse than coal.³⁹

Fracking also worsens climate change by expanding the areas where drillers can extract oil and gas. In California, fracking operations were concentrated in oil fields with high carbon-intensity crude, increasing the extraction of some of the world's most climate-damaging oil.⁴⁰ Limiting global temperature rise as close to 1.5°C as possible — to avoid catastrophic climate damages — requires an end to new fossil fuel extraction.⁴¹ Fracking pushes us in the opposite direction, prolonging carbon intensive extraction in California and opening up vast new deposits of fossil fuels nationally and internationally.

Fracking Increases Earthquake Risks

Fracking increases earthquake risks in our earthquake-prone state since fluids driven under high pressure have the potential to reactivate faults. As of 2025, researchers had attributed 344 earthquakes to fracking in the U.S. alone.⁴² Fracking can trigger earthquakes large enough to cause damage (i.e., with magnitude greater than 4),⁴³ and large fracking-induced earthquakes up to magnitude 5.7 have been documented.⁴⁴

Fracking can also trigger distant earthquakes up to 1.5 km from fracking sites.⁴⁵ Studies suggest there is no upper bound on the size of fracking-induced earthquakes.⁴⁶ Researchers have warned that fracking-induced earthquakes cannot be confidently predicted in advance of operations and “[c]urrent risk-mitigation strategies...have not yet proved reliable.”⁴⁷

The underground injection of fracking wastewater can also induce earthquakes, including large earthquakes documented up to magnitude 5.7, when injected fluids push faults past their tipping points.⁴⁸ In California, research linked oil and gas wastewater injection to an earthquake swarm in the Tejon oil field near Bakersfield in 2005, including two magnitude 4.7 quakes that struck about five miles from the injection wells.⁴⁹ In a separate study, researchers identified at least three other cases in Kern County where oil and gas wastewater injection was likely to have induced earthquakes.⁵⁰

Fracking Harms Disadvantaged Communities

Fracking in California was concentrated in areas that are designated as disadvantaged communities. The census tracts in Kern County that had fracking have higher rates of poverty and higher rates of water contamination than those without fracking, making these communities disproportionately vulnerable.⁵¹

Fracking Is Particularly Inefficient in California

Fracking is inefficient in California primarily because of the state’s complex geology.⁵² The Monterey Shale is jumbled and folded rather than flat and uniform like many other shale formations, which makes horizontal drilling followed by fracking inefficient for extracting oil and gas. Its high operational costs and low productivity appear to have greatly limited the use of fracking in California prior to the ban.

Fracking was happening at low levels well before the fracking ban was announced.

Oil and gas companies did relatively little fracking in California even before the state in 2021 announced a plan to implement a fracking ban in 2024. Almost all fracking (95 percent) occurred in only 3 of California’s ~200 actively producing oilfields. From 2016 through 2019, the number of completed fracking permits ranged from only 147 to 201 per

year.⁵³ Fracking permits comprised only ~5 percent of the total drilling-related permits issued by California in 2018 and 2019.⁵⁴

The fracking ban will only make a tiny dent in state oil production and revenues.

The fracking ban is projected to cause a minor 4 percent decline in oil production over 10 years (~0.4 percent per year).⁵⁵ State income tax revenue is projected to decrease by only 0.04 percent. Kern County — the county most affected by the ban — is projected to experience a decline in property tax revenue of less than 1 percent.⁵⁶

Banning Fracking Has Enormous Benefits

Fracking causes serious harms to our health, air, water, wildlife, and climate.

The benefits of banning fracking in California are enormous: improved public health, cleaner air and water, healthier wildlife, more drinking and irrigation water, lower earthquake risks, a cleaner climate, and safer communities.

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- ⁵³ CalGEM Well Star, Well Stimulation, <https://wellstar-public.conservation.ca.gov/WellStimulation/WellStimulation/Index>; 209 completed well stimulation permits in 2018 and 196 completed well stimulation permits in 2019 as compared with 3,454 permits issued in 2018 and 4,958 permits issued in 2019 for new drills, reworks, sidetracks, and deepening according to CalGEM’s WellStar Data Dashboard (<https://wellstar-dashboard.conservation.ca.gov/>)
- ⁵⁴ In 2018, California issued 3,454 drilling-related permits (new drill, rework, deepen, sidetrack) compared with 209 completed fracking permits; in 2019 California issued 4,958 drilling-related permits compared with 196 completed fracking permits. Data from Well Star at <https://wellstar-dashboard.conservation.ca.gov/>
- ⁵⁵ CDOC 2023 at 9
- ⁵⁶ CDOC 2023 at 12