

# The Myth of Clean Hydropower

Energy and Environment

*The Washington Post*  
*Democracy Dies in Darkness*

## Reservoirs are a major source of global greenhouse gases, scientists say

By **Chris Mooney** September 28, 2016 [✉ Email the author](#)



Switzerland's Grimsel reservoir dam, which provides hydroelectric power; a new study suggests reservoirs contribute more than had been known to greenhouse gases. (EPA/Peter Klaunzer)

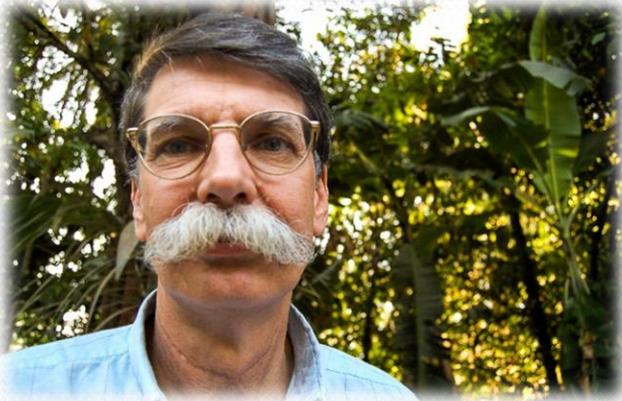
## Dams and Reservoirs Emit Greenhouse Gases and Make Climate Change Worse

# Dams Create Many Problems



- Dams Block Rivers – Fish, Sediment, Nutrients, Water.
- Dams Slow Rivers – Changes Ecology, Water Temperature, Sediment, Habitat.
- Dams Almost Always Make Water Quality Worse.
- Dams Can Cause Extinction to Fish and Aquatic Life.
- Dams Displace People, and cause human rights violations.
- Dams are Expensive.
- Dams can make flooding worse.
- Dams exacerbate coastal flooding, beach erosion, and sea level rise.
- Dams increase disease in humans.

# DAMS: The Methane/GHG Problem



Dr. Philip Fearnside  
Brazilian/IPCC scientist who  
“discovered” the methane  
problem with dams and  
reservoirs 30 years ago

Since that time, studies have been done by:

- U.S. EPA
- U.S. Army Corps
- Dozens of international university research scientists
- IPCC scientists (2006 Kyoto Protocol)
- IPCC 2019 Update
- U.S. National Science Foundation

In 2015 and 2016, global media attention began showing up in the *Washington Post*, *Climate Central*, *EcoWatch*, *Smithsonian*, *Science Magazine*, *The Guardian*, *Mongabay*, etc.

**CLIMATE CENTRAL** science

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### Hydropower May Be Huge Source of Methane Emissions

By Bobby Magill

Published: October 20th, 2014

Imagine nearly 6,000 dairy cows doing what cows do, belching and being flatulent for a full year. That's how much methane was emitted from one Ohio reservoir in 2012.

Reservoirs and hydropower are often thought of as climate friendly because they don't burn fossil fuels to produce electricity. But what if reservoirs that store water and produce electricity were among some of the world's largest contributors of greenhouse gas emissions?

Harsha Lake, a large reservoir near Cincinnati, Ohio, emitted as much methane in 2012 as roughly 5,500 dairy cows would have emitted over an entire year. Credit: Fivestory/istock

**EcoWatch**

By Gary Wockner

Sep. 30, 2016 11:58AM EST

### Dams Cause Climate Change

It's Official: Hydropower Is Dirty Energy

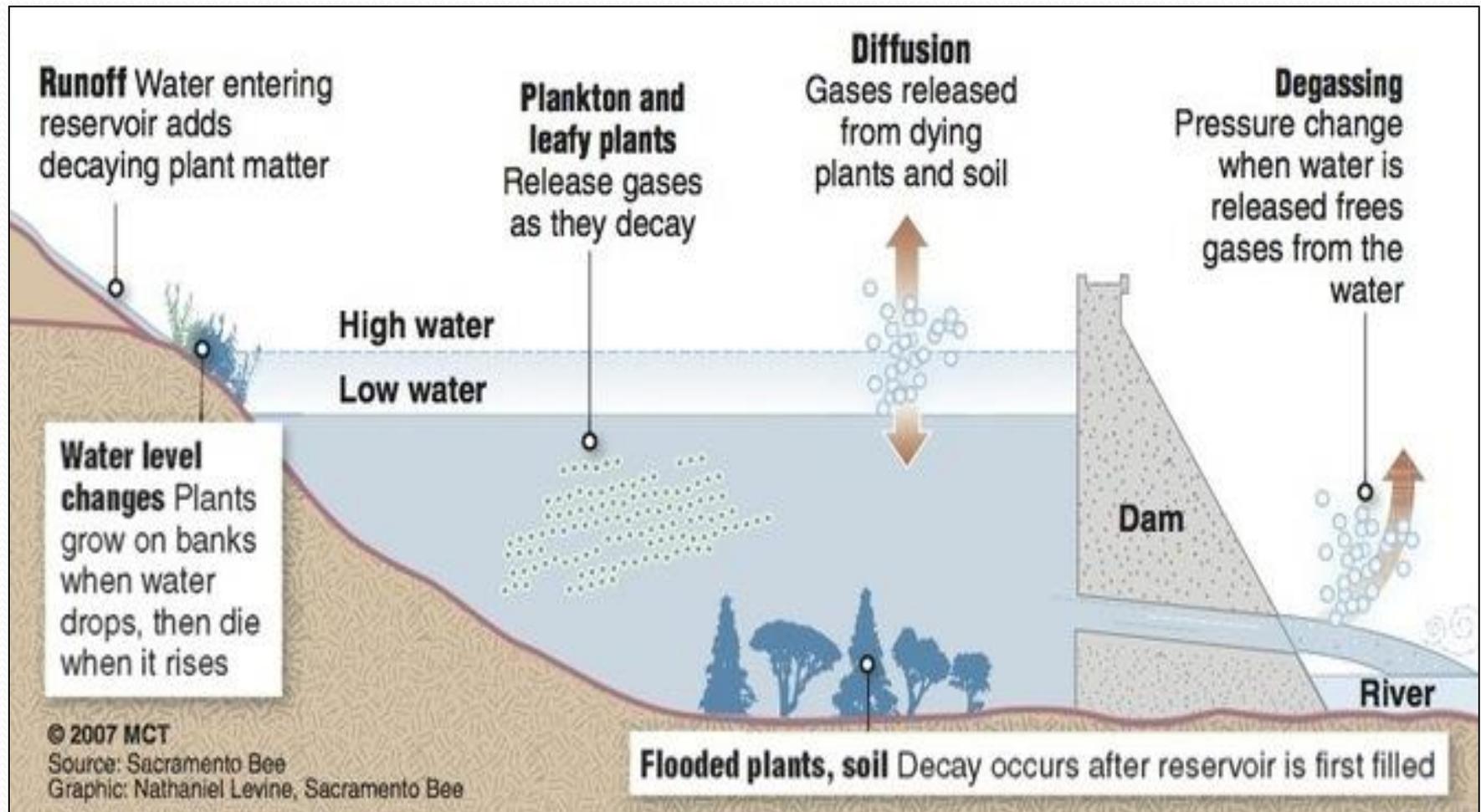
# How Dams and Reservoirs Create GHG Emissions: 1. Deforestation



- Forests sequester carbon.
- Estimates: Billions of acres of forests have been cleared worldwide for hydropower (reservoirs plus transmission lines). These forests do not regrow and are flooded.
- Over 6 million acres have been flooded in Quebec.

# How Dams and Reservoirs Create GHG Emissions: 2. Methane and CO<sub>2</sub>

(anaerobic breakdown of organic matter)



© 2007 MCT

Source: Sacramento Bee

Graphic: Nathaniel Levine, Sacramento Bee

# How Dams and Reservoirs Create GHG Emissions: 3. CH<sub>4</sub>/CO<sub>2</sub>/N<sub>2</sub>O

DOWNSTREAM: Dried-up Wetlands, Riparian Areas, and Mangroves



# Dam and Reservoir Greenhouse

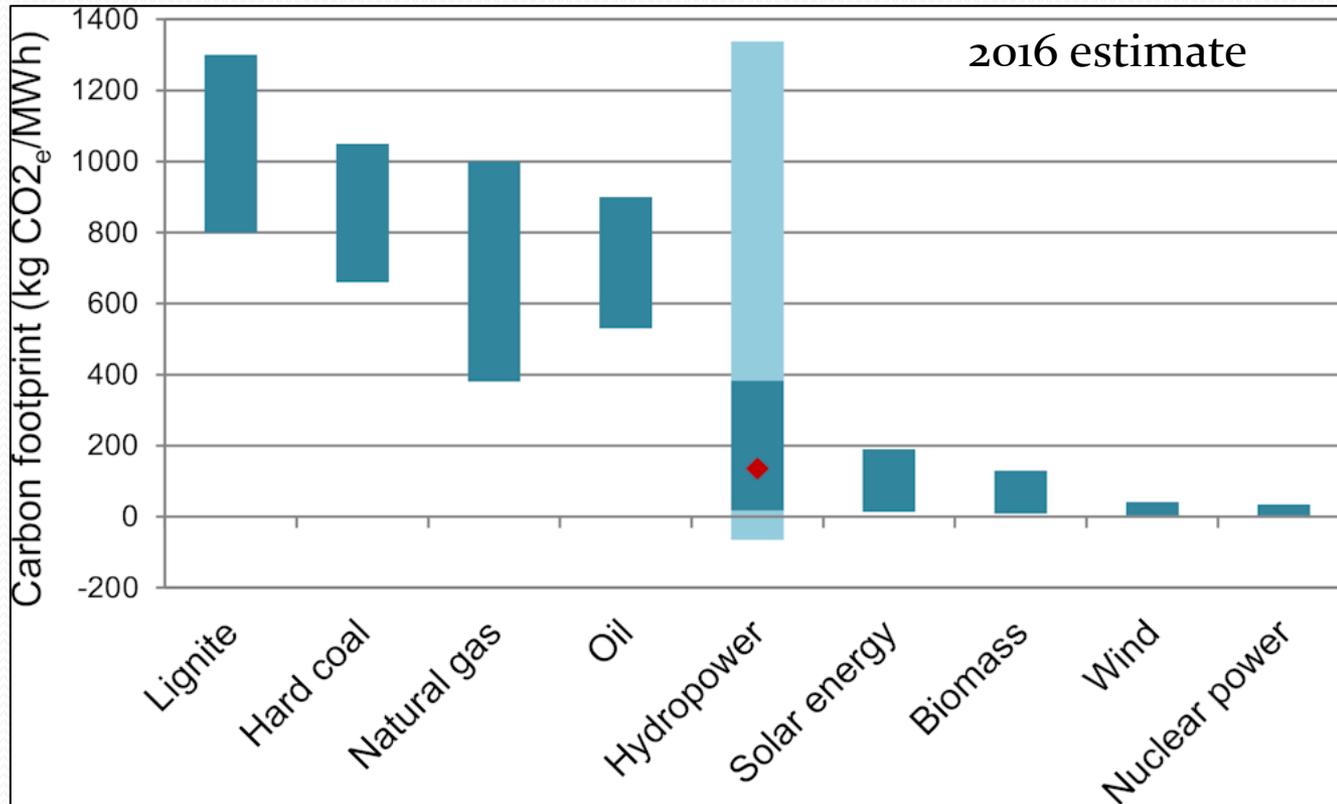
## Gas Emissions Are Worse Where:

- the dam is bigger and the reservoir is larger, and especially where the surface area of the reservoir is larger;
- the weather is warmer and wetter, and the water temperature of the reservoir is warmer;
- the initial flooding of the landscape involves large areas of vegetation;
- more vegetation and sediment run off into the reservoir;
- the reservoir's water level goes up and down on a seasonal or hydropower-ramping cycle causing vegetation to grow on the dry banks of the reservoir, and then become submerged when the reservoir level rises causing that vegetation to drown and decompose;
- the reservoir is newer and the landscape more recently flooded;
- the reservoir is near agricultural areas where fertilizer-heavy water and erosion runs off into a reservoir feeding the biological cycle that grows algae and other submerged vegetation;
- and, where any other type of heavy nutrient load is pouring into a reservoir including that from direct human wastes, stormwater runoff, or wastewater treatment plants.

Big, flat, warm reservoirs in tropical countries are the worst.  
Canadian reservoirs can also be consequential GHG emitters.

# How Bad Is The GHG Pollution?

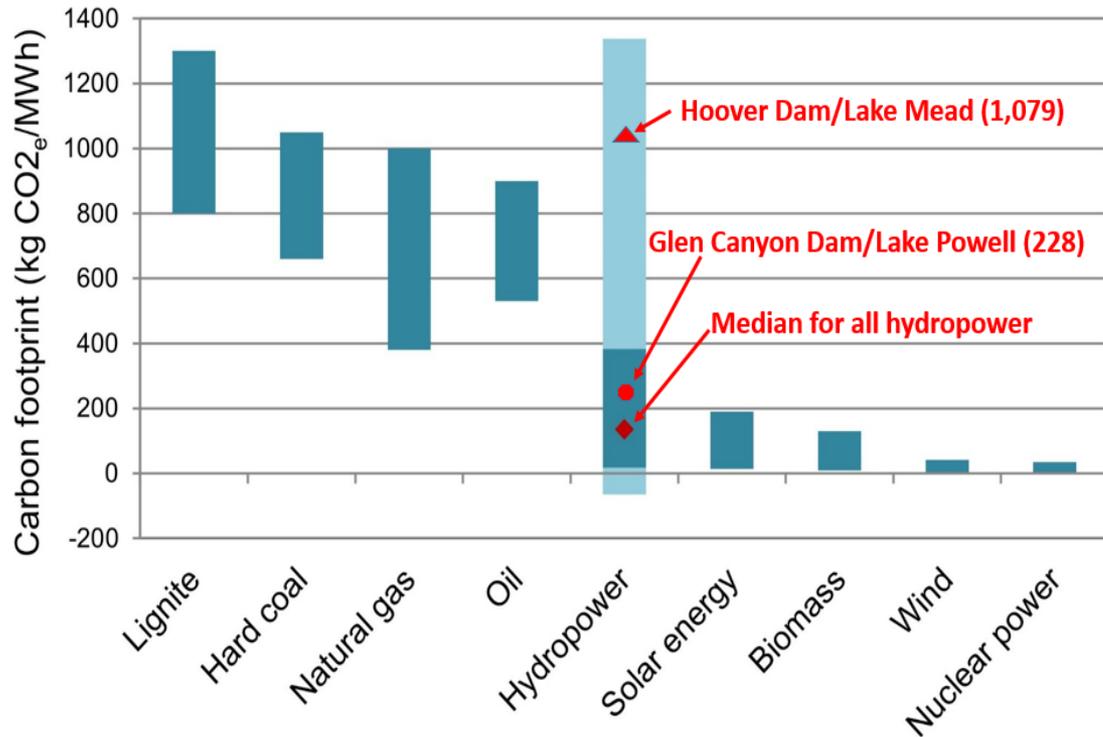
## Carbon Footprint of Various Energy Sources



“Those researchers suggest all large reservoirs globally could emit up to 104 teragrams of methane annually. By comparison, NASA estimates that global methane emissions associated with burning fossil fuels totals between 80 and 120 teragrams annually.” -- *Climate Central 2014*

# Hoover Dam and Lake Mead:

Hoover Dam is a hydroelectric plant that supplies electricity to all of southern California



WRITERS ON THE RANGE

## California isn't accounting for this major emitter

Even though large reservoirs emit methane, the state doesn't off-set their impact.

Gary Wockner | OPINION | April 11, 2017 | [PRINT](#) [SHARE](#)

Note: the opinions expressed in this column are those of the writer and do not necessarily reflect those of High Country News, its board or staff. If you'd like to share an opinion piece of your own, please write Betsy Marston at [betsym@hcn.org](mailto:betsym@hcn.org).



Gary Wockner is a contributor to Writers on the Range, the opinion service of High Country News. He is the director of the Save The Colorado River Campaign and the author of River Warrior: Fighting to Protect the World's Rivers.



# GHG Emissions from Quebec Hydropower

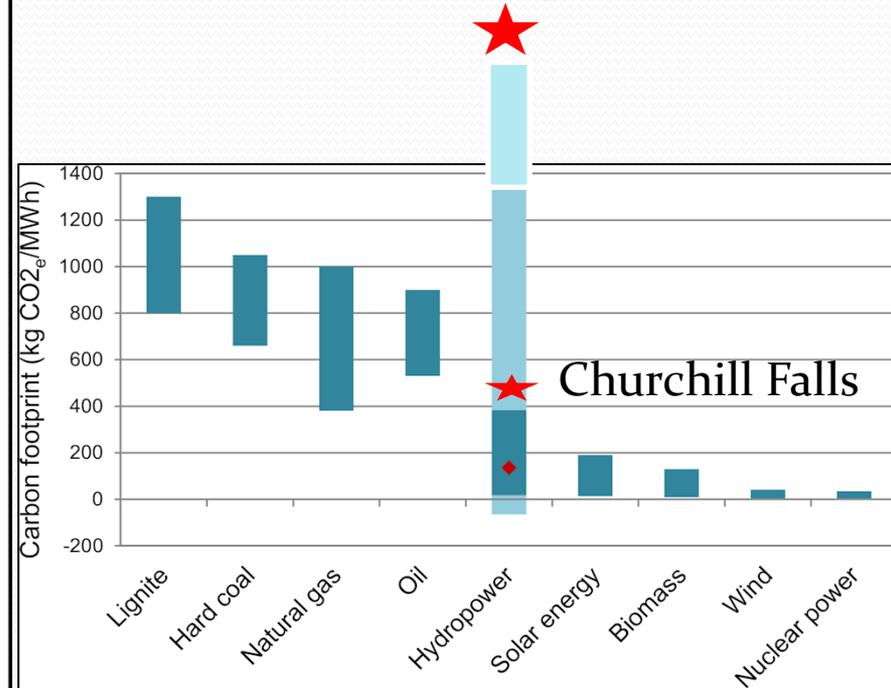
Professor Bradford Hager, MIT

Caniapiscou Reservoir

Table 1: Estimates of CO2e for Hydro Québec's reservoirs > 1 TWh/yr

System	Area (km2)	TWh			CO2e g/kWh			
		Max	H13	S&P	S&P data H13 TWh	S&P data S&P TWh	S&P model S&P TWh	T12 data H13 TWh
Robert-Bourassa (La Grande-2)	2835	37.4	37.4	5.2	57	412	576	
Churchill Falls*	4816	30.8		30.8			436	
Bersimis	798	12.5	12.5	7.8	35	56	313	
La Grande 4	765	10.1	10.1	8.9	46	52	309	
Manic 5	1973	9.8	9.8		124			
La Grande 3	2420	8.7	8.7	8.4	210	217	451	
La Grande 2A	2835	7.1	7.1		222			
Manic 2	124	6.5	5.1	6.5	10	8	180	
Manic 3	236	5.8	4.9	5.8	6	5	219	
Bersimis 2	38	5.5		5.5			119	
La Grande 1	70	4.5	4.5	2.7	12	20	165	
Outardes 3	11	4.5	3.2	4.5			42	
Outardes 4	625	3.7	2.6	3.7	194	138	329	

Laforge-1	960	2.7	2.7	1.7	371	588	605	
Eastmain-1	600	2.7	2.7		309			275
St-Marguerite 3	253	2.6	2.6		197			
Outardes 2	26	2.0		2.0				102
Brisay/Caniapiscou	4318	1.2	1.2	0.8	1501	2265	2250	



# New York City Electricity Sources

- Sixty percent of NYC's electricity is generated by natural gas powerplants.
- Natural gas GHG emissions range from 395 – 1,000 kg CO<sub>2</sub>e/mwh.
- Quebec hydropower facility GHG emissions range from 100 – 2,250 kg CO<sub>2</sub>e/mwh with an average of the 16 plants of 386.

**Outcome:** Switching from natural gas to Quebec hydropower will likely cause NYC to emit more GHG emissions, not less.

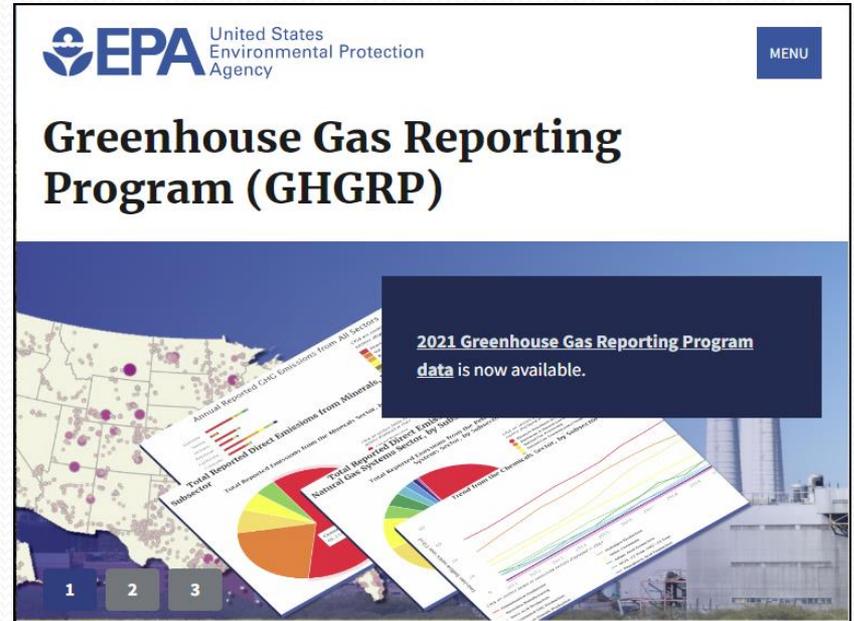
# National Initiative Has Begun TellTheDamTruth.com



**TELL THE DAM TRUTH**

Join our movement to get the U.S. government to **#TellTheDamTruth** and measure the true climate impact of dams and reservoirs.

**TELL THE DAM TRUTH** [TellTheDamTruth.com](http://TellTheDamTruth.com)

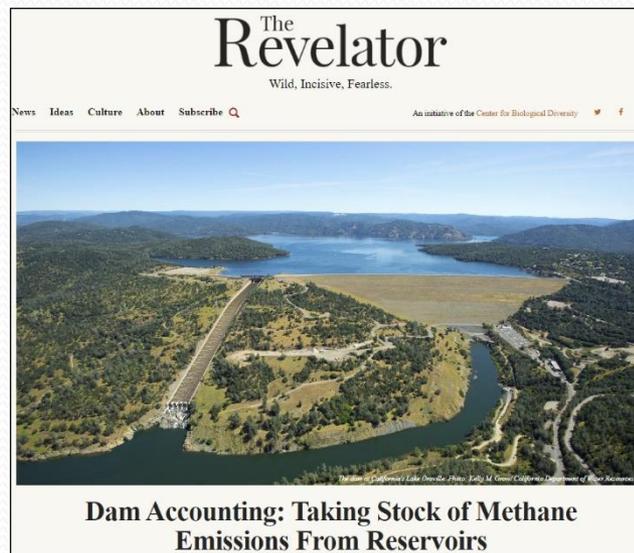


**EPA** United States Environmental Protection Agency

**Greenhouse Gas Reporting Program (GHGRP)**

**2021 Greenhouse Gas Reporting Program data** is now available.

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**Dam Accounting: Taking Stock of Methane Emissions From Reservoirs**