Reservoirs are a significant source of methane:

- Methane (CH₄) is a greenhouse gas 20-30x more powerful than carbon dioxide.
- Reservoirs (impoundments located behind dams) contribute 15-50 Tg of CH₄ to the atmosphere¹⁻².
- Previous work shows human-managed water level changes, such as drawdowns, are an important control on reservoir methane emissions¹⁻³.

Effects of Human Management Decisions on Reservoir Methane Emissions

How do human management decisions affect methane production, oxidation, and emissions in reservoirs?

Do reservoir drawdowns trigger higher CH₄ emissions?

- Study Sites: Lacamas Lake, WA; Keno Reservoir & JC Boyle Reservoir, OR
- Methods: Analyze C isotopes in dissolved & bubble CH₄; Compare emitted CH₄ isotope values before, during, and after drawdown (Lacamas);
  Compare emitted CH₄ isotope values between two reservoirs with different water level management (Keno & JC Boyle)
- Expected results: Emitted CH₄ during drawdowns will be isotopically lighter than stable periods because less methane oxidation is taking place
- Implications: If changing drawdown timing lowers CH₄ emissions, reservoir managers can schedule drawdowns accordingly to minimize greenhouse gas emissions

How does drawdown timing affect CH₄ emissions?

- Study Site: Lacamas Lake, WA
- Methods: Compare CH₄ emissions from drawdowns before turnover with emissions from a drawdown performed after turnover
- Expected results: Fall turnover mixes possible electron acceptors for methane oxidation with CH₄ in an oxygenated water column, encouraging methane oxidation and thus lowering emissions
- Implications: If changing drawdown timing lowers CH₄ emissions, reservoir managers can schedule drawdowns accordingly to minimize greenhouse gas emissions

How much CH₄ is outgassed versus oxidized during summertime spill in the Columbia River mainstem?

- Study Site: Bonneville Dam, OR/WA; The Dalles Dam, OR/WA
- Methods: Construct a CH₄ budget for before and during spill; Use a conservative tracer (Rn, Cl, Br) to track CH₄ during spill; Compare CH₄ oxidation rates before and during spill
- Expected Results: The majority of the CH₄ lost during spill will be outgassed rather than oxidized due to turbulence at the spillway.
- Implications: How CH₄ is lost through the system determines whether it is released as CH₄ (a powerful GHG) or CO₂ (a less powerful GHG)

References:


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