Grain Transportation Study concludes that dam breaching has essentially no impact on carbon emissions from transportation, either positive or negative

The Grain Transportation Study released on July 8, 2022 by Dr. Miguel Jaller shows that carbon emissions see only a minimal decrease or increase if the lower Snake River dams are removed. While these findings may seem surprising, they are consistent with the one other study that focused directly on this question (Casavant and Bell, 2001)[1]. Both studies, from 2001 and 2022, find that carbon emissions in the grain transportation system are a wash.

In 2022 the Water Foundation and American Rivers commissioned the Grain Transportation Study to estimate the carbon emissions and other air pollution generated when transporting grain across the Pacific Northwest under two scenarios: current emissions and the emissions generated should the four Lower Snake River dams be breached. This study by Dr. Miguel Jaller adds to the body of research on the lower Snake River dams and is a data point that shows **dam removal should have relatively little impact on carbon emissions** as grain transportation shifts away from barges.

Using one set of emissions factors, the new model showed a *decrease* in CO2 emissions of 9.14%. Using another, the model showed a *slight increase* of 1.37%.

1. **The Jaller study includes an estimate of current truck miles**

All grain leaves the farm on a truck. Trucks are the least efficient and highest cost way to move grain, so careful modeling of truck miles must be factored into both estimates of current emissions and post-breaching estimates. Dr. Jaller's analysis considered the measurement from the center of each zip code to the nearest ten existing barge or rail elevator and used the median as a proxy for estimating truck miles. When truck miles are added to the model, the emission question is effectively a wash. The Jaller study found that truck miles will increase slightly post-breaching, by 8%, and that the resulting increase in emissions is offset by the increasing efficiency of rail transportation (see #4).

The Jaller study assumes that farmers who currently barge on the LSR will find the lowest cost alternative to barging. That means they will truck their grain to the nearest rail elevator but are unlikely to truck it to Portland, Kalama, Longview, or Vancouver due to fuel and costs. On the other hand, the FCS Group study funded by the Pacific Northwest Waterways Association assumes a striking increase in truck miles and costs, because it appears they assume that some farmers will choose trucking as the sole mode of transportation.

2. **The Jaller study used the most recent publicly available emissions factors from studies that included truck, rail, and barge emissions, while a previous study appears to have used data that are over 40 years old.**

Two sources were used for emission factors in the Jaller Grain Transportation Study. The first, M580, is a study commissioned by the California Department of Transportation (Caltrans), developed to help decision makers prioritize investments in the Bay Area. The second set of emissions factors, TTI2019, were commissioned by the National

[1] Casavant, Ken, and Ball, Trent, Impacts of a Snake River Drawdown on Energy and Emissions, Based on Regional Energy Coefficients. Transportation Northwest, Dept. of Civil Engineering, University of Washington. August, 2001.

Waterways Foundation in a report titled "A Modal Comparison of Domestic Freight Transportation Effects on the General Public 2001 - 2019." Those sources are detailed under "Methodology" in the study. As Jaller writes,

> "References show that rail can transport a ton of cargo between 202 and 594 miles, and barges can transport that ton of cargo from between 203 and 573 miles, using a gallon of fuel. Therefore, a comparison of impacts will be affected by the rates of emissions chosen."

Other studies, notably the FCS Group report from 2020, do not state the emissions factor used or the study they relied on for those factors. However, associated industry websites list 1980 emissions factors in their calculations. Jaller used current emissions factors.

3. Rail is increasingly efficient

Of note in the 2001 Casavant and Ball study and the 2022 Jaller study is that **rail is similar in efficiency to barging**. You can see the emissions factors used in the studies in Table 1 below. Rail was estimated at 594 ton-miles per gallon in 2001, and recent studies now estimate rail between 472 to 929 ton-miles per gallon. These differences appear large because different locomotives are used and efficiency varies among systems. Both the Casavant and the Jaller studies point out that the emissions or energy use of Columbia or Snake River barges is unknown, and both used data based on national averages and estimates.

4. This conclusion is well-supported by previous studies

The Casavant and Ball study from 2001[2], using up-to-date emissions data at that time, came to a similar conclusion. They wrote, ***"Looking narrowly at energy and emissions environmental concerns, a drawdown of the Snake River for salmon restoration does not have a negative impact."*** This study remains relevant and should be included in any analysis of the impacts and benefits of removing the four lower Snake River dams.

Table 1. The number of miles one ton can be carried, per gallon of fuel.

	Inland Rivers Ports & Terminals, Inc Data still used today on industry websites. Appears to be in use since 1980.	**Casavant and Ball** (2001)	**TTI2019** A recent study commissioned by the National Waterways Foundation based on work funded by the USDOT and the EPA.	**M580** Developed to help Caltrans prioritize freight investments in the San Francisco bay area, using emission rates from the California Air Resource Board and 2016 barge emission data from the US EPA.
Truck	**59**	**N/A**	**151**	**121**
Rail	**202**	**594**	**472**	**929**
Barge	**514**	**379**	**675**	**647**

[2] Casavant, Ken, and Ball, Trent, Impacts of a Snake River Drawdown on Energy and Emissions, Based on Regional Energy Coefficients. Transportation Northwest, Dept. of Civil Engineering, University of Washington. August, 2001.

The Columbia and Snake Rivers are often conflated as a single system. To put the value of Snake River barging into context, here are some simple facts that separate the Snake River from the PNW ocean ports on the Columbia:

- 2 to 2.6 million metric tons of wheat travels by barge on the lower Snake River each year[3]
    - Most of that wheat comes from Washington farms south of Highway 26 as well as northern and southwestern Idaho
    - That is ~10% of all US wheat exports
- 13 to 16 million metric tons of wheat is exported each year from the ocean ports along the Columbia River between Portland and Kalama[4]
    - That's roughly half of all US wheat exports
    - Most of that wheat arrives at the ocean ports by rail
    - It comes from Montana, Oregon, Washington, Idaho, North Dakota, Kansas
    - Roughly 13% of those exports also travel on the Snake River
- 1.8 to 2.3 million metric tons of wheat is loaded onto Columbia River barges after the lower Snake River dams[5]
    - That is nearly half of the volume that arrives at the ocean ports on the Columbia by barge
    - Combined with the wheat already loaded along the lower Snake River, barging moves about a third of all the wheat exported from the ocean ports on the Columbia
- This can be confusing because while 13 to 16 million tons is exported on ocean going ships along the big Columbia River ports, 70% of that wheat doesn't travel on a river barge along the Columbia/Snake system. Instead, most of the wheat destined for export arrives at the ports by rail.
- The efficiency of a wheat shipment has to include the efficiency of every mode of transportation involved in the shipment's movement
    - All wheat transport uses trucking at some point in its journey, whether to connect the farm to barge or rail or to get to its destination
    - Even if barge and rail are more efficient than trucking, the total shipment efficiency may be affected by how much trucking is used, e.g., how far the shipment is trucked to a river port or rail facility

Not included in this study

A final note: this study did not consider emissions from vehicle idling, loading and unloading grain, from dam mitigation efforts such as trucking salmon around the dams, or from the transition from hydropower to other energy sources.

[3] US Army Corps of Engineers Monthly Tons Report by Lock
[4] USDA
[5] US Army Corps of Engineers Monthly Tons Report by Lock