

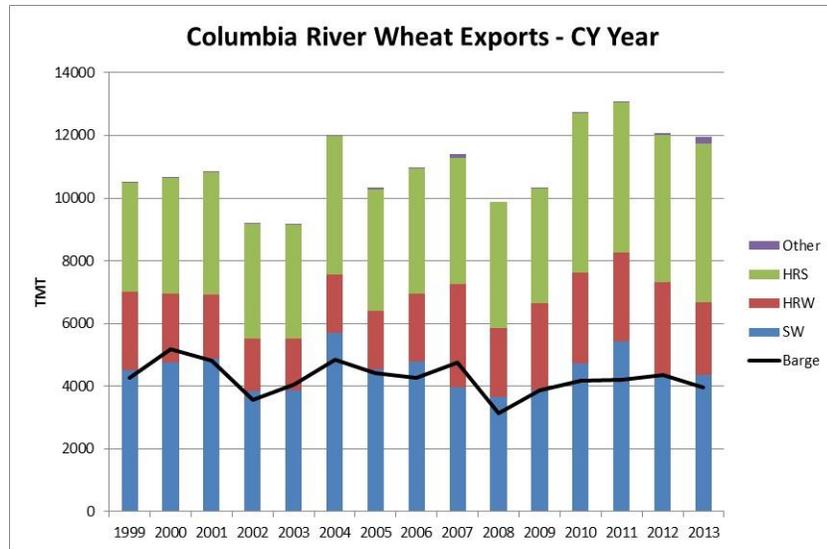


Overview of Wheat Movement on the Columbia River

Report Prepared August 17, 2016

All data based on five year averages (2011-2015)

- The Columbia-Snake River grain handling system includes:
 - 7 grain export terminals.
 - 26 up-country grain barge loading terminals along 360 miles of navigable river.
 - Eight dams that lift a barges a combined 735 feet.
 - 80 barges controlled by two companies (Shaver and Tidewater).
- The seven export terminals on the Columbia River annually export 26.5 MMT of grain, including 11.7 MMT of wheat. This makes the Columbia River the third largest grain export corridor in the world behind the Mississippi River and the Parana River in South America. Grain exports from the Columbia River continue to grow each year.
- Every year approximately 4.0 MMT of wheat, largely Soft White, is shipped down the Columbia River via barge from the states of Oregon, Washington, and Idaho. This is equivalent to:
 - 34% of all wheat exports from the Columbia River.
 - 15% of all grain exports from the Columbia River.
 - 15% of all wheat exported from the United States.
 - 70% of all wheat exported from the Pacific Northwest.
 - 50% of all wheat produced in the Pacific Northwest.
- The wheat moved by barge is largely sourced from the upper river system.
 - 18% from between Bonneville Dam and McNary Dam.
 - 36% from between McNary Dam and Lower Monumental Dam.
 - 46% from between Lower Monumental Dam and Lewiston, Idaho.
 - 54% of the wheat moved by barge moves through one or more of the four Lower Snake River dams.
- The wheat hauled by barge down the Columbia-Snake system is shipped worldwide:
 - 44% is exported to East Asia. Mainly Japan, Korea, and Taiwan.
 - 36% is exported to Southeast Asia. Mainly Philippines, Indonesia, and Thailand.
 - 10% is exported to the Middle East. Mainly Yemen and Egypt.
 - 10% is exported to Latin America. Mainly Guatemala, El Salvador, and Chile.
- The USDA values wheat exports from Oregon, Washington, and Idaho at \$1.3 billion. The barge system accounts for \$910 million of that total. This is just the value of the wheat sold, not the full economic benefit.
- The three Pacific Northwest States export 71% of their wheat. Exports account for 90% of the Oregon wheat crop, 85% of the Washington, and 50% of the Idaho crop.
- The barge system is most efficient mover of grain from both a cost and environmental standpoint. This competition with the rail system helps keep costs of moving grain in the Pacific Northwest relatively cheap compared to other parts of the country.



- The wheat moved annually by barge is equivalent to 40,000 railcar loads (400 unit trains) or 114,000 semi-truck loads.
- The current rail infrastructure in the Pacific Northwest is insufficient to handle the wheat currently hauled by barge. Some areas lack infrastructure all together. It would take significant investment to fully replace the Columbia-Snake River system with rail.
- Wheat movement by barge has declined over the past fifteen years. However, this is not due to the efficiency or health of the system, but rather a decline in Soft White wheat sales over the same period.
- Soft White wheat, the primary wheat grown in the Pacific Northwest, is the highest quality soft wheat (used for cookies, crackers, cakes, etc.) in the world. Thanks to its high yields and the cost savings of the barge system it also tends to be one of the cheaper wheats in the United States. This has created two types of Soft White buyers. Those who buy it for its high quality and value, and those who buy it for its low price.
- Over the past fifteen years Russia and Ukraine have emerged as major exporters of cheap wheat. Due to their close proximity to the Middle East, they have taken over price oriented wheat markets once serviced by Soft White, resulting in a decline in exports.
- US Wheat Associates projects future growth in Soft White exports as economic growth in countries across Southeast Asia and Latin America results in a greater number of quality and value oriented buyers. Exports of Soft White to China have also been growing.
- Over the past five years \$750 million has been invested into the Columbia River grain export terminals. This includes the construction of a new export terminal, major renovation of two export terminals, and upgrades to three export terminals.
- The investment is expected to have a big impact on the Columbia-Snake River system. Over the five years the seven export terminals on the Columbia River have expanded:
 - Barge unloading capacity by 34 percent.
 - Ship loading capacity by 28 percent.
 - Grain storage capacity by 39 percent.
- A grain company is currently working on a project to trans-load grain rail shipments onto barges at Boardman, Oregon, which would reduce rail congestion in the Columbia Gorge corridor.

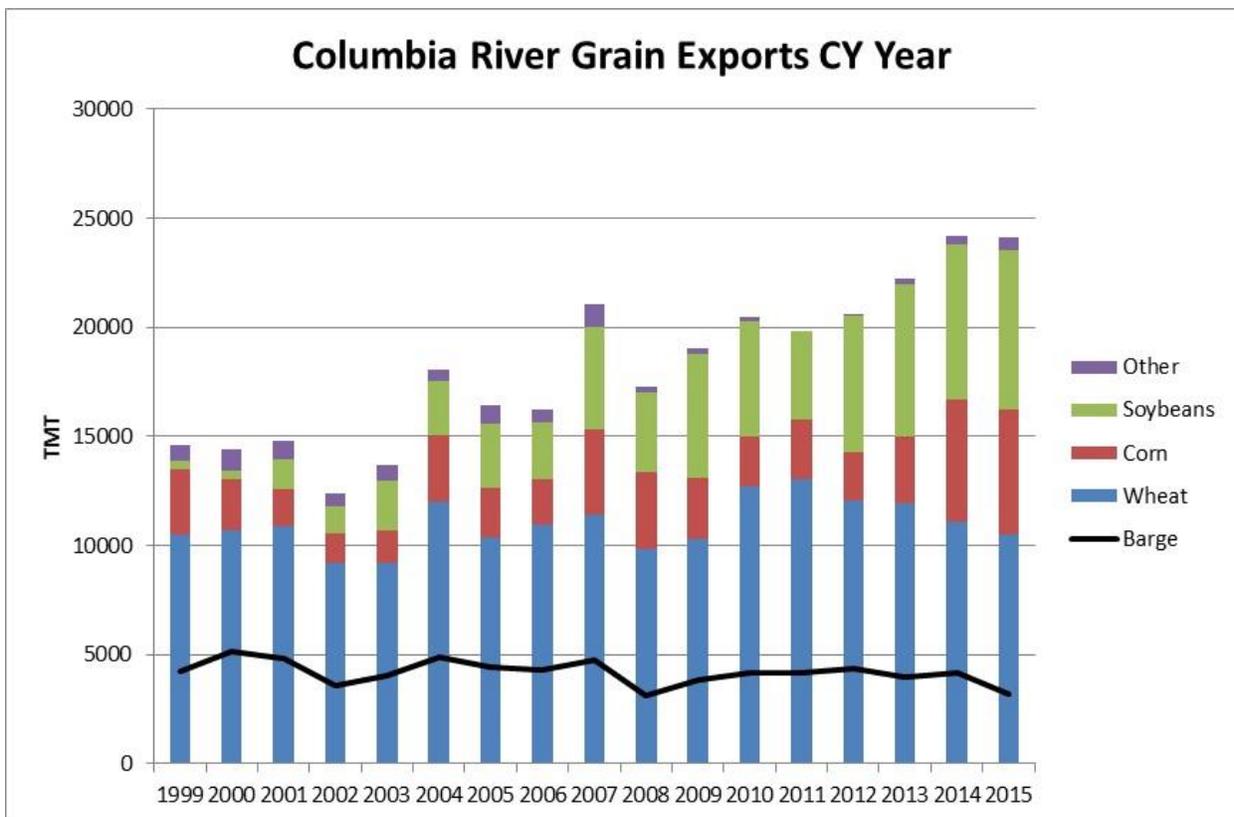
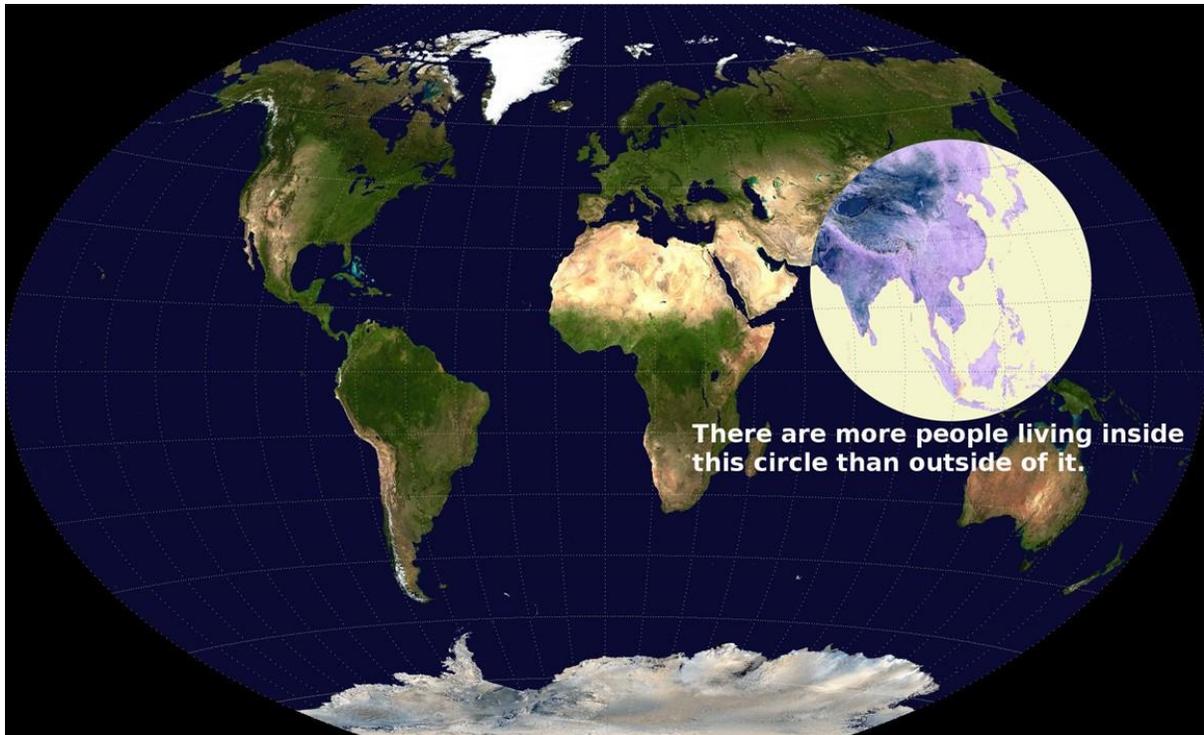


History of Wheat Movement on the Columbia-Snake

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- 1870's: Wheat from Eastern Washington, Eastern Oregon, and Northern Idaho is first carried down the river system via steamship to Portland. The wheat, contained in large burlap sacks, is milled into flour or exported directly to countries in East Asia. Steamships are able to navigate the river system from Portland up the Columbia River to Wenatchee, Washington and up the Snake River to Lewiston, Idaho; though overland portage is required at the Cascade Rapids and Celilo Falls.
- 1880's: Heyday of the movement of wheat via steamship down the Columbia-Snake River. Numerous new companies are formed and the amount of tonnage hauled increases greatly. However, rail lines begin to be built on the south bank of the Columbia River to compete.
- 1893: Rail lines stretching from Portland to Eastern Washington are completed. A large amount of the wheat shipped via steamship is shifted to rail since it does not have to deal with portages around the rapids.
- 1896: The Cascade Locks and Canal are completed, allowing steamships to bypass the Cascade Rapids. Wheat movement via steamship increases.
- 1910: The Army Corp of Engineers begins a series of improvement works on the Columbia and Snake Rivers. Over the next few years troublesome areas are dynamited at the John Day Rapids, Squally Hook Rapids, Canoe Encampment rapids, Umatilla Rapids, and Homley Rapids on the Columbia River.
- 1916: The Celilo Locks and Canal are completed, allowing steamships to bypass Celilo Falls. Steamships are able to carry wheat without portage. However, steamship movements of wheat continue to decline in favor of movements by rail which at the time is more efficient.
- 1920's: Wheat shipment shifts from bagged wheat to bulk wheat. Rail boxcars make the transition easily, while steamships are unable to do so. By 1923 wheat shipment via steamship ceases.
- 1934: Construction begins on Bonneville Dam. Farmers and other groups successfully lobby for the dam to include a set of navigation locks.
- 1938: Bonneville Dam is completed. Diesel powered tugs and barges begin hauling wheat through the dam locks and Celilo Canal and Locks to as far as Umatilla where movement is blocked by the Umatilla rapids. The barges require a deeper channel than the old steamships. Tugs and barges shoot the rapids between Umatilla and The Dalles.
- 1951: The locks at McNary Dam are completed and the Umatilla Rapids are flooded. Tugs and grain barges gain access to Pasco, Washington at the mouth of the Snake River.
- 1957: The locks at The Dalles Dam are completed and Celilo Falls is flooded. The amount of grain brought down by barges greatly increases due to its cheaper cost compared to hauling by rail.

- 1962: The locks at Ice Harbor Dam are completed. Tugs and grain barges gain access as far as Windust, Washington on the Snake River.
- 1968: The locks at the John Day Dam are completed, flooding the remaining areas of minor rapids on the Columbia River and greatly improving the efficiency of barge travel on the river system. Barge traffic dominates wheat movement in the Pacific Northwest.
- 1969: The locks at Lower Monumental Dam are completed. Tugs and grain barges gain access as far as Lyons Ferry, Washington on the Snake River.
- 1970: The locks at Little Goose Dam are completed. Tugs and grain barges gain access as far as Almota, Washington on the Snake River.
- 1975: The locks at Lower Granite Dam are completed. Tugs and grain barges gain access as far as Lewiston, Idaho. Over the next twenty-five years moving wheat by barges becomes so dominant in the Pacific Northwest that in many areas rail loaders are dismantled and many short lines are closed.
- 1981: The Army Corp of Engineers scraps plans to build Ben Franklin Dam on the Columbia River north of Pasco and add navigation locks to the Priest Rapids Dam, Wanapum Dam, and Rock Island Dam, which would have given barge access to Wenatchee, Washington.
- 1990's: Height of grain barge movements on the Columbia-Snake River system with many farmers in western Montana trucking their grain to Lewiston to be moved by barge.
- 2000's: Changing overseas market conditions result in a decline in wheat exports from the Portland area. Consequently grain barge movements peak and start to decline. Rising fuel costs affect trucking and lead to an increase in rail movements in areas farther away from the river system.
- 2010: The Army Corp of Engineers close the navigation locks at The Dalles Dam, John Day Dam, and Lower Monumental Dam for three months in order to carry out long-term repairs. The closure causes widespread short-term disruption for the Pacific Northwest wheat industry.
- 2016: The Army Corp of Engineers close the navigation locks at Bonneville Dam, The Dalles Dam, McNary Dam, Ice Harbor Dam, Lower Monumental Dam, and Little Goose Dam for three months in order to carry out long-term repairs. The closure is expected to cause widespread short-term disruption for the Pacific Northwest wheat industry.



Real Chicago Wheat Futures (In 2016 Dollars)

