2008 Report to the Legislature
Tire Recycling and Reuse in 2007
Tire Pile Cleanup Status for 2008

DEPARTMENT OF ECOLOGY
State of Washington

Abstract

Each year, the Department of Ecology (Ecology) collects data on tire recycling and reuse (RCW 70.95.545). This annual report summarizes the increase or reduction in the rates of recycling and reuse since 2002. This report also details the waste tire pile cleanup program progress.

Publication Information

This report is available on the Department of Ecology Web site at
http://www.ecy.wa.gov/biblio/0907007.html

For a printed copy of this report, contact:

Michelle Payne
E-mail: mdav461@ecy.wa.gov
Phone: (360) 407-6129
Address: PO Box 47600, Olympia WA 98504-7600

Author: Kara Steward

Washington State Department of Ecology
Solid Waste & Financial Assistance Program
E-mail: kste461@ecy.wa.gov
Phone: (360) 407-6250
Address: PO Box 47600, Olympia WA 98504-7600

2008 Report to the Legislature

Tire Recycling and Reuse in 2007

Tire Pile Cleanup Status for 2008

Ecology and the National Park Service remove a tire pile from Hurricane Ridge

Department of Ecology
Solid Waste and Financial Assistance Program

January 1, 2009

Tire Recycling and Reuse in 2007

Each year, the Department of Ecology (Ecology) collects data on tire recycling and reuse. This annual report summarizes the increase or reduction in the rates of recycling and reuse since 2002. The Legislature received Ecology's first *Scrap Tire Report* in 2002 (http://www.ecy.wa.gov/biblio/0207029.html).

The table below provides the recycling, reuse, disposal, and generation data from 2002 to 2007. The 2007 totals include Ecology Tire Pile Cleanup Program results from May to December of 2007. The next section of this report details the tire pile clean-up efforts through November of 2008.

> "*The department of ecology in conjunction with the appropriate private sector stakeholders shall track and report annually to the legislature the total increase or reduction of tire recycling or reuse rates in the state for each calendar year and for the cumulative calendar years from June 13, 2002*." RCW 70.95.545

Used tire generation, recycling, and reuse changes from 2006 to 2007 include:

- Washington generated 1,624 tons more used tires in 2007.
- The totals reported below include the May through December 2007 tire pile cleanup efforts, which totaled 33,289 tons of tires (go to page 9 for more clean up details).
- Reports showed recycling, reuse, and disposal increased by 29,971 tons in 2007.
- The percent of tires landfilled increased from 42 percent in 2006 to 46 percent in 2007.

Table 1 - Summary of Annual Tire Generation, Recycling and Reuse

Used/Waste Tires	2002 tons	2003 tons	2004 Tons	2005 tons	2006 tons	2007 tons
Baled Tires*	NA	NA	NA	NA	7,702	9,660
Landfill Disposal	21,273	22,226	15,246	22,446	33,697	50,703
Recycled Tires	27,102	27,753	37,568	46,483	23,532	27,869
Retreaded Tires	1,170	12,976	251	4,089	5,579	4,764
Tire Derived Fuel	2,817	9,664	15,400	5,167	9,250	16,735
Total Reported	**52,362**	**72,619**	**68,465**	**78,185**	**79,760**	**109,731**
Difference between reported and generated	28,626	11,267	12,301	5,707	5,594	NA
Generation**	**80,988**	**83,886**	**80,766**	**83,892**	**85,354**	**86,978**

* Baled tires are not reported separately for 2002 through 2005
** Based on number of vehicles registered in Washington
NA – total waste tires reported is greater than the estimated waste tires generated for that year

In the sections that follow, we describe in more detail the categories listed in the table above.

Recycling, reuse, disposal, and generation data in this report comes from various sources:

- Annual disposal reports from landfills, transfer stations, drop boxes, tire haulers, tire businesses, and tire storage sites.
- Reports and survey responses from recycling facilities.
- Tire cleanup program tracking data for 2007.
- Waste tire generation estimated based on vehicle registration data.

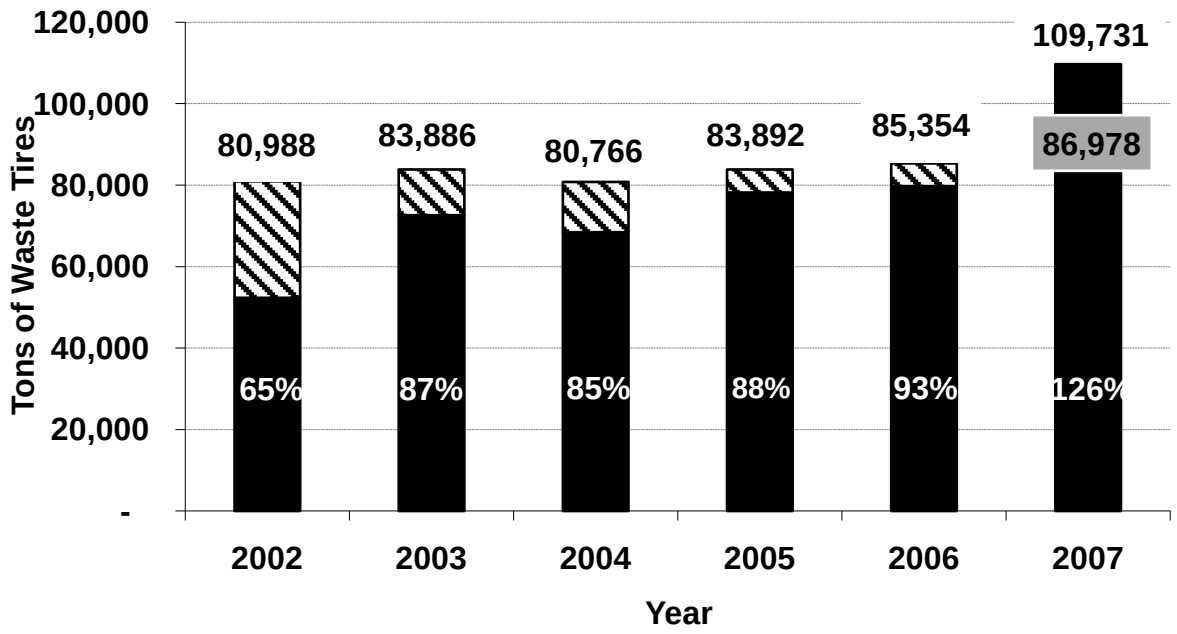
ANNUAL WASTE TIRE GENERATION

In Washington, we base the annual generation of used tires on the number and types of vehicles licensed in the state. The national average is one used tire a year from each passenger vehicle. The national average for other vehicles, such as trucks, trailers, motorcycles, is less than one, ranging from 0.25 to 0.4 used tires a year. We applied these percentages to the number of vehicle types registered to estimate the total number of used tires generated. The nearly 6.8 million vehicles licensed in Washington in 2006 generated approximately 5 million used tires.

Waste tires in Cle Elum

Chart 1, on the next page, shows total generation of used tires estimated for each year. In 2007, an estimated 86,978 tons of used tires were generated. Each year landfills, recyclers, and tire businesses send reports of waste tire end use to Ecology. The black portion of the column shows the total reported recycling or landfilling of waste tires. In 2007 reported end use of tires was 126 percent of the total generated. Most years the generated total (shown in black) is higher than the reported end use total. The difference between the total reported to Ecology and the estimated generation is shown as the hatched “unknown end use” portion of the chart. The higher reported end use of waste tires in 2007 is due to the start of activities of the waste tire cleanup program in May of 2007.

Chart 1 - Estimated Annual Waste Tire Generation

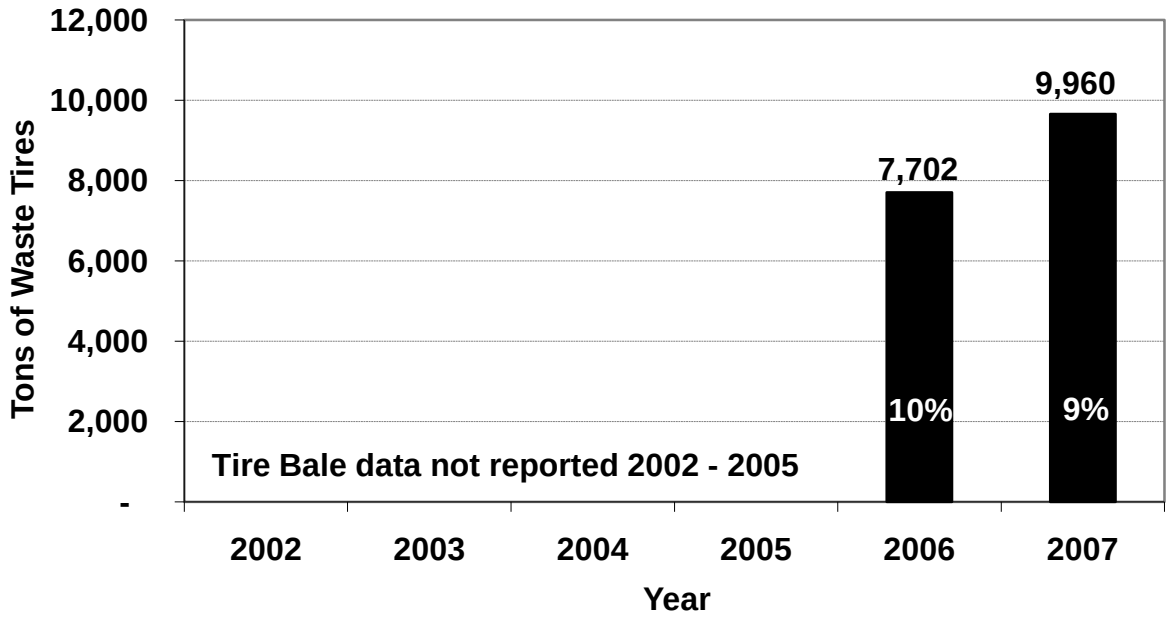


TIRE BALES USED FOR CONSTRUCTION

Reporting of tire bales used in construction projects is available for 2006 and 2007.
A tire bale contains about 100 passenger tires compressed into a block and wrapped with galvanized steel bands. The bales take the place of other fill materials at construction sites. In 2007, construction use included 9,660 tons of tire bales in road base, noise reduction walls, erosion control, and racetrack walls. Tire bale use increased 20% between 2006 and 2007. The photo to the right shows use of tire bales as road base (photo courtesy of L&S Tire Company). Chart 2, next page, shows the available tire bale data for 2006 and 2007.

Tire bales used for road base in Spokane County

Chart 2 - Use of Tire Bales



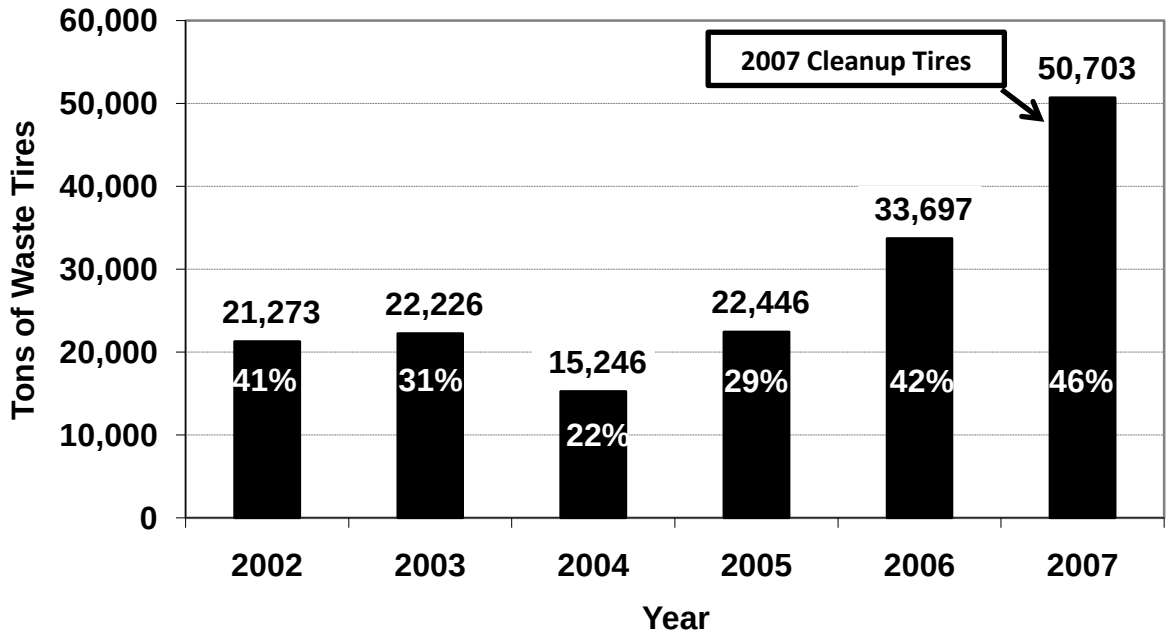
LANDFILL DISPOSAL OF WASTE TIRES CONTINUES

Tires are a problem for landfills because they are difficult to compact and do not decompose easily. Tires take up valuable landfill space, and over time the tires tend to float to the top, working their way up through the waste and soil. Tires disposed of in landfills are usually shredded or at least cut in half before disposal.

Chart 3, following page, shows the changes in the reported total tons of tires landfilled each year from 2002 to 2007. Percentages shown on the graph represent the landfilled waste tires compared to the total reported uses of tires. The highest volume and percentage of waste tire landfilling was reported in 2007. This total includes the Ecology funded tire pile cleanup efforts, which started in May of 2007.

Jefferson County residents bring tires to a 2008 collection event

Chart 3 - Landfilled Waste Tires



RECYCLING WASTE TIRES CREATES NEW PRODUCTS

Tires can be recycled by grinding up the rubber and remolding it for other purposes. Some uses of ground rubber include ground cover under playground equipment, running track material, and components of sports and playing fields (photo courtesy of RB Rubber Products, Inc.). Tires can also be cut, punched, or stamped into various rubber products, including floor mats, belts, gaskets, shoe soles, dock bumpers, seals, muffler hangers, shims, and washers.

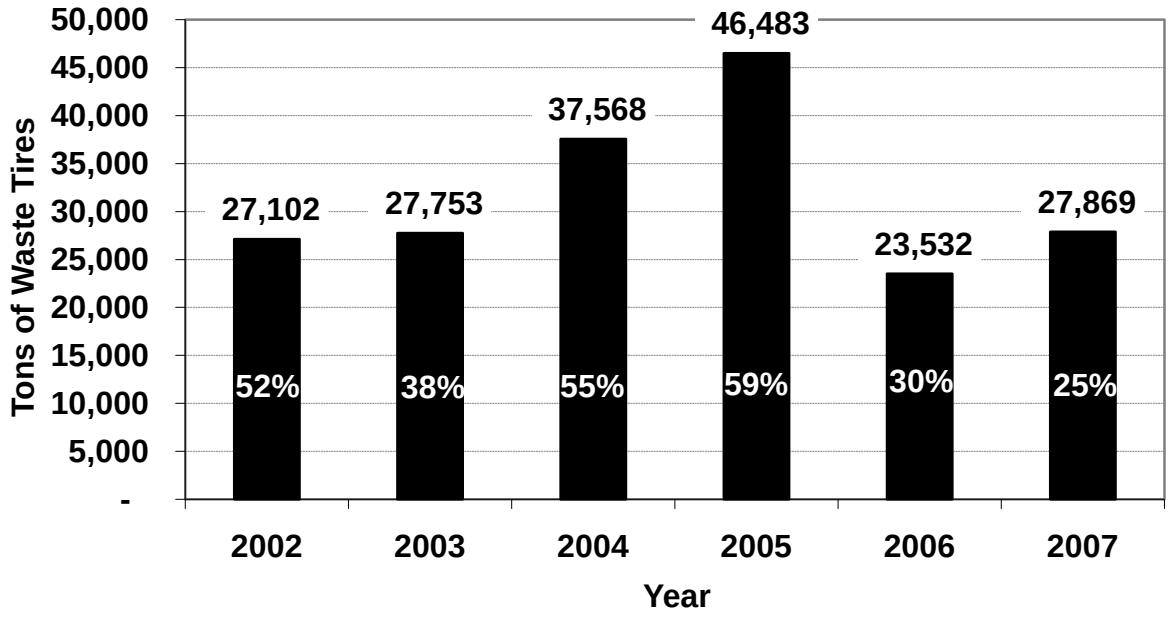
Recycled tire products

The annual totals and percentages of recycled tires are shown in Chart 4, next page. The amount of tires recycled is based on tire business reports and recycling facility surveys. During the first few years of collecting these reports, we found that some businesses included retreaded tires as recycled. That may be the reason for the high recycling totals reported in 2004 and 2005. Recycling totals in 2007 include the waste tire pile cleanup efforts.

The ground rubber product market has shown the greatest growth in recycled tire materials. However, the conversion to synthetic field turfs for football, soccer, and other playing surfaces will be limited by the finite number of athletic fields. The cut, punched, and stamped rubber

products market is limited to tires that do not have steel belts, known as “bias-ply” tires. There is a limited supply of bias-ply tires available for this market.

Chart 4 - Recycled Waste Tires



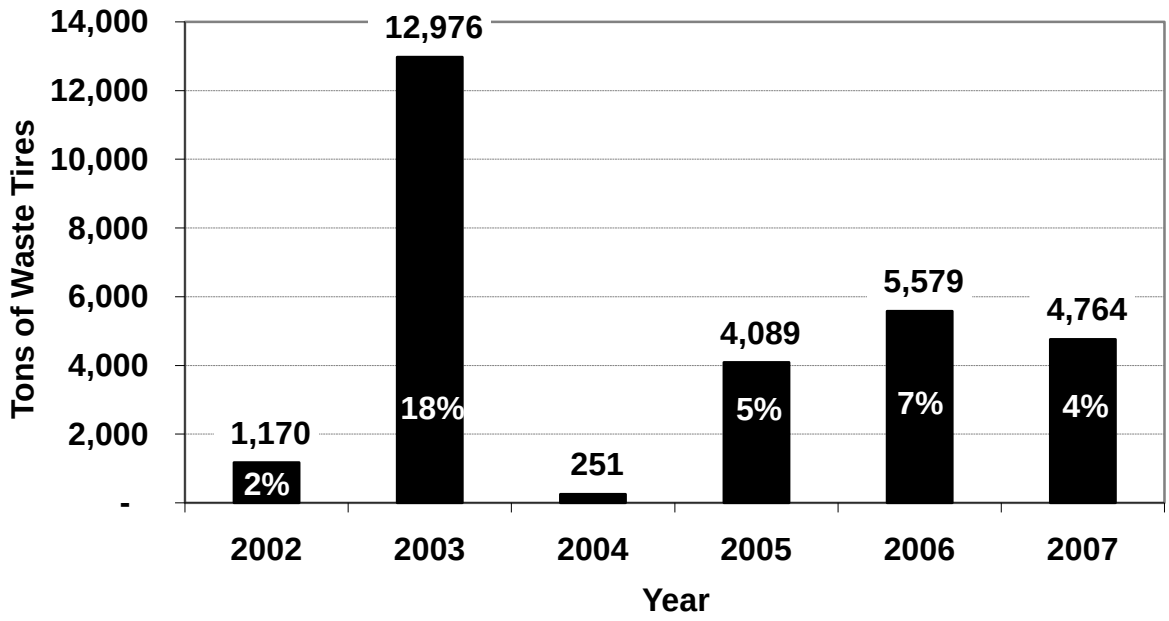
RETREADING A TIRE SAVES 15 GALLONS OF OIL

Retreaded tires contain up to 75 percent recycled content. Manufacturing one new truck tire takes 22 gallons of oil. Most of the oil is found in the casing. The retreading process places a new tread on the old tire casing. As a result, it takes only 7 gallons of oil to produce a retread.

Reported tire retread data show retreading varied greatly between 2002 and 2006. During the early years some businesses lumped several categories together in their reports to Ecology. The spike in the chart in 2003 was because some tire companies combined some recycled and retreaded tires into one category. Then in 2004 some tire company reports included retreaded tires in the recycled category. The retread data shown for 2005 through 2007 provide a more reliable data trend.

Chart 5, next page, shows the reported retreaded tires in total tons and percent of total reported uses.

Chart 5 - Retreaded Waste Tires



TIRE-DERIVED FUEL PROVIDES ENERGY FOR CEMENT KILNS

Because of their high heating value, waste tires make a good fuel. Tire-derived fuel (TDF) can provide up to 15,000 British thermal units (BTUs) per pound, which is higher than coal, oil, and wood. Burning waste tires is not recycling (under the state's definition), but we consider it a higher use than landfilling. Tires serve as fuel either shredded or whole, depending on the type of combustion device.

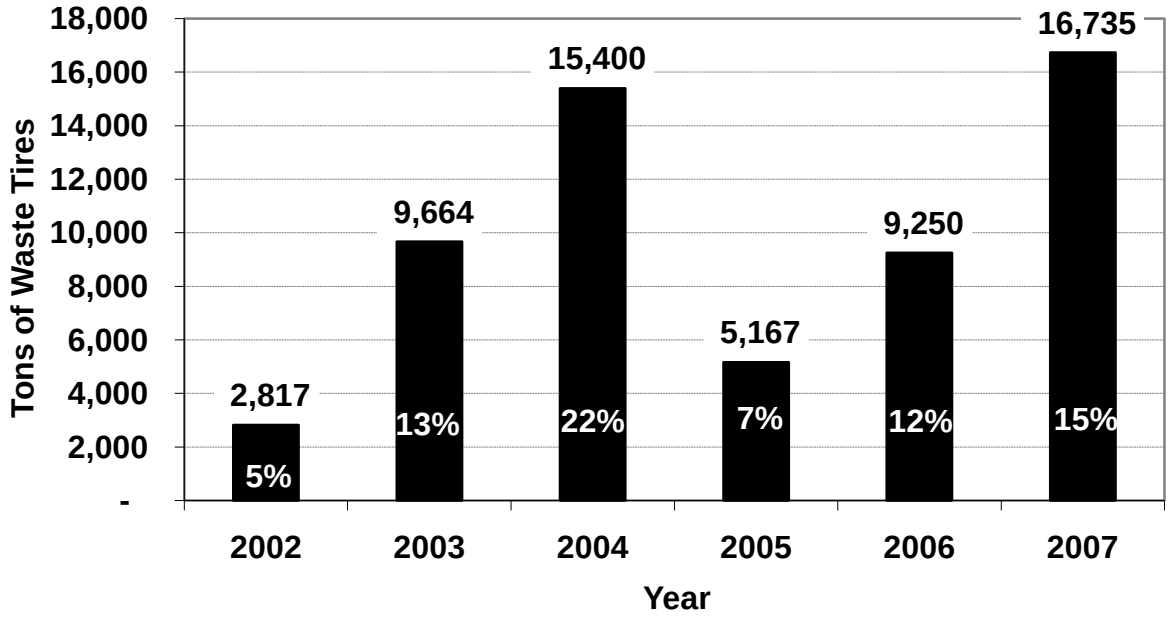
Ash Grove cement kiln in Seattle

In Washington, cement kilns use whole tires as fuel. The higher BTUs provided by tires allows the cement plant to reduce their use of other fuel sources. This results in a cost savings to the cement plant. Cement kilns operate at very high temperatures (around 2,600 degrees Fahrenheit) and have long residence times. This results in complete combustion of the tires. The metal in the steel belted tires combine with the cement product. Compared to coal, use of tires in cement kilns reduces nitrogen oxide emissions.

Cement kilns or other industrial facilities that use tires as fuel need to have a tire storage and handling plan, have secured a permit for all applicable state and federal environmental programs, and be in compliance with all the requirements of that permit.

Chart 6 shows total tons (and percentage) of tires used for fuel each year. Cement kiln demand for TDF determines the variation of fuel use over the years. The greatest reported TDF use occurred in 2007, which includes the waste tire pile cleanup efforts as well as increase in TDF demand from overseas markets.

Chart 6 - Waste Tires Used for Fuel



Tire Pile Cleanup Status for 2008

In 2005, the Legislature passed Substitute House Bill (SHB) 2085, creating a Waste Tire Removal Account to fund cleanup of unauthorized and unlicensed tire piles. Funds for this account come from a $1 fee charged on each new replacement tire sold in Washington. The state will collect this fee until June of 2010.

To be eligible for the cleanup program, piles must contain more than 800 waste passenger tires (or the combined weight of 16,000 pounds of tires). Ecology coordinates cleanup of waste tire piles with local health departments, fire departments, businesses, tribes, and private citizens.

WASTE TIRES PILE CLEANUP CONTINUES IN 2008

By November of 2008, Ecology identified 169 tire pile sites in Washington State, containing over 5 million waste tires. Cleanup data in the following tables are provided in tons of tires; one ton of tires equal about 100 passenger tires.

Tire pile cleanup activities started in May of 2007. By the end of 2007, a total of 27 tire pile sites containing over 3 million tires (over 30,000 tons of tires) were removed. In order to remove the largest single tire pile (containing over 2 million tires) as quick as possible, over 90% of the tires from the Goldendale-Wing Road site were shredded and landfilled. Nearly 60% of the tires from the other 26 sites were recycled or reused. Common recycling and reuse of waste tire materials includes crumb rubber, stamped rubber bumpers, tire rings, fuel for cement kilns and scrap steel (wheel rims).

During the first 11 months of 2008, another 48 tire pile site cleanups removed over 0.75 million tires. Tire recycling and reuse improved to more than 80% of the tires from these sites. Tire pile removal at the remaining 94 sites will continue through 2009 and into 2010.

Table 2 - Summary of Completed Tire Pile Cleanups by Calendar Year
(1 ton of tires = 100 passenger tires)

Year	Sites	Tons	Recycled or Reused	Cost
2007 *	27	33,289	56%	$ 4,364,719
2008	48	7,699	85%	$ 1,774,824
Completed	75	40,988	75%	$ 6,139,543
Remaining	94	9,412	>80%	$ 1,894,096
TOTAL	**169**	**50,400**	**>75%**	**$ 8,033,639**

* Goldendale site cleanup completed in 2007, total of 20,240 tons, only 8% recycled/reused

Note: Data in the 2007 Report to the Legislature (publication 08-07-014) under-reported total cleanup, the total for 2007 in Table 2 includes cleanups finished in 2007 but not reported to Ecology until early 2008.

RECYCLING AND REUSE OF TIRE PILE CLEANUP TIRES

The following pie charts show the recycling, reuse, and landfilling of cleanup program tires. A small portion of the cleanup tires were used as bales in construction projects (shown in yellow on the pie charts). Most of the landfilled tires during the 2007 cleanup activities came from the site in Goldendale, Washington. Landfilling of cleanup tires (blue on the pie charts) decreased in 2008 due to available recycling and reuse markets. Increase in recycling (green on the pie charts) may partly be a result of slower paced cleanup efforts allowing recycling markets to take in the clean up tires. The overseas demand for tire derived fuel in China, Korea, and Japan significantly impacted use of these tires as fuel (red on the pie charts).

Chart 7 - 2007 Tire Pile Disposal or Use

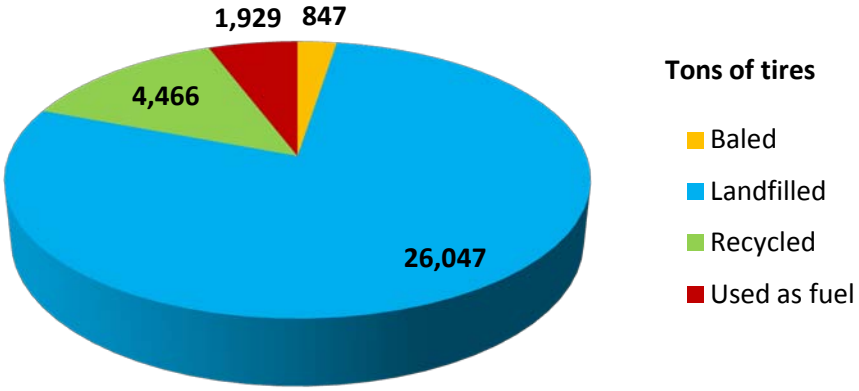
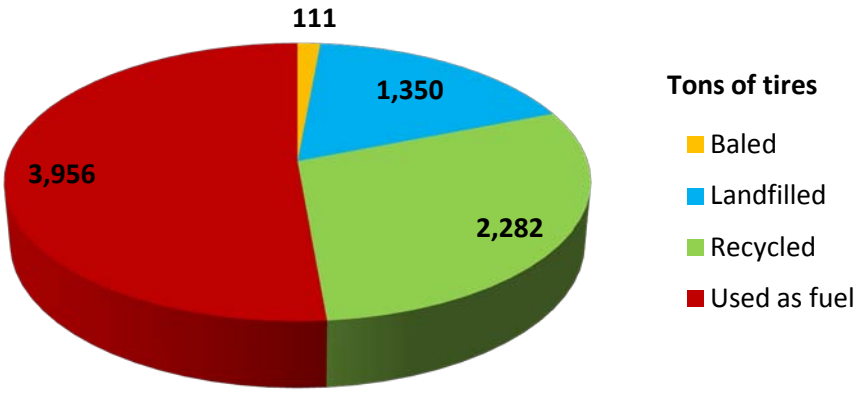


Chart 8 - 2008 Tire Pile Disposal or Use



A FEW EXAMPLES OF TIRE PILE CLEANUP EFFORTS

Donohoe Road, Chehalis, Lewis County

Donohoe Road before tire removal

June 6, 2007

View from the same spot after the flood

April 8, 2008

Removed a total of 67 tons of tires from the edge of an agricultural field along the Chehalis River embankment. Landfilled all tires from this site at a total cost of $16,800 (which is about $2.50 per tire). Completed this cleanup prior to the 2007 flood of the Chehalis River.

Grasser's Auto Wrecking, Centralia, Lewis County

Grasser's Auto before clean up

February 6, 2007

Grasser's Auto after clean up

July 17, 2007

A total of 862 tons of tires removed from a former auto wrecking property in northern Centralia. Over 50% of the tires at this site were still on the wheels. Recycled all of those wheels and 9% of the tires. Twenty-six percent of the tires were delivered to cement kilns for fuel use. Clean up of this site cost $160,000, which is about $1.85 per tire (or $185 per ton). Site cleanup completed prior to the flood of 2007.

West Richland Auto Wrecking, West Richland, Benton County

West Richland Auto before clean up

July 11, 2007

West Richland Auto after clean up

March 20, 2008

A total of 174 tons of tires removed from a former auto wrecking property in West Richland. Over 40% of the tires at this site were still on the wheels. All of the wheels and 33% of the tires were recycled. Twenty-six percent of the tires were delivered to cement kilns for fuel use. Clean up of this site cost $26,600, which is about $1.52 per tire (or $152 per ton).

Goldendale (Wing Road), Goldendale, Klickitat County

Goldendale before cleanup

October 23, 2006

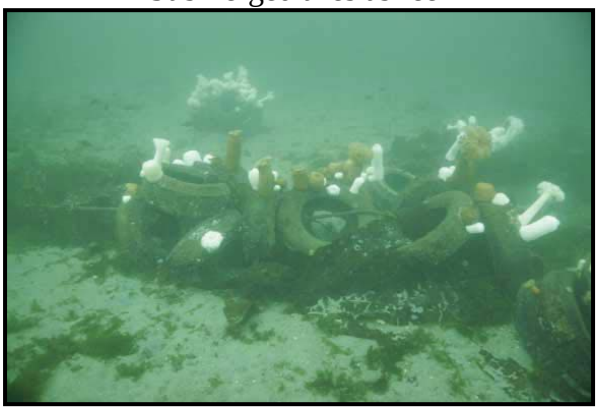
Goldendale cleanup nearly finished

November 8, 2007

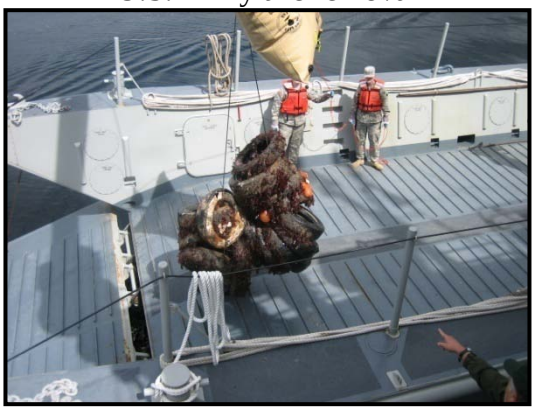
A total of 20,240 tons of tires removed from the largest tire pile remaining in the state. Due to the potential fire danger of a site this large, it was a priority to quickly clean up this site. Completed clean up in 6 months, moving nearly 3,400 tons of tires each month, local rubber recycling markets were unable to accept this volume this quick. Nearly all of the tires were shredded and landfilled, all wheels and lead wheel weights were recycled. Clean up of this site cost $2,160,000, which is about $1.06 per tire (or $106 per ton).

Salt Water State Park, Federal Way, King County

Submerged tires as reef



U.S. Army tire removal



Ecology teamed with the Washington State Department of Fish and Wildlife, Washington State Parks and Recreation Commission, and U.S. Army to remove 4 tons of tires from Salt Water State Park. In the 1980s, the tires were anchored for an artificial reef. After removal of the tires State Parks will construct a 300-foot replacement reef made from rocks, pre-cast concrete post, and artificial kelp. All of the removed tires were landfilled.

Hurricane Ridge, Olympic National Park, Clallam County

Hurricane Ridge tire pile

Tire removal effort

U.S. Coast Guard volunteers helped the National Park Service pull tires from the bottom of the Hurricane Ridge ski slope. In the 1980s the tires were put in a depression at the bottom of the ski lift. The National Park Service hired helicopter airlifted the tires to the trucks at the Hurricane Ridge parking lot. A total of 21 tons of tires were removed, 95% recycled or reused at a total cost of $5,704 (which is about $2.71 per tire).

WASTE TIRE PILE CLEANUP STATUS BY COUNTY

In collaboration with local governments, Ecology continues to identify new tire pile sites across the state. The following table summarizes, by county, the status of tire pile cleanup efforts.

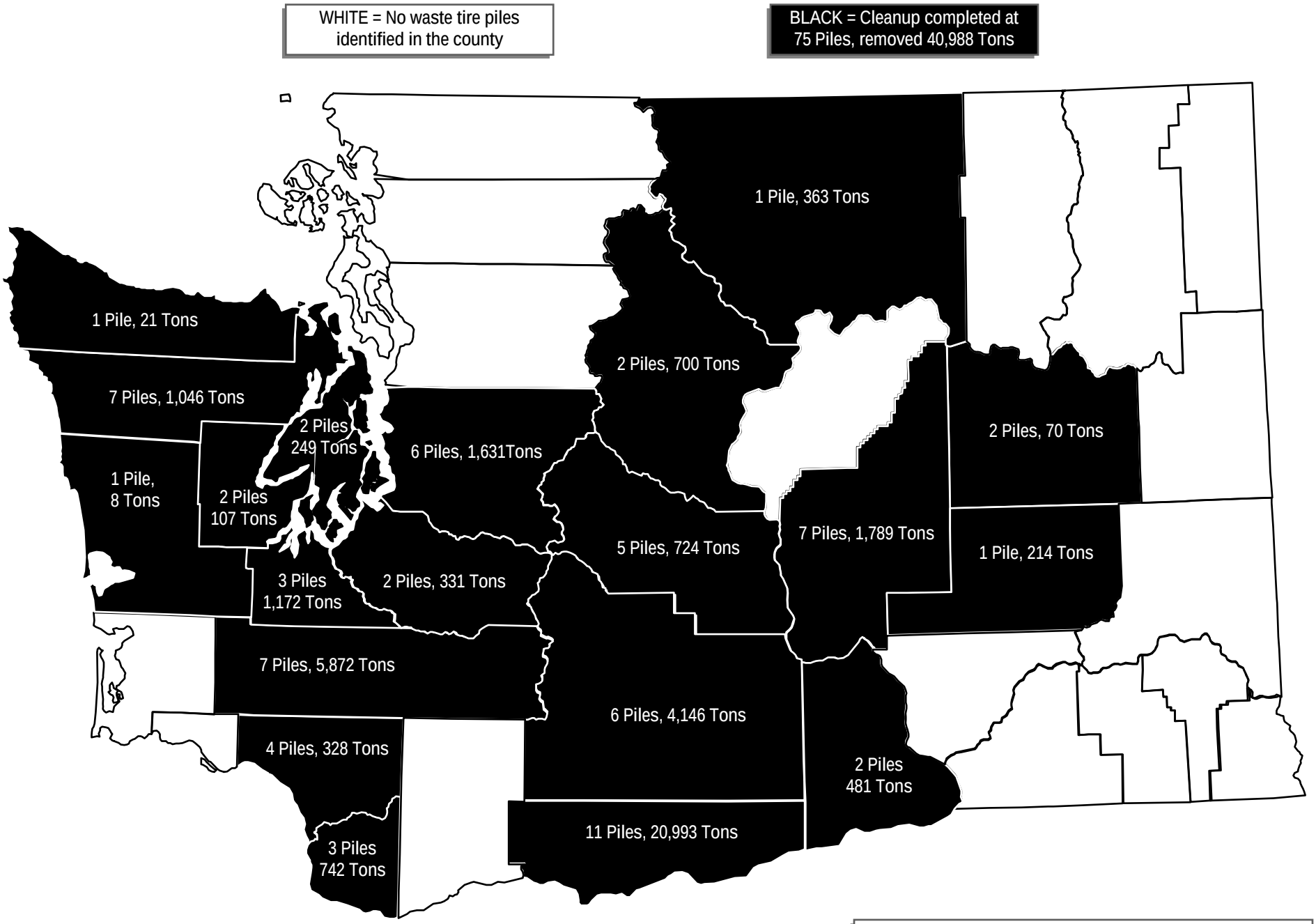
Table 3 - Tire Pile Cleanup Progress by County (2007 – 2008)

	Completed Tire Piles			Remaining Tire Piles		
County	**# Sites**	**Tons**	**Cost**	**# Sites**	**Tons**	**Cost**
Adams	1	214	$51,659	1	24	$5,601
Benton	2	481	$79,822	5	375	$90,635
Chelan	2	700	$155,511	2	200	$36,392
Clallam	1	21	$5,704	3	300	$54,588
Clark	3	742	$144,126			
Cowlitz	4	328	$68,526	2	200	$36,392
Ferry				1	100	$18,196
Franklin				4	480	$101,250
Grant	7	1,789	$440,728	7	472	$124,911
Grays Harbor	1	8	$2,042	10	1,110	$192,319
Island				1	100	$18,196
Jefferson	7	1046	$221,378			
King	6	1631	$288,881	5	546	$111,180
Kitsap	2	249	$42,630			
Kittitas	5	724	$173,254	2	150	$28,273
Klickitat	11	20,993	$2,330,650	5	417	$76,651
Lewis	7	5,872	$915,276	5	385	$79,576
Lincoln	2	70	$13,537	4	400	$106,776
Mason	2	107	$29,088	4	950	$166,173
Okanogan	1	363	$100,733	1	100	$18,196
Pend Oreille				3	145	$27,345
Pierce	2	331	$69,056	7	710	$141,828
Skagit				1	108	$22,909
Snohomish				4	400	$93,541
Spokane				4	500	$91,778
Stevens				1	75	$15,593
Thurston	3	1,172	$234,577	2	200	$36,392
Walla Walla				2	175	$43,131
Whatcom				3	300	$54,588
Whitman				2	100	$18,196
Yakima	6	4,146	$772,367	4	390	$83,492
Totals	**75**	**40,988**	**$6,139,543**	**94**	**9,412**	**$1,894,096**

The two maps show the progress of tire pile cleanup by county as of November 2008.

- Information on Map A, with a black background, shows completed tire cleanup.
- Information on Map B, with a grey background, shows remaining tire cleanup sites.

Map 1 - Tire Pile Cleanups Completed from May 2007 to November 2008

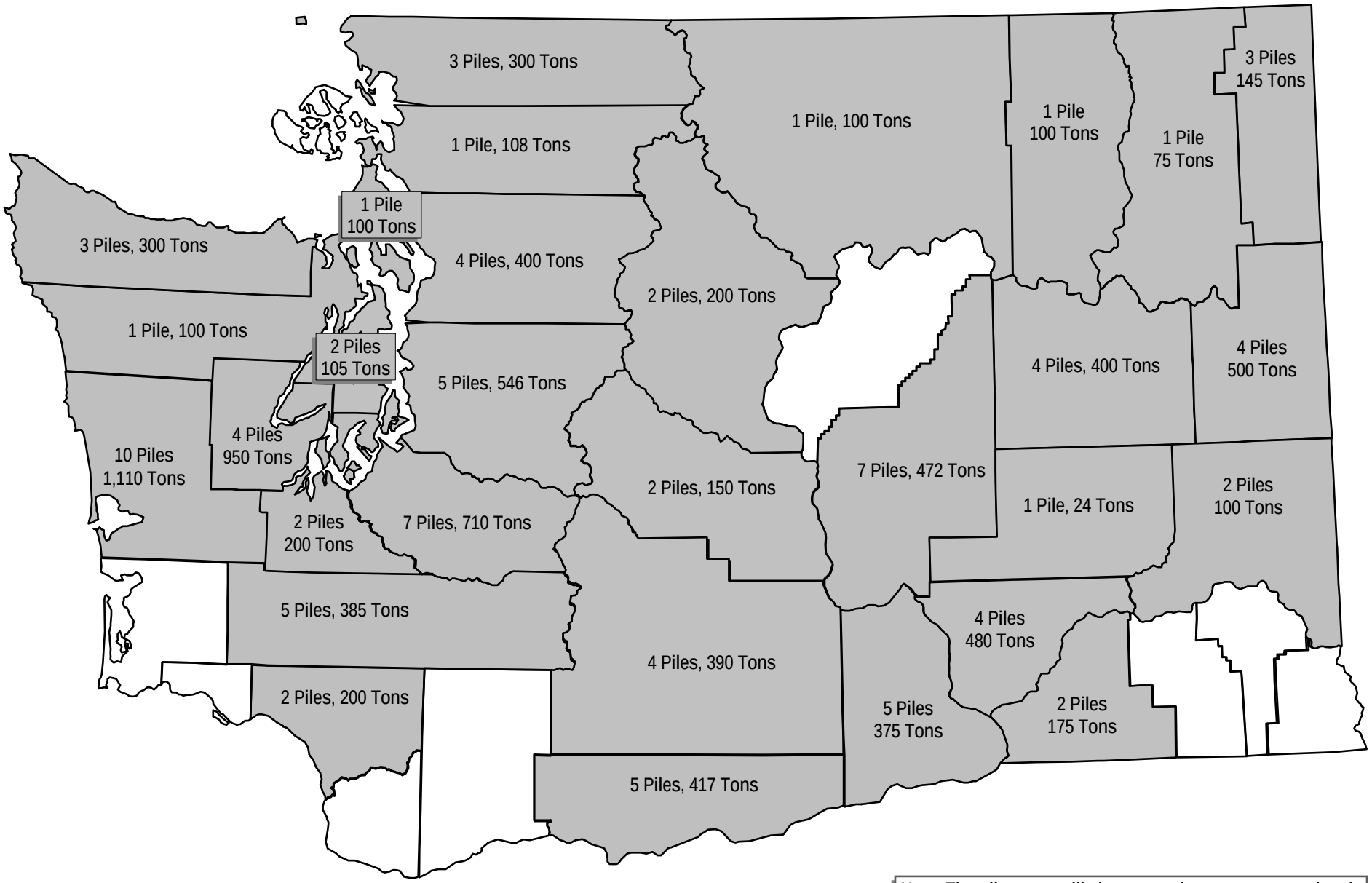


Note: Tire pile count will change as cleanups are completed.
1 ton of tires are about 100 passenger tires

Map 2 - Tire Pile Cleanups Remaining for 2009 and 2010

WHITE = No waste tire piles identified in the county

GREY = Cleanup remaining at 94 Piles, estimated 9,412 Tons



Note: Tire pile count will change as cleanups are completed.
1 ton of tires are about 100 passenger tires