

Evaluation of Proposed Phosphorous Discharge Regulations

Prepared for



Prepared by



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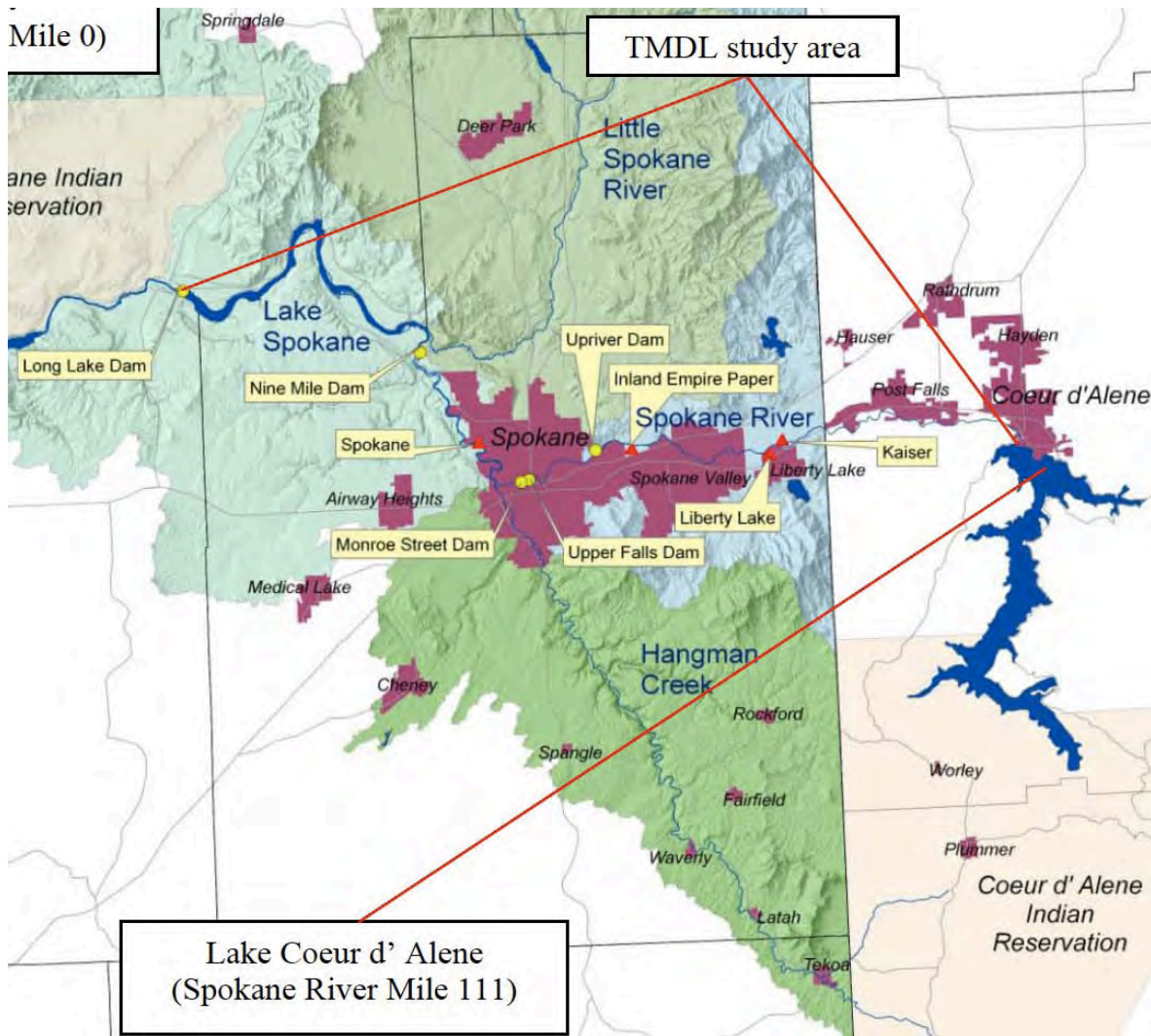
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Executive Summary

For readers unfamiliar with the setting and regulatory context discussed in this report, Figure 1 provides a map of the Spokane River study area, which straddles the state line between Washington and Idaho. Water quality regulations approved by the State of Washington will also apply to wastewater treatment plants in Idaho, with enforcement provided by the U.S. Environmental Protection Agency through National Pollutant Discharge Elimination System (NPDES) permits.

Figure 1. Map of Spokane River Study Area



Map Source: Washington Department of Ecology 2009.

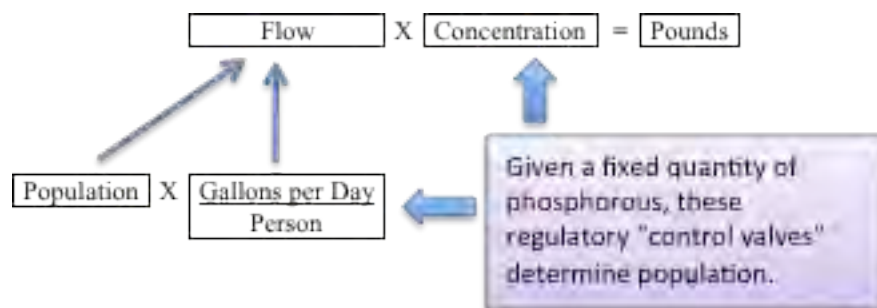
Reid Ewing, a professor at the University of Utah, periodically writes about “Research You Can Use” in *Planning* magazine. A recent contribution discussed evaluation research and provides a useful lens for examining the *Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load Water Quality Improvement Report* by Washington’s Department of Ecology, dated February 2010, and the *Spokane River Modeling Final Scenarios* by Portland State University’s Department Water Quality Research Group, dated January 2010. Dr. Ewing reminds us of a hierarchy for general types of evaluation research, with evaluation of inputs being the basic level, evaluation of outputs having mid-range utility and evaluation of outcomes providing the most benefit. Obtaining verifiable, good outcomes would be the best result of the proposed water quality standards for the Spokane River basin.

This report intends to assess the effects of water quality improvements, proposed by Washington Department of Ecology (hereafter referred to as “Ecology”), on the City of Post Falls and Kootenai County, Idaho. The Ecology analysis requires numerous quantitative inputs to a complex computer model that simulates possible water quality changes in the Spokane River, specifically the level of dissolved oxygen in Lake Spokane. Model inputs are discussed in the “Demographic Analysis” section. Model outputs are discussed in the “Evaluation of Water Quality Model.” The TischlerBise evaluation concludes with an assessment of the likely outcomes from implementation of the proposed phosphorous discharge regulations.

The regulatory environment is a complex web of rules, technical studies, and extensive documentation. For example, the latest versions of the two key documents evaluated by TischlerBise contain more than 400 pages. The myriad of details makes it difficult to see the forest for the trees. This evaluation is intended to aid decision-makers by summarizing the process, calculations, and likely effects of the proposed water quality regulations.

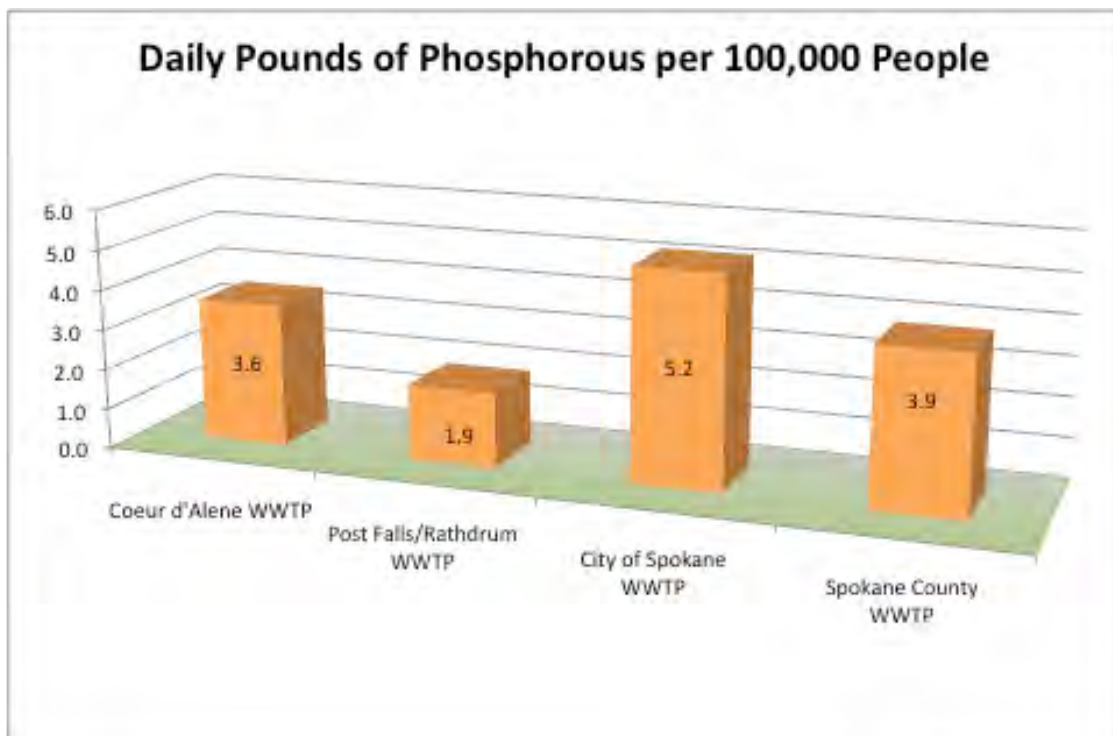
The typical regulatory outcome is a maximum amount of pollutant for a specific point source (i.e. a prescriptive standard). In the Spokane River basin, pounds of phosphorous were determined for Waste Water Treatment Plants (WWTP) owned and operated by three local governments in Idaho and three in Washington. Key calculations used to derive the pounds of phosphorous are summarized in Figure 2. Working backwards through the formula, it is evident that the pounds prescribed to each WWTP will essentially determine the service area population.

Figure 2. Schematic of Key Calculations



With a direct and strong correlation between each jurisdiction’s phosphorous allocation and their likely population cap, it is important for regulators to equitably adjust their “control valves” to yield similar levels of pollutant for each person in the Spokane River basin. If not, the agencies will likely face equal protection challenges, claiming arbitrary and capricious setting of phosphorous limits that result in windfalls for some jurisdictions and wipeouts for others. As an equal protection test, TischlerBise derived pounds of phosphorous per 100,000 people for two sewer service areas in Idaho and two in Washington. As shown in Figure 3, there are wide disparities in daily pounds of phosphorous per 100,000 people, with the City of Spokane receiving more than double the allocation of Post Falls and Rathdrum. The graph below was derived from Ecology’s proposed discharge limits and population projections by sewer service area obtained from websites of the respective local governments.

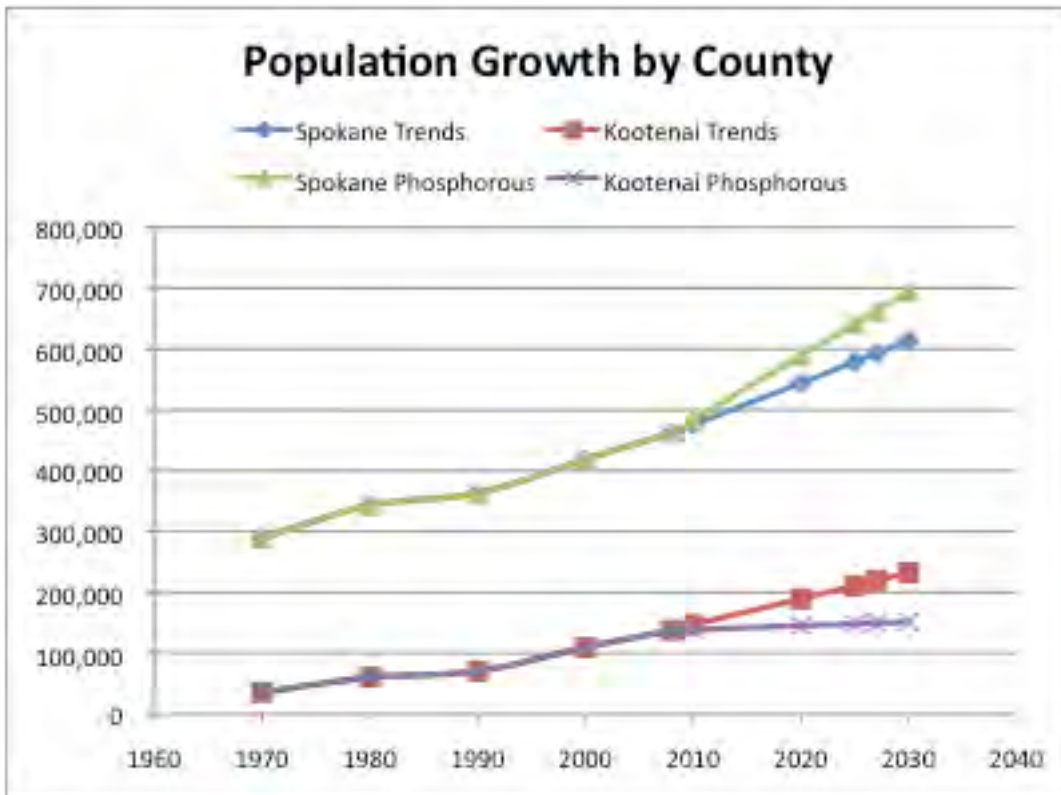
Figure 3. Graph of Phosphorous Allocation by Jurisdiction



The amount of phosphorous allocated by Ecology will become a de facto growth cap for each sewer service area. To assess the impact of the proposed regulations, TischlerBise compared Ecology’s 2027 phosphorous allocation by county to past and projected population shares for Spokane and Kootenai Counties. In 2027, Ecology allocated 4.74 daily pounds of phosphorous to sewer service providers in Kootenai County (18.4%) and 21.06 pounds to Spokane County (81.6%). As shown in Figure 4, the proposed allocation will alter population growth trends. Historical population data from 1970 through 2008 indicates Kootenai County has gained population share over time from 11% in 1970 to almost 23% in 2008. Implementation of Ecology’s proposed phosphorous allocations will cause a decline in Kootenai County’s population share, as indicated by the flat projection

line in the graph below. In contrast, Spokane County will experience an up turn in population growth, as indicated by the steeper slope in the line graph. As a basis of comparison, trend projections from Woods & Poole Economics are shown for both counties.

Figure 4. Graph of Population Growth by County



The current regulatory approach is based on a prescriptive standard that dictates a fixed quantity of phosphorous for a specific point source. The use of prescriptive standards sets up a zero-sum game, whereby each jurisdiction has to beggar their neighbor to maximize their waste load allocation. Given this scenario, there are huge economic incentives for each jurisdiction to overstate projected wastewater flow, yet the Ecology did not critically evaluate population projections and per capita wastewater flow assumptions used to derive projected effluent flow in 2027. The simple solution to this problem is for water quality regulations to specify the same output concentration (i.e. a performance standard) for all wastewater treatment plants in the watershed. It is not necessary to derive a specific quantity of phosphorous to each sewer service provider if all wastewater plants have the same quality output. Adopting a performance standard for the entire watershed allows market forces to determine where development takes place.

To evaluate the economic impact of the Ecology growth cap, TischlerBise used linear regression models, calibrated to Kootenai County data from 1970 through 2008, to forecast Gross Regional Product (GRP), earnings by place of work, and personal income by place of residence. If Kootenai County's regional job-share declines at the same rate as population,

economic activity is forecast to remain stagnate through 2030. In comparison to a GRP of \$7.5 billion, as forecast by Woods & Poole Economics, the growth cap will decrease GRP by \$3.6 billion in 2030. Projected Kootenai County earnings will be reduced by \$2.5 billion in the year 2030, in comparison to the Woods & Poole trends projection. Kootenai County's aggregate personal income in 2030 is also forecast to decrease by almost \$4.3 billion in comparison to the economic forecast based on past trends. These economic impacts are expressed in 2004 dollars (i.e., not inflated over time). Based on the above analysis of economic impacts from the proposed water quality regulations, Ecology's de facto growth cap will effectively shrink the local economy by 50%.

A recent study published by the U.S. Environmental Projection Agency (Ragsdale 2007) indicated residential sewer rates charged to maintain and operate advanced wastewater treatment facilities, with low phosphorous discharges, ranged from \$18 to \$46 per month. In comparison, the City of Post Falls currently charges a residential customer approximately \$27 per month for sewer service. Based on preliminary cost estimates for capital improvements necessary to comply with proposed discharge regulations, each sewer customer in Post Falls will face a sewer rate increase of approximately \$21 per month. Another EPA study (Kang et al 2008) estimated annual increases in sewer expenditures per pound of phosphorous removed. Based on average daily wastewater flow in 2008, Post Falls will be required to remove at least 139 pounds of phosphorous each day, or approximately 50,735 pounds per year. At the upper end of the documented unit costs, sewer expenditures in Post Falls could increase approximately \$342,000 per year. The on-going cost of phosphorous removal would be passed on to existing sewer customers resulting in a rate increase of approximately \$3 per month. In total, sewer customers in Post Falls may experience a rate increase of approximately \$24 per month due to the proposed phosphorous discharge regulations.

To evaluate alternative means of improving water quality in the Spokane River basin, it would be advantageous to have a comprehensive summary of all sources of phosphorous and the magnitude of their contributions, both currently and for the 20-year planning horizon. The Post Falls and the Long Lake dams provide unique opportunities to "calibrate" water quality models. If not already available, water flow and phosphorous concentrations could be monitored at both dams on a daily basis, with this data used as "control totals" for the ID and WA portions of the Spokane River basin. With flow and concentration data from both dams, it would be possible to calculate the total daily phosphorous load in the river. The aggregate phosphorous load could provide an important "reality check" on the computer model output for both point and non-point sources. It is impossible to adequately evaluate alternatives and make good public policy decisions without a reasonable understanding of current and proposed phosphorous contributions from point and non-point sources.

Demographic Analysis

In general, the smaller the geographic area, the more difficult it is to accurately forecast population and job growth. The Washington Department of Ecology's water quality analysis for the Spokane River basin is based on population projections for six individual sewer service areas (three areas in Idaho and three areas in Washington). As shown in the formula below, excerpted from water quality analysis, projected effluent flow (in millions of gallons per day) is a key factor determining the quantity of phosphorous that will be permitted from each wastewater treatment plant. In simple terms, the volume of flow is multiplied by the concentration of phosphorous in the effluent to yield the maximum pounds per day of phosphorous permitted.

Equation 1. Wasteload allocations for point sources.

$2027 \text{ Eff. Flow (MGD)} \times \text{Seasonal Avg. Conc. in Table 4 (ppm)}$

Problem with Effluent Flow Assumptions

Unfortunately, the current regulatory approach is based on a prescriptive standard that dictates a fixed quantity of phosphorous for a specific point source. The use of prescriptive standards sets up a zero-sum game, whereby each jurisdiction has to beggar their neighbor to maximize their waste load allocation. Given this scenario, there are huge economic incentives for each jurisdiction to overstate projected wastewater flow, yet the Washington Department of Ecology did not evaluate critically evaluate population projections and per capita wastewater flow assumptions used to derive projected effluent flow in 2027.

The simple solution to this problem is for water quality regulations to specify the same output concentration (i.e. a performance standard) for all wastewater treatment plants in the watershed. It is not necessary to derive a specific quantity of phosphorous to each sewer service provider if all wastewater plants have the same quality output. Adopting a performance standard for the entire watershed allows market forces to determine where development takes place.

If environmental regulators insist on a prescriptive standard for each wastewater treatment plant (i.e. pounds of phosphorous per day), the accuracy of the 2027 effluent projections becomes a major point of contention. The following sections evaluate important demographic data that must be considered to determine reasonable effluent flow projections for each sewer service area.

Population Growth

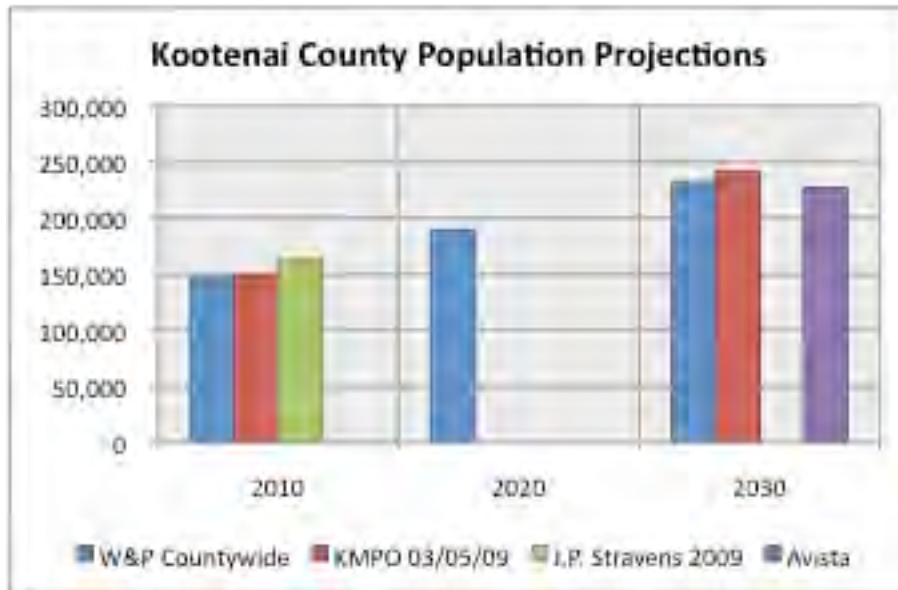
Figure 5 provides historical data on countywide population for Kootenai and Spokane Counties from the U.S. Census Bureau. The table indicates average annual population change between each time period and each county's population share. In the last 18 years, population growth has accelerated in Kootenai County, but remained relatively stable in Spokane County.

Figure 5. Historical County-Level Population Growth

	1970	1980	1990	2000	2008
U.S. Census Bureau					
Spokane Trends	289,339	343,083	363,029	418,827	462,677
Average Annual Growth		5,374	1,995	5,580	5,481
Spokane Share of Metro	89.0%	85.1%	83.7%	79.3%	77.1%
Kootenai Trends	35,591	60,036	70,443	109,546	137,475
Average Annual Growth		2,445	1,041	3,910	3,491
Kootenai Share of Metro	11.0%	14.9%	16.3%	20.7%	22.9%

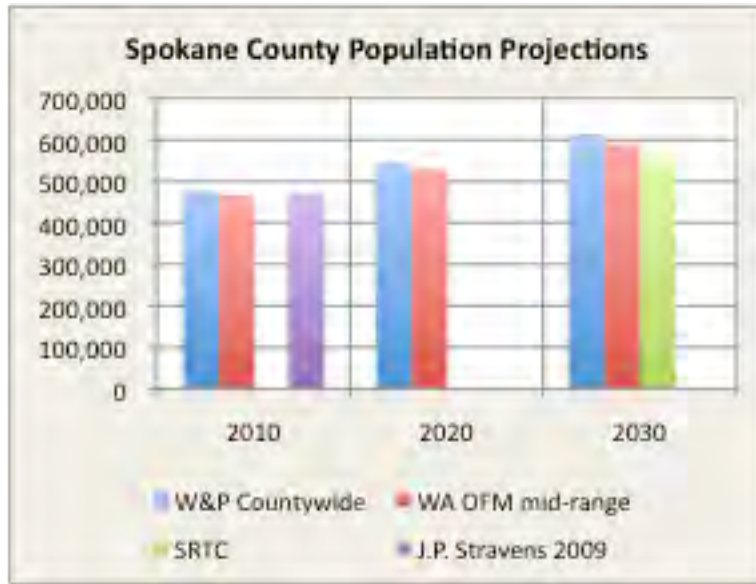
Looking forward, the crystal ball gets cloudy, with different sources indicating a variation in countywide projections (see Figure 6). The local transportation planning agency (KMPO) is less optimistic than a local demographer (J.P. Stravens) in the short run, but more optimistic about projected population in 2030. Even with a large and stable geographic area like Kootenai County, there is more than six percent variation in the 2030 projections. For smaller, sewer service areas with frequently changing boundaries, the confidence interval for 20 year population projections is very broad and full of caveats.

Figure 6. Alternative Population Projections for Kootenai County



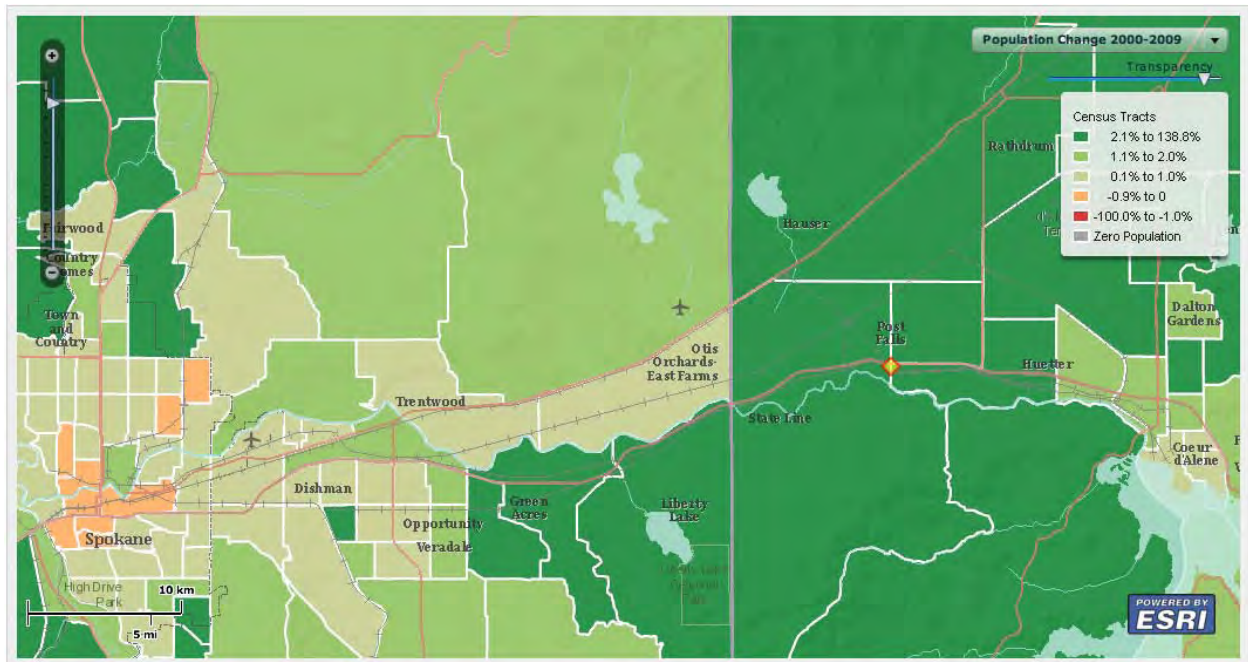
As shown in Figure 7, a similar pattern is seen in population projections for Spokane County. The most conservative 2030 projection is from the local transportation-planning agency (SRTC). The Spokane County population projection from Woods & Poole Economics is 9% higher than the SRTC projection.

Figure 7. Alternative Spokane County Population Projections



In comparison to Kootenai County, sewer service area projections for Spokane County are even more difficult because the County is planning to open a new wastewater treatment plant and some areas within the City of Spokane have lost population over the past nine years (see Figure 8). In contrast, faster population growth (shown with dark green in the map below) has occurred in Liberty Lakes, Post Falls, and Hayden.

Figure 8. Population Change by Census Tract 2000-2009



The purpose of this brief population analysis is to highlight the difficulty of small area population projections 20 years into the future. Because pounds of phosphorous are directly correlated to population, Ecology’s 2027 allocation will reverse past trends by increasing population share in Spokane County and decreasing share in Kootenai County. Figure 9 indicates the likely change in population share over time due to the proposed water quality regulations.

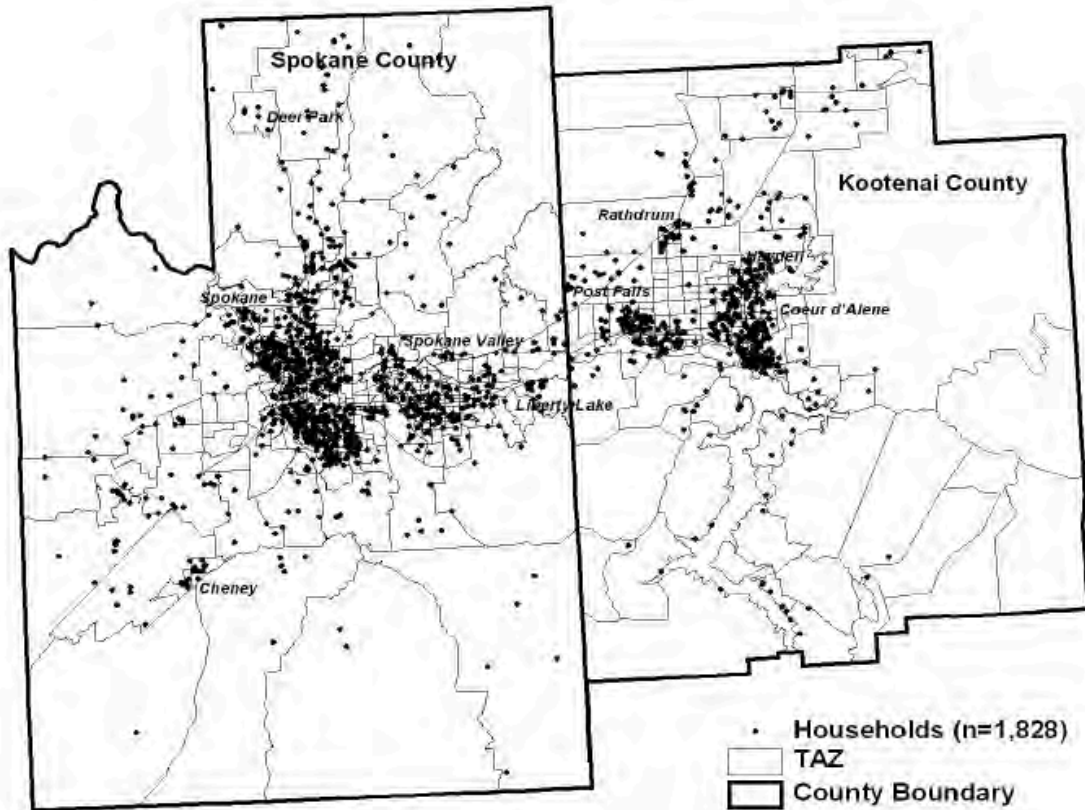
Figure 9. Population Shift Due to Growth Cap

	2010	2020	2025	2027	2030
Woods & Poole Economics					
Spokane Trends	475,973	544,063	578,975	593,016	614,077
Average Annual Growth	6,648	6,809	6,982	7,020	7,020
Spokane Share of Metro	76.4%	74.2%	73.3%	73.0%	72.5%
Kootenai Trends	146,904	189,275	210,874	219,573	232,622
Average Annual Growth	4,715	4,237	4,320	4,350	4,350
Kootenai Share of Metro	23.6%	25.8%	26.7%	27.0%	27.5%
Washington Department of Ecology					
Spokane Phosphorous	483,771	589,243	641,978	663,073	694,714
Average Annual Growth	10,547	10,547	10,547	10,547	10,547
Spokane Share of Metro	77.7%	80.2%	81.2%	81.6%	82.1%
Kootenai Phosphorous	138,743	145,080	148,249	149,516	151,418
Average Annual Growth	634	634	634	634	634
Kootenai Share of Metro	22.3%	19.8%	18.8%	18.4%	17.9%

A Better Way

Changing the regulatory approach to rely on a consistent performance standard for all wastewater treatment plants in the entire watershed would end the zero-sum game and negate the need for accurate small area development projections. This recommendation provides a better governance structure and it is consistent with the everyday experience of living and working in the Spokane River basin. The urban corridor along I-90 between Spokane and Coeur d’Alene is an interconnected metropolitan area with many residents working and shopping in adjacent communities. In 2005, the Metropolitan Planning Organizations for Spokane and Kootenai Counties funded a regional travel survey by NuStats. Figure 10 indicates the location of households surveyed and graphically depicts the proximity of communities located along the Spokane River. The 2005 travel survey indicated 13 percent of Kootenai households make work trips into Spokane County, while nine percent of shopping trips were destined for Spokane County.

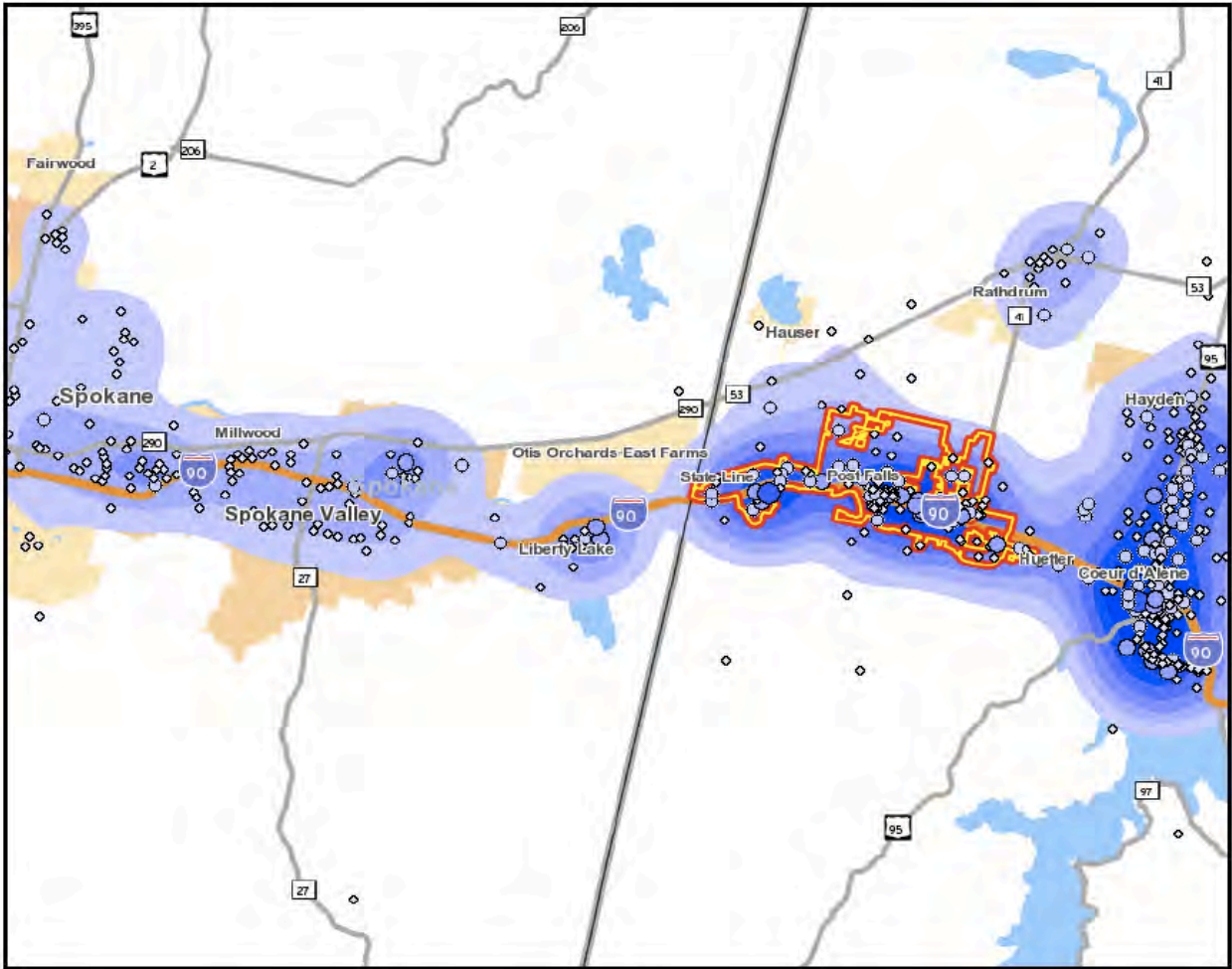
Figure 10. General Location of Households in the Spokane River Watershed



N=1,221 Spokane County and 607 Kootenai County unweighted households.

The U.S. Census Bureau’s web application named “OnTheMap” can also be used to document 2008 travel patterns for working residents in small geographic areas like Post Falls. As shown in Figure 11, 30.4% of workers living in Post Falls traveled east to Coeur d’Alene and 20.2% traveled west to Spokane County for their daily journey to work. In essence, Post Falls is a linking community in the string of pearls along the Spokane River. Efforts to enhance the environmental quality of an important natural asset should be a unifying force for the region, not one that fosters unnecessary rivalry. A change from prescriptive to performance standards would help to unify the region.

Figure 11. Interconnectivity of Commuting Patterns



Evaluation of Water Quality Model

To evaluate alternative means of improving water quality in the Spokane River, it would be advantageous to have a comprehensive summary of all sources of phosphorous and the magnitude of their contributions, both currently and for the 20-year planning horizon. The 399-page Water Quality Improvement Report from Washington's Department of Ecology (WDOE February 2010) provides pieces of the puzzle, but not in a format conducive to effective decision-making. It would be ideal to summarize current and projected data on water flow, by point and non-point sources, the concentration of phosphorous in the water, and the resulting phosphorous load (expressed as pounds per day). As shown in Figure 12, TischlerBise attempted to prepare a summary of phosphorous contributions using data from the Water Quality Improvement Report and the Spokane River Modeling Scenarios prepared by Portland State University (January 2010). The former provides data for the Washington sources (see Ecology Tables 3-6), with the Idaho data obtained from the later source (see PSU Table 2).

Although flows from point sources might be consistent throughout the year, non-point sources fluctuate significantly from the wet, winter months to the dry, summer months. Because summer phosphorous loading is the critical indicator for algae blooms, TischlerBise included "groundwater" flow amounts for July-October. Groundwater flow was split between ID and WA based on the Federal Energy Regulatory Commission (FERC) requirement that the Post Falls dam release at least 600 cubic feet per second.

The Post Falls and the Long Lake dams provide unique opportunities to "calibrate" water quality models. If not already available, water flow and phosphorous concentrations could be monitored at both dams on a daily basis, with this data used as "control totals" for the ID and WA portions of the Spokane River basin. With flow and concentration data from both dams, it would be possible to derive the total daily phosphorous load in the river. The aggregate phosphorous load could provide an important "reality check" on the computer model output for both point and non-point sources.

Although the comprehensive summary table of current and projected conditions (see Figure 12) needs refinement, regulators should provide this type of concise summary as an essential component in the decision-making process. It is impossible to adequately evaluate alternatives and make good public policy decisions without a reasonable understanding of current and proposed phosphorous contributions from point and non-point sources.

Figure 12. Summary of Phosphorous Contributions by Source

Estimated Phosphorous in the Spokane River July through October

<i>Sources</i>	Million Gallons per Day		Milligrams per Liter		Pounds per Day	
	2001	2027	2001	2027	2001	2027
Idaho						
Coeur d'Alene WWTP	3.30	7.60	1.000	0.036	27.54	2.28
HARSB WWTP	1.50	3.20	1.000	0.036	12.52	0.96
Post Falls/Rathdrum WWTP	2.40	5.00	1.000	0.036	20.03	1.50
ID Urban Stormwater	0.80	0.93	0.310	0.310	2.07	2.41
ID Groundwater	371.00	371.00	0.004	0.004	12.38	12.38
ID Subtotal	379.00	387.73			74.54	19.54
Cubic Feet per Second	586	600				
Acre-Feet per Year	1,163	1,190				
Washington						
Liberty Lake WWTP	0.60	1.50	4.108	0.036	20.57	0.45
City of Spokane WWTP	37.30	40.80	0.857	0.042	266.76	14.30
Spokane County WWTP	0.00	18.00	0.000	0.042	0.00	6.31
Inland Empire Paper	4.30	4.10	0.342	0.036	12.27	1.23
Kaiser Aluminum	15.90	15.40	0.019	0.025	2.52	3.21
Combined Sewer Overflows	0.20	0.12	0.950	0.950	1.59	0.95
WA Urban Stormwater	2.00	2.36	0.310	0.310	5.17	6.11
Three Tributaries	242.37	242.37	0.016	0.016	33.19	33.19
Groundwater Upstream of Lake	752.96	752.96	0.008	0.008	47.76	47.76
Surface Runoff Lake Watershed	116.34	116.34	0.025	0.025	24.27	24.27
WA Subtotal	1,171.97	1,193.95			414.10	137.78
Cubic Feet per Second	1,813	1,847				
Acre-Feet per Year	3,597	3,664				
Total Basin						
Grand Total	1,550.97	1,581.68			488.64	157.32
Cubic Feet per Second	2,400	2,447				
Acre-Feet per Year	4,760	4,854				

Lacking “control totals” at Post Falls and Long Lake dams, for both flow and phosphorous concentration, TischlerBise can only point out a few apparent weaknesses in the water quality analysis. First, the phosphorous problem requires an accurate understanding of the relationship between the quantity of phosphorous and the volume of water in Spokane River. The total summer flow estimated in the table above is roughly 1.6 billion gallons per day. As shown in Figure 13, TischlerBise used land area and annual precipitation to estimate the total water volume falling in the Spokane River basin. On an average annual basis, the basin is receiving roughly 7.2 billion gallons per day. Although this simplistic comparison of inputs and outputs does not account for groundwater recharge, evaporation, and dams being opened and closed, it does suggest there might be additional “unaccounted for” water.

Figure 13. Annual Precipitation in the Spokane River Basin by State

Idaho Basin

4,345 square miles of the Spokane River Basin is in ID
 2,780,800 acres in ID portion of Spokane River basin
 26.0 inches of average annual precipitation in Post Falls per year
 6,025,067 acre-feet per year of precipitation in ID portion
 5,379 million gallons per day of precipitation in ID portion

Washington Basin

2,295 square miles of the Spokane River Basin is in WA
 1,468,800 acres in WA portion of Spokane River basin
 16.5 inches of average annual precipitation in Spokane per year
 2,019,600 acre-feet per year of precipitation in WA portion
 1,803 million gallons per day of precipitation in WA portion

7,182 Total MGD in the Spokane River Basin

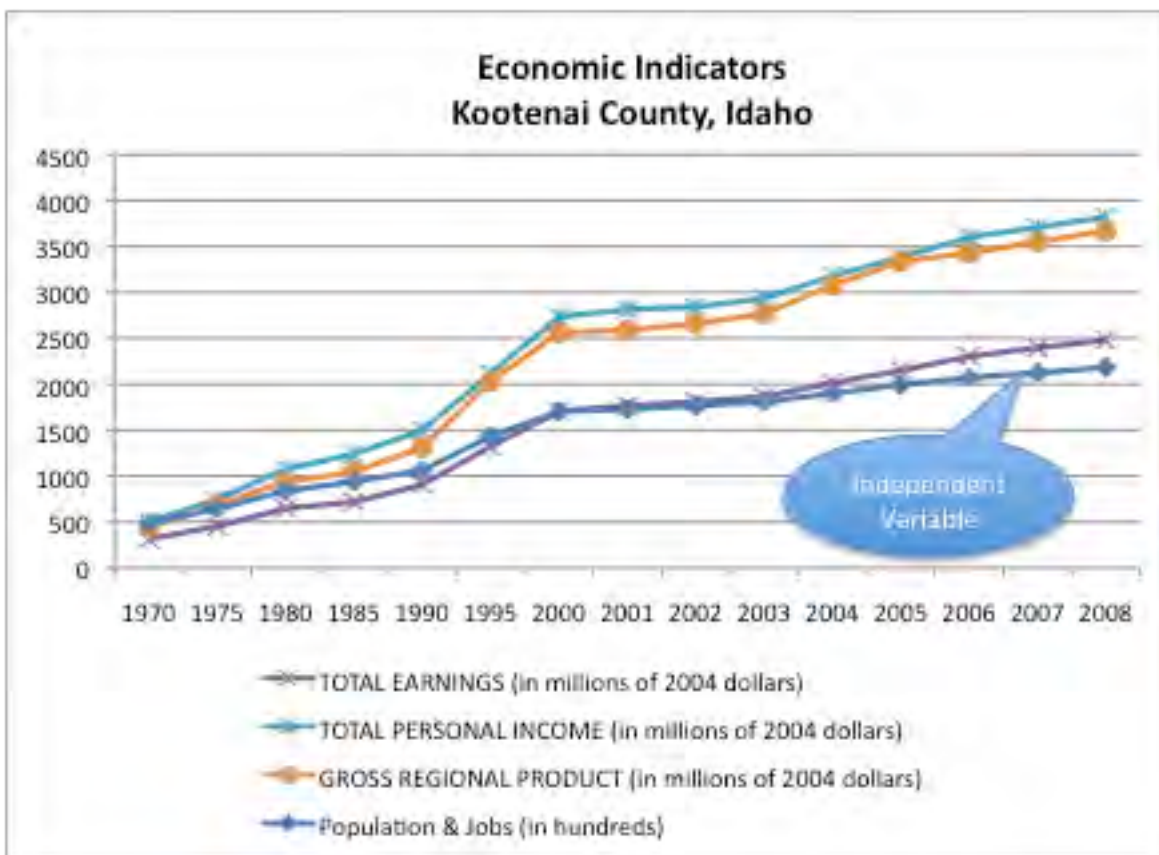
Source: Sq Mi data from Executive Summary, Spokane River and Lake Spokane Draft Water Quality Improvement Report, WA Dept. of Ecology, September 2009.

A second weakness in the water quality modeling effort is the insufficient analysis of stormwater runoff from agricultural and rural areas. As stated on page 30 of the draft water quality improvement report (WDOE September 2009), “The nonpoint total phosphorous source load accounts for a large portion of the overall load, especially during the spring months.” Ag/rural lands include a significant number of large-lot housing units on septic tanks, plus the phosphorous loading from crop fertilizer and livestock waste. Apparently, the water quality analysis considers Ag/rural stormwater to be “groundwater,” yet the phosphorous loading from these areas would have to be greater than the level measured in local wells.

Economic Impact

This section discusses potential economic impacts on Kootenai County due to more stringent water quality regulations. If the U.S. EPA imposes a prescriptive phosphorous standard, with a quantitative cap on the daily weight of phosphorous discharged, the three sewer-service providers in Kootenai County will face a de facto growth cap. The likely effect of a growth cap on Kootenai County economic indicators can be determined by examining demographic and economic data purchased from Woods & Poole Economics (2008). As shown in Figure 14, population plus jobs (the independent variable) is a strong predictor of three important economic indicators: 1) Gross Regional Product, 2) Earnings by place of work, and 3) Income by place of residence. These three economic indicators are discussed further in the following sections.

Figure 14. Population & Jobs as a Predictor of Economic Activity



It should be noted that this analysis of economic impact focuses on the impact to future growth in the region. The new regulations may have an adverse affect on existing businesses, resulting in closures or downsizing, a loss of jobs, a decrease in population, and an overall decline in existing economic activity. Possible effects on existing economic activity are discussed in the “Cost Estimates” section of this report. It also should be noted that this discussion is limited to the impact on the Coeur d’Alene Metropolitan Statistical

Area, which is comprised of Kootenai County. It does not account for the potential economic impact on the State of Idaho economy. Given the Coeur d'Alene MSA accounts for 7.5 percent of the State's Gross Domestic Product, any negative impact on the regional economy will adversely affect the State's economy and fiscal condition.

Gross Regional Product

A good measure of general economic activity is Gross Regional Product (GRP), which indicates the overall size of a metropolitan area's economy. As shown in Figure 15, Kootenai County's current GRP is estimated at approximately \$3.9 billion, growing 5.3 percent annually over the past 10 years. Kootenai County's economy is projected to grow at approximately 4.6 percent per year over the next twenty years with a projected GRP of approximately \$7.5 billion by the year 2030. This reflects an almost doubling of economic activity with a projected increase of \$3.6 billion in the region. Projections shown below are from Woods & Poole Economics (2008). Also shown in Figure 15 are economic activity per person and job, which is projected to grow from \$17,000 today to \$20,700 by the year 2030.

TischlerBise used a linear regression model, calibrated to Kootenai County data from 1970 through 2008, to forecast gross regional product, earnings by place of work, and personal income by place of residence, as shown in the tables below. Given the new water quality regulations, Kootenai County's share of regional population and jobs will decline over time (see Figure 9 above and related text). Instead of a GRP of \$7.5 billion by 2030, economic activity is forecast to remain stagnant for the next 20 years.

Figure 15. Potential Impact on the Kootenai County's Economy

Gross Regional Product

Kootenai County, ID	2010 2020 2030			2010-2030	
				Increase	Avg Anl
Projected GRP (millions of \$2004)	\$3,917	\$5,429	\$7,502	\$3,584	4.6%
Projected Population	146,904	189,275	232,622	85,718	2.9%
Projected Jobs	83,382	104,277	130,342	46,960	2.8%
Total Population and Jobs	230,286	293,552	362,964	132,678	2.0%
GRP per Person and Job	\$17,000	\$18,500	\$20,700		

Source: Woods & Poole Economics, Inc.

Kootenai County GRP	(in millions of 2004 dollars)			2010-2030		Potential Economic Impact
	2010	2020	2030	Increase	Avg Anl	
WA Dept of Ecology Growth Cap	\$3,917	\$3,711	\$3,930	\$11	0.0%	(\$3,572)

Earnings by Place of Work

Earnings include wages and salaries, other labor income like tips, and proprietors' income. Earnings data are by place of work. If an employee works in one county but resides in another, their earnings are counted in the county where the job is located. Because earnings relate to workers' compensation, they are not a measure of company earnings or profits. Earnings in Kootenai County grew by 5.5 percent annually over the past decade. Over the next 20 years, Woods & Poole projects earnings to increase by 4.6% annually, with the average job accounting for \$39,000 in earnings by 2030 (amounts are 2004 dollars). Because jobs are the best predictor of earnings, TischlerBise used a linear

regression model, with jobs as the independent variable, to quantify the potential decrease in earnings in Kootenai County. As shown in the bottom-right corner of Figure 16, projected countywide earnings will be reduced by \$2.5 billion in the year 2030 as a result of Ecology’s de facto growth cap.

Figure 16. Recent and Projected Kootenai County Earnings

Earnings				2010-2030	
Kootenai County, ID				Increase	Avg Anl
Projected Earnings (millions of \$2004)	2010	2020	2030	\$2,421	4.7%
Projected Jobs	83,382	104,277	130,342	10,960	2.2%
Earnings per Job	\$31,700	\$35,200	\$39,000		
Source: Woods & Poole Economics, Inc.					

Kootenai County Earnings				2010-2030		Potential Economic Impact
(in millions of 2004 dollars)				Increase	Avg Anl	
WA Dept of Ecology Growth Cap	2010	2020	2030	\$113	0.4%	(\$2,534)

Personal Income by Place of Residence

As shown in Figure 17, aggregate personal income in Kootenai County (expressed in 2004 dollars) is projected to increase faster over the next 20 years than it did in the previous decade. Per capita income is projected to increase from \$27,800 in 2010 to \$36,200 by 2030. The Woods & Poole data on personal income includes all labor income, dividends, interests, and transfer payments; tabulated by place of residence. Therefore, population is the best independent variable to use in a linear regression model. Based on Ecology’s de facto growth cap, aggregate personal income in 2030 is forecast to decrease by almost \$4.3 billion, as shown in the bottom-right corner of the table below.

Figure 17. Personal Income in Kootenai County

Personal Income				2010-2030	
Kootenai County, ID				Increase	Avg Anl
Personal Income (millions of \$2004)	2010	2020	2030	\$4,361	5.2%
Projected Population	146,904	189,275	232,622	85,718	2.2%
Income per Person	\$27,800	\$31,000	\$36,200		
Source: Woods & Poole Economics, Inc.					

Kootenai County Personal Income				2010-2030		Potential Economic Impact
(in millions of 2004 dollars)				Increase	Avg Anl	
WA Dept of Ecology Growth Cap	2010	2020	2030	\$421	0.6%	(\$4,253)

Regional Competitiveness

Although Coeur d’Alene MSA and the Spokane MSA are technically classified as two metro areas, the two counties are interconnected and economic success or failure in one area is likely to affect the other. In two recent “best of” rankings, both Coeur d’Alene and Spokane metros received high scores relative to comparable areas throughout the United States. In the Forbes Best Small Places for Business and Careers (March 2009), Coeur d’Alene ranked 33rd out of 179 based on factors such as cost of doing business, cost of living, crime rate, historical and projected job growth, educational attainment, and income growth. Spokane

ranked 29th out of 200 metro areas. In the Milken Institute and Greenstreet Real Estate Partner's Best-Performing Cities Index (Where America's Jobs are Created and Sustained, November 2009), the Coeur d'Alene MSA was ranked 15th out of 124 small cities (down from 2nd in 2008) and Spokane was ranked 41st out of 200 large cities (down from 35th in 2008). The Milken Institute's rankings include trends in job growth, wages, high-tech job growth, and population.

Based on the above analysis of economic impacts from the proposed water quality regulations, a de facto growth cap will effectively shrink Kootenai County's economy in 2030 by 50%. Although population and jobs normally attracted to the Idaho portion of the Spokane River basin will be redirected downstream to Washington, the predicted decline in economic activity may decrease the region's ability to compete with other metropolitan areas.

Cost Estimates

J-U-B Engineers completed Post Fall's Wastewater Treatment Plant (WWTP) Master Plan in July 2008. The Master Plan provides information on the current performance of the sewer system and estimates the cost of future capital improvements that might be necessary to meet anticipated water quality standards. The 2008 Master Plan anticipated a phosphorous discharge standard of 50 micrograms per liter within the next ten years, which would require extensive modification of the plant to include chemical coagulation and mechanical filtration of the effluent. The Master Plan also recommended spray irrigation of effluent for Biological Nutrient Removal (BNR). Post Falls is proceeding to implement BNR, with significant expenditures to acquire land and construct infrastructure for expansion of the wastewater treatment plant.

The effect of more stringent phosphorous removal is evident in a comparison of the daily quantities expected from the current and proposed regulations. Table 1-2 in the WWTP Master Plan indicates 189 pounds of phosphorous from an average daily flow of 3.1 Million Gallons per Day (MGD) under current regulations. In contrast, the water quality standards proposed by Washington Department of Ecology would limit the Post Falls WWTP to 1.5 pounds of phosphorous from an average daily flow of 5.0 MGD.

Monthly User Charge Increase

The U.S. Environmental Protection Agency released a report titled "Advanced Wastewater Treatment to Achieve Low Concentration of Phosphorous" (Ragsdale 2007) that provides 23 case studies of wastewater treatment plants operated by local governments in the United States. The abstract of this study states, "Cost of applying tertiary treatment for phosphorous removal is affordable, when measured by the monthly residential sewer fees charged by the municipalities that operate these exemplary facilities. The monthly residential sewer rates charged to maintain and operate the entire treatment facility ranged from as low as \$18 to the highest fee of \$46." In comparison, the City of Post Falls currently charges a residential customer approximately \$27 per month for sewer service.

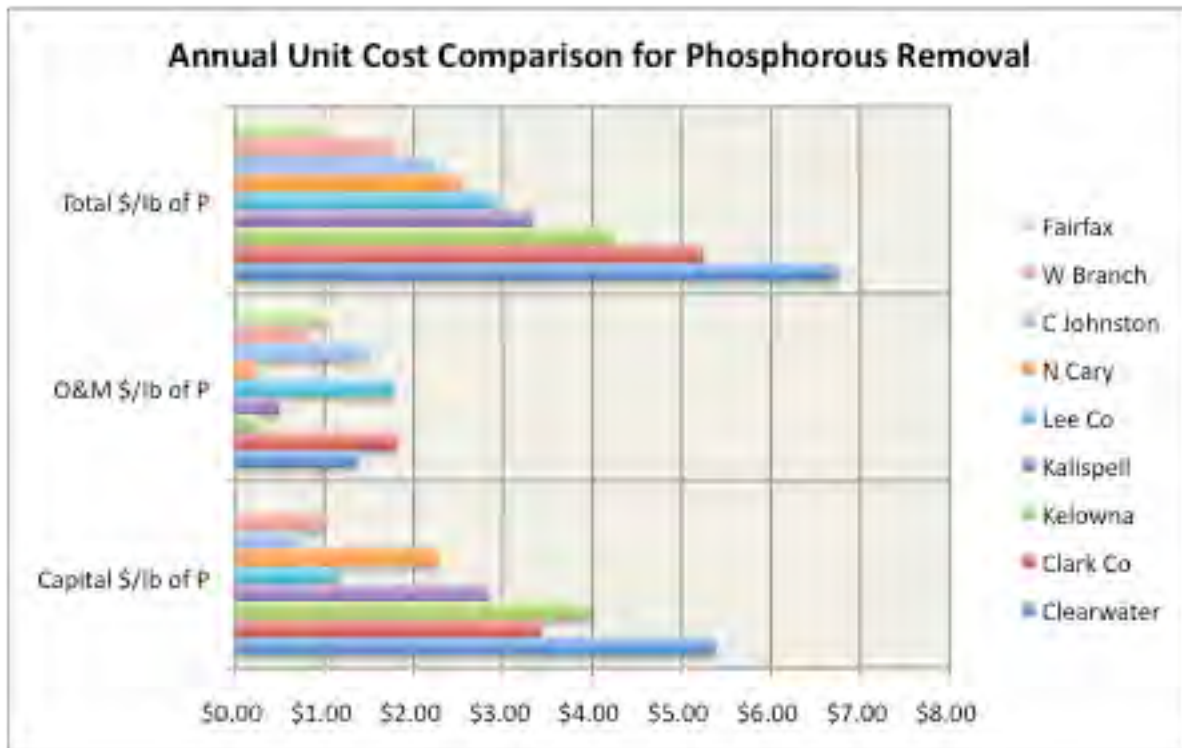
Capital Improvements

Table 19-1 in the J-U-B Master Plan provides preliminary cost estimates for capital improvements needed to both expand WWTP capacity and meet anticipated regulatory standards for phosphorous removal. Two major improvements are needed primarily for regulatory compliance. First, Post Falls will spend approximately \$13.2 million to implement BNR, improve oxygenation ditches, acquire a secondary clarifier, provide anoxic tanks, and UV modules. The second major expenditure of approximately \$14.3 million is for effluent coagulation and filtration infrastructure specifically for phosphorous removal. If the City bond financed the total capital cost of \$27.5 million over 20 years, at 6% annual interest, debt service payments would be approximately \$2.4 million per year. Given a rate base of approximately 9,600 sewer customers in 2008, each customer would face a sewer rate increase of approximately \$21 per month, or \$252 annually, to pay for these capital improvements.

Estimated Annual Costs per Pound of Phosphorous Removed

An extensive reference document published by the U.S. Environmental Protection Agency (Kang, et al 2008) provides capital and operating costs for both retrofitting and expanding wastewater treatment plants for nutrient removal. Data were collected and summarized for nine locations ranging from Florida to British Columbia. Design flows ranged from 3 MGD for a plant in Kalispell, MT to 110 MGD for a plant in Clark County, NV. To normalize costs in a format that facilitates more meaningful comparisons, the report converted annual capital and Operation & Maintenance (O&M) costs to dollars per pound of phosphorous removed. To annualize capital costs, the report assumed 20 year bond financing at six percent interest. O&M only included the additional cost of energy, chemicals, and extra sludge disposal associated with nutrient removal. As shown in Figure 18, annual unit costs ranged from \$1 to almost \$7 per pound of phosphorous removed.

Figure 18. Cost per Pound of Phosphorous Removed



Based on the average daily wastewater flow in 2008 and the average influent concentration of 7 mg of phosphorous per liter, Post Falls will be required to remove at least 139 pounds of phosphorous each day, or approximately 50,735 pounds per year. At the average cost increase of \$3.34 per pound of phosphorous removed, sewer expenditures will increase by at least \$169,000 per year. At the upper end of the documented unit costs, sewer expenditures in Post Falls could increase approximately \$342,000 per year. These on-going costs would be passed on to existing sewer customers.

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