



Chapter 173-430 WAC

Preliminary Cost Benefit and Least Burdensome Alternative Analysis for the Proposed Amendments to the Agricultural Burning Rule

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Executive Summary

The purpose of this rule amendment is to incorporate legislative changes, integrate technological advancements and include settlement agreement items related to agricultural burning that have occurred since the development of Chapter 173-430 WAC in 1994. The proposed amendments will provide clarifications and slight modifications to agricultural burning program requirements in Washington State. As required under RCW 34.05, Ecology is providing this Cost-Benefit and Least-Burdensome Alternative Analysis as part of the rule adopting process.

This report explores the benefits and costs of the proposed rule amendments for agricultural burning practices in Washington State. Burning has many benefits and is a low cost method of handling a variety of agricultural issues including disease, pests, weeds and excess stubble. In some areas, burning may aid in direct seeding practices which is a less soil invasive farming practice than traditional tillage. Additionally, the rule language has been updated to allow burning for “all agricultural products” which, along with recent legislation, may provide additional incentives for bio-diesel production in the Washington State. One amendment incorporates the "metered burning" system (described in the Settlement Agreement), which Ecology has developed during the past several years. This allows permitting authorities to make burn calls during periods of time when particulate exposure is less likely to occur in populated areas. This amendment reduces the cost impact of the existing rule by allowing agricultural burning to take place while causing minimal effects to public health.

The costs of the rule include the burn fee increase proposed for 2008 by the Agricultural Burning and Research Task Force, additional application documents and increased administrative duties for Ecology.

Ecology expects the benefits of the proposed rule amendments to exceed the costs. The net benefits are sufficiently predictable so that Ecology can proceed with the rule proposal. Ecology is accepting comments on this analysis.

A least burdensome analysis indicates this rule is least burdensome for the goals set by Ecology.

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I. Conclusions

After reviewing the proposed amendments to Chapter 173-430 WAC, Ecology expects the benefits of the rule change to exceed the costs. The net benefit is sufficiently likely that Ecology can proceed with the rule proposal.

II. Legal history

The legislature established an agricultural burning program in 1991. In following, Ecology established rules for a full-scale agricultural burning program that became effective in 1995. Since that time, additional legislation, rulemaking and litigation related to grass-seed field burning has taken effect. In 1999, a Voluntary Memorandum of Understanding (MOU) Agreement with the Washington Association of Wheat Growers to reduce emissions was finalized. Additionally, litigation by Save Our Summers resulted in a 9th Circuit Court of Appeals Settlement in November 2001. Ecology initiated rulemaking to comply with the Settlement Agreement and fulfill the mandatory regulatory review described in the Washington State Administrative Procedure Act, Chapter 34.05 RCW.

III. Description of changes created by the amendment

The majority of the changes in this amendment are required by law or by the settlement court order. A crosswalk between the old rule and the amended rule is located in Appendix A. The amendments which rely directly on the statute or court approved settlement agreement are not required to be analyzed under 19.85 RCW and therefore are not evaluated in this review. The following sections contain amendment components of the rule that provide additional direction beyond the law and court order decisions and therefore are evaluated in this analysis:

WAC 173-430-030 (1) This section explains that propane use to remove vegetative material is considered agricultural burning. The law has never been interpreted to allow propane burning to be a basis for avoiding a permit; this addition will clarify the interpretation of the rule language.

WAC 173-430-030 (8) The definition of farmer is updated to include any person engaged in the growing or producing for sale of any “agricultural product.” This will allow agricultural burning by farms that produce products that are inputs for other production purposes such as poplar trees used for pulp and paper or seed crop used for bio-diesel. This increases access to agricultural burning.

WAC 173-430-040 (2) The burn calls and metering amendment incorporates management practices for burning that have developed over the past several years and in doing so, have moved beyond the straight acreage analysis used in the Voluntary Memorandum Agreement. Metering is a technique that uses meteorological conditions and predictions to manage burning within the capacity of an air shed and may allow increased burning on specific days with minimal effect on people. As the Air Authorities and Ecology have determined how to predict when particulates will be disbursed by the wind, the number of allowable acres burned has increased. This information is used to make daily burn calls that define the quantity of allowable acres to burn in a given area. The metering generates information on the success of the burn and determines how the burn call avoided creating exposure impacts. In order to assure that health effects do not increase, the permit authorities must provide metering, data gathering, and annual reporting.¹

WAC 173-430-040 (3) In this section the burn permit application process has been amended to include a map requirement. This allows the issuers of burn permits to check the burn area more efficiently. As a result, the cost and time required to apply for a burn permit will increase.

WAC 173-430-040 (4) This section incorporates the maximum fee levels and the authority for fee level changes. The legislature established the authority of fee level changes to the Agricultural Burning Practices and Research Task Force. This section establishes fees set by the Agricultural Burning Practices and Research Task Force that remain below the maximum level by law of \$2.50 per acre. The section maintains the fee at the current level of \$2 per acre through 2007 and raises it to \$2.25 from 2008 on. The increase includes the Ecology Administration Fee increase from \$0.25 to \$0.50 per acre in 2007 and 2008. Additionally, the Task Force has determined that the research component of the fee will remain at \$0.50 per acre in 2006, drop down to \$0.25 per acre in 2007 and then rise back up to \$0.50 per acre in 2008.

In addition, new fee maximums for orchard tear-out burning are incorporated. According to RCW 70.94.743, outdoor burning of cultivated orchard trees, whether or not agricultural crops will be replanted on the land, shall be allowed as an ongoing agricultural activity, given it has been determined in writing that burning is an appropriate method to prevent or control the spread of horticultural pests or diseases. The fixed fee for orchard tear-out burning permits of up to 20 acres will increase from \$25 to \$50.

WAC 173-430-090 This section authorizes the permitting authority (Ecology and the Local Air Authorities with jurisdiction) to delegate sections of the Agricultural Burning Program. The requirements to maintain permitting authority are clarified. Additional reporting is required for the delegated permit authorities including copies of ordinances, copies of agreements, and consenting to audits and performance reviews.

¹ The annual report costs would be attributed to Ecology staff time. An estimate would likely be 1/10th of an FTE or 1/10th time for one person working full time: ~ \$10,000

IV. Costs

This rule change increases fees and creates additional particulate emissions.

Fee Increase

In 2008, the fee for agricultural burning will increase from \$2.00 to \$2.25 per acre. The fees are increasing in order to cover the cost of reviewing atmospheric conditions and creating burn calls. The total annual cost of the fee increase is estimated to be \$28,000 in 2008.

Administrative Costs

Additional copies of documents must be provided by the permitting authority. The annual report costs would be attributed to Ecology Staff time. An estimate would likely be 1/10th of a full time employee: approximately \$10,000.

Health Costs

The increased burning has the potential to create costs due to increased particulates. If burning is allowed during times when it will create amplified exposure to particulates for the population, there are potential health costs. Burning has the potential to affect 1.3 million people² on days when the particulates would come in contact with highly populated areas by wind. In addition, many rural communities may be affected as well. Those most at risk for health complications are children, the elderly and people suffering from respiratory diseases.³ The smoke emissions contain air pollutants including particulate matter, carbon monoxide and volatile organic compounds. These pollutants can aggravate heart and lung disease, irritate eyes, throat and sinuses, trigger headaches and allergies and increase severity of preexisting health problems.⁴ While burn calls have been shown to be generally effective at protecting human health, the weather predictions the burn calls were based upon sometimes contained miscalculations, which led to the possibility of making a flawed burn call.⁵ However, there have been very few incidents in the last five years.⁶ Each incident has been studied in order to determine preventative measures for future exposure incidents. Ecology believes that the burn calls can be done carefully and prevent health impacts. This analysis assumes excellent compliance with burn calls.

Given accurate timing of the burn calls, data collection and analysis should create the primary cost of the rule. Thus the primary cost of the rule is the fee increase of \$28,000 per year, increased in administrative duties of \$10,000 per year and the total map related cost of \$15,000 over time.

² See total population statistics in Table IV

³ *Health and Environmental Effects of Particulate Matter*, Environmental Protection Agency

⁴ *Farming for Clearer Air: Pulling Together to Make Progress*, Department of Ecology

⁵ Interview with Jon Jones, Environmental Specialist, Department of Ecology, March 2006.

⁶ The only serious case involved a change in conditions and smoke moved into the populated areas of Walla Walla.

V. Benefits

The ability to use agricultural burning as a “tool” was established by Chapter 70.94.650 RCW. Agricultural burning is allowed when it is reasonably necessary to carry out the enterprise. A farmer can show burning is reasonably necessary when it meets the criteria of the Best Management Practices (BMPs) and no practical alternative exists. BMPs are one of the ways to demonstrate the need to burn. Growers not using BMPs must establish that their proposed burn is reasonably necessary and that no practical alternative is available.⁷

The benefits from the ability to use burning as a “tool” are difficult to quantify. The goal of the following benefit valuations is to take into consideration current burn practices as well as emerging agricultural trends:

Reduced tillage

One benefit includes reduced tilling from direct seeding practices. Direct seeding is the practice of planting (drilling) seeds into fields that have not been first plowed or tilled (or only partially tilled.) Direct seeding reduces the disturbance to the soil that tilling creates. Currently, approximately 10% of farmers in Eastern Washington use no-till/direct seeding.⁸ As farmers shift from conventional tilling and seeding to minimum tillage and direct seed systems, organic matter in the soil increases which improves its ability to hold moisture. Additionally, reduced tilling maintains a crop residue cover that traps snow, reduces evaporation and prevents runoff water from carrying soil and other contaminants into streams and lakes. As a result, direct seeding increases the productive life span of fields and reduces both water turbidity and infilling of water storage systems. Burning can be substitution for proper crop rotation in the process of direct seeding.⁹ When fire is properly used as a component of “holistic” production systems, mechanical tillage operations are reduced significantly. On average, fire as a management tool saves three tillage operations.¹⁰

Weed, disease and pest control

Burning also leads to control of weeds, disease and pests. One example is Cephalosporium stripe, a fungal disease that can infect new seedlings of winter wheat through root systems. Without the availability of fire as a tool in conjunction with spring cropping and proper rotation to combat the fungi, management practices recommend that farmers produce alternative crops.¹¹ Often, these options have less economic potential or use excessive tillage which is devastating to soil conservation and quality. Jointed goatgrass has become a severe weed problem infesting over one million acres in the Pacific Northwest. Burning that is timed in correctly can kill 90% of the seed in the soil. There is no herbicide currently available that will control this weed selectively in winter

⁷ *Best Management Practices*, Department of Ecology Air Quality Program webpage

⁸ *Eastern Washington Farmers Diesel Emissions Reductions Program*

⁹ Interview with Jon Jones, Environmental Specialist, Department of Ecology, March 2006.

¹⁰ Schirman, Roland, *Using Fire as a Management Tool For Crop Production in Eastern Washington*

¹¹ Schirman, Roland, *Using Fire as a Management Tool For Crop Production in Eastern Washington*

wheat. If burning is absent as a mechanism for controlling jointed goatgrass, the recommended alternatives are to abstain from growing winter wheat and other winter cereal crops for three to five years.¹² Historically, spring wheat has yielded about two-thirds the grain of winter wheat. This is an estimated loss of \$227,000.¹³

Bio-diesel

An additional benefit may stem from the rule amendment that allows burning for “any agricultural product.” This allows for the possibility of burning crops that are processed into bio-diesel such as canola, rapeseed and mustard. Bio-diesel has many potential benefits including reductions in greenhouse gasses and reducing dependence on foreign oil. Canola is an excellent rotation crop for the Palouse area, and in the absence of other residue management techniques, burning is an efficient way to prepare the ground to establish Canola.¹⁴

Two bills passed the 2006 Washington State Legislature session that promote the production and use of bio-diesel within the state. Senate Bill 6508 sets a standard that two percent of the total diesel fuel sold in Washington must be bio-diesel fuel by the earlier of November 2008 or when it is determined the feedstock grown in Washington can provide the two-percent requirement. Additionally, the Energy Freedom Fund (House Bill 2939) provides \$17 million in assistance in the form of low interest loans to encourage the rapid adoption and use of bioenergy by stimulating the construction of facilities in Washington to generate energy from farm sources or convert organic matter into fuels.

Bio-diesel consumption in Washington State has grown from a few thousand gallons in 2001 to nearly 1.5 million gallons in 2004.¹⁵ Demand for bio-diesel in 2005 is expected to rise. To date, most of the bio-diesel fuel sold in Washington has been imported from the mid-west and is produced from soybean oil.¹⁶

The future of bio-diesel production in Washington is uncertain due to multiple factors; the most prominent being the ability of farmers to profit from the cultivation and sale of oilseeds. In 2004, U.S. Congress approved a tax credit of \$1 per gallon of renewable diesel. Additionally, The Energy Policy Act of 2005 grants small bio-diesel producers a 10-cent per gallon tax credit for up to 15 million gallons of agri-bio-diesel produced. Given these incentives, it is likely that bio-diesel production in Washington State will increase in the coming years. However, it is imperative that farmers are convinced that the economic returns for these crops are at least as good as other alternatives. Pacific AgriEnergy, LLC located in southeast Washington, completed a feasibility study that estimated that 120,000 tons of *brassica* oilseeds (both mustard and canola) could be locally produced. This would create 10 million gallons of bio-diesel. The study identified sufficient markets to meet the grower’s income requirements and should encourage regional farmers to participate in contract oilseed production. Pacific

¹² Schirman, Roland, *Using Fire as a Management Tool For Crop Production in Eastern Washington*

¹³ See appendix E

¹⁴ Interview with Jon Jones, Environmental Specialist, Department of Ecology, March 2006.

¹⁵ Lyons, John, *Biodiesel in Washington: A Snapshot*

¹⁶ Lyons, John, *Biodiesel in Washington: A Snapshot*

AgriEnergy LLC estimates that 120,000 tons of canola and mustard could be locally produces. This would equate to 31.5 million gallons of oil and a potential profit of \$5.9 million.

Following the finalization of the Voluntary Memorandum of Understanding (MOU) Agreement with the Washington Association of Wheat Growers, the number of crop acres burned covered by the voluntary agreement dropped by 37% from the baseline (see Appendix C). The reduction in burning was accomplished by shifts to Best Management Practices. However, the number of acres burned has rebounded from the low of 2001. As seen in Table IV and V, the trend of increased permitted burning has been consistent across crop types, counties, and irrigation patterns. An exception was 2005, when a fire hazard condition prevented burning. In general, nearly all applicants have been allowed to burn. In 2004 there were approximately four times as many acres permitted to burn than in 2002.

Table Va: Permitted Burn Acres by County

Sum of ACRES	YEAR				
County	2002	2003	2004	2005	Population
Adams	59		2,320	320	16,428
Asotin		73			20,551
Benton					142,475
Chelan			20		66,616
Columbia	31,424	109,793	114,045	46,705	4,064
Douglas		695	160		32,603
Ferry				35	7,260
Franklin	3,458	6,766	12,692	1,667	49,347
Garfield	60	17,236	16,598	11,565	2,397
Grant	2,305	3,596	4,250	1,688	74,698
Kittitas	70	264	277	50	33,362
Klickitat					19,161
Lincoln	492	1,192	1,035	321	10,184
Okanogan		39			39,564
Pend Oreille					11,732
Spokane					417,939
Stevens			30		40,066
Walla Walla	27,372	72,946	68,038	18,964	55,180
Whitman	20,838	52,097	67,577	34,042	40,740
Yakima					222,581
Grand Total	86,077	264,696	287,041	115,356	1,306,948
source: http://en.wikipedia.org/wiki/Eastern_Washington					
E. WA population by county.xls					

Table Vb: Permitted Burn Acres by Crop

Sum of ACRES	YEAR				
CROP	2002	2003	2004	2005	Grand Total
barley	820	4,477	2,567	2,388	10,252
beans	-	496	-	-	496
CRP	4,828	10,835	12,596	4,667	32,926
corn	-	116	430	1,893	2,439
grass cover	20	172	695	3,607	4,494
hay					
irrigated	151	2,255	1,864	1,868	6,137
dryland	-	-	45	56	101
oats	27	-	-	-	27
orchard	75	461	247	54	837
pasture	-	289	25	150	464
peas	-	-	617	-	617
spot burning	174	232	223	92	721
turnip - seed	-	30	-	-	30
weed control	54	28	154	128	364
wheat					
irrigated	7,223	16,580	24,593	76	48,471
dryland	72,705	228,726	242,985	100,377	644,794
Totals	86,077	264,696	287,041	115,356	753,170

VI. Net Benefits

The estimated benefits and avoided costs of agricultural burning are quantified in Appendix E. The benefits of direct-seed savings, control of jointed goatgrass, ability to double crop and the potential for local bio-diesel inputs to production add up to an estimated cost reduction is \$7.3 million. The value of total benefits is significantly greater than the \$53,000 in projected increased costs. The reader should note that this potential for a net benefit depends on excellent compliance with burn calls.

VI. Least Burdensome Alternative

The proposed rule is the result of a concerted effort to develop language that meets the statutory objectives while minimizing impacts to industrial and environmental concerns. However, during the development of this rule, several alternative rule processes were considered.

The approach taken with this rule is believed to reduce overall burdens in the most effective manner while remaining consistent with legislative changes, fee schedules and settlement agreement items. Further explanations of alternative considerations will be provided in the CR 103 version of this document.

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Appendix A: Crosswalk for Rule Revisions, New Language and Legal Citations

Preliminary

Chapter 173-430 WAC- Agricultural Burning						
Section	Change	RCW Requirement or Reference / Current WAC Reference	Settlement Agreement Reference	Analysis Required	Explanation	
020(4)	Brings forward existing language that prohibits burning during an air pollution episode or stage of impaired air quality.	RCW 70.94.745; RCW 70.94.743; RCW 70.94.473; WAC 070(g)	None		Update rule with impaired air quality definition and other statutory changes from 1995 to present.	
020(5)	Permit and fee requirement	RCW 70.94.650(1)&(2) WAC 1730-430-040(3)-(4)	None		Existing RCW sets a fee cap, requires the Ag. Burning Task Force to set level and requires fee adopted by rule. RCW 34.05.328(5)(b)(vi) states rules that set or adjust fees or rates pursuant to legislative standards are not required to provide further analysis. The fee for this program meets this criteria. No further analysis is required.	
	Incidental Agricultural Burning	RCW 70.94.745	None		Existing exception	

030(1)	Include propane flaming as part of the definition of agricultural burning.	RCW 70.94.650 is only for those using burning for agricultural activities.	None	SBEIS CBA	Propane flaming has long been included in the scope of burning in related to agricultural activities. Differentiates between ag. and non ag. settings.
030(8)	Adds corporate equivalent	Current WAC lists IRS schedule (f).	None		Corporations do not file a schedule (F) Also reviewed USDA criteria for "farm" Far too complex to apply to this program.
	Deletes "ingredient" in agricultural process.	RCW 70.94.650 focus on agricultural activities	None	CBA SBEIS	Increased emphasis on crops that are or could be ingredients. Examples include bio-diesel and bio-mass; poplar trees for pulp.
040(2)	Includes a smoke management index component to the agricultural burning program	Meteorological conditions	Yes. B(2)(b) B(6)(b)	CBA	Settlement agreement asked Ecology to consider a standard. The advisory committee reviewed current procedures agreed a standard was not

040(2)(a)	Describes smoke management index	RCW 70.94.650(1)(c)	B(1)(f)		helpful. The group then developed a concept that captures current procedures. RCW provision indicates the types of conditions to implement the program: time of year, meteorological conditions, and other criteria specified in Ecology rules.
040(2)(b)	Describes conditions when procedures must to be followed.				
040(2)(c)					
040(2)(d)					
040(2)(e)	Ecology or local air required to produce an annual report				Currently, Ecology produces the report.
040(3)(c)(i)	Additional map application requirement.			CBA SBEIS	Lessons from enforcement and program implementation.
040(3)(f)	Permit decision criteria	RCW 70.94.650(1)(c) WAC 173-430-070	None		Existing language in both.
040(3)(g)	Must approve or deny based on	WAC 173-430-080(1)(a)	None	CBA	Review with Delegated

	information in permit application		Requires evaluate and approve or deny			Authorities and Enforcement lessons
040(4)((a)(ii)	Creates a minimum permit fee level for orchard burning tear-out permits Task Force approved		RCW 70.94.650(2) RCW 70.04.743(1)(d)(ii)	None		Increases fee from \$25.00 to \$50.00 up to 20 acres. RCW 70.94. Section 743(2)(d)(ii) allows permitting for orchard tear out regardless whether the land will be replanted as an orchard. Fee level is within statutory cap. No further analysis is needed.
(040)(4)(b)(ii)	Fee is increased in 2008 to \$2.25. Fee distribution between categories is changed. Task Force approved.		RCW 70.94.650(2)	None	SBEIS CBA	Fee levels are within statutory cap. No further analysis should be needed.
(060)(2)	Changes the research review to every two years from annually		RCW 70.94.650(4)	None		Reduced Task Force meetings and harmonizing research projects with state budgeting process.
(080)(2)(a) and (2)(b)	Adds map to completed application criteria		RCW70.94.650(1) RCW70.94.654		CBA	080 and 090 contain items that to delegation. These items are in current delegation orders.

(080)(7)(a)	Add dates by which funds are transferred to Ecology	RCW70.94.650(1) RCW70.94.654				Each is designed to solve a specific problem and improve both efficiency and effectiveness in both the education and enforcement components
(080)(7)(b)	Adds dates by which Ecology is provided with permit information	RCW70.94.650(1) RCW70.94.654				
090(9)	Post-burn report	RCW70.94.650(1) RCW70.94.654	B(1)(f)			
(090)(10) (a) &(b)	Permitting authorities must use the web-based database	RCW70.94.650(1) RCW70.94.654				
090(2)(e)	Delegated authorities must agree to periodic audits and reviews	RCW70.94.650(1) RCW70.94.654	B(1)(a)	CBA		Review for delegated authorities looks at performance based on, the delegation agreement, complaints received, changes requested, and noteworthy items for that area. Ecology and Local Airs are subject to several types of audits.

Appendix B: Orchard Fee Increase Estimate for Average Permit

Orchard Burning Permits	# Permits 2002	Ave. Acres 2002	# Permits 2003	Ave. Acres 2003	# Permits 2004	Ave. Acres 2004	# Permits 2005	Ave. Acres 2005	Baseline (Ave. # Permits 2002-05)	Baseline (Ave. Acres 2002-05)	Fee increase*	Increase from baseline Cost 2006	Increase from baseline Cost 2007	Increase from baseline Cost 2008	Projected total cost from fee increase
Total orchard tree-removal burnings	3		23		12		3		13			\$208	\$208	\$290	\$707
Removal up to 20 acres	3	1- >20	16	1- >20	7	1- >20	2	1- >20	8	1->20	\$25	\$208	\$208	\$208	\$625
Removal of 20+ acres	0	0	7	34	5	30	1	22	15	21	0	0	0	82	\$82

*\$0.25 per acre increase for 20+ acres in 2008

Appendix C: Reductions in Total Burning by County under the Voluntary Memorandum of Understanding

		Adams	Asotin	Benton	Columbia	Douglas	Franklin	Garfield	Grant	Kittitas	Klickitat	Lincoln	Spokane	Stevens	Walla Walla	Whitman	TOTALS
1998	Spring 98	692	0	0	28,253	0	0	2,293	0	0	0	6,000	0	0	6,458	26,665	70,361
	Fall 98	5,184	3,255	1026	19,444	6142	7,303	6,807	1,511	0	0	10,663	0	73	17,476	80,701	159,585
	Total	5,876	3,255	1,026	47,697	6,142	7,303	9,100	1,511	0	0	16,663	0	73	23,934	107,366	229,946
	WAWG acre redistribution	-168	-94	-29	-1,371	-177	-210	-262	6,566	0	0	-479	0	-2	-688	-3,086	0
	Redistributed totals	5,708	3,161	997	46,326	5,965	7,093	8,838	8,077	0	0	16,184	0	71	23,246	104,280	229,946
	MOU Baseline (1)	5,672	3,161	997	46,326	5,965	7,093	8,838	8,063	0	0	16,184	0	71	23,246	104,280	229,896
	50% County MOU Goal (2)	2,836	1,581	499	23,163	2,983	3,547	4,419	4,032	0	0	8,092	0	36	11,623	52,140	114,948
99 - 00	Fall 99	2,523	615	913	12,376	2,569	6,101	200	3,672	29	0	5,093	13	0	17,987	40,611	92,702
Year 1	Spring 00	894	0	0	33,244	942	50	2,936	335	0	0	1,999	0	0	15,481	19,276	75,157
	Year Total	3,417	615	913	45,620	3,511	6,151	3,136	4,007	29	0	7,092	13	0	33,468	59,886	167,859
	% reduction from MOU Baseline	39.76%	80.54%	8.40%	1.52%	41.14%	13.28%	64.51%	50.30%	base = zero	base = zero	56.18%	base = zero	100.00%	-43.97%	42.57%	26.98%
00 - 01	Fall 00	2,224	0	15	14,279	289	4,902	0	1,791	35	0	2,422	19	0	16,620	46,694	89,289
Year 2	Spring 01	1,030	0	0	34,263	723	0	8,846	740	0	240	1,925	0	0	20,081	41,059	108,907
	Year Total	3,254	0	15	48,542	1,012	4,902	8,846	2,531	35	240	4,347	19	0	36,701	87,752	198,196
	% reduction from MOU Baseline	42.63%	100.00%	98.50%	-4.78%	83.03%	30.89%	-0.09%	68.61%	base = zero	base = zero	73.14%	base = zero	100.00%	-57.88%	15.85%	13.79%
01 - 02	Fall 01	1,242	0	0	12,435	0	3,705	0	1,801	0	0	1,085	0	0	16,534	18,816	55,617
Year 3	Spring 02	0	0	0	23,357	0	0	5,115	200	0	0	589	0	0	14,170	10,206	53,637
	Year Total	1,242	0	0	35,792	0	3,705	5,115	2,001	0	0	1,674	0	0	30,704	29,022	109,254
	% reduction from MOU Baseline	78.10%	100.00%	100.00%	22.74%	100.00%	47.77%	42.12%	75.18%	base = zero	base = zero	89.66%	base = zero	100.00%	-32.08%	72.17%	52.48%
02 - 03	Fall 02	1,406	0	0	10,958	0	3,313	60	3,414	0	0	920	0	0	15,939	22,464	58,473
Year 4	Spring 03	300	0	0	24,218	227	0	8,754	325	0	0	340	0	0	10,303	8,608	53,075
	Year Total	1,706	0	0	35,176	227	3,313	8,814	3,739	0	0	1,260	0	0	26,242	31,072	111,548
	% reduction from MOU Baseline	69.92%	100.00%	100.00%	24.07%	96.19%	53.29%	0.27%	53.63%	base = zero	base = zero	92.21%	base = zero	100.00%	-12.89%	70.20%	51.48%
03 - 04	Fall 03	3,363	80	0	14,235	0	8,319	1,113	4,638	0	0	2,071	11	0	23,138	20,586	77,554
Year 5	Spring 04	464	0	0	20,709	179	15	7,622	457	0	0	151	0	0	11,322	15,491	56,410
	Year Total	3,827	80	0	34,944	179	8,334	8,735	5,095	0	0	2,222	11	0	34,460	36,077	133,964
	% reduction from MOU Baseline	32.53%	97.47%	100.00%	24.57%	97.00%	-17.50%	1.17%	36.81%	base = zero	base = zero	86.27%	base = zero	100.00%	-48.24%	65.40%	41.73%
04 - 05	Fall 04	2422	0	0	17860	0	8016	1001	4586	51	0	1349	0	50	21547	24998	81971
Year 6	Spring 05 **	425	0	0	17158	0	0	6841	110	0	0	364	0	0	7846	16135	48879
	Year Total	2,847	0	0	35,018	0	8,016	7,842	4,696	51	0	1,713	0	50	29,393	41,133	130,850
	% reduction from MOU Baseline	49.81%	100.00%	100.00%	24.41%	100.00%	-13.01%	11.27%	41.76%	base = zero	base = zero	89.42%	base = zero	29.58%	-26.44%	60.56%	43.08%
05 - 06	Fall 05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year 7	Spring 06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Year Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	% reduction from MOU Baseline	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	base = zero	base = zero	100.00%	base = zero	100.00%	100.00%	100.00%	100.00%
	NOTES:	(1)	The MOU Baseline is the starting point for the % reduction determinations. These numbers are after the WAWG redistribution of acres to Grant county. The numbers are not updated to reflect corrected acreage from 1998 (the corrected numbers for 1998 are immediately above the MOU Baseline field).														
		(2)	50% County MOU Goal is one-half of the MOU Baseline number and is the goal to be reached at year 7 of the MOU														
	Interpreting the "% reduction from MOU Baseline":	If the percentage is a positive number it represents a decrease in acres burned. If the percentage is a negative number it represents an increase in acres burned. If the message "base = zero" appears it means that the base acres equals zero and therefore a percent change cannot be calculated.															
	The following counties were removed from this printout due to the cereal grain acreages for all seasons/years equaling zero:	Chelan, Island, Lewis, Okanogan, Skagit, Yakima															

Appendix D: Map Cost Estimate

Map Costs: Worst Case		
Travel time:	45	minutes
Additional copy/buying time:	15	minutes
Miles	10	
Cost per mile	0.45	
Rand McNally Map Cost:	\$5.36	(with tax)
Copy Machine cost:	\$0.08	(1 b&w page @ Kinko's)
Cost of Wheat Worker	\$ 9.50	per hour
Cost of time	\$ 9.50	
\$ cost	\$9.94	
Mapping cost	\$ 19.44	

Appendix E: Estimated Benefits and Avoided Costs

1. Direct-Seeding savings – Per acre savings of \$17.48 based on burning in conjunction with direct seeding system.
Acreage estimate: 15,461 (Based on 10% no-till/direct seed method practice in conjunction with average annual burned acres Eastern Washington based off Appenix C)
Estimate = \$270,000
2. Control of jointed goatgrass- 1 million acres of infested winter wheat in Washington,
Acreage estimate: \$0.3 million acres of winter wheat. At the 2004 price of \$3.68 per bushel and average cost of \$3.00 per bushel, net revenue is estimated to be \$227,000.
3. Agronomic Benefit: Per acre benefit of \$96.35 for re-crop (double crop) situations.
Acreage estimate (Grant, Franklin average burned acres) – 9,300
Estimate = \$900,000
4. Potential for bio-diesel production:
Pacific AgriEnergy LLC estimates that 120,000 tons of canola and mustard could be locally produced. This would equate to 31.5 million gallons of oil.
Estimate = potential profit of \$5.9 million.

Estimated value to Industry = \$7.3 million