DRAFT

Economic Impact of the Proposed Russian River Frost Regulation

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3/21/2011

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1. THE PROPOSED REGULATION

The State Water Resources Control Board is proposing the following regulation.

Version: draft reg_3_16_final_no_watermark.doc 3/16/2011

STATE WATER RESOURCES CONTROL BOARD

PROPOSED REGULATIONS

***DRAFT* Text of Proposed Regulations**

Amendment to Division 3 of Title 23 of the California Code of Regulations

Add the following section:

§ 862 Russian River, Special.

Budding grape vines and certain other crops in the Russian River watershed may be severely damaged by spring frosts. Frost protection of crops is a beneficial use of water under section 671 of this chapter. During a frost, however, the high instantaneous demand for water for frost protection by numerous vineyardists and other water users may reduce the supply in the Russian River stream system to a level that is harmful to salmonids. Harm to salmonids can be avoided by coordinating or otherwise managing diversions to reduce instantaneous demand. A diversion of water that is harmful to salmonids is an unreasonable use of water if the diversion could have been managed to avoid the harm.

(a) After March 14, 2012, any diversion of water from the Russian River stream system, including the pumping of hydraulically connected groundwater, for purposes of frost protection from March 15 through May 15 shall be unreasonable and a violation of Water Code section 100, unless the water is diverted in accordance with a board approved water demand management program (WDMP), or the water is diverted upstream of Warm Springs Dam in Sonoma County or Coyote Dam in Mendocino County.

(b) The WDMP shall ensure that the cumulative diversion rate for frost protection does not result in a reduction in stream stage that is harmful to salmonids. The WDMP, and any revisions thereof, shall be administered by an individual or governing body (governing body) capable of ensuring that the requirements of the program are met. Any WDMP developed pursuant to this section shall be submitted to the board by February 1 prior to the frost season.

(c) At a minimum, the WDMP shall include (1) an inventory of the frost diversion systems within the area subject to the WDMP, (2) a stream stage monitoring program, (3) an annual assessment of the potential risk of harm to salmonids due to frost diversions, (4) the identification and implementation of any corrective actions necessary to avoid harm to salmonids, and (5) annual reporting of program data, activities, and results. In addition, the WDMP shall identify the diverters who have agreed to participate in the program and shall include a schedule for conducting the frost inventory, implementing the stream stage monitoring program, and conducting the risk assessment.

(1) Inventory of frost diversion systems: The governing body shall establish an inventory of all frost diversions included in the WDMP. The inventory shall be updated annually with any changes to the inventory and with frost diversion data. The inventory shall include for each frost diversion:

(A) Name of the diverter,

(B) Source of water used and location of diversion,

(C) A description of the diversion system and its capacity,

(D) Acreage served, and

(E) The rate of diversion, hours of operation, and volume of water diverted during each frost event for the year.

(2) Stream stage monitoring program: The governing body shall develop a stream stage monitoring program in consultation with National Marine Fisheries Service (NMFS) and California Department of Fish and Game (DFG). The program shall include the following:

(A) A determination of the number, type, and location of stream gages necessary for the WDMP;

(B) A determination of the stream stage that is protective of salmonids for each gage;

(C) Provisions for the installation, calibration, and maintenance of stream gages and

(D) Monitoring and recording of stream stage at intervals not to exceed 15 minutes.

(3) Risk assessment: Based on the inventory and stream stage information described above, and information regarding the presence of habitat for salmonids, the governing body shall conduct a risk assessment that evaluates the potential for frost diversions to reduce the stream stage below protective levels. The risk assessment shall be based on sound science and shall be conducted in consultation with NMFS and DFG.

(4) Corrective Actions: If the governing body determines that diversions for purposes of frost protection have the potential to harm salmonids, the governing body shall notify the diverter(s) of the potential risk. The diverters, in consultation with the governing body, shall identify and implement corrective actions that will result in stream stage conditions that are protective of salmonids during the frost season. Corrective actions may include alternative methods for frost protection, best management practices, better coordination of diversions, construction of offstream storage facilities, real-time stream gage and diversion monitoring, or other alternative methods of diversion. Corrective actions also may include revisions to the number, location and type of stream stage monitoring gages, or to the stream stages considered protective of salmonids.

(5) Annual Reporting: The governing body shall submit a publically available annual report of program operations, risk assessment, and corrective actions by September 1 following the frost season that is the subject of the report. The report shall include:

(A) The frost inventory, including diversion data.

(B) Stream stage monitoring data.

(C) The risk assessment and its results, identification of the need for any additional data or analysis, and a schedule for obtaining the data or completing the analysis.

(D) Any corrective actions identified and implemented to date, and a schedule for implementing any additional corrective actions.

The report shall document consultations with DFG and NMFS regarding the stream stage monitoring program and risk assessment and shall explain any deviations from recommendations made by DFG or NMFS during the consultation process. In addition, the annual report shall evaluate whether the requirements of the WDMP were met during the preceding frost season, evaluate the effectiveness of the WDMP, and recommend any necessary changes to the WDMP. Any recommendations for revisions to the WDMP shall include a program implementation plan and schedule. The board may require changes to the WDMP, including but not limited to the risk assessment, corrective actions, and schedule of implementation, at any time.

(d) For purposes of this section, groundwater pumped within the Russian River watershed is considered hydraulically connected to the Russian River stream system unless the diverter can demonstrate to the satisfaction of the board that the groundwater being diverted is not hydraulically connected to any surface stream within the Russian River watershed.

(e) Compliance with this section shall constitute a condition of all water right permits and licenses that authorize the diversion of water from the Russian River stream system for purposes of frost protection. The diversion of water in violation of this regulation is subject to enforcement by the board. The board has continuing authority to revise terms and conditions of all permits that authorize the diversion of water for purposes of frost protection should future conditions warrant.

NOTE: Authority cited: Section 1058, Water Code.

Reference: Section 2, Article X, California Constitution; and Sections 100, 275 and 1051.5, Water Code.

2. PURPOSE OF THIS DOCUMENT

Government Code Section 11346.3 provides guidelines on how to assess a proposed regulation's economic impact on California businesses. An Economic Impact Statement (EIS) section has been added to the STD. 399 form for this purpose. The issuing state agencies must include a completed STD. 399 form with each proposed regulation that is submitted to the OAL for publication in the California Regulatory Notice Register.

This document is a supplement to the STD. 399 to present the assumptions and calculations that were made in estimating the economic impact of the proposed regulation.

3. RUSSIAN RIVER WATERSHED FROST PROTECTION

Water is diverted from the Russian River, its tributaries, and hydrologically linked aquifers to prevent frost damage to wine grapes and pears. This section contains estimates of the crop acreage that requires frost protection and the amount of water required for frost protection.

3.1 Wine Grape and Pear Acreage, Production, and Value of Production

Crop acreage is reported by county and not on a watershed basis. The following tables contain wine grape and pear acreages, production, and value of production for Mendocino and Sonoma counties.

3.1.1 Mendocino County

Mendocino County had 16,616 acres of wine grapes in 2009 with production valued at $78.5 million (Table 3-1). Value of production per acre was $4,724.

Table 3-1. Mendocino County Wine Grape Acreage, Production and Value of Production: 2000-2009.

Year	Bearing Acreage	Production (tons)	Yield (tons/ac)	Value/Ton	Total Value	Value/Acre
2000	12,838	58,106	4.5	$1,514	$87,960,000	$6,852
2001	14,800	59,808	4.0	$1,466	$87,678,400	$5,924
2002	15,202	59,128	3.9	$1,375	$81,301,400	$5,348
2003	15,576	57,960	3.7	$1,214	$70,360,700	$4,517
2004	15,608	52,252	3.3	$1,151	$60,141,500	$3,853
2005	16,084	61,962	3.9	$1,171	$72,557,900	$4,511
2006	16,142	70,866	4.4	$1,237	$87,661,500	$5,431
2007	16,342	61,589	3.8	$1,223	$75,348,300	$4,611
2008	16,400	45,779	2.8	$1,355	$62,047,200	$3,783
2009	16,616	59,617	3.6	$1,317	$78,502,000	$4,724

Source: Mendocino County Agricultural Crop Reports: 2000-2009, County of Mendocino Department of Agriculture.

The value of Mendocino County pear production declined by 33 percent from 2008 to 2009 (Table 3-2), resulting from a combination of lower acreage and price. In 2009, the value of production per acre was $7,200, considerably more than the $4,724 per acre from wine grape production.

Table 3-2. Mendocino County Pear Acreage, Production and Value of Production: 2000-2009.

Year	Bearing Acreage	Production (tons)	Yield (tons/ac)	Value/Ton	Total Value	Value/Acre
2000	2,633	51,862	19.7	$239	$12,375,900	$4,700
2001	2,360	46,054	19.5	$317	$14,527,000	$6,156
2002	2,350	38,826	16.5	$379	$14,718,400	$6,263
2003	2,316	39,540	17.1	$369	$14,554,950	$6,285
2004	2,140	37,466	17.5	$424	$15,897,100	$7,429
2005	2,115	28,410	13.4	$412	$11,704,400	$5,534
2006	2,129	42,324	19.9	$384	$16,270,500	$7,642
2007	2,047	37,903	18.5	$447	$16,927,200	$8,269
2008	1,953	32,120	16.4	$467	$15,012,722	$7,687
2009	1,398	25,774	18.4	$391	$10,065,900	$7,200

Source: Mendocino County Agricultural Crop Reports: 2000-2009, County of Mendocino Department of Agriculture.

The total value of Mendocino County wine grape and pear production in 2009 was $88,567,900 from a total of 18,014 acres (Table 3-3).

Table 3-3. Mendocino County Wine Grape and Pear Acreage and Value of Production: 2000-2009.

	Bearing	Wine Grape and Pear Production	
Year	Acreage[1]	Total Value[2]	Value/Acre
2000	15,471	$100,335,900	$6,485
2001	17,160	$102,205,400	$5,956
2002	17,552	$96,019,800	$5,471
2003	17,892	$84,915,650	$4,746
2004	17,748	$76,038,600	$4,284
2005	18,199	$84,262,300	$4,630
2006	18,271	$103,932,000	$5,688
2007	18,389	$92,275,500	$5,018
2008	18,353	$77,059,922	$4,199
2009	18,014	$88,567,900	$4,917

[1] Sum of "Bearing Acreage" columns, Table 3-1 and, Table 3-2.

[2] Sum of "Total Value" columns, Table 3-1 and, Table 3-2.

3.1.2 Sonoma County

Sonoma County wine grape acreage was 56,306 and the value of production over $465 million in 2009 (Table 3-4). The value of production per acre was $8,259.

Table 3-4.. Sonoma County Wine Grape Acreage, Production and Value of Production: 2000-2009.

Year	Bearing Acreage	Production (tons)	Yield (tons/ac)	Value/Ton	Total Value	Value/Acre
2000	42,221	190,789	4.5	$2,043	$389,853,900	$9,234
2001	43,589	173,583	4.0	$2,157	$374,389,700	$8,589
2002	46,587	183,139	3.9	$2,055	$376,422,300	$8,080
2003	52,176	160,768	3.1	$1,947	$313,076,600	$6,000
2004	50,010	165,783	3.3	$1,869	$309,871,300	$6,196
2005	54,243	230,910	4.3	$1,865	$430,563,500	$7,938
2006	55,507	216,248	3.9	$1,991	$430,496,900	$7,756
2007	54,777	198,533	3.6	$2,081	$416,549,600	$7,604
2008	55,431	168,992	3.0	$2,238	$378,161,800	$6,822
2009	56,306	212,675	3.8	$2,187	$465,036,400	$8,259

Source: Sonoma County Agricultural Crop Reports: 2000-2009, Office of the Agricultural Commissioner.

3.1.3 Mendocino and Sonoma Counties

The total value of wine grape and pear production in Mendocino and Sonoma counties was $553,604,300 from a total acreage of 74,320 in 2009, which were all time highs (Table 3-5). However, the 2009 value of production per acre of $7,449 was considerably below the 2000 level of $8,497 that resulted from high crop yields in that year.

Table 3-5. Sonoma and Mendocino County Wine Grape and Pear Acreage and Value of Production: 2000-2009.

	Bearing	Wine Grape and Pear Production	
Year	Acreage[1]	Total Value[2]	Value/Acre
2000	57,692	$490,189,800	$8,497
2001	60,749	$476,595,100	$7,845
2002	64,139	$472,442,100	$7,366
2003	70,068	$397,992,250	$5,680
2004	67,758	$385,909,900	$5,695
2005	72,442	$514,825,800	$7,107
2006	73,778	$534,428,900	$7,244
2007	73,166	$508,825,100	$6,954
2008	73,784	$455,221,722	$6,170
2009	74,320	$553,604,300	$7,449

[1] Sum of "Bearing Acreage" columns, Table 3-3 and, Table 3-4.

[2] Sum of "Total Value" columns, Table 3-3 and, Table 3-4.

3.2 Frost Protected Acreage, Value of Production and Water Requirements

Frost protected acreage using water from the Russian River stream system, value of production, and water requirements for frost protection are presented for Mendocino and Sonoma Counties.

3.2.1 Mendocino County

The University of California Cooperative Extension (UCCE) conducted a study for the Mendocino County Water Agency that estimated the water required per crop acre for frost protection for Mendocino County.[1] The UCCE estimated Mendocino frost protected acreage and water requirements using a focus group and survey confirmation of the frost protection methods, relevant production manuals, and project team experience and knowledge of the area (Table 3-6). The application rate for frost protection was assumed to be 50 gallons/minute/acre for grapes. In the case of pears, one acre-inch is applied for each frost protection event.

[1]Lewis, D. J., G. McGourty, J. Harper, R. Elkins, J. Christian-Smith, J. Nosera, P. Papper, R. Sanford, L. Schwankl, and T. Prichard. 2008. "Meeting Irrigated Agriculture Water Needs in the Mendocino County Portion of the Russian River" University of California Cooperative Extension Mendocino County, University of California Davis Department of Land Air and Water Resources, and University of California Kearny Agricultural Center. *[same edits to citation in Excel images]*

Table 3-6. Frost Protected Acreage and Annual Water Requirements in the Mendocino County Portion of the Russian River Watershed.

Sub-basin and Crop	Acreage	Water Required (acre feet/yr)	Water Required (acre feet/acre/yr)
Redwood Valley			
Wine Grapes	548	404	0.74
Pears	43	55	1.28
Total Redwood Valley	591	459	
Ukiah Valley			
Wine Grapes	2,155	595	0.28
Pears	1,175	649	0.55
Total Ukiah Valley	3,330	1,244	
Hopland			
Wine Grapes	1,360	376	0.28
Pears	335	185	0.55
Total Hopland	1,695	561	
Totals[1]	5,616	2,264	0.40

Source: Lewis, D. J., G. McGourty, J. Harper, R. Elkins, J. Christian-Smith, J. Nosera, P. Papper, R. Sanford, L. Schwankl, and T. Prichard. 2008. "Meeting Irrigated Agriculture Water Needs In The Mendocino County Portion Of The Russian River" University of California Cooperative Extension Mendocino County, University of California Davis Department of Land Air and Water Resources, and University of California Kearny Agricultural Center. Page 11.

[1]Totals do not include Potter Valley frost protected acreage.

3.2.2 Sonoma County

The Sonoma County Farm Bureau estimated wine grape acreage being frost protected with Russian River water. It surveyed Sonoma County growers that were located sufficiently close to the Russian River where diversions could potentially affect flow in the River and its tributaries. Survey results indicated that only 55 percent (15,582) of the total vineyard acreage surveyed (28,315) were frost protected by Russian River water (Table 3-7). The survey indicated that 8,493 acres of those surveyed in Sonoma County did not employ an active frost protection method.

Table 3-7. Frost Protected Acreage and Annual Water Requirements in the Sonoma County Portion of the Russian River Watershed, 2010.

Method of Frost Protection	Acreage	Percent
Russian River Water	15,582	55%
Wind	3,807	13%
Other	433	2%
Total Frost Protected	19,822	
Not Frost Protected	8,493	30%
Total Acreage in Survey	28,315	

Source: Lex McCorvey email to Pete Opatz, "Current Vineyard Survey Totals", Sonoma County Farm Bureau, March 17, 2010, and Lewis, D. J., G. McGourty, J. Harper, R. Elkins, J. Christian-Smith, J. Nosera, P. Papper, R. Sanford, L. Schwankl, and T. Prichard. 2008. "Meeting Irrigated Agriculture Water Needs In The Mendocino County Portion Of The Russian River" University of California Cooperative Extension Mendocino County, University of California Davis Department of Land Air and Water Resources, and University of California Kearny Agricultural Center. page 11.

3.2.3 Mendocino and Sonoma Counties

The total value of crop production at risk of frost damage being protected by Russian River water is $156,306,523 (Table 3-8). A total of 15,582 acres of Sonoma County wine grapes and 5,616 acres of Mendocino County wine grapes and pears comprise the total acreage of 21,198.

Table 3-8. Total Value of Russian River Frost Protected Crops at Risk-2009.

		Value of Production at Risk		Total Value of	Percent of Total Value of
County	Acreage[1]	Per Acre[2]	Total	Production[3]	Production
Mendocino	5,616	$4,917	$27,611,709	$88,567,900	31%
Sonoma	15,582	$8,259	$128,694,814	$465,036,400	28%
Total	21,198		$156,306,523	$553,604,300	28%

[1]Table 3-6 and 3-7.

[2]Table 3-3 and 3-4.

[3]Table 3-3, 3-4 and 3-5.

Mendocino growers have 31 percent of their wine grape and pear production value frost protected by Russian River water. This is comparable with the 28 percent of the Sonoma County production value at risk.

4. WATER DEMAND MANAGEMENT PROGRAM (WDMP)

The five main continuous requirements of the WDMP that will directly affect the operations of vineyards and orchards are: 1) conduct and update frost diversion system inventory; 2) design and implement a stream stage-monitoring program; 3) perform an annual risk assessment; 4) implement corrective actions; and 5) prepare an annual report.

4.1 Frost Diversion System Inventory

All WDMP diverters will conduct and report to the governing body an annual inventory containing the following information.

1. Diverter identification;
2. Source and location of water diversion;
3. Description and capacity of diversion system;
4. Frost protected acreage;
5. For each frost event during the year:
    a. Rate of diversion;
    b. Hours of operation,
    c. Volume of water diverted.

The estimated cost of the inventory to growers is assumed to cover expenses of recording and reporting the items list above. The cost totals are presented in Table 4.1. The annual cost per diversion was estimated by SWRCB staff, and was based on the Sonoma County frost ordinance.

The estimated cost of the inventory to growers is assumed to cover expenses of recording and reporting the items list above. The cost totals are presented in Table 4.1. The annual cost per diversion was estimated by SWRCB staff based on recommendations from Sonoma County.

Table 4-1. Annual Cost of Conducting the Frost Diversion System Inventory.

			Acreage/	Data Collection & Reporting[3]	
County	Acreage[1]	Diversions[2]	Diverson	Total	$/acre
Mendocino	5,616	455	12	$29,120	$5.19
Sonoma	15,582	962	16	$61,568	$3.95
Total	21,198	1,417		$90,688	

[1]Table 3-6 and 3-7.

[2]SWRCB spatial database, water33.sde, WBGIS EWRIMS Points of Diversion.

[3]Assumed annual cost per diversion: $64

4.2 Stream Stage Monitoring Program

The proposed regulation would require stage data in the Russian River and its tributaries to be recorded at intervals not to exceed 15 minutes. The number, type, and location of stream stage monitoring gages are to be established in consultation with the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (DFG).

For the purposes of this analysis, SWRCB staff assumed 71 stream gages would be installed in stages over three years, depending on funding and personnel availability (Table 4-2). The number, type, and placement of the gages would be reviewed on an annual basis. Currently, there are existing USGS gages in the Russian River and Dry Creek and other gages owned by state, federal and private entities installed in the watershed. For the purpose of this analysis, SWRCB staff assumed the governing body would be responsible for installing and maintaining 71 gages in the Russian River watershed. If some of the existing gages are appropriately located, and permission is allowed for use by the governing body, the costs shown in Table 4-2 would be reduced accordingly.

Table 4-2. Number of Stream Stage Monitoring Stations.

	Year 1	Year 2	Year 3
Mendocino County:			
Telemetery Stations	3	6	9
Water Level Logger Stations	6	13	19
Total Mendocino Co.	9	19	28
Sonoma County:			
Telemetery Stations	4	8	16
Water Level Logger Stations	10	19	27
Total Sonoma Co.	14	27	43
Total Russian River Watershed	23	46	71

Source: Number of gages: David Hines, NMFS. Distribution: SWRCB staff and Sonoma County Proposed Monitoring Plan.

The gages are likely to be one of two types, a telemetry station, or water level logger station. The telemetry stations have a lifetime of 20 years and the water level logger stations have a 10-year lifetime. Capital and annual costs for the monitoring station options are presented in Table 4-3.

Table 4-3. Stream Stage Monitoring and Reporting Station Options and Costs.

Cost Category	Capital Cost	Annual Cost
Telemetery Stations		
Installed Cost/Station[1]	$11,278	
Study to determine protective	$16,700	
Total	$27,978	$2,439
Service and Telemetry/yr		$5,000
Data Management/yr/Station		$0
Total Annual Cost per Station		$7,439
Water Level Logger Station		
Installed Cost/Station[2]	$1,337	
Study to determine protective	$16,700	
Total	$18,037	$1,573
Service/year		$1,000
Data Management/yr/Station		$0
Total Annual Cost per Station		$2,573

[1]Brad Hopkins, WA Dept of Ecology, Environmental Monitoring and Trends Section, personal communication 3/17/2010. Hopkins manages the Statewide Flow Monitoring Network. River and stream flow monitoring is conducted using 133 in-stream flow guages that were installed in the year 2000 at a cost of about $1.5 million. The system is USGS compliant (http://www.ecy.wa.gov/programs/eap/flow/shu_main.html). Annual cost is calculated assuming a 6%

[2]Ted Walsh, New Hampshire Department of Environmental Services, Watershed Management Bureau. "Chloride/Stream Gage Monitoring in the Hodgson Brook Watershed". HOBO Water Level Logger Deluxe kit $ 1,137.00. Includes U20-001 001-01 HOBO Logger, U20-001 001-04 HOBO Barometric pressure logger, U-DTW DTW-1 HOBO waterproof shuttle with coupler, U20-Case Case-1 Carrying case, BHW-PC HOBOware Pro software. Additional installation materials cost $200/gage (http://www.epa.gov/region1/neaeb2010/pdfs/7B-DevelopmentVolunteerBasedChlorideTMDL.pdf).

[3]Stetson Chanbers Group Revised Direct Cost Report, Table 3-2.

Table 4-4 contains the stream stage capital and annual costs for each county and the Russian River watershed. This analysis allocates the costs among the diverters on a per acre basis.

Table 4-4. Capital and Annual Costs of Stream Stage Monitoring and Reporting.

	Capital Costs[1]			Annual Costs[2]		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Mendocino County:						
Telemetery Stations	$83,935	$83,935	$83,935	$22,318	$44,636	$66,953
Water Level Logger Stations	$108,222	$126,259	$108,222	$15,435	$33,443	$48,878
Total Mendocino Co.	$192,157	$210,194	$192,157	$37,753	$78,079	$115,832
Sonoma County:						
Telemetery Stations	$111,913	$111,913	$223,826	$29,757	$59,514	$119,028
Water Level Logger Stations	$180,370	$162,333	$144,296	$25,725	$48,878	$69,459
Total Sonoma Co.	$292,283	$274,246	$368,122	$55,483	$108,393	$188,487
Total Russian River Watershed	$484,439	$484,439	$560,278	$93,236	$186,471	$304,319

[1]Number of new stations in a given year (Table 4.2) times capital cost/station (Table 4.3).

[2]Number of stations (Table 4.2) times annual cost/station (Table 4.3).

4.3 Risk Assessment

Based on the inventory and stream stage information described above, and information regarding the presence of habitat for salmonids, the governing body shall conduct a risk assessment that evaluates the potential for frost diversions to reduce the *stream stage below protective levels. The risk assessment shall be based on sound science and shall be conduct*ed in consultation with NMFS and DFG.

The annual cost of conducting the risk assessment was estimated by Water Board staff at $50,000.

4.4 Corrective Actions

If the governing body determines that diversions have the potential to harm salmonids, the governing body and the diverters shall identify and implement corrective actions.

4.4.1 Area That May Require Corrective Actions

For the purposes of this analysis, the area requiring corrective actions was assumed to be the wine grape vineyards and pear orchards upstream of NMFS' "Potential Stranding Sites" for salmonids. This was determined using the NMFS GIS layer of "Potential Stranding Sites" and the SWRCB Water33.sde "USA Prime Imagery" layer. Table 4-5 includes the measured crop acreages and areas protected by existing frost protection methods.

Table 4-5. Watersheds with Potential Corrective Actions, and Current Frost Protection Measures.

		Existing Frost Control Methods				
Mendocino County	Potential Corrective Action Acreage[1]	Protected by Wind Machines Acreage[1]	Protected by Other Methods Acreage[1]	Not Frost Protected[1]	Protected by Existing Water Storage Facilities Acreage[2]	Acreage Requiring Additional Corrective Action
McDowell Creek						
Wine grapes	312	0	0	0	443	0
Pears	0	0	0	0	0	0
Total	312	0	0	0	443	0
Dooley Creek						
Wine grapes	936	0	0	0	354	581
Pears	92	0	0	0	17	74
Total	1,028	0	0	0	372	656
Feliz Creek						
Wine grapes	352	0	0	0	318	34
Pears	108	0	0	0	49	59
Total	459	0	0	0	366	93
McNab Creek						
Wine grapes	86	0	0	0	165	0
Pears	7	0	0	0	6	0
Total	93	0	0	0	172	0
York Creek						
Wine grapes	302	0	0	0	60	242
Pears	33	0	0	0	4	29
Total	335	0	0	0	64	271
County Total	2,227	0	0	0	1,417	1,020
Sonoma County (wine grapes)						
Green Valley Atascadero Creek	607	82	9	182	277	57
Green Valley Purrington Creek	1,444	194	22	433	402	392
Green Creek Valley Main	91	12	1	27	45	5
Mark West Creek Main	584	79	9	175	25	296
Windsor Creek Main	606	82	9	182	2,832	0
Windsor Creek Tribute	331	45	5	99	906	0
Pod Creek	918	123	14	275	60	446
Mark West Weeks Creek	20	3	0	6	17	0
Mark Creek Humbug Creek	17	2	0	5	15	0
Mark West Creek	2,524	339	39	757	418	971
Mills Felta Creek	348	47	5	104	3,041	0
Wine Grape Creek	471	63	7	141	56	203
Pena Creek	179	24	3	54	0	99
West Slough Creek	375	50	6	112	660	0
Maacama Creek	2,946	396	45	884	1,328	293
Dutcher Creek	65	9	1	19	35	1
County Total	11,526	1,550	176	3,457	10,117	2,763
Watershed Total	13,753	1,550	176	3,457	11,534	3,783

Source: NMFS GIS layer "Potential Stranding Sites" and the SWRCB Water33.sde "USA Prime Imagery" layer.

[1]Percent of frost protection method, Table 3-7 multiplied by Potential Corrective Action Acreage.

[2]Pond Protection Capacity, Table 4-6 divided by frost water requirement, Table 4-7.

4.4.2 Existing Water Storage Facilities

A number of lakes and ponds exist in the Russian River watershed that could be used to store water for frost protection. Standard GIS techniques were used to estimate acreages of lakes and ponds in the Russian River watershed. The State Water Board WBGIS NHD Lakes layer and the SWRCB Water33.sde "USA Prime Imagery" layer provided independent perspectives on location, area and timing of existing water bodies. Pond and lake capacity was estimated using the standard area capacity relationship used by the NRCS where capacity is equal to area times the maximum depth times 0.4.[2] Maximum depth was assumed to be a function of area with a maximum lake depth of 12 feet and pond depth of 8 feet.

The ownership of some of the ponds and reservoirs visible on the referenced images is not known; therefore, the availability of the stored water and water right status are not known. In addition, some of the ponds are used for waste disposal or domestic and livestock water supply; therefore, the estimated watershed capacity was adjusted downward by 15 percent for Mendocino County and by 25 percent for Sonoma County. The adjustment was based on approximations of known wastewater treatment ponds and residential density in specific areas of the watershed.

Table 4-7 contains the estimated frost protection water requirements for crops and counties of the Russian River Watershed. These were used to estimate the acreage that is being frost protected using existing storage facilities (Table 4-5).

[2] Natural Resources Conservation Service-USDA, “Ponds – Planning, Design, Construction”, Agriculture Handbook 590, November, 1997. P12.

Table 4-6. Russian River Watershed Lake, Reservoir and Pond Water Storage Capacity.

Mendocino County	Number	Area (ac)	Capacity (af)[1]	Frost Protection Availability Factor[2]	Frost Protection Capacity (af)
McDowell Creek	6	47	144	0.85	122
Dooley Creek	9	43	127	0.85	108
Feliz Creek	15	47	135	0.85	115
McNab Creek	8	22	58	0.85	49
York Creek	11	31	82	0.85	69
County Total	49	190	545		463
Sonoma County					
Green Valley Atascadero Creek	15	36	102	0.75	77
Green Valley Purrington Creek	27	52	148	0.75	111
Green Creek Valley Main	5	7	17	0.75	12
Mark West Creek Main	2	4	9	0.75	7
Windsor Creek Main	16	330	1,044	0.75	783
Windsor Creek Tributary	12	106	334	0.75	251
Pod Creek	3	8	22	0.75	16
Mark West Weeks Creek	1	3	6	0.75	5
Mark West Humbug Creek	2	2	5	0.75	4
Mark West Creek	16	55	154	0.75	115
Mills Felta Creek	15	353	1,121	0.75	841
Wine Grape Creek	3	8	21	0.75	16
Pena Creek	0	0	0	0.75	0
West Slough Creek	20	82	243	0.75	183
Maacama Creek	33	162	490	0.75	367
Dutcher Creek	3	5	13	0.75	10
County Total	173	1,212	3,729		2,797
Watershed Total	222	1,402	4,274		3,260

Sources: State Water Resources Control Board, Spatial Database, water33.sde, WBGIS NHD_Lakes, and the Prime Imagery map service. The Prime Imagery map service presents satellite imagery for the world and high resolution aerial imagery for the United States. The service includes NASA Blue Marble: Next Generation 500m resolution imagery at small scales and i-cubed 15m eSAT imagery at medium-to-large scales for the world. It also includes GeoEye IKONOS 1m resolution imagery for Hawaii, parts of Alaska, and several hundred metropolitan areas around the world. The service also includes i-cubed Nationwide Prime 1m or better resolution imagery for the contiguous United States. I-cubed Nationwide Prime is a seamless, color mosaic of various commercial and government imagery sources, including Aerials Express 0.3 to 0.6m resolution imagery for metropolitan areas and the best available United States Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP) imagery and enhanced versions of United States Geological Survey (USGS) Digital Ortho Quarter Quad (DOQQ) imagery for other areas. Publication data: June 2009.

[1]Capacity is determined using the standard pond capacity equation.

[2]Not all water storage facilities are avialable for frost protection due to other ownership and other dedicated uses.

Table 4-7. Frost Protection Water Requirements.

Mendocino County	Water Required for Frost Protection (acre feet/acre/yr)[1]
McDowell Creek	
Wine grapes	0.28
Pears	0.55
Dooley Creek	
Wine grapes	0.28
Pears	0.55
Feliz Creek	
Wine grapes	0.28
Pears	0.55
McNab Creek	
Wine grapes	0.28
Pears	0.55
York Creek	
Wine grapes	0.74
Pears	1.28
Sonoma County	
Green Valley Atascadero Creek	0.28
Green Valley Purrington Creek	0.28
Green Creek Valley Main	0.28
Mark West Creek Main	0.28
Windsor Creek Main	0.28
Windsor Creek Tribute	0.28
Pod Creek	0.28
Mark West Weeks Creek	0.28
Mark Creek Humbug Creek	0.28
Mark West Creek	0.28
Mills Felta Creek	0.28
Wine Grape Creek	0.28
Pena Creek	0.28
West Slough Creek	0.28
Maacama Creek	0.28
Dutcher Creek	0.28

[1]These values are from Table 3-6. Values for Sonoma County were assumed to be equivalent to Hopland water requirements.

4.4.3 Constructing Additional Off-Stream Water Storage

The acreage that may require frost protection (Table 4-5) is assumed to be frost protected by constructing additional ponds, installing wind machines, or drilling water wells in order to meet the requirements of the regulation, in lieu of directly diverting water from the Russian River watershed.

The WDMP has not been approved and, therefore, costs must be estimated by assuming specific practices that could meet the provisions of the proposed regulation. Providing additional off-stream capacity to reduce direct diversions during the frost period is a practice that could meet those conditions.

Permanent set overhead sprinklers are the method of choice for frost protection for vineyards and orchards in the Russian River watershed. Since the equipment and operational practice is currently in place, providing additional off-stream storage is a practical alternative.

The USDA-NRCS Agricultural Water Enhancement Program (AWEP) cost shares 50% of the average cost to build ponds of less than 50 acre-feet. Last year, the 50 percent cost share was $2,625/af for an unlined pond and $3,622/af for a lined pond. NRCS stated that the typical pond capacity requested through the program is 30 acre–feet. NRCS will only cost share ponds that have a water right for storage.

Cost estimates for pond installation is presented in Table 4-8. They include the costs for regulatory compliance, including water right permitting costs.

Table 4-8. Off-Stream Water Storage Costs for Frost Protection.

	Capital Costs	Annual Costs	Units/Source
Capital Costs:			
Construction cost/pond	$157,500		30 af off-stream pond[1]
Pipeline cost/pond	$20,000		1,000 ft PVC @$20/ft[1]
Total Capital Costs/pond	$177,500		
NRCS AWEP Cost Share	$88,750		50% of capital cost[1]
Cost to grower	$88,750		
Permit costs:			
Water Rights Fees			SWRCB[2]
Application fee	$1,300		$1,000 + $15/af in excess of 10 af
Permit and license annual fee		$100	$100 + $0.023/ af in excess of 10 af
County Off-stream ponds			Sonoma County[3]
Grading plan check fee	$147		
Grading permit	$1,812		
NCIFP Policy[5]			
Water availability analysis	$18,100		Table 3-2, page 10[4]
Flow monitoring and reporting	$10,000	$1,200	Table 3-3, page 11[4]
Possible supplemental anadromy determination	$7,700		Table 3-2, page 10[4]
Possible site-specific MBF/MCD study	$57,200		Table 3-2, page 10[4]
study	$7,200		Table 3-2, page 10[4]
Possible stream class determination study	$10,200		Table 3-2, page 10[4]
Total grower costs/pond	$202,409	$16,005	Annual costs plus capital costs annualized at 6% for 30 years[8]
Operating & maintenance costs/pond		$1,000	
Total annual costs/pond		$18,306	annual capital costs/acre + OM&R/acre
Annual useable water supply/pond		30	acre-feet[1]
Total cost per acre-foot		$610	total annual cost/pond / annual useable water supply/pond
Annual water supply required per acre:			
Mendocino County		0.40	acre feet/yr[7]
Sonoma County		0.28	acre feet/yr[7]
Cost per crop acre:			
Mendocino County	$2,720	$246	cost per acre foot * annual water supply required per acre
Sonoma County	$1,865	$169	

[1]Mandel, Carol, Mendocino County District Conservationist, USDA-NRCS, Ukiah Field Office. Email to Gerald Horner, 3/26/2010, FW: NRCS cost shares.

[2]State Water Resources Control Board, Division of Water Rights, http://www.waterboards.ca.gov/waterrights/water_issues/programs/fees/docs/fee_schedule_fy0910.pdf

[3]Sonoma County, http://www.sonoma-county.org/prmd/fees/fee_2.pdf, 7/10/10

[4]Chambers Group, Inc. and Stetson Engineers Inc. "Revised Direct Cost Analysis for the Proposed Policy for Maintaining In-steam Flows in Northern CA Coastal Steams", Prepared for SWRCB, Jan., 2010.

[5]The analysis and monitoring specified are AB2121 compliant (North Coast Instream Flow Policy requires the State Water Board to adopt principles and guidelines fo maintaining instream flows in nothern California coastal streams). These fees are not be necessary if diversions are made from the Russian River mainstem.

[6]The costs of compliance with the North Coast Instream Flow Policy would not apply to applications to appropriate water from the mainstem of the Russian River.

[7]Table 3-6. The Hopland water requirement is assumed for Sonoma County.

[8]The selection of a discount rate is complicated. See:http://yosemite.epa.gov/ee/epa/eed.nsf/pages/Guidelines.html/$file/Guidelines.pdf, Page 6-1.

4.4.4 Installing Wind Machines

Another method of frost protection is wind machine. Wind machines cannot be considered sufficiently effective in some areas of the Russian River watershed to prevent damage from all frost events. Bearden and Elkins conclude that wind machines require a unique set of circumstances to be successful.

> "Wind machines depend on mixing warm air from above the vineyard with the colder air at ground level for effectiveness. A wind machine alone can raise the temperature in the vineyard by 25% of the difference between the air temperature at 4' and 40'. If there is a difference of four degrees you can get a 1 degree temperature rise. If there is little difference between the temperatures in the vineyard and above, wind machines are ineffective unless used with heaters."[3]

Table 4-9 contains cost estimates for the installation and operation of wind machines for frost protection. Cost estimates for heaters are not included, therefore, the application is limited to those areas where they would be effective.

Table 4-9. Wind Machine Frost Protection Costs.

Item	Capital Costs	Annual Costs	Source
Capital Costs/Unit:			
Purchase	$25,648		Barton[1]
Installation	$2,700		
Assembly	$2,000		
Autostart	$2,523		
Total Capital Costs/Unit	$32,871		
NRCS Cost Share;	$15,000		NRCS[2]
Total Net Capital Costs/Unit	$17,871	$1,298	annualized at 6% for 30 years
Frost protection coverage/unit		12	10-14 acres[3]
Total Annual Capital Costs/acre		$108	total capital costs / frost protection coverage/unit
Operating costs/hour		$26	8-10 gal/hr @ $2.90/gal[4]
Mendocino County:			
Annual hours[5]		138	23, 6-hour events
Annual operating cost		$3,602	operating cost/hour * annual hours
Total operating costs/acre		$300	total operating costs/frost protection coverage
Mendocino Co. Total Costs/Acre	$1,489	$408	total annual capital costs/ac + total operating costs/ac
Sonoma County:			
Annual hours[5]		78	13, 6-hour events
Annual operating cost		$2,036	operating cost/hour * annual hours
Total operating costs/acre		$170	total operating costs/frost protection coverage
Sonoma Co. Total Costs/Acre	$1,489	$278	total annual capital costs/ac + total operating costs/ac

[1]Barton, Jesse W., Gallery & Barton. Letter to Charles Hoppin, SWRCB, March 29, 2010. Exibit M: Petersen, Matt, letter proposal, Les Petersen Drilling & Pump Inc. Santa Rosa.

[2]50% but limited to %15,000. Personal communication: Mandel, Carol, Mendocino County District Conservationist, USDA-NRCS, Ukiah Field Office. 9/29/201

[3]Barton, Jesse W., Gallery & Barton. Letter to Charles Hoppin, SWRCB, 3/29/10, Page 12.

[4]Personal communication: Petersen, Matt, Les Petersen Drilling & Pump Inc. Santa Rosa, 7/13/2010

[5]Email to: State Water Resources Control Board from Russian River Frost Program, Exhibit 3 "Analysis of Low Stream Flows and Freezing Temperatuires at Hopland and Healdsburg" prepared by Wagner & Bonsignore Consulting Civil Engineers, November 10, 2009.

[3] Bearden, Bruce and Rachel Elkins. "Vineyard Frost Protection." UC Cooperative Extension, Mendocino and Lake County, January 1997. Page 4.

4.4.5 Drilling Water Wells

The Sonoma County Farm Bureau survey indicated that 294 wells were used to supply water for frost protection. Almost 85 percent of the wells were pumping from depths greater than 60 feet, which may not have a significant effect on the stage of the Russian River during the critical period. For this reason, it may be possible for the State Water Board to approve a WDMP that allows diverters to continue to pump from those wells. Alternatively, diverters may be able to demonstrate that they are not subject to the regulation because their wells are not hydraulically connected to a surface stream within the Russian River stream system. The costs of determining if a well is not hydraulically connected and therefore exempt from the regulation is not included in this analysis.

Installing new wells consistent with an approved WDMP, or that would be hydrologically independent of the Russian River, would be another option to growers. Barton states that a typical well and pump installation would cost about $41,000.[4] Since this does not include a large platform that is required for a well located in the floodplain, it can be considered a conservative or low estimate. It also does not include an electrical power source, although an alternative energy source could be used. Annualizing the cost of a well and pump at 6% for 30 years yields an annual cost of $2,979 (Table 4-10).

Table 4-10. Well Water Costs for Frost Protection.

Item	Capital Costs	Annual Costs	Comment
Capital costs/unit:	$41,000	$2,979	annualized at 6% for 30 years[1]
Annual pumping rate[2]		9	acre-feet/year
Total capital costs/acre foot		$337	annual capital costs / annual pumping rate
Pumping Cost per acre foot			
Mendocino County		$50	100' well, electrical powered pump
Sonoma County		$50	
Annual water supply required per acre:			
Mendocino County		0.40	acre feet/yr[3]
Sonoma County		0.28	acre feet/yr[3]
Total Costs per acre:			
Mendocino County	$1,871	$156	required water supply * (capital cost/af + pumping
Sonoma County	$1,283	$107	cost/af)

[1]Jesse Barton email to Gerald Horner, 4/6/2010 RE: Russian River frost reg.

[2]Based on well capacity

[3]Table 3-6. The Hopland water requirement is assumed for Sonoma County.

4.4.6 Coordinated Water Diversions

Diversion and stream stage data can be used to better manage the timing of diversions. The cost of coordinating diversions would be negligible.

4.4.7 Adaption of Best Management Practices

The total direct cost of the Corrective Action portion of the regulation depends on the extent of adoption of the frost protection alternatives, or best management practices (BMPs), by growers. Table 4-11 presents one possible adoption pattern. The resulting cost estimate is conservative, or high, because it assumes that all growers who do not already have storage reservoirs will construct new reservoirs, drill approved groundwater wells, or install wind machines. In reality, however, it may be possible for some

[4] Email from Jesse Barton, Gallery and Barton, to Gerald Horner, 4/6/2010 RE: Russian River frost reg.

growers to continue to directly divert surface water or use existing groundwater wells, consistent with an approved WDMP. These costs are assumed to be incurred after the first year of stream monitoring, reporting, and analysis.

Table 4-11. Corrective Actions Capital and Annual Costs.

	Adoption Rate	Acreage[1]	Capital Cost ($/ac)[2]	Total Capital Cost[3]	Annual Cost ($/ac)[2]	Total Annual Cost[4]
Mendocino County						
BMP Alternative						
Install ponds	70%	714	$2,720	$1,941,711	$245.99	$175,607
Wind machines	0%	0	$1,489	$0	$408.34	$0
Coordinated water diversions	20%	204	$0	$0	$50.00	$10,198
Drill wells	10%	102	$1,871	$190,804	$156.08	$15,917
Totals[5]		1,020	$2,091	$2,132,515	$197.80	$201,723
Sonoma County						
BMP Alternative						
Install ponds	65%	1,796	$1,865	$3,350,284	$168.70	$302,997
Wind machines	5%	138	$1,489	$205,754	$277.84	$38,387
Coordinated water diversions	20%	553	$0	$0	$50.00	$27,632
Drill wells	10%	276	$1,283	$354,543	$107.04	$29,577
Totals[5]		2,763	$1,415	$3,910,581	$144.25	$398,593

[1]Total acreage from Table 4-5.

[2]Tables 4-8, 4-9, 4-10.

[3]Capital cost per acre multiplied by acreage.

[4]Annual cost per acre multiplied by acreage.

[5]Total $/ac are weighted averages.

4.5 Annual Report

The annual report includes the inventory information, the stream stage monitoring data, the risk assessment, and any corrective actions identified and implemented. Staff estimates that the cost of preparing the report would be $20,000 annually.

4.6 Direct Cost of the Proposed Regulation

The total capital and annual direct costs for Mendocino and Sonoma growers for the first three years of the proposed regulation are presented in Table 4-12. For the purposes of this analysis, it was assumed that the first year of the proposed regulation will involve a frost inventory, stream flow monitoring, stream stage monitoring, and conducting a risk assessment. It was assumed that corrective action would begin in the second year as a result of the first year risk assessment. The installation of stream monitoring devices would also continue in the second year. Additional stream stage devices would be installed and the risk assessments would continue in subsequent years.

The total direct cost of the proposed regulation represents a reduction in income to growers but an increase in economic activity to firms providing services and products for frost protection therefore there is no net loss in aggregate welfare. The cost to growers of meeting the requirements of the proposed regulation is roughly equal the regional economic benefits realized by those expenditures.

Table 4-12. Total Capital and Annual Costs of the Proposed Regulation.

	Capital Cost			Annual Cost		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Mendocino County						
Inventory Costs[1]	$0	$0	$0	$29,120	$29,120	$29,120
Stream Stage Monitoring Program[2]	$192,157	$210,194	$192,157	$37,753	$78,079	$115,832
Risk Assessment[3]	$0	$0	$0	$9,802	$9,802	$9,802
Corrective Actions[4]	$0	$2,132,515	$0	$0	$201,723	$201,723
Annual Report[5]	$0	$0	$0	$5,299	$5,299	$5,299
Totals	$192,157	$2,342,709	$192,157	$81,974	$324,022	$361,775
Sonoma County						
Inventory Costs[1]	$0	$0	$0	$61,568	$61,568	$61,568
Stream Stage Monitoring Program[2]	$292,283	$274,246	$368,122	$55,483	$108,393	$188,487
Risk Assessment[3]	$0	$0	$0	$27,198	$27,198	$27,198
Corrective Actions[4]	$0	$3,910,581	$0	$0	$398,593	$398,593
Annual Report[5]	$0	$0	$0	$14,701	$14,701	$14,701
Totals	$292,283	$4,184,827	$368,122	$158,950	$610,452	$690,547
Russian River\Watershed Totals	$484,439	$6,527,536	$560,278	$240,924	$934,474	$1,052,322

[1]Table 4-1.

[2]Table 4-4.

[3]Section 4.3. Allocation of total costs to counties made proportional to Russian River frost protected acreage (Table 4-1).
Total cost of risk assessment: $37,000

[4]Table 4-11

[5]Section 4.5. Allocation of total costs to counties made proportional to Russian River frost protected acreage (Table 4-1).
Total cost of annual report: $20,000

Per acre capital and annual costs are required to estimate the change in profitability of producing wine grapes (Table 4-13).

Table 4-13. Per Acre Capital and Annual Costs of the Proposed Regulation.

	Acres	Total Capital Cost	Capital Cost Per Acre	Total Annual Cost	Annual Cost Per Acre
Mendocino County					
Russian River Diverters without Corrective Actions[1]	**4,596**				
Inventory Costs[2]		$0	0.00	$23,832	$5.19
Stream Stage Monitoring Program[3]		$486,548	105.86	$94,797	$20.63
Risk Assessment[4]		$0	0.00	$8,022	$1.75
Annual Report[4]		$0	0.00	$4,336	$0.94
Totals		**$486,548**	**105.86**	**$130,988**	**$28.50**
Russian River Diverters with Corrective Actions[6]	**1,020**				
Corrective Actions[5]		$2,132,515	2,091.04	$201,723	$197.80
Inventory Costs[2]		$0	0.00	$5,288	$5.19
Stream Stage Monitoring Program[3]		$107,959	105.86	$21,034	$20.63
Risk Assessment[4]		$0	0.00	$1,780	$1.75
Annual Report[4]		$0	0.00	$962	$0.94
Totals[3]		**$2,240,474**	**2,196.90**	**$230,787**	**$226.30**
Mendocino County Total	**5,616**				
Sonoma County					
Russian River Diverters without Corrective Actions[1]	**12,819**				
Inventory Costs[2]		$0	0.00	$50,650	$3.95
Stream Stage Monitoring Program[3]		$768,909	59.98	$155,063	$12.10
Risk Assessment[4]		$0	0.00	$22,375	$1.75
Annual Report[4]		$0	0.00	$12,094	$0.94
Totals		**$768,909**	**59.98**	**$240,182**	**$18.74**
Russian River Diverters with Corrective Actions[6]	**2,763**				
Corrective Actions[5]		$3,910,581	1,415.24	$398,593	$144.25
Inventory Costs[2]		$0	0.00	$4,030	$3.95
Stream Stage Monitoring Program[3]		$165,742	59.98	$12,336	$12.10
Risk Assessment[4]		$0	0.00	$1,780	$1.75
Annual Report[4]		$0	0.00	$962	$0.94
Totals[3]		**$4,076,323**	**1,475.22**	**$417,701**	**$162.99**
Sonoma County Total	**15,582**				
Russian River Watershed Total	**21,198**				

[1]Table 4-1 minus Net Acreage Requiring Frost Protection due to the Proposed Regulation (Table 4-5).

[2]Table 4-4.

[3]Table 4-4 Per acre cost equal to Year 3 totals divided by county acreage Table 4-1.

[4]Section 4.3 Per acre cost equal to total cost divided by county acreage Table 4-1.

[5]Per acre cost, Table 4-12.

[6]Table 4-5.

4.7 Initial and Annual Costs of a Small and Typical Business

STD. 399 requires estimates of initial costs and annual costs for a small and a typical business. Tables 4-14 contains initial (capital) and annual costs for operations of 40 to 640 acres in size for Mendocino and Sonoma counties.

Table 4-14. Inital (Capital) and Annual Costs of a Small and Typical Business.

	Mendocino County Russian River Diverters				Sonoma County Russian River Diverters			
	Without Corrective Actions		With Corrective Actions		Without Corrective Actions		With Corrective Actions	
	Capital	Annual	Capital	Annual	Capital	Annual	Capital	Annual
Per Acre[1]	$105.86	$28.50	$2,196.90	$226.30	$59.98	$18.74	$1,475.22	$162.99
Size of Operation[2]								
40	$4,234	$1,140	$87,876	$9,052	$2,399	$749	$59,009	$6,519
80	$8,469	$2,280	$175,752	$18,104	$4,799	$1,499	$118,018	$13,039
160	$16,938	$4,560	$351,504	$36,208	$9,597	$2,998	$236,036	$26,078
320	$33,875	$9,120	$703,009	$72,416	$19,194	$5,996	$472,071	$52,156
640	$67,750	$18,240	$1,406,018	$144,831	$38,388	$11,991	$944,142	$104,312

[1]Table 4-13.

[2]Size of operation multiplied by the respective per acre cost.

4.8 Change in Crop Acreage, Production, and Values Due to the Proposed Regulation

Changes in vineyard production levels as a result of additional production costs due to the proposed regulation were estimated using recently estimated wine grape acreage price elasticities.[5] Acreage price elasticities represent the percent change in acreage resulting from a one percent change in the price of the commodity.

The change in acreage, production, and value of production was estimated for two groups of growers for each county. The first group is the growers that may not be able to continue directly diverting from the Russian River, its tributaries, or hydraulically-connected groundwater, and may have to implement an alternative method of frost control. These growers will also be responsible for costs to monitor and report diversions, and their share of costs to monitor and report stream stage.

The second group includes the remaining growers that were using stored Russian River water and will probably be able to continue to rely on stored water for purposes of frost protection. They will also be responsible for costs to monitor and report diversions, and their share of costs to monitor and report stream stage.

The procedure to estimate the change in production and value of wine grapes is a three-step process. First, the change in production costs is translated into price changes for each wine grape variety. Second, the percent reduction in acreage is calculated for each variety based on the short-run and long-run acreage

[5] Volpe, Richard, Richard Green, Dale Heien, and Richard Howitt, "Estimating the Supply of California Wine Grapes Using Regional Systems of Equations", Department of Agricultural & Resource Economics, University of California, Davis, Journal of Wine Economics, forthcoming.

price elasticities[6]. Third, the value of the acreage reductions is calculated by multiplying the resulting production changes by the selling price of the grapes.

The detailed calculations are presented in an appendix (Section 6), and Table 4-15 contains a summary of the data and results. As described in section 3.2, the Sonoma County acreage using Russian River water was estimated by a survey of vineyard growers conducted by the Sonoma County Farm Bureau; a team of University of California agricultural specialists determined the acreage using Russian River water in Mendocino County.

The total acreage being frost-protected by diverting Russian River water is 23,050, of which 67 percent is located in Sonoma County. Approximately 63 percent of the Sonoma County acreage may be protected by existing ponds but only 23 percent of Mendocino County may be so protected.

WDMP costs were estimated using local data sources. Monitoring and reporting costs were derived from various federal and State agencies. Reductions in acreages were estimated using published acreage price elasticities. The average value of production of Mendocino wine grapes is slightly more than $5000 per acre (Table 4-15).

The reduction in wine grape and pear acreage represents a deadweight loss on the economy. A deadweight loss is considered the economic price society must pay to protect the endangered species.

Table 4-15. Russian River Watershed Reduction in Acreage and Value of Production Due to the Proposed Regulation.

				Annual Reduction in Acreage[2]			Annual Reduction in Value of Production[3]	
	Acreage[1]	Annual Cost/ac[1]	Total Cost	Short-run	Long-run	Percent Change	Short-run	Long-run
Mendocino County								
Russian River Diverters without Corrective Actions	4,596	$28.50	$130,988	6	23	0.5%	$25,626	$123,214
Russian River Diverters with Corrective Actions	1,020	$226.30	$230,787	10	41	4.0%	$69,582	$366,887
Total Mendocino County	5,616		$361,775	15	64	1.1%	$95,208	$490,101
Sonoma County								
Russian River Diverters without Corrective Actions	12,819	$18.74	$240,182	7	33	0.3%	$52,231	$260,797
Russian River Diverters with Corrective Actions	2,763	$162.99	$450,365	14	62	2.2%	$97,938	$489,021
Total Sonoma County	15,582		$690,547	21	95	0.6%	$150,169	$749,818
Watershed Total	21,198		$1,052,322	37	159	0.8%	$245,377	$1,239,919

[1]Table 4-13.

[2]Tables 6-2, 6-6, 6-10, 6-14.

[3]Tables 6-3, 6-7, 6-11, 6-15.

[6] The selection of the time period is complicated. In the short term, at least some factors of production are fixed. If costs are evaluated over a short period of time, then contractual or technological constraints prevent firms from responding quickly to increased compliance costs by adjusting their input mix or output decisions. In contrast, in the long term, all factors of production are variable. Firms can adjust any of their factors of production in response to changes in costs due to a new regulation. A longer time horizon affords greater opportunities for affected entities to change their production processes (for instance, to innovate).

4.9 Statewide Economic Impacts

The total statewide lifetime cost of the proposed regulation was estimated using input-output multipliers estimated by an IMPLAN model maintained by the California Department of Water Resources. Input-output analysis, also known as inter-industry analysis, is the name given to an analytical work conducted by Wassily Leontief in the late 1930's. The fundamental purpose of the input-output framework is to analyze the interdependence of industries in an economy through market-based transactions. Input-output analysis can provide important and timely information on the interrelationships in a regional economy and the impacts of changes on that economy.

When total sales of a particular industry changes, three types of impacts can be estimated using a traditional input-output model. They are direct, indirect, and induced effects. Combining the three types is termed Type SAM output multipliers. Type SAM multipliers take into account the expenditures resulting from increased incomes of households as well as inter-institutional transfers resulting from the change in economic activity. Therefore, Type SAM multipliers assume that as final demand changes, incomes increase or decrease along with inter-institutional transfers. As people and institutions increase or decrease expenditures, increases or decreases in the demand from local industries result.

Total costs were calculated by multiplying the direct reduction in value of wine grape production by the IMPLAN California Type SAM output multiplier for the fruit farming sector for all years the regulation is expected be in effect. Table 4-16 shows the reduction in value of wine grape production during years one through five, and the comparable total reduction in statewide production of goods and services.

4-16. Reduction in Statewide Economic Activity over the First Five Years of the Regulation.

	Year 1	Year 2	Year 3	Year 4	Year 5
Mendocino County					
Russian River Diverters without Corrective Actions[1]	$25,626	$50,023	$74,420	$98,817	$123,214
Russian River Diverters with Corrective Actions[2]	$69,582	$143,908	$218,235	$292,561	$366,887
Sonoma County					
Russian River Diverters without Corrective Actions[3]	$52,231	$104,372	$156,514	$208,656	$260,797
Russian River Diverters with Corrective Actions[4]	$97,938	$195,709	$293,479	$391,250	$489,021
Russian River Watershed	$245,377	$494,013	$742,648	$991,284	$1,239,919
Reduction in Total Statewide Economic Activity*	$403,278	$811,911	$1,220,544	$1,629,177	$2,037,810

[1]Table 6-4.

[2]Table 6-8.

[3]Table 6-12.

[4]Table 6-16.

*California Type SAM output multiplier for the fruit farming sector estimated in 2007 is 1.643502. IMPLAN® Multiplier Report, Minnesota IMPLAN Group, Inc, 1725 Tower Drive West, Suite 140, Stillwater, MN 55082.

A 30-year lifetime is assumed for the proposed regulation. The present value of future reductions is calculated by extending the Year 5 reduction in statewide economic activity to years 6 through 30.

Applying the standard net present value equation to this stream of output reductions results is the total statewide dollar costs of the proposed regulation over its lifetime of **$24,407,183**

4.10 Reporting Costs for a Typical Business

Reporting costs are assumed to include inventory costs, stream stage monitoring costs, and the annual report. A typical business is assumed to be 160 acres in size (Table 4-17).

Table 4-17. Reporting Costs for a Typical Business.

	Mendocino		Sonoma	
	Per Acre[1]	Total[2]	Per Acre[1]	Total[2]
Annual Report	$0.94	$151	$0.94	$151
Totals	$0.94	$151	$0.94	$151

[1]Table 4-13.

[2]A typial business is assumed to be 160 acres.

5. REGIONAL ECONOMIC IMPACTS

5.1 Impacted Regional Firms

This list does not include all impacted firms. This regulation directly impacts wine grape vineyards and orchard operations. However, many businesses will be impacted by this regulation because of the interdependence of input suppliers and fruit processors. The total economic impacts of this regulation was estimated using existing data and models of the economy. A list of the industries and the number of businesses that will be impacted by the regulation was formulated from the 2008 US Census County Business Patterns (Table 5-1).

An accurate number of growers depending on diversions from the Russian River is not known therefore number of diverters is shown in Table 5-1. Since one establishment may have more than one diversion, the number of Russian River frost diverters may be an over estimate.

Table 5-1. Regional Establishments Impacted by Changes in Vineyard and Orchard Operations.

NAICS code	Industry Description	Establishments (number)[1] Mendocino	Sonoma	Total
----	Russian River Frost Diverters[2]	455	962	1,417
1151	Support activities for crop production	9	33	42
31213	Wineries	26	234	260
32531	Fertilizer manufacturing	2	3	5
333111	Farm machinery and equipment manufacturing	1	1	2
42382	Farm and garden machinery and equipment merchant wholesalers	4	15	19
42459	Other farm product raw material merchant wholesalers	1	2	3
42491	Farm supplies merchant wholesalers	7	17	24
44422	Nursery, garden center, and farm supply stores	31	41	72
454312	Liquefied petroleum gas (bottled gas) dealers	8	9	17
454319	Other fuel dealers	1	1	2
484	Truck transportation	26	149	175
49313	Farm product warehousing and storage		1	1
5411	Legal services	42	309	351
5412	Accounting, tax preparation, bookkeeping, and payroll services	48	258	306
5413	Architectural, engineering, and related services	31	277	308
	Totals	**692**	**2,312**	**3,004**

Source: Selected Statistics by Sector, Sub-Sector, Industry Group, and Industry, County Business Patterns, 2008.

[1]With the exception of Russian River Diverters, includes only establishments with reported employees.

[2]State Water Resources Control Board, Division of Water Rights, EWRIMS.Points_of_Diversion.

The distribution of interindustry impacts of reductions in vineyard and orchard production was estimated by the IMPLAN model.

Fruit Farming	70.0%
Agricultural Support Service	0.9%
Mining	0.2%
Utilities	0.8%
Construction	2.9%
Manufacturing	2.1%
Wholesale Trade	2.3%
Retail Trade	4.1%
Transportation, Warehousing	0.9%
Information Services	1.3%
Finance, Insurance	3.2%
Real Estate, Rental, Leasing	4.5%
Professional & Technical Services	1.4%
Mangement Services	0.3%
Administrative Services	0.7%
Educational Services	0.2%
Health Care, Social Assistance	1.1%
Arts, Entertaiment, Recreation	0.4%
Lodging, Drinking Places & Food Services	1.2%
Other Services (excluding Government)	1.4%

5.2 Regional Income and Employment Impacts

Employment impacts from the regulation were estimated using a multiplier estimated by an IMPLAN input/output model. Employment impacts for the first five years of the regulation due to decreases in wine grape and pear production are presented in Table 5-2. The impacts shown in Table 5-2 does not include any benefits that would occur from expenditures necessary to comply with the regulation because they are offset by a reduction in grower incomes. They will be addressed in the benefits section of the STD 399 form.

Table 5-2. Impact of Reduced Wine Grape Acreage on Statewide Employment.

	Year 1	Year 2	Year 3	Year 4	Year 5
Reduction in total statewide employment*	4	7	11	14	18

*California Type II employment multiplier for the fruit farming sector estimated in 2007 was 1.95 jobs per $1m of output. IMPLAN® Multiplier Report, Minnesota IMPLAN Group, Inc, 1725 Tower Drive West, Suite 140, Stillwater, MN 55082.

5.3 Impact on Competitive Position of Russian River Diverters

This regulation will increase the production costs of vineyards and orchards currently diverting water from the Russian River stream system for frost protection. Additional costs will come from having to provide an alternative frost protection scheme either by diverting and storing water prior to March 15 for use during the frost season or using other frost protection methods. The proposed regulation will also require a frost inventory and stream stage monitoring program. This regulation would not apply outside of the Russian River watershed. However, a similar regulation does apply to diversions from the Napa River for purposes of frost protection.

5.4 Benefits of the Regulation

The proposed regulation and its benefits to salmonids are in furtherance of the public trust doctrine and the reasonable use doctrine. Under the public trust doctrine, the State Water Board has a duty to protect, where feasible, the State's public trust resources, including fisheries. The State Water Board also has the authority to prevent the waste or unreasonable use, unreasonable method of use, or the unreasonable method of diversion of all waters of the State.

The proposed regulation would also be in furtherance of the federal ESA and CESA. As stated in section 2 of the ESA, the act was designed to protect critically imperiled species from extinction as a consequence of economic growth and development untempered by adequate concern and conservation. The Russian River and its tributaries provide habitat for steelhead trout, Coho salmon, and Chinook salmon. The Coho salmon has been listed as endangered under both the federal Endangered Species Act[7] (ESA) and the California Endangered Species Act[8] (CESA). Steelhead trout and Chinook salmon have been listed as threatened species under the federal ESA and the CESA. The Coho salmon population in the Southern Oregon/Northern California region has declined from an estimated 150,000–400,000 naturally spawning fish in the 1940s to fewer than 10,000 naturally producing adults today. These reductions are due to natural and man-made changes, including water diversions; short-term atmospheric trends, such as El Niño, which cause extremes in annual rainfall on the northern California coast; predation by the California Sea Lion and Pacific Harbor Seal; and commercial timber harvesting.

As water diversions have contributed to salmonid population decline, the proposed regulation may help to restore a portion of the fish population in the Russian River watershed because it will cause diversions for purposes of frost protection use to be managed in a manner that will reduce the potential for stranding mortality of juvenile salmonids. To the extent that it helps restore a portion of the fish population, the proposed regulation could lead to an increase in recreational and commercial fishing, which would benefit people who work in the commercial fishing industry and the rural communities that provide goods and services to recreational anglers. In addition to protecting the fisheries, there is intrinsic value to preserving these species, which are indicators of a healthy ecosystem.

6. APPENDIX: REDUCTION IN ACREAGE, PRODUCTION AND VALUE OF PRODUCTION

6.1 Mendocino County Reduction in Acreage, Production and Value

Each county has two groups of growers that experience different costs and must be estimated separately due to acreage, frost risk and value of production. The first group may be required to provide frost protection by installing additional ponds, wind machines or wells, and the cost of monitoring and reporting diversions and stream stage. The second group is responsible for the cost of monitoring and reporting diversions and stream stage.

6.1.1 Reduction in Value of Production Due to WDMP Costs

Table 6-1 lists the Mendocino County acreage, production, value of production and percent decrease in value per acre for the major wine grape varieties grown in the Russian River watershed. The value/acre of production is calculated by dividing the total value of production by the bearing acreage. The percent decrease in value per acre is calculated by dividing the increase in the per acre cost of production by the value per acre. The percent decrease in the value per acre is equated to a reduction in the price of wine grapes.

[7] The federal Endangered Species Act of 1973 (16 U.S.C., § 1531 et seq.) (ESA).
[8] The California Endangered Species Act (Fish & G. Code, § 2050 et seq.) (CESA).

Table 6-1. Mendocino County Acreage and Production of Major Wine Grape Varieties, and Percent Decrease in Value per Acre Due to Non-Corrective Action Costs-2009.

	2009 Bearing Acreage	Production				Percent Decrease in Value/acre[1]
		Tons	$/ton	Total Value	Value/acre	
Red Varieties						
Cabernet Sauvignon	2,434	8,203	$1,341	$10,997,702	$4,518	0.6%
Merlot	1,736	4,255	$1,032	$4,390,813	$2,529	1.1%
Pinot Noir	2,291	7,444	$2,650	$19,727,865	$8,611	0.3%
Zinfandel	1,961	5,547	$1,366	$7,575,171	$3,863	0.7%
Total Reds	8,422			$42,691,551		
White Varieties						
Chardonnay	4,446	20,344	$1,154	$23,482,760	$5,282	0.5%
Sauvignon Blanc	766	3,331	$1,023	$3,409,355	$4,451	0.6%
Total Whites	5,212			$26,892,115		
Total Wine Grapes	13,634			$69,583,666	$5,104	

Source: Mendocino County Agricultural Crop Report, 2009, County of Mendoino Department of Agriculure.

[1]Equals the increase in production cost/acre (Table 4-14): $28.50 / Variety value per acre *100.

The reduction in acreage as a result of the increase in the cost of production is presented in Table 6-2. The percent reduction in acreage is calculated by multiplying the variety acreage price elasticity times the percent decrease in value per acre from Table 6-1. The reduction in acreage is derived by multiplying the percent reduction in acreage times the affected acreage.

Table 6-2. Mendocino County Reduction in Acreage due to Non-Corrective Action Costs.

	WDMP Acreage	Acreage Price Elasticity*		Percent Reduction in		Reduction In Acreage	
		Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
Red Varieties							
Cabernet Sauvignon	821	0.146	0.351	0.09%	0.22%	1	2
Merlot	585	0.398	1.094	0.45%	1.23%	3	7
Pinot Noir	772	0.509	3.891	0.17%	1.29%	1	10
Zinfandel	661	0.045	1.573	0.03%	1.16%	0	8
Total Reds	2,839					5	27
White Varieties							
Chardonnay	1,499	0.073	-0.447	0.04%	-0.24%	1	-4
Sauvignon Blanc	258	0.055	0.078	0.04%	0.05%	0	0
Total Whites	1,757					1	-3
	4,596					6	23

*percent change in acreage resulting in a one percent change in price

The short-run and long run reductions in production, and value of production as a result of the regulation are shown in Table 6-3. The reductions are derived by multiplying the reduction in production times the price received in 2009 (Table 6-1).

Table 6-3. Mendocino County Reduction in Production and Value Due Non-Corrective Action Costs.

	Yields	Reduction In:			
	(ton/ac)	Production (tons)		Value	
Red Varieties		Short-run	Long-run	Short-run	Long-run
Cabernet Sauvignon	3.37	2.5	6.1	$3,414	$8,208
Merlot	2.45	6.4	17.7	$6,638	$18,246
Pinot Noir	3.25	4.2	32.3	$11,203	$85,644
Zinfandel	2.83	0.6	21.7	$848	$29,636
Total Reds		13.8	77.8	$22,103	$141,734
White Varieties					
Chardonnay	4.58	2.7	(16.5)	$3,118	-$19,093
Sauvignon Blanc	4.35	0.4	0.6	$405	$574
Total Whites		3.1	(16.0)	$3,523	-$18,519
Totals		16.9	61.8	$25,626	$123,214

The reduction in wine grape production over the lifetime of the regulation was estimated using the short-run and long run reductions in value presented in Table 6-2. The short-run is defined as a period where most of the inputs or practices are fixed. In the long run, almost all of the resources become variable and the long-run elasticities are considerably greater than the short-run elasticities.

The transition from short-run to long run is assumed to take five years. During that period growers are assumed to reduce wine grape acreage or start other agricultural or non-agricultural activities. The annual estimated reduction in value of wine grape production over the first five years of the proposed regulation is presented in Table 6-4.

Table 6-4. Mendocino County Reduction in Production Values over the First Five Years of the Proposed Regulation due to Non-Corrective Action Costs.

	Value of Production[1]				
Red Varieties	Year 1	Year 2	Year 3	Year 4	Year 5
Cabernet Sauvignon	$3,414	$4,613	$5,811	$7,010	$8,208
Merlot	$6,638	$9,540	$12,442	$15,344	$18,246
Pinot Noir	$11,203	$29,813	$48,424	$67,034	$85,644
Zinfandel	$848	$8,045	$15,242	$22,439	$29,636
Total Reds	$22,103	$52,011	$81,919	$111,826	$141,734
White Varieties					
Chardonnay	$3,118	-$2,435	-$7,988	-$13,541	-$19,093
Sauvignon Blanc	$405	$447	$489	$532	$574
Total Whites	$3,523	-$1,988	-$7,498	-$13,009	-$18,519
Totals	$25,626	$50,023	$74,420	$98,817	$123,214

[1]Table 6-3 Interpolated between Short-run and Long-run Reduction in Value.

6.1.2 Reduction in Value of Production Due to the Cost of Monitoring and Reporting Diversions and Stream Stage

The analysis reported in this section was conducted for the growers that are responsible for the costs of monitoring diversions and stream flow only.

Table 6-5. Mendocino County Acreage and Production of Major Wine Grape Varieties, and Percent Decrease in Value per Acre Due to Corrective Action Costs-2009.

	2009 Bearing Acreage	Production				Percent Decrease in Value/acre[1]
		Tons	$/ton	Total Value	Value/acre	
Red Varieties						
Cabernet Sauvignon	2,434	8,203	$1,341	$10,997,702	$4,518	5.0%
Merlot	1,736	4,255	$1,032	$4,390,813	$2,529	8.9%
Pinot Noir	2,291	7,444	$2,650	$19,727,865	$8,611	2.6%
Zinfandel	1,961	5,547	$1,366	$7,575,171	$3,863	5.9%
Total Reds	8,422			$42,691,551		
White Varieties						
Chardonnay	4,446	20,344	$1,154	$23,482,760	$5,282	4.3%
Sauvignon Blanc	766	3,331	$1,023	$3,409,355	$4,451	5.1%
Total Whites	5,212			$26,892,115		
Total Wine Grapes	13,634			$69,583,666	$5,104	

Source: Mendocino County Agricultural Crop Report, 2009, County of Mendoino Department of Agriculure.

[1]Equals the increase in production cost/acre (Table 4-14): $226 / Variety value per acre *100.

Table 6-6. Mendocino Connty Reduction in Acreage Due to Corrective Action Costs.

	Affected Acreage	Acreage Price Elasticity*		Percent Reduction in Acreage		Reduction In Acreage	
		Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
Red Varieties							
Cabernet Sauvignon	182	0.146	0.351	0.73%	1.76%	1	3
Merlot	130	0.398	1.094	3.56%	9.79%	5	13
Pinot Noir	171	0.509	3.891	1.34%	10.23%	2	18
Zinfandel	147	0.045	1.573	0.26%	9.22%	0	14
Total Reds	630					9	47
White Varieties							
Chardonnay	333	0.073	-0.447	0.31%	-1.92%	1	-6
Sauvignon Blanc	57	0.055	0.078	0.28%	0.40%	0	0
Total Whites	390					1	-6
	1,020					10	41

*percent change in acreage resulting in a one percent change in price

Table 6-7. Mendocino County Reduction in Production and Value Due to Corrective Action Costs.

	Yields	Reduction In:			
	(ton/ac)	Production (tons)		Value	
Red Varieties		Short-run	Long-run	Short-run	Long-run
Cabernet Sauvignon	3.37	15.6	42.8	$20,893	$57,430
Merlot	2.45	5.6	43.0	$5,798	$44,322
Pinot Noir	3.25	1.3	43.9	$3,330	$116,395
Zinfandel	2.83	24.4	132.8	$33,354	$181,370
Total Reds		46.9	262.5	$63,375	$399,517
White Varieties					
Chardonnay	4.58	4.8	(29.1)	$5,494	-$33,641
Sauvignon Blanc	4.35	0.7	1.0	$713	$1,011
Total Whites		5.5	(28.2)	$6,207	-$32,629
Totals		52.3	234.4	$69,582	$366,887

Table 6-8. Mendocino County Reduction in Production Values over the First Five Years of the Proposed Regulation due to Corrective Action Costs.

	Value of Production[1]				
Red Varieties	Year 1	Year 2	Year 3	Year 4	Year 5
Cabernet Sauvignon	$20,893	$30,028	$39,162	$48,296	$57,430
Merlot	$5,798	$15,429	$25,060	$34,691	$44,322
Pinot Noir	$3,330	$31,596	$59,862	$88,129	$116,395
Zinfandel	$33,354	$70,358	$107,362	$144,366	$181,370
Total Reds	$63,375	$147,410	$231,446	$315,481	$399,517
White Varieties					
Chardonnay	$5,494	-$4,290	-$14,073	-$23,857	-$33,641
Sauvignon Blanc	$713	$788	$862	$937	$1,011
Total Whites	$6,207	-$3,502	-$13,211	-$22,920	-$32,629
Totals	$69,582	$143,908	$218,235	$292,561	$366,887

[1]Table 6-15 Interpolated between Short-run and Long-run Reduction in Value.

6.2 Sonoma County Reduction in Acreage, Production and Value

This group will not have to install additional frost protection facilities but will still probably be subject to monitoring and reporting costs.

6.2.1 Reduction in Value of Production Due to WDMP Costs

Table 6-9. Sonoma County Acreage and Production of Major Wine Grape Varieties, and Percent Decrease in Value per Acre Due to Non-Corrective Action Costs-2009.

	2009 Bearing Acreage	Production				Percent Decrease in Value/acre[1]
		Tons	$/ton	Total Value	Value/acre	
Red Varieties						
Cabernet Sauvignon	11,659	41,141	$2,281	$93,828,200	$8,048	0.2%
Merlot	5,737	16,507	$1,507	$24,875,300	$4,336	0.4%
Pinot Noir	10,746	31,961	$3,043	$97,260,500	$9,051	0.2%
Zinfandel	5,230	15,637	$2,462	$38,505,400	$7,363	0.3%
Total Reds	33,371			$254,469,400		
White Varieties						
Chardonnay	14,256	53,533	$2,017	$107,950,600	$7,572	0.2%
Sauvignon Blanc	2,303	11,873	$1,511	$17,938,700	$7,791	0.2%
Total Whites	16,558			$125,889,300		
Total Wine Grapes	49,930			$380,358,700	$7,618	

Source: Sonoma County Agricultural Crop Report, 2009, Office of the Agricultural Commissioner.

[1]Equals the increase in production cost/acre (Table 4-14): $19 / Variety value per acre *100.

Table 6-10. Sonoma County Reduction in Acreage due to Non-Corrective Action Costs.

	WDMP Acreage	Acreage Price Elasticity*		Percent Reduction in Acreage		Reduction In Acreage	
		Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
Red Varieties							
Cabernet Sauvignon	2,993	0.146	0.351	0.03%	0.08%	1	2
Merlot	1,473	0.398	1.094	0.17%	0.47%	3	7
Pinot Noir	2,759	0.509	3.891	0.11%	0.81%	3	22
Zinfandel	1,343	0.045	1.573	0.01%	0.40%	0	5
Total Reds	8,568					7	37
White Varieties							
Chardonnay	3,660	0.073	-0.447	0.02%	-0.11%	1	-4
Sauvignon Blanc	591	0.055	0.078	0.01%	0.02%	0	0
Total Whites	4,251					1	-4
	12,819					7	33

*percent change in acreage resulting in a one percent change in price

Table 6-11. Sonoma County Reduction in Production and Value Due Non-Corrective Action Costs.

	Yields	Reduction In:			
	(ton/ac)	Production (tons)		Value	
Red Varieties		Short-run	Long-run	Short-run	Long-run
Cabernet Sauvignon	3.53	3.6	8.6	$8,188	$19,685
Merlot	2.88	7.3	20.0	$10,984	$30,191
Pinot Noir	2.97	8.6	66.1	$26,312	$201,140
Zinfandel	2.99	0.5	16.1	$1,132	$39,572
Total Reds		20.0	110.8	$46,616	$290,587
White Varieties					
Chardonnay	3.76	2.5	(15.2)	$5,006	-$30,654
Sauvignon Blanc	5.16	0.4	0.6	$609	$864
Total Whites		2.9	(14.6)	$5,615	-$29,790
Totals		22.9	96.2	$52,231	$260,797

Table 6-12. Sonoma County Reduction in Production Values over the First Five Years of the Proposed Regulation due to Non-Corrective Action Costs.

	Value of Production[1]				
Red Varieties	Year 1	Year 2	Year 3	Year 4	Year 5
Cabernet Sauvignon	$8,188	$11,062	$13,936	$16,811	$19,685
Merlot	$10,984	$15,785	$20,587	$25,389	$30,191
Pinot Noir	$26,312	$70,019	$113,726	$157,433	$201,140
Zinfandel	$1,132	$10,742	$20,352	$29,962	$39,572
Total Reds	$46,616	$107,608	$168,601	$229,594	$290,587
White Varieties					
Chardonnay	$5,006	-$3,909	-$12,824	-$21,739	-$30,654
Sauvignon Blanc	$609	$673	$737	$800	$864
Total Whites	$5,615	-$3,236	-$12,087	-$20,939	-$29,790
Totals	$52,231	$104,372	$156,514	$208,656	$260,797

[1]Table 6-15 Interpolated between Short-run and Long-run Reduction in Value.

6.2.2 Reduction in Value of Production Due to the Cost of Monitoring and Reporting Diversions and Stream Stage

Table 6-13. Sonoma County Acreage and Production of Major Wine Grape Varieties, and Percent Decrease in Value per Acre Due to Corrective Action Costs-2009.

	2009 Bearing Acreage	Production				Percent Decrease in Value/acre[1]
		Tons	$/ton	Total Value	Value/acre	
Red Varieties						
Cabernet Sauvignon	11,659	41,141	$2,281	$93,828,200	$8,048	2.0%
Merlot	5,737	16,507	$1,507	$24,875,300	$4,336	3.8%
Pinot Noir	10,746	31,961	$3,043	$97,260,500	$9,051	1.8%
Zinfandel	5,230	15,637	$2,462	$38,505,400	$7,363	2.2%
Total Reds	33,371			$254,469,400		
White Varieties						
Chardonnay	14,256	53,533	$2,017	$107,950,600	$7,572	2.2%
Sauvignon Blanc	2,303	11,873	$1,511	$17,938,700	$7,791	2.1%
Total Whites	16,558			$125,889,300		
Total Wine Grapes	49,930			$380,358,700	$7,618	

Source: Sonoma County Agricultural Crop Report, 2009, Office of the Agricultural Commissioner.

[1]Equals the increase in production cost/acre (Table 4-14): $163 / Variety value per acre *100.

Table 6-14. Sonoma County Reduction in Acreage Due to Corrective Action Costs-2009.

	WDMP Acreage	Acreage Price Elasticity*		Percent Reduction in Acreage		Reduction In Acreage	
		Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
Red Varieties							
Cabernet Sauvignon	645	0.146	0.351	0.30%	0.71%	2	5
Merlot	317	0.398	1.094	1.50%	4.11%	5	13
Pinot Noir	595	0.509	3.891	0.92%	7.01%	5	42
Zinfandel	289	0.045	1.573	0.10%	3.48%	0	10
Total Reds	1,847					12	69
White Varieties							
Chardonnay	789	0.073	-0.447	0.16%	-0.96%	1	-8
Sauvignon Blanc	127	0.055	0.078	0.12%	0.16%	0	0
Total Whites	916					1	-7
	2,763					14	62

*percent change in acreage resulting in a one percent change in price

Table 6-15. Sonoma County Reduction in Production and Value Due to Corrective Action Costs.

	Yields	Reduction In:			
	(ton/ac)	Production (tons)		Value	
Red Varieties		Short-run	Long-run	Short-run	Long-run
Cabernet Sauvignon	3.53	6.7	16.2	$15,353	$36,911
Merlot	2.88	13.7	37.6	$20,595	$56,611
Pinot Noir	2.97	16.2	123.9	$49,338	$377,156
Zinfandel	2.99	0.9	30.1	$2,123	$74,201
Total Reds		37.5	207.8	$87,409	$544,879
White Varieties					
Chardonnay	3.76	4.7	(28.5)	$9,387	-$57,479
Sauvignon Blanc	5.16	0.8	1.1	$1,142	$1,620
Total Whites		5.4	(27.4)	$10,529	-$55,859
Totals		42.9	180.4	$97,938	$489,021

Table 6-16. Sonoma County Reduction in Production Values Due to Corrective Action Costs over the First Five Years of the Proposed Regulation.

	Value of Production[1]				
Red Varieties	Year 1	Year 2	Year 3	Year 4	Year 5
Cabernet Sauvignon	$15,353	$20,743	$26,132	$31,522	$36,911
Merlot	$20,595	$29,599	$38,603	$47,607	$56,611
Pinot Noir	$49,338	$131,292	$213,247	$295,202	$377,156
Zinfandel	$2,123	$20,142	$38,162	$56,182	$74,201
Total Reds	$87,409	$201,776	$316,144	$430,512	$544,879
White Varieties					
Chardonnay	$9,387	-$7,330	-$24,046	-$40,762	-$57,479
Sauvignon Blanc	$1,142	$1,262	$1,381	$1,501	$1,620
Total Whites	$10,529	-$6,068	-$22,665	-$39,262	-$55,859
Totals	$97,938	$195,709	$293,479	$391,250	$489,021

[1]Table 6-15 Interpolated between Short-run and Long-run Reduction in Value.

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