Pit River Subwatershed Irrigated Agriculture Regulatory Recommendations

28 May 2025

I. Purpose

This document describes a proposal to exempt Pit River subwatershed commercial irrigated agriculture from Waste Discharge Requirements General Order R5-2014-0030-11 in the Irrigated Lands Regulatory Program (ILRP or Program).

II. Overview

The Pit River subwatershed is located in portions of Lassen, Modoc, Shasta, and Siskiyou counties and is represented by the Sacramento Valley Water Quality Coalition (Coalition). Within the Pit River subwatershed, about 75,000 acres of commercial irrigated agriculture are enrolled in the ILRP, totaling 186 growers with 894 enrolled parcels. The primary irrigated crops grown in the subwatershed include pasture (79%); forage crops such as grain, hay, and grass hay (10%); and wild rice (6%). Strawberries, mint, onions, garlic, and other miscellaneous crops are also grown in the subwatershed (5%).

The Pit River subwatershed is heavily dominated by pasture and forage crops, which tend to be lower impact crops than valley agriculture, though they are not “zero impact”. These crops in California provide critical forage for livestock, particularly during the summer dry season. These forage production systems are broadly comprised of native and improved perennial forage grass species, perennial clovers, and other forage legumes. Forage from these systems is most commonly harvested by grazing livestock, and in some cases is harvested via a combination of grazing and haying.

Because of the low impact of forage and pasture crops that dominate the subwatershed, the Coalition has raised concerns about the appropriateness of including the Pit River subwatershed in the ILRP. Reasons brought to the Water Board for potential exemption include low- to zero-use of pesticides and fertilizers, permanent vegetative cover, a short growing season, and low economic returns coupled with continually rising compliance costs. Due to the low economic returns of irrigated pasture and forage crops, this has unintentionally created the situation where agricultural commodities least likely to be impacting waterways are proportionally paying the highest Program compliance costs when compared to per acre revenue.

III. Technical Considerations and Discussion

Pit River Irrigated Pasture, Grass Hay, and Alfalfa Hay Management Survey Summary

In collaboration with the Northeastern California Water Association (NECWA), the University of California, Davis (UCD) distributed a survey to 138 irrigated pasture, grass hay, and alfalfa hay growers in the Pit River subwatershed in 2022. The

voluntary survey was designed to obtain additional economic and operational information on the dominant crop types within the subwatershed (approximately 90% of the crop types within the Pit River subwatershed are irrigated pasture and forage crops). Of the 138 surveys distributed, 102 growers (74%) completed the survey. The completed surveys (41,273 acres) accounted for 83% of enrolled irrigated pasture, grass hay, and alfalfa hay acreage (49,471 acres) within the Pit River subwatershed in 2022.

UCD provided a summary analysis report to the Water Board (2022 UCD Report; see Appendix 1 for the full report). Table 1 provides some characteristics of the Pit River subwatershed irrigated pasture, grass hay, and alfalfa hay farms from the 2022 UCD Report. The summary report also provides information on different management practices reported by growers who completed the survey.

Table 1. Characteristics of Irrigated Pasture, Grass Hay, and Alfalfa Hay Operations - Pit River Subwatershed, 2022

Irrigated Pasture Surveyed	**20,577**
Sprinkler Irrigated	2,359
Flood Irrigated	18,218
Nitrogen Applied	3,939
Pesticides Applied	476
Grass Hay Surveyed	**14,761**
Sprinkler Irrigated	4,382
Flood Irrigated	10,379
Nitrogen Applied	10,831
Pesticides Applied	3,854
Alfalfa Hay Surveyed	**5,935**
Sprinkler Irrigated	4,649
Flood Irrigated	1,286
Nitrogen Applied	1,038[a]
Pesticides Applied	3,582

Notes:
Units are in acres.
[a] These are low rates of N (10 - 20 lbs. per acre) that occur with applications of 11-52 phosphorous (P) fertilizer. P is held tightly in the soil profile and thus applications are needed only once every 3 – 4 years. As a nitrogen fixing legume, alfalfa does not require N fertilization.

Pit River Subwatershed Irrigated Pasture, Grass Hay, and Alfalfa Hay Economic Analysis

UCD also completed an economic analysis using the 2022 survey findings (Appendix 1) and current annual State ILRP fees (Table 2). Table 3 below provides a summary of economic information provided by UCD.

Table 2. Current Annual State ILRP Fees

Tier		State Fee
A	All irrigated lands, except those in Tier B	**$1.50 / acre**
B	Irrigated pastures with no nitrogen input	**$1.20 / acre**

Table 3. Economic Analysis for Irrigated Pasture, Grass Hay, and Alfalfa Hay Operations - Pit River Subwatershed, 2022 (with inflation adjustments for 2025)

Primary Crop[a]	Acres Surveyed	Average Yield per Acre	Average Gross Revenue per Year[b]	Average Operating Costs per Year[c]	Estimated Average Net Revenue per Year
Irrigated Pasture	20,577	1.6 tons hay and 4.1 AUMs grazing[d]	$403 / acre	$882 / acre	$-479 / acre
Grass Hay	14,761	4.4 Tons	$691 / acre	$995 / acre	$-304 / acre
Alfalfa Hay	5,935	4.8 Tons	$1,584 / acre	$1,123 / acre	$461 / acre
Total	41,273				

Notes:

[a] Each acre is grouped here for its primary crop type/revenue source.

[b] Sources for valuation:
Irrigated Pasture – Inflation adjusted value from University of California, Davis Cost and Returns Study (Macon & Stewart 2020)
Grass and Alfalfa Hay – U.S. Department of Agriculture's California Direct Hay Report (October 2024)
Inflation Adjustments – Bureau of Labor Statistics, Producer Price Index for Farm Products

[c] Sources for operating costs:
Irrigated Pasture – Inflation adjusted operating costs (Macon & Stewart 2020)
Grass and Alfalfa Hay – Inflation adjusted operating costs from University of California, Davis Cost and Returns Study (Long et al. 2020 Alfalfa; Orloff et al. 2016 Orchard Grass)
Inflation Adjustments – Bureau of Labor Statistics, Producer Price Index for Farm Products

[d] An Animal Unit Month (AUM) is a measure used to quantify the amount of forage required to support a 1,000 lb. beef cow for one month.

UCD provided an analysis of State Program fees for Pit River subwatershed irrigated pasture growers. The analysis shows that low-risk crops are also the lowest (or one of the lowest) earning crops, as is the case with Pit River subwatershed irrigated pasture in the Coalition. Factoring in revenue, this leads to growers at low risk of causing or contributing to water quality impacts paying a much higher regulatory costs as a percentage of revenue that is disproportionate to those growers that are causing and contributing to the water quality impacts. Two examples were provided by UCD:

- When comparing the estimated revenue for irrigated pasture to a valley floor commodity such as almonds, a grower would have to graze 6.6 acres to

generate the same revenue as 1 acre of almonds. Therefore, the grower would be assessed $7.92 in State fees while an almond grower would only be assessed $1.50 to generate the same revenue. The State fee cost would be approximately 5 times higher proportional to an almond grower.

- Similarly, a grower would have to graze 12.8 acres to generate the same revenue as 1 acre of tomatoes. Therefore, the grower would be assessed $15.36 in State fees while a tomato grower would only be assessed $1.50 to generate the same revenue. The State fee cost would be approximately 10 times higher proportional to a tomato grower.

Surface Water Quality Data

There is currently one representative surface water quality monitoring site in the Pit River subwatershed, Pit River at Pittville Bridge. Pit River at Canby Bridge and Fall River at Fall River Ranch Bridge are special project monitoring sites which are not currently monitored. Pit River at Pittville Bridge was selected to track trends and identify water quality issues in the subwatershed. Because of the size of the subwatershed, the monitoring location is up to one hundred stream miles downstream of irrigated lands. Though the ILRP is not intended to monitor discharge at the edge of each farm, it is worth noting that a lack of water quality impacts observed at the monitoring site does not mean that water quality impacts are not potentially present elsewhere in the subwatershed.

Surface water monitoring has been conducted in Pit River for the ILRP since 2004 and approximately 87 ILRP monitoring events have been conducted in the subwatershed. High priority constituents for surface water quality under the ILRP include pesticides and toxicity.

Of the around 97 different pesticides monitored in Pit River, 38 have applicable water quality criteria, and 59 do not. For those 38 monitored pesticides with water quality criteria, there are approximately 160 individual monitoring results, of which there has been one (1) exceedance of the applicable water quality criteria for malathion in 2019. For the 59 pesticides without applicable water quality criteria, there are about 220 monitoring results.

There have been 19 monitoring events to collect water samples for toxicity, yielding 37 individual results. There have been a total of three (3) water column samples with significant toxicity: one (1) with significant toxicity to *Ceriodaphnia dubia* in 2011, and two (2) with significant toxicity to *Hyalella azteca* in March and July of 2021. *Hyalella azteca* is monitored as an indicator for pyrethroid pesticide toxicity and did not trigger a surface water quality management plan because no pyrethroids were detected at toxic concentrations concurrently. Additionally, there are three (3) results for sediment toxicity, none of which were found to have significant toxicity.

In the ILRP, two (2) exceedances of an applicable water quality objective or water quality

trigger[1] at a monitoring site within three (3) years triggers the development of a surface water quality management plan aimed to reduce irrigated agriculture's contribution to the water quality issue and avoid future exceedances. There are no active surface water quality management plans for high priority constituents in Pit River. There are active surface water quality management plans for dissolved oxygen and pH in the subwatershed, which are considered lower priority constituents under the ILRP. Previously completed surface water quality management plans include lead and the indicator bacteria *E. coli*.

Overall, ILRP monitoring results indicate that surface water is generally of good quality and that irrigated agriculture in the Pit River subwatershed is a low-threat to surface water quality.

303(d) Listed Waterbodies

The Federal Clean Water Act requires States to look at water quality data and determine which waterbodies are potentially impaired, resulting in a Section 303(d) listing. The data is further evaluated when being considered for TMDLs, Basin Plan Amendments, or other pollutant control programs.

Within the Pit River subwatershed, the 2024 Combined Report records 56 303(d) listed waterbodies. However, many listings are not associated with irrigated agriculture. Waterbodies with impairment that may be either caused by or contributed to by irrigated agriculture are listed in Table 4 below and include approximately 20 listings.

Table 4 – 2020 to 2022 303(d) List of Impaired Waters: Pit River Subwatershed

Waterbody	Pollutants
Ash Creek, Upper	Indicator Bacteria, pH
Beaver Creek	Indicator Bacteria
Canyon Creek (Modoc County)	Indicator Bacteria
Eastman Lake (Shasta County)	pH
Fall River (Pit)	Sedimentation/Siltation, pH**
Pit River (from confluence of N and S forks to Shasta Lake)	Nutrients, Organic Enrichment/Low Dissolved Oxygen, Dissolved Oxygen, Toxicity**
Pit River, North Fork	Dissolved Oxygen, pH
Pit River, South Fork	Boron*, Dissolved Oxygen, pH, Salinity*
Rush Creek (Modoc County)	pH
Willow Creek (Lassen County, Central Valley)	Indicator Bacteria, pH

* indicates the waterbody pollutant is proposed to be delisted in the 2024 303(d) list
** indicates the waterbody pollutant is proposed to be listed in the 2024 303(d) list

Groundwater Quality Data

Groundwater quality trend monitoring and drinking water well monitoring are required

[1] Trigger limits are designed to implement narrative Basin Plan objectives and to protect applicable beneficial uses.

under the ILRP. For groundwater quality, nitrate is the highest priority constituent potentially related to irrigated agriculture.

The two existing Groundwater Quality Trend Monitoring Program network wells in the area have shown no detectable nitrate in groundwater since sampling for the ILRP began in 2019. One is a domestic well near Fall River Mills and the second is a public supply well near Canby.

The Drinking Water Well Monitoring Program requires all drinking water wells located on enrolled parcels to be monitored for nitrate. Of approximately 38 wells monitored, four (4) wells have exceeded the Maximum Contaminant Level (MCL) of 10 milligrams per liter (mg/L) of nitrate + nitrite as nitrogen. One (1) well located in Shasta County had an exceedance in 2022. Three (3) wells located in Modoc County had exceedances in 2023. The Members provided notice to the users of the wells within 10 days of learning of the exceedances and sent copies of the notices to the Central Valley Water Board. Once a well sample has exceeded the MCL, annual sampling does not continue at that well.

The Coalition has also previously looked at historical drinking water well data collected outside of ILRP requirements. The historical dataset includes nitrate results dating back to the 1950s. Of 583 drinking water wells historically sampled for nitrate in the Pit River subwatershed, 18 wells, or 3% of the total sampled, previously exceeded the Maximum Contaminant Level of 10 mg/L.

Overall, ILRP monitoring results indicate that irrigated agriculture in the Pit River subwatershed is a low-threat to groundwater water quality.

Pesticide Use

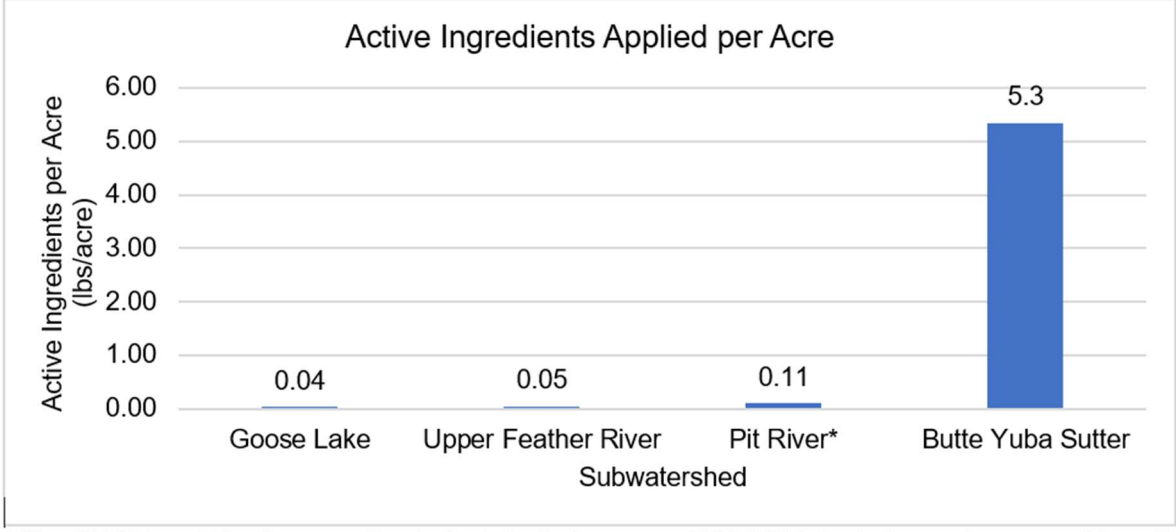
Pesticide Use Report (PUR) data was obtained from the California Department of Pesticide Regulation database for 2022, the most recent year available. PUR data includes data reported for all irrigated agriculture within the area, potentially up to 150,000 acres according to the California Department of Water Resources Land Use data; ILRP enrolled acreage is approximately 75,000 acres. For context and comparative purposes, in addition to Pit River, pesticide use data for two (2) previously exempted subwatersheds, Goose Lake and Upper Feather River, are included, as is a Sacramento Valley floor subwatershed, Butte Yuba Sutter (Table 5).

Table 5 – A comparison of pesticides applied in four irrigated lands subwatersheds within Sacramento Valley Water Quality Coalition

Subwatershed	Goose Lake	Upper Feather River	Pit River	Butte Yuba Sutter
Approximate Irrigated Acres	7,000	30,000	75,000-150,000	215,000
Number of Applied Pesticides	4	14	40	152
Total Active Ingredients Applied (lbs)	266	1,604	16,248	1,143,490
Active Ingredients Applied per Acre (lbs/acre)	0.04	0.05	0.11[a]	5.3

[a] The DWR Land Use Layer estimate for irrigated acreage (150,000 irrigated acres) was used to estimate average Pit River active ingredients applied per acre. Using the 75,000 enrolled irrigated acres, the active ingredients applied per acre is 0.22 lbs/acre.

Figure 1 – A comparison of active ingredients applied per acre for four (4) subwatersheds within Sacramento Valley Water Quality Coalition



* The DWR Land Use Layer estimate for irrigated acreage (150,000 irrigated acres) was used to estimate average Pit River active ingredients applied per acre. Using the 75,000 enrolled irrigated acres, the active ingredients applied per acre is 0.22 lbs/acre.

The 2022 PUR data indicates that pesticide applications in Pit River were primarily ground applications (92.5%) with limited aerial applications (7.5%). The pattern of ground and aerial pesticide applications reported in Pit River is consistent with Goose Lake, Upper Feather River, and Butte Yuba Sutter.

Pesticide active ingredients applied per acre of irrigated agriculture can provide a rough idea of pesticide use intensity in an area (Figure 1). It is worth noting that “pounds of active ingredient” is not directly analogous to toxicity as pesticide toxicity varies greatly

between pesticides and by mass; however, it can provide a rough idea of comparable pesticide use. The active ingredients applied per acre of irrigated agriculture in Pit River (0.11 lbs/acre) is approximately two (2) times that of Upper Feather River (0.05 lbs/acre) and approximately three (3) times that of Goose Lake (0.04 lbs/acre). However, the active ingredients applied per acre of valley floor irrigated agriculture in Butte Yuba Sutter (5.3 lbs/acre) is approximately 50 times that of Pit River. When compared to a Sacramento Valley floor subwatershed such as Butte Yuba Sutter, Pit River pesticide use is far lower. As discussed earlier in the staff report, monitoring demonstrates that irrigated agriculture in Pit River is at a low risk of water quality impacts due to pesticides.

IV. Draft Recommendations

Available information shows that Pit River irrigated agricultural operations are a low risk to surface and groundwater and are unlikely to affect beneficial uses. Additionally, state fee costs for the Pit River subwatershed are disproportionately high compared to valley floor agriculture. Because of this, exemption from participation in the ILRP is recommended.

If future information shows that irrigated agricultural operations may be causing or contributing to water quality problems, Waste Discharge Requirements General Order R5-2014-0030-11 will be modified to remove the exemption and these operations will be re-enrolled in the ILRP. The Water Board may require Pit River irrigated agricultural operations to participate in a water quality program specific to upper subwatershed operations or a grazing program, should either be developed in the future.

APPENDIX I

NECWA Irrigated Pasture, Grass Hay, and Alfalfa Grower Management Survey

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

NECWA Irrigated Pasture, Grass Hay, and Alfalfa Grower Management Survey.

This survey targeting growers of irrigated perennial forage crops in the Upper Pit River watershed, was initiated on March 24, 2022, and completed June 30, 2022.

RESULTS:

Table 1. Basic Survey Data and Response Rate

	Enrolled	Surveyed	Response Rate
Growers	138	102	74%
Acres	49,471	41,273	83%

Table 2. Characteristics of Irrigated Pasture Operations

Types of Irrigated Pasture	Acreage
Sprinkler Irrigated	2,359
Flood Irrigated	18,218
Total Combined Irrigated Pasture	20,577
Statistics of Irrigated Pasture	
Growers Producing Irrigated Pasture	73
Growers Applying N	24
Nitrogen (N) Applied Pasture Acreage	3,939
Average Rate of Nitrogen Application (Pounds N per Acre)	61[2]
Average Annual Production using Irrigated Pasture	1.6 tons hay and 4.1 AUM's grazing per Acre

1 An AUM = an Animal Unit Month or 1 cow/calf pair grazing for one month. Estimated at 1,000 lbs. of forage dry matter per acre.

2 rate of actual lbs./acre N by growers reporting use of N. Growers not reporting the use of N are not factored into this average.

Table 3. Characteristics of Grass Hay Operations

Types of Irrigated Grass Hay	Acreage
Sprinkler Irrigated	4,382
Flood Irrigated	10,379
Total Combined Irrigated Grass Hay	14,761
Statistics of Irrigated Grass Hay	
Growers Producing Grass Hay	47
Growers Applying N	39
Nitrogen (N) Applied Grass Hay Acreage	10,831
Average Rate of Nitrogen Application (Pounds N per Acre)	75[1]
Average Annual Production of Irrigated Grass Hay	4.4 tons per Acre

1 rate of actual lbs./acre N by growers reporting use of N. Growers not reporting the use of N are not factored into this average.

Table 4. Characteristics of Alfalfa Operations

Types of Irrigated Alfalfa	Acreage
Sprinkler Irrigated	4,649
Flood Irrigated	1,286
Total Combined Irrigated Alfalfa	5,935
Statistics of Irrigated Alfalfa	
Growers Producing Alfalfa	42
Growers Applying N	15[1]
Nitrogen (N) Applied Alfalfa Hay Acreage	1038
Average Annual Production of Irrigated Alfalfa	4.8 tons per Acre

[1] These are low rates of N (10 - 20 lbs. per acre) that occur with applications of 11-52 phosphorous (P) fertilizer. P is held tightly in the soil profile and thus applications are needed only once every 3 – 4 years. As a nitrogen fixing legume, alfalfa does not require N fertilization.

Nitrogen inputs occur primarily in grass dominated crops such as grass hay (most common) or irrigated pasture (less common). To optimize return on investment growers apply nitrogen to coincide with periods of rapid crop growth ensuring maximum nutrient uptake and use. The nitrogen application rates reported by growers are far below the agronomic potential for nitrogen uptake. A thorough scientific analysis of nitrogen use by forage grasses in the Upper Pit River watershed can be found in Wilson et al 2008 (full citation below).

Wilson, R.G., Orloff, S.B., Lancaster, D.L., Marcum, D.B., and Drake, D.J. 2008. Assessing nitrogen fertilizer needs for irrigated orchardgrass in the intermountain region of California. Online. Forage and Grazing Lands doi:10.1094/FG-2008-0618-01-RS.

Table 5. Crop Rotation, Stand-Life, and Planting Practices

	Number of growers that have replanted fields	Average stand-life of those who have replanted	Average number of months ground is bare when replanting occurs	Season of Replanting
Irrigated Pasture	11 (15%)	9.6 years	0.7 months*	64% Fall 36%Spring
Grass Hay	25 (53%)	9.5 years	1.7 months*	75% Fall 25% Spring
Alfalfa	41 (98%)	7.7 years	2.0 months*	77% Fall 23% Spring

*Combining stand life and bare ground planting time, replanted fields still maintain complete perennial vegetative ground cover 98% to 99% of the time overall. Fields that have not been replanted maintain perennial vegetative ground cover 100% of the time.

Table 6. Grazing Management Best Management Practices, Irrigated Pasture (73 growers, 20,577 acres)

Grazing Management Practices	Number of Respondents	Acres Reported
Grazing Management Plan	36 (49%)	9,001
Appropriate Stocking Rate	72 (99%)	19,782
Livestock Grazing Rotation	66 (90%)	18,422
Pasture Rest Before Irrigation	42 (58%)	10,964
Fencing to Control Access to Waterbodies	39 (53%)	12,502
Defined Stream Crossings	30 (41%)	10,237
Drinking Water Away from Waterbodies	41 (56%)	7,982
Salt/Supplement Away from Waterbodies	69 (95%)	18,459
Drag Pasture	69 (95%)	19,272

Table 7. Irrigation and Tail Water Management Best Management Practices Irrigated Pasture (73 growers, 20,577 acres)

Irrigation and Tail Water Management Practices	Number of Respondents	Acres Reported
Appropriate Application Rate of Water	71 (97%)	18,042
Uniform Application of Water	54 (74%)	14,263
Use of Soil Moisture Monitoring and/or CIMIS	36 (49%)	9,966
No Tail Water	23 (32%)	3,507
Tail Water Goes to Another Agricultural User Via Irrigation Ditch	27 (37%)	12,485
Tail Water Recovery/Return System	25 (34%)	8,855
Tail Water Filtered by Vegetated Ditch/Buffer/Strip	53 (73%)	15,395
Use of Catchment/Sediment Basin	25 (34%)	7,402
Wetlands to Filter Runoff	35 (48%)	12,097

Table 8. Pesticide Applications by Crop Type

Crop Type	Growers Applying Pesticide		Acres of Pesticide Applied	Percentage of Crop Area with Pesticide Application
	Spot Spray	Broadcast Spray		
Irrigated Pasture	15 (21%)	5 (7%)	476	2.3%
Grass Hay	6 (13%)	16 (34%)	3854	26.1%
Alfalfa	3 (7%)	22 (52%)	3582	60.4%

The need for pesticide use (Table 8.) in the Upper Pit River watershed is an annual decision faced by producers and fluctuates year to year both at the farm scale and watershed scale. The economics (relatively low returns) of forage crop production systems preclude over-reliance on inputs. Pesticides are applied only when necessary to combat a specific weed or pest infestation. Growers also indicate that when treatments are used, it is typically only a single treatment per year. Alfalfa crops are more likely to use pesticides but are also likely to have irrigation systems that have very minimal or no run-off. Additionally, when pesticides are used a suite of applicable best management practices are employed (Table 9.)

Table 9. Best Management Practices Used by Growers who Apply Pesticides.

Best Management Practice	Number of Growers		
	Irrigated Pasture	Alfalfa	Grass Hay
County Applies Pesticides	9 (45%)	9 (36%)	7 (32%)
County Permit Followed	20 (100%)	25 (100%)	22 (100%)
Follow Label Restrictions	20 (100%)	25 (100%)	22 (100%)
Sensitive Areas Mapped	10 (50%)	18 (72%)	15 (68%)
Attend Pesticide Applicator Trainings	20 (100%)	24 (96%)	22 (100%)
Monitor Wind Conditions	20 (100%)	25 (100%)	22 (100%)
Avoid Surface Water when Spraying	20 (100%)	25 (100%)	22 (100%)
Use Appropriate Buffer Zones	20 (100%)	23 (92%)	21 (95%)
Use strategies to Control Drift	20 (100%)	24 (96%)	22 (100%)
Monitor Rain Forecasts	17 (85%)	24 (96%)	22 (100%)
Use PCA Recommendations	14 (70%)	20 (80%)	22 (100%)
Ensure application equipment is calibrated	17 (85%)	19 (76%)	20 (91%)