Upper Feather River Irrigated Pasture and Alfalfa Pesticide Transport Risk Assessment Summary
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Background and Purpose

During the course of evaluating the low risk to water quality status of irrigated agriculture in the Upper Feather River sub-watershed of the Sacramento Valley Water Quality Coalition (SVWQC) it was determined from pesticide use reporting 2016 through 2021 provided by the Plumas-Sierra County Agricultural Commissioner that paraquat dichloride and lambda-cyhalothrin – both of potential concern to the Central Valley Regional Water Quality Control Board (WB) and others – were applied to irrigated acres in the sub-watershed (Tables 1 and 2). Application was limited in acreage with reported paraquat dichloride applications to sprinkler irrigated alfalfa parcels representing 1.7 to 2.9% of total irrigated acres annually between 2016 and 2021 (Table 1). Lambda-cyhalothrin was reported to be applied 3 out of the 6 years in the sub-watershed primarily to sprinkler irrigated alfalfa (125 to 1,081 acres annually) with total reported applications for those 3 years across alfalfa and irrigated pasture representing 0.4 to 4.4% of total irrigated acres (Table 2).

As one component of the low risk status evaluation for the sub-watershed, site (farm) specific assessments (case studies) were conducted during late September and early October of 2022 to determine the potential risk of hydrologic transport and subsequent downstream contamination of surface waters from applications of paraquat dichloride and lambda-cyhalothrin occurring on these farms. A total of five case studies were conducted by UC Cooperative Extension (UCCE) via on-farm visits during which a structured assessment framework was used to determine the amount, timing, and location of pesticide applications relative to hydrologic transport events (i.e., irrigation events, storm runoff) and proximity to surface waters. The structured assessment framework was developed collaboratively by UCCE and the WB based upon standard

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principles of pollutant environmental fate and transport risk assessment. Collectively the 5 case studies examined all of the reported/permitted applications of paraquat dichloride and lambda-cyhalothrin in the sub-watershed from 2016 through 2021.

Table 1. *Paraquat dichloride reported/permitted use in the Upper Feather River sub-watershed 2016 through 2021. No application reported/permitted on irrigated pasture was reported.*

Year	Alfalfa Acres	Alfalfa Active Ingredient (lbs)	% of Total Irrigated Acres
2016	785	410	2.6
2017	510	146	1.7
2018	730	252	2.4
2019	790	286	2.6
2020	625	214	2.1
2021	980	322	2.9

Table 2. *Lambda-cyhalothrin reported/permitted use in the Upper Feather River sub-watershed 2016 through 2021.*

Year	Alfalfa Acres	Alfalfa Active Ingredient (lbs)	Irrigated Pasture Acres	Irrigated Pasture Active Ingredient (lbs)	% of Total Irrigated Acres
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	125	2.5	0	0	0.4
2019	0	0	0	0	0
2020	555	11.3	100	2.9	2.1
2021	1,081	15.7	250	4.9	4.4

Paraquat Dichloride and Lambda-Cyhalothrin – Overview

These pesticides are of concern to the WB and others due to their potential toxicity to humans and the environment if handled and/or applied inappropriately. Both have the potential to cause acute and chronic health issues for aquatic organisms if they reach surface waters.

Paraquat dichloride (paraquat) is 1) a non-selective herbicide used for the control of broadleaf and grass weeds in agricultural and non-agricultural use settings; 2) a contact herbicide that inhibits photosynthesis, desiccating and destroying plant cell membranes within hours of application; and 3) a restricted use pesticide that can only be used by certified applicators due to "acute toxicity". Herbicide products containing paraquat are labeled with the signal word "danger" (high toxicity). In terms of environmental fate, paraquat 1) is rapidly absorbed into foliage and is rain-fast within 30 minutes of application; 2) remains in treated leaves under normal conditions; 3) is rapidly and tightly bound to soil particles; and 4) is completely inactive, biologically unavailable, and immobile in soil due to tight adsorption with no leaching potential. Unless paraquat were applied directly to surface waters (e.g., wind drift, overspray) the most likely means of transport to, and contamination of, surface waters would be mobilization and transport of paraquat bound to soil particles via soil erosion. Paraquat is also subject to moderate rates of photodegradation – it can be degraded from plant surfaces and possibly from soil surfaces to the extent of 25-50% in 3 weeks under conditions of full sunlight. The information above about paraquat is derived from the *Herbicide Handbook* (Weed Science Society of America, 14th Edition, 2014), the US Environmental Protection Agency's pesticide product labels, and the scientific literature.

Lambda-Cyhalothrin (lambda) 1) is a pyrethroid insecticide used for the control of a broad group of pests (e.g., aphids, weevils, grasshoppers, ants, termites, cockroaches, mosquitoes) in agricultural and non-agricultural (e.g., indoor/outdoor residential, commercial) use settings; 2) disrupts the nervous system of insects within minutes of contact leading to cessation of feeding, loss of muscular control, paralysis, and eventual death; 3) provides additional crop protection due to the insecticide's strong repellent effect toward insects; and 4) is a restricted use pesticide that can only be used by certified applicators due to "toxicity to fish and aquatic organisms". Insecticide products containing lambda-cyhalothrin are commonly labeled with the signal word "warning" (moderate toxicity). In terms of environmental fate, lambda 1) is rapidly and strongly adsorbed to soils and sediments; 2) is highly immobile in soil due to tight adsorption with almost no leaching potential; 3) can be subject to photodegradation with a half-life of less than 5 minutes in full sunlight; 4) can be subject to breakdown via hydrolysis in environments with pH >8; and 5) is subject to uptake from water (i.e., agricultural tailwater), adsorption, and accelerated degradation by plants in systems such as irrigated pasture, alfalfa, vegetated ditches, and wetlands. Unless lambda were applied directly to surface waters (e.g., wind drift, overspray) the most likely means of transport to, and contamination of, surface waters and sediments in surface waters would be mobilization and transport of lambda bound to soil (particularly soil organic matter) via soil erosion. The information above about lambda is derived from He, L.M., Troiano, J., Wang, A., and Goh, K.S.

2008. *Environmental Chemistry, Ecotoxicity, and Fate of Lambda-Cyhalothrin*, Reviews of Environmental Contamination and Toxicology, 195:71-91; the US Environmental Protection Agency's pesticide product labels; and the scientific literature.

Paraquat Dichloride and Lambda-Cyhalothrin – Permitted Uses in the UFRW sub-watershed

Table 1 reports the acres and pounds of active ingredient for paraquat reported/permitted by the Plumas-Sierra County Agricultural Commissioner for application in the UFRW sub-watershed from 2016 through 2021. Only one grower reported the use of paraquat on alfalfa (Case Study 4) for the purpose of controlling early spring broadleaf and grass weeds. Across all years, applications occurred between early March and mid-April (late winter depending upon annual weather conditions) subsequent to weed emergence but while alfalfa was still dormant.

Table 2 reports the acres and pounds of active ingredient for lambda reported/permitted by the Plumas-Sierra County Agricultural Commissioner for application in the UFRW sub-watershed from 2016 through 2021. Application of lambda was reported by one grower on irrigated pasture to control grasshopper outbreak in July of 2020 and by that same grower plus another grower for the same purpose in May of 2021 (Case Studies 1 and 2). Application of lambda was reported for alfalfa by one grower in late April of 2020 and 2021 for control of alfalfa weevil (Case Study 3), by one grower in June of 2018 for control of aphids (Case Study 4), and by one grower in early April of 2021 for control of alfalfa weevils and aphids (Case Study 5).

Paraquat Dichloride and Lambda-Cyhalothrin – Summary of Case Studies

Five site (farm) specific assessments (case studies) were conducted during late September and early October of 2022 to determine the potential risk of hydrologic transport and subsequent downstream contamination of surface waters from applications of paraquat dichloride and lambda-cyhalothrin. The details of each risk assessment, as well as site photographs can be found at the end of this summary.

Representativeness of the Case Study Sites. Upon site visits, it became clear that these farms are typical of irrigated pasture and alfalfa production operations across the sub-watershed and region in terms of weather, soils, hydrology, agronomic practices, irrigation, best management practice adoption, productivity and economics as described in Appendix 1X of this recommendation. These sites are also representative of potential risk of hydrologic transport and subsequent downstream contamination of surface waters from applications of pesticides broadly (i.e., paraquat and lambda as well as other pesticides of lesser environmental concern used in the sub-watershed). As a representative sub-sample of irrigated pasture and alfalfa operations, the findings below would have application broadly across these commodities throughout the sub-watershed.

Lambda-Cyhalothrin Application to Irrigated Pasture. As indicated above, application of lambda was reported by one grower on irrigated pasture to control grasshopper outbreak in July of 2020 and by two growers for the same purpose in May of 2021 (Case Studies 1 and 2). During the site assessment we found that both the actual acreage and amount of active ingredient applications were essentially an order of magnitude lower than what was reported/permitted (Table 2). In Case Study 1, the actual irrigated pasture acreage with application was 4 and 3 acres in 2020 and 2021, respectively – compared to the 100 acres permitted each year by the Agricultural Commissioner. Actual active ingredient applied was 0.09 and 0.07 pounds in 2020 and 2021, respectively – compared to the 2.97 and 1.98 pounds permitted for each year. Thus, total active ingredient applied over both years was 96.7% lower than permitted/reported in this case. The same was true for Case Study 2. In Case Study 2, the actual irrigated pasture acreage with application was 10 acres in 2021 – compared to the 150 acres permitted by the Agricultural Commissioner. Actual active ingredient applied was 0.23 pounds – compared to the 2.97 pounds permitted. Thus, total active ingredient applied was 92.3% lower than permitted/reported. In both cases, we found that lambda was actually being applied as a targeted application focused primarily on dryland areas where grasshoppers were reared immediately adjacent to irrigated pasture, and at a time when they were still too immature to take flight. In Case Study 1, 46% of the acres treated with lambda were dryland (not irrigated). In Case Study 2, 60% of the acres treated with lambda were dryland (not irrigated). Both of these cases represent targeted pesticide application, not field scale applications.

The risk of lambda transport to surface water as irrigation tailwater or storm runoff for both Case Study 1 and 2 was determined to be non-existent due to distances from surface waters, high topography between pastures and surface waters, and the fact that all irrigation is consumptively used on-ranch with no tailwater leaving the property, nor entering a surface water. Risk of direct deposition to surface waters due to drift was also determined to be non-existent due to distances from surface waters and use of best practices during pesticide application to prevent drift.

Paraquat Dichloride and Lambda-Cyhalothrin Application to Irrigated Alfalfa. As indicated above, only one grower reported the use of paraquat on alfalfa for the purpose of controlling early spring broadleaf and grass weeds all 6 years (Case Study 4). Lambda was applied to alfalfa in 3 of the 6 years to control weevils and/or aphids by 3 growers (Case Studies 3, 4, and 5). In all cases of paraquat and lambda application to alfalfa the actual acres and active ingredient applied was the same as permitted/reported by the Agricultural Commissioner (Case Study 3, 4, and 5). The risk of lambda transport to surface water as irrigation tailwater or storm runoff for both paraquat and lambda applied to alfalfa in these cases was determined to be none for a suite of reasons. First, all applications were made to low pressure sprinkler irrigated fields with no tailwater generation. Second, timing of application relative to snowmelt and possible summer storms prohibits the risk of storm runoff. Third, the nearest surface waters to any of the fields is 1 mile. Fourth, all fields have berms, railroad tracks, and/or roads which would prohibit any possibility of surface flow from the fields reaching surface waters. Risk of direct deposition to surface waters due to drift was also determined non-existent due to distances (>1 mile in all cases) from surface waters and application of best pesticide application practices to prevent drift.

Conclusions

The risk of transport to surface waters is almost nonexistent if not completely nonexistent in all cases. This assessment is based upon the 1) properties of paraquat and lambda to absorb tightly and immediately to soil particles; 2) complete vegetative soil cover at all sites preventing soil erosion and soil bound pesticide transport; 3) lack of evidence of erosion at any of the case studies; 4) lack of tailwater generation and/or lack of tailwater contribution to surface waters; 5) distances of pasture/fields to surface water; 6) temporal decoupling of the timing of application from potential hydrologic mobilization events for multiple days if not weeks – allowing pesticide absorption to soil and uptake by plants; 7) extremely low amount of active ingredient applied across all cases, and 8) implementation of irrigation application, tailwater management, and pesticide application BMPs.

APPENDIX III

Upper Feather River Irrigated Pasture Pesticide Transport Risk Assessments
Case Studies 1-5

Upper Feather River Irrigated Pasture and Alfalfa Pesticide Transport Risk Assessment

CASE STUDY #1

PESTICIDE APPLICATIONS AND PURPOSES: *what were the reported pesticide uses (2016-2021) covered by this assessment, were the actual uses different from what was permitted (a.k.a. reported), and what were the purpose for their use.*

Table 1. The pesticide uses reported (i.e., permitted) by this farm operator annually 2016 through 2021, and thus included in this case study, are summarized below.

Year	Pesticide	Meridian	Month-Day	Acres	AI* (lbs)
2020	LAMBDA-CYHALOTHRIN	32M26N10E22	7/8/2020	100	2.97
2021	LAMBDA-CYHALOTHRIN	32M26N10E22	5/3/2021	100	1.98

***AI = active ingredient**

Table 2. The pesticide uses actually implemented by this farm operator annually 2016 through 2021, if different from those reported (i.e., permitted) in Table 1. If not different, leave blank.

Year	Pesticide	Meridian	Month-Day	Acres Treated	AI** (lbs)
2020	LAMBDA-CYHALOTHRIN	32M26N10E22	7/8/2020	4 irrigated pasture 3 dry rangeland	0.09
2021	LAMBDA-CYHALOTHRIN	32M26N10E22	5/3/2021	3 irrigated pasture 3 dry rangeland	0.07

****AI = total active ingredient application to irrigated lands**

In this case, the reported use of lambda-cyhalothrin substantially exceeded the actual use in both 2020 and 2021. This pesticide was applied to non-irrigated (dry rangelands) at the upper edge of irrigated pasture. Timing and location of application was targeted to impact grasshoppers emerging from dryland rearing grounds prior to their movement into adjacent irrigated pasture. In 2020, application was made at ~0.023 lbs of active ingredient (~3 oz of product) per acre to 3 acres of non-irrigated rangeland and an adjacent 4 acres of irrigated pasture. In 2021, application was made at ~0.023 lbs of active ingredient (~3 oz of product) per acre to 3 acres of non-irrigated rangeland and to an adjacent 3 acres of irrigated pasture. The actual application of lambda-cyhalothrin to irrigated lands in this case study across both 2020 and 2021 was 0.16 lbs (Table 2), not 5 lbs as reported/permitted (Table 1).

1) Purpose(s) for paraquat dichloride applications (leave blank if not applicable)?

2) Purpose(s) for lambda-cyhalothrin applications (leave blank if not applicable)?

Control of grasshopper infestation

APPLICATIONS RELATIVE TO SURFACE WATERS AND HYDROLOGIC TRANSPORT PATHWAYS: *how close was pesticide applied to surface waters, what is the likelihood that pesticides applied to fields/pastures could be transported in surface runoff, tailwater ditches, vegetated ditches, buffers, etc. to surface waters.*

3) Are applications made primarily to irrigated fields/pastures, to dry areas within or at the edge of fields/pastures, or a combination of the above? Please provide a brief explanation and percentages if a combination of application to dry and irrigated ground.

The applications in this case study would be best described as targeted control of emerging grasshopper populations on non-irrigated adjacent rangelands where grasshopper eggs were laid in the soil and from which juveniles (pre-flight) were emerging at the time of application. Roughly 50% of the application (area and amount) was to dry rangelands to directly target emerging grasshoppers, and the remaining 50% was applied to the edge of the adjacent irrigated pasture to deter grasshopper entry to the irrigated pasture. In this case the application was made at the top of the pasture to rangelands above (elevational) irrigation water application and to a strip about 100 feet wide across the top of the irrigated pasture.

4) What is the distance (e.g., feet, yards, miles) from the fields/pastures with application to the nearest stream or surface waters (downstream and/or adjacent)? Is it likely that pesticides from these fields/pastures could transport as surface runoff to surface waters?

The nearest downslope surface water is Wolf Creek - approximately 1 mile. Indian Creek is above (elevational) the application site about 400 yards. Due to sedimentation over time, there is a dryland berm along Indian Creek which is of higher elevation than the irrigated pasture. Irrigation water is applied to the top of the field (~400 yards from Indian Creek) and the pasture slopes away from Indian Creek. Since the pesticide application was to the top of this pasture, the entire pasture (~800 yards) served as a transport filter. Discharge from the pasture enters a downslope dryland pasture and is fully consumed. There is no potential for transport of pesticides in this case.

5) Pesticides often absorb to soil particles once applied to a field/pasture, and could be transported with soil particles if soil erosion occurs following application. Were the fields/pastures with application covered with permanent vegetation (i.e. soil surface cover, field edge buffers)? Is it likely that pesticides from this these fields/pastures could transport via soil erosion to surface waters?

The pasture has permanent vegetation with no bare ground. Soil erosion was not evident and is not likely, and given the lack of surface runoff from the field described above, the potential for sediment transport is also not likely.

6) Is there any opportunity for direct application (i.e., overspray) or indirect drift (i.e., wind) of pesticides to streams or surface waters (downstream and/or adjacent)?

There is a 400 yard buffer between the application site and the nearest surface water (Indian Creek). Best practices were employed to such that application (ground application) occurred early morning on days with no wind to ensure product impacts the pest of concern without off-site impacts.

7) Are the fields/pastures with application flood or sprinkler irrigated? If a combination, what are the acres of flood and sprinkler irrigated?

The pasture is flood irrigated via risers delivering pumped water. The pasture is laser leveled with even irrigation water application and full control of timing, distribution, and amount of irrigation.

8) During irrigation events, do the fields/pastures with application generate surface runoff (i.e., tailwater)? If so, how much tailwater is generated (as a percentage of water applied) and where does the runoff go (e.g., another field/pasture, surface water)?

The pasture generates limited tailwater. Discharge from the pasture enters a downslope dryland pasture and is fully consumed with no tailwater discharge to surface waters.

9) In general – given soil texture, climate/weather conditions, irrigation water supplies, and other site specific factors – what is the potential for runoff from the fields/pastures receiving application to impact surface waters? Please provide a brief explanation.

Non-existent because of permanent vegetated fields, limited irrigation water, laser leveled fields with uniform flow, drought and dry soil conditions during application. No tailwater contribution to surface waters. Additionally, irrigation water is pumped, and power costs are prohibitive for runoff/excess flows. Weather forecast is monitored and application occurs only if there is no rain in the forecast.

APPLICATIONS RELATIVE TO HYDROLOGIC TRANSPORT EVENTS: *when were pesticides applied to field/pastures relative to hydrologic transport events such as irrigation, and what is the likelihood that pesticides applied to fields/pastures could be transported due to proximity in time to these events.*

10) Are applications made during the spring prior to, or during summer irrigation season – or during both periods?

During summer irrigation season.

11) For applications made in the spring prior to the irrigation season, on average how many days does application occur prior to the initiation of irrigation?

Not applicable.

12) For applications made during the summer irrigation season, on average how many days does application occur prior to the subsequent irrigation event?

Applications occurs about 2 days after irrigation, once soil surface is dry enough for ground application via light weight ATV. The first irrigation following pesticide application occurs 10-14 days post application irrigation depending on soil water conditions.

13) For any applications is there potential for rainfall or snow melt runoff events to transport pesticides from the field/pasture to surface waters?

Weather forecasts are monitored so that applications are not made prior to storm events. These applications occurred during the summer drought period when rainfall is limited and dry soils have high infiltration potential.

PESTICIDE APPLICATION BEST MANAGEMENT PRACTICES: *what are the standard best practices employed to assure safe and efficient application.*

14) Please indicate which of the following best management practices employed for the specific fields/pastures assessed for paraquat dichloride and lambda-cyhalothrin applications.

Practice	Implemented (Yes/No)
County Applies Pesticides	No
County Permit Followed	Yes
Follow Label Restrictions	Yes
Sensitive Areas Mapped	Yes
Attend Trainings	Yes
Monitor Wind Conditions	Yes
Reapply Rinsate to Treated Field	Yes
Avoid Surface Water When Spraying	Yes
Use Appropriate Buffer Zones	Yes
Use Drift Control Agents	Yes
Monitor Rain Forecasts	Yes
Use PCA Recommendations	Yes
Ag Commissioner Conducts Pretreatment Inspection	Yes

Case Study 1 - Photos

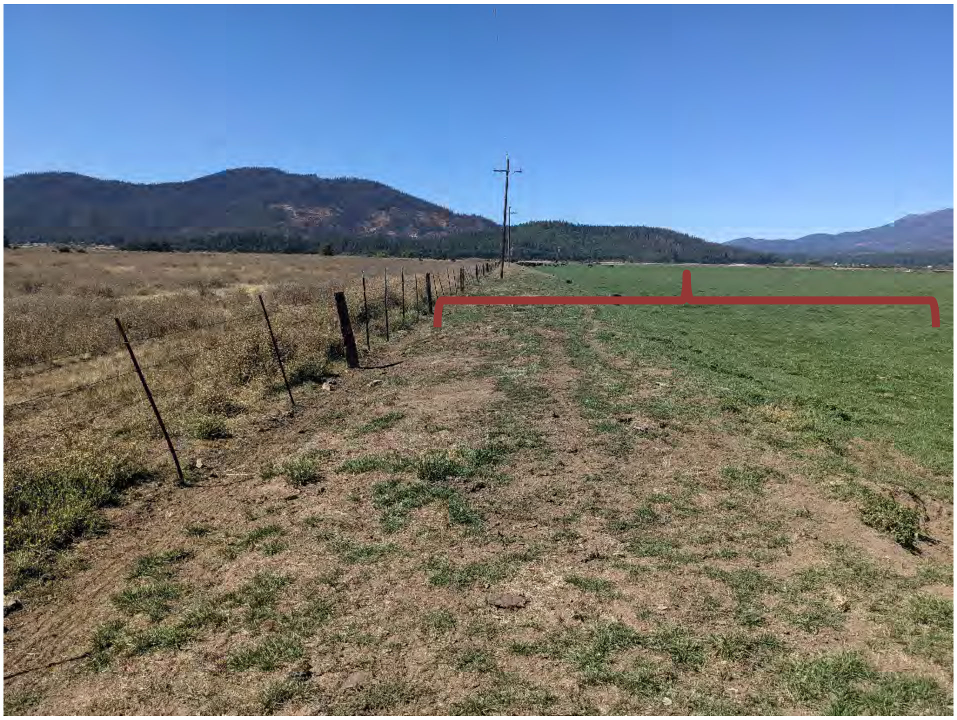
Image 1 – Case Study 1: Bracket indicates the area where lambda-cyhalothrin was applied.

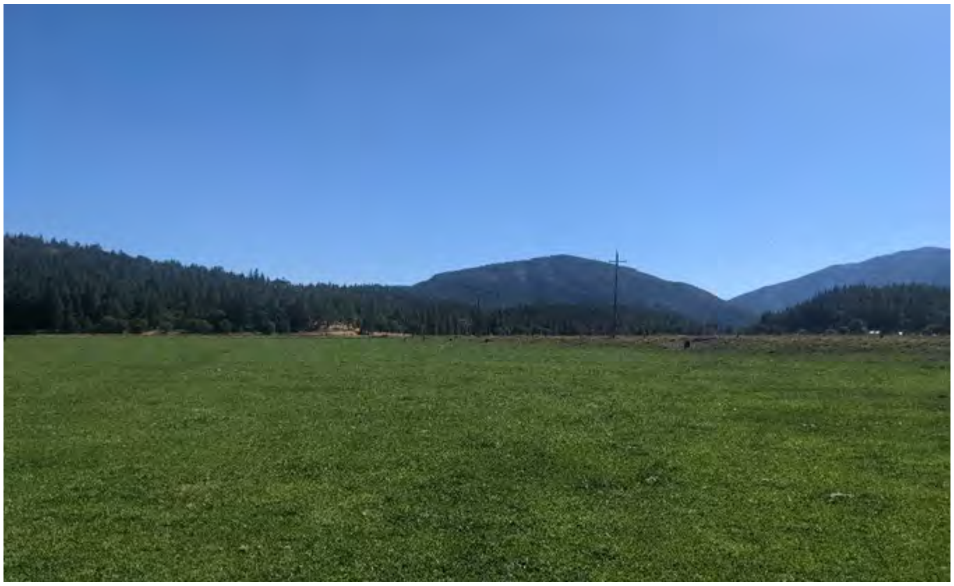
Image 2 – Case Study 1: Permanent vegetation on the irrigated pasture.

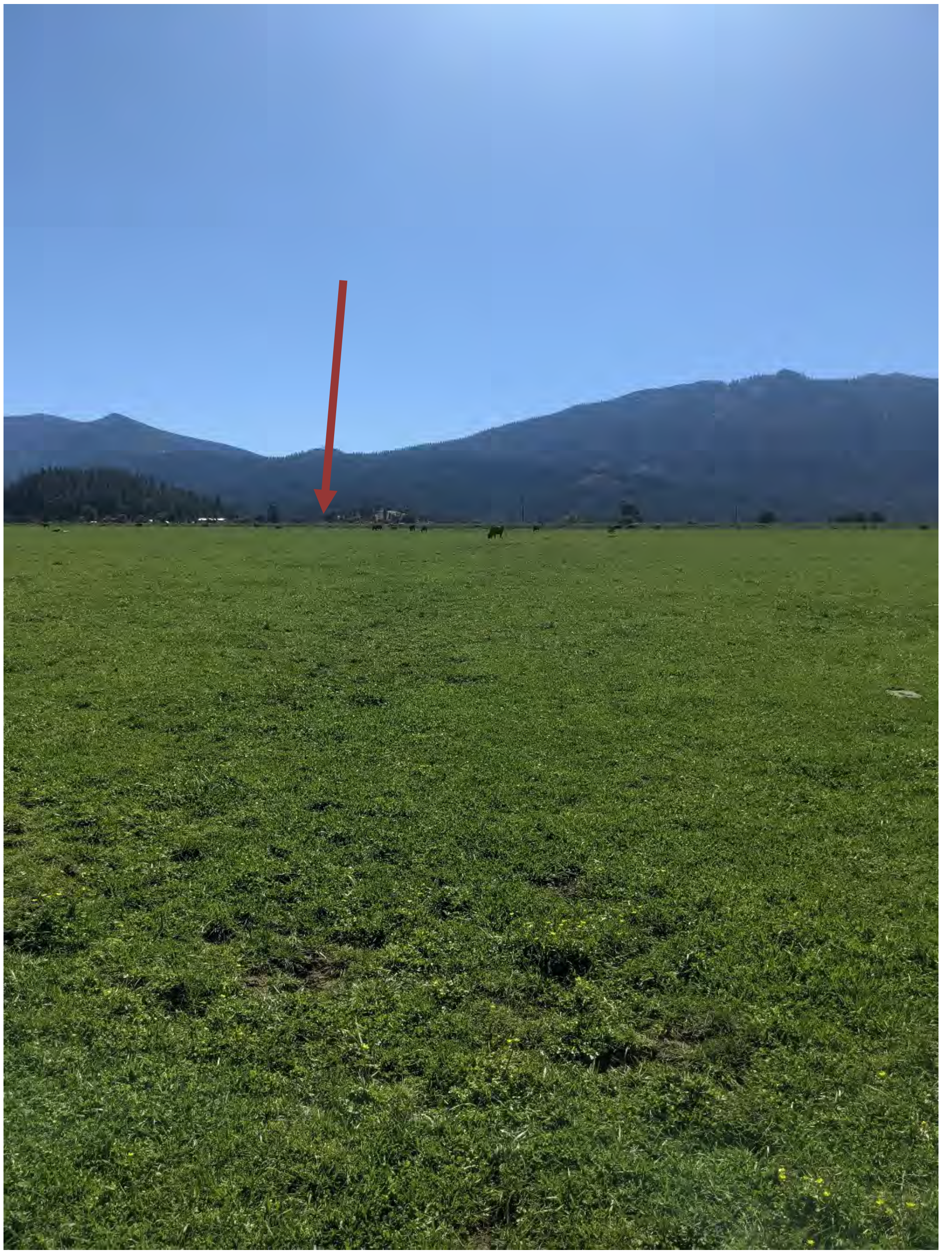

Image 3 – Case Study 1 – The arrow indicates the location of application at top of the pasture. The photo was taken from the bottom of the pasture and depicts the 800 yards of travel distance across the pasture. (taken from same location as Image 4)

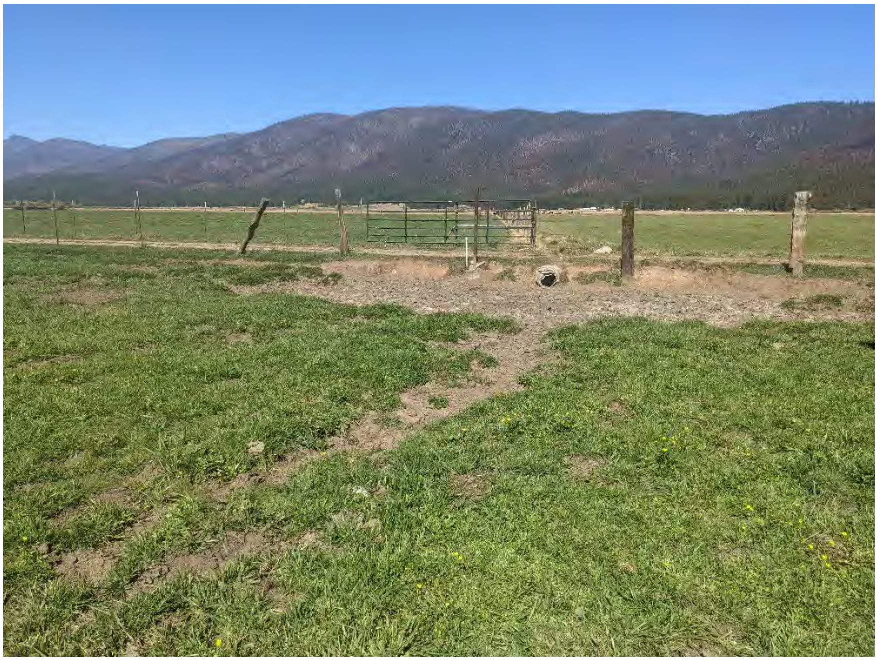

Image 4 – Case Study 1: Point of tailwater discharge from the irrigated pasture with application. Any tailwater from the pasture with application is applied to the pastures below the culvert.

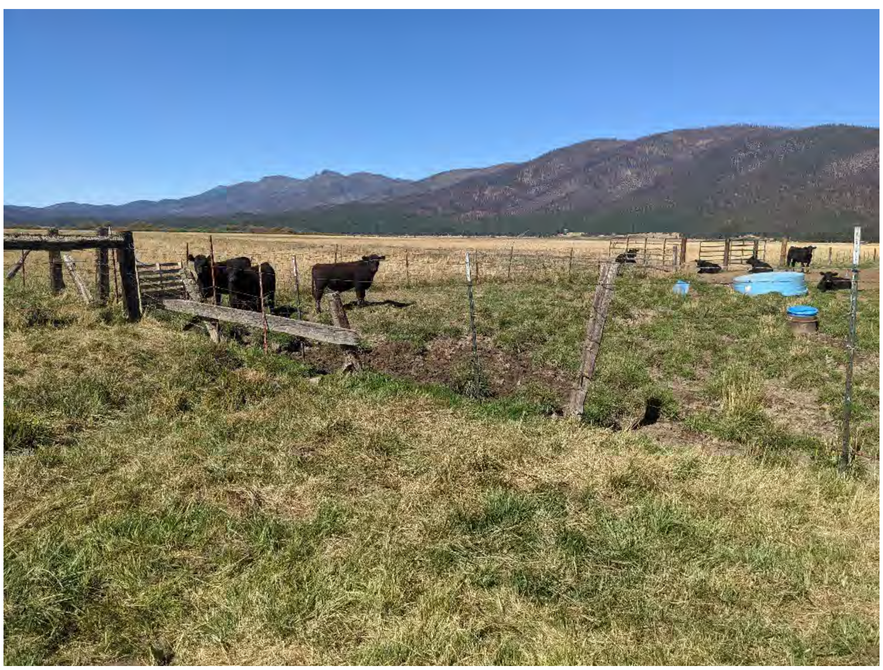

Image 5 – Case Study 1: The terminal pasture which receives any tailwater originating from the pasture with pesticide application – approximately 1600 yards up-slope. No tailwater is discharged from the dry pasture below the cattle in this photo.

Upper Feather River Irrigated Pasture and Alfalfa Pesticide Transport Risk Assessment

CASE STUDY #2

PESTICIDE APPLICATIONS AND PURPOSES: *what were the reported pesticide uses (2016-2021) covered by this assessment, were the actual uses different from what was permitted (a.k.a. reported), and what were the purpose for their use.*

Table 1. The pesticide uses reported (i.e., permitted) by this farm operator annually 2016 through 2021, and thus included in this case study, are summarized below.

Year	Pesticide	Meridian	Date	Acres	AI* (lbs)
2021	LAMBDA-CYHALOTHRIN	32M26N10E22	5/12/2021	150	2.97

***AI = active ingredient**

Table 2. The pesticide uses actually implemented by this farm operator annually 2016 through 2021, if different from those reported (i.e., permitted) in Table 1. If not different, leave blank.

Year	Pesticide	Meridian	Date	Acres Treated	AI** (lbs)
2021	LAMBDA-CYHALOTHRIN	32M26N10E22	5/12/2021	10 irrigated pasture 15 dry rangeland	0.23

****AI = total active ingredient application to irrigated lands**

In this case, the reported use of lambda-cyhalothrin substantially exceeded the actual use. This pesticide was applied primarily to non-irrigated (dry rangelands) and along the edge of adjacent irrigated pasture. Timing and location of application was targeted to impact grasshoppers emerging from dryland rearing grounds prior to their movement into adjacent irrigated pasture. Application was made at ~0.023 lbs of active ingredient (~3 oz of product) per acre to 15 acres of non-irrigated rangeland and an adjacent 10 acres of irrigated pasture. The actual application of lambda-cyhalothrin to irrigated lands in this case study was 0.23 lbs (Table 2), not 3 lbs as reported/permitted (Table 1).

1) Purpose(s) for paraquat dichloride applications (leave blank if not applicable)?

2) Purpose(s) for lambda-cyhalothrin applications (leave blank if not applicable)?

Control of grasshopper infestation.

APPLICATIONS RELATIVE TO SURFACE WATERS AND HYDROLOGIC TRANSPORT PATHWAYS: *how close was pesticide applied to surface waters, what is the likelihood that pesticides applied to fields/pastures could be transported in surface runoff, tailwater ditches, vegetated ditches, buffers, etc. to surface waters.*

3) Are applications made primarily to irrigated fields/pastures, to dry areas within or at the edge of fields/pastures, or a combination of the above? Please provide a brief explanation and percentages if a combination of application to dry and irrigated ground.

The applications in this case study would be best described as targeted control of emerging grasshopper populations on non-irrigated adjacent rangelands where grasshopper eggs were laid in the soil and from which juveniles (pre-flight) were emerging at the time of application. Roughly 60% of the application (area and amount) was to dry rangelands to directly target emerging grasshoppers, and the remaining 40% was applied to the edge of the adjacent irrigated pasture to deter grasshopper entry to the irrigated pasture. In this case the application was made at the top of the pasture to rangelands above (elevational) irrigation water application and to a strip about 100 feet wide across the top of 3 irrigated pastures.

4) What is the distance (e.g., feet, yards, miles) from the fields/pastures with application to the nearest stream or surface waters (downstream and/or adjacent)? Is it likely that pesticides from these fields/pastures could transport as surface runoff to surface waters?

There is no downslope surface water that receives tailwater from any of the irrigated pastures on this ranch, all irrigation water is consumed on this property. Indian Creek is above (elevational) the application site about 300 yards. Due to sedimentation over time, there is a dryland berm along Indian Creek which is of higher elevation than the irrigated pasture - the pasture slopes away from Indian Creek. The final field on this property receiving irrigation application/tailwater is a hay pasture which does not generate tailwater. There is no potential for transport of pesticides in this case.

5) Pesticides often absorb to soil particles once applied to a field/pasture, and could be transported with soil particles if soil erosion occurs following application. Were the fields/pastures with application covered with permanent vegetation (i.e. soil surface cover, field edge buffers)? Is it likely that pesticides from this these fields/pastures could transport via soil erosion to surface waters?

Yes, pasture has permanent vegetation. Additionally, there is a vegetated buffer at field edge and a riparian grazing exclosure with vegetated buffer between spray application area and waterway. No, it is not likely for sediment transport due to permanent vegetation, field geography (berm that prevents flow to creek) and tailwater from irrigation ends on field of property owner. Soil erosion was not evident and is not likely, and given the lack of surface runoff from the field described above, the potential for sediment transport is also not likely.

6) Is there any opportunity for direct application (i.e., overspray) or indirect drift (i.e., wind) of pesticides to streams or surface waters (downstream and/or adjacent)?

There is a 300 yard buffer between the application site and the nearest surface water (Indian Creek). Best practices were employed to such that application (ground application) occurred early morning on days with no wind to ensure product impacts the pest of concern without off-site impacts.

7) Are the fields/pastures with application flood or sprinkler irrigated? If a combination, what are the acres of flood and sprinkler irrigated?

The pastures are flood irrigated via vegetated delivery ditches delivering gravity flow irrigation water with adequate irrigation water application and control of timing, distribution, and amount of irrigation.

8) During irrigation events, do the fields/pastures with application generate surface runoff (i.e., tailwater)? If so, how much tailwater is generated (as a percentage of water applied) and where does the runoff go (e.g., another field/pasture, surface water)?

There is no downslope surface water that receives tailwater from any of the irrigated pastures on this ranch, all irrigation water is consumed on this property. Tailwater flows from one pasture to the next, and the final pasture on this property receiving irrigation application/tailwater is a hay pasture which does not generate tailwater.

9) In general – given soil texture, climate/weather conditions, irrigation water supplies, and other site specific factors – what is the potential for runoff from the fields/pastures receiving application to impact surface waters? Please provide a brief explanation.

Non-existent. Limited irrigation water, natural sediment barrier/berm to prevent tail water irrigation from entering Indian Creek, permanent vegetated fields, drought and dry soil conditions during application. No tailwater contributions to surface waters**.**

APPLICATIONS RELATIVE TO HYDROLOGIC TRANSPORT EVENTS: *when were pesticides applied to field/pastures relative to hydrologic transport events such as irrigation, and what is the likelihood that pesticides applied to fields/pastures could be transported due to proximity in time to these events.*

10) Are applications made during the spring prior to, or during summer irrigation season – or during both periods?

During the summer irrigation season.

11) For applications made in the spring prior to the irrigation season, on average how many days does application occur prior to the initiation of irrigation?

Not applicable.

12) For applications made during the summer irrigation season, on average how many days does application occur prior to the subsequent irrigation event?

Applications occurs about a week after irrigation once soil surface is dry enough for ground application via light weight ATV. The first irrigation following pesticide application occurs 14-16 days post application irrigation depending on soil water conditions.

13) For any applications is there potential for rainfall or snow melt runoff events to transport pesticides from the field/pasture to surface waters?

Weather forecasts are monitored so that applications are not made prior to storm events. These applications occurred during the summer drought period when rainfall is limited and dry soils have high infiltration potential.

PESTICIDE APPLICATION BEST MANAGEMENT PRACTICES: *what are the standard best practices employed to assure safe and efficient application.*

14) Please indicate which of the following best management practices employed for the specific fields/pastures assessed for paraquat dichloride and lambda-cyhalothrin applications.

Practice	Implemented (Yes/No)
County Applies Pesticides	No
County Permit Followed	Yes
Follow Label Restrictions	Yes
Sensitive Areas Mapped	Yes
Attend Trainings	Yes
Monitor Wind Conditions	Yes
Reapply Rinsate to Treated Field	Yes
Avoid Surface Water When Spraying	Yes
Use Appropriate Buffer Zones	Yes
Use Drift Control Agents	Yes
Monitor Rain Forecasts	Yes
Use PCA Recommendations	Yes
Ag Commissioner Conducts Pretreatment Inspection	Yes

Case Study 2 - Photos

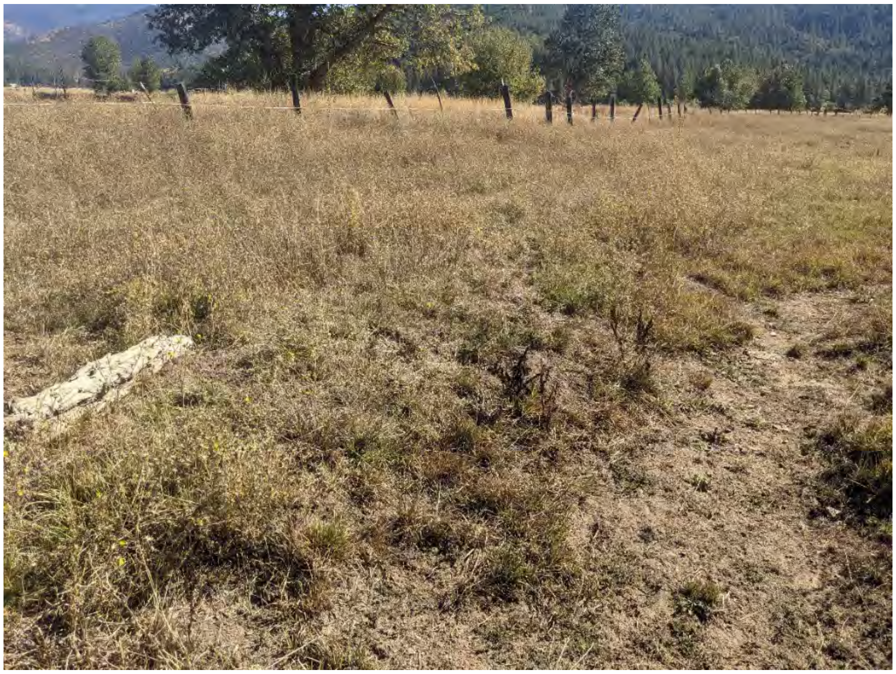

Image 1 – Case Study 2: Area where lambda-cyhalothrin was applied. Dry, upland area with elevated berm and vegetated buffer ~300 yard from Indian Creek.

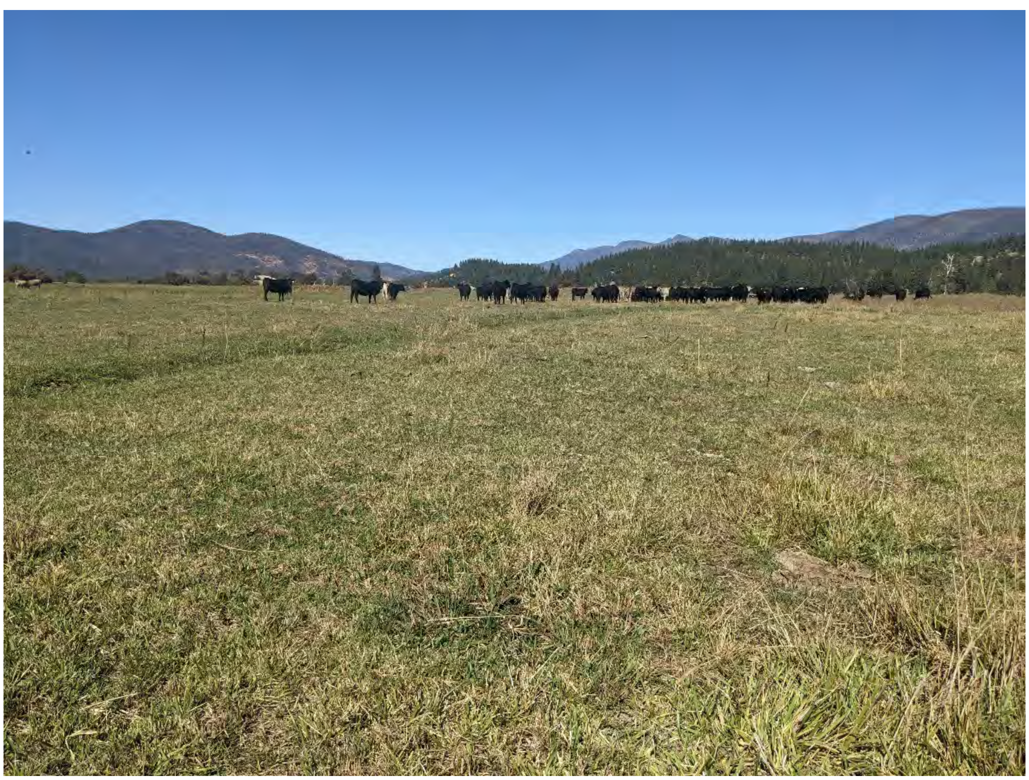

Image 2 – Case Study 2: Irrigated pasture with permanent vegetation.

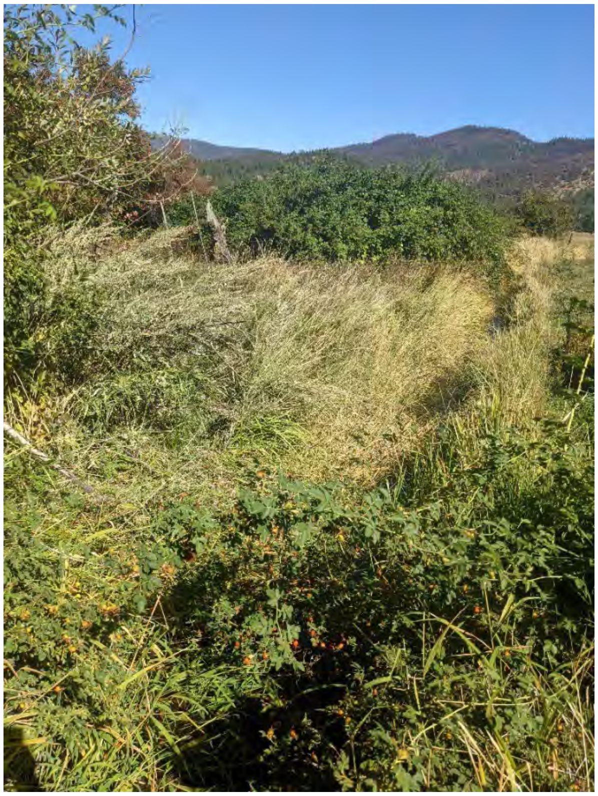

Image 3 – Case Study 2: Vegetated irrigation ditch.

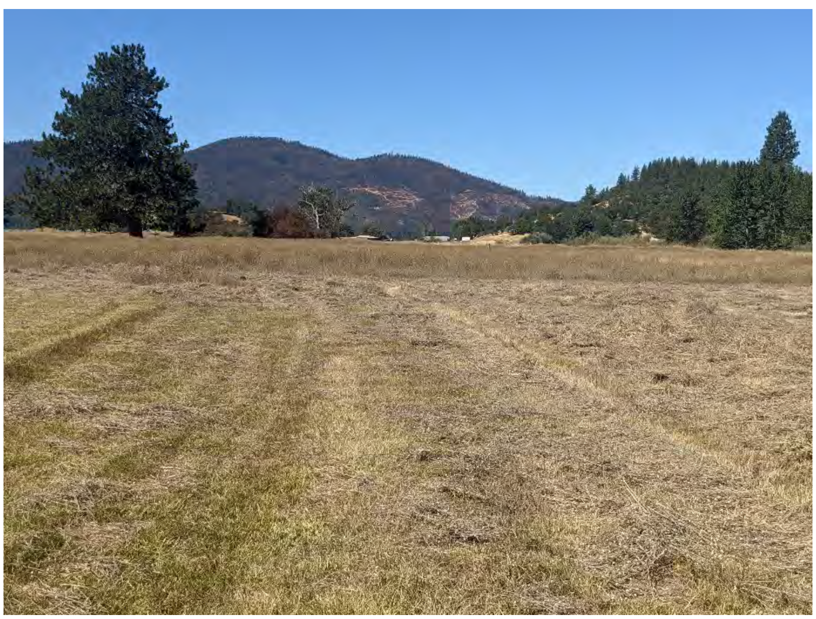

Image 4 – Case Study 2: The final field on this property receiving irrigation application/tailwater is a hay pasture which does not generate tailwater.

Upper Feather River Irrigated Pasture and Alfalfa Pesticide Transport Risk Assessment

CASE STUDY #3

PESTICIDE APPLICATIONS AND PURPOSES: *what were the reported pesticide uses (2016-2021) covered by this assessment, were the actual uses different from what was permitted (a.k.a. reported), and what were the purpose for their use.*

Table 1. The pesticide uses reported (i.e., permitted) and actually implemented by this farm operator annually 2016 through 2021, and thus included in this case study, are summarized below.

Year	Pesticide	Meridian	Date	Acres	AI* (lbs)
2020	LAMBDA-CYHALOTHRIN	32M23N15E27	4/22/2020	180	2.6
2020	LAMBDA-CYHALOTHRIN	32M23N15E20	4/23/2020	135	2.0
2020	LAMBDA-CYHALOTHRIN	32M23N15E29	4/24/2020	120	1.0
2020	LAMBDA-CYHALOTHRIN	32M23N15E29	4/25/2020	120	1.8
2021	LAMBDA-CYHALOTHRIN	32M23N15E29	4/17/2021	126	1.5
2021	LAMBDA-CYHALOTHRIN	32M23N15E29	4/20/2021	164	1.5
2021	LAMBDA-CYHALOTHRIN	32M23N15E30	4/22/2021	175	2.0
2021	LAMBDA-CYHALOTHRIN	32M23N15E27	4/23/2021	191	2.3
2021	LAMBDA-CYHALOTHRIN	32M23N15E20	4/30/2021	135	1.6
2021	LAMBDA-CYHALOTHRIN	32M23N15E21	5/1/2021	120	1.5

***AI = active ingredient**

1) Purpose(s) for paraquat dichloride applications (leave blank if not applicable)?

2) Purpose(s) for lambda-cyhalothrin applications (leave blank if not applicable)?

Control alfalfa weevil.

APPLICATIONS RELATIVE TO SURFACE WATERS AND HYDROLOGIC TRANSPORT PATHWAYS: *how close was pesticide applied to surface waters, what is the likelihood that pesticides applied to fields/pastures could be transported in surface runoff, tailwater ditches, vegetated ditches, buffers, etc. to surface waters.*

3) Are applications made primarily to irrigated fields/pastures, to dry areas within or at the edge of fields/pastures, or a combination of the above? Please provide a brief explanation and percentages if a combination of application to dry and irrigated ground.

All applications were directly to sprinkler irrigated alfalfa fields.

4) What is the distance (e.g., feet, yards, miles) from the fields/pastures with application to the nearest stream or surface water (downstream and/or adjacent)? Is it likely that pesticides from these fields/pastures could transport as surface runoff to surface waters?

Little Last Chance Creek is ~ 1.5 miles from the application sites, and the Middle Fork Feather River is ~3 miles from the application sites. Topography and barriers such as railroad tracks and roads prohibit hydrologic connection to both surface waters. There is no potential for pesticides applied to these fields to transport as surface runoff due to topography and barriers, distance, and low flow sprinkler irrigation which does not generate surface runoff.

5) Pesticides often absorb to soil particles once applied to a field/pasture, and could be transported with

soil particles if soil erosion occurs following application. Were the fields/pastures with application covered with permanent vegetation (i.e. soil surface cover, field edge buffers)? Is it likely that pesticides from this these fields/pastures could transport via soil erosion to surface waters?

The alfalfa fields have permanent vegetation with no bare ground. Soil erosion was not evident and is not likely, and given the lack of surface runoff from the field described above, the potential for sediment transport is also not likely. Also, there are permanent vegetated buffers around the edges of the field.

6) Is there any opportunity for direct application (i.e., overspray) or indirect drift (i.e., wind) of pesticides to streams or surface waters (downstream and/or adjacent)?

There is no potential for direct application or indirect of pesticides to enter surface waters. The applicated fields are at least 1.5 miles from the nearest surface waters. Best practices were employed to such that application occurred on days with no wind to ensure product impacts the pests/weeds of concern without off-site impacts.

7) Are the fields/pastures with application flood or sprinkler irrigated? If a combination, what are the acres of flood and sprinkler irrigated?

Low flow sprinkler irrigation.

8) During irrigation events, do the fields/pastures with application generate surface runoff (i.e., tailwater)? If so, how much tailwater is generated (as a percentage of water applied) and where does the runoff go (e.g., another field/pasture, surface water)?

No tailwater/surface runoff is generated from these fields under sprinkler irrigation.

9) In general – given soil texture, climate/weather conditions, irrigation water supplies, and other site specific factors – what is the potential for runoff from the fields/pastures receiving application to impact surface waters? Please provide a brief explanation.

None for fields with application. All fields are in permanent vegetation on sprinkler systems, it is costly to pump water to irrigate so only apply what the crop needs. No tailwater generated from fields. Additionally, soils in the region are dry during irrigation season. There are buffers that are not farmed (or sprayed) covered with native permanent vegetation edge the fields. The pesticide applications are prior to irrigation when soil is dry, to prevent soil damage.

APPLICATIONS RELATIVE TO HYDROLOGIC TRANSPORT EVENTS: *when were pesticides applied to field/pastures relative to hydrologic transport events such as irrigation, and what is the likelihood that pesticides applied to fields/pastures could be transported due to proximity in time to these events.*

10) Are applications made during the spring prior to, or during summer irrigation season – or during both periods?

Spring prior to irrigation.

11) For applications made in the spring prior to the irrigation season, on average how many days does application occur prior to the initiation of irrigation?

At least 4 days prior to irrigation, and greater if there are cool weather conditions. Irrigation post application is delayed as long as possible to insure pesticides have maximum possible time to impact the target pests.

12) For applications made during the summer irrigation season, on average how many days does application occur prior to the subsequent irrigation event?

Not applicable.

13) For any applications is there potential for rainfall or snow melt runoff events to transport pesticides from the field/pasture to surface waters?

Weather forecasts are monitored so that applications are not made prior to storm events. These applications occurred during the spring period following snowmelt and relatively dry soils at the time have high infiltration potential.

PESTICIDE APPLICATION BEST MANAGEMENT PRACTICES: *what are the standard best practices employed to assure safe and efficient application.*

14) Please indicate which of the following best management practices employed for the specific fields/pastures assessed for paraquat dichloride and lambda-cyhalothrin applications.

Practice	**Implemented (Yes/No)**
County Applies Pesticides	No
County Permit Followed	Yes
Follow Label Restrictions	Yes
Sensitive Areas Mapped	Yes
Attend Trainings	Yes
Monitor Wind Conditions	Yes
Reapply Rinsate to Treated Field	Yes
Avoid Surface Water When Spraying	Yes
Use Appropriate Buffer Zones	Yes
Use Drift Control Agents	Yes
Monitor Rain Forecasts	Yes
Use PCA Recommendations	Yes
Ag Commissioner Conducts Pretreatment Inspection	Yes

Case Study 3 - Photos

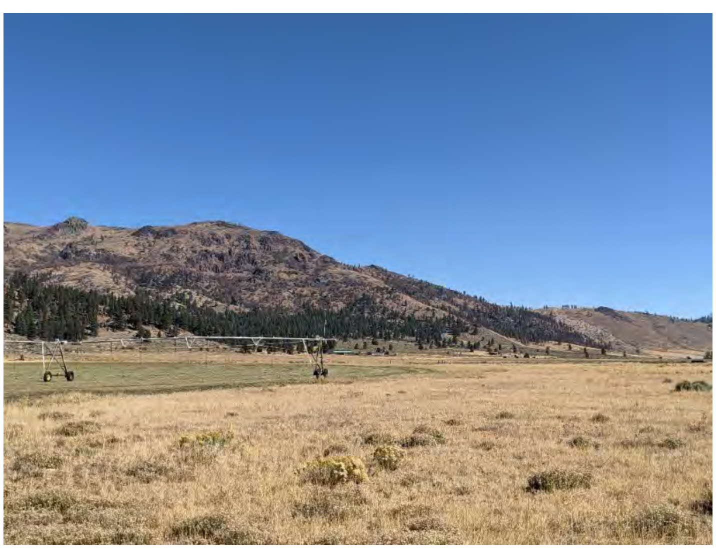

Image 1 – Case Study 3: Vegetated buffer around alfalfa field with sprinkler pivot irrigation.

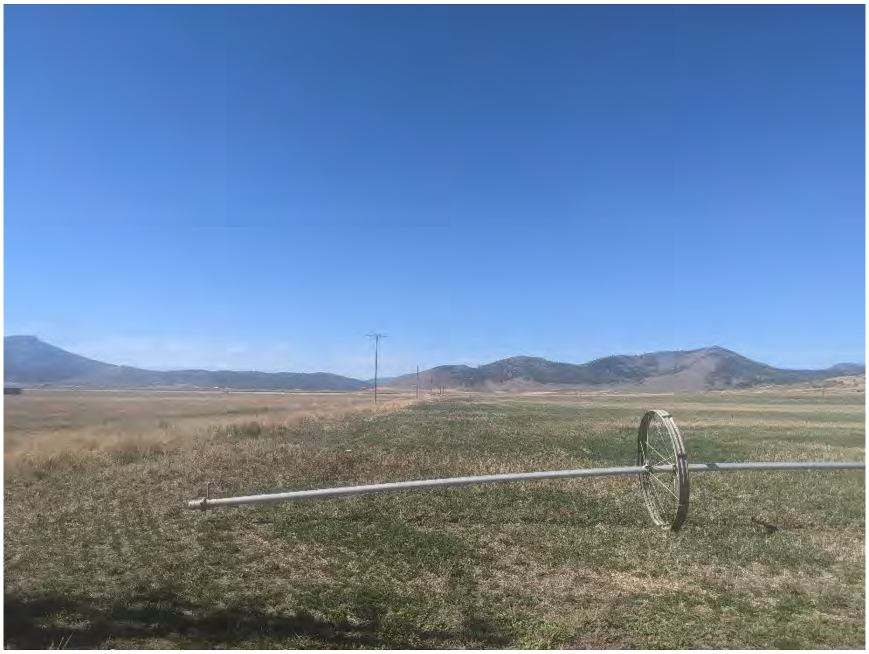

Image 2 – Case Study 3: Edge of field buffer on wheel line irrigated field.

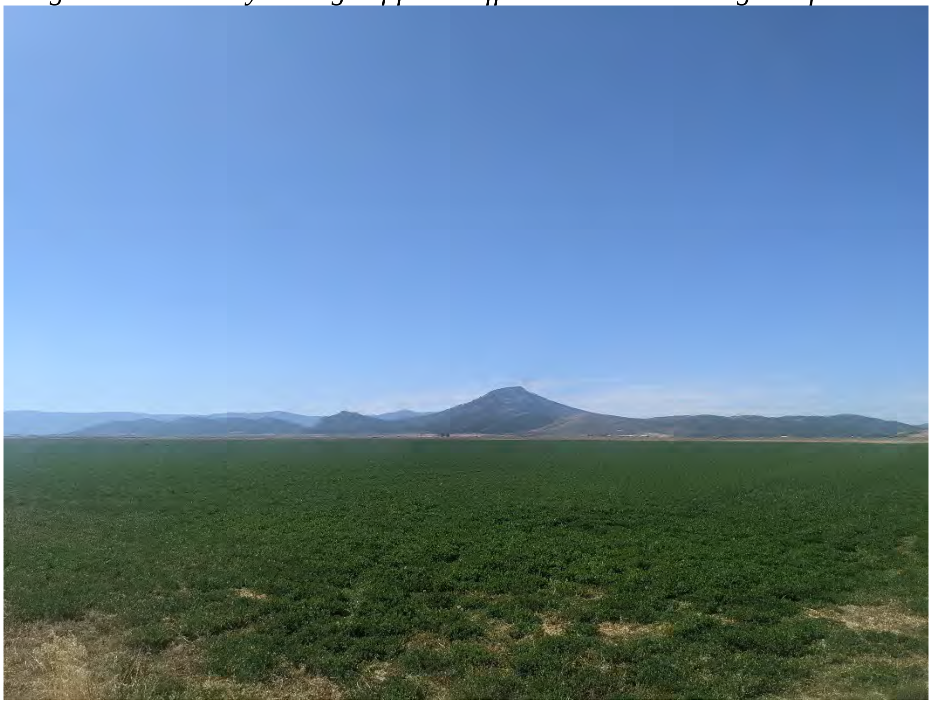

Image 3 – Case Study 3: Alfalfa field with permanent vegetation cover.

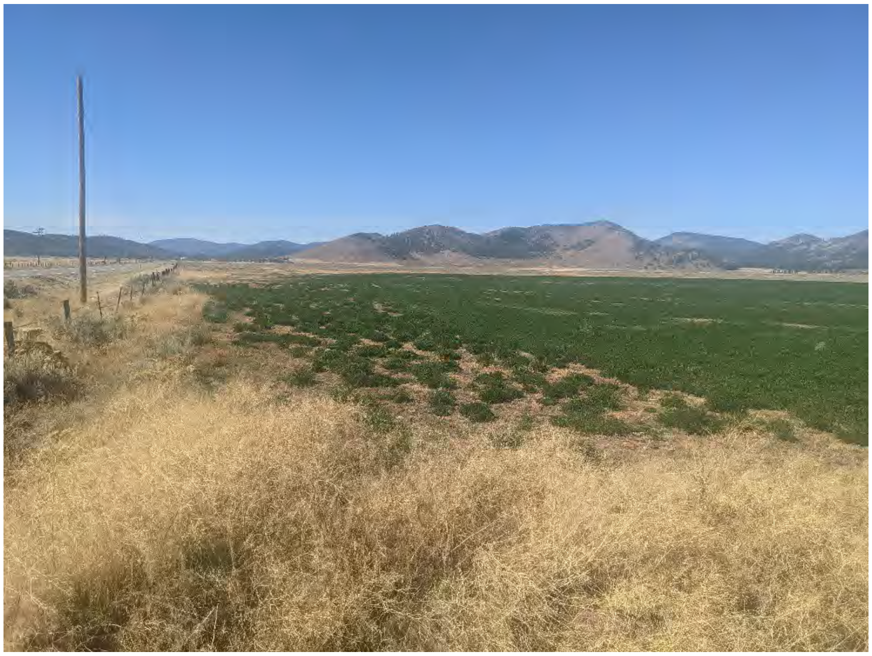

Image 4 – Case Study 3: Edge of field buffer and road barrier to transport.

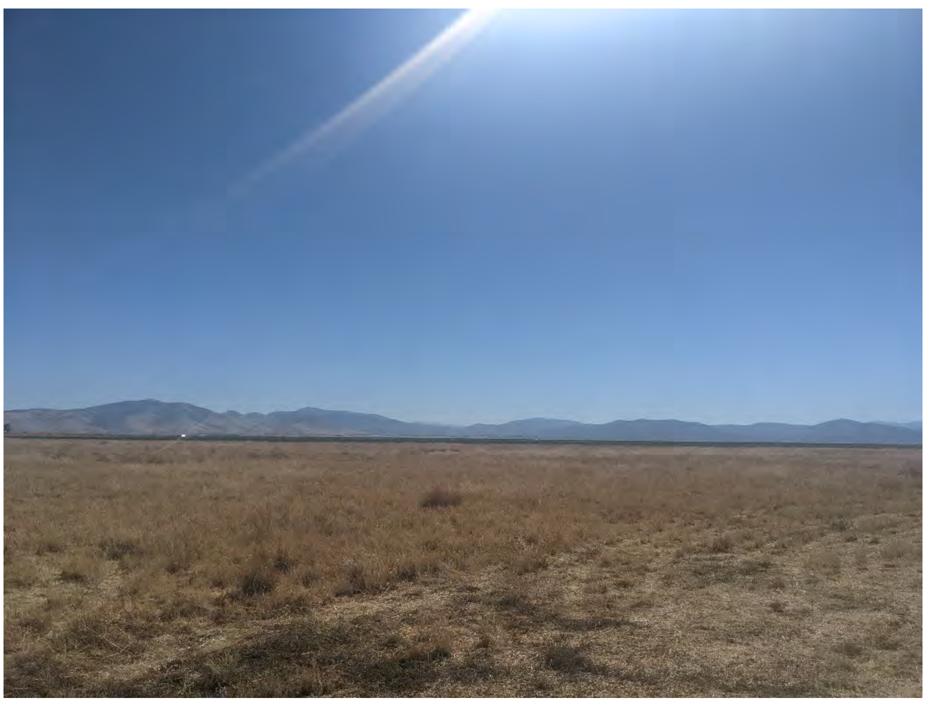

Image 5 - Site 3: Another example of extensive filed edge buffers on sprinkler irrigated fields that is representative of the watershed.

Upper Feather River Irrigated Pasture and Alfalfa Pesticide Transport Risk Assessment

CASE STUDY #4

PESTICIDE APPLICATIONS AND PURPOSES: *what were the reported pesticide uses (2016-2021) covered by this assessment, were the actual uses different from what was permitted (a.k.a. reported), and what were the purpose for their use.*

Table 1. The pesticide uses reported (i.e., permitted) and actually implemented by this farm operator annually 2016 through 2021, and thus included in this case study, are summarized below.

Year	Pesticide	Meridian	Date	Acres	AI* (lbs)
2016	PARAQUAT DICHLORIDE	32M22N15E04	3/21/2016	140	73.1
2016	PARAQUAT DICHLORIDE	32M22N15E03	3/22/2016	140	73.1
2016	PARAQUAT DICHLORIDE	32M22N15E04	3/23/2016	140	73.1
2016	PARAQUAT DICHLORIDE	32M22N15E14	3/24/2016	125	65.3
2016	PARAQUAT DICHLORIDE	32M22N15E10	3/25/2016	110	57.4
2016	PARAQUAT DICHLORIDE	32M22N15E04	3/27/2016	130	67.8
2017	PARAQUAT DICHLORIDE	32M22N15E10	4/3/2017	150	20.8
2017	PARAQUAT DICHLORIDE	32M22N15E10	4/3/2017	60	20.8
2017	PARAQUAT DICHLORIDE	32M22N15E14	4/4/2017	130	44.7
2017	PARAQUAT DICHLORIDE	32M22N15E04	4/5/2017	130	45.1
2017	PARAQUAT DICHLORIDE	32M22N15E10	4/5/2017	40	14.1
2018	PARAQUAT DICHLORIDE	32M22N15E10	3/30/2018	120	40.6
2018	PARAQUAT DICHLORIDE	32M22N15E04	4/2/2018	120	41.7
2018	PARAQUAT DICHLORIDE	32M22N15E10	4/3/2018	135	46.7
2018	PARAQUAT DICHLORIDE	32M22N15E10	4/4/2018	170	56.9
2018	PARAQUAT DICHLORIDE	32M22N15E10	4/4/2018	65	22.9
2018	PARAQUAT DICHLORIDE	32M22N15E14	4/6/2018	60	22.9
2018	PARAQUAT DICHLORIDE	32M22N15E03	4/9/2018	60	20.3
2018	LAMBDA-CYHALOTHRIN	32M22N15E04	6/1/2018	125	3.9
2019	PARAQUAT DICHLORIDE	32M22N15E10	4/3/2019	60	21.7
2019	PARAQUAT DICHLORIDE	32M22N15E11	4/4/2019	15	5.4
2019	PARAQUAT DICHLORIDE	32M22N15E10	4/4/2019	180	65.2
2019	PARAQUAT DICHLORIDE	32M22N15E14	4/5/2019	120	43.4
2019	PARAQUAT DICHLORIDE	32M22N15E03	4/5/2019	120	43.4
2019	PARAQUAT DICHLORIDE	32M22N15E04	4/10/2019	110	39.8
2019	PARAQUAT DICHLORIDE	32M22N15E14	4/12/2019	60	21.7
2019	PARAQUAT DICHLORIDE	32M22N15E10	4/13/2019	125	45.2
2020	PARAQUAT DICHLORIDE	32M22N15E10	4/4/2020	125	42.6
2020	PARAQUAT DICHLORIDE	32M22N15E04	4/5/2020	125	42.6
2020	PARAQUAT DICHLORIDE	32M22N15E04	4/11/2020	125	42.6
2020	PARAQUAT DICHLORIDE	32M22N15E10	4/21/2020	190	65.2
2020	PARAQUAT DICHLORIDE	32M22N15E14	4/21/2020	60	20.7
2021	PARAQUAT DICHLORIDE	32M22N15E10	3/5/2021	65	18.1
2021	PARAQUAT DICHLORIDE	32M22N15E10	3/5/2021	85	25.3
2021	PARAQUAT DICHLORIDE	32M22N15E04	3/6/2021	130	36.2
2021	PARAQUAT DICHLORIDE	32M22N15E03	3/25/2021	130	43.4
2021	PARAQUAT DICHLORIDE	32M22N15E04	3/25/2021	125	43.4

2021	PARAQUAT DICHLORIDE	32M22N15E10	3/25/2021	60	21.7
2021	PARAQUAT DICHLORIDE	32M22N15E10	3/26/2021	135	45.2
2021	PARAQUAT DICHLORIDE	32M22N15E04	3/27/2021	125	45.2
2021	PARAQUAT DICHLORIDE	32M22N15E14	3/28/2021	125	43.4

***AI = active ingredient**

1) Purpose(s) for <u>paraquat</u> dichloride applications (leave blank if not applicable)?

Control of Spring weeds.

2) Purpose(s) for <u>lambda-cyhalothrin</u> applications (leave blank if not applicable)?

Control of aphids.

<u>APPLICATIONS RELATIVE TO SURFACE WATERS AND HYDROLOGIC TRANSPORT PATHWAYS:</u> *<u>how close was pesticide applied to surface waters, what is the likelihood that pesticides applied to fields/pastures could be transported in surface runoff, tailwater ditches, vegetated ditches, buffers, etc. to surface waters.</u>*

3) Are applications made primarily to irrigated fields/pastures, to dry areas within or at the edge of fields/pastures, or a combination of the above? Please provide a brief explanation and percentages if a combination of application to dry and irrigated ground.

All applications were directly to sprinkler irrigated alfalfa fields.

4) What is the distance (e.g., feet, yards, miles) from the fields/pastures with application to the nearest stream or surface water (downstream and/or adjacent)? Is it likely that pesticides from these fields/pastures could transport as surface runoff to surface waters?

Little Last Chance Creek is ~0.75 mile from the application sites, and the Middle Fork Feather River is ~1 mile from the application sites. Topography and barriers such as railroad tracks and roads prohibit hydrologic connection to both surface waters. There is no potential for pesticides applied to these fields to transport as surface runoff due to topography and barriers, distance, and low flow sprinkler irrigation which does not generate surface runoff.

5) Pesticides often absorb to soil particles once applied to a field/pasture, and could be transported with soil particles if soil erosion occurs following application. Were the fields/pastures with application covered with permanent vegetation (i.e. soil surface cover, field edge buffers)? Is it likely that pesticides from this these fields/pastures could transport via soil erosion to surface waters?

The alfalfa fields have permanent vegetation with no bare ground. Soil erosion was not evident and is not likely, and given the lack of surface runoff from the field described above, the potential for sediment transport is also not likely. Also, there are permanent vegetated buffers around the edges of the field.

6) Is there any opportunity for direct application (i.e., overspray) or indirect drift (i.e., wind) of pesticides to streams or surface waters (downstream and/or adjacent)?

There is no potential for direct application or indirect of pesticides to enter surface waters. The applicated fields are at least 1.5 miles from the nearest surface waters. Best practices were employed to such that application occurred on days with no wind to ensure product impacts the pests/weeds of concern without off-site impacts.

7) Are the fields/pastures with application flood or sprinkler irrigated? If a combination, what are the acres of flood and sprinkler irrigated?

Low flow sprinkler irrigation.

8) During irrigation events, do the fields/pastures with application generate surface runoff (i.e., tailwater)? If so, how much tailwater is generated (as a percentage of water applied) and where does the runoff go (e.g., another field/pasture, surface water)?

No tailwater/surface runoff is generated from these fields under sprinkler irrigation.

9) In general – given soil texture, climate/weather conditions, irrigation water supplies, and other site specific factors – what is the potential for runoff from the fields/pastures receiving application to impact surface waters? Please provide a brief explanation.

None for fields with application. All fields are in permanent vegetation on sprinkler systems, it is costly to pump water to irrigate so only apply what the crop needs. No tailwater generated from fields. There are buffers that are not farmed (or sprayed) covered with native permanent vegetation edge the fields. The pesticide applications are prior to irrigation when soil is dry, to prevent soil damage. Weather forecast is monitored and application occurs only if there is no rain in the forecast.

APPLICATIONS RELATIVE TO HYDROLOGIC TRANSPORT EVENTS: *when were pesticides applied to field/pastures relative to hydrologic transport events such as irrigation, and what is the likelihood that pesticides applied to fields/pastures could be transported due to proximity in time to these events.*

10) Are applications made during the spring prior to, or during summer irrigation season – or during both periods?

LAMBDA-CYHALOTHRIN – during the irrigation season
PARAQUAT DICHLORIDE – prior to the irrigation season

11) For applications made in the spring prior to the irrigation season, on average how many days does application occur prior to the initiation of irrigation?

At least 7 days prior to irrigation, and greater if there are cool weather conditions. Irrigation post application is delayed as long as possible to insure pesticides have maximum possible time to impact the target pests.

12) For applications made during the summer irrigation season, on average how many days does application occur prior to the subsequent irrigation event?

One week prior to next irrigation event. The field is irrigated, then 2-3 days post-irrigation the pesticide is applied once soil conditions allow wheeled vehicle application, then the field is irrigated no sooner than 7 days post application.

13) For any applications is there potential for rainfall or snow melt runoff events to transport pesticides from the field/pasture to surface waters?

Weather forecasts are monitored so that applications are not made prior to storm events. These applications occurred during the spring and summer periods following snowmelt and relatively dry soils at the time have high infiltration potential.

PESTICIDE APPLICATION BEST MANAGEMENT PRACTICES: *what are the standard best practices employed to assure safe and efficient application.*

14) Please indicate which of the following best management practices employed for the specific fields/pastures assessed for paraquat dichloride and lambda-cyhalothrin applications.

Practice	Implemented (Yes/No)
County Applies Pesticides	No
County Permit Followed	Yes
Follow Label Restrictions	Yes
Sensitive Areas Mapped	Yes
Attend Trainings	Yes
Monitor Wind Conditions	Yes
Reapply Rinsate to Treated Field	Yes
Avoid Surface Water When Spraying	Yes
Use Appropriate Buffer Zones	Yes
Use Drift Control Agents	Yes
Monitor Rain Forecasts	Yes
Use PCA Recommendations	Yes
Ag Commissioner Conducts Pretreatment Inspection	Yes

Case Study 4 - Photos

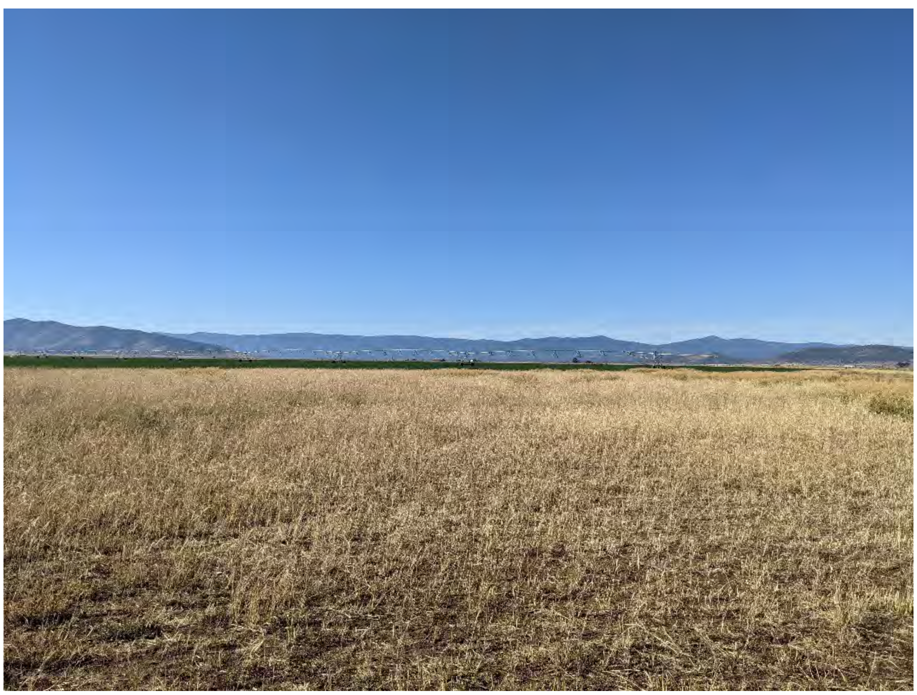

Image 1 – Case Study 4: Edge of field vegetated buffers for alfalfa field with sprinkler pivot irrigation.

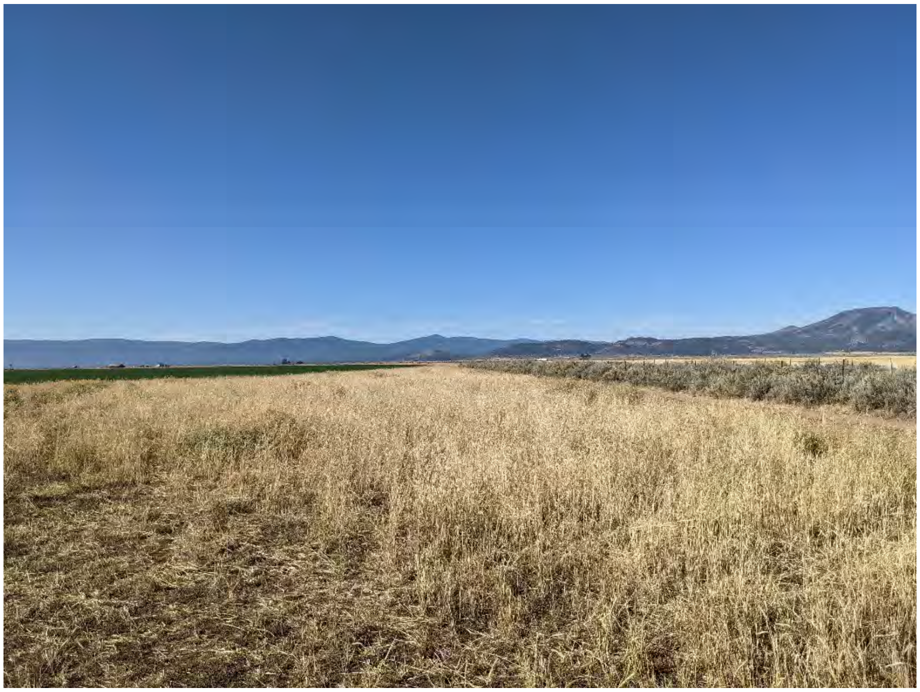
Image 2 – Case Study 4: Edge of field buffer on alfalfa field with sprinkler pivot irrigation.

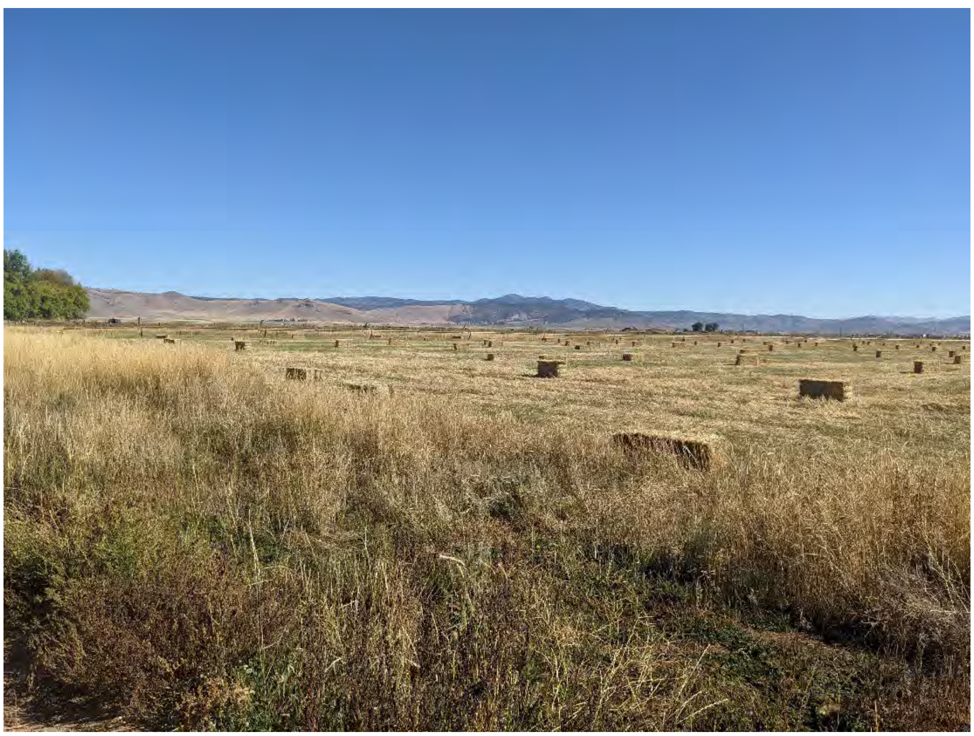
Image 3 – Case Study 4: Edge of field buffer on alfalfa field with sprinkler wheel line irrigation.

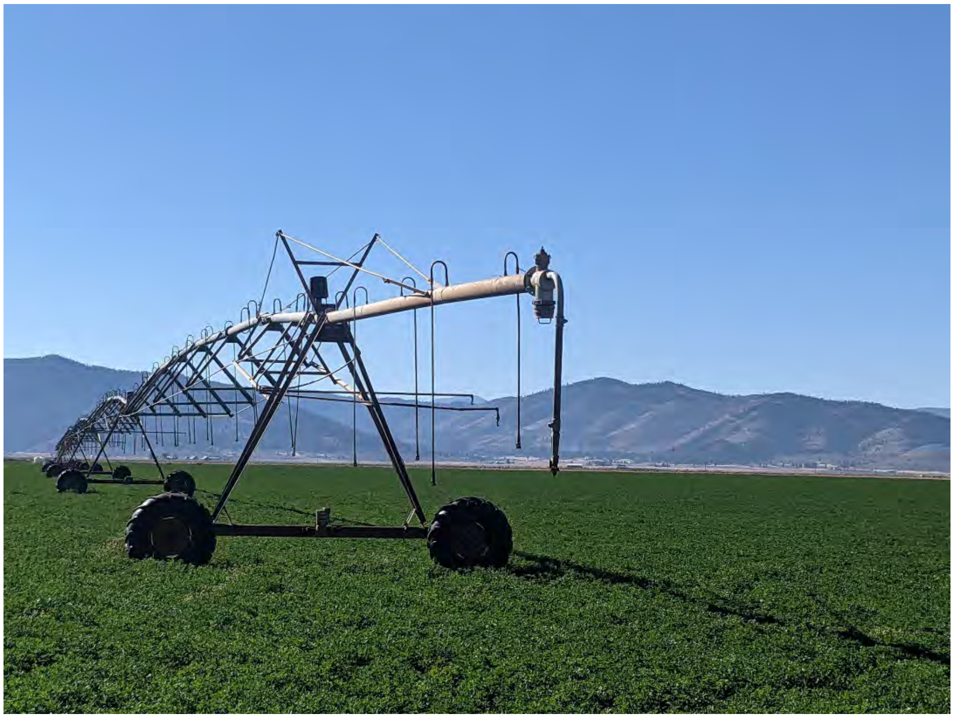

Image 4 – Case Study 4: Permanent vegetation in alfalfa field with low flow sprinkler pivot with no-end sprinklers.

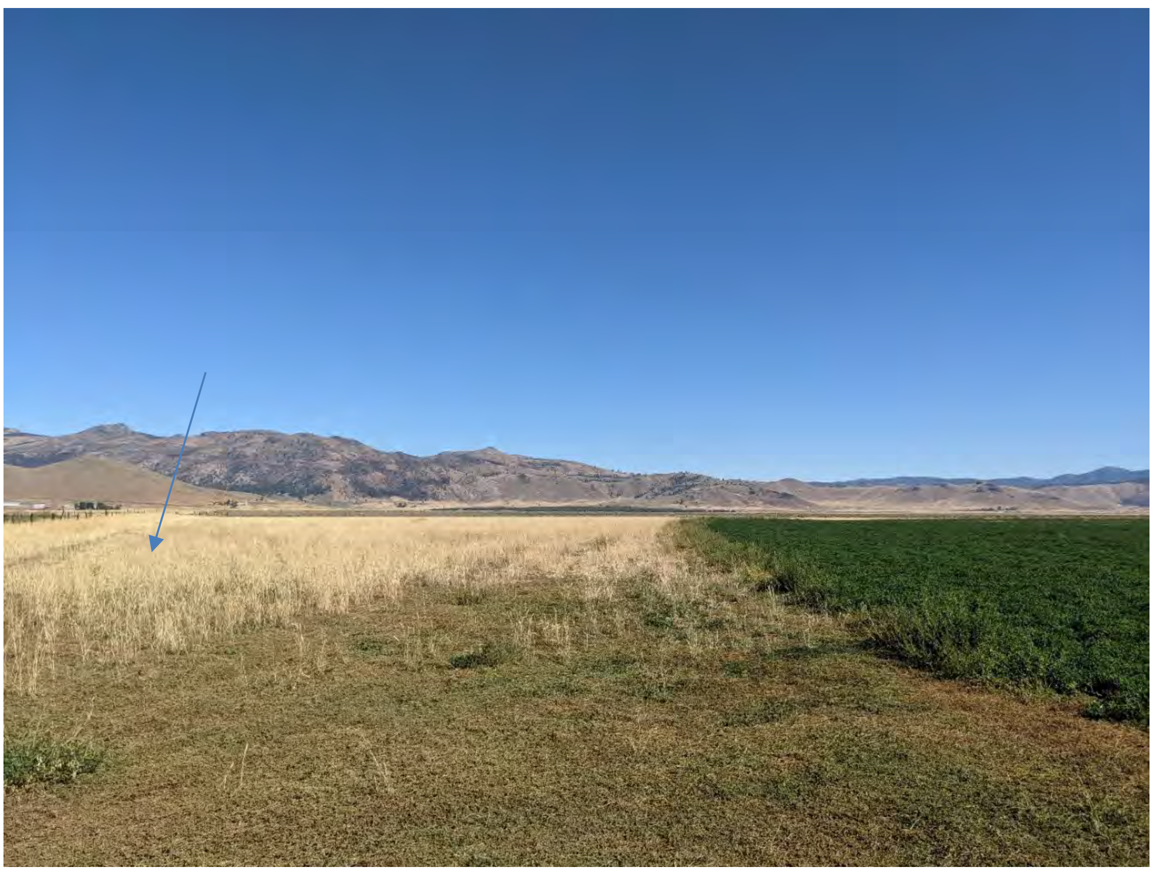

Image 5 – Case Study 4: Closest waterway from pivots is ~0.75 mile.

Upper Feather River Irrigated Pasture and Alfalfa Pesticide Transport Risk Assessment

CASE STUDY #5

PESTICIDE APPLICATIONS AND PURPOSES: *what were the reported pesticide uses (2016-2021) covered by this assessment, were the actual uses different from what was permitted (a.k.a. reported), and what were the purpose for their use.*

Table 1. The pesticide uses reported (i.e., permitted) actually implemented by this farm operator annually 2016 through 2021, and thus included in this case study, are summarized below.

Year	Pesticide	Meridian	Date	Acres	AI* (lbs)
2021	LAMBDA-CYHALOTHRIN	46M21N15E12	4/2/2021	110	3.4
2021	LAMBDA-CYHALOTHRIN	46M21N16E06	4/2/2021	60	1.8

***AI = active ingredient**

1) Purpose(s) for paraquat dichloride applications (leave blank if not applicable)?

2) Purpose(s) for lambda-cyhalothrin applications (leave blank if not applicable)?

Control alfalfa weevils and aphids.

APPLICATIONS RELATIVE TO SURFACE WATERS AND HYDROLOGIC TRANSPORT PATHWAYS: *how close was pesticide applied to surface waters, what is the likelihood that pesticides applied to fields/pastures could be transported in surface runoff, tailwater ditches, vegetated ditches, buffers, etc. to surface waters.*

3) Are applications made primarily to irrigated fields/pastures, to dry areas within or at the edge of fields/pastures, or a combination of the above? Please provide a brief explanation and percentages if a combination of application to dry and irrigated ground.

All applications were directly to sprinkler irrigated alfalfa fields.

4) What is the distance (e.g., feet, yards, miles) from the fields/pastures with application to the nearest stream or surface water (downstream and/or adjacent)? Is it likely that pesticides from these fields/pastures could transport as surface runoff to surface waters?

The nearest surface water is Smithneck Creek which is ~1 mile from fields with application. There is an ephemeral storm drain ~100 yards adjacent to one field which flows to a dry pasture and terminates without connection to a surface water. During 2019-2021 there has been no flow in the storm drain. There is no potential for pesticide from the fields to transport as surface runoff due to distance and topography between fields and Smithneck Creek, edge of field vegetated buffers, and no tailwater from the fields due to low flow sprinkler irrigation.

5) Pesticides often absorb to soil particles once applied to a field/pasture, and could be transported with soil particles if soil erosion occurs following application. Were the fields/pastures with application covered with permanent vegetation (i.e. soil surface cover, field edge buffers)? Is it likely that pesticides from this these fields/pastures could transport via soil erosion to surface waters?

The alfalfa fields have permanent vegetation with no bare ground. Soil erosion was not evident and is not likely, and given the lack of surface runoff from the field described above, the potential for sediment transport is also not likely. Also, there are permanent vegetated buffers around the edges of the field.

6) Is there any opportunity for direct application (i.e., overspray) or indirect drift (i.e., wind) of pesticides to streams or surface waters (downstream and/or adjacent)?

There is no potential for direct application or indirect of pesticides to enter surface waters. The applicated fields are ~1 mile from the nearest surface waters. Best practices were employed to such that application occurred on days with no wind to ensure product impacts the pests/weeds of concern without off-site impacts.

7) Are the fields/pastures with application flood or sprinkler irrigated? If a combination, what are the acres of flood and sprinkler irrigated?

Low flow sprinkler irrigation.

8) During irrigation events, do the fields/pastures with application generate surface runoff (i.e., tailwater)? If so, how much tailwater is generated (as a percentage of water applied) and where does the runoff go (e.g., another field/pasture, distance to surface water)?

No tailwater/surface runoff is generated from these fields under sprinkler irrigation.

9) In general – given soil texture, climate/weather conditions, irrigation water supplies, and other site specific factors – what is the potential for runoff from the fields/pastures receiving application to impact surface waters? Please provide a brief explanation.

None for fields with application. All fields are in permanent vegetation on sprinkler systems, it is costly to pump water to irrigate so only apply what the crop needs. No tailwater generated from fields. There are buffers that are not farmed (or sprayed) covered with native permanent vegetation edge the fields. The pesticide applications are prior to irrigation when soil is dry, to prevent soil damage. Weather forecast is monitored and application occurs only if there is no rain in the forecast.

APPLICATIONS RELATIVE TO HYDROLOGIC TRANSPORT EVENTS: *when were pesticides applied to field/pastures relative to hydrologic transport events such as irrigation, and what is the likelihood that pesticides applied to fields/pastures could be transported due to proximity in time to these events.*

10) Are applications made during the spring prior to, or during summer irrigation season – or during both periods?

Spring prior to irrigation.

11) For applications made in the spring prior to the irrigation season, on average how many days does application occur prior to the initiation of irrigation?

Usually a month prior to irrigation.

12) For applications made during the summer irrigation season, on average how many days does application occur prior to the subsequent irrigation event?

Not applicable

13) For any applications is there potential for rainfall or snow melt runoff events to transport pesticides from the field/pasture to surface waters?

Weather forecasts are monitored so that applications are not made prior to storm events. These applications occurred during the spring and summer periods following snowmelt and relatively dry soils at the time have high infiltration potential.

PESTICIDE APPLICATION BEST MANAGEMENT PRACTICES: *what are the standard best practices employed to assure safe and efficient application.*

14) Please indicate which of the following best management practices employed for the specific fields/pastures assessed for paraquat dichloride and lambda-cyhalothrin applications.

Practice	**Implemented (Yes/No)**
County Applies Pesticides	No
County Permit Followed	Yes
Follow Label Restrictions	Yes
Sensitive Areas Mapped	Yes
Attend Trainings	Yes
Monitor Wind Conditions	Yes
Reapply Rinsate to Treated Field	Yes
Avoid Surface Water When Spraying	Yes
Use Appropriate Buffer Zones	Yes
Use Drift Control Agents	Yes
Monitor Rain Forecasts	Yes
Use PCA Recommendations	Yes
Ag Commissioner Conducts Pretreatment Inspection	Yes

Case Study 5 - Site Photos

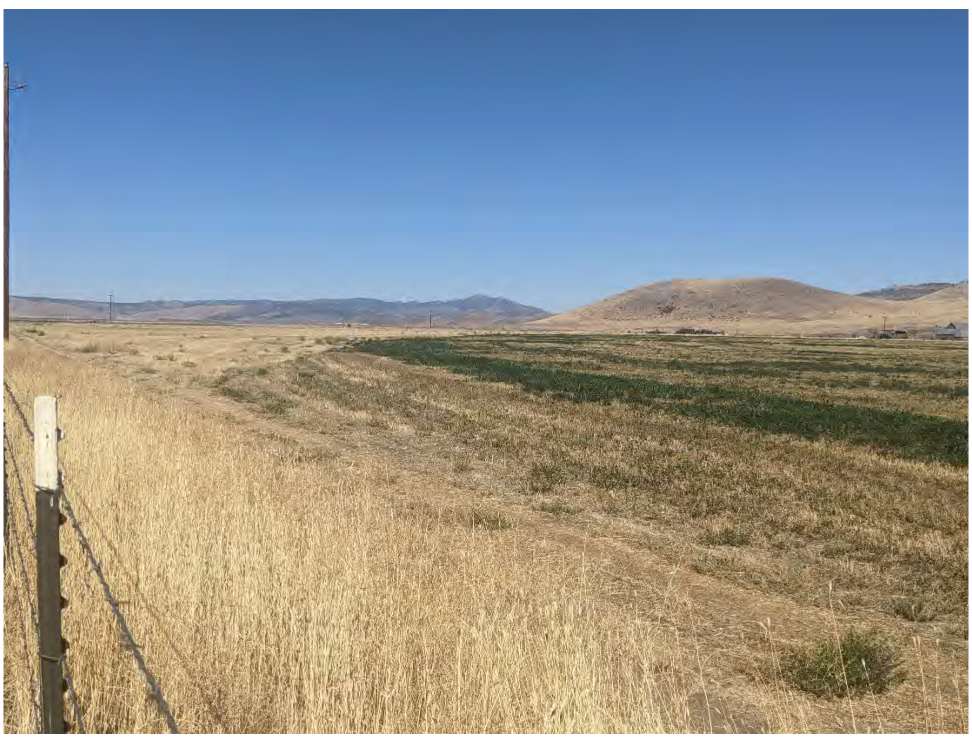

Image 1 – Case Study 5: Vegetated edge of field buffer.

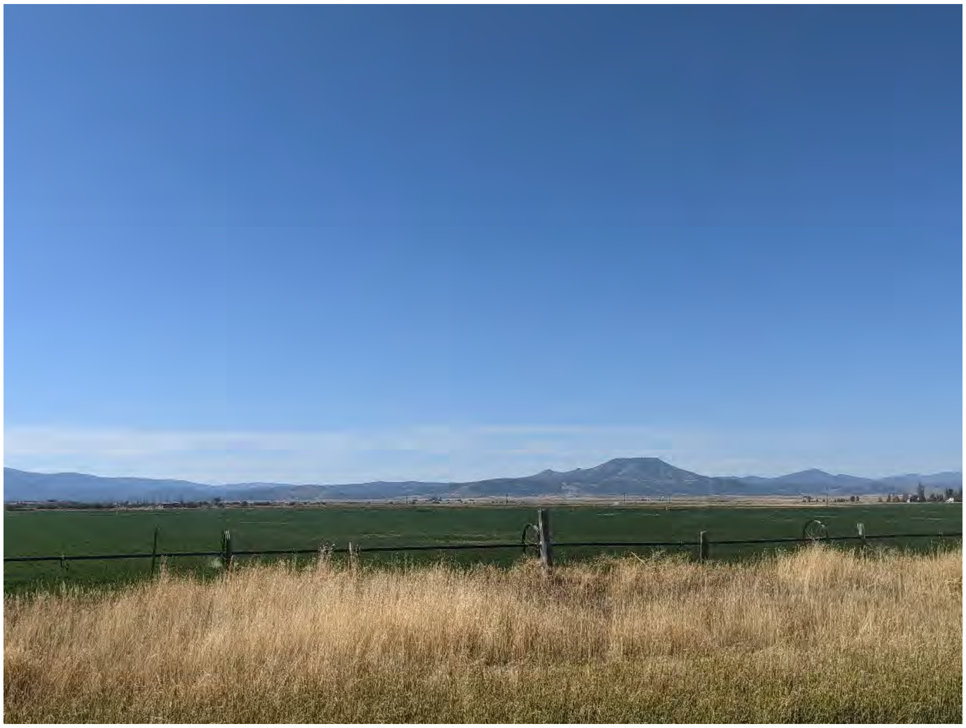
Image 2 – Case Study 5: Wheel line irrigated field with permanent native vegetation
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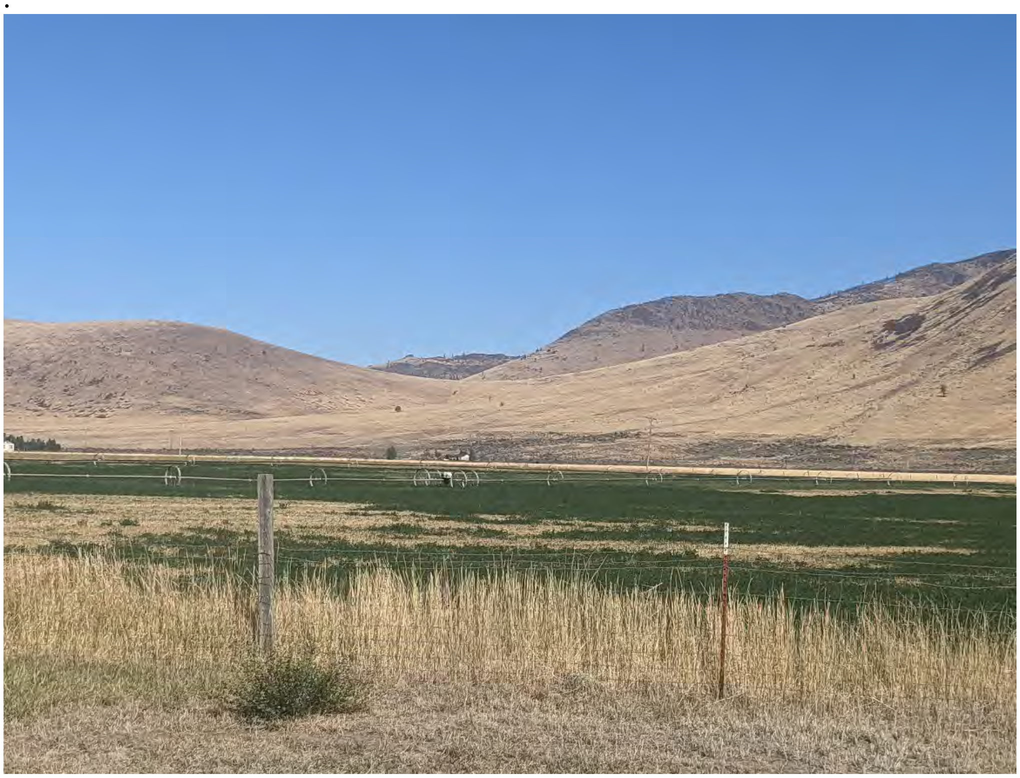
Image 3 – Case Study 5: Wheel line alfalfa field with permanent vegetated buffer.

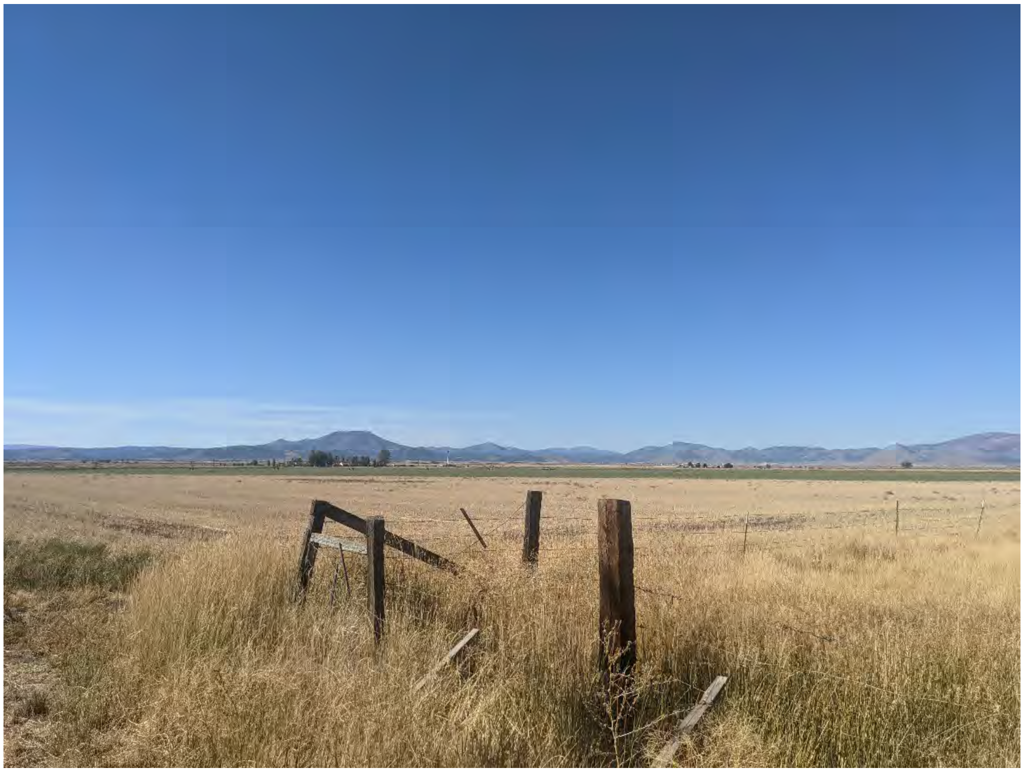

Image 4 – Case Study 5: Field edge vegetative buffers on sprinkler irrigated fields.