State of California
Department of Fish and Wildlife

M e m o r a n d u m

Date: December 30, 2014

To: DeWayne Little, Lieutenant
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From: Tobi Freeny, Senior Environmental Scientist (Specialist)
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Subject: **Environmental Impact Assessment; Cordes Property**

Summary: Two unnamed tributaries to Doby Creek and one unnamed tributary to Duckett Creek, both tributaries to North Fork Cottonwood Creek, were negatively impacted by activities that substantially altered the streams' bed, bank and channel, and placed sediment and refuse where they can pass into waters of the state. These activities consisted of the reconstruction or new construction of three stream crossings and grading activities. They were conducted without written notification to the California Department of Fish and Wildlife (CDFW) or obtaining a Lake and Streambed Alteration (LSA) agreement, totaling 10 separate violations of Fish and Game Code (FGC).

Overview: This memorandum documents the environmental impacts associated with the marijuana cultivation activities on unnamed tributaries to Doby and Duckett Creek, both tributaries to North Fork Cottonwood Creek, Shasta County. The subject parcel (041-300-35) is approximately 80 acres and is owned by Christopher Cordes. Inspections were conducted by CDFW and other allied agencies on October 28, 2014 and November 7, 2014.

Methods: Prior to the inspection, aerial photography, USGS topographic maps (Shasta Bally, 1978; Ono, 1981) and the California Natural Diversity Database were examined to determine locations of potential CDFW jurisdiction and any potential fish and wildlife resources or habitat documented within close proximity to the subject property. During the inspections, numerous activities causing substantial environmental impact were documented. GPS data were acquired during the site inspections using various GPS enabled equipment; all waypoints are approximate.

Expertise: I am employed as a Senior Environmental Scientist in CDFW Northern Region's Aquatic Conservation Planning Program as a member of the Watershed Enforcement Team (WET). I have over 13 years of experience working for CDFW in the capacity of a biologist/scientist. The last six years have been with the LSA Program evaluating jurisdictional areas, assessing environmental impacts to fish and wildlife resources, issuing LSA Agreements to avoid or minimize those impacts, and reviewing projects' compliance with the California Environmental Quality Act and the California Endangered Species Act (CESA).

Location and Maps: The location of the Cordes property is found east of Rainbow Lake and west of the town of Igo, approximately 15 miles southwest of the city of Redding (Figure 1).

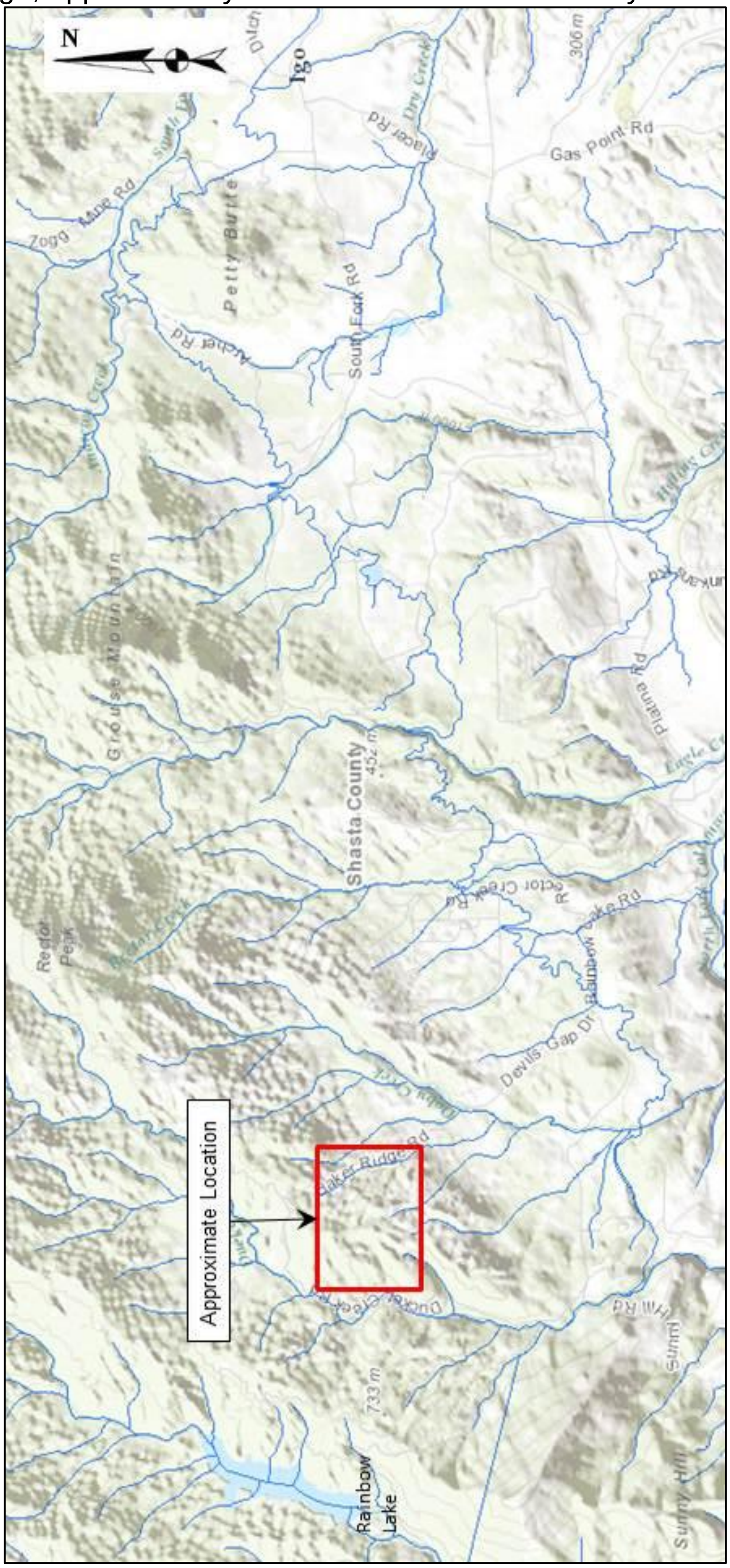

Figure 1. Vicinity Map showing the general location of the Cordes property.

The Site Map shows the aerial view of the property along with parcel lines and the approximate location of various features of the cultivation site and stream crossings (Figure 2).

Figure 2. Site Map of the Cordes property.

Grading Activities – The access road to the Cordes Property originally exited Baker Ridge Road and extended approximately 600 feet to the ridge top. The road has now been widened and become part of an extensive new road system (Figure 2). Not only has approximately 1.75 miles of new road been graded but two large landings as well. As part of these grading activities three stream crossings have either been newly constructed or modified. These activities were conducted without written notification to CDFW pursuant to FGC 1602(a) and resulted in substantial environmental impacts. The data collected for each jurisdictional stream crossing is included in Table 1.

TABLE 1. Cordes Stream Crossings

Crossing Name	**Culvert Diameter** (inches)	**Number of Culverts**	**Crossing Dimensions**				**Volume of Fill Material** (cubic yards)	**Length of Potential Coverage*** (feet)
			Length (feet)	Width (feet)	Depth (feet) upstream	Depth (feet) downstream		
1	24	1	24	17	12	18	224.7	7,280
2	N/A		32	20	0	12	142.2	4,608
3	N/A		78	12	0	10	173.3	5,616

*If the stream crossing was to fail the fill material would cover this length of stream, approximating a ten foot wide stream covered with one inch of sediment.

Crossing 1: Crossing 1 is located on an unnamed tributary to Doby Creek, not actively flowing at the crossing during both inspections however it was flowing approximately 0.75 mile downstream. This stream crossing was pre-existing, however, large quantities of sediment have been placed over the crossing to widen the road and raise the elevation (Figure 3).

Figure 3. The grading activity at Crossing 1with no erosion control in place. October 28, 2014

To modify a culverted stream crossing in the aforementioned manner substantial alterations to the bed, bank, and channel of the stream are unavoidable. Furthermore, substantial environmental impacts have and will occur due to the substandard construction activities utilized as described below.

- The 24-inch culvert is undersized (Figure 4). It may have been adequate in its pre-existing state, if there was an armored critical dip to allow high flows to pass. However, with the raised road elevation an armored critical dip is not appropriate.

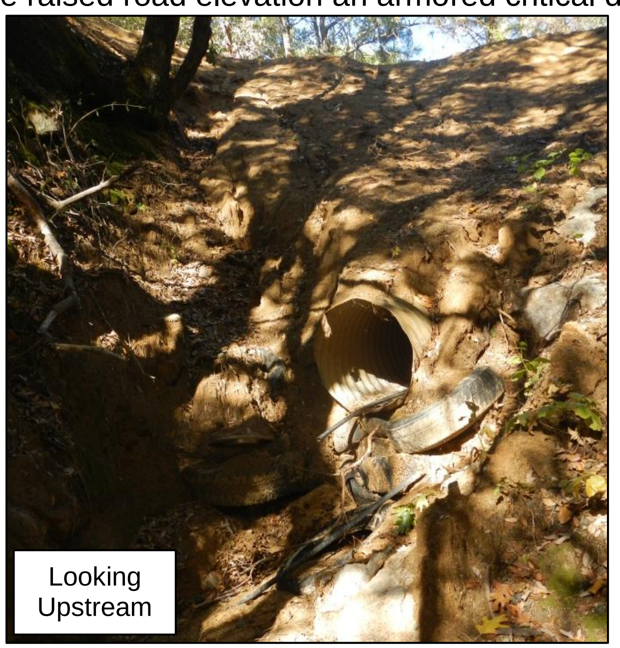

Figure 4. Crossing 1 looking at the downstream end of the culvert. The rust and waterline on the bottom of the culvert suggests it was pre-existing. Tires are visible underneath and to the right of the culvert, the assumption being they were used for erosion control. October 28, 2014

- The outlet and inlet of the culvert did not have erosion control installed, in the form of a concrete headwall or large rock cobble clean of fine sediment, to protect the fill slopes from the erosive activities of high flows and heavy rains (Figure 5). In fact, the only potential erosion control in place was in the form of tires which CDFW does not allow and considers deposition of refuse (Figure 4, 6 & 7). On perennial, intermittent and flashy ephemeral streams, erosion protection of stream crossing inlets and outlets are necessary. This is to not only protect the stream crossing from washing out but also to keep the fill material from eroding and the fine sediment from entering the watercourse, negatively impacting fish and wildlife resources within and downstream of the crossing site.

Figure 5. Looking down the fill slopes at Crossing 1 towards the outlet. Placement of fill material and erosion of that material is visible. October 28, 2014

- The sediment placed over the existing crossing and undersized culvert created a kind of dam. Add to this the sediment, from unauthorized grading activities, that has been washed into the stream, settled out and plugged the culvert pipe to over half of its diameter (Figure 6) and an even more “dam-like” structure has been created (Figure 7). Stream crossings should be constructed to allow water, specifically a 100 year flood, to pass under or through the crossing, while dams are constructed to hold large quantities of water without diverting. A crossing does not have the structural integrity of a dam so the potential for a crossing to fail greatly increases when it is required to function as a dam. When a crossing fails the fill material and infrastructure are released into the stream channel. When Crossing 1 fails it will release 224.7 cubic yards (cy) of material, which can cover a ten foot stream one inch in depth for approximately 7,280 feet, just short of 1½ miles (Table 1).

Figure 6. Crossing 1 inlet showing the culvert partially plugged with only 11-inches of 24-inch culvert left to pass flow. Tires are visible in the fill material, the assumption being they were used for erosion control. November 7, 2014

Figure 7. Crossing 1 looking towards the culvert inlet with the 12 foot high dam-like crossing structure evident. Large amounts of deposited sediment visible upstream of culvert. Tires visible in the fill material, the assumption being they were used for erosion control. October 28, 2014

Crossing 2: Crossing 2 is located on an unnamed tributary to Doby Creek, not actively flowing at the crossing during both inspections however it was flowing approximately 0.25 mile downstream. This crossing is close to the property line and may actually have been constructed in trespass on the northern neighbor's property (Figure 2). The stream exhibited physical characteristics of flow including presence of clear, natural bed, bank and channel and evidence of scour (Figure 8).

Figure 8. Evidence of scour and bed, bank or channel at Crossing 2. Inset shows close up of natural bed material upstream of crossing. October 28, 2014

The stream crossing was constructed with no culverts to pass flow (Figure 9). With no culvert in place to pass flow the water will have to flow over the road fill. The road in this area has not been armored to protect itself against these flows and will easily erode. Once this erosion begins the stream crossing will easily fail passing all of the fill material (142.2 cy) into the stream. Also, to place fill within a stream channel for the ease of crossing substantially alters the bed, bank, and channel of the stream. This alteration is unavoidable due to the required grading and excavation activities. Furthermore, substantial environmental impacts have and will occur due to the substandard construction activities utilized as described below.

Figure 9. Crossing 2 constructed with no culvert to pass flow. October 28, 2014

- No erosion control is installed on the fill slopes or over the road fill to protect against flowing water, that has nowhere else to go but across the road, or against heavy rainfall (Figure 9 & 10). The rock cobble placed on fill slopes should have 100% coverage and placed in an interlocking fashion. The areas unprotected by erosion control will allow fill material to be washed into the drainage by flows and rainfall. A stream crossing without culverts installed is considered a ford style crossing. If it is appropriate to design a ford type crossing specifically sized rock cobble should be placed across the fill in the area where water will flow. The flow topping the road due to no culvert installation weakens the integrity of the stream crossing greatly increasing the potential for the stream crossing to fail and washout releasing the fill material into the stream channel. When Crossing 2 fails it will release enough material to cover a ten foot stream one inch in depth for approximately 4,608 feet, just under one mile (Table 1). Erosion control not only protects the stream crossing from washing out and the fill material from eroding but stops fine sediment from entering the watercourse and negatively impacting fish and wildlife resources within and downstream of the crossing site.

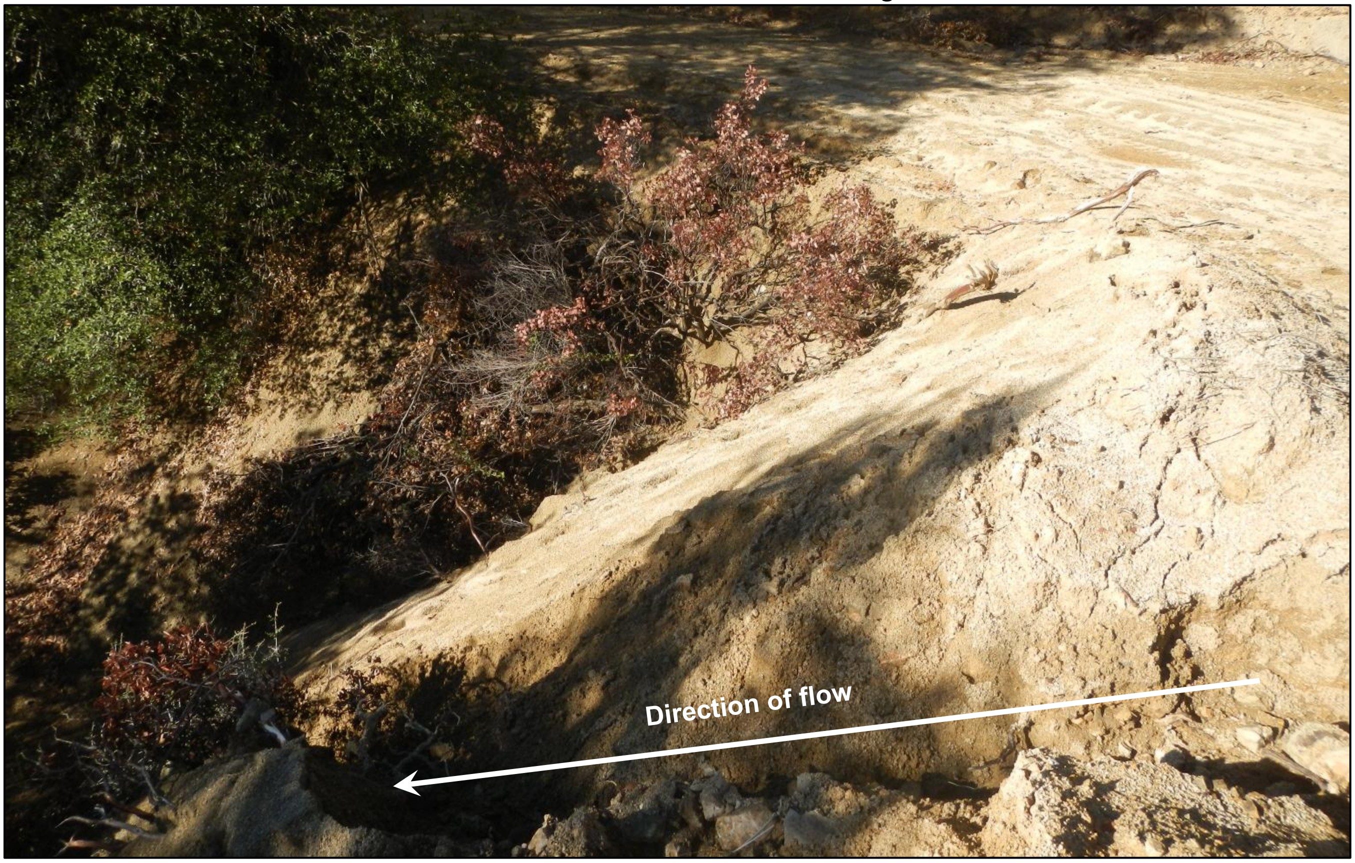

Figure 10. Downstream edge of Crossing 2 with no erosion control present. Evidence of scour is visible due to minimal rain events that have occurred prior to site inspections. October 28, 2014

Crossing 3: Crossing 3 is located on an unnamed tributary to Duckett Creek, not actively flowing during the inspection. The stream exhibited physical characteristics of flow including presence of clear, natural bed, bank and channel and evidence of scour (Figure 11).

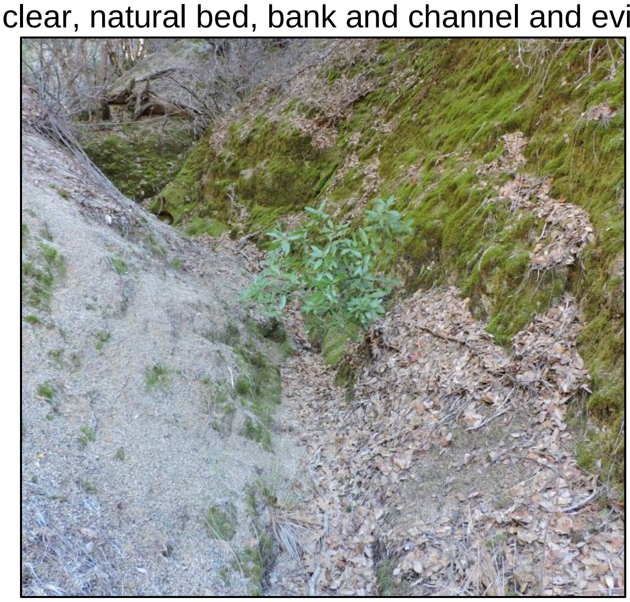

Figure 11. Evidence of scour and bed, bank or channel at Crossing 3. November 7, 2014

The stream crossing was constructed with no culverts to pass flow (Figure 12). With no culvert in place to pass flow the water will have to flow over the road fill. The road in this area has not been armored to protect itself against these flows and will easily erode. Once this erosion begins the stream crossing will easily fail passing all of the fill material (173.3 cy) into the stream. Also, to place fill within a stream channel for the ease of crossing substantially alters the bed, bank, and channel of the stream. This alteration is unavoidable due to the required grading and excavation activities. Furthermore, substantial environmental impacts have and will occur due to the substandard construction activities utilized as described below.

Figure 12. Crossing 3 constructed with no culvert to pass the flow. The photo was taken on the undisturbed edge upstream looking towards the downstream edge. The linear distance between these two points of altered stream channel was approximately 78 feet. November 7, 2014

- No erosion control is installed on the fill slopes or over the road fill to protect against flowing water, that has nowhere else to go but across the road, or against heavy rainfall (Figure 12 & 13). The rock cobble placed on fill slopes should have 100% coverage and placed in an interlocking fashion. The areas unprotected by erosion control will allow fill material to be washed into the drainage by flows and rainfall. A stream crossing without culverts installed is considered a ford style crossing. If it is appropriate to design a ford type crossing specifically sized rock cobble should be placed across the fill in the area where water will flow. The flow topping the road due to no culvert installation weakens the integrity of the stream crossing greatly increasing the potential for the stream crossing to fail and washout releasing the fill material into the stream channel. When Crossing 2 fails it will release enough material to cover a ten foot stream one inch in depth for approximately 4,320 feet, just over ¾ mile (Table 1). Erosion control not only protects the stream crossing from washing out and the fill material from eroding but stops fine sediment from entering the watercourse and negatively impacting fish and wildlife resources within and downstream of the crossing site.

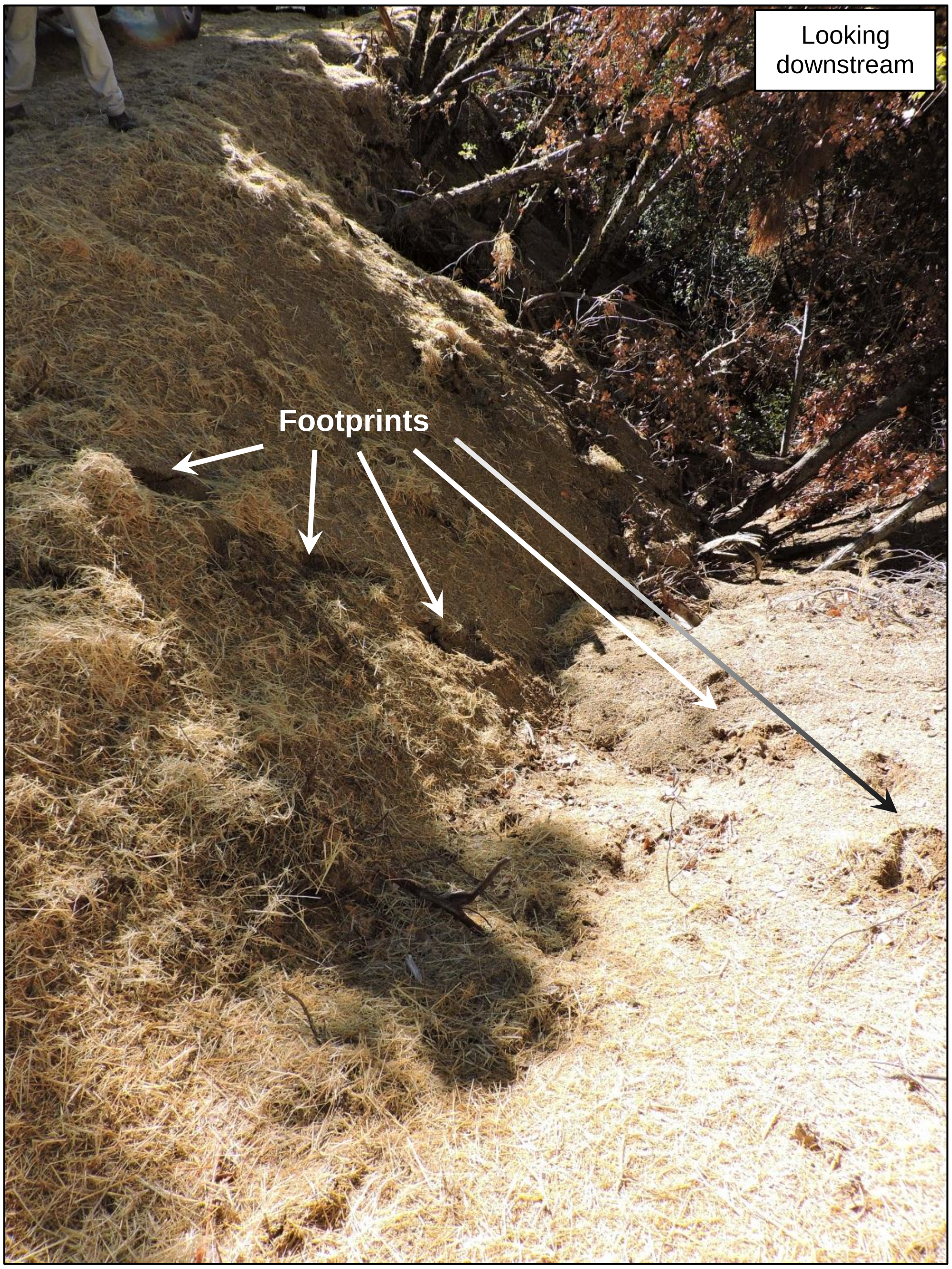

Figure 13. Looking down the fill slopes at Crossing 3. Footprints are visible in the fill material that when taken by the individual they sunk four to six inches into the fine, loose sediment. November 7, 2014

<u>Pollution Activities</u> – Three sites had pollutants either placed or discharged into the streams.

Water Pollution: Sediment - The extensive grading activity that occurred on the Cordes property will allow sediment to enter multiple unnamed tributaries to Doby Creek and Duckett Creek. It is likely that a portion of the grading activity occurred in trespass on adjacent landowner property (Figure 2). The two main streams where we concentrated our efforts and documented the discharge of sediment that had already occurred were the unnamed tributaries to the east and west of the large graded landings (Figure 2 & 14).

Figure 14. View of the graded landings from the ridge to the west. Erosion and rills in the excavated sediment is apparent even at this distance of about 500 feet. November 7, 2014

A large quantity of ground disturbance, in the form of road and site grading activities, occurred on the subject property without the proper permits or erosion control in place (Figures 15 - 21).

West Tributary:

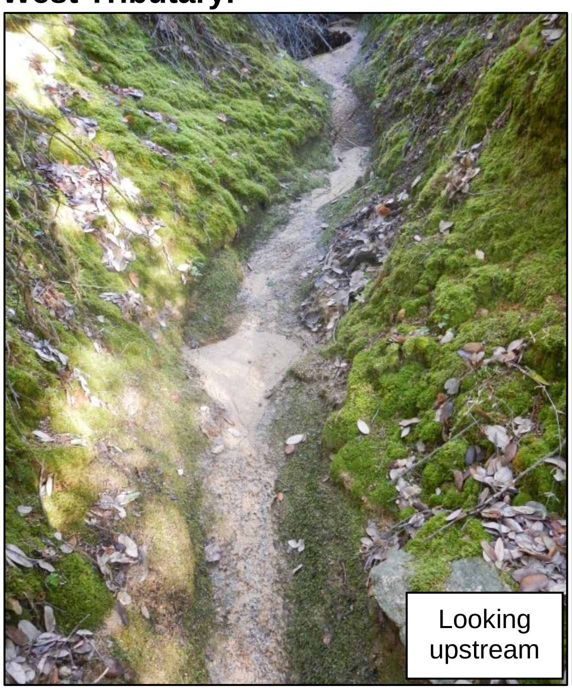

Figure 15. Evidence of fine sediment entering the west tributary. October 28, 2014

Figure 16. West tributary with evidence of large quantities of sediment washed into the stream. October 28, 2014

Figure17. Unaffected tributary entering the west side sediment laden stream (left). Inset photo shows how clear the pool is directly upstream (above). October 28, 2014

Figure 18. Freshwater benthic macroinvertebrate (Ephemeroptera) found in pool. October 28, 2014

Figure 19. Comparison of naturally occurring streambed material, left hand (top), and fine sediment from grading activities entering the stream, right hand (bottom). October 28, 2014

East Tributary:

Figure 20. The side slope of one of the graded landings showing evidence of the fine sediment being eroded into the east side tributary. The darker material is potting soil that was placed along the top edge of the slope that is also being washed into the drainage. October 28, 2014

Figure 21. Evidence of large quantities of deposited sediment in the east side tributary that is entering and settling out directly upstream of the crossing. The culvert is already diminished in capacity by half from settled sediment (same as Figures 6 & 7; see for more detail). October 28, 2014

The week preceding the initial site inspection had a small rain event. The fine loose sediment from the grading activities has already entered the stream and will continue to discharge to the streams, if corrective measures are not taken.

Water Pollution: Potting Soil – Large quantities of potting soil were discarded in areas that easily allowed the material to be washed into the streams (Figures 20 & 22). Potting soil contains perlite, which is a soil amendment added to provide aeration and optimize moisture retention; it is an amorphous volcanic glass that greatly expands when heated making it a bright white light weight material. Potting soil is not only detrimental to aquatic environments due to the deposition of soil and perlite but it also regularly contains quantities of gardening chemicals (e.g. fertilizers, insecticides, herbicides, rodenticides, etc) that are also detrimental if introduced into these environments. One method of determining if potting soil and its contaminants have entering an aquatic environment is by looking for or following deposited perlite that is easily transported by flowing water due to its buoyant nature.

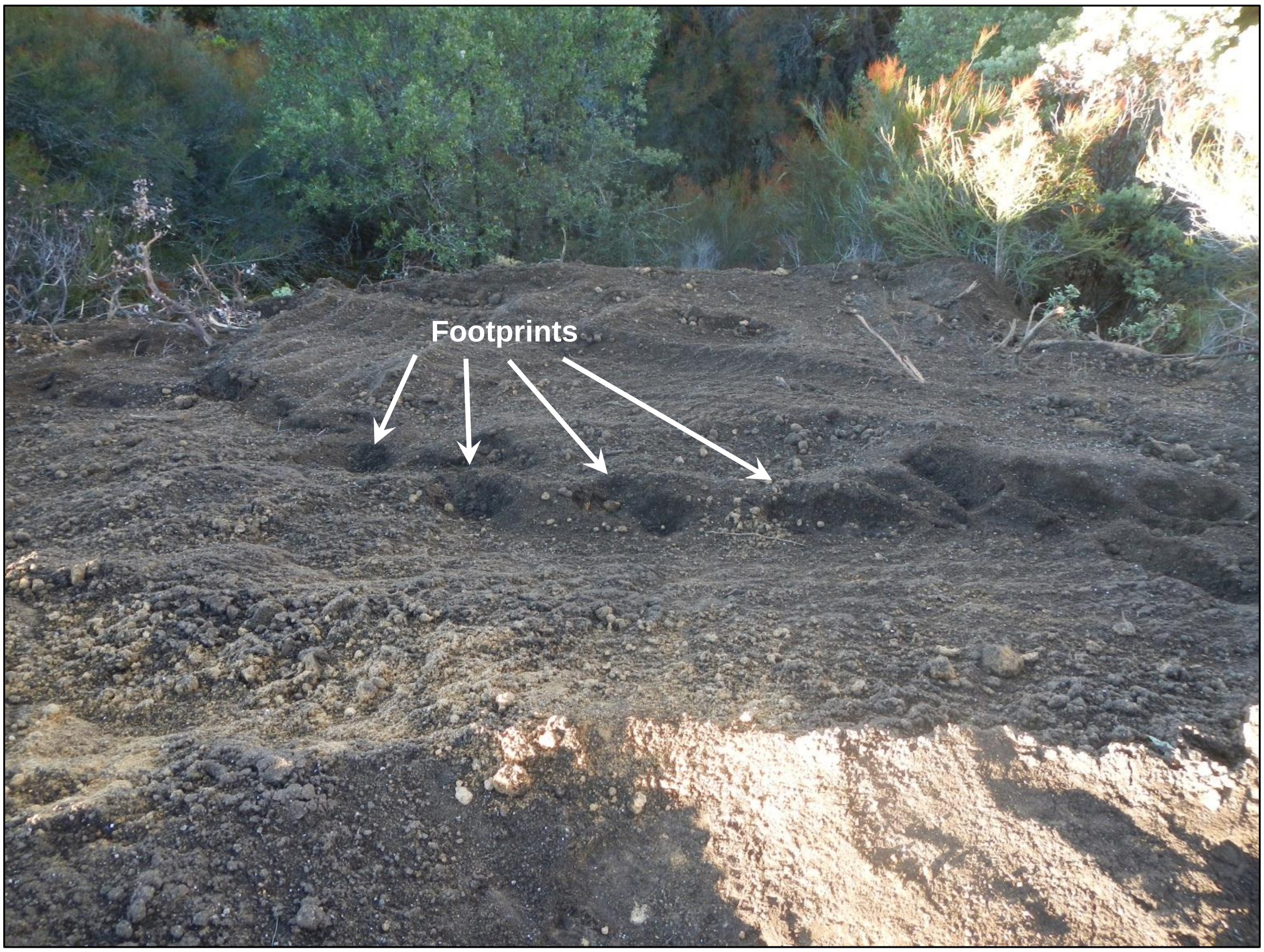

Figure 22. Potting soil dumped onto a graded side slope where it has been eroding into the west tributary. Footprints are visible in the loose soil that are approximately 12 inches deep (See Figures 20 & 26 as well). October 28, 2014

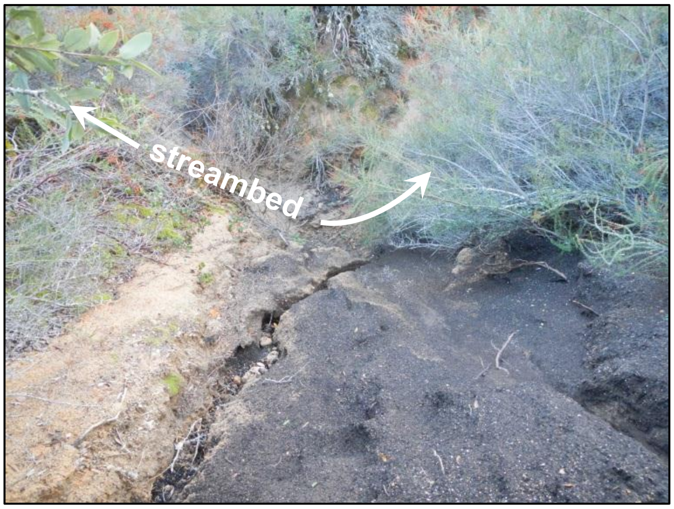

Figure 23. West side tributary showing evidence of erosion and deposition of potting soil. October 28, 2014

Figure 24. Evidence of potting soil and perlite that has entered the west side tributary and been relocated by flowing water and deposited downstream. October 28, 2014

Figure 25. Evidence of potting soil and perlite found approximately 500 feet downstream of where it was originally permitted to pass into the stream (Figure 23). Perlite easily visible along the stream as evidenced in the inset photo. October 28, 2014

Refuse Disposal: It appears that garbage was purposefully pushed over the edge of one of the graded landings, within 150 feet of the west tributary. Instead of disposing of this refuse in a legal manner it is evident it was placed in this location during grading activities due to placed sediment, scour patterns and the discarded potting soil partially covering the waste. One of the pieces of refuse was an older refrigerator or freezer that could contain chlorofluorocarbon (CFC) which can/will leak into the environment if not disposed of properly. CFCs are heavily regulated because of their destructive effects on the ozone layer. CFCs are directly linked to the depletion of the ozone layer, global warming and climate change.

Figure 26: Refuse that had been dumped over the edge of one of the graded landings within 150 feet of the west tributary to Doby Creek. The side casting and erosion of the sediment and potting soil are also visible. October 28, 2014

<u>Aquatic Resources at Risk</u> – Aquatic species and freshwater benthic macroinvertebrates are important organisms within the watershed. They are a food source for other organisms (e.g. fish, amphibians and birds) and are used to assess the health of freshwater environments.

Effects of Sediment and Turbidity on Aquatic Species: Fine sediment (sand, silt, and clay-sized particles less than 0.08 inches in diameter) produced by human activity is the "major pollutant of U.S. waters" (Waters 1995 taken from Annear *et al*. 2004) and is the "most important factor adversely affecting stream habitat" (Judy et al. 1984 taken from Annear *et al*. 2004). Some of the adverse effects associated with increased fine sediment include the following:

1. *Reduced survivorship of aquatic species because of low quality and complexity of habitat due to blanketing of substrate and infilling of pools*.

   Sediment-induced habitat alterations (e.g. the infilling of interstitial spaces in the streambed gravel and pools) negatively affect habitat quality and therefore survivorship of fish and other aquatic species. The addition of fine sediment to streams fills in habitats and reduces water depth causing an increase in water temperatures. Crevices and interstices in streambed gravel, cobble and boulders are used as habitat by many freshwater benthic macroinvertebrates and to avoid predation and high stream flows by other aquatic species. Deep pools are important to aquatic species as hiding places from predators and as cold-water oxygen-rich habitat during hot summer months. As sediment fills these pools, those species are exposed to the detrimental effects of warmer and less oxygenated water as well as becoming more susceptible to predation. During the breeding season many amphibians need clean attachment sites for eggs. A sediment laden stream will diminish the number of available breeding sites. In addition, settling sediment can smother egg masses.

2. *Chronic turbidity and settled sediment make it more difficult for aquatic species to feed and cause gill abrasion.*

   The main food source for the larval stage of frogs and many freshwater benthic macroinvertebrates is algae and vegetation present in the stream. Settled sediment not only covers the food source but over time eradicates it decreasing the available food and therefore reducing survival. Fine sediments that do not rapidly settle out can also be deleterious to aquatic species because they significantly increase the water's cloudiness and turbidity. Many aquatic species are sight feeders and as such, depend on water clarity for success in finding food. Turbid water decreases visibility, thereby adversely affecting foraging success diminishing survival. Turbidity can also cause aquatic species to spend energy to rid their gills of sediment by coughing and erode sensitive gill tissues, thereby inhibiting growth or even resulting in mortality.

3. A *decrease in the production of freshwater benthic macroinvertebrates due to substrate coating with fines or burial of substrates.*

   Freshwater benthic macroinvertebrates, including caddisflies (Trichoptera), mayflies (Ephemeroptera), water pennies (Coleoptera) and stoneflies (Plecoptera) are a food sources for many aquatic species. These insects develop on the clean surfaces of stream substrate ranging from large boulders to small gravel. The deposition of fine sediment around and over streambed substrates reduces both the area upon which aquatic insects may develop and interstices used as both habitat and hiding places to avoid predation and/or swift currents.

<u>Conclusion</u> – On October 28, 2014 and November 7, 2014, in the capacity of a CDFW Senior Environmental Scientist, I inspected the subject property as part of WET. During the inspections I observed activities that substantially altered the streams' bed, bank and channel, and placed sediment and refuse where they can pass into waters of the state. These activities consisted of the reconstruction or new construction of three stream crossings and grading activities.

The work associated with the three stream crossings are subject to FGC section 1600, et seq. Specifically, FGC section 1602(a) requires an entity to notify the CDFW before: 1) substantially diverting or obstructing the natural flow of a river, stream, or lake; 2) substantially changing the bed, channel, or bank of a river, stream, or lake; 3) using any material from the bed, channel, or bank of a river, stream, or lake; and/or 4) depositing or disposing of debris, waste, material containing crumbled, flaked, or ground pavement where it may pass into a river, stream, or lake. In this case, CDFW has determined that notification was required and a LSA agreement should have been obtained since the activities have and will substantially adversely affect the existing fish and wildlife resources. The purpose of issuing an LSA agreement for projects that substantially alter the bed, bank, and channel of streams and/or substantially divert or obstruct the natural flow is to ensure projects have protective measures to follow to avoid or minimize adverse impacts to those fish and wildlife resources. None of the work performed on the streams for the crossings had protective measures typically required in an LSA agreement.

The work conducted on the Cordes property (e.g. the construction of the three crossings, other grading activities, and the discarded potting soil) has placed and left deleterious material in a condition that will allow it to easily pass into the waters of the state, which is in violation of FGC 5650(a)(6). Specifically, this section states it is unlawful to deposit in, permit to pass into, or place where it can pass into the waters of this state…any substance or material deleterious to fish, plant life, mammals, or bird life. If all three crossings fail a total of 540.2 cy of material will enter waters of the state. This will be enough material to cover a ten foot stream one inch in depth for approximately 17,504 feet, approximately 3¼ miles (Table 1). Furthermore, fine sediment from grading activities and used potting soil has been left in a condition that has and will continue to allow the sediment and soil to easily pass into the various tributaries on the Cordes property.

Finally, refuse has been placed in areas where it can easily pass into waters of the State a violation of FGC section 5652(a). Specifically, this section states it is unlawful to deposit, permit to pass into, or place where it can pass into the waters of the state, or to abandon, dispose of, or throw away, within 150 feet of the high water mark of the waters of the state, any cans, bottles, garbage, motor vehicle or parts thereof, rubbish, litter, refuse, waste, debris, or the viscera or carcass of any dead mammal, or the carcass of any dead bird. This refuse includes numerous old vehicle tires, a refrigerator/freezer that could contain CFC, and other metal/wood/electronic components.

Due to the above stated environmental conditions and FGC violations freshwater benthic macroinvertebrates and other aquatic species will be adversely affected either by sediment load or pollution of the streams.

There were a total of 10 FGC violations associated with the marijuana cultivation (Table 2).

TABLE 2. FGC Violations			
Name	**Description of Activities**	**FGC Section**	**Violation Description**
Crossing 1	Constructed stream crossing	1602(a)	alteration
	Potential sediment discharge	5650(a)(6)	sediment
Crossing 2	Constructed stream crossing	1602(a)	alteration
	Potential sediment discharge	5650(a)(6)	sediment
Crossing 3	Constructed stream crossing	1602(a)	alteration
	Potential sediment discharge	5650(a)(6)	sediment
Grading Activities - west tributary	Sediment discharge	5650(a)(6)	sediment
Grading Activities - east tributary	Sediment discharge	5650(a)(6)	sediment
Pollution Activity - potting soil	Placement of deleterious material	5650(a)(6)	pollution
Refuse Disposal	Placement of refuse	5652(a)	pollution
Total FGC Violations = 10			

References:

Annear, T.I., Chisholm, H. Beecher, A. Locke, and 12 other authors. 2004. Instream flows for riverine resource stewardship, revised edition. Instream Flow Council, Cheyenne, WY.