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RECEIVED
9-22-14
SWRCB Clerk

September 22, 2014

Via email transmission

State Water Resources Control Board Members commentletters@waterboards.ca.gov

Re: Draft Order of Denial of Reconsideration – Deer Creek
Stanford Vina Ranch Irrigation Company

Members of the Board:

I. <u>Summary of Stanford Vina Ranch Irrigation Company's recommended action to the Board:</u>

1. We suggest that the SWRCB not adopt the Order denying Reconsideration, and at the same time that the Board not grant the Stanford Vina Petition for Reconsideration. The time limit of 90 days for Board action under Water Code Section 1122 on a Petition for Reconsideration has been exceeded.

2. It is not necessary or beneficial for the SWRCB to now try to make the dramatic statements regarding changing California water rights law to allow the Board to declare irrigation use unreasonable because someone thinks there is a more valuable use for the water. Instead of acting upon the Petition, the SWRCB should order an expedited hearing as to whether the 50 cfs Emergency Regulation should be amended by the Board based on evidence of actual fish needs and effects on irrigation within the Deer Creek service area.

3. That suggested plan of action would leave the Emergency Regulation with its 50 cfs bypass requirement starting October 1 in place and enforceable (if adult Steelhead are present). If the Board directs immediately that a short hearing occur as to Deer Creek, Stanford Vina's request to allow the California Department of Fish and Wildlife (CDFW) to excavate a narrowed channel in the streambed gravels that will require a bypass of less than 50 cfs can be considered and measures considered as to whether the strict calendar dates for these flows should be changed to incorporate water temperature conditions that permit use of the water beneficially for the fish and to protect the Spring-run redds from possible Fall-run adult superimposition and disturbance. Fall-run which are encouraged to swim upstream early by these new bypass requirements when lower elevation water is warm may not maintain separation from the Spring-run redds. If it remains dry in future years, such a channel, and a real-time regime for flows and such a procedure, will benefit conditions for later years. Before the SWRCB it orders dramatic

changes like this, the Board is required to consult under the Endangered Species Act with NMFS to avoid harm to the Spring-run. All of this could theoretically be accomplished in a short hearing.

4. The SWRCB is asked to agree to a mutual tolling of the statute of limitations upon any action for writ of mandate or taking claims by Stanford Vina so that our collective energy can be invested in the hearing and determination of whether there is a better mechanism to protect the fish, such as the channelization of bypass flows. If a Court action is eventually required, do you really want a record in place evidencing that public record requests explaining the basis for the emergency regulation have not been responded to and no evidence to allow a balancing was submitted or allowed?

II. Discussion

The proposed Order denying the Petition for Reconsideration places each of the Board Members who would presumably adopt the Staff's views contained within that Order in a position of declaring that from this date forth the SWRCB declares that it may at any time prefer any use of water over another use of water as more reasonable, and therefore render and declare irrigation use as unreasonable. Based upon the comparative judgments of personnel of the CDFW and the SWRCB communicated in private conversations leading to the Emergency Regulation, with no factual evidence presented at a hearing other than that more water is better for the fish species listed as endangered or threatened, this Board is placed in a position of ordering 50 cfs of water to be bypassed from specific calendar dates. This order is adopted regardless of the water temperature of the flows, and regardless of the fact that Spring-run Salmon and Steelhead have been protected and have prospered on Deer Creek without Fall-run Salmon disturbing the spawning redds of Spring-run Salmon for more than 125 years, by Stanford Vina's use of irrigation water in the fall. When winter rains arrive irrigation stops, and Steelhead enter and leave and Fall-run adults enter Deer Creek and spawn only when lower elevation reaches of Deer Creek are cool without molesting the upper sites of Spring-run Salmon redds.

On the basis of some form of communication between your staff, California CDFW and NMFS, you have been given an emergency regulation to adopt. Water users were not provided any opportunity other than Mr. O'Laughlin on behalf of Deer Creek Irrigation District and our efforts on behalf of Stanford Vina attempting to wrench 10 minutes of Board time to provide what evidence could be gathered in such an abbreviated notice period. There was no presentation of evidence by California CDFW or NMFS other than the conclusion that more water is better, and therefor use of water for irrigation should be curtailed and is unreasonable. On June 27, 2014, Public Records Requests were submitted by Stanford Vina to the SWRCB, CDFW and OAL for these communications. No records have been provided. Citing heavy work loads, neither the CDFW or the SWRCB have complied, so that what information was provided to the SWRCB authors to justify this Emergency Regulation is unknown.

You are fully aware that every court decision regarding the right to water use states that the decision requires balancing. Hopefully, your Board Member will be made uneasy by the fact that these conditions and water uses have been known for years, and now suddenly – under the cloak of emergency conditions – you are asked to overturn water law.

There is no point in rehashing the legal arguments as to why what is being proposed here is legally improper and you should not put your name on it. No point in explaining how society only operates if the rules are followed and can be relied upon...claims of emergency notwithstanding. We have to provide you an alternative today that is viable. Fortunately, we have been trying to provide that alternative prior to adoption of this standard of 50 cfs through June 30 and then commencing again on October 1 through the fall, winter and spring.

Stanford Vina has offered to excavate and create a channel connecting the pond areas in the streambed at its own cost. The narrowed channel flow would require far less than 50 cfs, would increase the velocity of the water and reduce the warming of the water, and would reduce opportunities for animal predation of fish migrating up-channel and juveniles going down-channel next spring if it stays dry and the channel is not washed out by flooding. Stanford Vina's formal proposal and photographs of August 12, 2014 (Exhibit "A") and DFG's non-committal response of August 27 (Exhibit "B") has not been followed by resolution nor formal objection. Director Bonham has been appealed to (letter of September 19, 2014, Exhibit "C").

So how can the Board extract itself without contradicting its Staff's position that water law should be changed as described and rationalized in this draft Order of Denial and as explained in the Petition for Reconsideration, while retaining the bypass requirement and allowing everyone to save face?

III. <u>Three Steps are Recommended</u>:

<u>Step 1:</u> **<u>Do not adopt the Order of Denial. The time limit for action has already expired.</u>**

Water Code Section 1122 states and requires:

> "The board shall order or deny reconsideration on a petition therefor not later than 90 days from the date the board adopts the decision or order."

More than 90 days have elapsed. The order was adopted on June 5. The 90 days elapsed on September 7. Therefore, to a great degree the text of this proposed Order Denying Reconsideration is an attempt by some of your staff to rationalize the Order for a Court review. First, they suggest you issue the order by Emergency Regulation, then the time runs out to reconsider or amend the order other than to rescind and cancel the emergency regulation as to

Deer Creek, which obviously you will not be comfortable in doing because of fear that some bypass flows are reasonable.

<u>Step 2:</u> <u>The SWRCB does not have to grant reconsideration. It can order a separate expedited brief hearing on whether the emergency regulation terms are correct and can be improved.</u>

If the Board took no action to adopt what is obviously a Order on Reconsideration that is window dressing but instead convened a hearing, assigning one of the Board members to hear evidence limited to perhaps 6 hours as to whether it is reasonable to conserve water to be bypassed by establishing an excavated channel and whether the maintenance of flows for the full calendar months through June and commencing again in October and November without regard to the temperature of the water and the possible detrimental effects upon Spring-run Salmon redds, and received a report from that Board member as to possible amendments or modifications of the emergency regulation, a long-term methodology might be developed, and by those steps develop a much better record if it is necessary to litigate these issues.

<u>Step 3:</u> <u>Tolling the Statute of Limitations so that litigation might be avoided.</u>

The next step would be for the Board to offer an agreement tolling any statute of limitations for filing a writ of mandate or any taking claims for all parties. We don't know if it is going to rain, and Stanford Vina would rather invest its money into efforts that reduce water demands and improve the fish conditions. Is the Board really going to adopt emergency regulations every dry year because CDFW is disorganized?

The legal effect of these three steps would be that the emergency order remains in effect.

Your final concern in taking these steps might be: Other diverters on Mill Creek, Antelope Creek and Deer Creek signed "cooperative agreements" with CDFW and waived their claims...obviously under threat and duress. You will be concerned that you might be rewarding the stubborn party. How does leaving the 50 cfs requirement in place starting 10 days from now (potentially October 1) as to Stanford Vina reward? The rule of law and certainty in society requires certain procedures. To use an analogy: The fact that 9 homeowners out of 10 might give up their ability to occupy their homes for a "more reasonable use" in the eyes of State officials to protect an Endangered or threatened species when threatened with $2500 per ac/ft fines does not mean that the one homeowner who relies on its Constitutional rights is rewarded because society finally pays attention to those societal principles and a hearing is held as to whether the needs of the species really require these measures! If this Board is worried about not encouraging persons to resist reasonable requests of the fisheries agencies and avoiding disputes, let's find out by evidence if the requests are reasonable. Confidence of water right holders in the SWRCB members willingness to question and determine facts is essential in making this system work.

IV. Conclusion

The SWRCB should provide for an evidentiary hearing, make specific determinations of what balancing of reasonable use for irrigation means in respect to reasonable use of fishery flows. Irrigation use does not become unreasonable or wasteful simply because government wishes it but does not wish to use eminent domain powers.

MINASIAN, MEITH,
SOARES, SEXTON & COOPER LLP

By: ______________________
PAUL R. MINASIAN, Attorneys for
STANFORD VINA RANCH IRRIGATION COMPANY

PRM:dd

Enclosures: Exhibit "A" - Letter 8-12-14 to Neil Manji, Regional Manager of CDFW (with enclosures)
Exhibit "B" - Manji response 8-12-14
Exhibit "C" - Letter to Bonham 9-19-14

cc w/enclosures: Charlton Bonham, CDFW Director, Chuck.Bonham@wildlife.ca.gov
Niel Manji, Regional Manager, CDFW, neil.manji@wildlife.ca.gov
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Stanford Vina Ranch Irrigation Company Board of Directors

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August 12, 2014

Via email transmission
neil.manji@wildlife.ca.gov

Neil Manji, Regional Manager
California Department of Fish and Wildlife
Northern Region
601 Locust Street
Redding, California 96001

Re: Fishery Management and Flows in Deer Creek, Tehama County

Dear Mr. Manji,

I. <u>Introduction:</u>

As you are aware, our office represents Stanford-Vina Ranch Irrigation Company. Members of your staff have been working to gain an understanding of anadromous fishery resources upon Deer Creek for a number of years, as have we.

In 2014, your staff and the Department of Fish and Wildlife's Sacramento staff have been engaged in encouraging the State Water Resources Control Board to take certain water resources of Stanford-Vina Ranch Irrigation Company under emergency regulations. Although we object to both the procedures used and the taking of property interests, proper use of resources requires that water supplies not simply be thrown at fish, hoping for some benefit to the fishery. We know your Department agrees with that principle in regard to both fish and water. In addition, we all understand that in perceived emergency conditions, actions may be taken which when viewed in hindsight could have been better tailored to the actual conditions. Here, there appears to be a real danger that unless changes are made in the flow regime, real damage to the spring run and steelhead fishery could be inflicted. There is substantial evidence that the fishery species have been protected by spring irrigation and fall irrigation diversions which a rigid calendar schedule of bypass flows such as that adopted by the SWRCB does not accommodate.

We appear to be beyond the issues related to repair of the fish ladders. We would ask that DFW join with us to attempt to resolve bypass and pulse flow issues in the Spring and Fall.

II. **DFW and NMFS should work with us on an expedited basis to implement a plan to be effective in Fall 2014 and in future dry years in both the Spring and Fall to implement a more flexible flow regime by which the fish would benefit.**

We propose that we focus on the following issues:

2.1 Spring flow issues. Attached you will find the April - July 2014 temperature readings for Deer Creek and Mill Creek locations. We think DFW and NMFS would have to agree that past studies by fishery agencies of steelhead, fall run salmon and spring run salmon behavior on Tehama County streams confirm that bypassing "hot" water downstream and attempting to wet the whole stream channel with base flows or pulse flows when temperatures of the water are elevated can actually be harmful to fish. Trying to keep the full Deer Creek channel wet attracts predators from the Sacramento River so that even if the juveniles outmigrating beyond the period of cooler water temperatures attempt migration in the warmer weather, the full wetting of a shallow stream bed creates ideal predator habitat for warm water fish as well as avian and terrestrial predators. Low velocity water spread over a wide stream bed adds to the mortality.

Similarly, although spring pulse flows are intended to encourage the last lingering adult spring run to leave the Sacramento River and move upstream, if they are not made before water temperatures exceed the upper limits, they simply warm flows which now spread across the whole channel. The warm water in the first instance assures such stress that these adults will either die or spawn in areas where the juveniles cannot emerge and survive.

The Deer Creek temperatures in late May 2014 demonstrate that both base flows made upon the rigid schedule adopted by the SWRCB were of little value to the fishery, and as discussed hereafter may have actually harmed steelhead. We suggest that the better plan is to encourage lingering Spring run adults to swim upstream in April and May only when temperatures are low and vigorous flow velocity in a narrowed channel between ponded areas exists. This same method would provide sufficient water to encourage use of those high velocity, narrowed channels for juveniles to return in the Spring to the Sacramento River and reduce predation potential while preserving what cold water characteristics are possible for these late outmigration fish, even though the Sacramento River conditions will not favor their survival.

2.2 The base flows proposed in the SWRCB Order in April, May and June of 50 cfs and two pulse flows of 100 cfs for 2 days sounds logical when the object of attracting the last few spring run adults to move and transport themselves past riffles with ease upstream. However, when it is realized that late migrating salmon juveniles and steelhead are now subject to being spread in warm water all over a channel below the Stanford-Vina Dam, unnecessarily warming the water and encouraging predators to move into Deer Creek and increasing juvenile salmon and steelhead mortality from bass and avian predators through shallow flows, it becomes obvious that survival may be threatened and losses may actually be increased over the historic natural pattern.

2.3 One probable reason that steelhead and spring run have prospered in Deer Creek and Mill Creek compared to other Central Valley streams where mortality from conditions in the Sacramento River and Delta may be a greater influence is that the Deer Creek and Mill Creek channels in dry years are actually often totally dried up by irrigation deliveries. Juvenile salmon outmigrate earlier and only when there are high natural flows, and colder water temperatures, and – probably more important – steelhead remain resident and do not attempt to outmigrate until these conditions again exist. The irrigation use of water and drying of the channel reduces predator populations. A more precise means of monitoring water temperature by having a narrowed channel from Stanford Vina Dam to the Sacramento River when drought conditions occur and conserving water flows in these narrowed areas to increase velocity and reduce warming are all practical to implement.

2.4 Our suggestions below are aimed at (i) maximizing all of our goals by reducing predator opportunities, restricting flows to a narrow but deeper channel with faster moving water, and hopefully cooler flows connecting pond areas when drought conditions exist on Deer Creek, (ii) ceasing bypass or pulse flows when average water temperatures reach levels that stress adults or juveniles and the temperatures likely mean that the bypassed water will not benefit the steelhead or salmon fishery, and (iii) delaying Fall bypass flows when there is a risk of harming the fishery resources in the Deer Creek system as may occur if Fall run are induced to spawn on top of Winter run redds when superimposition is possible. Fall flows should be delayed until Spring run adult spawning is substantially complete, and Spring bypass and pulse flows should not occur when water temperatures will increase predation of juveniles.

III. The channel modifications necessary to address dry spring or fall 2014 flow conditions without unnecessarily attracting predators or using water flows.

3.1 Attached you will find aerial photographs which identify, based upon a fully flowing stream in July of 2011, the potential areas where a backhoed channel approximately 1-2 feet deep and 3 feet wide could be excavated. Also attached are photographs taken in 2014 showing locations taken from ground-level where excavation would be required and FishBio's observation as to the work. We estimate that there are approximately 10 of such areas where excavation would be required, and if an estimate of 8-10 feet in length is utilized, approximately 500 cubic yards of material could be excavated to create higher flow sections. The materials would be deposited immediately adjacent to the channel construction and roughly spread to try to preserve the narrowed channel through some high flow conditions. In this way, the formed pond areas can be connected, and any base flows or future 2015 pulse flows made to attract spring run adults or conveying late emigrating juvenile spring run or steelhead can be channelized resulting in lower water temperatures, swifter flows and less opportunity for predation.

3.2 We believe the amount of water that could flow between these excavated reaches and the ponds could be reduced from 50 cfs to approximately 5 or 10 cfs, but this quantity would await actual field observations of adult spring run in a drought year (perhaps 2015) subject to the estimate being confirmed.

3.3 The work would be done by a backhoe or angle-bladed Caterpillar-type tractor which would be fueled outside of the channel and would be checked for potential oil and hydraulic leaks before being placed in the streambed. However, it is critical that regulating and permitting burdens represented by Section 1600 of DFG be limited so that the excavation work can be performed when the channel has limited flows in proximity to a flow condition that makes the channelization a water-saving and fish-enhancing measure. We discuss the authority for an emergency exemption from Fish and Game Code section 1600 below, and envision a contract in memorandum form with DFG as a substitute for the delay and expense of the 1600 process in this emergency.

3.4 We have attached the actual 2014 temperature readings for the water at the USGS gauge located above both the Deer Creek Irrigation District and Stanford-Vina Ranch Irrigation Company. These temperature readings are taken some 5 miles above the Sacramento River. There is obviously substantial additional warming in this distance. These temperature readings confirm that the temperature of the water rises by the first of June to levels which if they are not already in the areas of Deer Creek protected from warming the lower elevation water temperatures are most certainly going to stress adult spring run to the point where – even if induced to travel up Deer Creek by reduced irrigation diversions – they will not survive in any case and may spawn in equally warm water destining the spawning to be unsuccessful. The idea of simply setting bypass flows by the calendar without terminating them when lethal and stressful temperatures are reached is not applying the best existing scientific knowledge, and we suspect your scientists will agree. The Memorandum would provide for a temperature criteria for any bypass or pulse flows. This temperature criteria is also necessary to avoid using water flows for the purposes of sending steelhead juveniles downstream in those warm temperature conditions either in the spring or fall of 2014 when they can stay in the upper reaches of Deer Creek and prosper. Let's work together to put temperature conditions on the bypass of water and pulse flows in the spring and fall periods.

IV. **Fall flow issues:**

4.1 Obviously, we do not know what the fall and winter of 2014-15 is likely to bring, but to refresh your recollection, the SWRCB order contains two requirements:

A. From October 1 to March 31, if adult CCV steelhead are present, base flows of 50 cfs are to be bypassed; and,

B. From November 1 to June 30, if juvenile Sacramento River salmon or juvenile CCV steelhead are present, and adult salmon/steelhead are not present, base flows of 20 cfs are to be bypassed.

The SWRCB Order does not describe where the "presence" condition is to be determined. Hopefully DFW, NMFS, Stanford-Vina and Deer Creek Irrigation District can devise a methodology for determining the location and characteristics in determining the "presence" of these species relevant to the beginning of bypass flows. Obviously, the 270-day term of the emergency regulations will end long before June 30 of 2015.

4.2 These flow amounts as early as October 1 were obviously developed without consideration of the potential harm from fall run adult salmon being attracted to spawn on top of the spring run adult salmon redds in Deer and Mill Creeks. Flows commencing October 1 will have the effect of encouraging fall adult salmon to commence migrating upstream from the Sacramento River and spawning on top of the spring run salmon redds on Deer and Mill Creeks. As you know, the spring run adults reside between their migration upstream in April and early May and commence to spawn in August-September. We know that your object in having a base flow commencing October 1 is also aimed at steelhead, but real damage can be done to the spring run salmon population of Deer Creek and a violation of the Federal and State Endangered

Species Act can be caused by this "calendar date methodology" if fall run spawn on top of spring run redds before juvenile spring run, eggs are fertilized and embryos develop and the redds are disturbed before emergence.

4.3 We suggest a temperature criteria to delay any bypass flows until the water is cold enough to avoid stress to outmigrating juvenile steelhead using the narrowed channel, if it is employed, to reduce the bypass amount, and not stating the bypass which will attract Fall run adults until the Spring run adults have completed the spawning process and super imposition, is not a substantial risk.

4.4 Your organizations probably already realize that a pre-established calendar date schedule such as this is wrong. Let us work together to obtain a methodology that will benefit the fish. The historic irrigation practice for 100 years has resulted in bypass flows that might attract adult fall run salmon reaching the Sacramento River to migrate into Deer Creek not occurring until natural rain fall events and water temperature conditions cause the irrigation use of water to be curtailed in Stanford-Vina. The spring run redds are protected by this delay. A type of natural timing has resulted from irrigation use when rainfall events occur and a base flow to the Sacramento River occurs. At that time, spring run adult spawning, egg maturity and emergence of juveniles is well advanced and cannot be harmed by fall run salmon entering Deer Creek and spawning on top of spring run redds. You are well aware of the harm and genetic intermixing which can occur if fall run adults spawn in the same area and over the redds of the spring run before emergence. In the hurry and concern with water conditions in 2014, we think these facts were missed.

4.5 Our suggestion is that with the newly-excavated channel, bypass flows through the channel would be commenced in the fall only when (1) the water temperatures have declined to an agreed average temperature, and (2) snorkel surveys show that the spawning activity of spring run adults in the watershed above the USGS gauge is concluded or carcass studies already conducted by DFW similarly confirm the conclusion of spawning by spring run adults and the estimated time for emergence of the spring run juveniles shows little likely of damage from fall run spawning.

4.6 We know that the October 1 and November 1 dates were also aimed at steelhead migration upstream from the Sacramento River and downstream as well. The steelhead migration downstream has no specific date beyond which it must be accomplished, and obviously, predation will be less if more natural flow conditions from natural rainfall events occurs. The excavated, narrowed and deepened fish passage channel which would be installed in August-September 2014 and other dry years would assure that as farming uses of water decline, the steelhead will have a better chance of surviving predators than presently exists. Predation of steelhead is higher if they are exposed to warm water flows over a broad channel in lower Deer Creek. Not commencing bypass flows until spring run spawning is complete and water temperature is below an average of 65 degrees at the USGS and CDC gauges will best protect the steelhead populations as well. The current population on Deer and Mill Creeks evidences that agricultural use of water on these streams may actually have aided steelhead survival by timing their outmigration or upstream migration only when abundant cold natural flows in excess of farming use exist and predator habitat on the creeks is suppressed because of the dry stream bed sections.

V. DFW and Stanford-Vina Ranch Irrigation Company should jointly propose and request these changes:

5.1 We include a copy of the 1998 DFG Report made in regard to Mill Creek and Deer Creek, and certainly this information and later information all confirm that the time of spring run and steelhead run upstream is based more on their genetic makeup than upon the quantity of bypass flows than on the calendar. If the 2014-15 winter is not wet and drought persists, the low flow channel if not obliterated by high flows would provide a mechanism to avoid delay in spring run adult migration upstream in spring of 2015 and potentially downstream migration of juvenile salmon and steelhead in spring of 2015, again reducing predation opportunities.

5.2 We do not believe a Section 1602 permit is necessary in 2014 for this work under the terms and provisions of Section 1610 of the Fish and Game Code, as the work would be “immediate emergency work necessary to protect life or property.” Stanford-Vina is willing to perform the work in August 2014 in cooperation with the Department and with your advice. The Regional Water Quality Control Board will be notified and best management practices will be followed in regard to the excavations to limit sediment releases. Stanford-Vina will ask Deer Creek Irrigation District to participate in the cost of the work.

Assuming agreement can be reached, the Department of Fish and Wildlife and the water users would approach the State Water Resources Control Board with a revised operation memorandum applicable to this drought and future drought conditions for a modification of the emergency order to reduce the base flow requirement commencing October 1 if natural hydrology does not bring rains without waiver of any claims or rights on the part of either the SWRCB, DFW or the participants. All discussions of any settlement of these issues would of course be excluded from admission into evidence and neither party would utilize them to claim that an admission had occurred if agreement is not reached.

VI. Conclusion:

We believe the pulse flows and base flows established for mid-May and June of 2014 can be improved by modification to reflect good fish science. They would have been different and more precise if there had been sufficient time for DFW and NMFS to participate in a hearing and good science was applied. Flows in the Fall of 2014 should be temperature coordinated and reduced if a high-velocity narrowed channels system can be installed. In any case, base flows should not commence on October 1 unless the Spring run spawning in upstream areas is complete and super imposition will not result from Fall run adults spawning on Spring run spawning redds until the spawning is substantially complete. It is important if 2015 is dry and for future years that these coordination measures be implemented. We also believe your staff and that of Stanford-Vina can work together now to provide a means of monitoring temperature conditions and conserving water at the same time as achieving the goals of each in 2014 – and potentially 2015 – and establish a methodology useful in future years.

Let's work together to custom-make that operating order for Deer Creek and consider whether or not the lessons we learn on Deer Creek could be extended to Mill Creek and Antelope Creek and avoid problems of this nature in the future.

Very truly yours,

MINASIAN, MEITH, SOARES,
SEXTON & COOPER, LLP

By: [signature]
PAUL R. MINASIAN, ESQ.

PRM:dd

Enclosures:
1. 2014 FishBio Report: Review of Passage and Stream Conditions in Lower Deer Creek
2. 1998 Sport Fish Restoration Progress Report, Deer Creek and Mill Creek
3. 2014 Temperature Readings, Deer Creek & Mill Creek
4. 2001 Aerial Photographs – Deer Creek

cc w/enclosures: Barbara Evoy, State Water Resources Control Board, bevoy@waterboards.ca.gov
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Niel Moller, NMFS counsel, niel.moeller@noaa.gov
Tehama County Board of Supervisors, 633 Washington Street, P O Box 250, Red Bluff, CA 96080
Stanford Vina Ranch Irrigation Company Board of Directors
Dustin Cooper, Esq. Dcooper@minasianlaw.com

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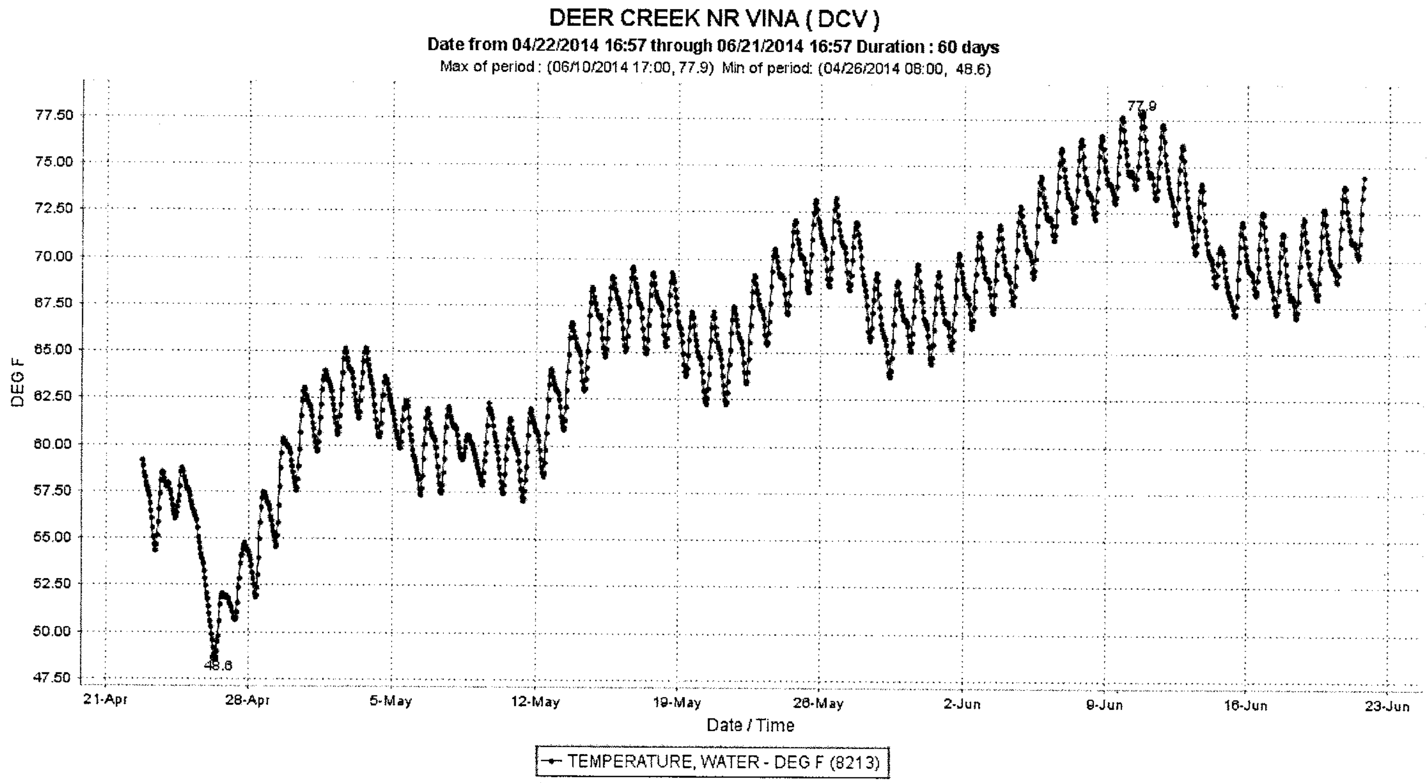

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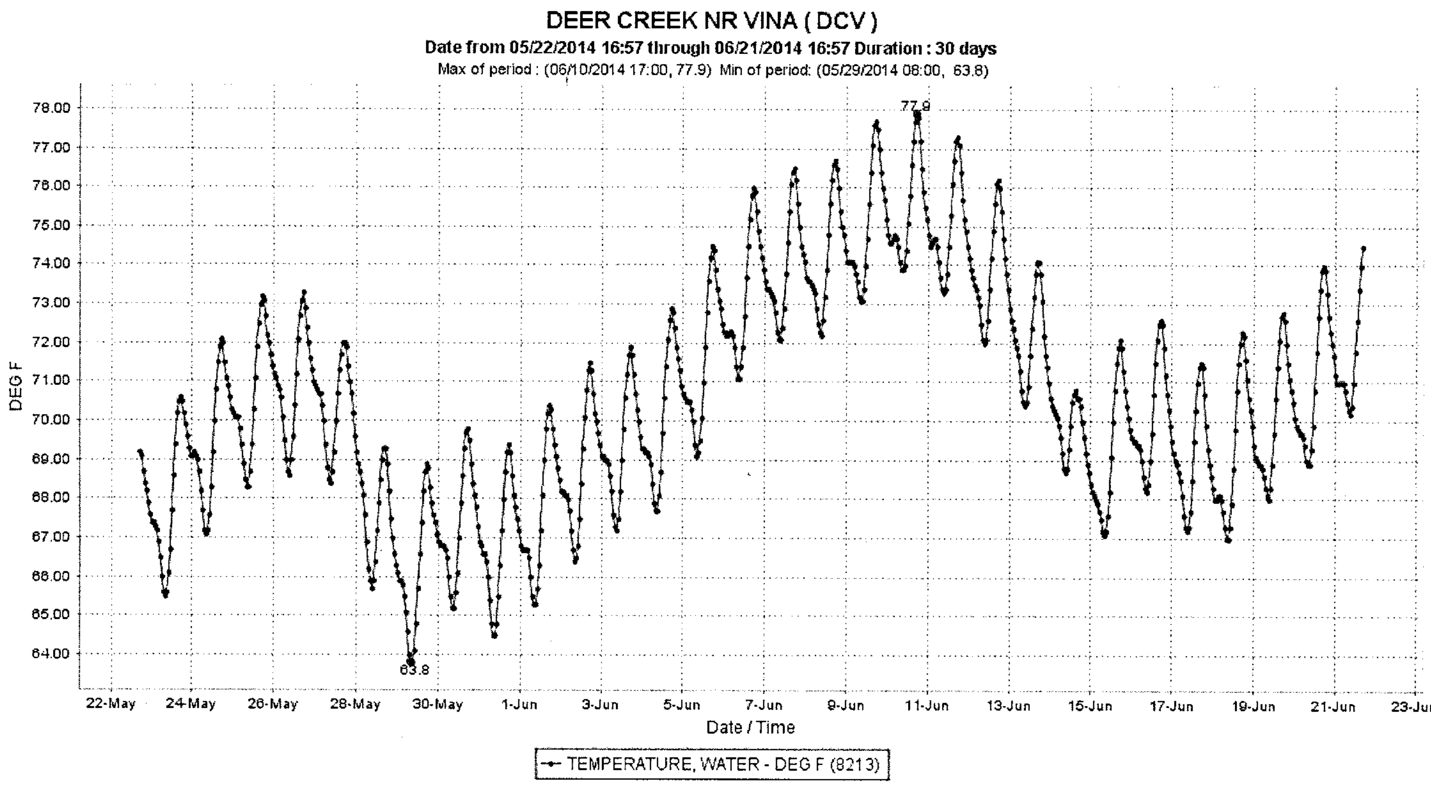
Plot all DCV Sensors | Real-Time DCV Data | DCV Data | Daily DCV Data | Show DCV Map | DCV Info

Plot from ending date: 06/21/2014 16:57 Span: 60 days Get custom plot

Station Comments:

03/24/2011 *Latitude and longitude updated according to information downloaded from USGS web site.*

2014 WATER TEMPERATURES
AT USGS GAUGE ABOVE STANFORD-VINA DIVERSION



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Plot from ending date: 06/21/2014 16:57 Span: 30 days Get custom plot

Station Comments:

03/24/2011 *Latitude and longitude updated according to information downloaded from USGS web site.*

2014 WATER TEMPERATURES
AT USGS GAUGE ABOVE STANFORD-VINA DIVERSION

DEER CREEK NR VINA (DCV)

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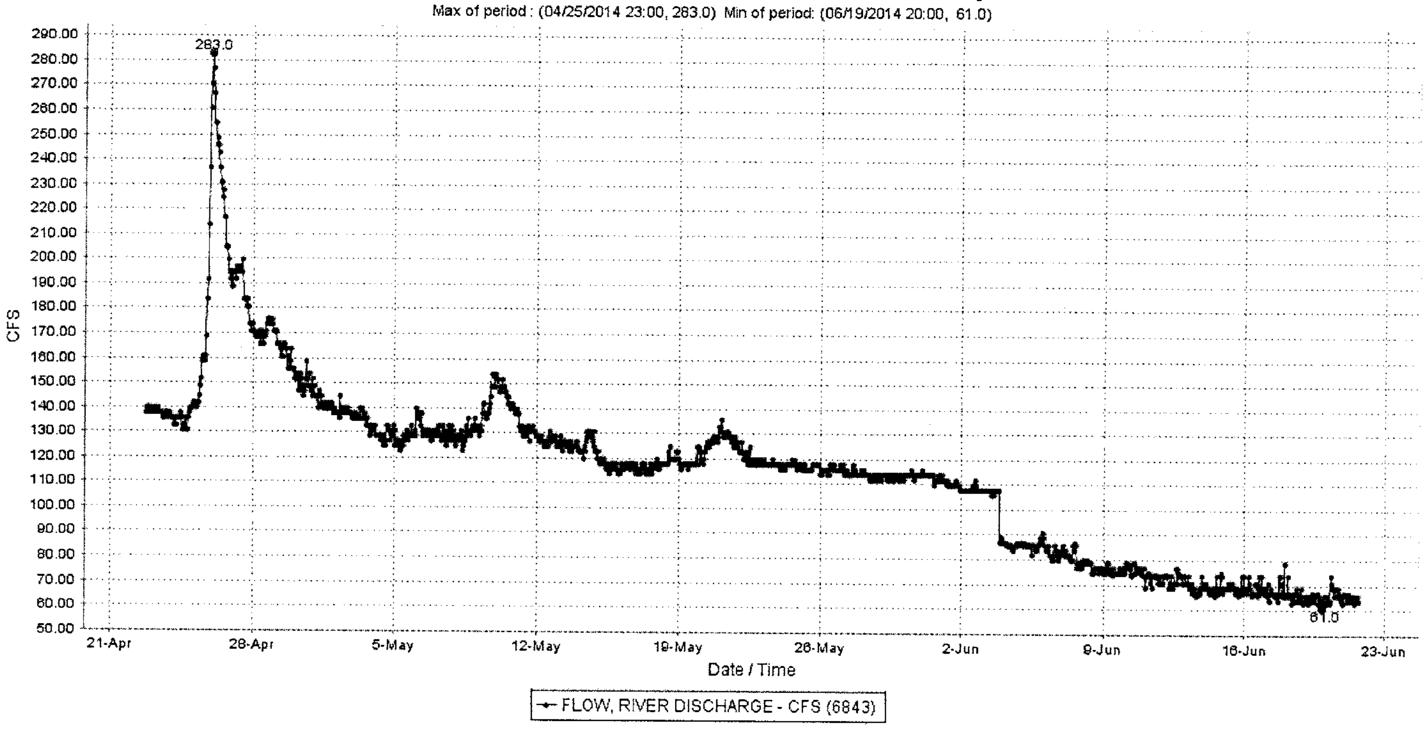
Max of period : (04/25/2014 23:00, 283.0) Min of period: (06/19/2014 20:00, 61.0)



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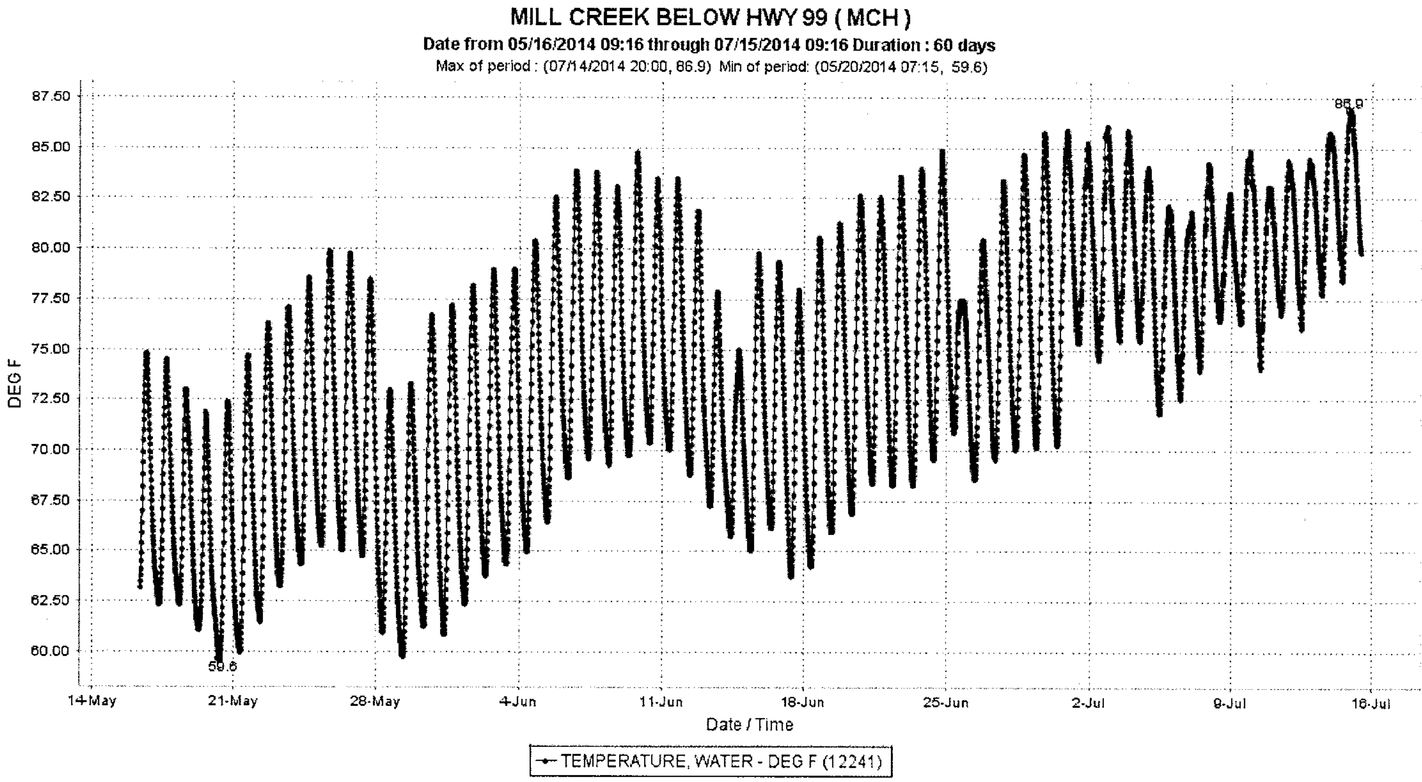
Plot from ending date: 06/21/2014 16:57 Span: 60 days Get custom plot

Station Comments:

03/24/2011 *Latitude and longitude updated according to information downloaded from USGS web site.*

2014 WATER TEMPERATURES
AT USGS GAUGE ABOVE STANFORD-VINA DIVERSION



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2014 WATER TEMPERATURES
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State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

JUVENILE SPRING-RUN CHINOOK SALMON EMERGENCE, REARING AND OUTMIGRATION PATTERNS IN DEER AND MILL CREEKS, TEHAMA COUNTY, FOR THE 1998 BROOD YEAR

SPORT FISH RESTORATION ANNUAL PROGRESS REPORT

by

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December 2001

FISHERY REPORT FOR 1998 BROOD YEAR
DEER CREEK & MILL CREEK

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INTRODUCTION

This annual brood year (BY) report investigates the life-history of spring-run Chinook salmon (SRCS), (*Oncorhynchus tshawtscha*), spawning in Mill and Deer creeks, Tehama County, California for 1998. This includes monitoring: holding and spawning distribution of adult SRCS returning in 1998, juvenile SRCS rearing studies in 1998 and 1999, and yearling SRCS emigration in 1999 and 2000. Also, included in this life-history investigation are the physical parameters of water flow and temperature during critical periods of adult and juvenile SRCS development.

SRCS once occupied the headwaters of most major river systems on California's Central Valley. Most of this former spring-run habitat has been eliminated by water development and dams that prevent adult salmon access to head water areas (CDFG, 1998). Present day range and distribution of spring-run salmon is restricted to a few tributaries in the Sacramento River System. Due to the declining population levels, loss of historical habitat and concerns over hybridization due to a lack of spatial separation with fall run in the Sacramento River and Feather rivers, tributary SRCS were listed as threatened under CESA and FESA in 1998. Mill, Deer and Butte creeks consistently support small numbers of spawning populations of spring-run chinook Even prior to water development, stream conditions in these remnant streams may have been marginal when compared to stream conditions historically occurring in the headwaters of the San Joaquin, Little Sacramento, McCloud and Pit rivers. One of the purposes of this life history investigation is to monitor these stream conditions for all stages of SRCS and identify and remedy any factors limiting survival.

This research is funded through the Federal Sport Fish Restoration Act. This 98 BY report is the sixth annual "Juvenile Spring-Run Chinook Salmon Emergence, Rearing and Outmigrant Report" for Mill and Deer Creeks. [1]

[1] This program received financial assistance through the Federal Aid in Sport Fish Restoration Act. The U.S. Department of the Interior prohibits discrimination on the basis of race, color, national origin, age, sex, or disability. If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information, please write to:

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METHODS

Adult SRCS holding distribution surveys are made by underwater snorkel count in August, prior to the onset of spawning. Spawning surveys are made by walking the creek and recording carcasses, live salmon and redds. These surveys are done in September and October. Tissues are collected from carcasses for genetic analysis with the objective of locating a distinct marker for the spring run of chinook salmon. Mill Creek again remained too turbid in 1998 to monitor the adult salmon holding distribution therefore only spawning distribution is documented. Both holding and spawning distribution of adult SRCS are documented for Deer Creek.

Areas where a high concentration of spawning is known to occur are sampled weekly at the onset of predicted fry emergence to determine relative growth of salmon fry and to predict the occurrence of a fry or yearling outmigration pattern for each brood year. A backpack electro shocking unit and a 10' x 4' x □" beach seine is used to capture fish for length and weight measurements. In the fall and early winter months, 5' rotary screw traps are fished near each creeks confluence with the Sacrament River to monitor outmigration of SRCS yearlings on a real-time basis. These data are used in predicting the occurrence of SRCS yearlings in the Sacramento-San Joaquin Delta.

Water temperature records are collected by the Department of Water Resources (DWR), Northern District Office Water Quality Branch. Onset Temperature Recorders are used to collect hourly data in Mill Creek at: the mouth, Hwy-99 Bridge, USGS gauge, mouth of Little Mill Creek, Black Rock, Hole-In-the-Ground Camp, and Hwy-36 Bridge. In Deer Creek, recorders are installed at: the mouth, Hwy-99 Bridge, Upper Diversion dam, Apperson Cow Camp, Ponderosa Way, A-Line Bridge, and Upper Falls. These records are used to document adult migration, rearing, and spawning temperatures, and juvenile egg incubation, emergence, rearing and emigration temperatures.

Water flow records are taken from DWR's California Data Exchange Centers (CDEC) web site: www.cdec.water.ca.gov. All flows are recorded as daily average means for the purposes of this report. This data is preliminary and subject to change. In order to determine migration flow needs for migrating adult and juvenile salmon, flow readings are taken upstream of irrigation diversions (CDEC station MLM (Mill Los Molinos), and DCV (Deer Creek Vina)), and downstream of irrigation diversions (CDEC station DVD (Deer Creek Vina)).

All sampling locations used for these SRCS life history investigations are shown in Appendix, Figure 1 (Mill Creek) and Appendix, Figure 2 (Deer Creek).

RESULTS AND DISCUSSION

Conditions for Adult SRCS Migration

In order to assess real-time water flow and temperature needs for adult SRCS immigration, monitoring of these conditions is necessary downstream of water diversion points from March through early July. In Mill Creek, flow records for this time period in 1998 are only available at the MLM station, which is located upstream of water diversion points. (In January 1999, a flow gauge, MCH (Mill Creek Highway), will be installed downstream from all diversion points and adult salmon migration flows can be monitored on a real-time basis.) Appendix, Figure 3 shows the natural average daily flows in Mill Creek in relation to the migration timing of adult SRCS. This migration timing data came from a counting station operated at Clough Dam from 1953 thru 1964. Using this generalized migration timing, 80% of adult spring-run salmon migrate between the time periods of 6 May and 23 June in Mill Creek. Natural flows averaged 800 cfs during this time period in the spring of 1998. The minimum flow recorded was 483 cfs and the maximum flow was 1,666 cfs. Although flow records below the water diversions are not available for this time period, the maximum amount of flow that can be diverted from lower Mill Creek is 203 cfs. Assuming this maximum amount was diverted, flows still remained above 280 cfs during the peak periods of adult salmon migration. Flow does not appear to have limited adult SRCS migration into Mill Creek in the spring of 1998.

Water temperatures at the mouth of Mill Creek are also not available for the spring of 1998. Appendix, Figure 4 displays the water temperature records in Mill Creek taken at the USGS gauge, upstream of diversion points. The average daily water temperature during the peak period of adult salmon migration was 54 EF. The minimum and maximum daily average water temperature was 49EF and 58EF, respectively. In the absence of temperature records at the mouth of Mill Creek, it is unknown whether water temperatures remained within the normal tolerance range for adult salmon migrating into Mill Creek. For adult chinook salmon in the Sacramento River, the maximum temperature for successful upstream migration appears to be less than 65EF (Boles, 1988). The upstream migration of adult chinook salmon from the Delta to the San Joaquin River has been prevented by water temperatures above 70EF. Upstream migration was resumed when water temperatures cooled to 65EF (Hallock et al, 1970). SRCS may be locally adapted to brief periods of elevated water temperatures in order to reach their natal holding and spawning areas. In the Lower Klamath River system water temperatures as high as 76EF apparently have no effect on upstream migration of adult salmon (Dunhan, 1968), although sustained water temperatures in excess of 80EF are lethal for adult salmon (Cramer and Hammack 1952). Continued monitoring of flows and water temperatures during periods of adult salmon migration into Mill Creek will facilitate real-time flow and temperature requirements for adult salmon migration.

In Deer Creek, flow records for the period of adult salmon migration are available for CDEC station DCV, located upstream of water diversion points. The downstream flow gauge, DVD, did not record flows from 16 March to 17 July. To estimate attraction flows for salmon migrating into Deer Creek during periods of no record, average daily diversion rates were calculated for the dates on record from 1 March to 15 July. The average daily diversion rate was 295 cfs. Appendix, Figure 5 shows the natural average daily flow (pre-diversions) and the estimated average daily attraction flow (post-diversion) in Deer Creek in relation to peak periods of salmon migration. (In Deer Creek, real-time migration timing has not been documented; therefore average migration timing of Mill Creek spring run is used. Salmon may migrate into Deer Creek earlier than Mill Creek). During peak periods of salmon migration, natural flows in

Deer Creek averaged 813 cfs. The minimum and maximum natural flow recorded were 452 cfs and 2,056 cfs respectively. Assuming that the average amount of water diverted during this time period is 295 cfs, the estimated attraction flow into Deer Creek averaged 510 cfs. The minimum and maximum estimated attraction flow is 119 cfs and 1,761 cfs, respectively. Attraction flows did not decrease below 100 cfs until 26 June. By this time over 95% of the run is estimated to have migrated into Deer Creek. Attraction flow does not appear to have limited SRCS migration into Deer Creek in 1998.

Deer Creek water temperatures were recorded near the gauging station at the canyon mouth and at the Hwy-99 Bridge (Appendix, Figure 6). The gauging station is upstream of water diversions and the Hwy-99 Bridge is downstream of diversion points. (Water temperatures at the mouth of Deer Creek were not recorded until after 24 June, therefore Hwy-99 temperature records will be used to represent temperatures during adult salmon migration. The average temperature difference between the mouth and Hwy-99 between 27 June and 15 July 1998 was 0.8EF.) The average daily water temperatures at Hwy-99 Bridge during the peak migration periods 6 May thru 23 June was 58EF. The maximum average daily temperature was 67EF. For this same time period the average daily temperature at the gauging station was 55EF with a maximum average daily temperature of 63EF. Assuming that adult salmon migration is similar in both Mill and Deer creeks, 87% of salmon had migrated into Deer Creek prior to the daily average water temperatures reaching 65EF. Ninety-eight percent of migration occurred prior to temperatures reaching 70EF. Water temperatures remained within the range of normal tolerance limits for adult SRCS migrating into Deer Creek in 1998. Continued monitoring of flows and water temperatures during periods of adult migration into Deer Creek will facilitate real-time flow and temperature requirements for adult salmon migration. Knowing the actual timing of SRCS migration into Deer Creek would assist the Department in negotiating for additional flows during critical periods of migration.

1998 Adult SRCS Population Counts and Spawning Surveys in Mill and Deer Creeks.

After the breeching of Clough Dam on Mill Creek in 1997, and subsequently investigating alternative methods of estimating adult spring-run populations, it was determined that spawner redd counts were the most feasible method of estimating the spring-run spawner escapement in Mill Creek (Harvey Arrison, 1997). Actual redd counts are expanded to a population estimate by assuming each female salmon constructs one redd and the female to male spawner ratio is 1:1. Using expanded redd counts, an estimated 424 adult SRCS spawned in Mill Creek in 1998 (Harvey Arrison, 1998a). In order to improve the accuracy of expanding redd counts to a population estimate, the actual ratio of females per redd will be investigated in future surveys. In addition to the redd counts, 26 carcasses were observed.

In Deer Creek a total of 1,879 adult SRCS salmon were counted in 1998. This count was derived from a snorkel survey of the adult SRCS holding habitat (Harvey Arrison, 1998b). A spawning census survey in the fall of 1998 counted a total of 793 redds and 137 carcasses (USFS, 1998).

Sex and Age Structure of the Population

All salmon carcasses encountered during spawning surveys in Mill and Deer creeks were sexed and measured to the nearest centimeter fork length (cm, FL). To increase the sample size, Mill and Deer creek data was combined. (This is assuming that the Mill and Deer creek populations have similar age structures.) A total of 43 carcasses were measured ranging in size from 49 cm FL to 83 cm FL (Appendix, Figure 7). Trapping records at RBDD indicate a cutoff length between adults and grilse salmon of 61 cm FL for all runs of salmon in the Sacramento River drainage. Using this RBDD criterion, 23% of the spring run were grilse and 77% were adult salmon, at least 3-years old. Given that an unknown percentage of spring run in Mill and Deer creeks exhibit a yearling life-history strategy, these fish may return at a different age and size than spring run fry which emigrate to the ocean within their first year. Therefore, a generalized cutoff length of 61cm may not reflect the actual age structure of SRCS in Mill and

Deer Creeks. Appendix, Figure 7 suggests that the cutoff length between two and three-year-old fish may be between 50 and 55cm FL. No attempt was made to further refine the age distribution of adult spring run for 1998. Sixty-seven percent of the carcasses identified were female and 33% were male. Due to the low sample size and the tendency for male salmon (grilse and adults) to swim away from the spawning areas before dying, this carcass data set may not reflect the actual age and sex composition of the population. DNA fin clips for genetic analysis were collected to aide researchers in characterizing Central Valley spring-run salmon population genetic structure and developing a loci to discriminate spring run from other Central Valley Chinook stocks. Collections were preserved using the Tris Buffer Method and sent to the Departments Salmon Stock Tissue Collection Archive. A total of 16 samples were collected in Mill Creek and 77 samples in Deer Creek.

Population Trend and Cohort Replacement Rate

For Mill Creek, the estimated 424 SRCS adults returning to spawn in 1998 represents a cohort replacement rate (CCR) of 1.3, when compared with the 320 spawners returning in 1995. Typically a CRR greater than 1.0 represents increasing cohort abundance. (In calculating CRR's it is currently assumed adult escapement methodologies are comparable, all spawners return as 3-year-old fish, there is a 1:1 sex ratio in the population, and there is no variation in these factors between brood years. In fact, as explained in the previous paragraph, age structure and sex ratio for SRCS is only speculative at this time.) Table 1 shows the CCR's for Mill Creek SRCS for the time periods 1957-1964, and 1990-1998. The 1998 population of 424 is still a significant decline from the counts of 3,500 salmon in the 1940's. In the 1990's counts have ranged from a low of 61 salmon in 1993 to a high of 844 in 1990 (Appendix, Figure 8).

For Deer Creek, the count of 1879 represents a CRR of 1.5, when compared with the 1295 spawners in 1995. This data represents an increase in cohort abundance. Table 2 shows the CCR's for Deer Creek spring-run salmon for the time periods 1990-1998. Counts in Deer Creek have been as high as 4,000 salmon in the 1940's. More recently in the 1990's, counts have ranged from a low of 209 salmon in 1992 to this year's high of 1,879 (Appendix, Figure 9).

TABLE 1. Mill Creek spring-run chinook salmon cohort replacement rates.

Cohort	Brood Year	Cohort Replacement Rate
1	1957	1203/1789=0.7
2	1958	2212/2967=0.7
3	1959	1580/2233=0.7
1	1960	2368/1203=2.0
2	1961	1245/2212=0.6
3	1962	1692/1580=1.1
1	1963	1315/2368=0.6
2	1964	1628/1245=1.3
1	1990	844/89=9.5
2	1991	319/572=0.6
3	1992	237/563=0.4
1	1993	61/844=0.1
2	1994	723/319=2.3
3	1995	320/237=1.4
1	1996	252/61=4.1
2	1997	202/723=0.3
3	1998	424/320=1.3

TABLE 2. Deer Creek spring-run chinook salmon cohort replacement rates.

Cohort	Brood Year	Cohort Replacement Rate
1	1990	458/200=2.3
2	1991	448/371=1.2
3	1992	209/77=2.7
1	1993	259/458=0.6
2	1994	485/448=1.1
3	1995	1295/209=6.2
1	1996	614/259=2.4
2	1997	466/485=1.0
3	1998	1879/1295=1.5

Conditions for Adult SRCS Holding and Spawning

Immature adult SRCS hold in the higher elevations of Mill and Deer creeks from the time of spring migration until the onset of fall spawning–approximately May through September. Temperature records in the holding and spawning habitat are presented here for the purpose of documenting the actual temperature regimes wild salmon are holding and spawning in. According to Hinz (1959), the survival of adult fish can be reduced when holding in water temperatures warmer than 59°F. Additionally, prolonged exposure of female salmon to water temperatures between 60°F and 62°F can reduce egg viability up to 30%. In Appendix, Figures 10 and 11, average daily mean water temperatures at select locations are graphed during adult salmon holding periods in Mill and Deer creeks, respectively. The maximum average daily temperature threshold for normal egg viability is shown as 59°F.

In Mill Creek at Hwy-36, the water temperature exceeded the 59°F threshold on three days between 3 and 7 September. The maximum temperature recorded was 60.5°F. At Hole-in-the Ground, water temperature remained at or below the 59°F throughout the adult salmon holding period. At Black Rock the average daily water temperature exceeded the threshold for 25 days between 25 July and 8 September. The maximum recorded average daily temperature was 63°F on 14 August. The water temperature at Little Mill remained above 59°F after 5 July. The maximum recorded water temperature was 69.5°F on 14 August. Since the holding distribution of adult salmon in Mill Creek was not monitored in 1998, no speculations can be made about the effects of elevated water temperatures on adult salmon survival or egg viability.

In Deer Creek, 10% of the SRCS population counted in 1998 was holding in the Upper Falls and A-Line reaches (Harvey Arrison, 1998b). Average daily water temperatures at Upper Falls exceeded 59°F on only one day, 25 July. In the A-line holding area, the water temperature rose above 59E for a total of 21 days between 21 July and 7 September. The maximum average daily water temperature during this time period was 61.9°F. Forty-nine percent of holding SRCS adults occurred between Polk Springs to Beaver Creek in 1998. The nearest temperature recording station is downstream at Ponderosa Way. Water temperatures at Ponderosa Way remained above 59°F from 2 July to 18 September. The highest daily average temperature during this time period was 67.1°F recorded on 14 August. No temperature records are available below Ponderosa Way for these time periods. Therefore, no conclusion can be made about the maximum water temperatures for the 30% of the salmon population holding between Ponderosa Way and Dillon Cove. Eighty percent of adult SRCS holding in Deer Creek in 1998 were in areas where the daily average water temperatures were above the referenced optimal level of 59°F. No temperature studies have been made on these creeks to investigate possible thermal stratification or spring influences and whether this may affect salmon distribution. It is unknown why adult salmon were concentrated in areas with water temperatures up to 8°F warmer than holding pools at higher elevations. In 1998 less than 1% of the population held in water temperatures considered optimal for survival. It is also unknown whether these higher temperatures affected spawning success or salmon egg viability.

Current literature suggests that the upper temperature tolerance for spawning adult salmon, without destroying egg viability, is 57°F (Reiser and Bjorn, 1979). When water temperatures exceed 57.5°F, up to 80% salmon egg and fry losses can occur (Healey, 1977). In Mill Creek the average daily water temperatures dropped below the 57°F threshold first in the Hole-in-the-Ground area on 8 September (Appendix, Figure 12). In the Black Rock and Hwy-36 reaches, temperatures decreased to below the threshold on 17 September. Areas of Mill Creek near Little Mill Creeks' confluence cooled down 3 October. Spawning surveys in 1998 did not begin until 21 September. It is unknown whether spawning activities began prior to water temperatures decreasing to below the threshold level. Water temperatures were below 57°F during the spawning surveys.

In Deer Creek temperatures dropped below the 57°F threshold first at A-Line on 10 September and then on 19 September for Ponderosa Way (Appendix, Figure 13). No water temperature records are available during SRCS spawning times in 1998 for the Upper Falls and Apperson Cow Camp Areas. In 1998, weekly surveys of indexed areas to determine the onset, peak and termination of spawning were not made, and therefore it is unknown whether spawning activities began prior to a decrease in water temperatures. The spawning distribution surveys were made the week of 13 October.

Egg Incubation, Hatching and Fry Emergence

Daily water temperature records are used to estimate the length of time from spawning for the eggs to hatch and fry to emerge from the gravels. In Mill Creek, water temperature records from Hole-in-the-Ground, Black Rock and below the Little Mill confluence are usually used for emergence timing studies. In 1998, complete water temperature records are only available for the Black Rock area of Mill Creek. In Deer Creek water temperature records from Upper Falls, A-Line Bridge, Ponderosa Way and Apperson Cow Camp are usually used for the emergence studies. This year there are no complete temperature data sets to use in predicting fry emergence in Deer Creek.

To predict an estimated time of fry emergence, daily temperature units (DTU) were calculated from the water temperature records on each creek. A DTU is defined as the average daily water temperature (in Fahrenheit) minus 32. From the time of egg fertilization, a cumulative total of 1,550 DTU's is required for the egg to hatch and the fry to emerge (Armor, 1991 in CDFG, 1998). Based on the number of redds and live fish seen on each of three spawning surveys, the week of 22 September appeared to represent the peak of spawning activities in the Black Rock area of Mill Creek. Using this peak spawning date, the calculated date of peak emergence of fry in the Black Rock area was 28 January1999 (Table 3). The time lapse between the onset and termination of spawning (generally late August through the end of October) can last up to eight weeks. This can lead to a great deal of variability in the onset and termination of fry emergence. Since weekly surveys to determine the onset and termination of spawning were not made in 1998, the earliest and latest expected emergence of fry is not estimated for either Mill or Deer Creek.

In Mill Creek, biweekly electrofishing surveys to detect 98BY fry emergence began 17 December at Black Rock. The first emergent fry was captured on 19 February, 21 days after calculated emergence. The first group of fry (>5 fish) was captured on 16 March, 46 days after calculated emergence (Table 4). In order to minimize damage to eggs and pre-emergent fry, electrofishing surveys are made in edge water habitats away from known redd locations. This may explain the time lapse between calculated emergence from the redd and emergent fry captured in the edge water habitat.

In Deer Creek, the first survey to detect 98BY fry was on 23 December at Ponderosa Way. One emergent fry was captured. The first group of fry (>5 fish) was observed on 4 January. At the A-line Bridge, the first emergent fry was captured on 26 February, and the first group of fry (>5 fish) was captured one month later on 24 March. Since there are no complete temperature data sets in Deer Creek for the winter of 1998, observed emergence cannot be compared with calculated emergence.

TABLE 3. Mean daily water temperatures in Mill Creek at lack Rock. Estimated time of fry emergence based on September 22 peak of spawning and calculated from daily temperature units (DTU).

Day	SEP 98 mean	TU	CUM TU		OCT 98 mean	TU	CUM TU		NOV 98 mean	TU	CUM TU		DEC 98 mean	TU	CUM TU		JAN 99 mean	TU	CUM TU
1	60.0				54.2	22.2	207.8		46.7	14.7	702.2		43.6	11.6	1042.2		40.4	8.4	1311
2	59.9				53.7	21.7	229.5		44.6	12.6	714.8		44.4	12.4	1054.6		40.4	8.4	1319
3	60.2				51.3	19.3	248.8		46.1	14.1	728.9		43.7	11.7	1066.3		40.4	8.4	1328
4	61.2				48.6	16.6	265.4		45.8	13.8	742.7		40.4	8.4	1074.7		40	8.0	1336
5	60.5				49.3	17.3	282.7		45.8	13.8	756.5		37.9	5.9	1080.6		40.1	8.1	1344
6	60.2				49.7	17.7	300.4		42.9	10.9	767.4		37.0	5.0	1085.6		40.6	8.6	1352
7	61.4				49.5	17.5	317.9		42.4	10.4	777.8		37.7	5.7	1091.3		39.8	7.8	1360
8	60.1				50.6	18.6	336.5		41.3	9.3	787.1		40.0	8.0	1099.3		39.9	7.9	1368
9	58.1				49.0	17.0	353.5		40.4	8.4	795.5		38.5	6.5	1105.8		40.5	8.5	1376
10	55.3				46.9	14.9	368.4		41.7	9.7	805.2		39.1	7.1	1112.9		40.7	8.7	1385
11	56.0			1/	46.0	14.0	382.4		41.2	9.2	814.4		40.8	8.8	1121.7		40.4	8.4	1394
12	57.4				48.6	16.6	399.0		41.9	9.9	824.3		42.5	10.5	1132.2		40.1	8.1	1402
13	57.5				48.6	16.6	415.6		42.8	10.8	835.1		43.2	11.2	1143.4		41.6	9.6	1411
14	57.7				48.6	16.6	432.2		42.5	10.5	845.6		41.8	9.8	1153.2		42.1	10.1	1421
15	58.1				48.6	16.6	448.8		44.0	12.0	857.6		40.8	8.8	1162.0		44.2	12.2	1434
16	57.3				48.6	16.6	465.4		44.2	12.2	869.8	2/	40.8	8.8	1170.8		44.3	12.3	1446
17	56.0				48.6	16.6	482.0		44.0	12.0	881.8		40.8	8.8	1179.6		43.5	11.5	1457
18	54.0				48.6	16.6	498.6		42.5	10.5	892.3		40.8	8.8	1188.4		43.3	11.3	1469
19	53.4				48.6	16.6	515.2		41.7	9.7	902.0		40.8	8.8	1197.2		42.7	10.7	1479
20	54.0				48.6	16.6	531.8		42.1	10.1	912.1		40.8	8.8	1206.0		42.3	10.3	1490
21	53.2				48.6	16.6	548.4		44.9	12.9	925.0		40.8	8.8	1214.8		41.6	9.6	1499
22	52.9	20.9	20.9		47.6	15.6	564.0		44.8	12.8	937.8		40.8	8.8	1223.6		41.8	9.8	1509
23	53.5	21.5	42.4		47.3	15.3	579.3		45.6	13.6	951.4		40.8	8.8	1232.4		40.1	8.1	1517
24	53.9	21.9	64.3		47.4	15.4	594.7		43.2	11.2	962.6		40.8	8.8	1241.2		38.7	6.7	1524
25	53.5	21.5	85.8		46.9	14.9	609.6		43.4	11.4	974.0		40.8	8.8	1250.0		38.9	6.9	1531
26	52.7	20.7	106.5		47.3	15.3	624.9		43.8	11.8	985.8		40.8	8.8	1258.8		40.8	8.8	1540
27	50.2	18.2	124.7		47.6	15.6	640.5		44.1	12.1	997.9		40.8	8.8	1267.6		39.5	7.5	1547
28	50.4	18.4	143.1		49.5	17.5	658.0		43.8	11.8	1009.7		40.8	8.8	1276.4 3/		39.6	7.6	1555
29	52.8	20.8	163.9		48.4	16.4	674.4		41.1	9.1	1018.8		40.8	8.8	1285.2		38.7	6.7	1561
30	53.7	21.7	185.6		45.1	13.1	687.5		43.8	11.8	1030.6		40.8	8.8	1294.0		38.6	6.6	1568
31					44.4	12.4	699.9						40.8	8.8	1302.8		39.6	7.6	1576

1/ No data 10/12/-20/99 monthly avg used

2/ No data 2/15-31/99 monthly avg used.

TABLE 4. Actual and calculated emergence of spring-run chinook salmon fry in Mill and Deer creeks from the estimated peak of spawning based on TU's. (Table 3) a/

	Mill Creek			Deer Creek		
	Hole-in-Ground	Black Rock	Little Mill	A-line	Ponderosa Way	Apperson
1st Observed Emergence	no surveys	2/19/99	no surveys	02/26/99	12/23/98	no surveys
1st Group Emergence n>5	no surveys	3/16/99	no surveys	03/24/99	1/4/99	no surveys
Calculated Emergence	incomplete records	01/28/99	incomplete records	incomplete records	incomplete records	incomplete records

a/ Due to low sampling intensity and the duration of time between the onset and termination of spawning, this data may not reflect the earliest dates of actual and calculated emergence.

SRCS Juvenile Rearing

In Mill Creek headwaters, 1998BY SRCS were sampled in bimonthly electrofishing samples from 19 February, 1999 through 31 March, 2000. A total of 170 juveniles were captured ranging in size from 33 mm FL to 111 mm FL (Table 5). In Deer Creek headwaters, 1998 BY SRCS were sampled from 23 December, 1998 through 7 February, 2000. A total of 271 juveniles were captured ranging in size from 32 mm FL to 78 mm FL (Table 6.) Combining Mill and Deer Creek rearing data, SRCS emerged at approximately 32 mm FL and grew to at least 111 mm FL over a 15-month period. Recently emerged fry, (33-39mmFL), continued to be sampled through 15 April, 1999 in Mill Creek, (Appendix, Figures 14 and 15), and 15 May, 1999 in Deer Creek, (Appendix, Figures 16 and 17). This apparent "continual emergence" may be a result of the range in spawning times resulting in a constant recruitment of smaller fish into the sampling site, or reduced growth of weaker fish. Once fish reached 70-80 mm FL in both creeks they appeared to either migrate out of the sample reaches or effectively escape the sampling gear (Appendix, Figures 16-19). Due to the gear selectivity associated with electrofishing, the actual maximum obtained growth may be larger than the observed maximum growth. In future years additional sampling techniques will be employed to get a more representative sample of rearing SRCS length distribution. From this data we cannot predict what proportion of the 1998BY emigrated as fry or reared over summer and emigrated as yearlings. Also, distribution of rearing juveniles in each watershed thru time has not been researched.

Growth Rates for rearing SRCS

Growth rates are not calculated for SRCS juveniles rearing in these creeks. In order to calculate a growth rate, sufficient numbers would need to be tagged with unique marks and consistently recaptured throughout the rearing period. This was attempted in 1996. All juveniles sampled during biweekly surveys in Mill and Deer Creek were Coded-Wire-Tagged (CWT'ed). A total of 157 SRCS was CWT'ed in Mill Creek, and a total of 782 was CWT'ed in Deer Creek. None of these tagged fish were recaptured on subsequent juvenile or adult surveys. In general, too few juveniles are captured to get recoveries on tagged fish. Calculated growth rates for chinook salmon rearing in the Upper Sacramento River averaged 0.33 mm/day and ranged from 0.26 to 0.40 mm/day, (Kjelson et.al., 1982). Growth rates for chinook salmon from two different brood years in Butte Creek (including spring run and fall run) were calculated at 0.77 mm/d (range 0.45 to 1.02mm/d) and 0.2 mm/d (range 0.09 to 0.32 mm/d) respectively, (Hill, 1999). SRCS in Butte Creek are incubating and rearing at different elevations and water temperatures than Mill and Deer Creek which may influence growth rates.

TABLE 5. Bimonthly electrofishing catch summary of spring-run Chinook salmon rearing in Mill Creek at Hole-in-the-Ground and Black Rock from December 1998 through March 2000. Only 1998 brood year fish are reported.

Capture Period	Mean FL (mm)	Standard Deviation	Range min (mm)	FL max (mm)	Total Number Captured
12/16/98-12/31/98					0
01/01/99-01/15/99					0
01/16/99-01/31/99					0
02/01/99-02/15/99					0
02/16/99-02/28/99	35	0.7	34	35	2
03/01/99-03/15/99	36	2.6	34	40	6
03/16/99-03/31/99	38	2.6	33	43	28
04/01/99-04/15/99	39	5.8	34	53	16
04/16/99-04/30/99	42	5.8	35	54	40
05/01/99-05/15/99	46	7.1	38	62	29
05/16/99-05/31/99	52	6.1	43	64	16
06/01/99-06/15/99	59	5.6	47	69	10
06/16/99-06/30/99	70	6.5	59	81	12
07/01/99-07/15/99	62	4.6	57	70	7
07/16/99-07/31/99					0
08/01/99-08/15/99					no surveys
08/16/99-08/31/99					no surveys
09/01/99-09/15/99					no surveys
09/16/99-09/30/99					0
10/01/99-10/15/99	No surveys between October 1, 1999 and December 31, 1999				
10/16/99-10/31/99					
11/01/99-11/15/99					
11/16/99-11/30/99					
12/01/99-12/15/99					
12/16/99-12/31/99					
01/01/00-01/15/00	108	4.2	105	111	2
01/16/00-01/31/00					0
02/01/00-02/15/00	109		109	109	1
02/16/00-02/29/00					0
03/01/00-03/15/00					0
03/16/00-03/31/00	107		107	107	1

TABLE 6. Bimonthly electrofishing catch summary of spring-run chinook salmon rearing in Deer Creek at A-Line Bridge and Ponderosa Way from December 1998 through February 200. Only 1998 brood year fish are reported.

Capture Period	Mean FL (mm)	Standard Deviation	Range min (mm)	FL max (mm)	Total Number Captured
12/16/98-12/31/98	35		35	35	1
01/01/99-01/15/99	35	1.1	34	37	27
01/16/99-01/31/99					0
02/01/99-02/15/99	35	0.9	33	36	17
02/16/99-02/28/99	36	0.6	35	36	3
03/01/99-03/15/99	38	1	37	39	4
03/16/99-03/31/99	36	2.8	33	46	27
04/01/99-04/15/99	35	1.6	32	39	29
04/16/99-04/30/99	36	2	32	44	89
05/01/99-05/15/99	37	2.2	34	42	14
05/16/99-05/31/99	43	7.6	36	52	4
06/01/99-06/15/99	53	4.9	41	61	15
06/16/99-06/30/99	58	5.7	47	71	30
07/01/99-07/15/99	72	3.5	67	76	7
07/16/99-07/31/99	70	8	62	78	3
No data collected between August 1, 1999 and December 7, 1999					
08/01/99-08/15/99					
08/16/99-08/31/99					
09/01/99-09/15/99					
09/16/99-09/30/99					
10/01/99-10/15/99					
10/16/99-10/31/99					
11/01/99-11/15/99					
11/16/99-11/30/99					
12/01/99-12/15/99					0
12/16/99-12/31/99					no surveys
01/01/00-01/15/00					0
01/16/00-01/31/00					0
02/01/00-02/15/00	73		73	73	1

SRCS Fry and Yearling Emigration

Rotary screw traps are used to sample fry and yearling chinook salmon outmigration in each creek. The purpose of this sampling is to determine the relative size at outmigration and the timing of outmigration. Abundance estimates of SRCS emigrants are not made due to the difficulties of obtaining trap efficiency estimates during peak emigration periods (i.e., high flow events, debris, trap removal, and run separation). Also, recaptures from the small numbers of wild fish captured in the trap may not be obtainable during normal flow events.

The screw traps in each creek are placed within the fall-run chinook salmon (FRCS) spawning habitat. Although fall run spawn later in the season than spring run, FRCS fry emergence and emigration timing may be similar to SRCS due to warmer water temperatures during egg incubation in fall run spawning areas. Therefore, chinook fry captured in the rotary screw trap are not identified to run. All yearling-sized chinook salmon captured in the traps are assumed to be SRCS.

In Mill Creek, the rotary screw trap was fished from 26 October 1998 through 31 of January 1999. The trap was not fished from 1 February 1999 through 7 October 1999. Trapping resumed 8 October 1999 and continued through 30 June 2000. A total of 485, 1998 BY SRCS and FRCS fry, and 50, 1998 BY SRCS yearlings were trapped during these time periods (Table 7 and Appendix, Figures 18 and 19). Fry ranged in size from 32 to 41 mm FL and yearlings ranged in size from 68 to 140 mm FL. The first 1998 BY fry outmigrant was captured on 16 November 1998. It is unknown when fry outmigration ended since the trap was removed in January 1999. The first yearling outmigrant was trapped on 10 October 1999. Yearlings continued to be captured through 1 May 2000.

For the 1998 BY outmigration sampling period there were two periods of increased migration. These peak periods of migration were associated with increased flow and turbidity (Appendix, Figures 20 and 21). From 10 January 1999 through 23 January 1999, 94% of the total trap catch for the fall sampling period emigrated from Mill Creek. Peak average weekly flow was 599 cfs and peak average weekly turbidity was 23 ntu's. From 9 January 2000 through 12 February 2000, 81% of the total trap catch for the spring of 2000 sampling period emigrated. Peak average weekly flow was 596 cfs and peak average turbidity was 18 cfs. (Actual peak flows and turbidities may have been higher during these time periods but the trap was removed at flows exceeding 1000 cfs).

TABLE 7. Size statistics and bimonthly catch of spring-run and fall-run chinook salmon fry and spring-run chinook salmon yearlings captured in the Mill Creek rotary screw trap. Only 1998 brood year salmon are reported.

Capture Period	Mean FL (mm)	Standard Deviation	Range FL min (mm)	max (mm)	Total Number Captured
11/16/98-11/30/98	34		34	34	1
12/01/98-12/15/98					0
12/16/98-12/31/98	35	1.4	33	37	6
01/01/99-01/15/99	35	1.2	32	39	132
01/16/99-01/31/99	36	1.4	33	41	346
02/01/99-02/15/99	no sampling February 1999 thru September 1999				
02/16/99-02/28/99					
03/01/99-03/15/99					
03/16/99-03/31/99					
04/01/99-04/15/99					
04/16/99-04/30/99					
05/01/99-05/15/99					
05/16/99-05/31/99					
06/01/99-06/15/99					
06/16/99-06/30/99					
07/01/99-07/15/99					
07/16/99-07/31/99					
08/01/99-08/15/99					
08/16/99-08/31/99					
09/01/99-09/15/99					
09/16/99-09/30/99					
10/01/99-10/15/99	111	1.5	109	112	3
10/16/99-10/31/99	103	18.6	68	140	15
11/01/99-11/15/99					0
11/16/99-11/30/99					0
12/01/99-12/15/99	102	8.4	91	110	5
12/16/99-12/31/99					0
01/01/00-01/15/00	95	6.4	90	99	2
01/16/00-01/31/00	108	16.3	87	131	6
02/01/00-02/15/00	103	8.6	94	113	5
02/16/00-02/29/00	107	3	104	110	3
03/01/00-03/15/00	113	7.5	103	122	5
03/16/00-03/31/00	99	4.9	95	102	2
04/01/00-04/15/00	131	1.2	130	132	3
04/16/00-04/30/00					0
05/01/00-05/15/00	128		128	128	1

In Deer Creek the rotary screw trap was fished from 26 October 1998 through 31 January 1999. The trap was not fished from 1 February 1999 through 14 October 1999. Trapping was resumed on 15 October 1999 and continued through 30 June 2000. A total of 1,052, 1998 BY SRCS and FRCS fry, and 120, 1998 BY SRCS yearlings were trapped during these time periods (Table 8 and Appendix, Figures 22 and 23). Fry ranged in size from 31 to 41 mm FL and yearlings ranged in size from 73 to 158 mm FL. The first 1998 BY fry was captured on 25 November 1998. It is unknown when fry outmigration ended since the trap was removed in January 1999. The first yearling outmigrant was trapped on 16 October 1999. Yearlings continued to be captured in the trap through 23 April 2000.

For the 1998 BY outmigration sampling period in Deer Creek there were two periods of increased migration. The first peak occurred 17 January through 30 January 1999. Eighty-seven percent of the total trap catch for the fall outmigration period emigrated from Deer Creek (Appendix, Figures 24 and 25). Peak average weekly flow was 526 cfs and peak average weekly turbidity was 8 ntu's. From 23 January through 12 February 2000, 41% of the trap catch for the spring sampling period emigrated. Peak average weekly flow and turbidity was 688 cfs and 7 ntu's, respectively. There were two other peak flow periods when no increase in emigration was recorded. This occurred the week of 29 November 1998 and the month of February 2000. Peak flows were 1,000 cfs and 1,500 cfs, respectively. Two additional peak turbidity periods occurred the weeks of 29 November 1998 and 24 October 1999. Removal of the traps restricts our ability to document emigration during these peak events.

<u>Water Temperatures at Emigration</u>

The upper lethal water temperature level for emigrating salmon is determined in part by acclimation temperatures. Higher acclimation temperatures produce higher tolerated temperature until an upper lethal limit is reached. For fish acclimated to 60EF the upper lethal limit is 70°F and for fish acclimated to 70°F the upper lethal limit is 76.8°F (Orsi, 1971; in Boles, 1988). For the fall 1999 yearling SRCS outmigration period in Mill Creek water temperature did not exceed 61°F at the trap site, (unpublished data). Water temperature data has not been compiled for the spring 2000 outmigration period. In Deer Creek, water temperatures at the trap site did not exceed 63.6°F during fall 1999 yearling SRCS emigration periods. Maximum water temperatures for the spring 2000 outmigration period at the trap site did not exceed 65°F.

Adult salmon are entering and juveniles are emigrating from these creeks during the early fall and late spring when water temperatures and flows are sub-optimal. Therefore, management of water temperature and flow for the less thermally tolerant and larger adults should automatically afford thermal protection and passage for juveniles.

TABLE 8. Size statistics and bimonthly catch of spring-run and fall-run chinook salmon fry and spring-run chinook salmon yearlings captured in the Deer Creek rotary screw trap. Only 1998 brood year fish are reported.

Capture Period	Mean FL (mm)	Standard Deviation	Range FL min (mm)	max (mm)	Total Number Captured
11/16/98-11/30/98	33	1	32	34	3
12/01/98-12/15/98	34	1.3	30	37	77
12/16/98-12/31/98	35	2.5	31	38	74
01/01/99-01/15/99	35	1.1	33	39	241
01/16/99-01/31/99	36	1.4	33	41	657
02/01/99-02/15/99	no sampling February 1, 1999 through October 15, 1999				
02/16/99-02/28/99					
03/01/99-03/15/99					
03/16/99-03/31/99					
04/01/99-04/15/99					
04/16/99-04/30/99					
05/01/99-05/15/99					
05/16/99-05/31/99					
06/01/99-06/15/99					
06/16/99-06/30/99					
07/01/99-07/15/99					
07/16/99-07/31/99					
08/01/99-08/15/99					
08/16/99-08/31/99					
09/01/99-09/15/99					
09/16/99-09/30/99					
10/01/99-10/15/99					
10/16/99-10/31/99	112	18.2	74	158	63
11/01/99-11/15/99	104	14.6	80	124	13
11/16/99-11/30/99	99	14.1	73	119	14
12/01/99-12/15/99					0
12/16/99-12/31/99	103	12.3	91	114	2
01/01/00-01/15/00	99		99	99	1
01/16/00-01/31/00	103	11.3	87	125	13
02/01/00-02/15/00	85	0	85	85	2
02/16/00-02/29/00	119		119	119	1
03/01/00-03/15/00	104	10.4	88	118	7
03/16/00-03/31/00	112		112	112	1
04/01/00-04/15/00	100	2.1	98	101	2
04/16/00-04/30/00	104		104	104	1

Condition Factors

One nonlethal method of determining the onset of smoltification in the field is to record the condition factor of outmigrants. (A condition factor, (K)), is a length-weight ratio calculated as: $K=W/L^3$, where W=weight in grams and L = length in millimeters. This ratio decreases as a fish loses body fat). Smolts weigh less and exhibit a lower length to weight ratio than do parr (Wedemeyer et. al. 1980). This season the measurement of the length to weight ratio was recorded throughout the season to determine if a drop in body weight occurred. In Mill Creek, the condition factor fluctuated between .00046 and .00029 (Appendix, Figure 26). The sample size is too small (n=24) to determine if a significant drop in body weight occurred during emigration. In Deer Creek the condition factor fluctuated between .00042 and .00037 (Appendix, Figure 27) with no apparent decrease in through time. The size selectivity of the screw trap may not represent the actual population of SRCS outmigrants. For example if the larger outmigrants or those fish in earlier stages of smoltification are able to avoid the trap, a drop in condition factors may not be apparent.

Real-time Delta Monitoring

Real-time monitoring of yearling SRCS emigration in Mill and Deer creeks is used in evaluating the distribution and movement of SRCS outmigrants through the Sacramento River and Sacramento-San Joaquin Delta. With the designation of SRCS as a candidate species under CESA in 1997, the Department and CALFED agencies established a SRCS Protection Plan (Spring-run Plan). The Spring-run Plan utilizes daily rotary screw trap data and measurement of environmental parameters (flow, turbidity), to identify when juvenile spring-run are likely entering the Delta. Once yearling salmon are detected in Mill, Deer and Butte creeks, operational responses are made to avoid or minimize the effects of the State Water Project and Central Valley Project facilities operations on juvenile salmon survival through the Delta.

RECOMMENDATIONS

Real-time monitoring of adult migration, water temperatures and water attraction flows in Mill and Deer creeks is needed for coordination between instream flows for fish and water management during periods of adult migration. The real-time monitoring of yearling spring-run chinook emigration should continue in order to provide data in evaluating salmon occurrence, distribution and movement through the Sacramento River and Sacramento-San Joaquin estuary. Emigration monitoring should be expanded to include the months of February through June when spring- and fall-run fry are migrating from each creek. Sacramento-San Joaquin flow standards and water project facilities operational criteria should be evaluated for these spring periods of SRCS fry outmigration.

Currently, the ability to identify the impacts of harvest on listed salmon, the potential of hybridization in habitats accessible to multiple runs of salmon, and impacts of water management on juvenile salmon is confounded by the inability to separate runs of chinook salmon based solely on phenotypical characteristics, life history differences and size criteria. Funding and staffing for genetic tissue and otolith collection and analysis on spring-run stocks has not been adequately coordinated. A comprehensive assessment of genetic population structure is needed in order to define a genetic baseline for stock identification.

There are no established minimum flow standards in Mill or Deer creeks to ensure adequate attraction and transport flow and temperatures from the Sacramento River upstream past diversions points in the valley floor. Currently there are no systematic surveys scheduled during the months of April thru June to monitor and document migration timing, fish passage, critical riffles, adult stranding or thermal barriers. There is a need to conduct systematic monitoring of the above listed parameters as a basis for establishing real-time minimum flow releases in each creek during the months of April-June. If it is determined that the instream flow requirements for migrating salmon exceeds available bypass flows below diversion points, alternate means of meeting irrigation demands will need to be identified.

The only spring-run population within the Central Valley being Coded Wire Tagged (CWT'ed) is Butte Creek. CWT returns are used in monitoring juvenile movement through the Sacramento San-Joaquin Delta, ocean movement and harvest, straying of adults and age structure of adult populations. A pilot CWT study was made in Mill and Deer creeks in 1995, but after extensive sampling effort, less than 1,000 fish were tagged. When population levels increase and at least 50,000 juveniles can be tagged in each creek, this project should resume a CWT'ing program.

In the Sacramento-San Joaquin River system the accepted method to separate captured juvenile chinook salmon into their respective runs is based on length criteria. This length criteria assumes that since the four runs of salmon spawn at different times, respective juveniles can be identified based on length, and length thru time can be estimated using a calculated growth curve (Fisher, 1992). This growth curve and length criteria were developed prior to our current knowledge on spring run life history and prior to current juvenile monitoring in spring run tributaries. As a result, the growth curve currently in use assumes an earlier than actual spawning time and an increased hatching and growth rate. Therefore, fish being trapped in rotary screw traps throughout the Central Valley are misidentified as true spring-run and true spring-run are being misidentified as winter- and late-fall run. In future brood year reports, Mill and Deer creek spring run will be compared to the current growth chart being used in the Central Valley. A new growth curve and length criteria should be developed for stream-type tributary SRCS.

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FROM: Gabriel Kopp and Doug Demko

DATE: July 28, 2014

SUBJECT: Review of Passage and Stream Conditions in lower Deer Creek

Unprecedented dry conditions over the course of multiple years have led to a challenging environment for water management in 2014. Conservation and prioritization efforts have resulted in difficult decisions to balance necessary environmental flows and integral water diversion for agriculture and livestock. Numerous streams have come under the scrutiny of the California Department of Fish and Wildlife (CDFW) and the State Water Resource Control Board (SWRCB). Deer Creek represents one of these streams. Deer Creek is a relatively smaller Central Valley stream with no water storage facilities, but three significant diversions. These diversions represent the only nodes of management by removing or allowing water to remain in the stream. Deer Creek supports Central Valley Steelhead and Spring Run Chinook salmon. All three diversion points lie in a migratory corridor, below the spawning reach for these species. Therefore, water kept in the stream primarily serves as a means of passage, but does not improve rearing conditions.

Current emergency regulations imposed by the SWRCB require that from October 1 to March 31, if adult steelhead are present, base flows of 50 cfs be maintained. In addition, from November 1 to June 30, if juvenile spring-run Chinook salmon or juvenile *O. mykiss* are present and adult salmon are *not* present, base flows of 20 cfs must be maintained. These regulations suggest that 20 cfs is considered a minimum passage flow by juvenile salmonids and 50 cfs for adults.

During the fall and early winter months, irrigators require diverted flows until seasonal precipitation begins. Regular precipitation may not occur until mid to late October. This makes minimum flow requirements in October and November especially critical. Current natural base flow (as of July 24, 2014) within Deer Creek is close to 60 cfs. Assuming the river would be of similar or slightly lower flow in October, regulations would allow only 10 cfs of diversion. Therefore, it is critical to determine what minimum flow in is biologically necessary for upstream and downstream passage and what measures or actions could possibly allow for lower base flows.

As a foundation for future negotiations for alternative flow and channel modifications to provide upstream and downstream passage, we addressed three questions:

1) Based on our May 17, 2014 field survey, how many potential passage impediments are there at flows under 50 cfs and where are they located?

2) Based on our field survey and aerial photographs, can we determine the base flow necessary for juvenile and adult passage at these locations?

3) What, if anything, can be done at these locations to modify the channel to improve passage at flows less than 50 cfs?

These questions are individually addressed below based on a recent field survey, available existing information, and professional judgment.

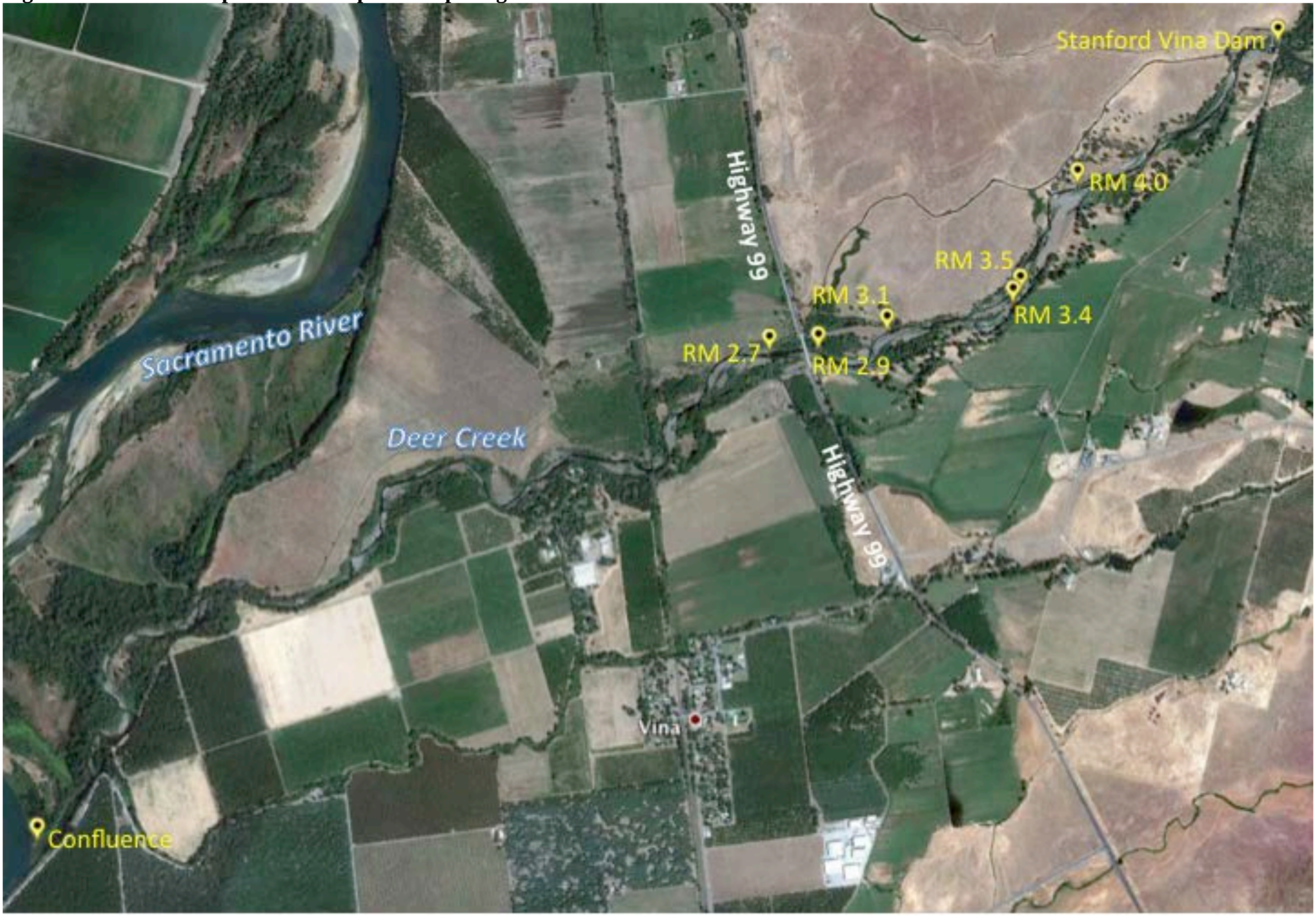
Based on our May 17, 2014 field survey, how many potential passage impediments are there at flows under 50 cfs and where are they located?

We surveyed lower Deer Creek from Stanford Vina Diversion (river mile or RM 4.5) to the confluence of the Sacramento River (RM 0.0) on May 17, 2014 to evaluate potential passage impediments at the existing flow (46-49 cfs). This surveyed reach represents what water remains in the channel between the lowest downstream diversion and the confluence of the Sacramento River and is the most critical reach for passage. The survey consisted of walking the reach and measuring wetted width, average depth, maximum depth, presence of a leaping pool, and overall water velocity (visually assessed not measured).

Multiple surveys at different low flows were not performed due to the current water conditions, time constraints, and challenges associated with controlling flow in Deer Creek (i.e. no dam control release). Although the flow ranged between 46-49 cfs at the time of our survey, we thoroughly reviewed areas that were suggestive of becoming passage issue points at even significantly lower flows. Broad and wide channels that evenly distribute flow and lack a leaping pool were areas of interest. These channel characteristics usually result in being the first areas to create passage challenges relative to other habitat in the river.

We identified six locations with characteristics (i.e. lack of depth/flow) that could impede upstream/downstream passage for salmonids, all between RM 2.7 and RM 4.5 (Stanford Vina Diversion; Figure 1). Additional detail for each site is presented in a summary table included as Appendix 1. All but two of the sites appeared to be readily passable at current and potentially lower flows near 20 cfs. Areas at RM 4.0 and 3.5 were considered to pose the greatest challenge and likely become the first areas to create passage issues during lower flow releases, while RM 2.7 would likely be the last site to become impassable.

Figure 1. Overview map of identified potential passage issue areas.



Based on our field survey and aerial photographs, can we determine the base flow necessary for juvenile and adult passage?

Assessing river conditions at lower flows than when surveyed required investigating other data sources. Aerial imagery collected over several years was obtained from Google Earth and allowed for us to evaluate whether the channel remained wetted at flows much lower than existed on our survey date. Dates on the aerial imagery collection were paired with historical flow monitoring data (California Data Exchange) to find numerous low flow examples. Discharge was represented from 6 to 49 cfs over four different years: 7-8 cfs (2010), 6-7 cfs (2012), 16-20 cfs (2013), and 46-49 cfs (2014). These aerial images were then compared with the two most challenging passage areas (RM 4.0 and 3.5) and the least challenging area (RM 2.7) based our May 17, 2014 survey data.

Shallow water and exposed rock reflect in aerial imagery, allowing for indications of passage conditions. Based on the reconnaissance-level of our survey, and the lack of depth and velocity data provided by the aerial photographs, we cannot precisely estimate the base level of flow required for successful upstream and downstream migration. However, we were surprised that the aerial photographs clearly show the entire river downstream of Stanford Vina Diversion (RM 0- RM 4.5) remains wetted at flows as low as 6 cfs. We were unable to assess flows lower than this to determine when the river no longer is wetted, but were able to confirm its state at 6 cfs.

The estimated potential for fish passage varied between sites based on the aerial imagery. Passage at RM 4.0 appears potentially feasible for adult and juvenile salmonids, even at lower flows approaching 10 cfs (Appendix 2, Table 1). The channel shape is narrower and constricted. Passage appeared to be restrictive for adult salmonids at RM 3.5 flow stages less than 46-49 cfs and likely juveniles below 20 cfs (Appendix 2, Table 2). The channel fans over a gravel bar, which spreads the flow evenly across a relatively broad width. At RM 2.7, aerial imagery remained dark with minimal shallow water reflection down to 7-8 cfs, suggesting passage may be possible below 10 cfs for adult and juvenile salmonids (Appendix 2, Table 3). The area began to show shallow water light reflections at 6-7 cfs. Passage determinations were based on professional judgment and could not be definitively determined without additional on-the-ground field measurements at different flows.

Overall, it appeared all sites but RM 3.5 would be passable for adult and juvenile salmonids at flows less than 50 cfs.

What, if anything, can be done at these locations to modify the channel to improve passage at flows less than 50 cfs?

The channel characteristics during low flows in Deer Creek offer the potential to make channel modifications in a timely manner with reasonable effort. All of the six identified areas posing potential fish passage issues at lower flows could potentially be modified to allow for passage of adult and juvenile salmon potentially at flows approaching 20 cfs. To conduct these modifications two approaches are suggested for consideration.

The first approach is simplistic, commonly used, and can be readily implemented with minimal impact. Each channel location suffers from flow being broadly spread over a wide even channel. The broad flow reduces depth and negates passage. Constricting the flow without significantly modifying the channel may increase the depth and provide sufficient flow for passage. Locally available moderate sized rock (i.e. stream cobble) can be taken from the channel or shoreline and stacked by hand in a downstream v-shape to channel lower flows at critical locations. These modifications are also referred to as simplified rock weirs. Examples of streams utilizing these modifications are presented in Figure 2. Constricting the channel down to 3 to 4 feet of width may result in 1 to 2 feet of depth. These stacks of rock will sustain lower flows and possibly provide suitable passage conditions at very low flows. Rock structures would then likely be displaced during seasonal winter flow events, allowing for the river to assume a more natural shape and appearance. This approach is cost effective, minimally disruptive, and effective during very low flows. Generally this resolution would need to be repeated if similar conditions were presented in the following year.

Figure 2. Examples of local cobble used to constrict flow and provide improved fish passage conditions in both small and moderate sized streams. Left picture: Spruce Brook, Connecticut, Department of Energy and Environmental Protection. Right picture: Hurdygurdy Creek, California, USDA.

The second approach would require heavy machinery to excavate a low flow channel at the identified critical passage points in the river. The low flow channel would similarly focus all flow in the stream into a narrower channel and provide passage at substantially lower base flows. The six identified areas occur in readily accessible locations that would feasibly be accessed by heavy equipment. Some locations, such as RM 3.5 may not be as conducive to the first approach and possibly better suited for channel modification or a blending of both approaches. Each location would need to be addressed on a case-by-case basis. Given the small size and scope of the project, the excavation activity duration would be brief and the effect of the activity likely minimal. Possible short-term effects would include increased turbidity and noise. Unlike the first approach, this effort would likely result in a longer-term solution that would either require minimal or no additional effort if another dry water year were to occur.

The overall conclusion from this review is that there is the possibility to provide suitable passage for all lifestages at flows significantly less than 50 cfs. Minimal activity at select locations could greatly improve passage conditions and allow for juvenile and adult salmonids to move freely at flows possibly as low as 15 to 20 cfs. Implementing these channel revisions and following up with additional monitoring would provide an adaptive pathway forward. This adaptive approach would allow for lower base flows, but also ensure that sufficient flow for adult and juvenile salmonid passage would be present. Considering and readily implementing these activities appears reasonable and merited, given the overall challenging conditions, difficult water management decisions, and need for maximized water usage.

Appendix 1

Summary of Areas on Deer Creek from the Sacramento River Confluence to Stanford Vina Dam That May Create Passage Issues at Low Flows

Location (River Miles)	Channel Features at 49 cfs	Field Researcher Notes	Image
RM 2.7	Channel width is less than 20 yards across with a depth ranging up to 1 foot in pockets. The location appeared passable at current flow by adult or juvenile salmonids.	Location is proximally below the Highway 99 bridge crossing. Not a critical location, but may become an area to monitor at very low base flows.	
RM 2.9	Channel width is less than 14 yards at the narrowest point. Water depth increased near the far shoreline to nearly 1 foot. The location appeared passable at current flow by adult or juvenile salmonids.	Location is proximally above the Highway 99 bridge crossing. Likely not an issue at most flows, but may become a challenging area at very low flow.	
RM 3.1	Channel width is less than 15 yards on average and maintains a water depth of 0.5 to 0.8 feet throughout. The location appeared passable at current flow by adult or juvenile salmonids.	Area is moderately susceptible to lower flows and would likely require modification at moderate to very low flows.	

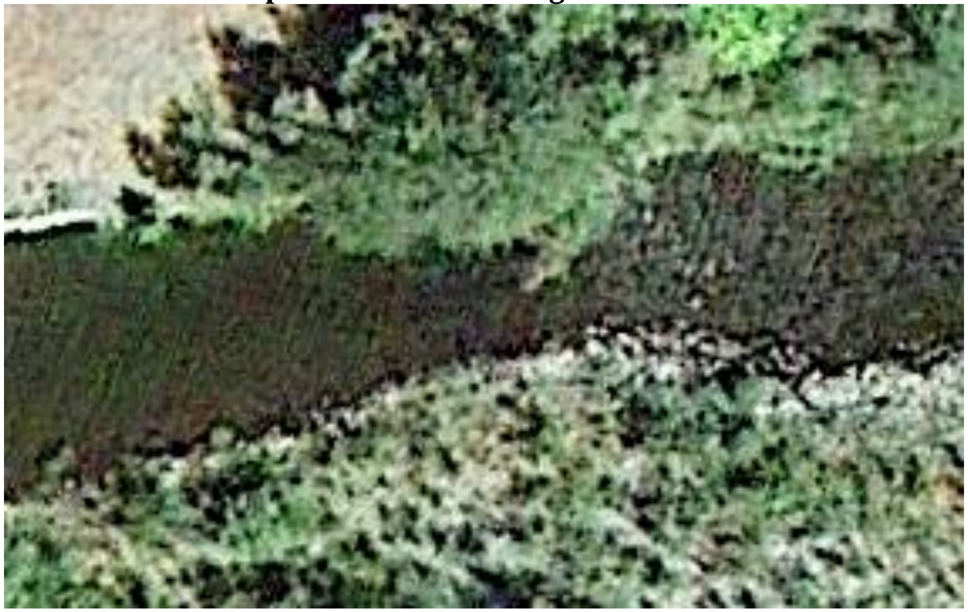
Location (River Miles)	Channel Features at 49 cfs	Field Researcher Notes	Image
RM 3.4	Channel width is less than 10 yards across. Water depth ranged from 0.5 to 0.75 feet. The location appeared passable at current flow by adult or juvenile salmonids.	Area is moderately susceptible to lower flows and would likely require modification at very low flows. There is a slot at the right of the image that provides the greatest depth and could be readily deepened to improve passage conditions.	
RM 3.5	Channel width was greater than 30 yards. Depth was less than 0.5 feet overall. Gravel bar width extends for several yards. The location appeared minimally passable at current flow for adult salmonids and reasonably passable for juveniles.	Critical area likely susceptible to passage issues more readily than other sites. Flow could be readily focused to immediately improve passage by mild channel excavation. The broad gravel bar width and length appears to be the primary issue.	
RM 4.0	Channel width was less than 10 to 15 yards. Depth was generally 0.5 feet across the channel. The location appeared passable at current flow by adult or juvenile salmonids.	Area is moderately susceptible to lower flows and would likely require modification at moderate to very low flows.	

Appendix 2

Historic Aerial Imagery Assessment at Passage Issue Areas During Low Flow Conditions

Table 1. Challenging passage area at RM 4.0 during four different flow conditions. Aerial photos are from Google Earth.

August 1, 2010 (7-8 cfs)



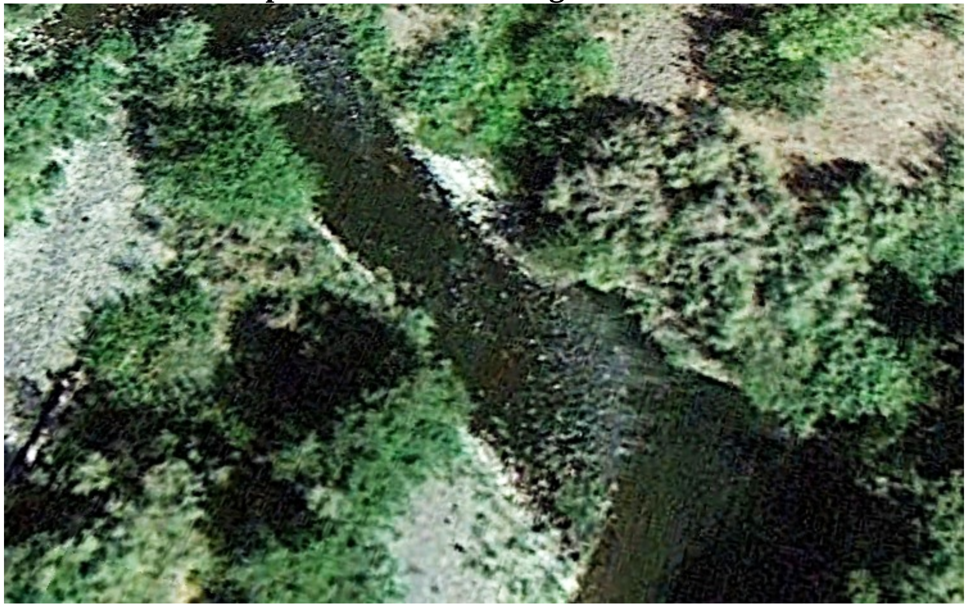
August 27, 2013 (16-20 cfs)

August 18, 2012 (6-7 cfs)

May 17, 2014 (46-49 cfs)

Table 2. Challenging passage area at RM 3.5 during four different flow conditions. Aerial photos are from Google Earth.

August 1, 2010 (7-8 cfs)

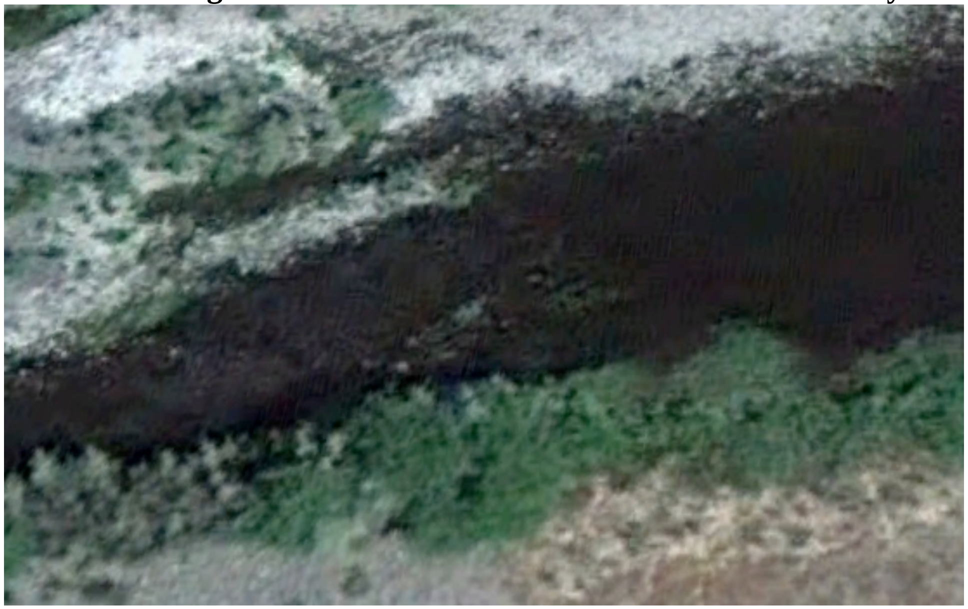


August 27, 2013 (16-20 cfs)

August 18, 2012 (6-7 cfs)

May 17, 2014 (46-49 cfs)

Table 3. Passage issue area at RM 2.7 that was identified as likely the last to become impassable of all identified sites.



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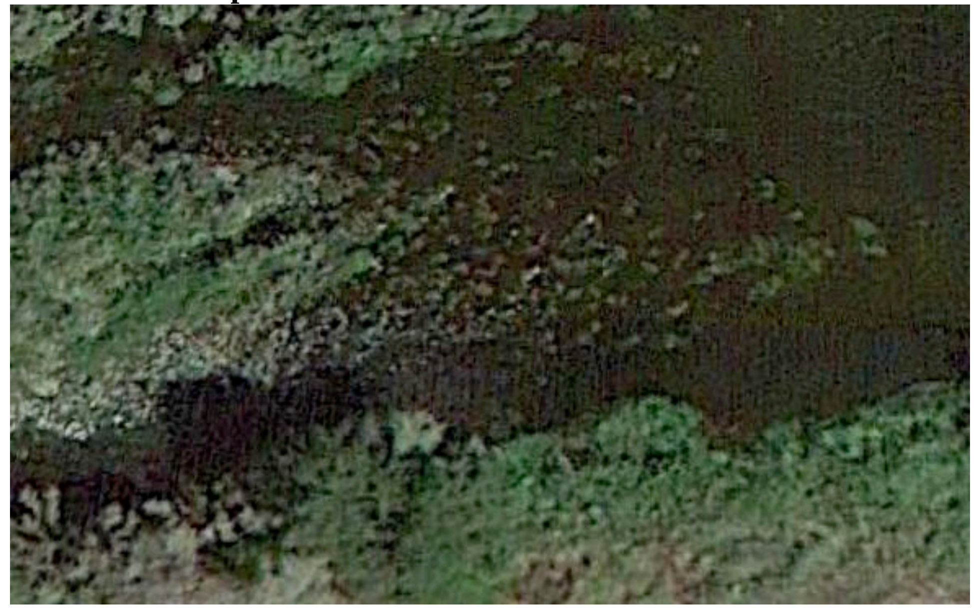
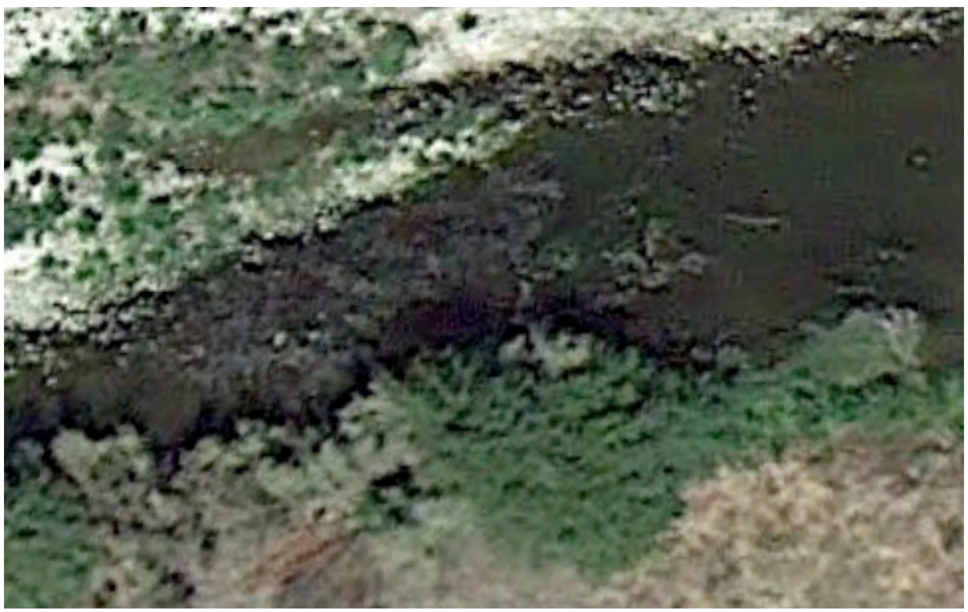
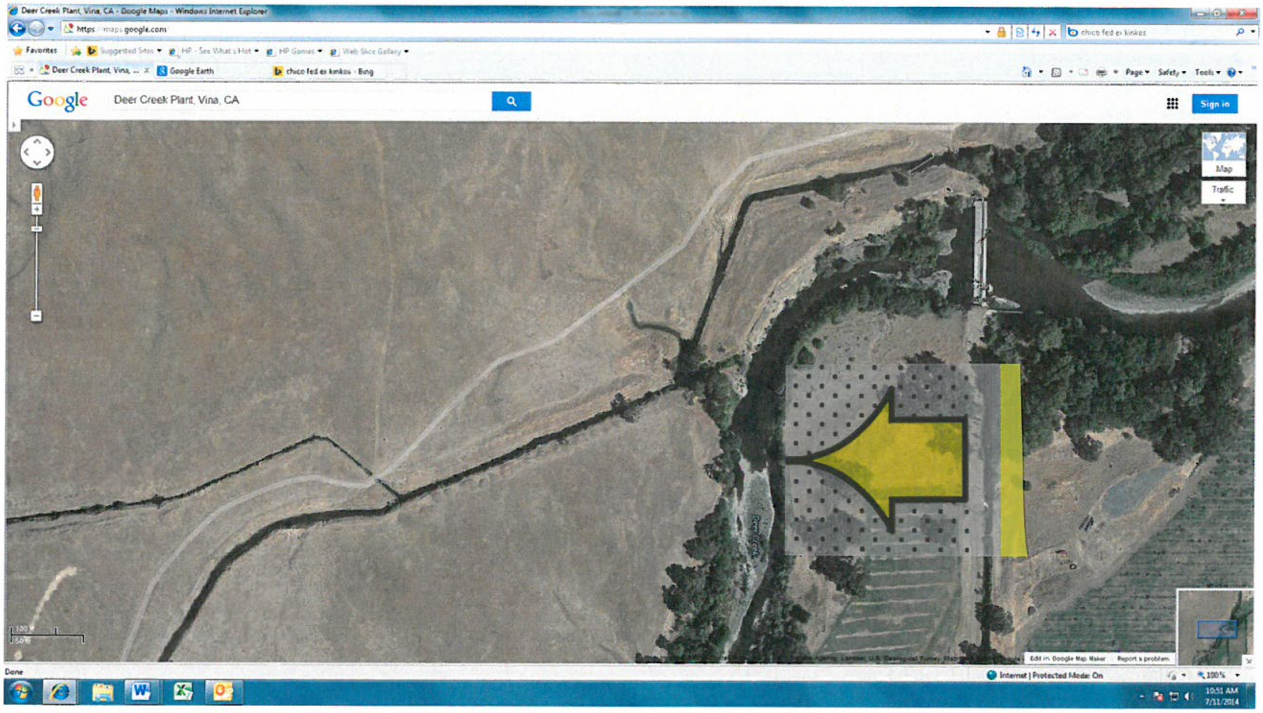


August 27, 2013 (16-20 cfs)



August 18, 2012 (6-7 cfs)

May 17, 2014 (46-49 cfs)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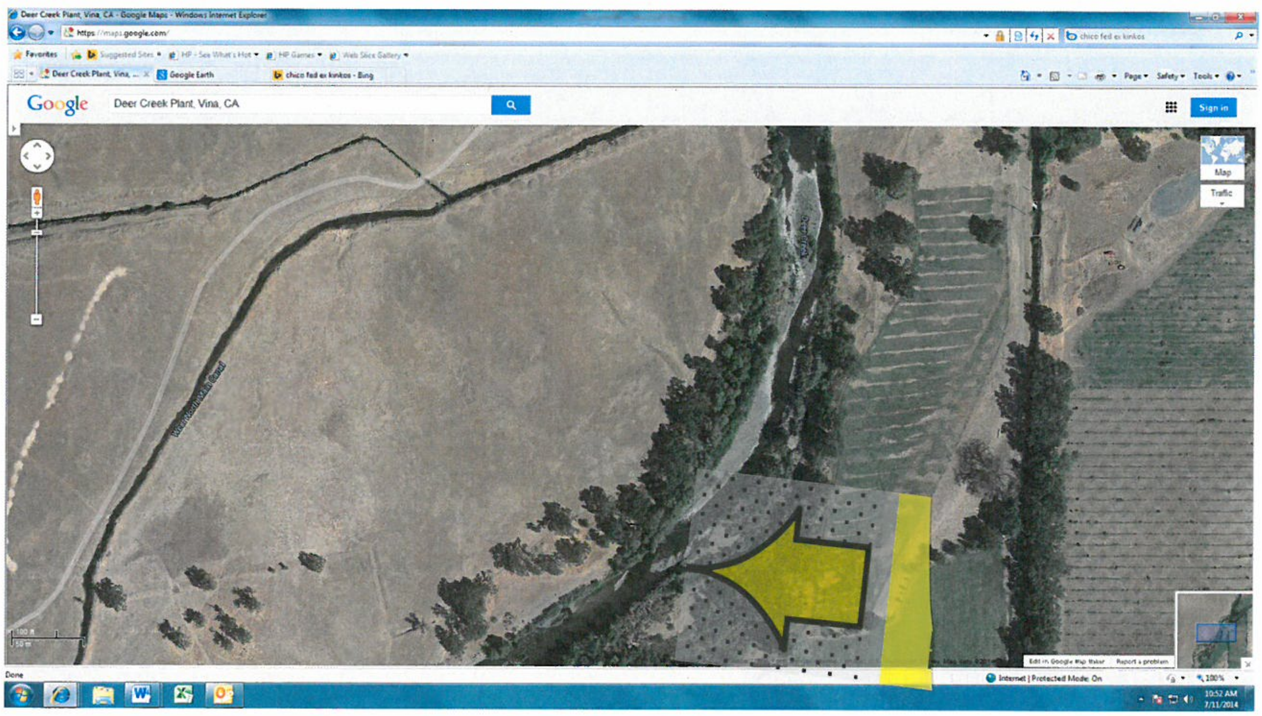
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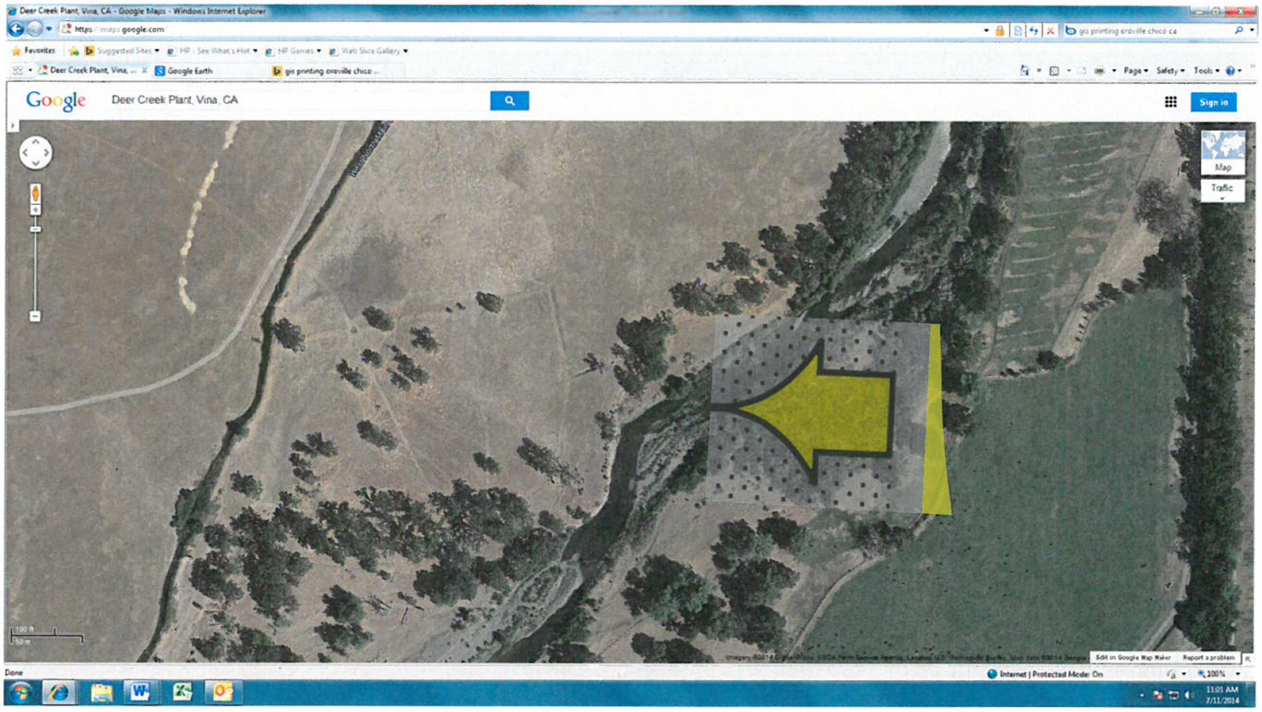
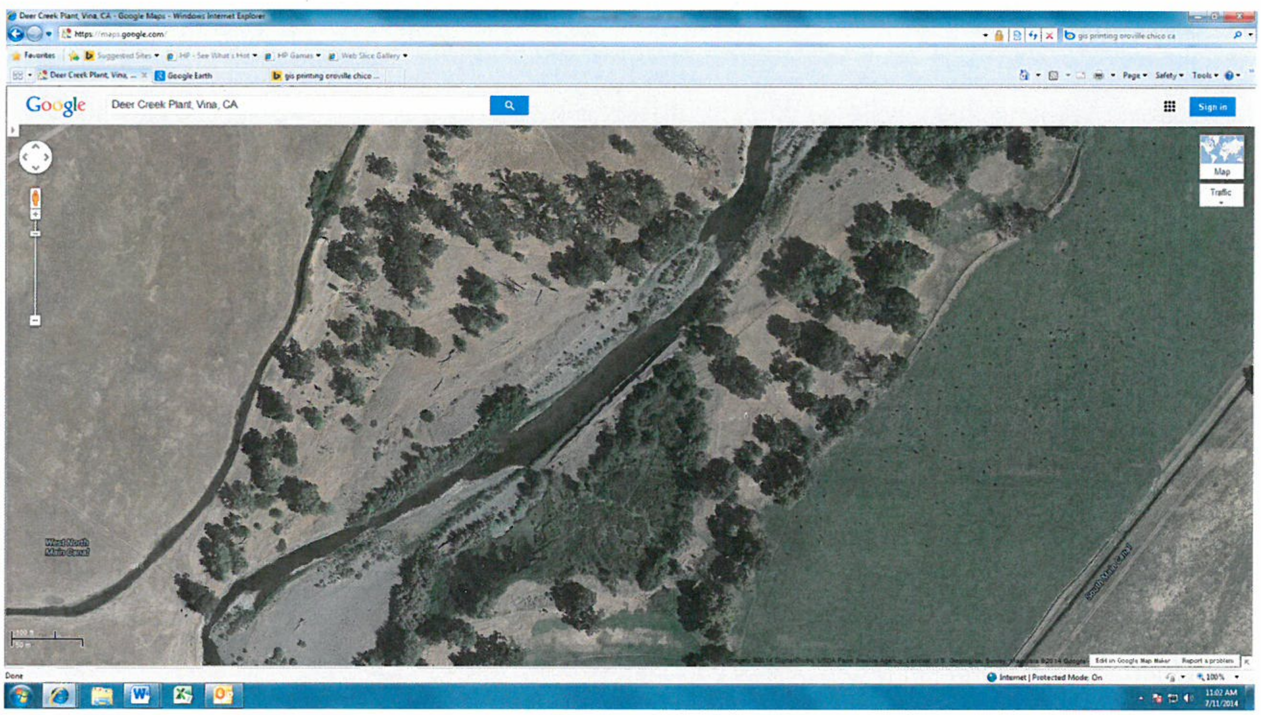
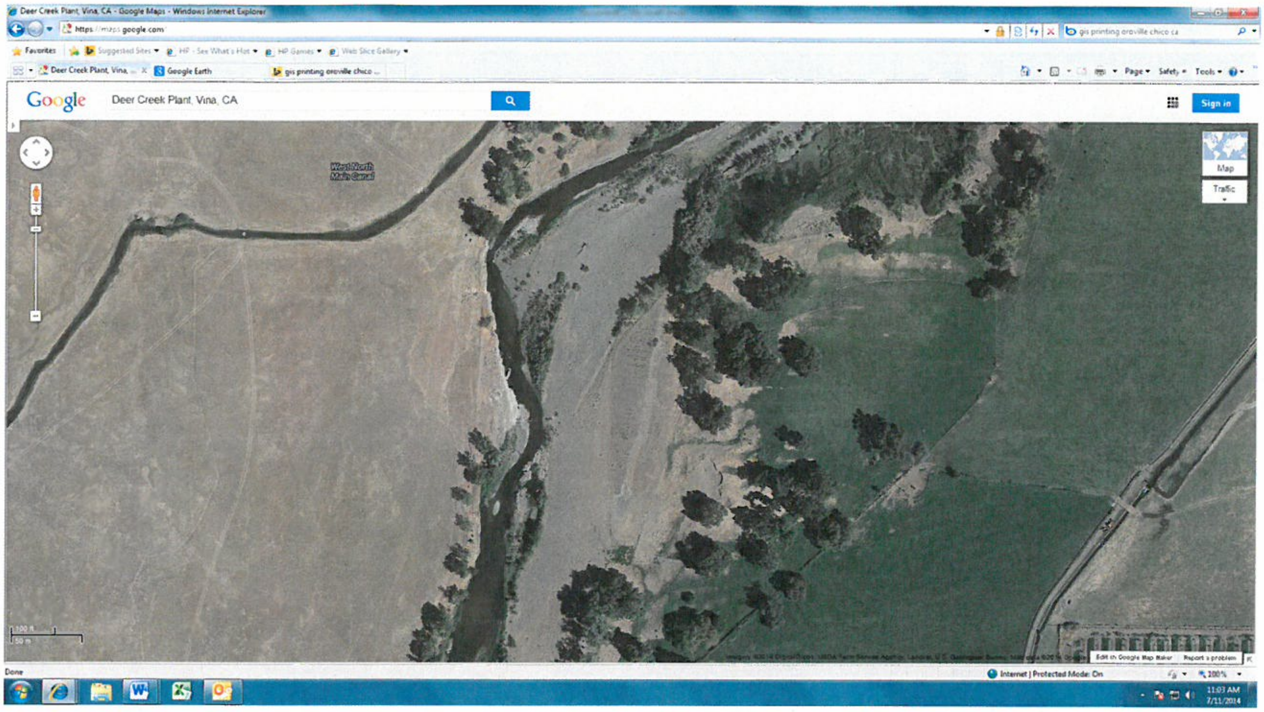




2011 Aerial Photos -- Deer Creek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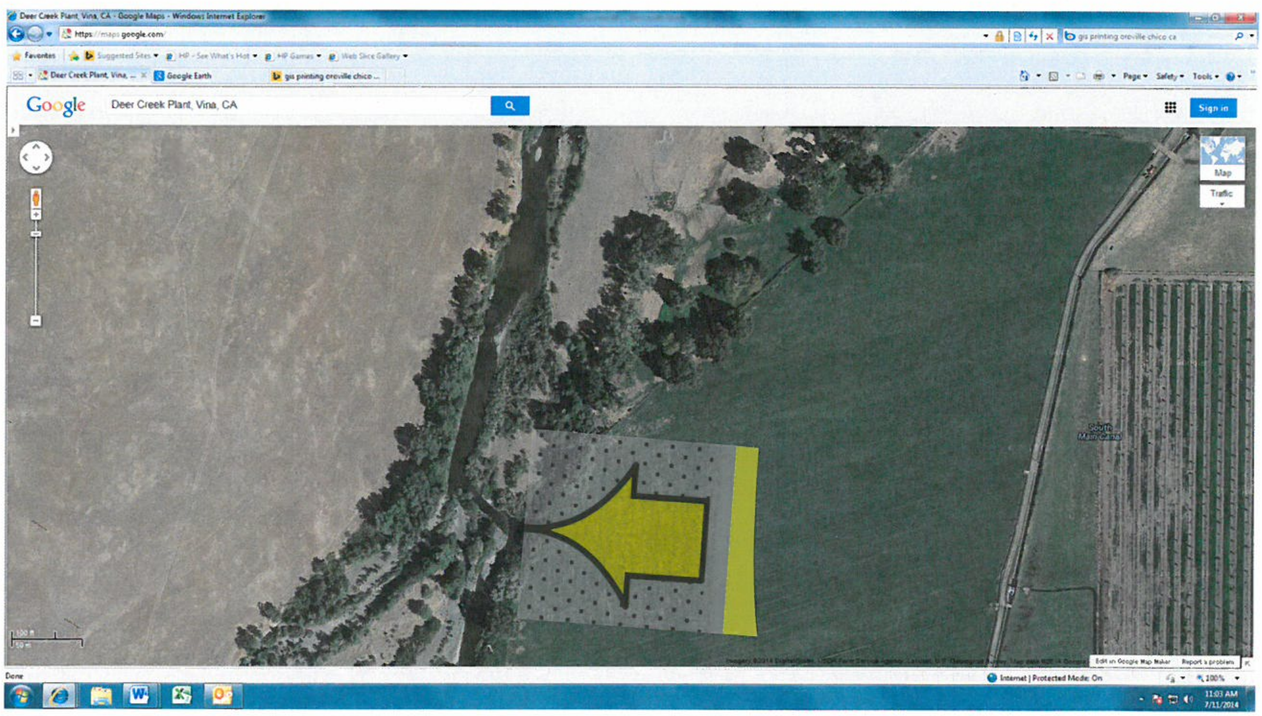
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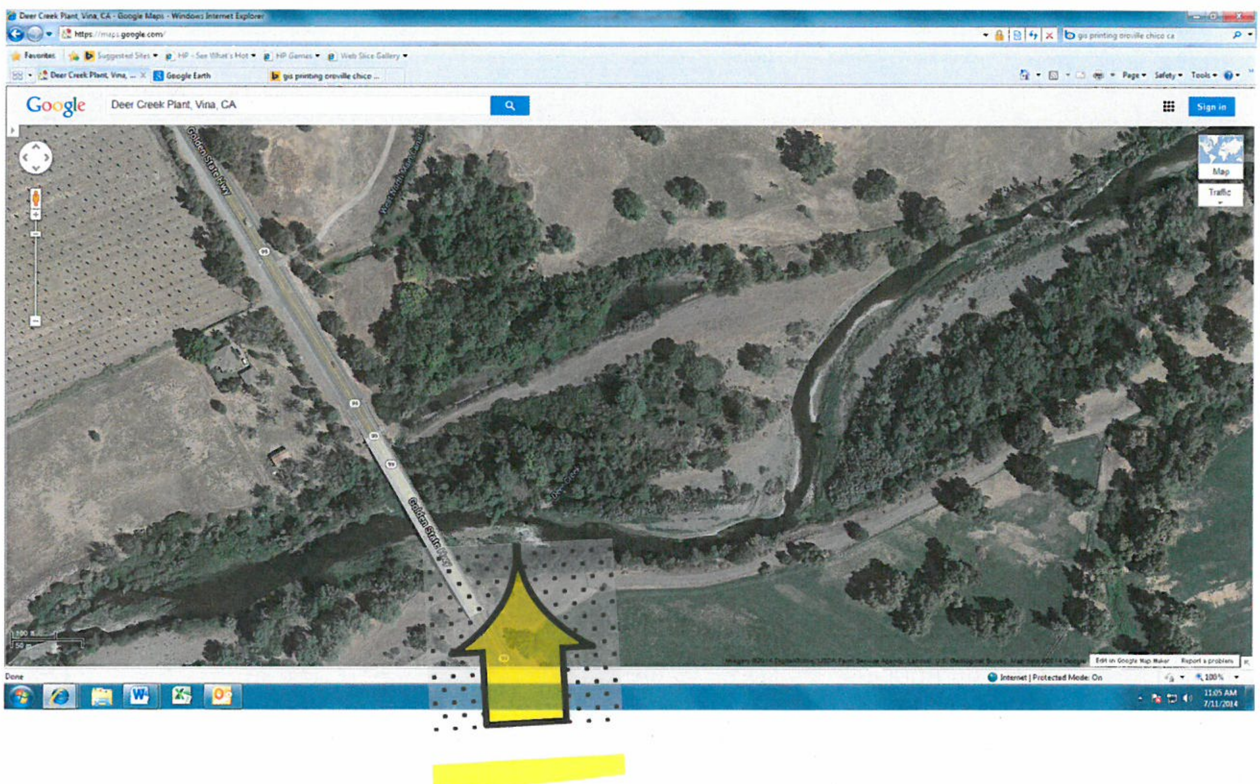

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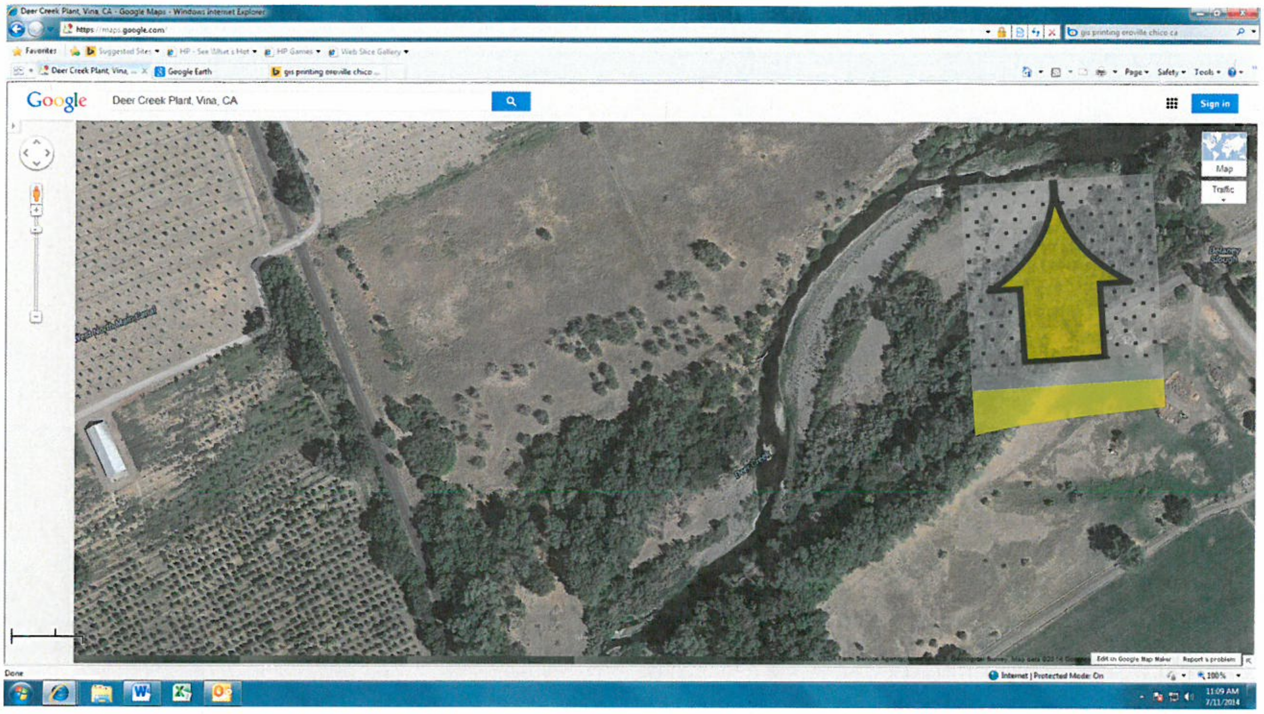
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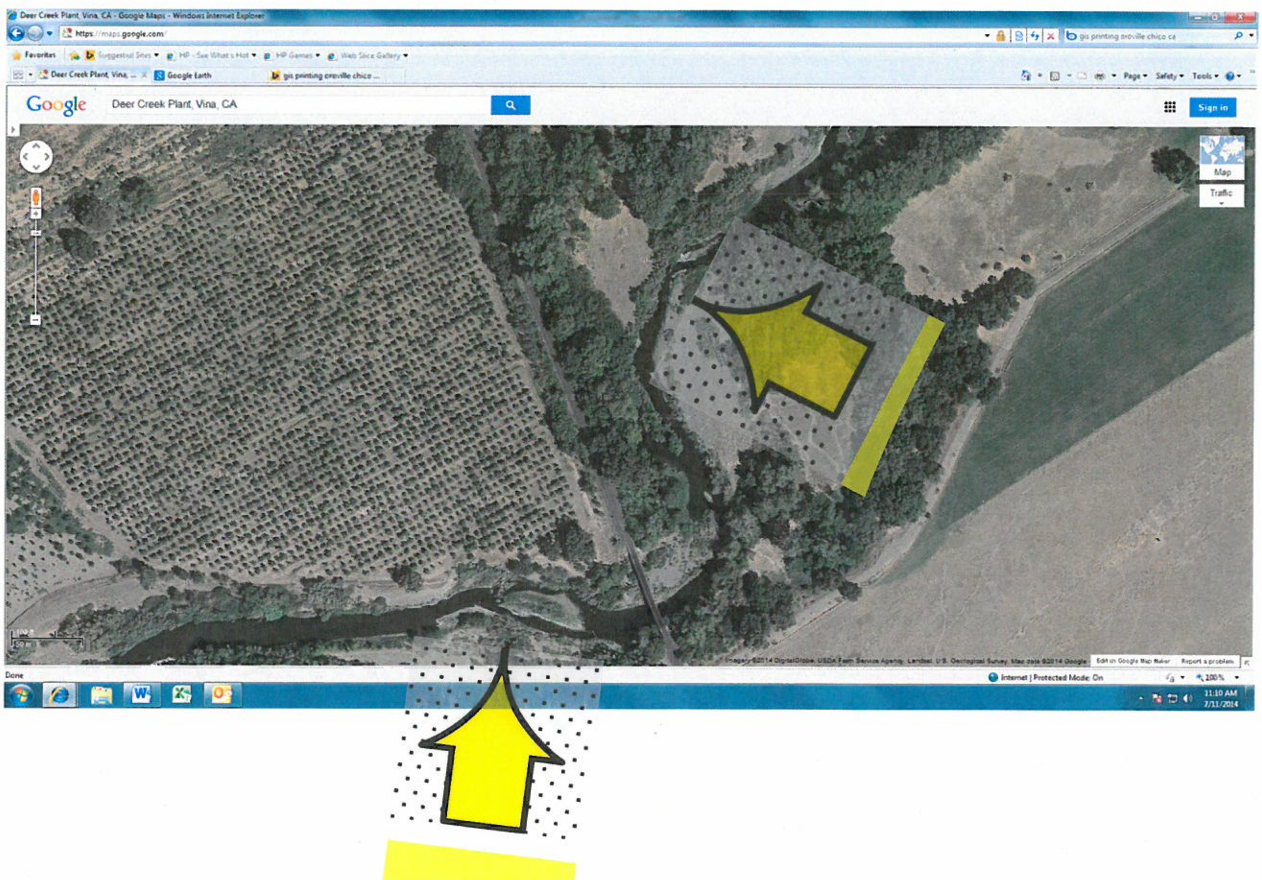
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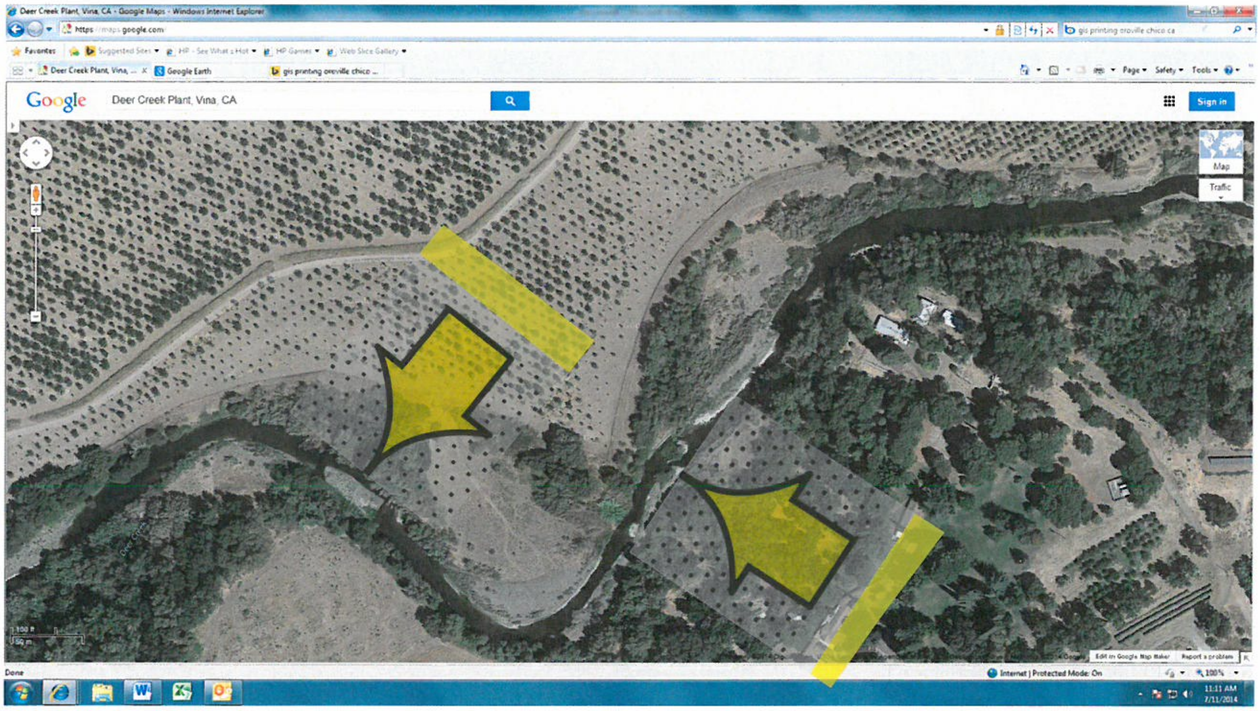
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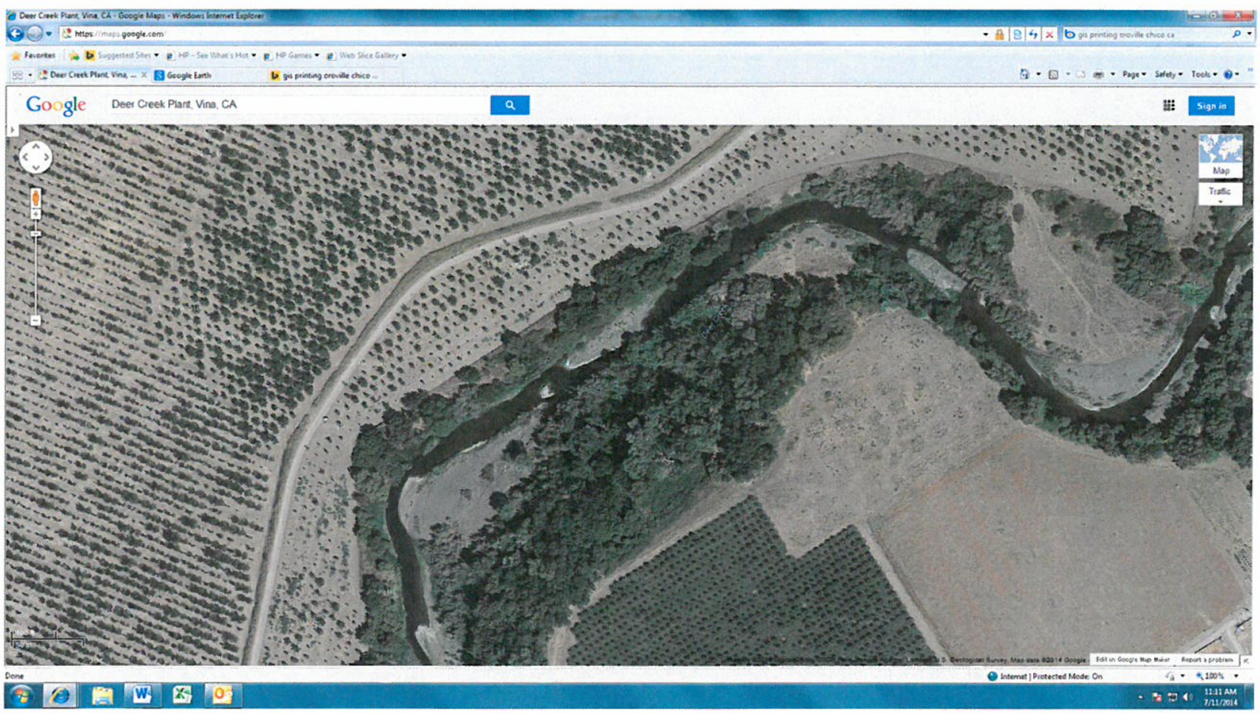
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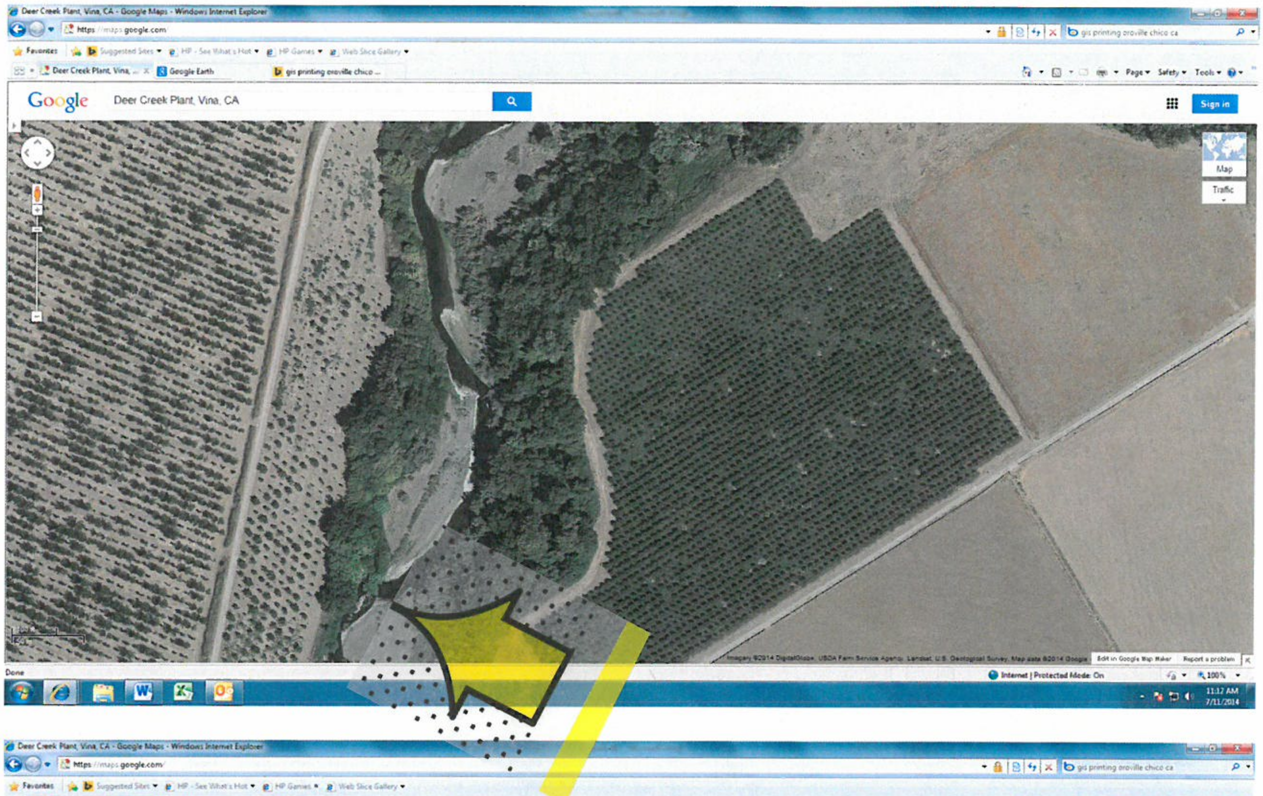

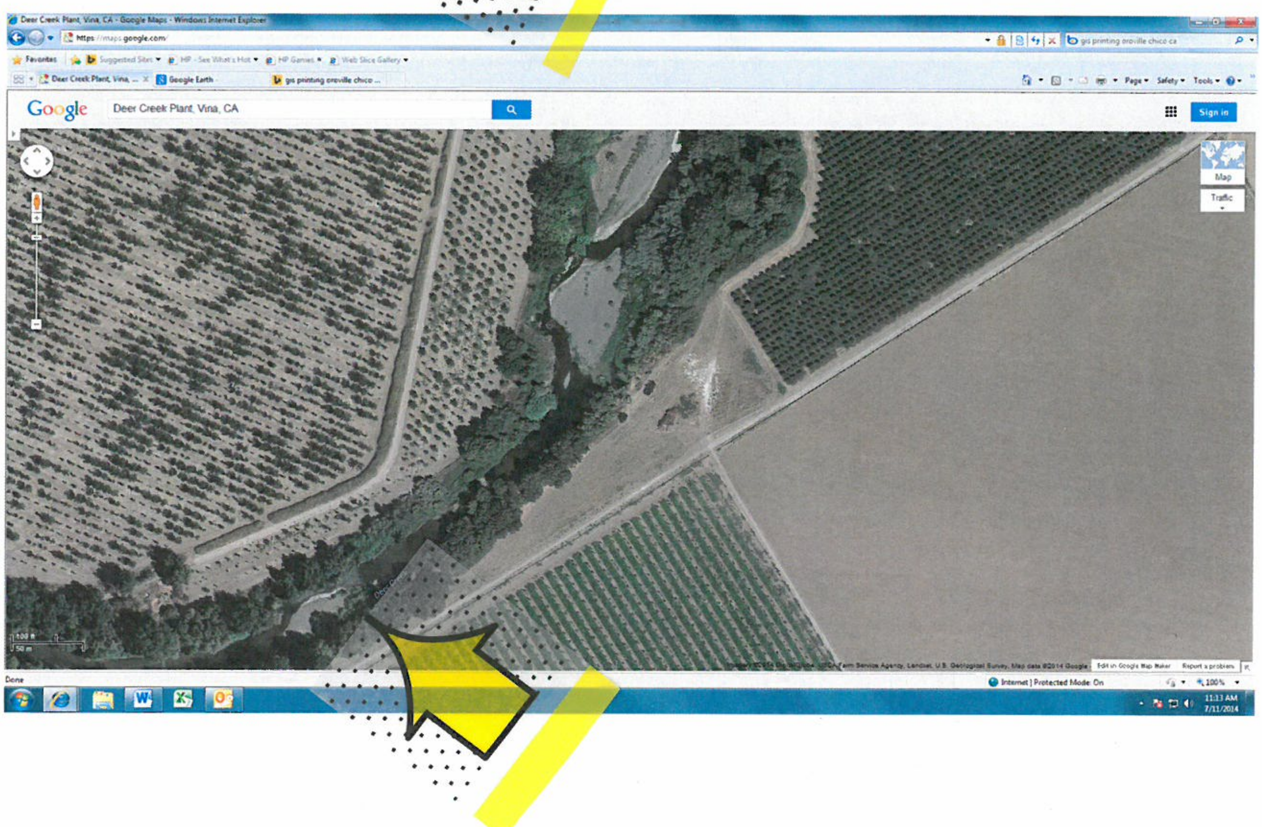

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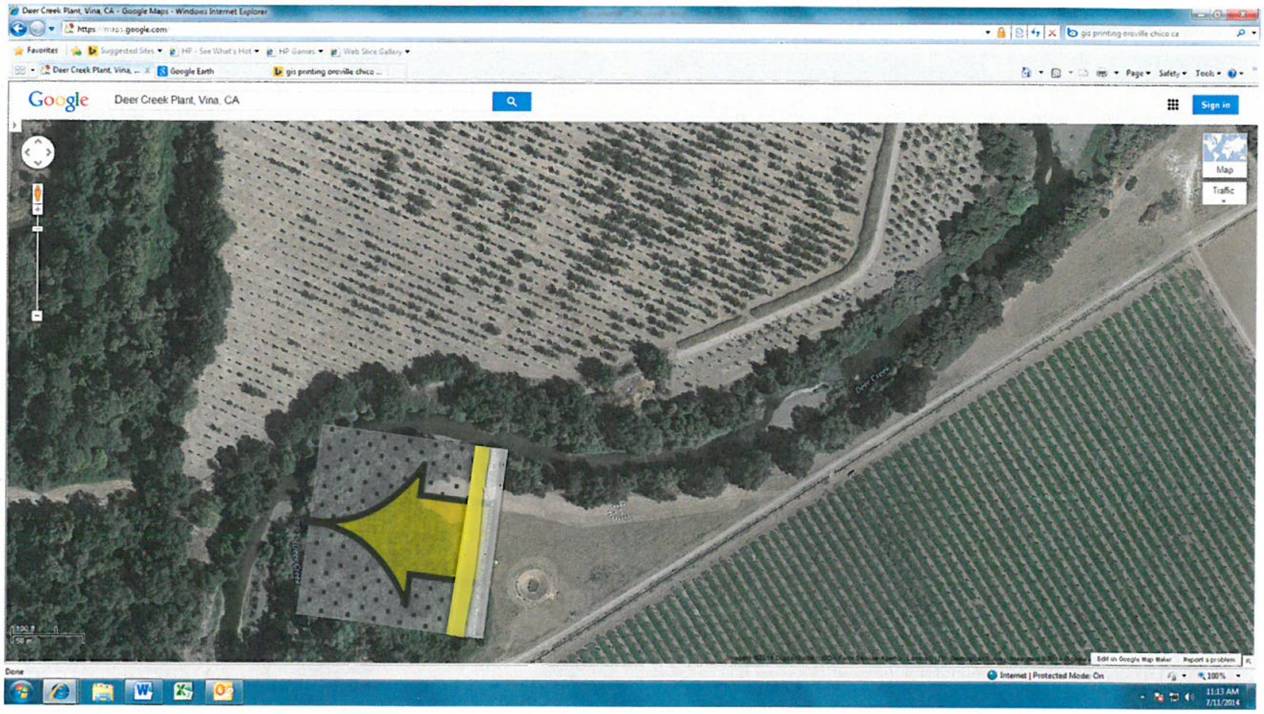

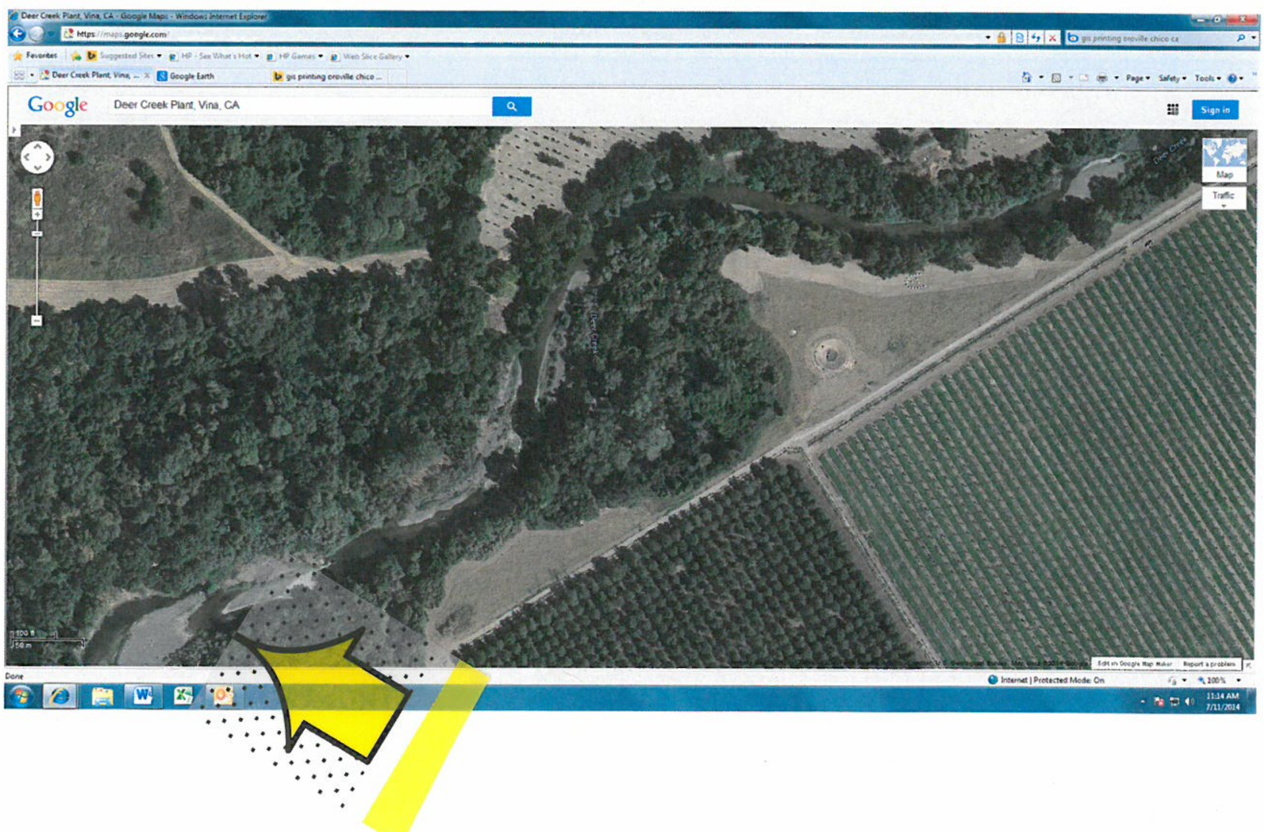

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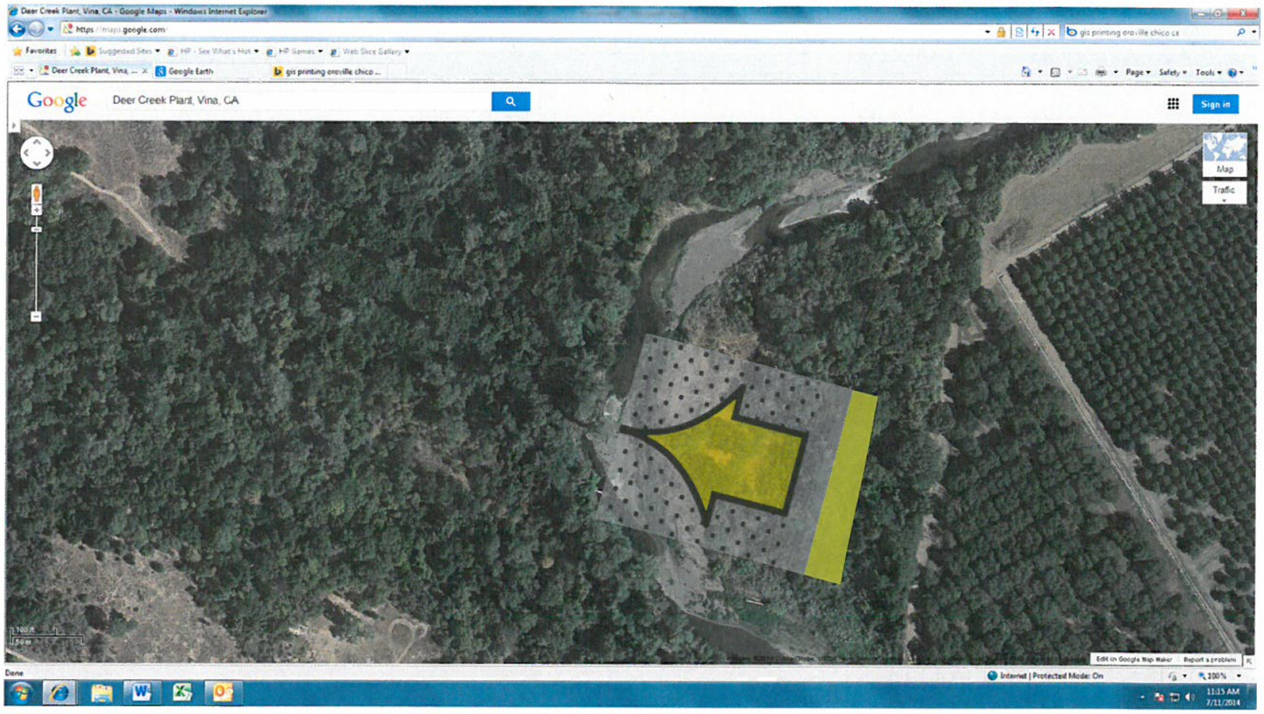
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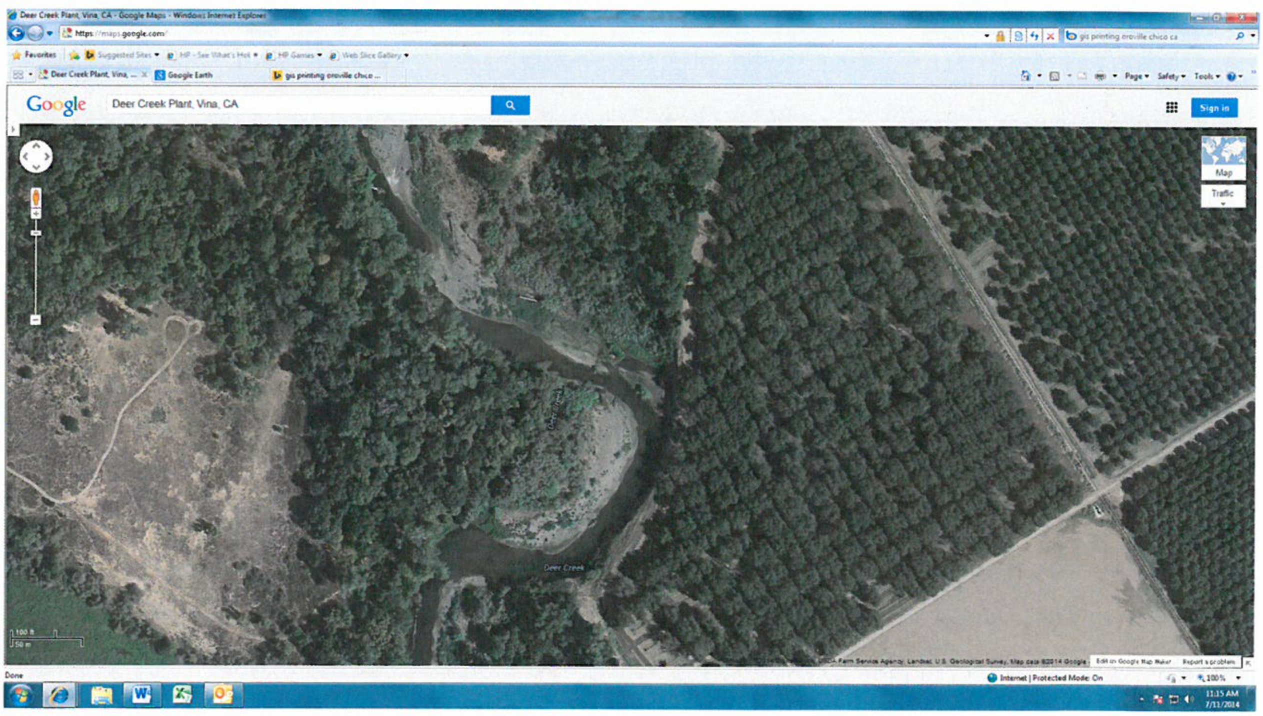
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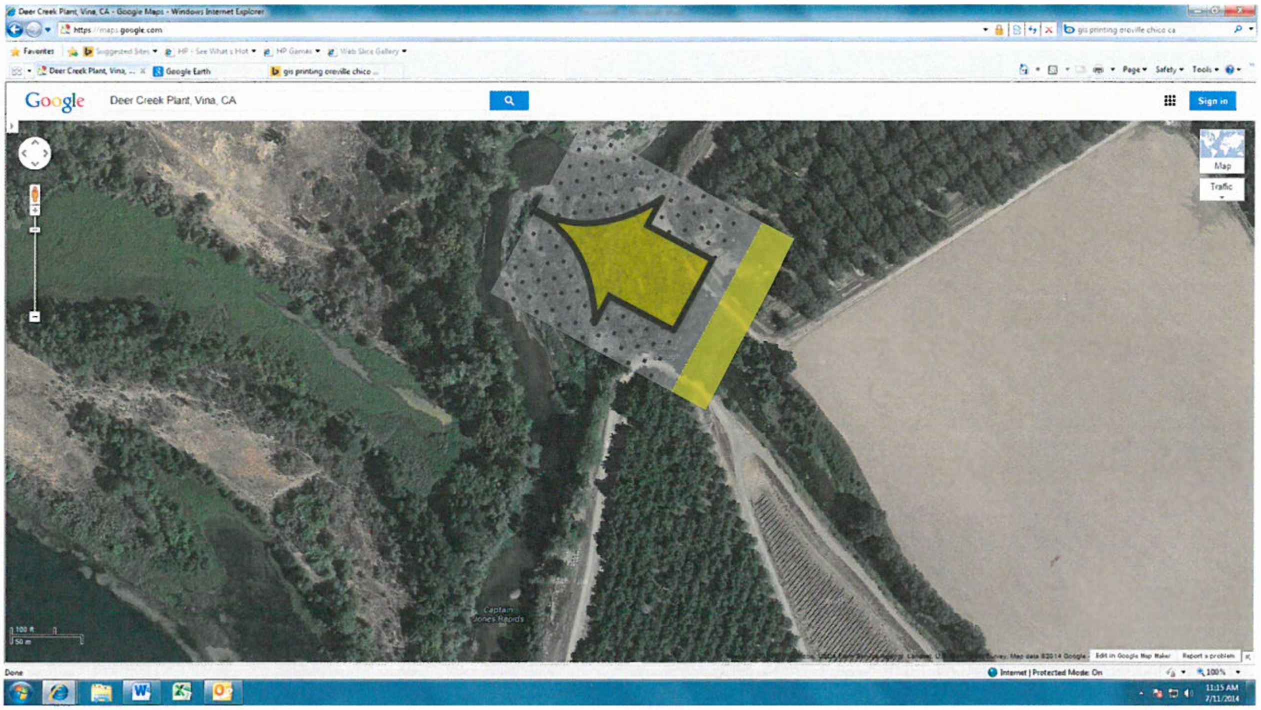

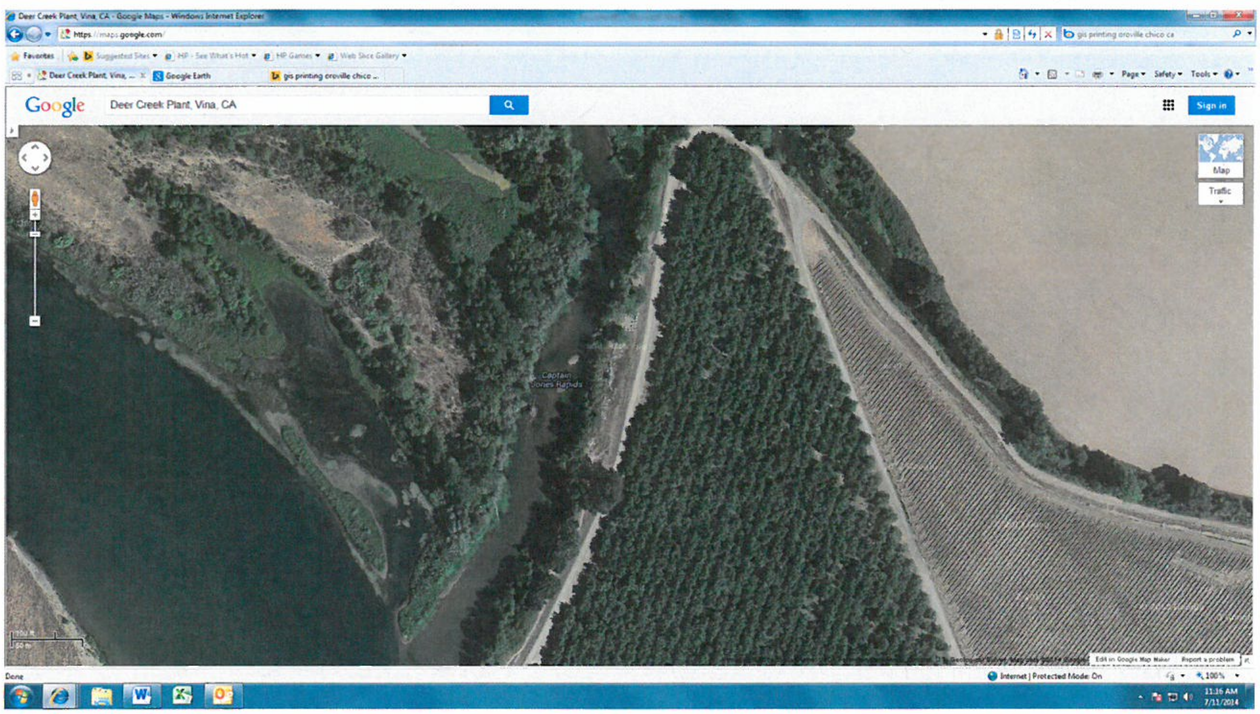

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Region 1 – Northern
601 Locust Street
Redding, CA 96001
www.wildlife.ca.gov

EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

August 27, 2014

Mr. Paul R. Minasian
Minasian, Meith, Soares, Sexton & Cooper, LLP
P.O. Box 1679
Oroville, CA 95965-1679

Subject: Fishery Management and Flows in Deer Creek, Tehama County

Dear Mr. Minasian:

This letter is in response to your letter dated August 12, 2014, received by the California Department of Fish and Wildlife (Department) on August 13, 2014. The Department is committed to protecting aquatic resources in Deer Creek and maximizing the beneficial uses of scarce water supplies during this time of extreme drought conditions.

Earlier in the year, the Department and National Oceanic and Atmospheric Administration Fisheries announced a Voluntary Drought Initiative to protect salmon and steelhead from the unprecedented drought. While this initiative is separate from the State Water Resources Control Board's authority and the independent actions it may pursue related to the drought, the Department has and continues to support any local and cooperative solutions formalized through an executed voluntary agreement as an alternative to mandatory curtailments.

The Department is currently reviewing your letter and attachments. While we may not agree with all of the issues raised in your letter, we would like to start discussions regarding entering into a voluntary agreement with Standford-Vina Ranch Irrigation Company (SVRIC). In general, any agreement between the Department and SVRIC would have similar requirements to the agreements the Department entered into with other water users within the watershed.

If you have any questions or would like to start discussions regarding entering into a voluntary agreement, please contact Curtis Milliron, Northern Region Fisheries Program Manager, at (530) 225-2280 or email Curtis.Milliron@wildlife.ca.gov.

Sincerely,

NEIL MANJI
Regional Manager

cc and ec Page 2

Received
AUG 29 2014
Minasian Law Firm

cc: Mr. Stafford Lehr, Chief, Fisheries Branch
Mr. Scott Cantrell, Chief, Water Branch
California Department of Fish and Wildlife
830 S Street
Sacramento, CA 95811
Enclosures: Minasian letter and documents

ec: Messrs. Curtis Milliron, Curt Babcock, and Jason Roberts
California Department of Fish and Wildlife
Curtis.Milliron@wildlife.ca.gov, Curt.Babcock@wildlife.ca.gov,
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September 19, 2014

Via email transmission

Charlton K. Bonham, Director
Department of Fish and Wildlife
State of California
1416 Ninth Street, 12th Floor
Sacramento, California 95814

Chuck.Bonham@wildlife.ca.gov

Re: Emergency Fishery Conditions on Deer Creek, Tehama County, California

Dear Chuck,

The facts are fairly simple in regard to Deer Creek fishery conditions. The situation requires leadership on both sides. I feel compelled to notify you of the general outlines of the problem and ask for your help and direction:

1. In the Governor's second Proclamation dated 4-25-14, item 7, he stated that the Department of Fish and Wildlife "...will implement projects that will respond to drought conditions...".

2. Your Department sought and received from the SWRCB an order from the SWRCB taking 50 cfs of Stanford Vina Ranch Irrigation Company water as early as October 1 "...if adult steelhead are present." Whether this and the water taken in June under the same Order is lawful or damaging in a manner compensable in law will be resolved at a later time, if at all. No identification of the location of the presence of adult steelhead was included.

3. Stanford Vina wrote a letter to Neil Manji of Region 1 proposing to excavate at our cost a channel in the bed of Deer Creek from the Stanford Vina diversion to the Sacramento River to reduce the flow claimed to be necessary from 50 cfs to a lesser amount, and to reduce predation. A copy of our letter to Mr. Manji dated August 12,

2014 with photographs and a report showing the condition of the channel and the feasibility of the plan is attached for your information.

4. Nancee Murray of your office is attempting to determine how to respond. We have offered to pay the costs of excavation of this channel, but it must be done on an emergency basis without 1601 permit delays or fees and without substantial delay if it is to be useful.

5. In that letter, we opined that if the bypass flows are made as early as October 1, the spring-run salmon redds upstream will for the first time be at risk of fall-run superimposition and damage and any release this early unless there is a temperature criteria for the bypass flows may actually damage and stress fall-run and steelhead which could delay entering or leaving Deer Creek, or spawning in the case of fall-run, until non-lethal water temperatures exist. Bypassing water will be ineffective because the water temperature is likely to be above mortal stress limits upon fall-run salmon and adult steelhead. There is no reason to move adult steelhead either downstream or upstream in those temperatures, and we suggested a temperature criteria should be applied. We have also pointed out that attracting fall-run through these flows to spawn on top of spring-run redds could cause a violation of the Federal Endangered Species Act (no consultation has occurred) because superimposition of the spring-run redds becomes very likely. Spring run have prospered in Deer Creek because irrigation diversions have encouraged fall-run adults to enter Deer Creek at times when colder water exists in reaches of the Creek where spring-run have not spawned.

6. A 60-day Citizens Notice to the State Water Resources Control Board members, the California Department of Fish and Wildlife and National Marine Fisheries Service itself that fostered this order encouraging superimposition of fall-run upon spring-run when the spring-run on Deer Creek have actually been protected from this harm by the irrigation practices of not maintaining bypass flows until winter rains begin is a step that should not have to be taken.

<u>Our Conclusion:</u> Your staff needs your direction:

1. To issue an emergency 1601 with no tails, fees or additional conditions, and let us jointly excavate this channel at our cost. Let’s agree that after excavation less than 50 cfs is required to flow in the narrowed channel, and ask the SWRCB to change their date and amount, including more inclusive criteria.

2. Let us put a temperature criteria upon the commencement of bypass flows and reduce the bypass flow, and jointly petition the SWRCB to the new methodology

2. Let us put a temperature criteria upon the commencement of bypass flows and reduce the bypass flow, and jointly petition the SWRCB to the new methodology designed to protect the spring-run salmon and provide reasonable flows for steelhead. If it continues dry through February, March and the early part of April 2015, flows cqan be provided for outmigrating juveniles in the newly-excavated, narrowed channel.

3. This hydrogology is not business as usual. We would ask to meet briefly with you and your staff, and at least, and for direction to your staff.

Very truly yours,

MINASIAN, MEITH, SOARES,
SEXTON & COOPER, LLP

By: ______________________
PAUL R. MINASIAN, ESQ.

PRM:dd

Enclosures: 2011 Aerial Photographs – Deer Creek
2014 temperature readings, Deer Creek & Mill Creek
SVRIC/Minasian letter to Manji 8-12-14
2014 Fish Bio Report: Review of Passage and Stream Conditions in Lower Deer Creek

cc: Board of Directors, Stanford Vina Ranch Irrigation Company

Stanford Vina\Bonham DFW.2.wpd