



California Regional Water Quality Control Board Central Coast Region



Linda S. Adams.
*Secretary for
Environmental Protection*

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Arnold Schwarzenegger
Governor

Agricultural Order Renewal
Public Comments and Alternatives to
02/01/2010 Preliminary Draft Staff Recommendations
Group 16: Comment Letters

All of these letters were received after the deadline of June 4, 2010.

Comment ID	Affiliation	Date Received
A34	Carl Stuckly, California Avocado Commission	6/18/2010
F72	Santa Barbara Pistachio Company	6/10/2010
F73	John Ivancovich	6/21/2010
F74	John Ivancovich (second letter)	6/28/2010
F75	Martin Jefferson & Sons	7/16/2010
F76	Dirk Giannini	7/08/2010
FB10	California Farm Bureau Federation	6/15/2010
FB12	California Farm Bureau	7/7/2010
M19	County of San Benito	6/14/2010
M22	Monterey County Board of Supervisors	6/14/2010
M23	California Department of Fish and Game	7/16/2010
M24	National Resource Conservation Service	7/15/2010
P25	Daniel Diaz and Ralph Bishop	06/21/2010
P26	Public Comment	07/12/2010
T9	Elsa Dooling	07/09/2010
U18	Sierra Club	06/17/2010
U19	Surfrider Foundation	6/18/2010

CARL STUCKY
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June 1, 2010

Central Coast Regional Water Quality Control Board
895 Aerovista Pl. #101
San Luis Obispo, CA 93401-8725

RE: Preliminary Draft for the Updated Agricultural Order

Chairman Jeffrey Young and Members of the Board,

Please enter this letter into your record of comments, in response to the Updated Agricultural Order.

While the Board's concerns, as addressed in the Updated Agricultural Order, are important, and recognizing that agriculture's impact on water quality needs improvement, the problems with the system created by this Order are serious and detrimental to the efficient allocation of resources, of both the agricultural community, and the Board itself.

1. The Order treats all agriculture, in all geographical areas, the same; when the problems vary greatly. The total reporting requirements are excessive, and unneeded, for certain crops in certain regions.
2. The Carpinteria Water District has a groundwater basin management plan and performs regular water quality analysis; to have individual growers testing and reporting to your Board is redundant, as all Water District records are available to the public. The total amount of data the Order requires regarding wells and groundwater would be so vast, as to make effective utilization by the Board staff almost impossible, and certainly excessively expensive. Every basin would require a complex set of characterization analysis, including age and movement analysis, as well as water quality analysis. Without a complete model, the parts won't yield meaningful results. Even then, the interpretation will be contested by seasoned experts.
3. Eutrophication of groundwater is a long term problem. It is inappropriate to require that current property owners bear responsibility for mitigation and providing remediation to owners of affected offsite wells. Contributions to eutrophication may be ancient, and the problem may exist, regardless of the current owner's farm practices. Furthermore, the problem may persist for generations, even if all farming were to stop. It is likely BMP's will help throughout the long term, but it is certainly not guaranteed.
4. The development and maintenance requirements for riparian corridors in the Order are impractical and arbitrary. Bank stabilization, along with the associated benefits, is important. However, your Order seems to have been written without a good understanding of actual stream dynamics. Not allowing channel clearing and maintenance

will, in time, lead to flooding. The evolution of natural stream channel and alluvial development is one of repeated movement of the channel. As vegetation grows, it holds more sediment from natural, as well as man-made, sources. At some point during high-flow periods, the amount of water exceeds the carrying capacity of the channel, and flooding, or scouring, occurs (scouring, often for a new channel, can occur outside of the riparian vegetation). Willows, in particular, have a growth and regeneration habit, which, after growth and scaffold collapse, inevitably leads to channel movement.

5. The riparian buffer width requirements are arbitrary. Beyond bank stabilization, the additional width requirements are not based on any sound science that shows superior performance with increased widths.
6. The definition of top of bank is subject to interpretation. The top of bank can be evident in some locations; however, in other locations, old channel terraces, both near and distant, as well as above the current era water flows, might be contested as top of bank.
7. Some of the bank stabilization requirements and timetables likely won't be possible in Santa Barbara County. In working with a local nonprofit, and a willing landowner, it took almost three years to get a relatively simple stream improvement project approved by the County Planning Department. In the same process, a bank stabilization project permit was not granted. After requiring detailed and costly surveying, grading and engineering plans, the grading and planting (native vegetation) of 200 feet of a vertical and eroding bank was denied because there was no imminent danger to a structure above a certain threshold in value. The continued erosion and loss of Class I farmland was deemed not significant and the permit denied.
8. While requiring individual growers to employ the very latest technologies in their farm operations, your Board is remiss in not adopting the same policy for its operations. Requiring every individual grower to provide such detailed evidence of ground conditions is grossly inefficient. My impression is that a knowledgeable contractor, such as the remote sensing center at Bren School, UCSB, could give the Board an annual analysis of stream bank vegetation, and its changes over time, for significantly less money than the program now entails. Furthermore, it would exist in a form that would readily lend itself to analysis and simplified focus on problem areas. The Order, as it is written now, will generate so much information that the staff requirements to review it all will be much more expensive - and much less effective.
9. The same applies to the pesticide reporting requirements. All growers file monthly pesticide use reports with the County Agricultural Commissioners, and this is public information. The Board's resources would be better allocated to developing a unified information system that compiles pesticide use by parcel, crop, owner and watershed, which could be combined with watershed water quality analysis. Overlays of various data sets would allow staff time to be much more focused on actual problem areas and changes over time, instead of filing and creating needless record storage systems.
10. The water quality testing and analysis program requirements also appear to be an inefficient allocation of time and expense. I agree with Sarah Greene's (CCWQP) characterization of the problem and a more effective cooperative method of analysis.

In summary, I agree that there are water quality problems that need to be addressed, and that some members of the agricultural community have been remiss in employing satisfactory remediation for the problems attributed to agricultural activities. However, the Board's

Updated Agricultural Order can be improved. As it stands, it requires an inefficient allocation of capital for both growers and staff. The Board needs to continue working on the draft, including seeking a more streamlined system and utilizing the latest technology, for compiling and analyzing multiple data sets, to achieve its desired goals.

Respectfully,

(signed)Carl Stucky

Life-long avocado grower
28 years self-employed agricultural consultant and farm manager
BS, Fruit Science, Cal Poly SLO.
BS, Microbiology, UCSD.



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June 8, 2010

Central Coast Water Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401



Dear Central Coast Water Control Board,

Our family grows pistachios in Cuyama (N.E. corner of Santa Barbara County.) We grow 100% organically, pump 100% of our water from our own wells, use 100% drip irrigation on 100% sandy soil.

There is no run off let alone any adverse chemical run off. There is also no water monitoring plan in the Cuyama Valley and no plan for enforcement if there were.

Please let me know how our organic family farm benefits from this program? Otherwise this is simple extortion devised by politicians, agri-business and politically connected service corporations such as Preservatives, Inc., that creates one more economic burden for those least culpable.

We in effect are being required to help pay for the mess created by agri-business who have put short term profit ahead of long term sustainability. This program for us is a reverse Robin Hood scenario that steals from the poor to pay for the greed and stupidity of the rich.

I anxiously await you reply.

Cordially,

Gene Zannon
Santa Barbara Pistachio Co.

c.c.

Santa Barbara 5th District Supervisor Joseph Centeno, 511 East Lakeside Parkway, SM, CA 93454
State Assemblyman Pedro Nava, 101 West Anapamu St. Suite A, SB, CA 93101
State Assemblywoman Jean Fuller, 400 California Avenue, Bakersfield, CA 93309
State Assemblyman Sam Blakeslec, 1104 Palm St., S.L.O., CA 93401
State Senator Roy Ashburn, 5001 California Avenue, Bakersfield, CA 93309
State Senator Tony Strickland, 223 East Thousand Oaks Blvd. Suite 400, Ventura, CA 91360
State Senator Dean Flores, 1800 30th St., Suite 350, Bakersfield, CA 93301
Governor Arnold Schwarzenegger, State Capital Building, Sacramento, CA 95814

enclosures

Central Coast Water Quality Pres, Inc.

Statement

P.O. Box 1049
Watsonville, Ca 95077

Date
4/30/2010

★ I put a stop payment on this check yesterday 6-3-10.
(23)

Santa Barbara Pistachio co.
3380 Highway 33
Maricopa, CA 93252

Phone #	Fax #
831-761-8644	831-761-8695

Terms	Account #	Amount Due	Amount Enc.
	AW3002	\$1,586.70	

Date	Transaction	Amount	Balance		
12/31/2005	Balance forward		0.00		
11/04/2006	INV Due 11/04/2006. Opening balance	793.35	793.35		
11/13/2006	PMT #1357. aw3002	-793.35	0.00		
12/01/2006	INV #1468. Due 12/01/2006.	793.35	793.35		
07/14/2007	PMT #1445.	-793.35	0.00		
12/20/2007	INV #1491. Due 01/16/2008.	793.35	793.35		
11/08/2008	PMT #1671.	-793.35	0.00		
01/03/2009	INV #1401. Due 01/03/2009.	793.35	793.35		
01/20/2010	INV #1337. Due 01/20/2010.	793.35	1,586.70		
<i>★ Paid 6/1/10 ch# 1879</i>					
CURRENT	1-30 DAYS PAST DUE	31-60 DAYS PAST DUE	61-90 DAYS PAST DUE	OVER 90 DAYS PAST DUE	Amount Due
0.00	0.00	0.00	0.00	1,586.70	\$1,586.70

P.S. I know how to resolve the water quality issue!
No water = No need to control water quality...
(43)

Irrigation draining California groundwater at 'unsustainable' pace

The GRACE satellites have tracked water movement from the Central Valley since 2003

By Sid Perkins

Web edition : Tuesday, December 15th, 2009

SAN FRANCISCO — In the past six years, the irrigation of crops in California's Central Valley has pulled groundwater from aquifers there at rates that are unsustainable if current trends continue, scientists say.

The Central Valley, which covers about 52,000 square kilometers, is one of the world's most productive agricultural regions, says Jay Famiglietti, director of the University of California Center for Hydrologic Modeling in Irvine. In 2002, farmers there produced more than 250 different crops worth a total of around \$17 billion — an amount that adds up to around one-twelfth of the nation's agricultural production, he notes.

But the productivity of those fertile fields is increasingly at risk: Satellite data suggest that more than 20 cubic kilometers of groundwater has been pumped from the valley's aquifers since October 2003. Famiglietti reported December 14 at the fall meeting of the American Geophysical Union. That's roughly 4 percent the volume of Lake Erie.

Famiglietti and his colleagues analyzed data gathered by the twin satellites of the GRACE mission, which can discern and measure the movements of water both above and below the ground, on a month-to-month basis (*SN: 1/4/03, p. 6*). Between October 2003 and March 2009, the San Joaquin and Sacramento River basins — the watersheds that include the Central Valley — together lost more than 31 cubic kilometers of water, the data suggest. About one-third of that net loss evaporated from the soil or flowed out to sea after melting from the region's snowpack or being pulled from surface reservoirs in those watersheds.

The rest, about 20.3 cubic kilometers, drained away after being pulled from underground aquifers for irrigation, the researchers speculate.

On average, water tables across the region dropped about 24 centimeters per year during the 66-month period the researchers studied. But most of the water loss occurred in the San Joaquin River basin, so water tables there probably dropped an average of about 50 centimeters each year.

Because central California has been afflicted by drought conditions since 2006, state and local governments have imposed restrictions on how much water can be withdrawn from surface reservoirs. Those restrictions, in turn, have triggered an even greater reliance on groundwater withdrawals, just at a time when the precipitation needed to recharge the region's aquifers is in short supply, says Famiglietti.

The satellites can detect changes in the amount of water in a region but not how much is left. Regardless of how much water remains in the aquifer, the researchers note that a declining water table will degrade water quality and will eventually force Californians to drill deeper wells. In the long term, continued depletions of groundwater in the region could pose a significant threat to U.S. food production and to the California economy, the researchers contend.

"By providing data on large-scale groundwater depletion rates, GRACE can help California water managers make informed decisions about allocating water resources," says Michael Watkins, a project scientist at NASA's Jet Propulsion Laboratory in Pasadena, Calif.



CONSERVATION ASSESSMENT FOR THE CUYAMA VALLEY:
CURRENT CONDITIONS AND PLANNING SCENARIOS

Project Members:
Caitlin Andersen
Bridget Dobrowski
Melissa Harris
Edith Moreno
Patrick Roehrdanz

Project Advisor:
Frank Davis

ON THE WEB AT [HTTP://WWW.BREN.UCSB.EDU/~TNC2](http://www.bren.ucsb.edu/~TNC2)

SPRING 2009

PROJECT OVERVIEW

The Nature Conservancy (TNC) of California has identified the Cuyama Valley (Figure 1) as a potential priority area due to its ecological richness, rare plant communities, and potential to function as a wildlife corridor between the conserved lands of the Carrizo Plain National Monument and Los Padres National Forest. The goal of our project was to assess the impacts of human land use on habitat connectivity, groundwater resources, and riparian vegetation. This analysis was performed for current conditions as well as potential futures. Our project results will provide tools and knowledge that will inform conservation planning in the region.

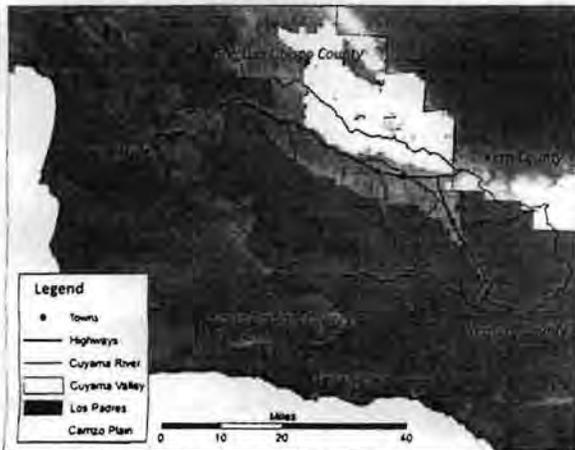


Figure 1: Location of the Cuyama Valley in California.

Results from our analysis allowed us to form a few main conclusions regarding the current status of conservation interests in the valley, as well as the likely impacts of planning scenarios.

- If groundwater extraction continues at its current rate, we estimate that available water will be depleted in 50 years. Future land use will be governed by the availability of this limited resource.
- Habitat connectivity is relatively strong under current conditions and in all modeled

scenarios. Major impediments include agriculture, developed regions, and major highways. Bridge underpasses help mitigate the effect of roads on species movement.

- Loss of historically present riparian vegetation and river complexity has occurred in conjunction with increasing groundwater extraction and agriculture.

APPROACH

Land Use – researched the types of human activity within the valley and how each has changed over time

Water Use – updated the groundwater budget for the region and highlighted trends of decline

Historic River Habitat – analyzed how riparian vegetation has changed due to groundwater pumping and land conversion

Habitat Connectivity – used Circuitscape software to model habitat connectivity within the valley for the San Joaquin kit fox, Blunt-nosed leopard lizard, Two-striped gartersnake, and Pronghorn antelope

Scenario Planning – developed four scenarios to evaluate impacts of changing dominant land use practices. All scenarios depict a plausible future for the region in the year 2050. They represent shifts in agriculture, development, and level of dedicated conservation.

LAND USE

Irrigated agriculture is the dominant land use, with 20,000-25,000 acres primarily devoted to row crops rotated between root vegetables, alfalfa, and grains. Rural residential development is currently limited to the unincorporated towns of Cuyama, New Cuyama, and Ventucopa totaling roughly 1,350 residents. Additionally, there are gravel, sand, and gypsum mines and several oil fields within the valley (Figure 2).

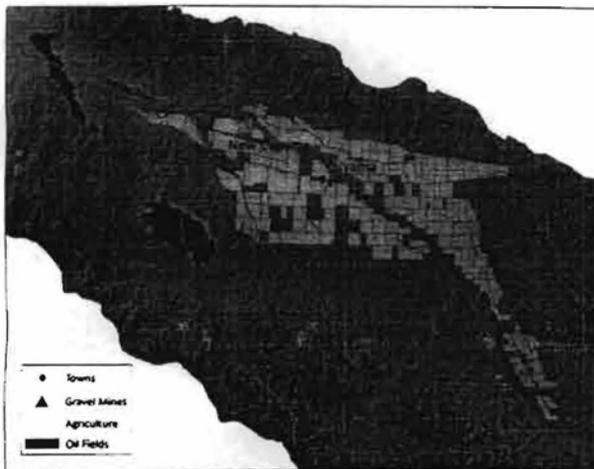


Figure 2: Current land uses in central portion of the Cuyama Valley.

HYDROLOGY AND WATER USE

The Cuyama groundwater basin is the sole source of water for the region and supports all of the land use in the valley. Over 95% of water is applied towards agriculture. The principal source of recharge to the basin is the Cuyama River, which is dry for most of the year except during winter storms. On average, the region receives less than ten inches of rain annually and faces serious hydrologic impacts as a result of low annual rainfall, high evapotranspiration rates, and intensive pumping for agriculture.

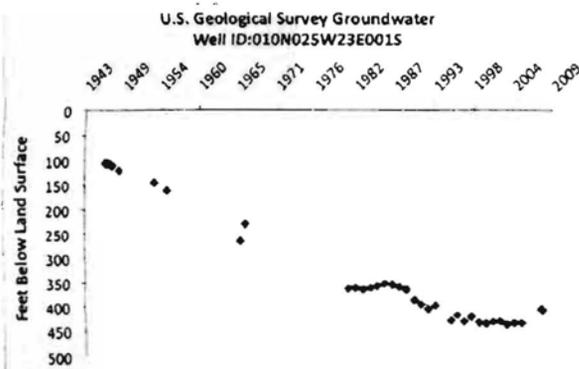


Figure 3: USGS Monitoring Data for a Cuyama Valley well.

Groundwater levels have declined over 300 feet in the last 60 years in some parts of the basin (Figure 3). We calculated that total withdrawals in the basin exceed recharge by just over 30,500 acre-feet/year. If the current rate of groundwater extraction continues, we

estimate that the total storage will deplete within 50 years.

HISTORIC RIVER HABITAT

We analyzed historic aerial photographs of the river to understand how groundwater pumping and land conversion has affected riparian vegetation within the valley. Eighteen transects were placed along a section of the river that runs through agriculture, as this area has experienced the most drastic land use changes. The width of the river channel and woody riparian vegetation was measured across each transect and compared over time.

The analysis showed that the largest change occurred between 1938 and 1978, most likely due to the introduction of agriculture (Figure 4). Prominent changes include the narrowing of the river channel and an overall loss of woody vegetation.

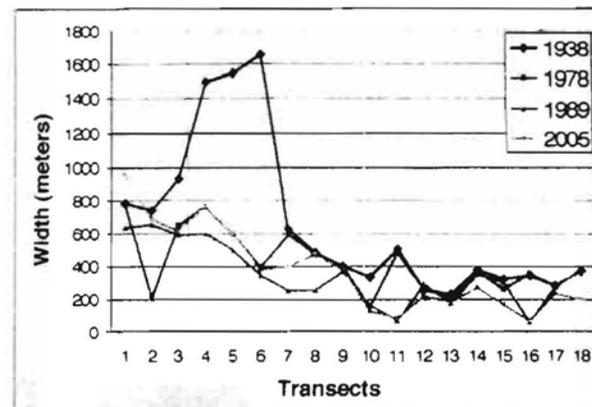


Figure 4: Combined channel and riparian vegetation width through time, from 1938 to 2005.

HABITAT CONNECTIVITY

The purpose of a connectivity analysis is to describe how easily a species can move through a landscape. We used a program called Circuitscape to model habitat connectivity across the valley, as well as along the river. Habitat suitability maps were created for four species – San Joaquin kit fox (*Vulpes macrotis mutica*), Blunt-nosed leopard lizard (*Gambelia sila*), Two-striped gartersnake (*Thamnophis hammondi*), and Pronghorn antelope (*Antilocapra americana*). Habitat types were assigned suitability values between 0 and 100 based on species preference, with a 0 being the least suitable. These habitat preference maps serve as



the input to Circuitscape. The output from Circuitscape (Figure 5) displays species movement in terms of electrical current. High current (bright yellow) indicates “pinch points” where species are funneled through a narrow area. These areas could be interpreted as critical pathways. Where current is less concentrated (green to blue), many options exist for species movement.

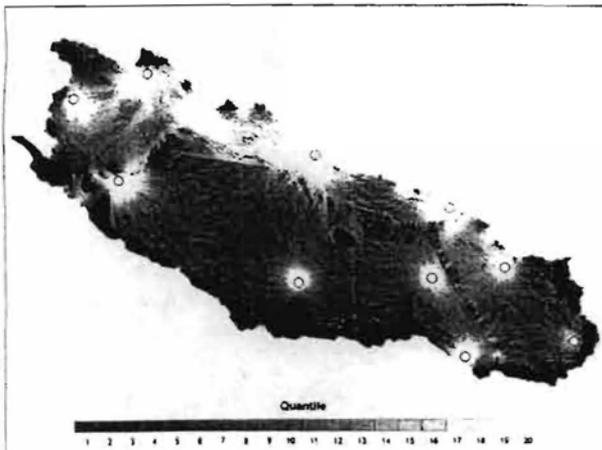


Figure 5: Circuitscape map for San Joaquin kit fox. Yellow and blue indicate high and low levels of current, respectively.

Our analysis showed there is low resistance across the landscape, indicating that connectivity is strong for all four species. Highways 166 and 33 impose the greatest barriers to movement. However, because resistance values overall are very low, this suggests that bridge underpasses provide adequate connections across the valley.

PLANNING SCENARIOS

The future of the Cuyama Valley is uncertain; however, it is important to consider possible future land use changes and their effect on conservation interests. These scenarios depict our vision of how the valley may look by the year 2050.

Ghost Town – groundwater pumping and treatment costs are so high that agriculture ceases and with no replacement industry, the valley is effectively deserted

Wine Country – the valley becomes a vibrant weekend destination providing boutique lodging, fine dining, and locally crafted wines

Satellite City – an increased demand for housing from Santa Maria spurs the growth of Cuyama and New Cuyama and groundwater is entirely diverted from agriculture to support this growth

Nature Preserve – conservation entities invest in the valley creating a fully protected link between the Carrizo Plain National Monument and Los Padres National Forest

Figure 6 illustrates the fundamental differences of each scenario along three axes of comparison: extent of agriculture, magnitude of human development, and level of dedicated conservation activity.

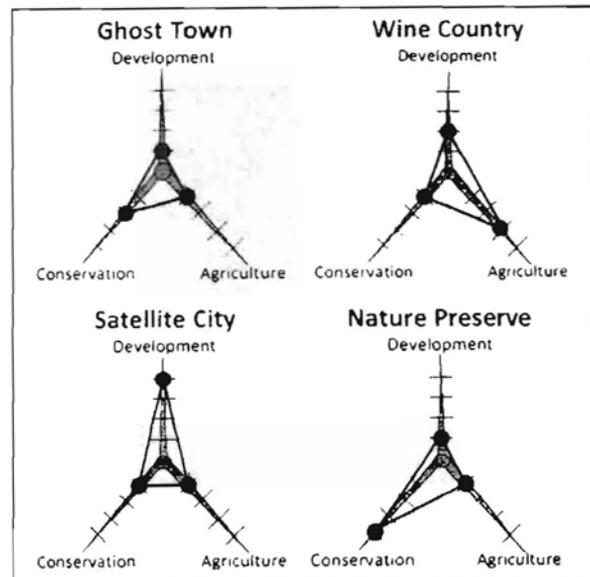


Figure 6: Scenario Comparison Figure.

SCENARIO METHODOLOGY

We made a few assumptions that dictate the outcome of all scenarios. First, it was assumed that no new water supply is brought to the region so development was limited by the natural supply of groundwater in the Wine Country and Satellite City scenarios. Secondly, climate change is expected to have minimal effects on the region by 2050, and was not incorporated into any scenario.

To understand the scenario impacts on the valley's connectivity and groundwater resources, the total acreages of (1) rural development, (2) industry, (3) row crop agriculture, (4) orchards and vineyards, and (5)



natural vegetation were altered and new water budget calculations and connectivity analyses were performed.

	Development	Industrial	Row Crop Agriculture	Orchard & Vineyard	Natural Vegetation
Current Conditions	274	2,643	26,228	2,299	51,220
Ghost Town	274	2,643	26,228	2,299	51,220
Wine Country	846	0	579	3,661	77,577
Satellite City	9,651	3,391	501	0	69,121
Nature Preserve	99	0	137	0	82,428

Table 1: Current and future land use acreage.

Table 1 summarizes how these land use acreages change for each scenario as compared to current conditions. An important feature to note is that land use acreages remain the same between current conditions and the Ghost Town scenario because it was assumed that the landscape would not drastically change. However, a deserted landscape will clearly function differently for species movement. Our Ghost Town connectivity analysis incorporated these considerations by assigning slightly higher suitability values for all species.

IMPACTS ON CONNECTIVITY

We evaluated how each planning scenario impacted habitat connectivity as compared to current conditions. Our analysis shows that resistance to species movement is reduced in all planning scenarios (Figure 7). However, since baseline values are already so small (less than 0.08), the overall gains in habitat connectivity are minimal. To make substantial improvements on habitat connectivity, Highways 166 and 33 would need to be altered to better facilitate species movement.

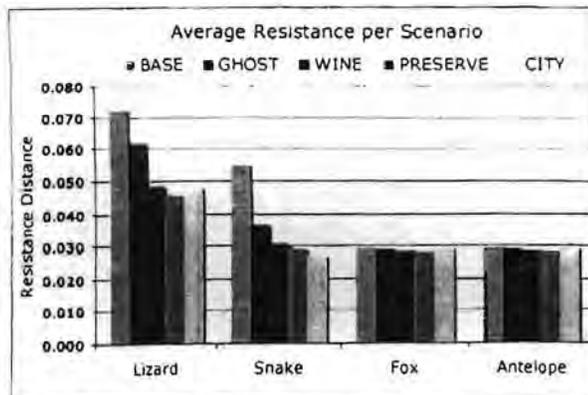


Figure 7: Average resistance per species per scenario.

IMPACTS ON GROUNDWATER

The current groundwater budget was adjusted to reflect changes in water use for each scenario (Table 2). It is important to reiterate that development in the Wine Country and Satellite City scenarios was limited by a groundwater extraction rate equal to recharge, and that no new water supplies are brought to the region.

In all scenarios, the groundwater budget is no longer in a state of deficit. There is now a small surplus in the Wine Country scenario even though agriculture is still expected to be the dominant user. There is a relatively large surplus in the Satellite City scenario, which is attributed to the 40% urban return flow assumed for this scenario. Both the Ghost Town and Nature Preserve scenarios experience significant surplus conditions due to the lack of groundwater extraction for human use. Although the groundwater basin experiences surplus conditions in all scenarios, it would take an appreciable amount of time to recharge the basin to pre-agricultural conditions.

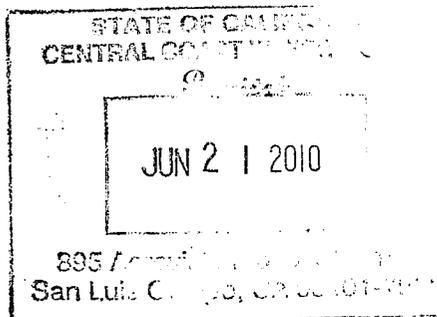
	Recharge AF/Yr	Net Irrigation AF/Yr	Net Muni. & Indust. AF/Yr	Natural Vegetation AF/Yr	Deficit or Surplus AF/Yr
Current Conditions	11,500	40,392	200	1,440	-30,532
Ghost Town	=	↓	↓	↓	10,660
Wine Country	=	↓	↑	=	542
Satellite City	=	↓	↑	=	5,260
Nature Preserve	=	↓	↓	↑	9,352

Table 2: Water balance calculations for current conditions and planning scenarios.

ACKNOWLEDGEMENTS

- Frank Davis, Project Advisor
- Tom Maloney, Tejon Ranch Conservancy
- Scott Butterfield, The Nature Conservancy
- Rusty Brown, Map & Imagery Laboratory, UCSB
- Tom Dunne, Bren School, UCSB
- Lee Hannah, Bren School, UCSB
- Heather Imgrund, Santa Barbara County Planning & Development
- Dennis Gibbs, County of Santa Barbara Water Resources Division

June 4, 2010



Jeffery S. Young, Chairman
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401

RE: PRELIMINARY DRAFT AGRICULTURAL ORDER, dated February 1, 2010

Mr. Young:

I am a cherry grower who lives and works in Hollister. The CCRWQCB staff's Proposed Conditional Ag Waiver affects me personally. I submit to you for your consideration the following comments about it.

It is proposed to delete the current requirement that **"All Dischargers are required to complete 15 hours of education"**, and, to substitute in its place **"Water quality education encouraged rather than required"**. From my perspective, this is an apparent, positive change in the program, so I am mentioning it in hopes that it remains as drafted. My reason for supporting it is that certain, small farmers like me are not able to devote 15 hours to such "training", as I hold a full-time, off-the-farm job to support my farm. It is in the evenings, weekends, holidays and vacation days when I try to keep up with all of the work that my farm requires. In my case, I do not need the training, as I have learned over the years how to manage my water use efficiently, and, no storm or irrigation waters leave my property. I maintain certain practices which minimize, if not eliminate, the chance of nitrogen leaching, and, use a minimum amount of minimum amount of nitrogen fertilizers. If such training must be required, then, it should be possible to perform it at the trainee's convenience, and, on his/her own time, via correspondence, rather than having to comply with attendance at scheduled classes that are at some distance away and at times that are inconvenient to the trainee.

In addition, I have the following comments, to the listed sections that are shown in **bold type**:

"5. Within 6 years from adoption of this Order, all Dischargers must implement management practices sufficient to eliminate or minimize nitrate and salt in groundwater discharges to meet water quality standards **." What is the definition of 'salt'? I must apply a lot of gypsum and sulfur to my soil, in order to get the sodium, alkali and salts in my irrigation water to breakdown, become soluble and leach out of the root zone, for the reasons that will be given below. How will this draft Ag Waiver affect my doing that, because I think that gypsum (a salt?) and sulfur cause chemical reactions with the sodium, alkali and salts in the soil to produce other 'salts' (e.g., sodium sulfate) that leach to groundwater?

“1. Within 2 years from the adoption of this Order, all Dischargers adjacent, in close proximity (within 1,000 feet) or otherwise discharging to an impaired surface water body identified on the Impaired Waters List, or discharging to tributaries to such water bodies, must implement management practices sufficient to eliminate irrigation runoff from their farming operation.”** In my case, my land may be just less than 1,000’ from the bank of the San Benito River, but, my land is lower than the riverbank, drains away from the river with no possibility of either leaving my land or draining to the river (no tributaries nearby). So, why should I have to prepare and maintain “management practices”?

“Irrigation Management-1. Dischargers must install and maintain irrigation systems to minimize or eliminate irrigation runoff and percolation to groundwater beyond the root zone that may transport pollutants from irrigated lands to waters of the State. At a minimum, the irrigation system distribution uniformity must be designed and operated to achieve the following efficiencies: 0.70 for furrow, 0.75 for hand-move sprinkler, 0.80 for solid sprinkle systems, 0.85 for drip and micro-sprinkler systems.” Same comment, regarding the application of gypsum and sulfur that are made above. We farmers who have water that is high in salts, alkali and sodium must apply gypsum and sulfur to our soil and/or irrigation water to get the sodium and salts to leach past the root zone and the alkali to breakdown. If we cannot do this, then, we cannot grow our crops. I believe that it is not possible to achieve the required “efficiencies”, if we must apply enough water to cause the needed leaching.

“2. Dischargers must implement appropriate irrigation scheduling duration and frequency, in consideration of weather factors such as wind and precipitation, to reduce or eliminate the discharge of irrigation runoff and to minimize percolation of water and waste below the root zone.” This idea of not allowing irrigation water to percolate below the root zone demonstrates complete ignorance by whoever drafted these requirements, for the reasons stated above, plus, when rainwater falls on the soil, it will leach whatever salts and other minerals have been applied uncontrollably by the irrigation water, or, by the use of gypsum and sulfur. Everyone who knows anything about farming knows that leaching of salts, sodium, chloride, etc, is an absolute necessity. And, all irrigation water contains salts to a greater or lesser degree, depending upon the quality of the water. To prevent leaching is to condemn the soil to eventual contamination and prevent it from being used for the growing of economic crops. My guess is that that is not one of the Board’s intended outcomes.

3. Dischargers must maintain the irrigation delivery system to eliminate operational spills such as overflows from standing pipes or water remaining from previously operated gravity flow delivery systems. This is nonsense. All irrigation systems produce some leakage that would be the source of fines under this requirement, especially by aggressive, unreasonable enforcement.

Nutrient and Salt Management –

4. Dischargers that use leaching to control salt in the soil profile must not cause or contribute to the exceedance of water quality standards. Leaching must not be performed to wash nitrate based salts from the soil profile. This appears to be a contradiction to me, when considered in light of the above requirements. By the way, what do you consider to be a

nitrate-based salt, how would a farmer know whether this is going to occur, and, how can it be prevented from leaching, when other compounds must be leached?

5. Dischargers must cease all foliar fertilizer applications a minimum of 72 hours before any forecasted rain event and up to 72 hours after a rain event has occurred. We cherry growers in Hollister usually need to spray Calcium Ammonium Nitrate (CAN) on our dormant trees between late January and early February, to promote uniform bloom and the setting of a crop, and, cause the trees to ripen their fruit early enough to fill a small market window, between the Central Valley growers and those in the Northwest. This procedure must be performed in a small window when the weather has caused enough, but, not too many, hours of 'chill'. This period of time varies from year-to-year. If we don't do this, we might not 'set a crop', the fruit will not ripen uniformly and we may have nothing to sell. If our fruit is not ripe when that market window is open, we have no market for our fruit. Late January and early February is in the middle of our 'rainy season'. To ask us to not spray the CAN on our trees within three days before a forecasted rain event or within three days after a rain event will mean that during many years, we will not be able to apply the CAN to our trees. The possible and very likely consequences are unacceptable.

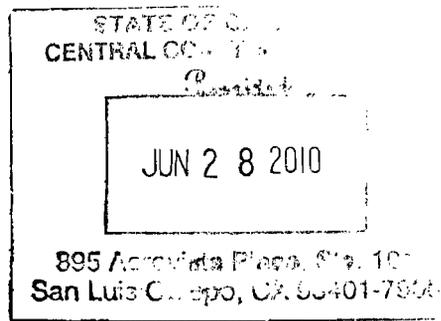
6. Dischargers must report nitrate concentration of irrigation water. Is this for the nitrate that comes with the water from the water source (e.g., well) or for the nitrate that might be applied to the water by the farmer, how frequently must this be reported, and, who is going to pay for this? My farm does not produce a large income. On average, I just break even. Any increases in costs drive me closer to abandoning the growing of cherries, or, even farming the land at all. If you need information that has a cost connected to its generation, then, I ask that you find the money to pay for. This is not a cost that I can afford to absorb. While I am not willing to submit my income tax reports for public distribution, if you need proof of what I am saying, then, I would be willing to allow your inspectors to visit my home where I will show to them my income tax reports to the IRS.

On page 11, the following existing requirements are stated:

Wastewaters percolated to groundwater were required to be of such quality at the point where they enter the ground so as to assure the protection of all actual or designated beneficial uses of all ground waters of the basin. Is this possible, when considering my above comments regarding gypsum and sulfur amendments to the soil, with subsequent leaching below the root zone?

Wastes discharged to groundwater were required to be free of toxic substances in excess of maximum contaminant levels (MCLs) for primary and secondary drinking water standards established by USEPA and CDPH, whichever is more stringent; taste, odor, or color producing substances; and nitrogenous compounds in quantities which could result in a groundwater nitrate concentration (as nitrate) above 45 mg/L. How is this possible to determine and who is going to do it and pay for it, when considering my above comments regarding gypsum and sulfur amendments to the soil, with subsequent leaching below the root zone?

June 21, 2010



Jeffery S. Young, Chairman
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401

RE: PRELIMINARY DRAFT AGRICULTURAL ORDER, dated February 1, 2010

Mr. Young:

In my June 2, 2010 letter to you, I expressed my concerns with the preliminary draft agricultural order, hereinafter referred to as “draft order”. In that letter, I explained why I and other farmers need to leach our soils to move salts, sodium and other compounds and elements out of the root zone, in order to grow our crops. I did so, because your draft order includes the following requirements:

“2. Dischargers must implement appropriate irrigation scheduling duration and frequency, in consideration of weather factors such as wind and precipitation, to reduce or eliminate the discharge of irrigation runoff and to minimize percolation of water and waste below the root zone.”

“6. Dischargers that use leaching to control salt in the soil profile must not cause or contribute to exceedance of water quality standards. Leaching must not be performed to wash nitrate based salts from the soil profile.”

“Wastes discharged to groundwater were required to be free of toxic substances in excess of maximum contaminant levels (MCLs) for primary and secondary drinking water standards established by USEPA and CDPH, whichever is more stringent; taste, odor, or color producing substances; and nitrogenous compounds in quantities which could result in a groundwater nitrate concentration (as nitrate) above 45 mg/L.”

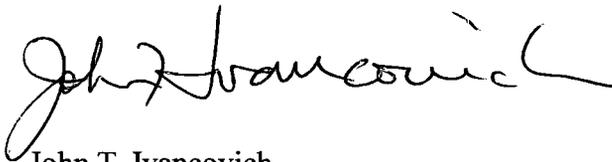
Since my June 2, 2010 letter to you, I came across the attached articles from the Colorado State University Cooperative Extension, titled Managing Saline Soils, by G. E. Gordon, et. al., and, from the University of California, Department of Agriculture and Natural Resources, titled Abiotic Disorders of Landscape Plants, by Laurence R. Costello, et. al. These documents contain much valuable information that is directly applicable to California agricultural conditions, needs and practices, and, confirms what I stated in my letter, as to why leaching of agricultural soils is necessary. Please enter these articles into the record, for consideration in the drafting of the Agricultural Order.

Also, your draft order states: **“Wastewaters percolated to groundwater were required to be of such quality at the point where they enter the ground so as to assure the protection of all**

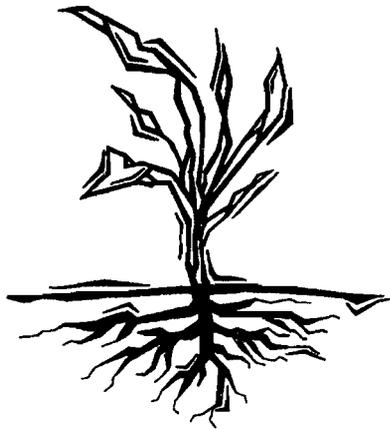
actual or designated beneficial uses of all groundwaters of the basin.” I would like to point out that the water that I draw from my well for irrigation purposes does not meet drinking water quality standards, and, through the irrigation process and subsequent required leaching, most of the compounds and elements that are in my well water must, or, automatically will, be leached out of the root zone, either by irrigation or rainfall. Over the decades, these may return to the ground water from which they came. Therefore, if I understand your draft order correctly, I would be prevented from irrigating my land with my well water. If this is a correct interpretation of your draft order, then, I would have to stop farming my land, because my well water is of such poor quality, and, there is no other water source for my farm.

Thank you for considering my comments.

Sincerely,

A handwritten signature in black ink that reads "John T. Ivancovich". The signature is written in a cursive style with a large, sweeping initial "J".

John T. Ivancovich
2420 Buena Vista Road
Hollister, CA 95023



SOIL

Managing Saline Soils

no. 0.503

by G.E. Cardon, J.G. Davis, T.A. Bauder, and R.M. Waskom^{1 (5/07)}

Quick Facts...

An estimated 980,000 acres of irrigated land in Colorado are affected by salts.

Crop losses may occur with irrigation water containing as little as 700 to 850 mg/L TDS (total dissolved solids) or EC > 1.2 dS/m.

Salt-affected soils may inhibit seed germination, retard plant growth, and cause irrigation difficulties.

Saline soils cannot be reclaimed by chemical amendments, conditioners or fertilizers.

Saline soils are often reclaimed by leaching salts from the plant root zone.

Colorado State University

Extension

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Reviewed 5/07.
www.ext.colostate.edu

Salinity problems are caused from the accumulation of soluble salts in the root zone. These excess salts reduce plant growth and vigor by altering water uptake and causing ion-specific toxicities or imbalances. Establishing good drainage is generally the cure for these problems, but salinity problems are often more complex. Proper management procedures, combined with periodic soil tests, are needed to prolong the productivity of salt-affected soils.

This fact sheet describes techniques for managing saline soils. Management for sodic soils may differ and is described in fact sheet 0.504, *Managing Sodic Soils*. You also may want to review fact sheet 0.521, *Diagnosing Saline and Sodic Soil Problems* to determine if you have a saline soil, sodic soil or perhaps another problem in your field.

Salt Sources

Saline soils are found throughout Colorado. These salts originate from the natural weathering of minerals or from fossil salt deposits left from ancient sea beds. Salts accumulate in the soil of arid climates as irrigation water or groundwater seepage evaporates, leaving minerals behind. Irrigation water often contains salts picked up as water moves across the landscape, or the salts may come from human-induced sources such as municipal runoff or water treatment. As water is diverted in a basin, salt levels increase as the water is consumed by transpiration or evaporation.

Table 1. Common salt compounds.

Salts are ionic crystalline compounds consisting of a cation and an anion.

Salt compound	Cation (+)	Anion (-)	Common name
NaCl	sodium	chloride	halite (table salt)
Na ₂ SO ₄	sodium	sulfate	Glauber's salt
MgSO ₄	magnesium	sulfate	epsom salts
NaHCO ₃	sodium	bicarbonate	baking soda
Na ₂ CO ₃	sodium	carbonate	sal soda
CaSO ₄	calcium	sulfate	gypsum
CaCO ₃	calcium	carbonate	calcite (lime)

Measuring Soil Salinity

Saline soils contain large amounts of water soluble salts that inhibit seed germination and plant growth. The salts are white, chemically neutral, and include chlorides, sulfates, carbonates and sometimes nitrates of calcium, magnesium, sodium and potassium (Table 1).

Salinity is measured by passing an electrical current through a soil solution extracted from a saturated soil sample. The ability of the solution

Table 2. Terms, units and conversions.

Symbol	Meaning	Units
<i>Total Salinity</i>		
TDS	Total dissolved solids	mg/L ^a ppm ^b
EC	Electrical conductivity	dS/m ^c mmho/cm ^d µmho/cm ^e

Conversions
1 dS/m = 1 mmho/cm = 1000 µmho/cm
1 mg/L = 1 ppm

^amg/L = milligrams per liter

^bppm = parts per million

^cdS/m = deciSiemens per meter at 25° C

^dmmho/cm = millimhos per centimeter at 25° C

^eµmho/cm = micromhos per centimeter at 25° C

to carry a current is called electrical conductivity (EC). EC is measured in deciSiemens per meter (dS/m), which is the numerical equivalent to the old measure of millimhos per centimeter (Table 2). The lower the salt content of the soil, the lower the dS/m rating and the less the effect on plant growth.

Yields of most crops are not significantly affected where salt levels are 0 to 2 dS/m. Generally, a level of 2 to 4 dS/m affects some crops. Levels of 4 to 5 dS/m affect many crops and above 8 dS/m affect all but the very tolerant crops (Table 4).

Treatment of Saline Soil

Saline soils cannot be reclaimed by chemical amendments, conditioners or fertilizers. A field can only be reclaimed by removing salts from the plant root zone. In some cases, selecting salt-tolerant crops may be needed in addition to managing soils.

There are three ways to manage saline soils. First, salts can be moved below the root zone by applying more water than the plant needs. This method is called the **leaching requirement** method. The second method, where soil moisture conditions dictate, combines the leaching requirement method with **artificial drainage**. Third, salts can be moved away from the root zone to locations in the soil, other than below the root zone, where they are not harmful. This third method is called **managed accumulation**.

Leaching Requirement

For most surface irrigation systems in Colorado (furrow and flood), irrigation inefficiency (or over-irrigation) generally is adequate to satisfy the leaching requirement. However, poor irrigation uniformity often results in salt accumulation in parts of a field or bed. Surface irrigators should compare leaching requirement values to measurements of irrigation efficiency to determine if additional irrigation is needed. Adding more water to satisfy a leaching requirement reduces irrigation efficiency and may result in the loss of nutrients or pesticides and further dissolution of salts from the soil profile.

Leaching is accomplished on a limited basis at key times during the growing season, particularly when a grower may have high quality water available. Surface water in most areas of the state tend to have lower salinity than shallow, alluvial groundwater. Deep groundwater may have an even lower salinity than either shallow groundwater or surface water. In situations where a grower has multiple water sources of varying quality, consider planned leaching events at key salinity stress periods for a given crop.

Most crops are highly sensitive to salinity stress in the germination and seedling stages. Once the crop grows past these stages, it can often tolerate and grow well in higher salinity conditions. Planned periodic leaching events might include a post-harvest irrigation to push salts below the root zone to prepare the soil (especially the seedbed/surface zone) for the following spring. Fall is the best time for a large, planned leaching event because nutrients have been drawn down. However, since each case is site-specific, examine the condition of the soil, groundwater, drainage, and irrigation system for a given field before developing a sound leaching plan.

Leaching Plus Artificial Drainage

Where shallow water tables limit the use of leaching, artificial drainage may be needed. Cut drainage ditches in fields below the water table level to channel away drainage water and allow the salts to leach out. Drainage tile or plastic drainpipe can also be buried in fields for this purpose. Proper design and construction of a drainage system is critical and should be performed by a trained professional, such as your local USDA-Natural Resources Conservation Service (NRCS).

Table 3. Estimated water application needed to leach salts.

Percent Salt Reduction	Amount of Water Required
50%	6 inches
80%	12 inches
90%	24 inches

Example: If a soil's electrical conductivity is 8 mmhos/cm, and you want to reduce it to 4 mmhos/cm. This represents a 50 percent reduction in salts. Therefore, 6 inches of water would be required.

With all artificial drainage systems you must also consider disposal of the drainage water. Restrictions on the discharge of drain water to streams may apply in certain situations and should be investigated through the Colorado Department of Public Health and Environment. In the case of regulated discharge, treatment or collection and evaporation of the water on site may be required and may add significant costs.

The advantage of artificial drainage is that it provides the ability to use high quality, low salinity irrigation water (if available to a grower) to completely remove salts from the soil. However, artificial drainage systems will not work where there is no saturated condition in the soil. Water will not collect in a drain if the soil around it is not saturated.

After drainage appears adequate, the leaching process can begin. Table 3 shows how much water is required to leach salts. Actual salt reduction depends upon water quality, soil texture and drainage.

Managed Accumulation

In addition to leaching salt below the root zone, salts can also be moved to areas away from the primary root zone with certain crop bedding and surface irrigation systems. Figures 1 and 2 illustrate several ways to manage salt accumulation in this manner. The goal is to ensure the zones of salt accumulation stay away from germinating seeds and plant roots. Irrigation uniformity

is essential with this method. Without uniform distribution of water, salts will build up in areas where the germinating seeds and seedling plants will experience growth reduction and possibly death.

Double-row bed systems require uniform wetting toward the middle of the bed. This leaves the sides and shoulders of the bed relatively free from injurious levels of salinity. Without uniform applications of water (one furrow receiving more or less than another), salts accumulate closer to one side of the bed. Periodic leaching of salts down from the soil surface and below the root zone may still be required to ensure the beds are not eventually salted out.

Alternate furrow irrigation may be desired for single-row bed systems. This is accomplished by irrigating every other furrow and leaving alternating furrows dry. Salts are pushed across the bed from the irrigated side of the furrow to the dry side. Care is needed to ensure enough water is applied to wet all the way across the bed to prevent build up in the planted area. This method of salinity management can still result in plant injury if large amounts of natural rainfall fill the normally dry furrows and push salts back across the bed toward the plants. This phenomenon also occurs if the normally dry furrows are accidentally irrigated.

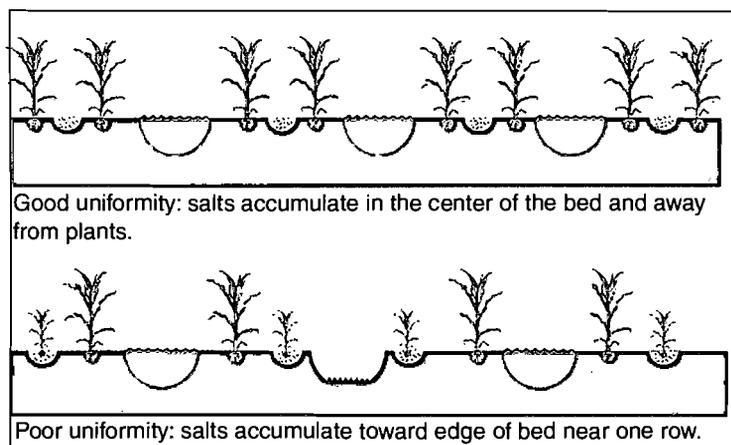


Figure 1. Salt management in double-row bed system.

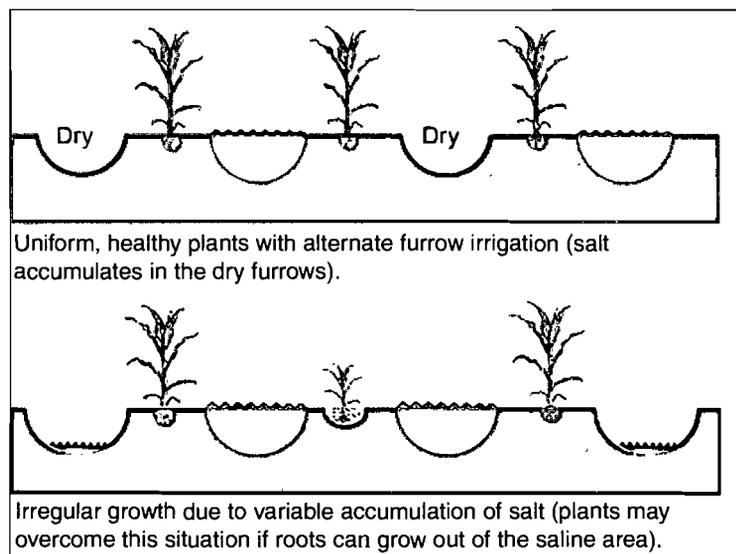


Figure 2. Salt management in single-row bed systems.

Sprinkler Irrigation

Sprinkler-irrigated fields with poor water quality present a challenge because it is difficult to apply enough water to leach the salts and you cannot effectively utilize row or bed configurations to manage accumulation. Growers should monitor the soil EC

and irrigation water salinity. Where adequate irrigation water exists above crop requirements, a leaching fraction (or percent of additional water needed above crop requirements) can be calculated for sprinkler irrigated fields using this equation:

In this equation, EC max is the maximum soil EC wanted in the root zone. (See Table 4.)

$$\%Leaching\ requirement = \frac{EC_{water}}{2 \times EC_{max}} \times 100$$

Apply this leaching fraction to coincide with periods of low soil N and residual pesticide. Again, fall is an optimal time to move salts below the root zone.

Crop Tolerance to Soil Salinity

Excessive soil salinity reduces the yield of many crops. This ranges from a slight crop loss to complete crop failure, depending on the type of crop and the severity of the salinity problem.

Although several treatments and management practices can reduce salt levels in the soil, there are some situations where it is either impossible or too

costly to attain desirably low soil salinity levels. In some cases, the only viable management option is to plant salt-tolerant crops. Sensitive crops, such as pinto beans, cannot be managed profitably in saline soils. Table 4 shows the relative salt tolerance of field, forage, and vegetable crops. The table shows the approximate soil salt content (expressed as the electrical conductivity of a saturated paste extract (EC_e) in dS/m at 25 degrees C) where 0, 10, 25, and 50 percent yield decreases may be expected. Actual yield reductions will vary depending upon the crop variety and the climatic conditions during the growing season.

Fruit crops may show greater yield variation because a large number of rootstocks and varieties are available. Also, stage of plant growth has a bearing on salt tolerance. Plants are usually most sensitive to salt during the emergence and early seedling stages. Tolerance usually increases as the crop develops.

The salt tolerance values apply only from the late seedling stage through maturity, during the period of most rapid plant growth. Crops in each class are generally ranked in order of decreasing salt tolerance.

Other Management Options

Residue Management

Crop residue at the soil surface reduces evaporative water losses, thereby limiting the upward movement of salt (from shallow, saline groundwater) into the root

Table 4. Potential yield reduction from saline soils for selected crops.

	Relative yield decrease %			
	0	10	25	50
	(EC _e)			
Field crops				
Barley	8.0	10.0	13.0	18.0
Sugarbeets*	7.0	8.7	11.0	15.0
Wheat	6.0	7.4	9.5	13.0
Sorghum	4.0	5.1	7.2	11.0
Soybean	5.0	5.5	6.2	7.5
Corn	1.7	2.5	3.8	5.9
Bean	1.0	1.5	2.3	3.6
Forages				
Tall wheatgrass	7.5	9.9	13.3	19.4
Wheatgrass	7.5	9.0	11.0	15.0
Crested wheatgrass	3.5	6.0	9.8	16.0
Tall fescue	3.9	5.8	8.6	13.3
Orchardgrass	1.5	3.1	5.5	9.6
Alfalfa	2.0	3.4	5.4	8.8
Meadow foxtail	1.5	2.5	4.1	6.7
Cloverslike, red, ladino, strawberry	1.5	2.3	3.6	5.7
Bluegrass and other turf **				
Vegetables				
Broccoli	2.8	3.9	5.5	8.2
Cucumber	2.5	3.3	4.4	6.3
Cantaloupe	2.2	3.6	5.7	9.1
Spinach	2.0	3.3	5.3	8.6
Cabbage	1.8	2.8	4.4	7.0
Potato	1.7	2.5	3.8	5.9
Sweet corn	1.7	2.5	3.8	5.9
Lettuce	1.3	2.1	3.2	5.2
Onion	1.2	1.8	2.8	4.3
Carrot	1.0	1.7	2.8	4.6

*Sensitive during germination and emergence, EC_e should not exceed 3dS/m at this time. Excerpted from R. S. Ayers and D.W. Westcot, 1976, Water Quality for Agriculture, Irrigation and Drainage Paper 29, FAO, Rome. Crop salt tolerance data in the table were developed, almost entirely, by the U.S. Salinity Laboratory, Riverside, CA.

**For specifics on turfgrass species, see Colorado State University Cooperative Extension fact sheet 7.227, *Growing Turf on Salt-Affected Sites*.

zone. Evaporation and thus, salt accumulation, tends to be greater in bare soils. Fields need to have 30 percent to 50 percent residue cover to significantly reduce evaporation. Under crop residue, soils remain wetter, allowing fall or winter precipitation to be more effective in leaching salts, particularly from the surface soil layers where damage to crop seedlings is most likely to occur.

Plastic mulches used with drip irrigation effectively reduce salt concentration from evaporation. Sub-surface drip irrigation pushes salts to the edge of the soil wetting front, reducing harmful effects on seedlings and plant roots.

Pre-plant Irrigation

As mentioned before, most crop plants are more susceptible to salt injury during germination or in the early seedling stages. An early-season application of good quality water, designed to fill the root zone and leach salts from the upper 6 to 12 inches of soil, may provide good enough conditions for the crop to grow through its most injury-prone stages.

Irrigation Frequency Management

Salts are most efficiently leached from the soil profile under higher frequency irrigation (shorter irrigation intervals). Keeping soil moisture levels higher between irrigation events effectively dilutes salt concentrations in the root zone, thereby reducing the salinity hazard.

Most surface irrigation systems (flood or furrow systems) cannot be controlled to apply less than 3 or 4 inches of water per application and are not generally suited to this method of salinity control. Sprinkler systems, particularly center-pivot and linear-move systems configured with low energy precision application (LEPA) nozzle packages or properly spaced drop nozzles, and drip irrigation systems provide the best control to allow this type of salinity management.

Summary

Under irrigated conditions in arid and semi-arid climates, the build-up of salinity in soils is inevitable. The severity and rapidity of build-up depends on a number of interacting factors such as the amount of dissolved salt in the irrigation water and the local climate. However, with proper management of soil moisture, irrigation system uniformity and efficiency, local drainage, and the right choice of crops, soil salinity can be managed to prolong field productivity.

¹G.E. Cardon, former associate professor, soil and crop sciences; J. Davis, Colorado State University Extension soils specialist and professor, soil and crop sciences; T.A. Bauder, Extension water quality specialist; and R.M. Waskom, Extension water resource specialist.

Abiotic Disorders of Landscape Plants

A DIAGNOSTIC GUIDE

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Publication 3420

TABLE 5.10. Methodology and criteria used in evaluating salinity and boron tolerance in selected references cited in table 5.7, cont.

Reference	Relative Tolerance			Methodology/criteria
	Low	Moderate	High	
Francols and Clark 1978	<3.0	3.0–6.0	6.0–9.0	Rating criteria: <50% growth reduction; no leaf plants aesthetically appealing. Experiment run in sandy loam soil. Plants irrigated with NaCl and added to yield EC _w of 0.7 (control), 4.4, and 7.8 mmhos/cm. Average EC _e was 1.0, 4.3, and 7.0 mmhos/cm. Soil salinity was uniform with depth throughout the root zone during summer.
Glattstein 1989	—	—	—	No methods stated; authors assumed plants included were in "moderate" category.
Harivandi 1988	<4.0 dS/m	4.0–8.0	8.0–16.0	—
Morris and Devitt 1990	—	—	—	Plants grown for 8 years in silty clay loam soil with saline groundwater. EC _w 26.0–40.0 at 3-foot depth. In root zone 8.0–13.0 mmhos/cm. Authors ranked by appearance.
Boron: EC_w				
Eaton 1944	<1.0	5	10.0–25.0	Plants grown from seed, outdoors, in large sand. Irrigated with 0.03, 1, 5, 10, 15 and 25 ppm boron. Adapted from Eaton 1935.
Farnham, Ayers, and Hasek 1985	0.5–1.0 mg/l	1.0–2.0	2.0–10.0	
Francois and Clark 1978	0.5	2.5	7.5	Plants grown outdoors in sand culture. Classification based on growth reduction and overall plant appearance.
Questa 1987	—	—	—	Inventoried plants growing in Concord, CA, parks were irrigated with high-boron water. Species were evaluated for injury and ranked according to severity based on boron concentration in soil and water, and severity of toxicity symptoms.
San Diego 1963	—	0.75–3.0	—	Observations at landscapes in San Bernadino County, CA, irrigated with boron water; ratings based on growth and leaf injury.

Source: After Matheny and Clark 1998.

Soil salinity affects irrigation management. As the soil dries, the concentration of salts is increased, which increases the potential for toxicity. Keeping soil moist reduces the potential for toxicity. In addition, osmotic tension decreases the availability of water to plants in saline soils. It may be necessary to increase irrigation frequency and/or duration when irrigating with saline water or managing a saline soil.

Care should be taken to avoid heavy applications of fertilizer, as they contribute to soil salinity. Where salinity is of concern, select high-analysis formulations with low salt hazard. Animal manures, mushroom

compost, and sewage sludge should be tested for salts before applying to landscapes. If misapplications of fertilizer or made or saline soil amendments applied, leach with good-quality water to move salts below the root zone.

Salt deposits on foliage can be washed off with good-quality water. When irrigating with saline water, avoid application by sprinklers.

Treating sodic soils requires providing a soluble source of calcium. Gypsum (CaSO₄•2H₂O) is the material commonly used. The calcium in gypsum displaces sodium in the soil, freeing the sodium to be

leached below the root zone of the plant. Excessive use of gypsum can cause problems, however, so test the soil first to make sure that sodium is excessive. A soil-testing laboratory can determine how much gypsum is required to reclaim sodic soil. If sodic soils are also saline, gypsum should be incorporated before leaching treatments are applied. There is no need to apply gypsum to soils that are simply alkaline (high pH) or calcareous. If the soil is calcareous (containing CaCO_3), sulfur can be applied to release the calcium for displacement of sodium. The reaction may take several months to several years (Cardon and Mortvedt 1999). See "Problems Related to pH," below, for more information. A summary of salt-related problems is provided in table 5.11.

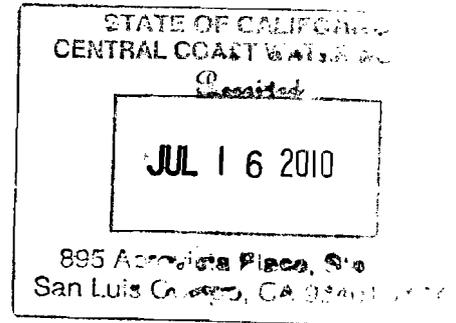
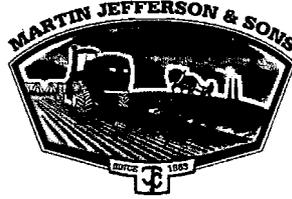
Figure 5.56. The lower foliage of this coast live oak (*Quercus agrifolia*) suffered salt damage when it was wetted with saline water through the irrigation system.

5.11. Summary of salt-related problems

Problem or Condition	Symptoms	Diagnosis	Occurrence and aggravating factors	Look-alike disorders	Treatment
Soil					
Saline	Stunted growth; chlorosis; leaf tip and marginal burn; defoliation; death.	Test soil for EC_e ; saline soils have EC_e greater than 4 dS/m. If irrigation water could be the source of salts, test water for total dissolved solids (TDS) and EC_w .	Species sensitivity to salts; low soil moisture; high water table; poor drainage; irrigation with saline water; application of deicing salts; heavy application of fertilizer or saline soil amendment.	Mineral deficiency; drought; herbicide toxicity; wind burn; acute air pollution; high light exposure.	Correct drainage problems; leach with good-quality water; select tolerant plants.
Sodic	Stunted growth; chlorosis; necrosis; death. May be white or black crust on soil surface. Water may pond on soil surface.	Test soil for sodium adsorption ratio (SAR) or exchangeable sodium percentage (ESP). Sodic soils have SAR >6 and ESP >10.	Species sensitivity to sodium; high water table; poor drainage; irrigating with water high in sodium; using softened water; application of NaCl as deicing salt.	Mineral deficiency; drought; herbicide toxicity; wind burn; acute air pollution; high light exposure.	Incorporate gypsum, or sulfur in calcareous soils; leach with good-quality water.
Saline-sodic	Stunted growth; chlorosis; necrosis; death. May be white or black crust on soil surface. Water may pond on soil surface.	Test soil for EC_e and sodium adsorption ratio (SAR). Saline-sodic soils have $\text{EC}_e > 4.0$ dS/m and SAR >6.	Species sensitivity to sodium and salt; high water table; poor drainage; irrigating with water high in sodium and salt; using softened water; application of NaCl as deicing salt; low soil moisture.	Mineral deficiency; drought; herbicide toxicity; wind burn; acute air pollution; high light exposure.	Incorporate gypsum, or sulfur in calcareous soils; leach with good-quality water.
Chloride	Stunted growth; necrosis of leaf tips or margins; bronzing; premature yellowing and abscission of leaves; chlorosis.	Test soil and tissue for Cl.	Species sensitivity to salts; low soil moisture; high water table; poor drainage; irrigation with high-Cl water; application of deicing salts; heavy application of chloride-containing fertilizer; close proximity to swimming pool.	Mineral deficiency; drought; herbicide toxicity; wind burn; acute air pollution; high light exposure.	Correct drainage problems; leach with good-quality water; select tolerant plants.

TABLE 5.11. Summary of salt-related problems, cont.

Problem or condition	Symptoms	Diagnosis	Occurrence and aggravating factors	Look-alike disorders	Treatment
Soil, cont.					
boron	Yellowing of leaf tip, followed by progressive chlorosis and necrosis of margins and between veins; necrosis is black and may appear as small spots near leaf margin.	Test soil or leaves for boron.	Species sensitivity to boron; irrigation with high-boron water; application of certain sewage effluent wastes; application of borate-containing herbicides.	Mineral deficiency; drought; herbicide toxicity; wind burn; acute air pollution; high light exposure.	Correct drainage problems; leach with good-quality water; select tolerant plants.
sodium	Mottled and interveinal chlorosis progressing to necrotic leaf tips, margins, and between veins.	Test soil and/or leaves for sodium.	Species sensitivity to sodium; irrigation with chemically softened water or other water high in sodium; application of NaCl as deicing salt.	Mineral deficiency; drought; herbicide toxicity; wind burn; acute air pollution; high light exposure.	Incorporate gypsum, or sulfur in calcareous soils; leach with good-quality water.
ammonium	Reduced growth; chlorosis; small necrotic spots on leaves.	Test soil for ammonium.	Species sensitivity to ammonium; heavy application of ammonium fertilizer; incorporation of soil amendment high in ammonium.	Mineral deficiency; herbicide toxicity; high light exposure.	Leach with good-quality water.
Leaves					
deicing salts	Damage occurs on the side of the plant facing the road, and to the splash height. In conifers, needles turn brown from tips downward. In broad-leaves and conifers, bud, twig, branch, and whole plant death may occur.	Test foliage for salts.	Species sensitivity; length of exposure and concentration of salts in spray.	Herbicide toxicity.	Wash off foliage. Use less-toxic deicing salt.
sprinkler irrigation	Leaf necrosis; damage occurs on foliage wetted by sprinkler.	Test foliage and water for chloride.	Irrigation water with >100 mg/l Cl; species sensitivity.	Drought; herbicide toxicity; wind burn; acute air pollution.	Wash off foliage with good-quality water.
ocean spray	Foliage necrotic on windward side of plant.	Test foliage for chloride.	Exposure of salt-sensitive species to wind-driven spray.	Mineral deficiency; drought; herbicide toxicity; wind burn; acute air pollution.	Wash off foliage with good-quality water.



P.O.Box 56
Salinas, CA 93308
Phone: (831) 384-1300 Fax: (831) 422-0755

July 8, 2010

Chairman Jeffery Young
Regional Water Quality Control Board
Central Coast Region
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401

Re: July 8, 2010 Ag Discharge Waiver Workshop

Attached are my comments that were delivered at the recent Ag Waiver Workshop held in Watsonville, CA on July 8, 2010. Once again, I'd like you to consider these recommendations and if you are interested in pursuing my offer please contact me.

Chairman Young, Board of Directors and Staff,

I have a few recommendations on moving forward with the new ag waiver process. From a grower's perspective, I'd like you to consider working towards your board's recommendation from the May workshop to pursue and work with agriculture and other entities to develop an ACHIEVABLE solution to the new draft of the Ag Discharge Waiver.

The ag industry has provided you with much criticism, technical information and examples of successful solutions. It would be extremely beneficial for each of you to come out onto our operations, get your boots dirty and become educated and knowledgeable about the technical and practical aspects that would help answer many of the concerns and questions that you posed today.

Myself and other growers on the Central Coast have invited you out to our operations in the past. I challenge your board to take us up on these offers in order to help guide you in making achievable and logical decisions. Not only will we be able to show you a plethora of examples regarding different water systems, run-off systems and wells but we will be able to educate you on how the Staff's recommendations regarding riparian buffers ARE in conflict with regulatory food safety buffers. We can show exactly how it would be extremely costly to growers for us to

implement the Staff's proposal by requiring prime ag land to be taken out of production. Might I suggest looking at the Leafy Greens Marketing Agreement for exact information on required buffers in regards to water, riparian areas and the potential for contamination due to "vectors".

Farmers want to work with you and comply with regulations to improve water quality but we want to do so in a logical, economic manner while ensuring that we are complying with other regulations. We do not have a "choice of which wells to use", as you so mistakenly stated Chairman Young. We use what we have and try to do so in the most sustainable, practical and economical manner.

You may not think that the "Ag Proposal" is perfect but it has many more achievable standards and recommendations than the Staff's proposal. I look forward to you all taking me up on this challenge and look forward to the multitude of opportunities that you all face in working with my fellow farmers.

Thank you,

A handwritten signature in black ink that reads "April England-Mackie". The signature is written in a cursive, flowing style.

April England-Mackie
Food Safety and Farm Programs Manager

July 8th, 2010

Central Coast Regional Water Quality Board

Good Afternoon Chairman Young and Board Members.

My name is Dirk Giannini. I am a fourth generation farmer in the Salinas Valley. Our family-owned and operated company farms a variety of row crops that vary from head lettuce, romaine lettuce, broccoli to spinach, carrots, and spring mix. All of these crops require different amounts and methods of irrigation and fertilizer.

I'd like to share with you some of the practices we have used on our ranches to prevent our ag inputs from entering downstream waterways. We continue to adapt and refine these and work with UC Cooperative Extension and others to consider new ideas. You might be surprised to know that it is a challenge to find management practices that can:

- reduce nitrates in surface water down to below the drinking water standard;
- assure us that no nutrients or ag chemicals are still in our tailwater;
- as well as eliminate tailwater from crops that must be sprinkler irrigated;
-

But we want to find those practices – so we keep looking.

Our ultimate goal is to make sure our tailwater is clean before it leaves any of our ranches. That is a tall order when we are pumping water from aquifers that are already high in nitrates and trying to make that water drinkable before it leaves the ranch. The area east of Salinas where we farm is steeply sloped with soils of Decomposed Granite and sandy loam. Here, we have tried and continue to work with various practices such as vegetative ditches, the use of PAM in sprinkler irrigation, the application of Landguard, and the use of drip irrigation.

The vegetative ditch sections were planted back in 2004 and 2006 with the support of the Resource Conservation District and Community Alliance of Family Farmers. Their purpose is to prevent sediment in the irrigation water from leaving the ranch. This means we are also preventing anything contained in that sediment from leaving. We sloped back the ditches and planted 100 foot sections all over the ranch. The grasses have done a good job of holding sediment on the ranches.

But with the onset of strict food safety concerns we are reluctant to expand this practice further, however, we still maintain the 6 grassed plots that we originally established and continue to look for other ways to reach our water quality goal.

For example, we have had very positive results with a sediment holding polymer known as PAM. We have worked with UC Cooperative Extension performing multiple trials that have shown us that PAM can drop sediment immediately in the field so it never ends up in a ditch. Consequently, it also drops anything else attached to the sediment. UC Extension has documented the effectiveness of this product. On ranches where we farm crops that require sprinkler irrigation with highly erodible soils, the use of PAM would be an excellent farm practice.

A third management practice we have tried is called Landguard. This is an enzyme that breaks down pesticides in tailwater. This practice has significantly reduced exceedences and would clean our tailwater before it leaves the ranch. The problem is that this practice has not been readily accepted by the Regional Water Board staff. In our watershed working groups, I have heard success stories about this product from neighbors and have witnessed it myself in the sampling program that is part of our education and outreach. Since there is not buy-in from the Regional Board, regardless of its effectiveness, we will have to set this practice aside and not pursue further implementation at this time.

Finally, our company has used drip irrigation and fertigation since 1991 on a number of crops although sprinkler is still needed in the first few growing weeks to ensure crop germination. Our challenge now is to shrink the period of time that we use sprinklers on our crops and also to see if we can use drip on more crops. We have seen water usage drop on some locations as much as 30 percent. We have also been able to spoon feed fertilizer directly to the root zone where the plant has the best access to it. Because of these practices, our fertilizer usage has dropped considerably. Less leaf wetness means less mildew and the use of less fungicides. We continue to invest in drip tape application. It is very expensive to install, maintain, and store; and it does not solve all water quality problems.

In closing, we will continue to put our energy into these efforts and hope that scientists will continue their research in developing new management practices. Three things are clear to me and I hope I've made them clear to you:

1. No single practice will work on every ranch the same way
2. No single practice will solve every water quality problem; and
3. A full range of proven, effective management practices that will assure me I can achieve all water quality objectives that meet regulatory standards is not readily available today.

Thank you for your time.



CALIFORNIA FARM BUREAU FEDERATION

NATURAL RESOURCES AND ENVIRONMENTAL DIVISION

2300 RIVER PLAZA DRIVE, SACRAMENTO, CA 95833-3293 · PHONE (916) 561-5665 · FAX (916) 561-5691

June 15, 2010

Via U.S. Mail and Email

*AgOrder@waterboards.ca.gov
chewitt@waterboards.ca.gov
rbriggs@waterboards.ca.gov*

Roger Briggs
California Regional Water Quality Control Board
Central Coast Region
895 Aerovista Place, Suite 101
San Luis Obispo, California 93401

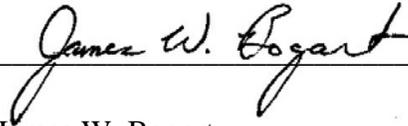
Re: *Formal Request to Meet with Regional Board Staff Regarding the Preliminary Alternative Agricultural Proposal in Response to Preliminary Staff Recommendations for an Agricultural Order to Control Discharges from Irrigated Lands*

Dear Mr. Briggs,

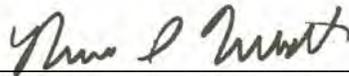
The following agricultural organizations formally request to meet with Regional Board staff to discuss future agricultural orders or waivers to control discharges from irrigated lands. The purpose of the meeting is to discuss the Preliminary Alternative Agricultural Proposal submitted to the Regional Board on April 1, 2010 in response to the Preliminary Staff Recommendations for an Agricultural Order to Control Discharges from Irrigated Lands. In addition, the agricultural organizations request to discuss, in the context of the Ag Proposal, staff's prioritization of the water quality goals in accordance with the Board's directive. Given the importance of this issue, we respectfully request a timely response to this formal meeting request. Please contact Kari Fisher at (916) 561-5666.

Sincerely,

Kari E. Fisher
Associate Counsel
California Farm Bureau Federation
Monterey County Farm Bureau
San Benito County Farm Bureau
San Luis Obispo County Farm Bureau
San Mateo County Farm Bureau
Santa Clara County Farm Bureau
Santa Cruz County Farm Bureau
Santa Barbara County Farm Bureau



James W. Bogart
President & General Counsel
Grower-Shipper Association of Central California



Richard Quandt
President
Grower-Shipper Association of Santa Barbara
and San Luis Obispo Counties



Gail Delihant
Director, CA Government Affairs
Western Growers



Kay Mercer
Executive Director
Central Coast Agricultural Water Quality Coalition



Kris O'Connor
Executive Director
Central Coast Vineyard Team

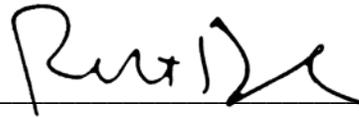
Letter to Roger Briggs

June 15, 2010

Page 3



Tom Bellamore
President
California Avocado Commission



Robert Dolezal
Executive Vice President
California Association of Nurseries and Garden Centers



Rick Tomlinson
Director of Government Affairs
California Strawberry Commission

cc: John H. Hayashi, Board Member
David T. Hodgin, Board Member
Dr. Monica S. Hunter, Board Member
Russell M. Jeffries, Vice Chairman of the Board
Gary C. Shallcross, Board Member
Tom P. O'Malley, Board Member
Roger Briggs, Executive Director
Lisa McCann
Angela Schroeter
Howard Kolb



CALIFORNIA FARM BUREAU FEDERATION

NATURAL RESOURCES AND ENVIRONMENTAL DIVISION

2300 RIVER PLAZA DRIVE, SACRAMENTO, CA 95833-3293 · PHONE (916) 561-5665 · FAX (916) 561-5691

July 6, 2010

Via U.S. Mail and Email

chewitt@waterboards.ca.gov

rbriggs@waterboards.ca.gov

Jeffrey S. Young, Chairman of the Board
California Regional Water Quality Control Board
Central Coast Region
895 Aerovista Place, Suite 101
San Luis Obispo, California 93401

Re: Staff Report for Offsite Meeting of July 7, 2010—Item 3: Water Quality Issues, Accomplishments, and Work Ahead

Dear Mr. Young and Members of the Board,

The California Farm Bureau Federation (“Farm Bureau”) is a non-governmental, non-profit, voluntary membership California corporation whose purpose is to protect and promote agricultural interests throughout the state of California and to find solutions to the problems of the farm, the farm home, and the rural community. Farm Bureau is California’s largest farm organization, comprised of 53 county Farm Bureaus currently representing approximately 81,000 members in 56 counties. Farm Bureau strives to protect and improve the ability of farmers and ranchers engaged in production agriculture to provide a reliable supply of food and fiber through responsible stewardship of California’s resources.

Upon review of the accompanying staff report, “*Water Quality Issues, Accomplishments, and Work Ahead*,” for the special July 7, 2010 offsite Board meeting, Farm Bureau is concerned with the Regional Board’s proposed approach for future Basin Plans amendments. An overarching concern is staff’s overbroad and negative characterization of agricultural discharges throughout the report, as well as the lack of evidence to support such statements. Additional concerns include:

The Proposed Approach and Resulting Basin Plan Amendments Should Not Contain Duplicative Regulation

The proposed approach to future Basin Plan amendments may lead to significant risk of regulatory overlap and duplication. Many of the activities and impacts sought to be regulated are currently directly or indirectly regulated through local governments, federal agencies, and other state agencies. For example, several proposed avenues of “increasing the Board’s authority” seek to infringe upon the regulatory authority of the Department of Fish and Game (“DFG”). Through its section 1600 Streambed Alteration Program, DFG already regulates certain upland riparian areas the Regional Board now seeks to regulate. Such duplicative regulation is both inefficient and unnecessary.

Letter to Chairman Young

July 6, 2010

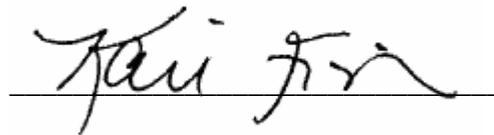
Page 2

The Proposed Approach and Resulting Basin Plan Amendments Are Overly Expansive and May Impermissibly Regulate Activities Beyond the Regional Board's Regulatory Authority

The Regional Board proposes to “increase (its) authority,” “require changes in land use planning and land use practices,” and “essentially reform” all land use planning and development. Such statements are overreaching and overbroad, expand and exceed traditional state water quality regulatory authority, intrude on traditional land use authority of local governments, and risk duplicative regulation. Traditional land use activities, such as land use planning, development, and regulation, are out of the purview of state water quality regulatory authority. By overly expanding the coverage of regulation in the proposed approach to amending the Basin Plan, the Regional Board may impermissibly intrude upon and conflict with local, state, and federal land use and development authority.

Thank you for the opportunity to provide our comments and concerns. We look forward to further involvement and discussion with the Regional Board on amending the Basin Plan.

Sincerely,



Kari E. Fisher
Associate Counsel
California Farm Bureau Federation

On behalf of:

Monterey County Farm Bureau
San Benito County Farm Bureau
San Luis Obispo County Farm Bureau
San Mateo County Farm Bureau
Santa Clara County Farm Bureau
Santa Cruz County Farm Bureau
Santa Barbara County Farm Bureau

cc: John H. Hayashi, Board Member
David T. Hodgin, Board Member
Dr. Monica S. Hunter, Board Member
Russell M. Jeffries, Vice Chairman of the Board
Gary C. Shallcross, Board Member
Tom P. O'Malley, Board Member
Roger Briggs, Executive Director



COUNTY OF SAN BENITO
BOARD OF SUPERVISORS



481 Fourth Street • Hollister, CA 95023
Phone: 831-636-4000 • Fax: 831-636-4010

RESOLUTION NO 2010-69
Urging the Regional Water Quality Control Board
To Re-establish the 2004 Ag Waiver

WHEREAS, Agriculture is the number one industry within San Benito County and the San Benito River Valley supports some of the most productive farmland in the state; and

WHEREAS, Agriculture within San Benito County is diverse, comprised of fields of peppers, garlic, onions, tomatoes, broccoli, celery and orchards; and

WHEREAS, this diversity speaks volumes about the understanding and responsibility of the water quality concern for the environment and future generations of farmers held by our agricultural industry today; and

WHEREAS, the County Board of Supervisors recognize the public trust it holds, and conducts its business with honesty, integrity and respect for the individual and the various industries, including agriculture, and holds the organization of County government to the same standard; and

WHEREAS, the County Board of Supervisors is concerned about the manner in which the Regional Water Quality Control Board (RWQCB), Region 3, and its staff have approached the renewal of the current Ag Waiver; and

WHEREAS, the County Board of Supervisors is deeply troubled by the substance and tone of the RWQCB staff proposals; and

WHEREAS, the County Board of Supervisors recognizes the Agricultural industry's stewardship and efforts made to improve water quality; and

WHEREAS, the County Board of Supervisors is concerned about RWQCB's staff insistence on a highly regulated program of specific actions and timelines in place of partnership.

NOW THEREFORE BE IT RESOLVED, the San Benito County Board of Supervisors urges the Regional Water Quality Control Board to re-establish the 2004 Ag Waiver based on the collaborative success of the past, and that they work with the agricultural industry to achieve a program that will meet our regional water quality needs.

PASSED AND ADOPTED by the San Benito County Board of Supervisors, State of California, at the meeting of said Board held on the 8th day of June, 2010 by the following vote:

AYES: SUPERVISORS: BOTELHO, LOE, BARRIOS, DE LA CRUZ, MONACO
NOES: SUPERVISORS: None
ABSENT: SUPERVISORS: None

Reb Monaco
Reb Monaco, Chairman

ATTEST: Linda Churchill
Clerk of the Board
By: Janet Schwager

Approved as to Legal Form

Matthew W. Granger

MONTEREY COUNTY



BOARD OF SUPERVISORS

JANE PARKER, SUPERVISOR – FOURTH DISTRICT

2616 FIRST AVENUE, MARINA, CA 93933

EMAIL: Jane.Parker@co.monterey.ca.us PHONE: (831) 755-5044 FAX: (831)384-1839

July 7, 2010

Board of Directors
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401

Re: Central Coast RWQCB Proposed Agricultural Order

Dear Board Members,

I wish to express my support for efforts by the Central Coast Regional Water Quality Control Board staff to address the serious environmental and health threats caused by pollutants in our region's water bodies. I concur with staff's statement that the Board must determine how best to regulate agricultural discharges on the Central Coast to directly address the major water quality issues of toxicity, nitrates, pesticides and sediment in agricultural runoff and/or leaching to groundwater so that we achieve desired water quality outcomes that support all beneficial uses. As you know, the laws of the state of California require no less.

During the public comment period on the proposed Agricultural Order, the Monterey County Board of Supervisors submitted a letter urging further consideration of the economic impacts of imposing such an order. That letter remains the County's official position, and I agree that economic impacts on one of our region's vital industries must be weighed along with health and environmental considerations. In addition, I wish to add my own viewpoint on this issue.

The evidence indicates that water quality has not improved under the Conditional Waiver program that was adopted in 2004. While many agricultural operators participated in this program and demonstrated great dedication to addressing these serious problems, the program has proven insufficient. The goal is to ensure that state standards on water quality are met. I know that you and your staff remain open to hearing alternatives to specific elements in the proposed regulation, and I encourage you to incorporate viable alternatives to the extent possible without compromising state water standards. I want to thank you for holding this public hearing on July 7, 2010 to allow additional comment on this Proposed Order. The importance of dialog and cooperation cannot be over-emphasized as we deal with the difficulty of balancing economics, the environment, and health.

MONTEREY COUNTY



BOARD OF SUPERVISORS

JANE PARKER, SUPERVISOR – FOURTH DISTRICT

2616 FIRST AVENUE, MARINA, CA 93933

EMAIL: Jane.Parker@co.monterey.ca.us PHONE: (831) 755-5044 FAX: (831)384-1839

Please feel free to contact me or my staff if you have questions concerning this letter or additional information you wish to share with me.

Sincerely,

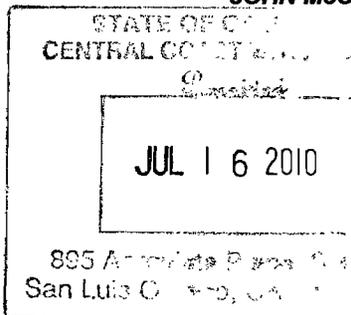
A handwritten signature in black ink that reads "Jane B. Parker".

Supervisor Jane Parker
District 4



California Natural Resources Agency
DEPARTMENT OF FISH AND GAME
<http://www.dfg.ca.gov>
 Central Region
 1234 East Shaw Avenue
 Fresno, California 93710
 (559) 243-4005

ARNOLD SCHWARZENEGGER, Governor
JOHN McCAMMAN, Director



July 8, 2010

Angelina Schroeter
 California Regional Water Quality Control Board
 895 Aerovista Place, Suite 101
 San Luis Obispo, California 93401

Subject: Preliminary Draft Agricultural Order No. R3-2010-00XX, Conditional Waiver for Irrigated Agriculture of Waste Discharge Requirements for Discharges from Irrigated Lands

Dear Ms. Schroeter:

The California Department of Fish and Game (Department) has reviewed the above referenced agricultural order. Currently, the Department's Central Region is a participant in the Westside Coalition Irrigated Lands Monitoring Program in the west-central part of the San Joaquin Valley as part of the Regional Water Quality Control Board's Region 5, Irrigated Lands Program. As such, we have a vested interest in the Statewide Irrigated Lands Program. The Central Coast Regional Water Quality Control Board (Board) proposes a very extensive water quality monitoring plan to protect all beneficial uses within the central coastal region, plus protect the Monterey Bay that receives these waters from land.

The Board's plan includes a new section titled, "Aquatic Habitat Protection Requirements" that seeks to protect aquatic habitat, including riparian zones, and fish and wildlife that depend on these habitats. We concur with and support the Board's planning efforts to protect one of California's most valuable wetland habitats. The Board's efforts are similar to those included in Cal Fire's (formerly California Department of Forestry and Fire Protection) stream protection provisions in the California Forest Practice Rules.

We further suggest the Board include the legal definition of a stream pursuant to the State of California's Code of Regulations' Title 14, Chapter 1, Section 1.72.

Stream (includes creeks and rivers). A stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation.

Enclosed is a set of figures we provide applicants who apply for Streambed Alteration Agreements pursuant to the Department's Lake and Streambed

Conserving California's Wildlife Since 1870

Angelina Schroeter
July 8, 2010
Page 2

Alteration Program per Fish and Game Code Section 1602. The figures shows cross sectional and aerial views of the top of bank, toe, and channel of a stream.

In summary, the Department concurs that the proposed agricultural order will be beneficial to protect Waters of the State in the central coastal region. Thank you for the opportunity to review and comment on this order. If the Board has any questions or comments, please contact Dr. Andrew Gordus, at (559) 243-4014, extension 239.

Sincerely,



Jeffrey R. Single, Ph.D.
Regional Manager

Attachment

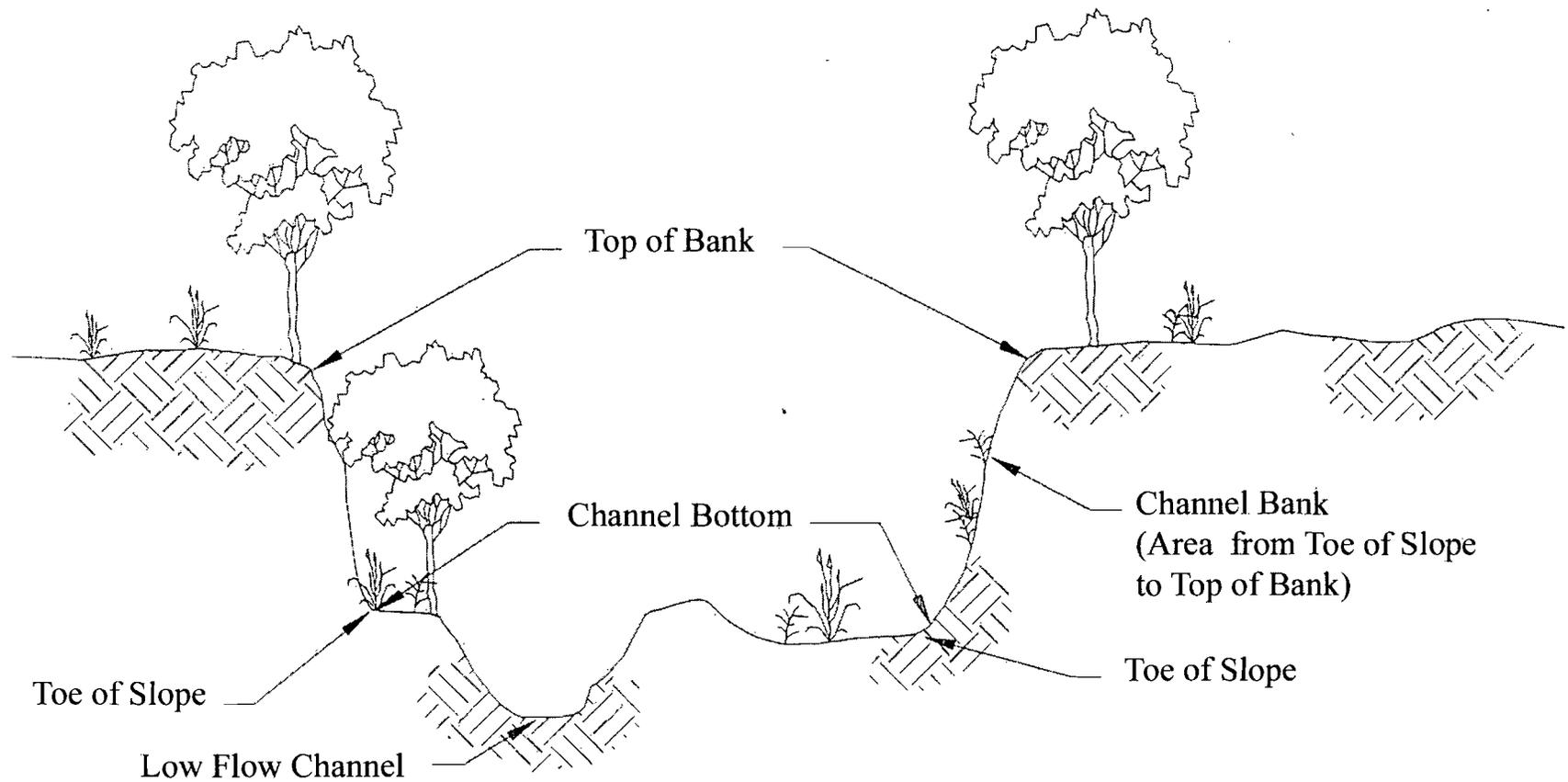


Exhibit 2 : Terms Defining Channel Structure
(Cross-sectional view)

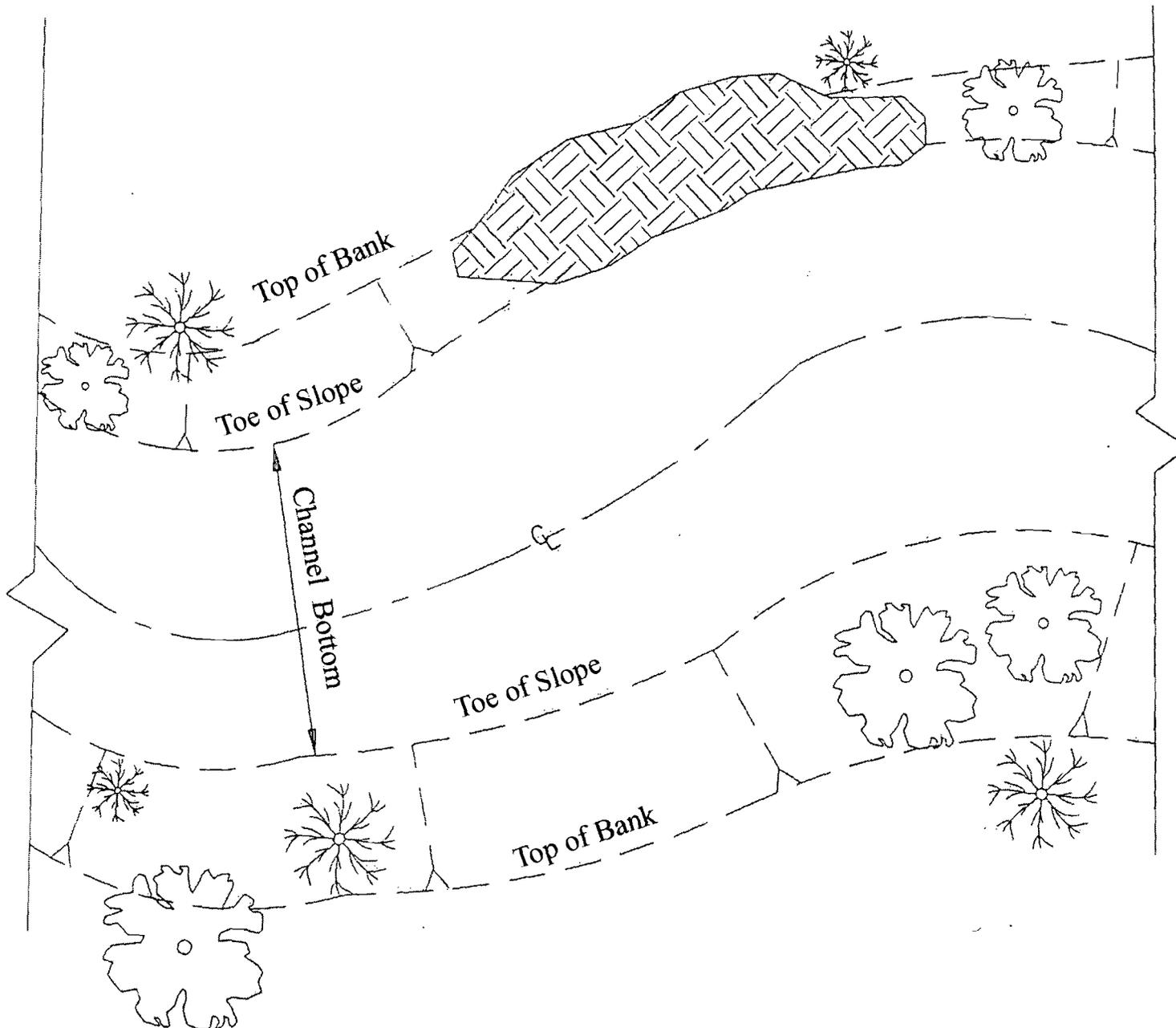


Exhibit 3: Terms Defining Channel Structure (Aerial view)

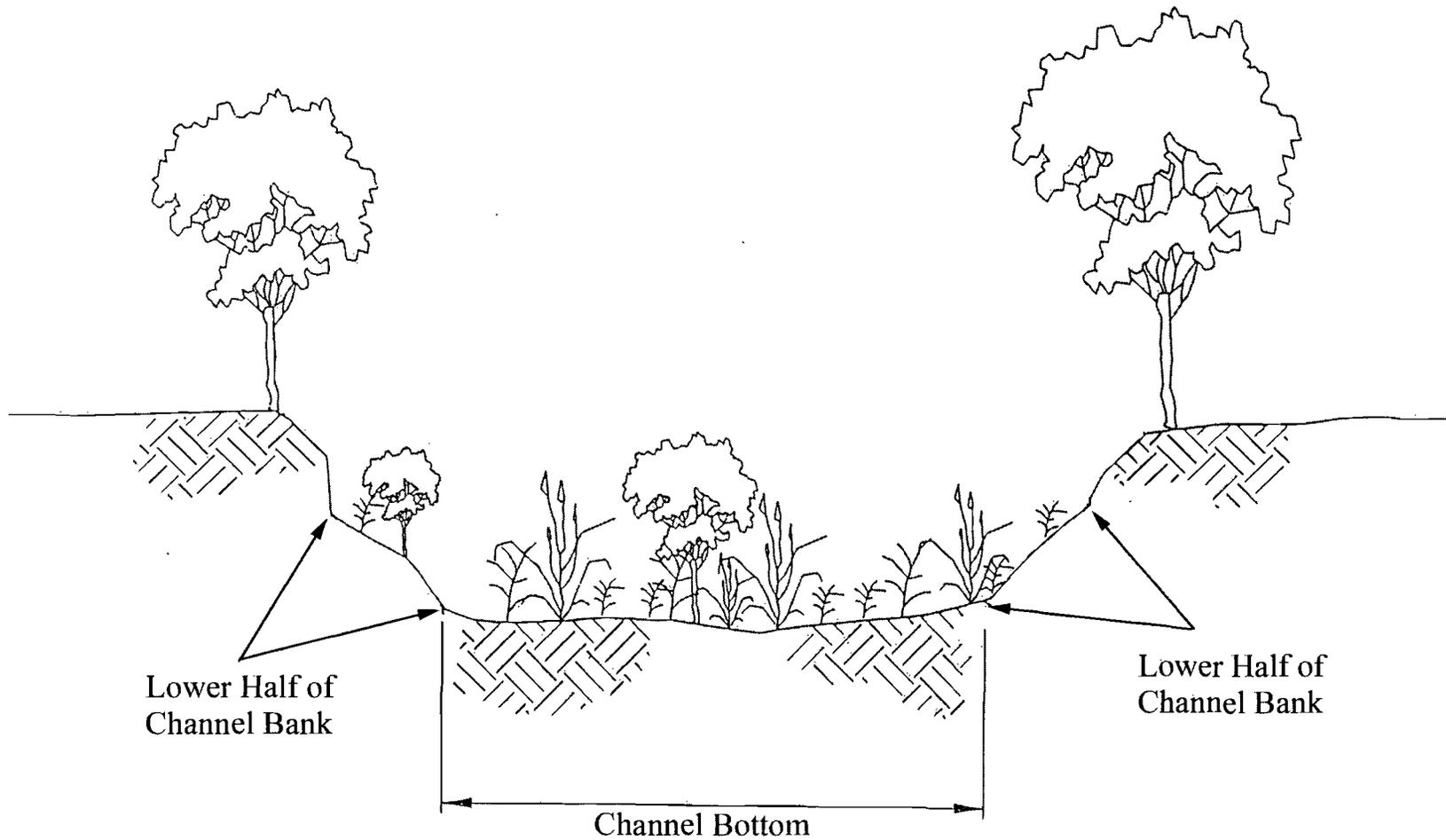


Exhibit 4: Control and Removal of Native Vegetation
Limits of Work are Channel Bottom and Lower Half of Banks

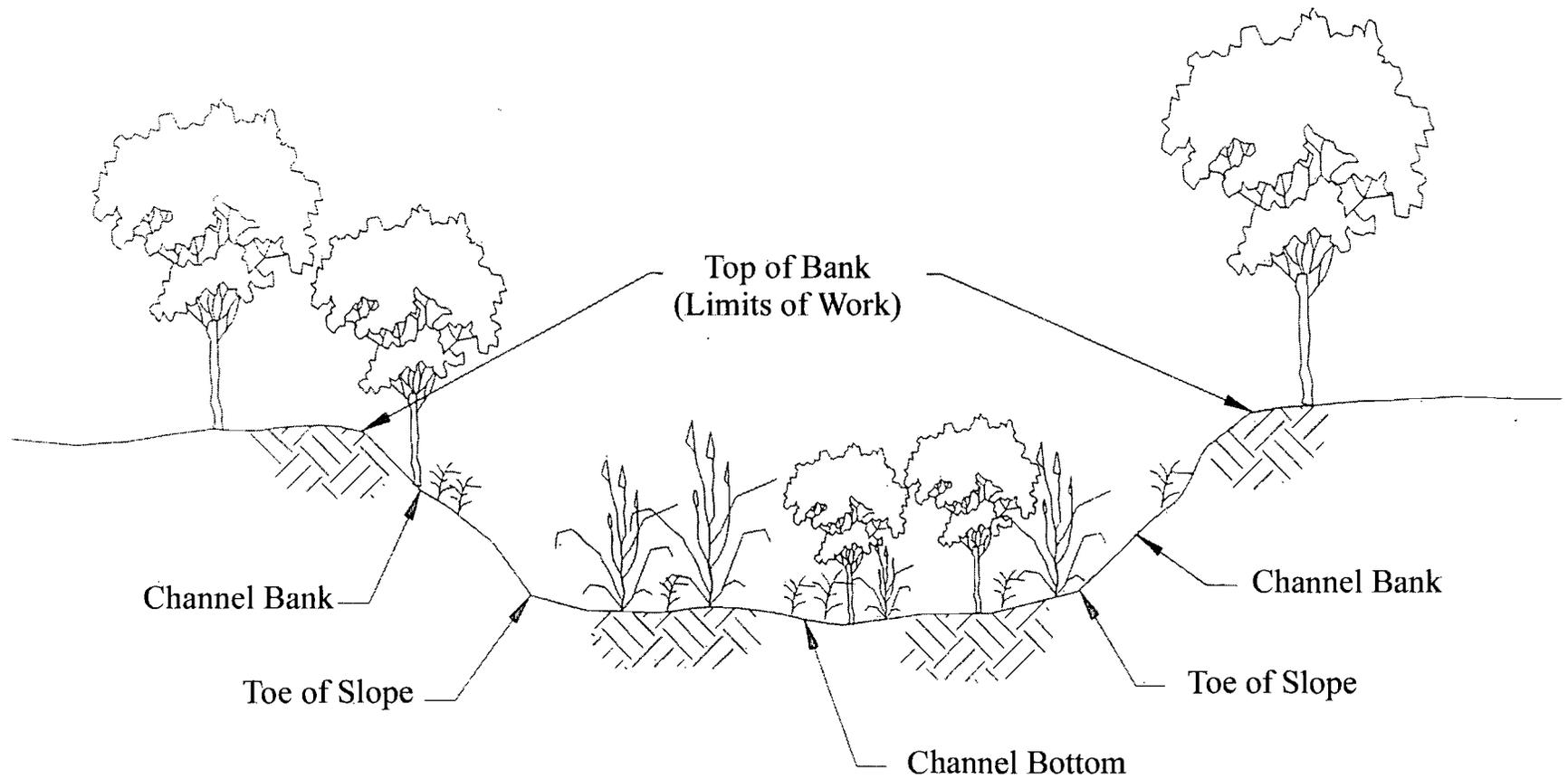


Exhibit 5: Control and Removal of Non-Native Vegetation

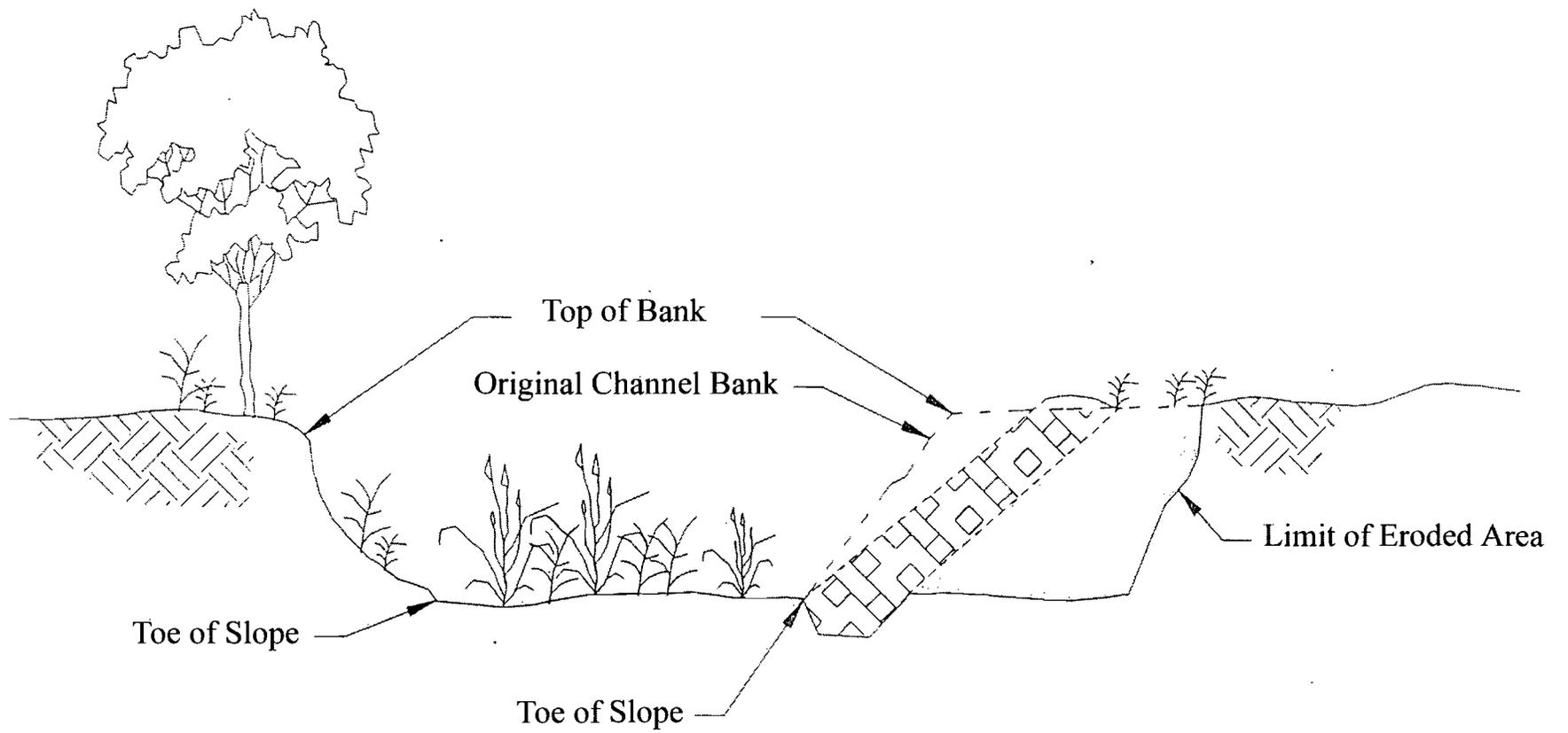


Exhibit 6: Minor Erosion Control Work

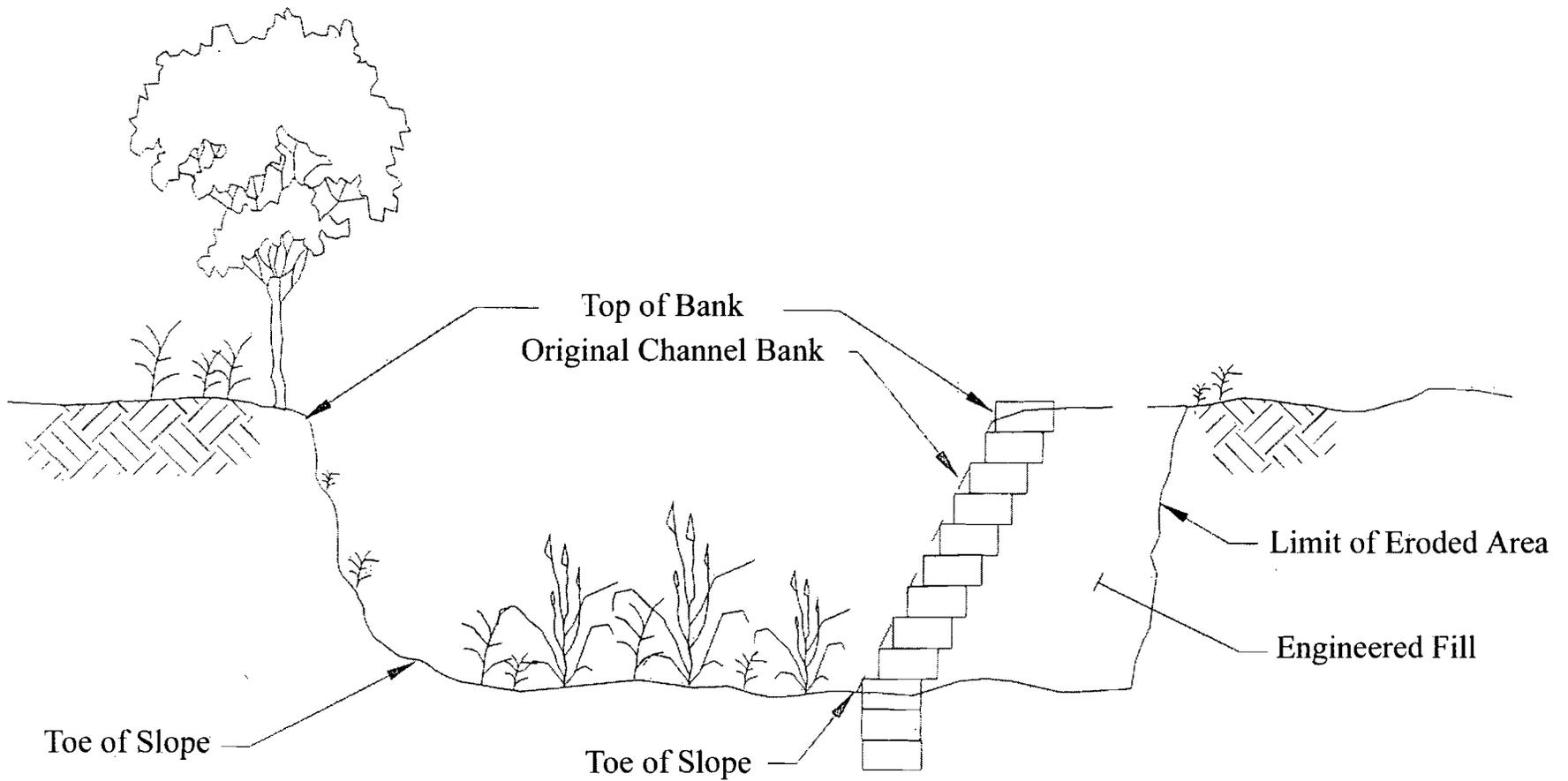


Exhibit 7: Minor Erosion Control Work

Hi, Monica-

I re-read the Feb. 2010 Staff Recommendations for the Discharges from Irrigated Lands Report again and would like to offer these comments:

1. The short courses offered through UC Extension and NRCS were a good first start at educating the growers on the importance of having a conservation farm plan and the impacts of agriculture on the water resources. I agree that is time to take the next step and I see that the Regional Board needs to emphasize accountability and verification. I hope you were able to review the Napa County watershed plan I sent you; I realize they have a different situation there as far as crop types, etc., but it is a good example of how things may be accomplished while keeping the program relatively simple to implement and maintain.
2. I like the Board's proposal to focus on the more severely impacted areas and prioritize along those lines. It also makes sense to stress the implementation of the most effective conservation practices, or BMPs. NRCS maintains the Conservation Practices Physical Effects document that reflects the best estimate of how and to what extent the practice will affect the soil or water resource. We will also be publishing the final report of the CEAP program soon which will detail the results of our findings into the effectiveness of our conservation practices. This would be of help to the Board and growers in determining which practices may provide more "bang for your buck".
3. While understanding that there is personal responsibility for each grower to implement and maintain structural and management practices, it is always important to keep in context the bigger picture or watershed concept. When NRCS provides a complete conservation plan, we take a look at the surrounding area to ensure all on- and off-farm impacts are taken into account. When all focus is on the individual farm, issues and benefits may be lost. One example- the grower that implements irrigation water management to perfection as to disallow any discharge from his farm, may have negatively impacted the farm next door that has relied on the use of the discharged water. While it may be more difficult to view things in a watershed scale, it more than pays off in the end. Benefits from regionally -based practices may have more positive impacts on the water resource than many individual practices.
4. The regional/watershed idea also applies to monitoring. I see where knowledge of the discharge from each farm would provide the Board with important data. But the monitoring regimens I am familiar with are very expensive and become site data rich/information poor. Most individual growers are not familiar with the proper technique of collecting and handling samples so they would have to hire someone equipped to sample, preserve, and maintain the chain of custody for each sample as well as finding an established lab to process and pay for the sampling. I have seen many monitoring programs started with the best intentions, only to end up with file drawers full of unprocessed data due to the lack of personnel to organize and analyze each sample. Some programs have taken samples for years and still have not produced anything close to statistically valid information. I am always wary of established monitoring for monitoring's sake. I believe you mentioned the Board was not looking into regional monitoring

and I was wondering if they might reconsider if the local groups were wanting to go about the program in that way. The coalitions established in Region 5 seem to have been successful in monitoring and pinpointing issues with respect to water quality in the Central Valley. They handle sample collection, analysis and reporting for a reasonable fee from each landowner. And, if problems are found, there is the option to perform further testing.

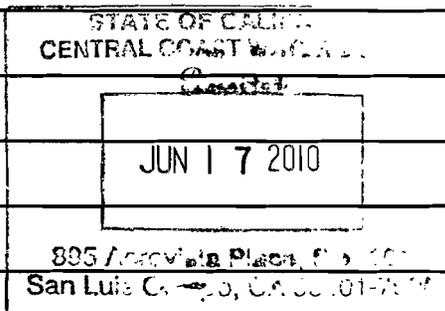
5. Has the Board considered the possible use of evaluations or assessments that could be performed by the growers that are easily taught and performed that could provide a simple look to see which surface waters may be being impacted. These evaluations could supplement a regional monitoring program. NRCS has the Water Quality Indicator's Guide and the Stream Visual Assessment Protocol and I assume other agencies or organizations have similar tools to do a broad first assessment that could eliminate the need for further evaluation on individual farms. These tools are easily learned and performed.
6. Water management is the first step towards good water quality. We also have techniques in place to include irrigation water management (IWM) in conservation planning. There are many qualified entities that could assist growers to develop IWM plans, coalitions (if they are formed), the local Resource Conservations Districts among others. I have not been involved in the local meetings and planning associated with the Ag Waiver program so I offer those names as merely suggestions; I am not trying to involve any group who does not wish to be involved or named.
7. We spoke last time about some of the singular issues associated with your region. There are so many different crops and farming operations in this area so there isn't any one strong growers' association with which to work, for example. And, recent food safety concerns have the potential to impact water quality and riparian habitat. The Monterey County RCD has successfully used vegetated ditches/constructed wetlands to clean up water discharged from farms in the past, but may not be able to employ these practices in the future due to requirements from the food producers. I appreciate the variety of concerns and solutions the Board must consider and I am pleased with the opportunity to provide my input.

Rebecca Challender
Water Quality Engineer
USDA-NRCS
430 G Street
Davis, CA 95616
(530) 792-5621
rebecca.challender@ca.usda.gov

Dear Angela

Please pass these communications to the board members. Both Daniel & I appreciate working with you. Previous to working with you we met up with some real chunkers (altho Bati Mcniel was a real nice & honest young lady). If there are any changes on our issues please let us know.

God Bless
Joseph



Communication to Board Members only

Altho I was able to attend the May 12th meeting time constraints did not allow me to stay and share my thoughts. As I am the sole caregiver for my 95 year old mother my personal appearance at meetings will the foreseeable future will not be possible. For that reason I will take pen in hand to express my concerns and opinions.

First of all may I express my heart felt gratitude for acting with such integrity where this issue is concerned. One person said to me "you got one sentence for 9 years work". My answer was "yes 1 sentence but

a very good sentence. Straight forward, to the point without any confusion as to what the definition of "is" is. I am a simple man and I appreciate the sentence as a simple common sense provision that in my opinion should make sense to anyone no matter what ideology they hold, and cost neutral to boot. I hope in your future negotiations concerning this order that you will stand firm on this provision # 28.

Only a social and legal beligerant could possibly find fault with it.

* one concern I might bring up; what teeth does this provision hold to bear. Historically for example S.B. County has a dumping law that

entails a \$25,000.00 dollar fine while S.H.O. county

has a law concerning dumping with not 1 iota

of "teeth". There for beligrants have no in-

centive to do any thing but stick their middle

finger in the air and continue as they did

for decades. I'm sure you get my drift.

* I must admitt I am a Neanderthal when

it comes to comprehending "Bureospeak" such

as compared your "Order" paperwork. After

reviewing it several times I was confused

to some extent about what ~~so~~ appeared

to be 1 provision that conflicted with another

in a number of cases. It is my fear that

there might be some unintended consequences

~~em~~ that might emanate from such an extensive order. In this arena it is my suggestion that you listen carefully to Mr. Hayashi concerning possible pit falls that might result from conflicting provisions or by painting agriculture with a "broad brush." This man has had feet on the ground experience just as Mr. Day & I did over a life time in his field of agriculture. By his actions in Nipomo where he walked the walk of responsible Ag operations he has proven to be a man of quality and not part of the belligerent %age of his Ag family. Experience is an exceptional form of

Knowledge and is difficult to grasp without actual experience.

* I found the position of the Ag folks at the May 12th interesting and in a few cases compelling. I found one position however absolutely disgusting and an attempt to circumvent the good work you have done.

It was very telling that their lawyer wanted Fish + Game (an agency universally hated by every Ag person I know) to hold the reins over water issues. I cannot speak for other areas but I can speak with full surity with out a shadow of a doubt that this totally disfunctional agency

in Nipona operated with unmitigated
derelictions of duty at best. At worst
they operated with total corruption under
the color of authority. It is no wonder
that the Ag lawyer wants the water
Board out of the picture: you actually
did your job with integrity. They ^(if you)
could easily ^{have} snipped the polletive helijerants
in the bud in 2001 but instead were in
bed with them working against their
mandated duty at every foot fall.
If they are given the reins, mark my
words their will be NOT IMPLEMENTATION
worth the powder to blow it to hell and

beligzants will be emboldened to continue their destructive practices just as they did in Nipomo for decades. If you ever need a deposition from me as to their history of depredation in Nipomo (to strengthen your agency position) you need but to ask.

Again I thank you Lady & Herbelman for your integrity in your inclusion of provision # 28 in your "order". Please keep me informed Angela through Angela as this situation evolves.

Sincerely
Ralph B. Bixby
AKA Creek Dog

Communication to Board members only

Mr. Diaz has called me to articulate
and opinions
some of his concerns on this issue. First of
all he would like to apologize for his con-
fidential comments concerning a particular
individual on the board. Mr. Diaz's comments
were driven by two things: #1 Mr. Diaz just
the same as the board members had sat through
9 1/2 hours of serious banter concerning the
issue. After 9 1/2 hours he was still in a
serious mode when 2 members of the board
were engaging in a chuckle fest in a noticable
manner. He found this activity insulting
and unprofessional. Had he had 60 more

seconds (we were offered 2 to 3 min.) he could have finished his thought that the individual in question was not the polluter. However the trash & chemical pollution still exists today on that parcel and others to this day. This leads to his second legitimate concern. Why after years of being aware of this situation has there been no implementation in the cleanup of the residual material still in the watercourses from 2001 and 2006. Please review the Executive Boards report when Mr. Furukawa proved us to be truthful by cleaning up "Some" of the trash. Please note that Mr.

Hayashi cleaned up "some" of the trash showing an admirable stance of good will in doing the right thing for the right ^{reason} thing. Contrast that with the belligerents whose responsibility it was to clean up the mess. Daniel feels that by "lawyering up" in the manner they did was transparently obstructionist to any one with a brain in their head. No more inspections etc etc. By this action their position was and Daniel believes is today. Fuck You! to the community to the overall environment including downstream Agriculturalists and Ladies & Gentlemen especially to you as a

State agency. The attitude of this entity demonstrates the need for regulations of their Ag family. all the they no doubt represent 1% (just as Hell Angels represent and are proud of their social and legal beligerance of the motorcycle "community") of the Ag community their in your face arrogance can cause their entire community to be painted by a broad brush. So Daniel as we both understand that the coag of government turn slowly - but how many years beyond 2006 should it take. Daniel believe after 9 years of personal experience that political

dereliction and corruption is behind
this lack of implementation by much
including Cal. Fish & Game. Of that there
is no ~~doubt~~ doubt!!! whatsoever!!!

We have attempted to exercise our
rights as citizens to work in concert
with good will and truth with a
government that we were taught was
by and for the people. We have expended
our energy we feel in substantial manner
and can only hope that the water board
can show sympathetic appreciation by
attempting to circumvent political
obstructionist malfeasance and effect

the clean up of the residential pollution
on all the water courses (completely
documented) that still exhibit an
issue. Mr. Diaz asked that the board
communicate with him through Angelia
as to the current situation concerning
they situation

Thank you

Robb Bishop for

Daniel Diaz

Mail Message

Reply



Mail

From: Angela Schroeter
To: AgOrder
Subject: Fwd: AG WAIVER

Monday - July 12, 2010 10:24 AM

>>> C 2 <onsolidground@live.com> 7/10/2010 3:07 PM >>>

As a mother of a seven and nine year old surfer, who has had one child suffer from an eight week long debilitating bout of giardia and another from a recent eye and skin infection, both caused by polluted ocean water, I feel obligated to tell my children they can not surf anymore. When a parent has to tell her children the ocean is off limits so they will not get acutely and/or chronically ill, it is far past a time of inaction. The officials responsible for our health must create and enforce strict regulations to protect our waters from dangerous pollutants, including agricultural discharge into local waterways. The "ag waiver" must define specific targets for improvement and impose specific timelines for compliance with the goal of producing demonstrable water quality improvements, in order to protect the public.

Mail Message

Reply



Mail

From: Elsa Dooling

<elsa.dooling@gmail.com>

Friday - July 9, 2010 12:56 PM

To: <mbarricarte@waterboards.ca.gov>**Subject:** Elsa Dooling, Community Organizer with Pesticide Watch following up**Attachments:** Mime.822 (4238 bytes) [\[View\]](#) [\[Save As\]](#)

Dear Monica,

Thank you for giving me your card at yesterday's Central Coast Water Board meeting in Watsonville. I am very interested in following up with the Staff about the concerns that I am receiving from our constituents here on the Central Coast about water quality and contamination due to pesticides and agriculture.

Please contact me via email or phone at your convenience so we can schedule next steps for further contact with the Staff.

Thank you again.

Sincerely,

Elsa Dooling
Central Coast Community Organizer
Pesticide Watch Education Fund
831.236.8538

PO Box 1217



California Regional Water Quality Control Board
Central Coast Region
895 Aerovista Place, Suite 101,
San Luis Obispo, California 93401-7906

Attention:
Angela Schroeter, Agricultural Regulatory Program Manager
aschroeter@waterboards.ca.gov
Howard Kolb, Agricultural Order Project Lead Staff
hkolb@waterboards.ca.gov.

Subject: preliminary draft Agricultural Order

June 16, 2010

Dear Angela Schroeter and Howard Kolb

Thank you for the opportunity to review the PRELIMINARY DRAFT AGRICULTURAL ORDER CONDITIONALLY WAIVING INDIVIDUAL WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM IRRIGATED LANDS (Order). Our review of this Order is oriented from the Sierra Club's interests to preserve and protect natural resources and associated water quality benefits provided by properly functioning streams and wetlands.

We appreciate the dilemma discussed in attachment 5, top of page 8, describing the challenge to implement a program to maximize water quality benefits and minimize implementation problems within the agricultural economy. We believe the draft order is on the right track to achieve the water quality objectives, and it appears compatible with some water resource and flood protection programs in the Central Coast that may contribute to solutions, offsetting costs to agriculturists. We are optimistic that the clarified and new regulations in the Order will result in agricultural practices that are able to integrate with multi-objective water resource and flood protection infrastructure projects and thus distribute and reduce costs among stakeholders. Presently in the Pajaro River Watershed, there are a few such projects which are organized into an Integrated Resource Water Management Plan (IRWMP) intended to benefit agricultural and other stakeholders in the Watershed. We anticipate the "Farm Plan" development process discussed in the Order will provide for water quality improvements that can be credited to the Watershed Projects, increasing their "Benefit Cost" ratios thus making them more competitive for federal and state funding. Our comments below elaborate on this point in the Pajaro River Watershed, with which we are most familiar, but which we anticipate may be generic to the Central Coast region.

Our review comments are organized about Attachment B, utilizing the page number and topic to list our comments as follows:

Page 5, Farm Plan <CLARIFICATION AND ADDITION >

Farm Plan must focus on resolving priority water quality issues related to individual operations and the watershed. Farm Plan must include irrigation management, pesticide management, nutrient management, salinity and sediment management, and Plan must identify and schedule implementation of practices to eliminate or minimize discharge of waste using best practicable treatment or control. Farm Plan nutrient management plan element must be certified by professional to be protective of water quality. Farm Plan must be updated at least annually. Upon notice by the Executive Officer, Farm Plan must be submitted to the Water Board. Discharger must modify Farm Plan upon notice by the Executive Officer. Farm Plan must include photo documentation of aquatic habitat.

We agree that the Farm Plan needs to address " *resolving priority water quality issues related to individual operations and the watershed.*" However, it appears the Draft Order prioritizes irrigation run-off issues over the matter of storm water drainage. We believe both issues should be addressed in the Final Order. Poorly managed storm water has potential adverse water quality impacts to local drainage, regional receiving channels and natural streams. Lower watershed communities are at a significantly greater risk than those in the upper watershed due to the accumulated impacts as the watershed area increases. Strategic storm water management on the other hand may address this disparity and conversely have greater potential positive impacts to receiving waters if multi-objective goals for drainage and flood control projects are pursued watershed wide. Contemporary state and federal flood protection programs are capable of accommodating such multi-objective planning, and there are such projects presently taking place in the Pajaro River Watershed. These projects include the USACE Upper Llagas Creek Project in the Morgan Hill area and the USACE Lower Pajaro River Project in the Watsonville area. Presently these projects are preparing environmental impact studies including NEPA and CEQA documents which are expected to be reviewed by the CCRWCB during the interim renewal period of time for this Order. The Sierra Club will advocate said contemporary multi-objective planning policy for these projects and point out how they can contribute or support the beneficial uses of water as discussed in the Attachment 2 page of this Draft Order. We believe water quality problem solving needs to occur at various scales and take into account the roles and responsibilities of all involved.

We support the CCRWQCB's focus on the "Farm Plan", and its role of contributing to solutions at the local scale, but believe it needs to be strategically linked to large scale solutions such as the aforementioned flood control projects. We are optimistic that the water resource-flood control infrastructure planned for the Pajaro River Watershed will provide for a robust agricultural economy because of the contemporary planning, cooperation and progress made in the water resources area. We believe the CCRWQC will need to issue a 401 Water Quality Certification for these projects and should condition them to require water quality improvement design and construction elements.

Despite the growing pains Pajaro River Watershed water agencies have endured lately, continued progress has prevailed producing work plans and funding to solve the Pajaro Watershed's water resource problems. The aforementioned Pajaro River IRWMP could study the pollution issues identified and reported in the Farm Plans. The Final Order should identify this potential IRWMP linkage to multi-objective problem solving to optimize private enterprise and government solutions and funding at the watershed scale.

Perhaps an International Standards Organization (ISO) protocol can ultimately be developed specific to Pajaro Valley excess irrigation/ storm water discharge practices adjacent to:

- Levees or modified floodplains
- reclaimed water pipelines
- wetlands
- groundwater recharge areas (instream and off stream)

Perhaps the universal recognition of an ISO for water quality could contribute to the array of solutions appropriate to address the food safety confidence issue.

Page 12, Aquatic Habitat Requirements; < ADDITION

See Preliminary Draft Order Attachment B- Terms and Conditions; Part G. >

Proposed requirements include 1) protection of existing perennial, intermittent, or ephemeral streams or riparian or wetland area habitat; 2) minimum buffers widths for perennial and intermittent streams; 3) minimum buffer widths for lakes, wetlands, and estuaries. OPTION to minimum buffer requirements is development and implementation of a Riparian Function Protection and Restoration Plan; 4) identification of aquatic habitat on ranch maps and photo documentation.

We agree that Aquatic Habitat requires protection as a beneficial use including aquatic life (warm or cold freshwater habitat, wildlife habitat). We view aquatic and riparian habitat as inter-dependent with water quality in its role hosting the chemical, physical, and biological processes that function to keep water clean and vital. It serves as an indicator of the integrity and health of a watershed and its resistance to water pollution and groundwater contamination. We are encouraged by the case studies cited in the PRELIMINARY DRAFT STAFF RECOMMENDATIONS FOR AN AGRICULTURAL ORDER page 17 where constructed wetlands were installed providing a measured level of water quality improvement. We anticipate that such wetland projects will require formal planning at the watershed scale in context with features such as river reaches or lakes that perhaps have been modified for flood protection or water supply purposes involving public works infrastructure. We believe the aforementioned projects in the Pajaro River Watershed (and projects in other locations in the region) provide opportunities to address agricultural run-off pollution issues to a significant degree. The local drainage collection and drainage system typically situated at the outboard toe of a flood protection levee could be designed to include a constructed wetland to receive pre-treated agricultural run-off. This run-off would originate from the tail water at the low end of an irrigated field shown on the Farm Plan and could drain into the levee drainage/wetland system for interim storage, treatment, monitoring, and appropriate remedial measures before it would be discharged onto the lower terrace floodplain and riparian corridor. This highly productive zone of hydrophilic vegetation could be managed to improve water quality in the receiving water body.

Thank you for the opportunity to comment on the Draft Order and we look forward to participating at your July 8, 2010 public meeting in Watsonville.

Sincerely,
Kenn Reiller
Chair, Sierra Club Ventana Chapter
Water Committee

Carol Georgi <cdgeorgi@hotmail.com> 06/18/10 16:37 >>>

Surfrider Foundation San Luis Bay Chapter www.slosurfrider.org

Attn: Angela Schroeter Agricultural Regulatory Program Manager California
Regional Water Quality Control Board
895 Aerovista Place, Suite 101 San Luis Obispo, CA 93401-7906
RE: public comment of the Agricultural Order

Dear Water Quality Board Members,

The Surfrider Foundation San Luis Bay Chapter is in support of the California Agricultural Order for water quality regulations for agricultural runoff. Our members use our coastal waters daily, and many report illness and disgust when agriculture runoff is present in the water. We have learned that urea in agricultural runoff results in the formation of domoic acid that acts as a neurotoxin in marine mammals and humans. This chemical reaction is one example of the harmful results caused by agricultural runoff and is documented by Dr Raphael Kudela of UCSC who informed SLO county of these health risks on April 29, 2010 at the Marine Interests Group. Dr Kudela's research is included at the bottom of this letter.

We need protection from agricultural runoff for our health and safety. We deserve to have non-polluted coastal waters; our beaches are not sewers. We understand that there are about 1500 farms on the central coast. Unregulated agricultural runoff is exposing citizens to health risks and asking the coastal communities to foot the bills of cleaning up rivers, streams, and coastal waters from pollution caused by agricultural runoff.

Non-polluted coastal waters is an important resource for all of California. We must work together to keep pollutants and toxins out of the water.

Yours Sincerely,

Jeff Pienak, Chair Surfrider Foundation San Luis Bay Chapter
www.slosurfrider.org

Addendum: Dr Raphael Kudela's research regarding the harm to humans from urea in coastal waters as a result of agricultural runoff.

Dr Raphael Kudela of UCSC spoke at the April MIG meeting "Marine Animals as Ocean Sentinels of Harmful Algae: Early Warning or ignored Problem"
Notes: the presence of urea in ocean water is rare; humans are the main source of urea in the ocean water from Agricultural runoff & septic system leakage. Urea in ocean water increases (doubles) the growth of the toxic bloom associated with red tide. When the toxic bloom growth is doubled, toxicity results. Domoic Acid (DA) is a chemical that is produced by algae or plankton when it blooms. In marine mammals and humans, DA is a tricarboxylic acid that acts as a neurotoxin.
65% of CA sea lion and sea otters studied, tested positive for domoic acid in their blood-----domoic acid information and

history: http://www.cimwi.org/stranded_domoic.html
-----this url is the pdf of Dr. Raphael Kudela's scientific research on toxic algae in California.

http://oceansci.ucsc.edu/faculty/documents/1_Kudela_HA_2008.pdf Accepted
Manuscript
Title: The Potential Role of Anthropogenically Derived Nitrogen in the

Growth of Harmful Algae in California, USA
Authors: Raphael M. Kudela, Jenny Q. Lane, William P. Cochlan
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The Potential Role of Anthropogenically Derived Nitrogen in the Growth

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The Potential Role of Anthropogenically Derived Nitrogen in the Growth of Harmful Algae in California, USA

Raphael M. Kudela^{1*}, Jenny Q. Lane¹, and William P. Cochlan²
¹Ocean Sciences Department, University of California Santa Cruz, 1156 High Street, Santa Cruz, CA 95064, USA
²Romberg Tiburon Center for Environmental Studies, San Francisco State

University, 3152 Paradise Drive, Tiburon, CA 94920-1250, USA
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1

Page 1 of 36

Accepted Manuscript

1 Abstract 2 3 Cultural eutrophication is frequently invoked as one factor in the global increase in 4 harmful algal blooms, but is difficult to definitively prove due to the myriad of factors 5 influencing coastal phytoplankton bloom development. To assess whether eutrophication 6 could be a factor in the development of harmful algal blooms in California (USA), we 7 review the ecophysiological potential for urea uptake by *Pseudo-nitzschia australis* 8 (*Bacillariophyceae*), *Heterosigma akashiwo* (*Raphidophyceae*), and *Lingulodinium* 9 *polyedrum* (*Dinophyceae*), all of which have been found at bloom concentrations and/or exhibited noxious effects in recent years in California coastal waters. We include new 11 measurements from a large (*Chlorophyll a* > 500 mg m⁻³) red tide event dominated by 12 *Akashiwo sanguinea* (*Dinophyceae*) in Monterey Bay, CA during September 2006. All of 13 these phytoplankton are capable of using nitrate, ammonium, and urea, although their 14 preference for these nitrogenous substrates varies. Using published data and recent 15 coastal time series measurements conducted in Monterey Bay and San Francisco Bay, 16 CA, we show that urea, presumably from coastal eutrophication, was present in 17 California waters at measurable concentrations during past harmful algal bloom events. 18 Based on these observations, we suggest that urea uptake could potentially sustain these 19 harmful algae, and that urea, which is seldom measured as part of coastal monitoring 20 programs, may be associated with these harmful algal events in California. 21 22 23 Key Words: ammonium, eutrophication, nitrate, nitrogen uptake kinetics, urea

<http://people.ucsc.edu/~kudela/>

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Kudela lab web page Latest Satellite Imagery Cal-PReEMPT (HAB monitoring) Class web pages Ocea130/230 Biological Oceanography Ocea 101

The Marine Environment Overview: I am a phytoplankton ecologist who

wishes to understand the fundamental question: what controls phytoplankton growth and distribution in the ocean. More specifically, how do the multiple interactions of light, macro- and micronutrients and phytoplankton physiology determine the rates, processes, and patterns we observe in the marine environment? Oceanography is rapidly moving away from observational science towards an understanding of underlying mechanistic processes at all scales, in part because of the wealth of revolutionary new technological and scientific advances. My approach is to combine a suite of 3 tools: (1) remotely sensed data from moorings and satellites in combination with biological models; (2) novel bio-optical methods assaying phytoplankton physiology; and (3) the refinement of stable and radio-tracer isotopes. Specific Research: We are currently working on several projects in the laboratory and field, primarily in central California. CIMT: Within the Monterey Bay National

Marine Sanctuary, we are part of a multi-institution program (the Center for Integrated Marine Technology) which aims to understand the linkages from wind to whales. We are involved in the shipboard and remote sensing components of this project. The CIMT website has many more details. ECOHAB: Within the Monterey Bay region, there are several funded groups working closely together on the Pseudo-nitzschia/domoic acid complex. We are funded to develop in the field and laboratory an understanding of how Si, N, C, and light interact physiologically to trigger DA production, and to develop molecular markers for toxin production.

Colleagues at MBARI (C. Scholin), UCSC (D. Garrison, M. Silver, J. Goldman, E. Rue), U. Maine (M. Wells), and MLML (G.J. Smith) are working on related aspects, ranging from the role of metal availability, including iron, to the transfer of toxin through the marine food web. Cal-PReEMPT: In collaboration with Dr. Gregg Langlois at the California Department of Health Services, we are developing better monitoring tools for Harmful Algal Blooms occurring in the state of California, with funding from the NOAA MERHAB program. This is a multi-year effort involving Peter Miller (lead PI) and Mary Silver at UCSC, as well as Rick Stumpf (NOAA) and collaborators in Oregon and Washington states. See the Cal-PreEMPT webpage for details.

NASA projects: A physiological model of nitrogen utilization by natural phytoplankton assemblages which can predict new production in coastal waters using remotely sensed data (AVHRR and ocean color data) or moorings was developed as part of NASA grant NAG5-6563. As part of the EPA funded Coastal Intensive Sites Network (CISNet; NASA grant NAG5-7632), we also developed regional algorithms (pigments, CDOM, sediments, new production) along a gradient of water conditions, from the blue-water stations occupied off central California to the turbid waters of San Pablo Bay. These methods are currently being applied to ongoing projects, including CoOP and CIMT.

CoOP: As part of an NSF-sponsored Coastal Ocean Projects program, we were part of a 5-year study of coastal productivity (The Role of Wind Driven Transport in Shelf Productivity). This program has 3 field years, with a combination of instrumented moorings and cruises, followed by two years of data assimilation and development of a coupled physical-biological model. We are responsible for the bio-optical component and shipboard process studies, and is developing regional algorithms for new and primary production. More information is available here.

As part of the CoOP program River Influences on Shelf Ecosystems (RISE), we are currently evaluating the role of the Columbia River Plume in modulating coastal productivity. This program is also 5 years, with 4 field seasons and an integrated modeling component. More information is available here.

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